Building for Everyone:

A Universal Design Approach

Entrances and horizontal circulation

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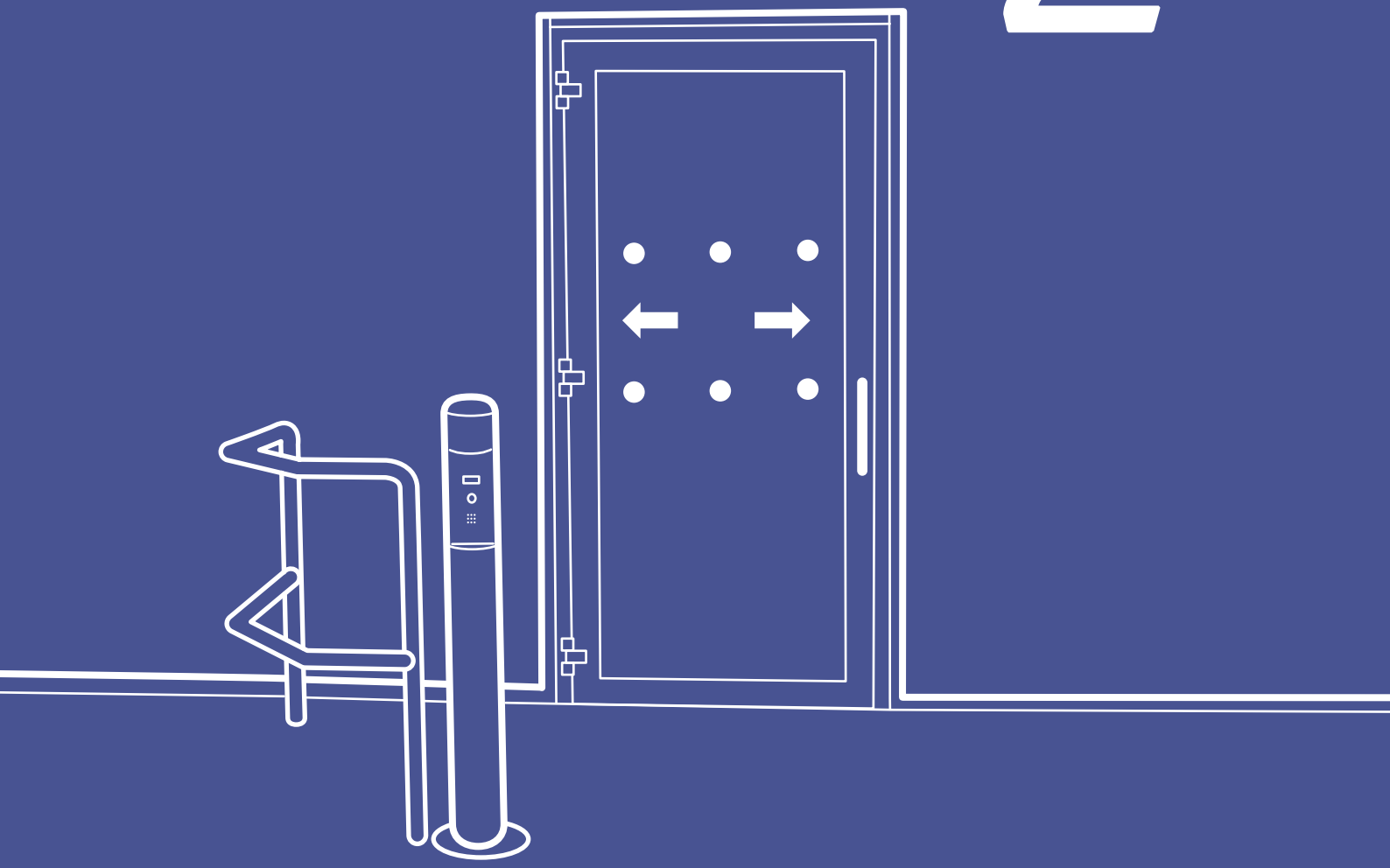

Centre for Excellence in Universal Design

Creating an environment that can be used by all people, regardless of their age, size, disability or ability.

The National Disability Authority's Centre for Excellence in Universal Design has a statutory role to promote the achievement of excellence in universal design in:

- the design of the built and external environment
- product/service design
- information and communications technologies (ICT)
- the development and promotion of standards
- education and professional development
- raising awareness of universal design

More information and updates on the website at: **www.universaldesign.ie**

Building for Everyone

Booklet 2 - Entrances and horizontal circulation

The other booklets from the
Building for Everyone series:

Booklet 1 - External environment and approach

Booklet 3 - Vertical circulation

Booklet 4 - Internal environment and services

Booklet 5 - Sanitary facilities

Booklet 6 - Facilities in buildings

Booklet 7 - Building types

Booklet 8 - Building management

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2.0 Objectives

The guidance in this booklet promotes the concept and philosophy of universal design and encourages developers, designers, builders and building managers to be innovative and think creatively about solutions that meet the needs of all building users regardless of their age, size, ability or disability.

The objectives of the series of booklets are to:

- identify and promote best practice with regard to universal design of the built and external environment
- provide best practice guidelines while recognising existing regulations in Ireland
- provide guidelines that are usable by and accessible to the target audience
- promote the achievement of universal design in Ireland

The objectives of this booklet are to:

- identify and promote best practice for access to and understanding of entrances to buildings and the horizontal circulation within buildings with regard to universal design
- increase awareness of, and to encourage designers to identify, the needs of all those who require access to buildings and the horizontal circulation within buildings in order to undertake daily activities
- highlight the wider benefits experienced by all when accessible and universally designed features are provided in building entrances and interiors
- encourage designers to provide universally designed solutions for the entrances to buildings and the horizontal circulation within buildings that look beyond the recommended requirements of national building regulations

2.1 Introduction

This booklet is part of the series "Building for Everyone – A Universal Design Approach," which aims to provide practical guidance on the universal design of buildings, places and facilities.

Universal design places human diversity at the heart of the design process so that buildings and environments can be designed to meet the needs of all users. It therefore covers all persons regardless of their age or size and those who have any particular physical, sensory, mental health or intellectual ability or disability. It is about achieving good design so that people can access, use, and understand the environment to the greatest extent and in the most independent and natural manner possible, without the need for adaptations or specialised solutions (see full definition in **Appendix A1**).

Why universal design?

People are diverse - some are left-handed and some right-handed - and vary in their age, size and functional capacities. Illness or disability (whether temporary or permanent) can also affect characteristics such as a person's mobility, dexterity, reach, balance, strength, stamina, sight, hearing, speech, touch, knowledge, understanding, memory, or sense of direction. A reference list with these booklets indicates some of the key differences in human abilities that should guide design of buildings and of outdoor places. (See full description of Human Abilities in **Appendix A2**).

People of diverse abilities should be able to use buildings and places comfortably and safely, as far as possible without special assistance. People should be able to find their way easily, understand how to use building facilities such as intercoms or lifts, know what is a pedestrian facility, and where they may encounter traffic.

Given the wide diversity of the population, a universal design approach, which caters for the broadest range of users from the outset, can result in buildings and places that can be used and enjoyed by everyone. That approach eliminates or reduces the need for expensive changes or retro fits to meet the needs of particular groups at a later stage.

It is good practice to ascertain the needs of the range of expected users as early as possible, and to check the practicality and usability of emerging designs with a diverse user panel.

Designing for one group can result in solutions that address the needs of many others. For example:

- level entry (Step-free) entrances facilitate not just wheelchair users but also people with buggies; people with suitcases or shopping trolleys; people using walking or mobility aids; and people with visual difficulties
- larger toilet compartments provide easier access to wheelchair users; those with luggage or parcels; parents with pushchairs or accompanying small children; those using walking or mobility aids; and larger-sized people
- clear, well-placed signage that uses recognised symbols or pictograms helps people with reading or cognitive difficulties, and those whose first language is neither English nor Irish

Sometimes one solution will not suit all and a range of options will need to be provided, for example:

- providing both steps and a ramp where there is a change in level
- providing parking ticket machines that offer slots at different heights to facilitate use at standing height, at sitting height, and by people of small stature

This series of booklets is for architects, engineers, planners, developers, designers, building contractors, building workers, building managers, and others involved in designing, commissioning and managing buildings and their surroundings. It provides guidance on a universal design approach to all new buildings, and the use and adaptation of existing environments.

Those who commission, design, construct or manage any part of the built and made environment also have a duty of care to adhere to relevant legislation and regulations including equality legislation, building regulations and health and safety regulations.

The guidance is based on a best practice approach, drawing on up-to-date international best practice; guidelines and standards; previous guidance by the National Disability Authority; and extends beyond disability access matters to incorporate a universal design approach. The series is fully compatible with Part M (2010) of the Building Regulations and associated Technical Guidance Documents related to Part M.

A disability access certificate is required for new buildings other than dwellings (including apartment buildings) and certain other works (as set out in Article 20 D (1) of SI 351 of 2009) to which the Requirements of Part M of the Building Regulations apply, which commence or take place on or after 1 January 2012. Further details on these and other relevant standards, codes of practice, and professional codes of practice are listed in **Appendix A3** Further Reading.

The detailed guidance provided here does not represent the only possible solution. Designers may come up with other ways to meet a diversity of users. New materials and technologies that emerge may open up further possibilities of accommodating the diversity of the population.

Checklists are provided throughout the series and while they provide a summary of main considerations and technical criteria, they should not be regarded as a substitute for the main text or an exhaustive list.

A comprehensive **index** is also available with the suite of booklets.

The Building for Everyone series is available online at **www.nda.ie** and **www.universaldesign.ie**. Electronic links are provided to relevant sections in the different booklets. As standards and requirements develop, the electronic versions of these booklets will be updated.

The electronic version is produced in accessible PDF format, in accordance with the Web Content Access Guidelines 2.0. If you have any difficulties in this regard or require the document, or particular sections, in alternative formats, please contact the Centre for Excellence in Universal Design at the National Disability Authority, **info@ceud.ie** or (01) 6080400.

2.2 Terminology

Accessible design – Design focussed on principles of extending standard design to people with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service.

Building – A permanent or temporary structure of any size that accommodates facilities to which people have access. A building accommodating sanitary facilities may include a toilet block in a public park or shower facilities at a campsite. A temporary building may include portable toilet facilities such as those provided at outdoor events.

Building user – Any person regardless of their age, size, ability or disability using facilities in a building or associated external environment.

Coir matting – A coarse kind of carpet made from coconut fibre usually used as a floor mat in matwells at building entrances.

Matwell – Entrance Door Matting Systems set into a frame in the floor.

Vision panel – A fixed, glazed panel set into a door that enables people to see through from one side of the door to the other. May also be termed 'viewing panel.'

Door ironmongery – A collective term for components including hinges, handles, locks and self-closing devices, which are used to facilitate the correct functioning of a door. May also be termed 'architectural ironmongery' or 'door furniture'.

Transom – A horizontal crosspiece across a window or separating a door from a window over it.

Universal Design = Useable = Understandable – Understanding users needs. For example an older person may require many resting places due to discomfort when walking for long distances.

2.3 Design Issues

2.3.1 Appearance and function

The design of an entrance has a significant influence on both the appearance and functionality of the building. Entrances signify the point of access to a building; provide a focal point for staff, residents and visitors; and serve to welcome people into the building. They may also characterise in a visual and practical way the ethos of the building or organisation and its approach to universal design.

A clearly visible and accessible entrance is likely to create a positive impression for all building users and make them feel welcome. If an entrance is hard to find or if it is difficult to access due to heavy doors or narrow door width, it creates a poor first impression and may make some people feel less welcome or even excluded.

The design of reception and waiting areas, and the ease in which people are able to move independently around a building, have a similar influence on overall accessibility. A well-designed building layout with clear access routes and doors that are sufficiently wide and easy to operate will demonstrate a commitment to universal design throughout.

Image 2.1 Entrance to a county council office.

2.3.2 To let people in or to keep people out?

A building entrance may be required to serve potentially conflicting functions, such as to permit controlled access by staff or residents but to deny access to unannounced callers, as may be the case in some private offices or residential premises.

Other entrances may provide unrestricted access to all to the extent that doors are held fully open during the day, such as in some large retail stores. Some entrance doors will permit unrestricted access but will remain closed in order to conserve energy and to reduce the intrusion of traffic noise.

The design of an entrance must acknowledge these and other requirements whilst ensuring that everybody who is likely and entitled to enter a building is able to do so conveniently and independently.

Similarly, internal doors provide a means of enclosing a room or providing an effective barrier between adjacent areas for reasons of privacy, noise reduction, fire safety or security. However, they must also be designed to permit easy passage for people to allow them to access facilities and to exit a building safely.

