

Accessible Components for the Built Environment: Technical Guidelines embracing Universal Design

Background

Accessibility¹ to sites, facilities and buildings is one of the most important prerequisites for the inclusion of both children and adults with disabilities. To a great extent, it determines the opportunity that all children, particularly those with disabilities need to be able to fulfil their right to education, health and community participation. It is also an area where tangible progress and results can be demonstrated.

While a fundamental precursor for inclusion, it is critical that UNICEF programmes go beyond physical accessibility to ensure the inclusion of children with disabilities through provision of assistive devices, addressing attitudinal barriers and strengthening disability inclusion in both policy and practice. Likewise, UNICEF will progressively adopt and promote accessibility and universal design² in all UNICEF premises.

In 2014, UNICEF's Supply Division launched a global survey on accessible construction to understand the extent to which UNICEF country offices (COs) were including accessible components in UNICEF premises (new construction or rehabilitation) and in facilities delivered under programmatic or emergency settings. The result highlighted that 59 per cent of offices included some of these design elements in their construction projects. However, all COs highlighted the need for technical support from HQ in relation to the specific components needed to construct accessible facilities.

In an effort to support COs address these challenges, and to also promote the systematic inclusion of accessible components in all facilities, the following technical cards have been designed. They should be used for planning universal design constructions along with the following documents:

1. International Standards for Accessible Construction (ISO 21542:2011) (electronic copies can be requested from Supply Division)
2. A booklet on accessibility related to inclusive education – “Access to School and the Learning Environment 1 (Physical, Information and Communication)” was published in 2015. In addition several tools on accessibility will be published by the Programme Division, Disability Section, in 2016. They include:
 - Detailed construction guidelines and specifications on accessible school construction
 - A toolkit on accessibility of the built environment, including considerations for accessibility of programme related construction and premises
3. Designs should also adhere to the accessibility standards defined in the existing national legislation and standards according to the country context.

A key consideration is that the cost for making facilities fully inclusive is marginal when the relevant accessible components have been carefully planned and included at the design stage. Furthermore, the social value and economic gain of including these features is significant when considering the impact that improved accessible facilities will make in providing access to a wider population in the society over the long-term.

To enhance accessibility of UNICEF offices and to ensure office occupants and visitors with disabilities have the required mobility, safety and comfort the Greening and Accessibility Fund (GrAF) was set up by UNICEF in 2015. The GrAF aims to assist UNICEF offices with financing Accessibility Improvement (AI) and Environmental Impact Reduction (EIR) projects in UNICEF premises.

To enable persons with disabilities to access and use a facility with safety, comfort and dignity, in addition to the built environment being physically accessible, it is also important that relevant personnel are sensitive and

¹ Accessibility is defined as a provision of buildings or parts of buildings for people, regardless of disability, age or gender, to be able to approach, enter, use, egress from and evacuate a building independently, in an equitable and dignified manner and to the greatest extent possible.

² The UNCRPD defines universal design as, “*The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design*”. (Ron Mace, Center for Universal Design, http://www.ncsu.edu/ncsu/design/cud/about_ud/about_ud.htm)

are aware of accessibility related issues and how to communicate and assist persons with disabilities. Such personnel may include those who are involved with security at entrances, reception, facilities management as well as those involved with emergency evacuation etc. While these Technical Cards address issues related to physical accessibility, simultaneous actions are also required to sensitize and train key personnel on inclusion of persons with disabilities. The following resources developed by the Disability Section could be useful in this regard:

All staff disability orientation video module- <http://www.unicef.org/disabilities/66434.html>

Inclusive communication video module- <https://agora.unicef.org/course/info.php?id=2756#maincontent>

Objective

To provide concise technical guidelines for UNICEF and partners to ensure accessible construction in all UNICEF premises and programme infrastructure, as per universal design principles.

Guidelines

In looking at infrastructure and its surroundings, four areas have been identified where barriers commonly arise for persons with disabilities: (1) movement in the outdoor environment and reaching the buildings, (2) entering, exiting and evacuating buildings, (3) movement within a building, and (4) use of individual rooms and facilities. Design requirements addressing these areas are presented in the Technical Cards for each accessible component. The structure of the technical cards and the description of the information is provided below.

Activity	Design Requirement	Applicable Components
1. Movement in the outdoor environment and outside buildings	Pedestrian routes in the built environment to be designed to guarantee easy movement from one entrance to the other. This means that pathways and routes should be easy to find, continuous, easy to use, free of obstacles, have a firm surface and be properly dimensioned	1.A Way-findings 1.B Pathway 1.C Parking 1.D Gaps, grates and other openings 1.E Outdoor facilities
2. Entering, exiting and evacuating buildings	The entrance(s), including final fire exits, to a building should be easy to find and easy to use by any person irrespective of impairment. They should be easy to use even during an emergency evacuation	2.A Ramps 2.B Handrails 2.C Entrance door and door handles 2.D Reception counter desk 2.E Fire emergency warning systems and signals
3. Movement within buildings	Indoor communication linking the entrance area with the various parts of a building should be easy to find and follow, be well dimensioned, have a good standard of lighting and be easy to use even during an emergency evacuation by all. Differences in levels should be clearly marked and safe, adequately lit with well dimensioned staircases, ramps and lift should be provided with suitable handrails. Staircases should facilitate safe assisted evacuation/rescue in emergencies. Doorways should be large enough to facilitate use for wheelchair or other mobility aid users	3.A Horizontal circulation (Corridors) 3.B Vertical circulation (Stairs and lift) 3.C Information, signage, simple layout
4. Use of individual rooms and facilities	Rooms should to be well dimensioned to allow for sufficient space for wheelchair users, a person using crutches or a person relying on an assistant. All fixtures and fittings should be appropriately designed and correctly positioned. Good lighting or natural light, and appropriate acoustics should always be considered. Signposted information of different kinds improves accessibility, usability and orientation.	4.A Window 4.B Switches and controls 4.C Toilet and water supply facilities 4. D Acoustics 4. E Security Access Systems 4. F Conference and meeting rooms 4. G Cafeterias 4. H Kitchens and Kitchenettes

Technical cards

Individual technical cards for each key component are presented below. Each card includes the description of the component and provides relevant examples (drawings and pictures), design considerations and recommended dos and don'ts.

The accessible components should work even during emergency evacuations. Please note that not all components are required in all types of buildings and all technical recommendations may not be able to be observed in some contexts for technical reasons. For example, some of the outdoor features like pathway from the main road/ parking lot to the entrance of the building may be required in a range of facilities, while lifts and accessible flush toilets can only be installed where there is connection to reliable power and water supplies.

In the technical cards, the footprint for a wheelchair is 800 mm wide and 1300 mm long. For larger wheelchairs and scooters, dimensions of relevant building component will have to be considered accordingly.

1. A Activity: Movement in the outdoor environment and outside buildings Component: Way-finding

Description of component:

The built environment should be designed, constructed and managed to facilitate orientation.

Orientation means to find one's way, to avoid obstacles, which could cause hazards, and to know when one has reached the destination.

Successful design to promote way-finding allows people to: (1) determine their location within a setting, (2) determine their destination and (3) develop a plan that will take them from their location to their destination.

The design of way-finding systems should include: identifying and marking spaces, grouping spaces, and linking and organizing spaces through both architectural and graphic means.

Technical Requirements:

Clear signage indicate the orientation, communication routes and direction.

Design Considerations:

Orientation and information:

- Suitable provision of signboards at the entrance of the building and at decision points within the building to describe the location and spatial distribution of the building
- Orientation should be facilitated by differences in acoustics, material, light and colour. Means to achieving satisfactory orientation conditions are:
 - a. Schematic layouts of the building
 - b. Way finding and guided paths with other physical support of information (visual, audible and tactile information), signage and symbols
 - c. Visual contrast
 - d. Consideration given to choice of colours and lighting
 - e. Visual, audible and tactile information according to the "two-sense principle"³
- A signboard at the entrance to and around a building complex with orientation map of the building with position of signboard clearly marked is a helpful guide for all visitors. Such design should indicate the use of the building elements (See Figure 1).

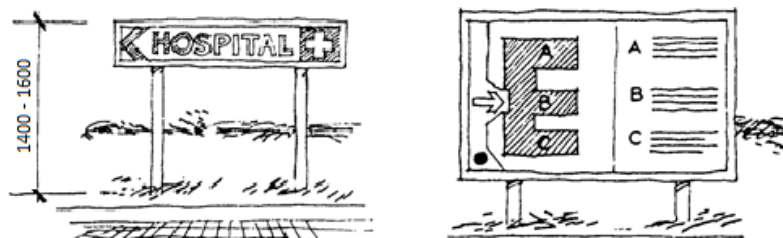


Figure 1: Directional sign and orientation map (Source: UNESCO 1990)

- Properly located signs of good design is of great importance for people to find their ways both in the outdoor environment and in buildings
- Preferably, Braille signage along with letters and symbols raised from background (at least 1mm, with size at least 15 mm) should be placed in order to enable persons with vision impairments to "read" the information using the tips of their fingers
- Additional illumination or visual contrast and tactile information, such as a change in material or tactile walking surface indicators, should be provided at decision points such as entrances, staircases, lifts, etc., to assist orientation and way finding

³ The two-senses principle requires that all information, including guidance aids, be perceivable by a minimum of two senses out of three (hearing, sight and touch), to enable visually impaired and hearing-impaired people to access all important information without outside assistance. (Federal Rehabilitation Council, Frankfurt/Main, 2012, http://www.bar-frankfurt.de/fileadmin/dateiliste/rehabilitation_und_teilhabe/Internationale_Themen/The_Ten_Commandments/downloads/BAR.The10Commandments.E.pdf)

- For recommendations on the height of the signage, please refer 3.C: Information, signage, simple layout

Dos:

- Building elements should be marked by increased illumination to facilitate way finding. The lighting in critical locations such as entrances, corridors, stairs, changes of level and workstations should facilitate easy identification
- In order to facilitate orientation and to ensure safe use of an environment, adjacent surfaces, information and potential hazards should provide a discernible visual contrast

Don'ts:

- Avoid creating shadows on areas of the sign and ensure the sign is in an area with good lighting
- Avoid suspended/protruding signs – they are very difficult to locate and too high to be read by a person with low-vision or a wheelchair user
- Use non-reflective surfaces and ensure that lighting does not create glare on the sign

Activity:
1. B Movement in the outdoor environment and outside buildings

Component:
Pathway

Description of component:

The design of the path or route to the building from site boundary or from the parking area should be designed and constructed to enable all people to approach, enter and exit the building easily.

Technical requirements:

Sufficient width and ensuring pathway is obstacle free (i.e. no protruding objects), continuous, firm, durable, slip resistant, level or adequately ramped with appropriately designed kerbs, tactile surfaces and handrails to prevent falling (as required).

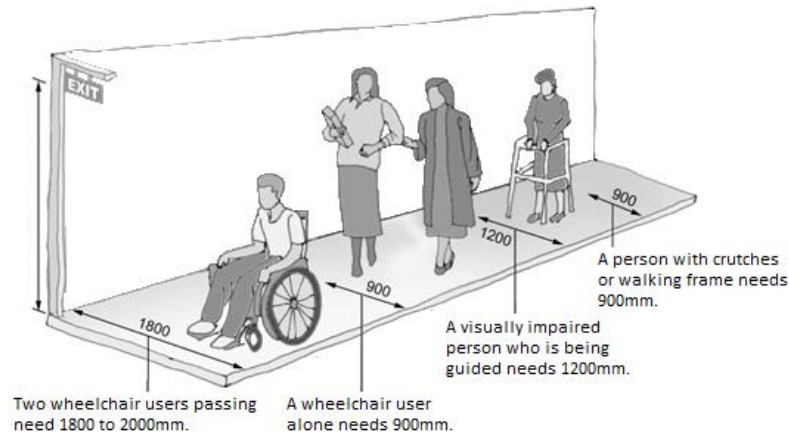


Figure 2: Required width of pathway by different users (Source: Adapted from Oxley 2002, by DFID 2004)

Design Considerations:

Width of pathway:

- To enable two wheelchair users to pass on a pathway, a minimum unobstructed width of 1800 mm is recommended

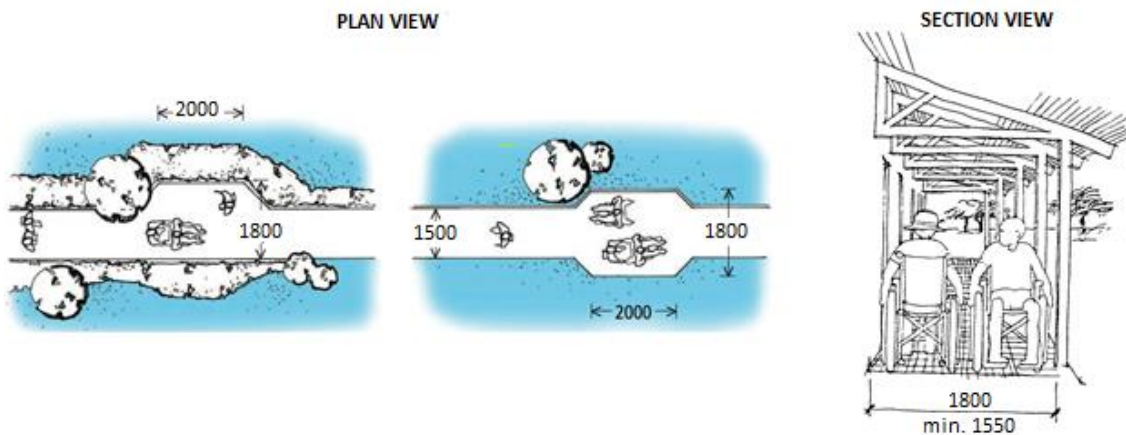


Figure 3: Minimum required width of pathway for wheelchair (Source: Centre for Accessible Environments 2004, UNESCO 1990)

