MALAYSIAN STANDARD

MS 1184:2014

Universal design and accessibility in the built environment - Code of practice (Second revision)

FOR CAWANGAN ARKTEK, JKR
REFERENCE PURPOSE ONLY
(No reproduction is allowed)

ICS: 25.060.1

Descriptors: universal design, disabled person, ambulant disabled, access, landscape, sign and symbol, facility, lift, requirement

DEPARTMENT OF STANDARDS MALAYSIA

DEVELOPMENT OF MALAYSIAN STANDARDS

The **Department of Standards Malaysia (STANDARDS MALAYSIA)** is the national standards and accreditation body of Malaysia.

The main function of STANDARDS MALAYSIA is to foster and promote standards, standardisation and accreditation as a means of advancing the national economy, promoting industrial efficiency and development, benefiting the health and safety of the public, protecting the consumers, facilitating domestic and international trade and furthering international cooperation in relation to standards and standardisation.

Malaysian Standards (MS) are developed through consensus by committees which comprise balanced representation of producers, users, consumers and others with relevant interests, as may be appropriate to the subject at hand. To the greatest extent possible, Malaysian Standards are aligned to or are adoption of international standards. Approval of a standard as a Malaysian Standard is governed by the Standards of Malaysia Act 1996 [Act 549]. Malaysian Standards are reviewed periodically. The use of Malaysian Standards is voluntary except in so far as they are made mandatory by regulatory authorities by means of regulations, local by-laws or any other similar ways.

For the purposes of Malaysian Standards, the folowing definitions apply:

Revision: A process where existing Malaysian Standard is reviewed and updated which resulted in the publication of a new edition of the Malaysian Standard.

Confirmed MS: A Malaysian Standard that has been reviewed by the responsible committee and confirmed that its contents are current.

Amendment: A process where a provision(s) of existing Malaysian Standard is altered. The changes are indicated in an amendment page which is incorporated into the existing Malaysian Standard. Amendments can be of technical and/or editorial nature.

Technical corrigendum: A corrected reprint of the current edition which is issued to correct either a technical error or ambiguity in a Malaysian Standard inadvertently introduced either in drafting or in printing and which could lead to incorrect or unsafe application of the publication.

NOTE: Technical corrigenda are not to correct errors which can be assumed to have no consequences in the application of the MS, for example minor printing errors.

STANDARDS MALAYSIA has appointed **SIRIM Berhad** as the agent to develop, distribute and sell Malaysian Standards.

For further information on Malaysian Standards, please contact:

Department of Standards Malaysia
Ministry of Science, Technology and Innovation
Level 1 & 2, Block 2300, Century Square
Jalan Usahawan
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel: 60 3 8318 0002
Fax: 60 3 8319 3131
http://www.standardsmalaysia.gov.my
E-mail: central@standardsmalaysia.gov.my

OR

SIRIM Berhad
(Company No. 367474 - V)
1, Persiaran Dato' Menteri
Section 2, P. O. Box 7035
40700 Shah Alam
Selangor Darul Ehsan
MALAYSIA

Tel: 60 3 5544 6000
Fax: 60 3 5510 8095
http://www.sirim.my
E-mail: msonline@sirim.my

Contents

Contents *(continued)*

Contents *(concluded)*

Page

Committee representation

The Industry Standards Committee on Building, Construction and Civil Engineering (ISC D) under whose authority this Malaysian Standard was developed, comprises representatives from the following organisations:

Association of Consulting Engineers Malaysia
Construction Industry Development Board Malaysia
Department of Irrigation and Drainage Malaysia
Department of Standards Malaysia
Dewan Bandaraya Kuala Lumpur
Federation of Malaysian Manufacturers
Jabatan Bomba dan Penyelamat Malaysia
Jabatan Kerajaan Tempatan
Jabatan Kerja Raya Malaysia
Malaysian Timber Council
Malaysian Timber Industry Board
Master Builders Association Malaysia
Pertubuhan Akitek Malaysia
Projek Lebuhraya Utara-Selatan Berhad
Real Estate and Housing Developers' Association Malaysia
SIRIM Berhad (Secretariat)
Suruhanjaya Perkhidmatan Air Negara
The Cement and Concrete Association of Malaysia
The Institution of Engineers, Malaysia
Universiti Sains Malaysia
Universiti Teknologi Malaysia

The Technical Committee on Building Design and Construction which supervised the development of this Malaysian Standard consists of representatives from the following organisations:

Construction Industry Development Board Malaysia

IKRAM QA Services Sdn Bhd

Jabatan Bomba dan Penyelamat Malaysia

Jabatan Kerja Raya Malaysia

Master Builders Association Malaysia

Pertubuhan Akitek Malaysia

Putrajaya Holdings Sdn Bhd

SIRIM Berhad (Secretariat)

Suruhanjaya Perkhidmatan Air Negara

Syarikat Perumahan Negara Berhad

The Institution of Engineers, Malaysia

The Institution of Surveyors, Malaysia

Universiti Teknologi MARA

Committee representation *(continued)*

The Working Group on Accessibility for Disabled Person which developed this Malaysian Standard consists of representatives from the following organisations:

Construction Industry Development Board Malaysia

Dewan Bandaraya Kuala Lumpur

Hospital Rehabilitasi Cheras

Jabatan Bomba dan Penyelamat Malaysia

Jabatan Kebajikan Masyarakat Malaysia

Jabatan Kerajaan Tempatan

Jabatan Kerja Raya Malaysia

Jabatan Landskap Negara

Jabatan Perancangan Bandar dan Desa

Jabatan Perumahan Negara

Malaysian Association for the Blind

Malaysian Federation of the Deaf

Persatuan Orang-orang Cacat Anggota Malaysia

Pertubuhan Akitek Malaysia

SIRIM Berhad (Secretariat)

Universiti Islam Antarabangsa Malaysia

Universiti Malaya

Co-opted members:

Universiti Islam Antarabangsa Malaysia

Foreword

This Malaysian Standard was developed by the Working Group on Accessibility for Disabled Person under the authority of the Industry Standards Committee on Building, Construction and Civil Engineering.

This Malaysian Standard cancels and replaces MS 1184:2002, *Code of practice on access for disabled persons to public buildings (First revision)* and MS 1331:2003, *Code of practice for access of disabled persons outside buildings (First revision)*.

Compliance with a Malaysian Standard does not of itself confer immunity from legal obligations.

Introduction

This Malaysian Standard provides building users, architects, designers, engineers, builders, building owners and managers, manufacturers, policy makers and legislators with requirements and recommendations to create a sustainable built environment which is accessible.

The purpose of this standard is to define how the built environment should be designed, constructed and managed to enable people to approach, enter, use, egress from and evacuate a building independently, in an equitable and dignified manner and to the greatest extent possible.

The intention of this standard is to meet the needs of the majority of people. This goal is achieved by agreement on minimum standards of provision which are generally accepted to accommodate the diversities of age, disabbilities and of human condition.

This standard should be applied to new and renovated buildings.

If these design requirements are taken into consideration in the early stages of building design, the costs of providing accessibility and usability measures are minimal and raise the value of the property in terms of sustainability. Where alterations and refurbishment occur, the additional cost depends on the size and complexity of the particular building and its adaptations.

This standard contains a combination of essential requirements, i.e. provisions which are essential for accessibility and usability of the built environment, and recommendations for an improved environment. The essential requirements are preceded by the word "shall". For recommendations which are desirable, the provisions are preceded by the word "should".

It is also important to ensure that existing buildings of historical, architectural and cultural importance are accessible and recommended appropriate alternative accessibility measures.

Universal design and accessibility in the built environment - Code of practice

1 Scope

This Malaysian Standard provides a range of requirements and recommendations for many of the elements of construction, assemblies, components and fittings which comprise the built environment. These requirements relate to the constructional aspects of access to buildings, to circulation within buildings, to egress from buildings in the normal course of events and evacuation in the event of an emergency. An informative annex is also included which deals with aspects of accessibility management in buildings.

This standard applies to buildings which the public has access to, including the followings:

a) residential buildings (landed properties are excluded);

b) offices, banks, post offices, shops, department stores, supermarkets, hotels and other administrative and commercial buildings;

c) rail, road, sea and air travel buildings and associated concourses, car-parking building and factories;

d) hospitals, medical centres, clinics and other health and welfare buildings;

e) restaurants, concert halls, theatres, cinemas, conference buildings, community buildings, swimming pools, sports buildings and other refreshment, entertainment and recreation buildings;

f) religious buildings;

g) schools, hostels, colleges, universities, zoos, museums, art galleries, libraries, exhibition buildings and, other educational, cultural and scientific buildings; and any other buildings or any part thereof to which members of the general public has access, as visitors/ occupants or for the purposes of the employment; and

h) historical buildings, heritage, sport and government buildings.

The aim of this standard is to set out the fundamental design and construction requirements and guidelines for making those buildings specified in Table 1.

The requirements and guidelines in this standard are intended to apply to persons with disabilities (PWDs). Where a building is required to be designed or retrofitted to accommodate children with disabilities, it is recommended that the "Design guidelines for children with disabilities" in Annex F be adopted and followed.

Where a physical environment is needed to meet the needs of persons with visual impairment, designers are encouraged to design or retrofit a building in accordance with the "Design guidelines for persons with visual impairment" in Annex G.

Where residential buildings are required to be designed or retrofitted to provide accessibility and safety to the future elderly and infirm population, it is recommended that the "Design guidelines for elderly" in Annex H be adopted and followed.

