Australasian Health Facility Guidelines

Design Guidance: Doors

28 January 2025

Version 1

AHIA
australasian health infrastructure alliance

AusHFG
Australasian Health Facility Guidelines

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Website: http://www.healthfacilityguidelines.com.au

Email: HI-AusHFGteam@health.nsw.gov.au

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AHIA recommends that those seeking to rely on the information in the AusHFG obtain their own independent expert advice.

Cultural Acknowledgement and Terminology

The Australasian Health Facility Guidelines (AusHFG) are developed in collaboration with stakeholders across Australia and Aotearoa, New Zealand.

Acknowledgement of Country

We acknowledge the Aboriginal people and Torres Strait Islander people as traditional owners and continuing custodians of the land throughout Australia and the Torres Strait Islands.

We acknowledge their connection to land, sea and community and pay respects to Elders past, present and emerging.

Acknowledgement of Te Tiriti o Waitangi

We acknowledge Māori as tāngata whenua in Aotearoa New Zealand.

Te Tiriti o Waitangi obligations have been considered in developing these resources.

Terminology and Language in the AusHFG

Throughout the AusHFG resources, the term ‘Indigenous Peoples’ is used to refer to both the Aboriginal and Torres Strait Islander Peoples of Australia and Māori of Aotearoa, New Zealand. Where references to specific cultural requirements or examples are described, the terms ‘Aboriginal and Torres Strait Islander Peoples’ and ‘Māori’ are used specifically. The AusHFG respect the right of Indigenous Peoples to describe their own cultural identities which may include these or other terms, including particular sovereign peoples or traditional place names.

Contents

1 Introduction 5
1.1 Context 6
1.2 Policy and Legislative Framework 7
1.2.1 Building Codes 7
1.2.2 Accessibility 7
2 Universal Design Principles 9
2.1 Application 10
3 Terminology 11
3.1 Door Types 11
3.2 Door Components 17
3.3 Other Important Terms 19
4 Construction and Performance Requirements 20
4.1 Leaf, Frame and Clear Opening Dimensions 20
4.1.1 Leaf and Frame Widths 20
4.1.2 Standard Door Leaf Widths 20
4.1.3 Clear Opening Width 21
4.1.4 Clear Opening Width Calculations 21
4.1.5 Typical Clear Openings and Associated Room Functions 22
4.1.6 Leaf and Frame Heights 23
4.1.7 Clear Opening Height 23
4.2 Door Materials 24
4.2.1 Solid Core Doors 24
4.2.2 Fully Glazed Doors 24
4.3 Glazing 25
4.3.1 Vision Panels 25
4.3.2 Sidelights 26
4.3.3 Transom / Highlight / Top Light Windows 26
4.3.4 Integral Blinds 27
4.3.5 Switchable Glass 28
4.3.6 Vision Panel Covers 28
4.4 Shielding 30
4.4.1 Ionising Radiation 30
4.4.2 Magnetic and Radio Frequency 31
4.5 Fire Doors and Smoke Doors 32
4.6 Negative and Positive Pressure 33
4.7 Acoustic Doors 34
4.8 Specialty Doors 35
4.8.1 Strong Room 35
4.8.2 Cool Room 35
5 Automatic Doors 36
5.1 Activation Devices 37
5.2 Safety, Ergonomics and Ease of Movement 37
5.3 Automation of Swing Doors with Unequal Leaves 38
6 Finishes and Door Protection 39
6.1 Clinical Spaces 39
6.2 Non-clinical Spaces 39
6.3 Back of House Spaces 40
6.4 Door Protection 40
6.5 Privacy Film 41
6.6 Glazing Decals 41

7 Accessibility 42
7.1 Exemptions to Access 42
7.2 Accessible Clear Openable Width of Doorways 42
7.3 Circulation at Doorways 43
7.4 Maximum Force to Operate 43
7.5 Luminance Contrast 44
7.5.1 Glazed Doors 45
7.6 Braille Tactile Signage Associated with Doorways 46
8 Door Hardware 47
8.1 Handles and Push Plates / Pull Handles 47
8.2 Locks and Latches 48
8.3 Hold Open Devices 48
8.4 Door Closers 49
8.5 Hinges 50
8.6 Emergency Release 50
8.7 Door Seals 50
8.8 Door Bolts 50
8.9 Door Stops 51
8.10 Automation / Motorisation 51
8.11 Door Sensors 51
9 Electronic Controls, Security and Access Control 52
9.1 Electronic Controls 52
9.2 Electronic Security Systems 52
9.3 Access Control 53
9.3.1 Proximity Swipe Card 53
9.3.2 Digital Keypad 53
9.3.3 Remote Door Release 54
9.3.4 Interlock Systems 54
9.4 Electronic Locks 55
9.5 Push Buttons 55
9.6 Door Control Locations 55
9.6.1 Door Controls on Totem / Bollard 56
10 Doors in Mental Health Units 57
10.1 Anti-Ligature Designs 57
10.1.1 Ligature Detection Systems 58
10.2 Anti-Barricade Designs 58
10.3 Other Functional Requirements 59
10.4 Continuous Hinges 59
10.5 Emergency Release Hardware 60
10.6 Robust Materials 60
11 Planning Principles 61
References 62
Glossary 64

1 Introduction

Hospitals are complex and technical buildings with key clinical and non-clinical functionality requirements. All doors within hospitals will have specific performance capabilities, including accessibility, security, safety, fire rating, infection prevention and control, and ventilation. The performance requirements of a door are determined by the function of the space around it.

Doors and their functionality have a substantial impact on everyday workflows. Hospital operators and design teams are required to develop and apply successful door strategies across a facility, understanding any specific performance requirements, to address the impact on workflows.

Trolley and bed movements within and between departments rely on well-considered door functionality to ensure efficient movement. Specific clinical spaces, such as medication rooms or mental health spaces, rely on well-planned access-control at doorways to support safety and security. Bedroom doors and doors to some treatment and diagnostic spaces are required to be easily opened and closed, but also require specific clearances to allow for bed movement in and out of the room. The effect of doors not meeting functional requirements results in damage to doors, such as scuff marks, chips to door leaves, broken door closers, or the need to place large instruction signs on doors or on the adjacent wall.

Doors represent a significant cost in any capital health infrastructure project due to their quantity, complexity, For example, electrically actioned doors, such as those with automated sensor openers, or fire doors with magnetic locks and access control, require extensive design co-ordination between various design consultants and trades (i.e. electrical engineering consultants, National Construction Code (NCC) or New Zealand Building Code (NZBC) consultants, Disability Discrimination Act (DDA) consultants, architectural consultants, etc.). Significant savings can be anticipated when hospital operators and design teams have a robust knowledge of door requirements and apply successful strategies during design to support efficient operation and continual management, thus reducing maintenance.

This document provides definitions, information and considerations for doors and associated elements that are used on healthcare infrastructure projects across Australia and New Zealand. The intent is to identify and provide guidance on:

- Terminology and Door Types
- Construction and Performance requirements
- Finishes
- Accessibility
- Hardware and Controls
- Doors within specific healthcare settings, such as Mental Health

Figure 1 Examples of various door types found across healthcare facilities

1.1 Context

The AusHFG are comprised of a series of documents that detail a range of information to assist project teams to plan and design healthcare facilities (see Figure 2). This guidance document should be read in conjunction with the AusHFG Standard Components, Relevant Health Planning Unit Documents and the over-arching guidance described in the AusHFG Parts:

- Part A: Introduction and Instructions for Use
- Part B: Health Facility Planning and Briefing
- Part C: Design for Access, Mobility, Safety and Security
- Part D: Infection Prevention and Control

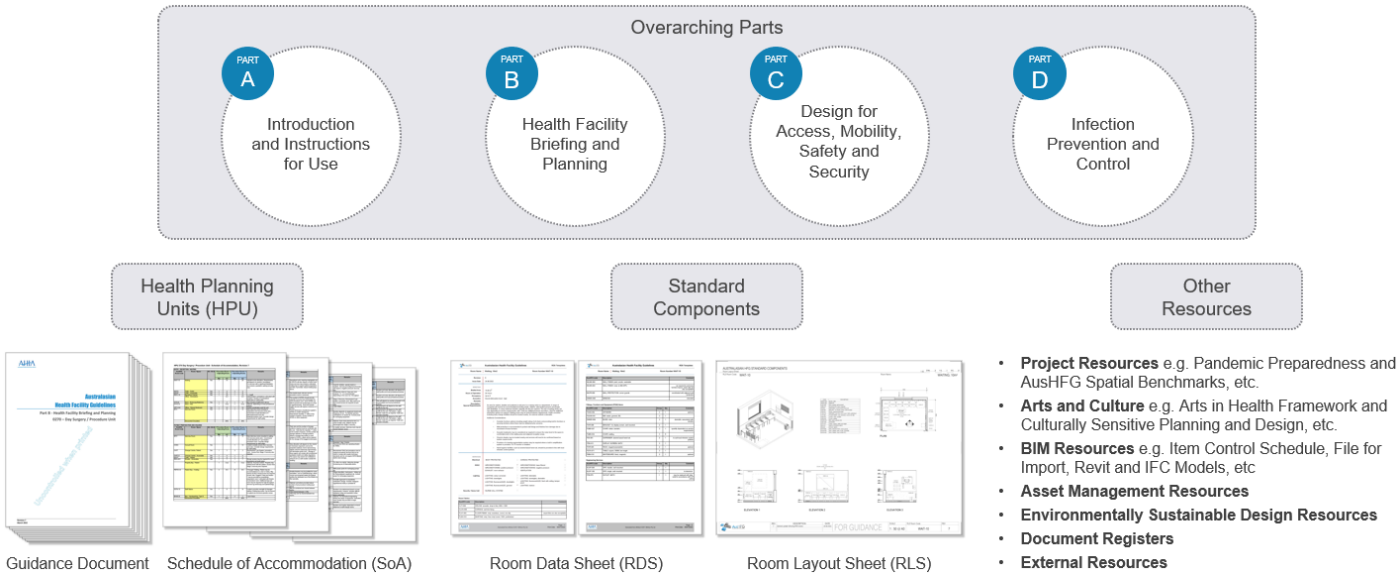


Figure 2 Structure of AusHFG resources

This document is intended to be a reference for **general information** on doors.

- For information regarding specific departmental requirements and considerations, refer to the individual Health Planning Unit documents.
- For information on specific room requirements, including recommended doors, as well as considerations for different contexts, refer to the Room Data Sheets (RDS) and Room Layout Sheets (RLS) for individual Standard Components.

1.2 Policy and Legislative Framework

Application of the AusHFG on a health capital project will be dependent on the jurisdiction in which the project is taking place. Before undertaking a project, planners and project personnel should familiarise themselves with individual jurisdiction plans, policies, service specific guidelines and reports. Jurisdictions may require project teams to apply these jurisdiction-specific resources in conjunction with or overriding AusHFG guidance.

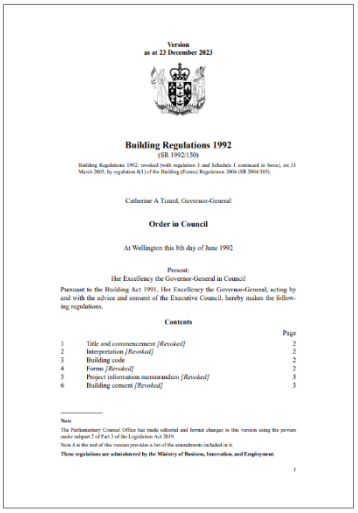
The guidance in the AusHFG is to be applied in conjunction with other resources that take precedence over the AusHFG, such as:

- Australian National Construction Code (NCC) or New Zealand Building Code (NZBC).
- Australian and New Zealand (NZ) Standards (where legislation mandates).
- Australian/NZ and local jurisdictional policies, for example relating to infection prevention and control, and work health and safety.

1.2.1 Building Codes

For the purposes of this document, the acronym 'NCC' will be used when referring to the National Construction Code for Australia, which is inclusive of the Building Code of Australia (BCA) as Volumes 1 and 2, and the Plumbing Code of Australia (PCA) as Volume 3 (see Figure 3). The acronym 'NZBC' will be used when referring to the New Zealand Building Code found in Schedule 1 of the Building Regulations 1992 (see Figure 4).

Figure 3 National Construction Code Volumes 1 2 and 3


Version as at 23 December 2023

Building Regulations 1992
(SR 1992/150)

Catherine A Tizard, Governor-General

Order in Council

At Wellington this 8th day of June 1992

Present:
Her Excellency the Governor-General in Council

Contents

Figure 4 New Zealand Building Code

The NCC (Australia) and the NZBC (New Zealand) provide the minimum performance requirements to be satisfied in their respective countries. These requirements may be exceeded to meet project specific needs.

1.2.2 Accessibility

Australia

The statutory framework for accessible access is nominated in Section D of the NCC.

NCC Part *A4 Referenced Documents* refers to *NCC Schedule 2* which nominates the Australian Standards relied upon by the NCC. NCC 2022 Part A4G1(3) provides the following clarification:

Where a new edition, issue or amendment of a primary referenced document is not listed in Schedule 2, the new edition, issue or amendment is not referenced for the purpose of the NCC.

The current requirements for doorways to rooms required to be accessible is nominated in AS1428.1:2009.

The following Acts, Codes, Standards and Guidelines will be referenced when selecting doors and door hardware for health facilities:

- National Construction Code
- AS 1428 Design for Access and Mobility
- Disability Discrimination Act 1992
- Disability (Access to Premises - Buildings) Standards 2010 (DDA 1992)

New Zealand

The statutory framework for accessible access is nominated in Section D of the NZBC. The current requirements for doorways to rooms required to be accessible is nominated in NZS 4121 Design for Accessibility and Mobility.

The following Acts, Codes, Standards and Guidelines will be referenced when selecting doors and door hardware for health facilities:

- New Zealand Building Code
- NZS 4121 Design for Access and Mobility
- The Building Act 2004
- New Zealand Public Health and Disability Act 2000
- Health and Disability Commissioner Act 1994
- Human Rights Act 1993
- New Zealand Bill of Rights Act 1990

Universal Design principles outlined within the Te Whatu Ora (Heath NZ) *Design Guidance Note DGN V2.0: NZ Health Facility Design* should be considered and incorporated with regard to the seven principles of Universal Design (see Section 2 Universal Design Principles).

2 Universal Design Principles

Universal Design is the design and composition of the environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability. The following seven universal design principles, developed in 1997 by a working group led from North Carolina State University, are intended to guide the design of environments, products and communications.

Principle 1: Equitable Use

The design is useful and marketable to people with diverse abilities.

- Provide the same means of use for all users; identical whenever possible or equivalent when not.
- Avoid segregating or stigmatizing any users.
- Provisions for privacy, security, and safety should be equally available to all users.
- Make the design appealing to all users.

Principle 2: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

- Provide choice in methods of use.
- Accommodate both right- and left-handed access and use.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.

Principle 3: Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

- Eliminate unnecessary complexity.
- Be consistent with user's expectations and intuition.
- Accommodate a wide range of literacy and language skills.
- Arrange information consistent with its importance.
- Provide effective prompting and feedback during and after task completion.

Principle 4: Perceptible Information

The design communicates information effectively to the user, regardless of ambient conditions or user's sensory abilities.

- Use multiple modes (pictorial, verbal, tactile) for presentation of essential information.
- Provide adequate contrast between essential information and its surroundings.
- Maximize "legibility" of essential information.
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Provide compatibility with various techniques or devices used by people with sensory limitations.

Principle 5: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental actions.

- Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- Provide warnings of hazards and errors.
- Provide fail safe features.
- Discourage unconscious action in tasks that require vigilance.

Principle 6: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum fatigue.

- Maintain a neutral body position.
- Use reasonable operating forces.
- Minimize repetitive actions.
- Minimize sustained physical effort.

Principle 7: Size and Space for Approach and Use

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

- Provide a clear line of sight to important elements for any seated or standing user.
- Make reach to all components comfortable for any seated or standing user.
- Accommodate variations in hand size, grip and dexterity.
- Provide adequate space for the use of assistive devices or personal assistance.

2.1 Application

Application of a Universal Design approach can be integrated into any design process through identification of diverse user needs, characteristics, capabilities, and preferences (including acknowledging where different user needs are in competition) which are then accounted for in the final design. As a building element, doors represent a significant element that can improve usability and access within a space. Applying Universal Design principles to doors at an individual level (door type, design and hardware specification) and at a strategic level (paths of travel, public and restricted areas, etc.) will benefit patients, visitors and staff.

3 Terminology

This section outlines standard door terminology regarding door types and door components. These terms will be used throughout this document, within the AusHFG Standard Components and in the AusHFG Item Control Schedule. The terms align with those currently used on health facility projects and with those typically used in the construction industry.

3.1 Door Types

Door types are characterised by the method in which the door is used. Considerations for applied hardware may affect the use of each door type, including the use of automated/motorised operation, fire management and security overlays.

Hinged Doors

A hinged door is a type of swing door where the door leaf (or leaves) swings to an open position on side-mounted hinges. Hinged doors may be single leaf doors, 1½ leaf doors, or double leaf doors (see Figure 5, Figure 6 and Figure 7).