Checklist – Building entrances appearance and function
• Entrances should signify the uses of a building or organisation and demonstrate positive approach to universal design.
• Entrances should be accessible whilst also maintaining security, environmental performance, and other requirements.

2.4 Entrances

Every building entrance should be easy to locate and clearly distinguishable from the rest of the building. The position of an entrance may be highlighted with architectural features such as a canopy or a door recess. A change in surface texture of the pavement or forecourt may help to signal the location of an entrance, particularly for people with visual difficulties.

Image 2.2 Example of an entrance canopy.

Audio clues, such as a small fountain or rustling plants, and olfactory features such as fragrant plants can also assist.

Artificial lighting can highlight the entrance to a building and make it more obvious at night for everyone.

In new buildings, all entrances – whether they are the principal entrance or any other entrance such as a staff entrance – must be universally designed.

It is not acceptable that people with different abilities such as people of different ages, size or disability should be required to use a secondary or alternative entrance.

In existing properties, site or building constraints may preclude universally designed access to the main entrance. All options for improvement should be considered in these circumstances, both internally and externally. Alterations to the internal layout of a building may provide the opportunity to create a new entrance in a more accessible and useable location. Externally, the provision of steps and ramps may be appropriate, or the installation of a platform lift if there is insufficient space for a ramp. However, if universally designed access still cannot be achieved, it may be necessary to provide an alternative entrance in a location that is accessible.

Any alternative entrance should be as freely available and clearly sign-posted as the principal entrance and should be available for everyone to use.

It is never acceptable for a service entrance to be the sole point of access for people with disabilities. Discrimination of this nature would be unacceptable in respect of any group.

Adequate space should be provided outside all entrance doors to enable people to manoeuvre, understand, access, and use any intercom or entry system. When leaving a building, people often pause outside an entrance to button a coat or open an umbrella; there should be sufficient space to do this without obstructing other people who are entering or leaving. Where entrances are located at the top or bottom of a ramp or a flight of steps, or at the end of a long passage, it is essential that sufficient space is provided for wheelchair users; parents with strollers; people with visual difficulties; guide dog users; and those with walking aids to manoeuvre and turn safely.

The recommended clear area for a landing or turning space immediately outside an entrance is 2400mm x 2400mm.

Outward-opening entrance doors should either be recessed or protected to avoid the risk of collision. Where outward-opening doors are located close to a flight of steps or a ramp, they should also be positioned to avoid the risk of anyone tripping or falling backwards down the steps or a ramp while opening the door.

The use of multiple doors would allow individuals a choice should they sense the approach of others to the same entrance, whether head-on or along-side. Refer to **Section 2.6.1** for further information on entrance doors.

Every accessible entrance must incorporate a level threshold, despite the challenge this presents in terms of waterproofing. Wherever possible, the threshold should be flush with the external ground surface and internal floor finish.

However, where a raised threshold is unavoidable for structural or other reasons, it should have an overall change in level of no more than 10mm, with any upstand greater than 5mm chamfered, ramped or pencil-rounded.

Features such as a recessed entrance or a canopy will help to reduce rainfall directly onto the area next to the doorway, thereby helping with the issue of waterproofing. The provision of drainage gullies adjacent or close to the entrance door can significantly reduce water penetration while not inhibiting access.

Recessed entrance doors and canopies also provide weather protection for people waiting outside. Protection from the weather is particularly useful if people are required to operate security or entry devices before being able to enter a building. It is recommended that a door recess or canopy should be 1200mm deep and have clear a head height of 2200 to 2500mm. Where single doors are recessed, they should have a 600mm-wide clear space adjacent to the handle-side of the door.

Where underground or multi-storey car parking is provided, both the lift and the principal entry to the building from that storey should be accessible from the car park.

If the entrance to a building is accessed via a pedestrian tunnel or an elevated walkway, the tunnel and walkway must be universally designed.

Where the only entrance to a building or facility is a service entrance, such as to an industrial unit, that entrance should be accessible.

Entrances to large buildings such as railway stations should have doors that are permanently left open so that access is unimpeded for all. If it is not possible

to have a door-free entrance for security or environmental reasons, entrance doors should be fully automatic, as **Section 2.6.6**.

Entrances to buildings that are required to be secure, such as courts or police stations, should still be accessible, with the necessary security measures designed for universally designed access.

In multi-tenanted buildings, the entrance to each tenancy should be accessible, in addition to the common, shared or public entrance to the building.

Checklist – Entrances
• Ensure entrances are clearly visible and prominent.
• Make sure all entrances in new buildings are universally designed.
• Design alternative entrances to existing buildings to meet universal requirements.
• Provide adequate space inside and outside entrance doors.
• Establish clear landing space outside entrance of 2440mm x 2440mm.
• Arrange outward-opening doors so that they are recessed or guarded.
• Ensure threshold to entrances are level or no greater than 10mm with chamfered, pencil-rounded or ramped profile.
• Provide canopy or door recess for weather protection.
• Leave a clear space of 600mm adjacent to handle-side of door.

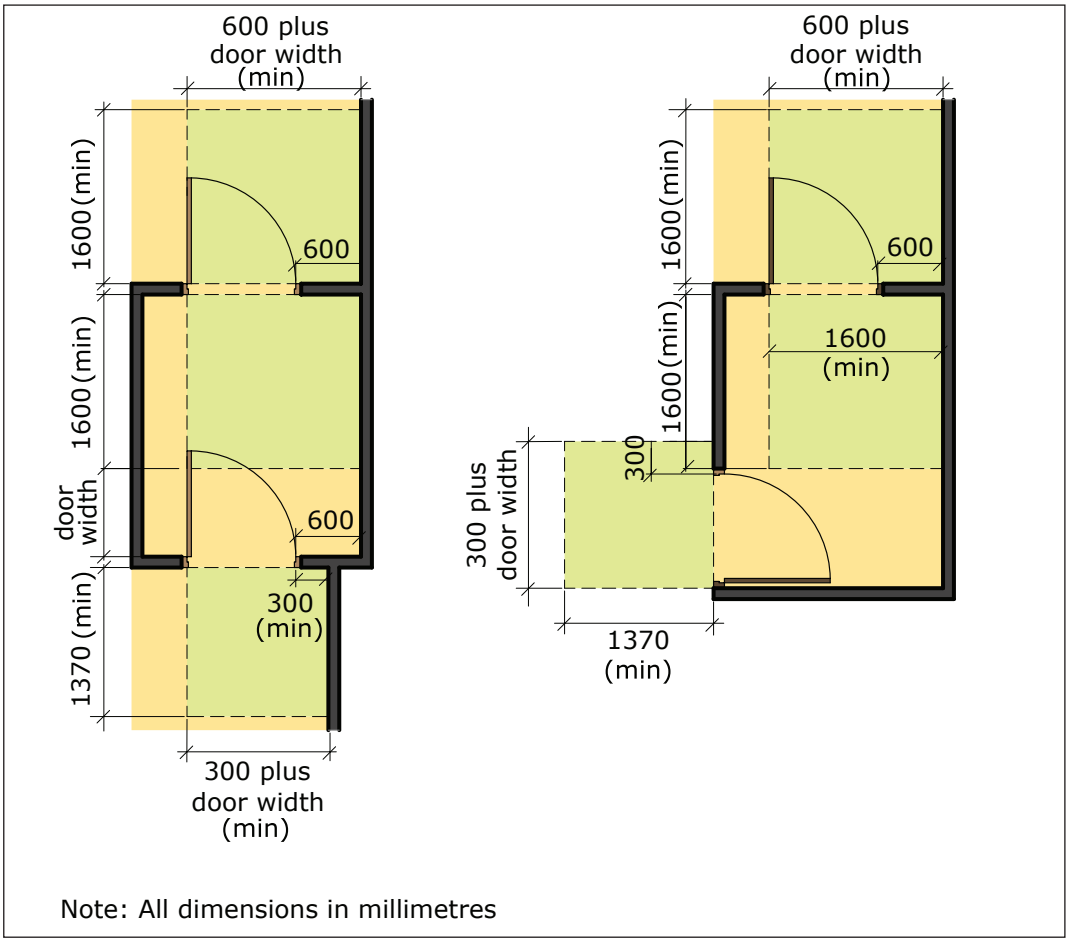
2.4.1 Entrance lobbies

An entrance lobby – that is, a lobby with an outer and inner door arrangement – is common practice in many buildings, and is often required for security or environmental reasons. However, it should not be considered imperative in every situation to create a lobby if the external doors and building layout are able to function without it. Even the most accessible doors create a potential barrier and reduce the available space. Therefore, if a lobby is not absolutely necessary, an entrance without one is likely to be a better solution.

Where they are required, entrance lobbies should be as large as possible, with adequate space for everybody to manoeuvre between both the inner and outer doors. The overall size will depend on a number of factors including the building type; the number of people expected to use the entrance at any one time, whether the entrance is in simultaneous use as an exit and whether any security features are required on either the inner or outer doors.

The entrance lobby to a small, ground floor office building will clearly be smaller than the lobby to a shopping mall, but it should still be accessible, useable, and meet the recommended dimensions shown in **Figure 2.1**. The entrance lobby to a large building such as a shopping mall or department store should be large enough to enable significant numbers of people to pass through in both directions. This is likely to require the provision of a series of doors side-by-side, with adequate lobby depth for people to move clear of one door before opening another. Where the level of traffic and frequency of use warrants, an automatic opening door should be fitted. See **Section 2.6.6** for further information.

Figure 2.1 Clear space requirements for lobbies.



Entrance lobbies to supermarkets and large retail stores should be designed to accommodate people pushing trolleys. For security reasons, these are often designed to permit only a one-way flow of people, but they still require adequate manoeuvring space.

In buildings in which the outer door is left unlocked, but the inner doors are subject to security controls, the size of the lobby should be sufficient for people to access the security controls, whether these are an entry system, intercom or security desk. There must also be ample room to manoeuvre between the inner and outer doors.

The recommended dimensions for entrance lobbies are illustrated in **Figure 2.1**. The key dimension is 1600mm between door swings. As discussed above, there will be many situations in which increased dimensions will be appropriate or necessary, such as in larger buildings; where large numbers of people are expected at any one time; or where security controls are in place.

Entrance lobbies should not be used as storage or display areas as this will reduce manoeuvring space and may present an obstruction or tripping hazard.

Items such as columns, ducts or piers should not project more than 100mm into the access route within an entrance lobby or they may cause an obstruction and be a potential hazard. In situations where this is unavoidable, such as in an existing building where structural items cannot be altered, a visually contrasting guard rail should be provided.

The lighting in entrance lobbies should be carefully selected and designed to provide a transition zone between the external and internal environment. When conditions outside are very bright, such as on a sunny day, a building interior can appear comparatively dull. During the hours of darkness, even a well-lit external approach can be much darker than the building's interior, and it can take time for people's eyes to adjust to the different conditions.

A sudden and substantial change in the lighting levels can create difficulties for many people and be painful to others. The lobby lighting should be designed to ease the transition between external and internal spaces, but also be adequate for safe circulation.

Where entrance lobbies comprise glazed screens or doors, care should be taken to ensure that they do not create distracting reflections, as this can be disorientating and potentially hazardous. Glazed components should be effectively highlighted incorporating permanent markings as set out in **Section 2.6.1**. The use of glass is not necessarily discouraged, but should be used with careful consideration. Glazing within an entrance or lobby area can be advantageous to many people as it enables a clear view into and out of a building. This provides reassurance to people entering a building for the first time and can help people to understand the layout of and the type of space they are entering. The use of glass lends further sensory awareness to people with hearing difficulties who can use reflected images to see people approaching from behind.

Matwells within entrance lobbies should be designed so that the mat is flush with the surrounding floor surface. The mat should remove rainwater from the soles of shoes, and from the wheels of prams, pushchairs, trollies and wheelchairs. Mats should have a firm, level surface. They should not be compressible or have deep pile, as such surfaces can be particularly problematic for people using crutches

or wheelchairs or for anyone pushing a wheeled item such as pram, pushchair or trolley.

Image 2.3 Example of swing door into lobby.

Image 2.4 Example of glazed lobby with automatic sliding doors.

Image 2.5 Example of level entrance into lobby with matwell.

Checklist – Entrance lobbies
• Provide an entrance lobby only where absolutely necessary.
• Ensure external and internal doors are accessible, understandable and useable.
• Provide recommended 1600mm between door swings, as **Figure 2.1**.
• Ensure lobbies are clear of obstructions such as displays or stored items.
• Make sure lighting eases the transition between external and internal environment.
• Highlight glazed screens and doors effectively.
• Ensure mats are firm and flush with the adjacent floor surface.