In the case of building owners, developers and managing agents who are keen to provide a family-friendly environment in buildings where families with infants and young children are likely to congregate, the "Design guidelines for family-friendly facilities" in Annex J are recommended for adoption.

In the case of parks and open spaces, landscape designers are encouraged to adopt the "Design guidelines for parks and open spaces" as indicated in Annex K, though it is important to maintain as much of the natural environment as possible.

Table 1. Accessibility for PWDs, the elderly and children in different types of buildings

Types of buildings	Accessible areas
1. Residential buildings: 1.1 Existing buildings: (a) 4-storeys and below (without lift access); (b) 4-storeys and below (with lift access); and (c) 5-storeys and above. 1.2 New buildings shall be provided with lift.	 All communal areas and facilities at ground floor. All communal areas and facilities. All communal areas and facilities. All communal areas and facilities.
2. Office buildings.	All areas intended for access by employees or public.
3. Shophouses.	All areas intended for access by employees or public.
4. Shopping complexes and multipurpose complexes.	All areas intended for access by employees or public.
5. Hotels, boarding houses and chalets.	All areas intended for access by employees or public.
6. Places of public resort.	All areas intended for access by employees or public.
7. Parks and open spaces including zoo, civic plaza, etc.	All areas intended for access by employees or public.
8. Schools, colleges, universities or institutions of learning.	All areas intended for access by staff, students or public.
9. Hostels, halls of residence or dormitories.	All areas intended for access by staff, students or public.

Table 1. Accessibility for PWDs, the elderly and children in different types of buildings
(continued)

Types of buildings	Accessible areas
10. Sports complexes and public swimming pools.	All areas intended for access by employees or public.
11. Restaurants and eating establishments.	All areas intended for access by employees or public.
12. Markets and hawker or food centres.	All areas intended for public access
13. Hospitals, clinics, dispensaries, nursing homes, homes for the aged and welfare homes.	All areas intended for access by staff, patients, inmates or public.
14. Factories, workshops, industrial buildings and office/showroom areas in warehouses.	All areas intended for access by employees or public.
15. Transport stations, interchanges, passenger terminals, administration buildings in depots, taxi and bus shelters.	All areas intended for access by employees or public.
16. Vehicle parks (surface parking or vehicle parking buildings).	Prescribed areas. For vehicle parking buildings, carpark decks to be made accessible.
17. Heritage building.	Prescribed areas intended for access by employees or public.

2 Normative references

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

MS 2015: Part 1, *Public Toilets - Part 1: Minimum design criteria*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1 ability faculty

Identifiable human attribute, including but not exclusively, to walk, to speak, to hear, to see, to feel by touch, to taste, to understand, and recognise.

3.2 access for persons with disabilities (PWDs), elderly and children

A continuous unobstructed path of travel capable of being negotiated by a person using a wheelchair or otherwise with limited mobility.

3.3 accessibility

Provision of buildings or parts of buildings for people, regardless of disability, age or gender, to be able to gain access to them, into them, to use them and exit from them.

NOTE. Accessibility includes ease of independent approach, entry, evacuation and/or use of a building and its services and facilities, by all of the building's potential users with an assurance of individual health, safety and welfare during the course of those activities.

3.4 accessible route

A continuous unobstructed path connecting all accessible elements and spaces in a building or facility that can be negotiated safely by persons with disabilities. For non-ambulatory persons, this accessible path shall not incorporate any step, drop, stairway, turnstile, revolving door, escalator or other impediment which would prevent it from being safely negotiated by such persons. Interior accessible routes shall include doorways, corridors, floors, ramps, lifts and clear floor spaces at fixtures. Exterior accessible routes include parking access aisles, kerb ramps, walkways and ramps.

3.5 access route plan

Plan(s) showing the barrier-free access to the building from adjacent buildings and nearest public facilities as well as barrier-free access within the building.

3.6 ambulant disabled persons

Persons who are able to walk but who may depend on prostheses (artificial limbs), orthoses (calipers), sticks, crutches or other mobility aids to walk, and others who can walk but have sensory impairment such as the visual impaired and hearing impaired.

3.7 area of rescue assistance

Building space directly adjoining, and visible from, a main vertical evacuation route, robustly and reliably protected from heat, smoke and flame during and after a fire, where people can temporarily wait with confidence for further information, instructions, and/or rescue assistance, without obstructing or interfering with the evacuation travel of other building users.

NOTE. "Robust" means structurally hardened and resistant to mechanical damage during the fire and for a period of time afterwards, i.e. the cooling phase.

3.8 assisted evacuation

Strategy that exists during which a designated person or persons provide assistance, during an emergency, to another person to leave a building or a specific part of the built environment and to reach a final place of safety.

3.9 assistive product

Product especially produced or generally available, for preventing, compensating for, monitoring, relieving or neutralising impairments, activity limitations and participation restrictions.

EXAMPLE. Devices, equipment, instruments, technology and software.

3.10 attention/warning pattern

Tactile walking surface indicators (TWSIs) that call attention to particular decision points.

3.11 audio

Verbal narration that conveys the visual aspects of a presentation or performance, chime, bell, beeps etc that can provide a good way to assist the visual impaired.

3.12 building related ill-health

Adverse impact on the health of building users while living, working, generally occupying or visiting a specific building caused by the planning, design, construction, management, operation or maintenance of that building.

3.13 buffer zone

Compartments and/or spaces immediately adjoining the fire compartment in a building.

3.14 built environment

External and internal environments and any element, component or fitting that is commissioned, designed, constructed and managed for use by people.

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.

3.15 circulation space

Unobstructed space necessary for access to, into and within and egress from any part of the built environment.

3.16 circulation path

An exterior or interior way of passage from one place to another for pedestrians including walkways, linkages, hallways, courtyards, stairways and stair landings.

3.17 colour deficiency

Inability to perceive certain colours and to clearly distinguish between combinations of these colours.

3.18 common

Serving more than one single-family dwelling or more than one building or more than one tenancy.

3.19 contraflow

Emergency access by fire fighters or rescue teams into a building and towards a fire, while people are still moving away from the fire and evacuating the building.

3.20 differences in LRV

Values 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.

3.21 disabled persons

Persons with a physical, hearing or sight impairment or any combination thereof, which affects their mobility outside buildings and related amenities.

Persons with disabilities are those who have long term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinders their full and effective participation in society.

3.22 disorientation

Permanent or temporary inability of a person to orient himself or herself with regard to space, time and context in either the built environment or virtual environment.

Acute disorientation brought on by the use of alcohol, "social" drugs and some medicines, or dramatic alterations in a person's circumstances, e.g. involvement in a fire incident, is not uncommon or abnormal. Long term progressive disorientation is a symptom of a variety of psychological and/or neurological disorders.

3.23 doorset

Building component consisting of a fixed part (the door frame), one or more movable parts (the door leaves), and their hardware, the function of which is to allow, or to prevent, access and egress.

NOTE. A doorset can also include a door sill or threshold.

3.24 evacuation from a building on fire

To withdraw, or cause to withdraw, all users from a fire building in planned and orderly phased movements to a place of safety remote from the building.

3.25 evacuation lift

Lift that can be used, during an emergency, for self or assisted egress.

3.26 fire compartment

Enclosed space, which may be subdivided, separated from adjoining spaces by fire barriers.

3.27 fire compartmentation

Division of a building into fire-tight compartments, by fire and smoke resisting elements of construction, in order to:

a) contain an outbreak of fire;

b) prevent damage, within the building, to other adjoining compartments and/or spaces;

c) protect a compartment interior from external fire attack, e.g. fire spread across the building's facade or from an adjacent building; and

d) minimise adverse, or harmful, environmental impacts outside the building.

3.28 fire defence plan

Operational guide for a specific building comprising fire engineering drawings, descriptive text, fire safety related product/system information, with supporting calculations and fire test data developed from the fire engineering strategy.

3.29 fire engineering strategy

Coherent and purposeful arrangement of fire prevention, fire protection and fire management measures which are developed in order to attain specified fire engineering design objectives.

3.30 fire prevention

All measures necessary to prevent an outbreak of fire in a building, including such secondary activities as fire research and education of the public concerning fire hazard.

3.31 fire protection

Use of spatial planning, building design, construction, services, systems, personnel and equipment in order to control and extinguish fire, and minimise any adverse or harmful environmental impacts caused.

3.32 fire resistance

Ability of an element of construction to withstand heat, smoke and flame or give protection from them for a period of time.

3.33 fire resisting doorset

Doorset, properly installed or mounted on site, the function of which is to resist the passage of heat, smoke and flame for a specified time during a fire.

3.34 going (stair)

Tread, horizontal distance between two consecutive nosings, measured on the centre line.

3.35 going (ramp)

Horizontal distance between the start and finish of a flight of a ramp.

3.36 guiding pattern

Tactile walking surface indicators (TWSIs) to indicate a direction of travel.

3.37 grab bar

Bar used to give a steadying or stabilising assistance to a person engaged in a particular function.

3.38 habitable room

Room, intended for dwelling purposes, including a kitchen, a bathroom and a utility room.

3.39 handrail

Component of a stair or of a ramp or other building components that provides guidance, balance and support.

3.40 hearing enhancement system

Piece of equipment, product system, hardware, software or service that is used to increase, maintain or improve listening capabilities of individuals with hearing impairments.

3.41 impairment

Limitation 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.

