ISO/TC 59/SC 16 N N 79

Date: 2007-11-07

DRAFT PROPOSAL 2nd ISO/CD 21542

ISO/TC 59/SC 16/WG 1

Secretariat: AENOR

Building construction — Accessibility and usability of the built environment

Construction – Accessibilité et facilité d'utilisation de l'environnement bâtiment

Document type: International standard
Document subtype: if applicable
Document stage: Committee Stage
Document language: E

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO Technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies voting.

ISO 21542 was prepared by Technical Committee ISO/TC 059, *Building construction*, Subcommittee SC16, *Accessibility and usability of the built environment*

This edition cancels and replaces ISO/TR 9527:1994, which has been technically revised and further developed.

Introduction

ISO 21542 is a standard dealing with accessibility for all in the built environment. The underlying premise of this standard is that the built environment should be designed, constructed and managed to enable each user to approach, enter, use and exit from a building, even if their abilities vary.

The purpose of this standard is to define a built environment in which people can have independent and safe access and egress, and in which they can function and use the built environment with maximum independence in an equitable and dignified manner. These principles are supported by Articles 9 and 11 of the UN Convention on the Rights of Persons with Disabilities (6 December 2006).

People can experience difficulties when entering, using or exiting a building or finding a particular location within the building. The built environment can present obstacles and barriers, both permanent and temporary, for all people, especially as their abilities vary.

This standard sets out the objectives, design considerations, recommendations and requirements that ISO believes will, when fully implemented, result in accessible and usable buildings.

This International Standard is a guidance document, providing users, architects, designers, engineers, builders, building owners, managers, policy makers and legislators with requirements and recommendations to create a built environment that is accessible to all.

For certain national standards bodies it might be necessary to allow for exceptions to this standard in certain circumstances. Such exceptions may result in greater or lesser requirements in accordance with and as defined by national regulations or legislation. Such exceptions shall be described in the National Foreword and in a national annex where so allowed in this standard.

This standard reflects the consensus approach reached by an international body of experts, representing a broad spectrum of interested parties.

This International Standard should lead to continuous improvement in the built environment. Whilst the objectives will always remain unchanged, the means of achieving them will be part of a continuing process of change, i.e. as human knowledge and building technology improve and as the relationship between generally accepted building practice and technology alters.

ISO/IEC Guide 71 and its guidance document ISO/PDTR 22411 should be used to augment and assist in understanding the requirements of this standard.

Within the figures all given dimensions are given in mm and measured from finished surfaces, unless otherwise stated.

Information about standards can be obtained through catalogues issued by ISO, IEC, national standards bodies and regulatory agencies. Lists of projects under development by various ISO technical committees can be found in the ISO technical programme of each committee. Additional useful information can also be found by searching in the work programme documents for a specific technical committee or its working groups. The catalogues and abstracts are issued yearly to the member bodies.

Modern technology opens up the opportunity for new ways to disseminate information about standards. Many national member bodies issue information on CD-ROM. Information also can be found on the World Wide Web by searching for quality-related subjects or under ISO. It is possible to search for information by committees, by published standards, and in a standards catalogue. It is also possible to obtain information on the revision status of a standard and the expected time of publication.

This information is updated regularly, and it is therefore an extremely useful tool to search for standards in a given field and the stage of development.

ISO on-line has the address http://www.iso.org;

IEC on-line has the address http://www.iec.ch;

On both of these servers, links to member bodies, which also have additional services, are available, sometimes by subscription. Other useful documents are given in the Bibliography.

1 Scope

This standard includes a range of requirements for many of the elements, components and fittings that comprise the built environment. These requirements relate to the constructional aspects of access to buildings, to circulation within buildings and to egress from buildings: the latter in the normal course of events and in the event of an emergency. An informative annex is also included that deals with some aspects of the management of buildings.

The intention of this standard is to meet the needs of the greatest feasible number of people and to accommodate the diversities of age and of human condition.

The standard contains provisions with respect to features in the external environment directly concerned with access to a building or group of buildings from the edge of the relevant site boundary or between such groups of buildings within a common site. However, the standard does not deal with those elements of the external environment, such as public open spaces, whose function is self-contained and unrelated to the use of any one specific building, nor does the standard deal with single family dwellings, other than those circulation spaces and fittings that are common to two or more such dwellings. Consideration is, at present, being given to the development and publication of additional parts to this standard to deal with the types of external environment described above and with single family dwellings.

The standard also contains, in the normative Annex A, information with respect to egress management procedures that are inappropriate for the normative sections.

For existing buildings there are options included in some paragraphs which appear as *"exceptional considerations for existing buildings in developing countries"* (see "Guidance on the Implications of the ISO Global Relevance Policy for CEN Standardization", 2005) and as *"exceptional considerations for existing buildings"* where a lower order of provisions than expected in new constructions are accepted due to technical and economical circumstances only.

NOTE This standard is primarily written for adults with disabilities but it includes some specifications regarding the specific accessibility requirements that would suit children with disabilities. However, it is envisaged that future revisions of the standard will include more detailed requirements.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4109-1, *Lift (US: Elevator) installation, Part 1: Class I, II, III and IV lifts*

ISO 4109-5, *Lift (Elevator) installation, Part 5: Control devices, signals and additional fittings*

ISO 7000, *Graphic symbols to be employed in indices and synoptic tables*

ISO 7001, *Public information symbols*

ISO/DIS 7176-5, *Wheelchairs - Part 5: Determination of dimensions, mass and manoeuvring space*

ISO 9386-1, *Power-operated lifting platforms for persons with impaired mobility - Rules for safety, dimensions and functional operation — Part 1: Vertical lifting platforms*

ISO 9386-2, *Power-operated lifting platforms for persons with impaired mobility - Rules for safety, dimensions and functional operation — Part 2: Powered stairlifts for seated, standing and wheelchair users moving in an inclined plane*

ISO/DIS 12055, *Building construction – Guardrail systems and rails for buildings*

ISO/CD 23599, *Assistive products for persons with vision impairment – Tactile walking surface indicators*

ISO/IEC Guide 71, *Guidelines for standards developers to address the needs of older persons and persons with disabilities*

IEC 60 118-4, *Methods of measurement of electro-acoustical characteristics of hearing aids - Magnetic field strength in audio-frequency induction loops for hearing aid purposes*

ISO/TR 13570-2, *Wheelchairs – Typical values and recommended limits for dimensions, mass and manoeuvring space as determined in ISO 7176-5*

ISO/PDTR 22411, *Ergonomic data and ergonomic guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities*

3 Terms and definitions

This standard contains terms that were either not considered for inclusion in ISO 6707-1: 2004, *Building and civil engineering – Vocabulary-Part 1: general terms,* or have assumed a broader meaning since the latter standard was finalised. Relevant sub-committees are working together in order to rationalise the respective vocabularies which may reduce the need for such a large list in this [draft] standard. Users of this [draft] standard are asked to bear that possibility in mind in using this [draft] standard.

For the purposes of this document, the terms and definitions given in ISO/IEC Guide 71 and the following apply:

3.1
ability
an identifiable human attribute, including but not exclusively, to walk, to speak, to hear, to see, to feel by touch, to taste, to understand, to cognate, to recognise

3.2
access
means of approach to, or means of entry into, or means of circulation within or exit from the built environment

NOTE ‘to access’ deprecated. (See ISO 6707-1, which defines “means of access”).

3.3
accessibility
a characteristic of the *built environment* whose quality is dependent on the *usability* of the means of *access* to it, into it, within it or exit from it and which can be determined by measurement or other agreed means

3.4
assisted egress
[protocol by which] a formal strategy [that] exists [during which][for] a designated person or designated persons [to] provide[s] assistance, during an emergency, to another person or other persons to leave a [building][specific part of the *built environment*] and to reach a final place of safety

3.5
assistive technology, assistive device
piece of equipment, product system, hardware, software or service that is used to increase, maintain or improve functional capabilities of individuals with disabilities (ISO/PDTR 22411:2006)

NOTE This can be acquired commercially off-the-shelf, modified or customized. The term includes technical aids for persons with disabilities. Assistive devices do not eliminate impairment but may lessen the difficulty an individual has in carrying out a task or activity in specific environments.

3.6
attention pattern
TWSIs to call attention to decision points

3.7
audio description
verbal narration that conveys the wholly visual aspects of a presentation or performance

3.8
built environment
that which is commissioned, designed, constructed and managed for use by people and which includes the external and internal environments and any element, component or fitting that is a fixed part of them

NOTE loose items are excluded because decisions with respect to their location within the built environment are more likely to be under the day-to-day control of facilities managers and not of those who commission, design or construct the built environment.

3.9
circulation space
unobstructed [three-dimensional] space necessary for access to, into, within and egress from any part of the built environment

Linked terms: '*circulation route*'

3.10
clear width
free unobstructed space necessary for access through a doorway

3.11
colour deficiency
the inability to percept certain colours and to clearly distinguish between combinations of these colours

NOTE Provision can and should be made, as it is the colours the majority of people with a colour deficiency will not be able to distinguish between, these being green, olive green, yellow, orange, pink and red. Any combination or variation of these colours cannot when used together be distinguished from each other by people who have a colour deficiency, sometimes incorrectly referred to as colour blindness. In Australia and most western countries 10 % of males and 0.5 % of females have a colour deficiency. A smaller percentage have a colour deficiency between the colours yellow and blue, <1 %.

3.12
common
serving more than one [single-family dwelling or more than one] building or more than one tenancy

3.13
differences in LRV
should be used to assess the degree of visual contrast between surfaces such as floors, walls, doors and ceilings and between key fittings/fixtures and surrounding surfaces

3.14
effective clear width
the unobstructed width of a circulation route or the available width for passage through a door opening, clear of all obstructions, such as handles and weather boards on the face of a hinged door, when the door is opened through 90 degrees, or when a sliding or folding door is opened to its fullest extent

3.15
evacuation lift
lift that may be used, during an emergency, for self or assisted egress

3.16
final exit
the boundary of the means of escape within a building and which provides egress to a final place of safety

3.17
going
horizontal distance between two consecutive *nosings*, or between the start and finish of a *flight* of a *ramp*, in each instance, measured on the walking line. (cf. ISO 6707)

3.18
guiding pattern
TWSIs to indicate a direction of travel

3.19
habitable room
room including a kitchen, a bathroom and a utility room intended for dwelling purposes

3.20
handrail
component of a stair or of a ramp that provides guidance, balance and support (modified cf. ISO 6707, 5.2.73)

3.21
hazard
[characteristic of] an element of the *built environment*, or of the element itself, whose design or location is such that may [provide a risk of][cause] harm to a person who uses it, or who is in proximity to it or who passes near to it [, provided that *suitable* warning or warnings of] [its characteristic or] its presence had not been provided]

3.22
impaired
lower than generally [anticipated][expected optimum] performance in a human *ability* which may be temporary or permanent and whose cause may be congenital, or through illness, or injury, [or social deprivation,] or the natural process of ageing

NOTE 1 'disabled' and 'disability' deprecated, as absolute and negative terms.

NOTE 2 'older people' and 'older persons' deprecated as indefinable and incorrect use of English.

3.23
impairment
problem in body function or structure such as a significant deviation or loss which can be temporary due, for example, to injury, or permanent, slight or severe and can fluctuate over time, in particular, deterioration due to ageing (ISO/PDTR 22411:2006)

NOTE 1 Body function can be a physiological or psychological function of a body system; body structure refers to an anatomic part of the body such as organs, limbs and their components (as defined in ICIDH-2 of July 1999).

NOTE 2 This definition differs from that in ISO 9999:2002 and, slightly, from ICIDH-2/ICF: May 2001, WHO.

3.24
intended user
a person who would normally expect to use the relevant element, component, or facility or product, including, in specific circumstances, a person whose individual needs can only be met by the design and installation of particular items of *assistive technology*.

3.25
landing
platform or part of a floor structure at each end of a flight of stairs or of a ramp or an area providing access to a lift car at each level of use (modified cf. ISO 6707, 5.5.21)

3.26
levelling accuracy
maximum vertical distance between car sill and landing sill during loading or unloading of the lift

3.27
lifting platform
device permanently installed to serve fixed landing levels, comprising a guided platform whose dimensions and means of construction permit the access of disabled passenger(s), with or without wheelchair(s) (cf. ISO 9386-1)

3.28
light reflectance value LRV
the proportion of visible light reflected by a surface at all wavelength and directions when illuminated by a light source

LRV is also known as the *luminance reflectance factor*

NOTE 1 The LRV is expressed on a scale of 0 – 100, with a value of 0 for pure black and a value of 100 for pure white.

3.29
luminance
the amount of light emitted from a [surface][source] in [a][any] given direction. (see ISO 6707-1 for variation)

3.30
manoeuvring zone
the minimum [planned] profile within which it is considered feasible to complete a manoeuvre needed to gain access to a specific facility, component or fitting: in particular while using a wheelchair or a walking aid or walking aids

3.31
means of escape
built provision intended to facilitate safe egress from a location within the *built environment* to a final place of safety

3.32
moving walkway
a moving accessible path of travel with an inclination up to 6 degree

3.33
nosing
projecting front edge of a tread or landing that may be rounded, chamfered or otherwise shaped (modified cf. ISO 6707, 5.5.26)

3.34
pitch line
notional line that touches the *nosings* of a *flight* on the walking line

3.35
platform
construction that provides a horizontal surface above the level of an adjoining surface

3.36
practicable
generally acceptable, having regard to the physical limitations imposed by the environment within which the provision is set

3.37
principal entrance
the entrance or, if there is more than one with equal status, the entrances that a visitor would normally expect to approach and to enter in order to *use* the building or other facility

3.38
principal entrance storey
in the context of a building, the storey that contains the *principal entrance* or *principal entrances* to the building

3.39
ramp
construction, in the form of an inclined plane that is steeper than 1:20 (5 %) from the horizontal, together with any intermediate landing, makes it possible to pass from one level to another (modified cf. ISO 6707, 5.5.29)

3.40
reflectance
the measure of light reflected in a given direction by a surface [in its installed environment] and which is expressed in a unit term from 0 to 100 on a scale, respectively, that represents a greyscale progression from the notional extremes of total light absorption (black) to total light reflection (white)

3.41
refuge
an area that is separated from a potential fire by fire-resisting construction~~,~~ intended to be an interim place of safety where a person or persons can wait for assistance to go to a final place of safety

3.42
rise
vertical distance between the upper horizontal surfaces of two consecutive treads, or of a *landing* and the next treads above or below it, or of a *flight* between consecutive *landings*. (cf. ISO 6707, 9.2.23)

3.43
riser
vertical component of a step between a tread or a *landing* and the tread or *landing* above or below it. (cf. ISO 6707, 5.5.23)

3.44
stair lift
appliance for transporting a person (either seated or standing) or person in a wheelchair between two or more landings by means of a guided carriage moving in an inclined plane

3.45
stopping accuracy
maximum vertical distance between car sill and landing sill at a moment where a car is stopped by the control system at its destination floor and the doors reach their fully open position

3.46
storey exit
a doorway, which may be a final exit, or which provides direct access to a protected stairway, firefighting lobby or external escape route

3.47
suitable
in the context of *access* to, or into, or within, or to *use* of, the *built environment*, means design, construction, installation and location that satisfies the needs of the *intended user*

3.48
tactile walking surface indicators (TWSI)
profiled paving surface with visual contrast criteria to provide a person with impaired sight using a long cane, underfoot or visual identification to become aware of a specific route or of the presence of a *hazard*

3.49
usability
a characteristic of the built environment whose degrees of convenience and risk in use can be determined by measurement or other agreed means

3.50
usable
a characteristic of the built environment that means that its use by the *intended user* is possible with degrees of convenience and risk that, considered together, are generally acceptable

3.51
user
person who interacts with the product, service or environment (ISO/PDTR 22411:2006)

3.52
visual contrast
the perception of a difference visually between one element of a building and another by reference to their light reflectance values LRV as the most relevant factor

3.53
wayfinding
descriptive of any system whereby information of an appropriate kind is provided to assist a person to pass through the *built environment* towards [an intended][a specific] destination

3.54
wheelchair [footprint][profile][zone] (cf. manoeuvring zone)
the plan profile of a wheelchair in use (see figure B.1)

4 General design considerations

The following general design considerations need to be taken into account when designing, constructing and managing the built environment (see also Annex B for more information).

4.1 Design requirements according to human abilities

The requirements in this standard relate to the principal human abilities that need to be considered when designing, constructing and managing the built environment. These abilities are described in Annex B which gives an overview of design considerations that should be taken into account for each of the different abilities.

When fully implemented the standard will be of benefit to all people, including

— people with hearing impairments,

— people with visual impairments,

— people with mobility impairments,

— people with cognitive impairments,

— elderly people,

— children.

4.2 Main planning and accessibility issues

Entering, using and egressing built environments together should be easy for individuals, families and groups that include persons with disabilities. Main topics are:

— designated parking near main entrance,

— short distances,

— level entrance and exits to exterior facilities,

— simple and logical layouts,

— level circulation with no steps or obstacles on storeys,

— easy access to information desks, lifts and WC compartments for disabled persons,

— safe egress and emergency exits,

— spacious lifts,

— safe stairs that are easy to use,

— slip resistant walking surfaces,

— wide door openings and easy door operation,

— adequate height, location and easy operation of controls and switches,

— good lighting,

— good visual contrast of walls, floors, doors and signage,

— good signage,

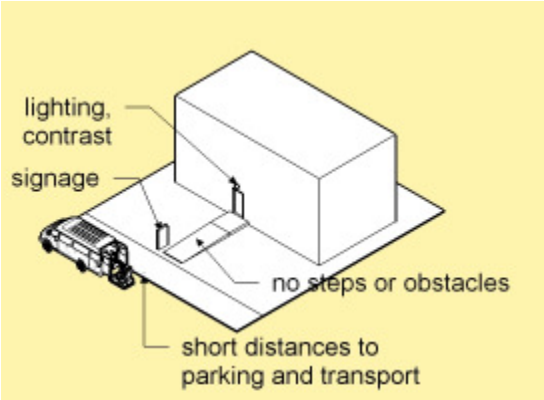
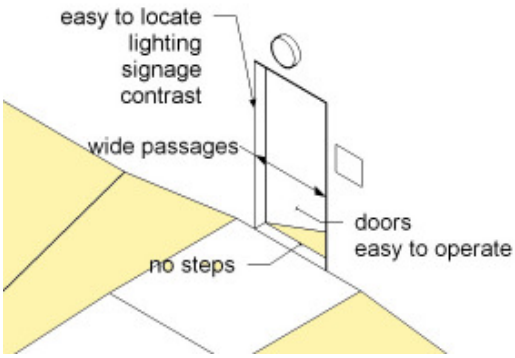
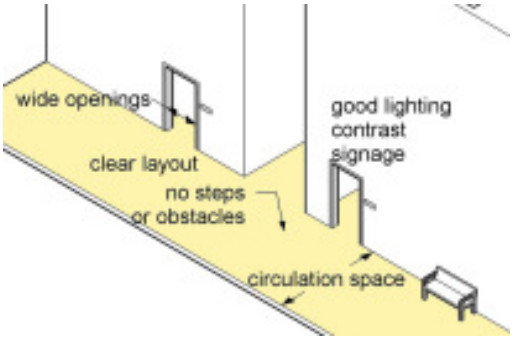
— important information communicated via two senses or more (tactile, audible and visual),

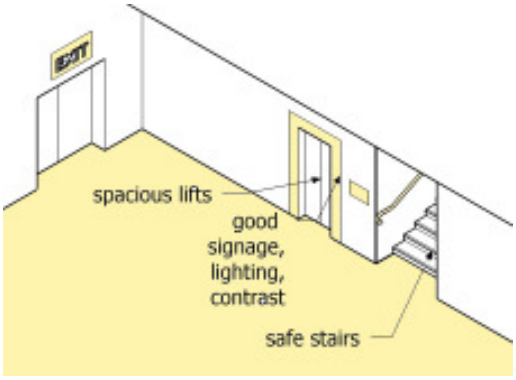
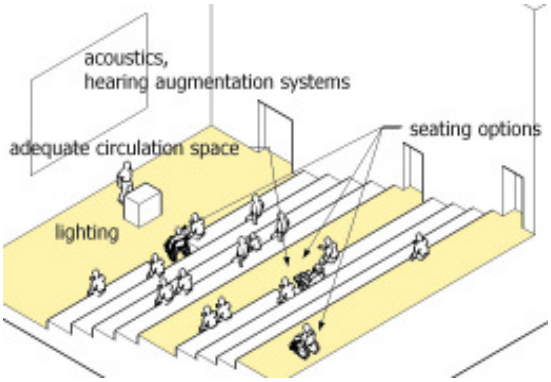
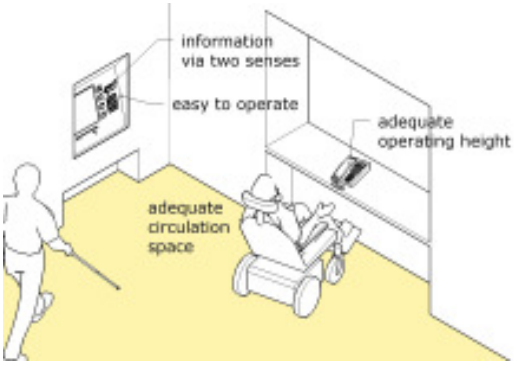
— good acoustics,

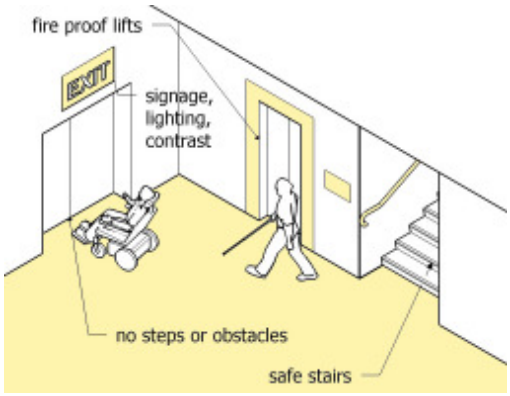
— hearing augmentation systems.

See Table 1 for examples of how these issues may combine when planning a built environment.

Table 1 — Examples of main accessibility issues in the early stages of planning

- equal approach to a building, e.g. designated parking, no steps or obstacles, short distances from parking and public transport, good signage, lighting and contrast. Links to main chapters with details: 5, 6, 7, 8, 9, 33, 34 and 39.	
- equal entry via the same entrances, e.g. easy to locate main entrances, no steps or obstacles, wide openings, low operating forces, good signage, lighting and visual contrast. Links to main chapters with details: 10, 18, 33, 34, 35 and 39.	
- equal following of the same paths in horizontal circulation, e.g. no steps or obstacles, adequate manouvering space, wide door openings, easy to operate doors, resting places, clear layout, good signage, lighting and visual contrast. Links to main chapters with details: 11, 18, 33, 34, 36 and 39.	

- equal following of the same paths in vertical circulation, e.g. safe stairs, spacious lifts with easy operation, good signage, lighting and visual contrast. Links to main chapters with details: 12, 13, 14, 15, 16, 17, 33, 34 and 39.	
- equal use of the same rooms, e.g. ample circulation space and different seating possibilities, good acoustics and hearing augmentation systems, good lighting and visual contrast. Links to main chapters with details: 21, 22, 23, 24, 25, 32, 33 and 34.	
- equal use of the same equipment and facilities, e.g. easy to understand and operate, adequate manouvering space and operating height, information via two senses. Links to main chapters with details: 11, 19 and 35.	
- equal use of the same toilet groups and sanitary facilities, e.g. good signage, adequate manouvering space, equipment within reach, easy operation. Links to main chapters with details: 26, 39 and 40	

- equal exit and egress routes, concepts for emergency planning, e.g. no steps or obstacles, fire proof lifts, good signage, lighting and contrast. Links to main chapters with details: 15, 33, 34, 37, 39 and Annex A (informative) Management of assisted escape from buildings	
- important information via two senses or more, e.g. visual, audible and tactile. Links to main chapters with details: 38 and 39	

5 Approach to the building

5.1 Arrival by motor vehicle

If no other national requirements or regulations are available the following minimum requirements concerning the number of parking places shall apply:

– total number of car parking spaces 1 – 49: not less than one designated parking space,

– for every additional 50 car parking spaces: one designated parking space.

It is important that the location of the designated parking spaces is clearly signposted at the entrance to the building site or car park. It is also important that such information directs the motorist to any specifically designated parking spaces and from these, to other facilities.

The designated parking spaces shall be located as near as possible to the principal entrance and the route from the accessible parking space to the main entrance should be 50 m or less.

The drop-off points for taxis, public transport etc. should be provided as near as possible to the main entrance.

5.2 Setting-down at the principal entrance

If there is a difference in levels between carriageway and footpath a kerb ramp has to be provided to facilitate the setting-down of passengers close to the principal entrance of a building. A tactile indicator should be provided from this kerb ramp to the principal entrance, consider also 6.1.

Such a facility will benefit a passenger who needs to transfer to and from a wheelchair, and vision impaired persons.

6 Designated parking space

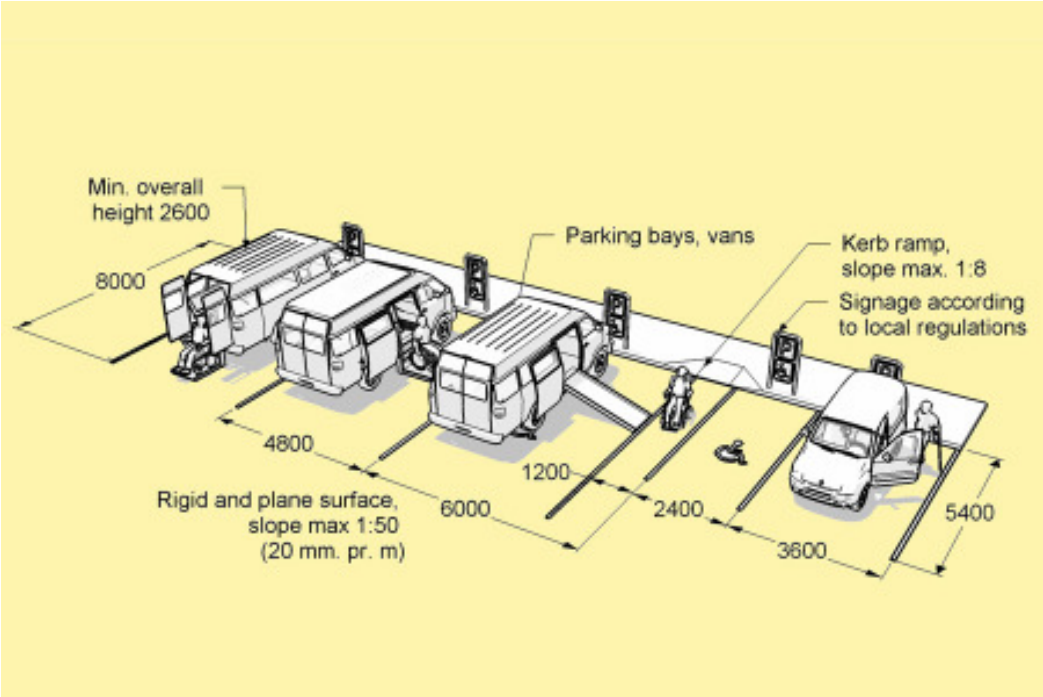


Figure 1 — Different types of designated parking spaces

The width of the parking space shall be 3 600 mm and the length shall be 5 400 mm, depending on:

— the way the motorist (wheelchair user) transfers from the vehicle,

— the size of the vehicle (e.g. multi-purpose vehicle).

The space for the transfer area beside smaller cars shall have a minimum width of 1 200 mm. The dedicated car space shall be 3600 mm wide and 5 400 mm long. The manoeuvring space at rear of vehicle should be 1 500 mm.

For multi-purpose vehicles with hoists or lifts more space is needed; at least a 2 400 mm area beside the car and/or at the rear of the car. The dedicated car space in this case shall be 4800 mm wide and 8000 mm long. As an alternative a parking space of 2 400 mm and 8 000 long along a sidewalk can be used, provided the sidewalk is at least 2 400 mm wide. See different types of designated parking spaces in figure 1.

Where ramps are used even more space is needed; at least a 3 600 mm area beside the car and/or at the rear of the car. The car space in this case shall be 6 000 mm wide and 8 000 mm long.

The marking for designated parking bays should contrast in colour and luminance with the background. The designated bays should be clearly marked and display the symbol of access (see 40). A vertical sign should

also display the symbol of access (see figure 64) to indicate the location of the designated parking bay. The vertical sign should be located so that it does not create a protrusion hazard.

The surface of a designated parking space should be even and stable with any variation of surface profile not exceeding 5 mm, that is, between paving, surface features and mix of different surfaces or finishes.

The designated parking space shall be located on a gradient not greater, throughout its length and its width, than 1:50 for concrete.

The parking space intended for a motorist that is accompanied by a child in a perambulator or a pushchair shall be designated and indicated with the 'parambulator' symbol.

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

A designated parking space shall be complemented by a kerb ramp if a higher pedestrian path is adjacent (see figure 2). This kerb ramp is to be attached or adjacent to the designated space to permit safe and convenient access from the parking bay onto the pavement. Kerb ramps shall have a slip-resistant surface. Consider also ISO/CD 23599.

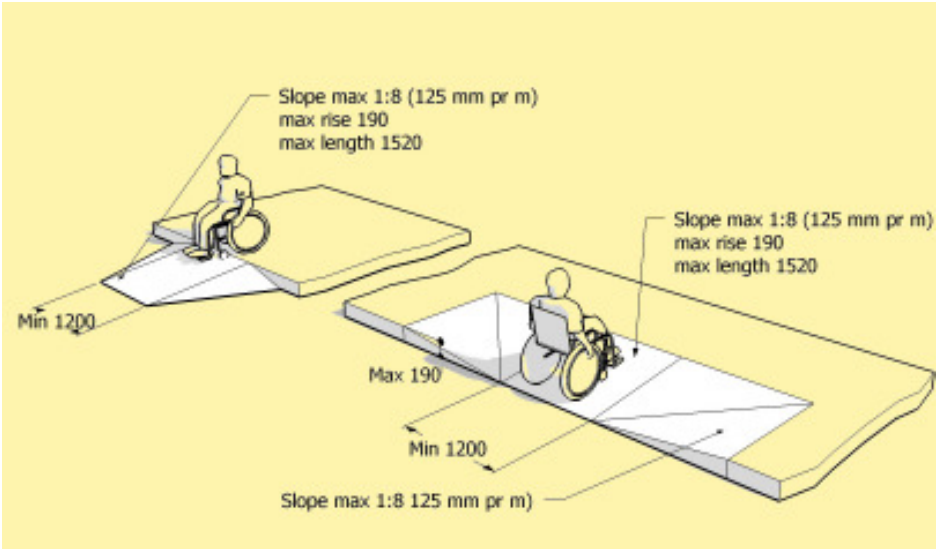


Figure 2 — Examples of kerb ramps

6.2 A multi-storey car park

If no other national requirements or regulations are available the minimum requirements outlined in section 5.1 above apply for multi-storey car parks.

The designated space should be located at the same level as the principal entrance of the building or buildings served by the car park. Designated parking spaces should be signposted and preferably on every level. A suitable passenger lift or ramp shall be installed to facilitate suitable access from the parked vehicle to the principal entrance of the building or buildings served by the car park.

Suitable indication of the route from the designated space to the building or buildings served by the car park shall be provided including to any parking machine, passenger lift, ramp and exit.

6.3 Entrance to a car park

The minimum height of a vehicle barrier to a car park shall be 2 600 mm from the surface of the carriageway to permit access by a vehicle converted for use by a wheelchair user. The minimum height of 2 600 mm shall be maintained from the vehicular entrance to the car park to any designated parking space and from there to the vehicular exit from the car park. If this provision is not feasible, suitable warnings shall be given and alternative designated spaces shall be provided outside the building.

6.4 Parking control

Information, presented in a suitable form, shall be available at the entrance to a car park and shall describe fully the terms under which individual motorists may use the facility.

If prepayment or post-payment machine is provided it should be allocated near to designated parking spaces and should provide all controls at a height in between 800 mm to 1 100 mm. Also consider 35 and figure 62.

Access to the machine shall be level and its operation has to be unobstructed. The machines should be located so that they do not create a hazard or barrier for people with visual impairments or people with mobility impairments.