Gradients of pathway:

- Gradients of pathways should not be steeper than 1:20 (approximately a 3 degree inclination) or a maximum of 1:12 (approximately a 5 degree inclination) for short distance, and not involve undue changes in level. Long slopes should be divided into stages by incorporating resting areas at approximately 50m intervals
- The provision of handrails (see 2B) can be extremely helpful especially on sloped pathways

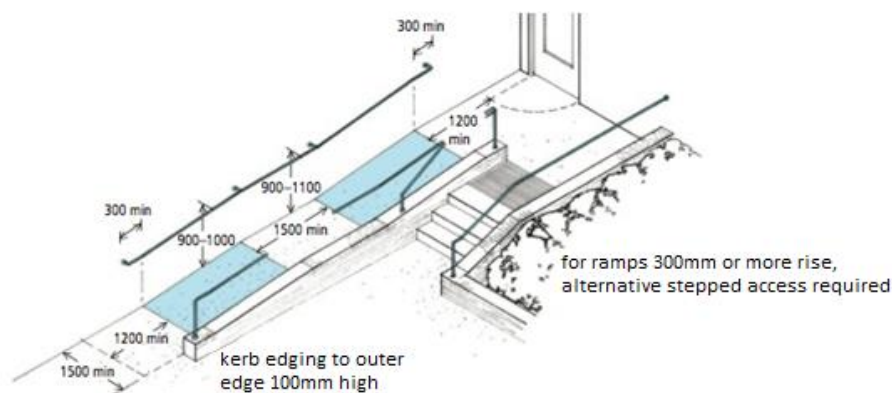


Figure 4: Gradients of pathway and handrails (Source: UNESCO 1990, Centre for Accessible Environments and RIBA 2004)

Surfaces of pathway:

- All pathway surfaces should be firm, even and slip resistant
- If possible, different materials, colours etc. may be used to assist recognition and orientation by persons with a vision impairment, e.g. contrasting lines painted on either edge of a pathway
- Any stairs should have contrasts in colour, as is described in 3.B - Vertical circulation (stairs and lifts)

Kerbs (a stone edging to a pavement or raised path):

- Kerbstones can be used to prevent vehicles from driving up onto pathways, causing an unexpected obstacle.
- Kerb ramps that meet relevant standards should be installed at points where pathways are specifically designed to cross heavily used roads. Key recommended specifications are:
 - a. A maximum kerb ramp slope of 9.1 per cent (see 2A for more detail) is recommended
 - b. Minimum ramp width of 1200 mm in new construction. In restricted spaces, the minimum width should not be less than 915 mm
 - c. Kerb ramp alignment should be perpendicular to the kerb face
 - d. Detectable warnings with a visual contrast with the adjacent walking surfaces across the lower part of the ramp are required
 - e. Sidewalk approach width should have a minimum of 1200 mm

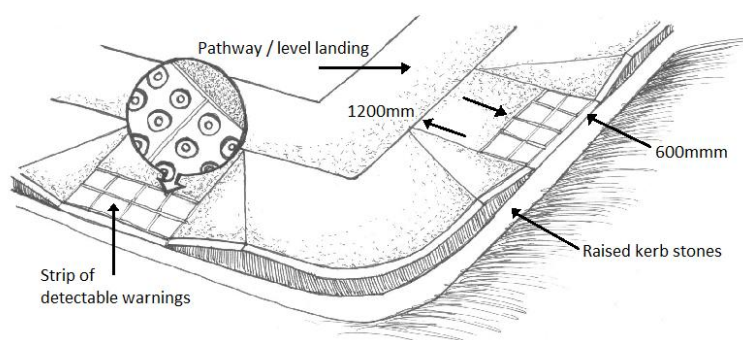


Figure 5: Kerb ramps for pathway (Source: U.S. Department of Transportation)

Dos:

- Secure arrangement with warning sign and barriers must be made for the temporary obstacles such as construction works to enable persons with vision impairments to register the presence of such obstacles and minimise the risk of injuring themselves

Don'ts

- Single isolated steps to take up small differences in levels along pathways should be avoided to minimise the risk of stumbling or falling
- All unnecessary obstacles, such as objects or signs mounted on walls, bollards, columns or free-standing supports along the walking path should be avoided

Description of component:

Cars are a practical method of transport for some people with disabilities and accessible parking is therefore an important consideration.

In developing countries, relatively few people with disabilities can afford private cars. Yet, as car ownership increases in general, it is good practice to provide accessible parking in key public facilities and buildings.

Technical Requirements:

Well positioned car parking should be reserved with signage, adequate space and level connection to pathway.

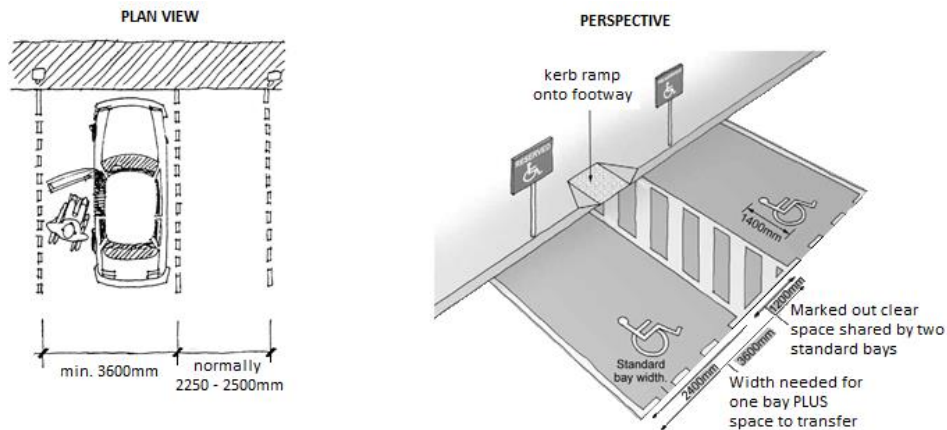


Figure 6: Dimension of access parking (Source: UNESCO 1990, Adapted from Oxley 2002, by DFID 2004)

Design Considerations:

Drop-off points for arrival of visitors by motor vehicle:

- Drop-off spaces should be provided as near as possible to the main accessible entrance for passengers arriving in taxis, public transport and also for large vehicles such as vans, etc.
- Vehicle drop-off spaces should be a minimum of 9000 mm in length, have a minimum width of 3600 mm and be served by a kerb ramp

Car parking:

- Where parking is provided, a minimum of one accessible designated parking space should be provided in every parking area for person with disability as close as possible (less than 50 m) to the principal entrance of the building
- Parking space should be wide enough for car doors to be fully opened to allow drivers and passengers with disabilities to transfer to a wheelchair or other assistive devices parked alongside
- The recommended minimum width of the parking space for a car is 3800 mm and the minimum length is 5400 mm. This minimum width includes the transfer area beside the car with a minimum of 1500 mm

Signage for parking:

- The location of accessible parking spaces should be clearly signposted from the car park entrance and it should be identified as provision for drivers or passengers with disabilities only
- Designated accessible parking spaces should be marked both on the pavement and using a vertical sign with the international symbol for accessible parking space to indicate the location of the designated accessible parking

Surface of parking:

- The accessible parking space should be on firm and level ground with no variation of surface exceeding 5 mm, between paving, surface features and mix of different surfaces or finishes
- The designated accessible parking spaces should be located on a gradient not greater, throughout its length and its width, than 1:50

Kerb ramp from parking space to an adjacent higher pedestrian path:

- The kerb ramp should be located in close proximity to the designated accessible parking area connecting the accessible path of travel to the principal entrance



Figure 7: Floor plan of on-street access parking with kerb ramp (Source: Centre for Accessible Environments and RIBA 2004)

Dos:

- Where on-site parking is not available, good practice would suggest maintaining a record of nearby accessible bays
- Provision should preferably be made to sheltered parking spaces reserved for persons with disabilities from sun and rain

Don'ts:

- Avoid abuse of parking space by adequate enforcement of rules
- Avoid parking location with steep gradients that cause difficulties for wheelchair users with side lift in their vehicle

Description of component:

All unnecessary obstacles should be avoided and where temporary obstacles, such as road works exist, secure arrangements must be made to register the presence of obstacles in good time to minimise the risk of people injuring themselves.

Technical Requirements:

Warning signs, barriers and lighting should be provided for temporary obstacles. Grates should be placed away from the pedestrian travel area and also away from the bottom of crosswalks and curb ramps, otherwise provide adequate cover.

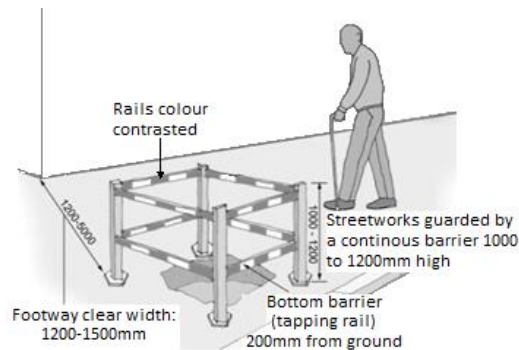


Figure 8: Guardrail for the street work (Source: Adapted from Oxley 2002, by DFID 2004)

Design Considerations:

Guardrail:

- Where there is a large drop at edge of pathways or opening on pathways, guardrails should be provided which should be at least 1100 mm high and painted to contrast with the surroundings

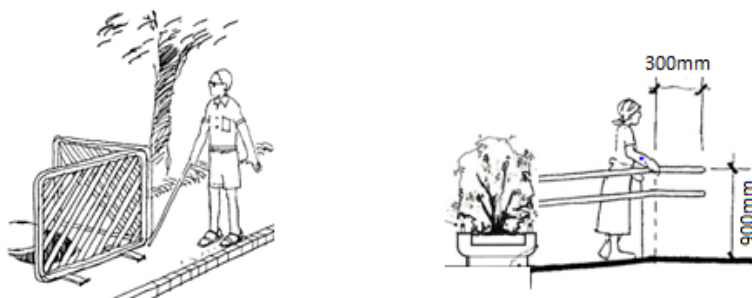


Figure 9: Example of guardrail for the opening on pathway (Source: UNESCO 1990)

Drainage on access routes:

- The cross-fall of a level or sloped path, a stepped path, a ramp, or a landing, that is provided to permit drainage of surface water, should not exceed 1:50 except in exceptional circumstances
- Dished channels should have a maximum width of 150 mm and a maximum drop into gully of 5 mm

Gratings:

- A drainage grating that is within the boundaries of a path or a ramp should be set flush with the surface
- If gratings are located in walking surfaces, then they should have spaces no greater than 13 mm wide in one direction. If gratings have elongated openings, then they should be placed so that the long dimension is perpendicular to the dominant direction of travel

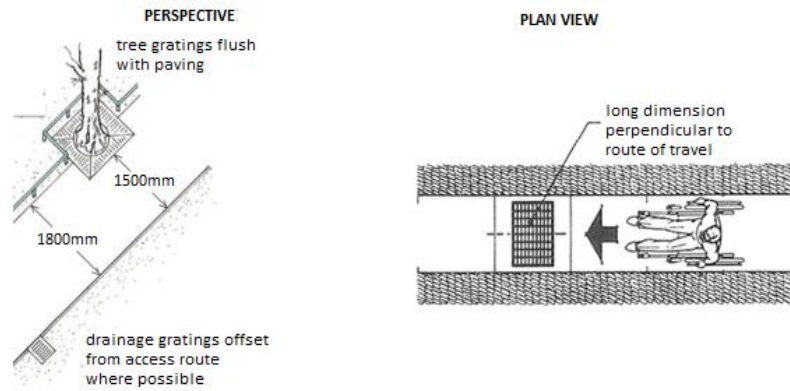


Figure 10: Gratings on pathway (Source: DFID 2004, ADA 1994)

Dos:

- The top, bottom and landings of steps and ramps should be properly drained in order to avoid water flowing down steps and ramps
- Observe plant varieties along the pathway carefully, avoiding, for example, thorny and poisonous plants and plants that drop seeds and leaves

Don'ts:

- Avoid constructing a dished channel within the boundaries of a path or ramp
- Surfaces such as sand, loose gravel, cobbles and terrazzo should be avoided

1. E Activity: Movement in the outdoor environment and outside buildings	Component: Outdoor facilities
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Description of component:

The term “Outdoor facilities” embraces a wide range of components in the outdoor environment including benches, signboards, bicycle stands, water supply facilities, playgrounds, etc. Location of outdoor facilities should always allow free passage and the safe use of site amenities.

Technical Requirements:

Careful positioning of adequate outdoor facilities that provide easier access and use, reduces potential hazards for all.