3.42 impairment, cognitive

Deficiency of neuropsychological function which can be related to injury or degeneration in specific area(s) of the brain.

3.43 impairment, mental

Slower than normal rate in a person's cognitive developmental maturation, or where the cognitive processes themselves appear to be slower than normal, with an associated implication of reduced, overall mental potential.

3.44 kerb ramp

Construction, in the form of an inclined plane that makes it possible to pass from street level to a higher pedestrian path.

3.45 keypad

Arrangement of buttons or touch pads with numbered keys in accordance with the standard telephone layout.

3.46 landing

Platform or part of a floor structure at the end of a flight of stairs or a ramp or at the entrance to a lift car.

3.47 levelling accuracy

Maximum vertical distance between a car sill and a landing sill during loading or unloading of the lift.

3.48 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).

3.49 light reflectance value (LRV)

Proportion of visible light reflected by a surface at all wavelengths and directions when illuminated by a light source.

LRV is also known as the luminance reflectance factor or CIE Y value.

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

3.50 luminance

Intensity of light emitted or reflected in a given direction from the surface element divided by the area of the element in the same direction.

3.51 manoeuvring zone

Minimum three dimensional space within which it is 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.

3.52 moving walkway

Moving accessible path of travel, either level or with an inclination up to 6°.

3.53 non-ambulant disabled persons

Persons who are not able to walk and require mobility aids such as wheelchair and scooter.

3.54 nosing

Projecting front edge of a tread or landing that can be rounded, chamfered or otherwise shaped.

3.55 place of relative safety

Location beyond the buffer zone surrounding a fire compartment in a building.

3.56 place of safety

Location beyond a perimeter which is a safe distance from the building and where necessary medical care and attention can be provided, or organised, within one hour of injury and where people can be identified.

3.57 principal entrance

Entrance or, if there is more than one with equal status, the entrances that people would normally expect to approach and to enter in order to use the building or other facility.

3.58 principal entrance storey

Storey that contains the principal entrance or principal entrances to the building.

3.59 ramp

Construction, in the form of an inclined plane that is steeper than or equal to 1:20 (5 %) from the horizontal, together with any intermediate landing, that makes it possible to pass from one level to another.

3.60 reflectance

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).

3.61 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.

3.62 riser

Vertical component of a step between a tread or a landing and the tread or landing above or below it.

3.63 stair lift

Appliance for transporting a person (either seated or standing) or a person in a wheelchair between two or more landings by means of a seat or platform moving in an inclined plane.

3.64 stopping accuracy

Maximum vertical distance between the car sill and landing sill at a moment when a car is stopped by the control system at its destination floor and the doors reach their fully open position.

3.65 suitable

Appropriate design, construction, installation or location meeting the needs of the intended user.

3.66 tactile walking surface indicator (TWSI)

Profiled paving surface with visual contrast criteria to enable a person with impaired sight using a long cane, underfoot or visual identification to detect a specific route (tactile directive indicator) or the presence of a hazard (tactile attention/warning indicator).

Tactile attention/warning indicators may be installed at the vicinity of pedestrian crosswalks, the platforms of railway stations, and both the top and bottom of stairs and ramps, and in front of escalators, travelators and lifts, and the like to ensure safety.

Tactile directive indicators may be used in combination with attention/warning indicators in order to indicate the walking route where no other tactual information is available to get from one place to another.

NOTE. See Annex A.

3.67 unobstructed width (general)

Free unobstructed space necessary for passage through a doorway, along a passageway, or other route element (e.g. stairway).

3.68 unobstructed width (door)

Available width for passage through a door opening, clear of all obstructions below 900 mm, measured when the door is opened 90°, or when a sliding or folding door is opened to its fullest extent.

3.69 usability

Characteristic of the built environment which can be used by everybody in convenience and safety.

3.70 user

Person who interacts with the product, service or environment.

3.71 visual contrast

Visual perception between one element of a building and another.

This can be produced by a difference in LRV or luminance, also called luminance contrast.

3.72 visual strobe alarm

A device used to produce regular flashes of light. It is one of a number of devices that can be used as a stroboscope.

3.73 wayfinding

Descriptive of a system whereby appropriate information is provided to assist a person to pass through the built environment towards a specific destination.

NOTE. Wayfinding includes orienting oneself, knowing one's destination, following the best route, recognising one's destination and finding one's way back out. People who are blind or who have a visual impairment benefit from tactile information to facilitate wayfinding.

4 General design considerations

4.1 General

The requirements in this standard relate to the principal human abilities that should 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.

4.2 Design requirements according to human abilities

When fully implemented, this standard is expected to be of benefit to all people, including:

a) people with hearing impairments;

b) people with visual impairments;

c) people with mobility impairments;

d) people with cognitive/ learning impairments;

e) people with hidden (such as strength, stamina, mental, dexterity and allergy) impairments; and

f) people with diversities in age and stature (including frail persons).

4.3 Accessibility to public buildings and the built environment

The areas or levels in the types of buildings specified in Table 1 shall be made accessible for PWDs, the elderly and children in accordance with the provisions of this standard.

4.4 Key accessibility issues

Entering, using and evacuating buildings should be safe and easy for individuals, families and groups which include persons with disabilities.

The main considerations are:

a) pedestrian access into site;

b) designated cycle and motor vehicle parking near the main entrance;

c) accessible path to the entrance;

d) appropriate external lighting;

e) accessible external furniture (seats, bins, etc.);

f) accessible information at the entrance to the site;

g) suitable drop-off point near main entrance;

h) reduced travelling distances;

i) level entrances and exits;

j) simple and logical layouts;

k) unobstructed level circulation;

l) easy access to information desks, lifts and toilet cubicle for disabled persons;

m) intuitive, obvious and accessible fire evacuation routes;

n) spacious lifts;

o) safe stairs that are easy to use, and facilitate safe assisted evacuation/rescue in emergencies;

p) slip-resistant walking surfaces;

q) wide door openings and easy door operation, sufficient space around doors that makes it possible to open and close them when seated in a wheelchair;

r) adequate manoeuvring space;

s) adequate height, location and easy operation of controls and switches;

t) good lighting;

u) good visual contrast of walls, floors, doors and signage;

v) good signage;

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

x) good acoustics;

y) hearing enhancement systems; and

z) management and maintenance of the built environment.

See Table 2 for examples of how these issues can be combined when planning a built environment.

Table 2. Examples of key accessibility issues in the early stages of planning

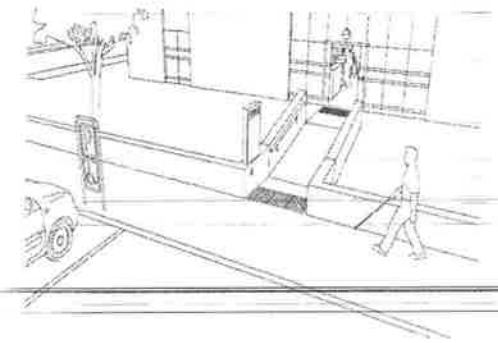
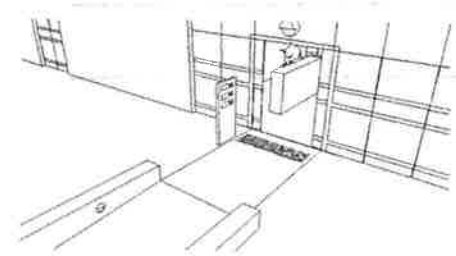
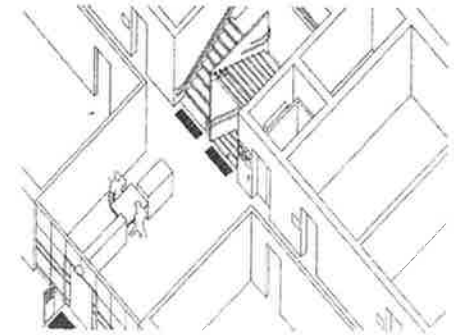
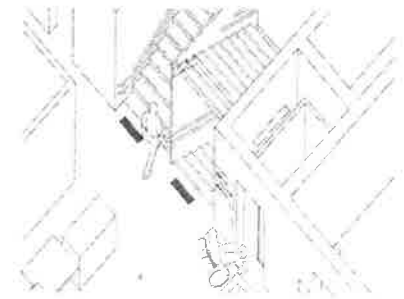
No.	Key accessibility issues	Example
1	Equitable approach to a building, e.g. designated parking, clear pedestrian routes separate from vehicles and cyclists, no steps or obstacles, short distances from parking and public transport, good signage, good lighting and good contrast. See Clauses 5, 6, 7, 8, 9, 31, 33 and 38.	
2	Equitable entry via the same entrances, e.g. easy to locate main entrances, no steps or obstacles, wide openings, adequate manoeuvring space in front of the door, low operating forces, good signage, good lighting and good visual contrast. See Clauses 10, 18, 31, 33, 34 and 38.	
3	Equitable use of the same paths in horizontal circulation, e.g. no steps or obstacles, adequate manoeuvring space, wide door openings, easy to operate doors, resting places, clear layout, good signage, good lighting and good visual contrast. See Clauses 11, 18, 31, 33, 35 and 38.	
4	Equitable access to the same paths in vertical circulation, e.g. safe stairs, spacious lifts with easy operation, good signage, good lighting and good visual contrast. See Clauses 12, 13, 14, 15, 17, 31, 33 and 38.	