7 Paths to the building

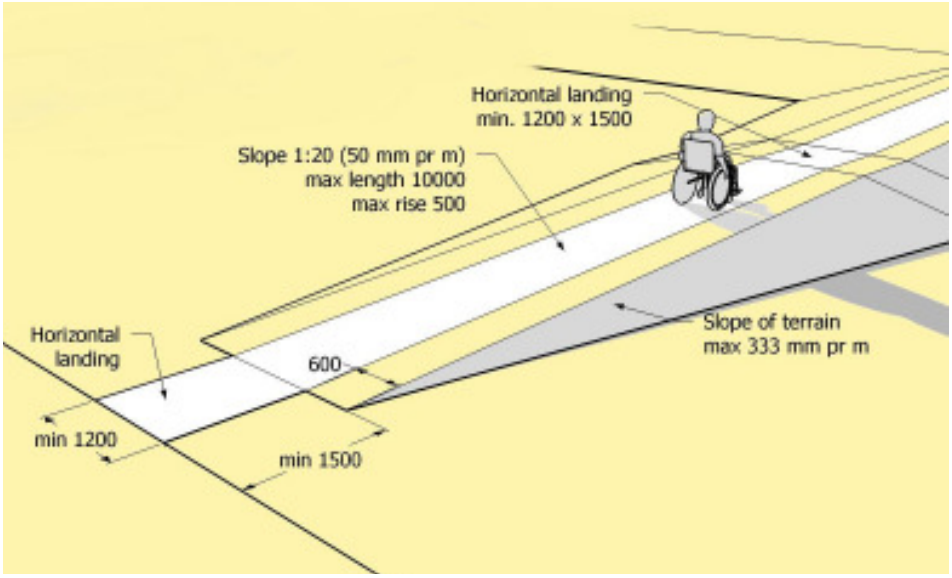


Figure 3 — Example of sloping path

The design of the path or route to the building from the boundary of the site or from car parking within the site should be designed, constructed and managed to enable all people to approach, enter and exit the building. See figure 3.

A step is an impassable physical barrier to some people. Equally, a slope can create a barrier for others and, especially in inclement weather, be more dangerous. The design of each means of access requires careful consideration.

The same considerations apply to the access between buildings and to and from associated facilities, as do those from the boundary of the site.

7.1 Way finding, guided path and other physical support of information

Suitable provision shall be made at the entrance to the site and from any car parking within the site to describe the location and nature of the path to the building.

Visual, audible and tactile information should be provided to assist orientation and way finding, consider also requirements in 38.

Tactile walking surface indicators should be used to indicate directional orientation information where no other cues indicate the path to the building. Tactile walking surfaces should be used to indicate hazards on the path to the building. Where required on a continuous accessible path of travel, warning indicators should be located at both the top and bottom of stairways, ramps, escalators, moving walks and travelators, consider ISO/CD 23599.

Orientation should be facilitated by differences in acoustics, material, light and colour. The design should indicate the use of the building elements, especially to make the main entrance obvious.

Additional illumination or colour contrast and tactile information, like a change in material or tactile walking surface indicators, should be provided at separate points to assist orientation and wayfinding.

Across large or open areas people who are blind need a tactile route or guiding line to follow by the cane. Where there are no other tactile cues, tactile walking surface indicators should be installed to provide guidance. To facilitate people with visual impairments who have some residual vision, routes to be followed should have different luminance from the surroundings.

Tactile or acoustic warnings at hazardous locations should provide greater confidence in the use of the built environment and will limit the risk of injury.

NOTE 1 Way finding means knowing where you are, knowing your destination, following the best route, recognizing your destination and, finding your way back out. People who are blind or who have a visual impairment need tactile information to facilitate way finding.

NOTE 2 Tactile floor coverings or a runner as well as tactile walking surface indicators can help in locating entrance doors, counters, etc.

NOTE 3 Sound-producing objects (such as ticking wall clocks and fountains) provide good way finding aids for people who are blind or have a visual impairment.

7.2 Path

The path to, around and between buildings should be level, stable and firm.

The cross fall gradient across an access route should not exceed 1 in 50 (2%), except when associated with a dropped kerb.

If site topography militates against the provision of a level path, a sloped path may be provided, subject to the inclusion of landings, not farther apart than 50 m, if the gradient of the path exceeds 1 in 33.

If the slope of any part of a path is to exceed 1 in 20, it shall be designed and constructed as a ramp (see 8).

In an exceptional circumstance, such as that associated with a kerb at the side of a road or an entrance to an existing building, it will be acceptable to provide a short slope with a maximum gradient of 1 in 8.

Obstacles, such as objects or signs mounted on walls, bollards, columns or free-standing supports in the walking path should be avoided.

Hazard protection should be provided if objects project more than 100 mm into an access route and their lower edge is more than 300 mm and less than 2 100 mm above the ground. See 7.14.

7.3 Width of the path

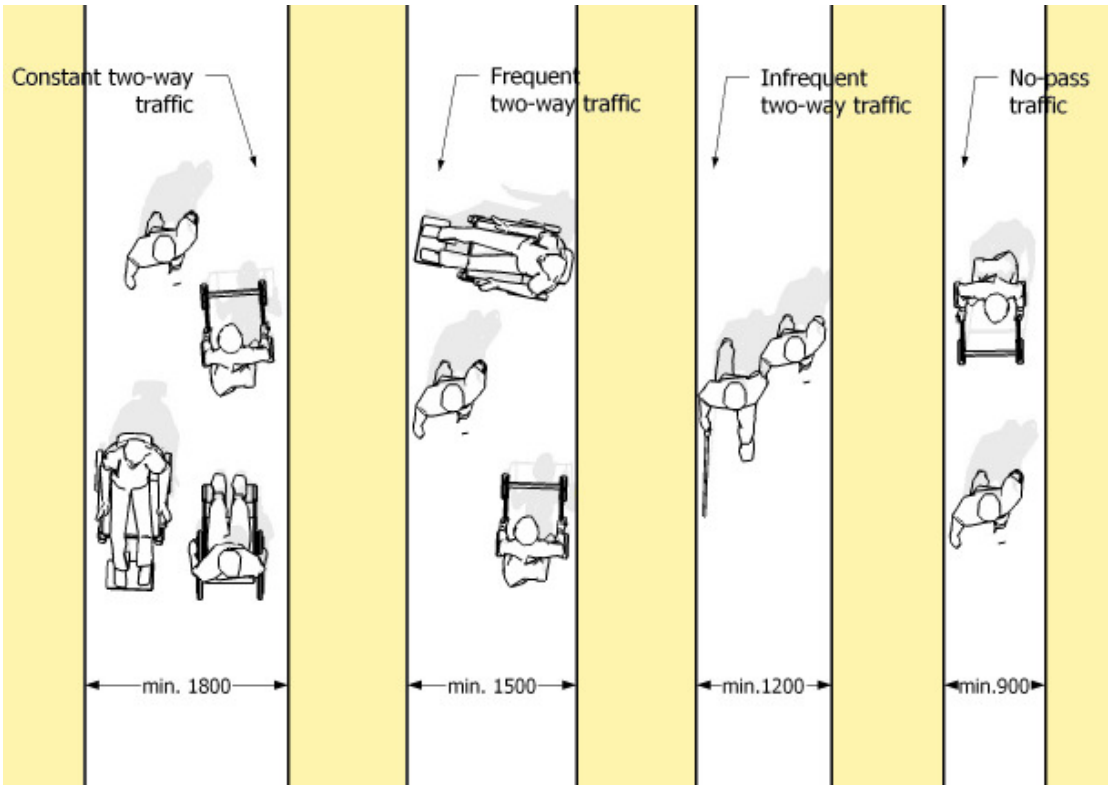


Figure 4— Different surface widths of the path depending on frequency

The surface width of the path shall be:

a) not less than 1 800 mm for constant two-way traffic;

b) not less than 1 500 mm for frequent two-way traffic, provided that passing places are included at suitable intervals;

c) not less than 1 200 mm for infrequent two-way traffic;

d) not less than 900 mm when it is unlikely that people have to pass one another (see figure 4).

7.4 Headroom of the path

The headroom along a path shall be maintained at a height of not less than 2 100 mm above the surface of the path.

7.5 Passing space

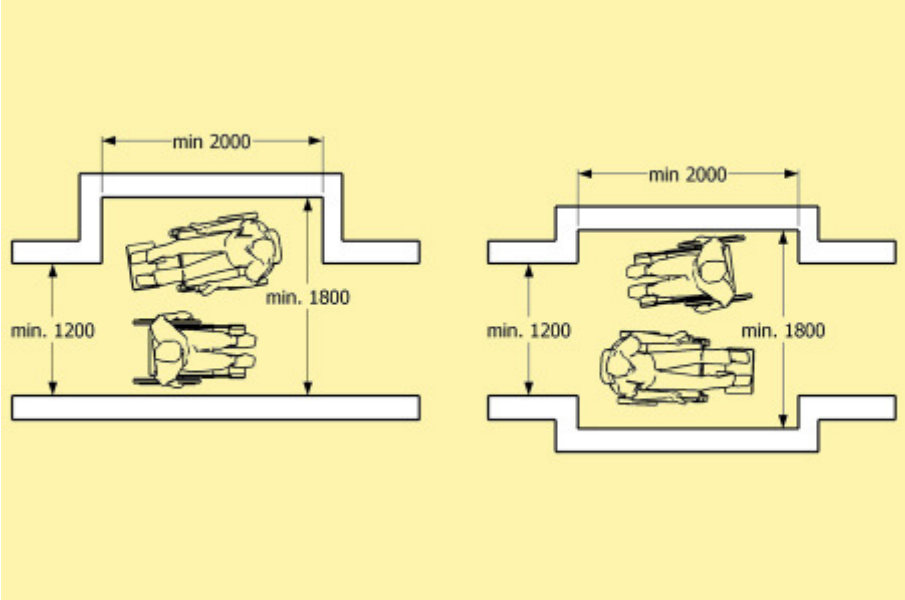


Figure 5 — Examples for passing spaces for wheelchair users

7.5.1 Passing space for wheelchairs

A path whose surface width is less than 1 800 mm (see 7.3 a)) and whose overall length is more than 50 m, shall be provided with a passing place or passing places, subject to the maximum distance apart of consecutive passing places being 50 m. Passing places should be 25 m maximum distance apart. This does not apply to a landing forming part of a sloped path, a ramp, steps or a stair.

A passing place shall be not less than 2 000 mm long and shall provide an overall surface width of at least 1 800 mm throughout its length.

Passing space for 2 people using wheelchairs shall be a minimum width of 1 800 mm for a minimum length of 2 000 mm. For example see figure 5.

NOTE Passage widening may be associated with intersections, turns and doorways so as to appear as integrated design features or enhancements.

7.6 Turning space for wheelchair on landings

For changes of direction of more than 45 ° on the landings of the path to the building the manoeuvring space shall be at least 1 500 mm x 1 500 mm. See similar requirements within ramps in 8:

7.7 Path construction

The path shall be rigid with a plain and slip-resistant surface and free from drainage gratings.

Care must be taken to ensure that adjacent surface materials underfoot do not display different slip resistance characteristics that might lead to stumbling, particularly, at the edges of changes of level or gradient, or on steps, stairs or ramps.

7.8 Stepped path and stair

For ambulant people, a stepped path is likely to provide a safer and more assuring means of access than a sloped path or a ramp. Above a specified gradient, steps ought to be provided to complement a sloped path or a ramp unless the overall change in level is 200 mm or less. In the latter instance, a short slope could be provided without an associated step.

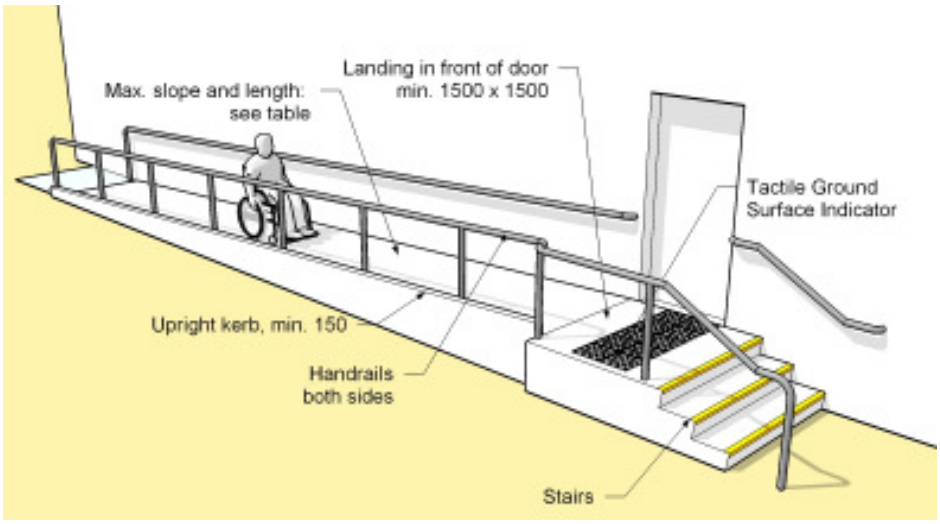


Figure 6 — Example of ramp with additional flight of steps

Wherever the length of a ramp exceeds 2 000 mm, an additional flight of steps shall be provided.

An isolated single step is unacceptable. Wherever a single step is provided it should be accompanied by an adjacent step ramp according to table 1.

Consider detailed requirements for stairs according to 13.

Where required on a continuous accessible path of travel, warning indicators shall be located at both the top and bottom of stairways, ramps, escalators, moving walks, and travelators.

7.9 Width of stepped path and stair

The surface width of stepped path and stair shall be not less than 1 200 mm. The clear unobstructed width of the flight of a single- or multi-channelled stepped path and stair shall be not less than 1 000 mm or more than 1 800 mm.

7.10 Landing of stepped path and stair

For requirements for landings consider also 13.3.

7.11 Landings of sloped paths

For landings at the foot and the head of a sloped path, consider also 8.7.

7.12 Support and guidance by handrail on sloped and stepped paths

Support and guidance by handrail should be provided on sloped and stepped paths:

– considering general requirements of handrails according to 14.

– a handrail shall be provided on each side of a flight of steps that consists of 2 or more risers.

– a handrail shall be provided on each side of a channel that may subdivide a flight of steps.

7.13 Drainage of path and stepped path or landing

The cross-fall of a level path, or of a stepped path or of a landing, that is provided to permit drainage of surface water, shall not exceed 1 in 50 if it is concrete and 1:33 if it is asphalt.

A dished channel shall not be constructed within the boundaries of a path.

A drainage grating that is within the boundaries of a path shall be set flush with the surface of the path. Such grating shall be placed so that its longitudinal elements are perpendicular to the main walking direction, and the gap between them shall not exceed 13 mm.

7.14 Solitary obstacles in a path

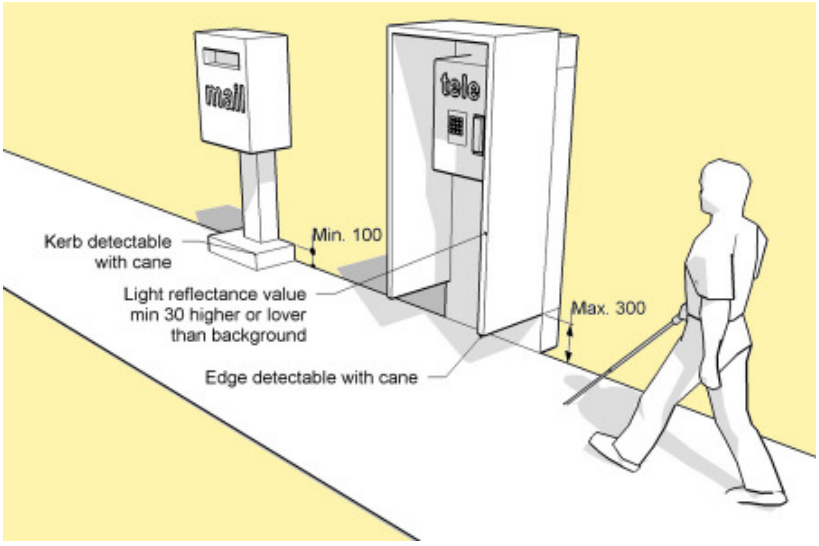


Figure 7 — Solitary obstacles

Objects with lower height than 750 mm may create a hazard for people. Permanent equipment that cannot be located beyond the boundaries of a path shall:

— be designed to be easily seen, minimum difference in LRVs of 30,

— be shielded to prevent impact,

— be accompanied by a feature that warns of the presence of a potential hazard and that is possible to detect for a person using a white guide cane or stick, see figure 7.

Any object projecting more than 100 mm between 300 mm and 2 100 mm above the ground level into an access route shall be clearly visible and needs to be possible to detect with a cane, see figure 7.

Protection on the ground can be made by a solid kerb or fixed element between 100 mm – 300 mm above floor under the protruding obstacle. Wing walls, side partitions, alcoves or recesses are solutions for protruding elements where free space under the object is needed.

7.15 Guarding against falling within a path

Consider requirements in 9.

8 Ramps

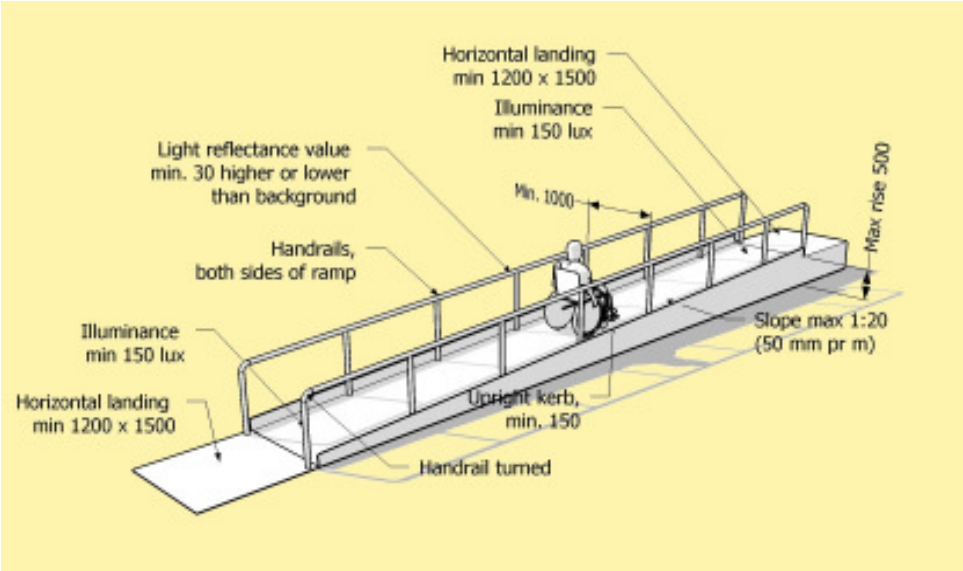


Figure 8 — Example of ramp with slope 1:20 and horizontal landings at beginning and end

Ramps provide an accessible route between changes of level. A ramp with the appropriate slope can provide accessibility without requiring reliance on a mechanical device.

In addition to the ramp a flight of steps and/or a lift should be provided if the change in level is more than 200 mm. See figure 6.

In buildings of more than two storeys, a lift should be provided.

8.1 Slope and length

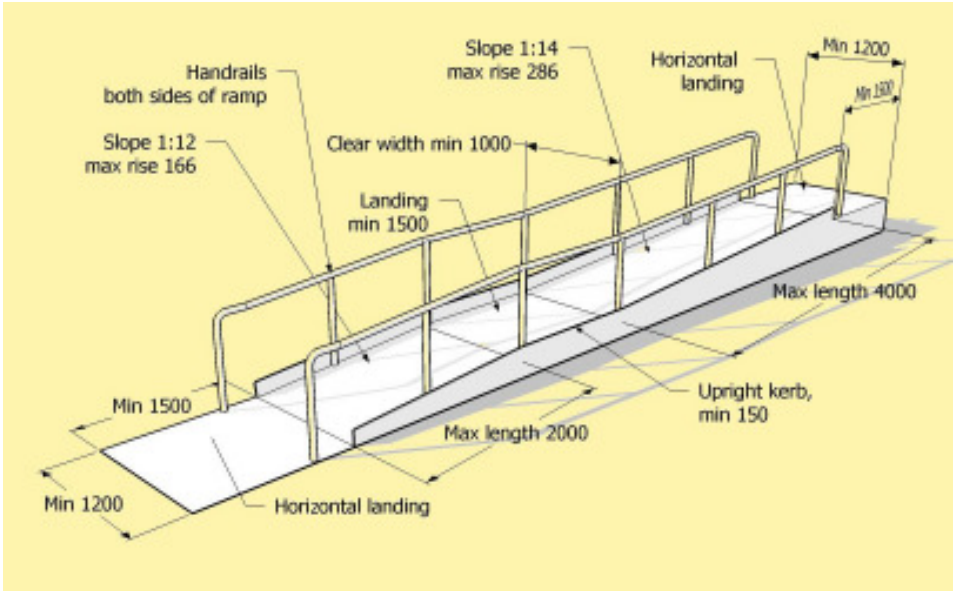


Figure 9 — Ramps with horizontal landings and handrail provisions.

The slope shall be the lowest possible and not exceed the maximums set out in Table 2 and 3.

Table 2 — Maximum slope and length of ramps

maximum slope	maximum length (going of the flight)	maximum rise
≥ 1 in 20 (5,00%)	10 000 mm	500 mm
1 in 18 (5,56 %)	8 000 mm	444 mm
1 in 16 (6,25 %)	6 000 mm	357 mm
1 in 14 (7,14 %)	4 000 mm	286 mm
1 in 12 (8,33 %)	2 000 mm	166 mm
step ramp: 1 in 10 (10,00 %)	1 900 mm	190 mm
kerb ramp (located within or attached to a kerb): 1 in 8 (12,50 %)	1 520 mm	190 mm

Table 3 — Exceptional considerations in adaptation of urban areas or at the entrance of existing buildings"

Maximum slope	maximum length (going of the flight)	maximum rise
1 in 12 (8,33 %)	15 000 mm	1 250 mm
1 in 10 (10,00 %)	10 000 mm	1 000 mm
1 in 8 (12,50 %)	3 000 mm	375 mm
Threshold ramp: 1 in 8 (12,50%) with no handrail provisions	280 mm	35 mm

NOTE A ramp with a higher gradient than 1:12 means a risk of accident and is heavy to use especially for elderly people and people in wheelchairs. It is not suitable for independent use. Ramps with a higher gradient than 1:12 should therefore only be used in existing environments under special circumstances decided at a National Level.

8.2 Width of ramps

– The surface width of a ramp shall be not less than 1 200 mm.

– The clear width of a ramp shall be not less than 1 000 mm.

"Exceptional considerations in adaptation of urban areas or at the entrance of existing buildings": The clear width of a ramp shall be not less than 900 mm.

8.3 Landings of ramps

An end landing shall be provided at the foot and at the head of a sloped path, a stepped path, and a ramp. The area of an end landing may be a part of the continuing path, see figure 9.

The length of an end landing and an intermediate landing shall be not less than 1 500 mm

The length of an intermediate landing at any change in direction of more than 10 degrees shall be at least 1 500 mm measured on the center line. See figure 10.

"Exceptional considerations for existing buildings": The clear space at the beginning and at the end of the ramp shall be at least 1 200 mm at surface level. Intermediate landings will also be at least 1 200 mm at surface level

The area of a landing shall be clear of any obstruction including the path of swing, onto it, of a door or gate.

8.4 Support and guidance by handrail on ramps

Consider general requirements of handrails according to 14 and the following:

– a handrail shall be provided on at least one side of a ramp when the length of the ramp is 2 000 mm or less and there is an alternative stepped access.

– a handrail shall be provided on each side of a ramp if the ramp exceeds 2 000 mm in length or if there is no accompanying stepped path.

The minimum distance between handrails shall be 1 000mm.

8.5 Drainage of sloped path and ramp

Consider the general requirements according to 7.11.

8.6 Surface materials

Surface materials shall be rigid with a plain and slip resistance surface, in both wet and dry conditions.

8.7 Guarding against falling within a ramp

See 9.

9 Guarding against falling within path and ramp

Providing protection at the side of the path is as much to do with preventing people who use wheelchairs overturning as with ambulant people injuring themselves as the result of a fall. Examples of protection against falling see figure 10.

– If a level or sloped path is bounded on one or both sides by terrain that slopes downwards by up to 30º from the horizontal, a firm and level margin of at least 600 mm shall be provided at the relevant side or sides.

– If a sloped path or ramp is bounded on one or both sides by terrain that slopes downwards by 30º or more, an upright kerb of minimum 150 mm shall be provided at the relevant side or sides. Kerbs shall have LRV of minimum 30 higher or lower than the ramp.

– If a path, or a sloping path, or a stepped path, or a ramp rises more than 600 mm above the adjacent ground, it shall be provided with guarding from that point onwards.

Guarding shall be designed to discourage a user, particularly a child, to climb it.

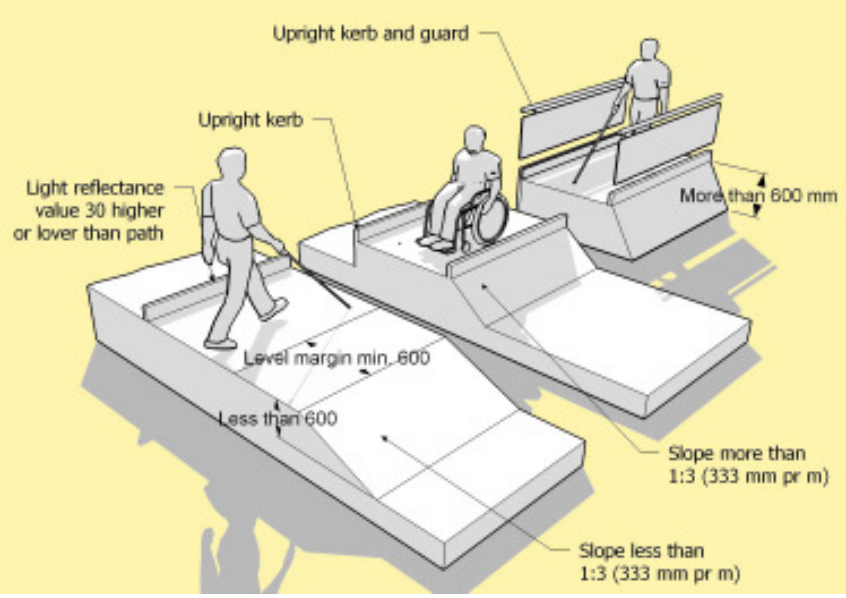


Figure 10 — Examples of protection against falling

10 Entrance to the building

The entrances to a building should be easy to locate, safe and convenient to use and limit exposure to rain and snow. At a minimum these requirements shall be met at the principal entrance to the building.

Entrance doors should be sufficiently high, wide and light to operate (see 18.1.3). At the same time, doors that swing or revolve need to be able to resist the forces of prevailing winds without opening unexpectedly.

10.1 Identification

The principal entrance to a building shall be identifiable from the boundary of the site and from any car parking within the site. If the entrance cannot be easily located, suitable means of visual and tactile way finding shall be provided.

10.2 Floor level at the entrance

Entry into the building shall be free from any change in plane at floor level. Maximum raised threshold should not exceed 20 mm.

If it is necessary to set the level of the entrance storey above that of the surrounding ground, a suitable sloped or ramped approach and landing shall be provided immediately on the outside of the principal entrance.

The top surface of any permanent or temporary feature, provided at floor level to limit the ingress of dirt or water, shall be set to be flush with the remainder of the floor. The surface shall be firm and level.

10.3 The principal entrance doorway

Detailed requirements for doors see 18.

10.4 Passage width

The minimum clear passage width of an entrance doorway shall be not less than 800 mm. More space might be required for a person using an electric wheelchair.

10.5 Passage height of a doorway

The minimum clear passage height of a doorway shall be not less than 2 000 mm.

10.6 Circulation space

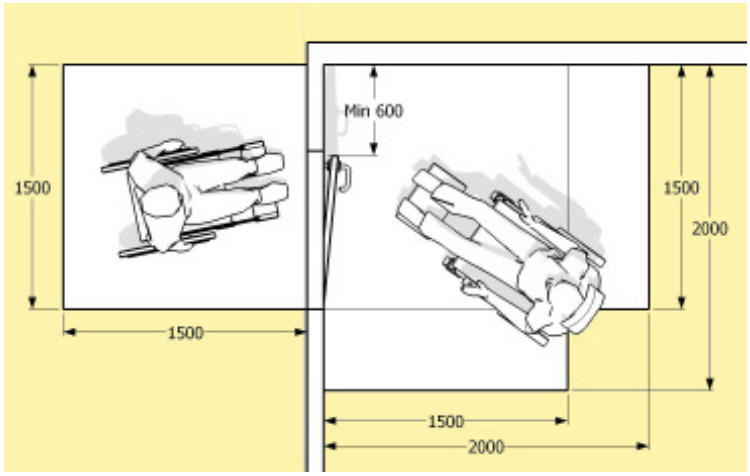


Figure 11 — Circulation space inwards and outwards of a swinging door

In front of the door opening into the building it should be a horizontal manoeuvring space of minimum 1 500 mm to 1 500 mm. For doors opening outwards it shall be minimum 1 500 mm by 2 000 mm. At least 600 mm distance is required to operate the door handle sideward. See figure 11.

For alternative openings and constructions consider A.7.

10.7 Lobbies

Lobbies should facilitate people to enter the built environment without any hindrance or barriers. Consideration needs to be given to the requirements for doors according to 18.1.

10.7.1 Unobstructed manoeuvring space

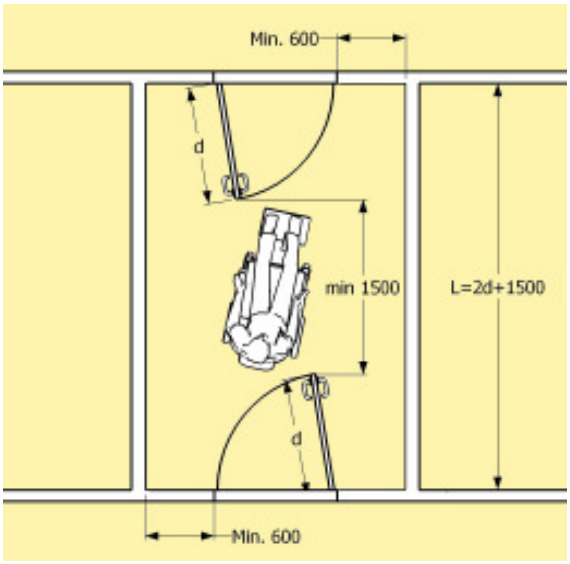


Figure 12 — Minimum dimensions of lobbies with single leaf doors

The minimum unobstructed manoeuvring space of an entrance lobby shall not be less than 1 500 mm free of door swing if both doors are without vision panels. If the doors have vision panels the distance of the open door leaves can be reduced to min. *d* + 1 500 mm (see figure 12).

For buildings where a person with mobility impairment might be assisted in entering the premises, these minimum dimensions have to be increased.

In single swing doors, the opening direction of the lobby door shall be toward the egress.

10.8 Visual awareness of an entrance door

Except when necessary to maintain security or privacy, an entrance door shall be designed to permit visual awareness of the layout of the building immediately beyond.

Consider also 18.1.5 and 18.1.6.

11 Horizontal circulation

Buildings should be designed, contructed and managed so that its internal layout is accessible and easily understood to all people. All aspects of horizontal circulation, including corridors, should be designed to facilitate for ease of movement for all people.

Horizontal circulation shall be level and without steps. Where differences in level cannot be avoided, ramps, lifts or platform lifts shall be provided, see 8, 15 and 16.

Where a raised threshold is necessary it shall be at a maximum height of 20 mm, be bevelled and have a difference of minimum 30 of LRVs compared to the floor.

11.1 Internal passages

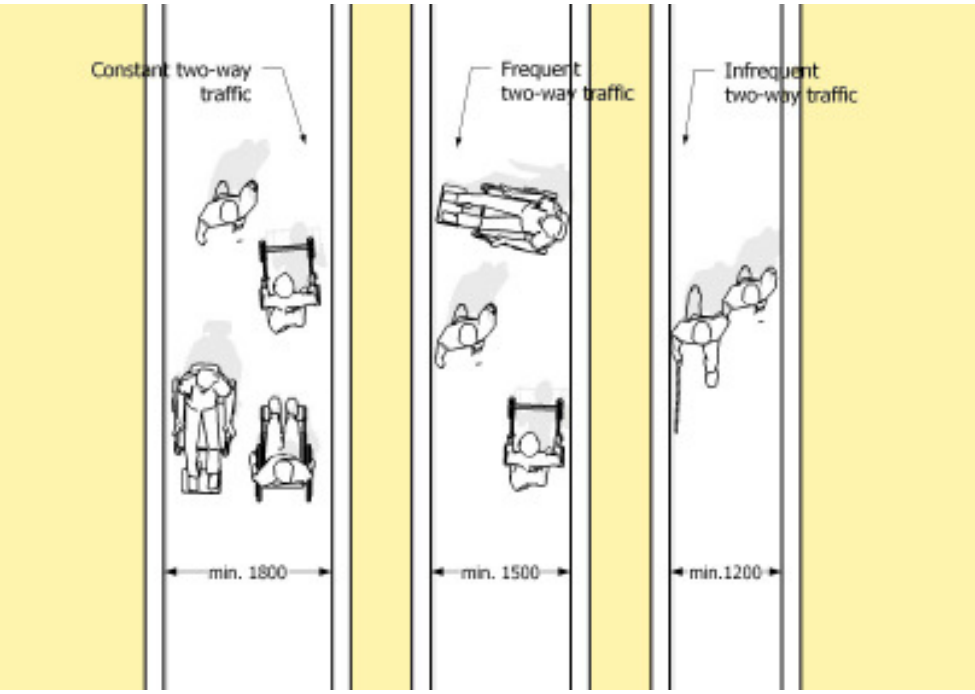


Figure 13 — Different corridor widths determined by intensity of use

The minimum free width of passages shall be 1 200 mm.