Design Considerations:

Position of outdoor facilities:

- Clearly defined routes should be planned for pedestrians
- If items of outdoor facilities have to be located within access routes, they should be clearly identified, for example using contrasting colour and luminance with the background against which they will be seen
- The provision of appropriate seating is important, especially on sloped site and long routes
- Free-standing posts or columns within access routes should incorporate a band of contrasting colour or luminance at 1500–1650 mm
- Cycle parking areas should be clear of pedestrian routes, and cycle stands should be clearly visible even when not in use

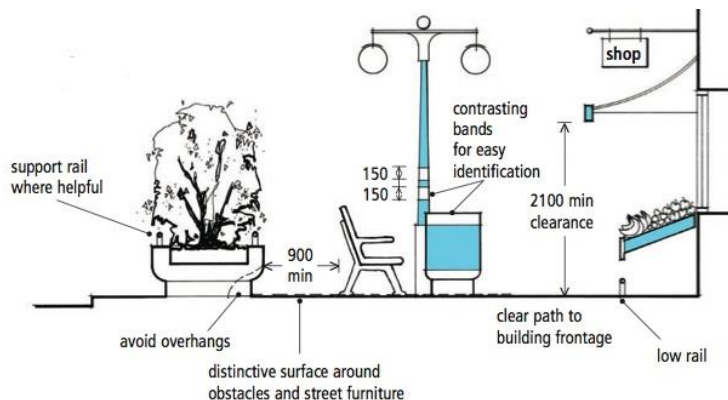


Figure 11: Street furniture (Source: Centre for Accessible Environments and RIBA 2004)

Outdoor bench/resting facilities:

- Seats should be designed with armrests to facilitate sitting down and standing up. A range of different types of seating should be provided to meet the needs of user:
 - a. Seat height 400 mm to 450 mm
 - b. Back support height 750 mm to 790 mm
 - c. Seat depth 400 mm to 450 mm
 - d. Angle of seat to backrest 100 to 105 degrees
 - e. Armrest height 220 mm to 300 mm above seat
 - f. Armrest set back from front of seat 75 mm
 - g. A minimum 150 mm set back under the seat for feet when standing up

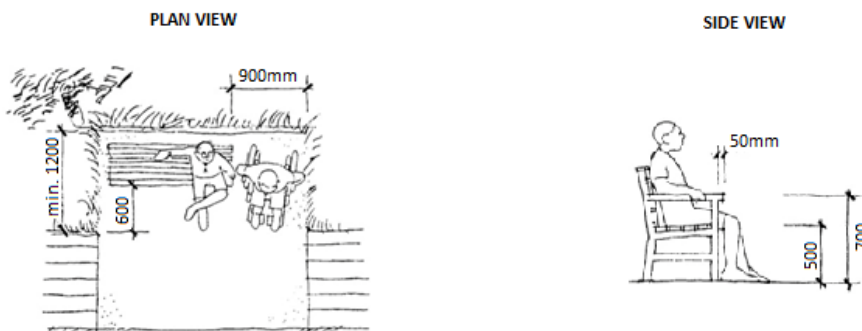


Figure 12: Outdoor bench and resting area (Source: UNESCO 1990)

Ramp access to a hand water pump apron:

- Where a hand pump has a concrete apron, this is liable to be slippery when wet, and treacherous for a user with poor balance
- For many users, it may be better to avoid the risks of a slippery surface by designing the hand pump to be used from outside the apron. This can be done by:
 - a. Installing the pump near the edge of the apron, so that it can be operated from outside the apron
 - b. Lengthening the pump handle so that it is long enough to operate from the edge of the apron. Help may still be needed to collect the water
 - c. Constructing the apron so that it is level with the surrounding ground, or so that any kerb or threshold has a rounded edge, to enable wheelchairs to wheel onto them if necessary
 - d. The concrete should have a roughened finish so that it is not slippery when wet, and kerbs should have smooth edges

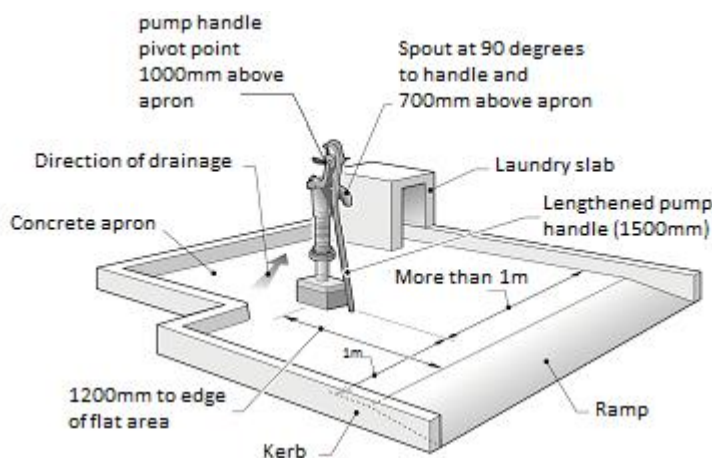


Figure 13: Example of accessible hand pump with concrete platform (Source: WEDC 2005)

Dos:

- Consider use of tonal contrast and/or textural changes in paving, and effective identification of defined routes.
- Consider the options to install the spout and pump handle at 90 degrees to each other to allow the user to pump water and hold the container to collect water at the same time. It also reduces the distance to move from the pump handle to the container
- Where possible, the height of spout or tap should consider the needs (e.g. common container size) and reach (e.g. standing or sitting) of different users. 800-1000 mm is suitable for someone sitting on a seat or wheelchair and for many crutch users. A provision of a shelf or platform to rest a container while filling water may be beneficial in some cases
- Where applicable, a flexible hose attached to a tap allows water to be directed into a container without lifting it off the floor. The end of the hose should be off the ground

Don'ts:

- Avoid placing outdoor facilities where it could cause obstacles for people with vision impairments or obstruct the passage of wheelchair users
- Avoid bench seats and pump handles with open ends and sharp corners
- Avoid smooth concrete finish for hand pump platform, as it will be slippery when wet

2. A

Activity:
Entry and exiting buildings

Component:
Ramps

Description of component:

The path or route to the building from the boundary of the site or from the parking area should be designed and constructed to enable all people to approach, enter and exit the building easily. Ramps and stairs are the most hazardous places for falls.

Ramps may be the only practical solution for people who cannot use steps or stairs, but other people may prefer to use stairs. In addition to a ramp, a flight of steps (see section 3B for more detail) should be provided if the change in level is more than 300 mm.

Technical Requirements:

Level or adequately ramped with gradients, and stepped if necessary with appropriately designed handrails.

Design Considerations:

Slope and length of ramps:

- The slope should not exceed the maximums set out in the table below:

Max. rise, mm	Max. slope	Max. slope, mm/m	Max. length between landings, mm	Outdoor use	Indoor use
No limit	Less than 1 in 20 (5.0%)	<50	No limit	Yes	Yes
500	1 in 20 (5.0%)	50	10 000	Yes	Yes
460	1 in 19 (5.3 %)	53	8 740	Yes	Yes
420	1 in 18 (5.6 %)	56	7 560	Yes	Yes
385	1 in 17 (5.9 %)	59	6 545	Yes	Yes
350	1 in 16 (6.3 %)	63	5 600	Yes	Yes
315	1 in 15 (6.7 %)	67	4 725	Yes	Yes
280	1 in 14 (7.1 %)	71	3 920	Yes	Yes
245	1 in 13 (7.7 %)	77	3 185	Yes	Yes
210	1 in 12 (8.3 %)	83	2 520	Yes	Yes
180	1 in 11 (9.1 %)	91	1 980	Kerb ramps only	Not recommended
150	1 in 10 (10.0 %)	100	1 500	Kerb ramps only	Not recommended
110	1 in 9 (11.1 %)	111	990	Kerb ramps only	Not recommended
75	1 in 8 (12.5 %)	125	600	Kerb ramps only	Threshold ramps only

(Source: ISO 2011)

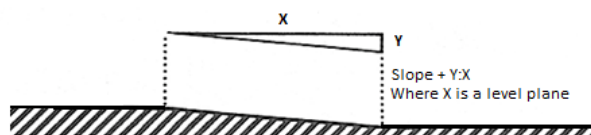


Figure 14: Measurement of ramp slope (Source: ADA 1994)

Width of ramps:

- The surface width of a ramp should be not less than 1200 mm
- The unobstructed width of a ramp should be not less than 1000 mm between the handrails or any obstructions

Landings of ramps:

- An end landing should be provided at the foot and the head of a sloped path, a stepped path, or a ramp. The area of an end landing may be a part of the continuing path
- The length of an end landing and an intermediate landing should be not less than 1500 mm
- The area of a landing should be clear of any obstruction, including the path of swing of a door or gate

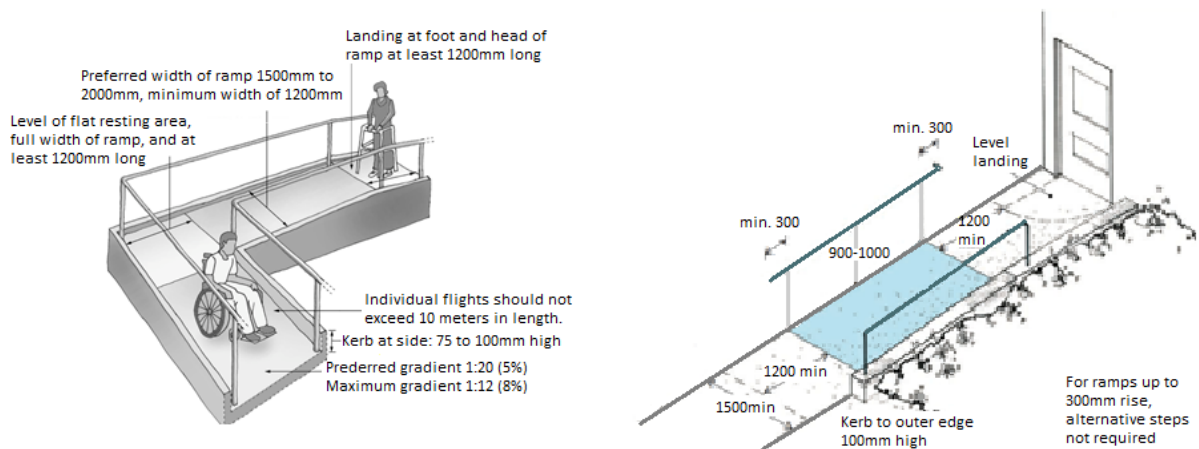


Figure 15: Ramp with handrails

(Source: Centre for Accessible Environments and RIBA 2004, Adapted from Oxley 2002, by DFID 2004)

Guarding / handrails along paths and ramps:

- Providing protection at the side of the path protects people who use wheelchairs and ambulant people from injuring themselves as the result of a fall
- If a path or a sloping path, stepped path, ramp, terrace or other unfenced platform rising more than 600 mm above the adjacent ground, guarding on both sides should be provided

Dos:

- A ramp with the appropriate slope can provide accessibility without requiring reliance on a mechanical device
- Ramps may be the only practical solution for people who cannot use steps or stairs, but other people may prefer to use stairs

Don'ts:

- A ramp with a gradient higher than 1:12 is difficult to use and can create a risk of an accident; it is therefore not suitable for independent use
- An inclination of up to six degrees will exclude a majority of wheelchair users from using a horizontal walkway independently

2. B

Activity:
Entry and exiting buildings

Component:
Handrails

Description of component:

A handrail provides a means of support, stability and guidance for the user. A handrail will help most people to go up or down a flight of steps or a ramp. However, a handrail also provides an essential means of support, stability and guidance for all building users during an emergency evacuation (e.g. fire, earthquake, flooding, etc.).

Handrails should be provided for stepped and sloped paths, ramps and stairs and lift cars according to the requirements.

Technical Requirements:

Provide adequate protection and support at the side of the path for people who use wheelchairs and ambulant people against injury as the result of a fall.

Design Considerations:

General requirements for handrails:

- A handrail provides a means of support, stability and guidance for the user. A handrail will help most people to go up or down a flight of steps or a ramp
- Handrails should be provided for stepped and sloped paths, ramps and stairs and lift cars according to the requirements given below
- A handrail within a building also provides an essential means of support, stability and guidance for all building users during an emergency evacuation

Provision of handrail on ramps:

- A handrail should be provided on either side of a ramp when the length of the ramp is 800 mm or less and there is an alternative stepped access
- A handrail should be provided on each side of a ramp if the ramp exceeds 800 mm in length

Provision of handrails on stairs:

- A handrail should be provided on both sides of all flights of stairs, and a central handrail should be provided when the unobstructed width of the stairs exceeds 2700 mm, provided that an unobstructed width of at least 1500 mm is provided on one side

Profile of a handrail:

- A handrail should have a rounded or elliptical profile that can be inscribed into a 45 mm circle, and subscribed to a 35 mm diameter circle. The radius of the rounded edges should be minimum 15 mm.
- A handrails should have an overall projection from any side obstruction of not more than 100 mm.