2.4.2 Reception and waiting areas

A well-designed reception area will welcome people into the building and enable them to orientate themselves. It will also allow them to gain information about the building and its services, report to security or reception personnel, seek assistance if required and sit comfortably in a waiting area. It may provide access

to other facilities such as telephones or interview rooms, depending on the building type.

A reception area or entrance foyer may comprise an open-plan hub at the centre of a large, busy building, connecting circulation routes on the entrance-level floor and to and from other floors. Conversely, it may comprise a small, enclosed area that provides a security and information function to a back-office. Whether it is a busy focal point, informal meeting place or a quiet security control point, it should be logically arranged, well signposted and accessible to everybody likely to use the building. All circulation routes should be clear and unobstructed and provide an obvious route of both exit and entrance.

The reception desk should be placed conspicuously so that it is obvious to everybody where it is located. The route to it from the entrance should be direct and unobstructed. The desk should be usable from both sides at a height of 950 to 1100mm for people standing and 760mm for people sitting down or using a wheelchair. A powered, height-adjustable desk may be considered in some applications. Detailed recommendations for counters and service desks are given in **Booklet 6: Facilities in buildings**.

Image 2.6 Example of a reception desk with two levels.
Note induction loop sign.

Image 2.7 Alternative view of a reception desk with two levels.

Reception desks should incorporate an induction loop system for the benefit of people who wear hearing aids, and the presence of the equipment should be clearly signed. Induction loops should also be used where ambient noise levels or the presence of a security screen makes communication difficult. The provision of a speech-enhancement system may also be appropriate.

In all spaces with inductive loop systems care should be taken to avoid the use of electrical and mechanical equipment that might cause electromagnetic interference.

Image 2.8 Example of signage for an induction loop at a reception desk.

Image 2.9 Example of signage for an induction loop.

Detailed recommendations for communication systems are given in **Booklet 4: Internal environment and services**.

Light sources, whether natural or artificial, should not be sited behind a receptionist. This causes silhouetting, which can make visual communication and lip reading very difficult. Where glazed screens are necessary for security,

environmental or other reasons, they should not inhibit visual communication nor create confusing reflections. This often precludes placing windows or glazed external walls adjacent to or directly opposite the screen, as these will undoubtedly create reflections during daylight hours and in situations where there are external artificial lights.

Image 2.10 Example of reception desk with natural lighting.

Lighting, whether natural or artificial, should be controllable within a reception and waiting area, in order to provide appropriate levels of light at all times. Light fittings and windows should be located so as to avoid glare and to give a uniform spread of light. The provision of blinds, dimmer switches and computer-controlled lighting systems should be considered.

Floor finishes should be firm, even and slip-resistant. Contrasting colour can be used to define circulation routes, such as the route between the entrance door and reception desk. Where there is a potential for water to be carried into the reception area on the soles of shoes and on wheels, the floor finish should be carefully selected so as to maintain slip resistance when wet. Secondary matting may be required beyond any entrance lobby area for this purpose, particularly if the general floor finish is a non-porous surface.

If the type of building is such that people are required to wait for any reason, a comfortable seating area within sight of the reception should be provided, with an adequate number and range of seats. Even when waiting is not generally required, a small number of seats should be provided for people who are not able to stand for long periods. The seats could be labeled 'priority for disabled or older users'. Some people may need to rest after arriving at the building and before leaving, such as while waiting for a taxi. Seats are also useful surfaces on which to place bags while putting on or taking off a coat, as they avoid the need for a person to bend to the floor.

Seats should be of a colour that contrasts with the surrounding area. Seats should be in the range of 450mm to 475mm high and a recommended width of 500mm with firmly padded seats incorporating rounded front edges. Chairs with stiff backrests and armrests are easier for many people to get in and out of the chair. A proportion of the chairs should be without armrests for people who require more space. Seats should be moveable with adequate space in the seating layout to accommodate wheelchair users; parents with strollers; people with visual difficulties; guide dog users; and those with walking aids. For further information on waiting areas and general seating refer to **Booklet 6: Facilities in buildings, Section 6.5**.

Where lightweight and easy to use chairs are used, an issue arises with regard to maintenance of public waiting areas and potential lack of accessibility if chairs are scattered: Care is advised in maintaining a clear public waiting area.

Image 2.11 Example of seating. Please note that chairs fixed together can make it difficult to arrange for signed conversation. Where possible, lightweight and easy to move chairs are more universally desirable.

Toilets accessible to all building users, regardless of their age, ability or disability, should be provided adjacent to the reception area and should be clearly signed. Detailed recommendations for toilets are included in **Booklet 5: Sanitary facilities**.

Signage should be provided within the reception area to highlight key facilities such as lifts, stairs, toilets, telephones, and the main building functions. The provision of clear signage that is easy for everyone to understand benefits all building users and increases independence. Some people who experience communication difficulties may prefer not to have to ask for directions or assistance, so the provision of effective signage is paramount. Detailed recommendations for the design of signage are covered in **Booklet 4: Internal environment and services**.

Image 2.12 Example of signage with braille.

If telephones are provided in a reception area for public use, they should be accessible, easy to understand, and incorporate variable volume controls and an inductive coupler for the benefit of people who have hearing difficulties. The provision of a combined unit that enables people to telephone, send text messages or to email is recommended. Further information on the provision of public telephones is given in **Booklet 6: Facilities in buildings**.

Image 2.13 Example of pay-phones at two different levels.

Checklist – Reception and waiting areas
• Ensure logical arrangement of circulation routes and facilities.
• Make sure reception desk is clearly visible with direct route from entrance doors.
• Provide induction loop system at reception desk.
• Install well-designed lighting to optimise visual communication and lip reading.
• Avoid glare by using controllable light sources.
• Choose floor finishes that are firm and slip-resistant.
• Provide comfortable seating and free space for wheelchair users; parents with strollers; people with visual difficulties; guide dog users; and those with walking aids.
• Locate toilet facilities adjacent to reception area.
• Highlight the location of key facilities with well-designed, clear signage.
• Ensure telephones or combined telephone, text and email units are accessible and useable.

2.4.3 Queuing areas and temporary barriers

In venues in which people are required to queue for tickets, information or services, such as at visitor attractions, the queuing arrangement should enable everybody to move along the queue conveniently, safely and as comfortably as possible.

When designing queuing areas, consideration should be given to the likely numbers of people queuing at peak times and the speed at which they will move through the queue. Many people will be able to cope with being in close confinement with other people for a brief period if the queue is fast-moving. However, if a queue is likely to be static or very slow-moving, the arrangement should ensure less congestion, whether perceived or otherwise.

Seating should also be provided in queuing areas. For more information refer to **Booklet 6: Facilities in buildings, Section 6.5**.

Where barriers are provided to define queuing lines, they should be firmly fixed to the ground or floor and provide a recommended clear width between barriers of 1100mm. They should be arranged in parallel, logical lines. The barriers should incorporate a rigid rail to serve as a handrail while people are waiting or moving along the line. Barriers and handrails should visually contrast with the surrounding surfaces.

In venues where attendance is predictably greater at certain times, temporary barriers may need to be erected. It is preferable if these can still be firmly fixed; the use of floor sockets or fixing plates, designed to receive removable stanchions or barriers, is a useful solution. The sockets or fixing plates should be installed with the surface flush with the surrounding floor finish, and with an integral cover or cap to conceal any holes or brackets that may otherwise present a tripping hazard.

Image 2.14 Example of stanchions with retractable belt to form queuing line.

The use of unfixed barriers or stanchions with retractable belts are often used when a more flexible queuing system is required, or as a form of temporary barrier. These can present a potential hazard, particularly in areas where they are

not normally situated, such as on principal access routes. Their use should be limited to situations where other options such as fixed barriers or hoardings are not practical. Where they are used, care should be taken to ensure that adequate manoeuvring space is maintained for all building users. This requires taking in to account the size of the projecting stanchion bases. In all situations, stanchions and belts should visually contrast with the surrounding surfaces so that they are readily identifiable.

Queuing announcement systems, such as those commonly used in healthcare buildings, are discussed in **Booklet 4: Internal environment and services**.

Checklist – Queuing areas and temporary barriers
• Fix queuing barriers firmly to the floor.
• Leave recommended aisle width of 1100mm.
• Ensure barriers incorporate rigid handrail and visually contrast with surrounding surfaces.
• Make sure sockets for temporary barriers are flush with floor surface and incorporate cap or cover.
• Limit the use of unfixed barriers.
• Provide seating at queuing areas.

2.5 Horizontal circulation

Horizontal circulation in a building may comprise access routes through open-plan areas, walkways, corridors and lobbies.

The overall arrangement of access routes should be logical, understandable, useable, and as direct as possible in terms of providing access to key facilities.

Travel distances should be minimised, although this of course will depend on the nature and size of the building. A well-designed building layout, with clear circulation routes that are easy to follow will benefit everybody.

Changes of level within a storey should be avoided if at all possible. Where this is not possible in an existing building, the installation of a ramp, passenger lift or platform lift may need to be considered and designed to be accessible. Elements of vertical circulation are covered in **Booklet 3: Vertical circulation**.

Image 2.15 Example of tactile surface at top and bottom of steps.

All circulation routes should be well maintained, free of obstacles and have adequate headroom. Windows should not open into circulation routes in a manner that would cause obstruction or reduce corridor width.

Open-plan areas in buildings such as offices, entrance foyers, shops and exhibition galleries are beneficial because they reduce the need for internal doors or other divisions, which often impede access. However, circulation routes should still be clearly defined, for example with the use of contrasting colour floor surfaces, a change in texture of floor coverings or the careful placement of furniture.

Potential obstructions or hazards should be adequately guarded and visually highlighted. The width of circulation routes should follow the guidance for corridors below.

Walkways typically provide an internal access route within a building or a link connecting one or more adjacent buildings in a large complex, such as a hospital or airport.

Enclosed walkways may bridge a road and link two buildings at first floor level or above.

Walkways are often lengthy and should incorporate seating at regular intervals to enable people to rest. It is also recommended that handrails be provided the full length of walkways and on both sides to provide support and directional guidance.

The width of walkways should follow the guidance for corridors below. However, it is likely in many circumstances that a greater width will be required in order to accommodate the number of people expected to use them.

Checklist – Horizontal circulation
• Plan overall layout to be as logical and direct as possible.
• Avoid changes of level within a storey.
• Maintain access routes carefully and keep them clear of potential obstructions.
• Ensure access routes through open-plan areas are well defined.
• Incorporate handrails to both sides of walkways and provide seating at regular intervals.

2.5.1 Corridors

Corridors in buildings accessed by members of the public should have a recommended clear width of 2000mm, as illustrated in **Figure 2.2**, to enable people to move in both directions and pass each other with ease.

In buildings that are not accessed by members of the public, a minimum corridor width of 1500mm is recommended.

In public buildings, DeafSpace recommends 2440mm wide corridors, and 2000mm for secondary corridors to allow space for people walking and signing to clearly view sign language.

Where a corridor is predominantly less than 1800mm wide, passing places should be provided. Passing places should be at least 2000mm long and 1800mm wide, and positioned within sight of another, or at intervals not exceeding 20m, whichever is the closer. Passing places also serve as turning areas, which are useful at corridor junctions, at the top of ramps and at the end of passageways. They enable wheelchair users and parents with strollers to turn and return along a corridor and generally improve access for all building users.