Routes should preferably intersect at right angles to each other.

“Exceptional considerations for existing buildings in developing countries”: In some member states where shorter and smaller wheelchairs are generally used and due to market situations the internal passages may be reduced to 900 mm for short straight passages of maximum 2 000 mm length. Wherever possible this internal passage should be increased to 1 200 mm.

Adequate circulation space, if a doorway exists, has to be provided.

Intensity of use of the corridor shall be a criterion when establishing the minimum width and length of the corridor (see figure 13).

Junctions within a corridor shall have a turning circle with a diameter of 1 800 mm or more, clear of any obstructions.

Clear minimum height of corridors shall be 2 100 mm.

Hanging objects on walls should be avoided, except when they comply with 7.14 The minimum clear width (the available width for passage in a corridor clear of any obstructions) shall remain 900 mm.

11.2 Turning space for 90 degree turn of a wheelchair in corridors

The space required for a wheelchair to make a 90 degree turn shall be designed according figure 14:

— a gradient no steeper than 1:40 and

— not be less than 1 200 mm wide and 1 200 mm long in the direction of travel.

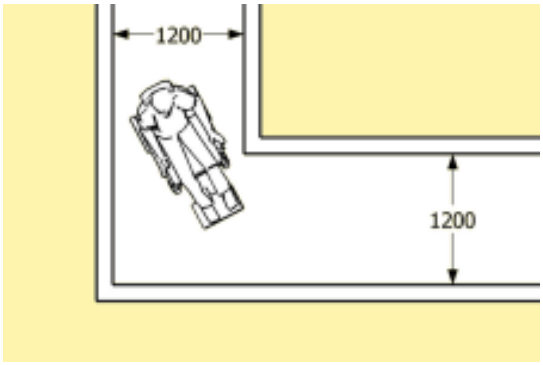


Figure 14 — Space required for a 90 degree turn

11.3 Circulation space for 180° wheelchair turn

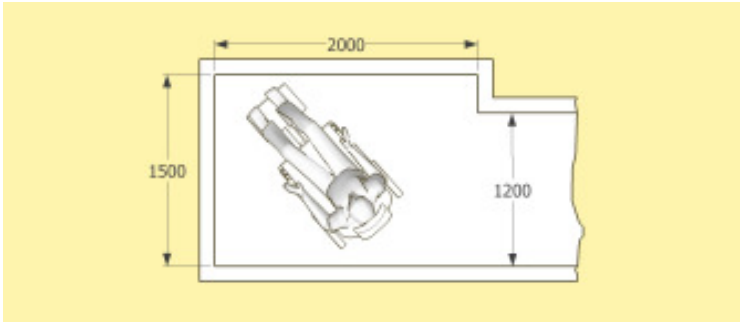


Figure 15 — Space required for a 180 degree turn in a corridor

The space required for a wheelchair to make a 180 ° turn shall be not less than 2 000 mm in the direction of travel and not less than 1 500 mm wide (see figure 15).

For landing dimensions, see 13.3 and figure 17.

12 Vertical circulation

Vertical circulation within buildings should be designed, contructed and managed so that it can easily be understood and used by people. Vertical circulation includes the provision of stairs, lifts and ramps, as well as escalators, travelators and platform lifts.

12.1 Ramps in buildings

General requirements for ramps are set out in 8. Internal ramps should, if possible, be avoided within any building. Internal ramps shall be designed in accordance to the following additional criteria:

— no series of ramps should rise more than 2 000 mm in total. If this is the case, an alternative should be provided, e.g. a lift;

— gradient of 1:12 (8.33 %) is the maximum permissible gradient within a building;

An internal ramp should have the lowest practical gradient.

The main horizontal circulation design should be level on each storey in order to ensure that the building is accessible to all people.

The minimum illumination at the top and bottom of the flight should be 150 lux and 100 lux in between the bottom and top.

13 Stairs

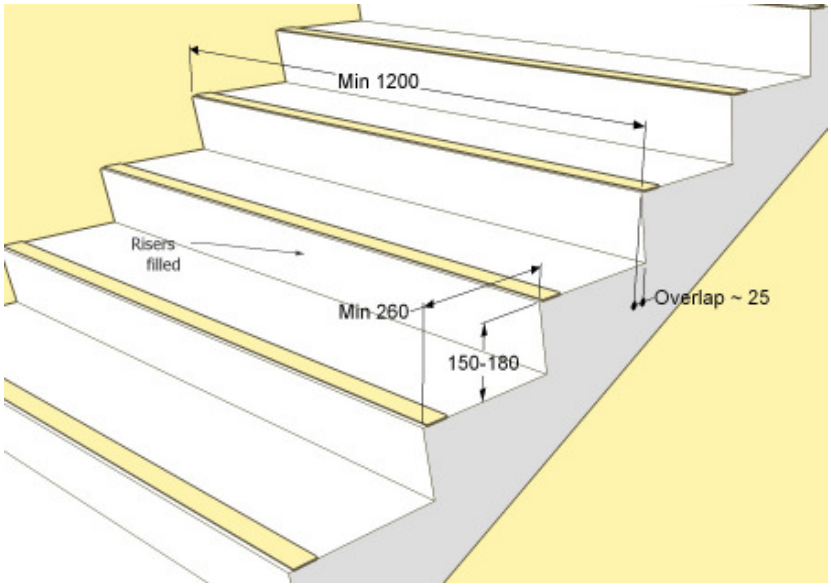


Figure 16 — Going and rise of steps with riser overlap

13.1 Rise and going of steps

The rise and going of steps within flights shall be uniform.

The sum of the going and twice the rise of a step shall be not less than 600 mm and not more than 640 mm.

The rise of a step shall not be open and be not less than 150 mm and not more than 180 mm high as indicated in figure 16.

The going of a step shall be not less than 260 mm deep.

A tread shall not overlap the tread below by more than 25 mm and the nosing shall provide an uninterrupted transmission between riser and tread, see figure 16.

The minimum illumination at the top and bottom of the flight should be 150 lux and 100 lux in between the stairs.

A flight of steps should not contain more than 12 risers. However, in circumstances where plan area is restricted, a flight of a stair shall contain no more than 16 risers. Successive flights should contain the same number of risers.

13.2 Width of stepped path and stair

The surface width of a stairs shall be not less than 1 200 mm. The clear unobstructed width of the flight of a single- or multi-channelled stepped path and stair shall be not less than 1 000 mm or more than 1 800 mm between handrails.

13.3 Landing of stepped path and stair

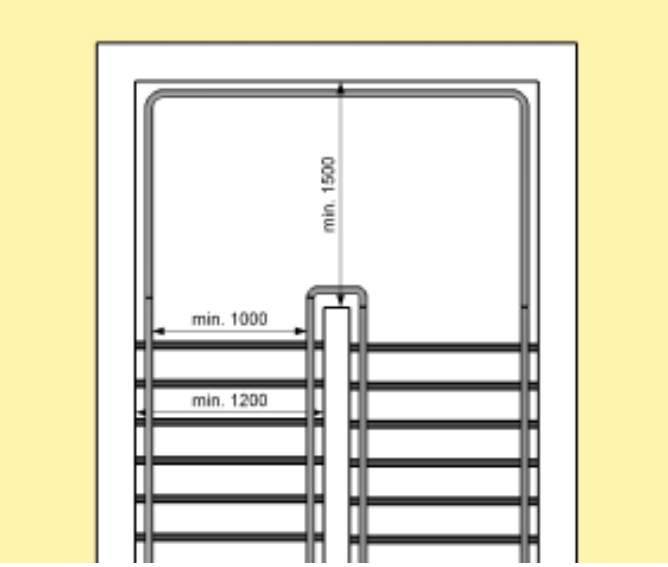


Figure 17 — Stair with continuing handrails and 180° landing

The area of a landing shall be clear of any obstruction including the path of swing, onto it, of a door or gate.

The clear space at the beginning, the end and intermediate landing length should be at least the same as the width of the stair but shall be never less than 1 200 mm. Where there is a half landing or a 180 ° turn it shall not be less than1 500 mm to facilitate transporting with stretcher in emergency cases (see figure 17).

If the stepped path is multi-channelled the length of an intermediate landing shall not be less than the clear width of the widest channel.

The area of a landing shall be clear of any obstruction including the path of swing, onto it, of a door or gate.

13.4 Head clearance

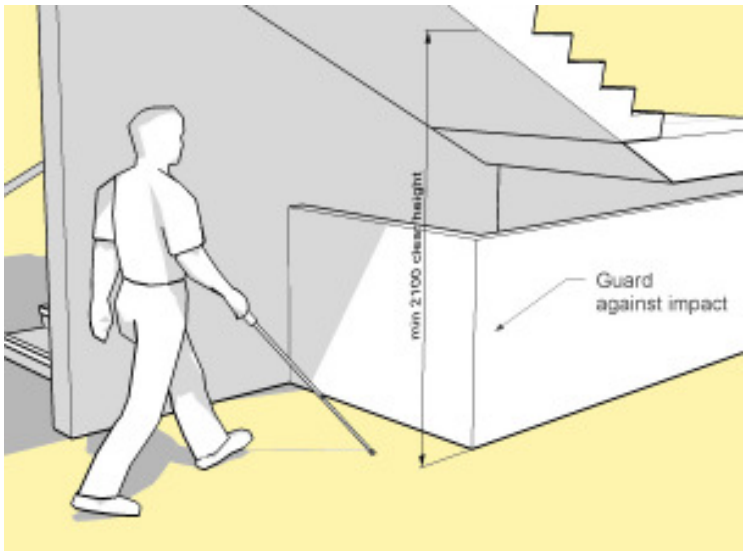


Figure 18 — Clear height under stairs

Clear accessible height under the stair shall be 2 100 mm minimum; if less it shall be shielded against impact. Alternatively the stair should be fitted with a feature that is possible for a person using a white guide cane or stick to detect. See figure 18.

Head clearance on the stair shall be minimum 2 100 mm.

13.5 Visual and tactile warnings

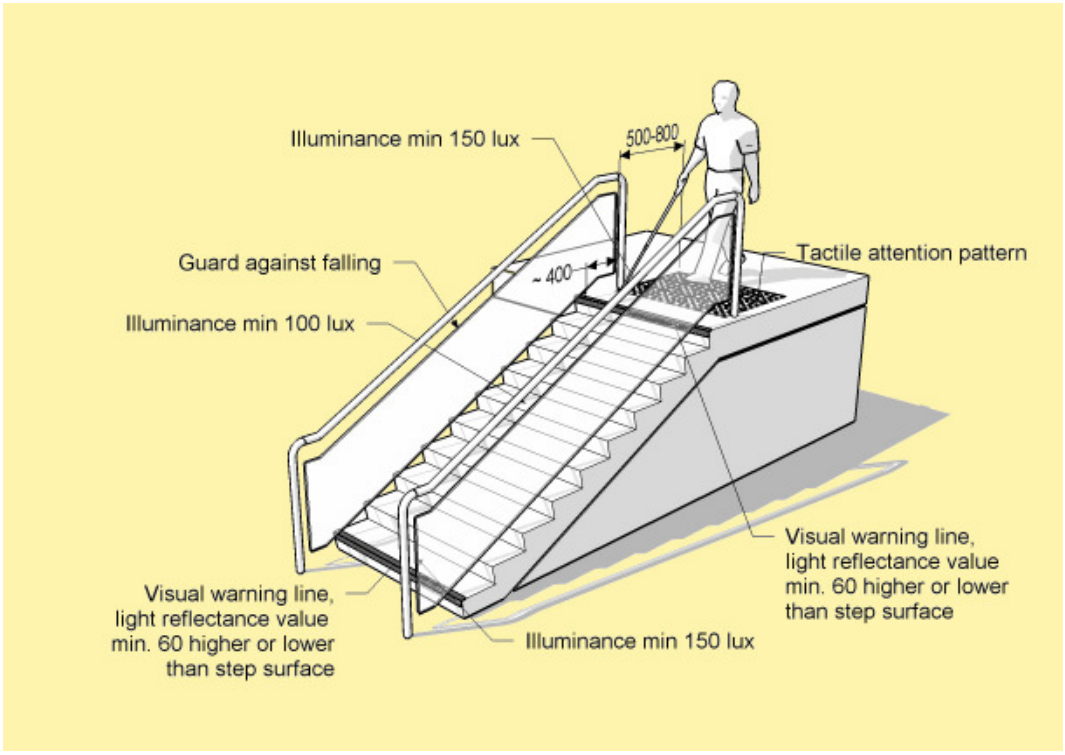


Figure 19 — Tactile attention pattern (TWSI), visual indicator and handrail

There shall be a visual contrast between landings and top and bottom step of a flight of steps. As a preferred solution, the front edge of each step should have a LRV of minimum 30.

A visual warning line with a width of between 50 mm to 75 mm minimum width should be on the going of the first and the last step of the flight. It is recommended to mark each step with a visual warning line.

The tactile attention pattern should have a width of 400 mm – 800 mm ending 300 mm – 500 mm before the front edge of the first down going step. The height or depth of the tactile indicators should be 4 mm to 5 mm (see figure 19); consider also ISO/CD 23599.

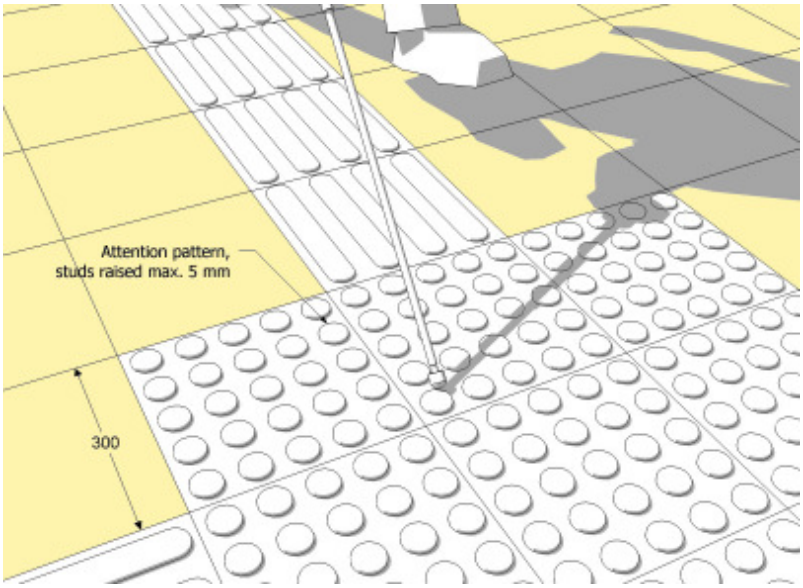


Figure 20 — Example of tactile attention pattern

13.6 Illuminance

The minimum illuminance at the top and bottom of the flight should be 150 lux and 100 lux in between the stairs.

13.7 Handrails

Consider 14.

13.8 Guarding against falling on stairs

Consider 9.

14 Handrails

A handrail provides a means of support, stability and guidance for the user. It is unlikely that the presence of a handrail will prevent a fall because of the reaction time needed to grasp. However, the presence of a handrail will assist most people in climbing a set of steps or a ramp.

Handrails shall be provided for stepped and sloped paths, ramps and stairs (7.12, 8.4 and 13.7) and lift cars (15.5) according to the following general requirements:

– The minimum visual contrast of a handrail to the background shall comply with the requirements outlined in 34.

– Vertical height of the top of the handrail shall be between 850 mm and 1 000 mm above the surface;

– Handrails should be continuous and extend 300 mm beyond the start and finish of the stairs or ramp and turned into the wall on the closed side of the ramp or stairs or be turned down and terminate at the floor or ground level.

14.1 Provision of handrails

See specific requirements concerning handrails for paths in 7.12, and for ramps in 8.4**.**

– a handrail shall be provided at both sides of all flights of stairs,

– a central handrail should be provided when the width of the stairs exceeds 1 800 mm, provided that a clear width of at least 1 000mm is provided, consider also ISO/DIS 12055.

“Exceptional considerations for existing buildings”: a handrail should be provided, at least, at one side of the flight (principal difficulties arise in relation to heritage buildings).

14.2 Profile of a handrail

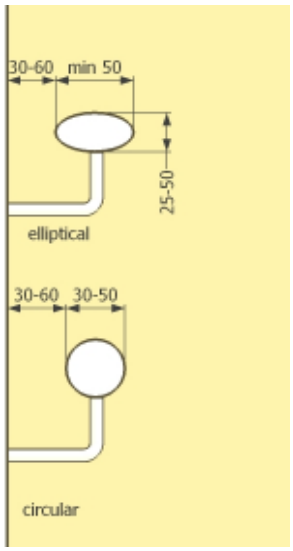


Figure 21 — Round and elliptical handrail profile

A handrail shall:

a) have an elliptical profile of 50 mm wide and 40 mm deep, or thereabouts, or have a circular profile of not less than 30 mm - 35 mm or not more than 50 mm in diameter as shown in figure 21;

b) be terminated in a manner that limits the risk of clothing being caught, design of beginnings, ends and turns of the handrail should be turned towards the wall, the floor or other surfaces;

c) be located to provide a space within a range of 30 mm to 60 mm from an adjacent wall or other obstruction;

d) be supported, centrally from below, with not less than 50 mm between the underside of the handrail and the top surface of the support;

e) surface of the handrail shall be slip resistant.

NOTE A wide and relatively flat-topped surface to a handrail provides better support than does a regularly curved one. Grasp ability is better afforded by a handrail design that does not require significant hand and finger joint movement. For these reasons, the use of a handrail that is elliptical in design is the preferred choice.

14.3 Continuity of a handrail

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.

14.4 Height of a handrail

The height to the top of a handrail shall be not less than 850 mm and not more than 1 000 mm above the surface of a ramp, stair or landing or a stepped path.

If a second handrail is provided it should be between 600 mm and 750 mm in height.

If a stair rises more than 600 mm above the adjacent ground it shall be provided with guarding from that point onwards, see 7.15.

14.5 Horizontal extension of a handrail

A handrail on a stepped path, stair or on a ramp shall extend not less than 300 mm beyond the first and last nosing of each flight: the extension of the handrail to be horizontal.

A handrail shall not project into a transverse circulation path unless it is continuous and intended to form part of the guidance along that path.

14.6 Visual and tactile information

The minimum visual contrast of the handrail against the adjacent background (e.g. wall) shall comply with the requirements outlined in 34.

Tactile symbols or raised text should be given on the handrail as an additional supportive measure for people who are blind or have a visual impairment, e.g. indication of the number before arriving to the next floor.

Visual and tactile information should be provided according to 7.1, 34, 38 and 39. Consider also ISO/CD 23599.

14.7 Mechanical resistance

Handrails shall be securely fixed and rigid. The fastenings and the materials, and construction of handrails, shall be able to withstand forces of minimum 1.2 kN vertical and horizontal.

15 Lifts (Elevators)

15.1 General comments

All levels of a building should be accessible with ramps or lifts (US: Elevators). Lifts shall be accessible for all persons including persons with disabilities.

NOTE 1 Requirements for the minimum size and numbers of lift cars are a matter of national building regulation.

If in a building different numbers of floors are constructed, a minimum space for an accessible lift with car size 1 100 mm x 1 400 mm should be provided for later adaptation.

Requirements concerning the size of the lifts are stated in ISO 4190-1 as lifts *"accessible for wheelchairs"* in two levels:

– "*accessible lift cars for wheelchairs*" which fulfil minimum handicap requirements,

– "*accessible lift cars for wheelchairs*" for full manoeuvrability of a wheelchair.

The requirements of ISO 4190-1 concern:

– nominal load,

– nominal speed,

– car width and car depth,

– car entrance,

– well width and well depth,

– pit depth,

– headroom height.

The standard gives dimensions for lifts:

– Class I, Residential lifts,

– Class I, General–purpose lifts,

– Class III, Health–care lifts,

– Class VI, Intensive–use lifts,

– Lifts for specific local markets,

All technical requirements concerning accessible lifts shall comply with ISO 4190-1.

All control devices, signals and additional fittings shall comply with ISO 4190-5, especially where particular requirements for ease access for disabled persons are mentioned.

In the following paragraphs only some main requirements for accessible lifts are described.

15.2 Car dimensions

Accessible lift car sizes have to be chosen according to ISO 4190-1 marked with the wheelchair symbol which fulfils minimum handicap requirements. For full manoeuvrability of a wheelchair the lift car sizes with the wheelchair symbol have to be chosen.

Class I – Residential lifts/General–purpose lifts:
- – Series A with 800 mm entrances,
- – Series B with 900 mm entrances and
- – Serie C with 1 100 mm are accessible for wheelchairs and walking aids with an accompanying person.

Class III – Health-care lifts are accessible also for different bed dimensions and allow full manoeuvrability of a wheelchair.

15.2.1 Lift Class I – Series A with 800 mm entrance

– Lifts Series A with 800 mm entrance, 630 kg, car size 1 100 mm x 1 400 mm:
This lift type accommodates one wheelchair user or one person with walking aids with an accompanying person. The door has to be provided on the narrow side of the car. The door width may not accomodate all wheelchair users.

– Lifts Series A with 800 mm entrance, 1 000 kg, car size 1 100 mm x 2 100 mm:
If transport with a stretcher is considered necessary for residential houses, this lift type should be used. The door has to be provided on the narrow side of the car. The door width may not accomodate all wheelchair users.

15.2.2 Lift Class I – Series B with 900 mm entrance

– Lifts Series B with 900 mm entrance, 630 kg, car size 1 100 mm x 1 400 mm:
This lift type can accommodate one wheelchair user or one person with walking aids with an accompanying person. The door has to be provided on the narrow side of the car.

– Lifts Series B with 900 mm entrance, 1 000 kg, car size 1 100 mm x 2 100 mm:
If transport with a stretcher is considered necessary for residential houses, this lift type should be used. The door has to be provided on the narrow side of the car.

If an additional door is installed on the long side of the car the lift Series B with 900 mm entrance, 1 000 kg, car size 1 600 mm x 1 400 mm has to be used.

15.2.3 Lift Class I – Series C with 1 100 mm entrance

– Lifts Series C with 1 100 mm entrance, 1 000 kg, car size 1 600 mm x 1 400 mm:
The door can be provided on both sides of the car.

– Lifts Series C with 1 100 mm entrance, 1 275 kg, car size 2 000 mm x 1 400 mm:
The door can be provided on both sides of the car. This car allows full manoeuvrability of a wheelchair and is marked with the wheelchair symbol (*).

15.2.4 Lift Class IV – Health-care Lifts

To facilitate transporting with stretcher in emergency cases the following standard lifts have to be used:

– 1 100 mm entrance: 1 200 mm x 2 300 mm/1 275 kg,

– 1 300 mm entrance: 1 400 mm x 2 400 mm/1 600 kg, 1 500 mm x 2 700 mm/2 000 kg,
1 800 mm x 2700 mm/2500 kg,

– 1 400 mm entrance: 1 800 mm x 2 700 mm/2 500 kg

All these lifts are marked with the wheelchair symbol and allow full manoeuvrability with a wheelchair.

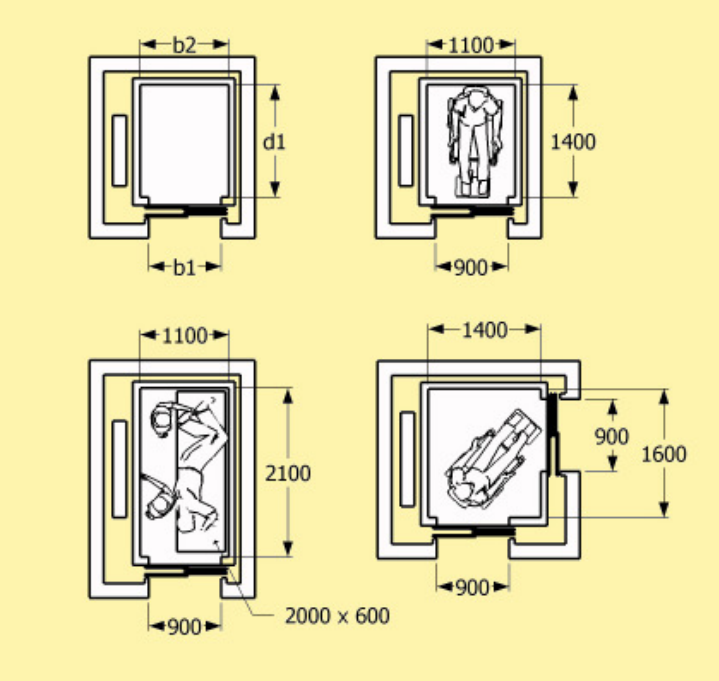


Figure 22 — Examples of lifts accommodating one person in a wheelchair, a person on a stretcher and a person performing a 90 degree turn between two adjacent lift doors

15.3 Entrances – Door opening

Obstacle-free accessibility of the landing floors is required on all eligible floors.

Entrance clear opening shall be at least 800 mm.

NOTE National regulations can require more than 800 mm (see Introduction)

Series B lifts with an entrance clear opening of 900 mm should be provided, according to ISO 4190-1:1999 and series C lifts with a clear opening of 1 100 mm according to the same standard (see ISO 4190-1:1999, table 1).

For lift types in 15.2.1 and 15.2.2 the car door shall be situated at the narrow side of the car. For lift types in 15.2.3 the car door can be located on both sides.

The car and landing doors shall be constructed as automatic power operated horizontally sliding doors.

The colour and tone of the doors should contrast with the surrounding wall finish to assist location of doors.

The control system shall allow for the door dwell time to be adjustable to suit the conditions where the lift is installed (normally between 2 s and 20 s). Means to reduce this time shall be installed e.g. by using a door close button in the car. The means of the adjustment shall not be accessible to users.

The protection device shall cover the opening over the distance between at least 25 mm and 1 800 mm above the car door sill (e.g. light curtain). The device shall be a sensor which prevents physical contact between the user and the leading edges of the closing door panel(s).

Sufficient manoeuvring space outside the car door shall be provided according to 19.3 and B.8.1. If a stair is situated opposite the car door the distance to the stair shall be at least 2 000 mm for safe manoeuvring (see figure 23). The manoeuvring is adequately lit with an illumination of minimum 100 lux.

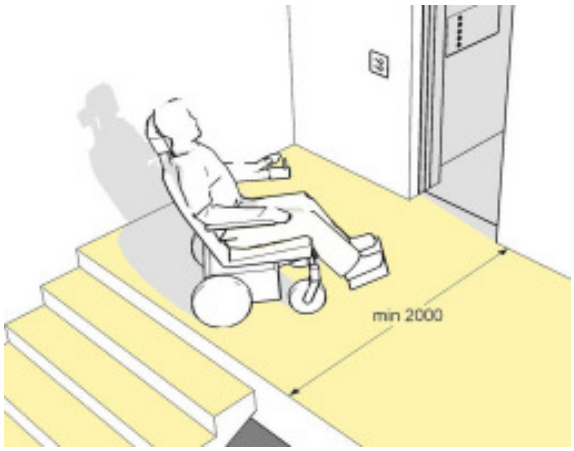


Figure 23 — Manoeuvring space outside the car door opposite a stair

A distinguishable floor surface, approximately 1 500 mm by 1 500 mm outside the doors will aid location. This could comprise a change of colour or floor finish. Changes in floor finish should be flush.

If manual sliding or concertina doors are to be installed, door circulation spaces, door handles and operating forces shall be in accordance with 18.1 and 35.1.

15.4 Equipment in the car

15.4.1 Handrail

At least one handrail shall be provided in the car and shall be fixed horizontally on the same side as the car operating panel.

The gripping part of the handrail shall

— have a minimum dimension of 30 mm, a maximum dimension 45 mm and

— be located between 55 mm and 70 mm from the car panel.

— have no sharp edges.

The handrail shall be fixed at a height from the floor at 850 mm ± 10 mm.

The free space between the wall and the gripping part shall be between 35 mm and 45 mm.

The handrail shall be interrupted where the car operating panel is located on the same wall in order to avoid obstructing buttons or controls.

The projecting ends of handrails shall be closed and turned towards the wall to minimise the risk of injury.

15.4.2 Seat

Where a tip-up seat is provided it shall have the following characteristics:

a) seat height from the floor: (500 ± 20) mm;

b) depth: (300 - 400) mm;

c) width (400 - 500) mm;

d) ability to support a load of 100 kg.

15.4.3 Mirror or mirrored wall within the car

In case of a car size of 1100 mm x 1400 mm where a user of a wheelchair cannot turn it around, a device (e.g. a small mirror) shall be installed to enable this user to observe obstacles behind them when moving backwards out of the car. Where a glass mirror is used it shall be safety glass.

Where any wall of the car is substantially mirrored or covered with a reflective surface, measures shall be taken to avoid creating optical confusion for users with visual impairment (e.g. decorated glass, or a minimum vertical distance of 300 mm between the floor and the bottom edge of the mirror, etc.).

15.4.4 Floor and wall surfaces of the car

Internal walls shall have a non-reflective, matt finish in a colour and tone contrasting with the floor.

The car floor shall be rigid, slip-resistant and have a non-reflective, matt finish.

The floor of the car should have a similar surface characteristic to the landing floor. The control buttons should protrude some millimetres from the car wall.

15.4.5 Allergic materials

Typical materials to which the user may be allergic include nickel, chromium, cobalt and natural or synthetic rubber; these materials should be avoided in buttons, controls, handles or handrails.

15.4.6 Lighting

Internal car lighting should provide a level of illumination of minimum 100 lux at floor level uniformly distributed avoiding the use of spotlights.

15.4.7 Emergency warnings

Emergency warnings shall comply with requirements in ISO 4190-5.

The car shall have one alarm device (two-way communication system) permanently connected to a safety organization according to the following:

a) The device shall ensure voice communication in both directions with an organization in charge of passenger rescue or the person in charge of the safety of the building.

   NOTE As an aid to communication, an induction loop can assist people with impaired hearing. In this case, the availability of the induction loop is shown in the car by the symbol “induction loop” — audio frequency induction loop system (AFILS).

b) A permanent operating force shall not be necessary to send the alarm.

c) The device shall provide visual and audible information feedback for passengers confirming

   – alarm sent, using a “bell” symbol, and

   – alarm received, voice communication established, using the “communication established” symbol

15.4.8 Stopping/Levelling accuracy

Under intended use:

— the stopping accuracy of the car shall be ± 10 mm;

— a levelling accuracy of ± 20 mm shall be maintained.

15.5 Control devices and signals

Landing and car control devices and signals shall comply with ISO 4190-5; especially those recommended for ensuring the ease of use and access for disabled persons. In Annex A keypad systems and destination oriented lift systems are described. The particular requirements within Annex B for lifts specifically designed to increase accessibility for persons with disabilities — particularly those in wheelchairs — which prefer special horizontal car operating panel shall comply.

In order to maximise the use of any remaining vision, visual contrasts in colour, or, more importantly, tone, can be used positively to help identifying objects and avoid hazards. Proper lighting is essential in conjunction with colours. Blind people need tactile and audible arrangements to be able to function independently. Tactile figures are at the same time both visual and tactile. They should have a good visual contrast according 34 to support people with impaired vision.

A black number or letter on white background is easiest to perceive, and if lit, the contrast should be the other way round in order to avoid glare. Tactile figures in order to be easy to perceive should not be smaller than 15 mm high. The profile of the relief figure should be shaped as a rounded upside-down turned letter V with the height of at least 0,8 mm.

Braille can be used as a complementary and independent feature to tactile figures and is useful where large texts are necessary.

The lift call button should be colour and tone contrasted with the surrounding finishes. This can be achieved using a contrasting panel, or a contrasting border around the button panel.

For passenger lifts accessible to wheelchair users, the buttons shall be accessible by parallel approach of the wheelchair travel. The recommended distance to the centre line of any of the buttons from any wall or door at right angles is 500 mm minimum.

15.5.1 Landing control devices

Consider the particular requirements control devices, signals etc. in ISO 4190-5 especially these which have a reference to ease access and use for disabled persons. Particular requirements from Annex B may be applied to suit special customer needs or to meet national regulations for lifts specifically designed to increase accessibility for persons with disabilities — particularly those in wheelchairs. They are applicable to a nominal load ≥ 630 kg for passenger lifts.

a) For call registration, the necessary operating force on the active part of the button shall be a minimum 2,5 N and a maximum of 5 N.

b) Minimum dimension of the active part: 50 mm × 50 mm or diameter 50 mm.

c) The active part of the button shall be identifiable visually and by touch from the faceplate.

d) The information of call registration shall be visible, audible and adjustable between 35 dB(A) and 65 dB(A). The audible signal shall be given on every individual operation of the button even if the call is already registered.

e) The height from the floor of the lowest button shall be 850 mm ± 5 mm and the height from the floor to the highest button shall be 1 000 mm ± 5 mm.

f) The plate of the landing floor button shall be contrasted to its surrounding background according 34.

g) For passenger lifts accessible to wheelchair users, the minimum distance to the centre line of the button from any corner shall be 500 mm.