Table 2. Examples of key accessibility issues in the early stages of planning *(continued)*

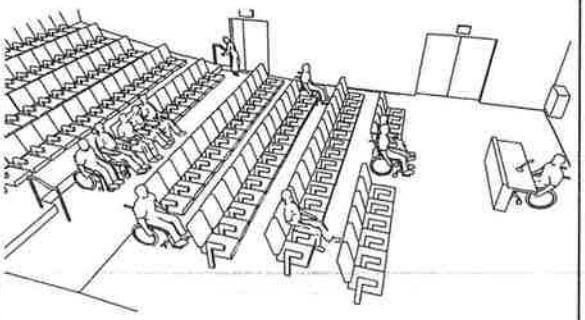
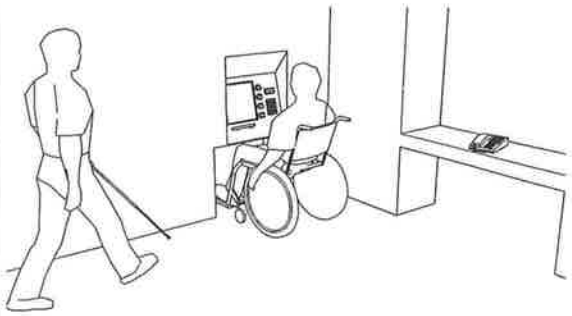
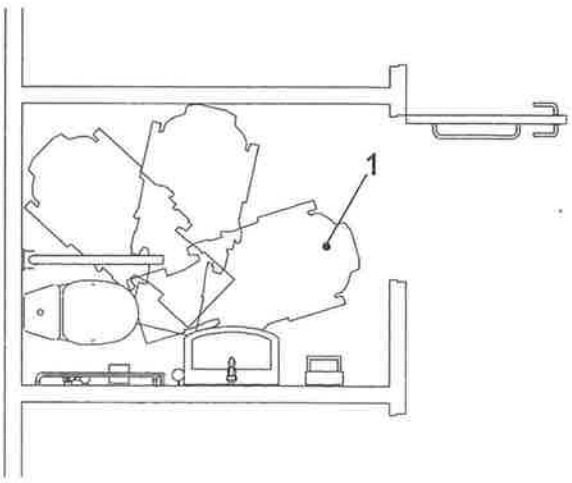
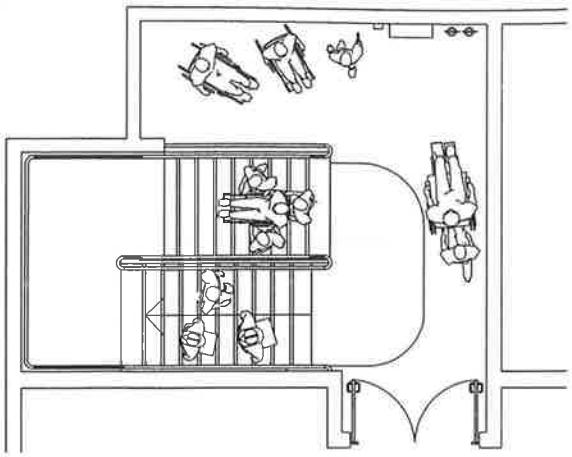
No.	Key accessibility issues	Example
5	Equitable use of the same rooms, e.g. ample circulation space and different seating possibilities, good acoustics and hearing enhancement systems, good lighting and good visual contrast. See Clauses 20, 21, 22, 23, 24, 30, 31 and 33.	
6	Equitable use of the same equipment and facilities, e.g. easy to understand and operate, adequate manoeuvring space and operating height, information via two senses. See Clauses 11, 19 and 34.	
7	Equitable use of toilet and sanitary facilities, e.g. good signage, adequate manoeuvring space, good transfer options, well-placed equipment, easy operation. See Clauses 25, 37 and 39.	

Table 2. Examples of key accessibility issues in the early stages of planning
(concluded)

No.	Key accessibility issues	Example
8	Equitable exit and evacuation routes, concepts for emergency planning, e.g. no steps or obstacles, fire protected lifts, good signage, good lighting, good visual contrast, good fire safety, protection and evacuation, accessible evacuation routes. See Clauses 15, 31, 32, 33, 36 and 38.	
9	Important information via two senses or more, e.g. visual, audible and tactile. See Clauses 37 and 38.	

5 Approach to the building

5.1 Access route

At least one route from the road adjacent to the building leading to the public rooms and at least one route from public rooms to toilet cubicles and parking spaces for wheelchair users should be easily accessible by wheelchair users. Examples of access route are as shown in Figure 1.

5.2 Key points in building plans

From a minimum level to a more comfortable level of PWDs, the elderly and children.

5.2.1 Planning continuous movement flow

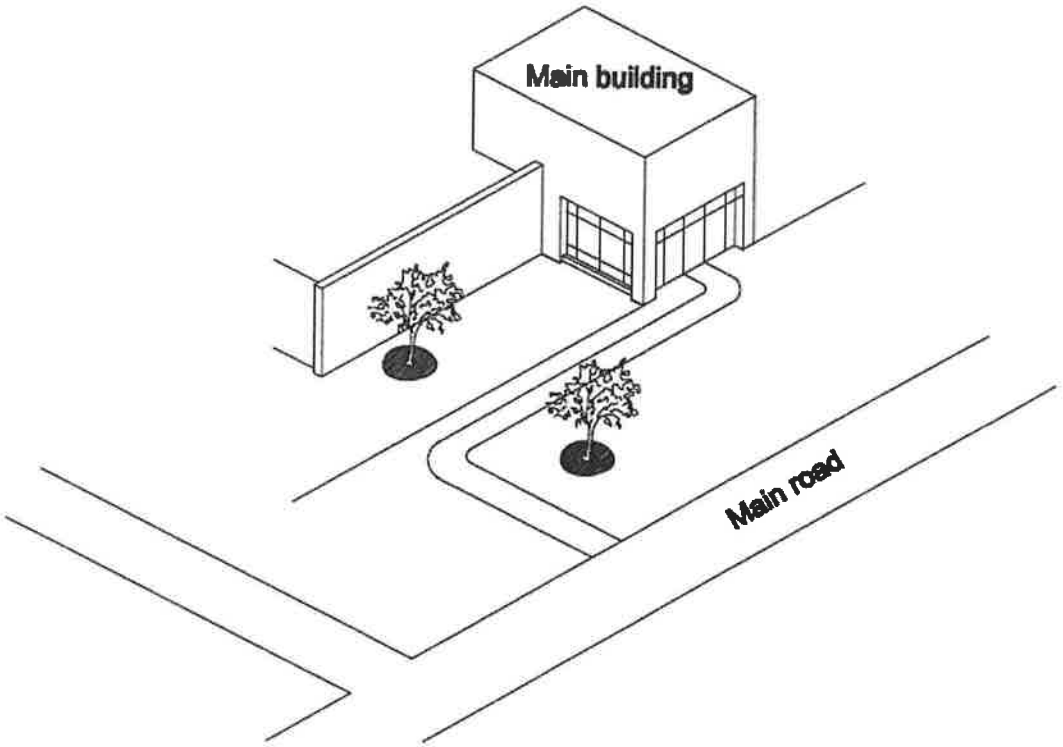
Being able to move safely from the road and passageways within the building grounds to the destination room etc. is fundamental. Priority areas for development will vary according to the function of this movement flow. For example, the flow in a restaurant would be from the dining room to the toilet, in the train station it is from the ticketing counter to the departure hall, sporting facilities it is to the spectators' seats, and in theatres it is vertical movement to audience seats, dressing rooms, and the stage. In hotels and inns, there is a need for easy access to guestrooms or communal area.

5.2.2 Detailed safety plan

Planning for appropriate measures to alleviate the risk presented by steps, and prevent people from stumbling or colliding into protruding objects while using the facilities shall be undertaken.

Other than when there are alternative movement means or there are no particular functional difficulties, special care should be taken to keep steps to a minimum.

a) Establish at least one seamless route in the extended section and from the road to public rooms in the extended sections.



b) Install toilet cubicles and parking spaces for wheelchair users (when establishing public toilets and car parks), and establish at least one seamless route from public rooms to the toilets and parking spaces.

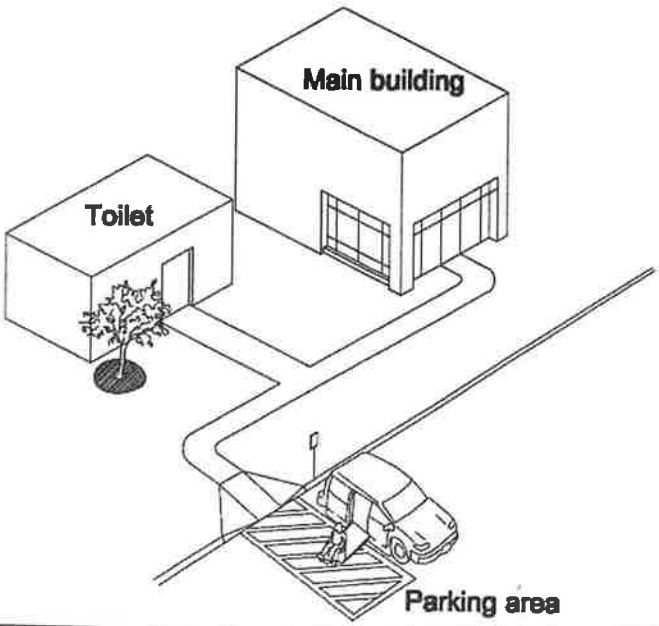


Figure 1. Examples of access route

5.2.3 Appropriate dimensions

Planning for suitable spatial measurements, such as the space required for various kinds of movement based on an understanding of users' needs, the space required for wheelchairs to turn around, the height of openings and switches, and the position of signs shall be undertaken.