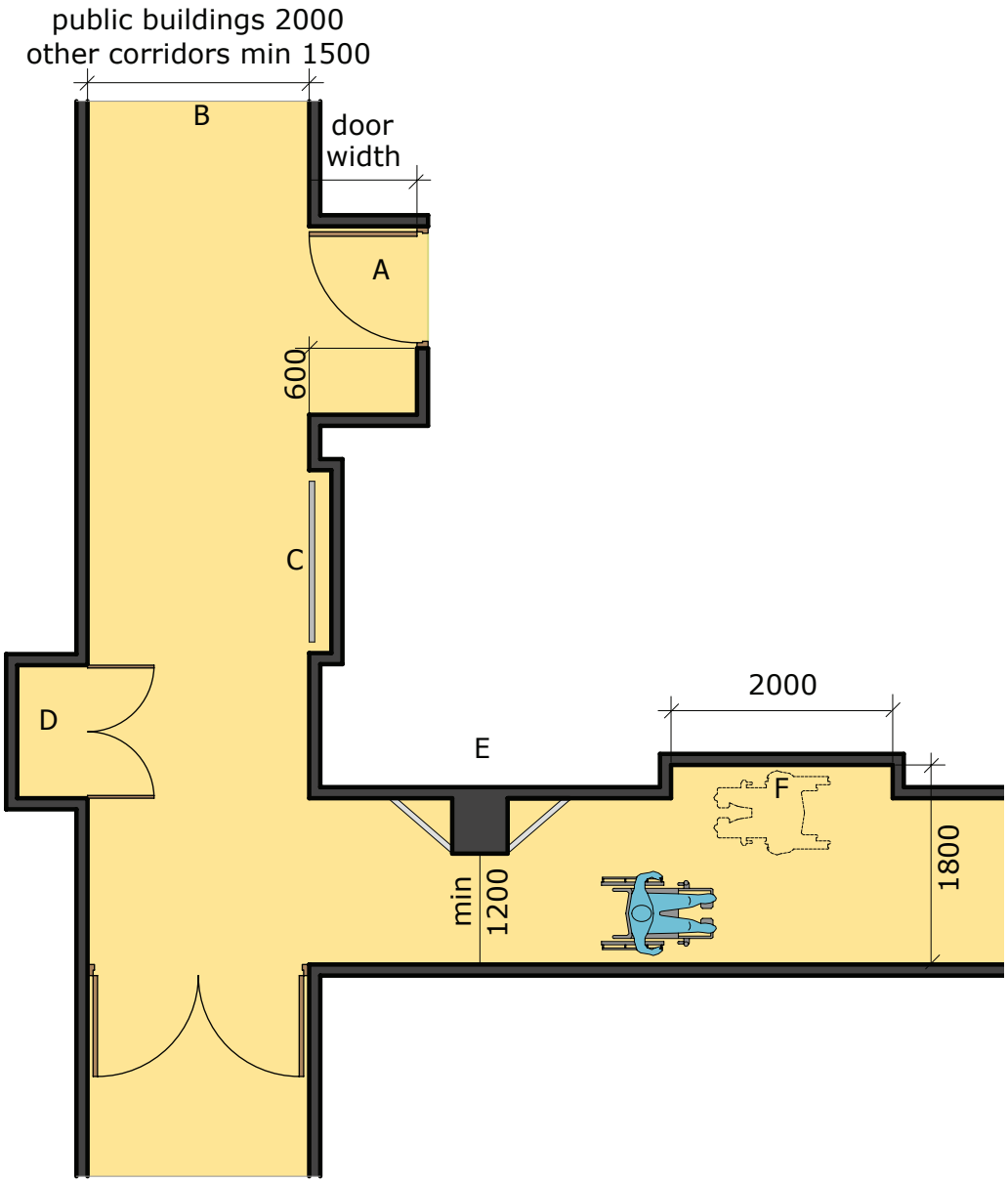
A wheelchair user or parents with strollers should never be forced to reverse along a corridor, as this can be a very difficult manoeuvre, particularly over a long distance.

It should also be noted that eased or translucent corners on corridors allow people with hearing difficulties to see others approaching and avoid collision.

Ensure the handrails are adequately fixed, comfortable to touch, and contrast in colour with the surrounding walls. The handrails should indicate where they are ending. Handrails may also be fitted across doors that are not in regular use.

Passing spaces also allow people with hearing difficulties to form conversation circles on corridors while allowing others to pass comfortably.

Figure 2.2 Clear space requirements for corridors.



Key

A. Outward opening doors such as doors to accessible toiltets to be recessed. The door recess to equal to the width of the door
B. Corridors in public buildings to be 2000mm wide. Other corridors to be minimum 1500mm wide with passing places
C. Radiators and other wall mounted items to be recessed
D. Duct or store; doors that are normally locked may open outwards, but should be clearly signed and protected when in use
E. Projections such as column or pipe ducts should be permanently guarded
F. Passing places to be provided to corridors less than 1800mm wide and to be minimum 2000mm long and 1800mm wide

Note: All dimensions in millimetres

Where there is a reduction in the width of a corridor, due to a projecting column or duct, for example, the resulting clear width should not be less than 1200mm and the projection should be guarded.

Items such as radiators and fire extinguishers should ideally be recessed so that they do not project into the clear width of the corridor.

Items such as plants or seats located in a corridor should be sited only where they do not cause an obstruction and where there is adequate clear width remaining.

The provision of handrails along corridors may be appropriate in some situations to provide support, balance and directional guidance. Handrails should be provided on corridors over 20m long. Where handrails are provided, the clear corridor width should be measured between the handrails and not between the walls. The position of radiators should be carefully considered in relation to handrails to ensure that the handrails do not become too hot.

On long internal corridors, seats should be provided at intervals of no more than 20m to enable people to rest. Seats should be positioned close to the corridor, but not obstructing the clear width. Detailed guidance on the provision of seating is included in **Booklet 6: Facilities in buildings**.

Image 2.16 Example of a corridor in a school.

Checklist – Corridors
• Ensure recommended 2000mm clear width for corridors in public buildings.
• Ensure recommended 1500mm clear width for corridors in other buildings.
• Provide passing places of 2000mm long x 1800mm wide in corridors less than 1800mm wide.
• Make sure short constrictions in width are not be less than 1200mm.
• Recess wall-mounted items wherever possible.
• Ensure any projections into the clear width are guarded.
• Consider using handrails for certain building types and in all cases where corridors are over 20m long.
• Provide seats at no more than 20m intervals on long corridors.

2.5.2 Internal lobbies

Wherever possible, buildings should be designed without the need for internal lobbies. Even the most accessible doors present a barrier to some people and the presence of a lobby impedes general access for all building users. However, it is acknowledged that internal lobbies will be required in certain circumstances, such as to provide fire separation, to act as an acoustic barrier, for security reasons or for privacy.

Where they are required, internal lobbies should be large enough to accommodate the number of people expected to pass through them at any one time, with adequate space for people to move clear of one door before opening the next, and with suitable doors and door controls.

The recommended dimensions for internal lobbies are the same as those for entrance lobbies, as illustrated in **Figure 2.1**.

The lobby arrangement should enable people to pass through in the opposite direction and provide sufficient space for manoeuvre. Again, the key dimension is 1600mm between door swings.

The floor surface within an internal lobby should be firm and level, and flush with the surface in the circulation spaces either side. It may be appropriate for the floor finish in the lobby to differ from that in the adjacent areas.

Any change in floor finish should occur at the line of the door and have edges firmly fixed with edge strips or threshold plates.

For further details on floor finishes, refer to **Booklet 4: Internal environment and services**. For details on internal doors, see **Section 2.6.4**.

Checklist – Internal lobbies
• Avoid creating internal lobbies unless absolutely necessary.
• Design lobbies in accordance with dimensions in **Figure 2.1.**
• Install floor surfaces that are firm and level.
• Ensure junctions between different floor finishes are fixed with threshold plates.

2.6 Doors

The design, specification and maintenance of doors and associated ironmongery can substantially affect the accessibility of a building. The very presence of a door presents a barrier by forming a division between adjacent rooms or spaces. Indeed, doors are designed to enclose and in many cases to seal tight against the weather, fire or sound. The requirement to provide easy and understandable access through doors often presents a significant challenge to designers.

As a starting point, designers should consider whether doors are necessary and, wherever possible, plan the building to minimise the need for doors.

Quiet and noisy areas of a building could be separated by a buffer zone to avoid the need for a lobby or heavy doors. In some buildings, door-free access can be provided to toilet areas, with privacy maintained by the careful positioning of walls and screens and effective ventilation achieved using pressure differentials.

(This requires a higher extract rate in the toilet area compared with the adjacent lobby or foyer so that air moves from the foyer into the toilet, rather than the other way round.)

Where doors are provided, they should be easy to identify, wide enough for people to pass through comfortably and easy to operate. In order to approach and open a door or to operate controls and ironmongery, sufficient space is required on both sides for a person to manoeuvre and for the door to swing or slide.

Checklist – Doors
• Avoid the use of doors where other solutions are possible.
• Consider how the building layout can be used to divide or screen areas as an alternative to using conventional doorways.
• Make sure doors are easy to identify, sufficiently wide and easy to operate.
• Ensure sufficient space is available on both sides of the door.

2.6.1 Entrance doors

Image 2.17 Example of an entrance to a town library.

There should be a clear space on both the inside and outside of an entrance door to enable people to manoeuvre and swing the door open. Greater space is required on the pull-side of swing-doors to enable a person to pull the door open and to manoeuvre clear of the door swing. **Figure 2.4** illustrates the recommended unobstructed space that should be provided for different door configurations and for different directions of approach.

Vision panels should be provided in all entrance and entrance lobby doors. This is to enable people to see whether another person is approaching the door on the other side and also to gauge the size and type of space they are about to enter. Good visibility can help people to orientate themselves as they enter or leave a building and provides reassurance that they are moving into a safe place.

The zone of visibility should extend between 400mm and 1600mm above floor level, be at least 150mm wide and be positioned no more than 200mm from the leading edge of the door, as **Figure 2.5**.

Vision panels do not have to be rectangular, but they should provide a clear view through the door for people at all eye levels.

The clear opening width of entrance doors to new buildings should be 1000mm and at least 850mm for existing buildings (although 1000mm is preferred wherever practical). The effective clear width should be measured from the face of the door in the open position to the door stop on the opposite frame, taking into account any projecting door handles, as **Figure 2.3**.

Where there are double doors, the primary door leaf of each pair of doors should provide the clear widths noted above.

In large buildings and where large numbers of people are expected to use the doors simultaneously, wider doors should be provided.

All hinged entrance doors should be capable of opening to at least 90 degrees.

Figure 2.3 Measuring door clear opening.