If markings exist, the size of the symbol shall be a minimum of 15 mm in raised relief with a thickness not less than 0,8 mm and contrasted to its surrounding background.

The symbol shall be in one of the two following positions:

— preferably on the active part of the button;

— on the left of the active part of the button, at a distance between 10 mm and 15 mm, when measured from the edge of the active part of the button to the edge of the raised relief.

15.5.2 Car control devices

The following requirements for horizontal car controls of ISO 4190-5, Annex B, have to be considered (see figures 24 – 26) to ease use and access for persons with disabilities – particular those in wheelchairs:

a) The requirements according to 15.6.1 a), b), c), d), f) and g) apply.

b) The axis of the first row of buttons shall be located 850 mm from the floor.

c) The distance between adjacent parts of two buttons shall be 10 mm ± 1 mm.

d) The size of any symbol shall be a minimum of 15 mm, in raised relief with a thickness not less than 0,8 mm, located on the active part of the button.

e) Order and positioning of call buttons (see figures 24, 25 and 26):

The call buttons shall be laid horizontally on a tilted plate. The projection on the horizontal of the tilted part shall be equal to 100 mm ± 10.

— In the case of a single row of floor buttons, the floor buttons shall be set from left to right on the centre line of the plate. The “re-opening” door and alarm button shall be on the left of the car operating panel; the alarm button shall be above the “re-opening” door button with a gap of 10 mm ± 1 mm between active parts.

— In the case of two rows of floor buttons, the floor buttons shall be staggered above and below the centre line of the plate in growing order, from bottom to top and from left to right. The “re-opening” door and alarm button shall be on the left of the car operating panel; the alarm button shall be located on the centre line of the plate with a gap of 10 mm ± 1 between active parts.

f) For other car-operating panels, the requirements of ISO 4190-5:2006, 3.2.2.3.4 apply.

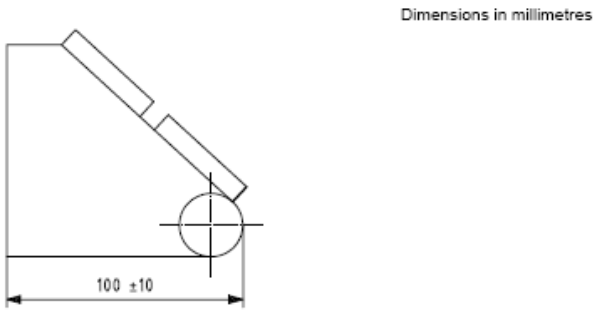


Figure 24 — Horizontal car controls, XL type - Side view, example (ISO 4109-5)

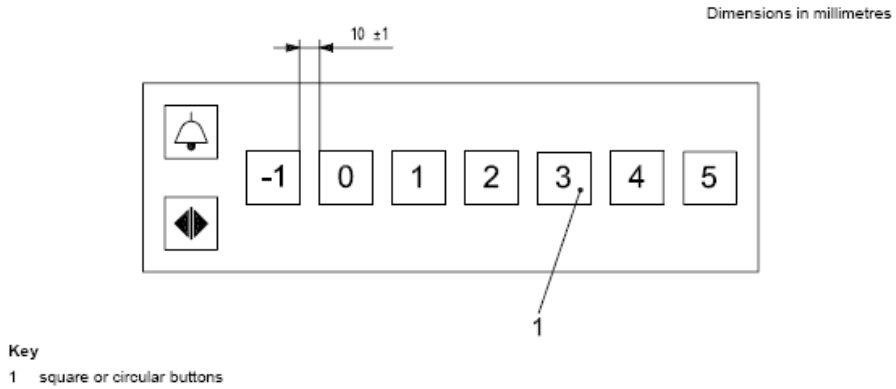


Figure 25 — Example of arrangement of one row of square push buttons (50 mm x 50 mm) (ISO 4109-5)

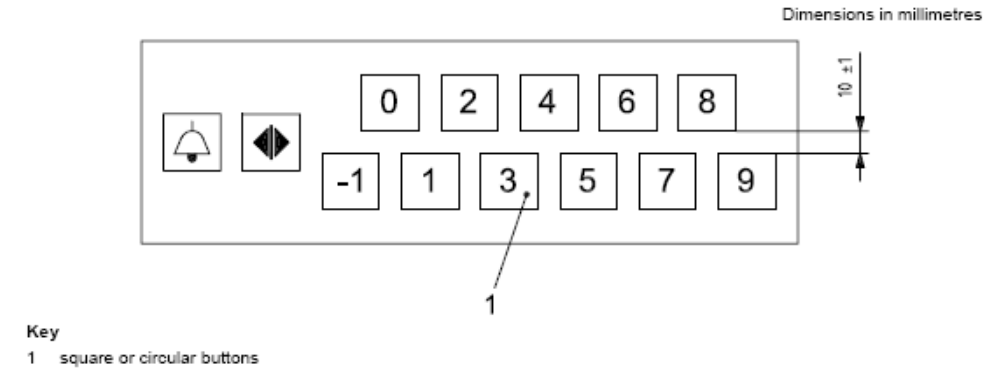


Figure 26 — Example of arrangement of two rows of square push buttons (50 mm x 50 mm) (ISO 4109-5)

16 Vertical platform and stair lifts

16.1 General

“Exceptional considerations for existing buildings”: Vertical platform and stair lifts shall be provided where no accessible lift is possible:

— vertical platform lifts shall comply with ISO 9386-1, ISO 9386-2. For vertical lifting platforms see also prEN 81-41,

— stair lifts shall comply with ISO 9386-1, ISO 9386-2. For stair lifts and inclined lifting platforms see also prEN 81-40.

16.2 Height for platform lifts

The height for platform lifts shall be less than 4 000 mm.

16.3 Vertical platform construction

Vertical parts of the platform shall be able to withstand the application of a force of 300 N, acting at right angles at any point over an area of 5 cm2 of round or square shape without elastic deformation exceeding 10 mm and without any permanent deformation.

Where the driving, guiding or lifting mechanisms present hazards at the sides of a platform, the mechanisms shall be guarded to protect the users. The guarding shall be smooth, hard and continuous.

17 Moving walkways

The contents of this standard are based on the assumption that persons using escalators and moving walks are able to do so unaided. However, motor and sensory abilities in a population can vary over a wide range, escalators and moving walks are also likely to be used by persons with a range of other disabilities.

Some individuals, in particular older people, might have more than one impairment. Some individuals are not able to use an escalator or moving walk independently and rely on assistance/support being provided by a companion. Furthermore some individuals can be encumbered by objects or be responsible for other persons, which can affect their mobility. The extent to which an individual is incapacitated by impairments and encumbrances often depends on the usability of products, services and the environment.

The most important issue to take into account during selection and installation of escalators and moving walks is their safe use by all persons.

Lifts are the preferred method of vertical travel for most people with disabilities and in particular wheelchair users and persons with assistance dogs.

Persons with wheelchair can generally use horizontal moving walks and moving walks with an inclination up to 6 degrees, either unaided, or with an accompanying person. Moving walks with inclinations greater than 6 degrees and escalators are not suitable for persons with wheelchairs.

Special warnings about the presence of escalators or moving walks to inform blind people and to avoid that they try to use it in wrong direction (e.g. audible signal or tactile signalisation as TWSI on the ground) are not taken into account within this standard.

NOTE Different solutions are available worldwide due to the different design concepts and building regulations and are not harmonised yet. These specialised details need to be integrated with the whole design of the building.

Additional signs should be provided to indicate the location of other facilities, these facilities should be in close proximity to the escalators and moving walks and easy to find.

Moving walkways shall be free of protruding objects and obstacles up to a height of 2 100 mm.

A minimum level of illumination of 100 lux shall be provided on moving walkways.

18 Doors and windows

18.1 Doors and door furniture

General requirements for entrance doorways see 10.3.

Doorways shall be designed in accordance to the following additional criteria:

— clear width of doors shall be minimum 800 mm,

— clear height of doors shall be at least 2 000 mm (compare with 10.5),

— a level threshold is recommended for internal and external doors,

— where a raised threshold is/exists/provided/necessary it shall be at a maximum height of 20 mm, be bevelled and have visual contrast,

— a level manoeuvring area on either side of a door (see figure 11 and 12)

— If any door is opening towards a descending stair, the minimum distance for manoeuvring should be 2 000 mm to minimize the risk for wheelchair users, see also 13.3 landings.

18.1.1 Clear opening of doorways

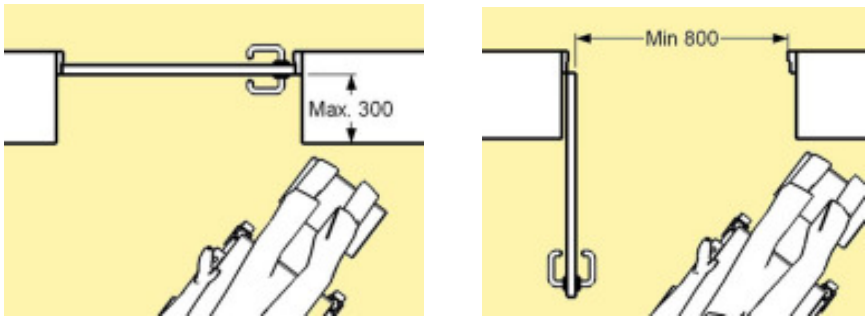


Figure 27 — Clear opening of swing doors

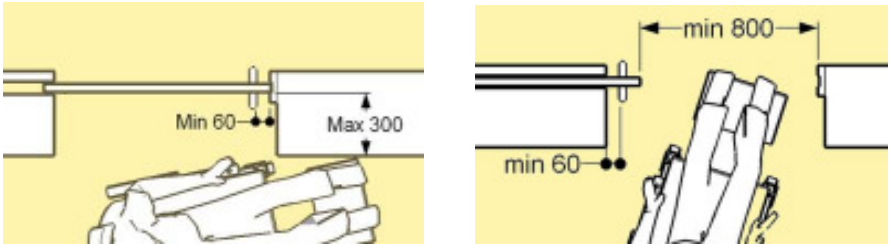


Figure 28 — Clear opening of sliding doors

The minimum clear opening of a doorway on a continuous accessible path of travel shall be 800 mm when measured from the face of the door (see Figure 27 and 28). Consider detailed information and alternatives in A.7.

The maximum distance from the face of the door to the wall surface shall not exceed 300 mm.

18.1.2 Position of a door

An operating space of not less than 600 mm shall be provided between the leading edge of a door and a wall that is perpendicular to the doorway: This space is necessary to permit opening of the door by a wheelchair user or a walking frame user (see Figure 27). This requirement does not apply to automatic doors.

18.1.3 Operating force

When the operating force needed to open the door is higher than 2.2 kN, it is recommended to use an automatic opening door.

People with impaired mobility often experience difficulties when using self-closing doors. The force required to open doors should be less than 2.2 kN.

Buildings for public use should preferably have sliding automatic doors with dual powered controlled door opening and closing and a hold-open device.

18.1.4 Glazed doors and glazed areas

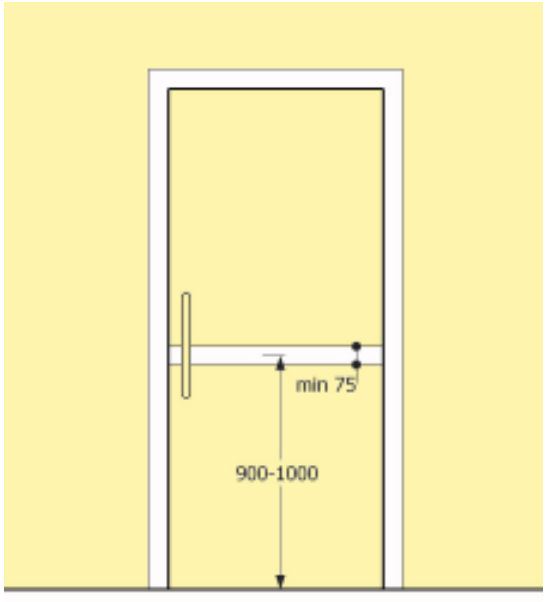


Figure 29 — Markings on glazed doors

Glazed (screen) walls and fully glazed doors shall be clearly marked with visual indicators. Large glazed areas close to circulation spaces could be mistaken for openings.

Uninterrupted visual indicators of at least 75 mm height with a minimum visual contrast of 30 to the background shall be placed at a height between 900 mm – 1 000 mm above floor level, see figure 29.

NOTE People who are blind or have a visual impairment, have a depth of field limitation, which results in them looking down at an angle of 45 – 50 degrees. This also allows them to choose a safe path of travel. When they are within 1 m – 1,5 metres from a fully glazed door or sidelight they will be able to detect the visual barrier at a height of 900 mm – 1 000 mm, provided the visual contrast criteria has been applied to the background on which it is being viewed. The background in all cases will be the circulation space on the opposite side of the door.

18.1.5 Viewing panels in doors

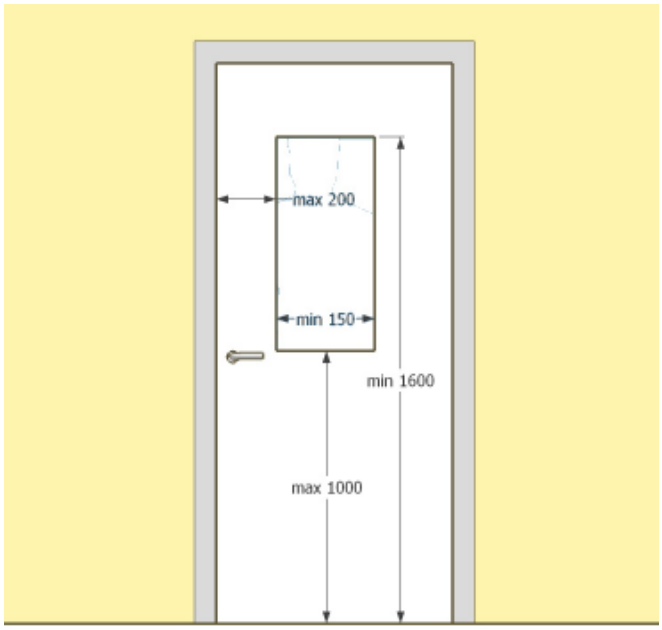


Figure 30 — Door with glazing viewing panel

If viewing panels are provided they shall comply with the following requirements (see also figure 30):

— the lower edge of the glazing shall be no more than 1 000 mm above the plane of the finished floor,

— the upper edge of the glazing panel shall be not less than 1 600 mm above the plane of the finished floor,

— in width, the glazing shall extend to within not more than 200 mm from the latch edge of the door and the glazing not less than 150 mm wide,

— the glazing panel may be subdivided by narrow construction cross sections if sight is not restricted.

18.1.6 Visual contrast of doors and door furniture to the wall

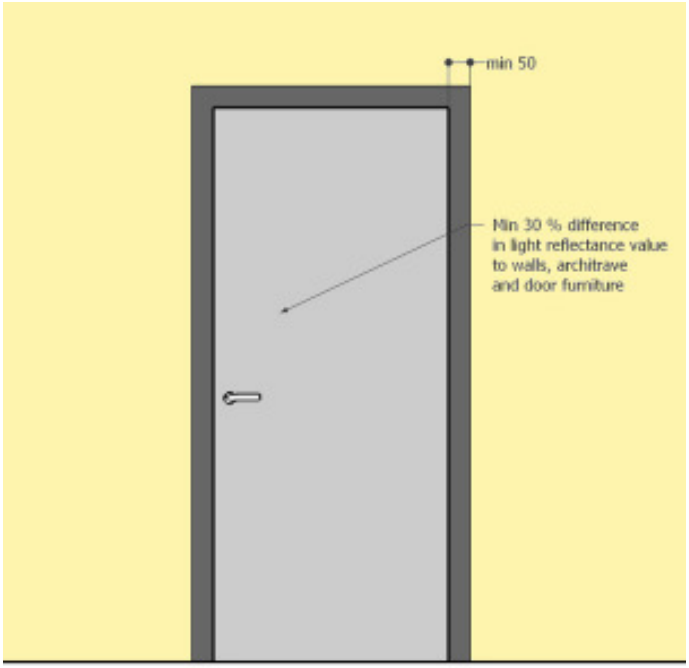


Figure 31 — Door with sufficient visual contrast

Doors forming part of an accessible path of travel shall have a visual contrast of not less than 30, described in 34, provided between

— door and door furniture;

— door and adjacent wall:

— architrave and wall; or

— door and architrave.

The minimum width of the area of visual contrast shall be 50 mm.

If this is not possible to achieve, at least a marking of 50 mm width (e.g. around the frame of the door), with a different visual contrast from the wall – LRV not less than 30 – must surround all the perimeter of the door (see figure 31).

18.1.7 Automatic opening doors

The minimum width shall be at least 800 mm. In narrow spaces sliding doors may be preferable. All automatic doors should be capable of remaining totally open (at least by 90º in the case of hinged doors) without manual support.

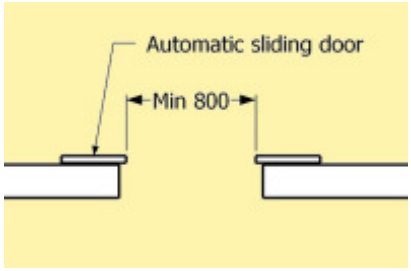


Figure 32 — Automatic sliding door

18.1.8 Powered swing door

A powered swing door shall be:

— provided with a suitable detection device that is set to ensure that a person approaching or leaving the door will not come into contact with the door during the opening and closing phases;

— fitted with a return delay mechanism that allows sufficient time for safe passage and for detecting the presence of a person laying on the floor within the door closing area;

— capable of being used manually in the event of electrical or mechanical failure.

18.1.9 Revolving door

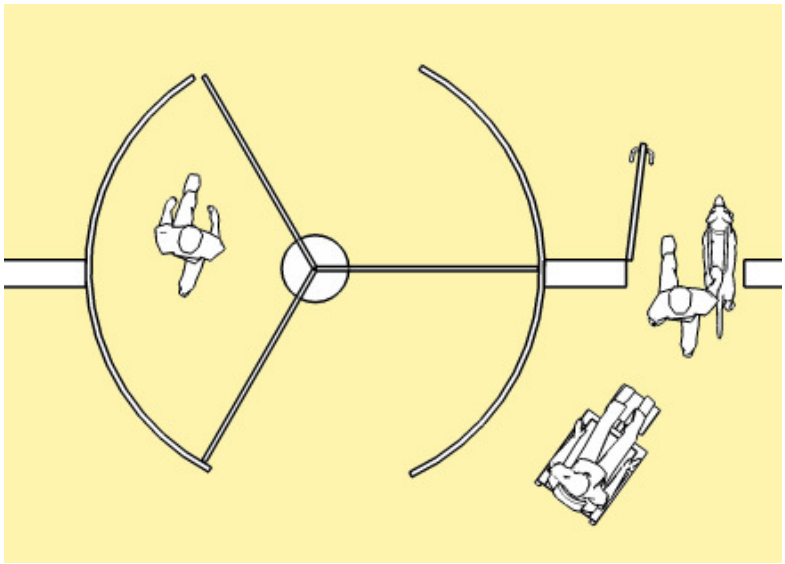


Figure 33 — Revolving door accompanied by door suitable for people who walk slowly, use a wheelchair or have impaired sight

Where a revolving door or turnstile is installed a hinged or sliding door shall be provided as an alternative alongside.

NOTE Unless of a significant size and power-operated, revolving doors are not suitable for use by people who can only walk slowly, use a wheelchair or have impaired sight.

A revolving door shall be large enough to allow safe passage and accommodation for a child's perambulator and its accompaniment by two adults or for a wheelchair user and a companion (see figure 33).

An automatic revolving door shall be equipped with means to slow it or to stop it if it is subjected to pressure or resistance.

18.1.10 Automatic sliding or folding door

An automatic sliding or folding door shall be equipped with a mechanism to prevent its colliding with a user and anything that is being pushed pulled or, otherwise, being transported through the doorway.

Stair landing doors and room doors

Doors should not obstruct the flow of people or create a collision hazard. The door shall never obstruct the escape route.

18.1.11 Door furniture

Door locks or other technical devices to open the doors shall be reachable and operable. Door furniture shall be between 800 mm and 1 000 mm in height, preferably 900 mm. (Consider also B.8.1).

Adequate clear passage spaces must be available on either side of the doors to enable people in wheelchairs to access the door controls and pass through. Consider 18.1.1 and Figures 11 and 12.

18.1.12 Glazed walls and screens

Glazed walls and glazed screens should be marked as stated in 18.1.4.

18.2 Windows and window furniture

18.2.1 Restriction opening

Opening windows shall not project into pedestrian areas below a height of 2 100 mm.

18.2.2 Manoeuvrability of hardware and shutters

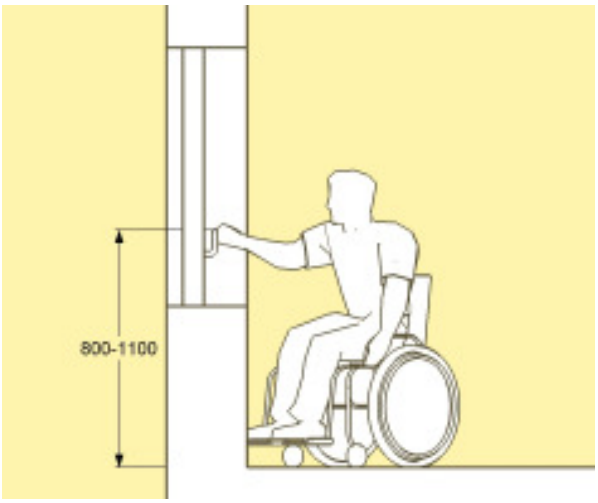


Figure 34 — Heights of hardware and shutters

Windows should be easy to open and close and windows should be manoeuvrable with only one hand.

Hardware and shutters and switches for remote control should be placed between 800 mm and 1 100 mm above floor (see figure 34). If this is not possible the maximum height is 1 200 mm above floor.

18.2.3 Height of the window

To enable wheelchair users to see through a window comfortably, the glazing should be no higher than 1 100 mm from the floor.

18.2.4 Visual indication of glazed areas

Consider the requirements stated in 18.1.4 and 34.

19 Receptions, counters, desks and ticket offices

19.1 Hearing and lip-reading

Receptions, counters, ticket sales and offices in noisy environments etc. or those equipped with a separating security screen shall have at least one position fitted with a hearing augmentation system (e.g. induction loop system) to assist hearing-aid users, as described in 32, and shall be clearly marked with the appropriate symbol.

Avoid positioning of these facilities in front of windows where bright sunshine will cause the user's face to be in shadow and hence difficult to lip-read. Reflections and glare on separating safety glazes have to be avoided.

An alternative access to the desk/service for people with visual impairments should be provided.

19.2 Location

Counters and reception desks should be located and clearly identified so that they are easily recognisable from a building entrance by people with visual impairments. Information reception points near the main entrance could be a suitable provision for greater buildings to support people with visual impairments.

Use of contrasting materials and colours is recommended.

NOTE Suitable carpets or entrance flooring systems or tactile walking surface indicators can help in locating reception counters for people who are blind or partially sighted. Such products should be specially designed to greatly reduce trip & slip hazards.

The general design requirements for colour and visual contrast should be considered (see 34).

19.3 Space to manoeuvre

Counters, desks and ticket offices should be accessible by wheelchair users on the service side and the server side. At least 1 500 mm diameter clear manoeuvring space shall be provided on the service side and the server side, 1 800 mm is preferred.

19.4 Height

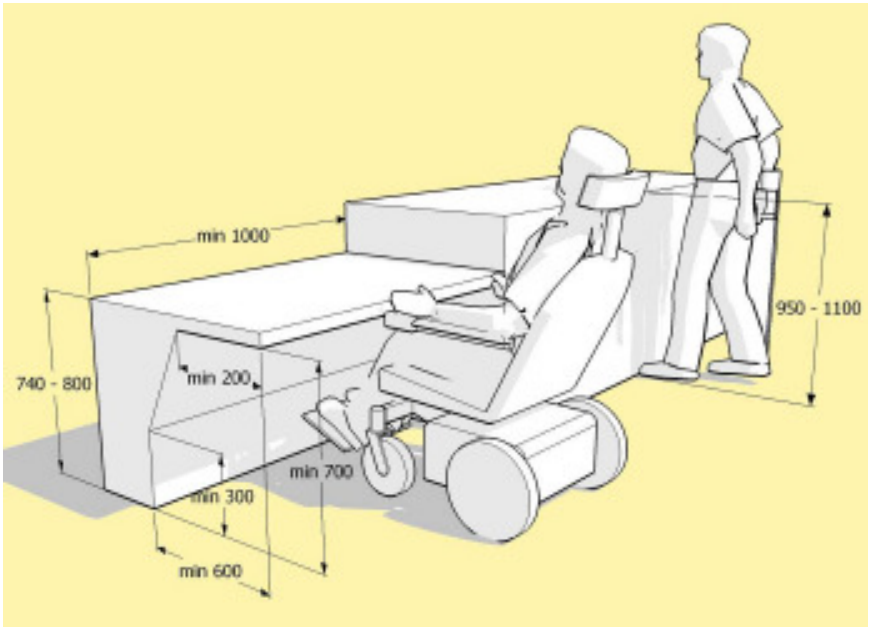


Figure 35 — Heights of counters suitable for wheelchair users

The surface level has to be provided in a range between 740 mm – 800 mm. Free accessible height underneath shall be provided with at least 700 mm and 1 000 mm width, see also Figure 35.

Reception desks where some kind of writing is supposed to be done by the visitor (for example receptions at hotels) should allow frontal approach by wheelchair users with space to provide clearance for wheelchair user's knees. At least a part of the desk should be at a height suitable as a writing place for standing people, see Figure 40. For communication only the desk shall have a maximum height of 900 mm.

19.5 Lighting

To facilitate lip reading, the lighting design should ensure that the receptionist's face is evenly lit.

The reading and writing surfaces at counters, desks and ticket offices shall be illuminated to a level of at least 200 lux in the room and on the desk in a range of 350 lux– 450 lux.

19.6 Waiting area

If a queue number ticket system is used, it shall be suitably designed and be accessible. All control devices shall be located according to 35 and B.8. All necessary information shall be given in simple wording, with sufficient visual contrast – LRV of minimum 30 – and based on the two-sense-principle (consider 32 and 34). The ticket machine and the calling system shall provide visual and audible output.

Some seats should be located so that a guide dog or assistance dog can accompany its owner and rest in front of, or under, the seat.

20 Cloak-room

Mirror should be possible to use from standing and sitting position.

A chair with armrests is needed for people who need to sit down to put shoes on or take them off (reference to seating).

Coat hooks should be set at different heights: some of the hangers at 850 mm – 1 200 mm; the other hangers at 1 800 mm.

21 Auditoriums, concert halls, sports arenas and similar seating

21.1 Hearing augmentation systems

A hearing augmentation system should be provided. The system should also allow people on the stage/platform to use the same system. Consider requirements in 32.

21.2 Lighting for interpreters sign language

Adequate provisions should be made for people to interpret sign language and if practicable to lip-read. Lighting on the faces and hands of presenters and people signing will need to be provided at an angle of 45 – 50 degrees from horizontal at ceiling level for people with a hearing impairment to read the presenter's lips and the signer's lips and hands. A suitable contrasting backdrop must also be provided, to assist in reading the presenter's lips and hands.

21.3 Designated seating for wheelchair user

At least 1% of seats shall be designated for wheelchairs users (with a minimum of 2). These spaces should be integrated among other seats and allow two wheelchair users to stay together. It is recommended that the armrest on the seats at the end of the row be lift-up ones to allow transfer from the wheelchair onto a seat.

21.4 Access to stage and backstage

Access to the stage and to the backstage area for people using wheelchairs shall be provided in new buildings. Adequate provisions should be made to direct the user to the designated spaces.

21.5 Row and seat numbers

The row and seat numbers should be legible for the benefit of people who are blind or have a visual impairment. They should be tactile, with adequate size and visual contrast; consider requirements in 34 and 39.

21.6 Accessible Changing rooms

The minimum number of accessible changing rooms may be subject to national requirements or regulations, depending on the type and use of the building.

In the event that changing rooms are provided alongside a toilet area, these should comply with the specifications indicated in 26.

A fixed bench should be set at a height of 400 mm – 480 mm above floor level. The bench should be no less than 500 mm wide x 2 000 mm in length, and provided with a grab rail at a height of 750 mm with a clearance of between 45 mm and 65 mm from the wall.

A clear space of 1 500 mm x 1 500 mm beside the bench shall be provided.

Coat hooks should be set at different heights: 850 mm – 1 200 mm, additionally at least one hook at 1 800 mm.

Provision of call bell may be provided in accordance with 35.

Changing rooms in sports facilities shall have a minimum area of 4 m^2.

22 Conference rooms, meeting rooms

Consider the special requirements for accessible sanitary facilities in 26 and sufficient acoustic provisions in 32 especially induction loop systems.

NOTE Reverberation time for speech, music etc. should be given by national provisions.

All equipment supposed to be used by people chairing or participating in the meeting shall be in a height of 800 mm -1 100 mm. Consider also 35.1.

23 Viewing spaces in assembly areas

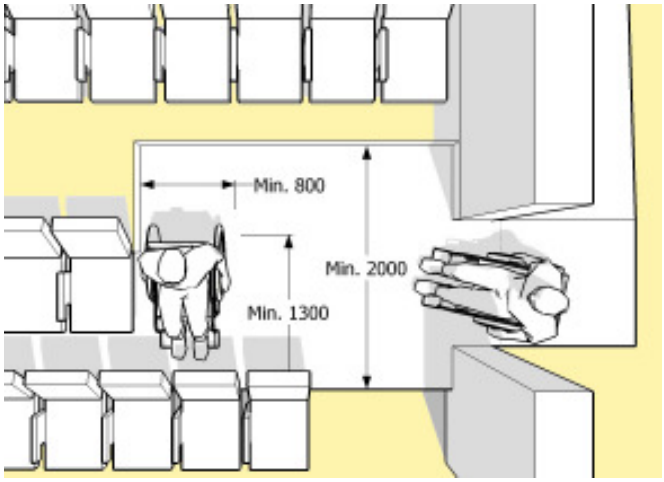


Figure 36 — Example space for wheelchair users

23.1 Floor area

The floor area for a wheelchair viewing space shall be connected to an accessible path of travel and shall meet the following requirements:

— at least 800 mm x 1 300 mm

— the depth of the row shall be minimum 2 000 mm

— on a clear and level surface

— multiple wheelchair spaces shall be located beside regular seating rows especially for the accompanying person.

Manoeuvring space to and from the designated area shall be provided.

23.2 Sight lines

Wheelchair spaces shall provide viewing spaces that are:

— comparable to those for all viewing positions with minimum unobstructed eye level up to 1 200 mm and

— not reduced or obstructed by standing members of the audience.

Row and seat number identification signs shall be legible to persons who are visually impaired (consider 39.5).

24 Bars, pubs, restaurants etc.

Sufficient space for internal passages and manoeuvring space between tables and the way to the accessible sanitary facilities is necessary (consider 4, 10, 18.1, 26, 35 and B.8.1).

An induction loop system should be installed at the counter. Consider the acoustic recommendations in 32

The general design requirements for colour and visual contrast should be considered as described in 34.

25 Terraces, verandas and balconies

Terraces, verandas and balconies shall be accessible to all people, including people with mobility impairments, in accordance with 10.6 and 35.

Parts of these facilities should be covered with a canopy/pergola to give shelter against the weather (sun/rain/snow).

Walking surfaces should be slip resistant.

26 Accessible toilets and sanitary rooms

The requirements contained in this section apply to building in use by the public, for example hotels, working places, public buildings and buildings used for sport and recreation activities.

Fixtures and fittings in sanitary facilities should visually contrast with the items and surface on which they are positioned.

The minimum illumination at 800 mm above floor level should be 200 lux in the area of the washbasin.

The floor surface should be slip resistant, anti-glare and firm.

Sanitary facilities shall be able to accommodate a variety of users, including children and parents with children.

Ambulant accessible toilet, 600 mm – 650 mm, 46 cm – 48 cm, 900 mm square in front of the pan, door should be opened outwards; see figure 37.