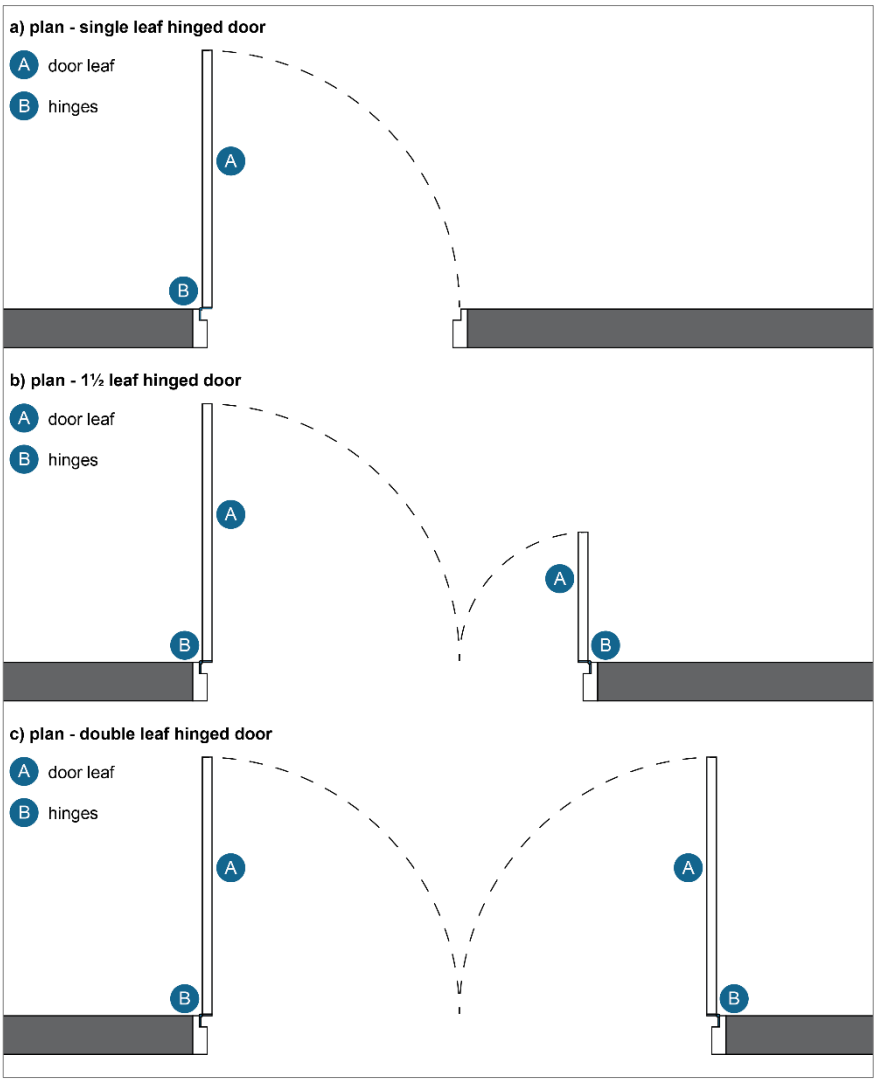


Figure 5 Diagram of hinged a) a single leaf door, b) a 1½ leaf door, and c) a double leaf door

Figure 6 Example of single leaf hinged door to a meeting room

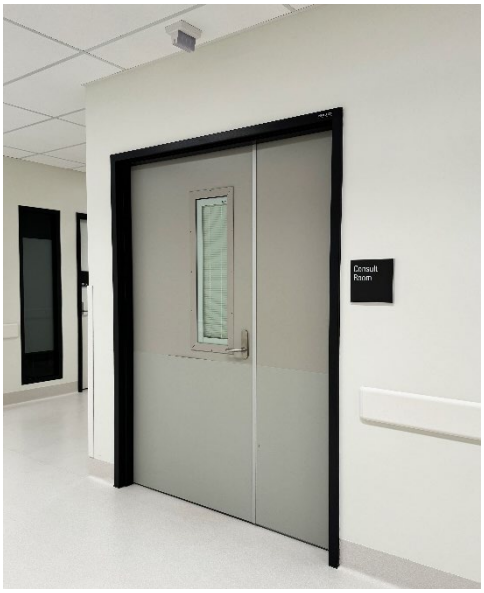


Figure 7 Example of 1½ leaf hinged door to a consult room

Pivot Doors

A pivot door is a type of swing door where the door leaf (or leaves) swings to an open position on a vertical pivot point (see Figure 8 and Figure 9). A pivot door uses two pivot hinges, one mounted on the top side of the door leaf and attached to the head of the frame, and the other is mounted on the bottom side of the door leaf and is attached to the floor. The door swing can be restricted to swing in one direction or allowed to swing in both directions. Pivot doors may be single leaf doors or double leaf doors.

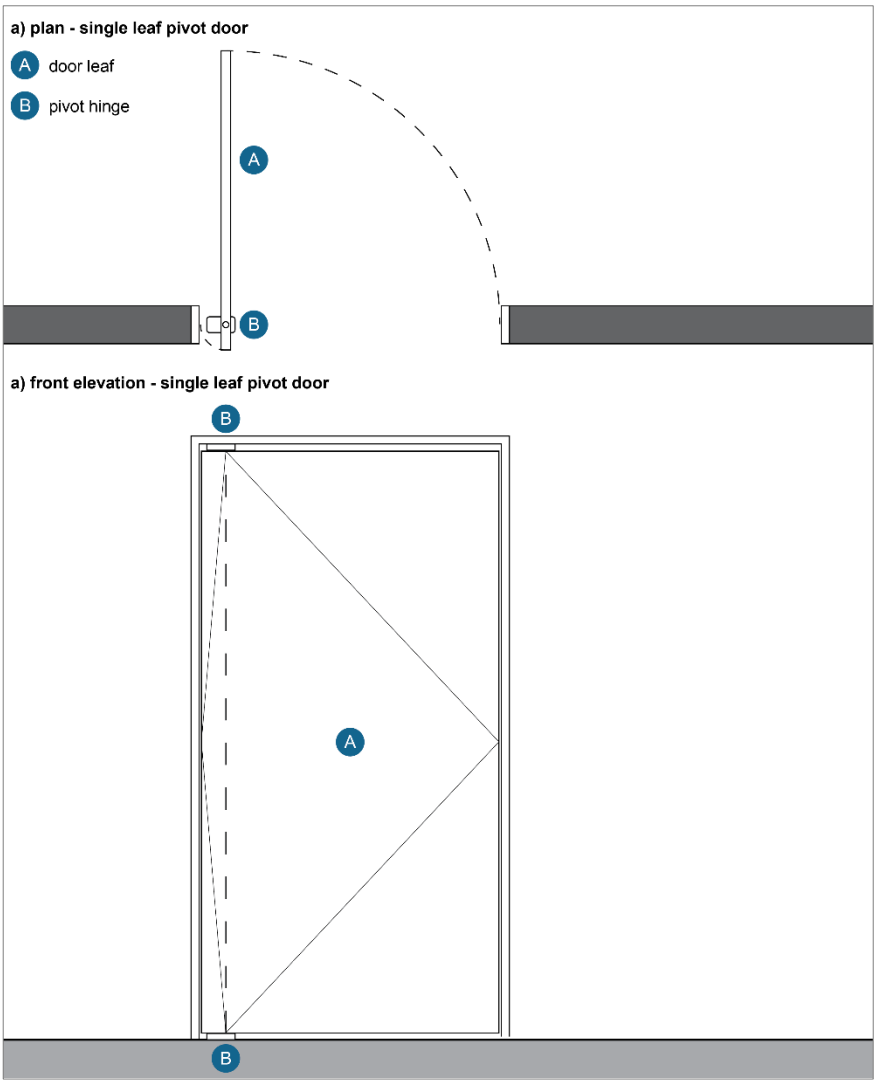


Figure 8 Diagrams of single leaf pivot doors in a) plan, and b) elevation

Pivot doors design may be used with emergency release hardware (see Section 8.5 Emergency Release) to allow a door that is typically restricted to swinging in one direction, to swing in the opposite direction for access to the room in an emergency. This is common for toilet doors where it would be inappropriate for the door to swing out into a circulaton zone.

Figure 9 Example of pivot door in corridor

Figure 10 Example of pivot door to toilet with emergency release hardware

Sliding Doors

The door leaf (or leaves) of sliding doors move sideways to an open position into cavity, along the surface of an adjacent wall or along adjacent glazing (see Figure 11). Sliding doors may be single leaf doors or double leaf doors (also called bi-parting doors). For doors with multiple leaves that slide in the same direction refer to the section below on Stacking Doors.

In healthcare settings, the use of cavity sliding doors must be carefully considered. Ongoing maintenance and significant infection prevention and control requirements, including the ability to clean the door leaf, frame and surrounds, must be assessed to ensure the use of a cavity sliding door is an appropriate option.

Figure 11 Example of sliding doors to an anaesthetic preparation room

Stacking Doors

The door leaves of stacking doors, also referred to as telescopic doors, slide horizontally along a track to stack in an open position along the surface of an adjacent wall or alongside a single fixed panel (see Figure 12 and Figure 13).

Figure 12 Example of manually operated stacking door with two leaves stacking behind a fixed panel to an acute care room

Figure 13 Example of an automatic stacking door with two leaves stacking beside a wall to an ambulance entry

Folding Doors

For a folding door (also bi-folding or concertina doors), two or more door leaves are hinged together with one leaf fixed to the door frame (see Figure 14). The hinged leaves fold in on themselves whilst sliding horizontally on a track (typically top hung) to stack to the side in an open position perpendicular to the frame.

Figure 14 Example of automatic folding door with 4 leaves at a building entry

Roller Shutter / Roller Grille

A roller shutter is a curtain of interconnected hinged slats, or a sheet of flexible corrugated material which slides vertically along guide rails and then rolls around a barrel/drum or slides horizontally overhead on tracks that are paralell to the ceiling (see Figure 15). A Roller Grille is similar in configuration and movement to a roller shutter, however the curtain is made up of interlinked metal tubing and is used where physical access may need to be restricted but visual access is required or preferred (see Figure 16).

Both types of roller doors may be manually operated, by lifting from the bottom of the curtain or with a chain mounted at the side of the door. However, it is common for large roller doors to be motorised due to WHS requirements relating to the weight of the door curtain and the reach required to secure the curtain in the open position or pull the curtain down to close it.

Figure 15 Example of roller shutter to a loading dock

Figure 16 Example of a roller grille to a reception desk

Revolving Doors

Revolving doors typically have two, three or four leaves fixed to a central shaft. The leaves rotate around a vertical axis within a cylindrical enclosure (see Figure 17). The moving leaf may also be cylindrical, though this is not a common configuration.

Revolving doors have higher initial investment and ongoing maintenance costs compared to other types of automatic doors and they require a significant amount of space, making them unsuitable for small entrances. However, revolving doors can support energy efficiency by reducing drafts that are associated with airlocks/entry ways, positively impacting HVAC running costs.

For emergency evacuation, revolving doors should not be the only exit point.They should be accompanied by outward swinging exit doors to support smooth movement of people during egress.

Revolving doors are not typically used in hospitals as the designs are often not accessible for people with disabilities, are intimmidating to people who move slowly or with assistive equipment and can be difficult to navigate by those using carts or prams.

Figure 17 Example of a revolving door at a building entry

Operable Walls

Operable walls are made up of panels (either individual or in hinged pairs/groups) that move horizontally along a track. When fitted together the panels form a continuous wall and when open, the panels stack to the side between two or more rooms allowing for a larger space to be used (see Figure 18, Figure 19 and Figure 20).

In healthcare settings, operable walls are commonly used in education areas and administration areas where large spaces need to be flexible and able to be broken into smaller spaces, increasing overall utilisation of the space.

Panels are often finished with sound absorbing materials, as their common use in meeting and learning spaces dictates the acoustic requirements the operable walls need to support. However, panels may be finished with a variety of materials, including timber, laminate and glass. Functional elements such as whiteboard materials may be incorporated into the panels as well.

Hinged doors may be inset into the operable panels (see Figure 18 and Figure 20) to allow for access between rooms when the panels are closed – these doors would be specified as part of the overall operable wall system.

Figure 18 Example of operable wall with some panels stacked

Figure 19 Example of operable wall with an inset door to one panel

Figure 20 Example of inset door in an operable wall panel

Gates

A gate is a hinged, pivot or sliding door within a fence or barriers. In external applications, such as surrounding uncovered plant areas, gates are typically metalwork, along with the fence they are integrated into (see Figure 21). When used internally, for example as part of a barrier surrounding a child play area in a waiting room, various materials such as timber, glass and metal may be used (see Figure 22).

Gates are typically specified as part of the overall fencing/barrier system in which they are integrated.

Figure 21 Example of an external gate in a metal work fence

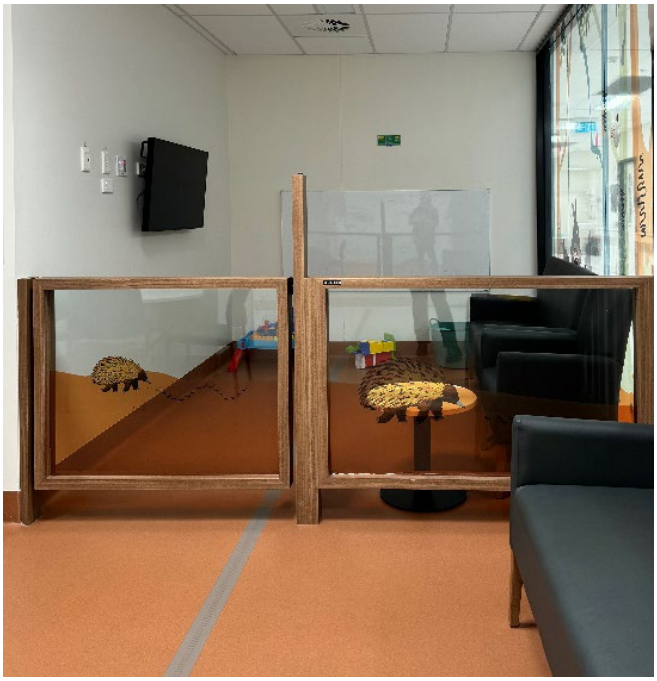


Figure 22 Example of interior gate to a children's play area

3.2 Door Components

Door components are specific door elements required for functionality and use of a door. Some of these components are not nominated within the AusHFG Standard Components or AusHFG Item Control Schedule. However, they are required to be detailed and scheduled on projects to provide all the information required for installation and operation. The descriptions of door components are noted in Table 1 below.

Component	Description
Door Set	An assembly all door elements inclusive of leaves, surrounding frame and all hardware including hinges, handles, closers, locks/ latches and associated electronic items for security and/or door operation.
Leaf	A moving panel of a door set; can be constructed from various materials
Active Leaf	Typically, the active leaf refers to the door leaf that opens first and closes last (for double or 1½ leaf doors). In this scenario, the inactive leave must be closed prior to the active leaf and may need to be secured in place with a door bolt so the active leaf can latch onto it. There may be two active leaves in doors where both doors require 'push/pull' actions to operate.
Frame	The exposed surround to a door opening, typically in a wall. The frame may have door hardware attached such as hinges and latches. Frames can be provided in many different profiles and materials. Frames may not be necessary to some door types e.g. sliding doors and pivot doors.
Vision Panel	A glazed cut-out within the door panel, allowing visual access. See Section 4.3.1 Vision Panels for more information.
Sidelight	Vertical fixed glazing panel adjacent to the door set. See Section 4.3.2 Sidelights for more information.
Transom / Highlight / Top Light Windows	Fixed glazing panel over the door set. See Section 4.3.3 Transom / Highlight / Top Light Windows for more information.
Hardware	A broad term used to describe items that are fitted or related to door sets such as handles, locksets, latches, snibs, bolts, strikes, closers, hinges, pivots, sliding track assemblies, door stops, door seals, electronic locks, reed switches, etc. See Section 8 Door Hardware for more information.
Electronic Door Controls	Electronic components that a user interacts with to operate a door. This includes items used to actuate automatic doors, lock/ unlock electrically locked doors, and electronically hold open doors. Examples are proximity card readers, push to open buttons (local or remote), touch-less hand sensors, overhead sensors, electromagnetic hold open devices, elbow and knee switches, electronic keypads, etc. See Section 8 Door Hardware for more information.
Automatic Door (Motorisation)	A door with motorised features (motor, controller etc.) that allow for powered operation of door leaves and use various methods of actuation (sensor, push button, wave plate activation, etc.) to trigger opening/closing. See Section 5 Automatic Doors for more information.
Electronic Security	Integrated security elements that restrict and monitor access, detect intruders and trigger alarms, e.g. swipe card readers, reed switches, electric strikes, etc. These elements are typically programmable and interface with the fire safety system. See Section 9 Electronic Controls, Security and Access Control for more information.
Seals	Material applied to the perimeter of a door leaf, between door leaves, and/or to the bottom of a door leaf to create a barrier to reduce sound, smoke and/or air infiltration.
Finishes	Surface treatments applied to door leaves and frames such as paint or laminate, graphic decals, privacy film, powder coating, etc. See Section 6 Finishes and Door Protection for more information.