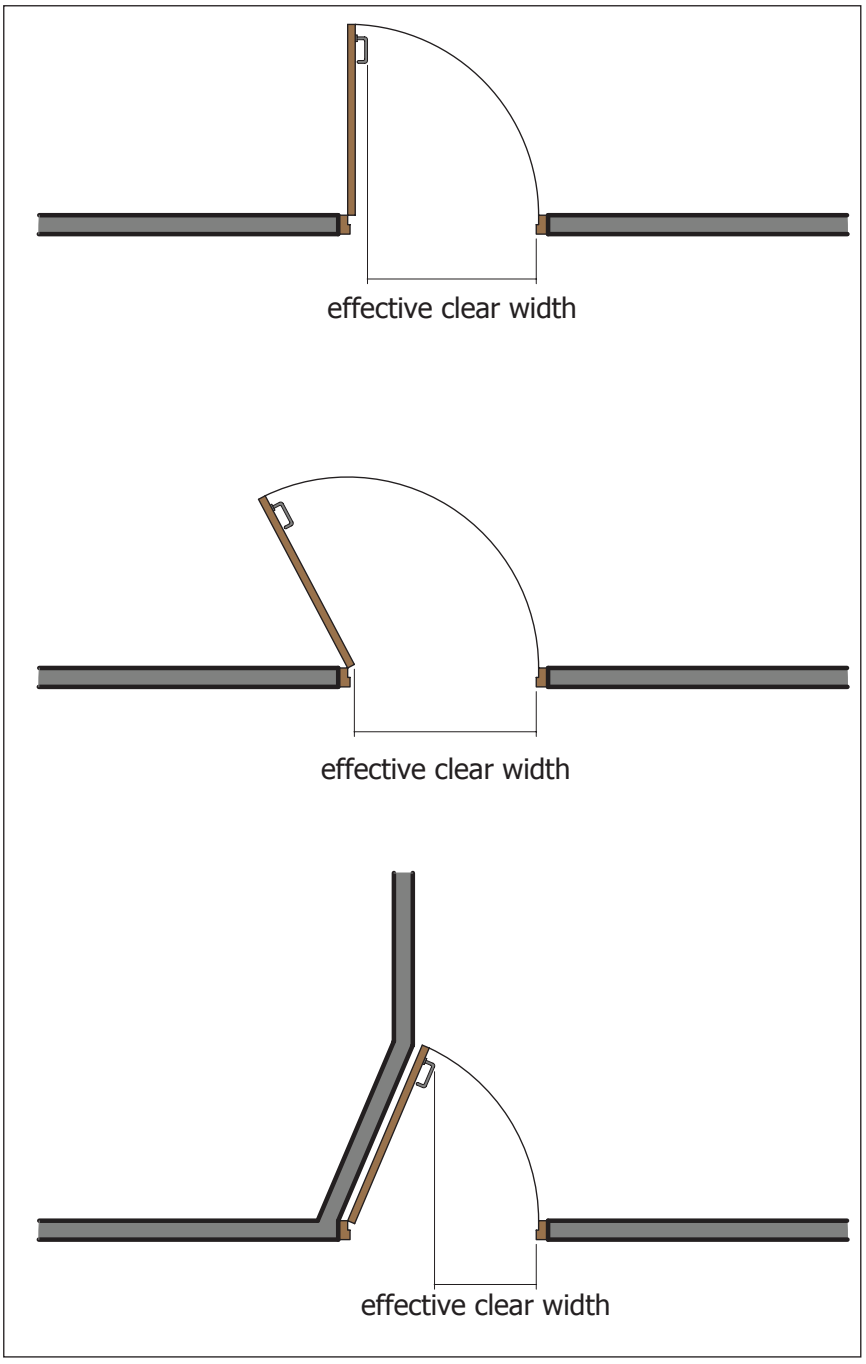
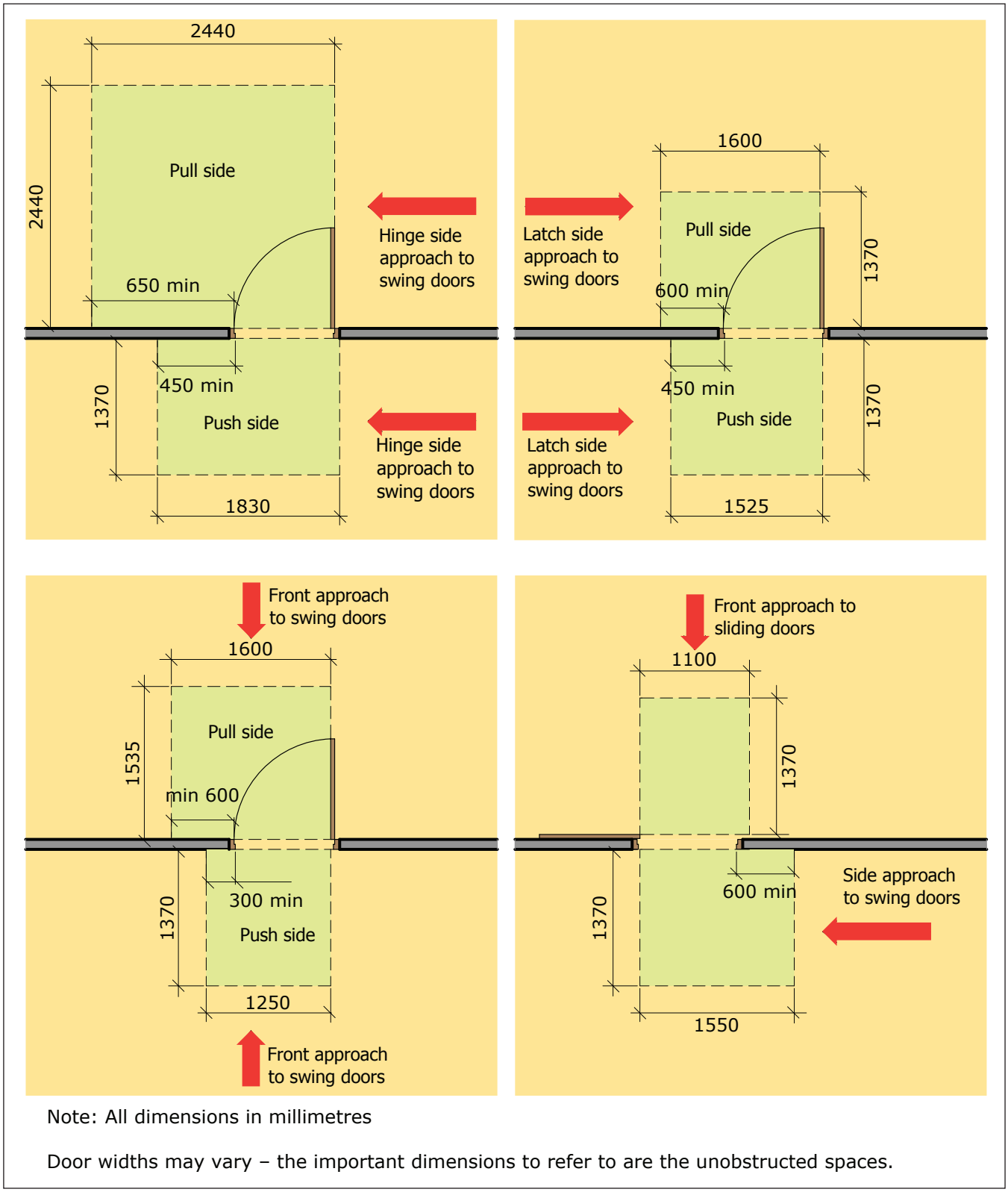


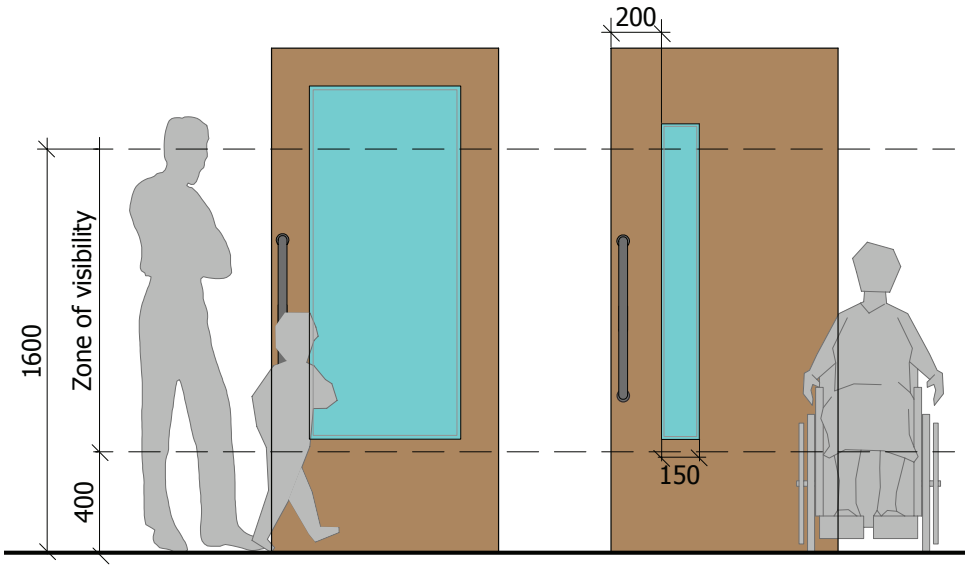
Figure 2.4 Recommended unobstructed space that should be provided for different door configurations and for different directions of approach.



Note: All dimensions in millimetres

Door widths may vary – the important dimensions to refer to are the unobstructed spaces.

Figure 2.5 Door vision panels.

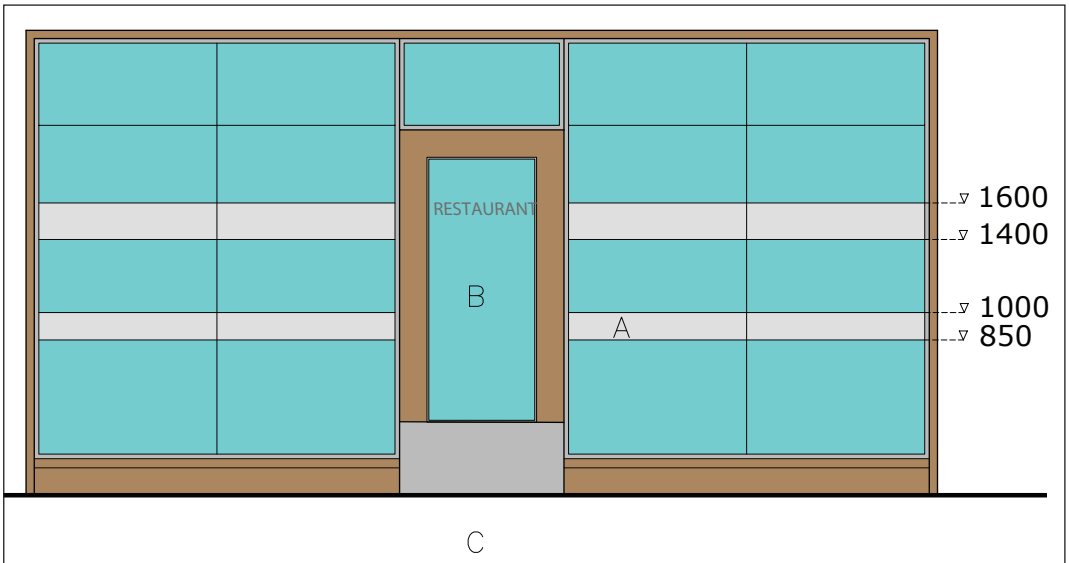


Note: All dimensions in millimetres

Where a door or fixed panel is mostly glazed or comprises a single pane of glass, it should incorporate permanent markings so that its presence is clearly apparent to people at a range of eye levels. The markings should be at two levels, 850mm to 1000mm and 1400mm to 1600mm above floor level, as **Figure 2.6**. The markings should contrast visually with the background surfaces viewed through the door in both directions and in all lighting conditions. This can be difficult to achieve as the background surfaces will undoubtedly differ inside and outside a building, as will the lighting conditions. The use of two-tone markings often improves visibility.

Whatever style or colour is adopted, it is imperative that the presence of glass is clearly highlighted, as otherwise it presents a significant hazard to all building users.

Figure 2.6 Glass markings for safety.



Key

A. Frosted glass manifest as safety and visibility strip
B. Glazed door to be clearly highlighted in relation to adjacent screen. Door to have solid protection to lower level and a contrasting strip to all edges.
C. Kickplate

Note: All dimensions in millimetres

Image 2.18 Example of glass markings.

Entrance doors should visually contrast with adjacent surfaces so that they are easy to identify. Where doors comprise a glazed or other panel that is of a similar material to the adjacent wall, they should be highlighted with a contrasting colour frame, decorative feature or other means so that the presence of the door is clearly apparent within the building façade.

The edges of frameless glass doors should be made apparent so that they are easily identified when open and closed. This can be achieved using a visually contrasting strip at least 25mm wide on all sides of the door. It is recommended that the lower 400mm of such doors or screens should be of a solid material to avoid possible damage from wheelchair footplates.

Where possible entrance doors should be automated.

Door ironmongery should be carefully selected to ensure that the door is universally designed. Door ironmongery is discussed in **Section 2.6.5**.

Door entry controls or intercom systems should be clear of obstructions and positioned away from any projecting columns and return walls. Further details on door security and entry systems are given in **Section 2.6.7**.

2.6.2 Revolving doors

Revolving doors should be avoided wherever possible as they are inaccessible to many people and hazardous to others. Even the largest, slowest moving, power-operated revolving door is unlikely to serve as a universal means of access and, in new buildings, the alternative of automatic sliding doors or powered hinged doors should be chosen.

Where large, slow-moving, power-operated revolving doors are installed, there should be an associated sliding or hinged door for people who are not able to use the revolving door or who prefer not to. The door should be designed and installed in such as way that results in the door reducing speed or stopping if any pressure is exerted while in use.

Image 2.19 Example of revolving door with a hinged automatic door located either side.

Conventional revolving doors that are generally smaller and require a person to push the door manually should never be used and are recommended to be removed from existing buildings.

2.6.3 Turnstiles

Where turnstiles are required, such as to control access to a visitor attraction or as a means of ticketing control, they should be accompanied by an accessible gate. The gate should be immediately adjacent to the turnstile, or to each row of turnstiles, and should be available for use at all times.

The gate should provide a clear width of 950mm and be easy to operate. The gate should contrast visually with the surrounding surface so that it is easy to identify and it should be marked with the International Symbol for Access.

Image 2.20 Example of turnstile and accessible gate.

Checklist – Entrance doors
• Ensure entrance doors to new buildings have clear opening of 1000mm.
• Ensure existing building entrance doors are not less than 850mm.
• Provide adequate clear space on both sides of doors, in accordance with **Figure 2.4**.
• Provide 600mm clear space adjacent to the handle-side of doors.
• Incorporate vision panels into all entrance and entrance lobby doors.
• Incorporate visually contrasting markings at two levels on all glazed doors and screens.
• Make sure entrance doors contrast visually with adjacent walls or screens.
• Include a highly contrasting strip on all edges of frameless glass doors.
• Provide door protection to the lower 400mm of glass doors.
Checklist – Revolving doors
• Avoid the use of revolving doors wherever possible.
• Provide an accessible sliding or hinged door where revolving doors are installed.
• Remove existing conventional, manually-operated revolving doors and replace with a more accessible entrance door.
Checklist – Turnstiles
• Provide an accessible gate wherever turnstiles are located.
• Install accessible gates with recommended 950mm clear width.
• Ensure gates contrast visually with surroundings and are clearly signed.