5.2.4 Considering economic efficiency, flexibility, and general efficiency

Planning space and facilities that can be used by all users rather than designing specifically for PWDs and the elderly will lead to lower construction costs, and the more efficient use of space.

Consideration should be given to ease and efficiency of use, including providing a suitable number of parking spaces for wheelchair users, multifunctional toilet cubicles, and a large number of toilet cubicles that are slightly bigger than normal, and integrating signs in adjacent or co-located buildings. Meeting facilities, theaters, stations and the like may need to adopt a flexible seating arrangement, e.g., movable or detachable seats, in response to fluctuating numbers of users.

5.2.5 Ensuring ease of use and recognition

While making the overall building user-friendly is fundamental, consideration should also be given to the fitting of switches and door knobs that can be readily used and recognised by PWDs, the elderly, children, visually impaired, or those with upper limb disabilities.

Building signs should be designed to be simple, clear and easily understood by intellectually impaired, the elderly and children.

5.2.6 Staff placement according to users' needs

It is desirable to examine situations where from a use or location perspective, personal assistance is essential; for example, guidance and assistance for visually impaired people, sign language interpretation for hearing impaired people, special guidance for intellectually disabled people, and assistance and guidance for all facility users during an emergency.

5.3 Building plan checkpoints

Figure 2 describes the basic space development checkpoints.

5.3.1 Overall checkpoints

The objective of having overall checkpoints is for designers to ensure seamless accessibility to those areas by persons with disabilities. The checkpoints are:

a) Is the flow plan easy to understand and compact?

b) Is information and sign (sound, text, pictographs, guiding tiles, etc.) placement suitable, and easy to understand and see.

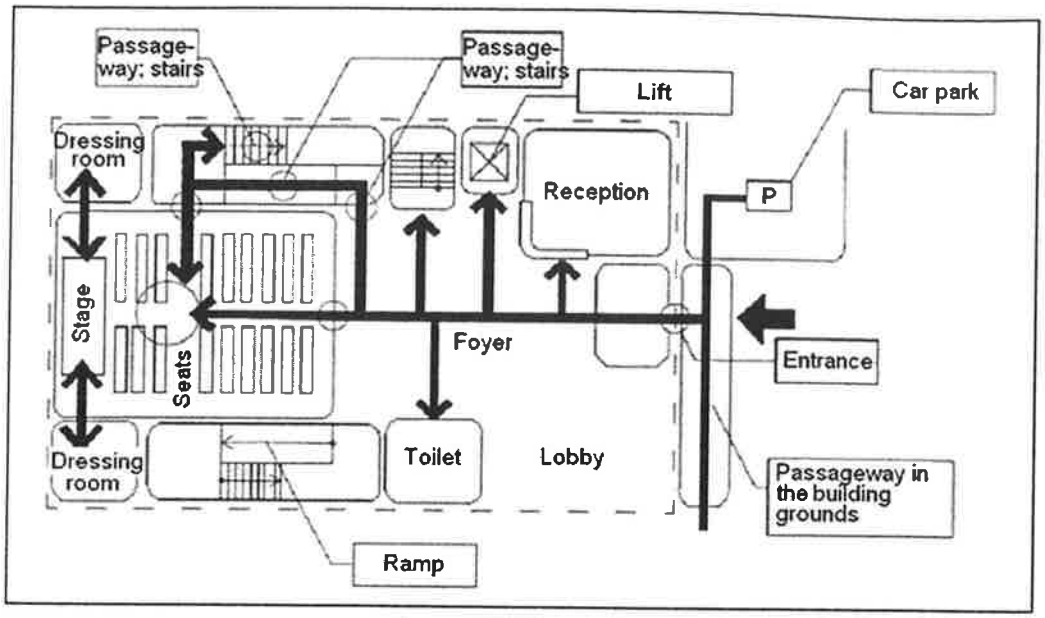


Figure 2. Basic space development checkpoints: facilities used by the general public

5.3.2 Personnel checkpoints

Considerations shall be given to provide personnel checkpoints to assist persons with disabilities to have access into the building. The checkpoints are as follows:

a) placement of staff who can guide and explain;

b) placement of staff able to communicate in sign language;

c) examine methods of meeting the needs of PWDs; and

d) emergency notification and evacuation assistance staff.

5.3.3 Spatial checkpoints

The objective of having spatial checkpoints is for designers to fulfill a broad range of the needs and requirements of persons with disabilities in the built environment. The checkpoints are as follows:

a) Passageways within the building grounds

- Are passageways easy to use and safe?
- Are passageways wide enough for PWDs and the elderly to pass safely?

b) Entrances

- Are entrances in accordance to the required dimensions, and appropriately structured so they are easy to use?

c) Passageways and stairs

– Are passageways and stairs the appropriate width, shape and gradient?

d) Lifts

– Are lifts car the appropriate shape and size?

e) Toilets

– Are the facilities, size and number of cubicles appropriate?

f) Ramps

– Are ramps the appropriate width and gradient?

g) Car parks

– Are parking spaces for wheelchair users (size, passage, number of spaces, standing signage, etc.) and their location appropriate?

h) Connectivity

– Do the passageways have seamless routes within the building and from one building to another?

5.3.4 Facilities checkpoints

The objective of having facilities checkpoints is for designers to ensure design allowances for the needs and characteristics of those specific users. The checkpoints are as follows:

a) Are the facilities easily accessible to all?

b) Are the toilets easily accessible to all?

c) Are there mothers' rooms for changing babies nappies?

d) Are the counters, switches and mirrors appropriately positioned and related equipment easy to use?

e) Are there information/communication devices and writing tools for people with visual or hearing impairment?

f) Are there emergency notification and evacuation systems for PWDs and the elderly?

5.4 Checkpoints by building usage

It is important for buildings used by the general public (facilities for unspecified users) to generalise and satisfy a broad range of needs and requirements of their users, whereas buildings whose users are more specific (facilities for specified users) have to consider and make design allowances for the needs and characteristics of those specific users.

When designing facilities, it is important to envision the kinds of users for each usage, satisfying the checkpoints in Figure 3.

5.5 Main entrance

If there is a difference in level between the carriageway and the footpath, a kerb ramp (see 8.2) shall be provided to facilitate the setting-down of people close to the main entrance of a building. This benefits people who need to transfer to and from a wheelchair and others.

Tactile guiding and attention/warning surface indicators should be provided to lead visual impaired persons to the main entrance where no other clues indicate the path to the building. See example in Figure 4.

5.6 Arrival by motor vehicle

Space should be provided for passenger drop-off points for taxis, public transport and also for large vehicles such as vans, etc., as near as possible to the main accessible entrance. Vehicle drop-off areas should be a minimum of 9 000 mm in length, have a minimum width of 3 600 mm and be served by a kerb ramp.

See designated accessible parking space in Clause 6.