Component	Description
Door Protection	A protective plate or nosing, typically applied to door leaves and protective elements applied to door frames (as applicable) in addition to finishes, to prevent damage by minimising the effect of impact from traffic and equipment. Door and frame protection can be made from various materials to suit the functionality. See Section 6.4 Door Protection for more information.
Ventilation	Physical components such as grilles or an undercut to door leaf to ensure adequate ventilation and exhaust to rooms

Table 1 Door components and descriptions

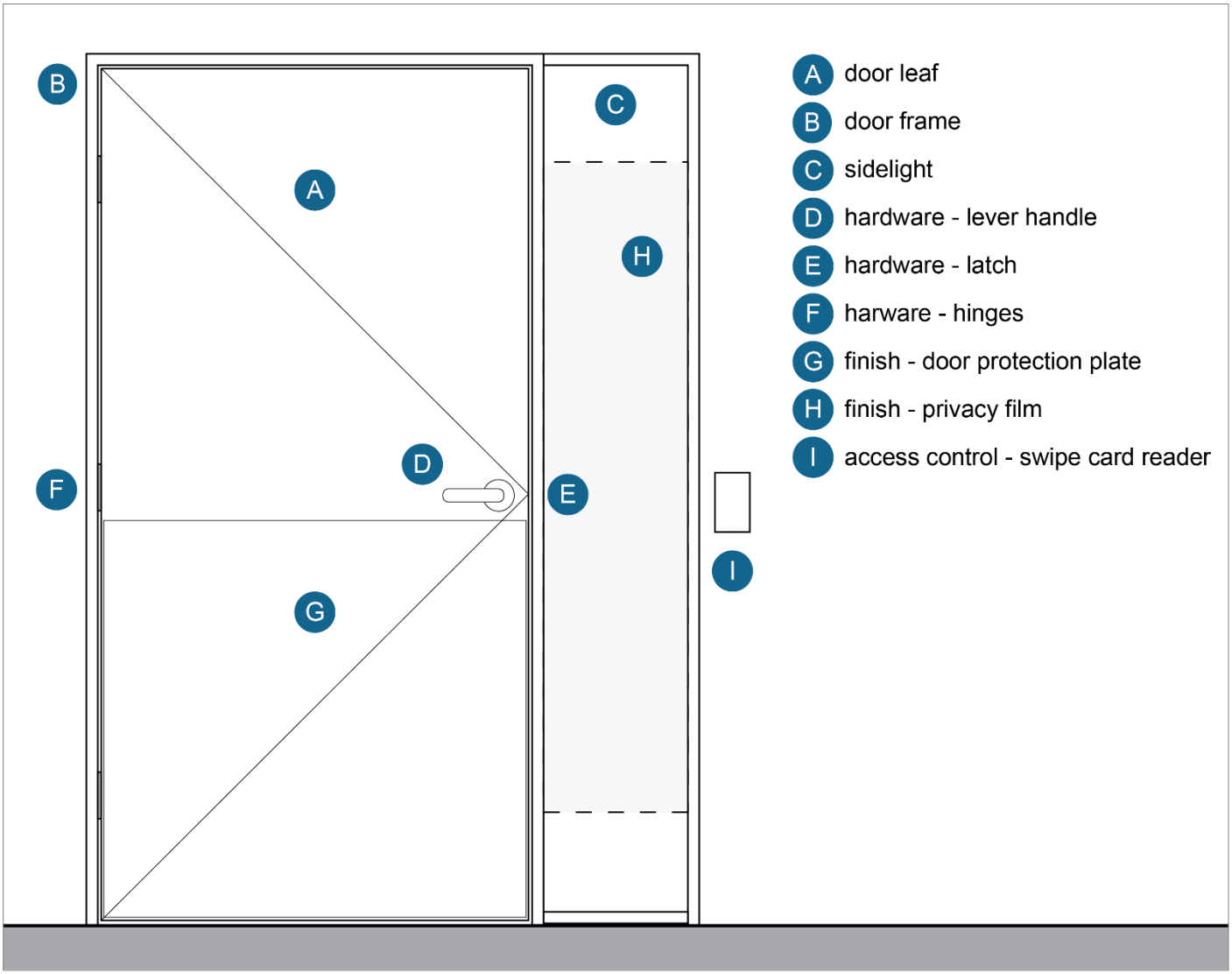


Figure 23 Illustration of door components (not all components included)

3.3 Other Important Terms

The following include important terms for dimensions and requirements that are covered throughout this document but have been compiled in Table 2 below to sit alongside the other terminology sections.

Term	Description
Clear Opening Width	The width of opening the door opening measured from the face of the opened door to the door frame (or door seal if this protrudes into the opening), or from door face to door face where applicable. For swing doors, this is measured when door leaves are open to 90 degrees. For other door types, e.g. sliding, folding, stacking, etc. clear width is taken when the door is fully open. See Section 4.1 Leaf, Frame and Clear Opening Dimensions for more information.
Clear Opening Height	Measured from the finished floor level (FFL) to underside of door frame head including any hardware or door seals protruding below the frame. See Section 4.1 Leaf, Frame and Clear Opening Dimensions for more information.
Fire/Smoke Rating	Building code rating that determines the construction and operational requirements of a door to meet needs for fire and smoke compartments. Fire door and smoke door construction and operational requirements are strictly defined by statutory authorities for fire safety. See Section 4.5 Fire Doors and Smoke Doors for more information.
Shielding	Composition/material requirements of a door set that is intended to: • prevent ionising radiation passing through to adjacent areas • reduce the impact of an electromagnetic field on adjacent areas • reduce the impact of high frequency electromagnetic fields from outside a room on the equipment inside a room. See Section 4.3.6 Shielding for more information.

Table 2 Important terminology and descriptions

4 Construction and Performance Requirements

This section will outline specific information regarding the construction and performance requirements of doors for use in the AusHFG Standard Components and health facility projects.

4.1 Leaf, Frame and Clear Opening Dimensions

4.1.1 Leaf and Frame Widths

Leaf widths and frame widths need to be considered when nominating door sizes:

- **Leaf width** is the horizontal width of a door panel.
- **Frame width** is larger than the door leaf width and is the horizontal width required for the frame to accommodate the nominated leaf width as well as the associated door components such as hinges, hardware, controls, automation requirements and seals.

4.1.2 Standard Door Leaf Widths

Where possible, standard door leaf widths should be utilised throughout all health facility projects. For single leaf hinged doors, standard door leaf sizes typically increase in 50mm increments commencing from the default 820mm wide leaf. Standard door leaf sizes should also apply to double leaf doors and 1½ leaf doors, pivot doors, sliding doors (of timber construction) and folding doors where appropriate.

It is important to consider the ongoing maintenance of doors, as the facility will need to be able to readily replace or maintain doors when they are damaged. Ensuring that standard door sizes and vision panels sizes are used throughout will assist with the ongoing operational costs.

Standard solid core door leaf sizes (leaf height x leaf size) are noted in Table 3 below:

2040 Door Heights (Australia | New Zealand)	2340 Door Heights (Australia | New Zealand)
2040 x 520 | 2040 x 510	2340 x 520 | 2340 x 510
2040 x 620 | 2040 x 610	2340 x 620 | 2340 x 610
2040 x 720 | 2040 x 710	2340 x 720 | 2340 x 710
2040 x 770 | 2040 x 760	2340 x 770 | 2340 x 760
2040 x 820 | 2040 x 810	2340 x 820 | 2340 x 810
2040 x 870 | 2040 x 860	2340 x 870 | 2340 x 860
2040 x 920 | 2040 x 910	2340 x 920 | 2340 x 910
2040 x 970 | 2040 x 960	2340 x 970 | 2340 x 960
2040 x 1020 | 2040 x 1010	2340 x 1020 | 2340 x 1010
2040 x 1070 | 2040 x 1060	2340 x 1070 | 2340 x 1060
2040 x 1120 | 2040 x 1110	2340 x 1120 | 2340 x 1110

Table 3 Standard solid core door leaf sizes for 2040 and 2340 high leaves

4.1.3 Clear Opening Width

The AusHFG Standard Components and AusHFG Item Control Schedule include door items with a nominated clear opening width.

- The **clear opening width** is measured from the face of the opened door to the door frame (or a door seal if this protrudes into the opening), or from door face to door face where applicable (i.e. for double and 1½ leaf doors).
- For swing doors, the clear opening width is measured when the door leaves are open to 90 degrees. For other door types, e.g. sliding, folding, stacking, etc. clear width is taken when the door is fully open.

Considerations for determining clear opening widths include:

- Accessibility requirements outlined in AS 1428.1 (2009) and NZS 4121 (2001) provide guidance on clear opening widths to various spaces. See Section 7.1 Accessible Clear Openable Width of Doorways for more information.
- Specific fire engineering requirements may stipulate changes to minimum openings and need to be considered in conjunction with other functional requirements.
- In spaces that accommodate bariatric patients, the clear opening width should account for the functional use of the room, including the movement of patients in larger width beds, wheelchairs or patient lifting devices, to ensure that the door meets all clear opening width requirements.
- For sliding doors, when choosing an appropriate door leaf size consideration needs to be given to ensuring there is adequate space for the sliding leaf when fully open, there are appropriate clearances for handles, and risk of shearing injury to fingers is minimised (refer to AS 5007 safeguarding against head, body and finger traps).
- Clearances required for Major Medical Equipment (MME) transfer pathways should be considered as part of the design of the corridor network and associated doors to ensure that equipment can be replaced.

4.1.4 Clear Opening Width Calculations

The formula to the calculate the clear opening width of a standard **hinged** door leaf is:

door leaf width *less* **door leaf thickness** *less* **frame rebate** *less* **frame/hinge allowance** (+/- 10mm)

= **clear opening width**

Considerations should be made for the impact of applied finishes on the thickness of the door leaf, specific shielding requirements, fire rating requirements, door seals and the type of door frame (i.e. rebated or non-rebated).

Example: Australian single door leaf size of 2040 x 970

970mm door leaf width – 45mm door leaf thickness – 15mm frame rebate – 10mm frame/hinge allowance

= 900mm clear opening width (+/- 10mm)

Example: Australian double door leaf size of 2040 x 920

1840mm door leaf width (920mm x 2) – 90mm door leaf thickness (45mm x2) – 20mm frame/hinge allowance (10mm x2)

= 1730mm clear opening width (+/- 10mm)

Note: for a double leaf or 1½ leaf door, the frame rebate does not need to be deducted as the rebate would not protrude past the thickness of the door leaf.

The formula to the calculate the clear opening width of a standard **sliding** door leaf is:

door leaf width *less* **door handle clearance** (+/- 120mm)

= **clear opening width**

Considerations should be made for the impact of applied finishes on the thickness of the door leaf, specific shielding requirements, fire rating requirements, door seals and the type of door frame (i.e. rebated or non-rebated).

Example: Australian single sliding door leaf size of 2040 x 1020

1020mm door leaf width – 120mm door handle allowance

= 900mm clear opening width (+/- 10mm)

4.1.5 Typical Clear Openings and Associated Room Functions

Clear opening widths that are commonly used for various rooms within healthcare facilities are outlined in Table 4 below. The door leaf sizes noted are indicating the typical door leaf required to meet the clear opening width for a hinged, solid core door swing door that is not fire/smoke rated.

Clear Opening	Door Leaf Size (Australia | New Zealand)	Typical Function
700 clear opening	770 leaf | 760 leaf *	• Public and staff toilets (standard and ambulant) ** Note: a larger leaf is required to provide the clear opening width where a pivot door with emergency release is used*
850 clear opening	920 leaf | 910 leaf	• Staff only access
900 clear opening	970 leaf | 960 leaf	• Patient / wheelchair access • Utility rooms
950 clear opening	1020 leaf | 1010 leaf	• Small trolley access
1050 clear opening	1120 leaf | 1110 leaf	• Medium trolley access • Bariatric wheelchair access
1100 clear opening	1170 leaf | 1160 leaf (max 1200)	• Patient bedroom (where single leaf door is provided)
1200 clear opening	970 leaf + 370 leaf | 960 leaf + 360 leaf	• Patient ensuites (bariatric and high assistance) • Utility rooms using large equipment
1400 clear opening	970 leaf + 570 leaf | 960 leaf + 560 leaf	• Patient bedrooms • Patient bays enclosed • Consult rooms universal • Treatment rooms
1600 clear opening	1020 leaf + 720 leaf | 1010 leaf + 710 leaf 870 leaf + 870 leaf | 860 leaf + 860 leaf	• Patient bedroom (bariatric) • Gymnasiums • Anaesthetic preparation rooms • Operating / procedure rooms • Airlocks
1800 clear opening	970 leaf + 970 leaf | 960 leaf + 960 leaf	• Medical imaging modalities • Some clinical corridors (Refer to Part C: Design for Access, Mobility, Safety and Security for more information on corridor widths)

Table 4 Typical clear opening widths and associated room functions in healthcare facilities

4.1.6 Leaf and Frame Heights

Leaf and frame heights need to be considered when nominating door sizes:

- The **leaf height** is the vertical height of a door panel
- The **frame height** is larger to accommodate the nominated leaf height and the associated door components such as hardware, controls, automation requirements and seals.

4.1.7 Clear Opening Height

The **clear opening height** is measured from the finished floor level (FFL) to underside of door frame head including any hardware or door seals protruding below the frame.

The minimum height for any door frame within a project must ensure a 1980mm clear opening height, as nominated within NCC Clause D1.6. This minimum clear opening must be free of any obstructions including door controls, closers, and any automation components.

The standard door leaf heights available throughout Australia and New Zealand meet all NCC and NZBC requirements, however other sizes are available and may be required in order to provide a clear opening height that suits the function of the space it opens into.

Spaces that require specific door clear opening heights to meet functional requirements include, but are not limited to, medical imaging modalities, bariatric facilities and where patient lifting tracks transfer between rooms (see Figure 24).

A higher door leaf should be considered for rooms where MME and Fixtures, Furniture and Equipment (FF&E) require larger clear openings (height and width) for installation and repair/replacement of parts, as well as building services rooms, such as electrical rooms, electrical cupboards and communications rooms, to ensure that the equipment can be installed to meet regulations.

The standardisation of door heights throughout the facility should be considered at the outset of a project. There may be cost implications associated with adopting higher door heights which need to be considered as part of the decision process.

It is important to be aware of doors requiring electromagnetic locks (EMLs) as the device projects under the door frame when mounted on the push side of a door leaf.

Selection of the EML is based on holding strength so they will vary in height and therefore a higher door leaf may be required where EMLs are used to ensure a compliant clear opening height is achieved.

Figure 24 Patient lifting track transferring from a bariatric bedroom to the associated ensuite

4.2 Door Materials

4.2.1 Solid Core Doors

Solid core doors are typically made from timber and are highly versatile, allowing the facility to achieve various looks, from domestic to contemporary. Timber doors are durable and provide excellent insulation. However, they may require applied door protection and regular maintenance as they are susceptible to damage. Timber doors can be solid or engineered, with engineered doors often offering better stability and resistance to warping or cracking. Examples are shown in Figure 25, Figure 26 and Figure 27 below.

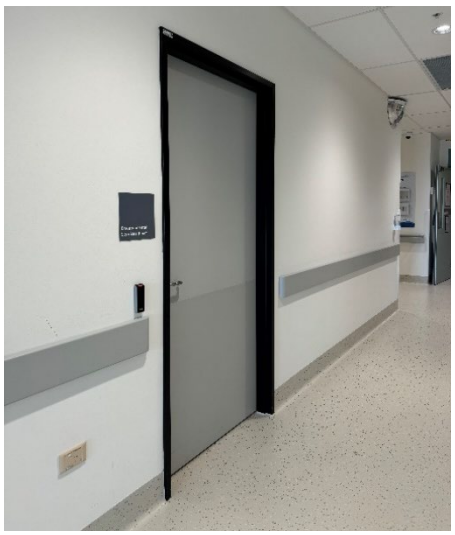


Figure 25 Example of single leaf solid core door

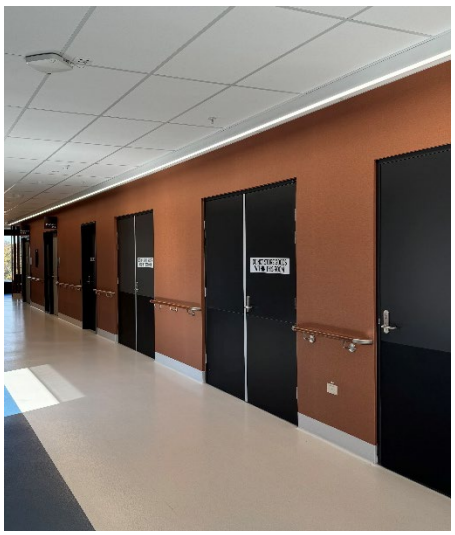


Figure 26 Example of single and double leaf solid core doors in a corridor

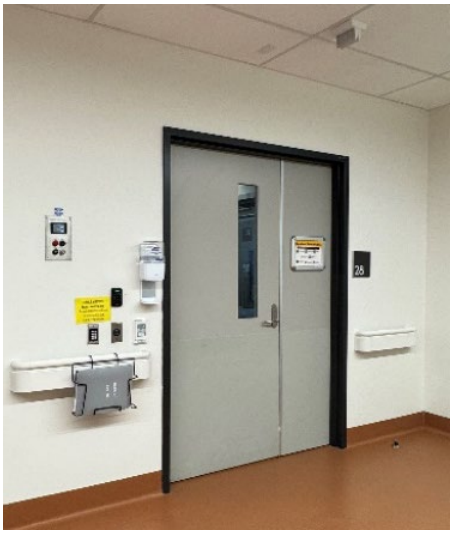


Figure 27 example of single leaf solid core door with vision panel

4.2.2 Fully Glazed Doors

Glazed doors are often provided to allow natural light into a space and to support visibility into different areas. Various types of doors can be glazed including Swing, Pivot, Sliding, Stacking, Folding and Revolving doors. Glazed doors can be constructed from timber or aluminium framing to suit functional requirements. These doors typically offer less privacy and insulation, and this should be considered to ensure appropriate application to suit the intended use of the space.