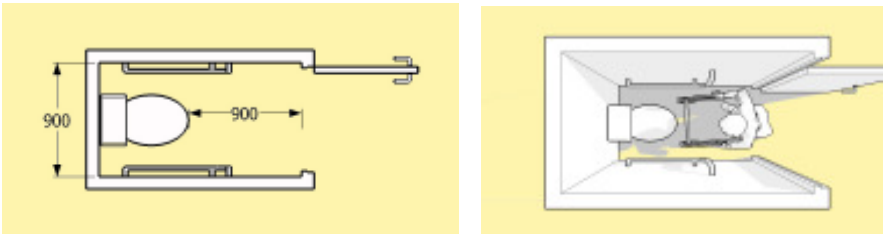


Figure 37 — Ambulant WC

26.1 Accessible Toilets

If no other national requirements or regulations are available, the following will apply:

— at least one accessible toilet shall be provided,

— the accessible toilet shall always contain a washbasin.

National provisions may give the number and type of WC (lateral transfer from two sides or corner WC), taking into consideration the type and use of the building and circumstances in which unisex or single sex provision would be acceptable.

Accessible toilets that can be used by both sexes allow the greatest flexibility for people who require assistance.

Light switches should be fixed inside all accessible toilet cubicles or the light should automatically switch on when someone enters the room. Timed light switches should not be installed or used.

26.2 Dimensions for accessible toilets

Layout of toilets should be designed with separate mens, womens and accessible toilets.

The accessible toilet shall allow a clear manoeuvring circle at floor level of 1 500 mm diameter. (See B.8).

The cubicle shall allow a clear turning-circle of 1 500 mm diameter at floor level in front of the toilet seat and also in front of the washbasin.

“Exceptional considerations in existing buildings”: If the measures given above cannot be achieved due to technical reasons the manoeuvring circle at floor level may be reduced but it must be recognised that such a reduction would discriminate against a substantial number of people who use wheelchairs.

The WC space should allow frontal, oblique and lateral transfer to the WC. The minimum measures for an accessible WC with all transfer possibilities are 2 200 mm width and 2 500 mm depth.

The WC with lateral transfer from both sides is recommended (see figure 38). For lateral transfer the minimum free clearance shall be 900 mm (better up to 1 200 mm) beside the toilet seat.

NOTE Minimum clearance of 900 mm accommodates only 65% of the wheelchair users, clearance of 1 200 mm accommodates 90% of all wheelchair users especially also those who use electric wheelchairs.

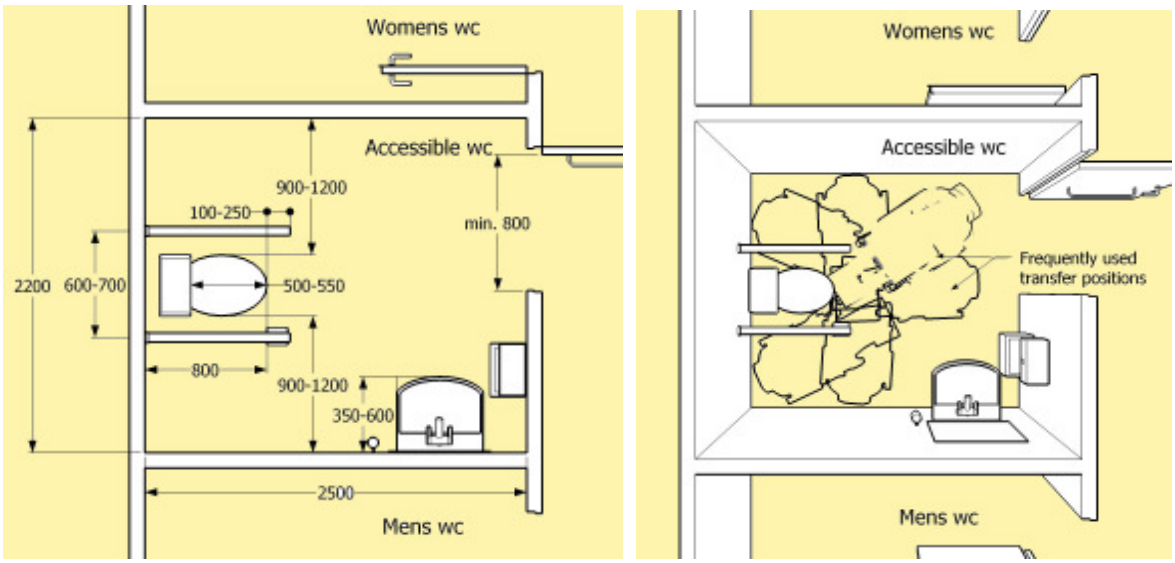


Figure 38 — Accessible assisted WC, lateral transfer from both sides possible

When more than one accessible corner WC (free space on one side of the toilet, see figure 39) is planned, a choice of layout suitable for left hand and right hand transfer should be provided. The minimum measures for an accessible corner WC are 1 650 mm width and 2 150 mm depth.

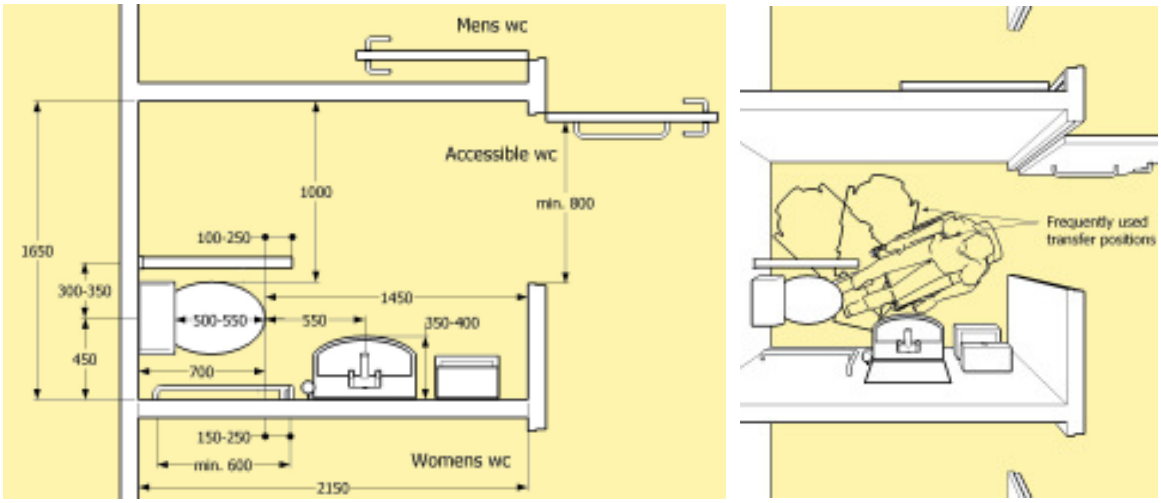


Figure 39 — Accessible corner WC, transfer from one side possible

26.3 Toilet Doors

Toilet doors should comply with the specifications indicated in 18.1.

The door shall have a clear width of at least 800 mm and it shall be easy to open and close. The door should open outwards. If the door opens inwards, there must be the ability to open the door outwards or to remove it from the outside. There should be no openings under or above the door.

26.4 Sanitary fittings

26.5 Toilet seat

The top of the toilet seat shall be between 400 mm and 480 mm from the floor.

NOTE 1 The differences in stature of the population worldwide may require lower or higher heights of toilet seats. National regulations may give the most convenient and appropriate height for an accessible toilet seat at a national level.

The minimum distance from the edge of the toilet seat to the rear wall should be between 650 mm and 800 mm**,** see figures 38and 39.

NOTE 2 The differences in stature of the population worldwide may require different length of toilet seats. National regulations may give the most convenient and appropriate length for an accessible toilet seat at a national level.

Minimum distance of a corner WC from the pan to the adjacent wall should be 250 mm (see figure 39).

If a backrest is provided the distance from the seat to the backrest should range between 500 mm and 550 mm (see figure 39).

Toilets for children should have a distance from the center line to the adjacent wall of 305 mm – 380 mm. The toilet seat height is 205 mm – 380 mm.

26.6 Grab rails

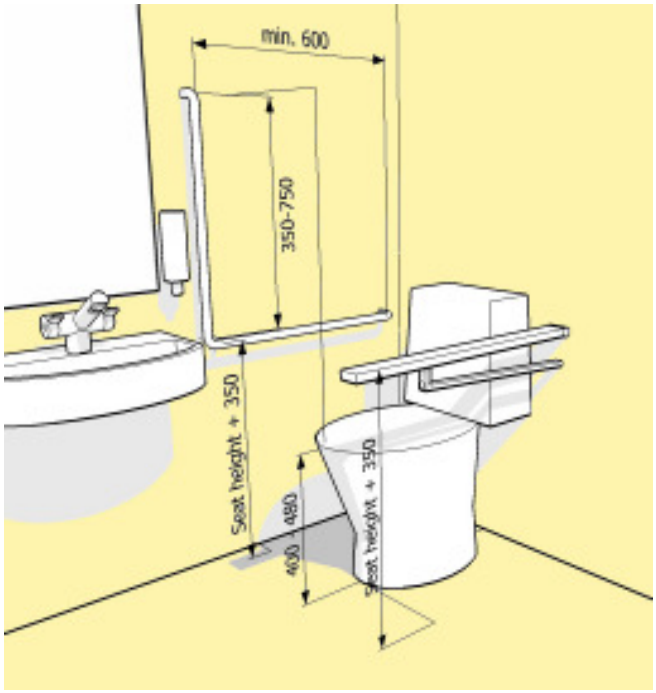


Figure 40 — Positioning of grab rails and toilet paper in an accessible corner toilet

On both sides of the toilet a grab rail shall be provided at the distance of 300 mm to 350 mm from the centre of the pan. Minimum distance from the wall should be 50 mm.

On those sides where lateral transfer is possible, a foldable grab shall be provided at a height of 750 mm. Grab rails shall withstand 1kN force from any direction. The length of the foldable grab rail should overlap the front edge of the toilet seat in between 100 mm – 250 mm.

Where a wall is beside the toilet, a horizontal grab rail shall be provided at a height of 750 mm and a vertical grab rail shall be provided between 750 mm in height and the upper edge 350 mm – 750 mm higher, with distance of minimum 150 mm to the front edge of the toilet seat (see figure 40). The height of the grab rail should be 350 mm above the seat height.

The top 270 degree arc of the horizontal grab rail has to be uninterrupted for its full length.

Grab rail height for toilets for children should be 510 mm – 635 mm.

26.7 Toilet paper

Dispenser for toilet paper must be reachable from the toilet seat, either under the grab rail or at the side-wall of a corner WC at a height of 600 mm to 700 mm from the floor, see figure 40.

26.8 Washbasin

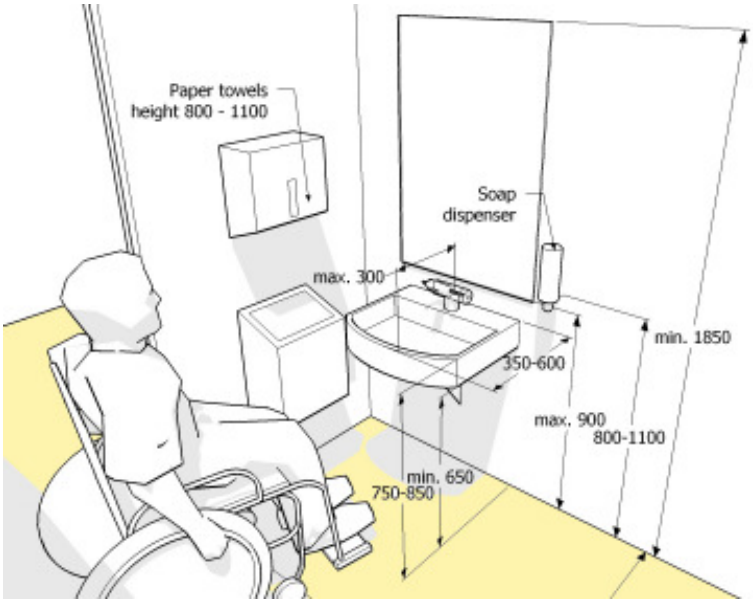


Figure 41 — Placement of washbasin and mirror above the washbasin with distance of sanitary appliance

A washbasin shall be provided within an accessible toilet.

The top of the washbasin should be located between 750 mm to 850 mm from the floor.

NOTE The differences in stature of the population worldwide may require lower or higher heights of washbasin. National regulations may give the most convenient and appropriate height for washbasins at a national level.

The space under the washbasin shall be unobstructed with a knee clearance centred on the washbasin between 650 mm and 700 mm high and 200 mm deep. In addition, a toe clearance of minimally 300 mm high has to be provided (see figure 41).

In front of the washbasin, space should allow frontal or oblique approach by a wheelchair.

The washbasin should be located with a depth of 350 mm – 600 mm from the wall.

The reaching distance of the tap control shall be maximum 300 mm, according to fig. 42.

The mirror above the washbasin shall be minimum 900 mm above the floor up to a height of 1 850 mm, see Figure 41. If a second mirror is provided the minimum height above the floor should be 600 mm up to 1 850 mm.

A shelf of minimally 200 mm x 400 mm shall be provided near the washbasin at a height of 850 mm or combined with the washbasin.

In some countries a smaller washbasin (350 mm – 400 mm) is widely used with a distance from the pan to the middle of the washbasin of 550 mm. If the washbasin cannot be reached a hose should be provided from the seated position.

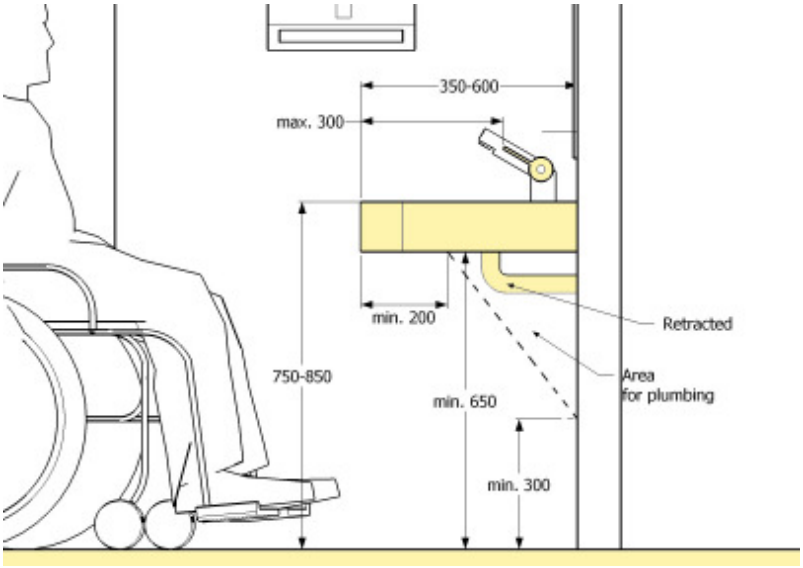


Figure 42 — Washbasin with knee / toe clearance

26.9 Water supply

If the washbasin cannot be reached from the toilet seat an independent water supply (hand-held shower) should be next to the toilet needed for hygiene. An alternative can be a combination of bidet and pan/built-in – bidet.

26.10 Taps

Taps should be mixer, lever or sensor operated to aid operation. The tap controls should be set no more than 300 mm from the front of the washbasin.

It is recommended that a thermostat be installed to limit the temperature of hot water to a maximum of 40 °C in order to prevent scalding.

26.11 Urinals

When wall hung urinals are fitted in the toilet, at least one of these should be set at a height between 600 mm and 750 mm and equipped with a 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 at least 750 mm wide and 100 mm deep.

26.12 Other fittings

All other fittings like coat hook, water tank, hand dryer, hand-held shower etc. should be set at a height of 800 mm – 1 000 mm (consider also 35.1).

Toilet doors should be easy to open and close and comply with the general specifications indicated for doors in 18. A horizontal pull handle on outward opening doors shall be provided at a height of 700 mm above floor.

Doors should preferably open outwards. If the door opens inwards, there must be the ability to open the door outwards or to remove it from the outside (in this case it will be necessary to provide more clear space inside the WC room).

There should be no openings under or above the door.

Light switches should be fixed inside all accessible toilet cubicles or the light automatically lit when someone enters the room. Timed light switches should not be installed or used.

26.13 Alarm

An alarm system shall be provided which can be activated from two positions (position 1: sitting on the toilet, position 2: laying on the floor). This alarm system has to be connected with an emergency help desk.

26.14 Shower

The shower area shall have level access entry and there shall be no fixed elements that prevent approach and side access to same.

The shower area should be 900 mm x 1 300 mm with a transfer area of 900 mm x 1 300.

The slope of floor in the shower recess shall have a gradient between 1:50 and 1:60. The outside area of the shower floor shall have a gradient between 1:70 and 1:80 draining into the shower recess. Transition into the shower recess shall be level without a step down, a raised step kerb or hob at the entry to the recess.

The waste outlet should be centrally located and be a round type outlet and not the channel type to ensure stability of the shower chair.

The shower should be fitted with an easily operable foldable seat that folds in an upward direction. If a foldable seat is provided, the minimum size shall be 450 mm x 450 mm, set at 400 mm – 480 mm above floor level and a maximum of 40 mm from the rear wall. The fastenings for grab rails and construction for the foldable seat shall be able to withstand a force of 1,1 kN applied at any position and in any direction.

NOTE Shower wheelchairs are sometimes used instead of shower seats. See Figure. 43.

The foldable seat shall have the following features:

— self-draining

— slip-resistant

— rounded front corners (radius 10 mm to 15 mm)

— rounded top edges (minimum radius of 2 mm to 3 mm)

— fold in a upwards direction, when folded it shall not present a hazard and the grab rail shall be accessible from the foldable seat

Grab rails shall be set according to 26.6 and figure 43. The shower area shall always be fitted with at least one vertical grab rail which may hold the flexible shower head. The length of the flexible shower hose shall be at a minimum 1 200 mm. The handheld shower head should be provided within at least 1 000 mm and 1 800 mm above the plane of the finished floor. Shower hose fitting should be at a minimum of 1 300 mm above floor level.

Shower controls and folding seat shall be set according to figure 43.

If the shower is combined with an accessible toilet the manoeuvring areas may overlap as shown in Figure 44.

If two or more shower recesses are provided, at least one shall be on the opposite side.

26.15 Individual Shower room

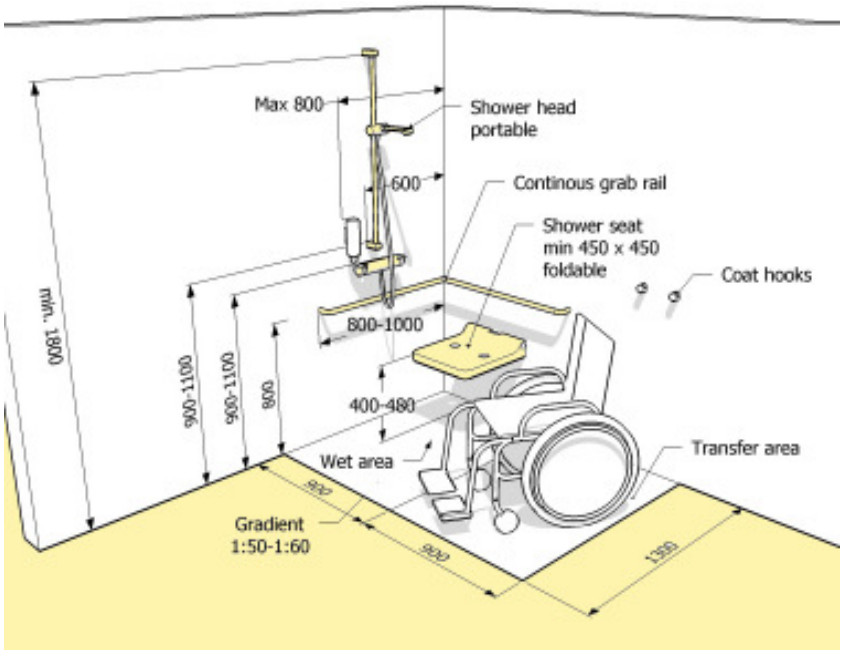


Figure 43 — Example of a shower place with grab rails, adjustable shower head and folding seat

A free space of at least 1 300 mm x 900 mm shall be provided to the side of the foldable seat to allow access from a wheelchair in addition to the manoeuvring space of 1 500 mm.

The means of screening a shower recess shall be either by a curtain or a door system that maintains the required circulation and manoeuvring space.

A shower head support grab rail shall be fixed on the wall in the position shown in Figure 43.

A hand held shower head shall be provided which has a flexible hose of a minimum length of 1 200 mm and is able to reach within 100 mm of the shower floor.

An adjustable shower head holder shall be provided to support the shower head, and which complies with the following:

— be installed on the shower head holder support grab rail as shown in Figure 43,

— allow the graspable portion of the shower head to be positioned at various angles and heights,

— allow the graspable portion of the shower head to be located at heights between 1 000 mm and 1 800 mm above the plane of the finished floor.

The fastenings, materials and construction of the seat shall be able to withstand a force of 1.1 kN applied at any position and in any direction.

Grab rails shall be fixed on the walls in the positions shown in figures 43. All other devices, e.g. taps, soap holder may be situated in an accessible range of 900 mm to 1 100 mm.

26.16 Bathrooms

This section applies to buildings that require bathing facilities, such as hotels, motels, hostels, residential homes and sports buildings where baths are provided as an alternative, or as a supplement to showers.

If only one accessible bedroom for people with disabilities is provided, it should be connected to an accessible shower room, rather than a bathroom, since many disabled people can only use a shower due to their physical disability. If more than one accessible bedroom is provided, a choice of shower or bath and a choice of right or left hand transfer to WC and shower or bath should be provided.

All accessible bathrooms should always contain an accessible WC.

En suite facilities should be chosen as the preferred solution for accessible bedrooms, even when they are not provided generally for guests or residents in a hotel, motel or nursing home. If this is not possible, bathroom accommodation should be provided in close proximity to accessible bedrooms.

The minimum overall dimensions of a bathroom intended principally for independent use, incorporating a corner WC and a large basin, should be as shown in figures 44, 46 and 47.

In bathrooms with a WC that are intended for independent use, the direction of transfer to both bath and WC should be consistent.

When more than one bathroom for independent use incorporating a corner WC is planned, a choice of left hand and right hand transfer layouts should be provided.

Auxiliary grab rails should be set in accordance with the location of the bathtub.

NOTE To make a bathtub accessible for user of bath lift or hoist, a free unobstructed space under the bathtub is needed.

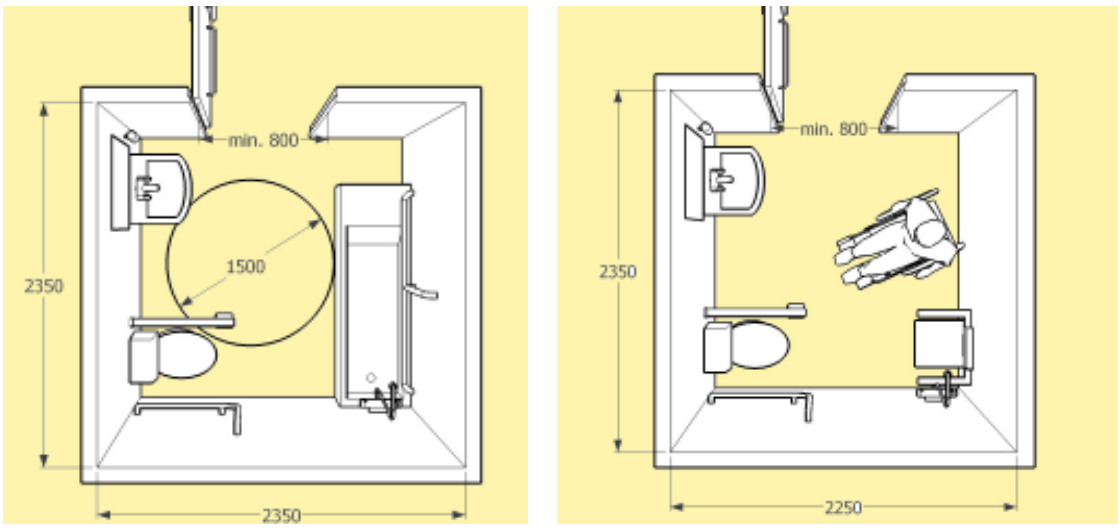


Figure 44 — Examples of a bathroom with bathtub and shower for independent use with a corner WC

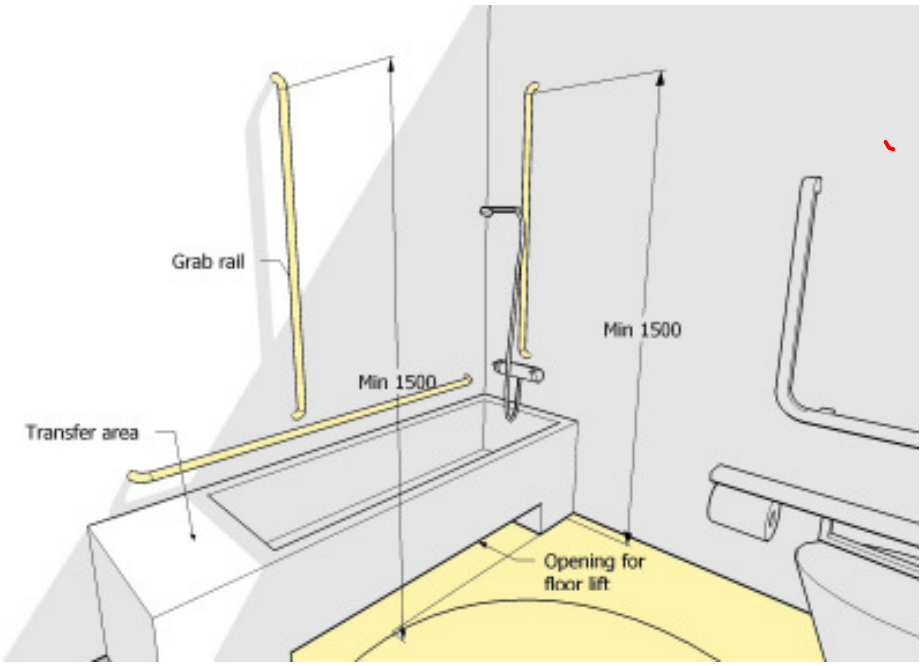


Figure 45 — Example for Grab rails and transfer facilities surrounding the bathtub Transfer posibilities

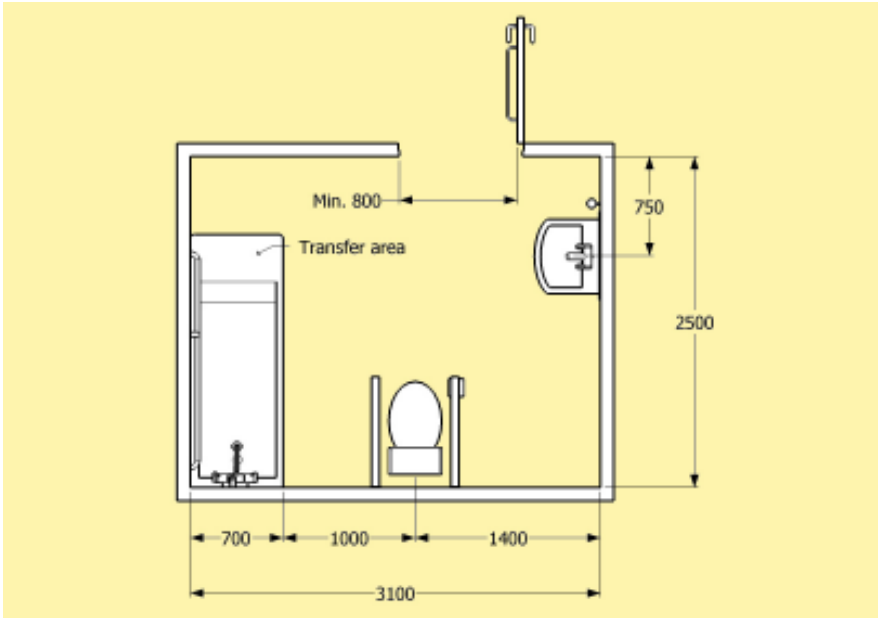


Figure 46 — Example of a bathroom for assisted use of a bath and peninsular WC

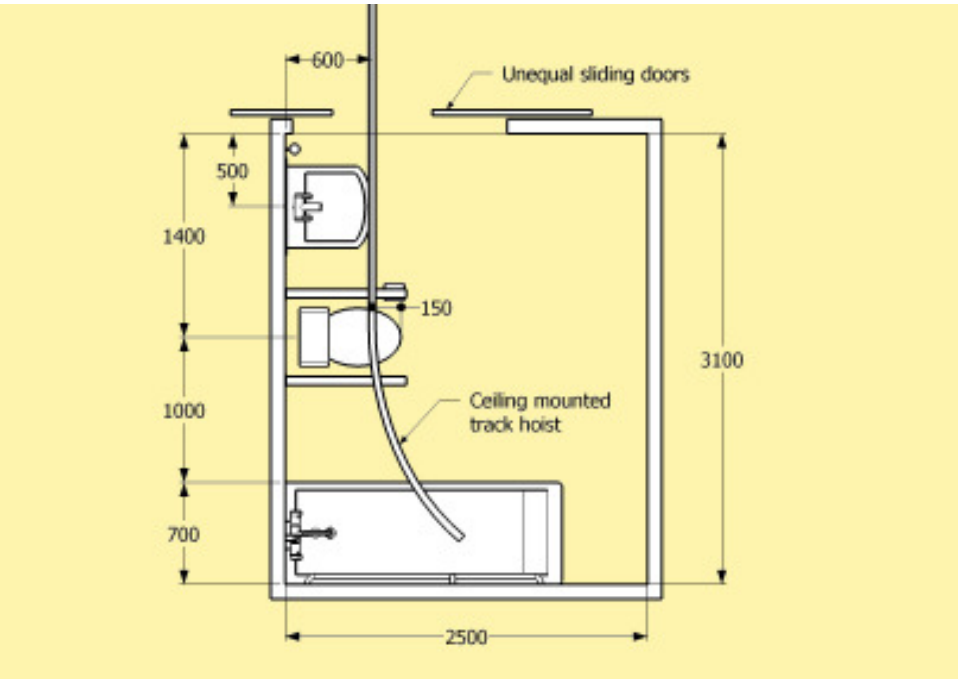


Figure 47 — Example of a bathroom with a ceiling mounted tracked hoist for independent or assisted use

Auxiliary grab rails should be set in accordance with the location of the bathtub.

NOTE To make the bathtub accessible for user of bath lift or hoist, a free unobstructed space under the bathtub is needed.

27 Accessible bedroom in non-domestic buildings (hotels etc.)

Access to the accessible room shall be in accordance with the requirements outlined in this standard, in particular with section 4 and 5. The minimum number of accessible bedrooms in non-domestic building (hotels, guesthouses, etc.) may be subject to national requirements or regulations. At a minimum one accessible bedroom should be provided for every 20 standard bedrooms, or part thereof.

Queensize bed is preferred, 1 500 mm width x 2 000 mm length.

An open space of at least 300 mm between the floor and the bed should be provided to facilitate the use of a lifter or hoist.

The free space on at least one side of the bed should be 1 500 mm but shall not be less than 1 200 mm. On the short side of the bed at least 1 200 mm is required.

Sufficient clear manoeuvring space is needed around the cupboard, doors and way to the sanitary facilities (toilet room).

There should be a bench for luggage at a height 450 mm – 650 mm.

The minimum height of a bed shall be 450 mm - 500 mm, when it is compressed under a 90 kg weight.

Communication for people with hearing impairments/visual impairments/cognitive functioning and according signs – consider 32 and Annex B.

Alarm systems shall be accessible to people with visual and hearing impairments, including, for example, vibratory warning systems.