2.6.4 Internal doors

Internal doors should provide a clear width of 850mm, although a greater width is preferred wherever practical. The clear width should be measured in accordance with **Figure 2.3** Clear space for access and manoeuvre should be provided on both sides of the door in accordance with **Figure 2.4** Refer also to the guidance on entrance doors in **Section 2.6.1**.

Where internal doors are positioned in thick walls, the door should generally be located centrally within the depth of the wall. This will reduce the distance people are required to reach into the opening to access any handles or locks.

Where walls are so thick that they create a passageway leading to a door opening, the provision of automatic door opening devices should be considered, as **Section 2.6.6**, which will make access easier, useable and understandable for all building users.

As a general rule, doors should always open into rooms and away from circulation routes such as corridors and landings.

Doors that open outwards into corridors or circulation routes present a significant hazard to all buildings users, but particularly to people with visual difficulties.

If it is necessary for a door to open outwards for reasons of emergency evacuation, it should be recessed or guarded by a barrier or other device.

Doors opening onto the landings of ramps or stairs should not reduce their effective width or length. Doors must not open directly onto ramps.

Doors that open out onto landings should not encroach into an escape route, into a refuge area or into a circulation route.

Doors opening into a room should be hung so that they open against an adjoining wall. A nib of wall at the door hinge side will allow it to open beyond 90 degrees without hitting against the wall, which will increase the effective clear width. In this way, people entering are directed towards the centre of the room rather than to the adjacent wall where there may be obstructions such as furniture. This arrangement also makes it easier for people to manoeuvre around the door swing and maximises the clear space available adjacent to the leading edge.

The direction of opening of doors into rooms should, wherever possible, be consistent throughout a building.

Internal doors should visually contrast with adjacent wall surfaces so that they are easy to identify. A door that is not self-closing, and may therefore be left partially or fully open, may present a potential hazard or obstruction. Therefore the surface

of the leading edge of this door should visually contrast with the main surface of the door so that its presence is more readily apparent.

Where double doors are used, the primary door leaf should be clearly identified.

Wherever practical, internal doors should incorporate vision panels – See **Image 2.21**. They are essential for any doors on general circulation and escape routes such as doors dividing corridors and doors leading into lobbies and stairways.

Vision panels are also recommended for room doors, as long as security, privacy and light are not an issue. They are beneficial because they enable people to see whether a room is in use before they enter, which is often useful for classrooms, interview rooms and offices. The design of vision panels should follow the guidance on external doors in **Section 2.6.3**. Where, for privacy or security reasons, vision panels are not suitable, it is recommended to put transoms of glass above the door to allow subtle senses of movement from either side of the door. This is of particular use to people with hearing difficulties.

Image 2.21 Door with vision panels. Note lack of kick plate to base of door. A kick plate can protect the base of the door especially when wheelchair users use the door.

Checklist – Internal doors
• Ensure recommended clear width of internal doors of 850mm.
• Provide clear space to both sides of door, in accordance with **Figure 2.4**.
• Protect outward-opening doors with a door recess or guardrail.
• Install inward-opening doors to open against a side wall.
• Ensure the direction of door openings is consistent throughout a building.
• Make sure doors contrast visually with adjacent wall surfaces.
• Incorporate vision panels wherever practical.

2.6.5 Door ironmongery

2.6.5.1 Hinges

The number and type of hinges should be selected to suit the size and weight of the door, bearing in mind any additional weight likely due to a person leaning on the door or handle for support.

Low-friction hinges are recommended as these minimise opening and closing forces and improve door swing.

Rising butt hinges can be useful when doors do not have mechanical self-closing devices, but benefit from returning to the closed position after use so as not to cause an obstruction. Rising butt hinges make the door rise slightly on a spiral pivot when it is opened, and subsequently close due to the force of gravity when released.

Swing-clear hinges incorporate an angled bracket that aligns the door with the frame when opened to 90 degrees. These are useful in maximising the clear opening width of doors where space is otherwise limited.

2.6.5.2 Handles, latches and locks

People generally need to use door handles to go through a door. It is essential that handles are clearly identifiable, within reach and easy to use.

Door knobs should be avoided as they can be very difficult to grip and turn. Lever handles are generally the easiest for most people to use, either by using hands gripped around the lever bar or by using a forearm or elbow.

Door lever handles should be positioned 800 to 1100mm above floor or ground level, although a height of 900mm is preferred, as **Figure 2.7**.

In some cases, such as where child safety is a concern, it may be acceptable to locate the handles higher, out of the reach of children.

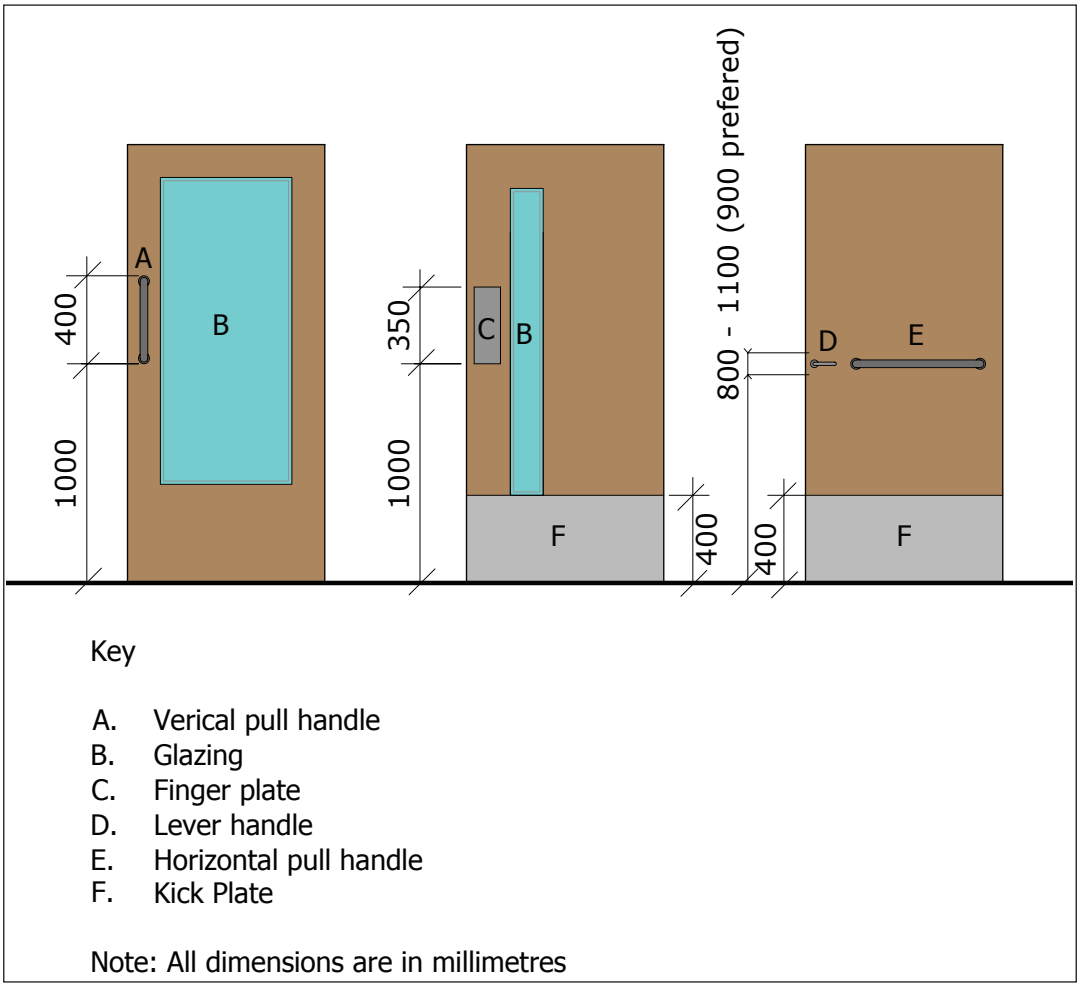
Where doors have a lock, the lock should be positioned above the handle and a recommended 72mm vertical distance from the lever handle to keyhole so that the latter is clearly visible and unobstructed.

Keys should be easy to use, or capable of being fitted with a bow adaptor to make them large and easier to grip. Winged or lever-thumb turns are generally easier to operate and should be used in preference to small, round knob turns.

Lever handles should contrast visually with the door so that they are easy to identify. Where lever handles are provided on the outside face of external doors, they should be of a material that is not cold to touch, such as timber or plastic-coated steel.

Metal handles should be avoided wherever possible as they can become very cold in winter weather conditions, making them extremely uncomfortable and possibly painful for some people to use.

Figure 2.7 Door ironmongery.



On latched doors fitted with self-closing devices, the use of a modified strike plate incorporating a gravity cam should be considered. These are tripped by the projecting latch as the door closes. They significantly reduce the resistance otherwise presented by a conventional latch when the door moves to the fully closed position. By reducing resistance, the forces of any self-closing device can be reduced, which provides easier and useable access for all building users.

Modified strike plates are not suitable for use on external doors.

2.6.5.3 Pull handles and rails

Doors that do not have latches, such as doors dividing corridors and doors into lobbies that are fitted with self-closing devices, are typically operated using pull handles instead of lever handles.

Pull handles should be 400mm long and positioned vertically with the lower end 1000mm above floor level. The clearance from the door face to the handle should be 50mm.

Double-swing doors, that is, doors that are able to swing in both directions, should have a pull handle on both sides of the door. Even though double-swing doors can always be pushed open, there will be circumstances when a person may need or prefer to pull the door, such as when opening the door for another person. Signage should be provided indicating which side is 'Push' and which side is 'Pull'.

Full-height tubular pull handles are beneficial in that they provide the maximum possible range of heights for gripping the handle, but they reduce the clear width of the door opening in doing so. Where provided, the clear width of the door should take into account the projection of the handle when the door is fully open.

Where doors do not have self-closing devices, a horizontal rail should be provided on the closing face to make it easier for people to pull the door closed behind them. The rail should be positioned 1000mm above floor level. This is common practice for doors to accessible toilets, but should also be considered for other situations.

As recommended for lever handles, pull handles and rails should visually contrast with the door so that they are easy to identify. They should also be of a material that is not cold to touch, such as timber or plastic-coated steel, when located on the external face of doors.

2.6.5.4 Finger plates and kick plates

Doors that are required to be pushed open, such as doors on circulation routes that are fitted with self-closing devices, are recommended to be protected against undue wear with the use of finger plates and kick plates.

Finger plates are recommended to be positioned with the lower edge 1000mm above floor level, and should be at least 350mm high. They provide the additional benefit of highlighting which side of the door should be pushed in situations in which there is no handle to identify the leading edge of the door. Finger plates should contrast visually with the door so that they are identifiable.

Highly reflective finger plates should be avoided as they may appear to be a vision panel and thereby cause confusion.

Kick plates are recommended to extend the full width of the door and to 400mm above floor level as this will protect doors from damage by wheelchair footplates or by people pushing or holding the door open with a foot.

Image 2.22 Example of door with finger and kick plates.

2.6.5.5 Door-closing devices

Some doors in nearly all non-domestic buildings will be required to self-close, including all fire-resisting doors, many entrance and lobby doors, and doors required to be shut for security, acoustic or environmental reasons.

However, doors fitted with conventional mechanical self-closing devices can present a significant barrier to many people due to the force required to push or pull the door open. In all cases where self-closing devices are required, designers should consider the options available to reduce or overcome the door

forces to facilitate independent an understandable access around the building for everybody.

Image 2.23 Example of a door closer linked to an automatic fire detection and alarm system with a wall-mounted access button.

Self-closing devices should be selected to suit the door type, size, location within the building, and likely frequency of use. Designers should also bear in mind the effect of friction caused by other items of door ironmongery such as hinges, latches, weather seals and fire or smoke control devices as these all influence the forces required to open and close the door.

All self-closing devices should be adjustable and have 'controlled' action that enables closing pressure at different positions in the closing cycle to be adjusted. Fixed-strength and spring door-closing devices should not be used as they cannot be adjusted to suit local site conditions and may close the door in an uncontrolled or unpredictable way, which is potentially hazardous.

Delayed-action door closers can be useful in some situations such as on room doors. They work by delaying the closing action of the door, thereby providing a longer period of time for a person to move through a doorway before the closing force is exerted. They also remove the need for a person to maintain continuous pressure on the door in order to keep it open while they pass through, which is beneficial to all users especially older people and those with limited strength, reach or dexterity.