The door items in the AusHFG Standard Components and AusHFG Item Control Schedule include the following nomenclature to describe glazed doors:

- Fully glazed, framed (see Figure 28)
- Fully glazed, framed with mid-rail (see Figure 29)
- Fully glazed, frameless (see Figure 30)

Figure 28 Example of a fully glazed framed sliding door

Figure 29 Example of a fully glazed, framed door with mid-rail

Figure 30 Example of a fully glazed, frameless automatic sliding door

4.3 Glazing

4.3.1 Vision Panels

Vision panels within doors come in varying sizes and configurations to suit specific functions. All vision panels must adhere to:

- AS1288 and AS2208 (Australia) or NZS 4223 (New Zealand)
- Specific requirements regarding accessibility within AS1428.1 (Australia) and NZS 4121 (New Zealand)

It is also best practice to consider:

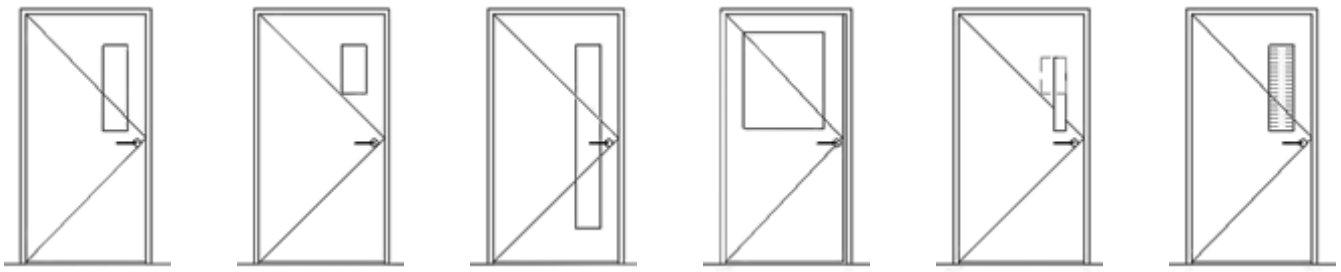
- Universal design principles
- Occupational and Workplace Safety Guidelines
- Patient and Consumer Privacy Guidelines
- Environmentally sustainable design principles (external doors)

Considerations when specifying vision panels on a project include:

- Size (width x height) and height above floor level
- Glass Type (single or double glazing, laminated, toughened, fire rated, etc.)
- Applied Finish (privacy film, decal, etc.)
- Specific requirements (shielding, integral blinds including controls for operation on one or both sides, covers for privacy or laser shielding, etc.)

The door items in the AusHFG Standard Components and AusHFG Item Control Schedule include the following nomenclature for vision panels based on their size and functional requirements (illustrated in Figure 31):

- Standard
- Small (used in clinical settings to protect privacy, such as Mental Health)
- Tall (used in administration areas and in some clinical settings such as paediatrics for improved vision into rooms)
- Wide
- Fire Rated
- [Any type noted above] with integral blinds or switchable privacy glass (may be used in intensive care units (ICU) and acute mental health inpatient units)



Standard VP | *Small VP* | *Tall VP* | *Wide VP* | *Fire Rated VP* | *VP with Integral Blind (shown to Standard VP but may be to any size)*

Figure 31 Illustration of vision panel size and placement

Fire rated glazed panels in Australia are typically limited to 300mm x 200mm or 600mm x 100mm panels to meet compliance with the fire resistance rating requirements. Fire rated glazed panels in New Zealand are typically limited to a maximum size of 0.32m2 panels to meet compliance with the fire resistance rating requirements and can only be installed in the active leaf.

4.3.2 Sidelights

Sidelights are fixed vertical glazed panels adjacent to a door and can be a separate component or combined with the door construction (see Figure 32, Figure 33 and Figure 34).

Figure 32 Example of sidelight to a single leaf solid core door to an interview room

Figure 33 Example of sidelights (separate from door frame) to offices on an inpatient unit

Figure 34 Example of sidelights to automatic sliding doors

4.3.3 Transom / Highlight / Top Light Windows

Transom windows, also referred to as highlights or top lights, are fixed horizontal glazed panels that are installed above a door and can be a separate component or combined with the door construction (see Figure 35, Figure 36 and Figure 37). Transom windows are used to support the permeation of natural light into adjacent spaces, particularly where a solid core door is required for privacy.

Figure 35 Example of transom window to external double door

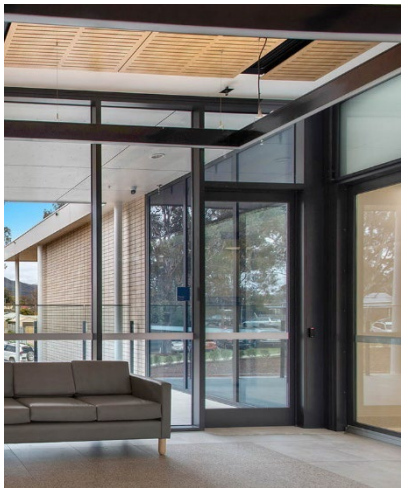


Figure 36 Example of transom window to external single door

Figure 37 Example of transom window over solid core door to office

4.3.4 Integral Blinds

Vision panels with integral blinds, typically venetian blinds, can be custom sized or can be provided as proprietary panels in set sizes. Selection will be dependent on the intended function, as well as consideration of ongoing cost for maintenance and replacement. All vision panels with integral blinds must be double glazed, sealed units.

The controller for opening and closing the blind is typically mounted on the vision panel frame.

- Controls may be located to the inside of the room, the outside of the room, or both as required, for patient privacy and observation by staff. In some instances, controls may be removeable, rather than permanently fixed, e.g. may be removed from the bedroom side of the door to ensure observation requirements can be met.
- Integral blinds can be controlled via numerous methods, from manually operated sliding controls to automated controls.

Integral blinds are typically used in clinical areas with high infection prevention and control requirements, including isolation rooms, ante rooms, operating suites and intensive care rooms, or rooms with requirements to remove potential ligature points, such as mental health rooms (see Figure 38). Projects should consider the type (such as automated or manual) and use (such as staff only use or staff and patient/consumer use) of the integral blind to ensure the blind and controls meet all requirements.

To open integral venetian blinds the controls can allow for the slats to be tilted and/or for the whole blind to be lifted (see Figure 39). Some manufacturers caution against raising the whole blind frequently as it can increase the risk that the blind fails, becoming a maintenance issue. Tilting the slats provides adequate visualisation in most cases but there may be instances where the blind may need to be raised completely, including where mobile x-ray imaging is required for an infectious, isolated patient. In such a scenario, a digital x-ray detector is covered in a protective bag and a staff member wearing appropriate personal protective equipment (PPE) enters the room with the infectious patient. If they are able to, the patient stands in position near the door as directed by the staff member inside the room and holds the detector. A staff member outside the room positions the mobile X-Ray unit perpendicular against glass window (see Figure 40). Both staff ensure correct positioning of the patient and detector before stepping clear and the staff member outside captures the image.

Figure 38 Example of double doors containing vision panels with integral blinds

Figure 39 Example of vision panel with integral blind in closed and open position

Figure 40 Mobile imaging unit for x-ray of infectious patient through vision panel

4.3.5 Switchable Glass

Switchable glass, sometimes referred to as switch glass, smart glass, dynamic glass or privacy glass, is glass that changes from frosted/opaque when turned off, to clear when turned on (see Figure 42 and Figure 41). Clarity is claimed to be around 70% to 75% for 9mm thick glass, compared to around 99% for 6mm clear float glass, so there is a consequence for light transmission through the glass when switchable glass is used.

Switchable glass has many functional uses, such as providing patient privacy and observation by staff in key clinical areas such as emergency departments (ED) and ICUs, particularly where infection prevention and control (IP&C) measures dictate that privacy curtains should not be used.

The warranty period for switchable glass may be up to 5 years and the approximate lifespan of switchable glass products is dependent on the number of on/off cycles and the need to leave the glass in its off state for a certain period of time per day. Leaving the glass in its off (opaque) state for the recommended 4-5 hours per day may be difficult to achieve in an ICU given the need to observe critically ill patients at all times. The lifespan is also degraded if the glass is left in its on (transparent) state for over 20 hours at one time.

Switchable glass will default to frosted/opaque when power is not available, and this must be considered when implementation is considered in a design, particularly where patient observation is critical.

While the cost of switchable glass has trended downwards and is now comparable to double glazing with integral blinds, switchable glass may be expensive to repair and replace depending on the fault encountered. Ongoing financial impact of specifying switchable glass needs to be considered as well as impacts on the use of the room during repair and replacement.

Figure 41 Switchable glass in ICU when turned off (opaque)

Figure 42 Switchable glass in ICU when turned on (transparent)

4.3.6 Vision Panel Covers

Vision panel covers are applied to vision panels within doors that access specific clinical areas, such as rooms within medical imaging units, nuclear medicine units and operating suites (see Figure 44 and Figure 43). A vision panel cover is provided for the protection of staff and patients outside of the room and is closed by staff when lasers are being used or when patient privacy is required. As the cover is operated by staff, it must be determined if the cover is placed inside the room (e.g. in an operating room) or outside the room (e.g. operated by staff from within a medical imaging control room).

Typically lead glass is adequate for radiation shielding purposes, however a cover may be required to meet radiation shielding requirements as determined by an independent radiation consultant (see Section 4.4 Shielding for more information).

Vision panel covers can be custom designed or may be proprietary items.

Figure 43 Example of custom hinged vision panel cover to sliding door

Figure 44 Example of sliding vision panel covers (proprietary items)

4.4 Shielding

Shielding refers to the composition/material requirements of a door set that is intended to:

- prevent ionising radiation passing through to adjacent areas
- reduce the impact of an electromagnetic field on adjacent areas
- reduce the impact of high frequency electromagnetic fields from outside a room on the equipment inside a room.

Shielding may require the application/integration of additional material, such as lead lining, to a typical solid core door leaf as well as specific frame construction and materials to meet safety requirements in rooms such as those containing medical imaging modalities, nuclear medicine imaging and preparation areas and operating suites. Shielding requirements may also include additional features such as lead glass vision panels or opaque coverings to vision panels. In some cases, where a radiation source is weak, a solid core door leaf in an appropriate frame (e.g. steel frame) may be sufficient to shield adjacent spaces from radiation, however, this should always be assessed and confirmed by a radiation specialist.

Specialist consultants review and assess the risks posed by various forms of radiation including ionising radiation, laser, and electromagnetic fields to determine the type of shielding required. The shielding requirements are determined for a room as a whole, including to the doors, vision panels and door frames, and requires review and sign off by an independent radiation consultant.

It is important to note that the application of materials for shielding to doors increases the weight of the door leaf and as such, door hardware needs to be considered to ensure smooth operation of the door, and that the manual handling (pushing/pulling force) required for operation meets all Work Health and Safety (WHS) requirements. This may include provision of automation controls or heavy-duty mechanisms to mitigate the risk of injury associated with operation of the door.

4.4.1 Ionising Radiation

Ionising radiation is a type of energy released by atoms that travels in the form of electromagnetic waves, and it is used in the production of radiology imagery.

- Imaging modalities including X-Ray, Fluoroscopy, Mammography, Orthopantomography (OPG), CT Scanning, Gamma Cameras, Single Photon Emission Computed Tomography-Computed Tomography (SPECT-CT) and Positron Emission Tomography-Computed Tomography (PET-CT) emit varying levels of ionising radiation.
- Treatment and procedure rooms such as angiography laboratories, cardiac catheter laboratories, interventional radiology rooms, hybrid theatres, theatres where mobile imaging units are used, and radiotherapy bunkers containing linear accelerators all require shielding from ionising radiation.

Shielding for all doors accessing these rooms (and adjacent spaces as required) should be provided in accordance with an assessment by a consulting radiation expert. A consulting radiation expert will take into consideration:

- equipment that is the source of the radiation
- estimated workload/use of the equipment
- distance of doors from the radiation source
- the location of the radiation source within a department/site including adjacent occupied spaces

Figure 45 Example of lead lined door to OPG room with x-ray in use light above and radiation warning signage

Lead lining is the most common approach to providing shielding to a door within these spaces.

It is important to note that ventilation grilles are not to be included within doors that are required to be shielded. Air transfer / mechanical ventilation design should not include solutions that involve the doors for these rooms.

4.4.2 Magnetic and Radio Frequency

- **Magnetic shielding**, or **Electromagnetic shielding**, is the process of lowering the electromagnetic field in an area by barricading it with conductive or magnetic material. Typically, this is achieved with steel or copper placed within the walls of the imaging rooms, such as for Magnetic Resonance Imaging (MRI) scanners.
- **Radiofrequency (RF) shielding**, guards against high frequency electromagnetic fields outside of MRI scanner rooms and is typically made from copper.

Shielding for all doors accessing these rooms should be applied in accordance with information from an assessment by a consulting radiation expert, who will take into consideration the type and estimated use of the modality and its location.

RF Shielding doors (see Figure 46) are typically proprietary doors that come in limited sizes (custom sizes may be available but are subject to extended lead times and higher cost). The doors can be provided as swing or sliding configurations to suit the access requirements. RF Shielding doors typically do not have vision panels, however they can be manufactured.

Safety accessories may be associated with doors to MRI room, for example retractable belts and drop-down barriers (see Figure 47). These physical barriers serve as a visual and tactile reminder, prompting staff to pause and double-check their readiness before entry. By incorporating these features, facilities enhance adherence to safety protocols.

Figure 46 Example of RF shielding door to MRI room

Figure 47 Example of drop-down safety barrier to MRI room

4.5 Fire Doors and Smoke Doors

Statutory requirements relating to fire safety dictate that certain doors within a building will be required to meet a minimum fire rating as a fire door and/ or construction as a smoke door. Commonly these doors will be situated within the boundary walls of a fire and/ or smoke compartment but fire/smoke rated doors may also be required in other situations.

Fire-resistance rating signifies the doors' effectiveness in slowing or stopping the spread of fire and smoke throughout a building. Fire doors are certified and tested in accordance with AS 1905.1:2015 and NZS 4520:2010 door assemblies subject to restrictions on dimensions, installation, hardware and functionality. The specific rating required of a door is dependent on the associated fire-resistance rating of the adjacent wall.

Fire doors may also be required to be smoke sealed, for example, if they form part of a fire/smoke compartment wall. Other smoke doors are not necessarily fire-rated but need to meet certain criteria defined by building codes.

Specific components of Fire rated doors to be considered are:

- Door Leaf construction
- Door Frame construction (including tagging of doors)
- Vision panels (maximum size)
- Seals
- Hardware
- Security
- Statutory Signage

Figure 48 Example of fire door with statutory signage

Figure 49 Example of fire door with small vision panel and statutory signage

Fire and smoke doors are used in horizontal egress paths for evacuation between fire and smoke compartments. For compliance with building codes, these doors must permit free egress in fire mode. There are several considerations relating to door hardware for fire doors that are highlighted in the list below:

- Secured doors may require fail-safe electric locking that releases in the event of a fire.
- Fire and smoke doors in corridors that are typically held in the open position will be required to be released to close in fire mode. Hold open devices include electromagnetic devices (typically wall mounted) or special electromechanical door closers which are fire tripped to release in fire mode. These devices can also be released via a standalone or integrated testing switch or button. It is recommended this button is to be mounted so that the switch/ button is 1700 AFFL.
- Auto sliding doors are to be linked to the fire system to open automatically when in fire mode.

Sliding and pivot fire and smoke doors should be avoided.

4.6 Negative and Positive Pressure

Some rooms within clinical settings are required to be pressurised (typically isolation rooms, clean room environments and procedure rooms, including operating suites) and the doors to these rooms have specific requirements to ensure that pressurisation is maintained.

Each jurisdiction may have specific requirements for pressurised rooms which should be considered; local engineering services guidelines are to be referred to, alongside local IP&C guidance. The following resource providing more detailed guidance can also be found on the AusHFG website: Isolation Rooms - Engineering and Design Requirements

Doors for pressurised rooms typically follow a set of rules dependent on the location and function:

- Swing doors are preferred for maintaining room pressure (as sliding doors do not adequately maintain the pressurisation requirements).
- Direction of door swing should be against the flow of ventilation (negative pressure doors swing outwards, positive pressure doors swing inwards – see Figure 50). There may be instances where this varies, for example, some operating room doors swing to suit the movement of beds (entry/exit) rather than being dictated by pressure requirements.
- Doors should be close fitting and without leaks, using door seals on all edges to meet pressurisation requirements.
- Door frames should be sealed to the wall.
- Doors may have delayed action closers, hold open closers or have the option to be automated to assist with movement of patients.
- Rooms should allow adequate clearance between successive doors (such as ante rooms) to allow one door to be opened and closed and the room to be pressurised before the subsequent door is opened.
- Some doors will require connection to the pressure alarm which will activate should the door not be adequately closed, to ensure adequate pressurisation is maintained. This type of alarm would be used in crucial areas such as cytotoxic suites in pharmacies or certain laboratory suites.
- Doors may not be able to meet the required AS1428.1 “maximum force to open” when a room is pressurised and hence an acceptable Performance Solution may need to be sought. Door closers fitted to the primary leaf (the last to close) will be under greater pressure than the door which closes first. Where a double door set is fitted, consideration is to be given to the last door to close with regards to the power setting.
- Doors should include glazing to allow for adequate staff observation from outside of the room whilst pressurised, including any that act as ante room doors (which need to adhere to the above guidelines to suit the pressurisation of the space).