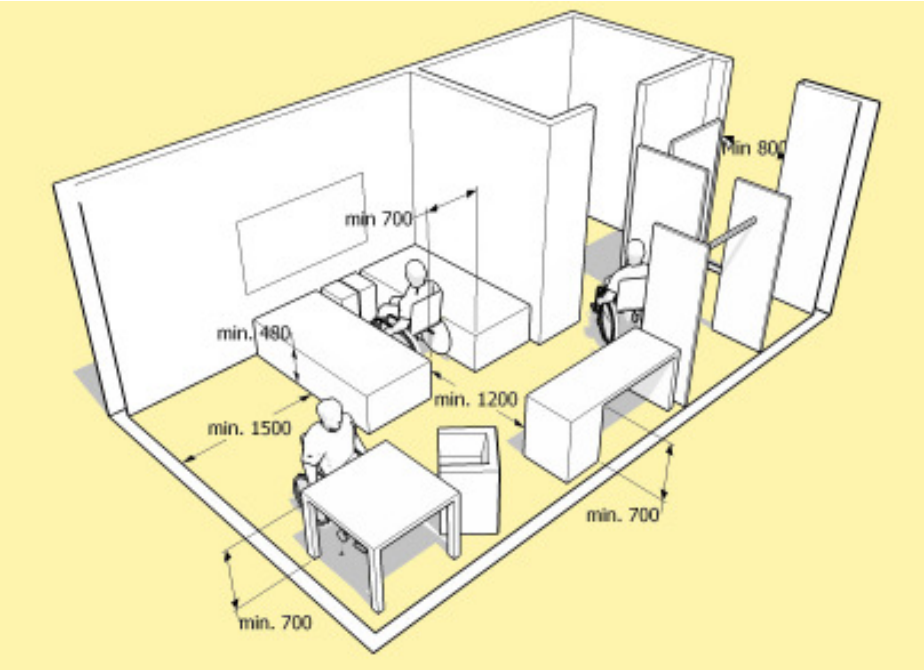


Figure 48 — Example for space allowances for accessible bedroom

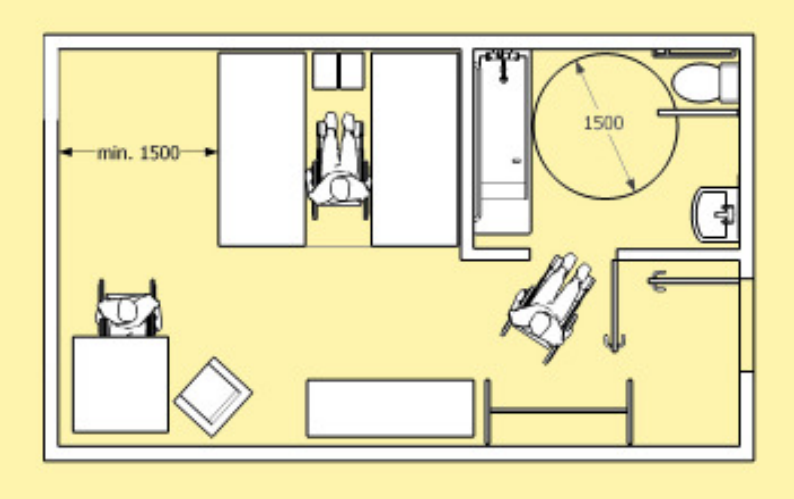


Figure 49 — Example for space allowances for accessible bedroom and bathroom

Consider figures 44 to 47 for details of an accessible bathroom. Manoeuvring space of minimum 1 500 mm x 1 500 mm allows front facing or 45° oblique transfer by wheel chair user.

28 Kitchen areas

Kitchen areas shall take into account general design considerations. Particular consideration should be given to also design considerations in 4 and to manoeuvring space (see B.8.1), slip resistant walking surface in 31 and accessible height of controls and devices (see 35.1).

Essential devices (oven, refrigerator etc.) of a kitchen should be possible to be used by persons both standing and persons sitting in a wheelchair and a counter should be located beside the device.

Part of the shelves should be within reaching distance for a wheelchair user, between 500 mm and 1 100 mm above floor surface.

Sink taps should be reachable and easy to operate with one hand. 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.

29 Storage areas

The minimum manoeuvring space (see B.8.1) and reachability for wheelchair users (see B.8.3) should be taken into consideration when designing and constructing a storage area.

Part of the shelves should be within reaching distance for a wheelchair user, between 500 mm and 1 100 mm. above floor surface.

If a door is provided it should open outwards.

30 Facilities for guide dogs and other assistance dogs

In audience and spectator facilities (also applies to waiting rooms/other seating areas) it is recommended that people with assistance dogs should have the choice of sitting next to a conventionally seated person or companion, and consideration should be given to providing an area next to certain seats for an assistance dog to rest.

Some seats should be located so that a guide dog or assistance dog can accompany its owner and rest in front of, or under the seat.

30.1 Relief facilities for guide dogs and assistance dogs

A relief facility for guide dogs and assistance dogs should be provided near large buildings such as shopping centres, leisure or entertainment complexes and transport interchange buildings, and any building where a guide dog owner or assistance dog owner is employed.

A secure area should be provided close to the building for us as a dog relief facility. The dog relief area should be at least 3 m x 4 m with a 1 200 mm high secure fence. The entrance gate to the enclosed area should have an easy to operate and secure catch. The surface area should be concrete with a smooth finish to assist cleaning and a slight fall, of 3,5 %, to assist drainage. It would be good practice to provide a waste bin and a supply of plastic bags, close to the entrance. A sign saying "For assistance dogs only" should be displayed. The area should be regularly cleaned and well maintained.

31 Floor and wall surfaces

Floor coverings shall be firm and slip-resistant in both dry and wet conditions.

Floor and wall surfaces should be anti-glare. Confusing reflections caused by inappropriate use of floor and wall finishes and placement of mirrors and glazing should be avoided.

Concerning visual contrast consider in 34.

The surfaces should contribute to an acoustic environment that helps orientation, consider also 32 and 38.

32 Noise and acoustics

The acoustic environment in a building or in an area of a building should be suitable for the intended function, and be utilised by all building users. This will include people who are deaf or hear of hearing.

Many people who have a degree of hearing loss, if able to afford it, have assistive devices to amplify sound, such as hearing aids and cochlear implants.

However, if the acoustic environment is not supportive of these devices, they will not work as effectively to benefit the user. In addition, many people who are unable to afford them, or have mild or temporary hearing loss and do not have assistive devices, will not be able to access information or communicate effectively.

If building users are profoundly deaf, lighting, the use of colour and viusal contrast and tactile cues assist in accurate interpretation of information.

Most people with hearing loss, whether profoundly deaf or not, and people without hearing loss, rely on sight to lip read or interpret facial expressions; therefore suitable lighting, colour and visual contrast should be considered to benefit all building users where the acoustic environment is regarded as important.

Information normally conveyed in visual form may not be accessible for people who are blind or partially sighted. This information should be conveyed audibly, and the audible clarity of this information will be affected by the acoustic environment.

The following design considerations should be taken into account to maximize the functionality of the acoustic environment, and to support the use of assistive devices.

32.1 Acoustic requirements

People with hearing impairments have particular difficulty in comprehending sounds and words in noisy environments. Whilst a certain level of background noise may be unavoidable, it can often be ‘designed out’. for example, by not positioning a meeting room near a busy road, by introducing a buffer zone between a meeting area and extraneous noise, or by partitioning a restaurant.

The acoustics in a room is essentially connected with its location in the building and with the acoustic insulation of the building elements. The distribution of noise from within the room itself and exterior sources is depending on the sound absorption of the surrounding surfaces and furnishing of the room. The calculation of the absorption is significant in rooms where you need “hörsamkeit” and also where noise reduction is required.

Good acoustics can be achieved by optimum reverberation time according to the use/purpose of the room and by ensuring a low background noise level.

Besides the reverberation time the geometry and shape of the room, the distribution of sound absorbing and reflecting surfaces and the diffusion are important for good acoustics. Surfaces that absorb sound should be selected, in addition to those that reflect it. It is important to select a firm floor surface that reflects sound that people with mobility impairments can use effectively. To develop an effective acoustic environment, sound absorbent surfaces can be used on floors and ceilings.

The optimum reverberation time of a room should be determined by the volume and the intended purpose of the room.

For communication, class rooms, meeting rooms (30 m^3 to 1 000 m^3) with audio visual presentations the optimum reverberation time should be between 0.3 sec. and 0.8 sec.; for speech only as in auditoriums, lecturing halls (30 m^3 to 10 000 m^3) between 0.4 sec. and 1.3 sec., for music performance rooms (30 m^3 to 10 000 m^3) between 0.75 sec. and 1.85 sec.

32.2 Assistive devices and assistive listening systems

An assistive listening system fitted at an information point can significantly assist the ability to communicate for a person with a hearing impairment who uses a personal hearing aid, or has a cochlear implant fitted. Hearing aids or cochlear impairments may have a Telecoil (T-switch) which can further reduce background noise.

Hearing augmentation systems, for example induction loops or infrared signal transmitting systems shall be provided in conference and meeting areas.

Induction loops should fulfil the technical values according to IEC 60 118-4.

NOTE Hearing augmentation systems amplify audible communication and can be used by people who have a hearing impairment. They include a direct wire system, an inductive loop system, an infrared system and a radio frequency system. All of these systems transmit a signal. Special-purpose receivers are required for infrared and radio frequency systems, while hearing aids equipped with a T-switch are capable of receiving the signal from an induction loop system. Receivers can be equipped to be compatible with hearing aids.

An induction loop should be provided if needed in the lift car for the emergency alarm device (see EN 81-70, 5.4.4.3).

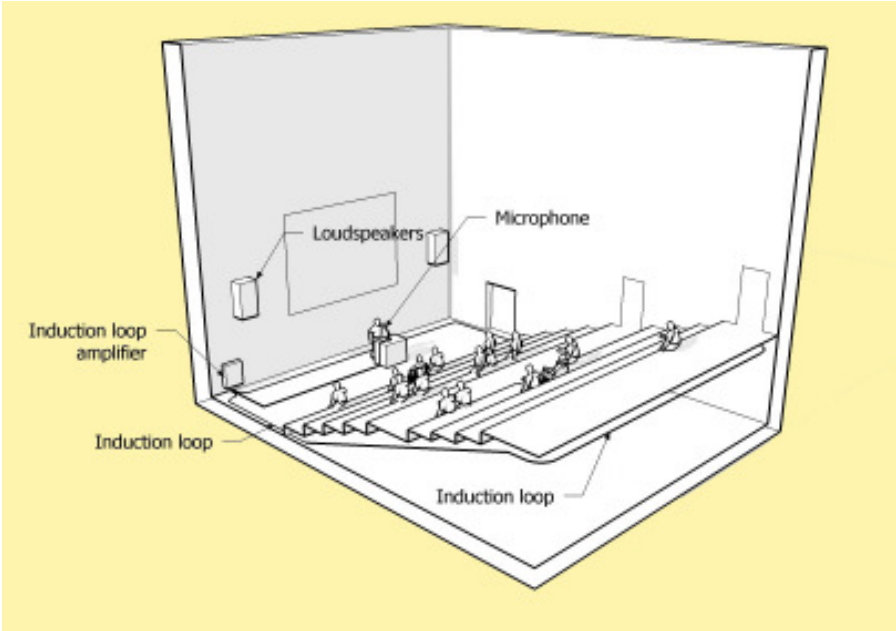


Figure 50 — Example of induction loop system in conference room

33 Lighting

The planning of artificial lighting should be co-ordinated with the planning of natural lighting, the choice of surfaces and colours. Lighting can be used to accentuate interior colour, tone and texture scheme and to facilitate orientation, see 38 Orientation.

33.1 External lighting

The routes to and around a building shall be provided with sufficient artificial lighting to facilitate awareness of changes of level and of gradient. The positioning of lights should be such that it does not cause glare,

reflection or shadows. Ramps, entrances, steps, signage, etc. should be well lit artificially, with an illuminance of at least 100 lux.

33.2 Natural lighting

Light from windows should be possible to shade. Concerning location of windows consider 33.3 – 33.6 and 18.2.3.

33.3 Artificial lighting

Lighting should provide visual conditions in relation to the visual task, orientation and safety. Key factors are:

— level of illumination of horizontal and vertical surfaces,

— limitation of glare by light source and glare by reflections,

— uniformity and luminance distribution,

— direction of lighting and shading,

— colour rendering.

Artificial lighting should give good colour rendering. Light sources with a colour rendering Ra of 80 are recommended.

NOTE 1 for safety colours see ISO 3846

NOTE 2 Good artificial lighting is crucial ensuring that visual impaired people are able to use buildings safely and conveniently and that people with hearing impairments will be able to lip-read.

33.4 Lighting to facilitate way finding

Lighting should facilitate way finding. Building elements should be marked by extra illumination. The lighting in critical locations such as entrances, corridors, stairs, changes of level, workstations should facilitate the identification (consider also 33.3).

33.5 Controllable and adjustable lighting

All lighting including natural light should be controllable to avoid glare. Shades, blinds, or curtains should be provided for windows.

Artificial lighting may be adjustable to suit the needs of the individual.

33.6 Light levels in different areas

Good light levels should be provided in hazardous areas such as stairs or changes in levels along a route, around doors and at any entrance to communication or information systems.

A minimum light level should be provided according to the visual task, see table 4.

Table 4 Minimum light level in different areas

different areas	Emin [lux]
Circulation area	100
Stairs, ramps, escalators	150 – 200

Rooms where people stay	300 – 500
Visual task with small details or low contrast	1 000

33.7 Lighting in auditoriums

Lighting conditions that support lip reading and sign language should be included. The environment should be designed to avoid reflection and glare, and it should be possible to adjust both natural and artificial light.

33.8 Avoiding glare and shadows

Lighting should not produce glare. This can be achieved by:

— protection of light sources by shielding or shading,

— use of indirect lighting,

— appropriate location of light source in relation to the direction of vision and to the object that is to be observed,

— uplighters, with light sources at floor or low level, should not be used,

— avoidance of windows at the end of corridors,

— avoidance of light sources against dark surfaces by choosing light colours for ceilings or walls,

— avoidance of abrupt transitions from light to dark spaces. Indoor and outdoor lighting around the doorway should be suitably adjusted to prevent dazzle when entering or leaving the building.

The United Glare Rate *UGRL* should not exceed 25 for circulation areas and 22 for rooms where people stay.

NOTE 1 For determination of United Glare Rate, see methodology defined by CIE.

NOTE 2 Due to the increase of optical scatter in the eye, the effects of glare are exacerbated for the elderly and for individuals with some types of visual impairments (e.g., cataracts, corneal edema, and vitreous opacities). Glare can cause discomfort and interfere with task performance by decreasing the perceived contrast in visual displays (i.e., disability glare).

Windows at the end of corridors might cause glare and should be avoided.

34 Visual contrast

In order to facilitate orientation and to ensure safe use of an environment, adjacent surfaces, information and potential hazards shall provide a discernible visual contrast.

The relative difference in luminance of adjacent surfaces shall be provided in relation to the visual task. The minimum difference in light reflectance value LRV shall be provided according to table 5.

NOTE 1 The *LRV* sometimes also called the *luminance reflectance factor* is expressed on a scale of 0 – 100, with a value of 0 for pure black and a value of 100 for pure white.

Table 5: Minimum difference in light reflectance value LRV according to the visual task

Visual task	Difference on the LRV scale
Large area surfaces (i.e. walls, floors, doors, ceiling)	≥ 20 points

Elements and components to facilitate orientation (i.e. handrails, switches and controls, tactile walking surface indicators)	≥ 30 points
Potential hazards (i.e. steps, glass surfaces)	≥ 60 points
Text information (i.e. signage)	≥ 60 points

Where the lighting is low, a higher contrast should be used. Refer to published recommended levels of illumination and to 33.4 for extra illumination to mark important areas or details.

NOTE 2 The perception of visual contrast increases with better lighting conditions.

Reflections and glare on large areas should be avoided.

NOTE 3 Reflections and glare from shiny surfaces may reduce visual contrast and may confuse people with visual impairments.

Floor patterns should have a visual contrast of less than 20 points difference on the LRV scale.

NOTE 4 Highly contrasted floor patterns can be perceived as differences in floor level, which may confuse people with visual impairments or cognition capacity. Highly contrasted floor patterns may trigger an attack of vertigo.

Methods for the determination of visual contrast: see annexe B 9.2.

34.1 Choice of colours and patterns

Different colours should be used for identification of doors, different storeys or departments in a building to aid persons with impaired cognitive ability. The colours used to facilitate orientation shall also provide difference in LRV according to 34. Combinations of red tones and green tones should be avoided.

The choice of colours should be co-ordinated with planning of lighting (see 33).

NOTE people with a colour deficiency are unable to perceive some or all colours. Colour deficiency of red and green tones is the most common (10% of the male population). Many visually impaired people can perceive light and dark, even if they cannot perceive colours.

35 Equipment, controls and switches

35.1 Accessible location and height for devices, controls etc.

The design and construction of the operating controls and devices should aim to ensure the independent and safe operation of controls and devices by all people.

Operating controls and devices include, but are not limited to:

— door handles and locks;

— lever, mixer or cross-head taps;

— activation devices;

— window openers and locks;

— electrical outlets and switches.

This ease of operation should allow the possibility of hand-free operation and the use of elbow, etc. Minimum manual effort should be required in all cases, such as in the opening and closing of doors.

Devices, controls etc. shall be installed at an accessible height for reaching and operating, between 400 mm and 1 200 mm above floor level and shall be located 500 mm from any internal corner, preferably 700 mm. For detailed requirements see also 4.3 and 4.8.

Sufficient lighting of the control devices and all relevant information has to be provided, see 4.6, 4.7 and 4.8.

Round or oval type door knobs are not suitable for people with mobility impairment in their arms or hands, for people of small stature and less strength and for children.

All switches and controls should be located within reach of persons in wheelchairs. They should be easy to handle and it should be easy to understand how to use them.

35.2 Heights and distances

Control devices (radiator valves, fuse boxes, switches, push-buttons, intercoms, etc.) shall be installed in a range of 800 mm – 1 100 mm, and they shall be located 500 mm from any internal corner.

Landing controls and car controls in lifts see 15.3 and 15.4

Control devices combined with text or figures should have the text and figures or the whole control device placed at the angle of approximately 45° to the wall so that they are easier to read and operate. (For example panel in elevator).

Control devices placed on a horizontal surface should be placed at a height of approximately 800 mm – 900 mm and within 300 mm from the edge of the surface.

Socket outlets including those for telephone or TV should be located not less than 400 mm from the floor.

Reading meters should be located between 1 200 mm and 1 400 mm from the floor.

NOTE Regulation on safety related to e.g. electricity should be consulted in every country.

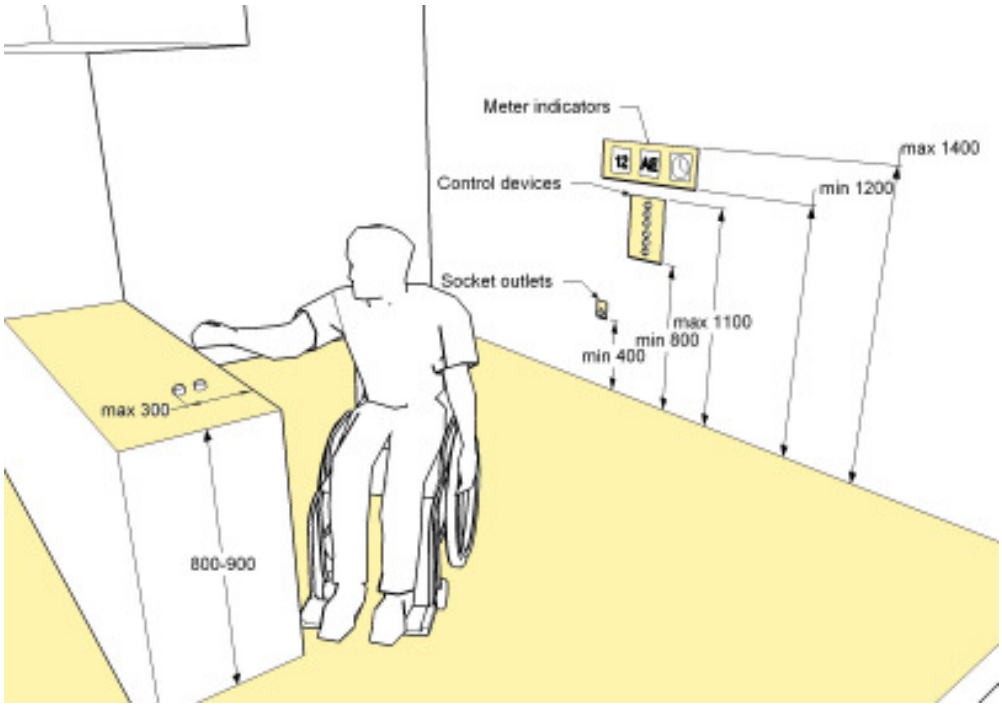


Figure 51 — Heights of switches, socket outlets, reading controls and controls on horizontal surface

Door handles should be placed according to Figure 52. The upper figure shows the height of a handle for pushing or pulling the door. The middle figure shows the height of a handle of a door. The lowest figure is an example of a handle that might facilitate a wheelchair user to close the door behind him, for example, in a toilet.

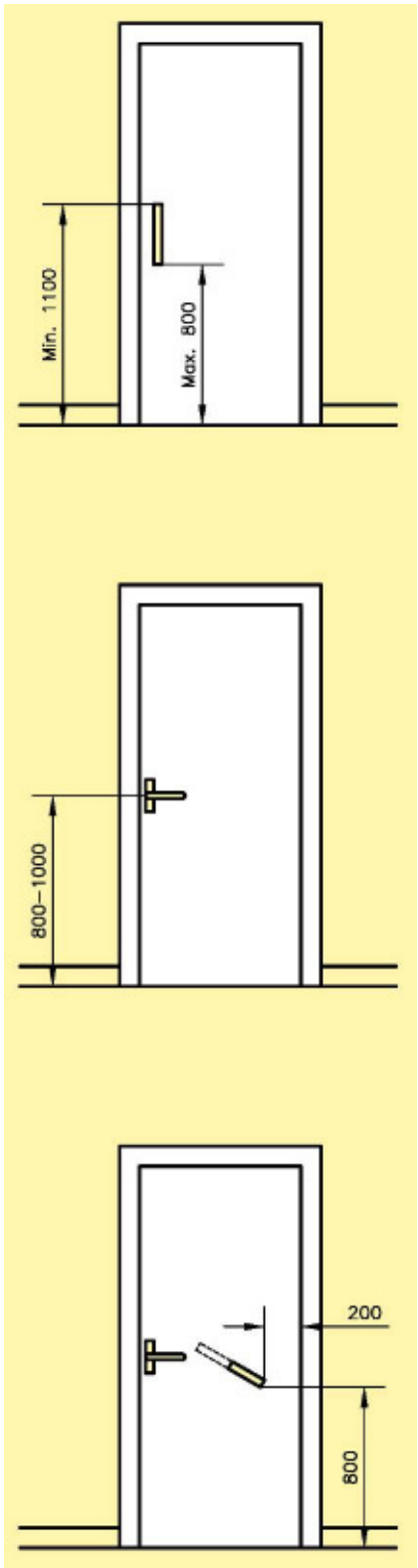


Figure 52 — Different door handles

35.3 Distance from adjacent walls, internal corner, swing arc of an opening door

The distance of the centre of switches and devices for controls for doors or windows, etc. from an internal corner or any projecting element shall be 600 mm minimum (see figure 53).

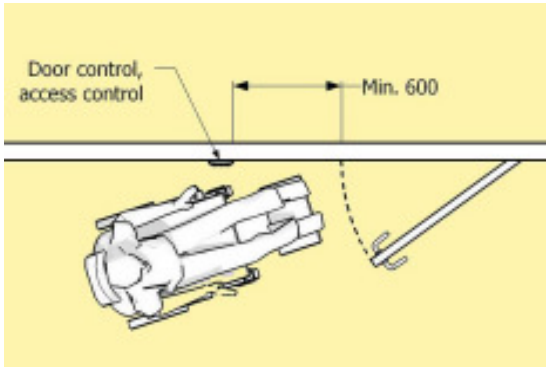


Figure 53 — Position of door and access controls

Controls for powered door openers to hinged doors should be located so that the doors do not conflict with wheelchairs, sticks, walking aids, etc. Controls for powered door openers to hinged doors should be located a minimum of 1 000 mm from the swing of the arc of the door so that the door is clear of people in wheelchairs, scooters or other assistive devices (see figure 54). Dwell time shall be sufficient for a person using wheelchair or assisting devices to safely pass through the door before it closes.

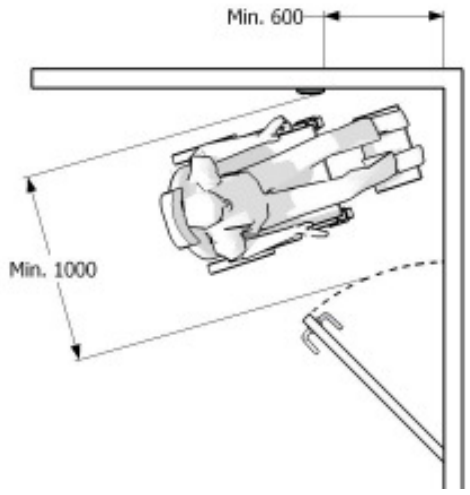


Figure 54 — Distance of controls for powered door openers

35.4 Easy to operate

Consider requirements in 4.13.

To aid operation for people with impaired coordination or visual impairments, switches, etc. should have large push plates.

Door, window and wall handles should be at least 100 mm long.

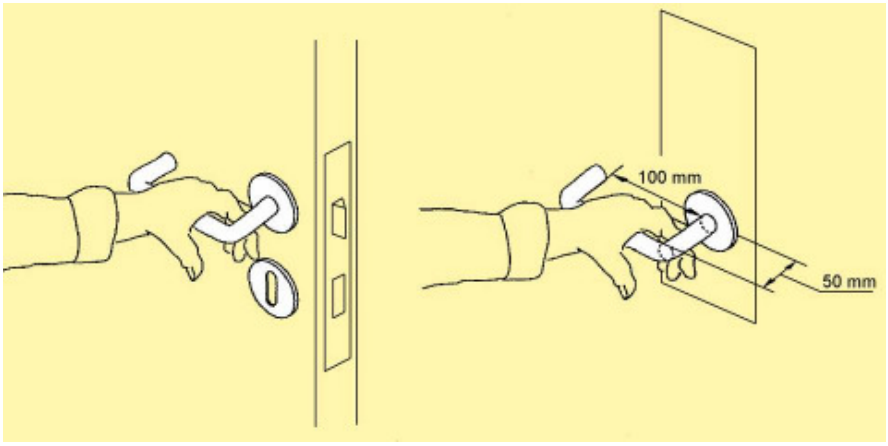


Figure 55 — Design door handle

Lever handles should be 20 mm – 25 mm in diameter; “D-Lever” handles are preferred (see figure 55).

A vertical handle (bar handle) for sliding doors should be 30 mm – 50 mm in diameter, and preferably 45 mm in diameter. A clearance of between 45 mm – 65 mm should be established between the bar and the wall.

Door locks and bolts should be set at least 50 mm from the edges of door leaves.

Consider general requirements for handrails according to 14.

Suitable clearance should be provided between adjacent fixtures and fittings to prevent accidental operation. Operating force on control buttons and push plates should be 2,5 N - 5,0 N.

35.5 Easy to identify

Buttons and devices should be identified by applying the visual contrast criteria, unless they have a uniform location.

Information should preferably be in raised tactile and Braille signage.

35.6 Easy to understand

It should be easy to understand how to use controls. The design should indicate how to use the control.

The allocation of identical control devices for different functions should be avoided. On the other hand control devices for similar functions should have a similar design and their activation should be the same for identical functions throughout the whole facility

35.7 Telephones

Telephones shall have a clear accessible approach from the front or from the side taking into account the necessary manoeuvring areas, consider B.8.1 and all relevant requirements for people with impaired senses, described in 4. All necessary information should be delivered through at least two senses, e.g. visual, aural and tactile. Especially on the telephone keypad the number 5 shall have a tactile point.

Control devices shall not be higher than 1 100 mm. A clear space underneath shall be provided for wheelchair-user’s knees, see figure 56. At least one telephone in any group should fulfil these conditions and be equipped with induction loop and text display.

Public telephones should be located outside the access route and should be easily seen by people with visual impairments.

Side protection has to be considered according to 7.14 and 7.15.

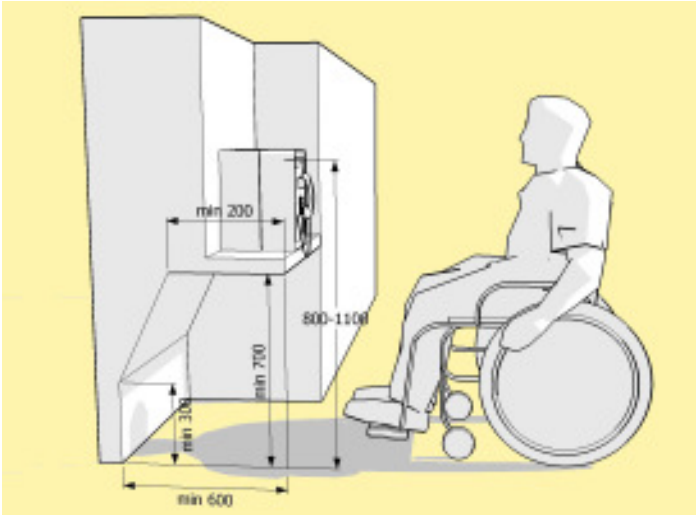


Figure 56 — Height of telephone controls for wheelchair users

35.8 Card access, vending, ticket and automatic teller machines etc.

Machines for dispensing money, tickets or small goods should be accessible and, where possible, should be located on the same level as the adjacent floor or pavement.The approach to dispensers should be clear and unobstructed, and at least 900 mm wide. To undergo with the wheelchair footrest minimum 300 mm height and minimum 200 mm depth should be provided.

The clear area immediately in front of the machine should be at least 1 800 mm x 1 800 mm, to allow a wheelchair user to approach the controls sideways, and to turn around after use. An area of this dimension also affords an element of privacy at ATMs if the queue starts outside the area.

The operation of the machine should be easy to understand.

Glare from sun, artificial lighting and streetlight on the screen should be avoided.

Card access shall:

a) have a slot
   – located at a height of 800 mm to 900 mm from the floor,
   – with its edge bevelled and
   – colour–contrasted with the surrounding surface

b) included tactile graphic symbols on the surrounding surface that
   – represent the card and
   – identify the orientation of the card insertion and

c) have both audible (beep) and visual (light) signals to indicate that access has been granted.

Keypad shall:

a) be located a a height of 800 mm to 1 100 mm from the floor,

b) be colour-contrasted with the background,

c) have characters that are colour-contrasted with the keys,

d) if numeric, be telephone type and have a raised dot on number 5 that
– is 0.7 ± 0.1 mm high and
– has a base 1.5 mm in diameter and

e) have both audible (beep) and visual (light) signals to indicate that access has been granted.

NOTE The keys should be readable from both a standing and a seated position.

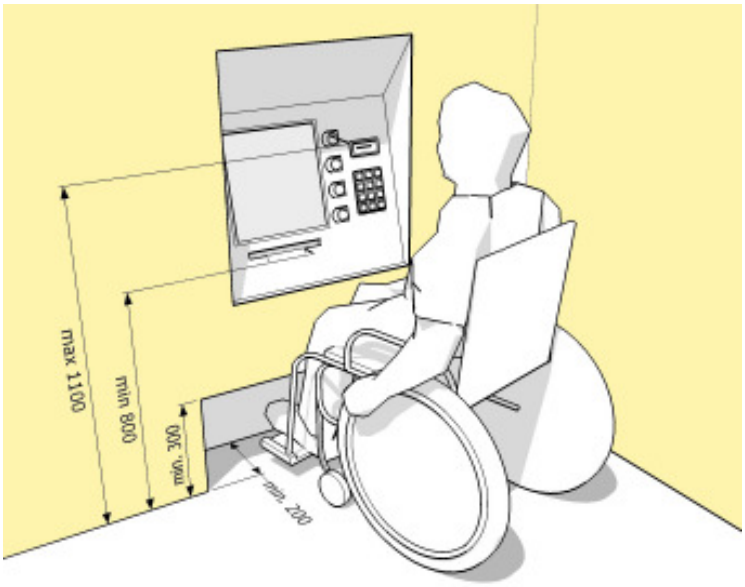


Figure 57 — Example of a vending machine

35.9 Security access systems

Security access systems shall

(a) be located along the accessible route,

(b) comply with all requirements concerning accessible manoeuvring space according B.8.1 and accessibility of all controls and devices,

(c) comply with card access and keypad requirements given in 35.8,

(d) provide equitable alternative means to allow persons with disabilities through the security system.

NOTE Security access systems should be usable by everyone. Proximity or contactless scanners may facilitate this. Biomentric systems (e.g. retinal or palm sanners) cannot accommodate all users.

Security gates or screnns shall consider all relevant requirements for accessible manoeuvring space according B.8.1 and where queue systems are used have both audible (beep) and visual (light) signals to indicate “proceed” and “stop” instructions.

35.10 Drinking fountains

These machines shall be accessible according to B.8.1, B 8.2 and 35.1, situated adjacent to path of travel and have at least two different heights.

Where only one is provided it shall have a height of 700 mm above floor level.

The water outlet shall be as close as possible to the front of the unit. It shall direct the flow of water to a height of 80 mm – 100 mm in a trajectory that is parallel or nearly parallel to the front of the unit.

Controls shall be centrally positioned at the front of the unit or, if at the side, on both sides, not more than 180 mm from the front. Controls must be operable with one hand with an operating force of not more than 19,5 N.

35.11 Refuse bins

Source separation systems should be designed for accessibility and made accessible for wheelchair users.

36 Furnishing

36.1 Seating in waiting areas

Specific seating facilities should be provided in public buildings in order to wait and to rest; see also 19.6.

The location of seats (including reserved areas for wheelchairs) should not disturb the general circulation.

Sufficient space should be provided between rows to allow wheelchair passing (minimum width 900 mm). At least at one position in the row (e.g. at the end) sufficient manoeuvring space to turn around has to be ensured, see B.8.1.