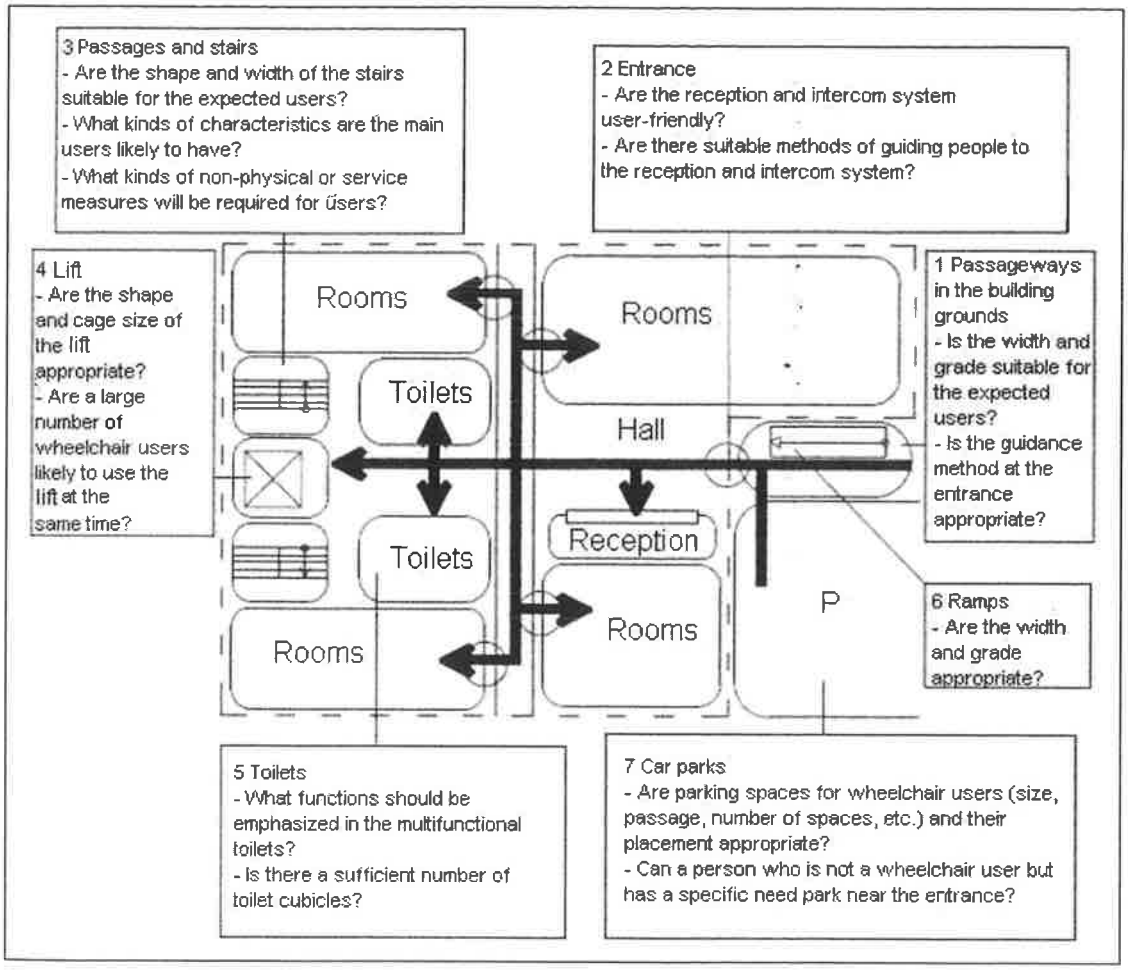


Figure 3. Checkpoints by building usage

6 Designated accessible parking space

6.1 Location

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

6.2 Number of designated accessible parking spaces

If no statutory requirements, the following minimum requirements concerning the number of parking places shall apply:

a) a minimum of one accessible designated parking space should be provided in every parking area;

b) up to 25 parking spaces: one designated accessible parking space;

c) up to 50 parking spaces: two designated accessible parking spaces;

d) up to 100 parking spaces: four designated accessible parking spaces;

e) up to 200 parking spaces: six designated accessible parking spaces; and

f) over 200 parking spaces: six designated accessible parking spaces and one for each additional 100.

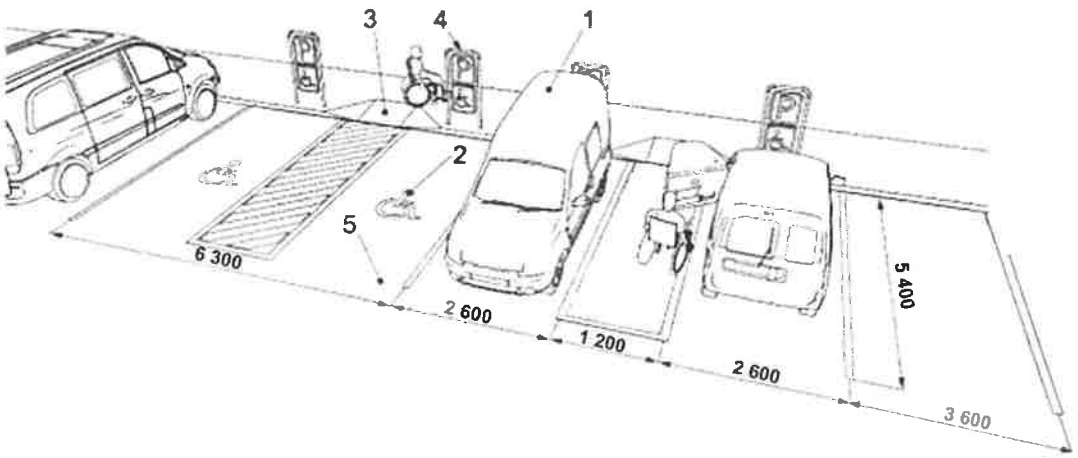
In specialised facilities such as health care facilities, shopping areas and recreational facilities, a greater number of designated accessible parking spaces should be considered.

Additionally, some designated accessible parking spaces should be provided for motorists accompanied by a child in a stroller or pushchair and shall be designated with a stroller sign.

6.3 Car parking

The minimum width of the parking space for a car shall be 3 600 mm and the minimum length shall be 5 400 mm. This minimum width includes the transfer area beside the car with a minimum of 1 200 mm. Figure 4 shows one single parking bay and aisle.

Dimensions in millimetres



Key

1 minimum unobstructed height for vans 2 600 mm
2 symbol of access
3 kerb ramp
4 signage, including symbol of access
5 firm ground

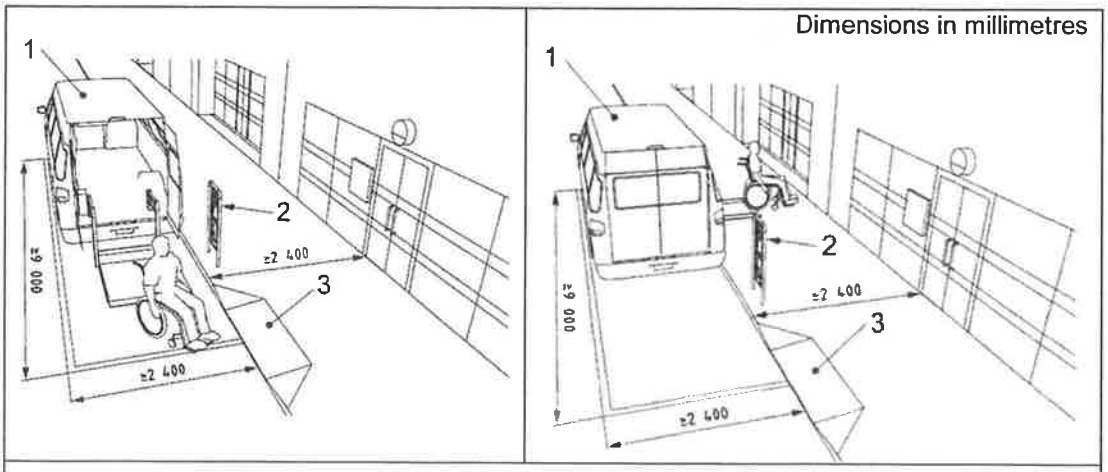
Figure 4. Example of designated parking spaces

6.4 Van parking with auxiliary movable ramps

The minimum width of the accessible parking space for a van shall have at least the same dimensions as for car parking spaces (see 6.3). Transfer areas between spaces can be shared.

Depending on the typology of the building (e.g. hospitals and nursing homes), it is encouraged to have a special parking space for multi-purpose vehicles with hoists or lifts, which require more space; at least an additional 2 400 mm area beside the van and/or at the rear of the van. The dedicated parking space in this case should be 4 800 mm wide and 9 000 mm long (see different types of designated parking spaces in Figure 5).

As an alternative, a parking space of 2 400 mm wide × 9 000 mm in length along a sidewalk can be used, provided the sidewalk is at least 2 400 mm wide.



Key

1 minimum unobstructed height 2 600 mm
2 signage, including symbol of access
3 kerb ramp

Figure 5. Example of parking space along a sidewalk

6.5 Signage

It is important that the locations of the designated parking spaces are clearly signposted at the entrance to the building site or car park with information providing direction to designated parking spaces and to other accessible facilities. Therefore, directional arrows combined with the international symbol of access (see Figure 89) shall be used.

Designated accessible parking spaces shall be marked both on the pavement with the international symbol of access (see Figure 89) and with a vertical sign with the international symbol for accessible parking space to indicate the location of the designated accessible parking. The vertical sign should be located so that it does not create a hazard (see Figure 2 and Figure 6).

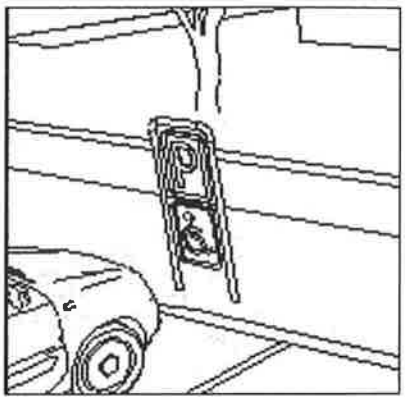


Figure 6. Example of vertical signage

6.6 Surface

The accessible parking space shall be on firm and level ground with no variation of surface exceeding 5 mm, between paving, surface features and mix of different surfaces or finishes.

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

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

The kerb ramp shall be located in close proximity to the designated accessible parking area connecting the accessible path of travel to the main entrance as shown in Figure 7.

Kerb cut shall be located on the extreme left or right within the accessible parking lot. Kerb cut shall not be placed in the middle of the accessible parking lot to avoid difficulty in accessing the kerb cut.

The kerb ramp width shall be a minimum of 1 000 mm. The gradient of the kerb ramp shall consider the requirements in Clause 8 and comply with Table 3

The accessible path to the kerb ramp can be marked with hatching painted on the road surface to prevent people from parking in this area (see Figure 4). Kerb ramps shall have a slip-resistant surface.

6.8 Indoor parking

6.8.1 General

If an indoor parking facility is not accessible, suitable warnings shall be given at the entrance and alternative designated accessible parking spaces shall be provided outside the building.

6.8.2 Signage at the entrance to parking spaces

Signage should be posted at the entrance to any parking area indicating the location of the designated accessible parking spaces.

Suitable indication shall be provided for the route from the accessible designated parking space to the building or buildings served by the car park, including to parking machines, passenger lifts, ramps, exits and any accessible devices or services (e.g. accessible toilets).