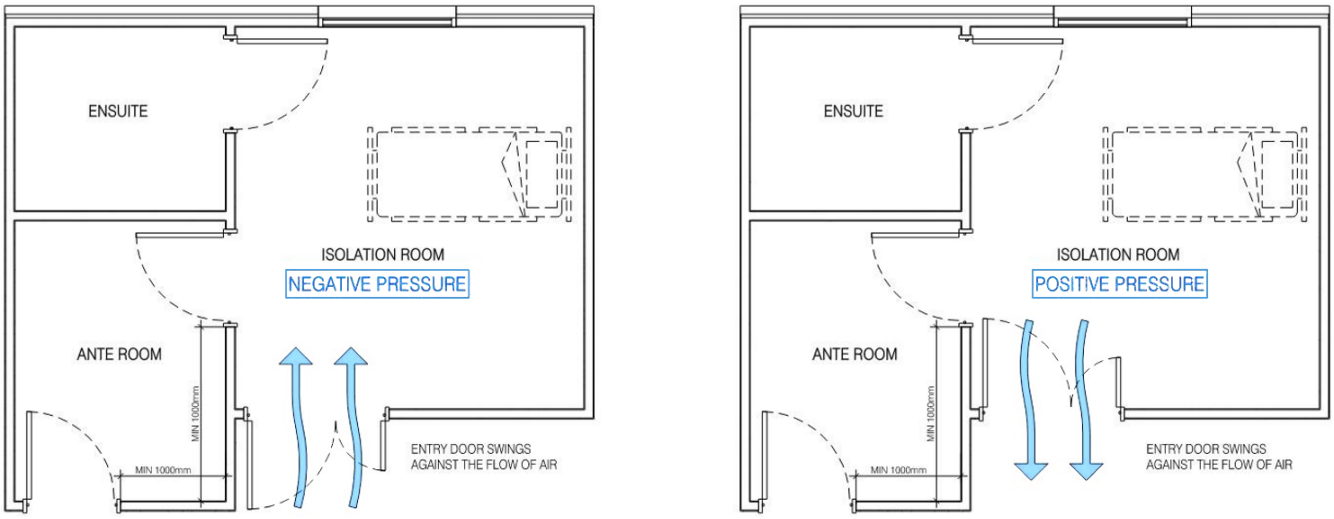


Figure 50 Illustration of door swing direction for negative pressure and positive pressure rooms

4.7 Acoustic Doors

Doors will limit the overall sound insulation of a partition since they are generally of much lighter construction than the partition. Acoustic doors are designed to better mitigate the amount of noise transfer from one room to another. Depending on the arrangement of the door, and the relationship of the room to adjacent spaces, a door with a sound insulation performance that is less than the partition itself will typically be appropriate. The required door and seal performance will need to be determined based on the required overall rating of the partition.

The factors that impact the level of acoustic treatment of doors include how well the door is sealed, the material density of the door and door construction.

The location of doors is important, and the following should be considered when room layout is being determined:

- Maximise the distance between doors of neighbouring spaces, rather than planning doors to be side-by-side.
- Doors along corridors should be offset where possible, rather than directly opposite one another.
- Sliding doors and/or pivot doors should be avoided where any degree of acoustic separation is required.
- Doors should be avoided between noise generating / sensitive rooms and installed in partitions that face corridors instead.

There are generally two door types that are used in health facility buildings including:

- General doors with no specific acoustic performance.
- Acoustic doors that provide a higher level of speech privacy typically achieved with a thick solid core door with full perimeter seals, including threshold and meeting stile seals.

Whilst doors can be treated and constructed to achieve specific acoustic performance, there will be instances in specific critical spaces, such as plant rooms (see Figure 51), audiology booths, etc (see Figure 52). that require proprietary acoustic materials or construction systems.

Locating ventilation grilles in the door is not recommended. Air transfer / mechanical ventilation design should not include solutions that involve the doors for when a room is required to be acoustically isolated.

Each jurisdiction may have developed their own engineering services guidelines which outline requirements for acoustic design within health facilities, including references regarding the treatment of doors. These guidelines should be considered alongside consultation with expert acoustic consultants.

Figure 51 Example of external acoustic louvred door to plant room

Figure 52 Example of acoustic doors to audiology testing booth

4.8 Specialty Doors

4.8.1 Strong Room

Strong room doors are used to provide a greater level of security, for example, with the storage of accountable drugs within pharmacy units (see Figure 53 and Figure 54). Strong Room doors are proprietary doors that are made of thick gauge steel with a dense core. They have reinforced hinges and are typically feature a heavy duty powdercoat finish.

Electronic security controls are likely to be associated with these doors (see Section 9 Electronic Security and Access Control for more information).

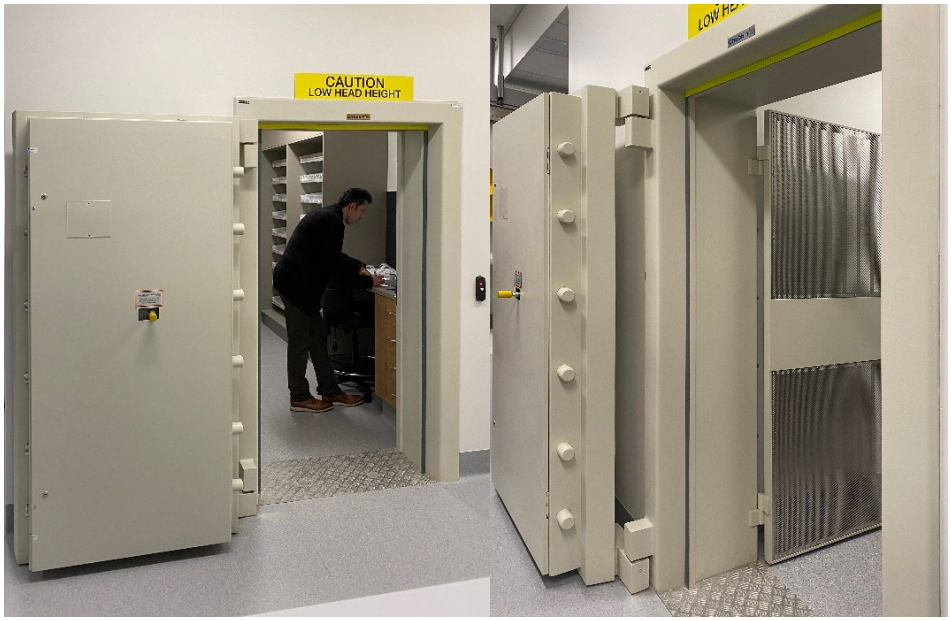


Figure 53 Example of strong room door to accountable drugs store in pharmacy

Figure 54 Example of proprietary strong room door

4.8.2 Cool Room

Cool room panel doors, also called insulated doors, are designed to provide optimal cool room/freezer performance and assist with the reduction of energy usage. These doors are typically swing or sliding type and made in various thicknesses to suit specific functional requirements. Access control and hardware needs to be considered to provide the required safety and security requirements.

Figure 56 Example of cool room hinged door

Figure 55 Example of cool room sliding door to body holding in mortuary unit

Figure 57 Example of cool room panel sliding door

5 Automatic Doors

Automatic doors enhance safety and convenience by enabling safe, often hands-free access to entrances, public areas, and clinical environments within healthcare facilities. Their integration can support key clinical and operational functions, infection prevention and control (IP&C), security, and overall efficiency. However, careful consideration is essential when choosing automatic doors, as they involve higher costs compared to non-automated options like hold-open devices and door closers.

Automation can be provided through proprietary systems that supply the entire door set for an automated door or by adding hardware that motorises the movement of the door. Automation can be added to most door types to suit the intended functional requirements of the space.

Automation types include:

- Automatic swing doors
- Automatic sliding and stacking doors
- Automatic folding doors
- Revolving doors
- Automatic roller shutters

Automatic doors are required to meet the relevant authority standards, including path of travel, clear openings, emergency egress and fire egress. Automatic doors should be serviced by generator-backed essential power to ensure continual operation (with minimal disruption). There is no requirement for uninterruptible power supply (UPS) unless generator-backed essential supply is not available or there are specific project requirements that have been considered and approved.

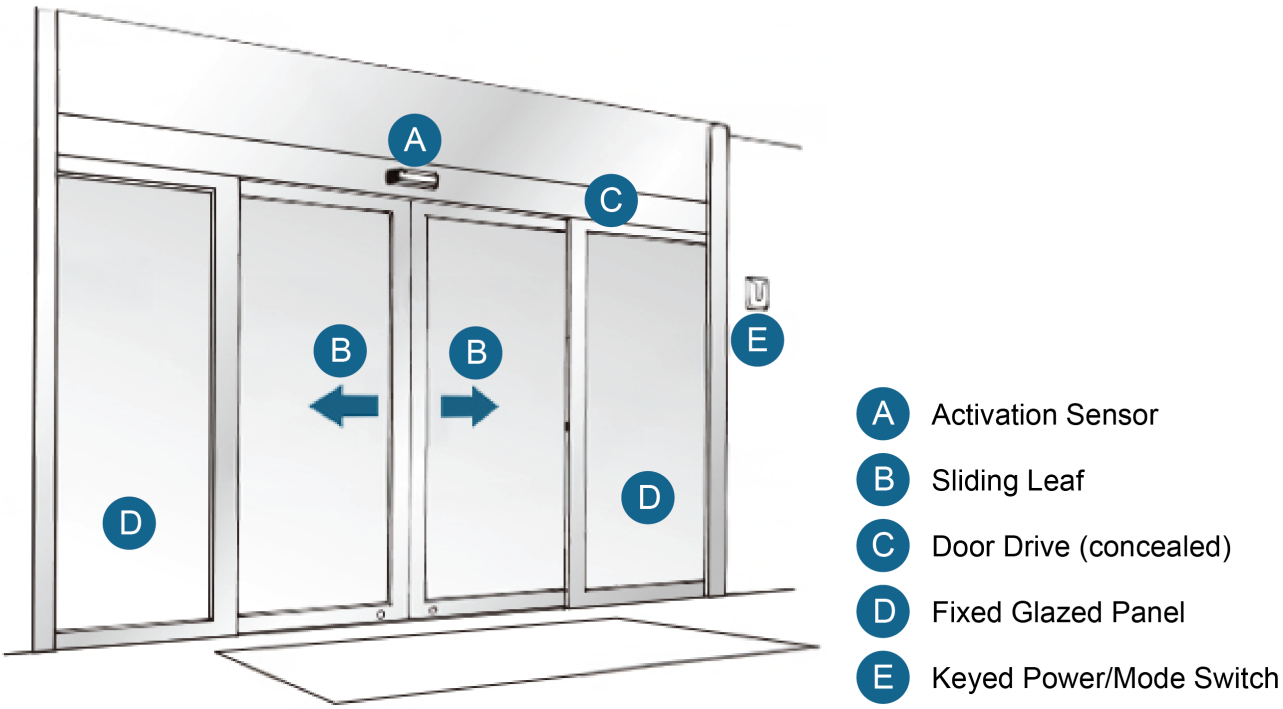


Figure 58 Illustration of automatic door components

5.1 Activation Devices

Automatic doors can be operated via various types of activation devices (actuators) including:

- overhead motion sensors (mounted on the door frame, wall or ceiling)
- push buttons (see Figure 59) - to be mushroom button under AS 1428.1:2009 cl. 13.5.4
- card readers
- touch-less hand (wave) sensors (see Figure 60)
- elbow operated switches/pads
- knee operated switches pads
- keypad
- floor mats
- remote actuation e.g. via master intercom units or push button at staff stations/receptions

The location of activation devices must be considered in relation to the anticipated type and direction of traffic e.g. staff moving patients on beds/trolleys, wheelchair users, adults and children. The mounting heights of activation devices and the distance it is placed from the door or other building elements may also be subject to compliance with accessibility requirements.

Consider requirement for local keyed mode switches or the like, especially for sliding doors. These devices are for use by staff to change the operation of the automatic door, e.g. to hold open indefinitely, turn off auto operation for maintenance etc.

Safety devices are also to be provided for automatic doors to avoid the doors being hazardous when closing and opening. These are commonly sensors and typically separate to sensors used for actuation.

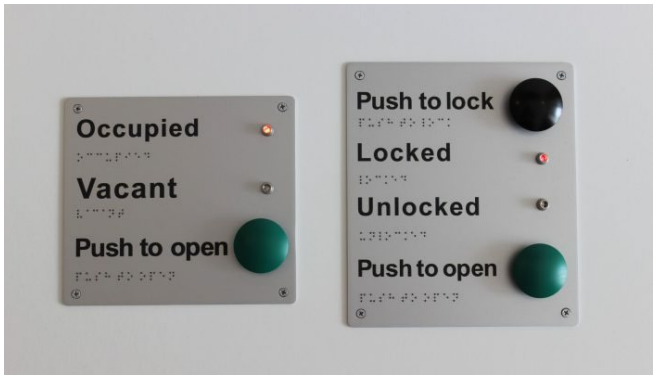


Figure 59 Example of push to open and push to lock buttons of a privacy system for accessible toilets and parenting rooms

Figure 60 Example of touch-less door activation in an operating room

5.2 Safety, Ergonomics and Ease of Movement

Designing for safety with automatic doors includes mitigating risk of injury from direct interaction with the door (e.g. finger jam injuries), plus how the door can contribute to the security of adjacent spaces and improve ergonomics to reduce the risk of manual handling injuries (e.g. manoeuvring bulky equipment along a path of travel).

Key considerations for automatic doors when designing for safe use include:

- Sensor automation (detection extent, obstruction detection)
- Location of push buttons or touch-free sensors
- Finger-jam considerations for swing, sliding, stacker and folding doors

- Opening and delayed closing times
- Security capabilities
- Safety / crush considerations regarding the open space left behind the fixed panel of sliding doors

Automated doors provide the ability to transfer patients, equipment and stock with ease, however the following important factors need to be considered:

- Clear space for the movement of wheeled equipment and people through doorways
- Location of actuators (overhead sensors, push buttons or touch-free sensors) to allow for continuous movement

5.3 Automation of Swing Doors with Unequal Leaves

For unequal leaf swing doors (not fire rated), an automatic swing door operator will only be fitted to the primary leaf except where explicitly required. For example, a 920/480 door set will not need automation of the “occasional” leaf. An automated swing door operator cannot be fitted to a door leaf narrower than 600mm, with some products noting a minimum leaf width of 750mm.

6 Finishes and Door Protection

Finishes to doors within health facilities are very important to ensure continual operation with minimal ongoing maintenance. Finishes can range from paint finish to applied finishes and can be specifically chosen to provide protection against damage from beds, trolleys, equipment, and continual use. The types of finishes used vary across the functional areas of a health care facility, with special consideration given to finishes required for clinical areas and back of house areas which experience the most damage.

6.1 Clinical Spaces

Clinical spaces, including inpatient units, operating suites, emergency departments, medical imaging and ICU, require finishes that can withstand the considerable cleaning requirements of these areas. Finishes can range from paint finish (washable/scrub resistant as required) with applied door protection, to full height applied finishes, and selection will be informed by the functions of the adjacent spaces (see Figure 61).

Finishes applied to doors and frames contribute to the definition of spaces and intuitive wayfinding for patients, visitors and staff in clinical units. Finishes selected must also meet any applicable accessibility requirements, for example, luminance contrast requirements for vision impairment (see Section 7.5 Luminance Contrast for more information).

Door protection is used extensively throughout these areas to ensure that any damage to the door or door frames from the movement of beds and medical equipment, does not impact on the operation of the clinical spaces or create an IP&C issue (see Part D: Infection Prevention and Control for more information on finishes selection for clinical spaces).

Figure 61 Example of finishes applied to doors in clinical spaces

6.2 Non-clinical Spaces

Non-clinical spaces, such as administration areas, typically do not require extensive door or frame protection as found in clinical spaces. However doors in these areas may still experience damage from every day use, such as from wheelchairs, walking frames and cleaning equipment such as vacuums. The need for and extent of door and door frame protection should be considered through assessment of potential sources of impact.

As noted above for clinical spaces, door finishes are often used throughout non-clinical areas to define spaces and support intuitive wayfinding and the finishes that are selected for doors must also meet any applicable accessibility requirements (see Figure 62).

Figure 62 Example of finishes applied to doors in non-clinical spaces

6.3 Back of House Spaces

Back of House spaces, which including loading docks, logistics storage areas, waste management and maintenance areas, experience extensive damage to walls and doors due to the large amount of trolley, stock and equipment movement (see Figure 63). Finishes to doors and door frames in these areas must be robust. Depending on the anticipated traffic in the various back of house areas, some doors may only have rigid vinyl sheets to an appropriate height to provide protection (i.e. in low traffic areas) while doors in other areas will require heavy duty finishes to provide adequate protection, such as stainless-steel plates or steel panelling/cladding (i.e. in high traffic areas).

Figure 63 Example of finishes applied to doors in back of house spaces

6.4 Door Protection

Door protection refers to the products that are applied to door leaves and door frames that safeguard doors from damage, such as scratches, chipping and dents. Protection comes in a range of materials and products, including rigid vinyl, stainless steel, steel, checker plate and laminate. Door protection can also be used to assist with intuitive wayfinding and provide integrated signage to doors through colour selection and the ability for manufacturers to print directly onto materials.

Door protection comes in the following options:

- Door leaf protection (face protection plates, cladding and kickplates)
- Door edge protection
- Door frame protection (corners and full frame)

These elements are illustrated in Figure 65 below.