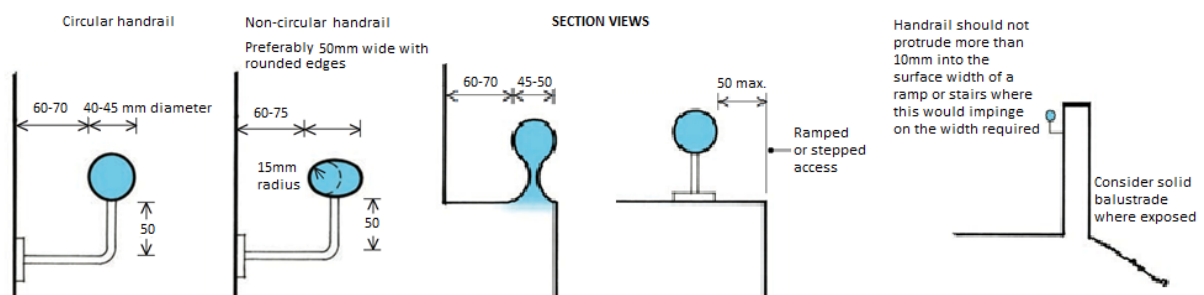


Figure 16: Example of handrail profile (Source: Centre for Accessible Environments and RIBA 2004)

Height and continuity of a handrail:

- The height to the top of a handrail should be between 850 mm and 1000 mm above the surface of a ramp, the pitch line of a stair, and the surface of a landing
- A second handrail, with a lower profile than the first one, should be provided for children, people of short stature and people in wheelchairs. The height to the top of the second handrail should be between 600 mm and 750 mm above the surface of a ramp, the pitch line of a stair, and the surface of a landing
- Handrails should be continuous throughout the flight of a ramp, stair, stepped path and intermediate landing, except where they intercept with a doorway or path of travel

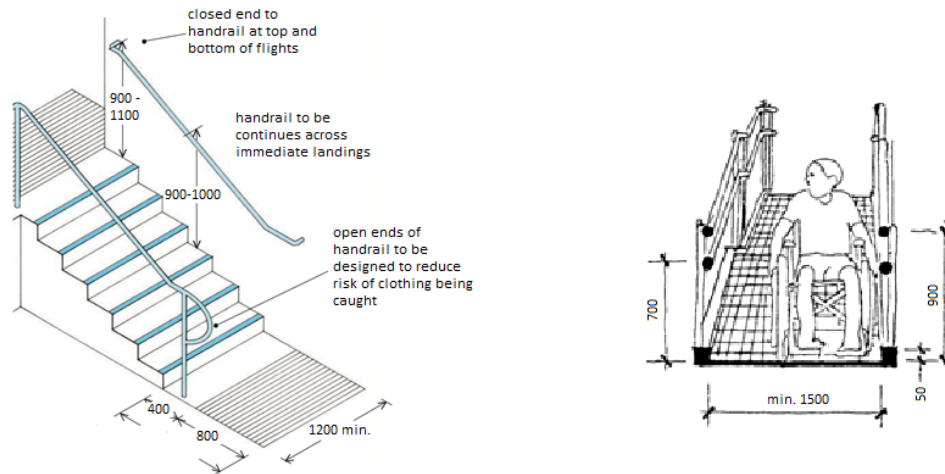


Figure 17: Height of handrails (Source: UNESCO 1990, Centre for Accessible Environments and RIBA 2004)

Horizontal extension of a handrail:

- A handrail on a stepped path, stair or ramp should have a horizontal extension of not less than 300 mm beyond the first and last nosing of each flight

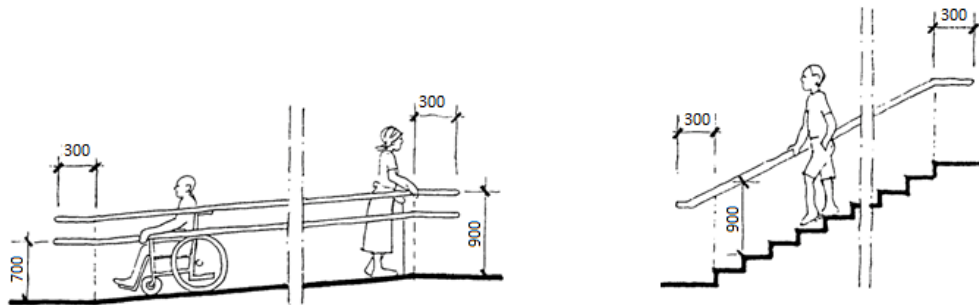


Figure 18: Horizontal extension of handrails (Source: UNESCO 1990)

Mechanical resistance:

- Handrails should be securely fixed and rigid. The fastenings and the materials should be able to withstand a minimum point load, both vertical and horizontal, of 1,7 kN

Dos:

- A wide and relatively flat-topped surface on a handrail provides better support than a regularly curved one, as it is easier to grasp and does not require significant hand and finger joint movement. For these reasons, the use of a handrail that is elliptical is preferred
- Consideration should be given to the provision of a second (lower) handrail set at 600 mm on stairs, particularly in schools, for use by children, people of short stature and wheelchair users
- Surfaces such as hardwood or nylon-coated steel are recommended in preference to surface materials that are cold to the touch especially in cold climate area

Don'ts:

- A handrail or grab bar should be free of any sharp or abrasive elements. Edges should have a minimum radius of 3.2 mm.
- Grab bars should not rotate within their fittings

2. C

Activity:
Entry and exiting buildings

Component:
Entrance door and door handles

Description of component:

The entrance to a building should be identifiable from the boundary of the site and from any designated accessible parking spaces on the site.

The entrance(s), including final fire exits, to a building should be easy to locate, safe and convenient to use and have limited exposure to rain. Entrance doors should be sufficiently high and wide, easy and intuitive to operate.

Entrance doors should be capable of resisting the forces of prevailing winds without opening unexpectedly.

Technical Requirements:

Level area in front of the door, clear signing, adequate light and colour contrast, level or minimum threshold with sufficient width, and easy to operate.

Design Considerations:

Floor level at the entrance:

- Entrances into the building should be level
- Any raised threshold should not exceed 20 mm.
- If the level of the entrance storey is above that of the surrounding ground, a suitable sloped or ramped approach and landing should be provided immediately outside the principal entrance

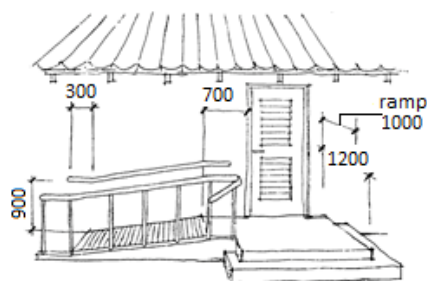


Figure 19: Entrance door and door threshold (Source: UNESCO 1990, ISO 2011)

Doorway width:

- The minimum unobstructed width of an entrance doorway should be not less than 800 mm. 850 mm or more is recommended, as more space can be required for a person using a powered wheelchair

Circulation space:

- In front of the door opening into the building, there should be a minimum horizontal manoeuvring space of at least 1500 mm by 1500 mm.
- Where turning 180° in a wheelchair may be required, there should be a minimum of 1600 mm by 2150 mm
- A manoeuvring space of not less than 600 mm should be provided between the leading edge of a door/the latch side of the door and a wall that is perpendicular to the doorway as shown below. 700 mm or more is recommended
- This space is necessary to allow opening of the door by a wheelchair or a walking frame user

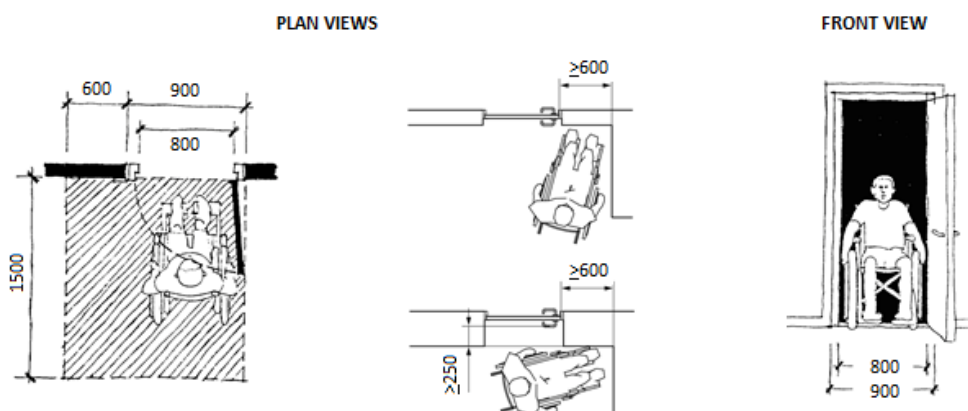


Figure 20: Dimensions of entrance door (Source: UNESCO 1990, ISO 2011)

Clear height of a doorway:

- The minimum clear height of a doorway should be not less than 2000 mm.

Door furniture and handles:

- Door locks, door handles, bells and other devices for gaining entry to a place should be easy to locate, identify, reach and use, and should be operable with only one hand
- The furniture and door handle should be mounted approximately 800-900 mm above floor level to permit easy manoeuvring from both sitting and standing positions
- D-lever handles are preferred and lever handles should be minimum 80mm in length and between 19 mm and 25 mm in diameter
- Entrance doors to public buildings should preferably be equipped with pull handle with a length of at least 300 mm, and with lower end approximately 800 mm above floor level
- Adequate clear space should be available on either side of the doors to enable people in wheelchairs to access the door controls and pass through

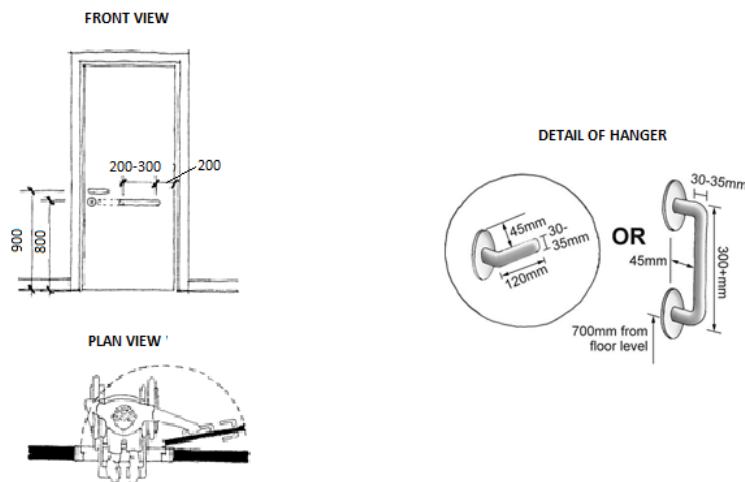


Figure 21: Height of Door handles and example of D-lever handles (Source: UNESCO 1990, Adapted from Oxley 2002, by DFID 2004)

Fire resisting door-sets/final evacuation door:

- Special consideration should be given to the choice of closing device for a fire resisting door-set. It should be easily openable from the inside without the use of a key
- The door leaf should always be easy, intuitive and obvious for everyone to open, whatever its configuration, dimensions or hardware

Dos:

- Canopies, porches, or other arrangements can make it easier to identify the entrance from the rest of the building
- It is helpful to make clear whether doors are to be pulled or pushed

Don'ts:

- Round or oval type door knobs are not suitable for people with mobility impairments, for people of small stature or less strength and for children

2. D

Activity:
Entry and exiting buildings

Component:
Reception counter desk

Description of component:

Reception areas and desks should be designed, fitted out and furnished to enable all people to be greeted and directed as required. As reception areas and reception staff are often the first impression about an organisation or service, it is important that they are accessible for all, including people with disabilities. Reception desks should be designed and located to be used by people standing and in wheelchairs, and other reception furniture should be positioned to allow space to manoeuvre.

Technical Requirements:

Adequately designed reception area and desk/counter.