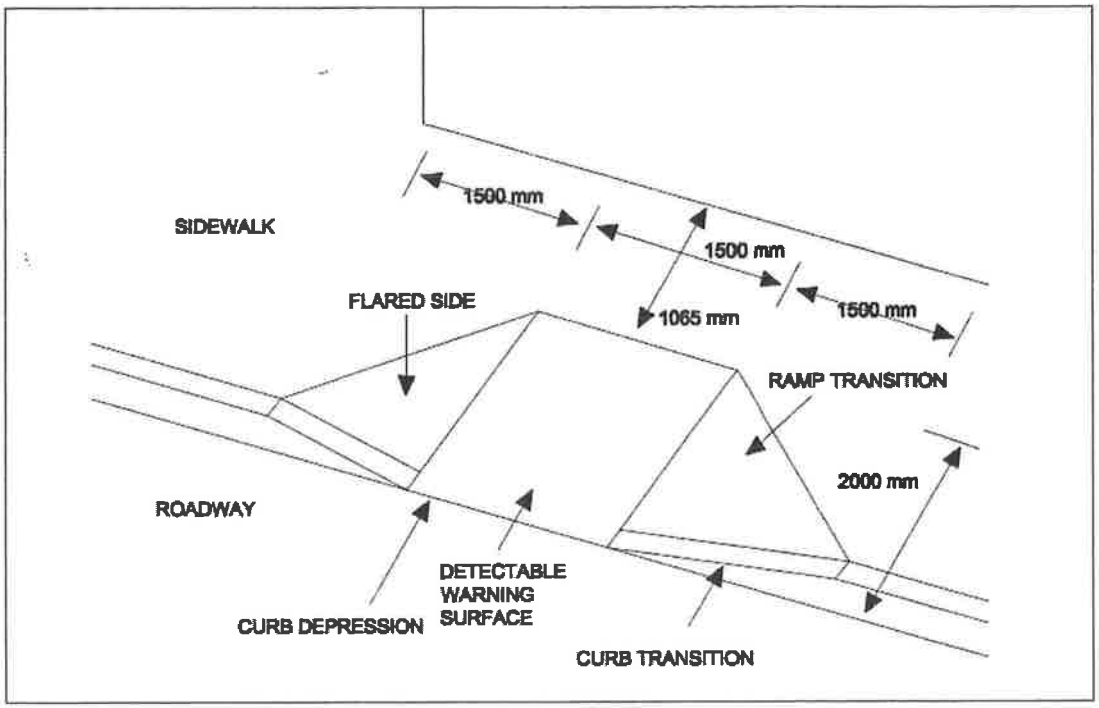


Figure 7. Kerb ramp

6.8.3 Proposed signage for indoor parking

Vertical signs shall have the followings:

a) dimensions of at least 450 mm by 450 mm;

b) installed at a height of at least 1 500 mm from the floor surface to the centre of the sign; and

c) telephone number of the building management or the relevant authority clearly printed on them for the purpose of reporting unauthorised parking.

6.8.4 Location of designated accessible parking spaces

Designated accessible parking spaces shall be located at the same level as the main entrance or another entrance to the building or buildings served by the car park.

Designated accessible parking spaces should be signposted.

A suitable passenger lift or separated pedestrian ramp shall be installed to provide access from the parked vehicle to the main entrance of the building or buildings served by the car park. A lift should also be provided for use by people parked in non-designated spaces.

Location of accessible parking spaces (indoor parking) should be as close as possible to the entrances/lifts.

6.8.5 Height of clearance

The clearance height at the entrance to parking facilities should be at a minimum of 2 400 mm.

6.9 Parking control

If a payment machine is provided it shall provide all controls at a height between 800 mm and 1 100 mm. Refer to Clause 34.

Access to the machine shall be level along an accessible route and easy to operate. The machine shall be located so that it does not create a hazard or barrier for people with visual impairments or people with mobility impairments.

7 Paths to the building

7.1 General

The design of the path or route to the building from the boundary of the site or from the parking area should be designed and constructed to enable all people to approach, enter and exit the building (see Figure 8 and Annex A).

Where a kerb ramp is located in the direct line of pedestrian travel, the dished area of the kerb shall be fitted with tactile walking surface indicator (attention/warning pattern e.g. warning indicator). See Annex A for detailed information.

Pedestrian paths or routes shall be separated from routes used by cyclists and motor vehicles. Where necessary, crossing points should be provided with appropriate kerbs and tactile walking surface indicator (TWSI).

Access between buildings shall also comply with this subclause.

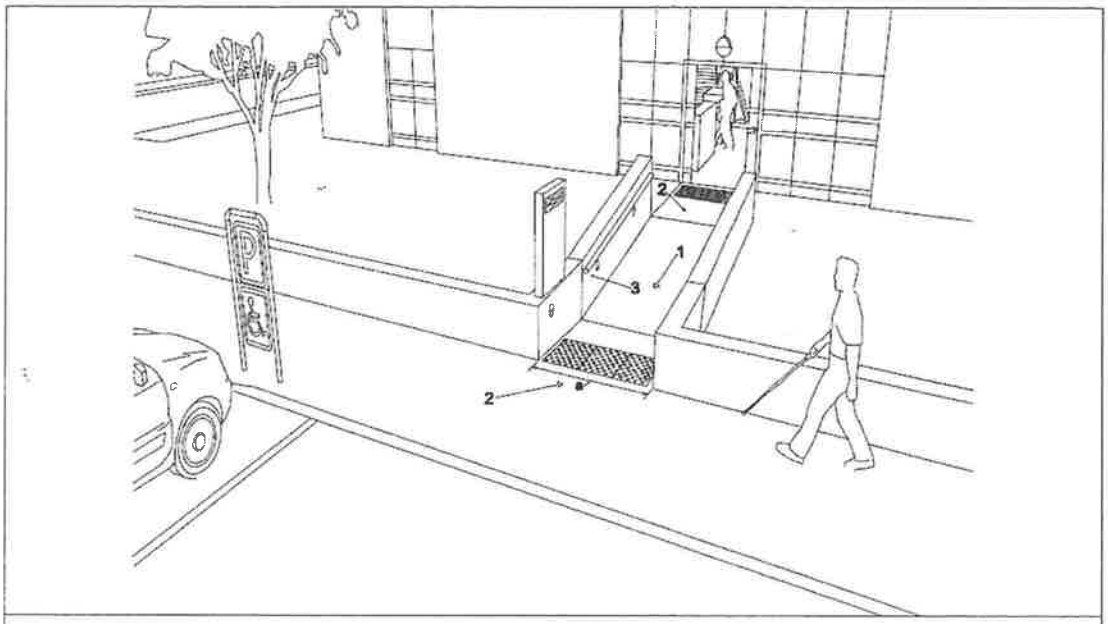
7.2 Wayfinding, guided path and other physical support of information

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

In very complex sites, visual, audible and tactile information should be provided to assist in orientation and wayfinding. The requirements in Clause 37 should also be considered.

Orientation can be facilitated by differences in acoustics, surface material, light and colour. The design should indicate the use of the building elements, especially the location of the main entrance, making it clearly visible.

Additional illumination or visual contrast and tactile information, such as a change in material or tactile walking surface indicator (TWSI) (see Annex A), shall be provided at key decision points to assist orientation and wayfinding.



Key

1 sloping path (when the slope is steeper than 1:20 (5 %) the path shall be constructed as a ramp)
2 horizontal landing at both ends of sloping path, intermediate landings spaced according to Table 3
3 wall as tactile clue on direction
[a] width of sloping path minimum 1 200 mm

Figure 8. Example of sloping path

To assist people with visual impairment who have some residual vision, routes to be followed shall have a minimum difference in luminance to the surroundings (see Clause 33).

Tactile walking surface indicator (TWSI) shall be used to indicate the directional orientation especially where no other clues indicate the path to the building. Across large or open areas, people who are visual impaired need a tactile route or guiding line to follow (see Annex A).

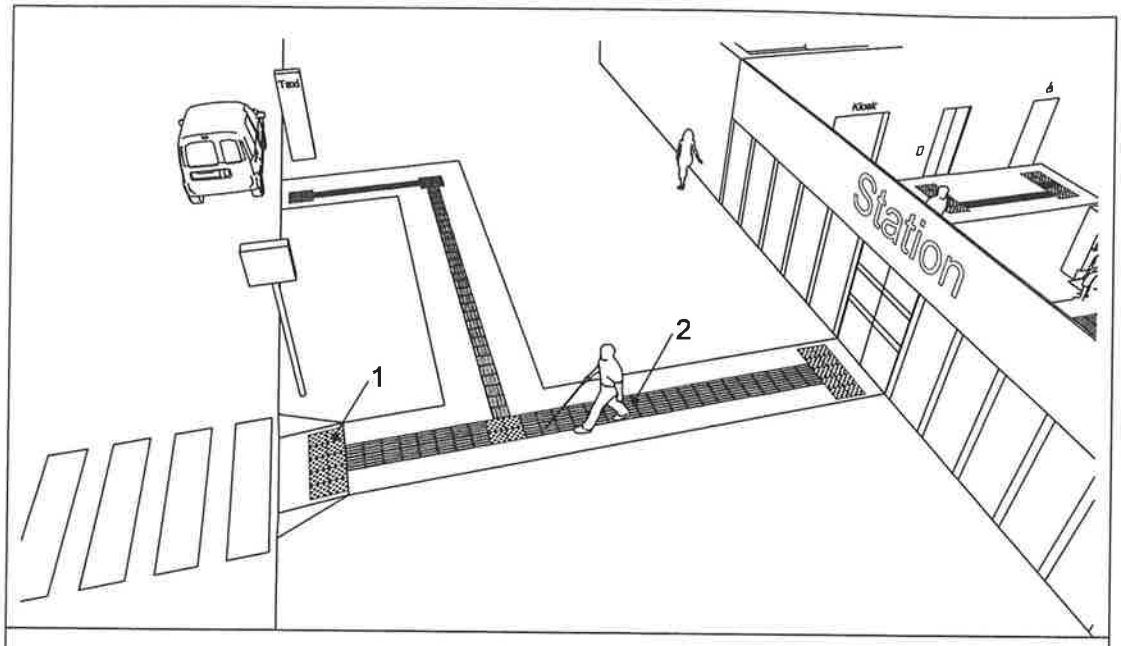
Where hazards on the direct line of pedestrian travel such as stairs, escalators, moving walks or travelators and ramps with a slope of more than 1:16 cannot be avoided, tactile warning indicators and visual markings shall be provided.