The seats should have armrests to facilitate sitting down and standing up. The seats should also have support for the back. The design and height of the chair should facilitate easier stand up especially for elderly people.

Consider also 30 regarding facilities for guide dogs and other assistance dogs.

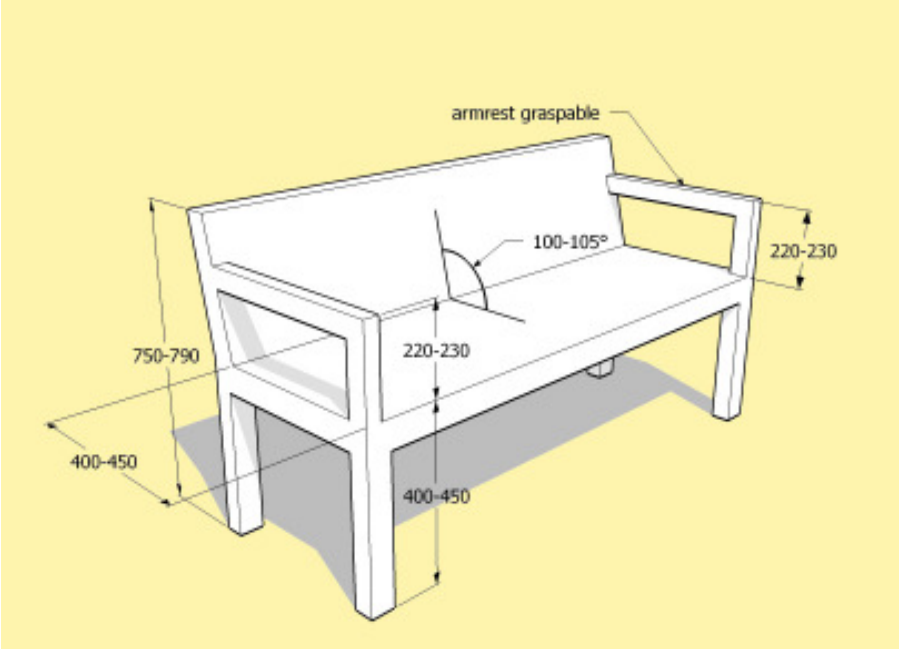


Figure 58 — Example of a seat with armrest and back support

A range of different types of seating can be provided so long as seating at 60m intervals complies with the following criteria:

— seat height: 400 mm – 450 mm,

— back support height: 750 mm – 790 mm,

— seat depth: 400 mm – 450 mm,

— angle of seat / backrest, 100° - 105º,

— armrest height: 220 mm – 300 mm above seat,

— armrest set back from front of seat ≤ 75 mm,

— minimum 150 mm set back under the seat for feet when standing up.

36.2 Seating at desks, tables etc.

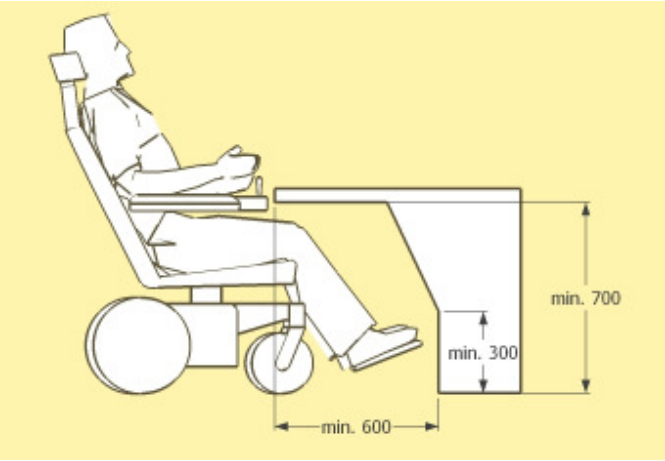


Figure 59 — Table and desk height for wheelchair users

To allow frontal approach with a wheelchair to a table, desk, counter, telephone etc. an unobstructed space with minimum free height of 700 mm and minimum free depth of 600 mm to accommodate knees underneath is required. For footrests a minimum height of 300 mm is required. See figure 59.

If tables with fixed seats are used, there has to be a place for at least one person in a wheelchair at the table.

37 Emergency systems, rescue and escape

37.1 Assistive emergency alarm systems

Most emergency alarms rely on a high decibel audible alarm, which may not be audible to people who are deaf or people with a hearing impairment.

This type of system can be complemented by a visual or tactile alarm. Visual alarms should be fitted throughout the building, within the sight lines of the building users, including inside facilities such as WCs.

An alternative is to incorporate an emergency warning system that can support a portable vibrating pager, which can be carried by the individual who is profoundly deaf, and used to warn them in the event of an emergency.

37.2 Assisted escape

See Annex A.

38 Orientation and information

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.

Means to achieving satisfactory orientation conditions are

— planning layouts,

— way finding and guided paths (TWSI), other physical support of information,

— signage,

— visual contrast,

— choice of colours,

— avoiding surfaces which might make orientation more difficult, (expand!)

— lighting,

— visual, audible and tactile information according to the two-sense-principle, see 4.8.

To avoid hazards in buildings and in the outdoor environment consider also 4.10.

38.1 Principle of two senses

Supportive measures for information and wayfinding shall be provided in a format that is accessible to people with sensory impairments according to the principle of two senses:

— audible/tactile information for people with visual impairments, and

— visual information for people with hearing impairments

38.2 Audible information

Consideration should be taken to suitable amplification, acoustic conditions, and that the message is easily understandable and unambiguous. Consider also the principle of two senses in 38.1.

Loud speaking systems should be clearly audible and completed with hearing augmentation system as described in 32.

Emergency information and warning systems are described in 15.4.7, 26.13 and in Annex A.

38.3 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 will be able to distinguish between the different types of information that they receive in the transport environment.

Information can be divided into three levels:

— Level 1 information, such as urgent safety information or immediate bus or train departures;

— Level 2 information, such as general timetable information, information about how to make a complaint and general safety information;

— Level 3 information, such as advertising.

It is important that these three levels of information are clearly distinguished.

Information should be complete but concise. Too much information makes it difficult for people to retain.

All information provided should be accurate and consistent. Information that is not accurate is worse than useless. Conflicting information can add to the stress that passengers experience and, because this

consistency is so important, failure in provision, however infrequent, will diminish passengers' confidence in the system.

In general, information should be provided at the time when it is needed, for example: at the point of departure on a journey. However, many people with disabilities would like to have information about their intended journey well in advance. Timely information also means that the information should be up-to-date. Where, for example, a lift or a toilet is out of service, passengers with disabilities need to be informed promptly.

39 Signage

Signs should be readable and legible for people who are blind, have visual impairments or intellectual disabilities. Well-illuminated, clear and readable signs placed at the proper height should be used. Concerning height, consider 39.2 and 39.11.

The information with text should if possible be supplemented with universally recognised symbols to facilitate comprehension for everyone. Concerning symbols see 40.

Design signs should be provided in relief and Braille, see 39.10.

The signs should be made of robust materials and be easy to change, clean and repair.

An excessive quantity of signs should be avoided.

39.1 Main types of signs

— Orientation signs: Sketches, plans, models, etc.

— Directional signs: Directional information from point A to B.

— Functional signs: Explanatory information

— Informative signs: Purely information, for example a name

— Signs for emergency exits, see Annex A.

39.2 Location of signs

Placement outside the building

Information signs shall be located adjacent to the entrance door and be illuminated and clearly visible. The sign shall be placed on the latch side. For design and size of letters - see 39.5

Calling systems shall also be placed on the latch side and preferably in a range of 1 000 mm – 1 200 mm above ground level.

39.3 Placement in the building

Orientation signs should be located in accessible places (for wheelchair users and others), and in such a way that they can be examined as quietly and comfortably as possible.

In public buildings there should be an orientation plan immediately inside the main entrance. This plan should follow all relevant design criteria stated in 4 and 39.14.

Directional signs should clearly direct people to the facilities they wish to visit. They should be located where directional decisions are made and constitute a logical orientation sequence from the starting point to different

points of destination. They should be repeated, not too often, but every time there is a possibility of alteration in the traffic direction.

WC-compartments should be sign posted from all parts of a precinct or building.

Stairwells should have information signs identifying all points of entry and exit.

Floor number shall be located on each side of the outer frame of each lift-car entrance on each floor.

39.4 Height of signs

Directional signs and functional signs should incorporate raised tactile signage and Braille on signs located below 1 600 mm. Consider also 39.11and 39.12. for raised tactile signs and 39.13 for Braille signs.

Signs should be located where they are clearly visible to people in seated, standing and walking positions.

Signs should be placed in a range of 1 200 mm - 1 600 mm from the finished floor level or ground surface. They should be readable from a very short viewing distance.

Where it is likely that the sign may be obstructed as in a crowded situation, the signs must be placed at a height of at least 2 100 mm above the finished surface of the ground or floor. The same requirement applies to signs fixed to the ceiling or projected from walls. In that case there should be two signs, one that could be seen from a distance above other people's heads, one as a complement at the height recommended above.

Door signs shall be located on the wall on the latch side of the door. The leading edge of the sign shall be in a range of 50 mm – 100 mm from the architrave.

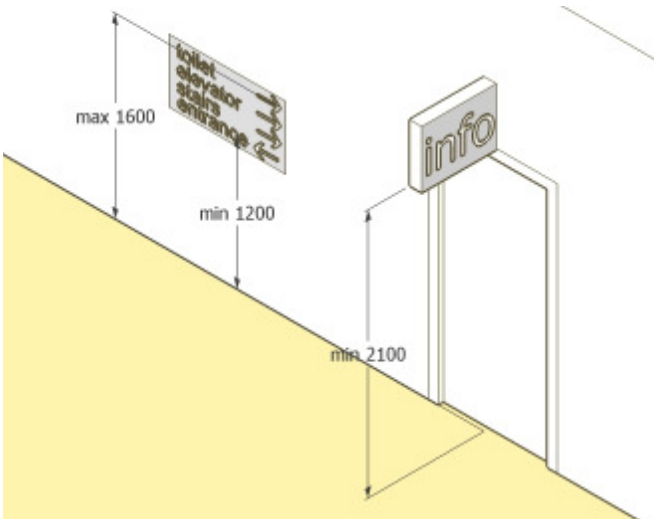


Figure 60 — Height of signs

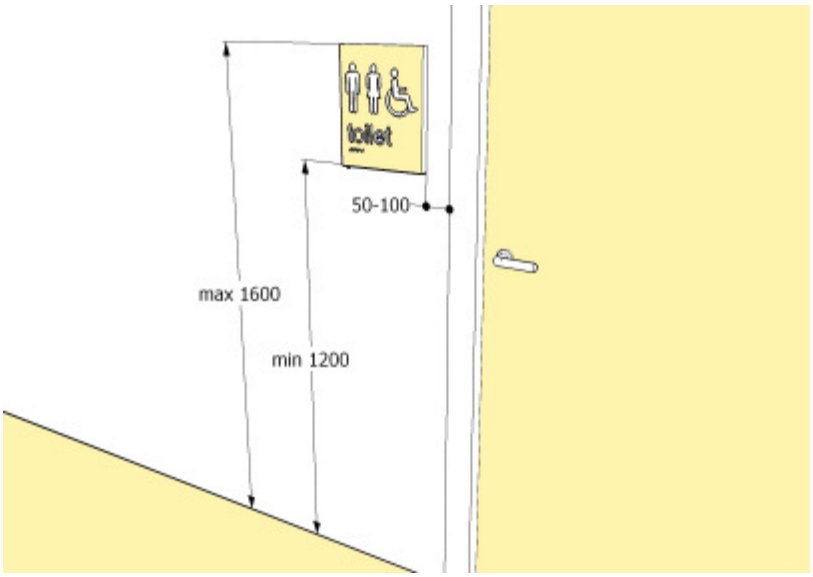


Figure 61 — Location of door signs on the latch side of the door

39.5 Design and size of lettering

The fonts should be easy readable. The font style should be a Sans serif font similar to Helvetica or Arial medium.

The height of the letters will depend on the reading distance. A letter height 15 mm – 20 mm in height for each metre of viewing distance is to be preferred. The letter height should not be less than 15 mm.

It is recommended that all words should have a combination of upper and lower case (sentence case).

The words should not be placed close together. Adequate height spacing should separate the lines. Lines of text should be ranged left from a vertical line (unjustified).

Signs with single word may be centre justified.

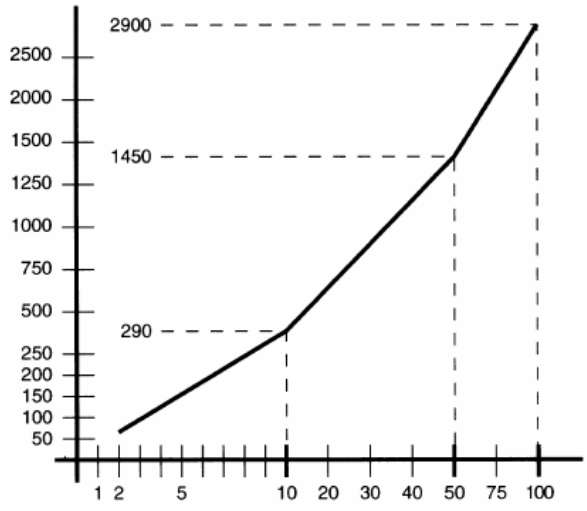


Figure 62 — Height of lettering according to relevant reading distance

39.6 Differences in light reflectance values LRV

Minimum difference in LRVs for small targets like signs and inscriptions should be 60.

The signboard should have a difference in LRVs from the background of minimum 30.

Red-green combination should be avoided. Difficulties in perception can also appear when using the colours green, olive green, yellow, orange, pink and red. Refer to the contrast section within Annex B.9.

39.7 Glare free

Ensure that the sign is glare free when mounted. This is depending on how the sign is placed, the material and the illumination. The background, symbols, logos and other features shall be of a matte or low sheen finish.

39.8 Illumination

Signs should be well illuminated with no glare.

Signs can be luminescent or artificially lit.

39.9 Understandable

Signs should be readily understandable as to their purpose. They should be designed so as to be simple and easy to interpret. The message should be unambiguous.

Short sentences and simple words should be used. Abbreviations and very long words are hard to understand and should be avoided.

39.10 Raised Tactile and Braille

Raised tactile letters on signs - and Braille - shall be provided.

39.11 Provision of raised tactile and Braille signs

Signs on panels in lifts, number of rooms in hotels, doors to public toilets and so on shall be raised tactile and include Braille. See also 39.4.

Door signs shall be located on the wall on the latch side of the door. The leading edge of the sign shall be a minimum of 50 mm from the frame.

The suitable height of raised tactile information is preferred at a height between 1 200 mm – 1 600 mm. Signs with tactile information placed at a lower height should be mounted at an angle from the horizontal (preferably 20º – 30º, max. 45º).

39.12 Tactile letters

Letters of 15 mm - 55 mm in height and no less than 1 mm and no more than 1.5 mm in raised relief are preferred.

39.13 Braille

Where an arrow is used in the tactile sign, a small arrow shall be provided for Braille readers.

On signs with multiple lines of text and characters, a semi circular Braille locator at the left margin shall be horizontally aligned with the first line of Braille text.

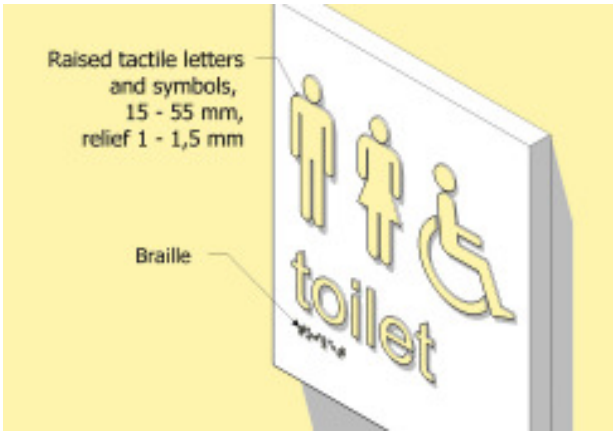


Figure 63 — Example of raised tactile signs and Braille

Braille should be raised, domed and comfortable to touch. It should be located 8 mm below the bottom line of text and be left justified.

39.14 Tactile Symbols

Tactile symbols applied on handrails and doors or on maps and floor plans shall have raised relief contour similar to tactile letters for persons with visual impairments and blind persons.

39.15 Tactile Maps and Floor Plans

Only essential information shall be included on the tactile map or floor plan.

Mounting angles for maps & floor plans should be between 20º and 30º from the horizon for ease of reading.

Illumination level over the face of the map should be between 350 lux and 450 lux, without a glare being created.

The legend should be located at the bottom of the map and justified to the left. The use of a recessed Braille locater on the left hand side will assist in locating the legend.

The map shall be oriented with the building.

39.16 Information Displays

If video and media information displays are used, they should be placed at a height according to 39.2 and their lettering, etc. should be in conformity with the recommendations above.

A complementary audible information system (induction loop system) should be provided.

40 Symbols

Symbol Group (WG 3) has been asked for more information where and when these symbols should be used.

Some symbols concerning parents with a perambulator or child changing facilities are missing.

Accessible buildings and facilities and generally accessible areas shall be marked with the symbol “wheelchair user”, “ambulant disabled person” or “hearing impaired person” etc.

Entrances to accessible buildings and facilities shall be equipped with guides and direction finders.

Particularly the following facilities for disabled persons should be marked:

– car parking places (parking places, garages),

– access and entrances without steps to buildings, especially where they are not identical with the main entrance,

– accessible elevators, in cases where not all are accessible; lifting platforms and similar mounting devices,

– accessible sanitary rooms,

– foot passages on a second level,

– telephone booths and emergency call facilities,

– wheelchair places and accessible seats,

– guide dog facilities,

– changing rooms,

– Entries into swimming pools or mechanical lifting devices.

Figure 64 — Accessible facility or entrance (UK)

Figure 65 — Accessible parking (UK)

Figure 66 — Accessible toilet unisex (modified UK)

Figure 67 — Accessible toilet for woman (UK)

Figure 68 — Accessible toilet for man (UK)

Figure 69 — Accessible lift (UK)

Figure 70 — Mobility impaired (UK)

Figure 71 — Guide dogs allowed (UK)

Figure 72 — Facilities for vision impaired (UK)

Figure 73 — Blind person (World Blind Union)

Figure 74 — Facilities for hearing impaired (World Federation of the Deaf symbol)

Figure 75 — Induction loop system (World Federation of the Deaf symbol)

Figure 76 — Infra-red System (World Federation of the Deaf symbol)

Figure 77 — Telephone amplification (ETSI)

Figure 78 — Text Telephone (UK)

Figure 79 — Video telephone suitable for lip reading (ETSI)

Figure 80 — Assistance available (International Symbol of Assistance)

Annex A
(informative)
Management of assisted escape from buildings

A.1 General

Other national standards, for instance, BS 5588-8: 1999, *Incorporating Amendment No.1 – Fire precautions in the design, construction and use of buildings – Part 8: Code of practice for means of escape for disabled people*, together with BS-5588-12: *Fire precautions in the design, construction and use of buildings – Part 12: Managing fire safety*, are specifically designed to provide advice to those that manage buildings on measures that they should adopt to facilitate the assisted egress of people from buildings.

This standard does not include an exhaustive list of guidelines for those that oversee buildings: it merely highlights some of the principal considerations.

The principal means of escape from a multi-storey building include protected horizontal routes and suitably designed escape stairs that the occupants can use independently. However, such routes may not be suitable for people who have made their way, by passenger lift, to a storey above or below an entrance level but who are unable to use a stair to leave a building independently. Equally, traditional forms of instruction with respect to the use of escape routes may be difficult for some people to comprehend. For these reasons, alternative provisions need to be made, such as places of temporary refuge, assistance down or up stairs, or evacuation lifts that can be used under designated supervision. More easily understood instructions need to be provided. That said, escape stairs would always remain the principal means of escape, irrespective of the potential for using passenger lifts. The arrangements for assisted use of such stairs remain the responsibility of those in control of the building.

The types of management system envisaged in this annex might only be available in organisations that have the human resource capacity to introduce them. There may be instances in which suitable systems are impractical, such as in buildings that accommodate small enterprises, consisting of only a few people who may not have the physical capability to provide assistance. Any specific constraints on access and use would remain to be determined locally and do not form part of this standard.

Many existing buildings to which alterations are not proposed are unlikely to display the physical attributes needed to support the provision of means of assisted escape, such as the space to provide suitable horizontal circulation or places of temporary refuge. Also, they may contain types of passenger lifts, unsuitable for use for escape. In such instances, a more studied approach to the design of any management system would need to be adopted.

A.2 Procedures to facilitate assisted egress from a building

Suitable procedures depend on the provision and maintenance of well-trained assistance within the workforce. This will manifest itself in a well-developed ability to identify and be able to react to the needs of specific individuals. Equally, success will depend on making everyone using a building aware of their own responsibility to bring to the attention of the building's management that they are likely to need assistance in the event of an evacuation of the building: and what are their needs. This latter is particularly true in buildings in which people sleep.

Those that oversee buildings should consult with their local fire authority in developing any strategy. There should be regular practices of building evacuation: in particular, awareness of and implementation of phased evacuation techniques. In all instances, the free and continuous movement of people should not be interrupted.

A.3 Techniques for assisting people up and down a stair

Those with the responsibility to assist people up or down a stair should be made familiar with existing and developing techniques for providing appropriate assistance. Such techniques may, for instance, involve leading a person who is particularly distressed, or who does not comprehend signs, or whose vision is impaired, or who has to remain seated, either in a wheelchair or other specially provided carrying seats. There may be organisations, nationally or in the locality, that are able to provide relevant advice. That said, any advice should be properly assessed and tested.

A.4 Management of evacuation lifts

A lift to be used for the evacuation of people with impaird mobility and impaired senses should be an evacuation lift and should be operated under the direction and control of management or specially trained persons. It is important that only disabled people with impaired mobility rely on a lift in case of fire and essential that the lift car is taken only to those levels where a disabled person is in need of assistance.

To make such a system effective, a number of "fire assistants" should be designated and they should be capable of carrying out the necessary duties quickly and efficiently at all times during which the building is occupied.

Depending of the building evacuation strategy 2 types of evacuation of disabled persons with impaired mobility can be realized (the choice of this strategy has to be determined when the lift is specified and ordered to its supplier):

— evacuation under the control of a "fire assistant" who controls the lift as an attendant (lift driver),

— self evacuation without lift attendant (automatic collective control), or assisted if required by the "fire assistants" appointed at each level.

The evacuation procedure for disabled people should begin at the first warning of alert or fire.

In premises where there is a two-stage fire warning system, this may be on the sounding of the "alert" or "first-stage" alarm. Except in two storey buildings, some form of communications system should be provided to enable the rapid and unambiguous identification of those storeys with disabled people requiring evacuation, and the relaying of this information to the person operating the evacuation lift car.

If an evacuation lift fails to arrive at a landing, or access to it at any level is obstructed by the fire, it will be necessary to use a stairway. Should the lift itself remain safe to use it may only be necessary to descend to the storey below using the stairway and from there continue the descent by lift. It is necessary therefore to determine the best method of negotiating stairs and some practice may be necessary.

As soon as the fire service arrives they may take management of the evacuation but this should not be assumed as the evacuation of the building is normally the responsibility of the building operator.

If the evacuation mode is initiated automatically the building management should have provision to override the signal.

Subsequent priorities for the use of evacuation lifts and firefighting lifts may then be decided by the fire service.

The duties to be undertaken by the "fire assistant" of each level, immediately on receipt of an alert signal, should include the following.

a) ensure that any disabled people in the storey for which that person is responsible move to the nearest refuge (lift lobby etc.) to await the lift;

b) help in the evacuation of disabled by using the lift;

c) inform those in charge of the urgency of the situation on their floor;

d) notify those in charge when everyone n their floor has been evacuated.

It should be appreciated, however, that the actual fire conditions may necessitate changes in the planned sequence.

A.5 The evacuation strategy and incident plan

The initial phase of the evacuation strategy is the determination of the exact location of the fire or other incident and relating that to the location of those in need of assistance. By agreement on the order of evacuation, normally, that of the fire or incident floor first, followed by that of the floor immediately above and then those of the remaining floors above that, beginning at the top, evacuation should take place. Within the storey in which the incident has occurred, movement of those needing assistance should be effected to the appropriate refuge: thence for assistance via a suitable passenger lift or by a stair to the final exit. Depending on the scale and nature of the incident, it is conceivable that those not needing assistance may only be moved to the storey below the incident. That will be a matter of judgement at the time.

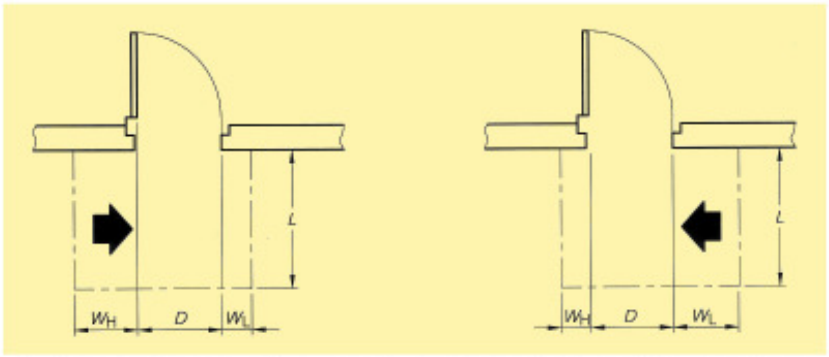
A.6 Illustration of emergency plan strategies

It is helpful if descriptions of strategies, including diagrams as well as specific documents for those with visual impairments, are available for those using the building: though, clearly, a judgement will need to be made on how detailed they can be, depending, for instance, on the need for security. Such illustrations may describe evacuation sequences and the nature and interval of communication of information.

A.7 Circulation spaces at doorways

On every accessible path of travel sufficient circulation spaces shall be provided in both directions at doorways.

Where the clear opening width *D* of the doorway is other than specified in figure 11 and figure 12 before the clear circulation space at doorways on a continuous accessible path of travel shall be not less than the dimensions specified in the tables in figures A.1 and A.2 for the appropriate clear opening width of 800 mm and 850 mm.



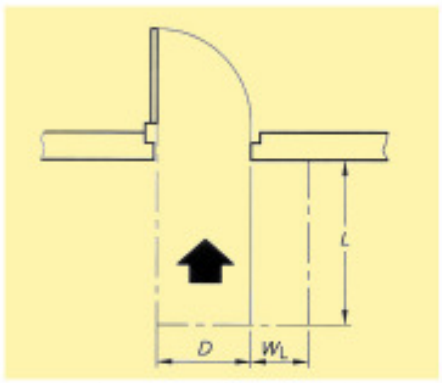
Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1160	610	220
850	1120	610	190
900	1085	610	165
950	1060	610	145
1000	1040	610	145

(a) Hinge-side approach–door opens away from a user

Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1200	200	610
850	1140	95	610
900	1110	50	610
950	1075	0	610
1000	1055	0	610

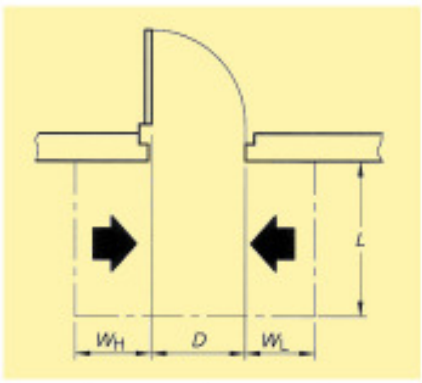
(b) Latch-side approach–door opens away from a user

Figure A.1 (a)–(b) — Circulation spaces at doorways with swinging doors



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1350	0	470
850	1350	0	460
900	1350	0	445
950	1350	0	435
1000	1350	0	415

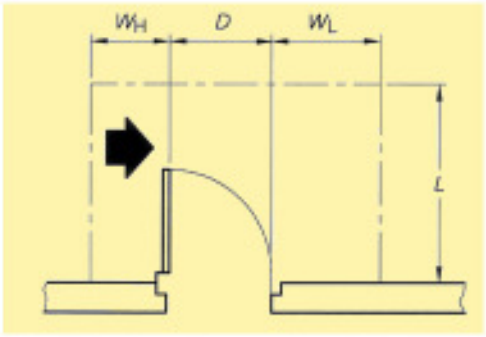
(c) Front approach–door opens away from a user



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1200	610	610
850	1140	610	610
900	1110	610	610
950	1075	610	610
1000	1055	610	610

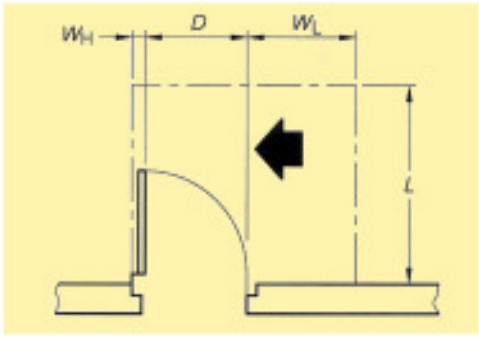
(d) Either approach–door opens away from a user

Figure A.1 (c)–(d) — Circulation spaces at doorways with swinging doors



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1510	610	840
850	1570	610	810
900	1665	610	780
950	1725	610	725
1000	1815	610	625

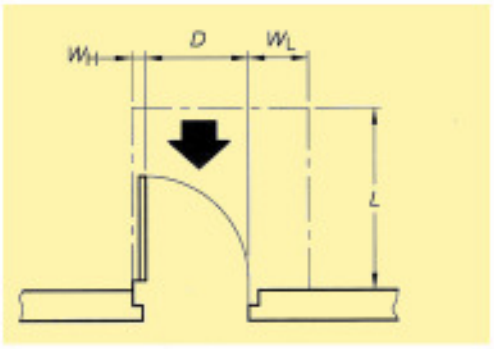
(e) Hinge-side approach–door opens towards a user



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1510	110	840
850	1570	110	810
900	1665	110	780
950	1725	110	725
1000	1815	110	625

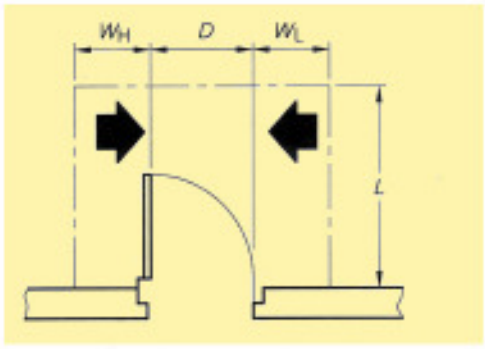
(f) Latch-side approach–door opens towards a user

Figure A.1 (e)–(f) — Circulation spaces at doorways with swinging doors



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1350	110	470
850	1350	110	460
900	1350	110	445
950	1350	110	435
1000	1350	110	415

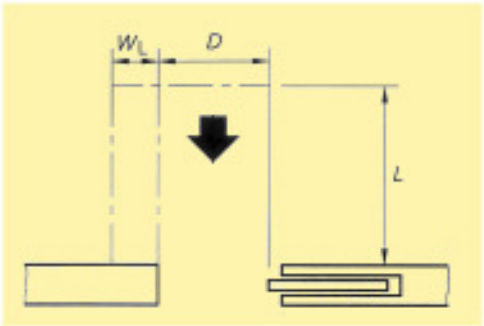
(g) Front approach–door opens towards a user



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1510	610	840
850	1570	610	810
900	1665	610	780
950	1725	610	725
1000	1815	610	625

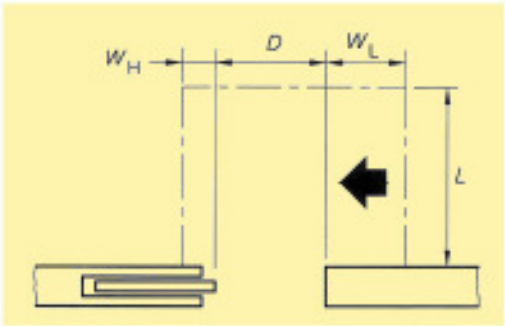
(h) Either approach–door opens towards a user

Figure A.1 (g)–(h) — Circulation spaces at doorways with swinging doors



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1350	0	470
850	1350	0	460
900	1350	0	445
950	1350	0	435
1000	1350	0	415

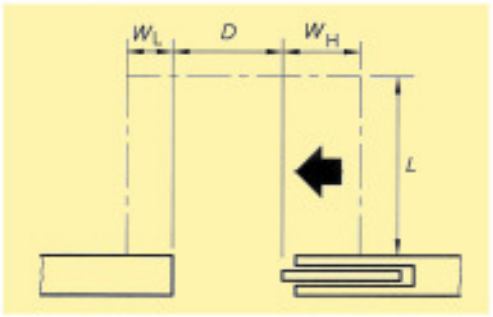
(a) Front approach



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1160	160	610
850	1130	135	610
900	1110	95	610
950	1080	80	610
1000	1055	55	610

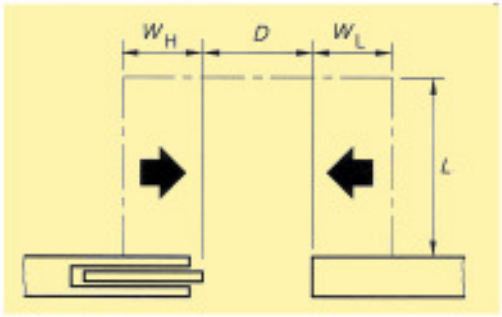
(b) Latch-side approach

Figure A.2 (a)–(b) — Circulation spaces at doorways with sliding doors



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1180	610	305
850	1180	610	255
900	1180	610	205
950	1180	610	160
1000	1180	610	105

(c) Slide-side approach



Dimension *D*	Dimension *L*	Dimension W_H	Dimension W_L
800	1180	610	610
850	1180	610	610
900	1180	610	610
950	1180	610	610
1000	1180	610	610

(d) Either approach

Figure A.2 (c)–(d) — Circulation spaces at doorways with sliding doors

Annex B
(informative)
Human abilities and associated design considerations

B.1 General Introduction

The prime objective in designing, constructing and managing the built environment is to ensure that, as far as is feasible, it will satisfy the diverse needs of all of its intended users. Such an environment should reasonably satisfy the needs of any one individual without unreasonably compromising those of another. This is particularly important in areas in which matters of health and safety are pre-eminent. In many instances, the use by specific individuals, of assistive technology, will compensate for inadequacies in the design of the built environment. However, that should be seen as a last resort.