Figure 64 Example of door protection plates to doors along a corridor in an inpatient unit

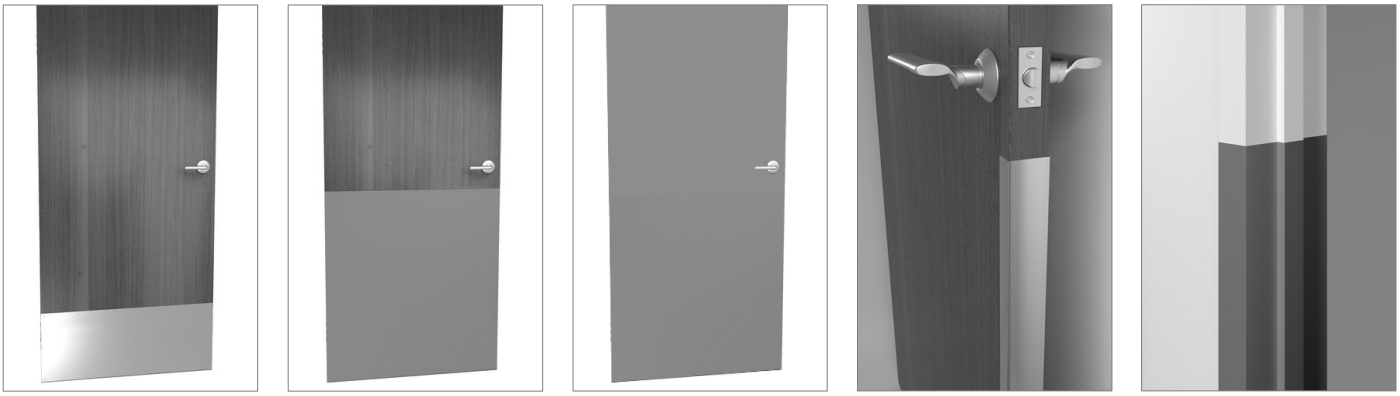


Figure 65 Examples of door protection elements (from left to right): kickplate, door protection plate to nominated height, door protection plate to full height, door edge protection, door frame protection

6.5 Privacy Film

Privacy film is a translucent finish that can be applied to glazing (i.e. to a glazed door, to a vision panel within a door or to a sidelight associated with a door) to provide privacy to the room while still allowing for the transfer of light and for people outside the room to easily understand that the room is in use (see Figure 66). Privacy film can serve additional functions such as to satisfy NCC / NZBC compliance for safety decals on glazing and for intuitive wayfinding and signage.

Applicable WHS regulations for the safety of staff working in isolation should be considered as part of the design for privacy film. These regulations may result in clear sections (i.e. clear borders or a clear strip) being incorporated into the film at an agreed height.

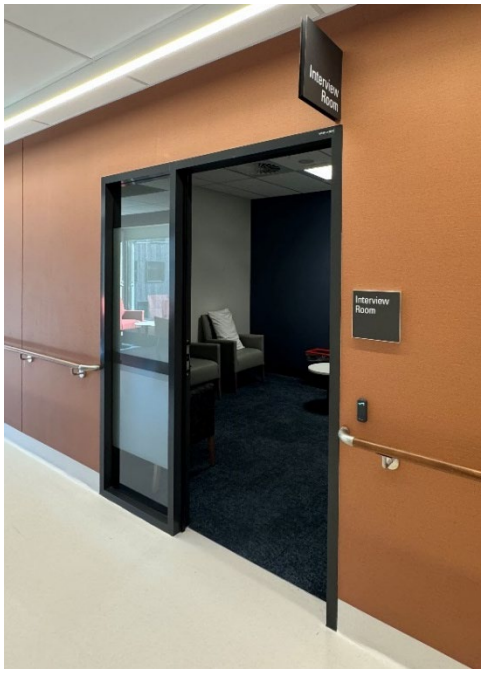


Figure 66 Example of door to interview room with sidelight finished with privacy film

6.6 Glazing Decals

Glazing decals are a finish, typically translucent, that can be applied to glazing, i.e. to a glazed door, to a vision panel within a door or to a sidelight associated with a door (see Figure 67 and Figure 68), to:

- suit specific functional purposes, including compliance with NCC/NZBC and accessibility regulations, and supporting intuitive wayfinding and signage.
- to aesthetically treat spaces to align with the interior design strategy, particularly to contribute to creating a welcoming and calm atmosphere.

Figure 67 Example of glazing decal to fully glazed stacking door for an acute care room

Figure 68 Example of glazing decal to a fully glazed door and associated glazing

7 Accessibility

Doors play a crucial role in ensuring accessibility; their design, placement, and functionality significantly impact how people interact with and navigate spaces, particularly for those with mobility challenges, visual impairments, or other disabilities. Through careful consideration of accessibility in door design, healthcare environments can empower everyone to move freely and participate fully.

For information on statutory requirements see Section 1.2 Policy and Legislative Framework at the beginning of this document.

7.1 Exemptions to Access

Under the National Construction Code (NCC) and the Disability Access to Premises – Buildings Standard (DAPS) in Australia it is possible for certain parts of certain buildings to be exempt from disability access provisions on the grounds that providing access for people with disabilities would be:

- Inappropriate because of the particular purpose for which the area is used.
- Unsafe or pose a health risk for people with disability.

These exemptions, if granted by the building certifier can also be applied to any path of travel which only provides access to an exempted area.

To claim the D3.4 Exemption it is necessary to consider disabilities both in combination and separately. To determine whether the application is appropriate or whether some amount of 'Reasonable Adjustment' can be made which would remove any disadvantage, or which may be appropriate for the use of the area by some people, or which would remove any health or safety risk for some people with certain types of disabilities.

Disabilities are not limited to physical mobility limitations. Sensory, hearing and speech impairments, learning and understanding difficulties, physical restrictions (for example, limited use of legs or feet, limited use of arms, hands, fingers, and difficulty gripping), and psychosocial.

It is best to minimise the use of a Part D3.4 Exemption within facilities whenever possible, however, it is understandable that in some buildings some people with some types of disabilities cannot be safely employed to either work in these spaces or visit these spaces. A list of rooms which are not required to be accessible should be confirmed by the project team against jurisdictional guidance and be informed by an accessibility consultant on each project.

7.2 Accessible Clear Openable Width of Doorways

The minimum clear openable width requirements for accessibility are nominated in AS1428.1 (clause 13) and NZS 4121 (clause 7).

- Fire Engineering regulations may impact the clear openable width requirements and are to be considered by the accessibility consultant in conjunction with the consultant fire engineer for each project.
- The width of the doorway should be enlarged in relation to the functions of the room or space e.g. moving of patients and/or equipment.
- Minimum clear openable width of the active leaf of double doors is to be 850mm.
- Clear openable width is to account for seals and trims which may be applied for the operation of the door as well as the thickness of the door leaf that is needed to meet the requirements of the space (e.g. acoustic or shielding requirements).

7.3 Circulation at Doorways

Information on the required circulation clearance at doorways is provided in the relevant standards as summarised below:

- The latch side (WL), hinge side (WH), and depth (L) clearances nominated in AS1428.1 for manually operated swing and sliding doors (including multi leaf sliding doors) apply.
- The latch side (WL), hinge side (WH), and depth (L) clearances nominated in AS1428.1 for automated swing doors apply.
- The latch side (WL), hinge side (WH), and depth (L) clearances nominated in AS1428.1 for automated sliding doors do not apply.
- The clearances nominated in NZS 4121 clause 7 apply.

When interpreting AS1428.1 diagrams, note that the calculation of circulation clearances that are required for a door is affected by three factors:

- The direction that the door leaf swings (i.e. clearance requirements for the side of the door where the door leaf swings towards the user will be different to the clearance requirements on the other side of the door where the door leaf swings away from the user).
- The direction from which the doorway is approached (i.e. the door can be approached from front on, or from the latch side, hinge side or either side).
- The clear width dimension.

Additional notes:

- The required circulation clearance must be free of protrusions from the finished floor level to the full height of the door.
- Circulation clearances of multiple door doors may over lap.

7.4 Maximum Force to Operate

In rooms that are required to be accessible, the maximum force to operate doors fitted with door closers is nominated in AS1428.1 and NZS 4121.

The following is to be considered when selecting / specifying door closers:

- Size and thickness of the door(s)
- Construction of the door (solid core / aluminium frame / acoustic / lead lined)
- Weight of the door
- Positive and negative pressure on either side of the door
- Specific hardware requirements to suit the functionality of the door (such as anti-ligature and anti-barricade)

If the above is not considered when specifying the door closer, it is likely that the force to operate doors will not comply with AS1428.1 / NZS 4121. The door closer requirements nominated in AS1428.1 and NZS 4121 only apply to installations where door closers are installed on doors to rooms required to be accessible. The requirements do not apply to doors to fire stairs or doors separating fire /smoke compartments.

Where door closers are installed, and it is not possible to comply with the requirements for the maximum force to operate doors, a Performance Based Design Brief and Solution many need to be prepared for an alternative approach.

7.5 Luminance Contrast

Luminance contrast is the light reflected from one surface or component, compared to the light reflected from another surface or component. AS1428.1 and NZS 4121 outlines the requirements for luminous contrast at doorways.

Some rooms that are not required to be accessible (see Section 7.1 Exemptions to Access) may not need to satisfy the requirements for doorway luminance contrast. Doors to which luminance contrast requirements apply will need to be confirmed by the project team against jurisdictional guidance.

The design process must consider the materials of walls, doors, and associated framing as well as the reflectance of glazing when addressing the luminance contrast provisions of AS1428.1 and NZS 4121, including:

- Application of door protection to the face(s) of the door leaf
- Application of door frame protection to the door jambs
- Application of graphics to adjacent walls and doors post completion of main building works.

Figure 69 indicates approaches to luminance contrast at doorways where the door leaf is painted. Requirements apply to both sides of the door.

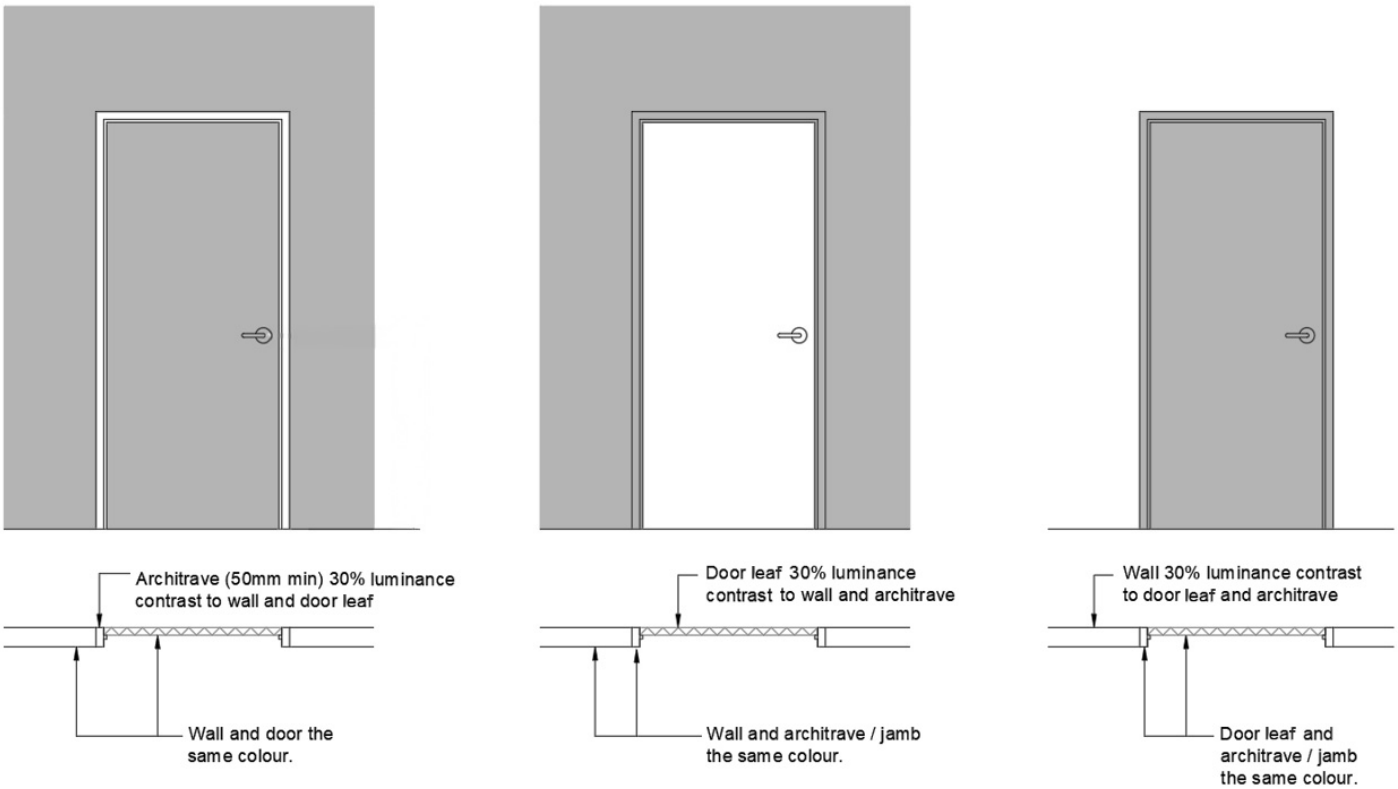


Figure 69 Illustrations of approaches to achieving luminance contrast for solid core doors

7.5.1 Glazed Doors

Luminance contrast requirements as noted above apply to glazed doors (both framed and frameless).

The aluminium framed installation shown in Figure 70 is an example which does not satisfy the luminance contrast provisions of AS1428.1 and NZS 4121. Compliance in this example could have been achieved by a combination of the following:

- Paint the surround wall a colour to achieve a 30% luminous contrast to the frame.
- Apply a film to the glazing to achieve 30% luminous contrast.
- Select an alternative glass colour to achieve 30% luminous contrast.
- Select an alternative metal colour to for the door frame to achieve 30% luminous contrast

Figure 70 Example of fully glazed door that does not comply with luminance contrast requirements

The provisions of AS1428.1 and NZS 4121 do not specifically address frameless door installations.

Compliance necessitates the following be addressed:

- Luminance contrast is to be achieved between the door leaf (leaves) and adjacent wall including curtain walling.
- Luminous contrast can be achieved by differing glass colour or the introduction of a portal to the fameless glass section.
- Where frameless glass doors are installed, the vertical edge of the doors is to be defined with a 50mm min strip.

7.6 Braille Tactile Signage Associated with Doorways

Australian requirements for Braille tactile signage are nominated in the NCC. For New Zealand, the NZBC F8/AS1 Signage – Accessible Signage Guidelines, Braille, Tactile and Clear Print (Fifth Edition 2018) advises Braille tactile signage to be an optional, not mandatory, inclusion.

The NCC requires the Braille Tactile signage is provided to:

- Exit doors
- Doors to sanitary compartments (see Figure 71)
- Locations where hearing augmentation is provided.

The NCC requires the Braille Tactile signage is to be located on the latch side of the door or, where this is not possible, on the face of the door. Where the statutory Braille Tactile signage will need to be located on glazing, a backing plate should be used (see Figure 72).

Where multiple statutory signs are required to be associated with a doors, the signs can be aggregated as shown in Figure 73.

Additionally, Braille Tactile signage may be required where a push button or a swipe reader has been installed to operate an automatic door (NCC 2022 Clause D3D26 a) and b)). The detailing of these signs is to be in accordance with the signage requirements of the NCC. The wording of this Braille Tactile signage requires careful consideration. Possible wording for this sign is as follows:

- Push to Open
- Push to Exit
- Swipe to Open
- Swipe to Exit.

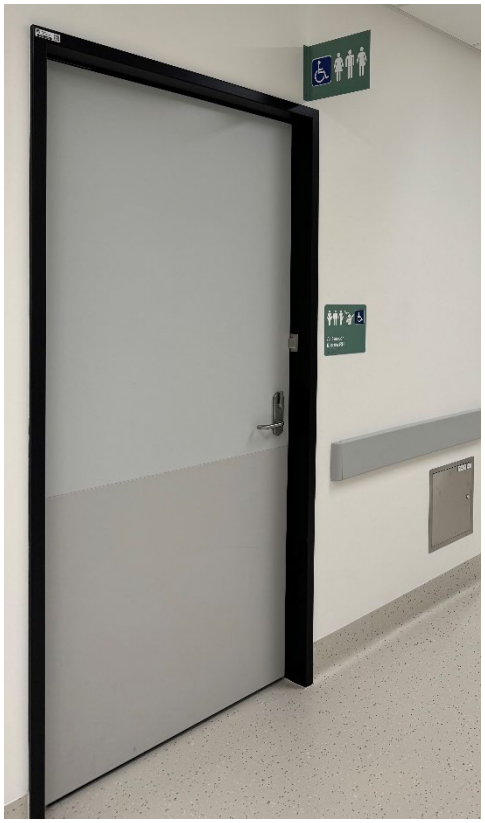


Figure 71 Example of toilet door with associated Braille tactile signage

Figure 72 Example of Braille tactile signage mounted on glazing

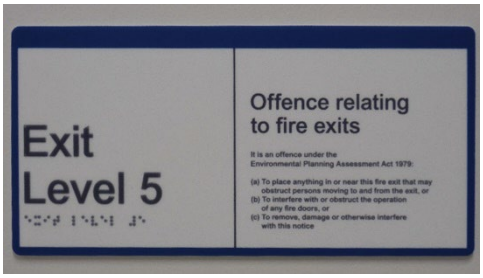


Figure 73 Example of combined Braille tactile signage and other statutory signage

8 Door Hardware

Door hardware is a broad term used to describe items that are fitted or related to door sets such as handles, locksets, latches, snibs, bolts, strikes, closers, hinges, pivots, sliding track assemblies, door stops, door seals, electronic locks, reed switches, motorisation/automation, etc. Door hardware plays a crucial role within a health facility, to ensure that the continual operation is maintained, spaces are safe and secured and infection prevention and control measures are met.