Design Considerations:

Location:

- Counters and reception desks should be located and clearly identified so that they are easily recognisable from a site and building entrance
- Reception areas should be positioned near the main entrance

Space to manoeuvre:

- Counters and desks should be accessible to wheelchair users on both sides
- A clear manoeuvring space at least 1500 mm square should be provided in front of the counter on the receptionist's side and on the visitor's side. 1800 mm square is preferred

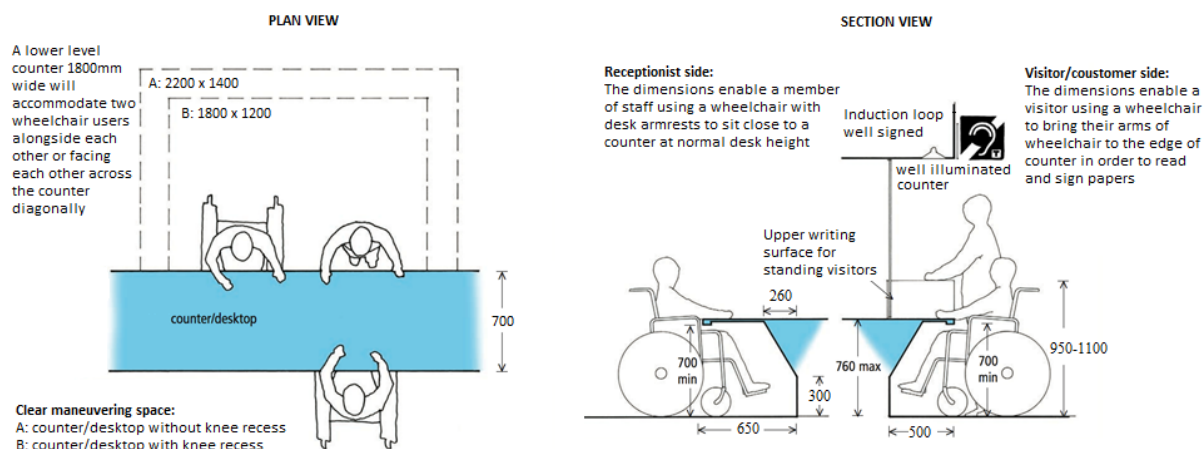


Figure 22: Reception desk (Source: Centre for Accessible Environments and RIBA 2004)

Height:

- Reception desks where a visitor needs to write should allow frontal approach by wheelchair users with space to provide clearance for wheelchair user's. The counter level should be between 740 mm to 800 mm from the floor. The clear knee space underneath should be at least 700 mm deep and 900 mm wide
- Part of the desk should also be at a height suitable for people standing to write, between 950 mm and 1100 mm

Lighting:

- To facilitate lip-reading, lighting should provide even illumination

Seating:

- Seating should be provided for people who cannot stand for long in a waiting area around reception. A good height for seats or benches is about 480 mm above the floor
- Some seating can consist of perch-type seating at height approximately 700 mm above floor level against which visitors can lean or half-sit. They are simple and inexpensive to construct and maintain, and comfortable for people with arthritis or back problems who find it difficult to get up from a low seat

Dos:

- Reception areas, counters, especially in noisy environments or those equipped with a separating security screen, can have at least one position fitted with a hearing enhancement system (e.g. induction loop system) to assist hearing-aid users, and be clearly marked with the appropriate symbol

Don'ts:

- Avoid positioning service counters in front of windows where bright sunshine causes the user's face to be in shadow and hence difficult to lip-read. Service counters equipped with a service screen are particularly inconvenient. Reflections and glare should be avoided

2. E

Activity:
Entry and exiting buildings

Component:
Fire emergency warning systems and signals

Description of component:

In all building types, a reliable and effective fire warning system that communicate simultaneously by sounder, light strobe and voice message is essential.

Technical Requirements:

Room layouts, lighting levels and furniture arrangements should be considered to ensure that these alarms are visible. Alarm systems with visual strobe light should be provided to accommodate people with hearing impairments, particularly in isolated areas (bathrooms, meeting rooms) and noisy areas.

Design Considerations:

Light warning signals:

- Light strobes/beacons should be clearly visible
- Light strobes should be located in washrooms and in other locations within buildings where people are apt to be alone and also in noisy environments
- A slow rate of flash should be ensured (e.g. once every two seconds) in order to avoid epileptic seizures and the flash of one strobe/beacon should be synchronized with the flashes of all other light strobes/beacons in view

Acoustic warning systems

- A larger number of sounders between 85 dB to 95 dB with low output should be specified
- Vocal messages should be short and should contain appropriate warning information which is easily assimilated

Dos:

- A larger number of strobes/beacons with low output should be specified to suit the use of particular areas. A strobe frequency of 0,5 Hz – 4 Hz minimizes the risk of triggering a reaction from a person with epilepsy.
- In multi-cultural built environment, messages should be given in at least two different languages
- Vibrating devices such as pagers or mobile phones can be integrated with alarm systems to provide an individual tactile sensation alarm

Don'ts

- Never install a small number of strobes/beacons with high output as these produce glare causing confusion and disorientation among building users
- Never install a small number of sounders with high output. This only leads to confusion and disorientation among building users

3. A

Activity:
Movement within buildings

Component:
Horizontal circulation (Corridors)

Description of component:

The main horizontal circulation design should be level on each floor without steps in order to ensure that the building is accessible to all people. Where differences in level cannot be avoided, ramps or lifts should be provided.

To accommodate people with visual impairments, routes should have detectable delimitations and different visual contrast from the surroundings.

Technical Requirements:

Adequately wide and space to allow easy manoeuvrability, slip resistant floor, free of obstacle and protruding objects, adequate light and colour contrast on wall, with appropriately designed handrails as required.

Design Considerations:

Internal passages:

- The minimum unobstructed width of corridors should be 1200 mm, with a preference for a width of 1800 mm
- Where less than 1800 mm wide, a corridor should be provided with passing places, 1800 mm wide and at least 1800 mm in length at reasonable intervals. These dimensions should be exclusive of handrails and any other projections, e.g. portable fire extinguishers, notice boards, coat hooks, etc.
- Adequate circulation space, where a doorway exists, should be provided
- Changes of direction within a corridor should have a turning circle with a diameter of 1500 mm or more, clear of any obstructions. It may be reduced to a width of 1000 mm and a length of 1000 mm in the direction of travel in countries where shorter and smaller wheelchairs are commonly used
- The minimum clear height of corridors should be 2100 mm
- The space required for a wheelchair to make a 180° turn should be not less than 2000 mm in the direction of travel and not less than 1500 mm wide. This may be reduced to 1200 mm in countries where shorter and smaller wheelchairs are commonly used

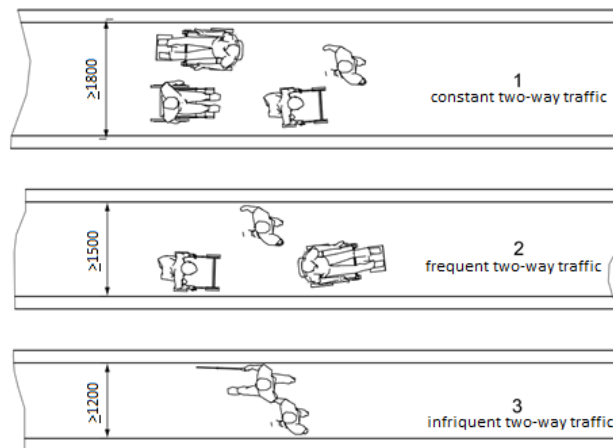


Figure 23: Required width of corridor (Source: ISO 2011)

Floor and wall surfaces:

- Floor coverings should be firm and slip-resistant in both dry and wet conditions
- Floor and wall surfaces should be anti-glare

Dos:

- Handrails are extremely helpful and provide support for people with mobility impairments, guidance for people who are blind or have a vision impairment and can also support Braille information or tactile information
- Verandas around the outside of buildings can be used for both communications and for waiting. The width should not be less than 1800 mm. This will ensure smooth pedestrian flows for all people

Don'ts:

- Reflections caused by the inappropriate use of floor and wall finishes and by the location of mirrors and glazing should be avoided
- Highly contrasted floor patterns can be perceived as differences in floor level, which may confuse people with vision impairments or cognition capacity. Highly contrasted floor patterns may trigger an attack of vertigo

3. B

Activity:
Movement within buildings

Component:
Vertical circulation (Stairs and lifts)

Description of component:

Vertical circulation within buildings should be designed, constructed and managed so that it can easily be understood and used by all people.

Vertical circulation includes the provision of ramps (see 2A for detail), stairs and lifts.

Lifts are the preferred method of vertical travel for most people with disabilities and in particular wheelchair users and persons with assistance dogs. They are essential in multi-story buildings that accommodate public facilities, in order to give persons with disabilities access to the upper floors.

Note: Requirements for lift cars being used for evacuation are a matter of national building regulation. Lifts should not be used for evacuation unless the lift is built for this purpose and suitably protected by the building design following the applicable regulation. Please see ISO 21542 for the recommendations for the use of lifts (elevators) for fire evacuation.

Where there are no safe options for vertical movement of people with mobility impairments, it may be necessary for them to wait at places of relative safety until the fire services arrive and complete the evacuation. It is important that such scenarios be discussed and agreed with the fire services in advance, so they can ensure that adequate resources are available for both evacuation and firefighting.

Technical Requirements:

Ramps with handrails for internal level changes and any raised areas.

Lifting devices and suitable stairs with handrails to all storeys above and below ground.

Design Considerations:

Rise and going of stairs:

- The rise and tread of stairs within flights should be uniform
- The minimum going of the tread should be 260 mm, and the maximum rise should be 180 mm. Due to safety reasons and anthropometric differences, it may be recommended to increase the minimum depth of the going
- The projection of a stair nosing over the tread below should be avoided but, if necessary, should not be more than 25 mm. The nosing should provide an uninterrupted transmission between riser and tread

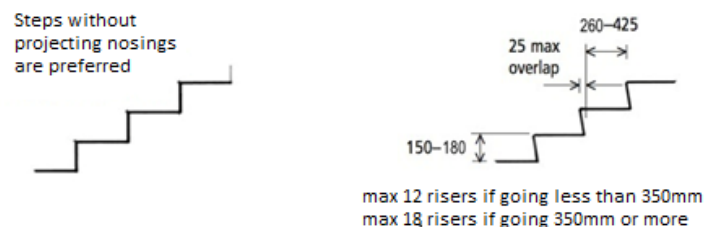
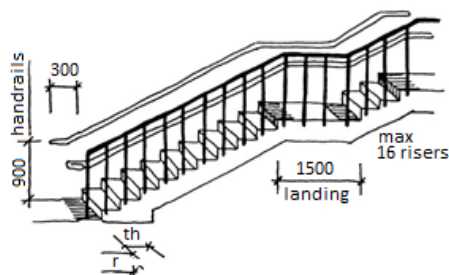


Figure 24: Profile of stairs (Source: Centre for Accessible Environments and RIBA 2004)

- A flight of stairs should not contain more than 16 risers. However, in circumstances where the plan area is restricted, a flight of a stairs should contain no more than 20 risers



	width of stairway in meters	size of threads and risers in meters
stairways in institutional buildings	1.2	th = 0.30 r = 0.15
common stairways serving two or more dwellings	1	th = min 0.25 r = max 0.18
stairways within dwellings	0.8	th = min 0.22 r = max 0.22
stairways outdoors	1.3	th = min 0.30 r = max 0.15

Figure 25: Recommended dimensions of stair (Source: UNESCO 1990)

Minimum width of stair flights

- The recommended minimum width of a flight of stairs should be 1200 mm and it should not be less than 900 mm in all circumstances
- The recommended minimum width between handrails should be 1000 mm and should not be less than it 800 mm all circumstances

Staircase landings

- The area of a landing should be clear of any obstruction including the path of the swing of a door or gate. Where there is a half landing or a 180° turn, it should never be less than 1500 mm wide in order to facilitate carrying a person on a stretcher

Visual and tactile warnings for stairs

- There should be a visual contrast between landings and the top and bottom step of a flight of stairs. Preferably, a visual warning line with a single strip of 40 mm to 50 mm without a break should be provided on the front edge of the going of each step and may return down the riser for a maximum of 10 mm
- The visual indicator on the going may be set back a maximum of 15 mm from the front of the nosing or, a visual warning line with a width between 50 mm and 100 mm should be provided on the going of the first and the last step of the flight
- Where a stair is in an open area, a tactile attention pattern may be beneficial. However, where different materials are used for the flights and landings of a stair, care should be taken to ensure that their frictional characteristics are similar in order to minimise the risk of stumbling
- Where tactile attention patterns are used, they should be provided on the landings at the top and bottom of every flight of stairs across the whole width of the stair. The tactile attention pattern should have a depth of between 600 mm and 900 mm, and end 300 mm to 500 mm before the front edge of the first down going step

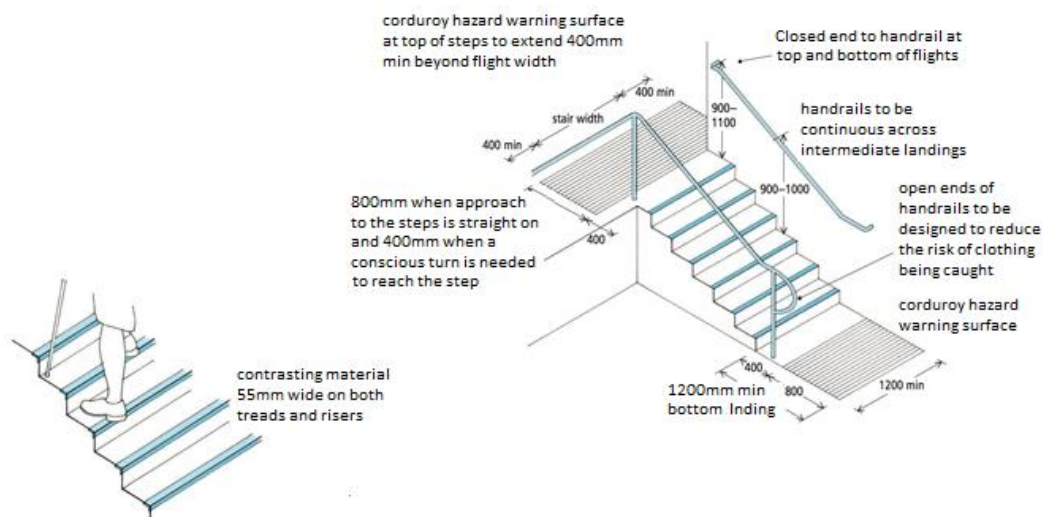


Figure 26: Warnings for stairs (Source: Centre for Accessible Environments and RIBA 2004)

Location of lifts:

- The lift(s) should be located near the main entrance of a building and be clearly marked
- The lift(s) should ascend to each floor at central point from where it is possible to easily orient oneself
- It should be possible to reach the lift at every floor without having to go up and down steps
- The location of lifts/elevators in a building should always be considered in relation to their supporting fire evacuation staircases, with associated areas of rescue assistance, and direct protected access to final fire exits leading to places of safety remote from the building

Inner dimension of lift:

- Where national regulations do not require a lift in a multi-storey building, a space for an accessible lift with a minimum internal lift-car size of 1100 mm x 1400 mm of 630 kg, with minimum width of at least 800mm, preferably 900 mm for lift doors should be provided for later adaptation

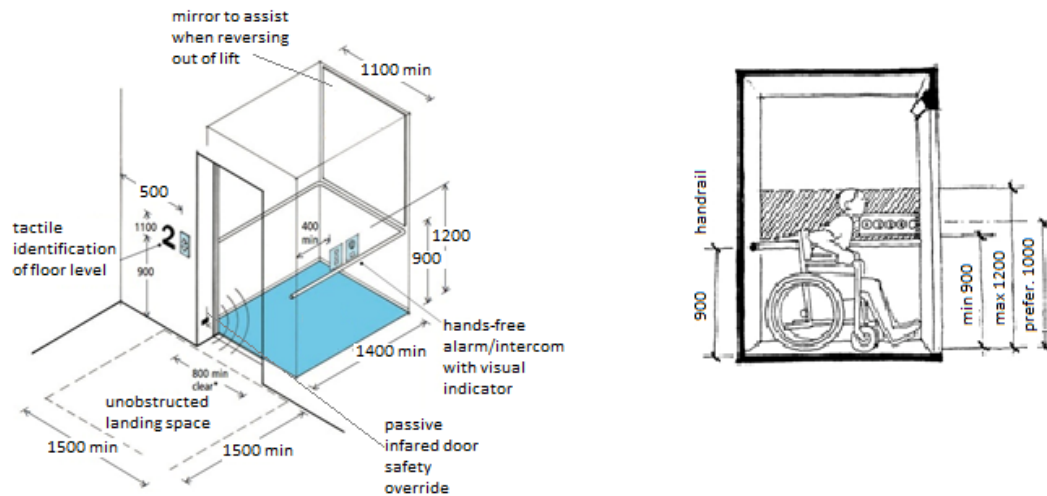


Figure 27: Dimensions of lift (Source: Centre for Accessible Environments and RIBA Enterprises 2004, UNESCO 1990)

Lift control devices and signals:

- Signs and car controls should be placed at a level that is reachable by people of short stature and wheelchair users
- Lift controls/ switches should have Braille signage and audio signals.
- Landing controls should be placed at a minimum distance of 500 mm (600 mm recommended) from any adjacent corner or wall. Car controls should be placed at a minimum distance of 400 mm (500 mm recommended) from any adjacent corner or wall
- Both landing controls and car controls should be placed between 900 mm and 1200 mm above floor level, preferably 1100 mm
- The controls can be placed either vertically or horizontally within this area
- The order of the controls should be easy to understand 'logical'
- The door should close at limited velocity which should be more than four seconds

Dos:

- For the purpose of safe assisted fire evacuation of people, the rise of a stair should not have a height greater than 180 mm, and the going of a stair should be not less than 425 mm
- To allow sufficient space for firefighters rescue teams entering a building and towards a fire, while people are still evacuating from the building, the clear unobstructed width, exclusive of handrails and any other projections, of the flight of single- or multi-channelled stairs should be not less than 1 500 mm. The surface width of a flight of stairs should not be less than 1700 mm
- The minimum illumination at the top and bottom of the ramp or staircases should be at least of 200 lux and 150 lux in between the bottom and top
- All technical requirements for accessible lifts should comply with ISO 4190-1

Don'ts:

- Spiral stairs and tapered treads are not recommended
- Open risers should not be used
- Avoid single steps
- In order to avoid trips and falls during a fire evacuation, avoid a gradient of slope within a building that exceeds 1:15 (67 mm/m, 6,7%)

Description of component:

Buildings should be designed, constructed and managed so that the internal spaces are accessible and easily understood. All aspects of horizontal circulation, including corridors, should be designed to facilitate ease of movement for all people. Suitable provision e.g. spatial layouts, signage and symbols that indicate the use of the building elements should be made at the entrance to the building and at decision points within the building to describe the location and spatial organisation of the building. This will enable a person to understand where in the building you are located and the path to use for going to a desired space.

Technical Requirements:

Clear well-lit and colour contrasted signing, symbol that indicate the communication routes and direction within the building.

Information concerning safety and emergency evacuation procedures should be conveniently located at all entrances and final emergency exits. Information on evacuation plans should be available to all building users in a format they can understand. This may include Braille, large print and audio.

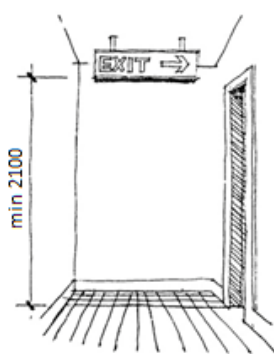


Figure 28: Minimum clearance for hanging sign (Source: UNESCO)

Design Considerations:

Supportive measures for information and way-finding should be provided in a format that is accessible to people with sensory impairments according to the principle of two senses, which include:

- Audible/tactile information for people with vision impairments where consideration should be given to provide suitable amplification and acoustic conditions; the message should be easily understandable and unambiguous
- Visual information for people with hearing impairments

Levels of information:

- Information should be clear, concise, accurate and timely. Clarity of information can be defined as information that is legible and easily understood
- Clarity of information therefore presupposes that people are able to distinguish between the different types of information that they receive
- Information can be divided into:
 - o Level 1: safety information
 - o Level 2: general information
- It is important that these levels of information are clearly distinguished
- All information provided should be accurate and consistent

Signage:

- Signs should be readable and legible for people who have low vision or intellectual impairments with colour contrast and large font size (see below)
- Well-illuminated, clear and readable signs should be placed at a consistent height
- Information with text should be supplemented with graphics to facilitate comprehension for everyone
- Signs should be provided in relief and Braille where possible. The signs should be made of robust materials and be easy to change, clean and repair

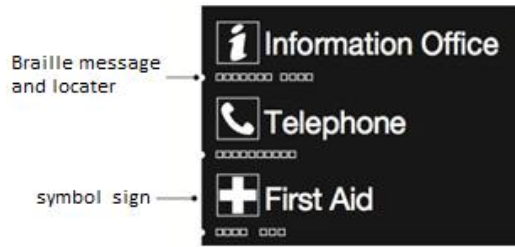


Figure 29: Example of standard symbol (Source: Centre for Accessible Environments and RIBA 2004)

Placement of signage:

- Orientation signs should be located in accessible places adjacent to, but not directly in, main access routes so that they can be examined without disturbance
- In public buildings there should be an orientation plan immediately inside the main entrance
- Directional signs should be:
 - a. Made clear to direct people to the facilities
 - b. Located where directional decisions are made and constitute a logical orientation sequence from the starting point to different points of destination
 - c. Repeated, not too often, but every time there is a possibility of alteration in the traffic direction
- Directional signage to washrooms should be provided in different locations of a precinct or building
- Stairwells should have information signs identifying all points of entry and exit
- Floor numbers should be located on each floor at top and bottom of stairs, close to handrails and on each side of the outer frame of each lift-car entrance on each floor and prominently displayed elsewhere so they are visible from the lift car at each level

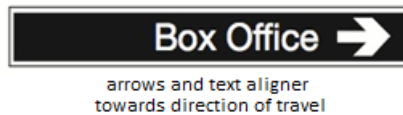


Figure 30: Directional signage (Source: Centre for Accessible Environments and RIBA 2004)

Height and location of signs:

- Place signs at a consistent height and location which would be most logical and usable throughout the building or facility (e.g. entrance point to corridor or room) which are visible to people who are seated, standing or walking
- Signage/signposts should be placed at a height of 1200-1600 mm from floor level to the bottom of the sign, which can be reached easily without obstruction for raised text or Braille readers with the fingers
- For buildings and facilities where the main users are children, place the signs between 900-1200 mm from floor level to the bottom of the sign plate
- Where it is likely that the sign may be obstructed, as in a crowded situation (meeting point etc.), the signs should be placed at a height of at least 2100 mm above the floor. The same requirement applies to signs hanging from the ceiling or projecting to walls. In that case, there should be two signs; one that can be seen from a distance above other people's heads, one as a complement at the height recommended above
- Where there is sufficient space, door signs should be located on the latch side of the door within 50 mm to 100 mm of the architrave

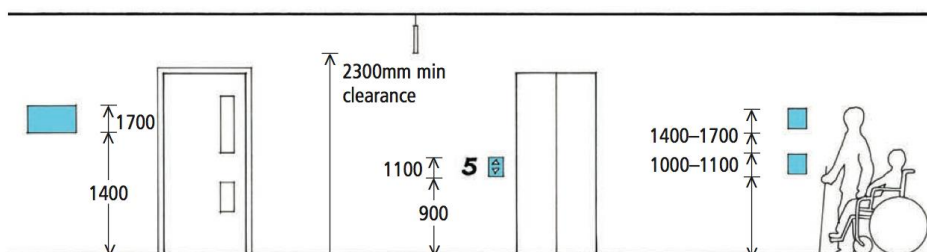


Figure 31: Recommended location of signage (Source: Centre for Accessible Environments and RIBA 2004)

Contrast:

- Ensure that the sign visually contrasts with its background so that low-vision people can locate it more easily.
- It is recommended to use a sign with:
 - a dark background and light-coloured print on a light-coloured wall

- a thick border of contrasting colour to assist with differentiation if a sign must be placed on a similar-coloured wall or on glass

Font and size of lettering:

- The fonts should be easy to read. The font style should be a sans serif font similar to Helvetica or Arial medium.
- The letter height depends on the reading distance. A letter height between 20 mm and 30 mm for each meter of viewing distance is preferred. The letter height should not be less than 15 mm
- It is recommended that messages of single words or groups of words begin with an upper case letter and continue with lower case letters (sentence case)

Graphical symbols:

- Graphical symbols should be used in conjunction with building signage systems wherever possible.
- Graphical symbols should:
 - be highly contrasted and properly illuminated
 - be used on guides and directional signage
- Graphical symbols on directional and door signs should be tactile, and should be accompanied by raised lettering and Braille
- Signs above a height of 1600 mm do not need to be tactile, nor to include raised lettering or Braille information
- The size of graphical symbols is dependent on the viewing distance (D). The minimum size of the inner outline of the frame of graphical symbols (s) can be derived from formulas below applicable for a viewing distance of 1000 mm to 10000 mm

$$(s) = 0.09 \times (D)$$

(s) : The minimum size of the inner outline of the frame of graphical symbols

(D): viewing distance

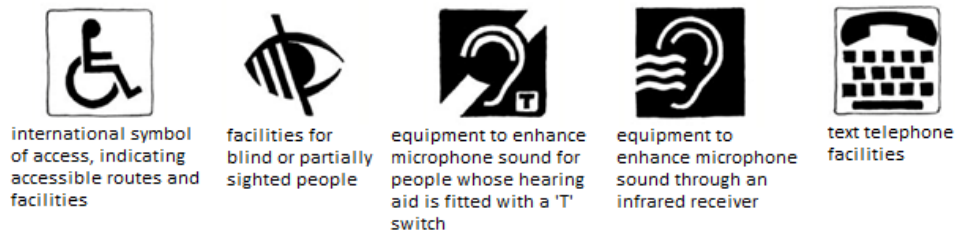


Figure 32: Universal accessibility symbols (Source: Centre for Accessible Environments and RIBA 2004)

Braille:

- Where an arrow is used in the tactile sign, a small arrow shall be provided for Braille readers
- Braille should be raised, domed and comfortable to touch. It should be located 8 mm below the bottom line of the text and be left justified.

Tactile symbols:

- Tactile symbols applied on handrails, doors, maps or floor plans shall have a raised relief contour similar to tactile letters.

Dos:

- Different colours should be used for identification of doors, different storeys or departments in a building to aid persons with low vision and intellectual impairments
- Recommended location of signage and information in high-contrast, tactile print signage and Braille, where possible:
 - Toilets/bathrooms– both general and specifically accessible facilities
 - Numbers on stair landing hand rails to allow identification of floors
 - Office and room name/ number plates
 - Emergency doors and exits
 - Emergency evacuation instructions
 - Cautionary signage
 - Floor and building directories
 - Operating instructions e.g. for emergency facilities or toilets
 - Elevators – controls and floor indicators

Don'ts:

- An excessive quantity of signs in close proximity should be avoided, as well as visual material placed too close to wall fixed signs (e.g. posters, timetables, etc.)
- Red-green combination on signage should be avoided. Difficulties in perception can also appear when using the colours green, olive green, yellow, orange, pink and red
- Abbreviations and very long words are hard to understand and should be avoided

4. A

Activity:
Use of individual rooms and facilities

Component:
Windows

Description of component:

Windows are primarily incorporated into building for enjoying the outdoor view, providing indoor ventilation and to let daylight into individual rooms. The placement and design of windows will determine how satisfactory the daylight conditions will be in each room. This affects the ability of persons with vision impairments to orientate themselves and to identify persons and things in a room. The location and relative height of windows is also important so that wheelchair users can look out of and open windows.