Every effort should be made to mitigate the effects that constraints, such as limitations of space or topography, may have on the development of new environments that suit everyone's needs. Additional and different constraints are likely to be encountered when attempting to modify the layout and structure of an existing building or external environment, historic or not. However, as many as are feasible of the individual provisions within this standard should be adopted: whether the environment is newly constructed or is an existing one that is to be modified.

Clause B.2 describes the principal human faculties that need to be considered when designing, constructing and managing the built environment. As well, the section highlights a number of design considerations that should allow the environment to accommodate different levels of performance.

Physical, sensory and mental faculties vary in [quality][character] from person to person. Diversity is normal. However, some differences may be heightened through the age or social condition of the individual, or be congenital or the result of accident or illness. The state of the faculty may be temporary or permanent, be in the ascendancy, be stable, or be in decline. No one will display optimal characteristics in every faculty at any time. Inevitably, there will need to be compromise, both in the ability of the environment to accommodate the individual and in the expectation that the individual can place on the environment.

B.2 Physical abilities

Physical faculties include walking, balance, handling, pulling, pushing, lifting and reaching. Many activities involve simultaneous use of more than one of these skills and, then, some mental co-ordination is likely to be important. Some activities are likely to require a significant amount of aerobic or anaerobic effort.

B.2.1 Walking

Egress in the event of emergencies needs to be established by planning architectural and evacuation strategies for people with limited walking ability. Specific accommodation and management systems will need putting in place to effect assisted means of egress in the event of emergency, see Annex A.

For some people any walking - whether on the level or up gradients, steps and stairs - is problematic. They may need to stop frequently, to regain strength or breath, or to ease pain. Often, a lack of stamina is less of a problem than the need to restrict the number of movements of joints, when using a stair, for instance. For some, there may be dependency on a walking aid or on a wheelchair for mobility.

In addressing the needs of people with walking difficulties, the principal design considerations include:

— path of travel to be clear, unobstructed and an appropriate width

— the proximity of facilities to one another;

— the ease of incline of gradients and of the pitch of steps and stairs;

— the frequency of resting-places and of rest facilities, on the level and on gradients;

— the number of steps in a flight;

— optional means of travel from one level to another;

— the provision of hand and arm supports on both sides;

— the evenness, firmness and slip-resistance of walking surfaces.

It is important to ensure that provisions geared to the needs of those that use wheeled means of travel are also designed to limit the risk to pedestrians of slipping or stumbling, especially in inclement weather;

B.2.2 Balance

An inability to maintain balance can be mitigated if components and controls, generally, are installed to be within easy reach.

A surface against which a person may stumble against or walk into should be designed to limit abrasion.

B.2.3 Handling

Handling involves the use of one or both hands. A significant minority of people are, naturally, left-handed. Others might, for a variety of reasons, not have the use of either one or both of their hands. Facilities and components should be designed to be suitable for use with one and with either hand.

Handling includes gripping, grasping and manipulation. Each of these has a different purpose with specific design considerations. For instance, components that are intended to limit the risk of falling or to provide support, when rising from a seated position, should be designed to be graspable. Their form, their circumference, their inherent strength, their fixing to any supporting structure and the stability of the supporting structure, itself, are likely to be critical. Other components, such as stair handrails that are, principally, for guiding, for steadying or for supporting people in motion and are unlikely to arrest a fall, should be designed to be graspable. Their form and circumference are less likely to be critical.

Manipulation involves the moving, turning and twisting of components with a hand or hands. For those who have difficulty in performing such actions, the size and shape of the component and its ease of movement are critical. Often a balance will need to be stuck between ease of use and the degree, for instance, to which the design of the component has to be influenced by the need to provide security.

Manipulation that can be achieved by using a pushing, a pulling or a pressing action using a clenched fist, or by using the wrist or the elbow is important to some people and should be possible in some specific situations.

B.2.4 Strength and endurance

Few elements of the built environment are likely to require aerobic strength to use them. Most are intended for operation within a short timescale, predominantly by handling. The obvious exceptions are sloping paths and floors, stairways and long travel distances, when sustained effort may be needed to negotiate them.

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

People, generally, find it easier to push a component, a door for instance, than to pull it. This is particularly so, if the individual uses a wheelchair to get around. That said, self-closing devices on manual doors can be difficult for some people to operate, particularly if the doors are required to be set to resist wind forces. Such devices can also be difficult to resist when they begin their closing action. For these reasons, doors that open and close automatically are preferred.

B.2.5 Lifting

The need to lift heavy weights is not routine in using the built environment. Nevertheless, opening of, for instance, a vertically sliding sash window or an upward opening access gate, may prove difficult for some people.

B.2.6 Reaching

The principal facilities whose usability is dependent on an individual's reach include telephones, desks, shop and office counters and work surfaces, electrical and other service controls, taps, door and window furniture. Decisions on the design and location of some building features, such as socket outlets, shelf units, or low-level cabinets in supermarkets, may need to be made on the basis of the need or the frequency with which they are used. Research has indicated that the options of 'comfortable reach ranges' or 'extended reach ranges' can be adopted in appropriate situations.

A 'comfortable reach range' has been defined as one that is appropriate to an activity that is likely to be frequent and in need of precise execution and that does not involve stretching or bending from the waist.

An 'extended reach range' has been defined as one that is appropriate to an activity that is likely, neither, to need precision nor to be frequent and that can involve stretching or bending from the waist.

To have components within easy reach is particularly important for those who are frail, or who have difficulty maintaining their balance, or who use a wheelchair. It is important that people avoid losing their balance when attempting to reach out to grasp or to operate a component.

For wheelchair users the reach range is limited depending on the seating position and depending on the wheelchair makes it impossible to come close to a component for example in a corner.

The reach range is also dependant on the length of the person, the possibility to stretch out and use the arms, the balance and the mobility in the upper body. Impaired balance makes it impossible for some wheelchair users to bend forwards.

It is important that wheelchair users are able to avoid overbalancing when attempting to reach out to grasp or to operate a component. See also General design considerations for wheelchair users in B.8.

B.2.7 Speech

Speech is the expression of thoughts by means of articulate sounds. At locations at which two-way communication is needed, it is important that visual means are provided. By such means, difficulties presented by diversity in the communicants' languages and speech characteristics may be eased by the opportunity for facial and hand gesture or, in some instances, the use of recognised formal signed languages.

B.3 Sensory abilities

These are abilities by which the body perceives an external stimulus. They include sight, hearing, touch, smell and taste. This Standard does not deal with matters relating to smell and taste.

B.3.1 Sight

Sight allows the individual to be aware of and to record the luminance of surfaces and objects and their form, size and colour. The principal activities affected are component selection and orientation and wayfinding including the reading of essential information.

For people who are blind and people who have a severe visual impairment, the provision of suitable tactile walking surface indicators, tactile or acoustic warnings at hazardous locations, should provide greater confidence in the use of the built environment and should limit the risk of injury. For all people with visual

impairment, it is important to be within an environment in which they are able to orientate themselves by listening for cues, or by touch with their hands or underfoot. Shape, light and visual contrast are also important factors. In providing tactile cues, especially underfoot, it is important to ensure that stumbling and tripping hazards are not created.

Differences in friction between one floor surface, or one stair tread surface, and the next may also cause stumbling. So adjacent surfaces that display different standards of slip-resistance or that depend on raised surfaces should be used with discretion, especially in an era of increasing claims for compensation for injury.

Ensuring an effective visual contrast between surfaces or objects is useful: as an aid to wayfinding, or to safety at critical locations, or as a means of identifying a specific piece of equipment against its background, especially for people with impaired sight.

Simple and clear images are essential if information is to be successfully conveyed.

Visual contrast between adjacent surfaces, especially in the manner in which colour is used to differentiate between surfaces and components, needs to be carefully considered and sparingly adopted. It is important, for instance, to ensure that the dividing line between different luminances on the same plane is not mistaken as being, for instance, the rise between a horizontal and a vertical surface. This is particularly important in the context of steps and stairs.

An environment that accommodates the broad range of visual characteristics will display:

— a simple, logical and easily understood arrangement, preferably, with intersecting routes at right angles to each other;

— an easily discernible system of ‘wayfinding’

— visual contrast between adjacent objects and surfaces where it is necessary to provide important information,

— choices of colour that satisfy the needs of those with anomalous colour vision but that do not militate against the use of generally acceptable harmonious or monochromatic colours;

— appropriate warnings of the onset of abrupt changes of level or the existence of obstructions;

— absence of confusing reflections caused by inappropriate floor and wall finishes and placement of mirrors and glazing;

— a suitable level of lighting, lacking glare, and, as far is practicable, resembling natural light;

— complementary audible information, if appropriate.

B.3.2 Hearing

Hearing permits the individual to be aware of sound, to determine its direction and, possibly, its source, and to discern its pitch, frequency, volume and variation. Its quality is central to an effective means of communication and information.

The creation of an internal environment that is wholly sensitive to variations in individuals’ quality of hearing is not practicable. A sensible balance between the provision of reflective and absorbent surfaces will limit the confusion caused, respectively, by excessive reverberation or by an absence of it. A low level of background noise is essential.

Whilst skill in the planning of a building and in the selection of structural and surface materials can make a substantial difference in audibility, it may not be sufficient in every instance. Locations in which aural contact is critical, such as auditoriums, meeting rooms and reception areas, are likely to need additional means of sound enhancement. These means include assistive listening systems such as audio frequency loop induction and

infrared systems. Whether the expenditure on such a facility is warranted in every instance may be judged against the nature and scale of the immediate environment in which it would be installed.

Depending on the nature of a specific environment, it may be necessary to incorporate specific lighting levels or elements of focussed lighting that assist lip-reading.

Most people with hearing impairments use a hearing aid which amplifies all sounds caught by the microphone, making communications very difficult in noisy environments.

Hearing augmentation systems amplify audible communication and can be used by people who have a hearing impairment. They include a direct wire system, an induction loop system, an infrared system and a radio frequency system. All of these systems transmit a signal. Special-purpose receivers are required for infrared and radio frequency systems, while hearing aids equipped with a T-switch are capable of receiving the signal from an induction loop system. Receivers can be equipped to be compatible with hearing aids. Written and pictorial information that complements oral information is a valuable provision but in one case necessary: Safety in case of fire and other emergencies.

B.3.3 Touch

Touch stimulates the perception of an object through physical contact. For those individuals who place great reliance on feeling their way about the environment, it is important to be exposed to surfaces that do not cause distress or injury.

Roughness of surface may cause abrasions that are more serious than, merely, temporarily unpleasant for some skin conditions. Moreover, it is not surface texture alone that might be problematic. Some metals may cause adverse reactions when touched. Their identities, their effects and their use should be carefully explored before they are considered for components that are handled frequently.

B.4 Mental abilities

Mental faculties include those processes that are carried out in the mind of the individual. They include cognition, intellect, interpretation, learning and memory. A difficulty in learning to interpret words, individual letters or symbols must not be assumed to imply intellectual deficiency; on the contrary. What is important to recognise is that, to provide a usable environment for the population at large, all means of communication should have an immediate impact and be easily understood.

B.4.1 Cognition

Cognition is the acquisition of knowledge and understanding through, thought, experience and the senses. By this means, and through recognition, people can understand and interpret signs and other forms of information or instruction.

B.4.2 Intellect

Intellect is the faculty of reasoning and understanding objectively, especially with regard to abstract matters.

B.4.3 Interpretation

Interpretation involves understanding messages and information as having a particular meaning or significance.

B.4.5 Learning

Learning is central to many aspects of understanding, reasoning and interpretation. Some individuals might suffer because of a home, or a broader social or educational environment that offers inadequate, inappropriate or ineffective stimuli for learning. A specific difficulty may be inherited. A failure to recognise

words and their meanings will adversely affect an individual's ability to move successfully and safely about within the built environment.

B.4.6 Memory

As we age, we find it increasingly difficult to absorb new information. Though our long-term memory might remain reasonably clear, our short-term memory tends to become less effective. For these reasons, changes in the environment should be carefully considered before implementation. Whenever changes are undertaken, clear and simple information with respect to the new layouts is essential.

In most children, memory is efficient and knowledge gained from new experiences is stored for the future. However, lack of awareness of danger in a new and unfamiliar situation could create a problem.

B.4.7 Design considerations that take account of mental abilities

Aural and visual messages should be simple, clear and have immediate impact. Figures, symbols and simple words are likely to be the most effective. Symbols should be instantly recognisable as representing images seen and activities undertaken in everyday life. They should not require a well-developed intellectual capacity to decipher or to understand, such as might be required to interpret subtle artistry. Nor should they be ambiguous. For instance, within a circulation route, an isolated arrow that points diagonally upwards might be interpreted as implying the existence, nearby, of a stair or a ramp leading to a higher level rather than as an alternative horizontal circulation route. This is merely one example: there are likely to be many more.

Special design considerations:

— simple and clear planning layout; important parts and details placed in a consequent way and designed so that they are easy to find;

— changes in the environment carefully considered before implementation; whenever changes are undertaken, clear and simple information with respect to the new layouts should be provided,

— self-explanatory environment; design should indicate the use of the built environment or elements in it; unnecessary complexity should be avoided,

— simple, intuitive design of circulation routes;

— doors designed so that their operation is intuitive whether they are push, pull or sliding doors;

— text signage that uses plain language;

— aural and visual messages which are conspicuous, concise, comprehensible;

— wayfinding plans or maps that clearly indicate the person's current position in relation to the rest of the building or facility and which do not include extraneous information that may be confused with destinations or physical features;

— wayfinding cues that are easy to follow; e.g. tactile, graphic, audible or architectural;

— directional and other information which combine text with universally recognisable symbols;

— signs with graphics that are in conformance with ISO 7000 and ISO 7001; and

— in areas where key cards are used for access, such as hotels, the need for fine motor control and precise timing of the swipe or dip of the card in the reader should be minimized.

Messages should be conspicuous, concise, comprehensible and relatively frequent. Directional and other information should combine text with universally [recognisable][interpretable] symbols. Advantage should be taken of research that demonstrates which types of symbols have an immediate and lasting effect.

B.5 Additional factors

B.5.1 Accommodating the developing child

“Minor and easily healed injuries are part of every child’s learning process and a far more normal part of their lives than of adults,” (CEN/BT/WG117/N11, Draft Guidance Document – 6 August 2001).

An element of risk is an essential part of a child’s development. That said, it is important to ensure that component parts of the built environment do not present an open invitation to unwary children that could lead to serious injury or to death. For instance, guarding to stairs and floor edges that is easy to climb is likely to be more attractive to an unwary child than to a mature adult. A tactile surface, underfoot, sufficiently raised to be perceptible to an adult through the sole of a shoe, may constitute a tripping hazard for a small child.

Of lesser, but significant, importance is the need to ensure that children who may escape the attention of their parents in public places do not become lost. That risk is heightened at a time when, for instance, landing call and floor selection buttons for passenger lifts are being designed to be within the reach of small children. It is important to ensure, either, that such controls are placed at the upper level of the ‘extended reach range’, or designed in such a manner as to be difficult to comprehend by young children or not to appear attractive. This will not be easy.

B.6 Accommodating ageing adults

Life span within the human population is increasing. More and more do we expect to maintain an economic and a social life within, both, public and private domains as we age. Many human faculties are in marked decline as we age. Familiarity with a particular environment is an aid. However, the provision of permanent familiarity with a particular environment cannot be a reason never to alter it. It is important to give due notice of change and to ensure that easily understood information is available to permit new familiarities to emerge.

The principal risks to elderly people are from falls. A loss of consciousness or the breaking of brittle bones, or both, is likely to be more life threatening to the elderly person than to the young one. The availability, within reach, of supporting components will limit the risks.

B.7 Diversity of stature

There is a wide diversity of stature within the human population. Predominantly, this has had to do with the average height of people in various parts of the world. Whilst regional differences may in the past have led to regional standards for the design of the built environment, it is difficult to justify this approach today. The increase in tourism, business travel and population migration has led to a demand for more rationalisation, internationally, in the use of anthropometrics and ergonomics and in their influence on the design of the built environment. The provisions in this standard include ranges that should accommodate those regional differences. The ranges have been set so that member nations who decide to adopt specific criteria that reflect their own circumstances will not unduly inconvenience individuals whose stature does not.

The ranges included for the positioning of components or the heights of, for instance, steps should also recognise the needs of those who do not reach their anticipated full height.

In some of the more developed countries, less physically-demanding work and leisure pursuits, changes in diet and an increasing use of the motor car for short journeys, for instance, have combined in a trend towards increased girth and weight within the population. It remains to be seen whether these latter lead to demands for an increase in specific spatial and stability standards. Clearly, there would be an economic price to be paid and it is for society to decide whether or not to accommodate such demands, should they be made. These are matters beyond the scope of this Standard, at present, and are not reflected in its provisions.

B.8 General design considerations for wheelchair users

B.8.1 Application and manoeuvring space

Manoeuvring space of 1 500 mm diameter shall be provided in all areas where a significant change in direction for wheelchair users and persons with walking aids is required.

“Exceptional considerations for existing buildings in developing countries”: In some member states where shorter wheelchairs are generally used due to market situations the manoeuvring space may be reduced to 1 200 mm. Whenever possible this circle should be increased to 1 500 mm.

The dimensions stated in this Standard, relevant to the use of wheelchairs, are related to the footprint of commonly used wheelchair sizes and users (see Figure B.1).

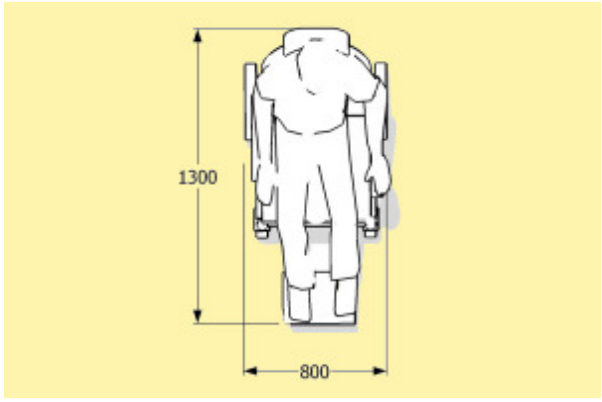


Figure B.1 — Footprint of a wheelchair

The footprint for a wheelchair within this standard is based on ISO 7176-5 and ISO/TR 13570-2 and is 800 mm wide and 1 300 mm long.

B.8.2 Space allowance for wheelchair users

Table B.1: Wheelchair data according to EN 12183 and EN 12184

	Manual wheelchair	**Electrical wheelchair for use inside and outside** **Class B in CEN 12184**	**Electrical wheelchair for use outside** **Class C in CEN 12184**
Dimension:	0,70 m × 1,20 m (user´s feet add approximately 50 mm to the length) According to CEN 12183 which refer to ISO 7193	0,70 m × 1,3 m According to CEN 12184	0,80 m × 1,40 m According to CEN 12184
Turn around width between limiting walls	1,3 m According to CEN 12183	1,5 m According to CEN 12184	1,80 m According to CEN 12184

Recommended length, width, and turn around width according to EN 12183 and EN 12184

The circulation space requirements of the wheelchair users and the conditions should be established taking into account the wheelchair maximum overall dimensions in the table above.

Wheelchairs have different dimensions and space requirements depending on the type of wheelchair. The type of wheelchair used is dependant on whether the wheelchair is supposed to be used outside or indoors but also on the degree and type of impairment of the user. In the standard referred to in the table, consideration has not been given to the fact that some people need individual adaptation of the chair, for example if the they have a stiff leg and have to sit with their leg stretched out, if the back of the chair is lowered or if an exceptionally wide wheelchair is needed.

At a national level it should be decided what type of wheelchair should be considered in different types of built environment.

When wheelchairs are pushed by a third party the total length occupied by the chair and occupant does not exceed 1 500 mm when stationary and 1 750 mm when moving.

To propel a chair manually by operating the rims of the main wheels a clearance of not less than 50 mm, and preferably 100 mm, is needed. Over longer travel distances additional space is needed.

The area required for turning is, besides the type of wheelchair and adaptation of the wheelchair, also dependant on the ability of the user to manoeuvre the wheelchair and the way the turning is done. The recommended dimension needed for turning a wheelchair is often described as a circle but it doesn't need to be a circle. Often turning is done with several movements with the wheelchair, including backing operation. The area needed is dependant on the number of backing operations. If no backing operation is accepted a larger space is needed.

B.8.3 Reach range

Most wheelchairs have a seat height between 460 mm and 550 mm. The seated position of a wheelchair user restricts arm reach in both vertical and horizontal directions, even when the occupant has full use of his or her arms and upper body. Many wheelchair users have impaired mobility in their arms or impaired balance that make it impossible to lean forward without risk of falling from the wheelchair. That means that the reach is even more reduced.

The maximum reach of a wheelchair user is confined to a height of 480 mm to 1 200 mm above floor level and a maximum side reach of 250 mm from the outer side of the wheelchair.

The reach of a wheelchair user with impaired balance and impaired mobility in the arms is much reduced. The height, which is possible for almost all people to reach, is 700 mm - 850 mm above floor level. Many can reach up to 1 000 mm comfortably sideways reach for at least 90% of wheelchair users according to an ergonomic study in UK).

As the wheelchair occupant's side reach is generally greater than their front reach, provision should be made for suitable lateral access.

Figure B.1 shows the maximum and the comfortable common reaching zone of wheelchair users (from UN *Enable – Design Manual for Barrier Free Environment*). For example only 80% can comfortably reach sideways to a height of 1 200 mm. (Based on ergonomic study in UK)

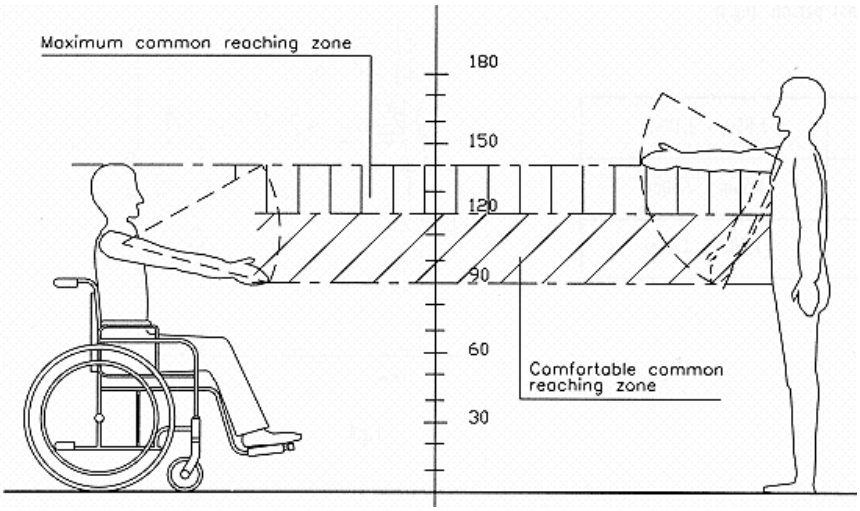


Figure B.1 – Applying the comfortable and maximum common reaching zone by wheelchair user and standing person
(UN Enable Design Manual for Barrier Free Environment)

To allow front approach by wheelchairs to elements, sufficient space should be provided below the element to allow for the wheelchair user's knees and preferably the armrests of the wheelchair. When it is not possible to arrange this, provision should be made for suitable lateral access, as the wheelchair occupant's side reach is generally greater than their front reach.

B.8.3 Reach of users seated in wheelchairs – distance from corner and other barriers

The reach to worktops and elements located in the room corners is limited by the wheels of the wheelchair, due to the length of the armrests and footrests.

The maximum distance from any wall, transversal elements or room corners to elements that have to be reached depends on the size of the wheelchair and if the wheelchair user has impaired mobility in the arms or impaired balance. The distance shall not be less than 500 mm if the person has good balance and mobility, and 700 mm – 1 000 mm if the person has impaired mobility in the arms or impaired balance.

B.8.4 Space around elements to provide reachability

Wherever possible, a free clearance space, in which it is possible to inscribe a circle of at least 1 500 mm diameter, should be left in front of all elements to enable manoeuvrability and free access by wheelchair users.

When space restrictions do not allow the preceding requisite, a minimum area of at least 800 mm x 1 200 mm should be left in front of the element in order to allow ease of access from another area. It is easier for wheelchair users to reach out sideways rather than directly in front of them and, therefore, suitable space should be allowed for wheelchair approach to the side of the element.

B.8.5 Space to provide clearance for wheelchair user's knees

In order to favour the occupant's front reach to those elements that require this type of access, such as desks and counters, tables or public telephones, suitable space should be provided below the element in question in order to provide clearance for the wheelchair user's knees and, preferably the armrests to the wheelchair, in order to allow maximum approach.

The space should be at least 800 mm wide, 600 mm deep and a minimum of 680 mm high. In order to enable maximum approach by allowing armrest clearance (work tables, etc.), the free area should be at least 800 mm wide, 600 mm deep and with a minimum free height of 780 mm.

Where only knee space is required (as in the case of washbasins and counters), the lower free space should be at least 800 mm wide, 600 mm deep at foot level and at knee level, with a minimum free height of 700 mm.

B.8.6 Convenient height of worktops

For wheelchair users the convenient height of worktops is between 750 mm and 850 mm; flexible provision is preferred.

B.8.7 Eye-level

The eye level of a seated person varies on average between 990 mm and 1 250 mm. This factor should be taken into account in elements such as windows, information desks and counters or glass doors.

B.9 Visual contrast

Editorial note: Most of this information about Visual Contrast comes from the Research Group for Inclusive Environments in the University of Reading /UK (Professor Keith Bright) which has done a lot of research work in this field. More information about Colour Contrast and Perception has been published also there, see more in http://www.extra.rdg.ac.uk/ie/

B.9.1 General

In any environment the appropriate use of visual contrast can assist all users to move around, identify features and communicate with others.

People with visual impairments use visual contrast to gather information are not looking for particular colours but for contrast between adjacent colours. It is the visual contrast between two adjacent areas which will assist in giving them the information they need.

For most situations, the LRV of the colour used in a product or paint can be obtained from the manufacturer. It has to be noted that the recorded value is dependent upon the illuminance (or lighting level) when the measurement was taken. Therefore LRVs are only truly applicable in situations where the same lighting conditions are available.

Light is essential for the perception of colour. People with visual impairments may be unable to perceive some or all colours, indeed some people who are not recognised as visual impaired may be unable to perceive all colours. However many visual impaired people can perceive light and dark and since this is also a feature of coloured surfaces their appearance can be influenced by the nature of the lighting condition.

B.9.2 Determination of differences in luminance

For providing the experience of visual contrast the relative difference in luminance (brightness) of adjacent surfaces is important and has to be determined. Differences in hue (the nature of the colour) or chroma (the intensity of the colour) alone doe not provide adequate visual contrast.

B.9.2.1 Determination of luminance

To determine the relative difference in luminance, the LRV of a surface must be known. Manufacturers provide LRVs of colours and finishing.

Where the LRVs are not provided, the luminance of the two surfaces can be measured under equal illumination conditions for the two surfaces.

B.9.2.2 Difference in LRV-values

The recommended point difference between two surfaces in LRV-values is described in 34.

This is based on the difference in LRV of the two adjacent surfaces or of a component and its background. The LRV-scale runs from 0, which is a perfectly absorbing surface that could be assumed to be totally black, up to 100, which is a perfectly reflective surface that could be considered to be the perfect white. Because of practical influences in any application, black is always greater than 0 and white never equals 100.

B.9.2.3 Different algorithms for visual contrast

To determine visual contrast different algorithms are also used throughout the world. The following table gives the equivalent for the recommended minimum contrast determined with the three algorithms most commonly used. All three algorithms are very similar in that each of the algorithms involves two identical variables and that the resultant difference is a dimensionless ratio. In effect, each of the three algorithms can be used to compare surfaces of different luminance reflectance, the only difference being the value of the resulting contrast. All three equations involve a fraction with identical numerators, namely the difference between the two luminous reflective values. The denominators, however, are different.

Table B.9.2 - Recommended visual contrast according to the different algorithms most commonly used troughout the world by reference to their luminance

	$\frac{L_1 - L_2}{L_1 + L_2} \times 100$	$\frac{L_1 - L_2}{L_1} \times 100$	$\frac{L_1 - L_2}{05.\ (L_1 + L_2)} \times 100$
potential hazards text information	60	75	120
elements and components for orientation	30	46	60

L_1 is the greater luminance and L_2 is the lesser luminance.

A minimum difference in LRVs and though in luminance between the two surfaces is essential in order to distinguish their visual contrast. All three algorithms have a problem when used to compare two relatively dark surfaces. For example where a dark grey surface with a luminance reflectance value of 0.2 is compared to an almost black surface of 0.1, the visual contrast calculated with all three algorithms would achieve an acceptable value (33 / 50 / 66). But in practice the visual contrast between these two surfaces would be insufficient for people with vision impairments.

Good illumination assists in the perception of items of the built environment and to achieve adequate luminance reflection. Where the level of illumination is low, a higher level of contrast is required.

B.9.3 Relevant design factors

To emphasise features and assist navigation certain factors should be considered in any design:

— To distinguish the boundaries of larger surfaces such as floors, walls, doors and ceilings appropriate differences in LRV should be used. The LRV of the wall colour should be different to that used on the ceiling and the floor;

— To provide an accurate impression of the size of the space, the LRV of deep skirting boards should be the same as that of the wall (less important for a shallow skirting up to 100 mm or 125 mm deep);

— Reflections and glare from shiny surfaces confuse people with visual impairments and the use of these finishes on larger areas should be avoided. Glare may additionally affect the ability of people who have a hearing impairment to communicate using lip-reading;

— Adequate visual contrast should be used to identify potential hazards;

— If the architrave around a door has visual contrast to the surrounding wall, the opportunity to identify the presence of the door will be available even when the door is open.

— To highlight the presence of a door different measures are recommended:

Preferably, the door and the architrave should contrast with the surrounding wall;

If the door and the wall have similar LRV and only the LRV of the architrave providing the contrast, it will still be possible to identify the presence of a feature, but it may take longer to identify it as a door opening;

If the architrave and the surrounding wall have the same LRV and only the LRV of the door itself is providing contrast, it will be much more difficult to identify the presence of the door when the door is open. Only when the door is closed sufficient visual contrast to the architrave and surrounding wall is available.

The above list highlights only one or two areas for consideration. Additionally there are many other factors which affect selection and use of colours in environments.

NOTE More information about Colour Contrast and Perception has been published by the Research Group for Inclusive Environments in the University of Reading, UK: http://www.extra.rdg.ac.uk/ie/

B.10 Air quality

Indoor climate is important to everyone but especially for people with allergies. Therefore:

— the use of materials with high emission levels, which may cause problems for people with a high allergenic sensitivity, is to be avoided;

— limitation of formaldehyde density indoors: regulating emission from materials used as interior finish (mostly plywood);

— 24 hour ventilation system for habitable rooms (for dwellings, mechanical systems with the minimum capacity of 0.5 air change per hour) is recommended;

— limitation of inflow from adjoining spaces into habitable rooms, and

— complete ban of chlorpyrifos (organophosphate) used to prevent termite damage to wooden structural members (mostly foundations).

It is expected that the introduction of mechanical ventilation systems will lower the density of VOC (volatile organic chemicals come from various sources, not just from building materials) in general, thus lowering the risk of sick-house syndrome.

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Please send your national accessibility standards (English title) to klenovec@designforall.at