All door locks and hardware are to be compliant with the relevant performance requirements of NCC / NZBC, together with the requirements of the AS1428.1 / NZS 4121. WHS guidelines, user and patient safety, security requirements, special requirements (including anti-ligature), and consideration for durability should be applied alongside statutory requirements ensure the door hardware is fit for purpose.

The use of flexible hardware systems is to be considered where the function of the room it provides access to may be changed without wanting to change the hardware. The type of locking function should be appropriate for the use of the room and prevent a person becoming inadvertently locked in a room. Keyless entry systems may be required for controlled access areas.

In Mental Health facilities, door hardware used within patient accessible areas can be required to be manufactured and marketed as anti-ligature and anti-barricade, to meet safety requirements (see Section 10 Doors in Mental Health Units for more information). Specialised hardware should be installed in accordance with manufacturer's instructions, and all hardware elements are to work together to meet the functional requirements. The use of specific door hardware in areas such as mental health may necessitate performance-based assessment against the NCC and NZBC.

8.1 Handles and Push Plates / Pull Handles

Door handles and push plates / pull handles are the functioning opening mechanism that allow users to manually open doors. These can range from lever handles (with or without key operation), fixed push plates or bars, fixed handles and emergency panic bars. These are required to meet the functional requirements of the spaces that they serve and allow for ease of access throughout.

In areas with frequent movement by or through doorways, door handles should be selected with a shape that minimises the risk of snagging clothing or other items. Lever handles with a full return are recommended (see Figure 74).

In many instances, a door latch is not necessary. Rooms that do not require latching may work well with only a push plate / pull handle (see Figure 75) and a self-closer. Push plates / pull handles should be used in rooms that are used frequently by staff carrying objects that require hands-free operation, such utility rooms. Mental health settings may differ from other clinical areas to ensure requirements for access and safety are met.

Figure 74 Example of lever handle with full return

Figure 75 Example of push plate and pull handle

8.2 Locks and Latches

Door Locks and Latches are the fastening mechanisms that secure doors, either in a locked or non-locked position within the door frames. Locks and Latches come in varying configurations to suit the functional requirements of the spaces they secure. These include:

- Mortice locks (see Figure 76)
- Deadbolts
- Tubular latches
- Privacy latches or bolts (see Figure 77)
- Mechanical Code locks (push button keypad locks)
- Locking systems requiring credentials (such as within Mental Health areas)

Figure 76 Example of mortise lock

Figure 77 Example of privacy latch with occupancy indicator

8.3 Hold Open Devices

Hold open devices are the mechanical devices that allow doors to be held in the opened position, either for a specific time period or to suit a specific function (see Figure 78 and Figure 79). Hold open devices are used throughout health facility buildings to allow for ease of access within key critical areas as well as to ensure that the facility meets compliance with statutory regulations. These devices should be considered for doors that may need to remain open, such as doors on main traffic routes and delivery doors.

Devices should meet the following recommendations:

- Hold-open devices should be capable of activation and de-activation without any need for the staff to bend down, reach upwards or reach behind the door
- In rooms where it is required to achieve a specific air pressurisation or isolation scheme (see Section 4.6 Negative and Positive Pressure for more information) the use of hold open devices (integral with a door closer) may be required to support bed movement. Maintenance of pressure is then reliant on staff ensuring that the door is closed once the bed is moved through the doorway. The need to support bed movement and the need to maintain pressure in these rooms should be balanced, and a delayed action self-closer may be more appropriate in some circumstances to minimise pressure loss.
- In areas frequently used by staff holding objects or pushing trolleys, the use of hold open devices (integral with a door closer) or delayed action self-closers is recommended.

- Hold-open devices used for fire and smoke doors should comply with the NCC and NZBC and be controlled to release in fire mode.

Figure 78 Example of wall mounted hold open device

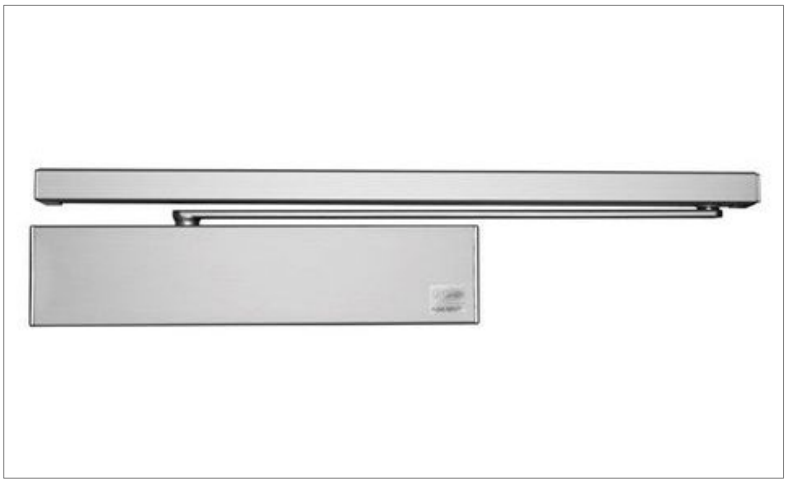


Figure 79 Example of frame mounted hold open device

8.4 Door Closers

Many doors are required to have door closers installed to ensure that a door self-closes. Manual closers store the force used to open the door in some type of spring and reuse it to close the door. Automatic types use electricity to regulate door swing behaviour.

Door closers can be linked to a building's fire and security alarm systems to ensure doors to fire compartments close when alarms are activated. Requirements for door closers for fire and smoke doors are covered under the Building Code of Australia (BCA) in the NCC. The NZBC provides design considerations on the use of door closers and guidance for doors on accessible routes under clause D1.3.

There are various reasons door closers may be used, including:

- statutory compliance of smoke doors
- external doors of air-conditioned spaces for energy conservation
- push/ pull doors e.g. to dirty utilities
- on doors with electronic security e.g. doors with swipe card readers (to minimise risk of door being left unlocked)
- pressurisation e.g. isolation rooms with negative or positive pressure.

Note that AS 1428.1 and NZS 4121 prescribe the maximum force needed to open the door in various situations and door closers can contribute to the force required to open (fire and smoke doors are exempted from this maximum force requirement in these standards). It is therefore desirable to omit closers wherever possible for accessibility reasons and reduced maintenance.

Delayed action closers, also called “controlled closers”, are a type of door close that regulates the door’s opening and closing speed, latch speed, and delayed action return. They are typically where there is a high incidence of staff carrying objects or wheeling trolleys. Dependent on closer selection, these devices can be adjusted on-site to optimise their operation in terms of delayed action, closing force, speed, etc, to suit anticipated traffic.

The over-provision of self-closers can lead to unnecessary capital expenditure and maintenance costs. Door closers should not be fitted where they exacerbate or create manual handling risks, where they impede the movement of patients or where they reduce the independence of patients.

8.5 Hinges

Most door hinges are fixed to the door frame for the opening of swing doors and folding doors. Pivot hinges differ in that they are typically secured to the head of the door frame and the floor.

For information on hinges in mental health settings see Section 10 Doors in Mental Health Units.

8.6 Emergency Release

Emergency releases may allow access to a person who has collapsed inside a small room or access into room what has been intentionally barricaded. Emergency release may be achieved by a combination of the following:

- ability to unlock from the outside e.g. with key
- unlatch the door from the outside e.g. override privacy latch/ bolt using a slot or snib release
- providing pivot doors with retractable stops, e.g. to patient sanitary facilities as an alternative to outward swinging doors (see Figure 80)
- providing double action hinges with swing away door stop (often used in mental health settings, see Section 10.2 Anti-Barricade Designs)

Figure 80 Example of retractable stop to a pivot door on a sanitary compartment

8.7 Door Seals

Door seals are essential components for doors to meet functional requirements. They serve as a barrier against external elements, such as air drafts, water, dust and noise, helping to maintain indoor comfort and energy efficiency. Statutory requirements may also require the application of smoke seals which are specifically designed to restrict the passage of smoke in the event of a fire.

8.8 Door Bolts

Door bolts are a fitted door component that locks the door leaf to prevent opening or closing. Door bolts can be manual fittings or spring actuated fittings, depending on the requirement. These are often used to secure the inactive leaf of double or 1½ leaf doors.

Where door bolts are mounted to the top of door leaves it is recommended that the length of the bolt be such that the handle is not higher than 1700-1800 AFFL to ensure ease of use. It is preferred in clinical areas for the door bolt to be mounted to the top of the leaf to avoid needing a ferrule in the floor which would be an IP&C issue.

Door bolts come with various options, including:

- Barrel bolts
- Flush bolts
- Panic bolts (also referred to as skeleton bolts)
- Roller bolts

8.9 Door Stops

Door stops are small fittings that are fitted to the door, floor or adjacent wall to prevent damaging contact between an opened door and the wall or, in some instances to limit the swing of a door.

8.10 Automation / Motorisation

Motorisation and automation mechanisms are fitted to doors to allow for the automatic operation of doors. These are used at main entries and within key critical clinical spaces to assist with the movement of patients, beds, trolleys and equipment. See Section 5 Automatic Doors for more information.

8.11 Door Sensors

Door sensors are fitted to automated swing, sliding, stacking, revolving and roller doors/shutters. Door sensor options include:

- touch-less door controls used to actuate automatic doors, including overhead motion sensors, touch-less hand sensors and wireless remote controls (see Section 5.1 Activation Devices for more information)
- Safety sensors to minimise injury risk associated with automatic doors

Door sensors are used in critical clinical areas to allow hands-free activation and continual movement of patients, beds and equipment. They are also used for entry lobbies and airlocks and for accessible amenities to comply with AS1428.1 and NZS 4121 requirements.

Consideration should be given to the sensitivity (adjustable field) of door sensors to ensure appropriate activation and to prevent unintentional activation.

9 Electronic Controls, Security and Access Control

9.1 Electronic Controls

Electronic access control systems can be configured to regulate and restrict the movement of visitors, patients and staff for reasons of:

- security
- privacy (e.g. privacy door systems to accessible WCs with auto doors)
- infection control (e.g. interlocking doors)
- electronic hold opens for ease of circulation (see Section 8.3 Hold Open Devices)
- statutory requirements

These electronic controls can apply to manually operated as well as automatic doors and include:

- electronic door controls – card readers, electronic keypads, request to exit devices such as push buttons or similar, break glass door releases, door controls located remotely e.g. at staff stations, etc.
- associated accessories – electric locks, reed switches, power transfers, PIR sensors, etc.
- software systems that enable programming as part of the Building Management System (BMS), typically security interfacing with fire services systems

Electronic door controls can impact how a door functions, depending on whether the door is:

- a manually operable door, but electrically locked (the control will unlock the door, but the user will still need to open the door manually)
- an automatic swing door, which is electrically locked and electronically actuated (the control will unlock the door, and the door will open/ close automatically)
- an automatic swing door, which is not locked but is electronically actuated (the control will open/ close the door automatically)

9.2 Electronic Security Systems

Electronic security systems and access control door hardware control access across the facility to ensure that restricted areas are only accessible by authorized personnel. Statutory authority requirement overlays, such as fire safety overlays for 'fail open' requirements, are to be addressed alongside security requirements.

As a risk management measure, all perimeter doors should be provided with locks to prevent unauthorised entry or exit. In the case of openings into a secure area or courtyard, security may still be breached in a variety of ways. Any decision to omit locks should be formally recorded.

The use of alarms to indicate the unauthorised use of perimeter doors not used for public access and the use of secure hinges (non-removable pins, etc.) to doors identified by risk assessment should be considered. Entry and exit points into a facility or department should be reduced to a minimum and provided with monitoring / access control as applicable. Suitable provision should be made for use after hours and after dark.

9.3 Access Control

Access Control can be provided with many options, including:

- proximity swipe card
- keypad access
- remote door control and release

Electronic access control can provide a record of access via a Building Management System (BMS). There are many considerations to determine the specific hardware requirement, including:

- restricted access for staff only
- restricted access for authorized staff only
- restricted access for clinical purposes
- restricted access for authority regulation compliance
- restricted access for after hours
- restricted access during health facility emergency procedures and “codes”

9.3.1 Proximity Swipe Card

Swipe card access is frequently used throughout health facilities as it provides a customizable access control system to suit specific requirements and functions. Cards in the form of swipe or proximity cards can be programmed via security software system to allow various levels of access. As such, they are able to be customised as:

- user cards
- zone cards
- global access cards
- security cards (masters)
- one time user cards

Card readers can be installed as a separate component adjacent to the secure door (see Figure 81) or within the door handle / hardware as an integrated solution. Swipe card readers can also be used on drugs of dependence safes, cupboards, and other fixtures to restrict access.

Figure 81 Example of swipe card reader adjacent to the latch side of a solid core door

9.3.2 Digital Keypad

Distinct from mechanical keypad locks, electronic digital keypads may be used to unlock the electrically locked door, provided as an alternative or in addition to a card reader. These may be useful for access by external couriers, ambulance officers and the like, if detailed record logs are not essential. Such devices must be reprogrammable. Digital Keypads can be installed as a separate component adjacent to the secure door or within the door handle / hardware as an integrated solution.

9.3.3 Remote Door Release

Remote Door Release hardware allows for the automated activation or deactivation of secure doors from a remote location. The release button is typically located adjacent to the secure door or nearby within a secure staff only accessible area, such as a reception desk or office area, and can be fixed to the wall or below a joinery bench. These locks can be activated or deactivated remotely, allowing medical staff to swiftly secure or open doors as needed to ensure smooth patient flow while maintaining safety, or to release fire doors that have been held open by electromagnetic door holders.

These are usually provided additional to door controls, in the immediate vicinity of an electronically locked door, such as a central reception or staff station. The remote door control may be:

- a push button (or similar) located remotely from the door where the user has visibility of the person before permitting entry. Typically, the button would be wall mounted or mounted on the joinery of the reception desk or staff station.
- integrated into master intercom station, for instance at a staff station, were direct view of the person seeking entry is not possible. In this situation it is usual that there be a video intercom station on the entry side of the door used to contact the authorising staff member to check that the visitor to allowed to enter. The master intercom can be wall mounted or on a bench as a loose or fixed item.

Remote door controls may also initiate special modes such as emergency lock down in duress situations for specific programmed security zones.

9.3.4 Interlock Systems

Interlock systems are provided where 2 or more doors are not to be opened simultaneously for reasons such as infection control, security or weather ingress. Interlocking systems for doors may not be appropriate for specific settings, such as rooms that must allow for secondary access / egress due to occupational violence and aggression.

Interlock systems may be used in health facilities in the following settings:

- Entry airlocks (including external entry doors, hospital departments and secure units)
- Isolation Rooms, including Ante Rooms
- Specialty clinical areas, such as pandemic/infectious quarantine units, some mental health settings, etc.
- Specialty clinical support areas, such as sterile services department (SSU), cytotoxic suites in pharmacy, PC 3 lab suites, etc.

Interlock systems for doors that are required to be secured when medical equipment is in use may be considered. This includes medical imaging departments, where the door operation is linked to the medical equipment and opening a door would result in the shutdown of medical equipment that produces ionising radiation to reduce the risk of exposure.

9.4 Electronic Locks

Electronic mechanisms that secure doors via a powered solution, including:

- electric strike
- electromagnetic locks
- electric mortice locks
- locking via motors (i.e. to automatic sliding doors and automated roller shutters)

To avoid security being compromised by doors being left or held open, electrically locked swing doors should be self-closing. As such, delayed action closers to such doors are recommended where wheeled traffic is anticipated.

9.5 Push Buttons

Push buttons (also called/labelled as push to exit buttons, push to open buttons or door release buttons) functions will vary depending on if the door is manually operated or automatic:

- For an electrically locked, manually operated door (the push to exit button will unlock the door but the user will still need to open the door manually).
- For an electrically locked, automatic door (the push to exit button will unlock the door and the door will open/ close automatically).

Where a push button is specified to release a door, the dimension of the button is to be 35mm x 35mm or 35mm diameter. In some instances, a 'swipe' to release the button may be proposed. The swipe zone should be 35mm diameter or equivalent.

9.6 Door Control Locations

The function of the door should determine the optimal location for the door control, be it adjacent to the door or a distance from the door to allow for continual movement once activated, either when walking or moving beds and equipment. Controls must also be located accordance with AS1428.1 and NZS 4121 for rooms that are required to be accessible. Signage to be provided as required to satisfy accessibility requirements as per AS1428.1 and NZS 4121.

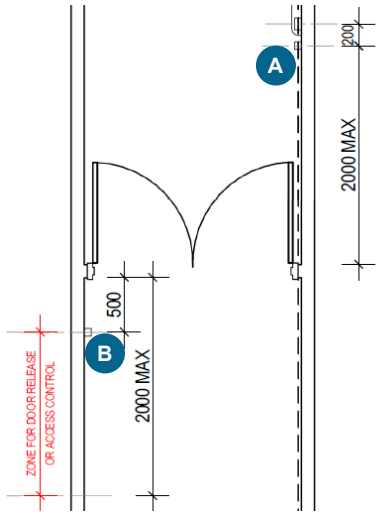
Door controls should be located together to ensure ease of use, yet sufficiently separated to ensure functionality is distinguishable. Door controls should also consider the applied finishes to the host wall, ensuring that the control is easily identifiable and accessible. This includes locating door controls away from walls with feature paint, applied protection and feature graphics / murals where the control may be not easily identifiable (see Figure 82).