However, delayed action door closers are not recommended for doors on circulation routes.

In buildings fitted with an automatic fire detection and alarm system, door-closing devices can be linked to hold-open and swing-free devices that enable doors to be held open in normal use, or to swing free of any mechanical force. These are the preferred solution in all practicable situations in order to reduce or eliminate the need for people to manually overcome the force of self-closing devices.

For doors fitted with self-closing devices that are not fire-resisting doors, the forces required to open the door should be limited to the following:

- 15 N to initially open the door.
- 6 N to swing the door.
- 7.5 N to hold the door open between 60 degrees and 90 degrees.

- The forces should be measured at the leading edge of the door. Zero degrees represents a door that is fully closed and 90 degrees a door that is fully open.

- Doors that are required to be fire-resisting are unlikely to be able to achieve the limits above due to the force required to fully close the door against any latch, seal and hinge resistance. The forces required to open fire-resisting doors should be limited to the following:
  - 30 N from 0 degrees to 30 degrees.
  - 22.5 N from 30 degrees to 60 degrees.

- Doors and surface-mounted door-closing devices should be positioned where there is sufficient room for the closer arm to fully function, without it clashing with any return wall and for the door to open to 90 degrees.

Electromagnetic hold-open devices enable doors to be held open in a fixed position, allowing unobstructed or at least much easier and useable access for all building users, especially older people and those with limited strength, reach or dexterity. When the power supply to these devices is interrupted by a smoke detection signal, operated by a manual release mechanism or power failure, the doors close under the power of the closing device.

Electromagnetic hold-open devices are suitable for doors on circulation routes such as corridors, and for some lobby doors.

Image 2.24 Example of electromagnetic hold-open device for doors in use.

Image 2.25 Example of electromagnetic hold-open device.

Swing-free door-closing devices enable doors to be opened with minimal effort as they are free of closing pressure under normal operation. When activated by the fire alarm, they revert to spring power and close the door.

Swing-free door closing devices are susceptible to changes in air pressure in buildings and should not therefore be used on circulation routes where they may present a potential hazard or be blown shut. They are suitable for inward-opening room doors and at other similar locations.

2.6.5.6 Emergency exit door ironmongery

Locks and handles on emergency exit doors should be capable of easy operation by all building users.

Generally, mechanisms that require a direct pushing action such as horizontal push bars, push pads or lever handles are easier to use than those that require a simultaneous lifting action.

Emergency exit doors should be capable of being opened in a single action. That is, any lock or latch should be simultaneously released.

2.6.5.7 Other ironmongery

Letter plates and boxes should be positioned 900mm above ground level to facilitate use without bending. They should be positioned where there is a level approach at least 900mm wide.

Checklist – Door ironmongery
Hinges
• Use low friction hinges to minimise door opening and closing forces.
• Consider rising-butt hinges for doors not fitted with self-closing devices.
• Use swing-clear hinges to maximise clear opening width where space is limited.
Handles, latches and locks
• Handles to contrast visually with door leaf and be easy to reach.
• Avoid the use of knob handles.
• Position locks above handles, or with a vertical clearance of at least 72mm.
• Use large winged or lever-thumb turns instead of knob thumb turns.
• Choose handles to external doors that are not cold to touch.
• Consider the use of a modified strike plate for internal self-closing doors.

Checklist continued
Pull handles and rails
• Configure pull handles as per **Figure 2.7**.
• Provide pull handles to double-swing doors.
• Use full-height tubular handles only where clear opening width is increased to compensate for the handle projection.
• Provide horizontal rails on the closing face of outward-opening doors.
Finger plates and kick plates
• Install finger plates on the push side of doors that do not have handles, as **Figure 2.7.**
• Provide kick plates to full width of doors and to height of 400mm.
Door-closing devices
• Use door-closing devices only where necessary.
• Ensure all self-closing devices have controlled action.
• Make sure door opening forces are within the limits set for each stage of the opening cycle.
• Consider delayed-action door closers for room doors.
• Consider improving accessibility with the use of electromagnetic hold-open devices and swing-free door-closing devices.
Emergency exit door ironmongery
• Ensure emergency exit door ironmongery is accessible.
Other ironmongery
• Position letter plates 900mm above ground level.

2.6.6 Automatic door systems

Automatic, or power-operated, door systems make buildings easy to access and useable for everybody. They are particularly useful where a high force would otherwise be required to open the door, such as for external doors and entrance lobby doors that are susceptible to external wind pressures. They are also useful for internal doors that are required to remain closed for security or other reasons

but may be difficult for some people to open. Power-assisted doors enable doors to be opened manually, but provide a means of automatic operation for people who require it.

Automatic door systems can be used in conjunction with either sliding, swing or balanced doors and may be fully automatic or comprise a manually-activated control device. The most suitable type of device for any situation will depend on the nature of the building, the frequency of use, the available space and whether any additional security control mechanisms are required.

Image 2.26 Example of automatic swing doors at entrance with pole-mounted access button. DeafSpace recommends floor located warnings in advance of guarding rail in front of approach to door, and warning of swing on mounted button.

Sliding doors may comprise a single sliding door, a double bi-parting door, or a telescopic straight sliding door (where two or more doors slide across one another in the same direction). Sliding doors may be straight, curved or folding.

Whichever arrangement is adopted, the direction of movement and resulting 'clear opening' should be obvious. Theobvious. The most logical arrangement is for the clear opening to be located centrally.

Where the clear opening is positioned to one side, such as with telescopic sliding doors, the arrangement is not always immediately obvious. Automatic sliding doors are generally preferred to automatic swing doors as their action is less likely to present an obstruction.

Swing doors may comprise of single or double doors and may be installed as an integral unit in a new building or in the form of a powered operating unit attached to an existing door. Swing doors require more space than sliding doors and additional space is required to enable people to approach and manoeuvre around the door, clear of the door swing.

Image 2.27 Example of swing door entrance. Note use of chrome for intercom and rail – a painted system is recommended as shiny surfaces can cause problems for those with visual difficulties. In addition, the intercom/security system would be better placed adjacent to the door handle to accommodate those with cognitive or mental difficulties.

Balanced doors are typically bi-parting and combine a sliding and swing action. They are useful where space is limited, as the door leaves do not project as far from the pivot position as a swing door of similar width. However, they are not commonly used and this, combined with their unusual method of opening, may be confusing for some people.

Whichever type of door is used, the layout of the door and surrounding area should ensure that sufficient space is provided for people to approach, pass through, and move clear of the opening. It should also take into account the expected number of people in the building. The approach routes should be clear of obstructions and avoid the potential for cross-flow of pedestrians. Doors that are fully automatic should be positioned so that passing pedestrians do not inadvertently activate the door system.

Fully automatic doors open on activation of a sensor, which may be either a motion sensor or a presence sensor. Safety devices prevent the doors closing on a person who remains in the doorway, without the need for any physical pressure to be exerted. The sensors and safety devices should be designed to protect people using the door and should be capable of detecting a person even if they are slow-moving or stationary. Systems that only detect obstructions at specific heights should be avoided.

The activation system should ensure that the door starts to open when a person is no closer than 1400mm from the door in the open position. All automatic doors should be set to provide sufficient time for a person to move slowly through the doorway. For automatic swing doors, the recommended period is a minimum of five seconds.

Manually-activated powered doors may be controlled using a wall- or post-mounted push pad or button, a proximity reader, card swipe device or remote control transmitter.

Wall- or post-mounted controls should contrast visually with the surrounding surfaces and incorporate the International Symbol for Access.

Wall- or post-mounted controls should be positioned 750mm to 1000mm above floor level and no closer than 1000mm to the swing of the door or clear of a sliding door in the open position.

It should not be necessary for a person to have to manoeuvre backwards or clear of the door swing after activation of the door control device.

Power-assisted doors operate by opening automatically after the door is gently touched, pushed or pulled. After a set hold-open period, the door closes in a similar way to doors fitted with mechanical self-closing devices. Power-assisted doors are generally suitable for doors with relatively low levels of use.

When the door is closing, the force required to resist door movement, if a person becomes stuck in the doorway, should not exceed 67 N as this force is considered to present a risk to building users. The provision of supplementary presence-sensing safety devices should be considered.

Image 2.28 Example of powered door with access push plate.

Potential finger traps and body traps should be avoided by careful design and placement of all automatic and power-assisted doors in relation to fixed framing and adjacent walls.

Swing and balanced doors should have a fixed barrier wherever the doors can be approached from the side in order to prevent people being struck by the door as it opens.

Barriers should be at least 900mm high and contrast visually with the surrounding surfaces. All automatic and power-assisted doors should be clearly signed so that their mode of operation is obvious to all building users.

Powered doors (whether sliding, swing or balanced) that are also designated as emergency exits should incorporate either a fail-safe system or manual break-out facility.

A fail-safe system that is set so that the doors are fully opened when the fire alarm is activated is more inherently accessible, useable, and preferred to a manual break-out facility. However, if the door is an internal fire-resisting door, the door should remain closed but be capable of manual operation in accordance with the recommendations in **Section 2.6.5**. Manual break-out, particularly for sliding doors and swing doors that need to be opened in the opposite direction, typically require considerable force to open, which is likely to preclude independent evacuation for many people.

Image 2.29 Example of powered door with push plate.

Image 2.30 Example of powered door with push plate.

Checklist – Automatic door systems
• Ensure adequate clear space on both sides of the door.
• Avoid potential cross-flow of pedestrians adjacent to automatic doors.
• Ensure activation and safety systems protect people who are slow-moving or who have fallen in the doorway.
• Ensure activation system is set to open door when person is no closer than 1400mm.
• Make sure opening time is sufficient for people who are slow-moving.
• Position controls for manually-activated automatic doors within reach and clear of door swing.
• Ensure controls are clearly visible with clear signage.
• Consider the need for additional safety devices for power-assisted doors.
• Guard against all potential finger and body traps.
• Provide barriers to guard all swing doors that can be approached from the side.
• Provide break-out or fail-safe systems on all automatic doors situated on exit routes.

2.6.7 Door security and entry systems

Many entrances to buildings and some internal doors require access to be controlled for security reasons. There are many electronic entry systems, locks and intercoms available on the market that provide an array of solutions to suit the simplest to the most complex of applications.

Whichever solution is selected, designers and specifiers should ensure that it can be readily used by all building users. This means that the system should be clearly visible, within reach, easy to understand and straightforward to operate.

Door entry systems should be located adjacent to the handle side of the door, no further than 200mm from the door frame, and between 750mm and 1000mm above floor or ground level.

Intercoms (entryphones) should be positioned to suit people at a range of heights. Any controls such as buttons should be large and easy to operate and be in the range 1000 to 1200mm above floor or ground level. The microphone should be capable of picking up speech from people of different heights.

As well as enabling people to communicate orally with a receptionist or resident, intercoms should incorporate a visual text display so that people with hearing difficulties can read instructions or advice on entry.

Additionally induction loops should be incorporated into the intercom. For further details on induction loops, please refer to **Booklet 4: Internal environment and services**.

A video intercom that enables the visitor and the receptionist or resident to view each other is beneficial for many people particularly those with hearing or speech difficulties.

Image 2.31 Example of intercom access system.

Card entry systems, which may be either card-swipe or proximity devices, should be positioned with the card reader between 900mm and 1000mm above floor or ground level and within 200mm of the door frame.

The device should contrast visually with the wall surface and, for card-swipe devices, the card slot should either be illuminated or contrast visually with the rest of the unit.

Card-swipe devices should be orientated vertically. The card itself should incorporate some form of tactile surface such as raised lettering, as well as a distinctive colour on one side so that all users are able to easily orientate the card within the reading device.

Proximity card devices are preferred to card-swipe readers as they do not require the same degree of hand control and are therefore inherently more accessible and useable.

The Centre for Excellence in Universal Design's guidelines on public access terminals and smart card systems contain further advice on door entry systems as follows:

- Reach heights for all operable parts
- Positioning of displays
- Size and spacing of controls
- Alternative outputs including audio
- Approach to and location of terminals
- Relevant standards
- Guidelines, techniques, checklists for each user type including older people

Keypad entry systems should incorporate buttons that are raised above the mounting plate so as to be easily located by touch. The buttons should contrast visually with the mounting plate and the mounting plate with the wall surface. Each button should have an embossed (raised) symbol, number, or letter arranged in a logical order.

Doorbells and call buttons should give visual indication of their operation, such as a light that flashes when the button is pressed.