Technical Requirements:

Placement of carefully designed windows that are easy and safe to operate, and satisfy requirements for daylight and ventilation.

Design Considerations:

Placing of windows:

- Window openings should be placed in a way to avoid glare, which can be a problem for people with vision impairments
- Excessive contrast in lighting should be avoided if pale wall colours are used beside the window or supplementary artificial lighting is employed

Restriction on opening:

- Opening windows should not interfere with pedestrian areas, hence they should not be placed below a height of 2100 mm

Manoeuvrability of hardware and shutters:

- Windows should be easy to open and close by all
- It should be possible to open and close the windows with only one hand
- Hardware and shutters should be placed between 800 mm and 1100 mm above the floor
- Window handles should be at least 80 mm long
- Shutters should be designed so that they can always be fastened securely and flush with the wall, irrespective of whether they are in the open or closed position

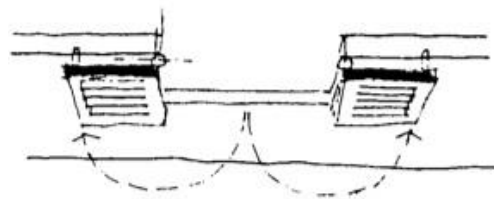


Figure 33: Window shutters (Source: UNESCO 1990)

Height of the window:

- To enable wheelchair users to see through a window, the lower edge of the glazing should be positioned between 800 mm and 1100 mm from the floor depending on the target users' seat height

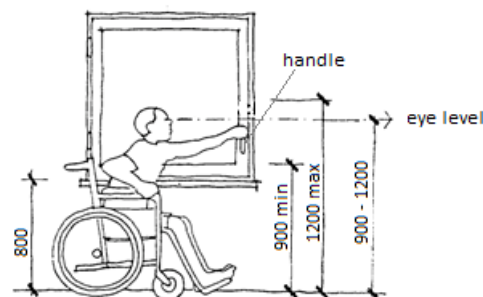


Figure 34: Height of window (Source: UNESCO 1990)

Dos:

- Natural light should be controllable and adjustable by device such as blinds where possible to suit the needs of the individual
- Keeping windows and blinds clean maximizes the amount of light available

- Each window unit should have a maximum width of 600 mm and be side-hung for each opening

Don'ts:

- Windows that are too easy to open may create risks for children falling out. In such case, installation of safety devices are to be considered to prevent accidents
- To minimise the risk of allergies from skin contact with chrome and nickel, these materials should be avoided in the window controls
- Large window should be avoided at the ends of the corridors

Description of component:

The design and construction of operating switches, controls and devices should be such as that they can be operated safely and independently by all, including people with disabilities.

Switches and controls should be easy to use, e.g. by hands-free operation or by using the elbow.

All switches and controls should be easy to understand without requiring specialist knowledge.

Technical Requirements:

Appropriately designed and positioned sockets switches and other controls.

Design Considerations:

Location, heights and distances

- Switches, sockets and other controls should be installed at an accessible height for reaching and operating, between 800 mm and 1100 mm above floor level and should be located a minimum of 600 mm from any internal corner, preferably 700 mm
- As an exception, electrical wall socket outlets, telephone points and TV sockets could be located at a minimum height of 400 mm above floor level
- Control devices (radiator valves, fuse boxes, switches, push-buttons, intercoms, etc.) should be installed between 800 mm and 1100 mm above floor level, and they should be located a minimum of 600 mm from any internal corner

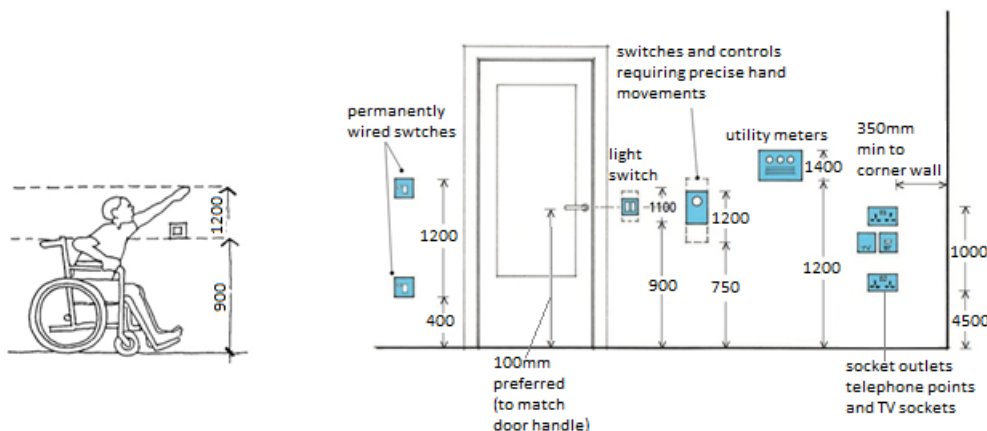


Figure 35: Height and location of switch (Source: UNESCO 1990, Centre for Accessible Environments and RIBA 2004)

Operation:

- To help people with reduced dexterity or vision impairments, electrical switches should have large push plates

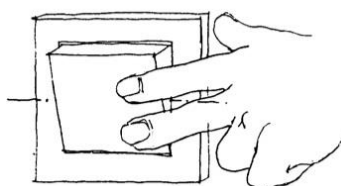


Figure 36: Example of large push switch (Source: UNESCO 1990)

Identification:

- Buttons and devices should be identified by visual contrast
- Information should be in raised tactile and Braille signage
- Important controls should have an integral Braille indication

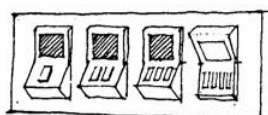


Figure 37: Example of switch with raised tactile (Source: UNESCO 1990)

Usability

- Control devices for different functions should be of different design. Control devices for similar functions should have a similar design and activation mechanism, and be the same for identical functions throughout the facility

Dos:

- Ensure that switched socket outlets, mains and circuit isolator switches indicate clearly whether they are 'on' or 'off' (red and green colour indication, if used, should be supplemented by text or pictogram indication)

Don'ts:

- Avoid flushed or recessed controls, as these are not accessible to people with limited dexterity

Toilet room doors:

- The door should have an unobstructed width of at least 800 mm, with 850 mm as a recommended value. It should be easy to open and close. The door should open outwards. If the door opens inwards, there should be a way to open the door, or remove it, from the outside. There should be no openings under or above the door

Toilet seat

- The top of the toilet seat should be between 400 mm and 480 mm from the floor. The anthropometric differences in the population worldwide may require lower or higher heights of toilet seats
- It should be noted that toilet seats with a height of more than 460 mm may cause a problem of instability when sitting on the toilet seat. Toilet seats of less than 460 mm may cause a problem of transfer getting back to the wheelchair
- The minimum distance from the edge of the toilet seat to the rear wall should be between 650 mm and 800 mm
- The minimum distance from the centre line of a toilet to the adjacent wall should be 450 mm
- Toilets for children should have a distance from the centre line to the adjacent wall between 305 mm to 380 mm. The toilet seat height should be between 205 mm to 380 mm

Grab rails:

- On both sides of a toilet, a grab rail (whether drop-down or fixed to the wall) should be provided at a distance between 300 mm to 350 mm from the centre of the toilet
- The minimum distance from the wall should be 40 mm
- On the sides where a lateral transfer is possible, a foldable grab rail (drop-down support rail) should be provided at a height of 200 mm to 300 mm above the toilet seat
- Grab rails should withstand minimum 1 kN (100kg) force from any direction, with 1,7 kN (170kg) as a recommendation. The length of the foldable grab rail should overlap the front edge of the toilet seat in between 100 mm and 250 mm. The positioning of a foldable grab rail should allow access from a wheelchair when folded up
- Where a wall is beside the toilet, a horizontal grab rail should be provided at a height of 200 mm to 300 mm above the toilet seat, and a vertical grab rail should extend from the horizontal grab rail to a height of 1 700 mm above floor level. The grab rail should extend a distance of minimum 150 mm to the front edge of the toilet seat
- The horizontal grab rail should be uninterrupted for its full length
- The grab rail height for toilets for children should be between 510 mm to 635 mm
- Grab rails should have a circular profile of not less than 35 mm and not more than 50 mm diameter
- The positioning of accessories such as hand towel, soap, waste bin, etc., should not hamper the use of the grab rail

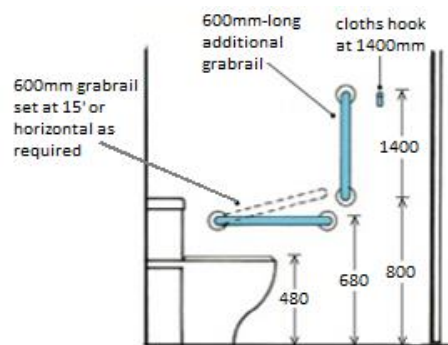


Figure 39: Location of grab rails (Source: Centre for Accessible Environments and RIBA 2004)

Washbasin:

- A wash basin should be provided within an accessible toilet room
- The positioning of a wash basin should allow access from a wheelchair
- The top of the wash basin should be located between 750 mm to 850 mm from the floor
- The space under the wash basin should be unobstructed with a knee clearance centred on the wash basin between 650 mm and 700 mm high and 200 mm deep. In addition, a toe clearance of at least 300 mm high should be provided
- National regulations may give the most convenient and appropriate height for washbasins at a national level

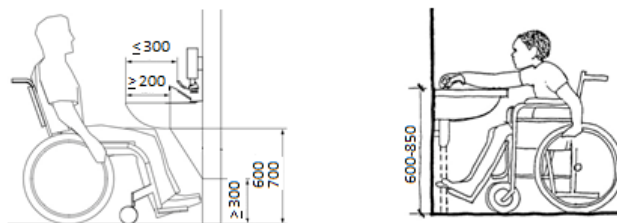


Figure 40: Accessible wash basin (Source: ISO-21542 2011, UNESCO 1990)

Taps and other fittings:

- Standard twist action taps are generally easy to use and control the flow of water easily. Large size taps (22 mm diameter) are better than small ones (12 mm diameter) because they are more robust and easier to operate
- Where available a ‘hospital tap’ with a long lever is recommended, as it is easy to operate with almost any body part
- The tap controls should be set no more than 300 mm from the front of the wash basin
- If a sanitary bin is supplied, it should be reachable from the toilet seat. Sanitary bins with non-touch opening devices are preferred
- Any fire alarms should emit a visual and audible warning to occupants of toilet rooms

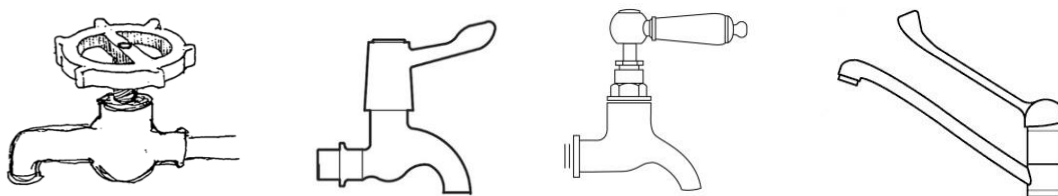


Figure 41: Example of tap

Urinals:

- When wall hung urinals are fitted in the washroom, at least one of these should be set at a height to the bottom rim of the urinal between 600 mm and 750 mm and equipped with a vertical grab rail
- When wall hung urinals are fitted in the washroom, at least one of these should have its rim set at a height of 380 mm for wheelchair users and at least one should have its rim set at a height of 500 mm for standing users. Both should be equipped with a vertical grab rail
- This wall hung urinal should be set clear above the floor level, without any raised access platform and with a clear floor area in front of the urinal of at least 750 mm wide and 1200 mm deep
- When wall hung urinals are fitted in the washroom, it is recommended that at least one of these have its rim set at a height of 380 mm for wheelchair users and at least one have its rim set at a height of 500 mm for standing users. When installed, both should be equipped with a vertical grab rail
- Urinals should contrast visually with the wall to which they are attached

Dos:

- Where two taps are used, the left one should be connected to the hot water supply
- Taps where a single lever action control both temperature and flow of water may be recommended where available

Don'ts:

- Shiny ceramic tiles and floors should be avoided. They may be slippery and also cause reflection and glare, which may be visually confusing

4. D

Activity:
Use of individual rooms and facilities

Component:
Acoustics

Description of component:

The acoustic environment in a building should be suitable for its intended function for all building users. For people who are deaf or hard of hearing, good lighting is also essential to understand the sign language interpreter and/or optical information devices.

Technical Requirements:

Good acoustics of building that benefit people with hearing impairments.

Design Considerations:

Acoustic requirements:

- People with hearing impairments have particular difficulty in making out sounds and words in noisy environments
- Adequate sound insulation should minimise noise from both outside and inside the building. Noise can often be “mitigated”, for example, by introducing a buffer zone (e.g. storage room) between a meeting area and extraneous noise
- The acoustics in a room are essentially connected with its location in the building and with the acoustic insulation of the building elements. The distribution of noise within the room itself and from exterior sources depends on the sound absorption of the surrounding surfaces and furnishing of the room
- Good acoustics should be achieved by optimising the reverberation time, by considering the use/purpose of the room and by ensuring a low background noise level. The optimum reverberation time of a room should be determined having regard to the volume and the intended purpose of the room. (Requirements for reverberation time are given in some National Standards, such as DIN 18041.)