For electrically locked but manually operated doors, controls such as push buttons should be close to the door (minimum of 500mm from an internal corner), as the user still needs to manually open the door once it is unlocked.

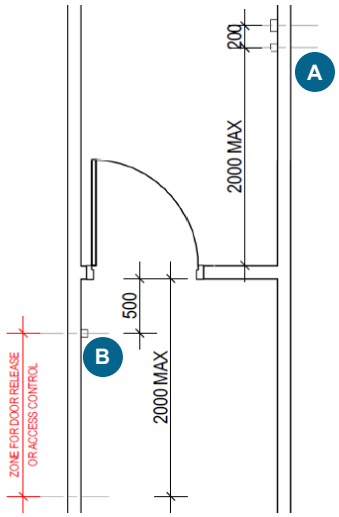
Where the function and use of the door dictates that the door controls to be located more than 1-2m from a doorway that is required to be in the closed position, a Performance Based Design Brief and Solution will need to be prepared.

Figure 82 Example of door controls located on top of graphic design features and are therefore difficult to identify

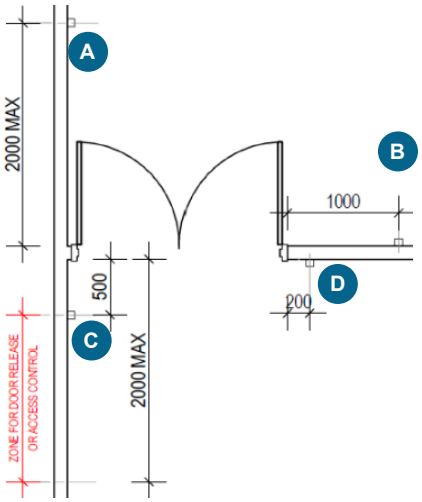
The diagrams in Table 5 show examples of appropriate locations for door release buttons:



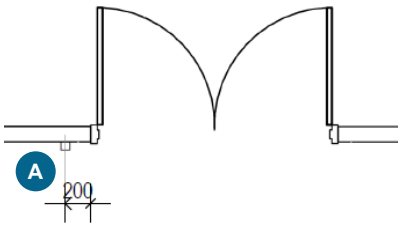
A - door control location when double door swings towards the user
B - door control location when double door swings away from the user



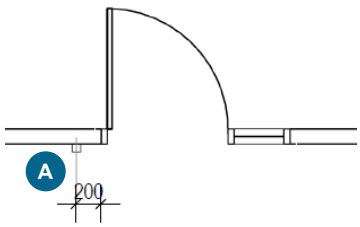
A - door control location when single door swings towards the user
B - door control location when single door swings towards the user



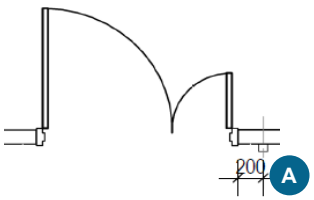
A - door control location when double door swings towards the user
B - door control location when double door swings towards the user (wall perpendicular to path of travel)
C - door control location when double door swings away from the user
D - door control location when double door swings away from the user (wall perpendicular to path of travel)



A - door control location when double door swings away from the user (wall perpendicular to path of travel)



A - possible door control location when single door swings away from the user (with sidelight to latch side of door)



A - door control location when 1½ door swings away from the user (wall perpendicular to path of travel)

Table 5 Illustrations of appropriate locations for door controls in relation to the doors they act upon

9.6.1 Door Controls on Totem / Bollard

At the entrances to a hospital and other areas that incorporate glazed curtain walling, door controls may be provided on a bollard or totem (see Figure 83). This bollard or totem is to be located within 1m-2m of the doors operated by the controls. Signage as required to satisfy accessibility requirements as per AS1428.1 and NZS 4121.

Bollards may accommodate:

- Door controls and access controls (push buttons, card readers, keypads, etc.)
- Video intercoms
- Signage

Figure 83 Example of door controls (swipe card for after hours and push to open button) and intercom on bollard

10 Doors in Mental Health Units

Doors within mental health settings, including community and bed-based services, are required to use specialist anti-ligature, tamper-proof, robust door hardware in certain areas to reduce the risk of consumers being able to attach a ligature with the intent of self-harm, or otherwise use elements of the door to cause harm to themselves or others. Of particular concern in mental health settings are doors to spaces that mental health consumers access alone and unobserved (such as doors to bedrooms and ensuites) as well as doors that are not always easily observable by staff.

Consideration may be given to using standard hardware and door features in low-risk areas of mental health settings where doors are intended for visitor and staff use only. A risk assessment and zoning of different areas of a mental health unit will inform these decisions (for more information see HPU 131 Mental Health – Overarching Guideline).

Door set components that are specifically designed for mental health settings are illustrated in Figure 84 and may include:

1. Locksets
2. Handles
3. Hinges
4. Swing-away door stops
5. Door stops
6. Door top alarms / full door weight sensors
7. Door closers
8. Locking bolts
9. Vision panels, including operating mechanisms for integral blinds/switchable glass

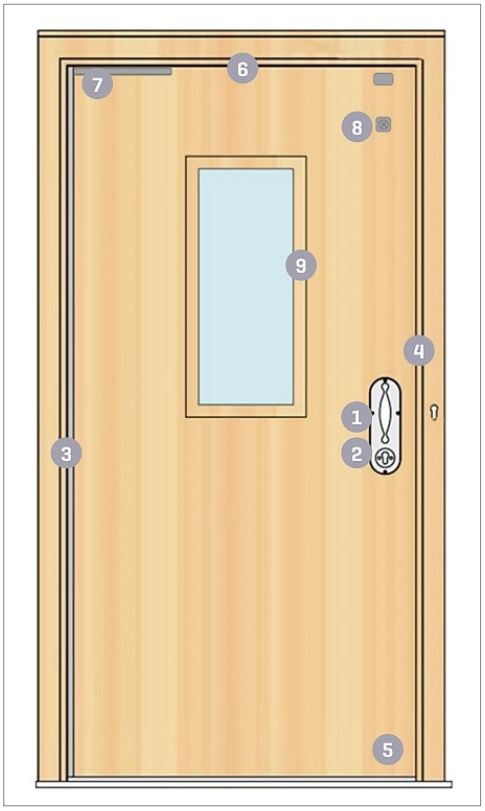


Figure 84 Door set components that can be specifically designed for mental health settings

Door sets/hardware in mental health settings should:

- Mitigate risk of self-harm.
- Ensure easy operation of the door.
- Be sufficiently robust and durable.
- Help create a therapeutic environment for consumers.

10.1 Anti-Ligature Designs

Anti-ligature door sets/hardware are designed to remove any element that could provide an attachment point for a ligature with the aim of making mental health environments safer for people who are most vulnerable.

There are many options for anti-ligature and anti-barricade doors available within Australia and New Zealand, which includes swing doors and, more recently, new sliding door options. Anti-ligature door hardware may be purchased as a door set, which meets all functional and security requirements, rather than a combination of products from different manufacturers and suppliers.

To reduce risks and minimise harm, all door sets/hardware used in consumer areas of mental health settings (and any areas deemed an area of concern in a risk assessment) should be:

- Of a type specifically design, manufactured and marketed as ‘anti-ligature’; and
- Installed in accordance with the manufacturer’s instructions.

As there is no official accreditation for products marketed as ‘anti-ligature’, it is recommended that project teams test any door sets/hardware to be used on a project to confirm they meet all safety requirements.

10.1.1 Ligature Detection Systems

Ligature Detection systems are a type of sensor and alarm system designed to detect ligature attempts and alert staff. These products can be integrated with staff duress or nurse call systems to ensure staff are alerted to a ligature attempt and are able to intervene in a timely manner. Ligature alarms are an important consideration in the design of doors within mental health facilities where it isn't possible to minimise the ligature risk through design or constant observation.

Ligature Detection systems include door top alarms (see Figure 85) and full door edge ligature alarm systems and should be supplied on an essential power supply at minimum, with preference for it to be on an UPS backed supply.

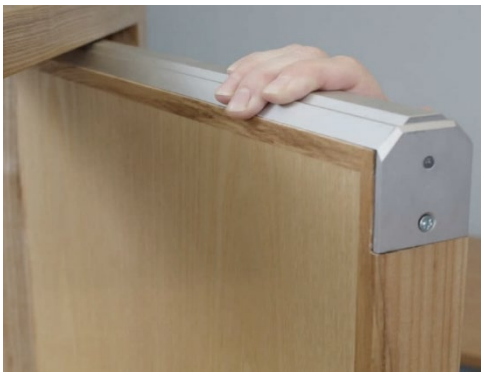


Figure 85 Example of door top pressure sensor

10.2 Anti-Barricade Designs

Anti-barricade door systems allow staff to overcome consumer barricading incidents swiftly and safely to reduce risk in mental health settings and other challenging environments. Anti-barricade door systems allow staff to swing doors in the opposite direction than the primary swing.

To allow the door to open outwards, these systems typically involve the ability to remove or retract/collapse/swing-away a door stop on the latch side of a door (see Figure 86 and Figure 87). However, some anti-barricade systems rely on a retractable continuous hinge which shifts the door leaf back from the frame rebate allowing the door to swing outwards.

Figure 86 Example of anti-barricade door with swing away door stop

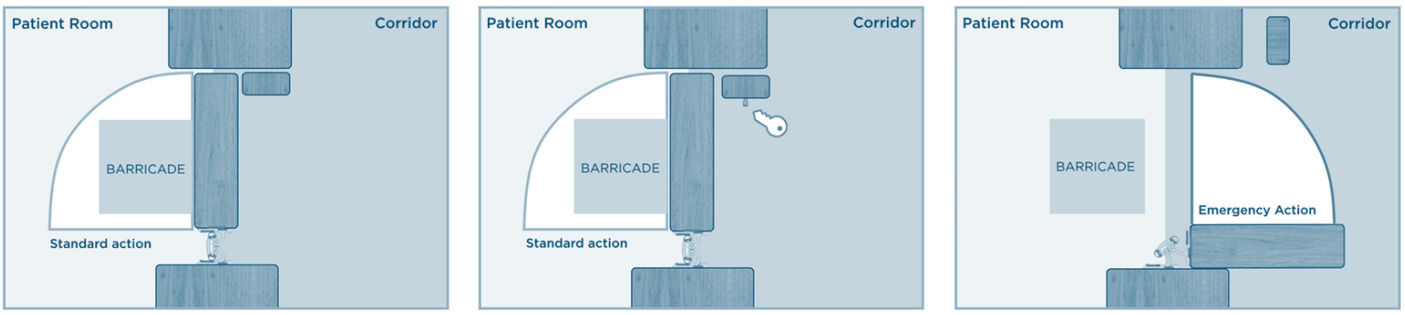


Figure 87 diagrams illustrating the process of overcoming a barricade incident (from left to right): door is barricaded, door stop is unlocked and removed/swung away, door is opened outwards

10.3 Other Functional Requirements

In addition to supporting the safety of consumers and staff, doors in mental health units may need to respond to several other functional requirements, such as:

- Fire safety
- Security
- Accessibility

Careful consideration is required to ensure that the appropriate door and hardware is selected for the situation. Projects should consider:

- Door swing - single, dual, into frame support
- Door type - single leaf, 1½ leaf, double leaf, etc.
- Door robustness - solid core, metal covered, steel door
- Door hardware – including handle, and lock type

10.4 Continuous Hinges

Continuous hinges are full length continuous geared designed to protect against ligature attempts, tampering and finger entrapment.

There are twoh main types of continuous hinges

- double swing continuous hinges (see Figure 89)
- single swing continuous hinges (see Figure 88)

Double swing continuous hinges are typically used for doors that routinely swing inwards but may need to swing out to in case they are barricaded. These are not to be confused with pivot mechanisms which present a ligature risk. Double swing hinges need to be used in conjunction with other features such as a swing away frame stop, and the use of such hinges will impact the clear opening widths achieved.

Figure 88 Example of single swing continuous hinges

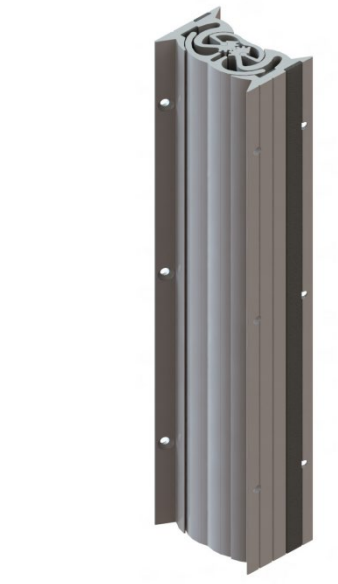


Figure 89 Example of double swing continuous, shrouded hinges

10.5 Emergency Release Hardware

Emergency Release hardware enable staff to override the primary locking mechanism of any door and are used extensively throughout mental health facilities.

Override systems available, include:

- Key override system (see Figure 90)
- Electronic override system (see Figure 91)

Figure 90 Example of anti-ligature hande with privacy latch and key override

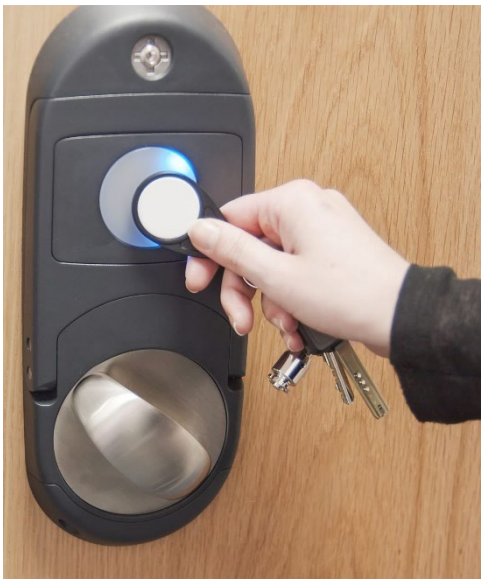


Figure 91 Example of anti-ligature door handle with electronic access control with override

10.6 Robust Materials

Anti-ligature and Anti-barricade doors are to be made from robust materials to withstand the rigours of mental health environments. The doors are a solid timber core construction made from layers of hardwood with varying applied finishes to suit requirements and desired aesthetics. Door leaves may be thicker than standard doors to contribute to robustness and to suit continuous hinges. Door hardware applied to doors with increased robustness to meet the requirements of mental health settings should consider the additional weight of these doors and the force required to operate them. Consideration should also be given to the strengthening of door frames.

Perimeter doors or doors used for separation of different cohorts of patients may be subject to more attempts at tampering, damage and attack. As such, the robustness of door and hardware must be carefully considered for these doors.

11 Planning Principles

To assist the assessment of the significant number of competing requirements that doors are required to meet, the following notes the overarching requirements, in order of priority:

1. Mandatory legislative requirements that determine door sizes and types:
    a) Fire compartmentation and separation (per NCC and NZBC);
    b) Design for People with Disabilities (per AS1428 and NZS 4121) as referenced by the relevant building codes; and
    c) Other NCC and NZBC requirements.

2. Other significant requirements for doors are:
    a) Security, including:
        i. the safety of all persons in the facility, and
        ii. controlled areas (drug storage / hazardous materials / plant rooms).
    b) Safety, including:
        i. Anti-ligature provisions where required for patients at risk of self-harm,
        ii. Radiation shielding,
        iii. Infection control, and
        iv. Food safety requirements.
    c) Clinical operational requirements.

3. General requirements include:
    a) Appropriately sized to accommodate items that move through them,
    b) Design for ease of movement (e.g. automatic doors / push to open),
    c) Glazed doors for amenity (maximise penetration of natural light) and oversight, and
    d) Robustness.

The following may assist with the timely capture of door requirements:

- It is recommended that a review of security and safety requirements is completed with the design team and relevant stakeholders after the general arrangement / floor plan has been endorsed.
- When conducting a review of door requirements, it is best to look at an entire floor on a single drawing, so that staff, visitor and patient movements can be appreciated wholistically. Prior to this review, the design team must determine the required fire compartmentation.

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Glossary

Acronyms

Acronym	Definition
AHIA	Australasian Health Infrastructure Alliance
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
AusHFG	Australasian Health Facility Guidelines
BCA	Building Code of Australia – Volume 1 and Volume 2 of the NCC
BMS	Building Management System
DDA	Disability Discrimination Act
ED	Emergency Department
EML	Electromagnetic Lock
ESD	Environmentally Sustainable Development
FF&E	Furniture, Fittings and Equipment
FFL	Finished Floor Level (also AFFL – Above Finished Floor Level)
HPU	Health Planning Unit
HVAC	Heating, Ventilation, and Air-conditioning
ICU	Intensive Care Unit
ISO	International Standards Organization
IP&C	Infection Prevention and Control
MME	Major Medical Equipment
NCC	National Construction Code (Australia)
NZBC	New Zealand Building Code
NZS	New Zealand Standard
OR	Operating Room
PPE	Personal Protective Equipment
RF	Radiofrequency
RDS	Room Data Sheet
RLS	Room Layout Sheet
UPS	Uninterruptable Power Suppy
WHS	Workplace Health and Safety