Refer to the Public Access Terminal Guidelines available at the Centre for Excellence in Universal Design website: **www.universaldesign.ie/standards**

Checklist – Door security and entry systems
• Locate door entry systems within reach of all users, on the handle side of the door.
• Intercoms to be supplemented with a text display.
• Consider the use of video intercom to aid identification and communication.
• Orientate card-swipe devices vertically.
• Consider the use of proximity card devices in preference to card-swipe devices.
• Incorporate raised buttons and embossed symbols, numbers or letters in keypads.
• Ensure all devices contrast visually and are easy to identify.
• Install doorbells and call buttons that provide visual indication of operation.

A1 Definition of Universal Design

Universal Design

‘Universal Design refers to the design and composition of an 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.’

Synopsis of the Disability Act, 2005.

A2 Human Abilities and Design

The following piece of text is an extract from European Ref: CEN/CENELEC Guide 6 ‘Guidelines for standards developers to address the needs of older persons and persons with disabilities’.

It states that: Physical, sensory and mental abilities vary from person to person and for individuals as they get older. Diversity is normal. Designers need to be aware of difference across the range of human abilities, and of associated design considerations.

(a) Physical abilities

This includes walking, balance, handling, pulling, pushing, lifting and reaching. Many activities involve simultaneous use of more than one of these skills. Physical strength and stamina may also affect people’s abilities to perform these actions.

Walking

For some people walking on the level or up gradients is difficult. Some people may have a limited walking range, may have difficulty with turning movements or may use mobility devices such as crutches or a walker. They may need to stop frequently, to regain strength or catch breath. Design considerations include provision of handrails, seats at regular intervals, convenient set-down parking and adequate time for slower pedestrians at road crossings. Designers should also consider the needs of people walking and engaging in sign language when designing access to and from buildings plus within the buildings themselves.

Balance

Balance limitations can affect someone's gait or control of hand movements. Design considerations include handrails, regular seating, and providing controls within easy reach. A surface against which a person may stumble against or walk into should be designed to limit abrasion.

Handling

A significant minority of people are left-handed. Some people may have restricted use or no use of one or both hands, or may have limits on strength or precision. Facilities and components should be designed to be suitable for use with either hand or with one hand only. Handling includes gripping, grasping and manipulation. Each of these has a different purpose with specific design considerations. For instance, components should be designed to be easily held. The circumference of the supporting structure and stability are critical. Manipulation involves the moving, turning and twisting of components with a hand or hands. For those who have limited manipulation abilities, size and shape and ease of movement are critical. Another option to consider is to design for manipulation by using a pushing, pulling or pressing action using a clenched fist, or by using the wrist or the elbow.

Strength and endurance

Strength and endurance may be required on sloping paths and floors, stairways and long travel distances, when sustained effort may be needed.

For those with limited endurance, frequent resting-places are essential.

People generally find it easier to push a component, than to pull it. This is particularly so if the individual uses a wheelchair. Self-closing devices on manual doors can be difficult for some people to operate, particularly if the doors are required to resist wind forces. For these reasons, doors that open and close automatically are preferred.

Lifting

Activities such as opening a vertically sliding sash window and an upward opening access gate, should be designed to be easily operated with minimal force.

Reaching

Design has a role to play in ensuring that key components in a building or environment are in easy reach, bearing in mind the range of people's sizes and abilities. Having components within easy reach is particularly important for those with more severe limitations in mobility. The reach range is dependant on the height and arm length of the person, use of the arms, and the balance and mobility of the upper body. A 'comfortable reach range' has been defined as one that is appropriate to an activity that is likely to be frequent and in need of precise execution and that does not involve stretching or bending from the waist. Putting things within comfortable reach can ensure use by a greater number of people. An 'extended reach range' has been defined as one that is appropriate to an activity that is likely, neither to need precision nor to be frequent and that can involve stretching or bending from the waist.

(b) Sensory abilities

Speech

Some conditions affect the capacity for or quality of speech. Two-way communication can be facilitated by environments designed to minimise barriers to hearing low or indistinct speech.

Hearing

People differ in their capacity to hear sound, to determine its direction, its source, to discern pitch, frequency, volume and variation and to separate out different sounds. Hearing quality is important for communication, for information, and for detection of hazards such as traffic. Many people with hearing difficulties

use a hearing aid which amplifies all sounds caught by the microphone, making communications very difficult in noisy environments. Keeping background noise level low is essential. The selection of structural and surface materials can make a substantial difference in audibility. Auditoriums, meeting rooms and reception areas can benefit from additional sound enhancement such as a loop system. The careful design of illumination can assist in communication such as lip reading and sign language. Provision of visual information and visual alarm systems can communicate information to those who have hearing difficulties or who cannot hear. Designers should also consider the colour and size of rooms and even the furnishing arrangement as this is very important for visually based communication. Also the use of vibration as means of sensing others should be considered.

Sight

Vision allows an individual to be aware of the luminance of surfaces, objects, form, size and colour. For people who are blind or who have visual difficulties, the provision of suitable tactile walking surface indicators and tactile or acoustic warnings at hazardous locations, should provide information on using the built environment and should limit the risk of injury. The built environment can be designed for orientation by providing sound cues and tactile cues. An easily discernible system of 'way finding' should also be considered. For people with limited, but low vision, effective visual contrast between surfaces or objects helps to identify critical locations. Warning markings on glass surfaces, and markings on the edges of stair treads, help minimise hazards.

Differences in friction between one floor surface, or one stair tread surface, and the next should be avoided. Therefore, adjacent surfaces that display different standards of slip-resistance, or that depend on raised surfaces, should be carefully considered

Touch

In selecting surfaces in the built environment that people will need to touch (such as handrails, handles, knobs and controls, tactile information), it is important to select materials that avoid distress, injury or allergies. Surfaces should be free of abrasions. Metals that may cause adverse reactions when touched should be avoided.

(c) Mental abilities

Mental abilities include cognition, intellect, interpretation, learning and memory. People differ in their knowledge, their capacity to understand, reason, or interpret information. Designing for differences in these capacities helps provide a usable environment for the population at large, from the very young to the old, and people of diverse abilities. Means of communication in the environment should be designed to be immediately and easily understood, and correctly interpreted. As people age, some experience loss of memory or find it increasingly difficult to absorb new information, so changes in the environment should be carefully considered before implementation.

Design considerations that take account of mental abilities

Aural and visual messages should be simple, clear and have immediate impact. Figures, symbols and simple words are likely to be the most effective. Symbols should be instantly recognisable as representing images seen and activities undertaken in everyday life.

Way finding should be simple, such as tactile, graphic, audible or architectural cues that are easy to follow. Signage should be large and clear. Way-finding maps should be clear, indicate the person's whereabouts in the building or facility, and be free from extraneous information.

(d) Age and size

Accommodating the developing child

It is important to create environments that are safe, accessible and useable for children. Individual components should be safe and useable as age-appropriate. Learning to manage risk is an essential part of a child's development.

Accommodating ageing adults

Life span within the human population is increasing. More and more we expect to maintain an economic and social life within both the public and private domains as we age. However, many human faculties are in decline as we age, such as mobility, dexterity, stamina, strength, hearing, sight, or memory. Familiarity with a particular environment is important.

Diversity of size

The population contains a diversity of sizes and heights, from children, to the diversity in the height of fully-grown adults. The positioning of components and the heights of building elements such as steps should recognise the diversity of height. Increased weight and girth is now also a feature of the population.

Ref: CEN/CENELEC Guide 6 'Guidelines for standards developers to address the needs of older persons & persons with disabilities'.
http://www.cen.eu/cen/Sectors/Sectors/ISSS/About_ISSS/Documents/cclcgd006.pdf

A3 Further Reading

National and international standards and codes of practice

AS 1428.1-2001 Design for access and mobility. General requirements for access – New building work.

AS 1428.2-1992 Design for access and mobility. Enhanced and additional requirements – Buildings and facilities.

AS 1428.3-1992 Design for access and mobility. Requirements for children and adolescents with physical disabilities.

AS 1428.4-2002 Design for access and mobility. Tactile indicators.

BS 4800: 1989 Paint colours for building purposes (whilst the colours in this standard cannot be seen on CD-ROM or online the text can still be used).

BS 5395-1:2000 Stairs, ladders and walkways – Part 1: Code of practice for the design, construction and maintenance of straight stairs and winders.

BS 5588-8:1999 Fire precautions in the design, construction and use of buildings – Part 8: Code of practice for means of escape for disabled people.

BS 5776:1996 (incorporating amendment No.1) Specification for Powered stairlifts

BS 6440:1999 (Incorporating amendment No.1) Powered lifting platforms for use by disabled persons – Code of practice.

BS 6440:1999 Powered lifting platforms for use by disabled persons – Code of practice (partially superseded by BS EN 81-40:2008. The remainder of BS 6440:1999 will eventually be superseded by EN 81-41: 2009 Safety rules for the construction and installation of lifts – Special lifts for the transport of persons and goods – Part 41: Vertical lifting platforms intended for use by persons with impaired mobility).

BS 6465-1:2006+A1:2009 Sanitary installations. Code of practice for the design of sanitary facilities and scales of provision of sanitary and associated appliances.

BS 6571-4: 1989 Vehicle parking control equipment – Part 4: Specification for barrier type parking control equipment.

BS 7036-1:1996 Code of practice for Safety at powered doors for pedestrian use – Part 1. General.

BS 7036-4:1996 Code of practice for Safety at powered doors for pedestrian use – Part 4. Low energy swing doors.

BS 7997:2003 Products for tactile paving surface indicators – Specification.

BS 8300:2009 (Incorporating amendment No.1) Design of buildings and their approaches to meet the needs of disabled people – Code of practice.

BS 8493:2008 (+A1:2010): Light reflectance value (LRV) of a surface – Method of test.

BS 8501:2002 Graphic symbols and signs – Public information symbols (AMD 16897).

BS EN 115:1995 Safety rules for the construction and installation of escalators and moving walkways.

BS EN 15838:2009 Customer contact centres, Requirements for service provision.

BS EN81-70:2003 Safety rules for the construction and installation of lifts – Particular applications for passenger and good passengers lifts – Part 70: Accessibility to lifts for persons including persons with disability.

Building Regulations (Part M Amendment) Regulations 2010 (S.I. No. 513 of 2010).

Citizens Information Board – Accessible information for all (2009).

DD 266:2007 (Draft for Development) Design of accessible housing – Lifetime home – Code of practice.

I.S. EN 1991-1-1:2002 – Eurocode 1: Actions on structures Part 1-1: General actions – densities, self weight, imposed loads for buildings (including Irish National Annex: 2005).

I.S. EN 81-1: 1999 Safety rules for the construction and installation of lifts – electric lifts (Amd 1) (+A3:2009).

I.S. EN 81-2:1999 Safety rules for the construction and installation of lifts – hydraulic lifts (Amd 1) (+A3:2009).

I.S. EN 81-70:2003 Safety rules for the construction and installation of lifts – Particular applications for passenger and good passenger lifts. Accessibility to lifts for persons including persons with disability (Amd A1:2005).

I.S. EN 997:2003 (+A1:2006) WC pans and WC suites with integral trap (AMD Corrigendum 14805) (AMD 16965).

IEC 60118-4:2006 Electroacoustics. Hearing aids. Induction loop systems for hearing aid purposes. Magnetic field strength (ISBN 978 0 580 50047 3).

International standard for Induction loops. IEC 60118-4.

Irish Code of Practice on Accessibility of Public Services and Information Provided by Public Bodies www.nda.ie/website/nda/cntmgmtnew.nsf/0/3DB134DF72E1846A8025710F0040BF3D/$File/finaldrcode_nda.htm

Key cards should conform to EN 1332. For further information on key cards please see: http://www.universaldesign.ie/useandapply/ict/itaccessibilityguidelines/smartcards/guidelines/smartcardguidelines/cards

Lifetime Homes Standard: http://www.lifetimehomes.org.uk

Norwegian Universal design of building standard, 2009.

Passenger Lift Design: The Machinery Directive 2006/42/EC; Lifts should conform to BS 6440.

National and international reference documents

2020 Vision – Sustainable Travel and Transport: Public Consultation Document. Department of Transport.

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City of London 2006 Facility Accessibility Design Standards. London, Canada, 2006 Promoting Safe Egress and Evacuation for people with Disabilities - National Disability Authority.

Gallaudet DeafSpace Design Guidelines 2010.

Department of Transport & the National Disability Authority Guidelines for Accessible Maritime Passenger Transport http://www.nda.ie/website/nda/cntmgmtnew.nsf/0/45AA46D1F77D7EF2802576DC005C5954?OpenDocument

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Inclusive Mobility. Department for Transport, UK.

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Parking for disabled people. Department for Transport, UK.

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