Dos:

- Separate quiet and noisy areas of buildings with a buffer zone
- Air conditioning units and extractor fans create a lot of background noise. They should be regularly maintained in order to reduce noise
- Consider the negative consequences of considerable noise generated by steel roofing sheet in heavy rain for people with hearing difficulties

Don'ts:

- Avoid too many hard surfaces, which create echo and increase general noise level and cause problems for people with hearing impairments

4. E

Activity:
Use of individual rooms and facilities

Component:
Security Access Systems

Description of component:

Security access systems to enter particular buildings, facilities or spaces should be suitable for use by all, including persons with disabilities. The design and placement of systems need to consider persons with limited manual dexterity, visual disabilities or difficulty reaching objects (e.g. limited upper body movement).

Technical Requirements:

Security barriers, including but not limited to security bollards and security check points, shall not obstruct a required *accessible route* or *accessible means of egress*.

Any security access systems (bell or intercom, card reader or encoded entry/exit system) should be located in a space that enables accessible manoeuvring and should be easy to reach for a person using mobility aids such as wheelchairs. The security access system should be easy to identify by persons with visual impairments, using a distinct colour or texture, and using Braille for controls.

Design Considerations:

Design requirements:

- Card entry systems should be wall/post mounted, between 1000 mm and 1100 mm from the floor, measured from the centre of the control card entry system
- Where keypads or other encoded entry/exit systems are used, the buttons should be raised, mounted on a bright coloured background and include raised numerals or letters in a constant array
- Where keypad systems are door or jamb mounted, there should be enough space (e.g., free of the door swing), to allow a person using mobility aids (e.g. crutches or canes) to approach and use the keypad and the door safely
- When using card systems, the cards should be of easy use by persons who have visual impairments, either by adopting a distinct colour or texture on one side or by using raised numbers, letters and Braille.

Dos:

- Where security barriers incorporate elements that cannot comply with these requirements such as certain metal detectors, fluoroscopes, or other similar devices, an alternative *accessible route* shall be located adjacent to security screening devices. The *accessible route* shall permit persons with disabilities to maintain visual control of their personal items, similar to the degree of control that persons using the security barrier have on their belongings.
- Any security access system should be visible, well-lit and ideally, should include audible and visual instructions for hearing and visually impaired people. The visible instructions should include large, well-spaced tactile numerals and letters to assist visually impaired users.
- Consider to use proximity cards when security card entry systems is selected, as they do not require the user to reach, swipe or push.

Don'ts:

- Although advances in biometrics are providing new opportunities for accessible security systems, available biometric systems (e.g. retinal or palm scanners) often cannot accommodate all users.

Description of component:

Meeting rooms, whether used by staff or visitors, should all be designed to be accessible to persons with disabilities, including persons using mobility aids, persons with visual impairments as well as people who have a hearing impairment and use a hearing aid to participate and communicate.

Technical Requirements:

All equipment in conference rooms shall be usable by all people chairing or participating in the meeting.

In addition to the requirements for sufficient acoustic provision (see Component 4. D), a sound augmentation system or other assistive listening system are recommended for main meeting rooms serving more than 35 persons.

Design Considerations:

Design requirements:

- Accessible seating should be distributed and integrated throughout seating areas of conference/meeting rooms with different vantage points available to all persons with disabilities
- Wheelchair users should be able to sit in a position that enables them to have a clear view of the event, with a space of 900 x 1400mm to manoeuvre easily
- The stage in conference and meetings rooms should have a ramp allowing easy access to presenters using wheelchairs.
- All equipment in conference rooms shall be usable by people chairing or participating in the meeting and shall be at a height between 800 mm to 1100 mm.
- Consider the requirements for sufficient acoustic provision in 4.D and a sound augmentation system should be provided.

Dos:

- When audio induction loop system is provided in meeting rooms, dimmer switches (or other transformer coils) should be carefully located so as not to cause electro-magnetic interference with any audio induction loops. Care also should be taken when installing loop systems, as hearing aids can pick up interference, for example from air conditioning units or computers, negating the benefits of the loop
- Where an FM loop system, or other assistive listening device is provided in public buildings or meeting areas, portable headsets compatible with personal hearing aids should be made available to persons who may require them
- To minimize noise from air handling systems, it is recommended that fan mounts be acoustically isolated. Related ductwork should be insulated to aid persons with hearing limitations
- Consideration should be given to installing screen signs where appropriate for people who do not use hearing aids.

Don'ts:

- Do not segregate the seating positions of wheelchair users from non-disabled companions.

4. G

Activity:
Use of individual rooms and facilities

Component:
Cafeterias

Description of component:

Areas providing food or beverage services should be accessible to persons with disabilities, including persons using mobility aids, such as wheelchairs and crutches. Cafeterias should be designed and furnished to facilitate easy orientation, manoeuvring and use by persons with disabilities.

Technical Requirements:

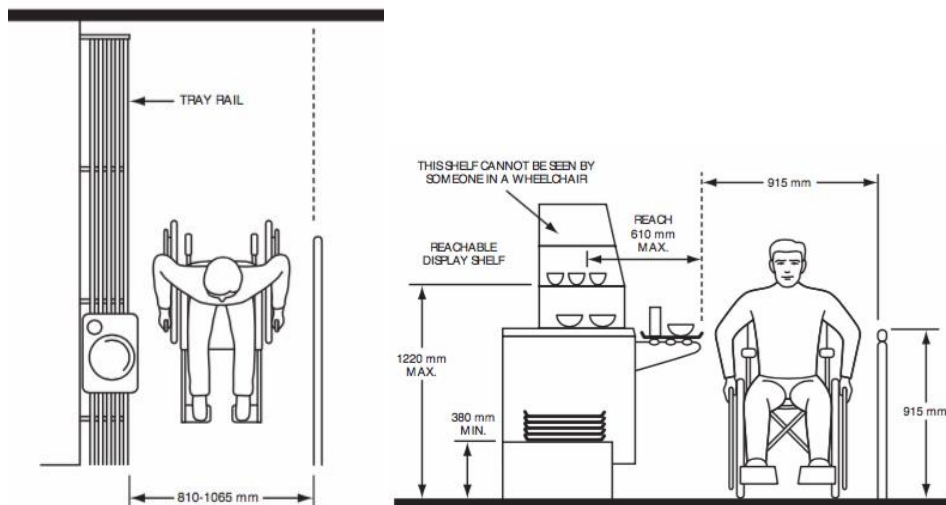
A minimum of 25 % of the tables shall be usable by wheelchair users and shall have an unobstructed lateral access for wheelchair users.

Sufficient manoeuvring space between tables, entrance and the route to the accessible sanitary facilities shall be provided.

Design Considerations:

Technical requirements:

- Accessible seating locations for persons using wheelchairs should be available in all areas or levels, providing food or beverage services
- Aisle spaces between furniture, equipment or other fixed objects should be wide enough to allow a person using a wheelchair and a companion, to pass, i.e., major aisles should be a minimum of 1065 mm wide. The narrowest aisle should be at least 810 mm wide. Where counter service is provided, at least one section of the counter should be no higher than 915 mm by 760 mm wide, to allow a person using a wheelchair to approach
- Where cafeteria or buffet style food services are provided, displays should be accessible and mounted on surfaces no higher than 915 mm from the floor. Overhead display shelves should be no higher than 1220 mm (e.g., for desserts and salads etc.)



- Cashier locations should include accessible aisles, a minimum of 915 mm wide with clear resting surfaces for trays etc. Surfaces should be mounted no higher than 915 mm from the floor
- Wherever turnstiles or other crowd control gates are used to manage the movement of people, such turnstiles should either be of breakaway design to accommodate persons using wheelchairs or have an adjacent access gate that is wide enough to allow the passage of persons using wheelchairs or other mobility aids. Clearances at turnstiles or gates should be a minimum of 860 mm clear width.

Dos:

- Where tray rails are provided, they should be as continuous as possible to allow persons using wheelchairs to slide a tray along easily
- Consider the acoustic recommendations in 4.D and also the general design requirements for colour and visual contrast as described in 3.C.

Don'ts:

- Avoid random access cafeteria set-ups as they are difficult for persons with visual impairments to comprehend, and difficult to use by persons who have mobility impairments.

Description of component:

Kitchens and kitchenettes, including appliances and fittings (such as sinks), should be designed to enable use by all people, including people with mobility impairments such as wheelchair users.

Technical Requirements:

There is sufficient space for everyone to move and floors shall be slip resistant.

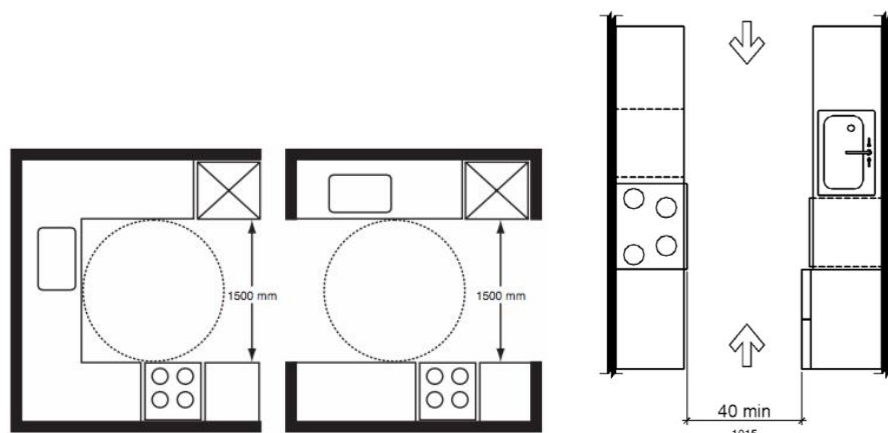
Essential kitchen appliances (oven, refrigerator, etc.) should be usable by persons both standing and sitting in a wheelchair, and a worktop should be located beside all appliances.

The sink taps should be reachable and easy to operate with one hand. The sink should be reachable for a wheelchair user and it is recommended to provide adequate space under the sink according to the user's needs or to provide adequate space beside the sink. If a knee recess is provided under a sink, its underside should be insulated.

Design Considerations:

Design requirements:

- Aisles between counters no less than 1065 mm wide
- Where possible, turning space for a wheelchair should also be available in dead end areas. A turning space of 1500 mm in diameter should be provided with clear knee space below counters/work surface
- The kitchen work surface shall be at a maximum height of 865 mm above the finish floor or ground



- All cupboards, cabinets and pantries should be designed to be accessible to persons using mobility aids (such as wheelchairs) with upper shelves no higher than 1370 mm from the floor
- Where microwave ovens are installed, they should be located at counter height with a clear level area of counter in front, allowing easy transfer of food items
- Kitchen stoves ideally should have front or side controls to minimize burns
- Additional lighting should be provided over the sink, cooking and work surfaces to ensure safe use of facilities by persons with low vision or limited dexterity.

Dos:

- Suitable turning space and knee space below counters allows free movement and approach by persons using wheelchairs
- Consider the use of larger microwave and convection ovens, side-by-side refrigerator/freezer units to facilitate easier use and access for persons using mobility aids
- Clear counter space, a minimum of 300 mm wide on both sides of stoves should be provided for safe operation
- Duplex receptacles (e.g., power outlets) above counter height (no higher than 1065 mm from floor level) should be provided so that loose electrical cords at floor level do not cause a potential tripping hazard, especially for persons with visual limitations
- Automatic off-switches should be provided where possible, to control unattended/unused burners.

Don'ts:

- Avoid having stove controls at back or location that requires user to reach across burners as burns may occur from reaching over hot items or open burners.

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Checklist for Country Offices (COs)

COs are requested to complete the table below showing the accessible components included in the design of any new construction (see technical cards above). This information will enable UNICEF Supply Division's Construction Unit (CU) and Programme Division (PD) Disability Section to review and revise accessibility guidance for the promotion and implementation of accessibility and universal design in all UNICEF premises and programme related construction.

CO: _____ **Construction project:** _____ **Year:** _____ **Implementation strategy:** (direct implementation through construction companies, indirect implementation through implementing partners Governments / NGO's)

Activity	Components	Included in the design		Estimated costs in USD	Remarks
		Yes	No		
1. Movement in the outdoor environment and outside buildings	1.A Way-findings				
	1.B Pathway				
	1.C Parking				
	1.D Gaps, grates and other openings				
	1.E Outdoor facilities				
2. Entry and exiting buildings	2.A Ramps				
	2.B Handrails				
	2.C Entrance door and door handles				
	2.D Reception counter desk				
3. Movement within buildings	3.A Horizontal circulation (Corridors)				
	3.B Vertical circulation (Stairs and lift)				
	3.C Information, signage, simple layout				
4. Use of individual rooms and facilities	4.A Windows				
	4.B Switches				
	4.C Toilet and water supply facilities				
	4.D Acoustics				
	4.E Security Access Systems				
	4.F Conference and meeting rooms				
	4.G Cafeterias				
	4.H Kitchens and Kitchenettes				