To assist orientation and wayfinding, the requirements in Clause 37 should also be considered.

NOTES:

1. Tactile floor coverings or a runner as well as tactile walking surface indicator (TWSI) can help in locating entrance doors, counters, etc.

2. Sound-producing objects (such as ticking wall clocks and fountains) can provide a good way to assist people who have visual impairment and can supplement tactile information. These provisions are particularly aimed at people with a combination of sensory impairments.



Key

1 tactile walking surface indicator (TWSI) as attention/warning pattern for decision points or hazards
2 tactile walking surface indicator (TWSI) as guiding pattern

Figure 9. Example of tactile walking surface indicator (TWSI) used in open area

7.3 Path

The path to, around and between buildings should be levelled and firmed.

The cross fall gradient across an access route should not exceed 1:50 (20 mm/m), except when associated with a dropped kerb. See 7.13 for requirements on drainage of paths.

If the slope or any part of a path on an accessible route to a building exceeds 1:20, it shall be designed and constructed as a ramp (see Clause 8).

Obstacles, such as objects or signs mounted on walls, bollards, columns or free-standing supports along the walking path shall be avoided (see Figure 10). Unavoidable free standing posts or columns within access routes shall be clearly marked with visual indicators. Visual indicators at least 75 mm in height with visual contrast to the background and shall be placed at a height between 900 mm to 1 000 mm and 1 500 mm to 1 600 mm above floor level.

Any solitary obstacles projecting into an access route shall be treated in accordance with 7.14.

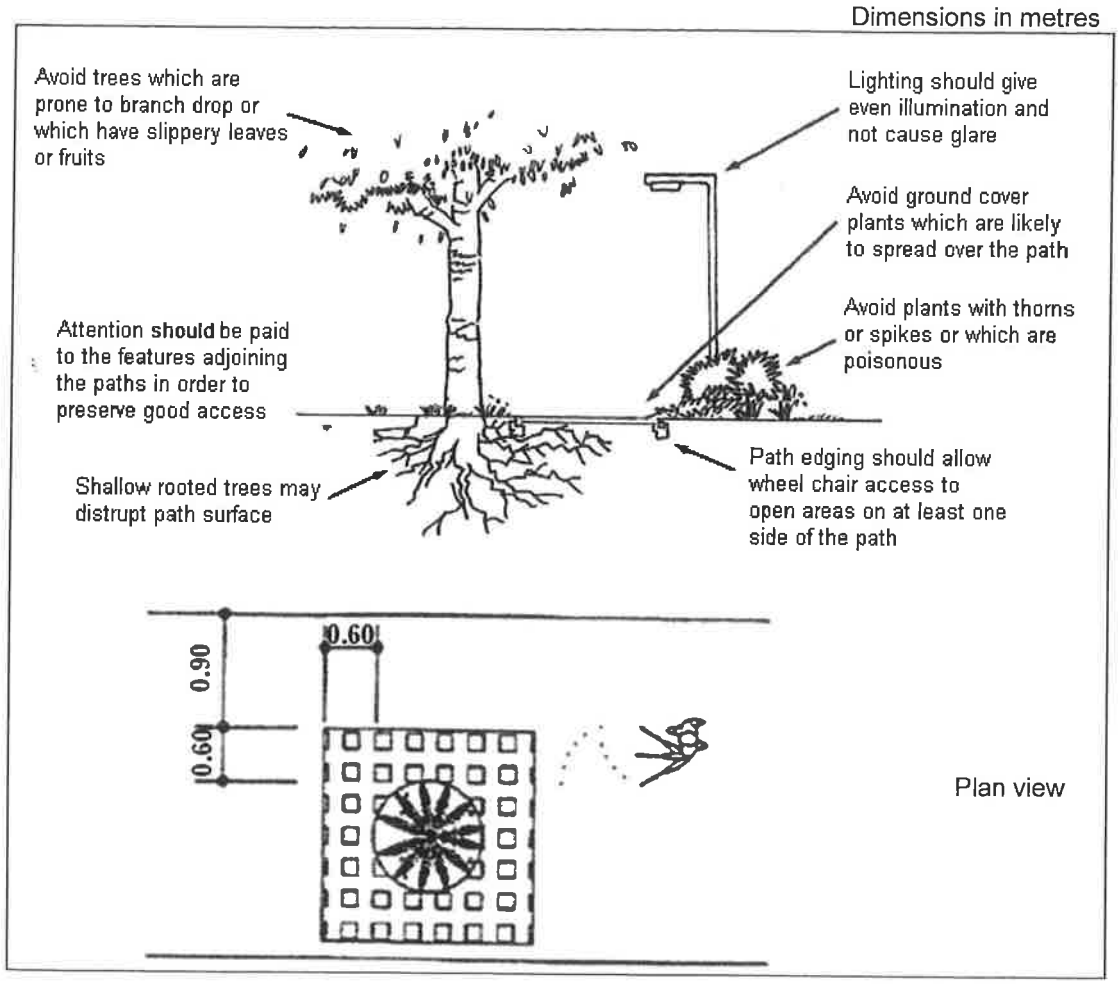


Figure 10. Examples of features that preserve good access

7.4 Width of the path

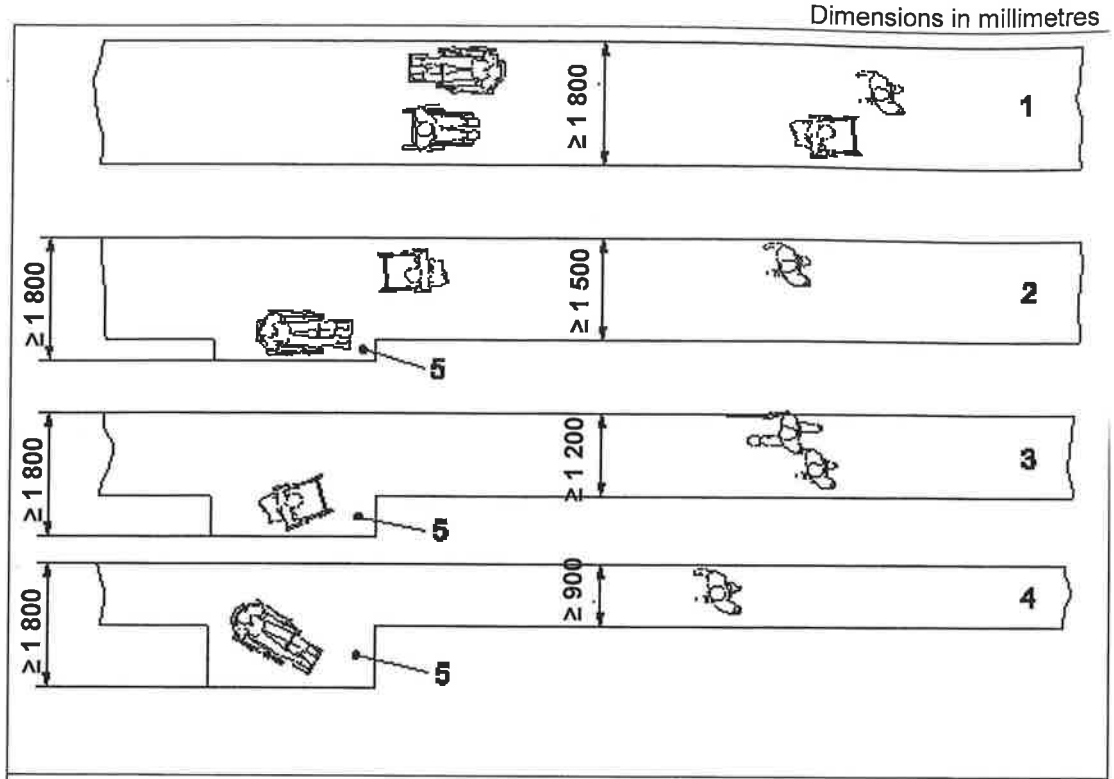
The unobstructed width of the path shall be (see Figure 11):

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 intervals of maximum 25 m;

c) not less than 1 200 mm for infrequent two-way traffic; a passing and turning space of at least 1 800 mm × 2 000 mm should be provided for every 25 m (see 7.5); and

d) not less than 900 mm when it is unlikely that people will have to pass one another; a turning space of at least 1 500 mm × 1 500 mm should be provided for every 25 m (see 7.6).



Key

1 constant two-way traffic
2 frequent two-way traffic
3 infrequent two-way traffic
4 no-pass traffic
5 passing and turning space every 25 m (only acceptable for wheelchair users under exceptional circumstances)

Figure 11. Different surface widths of the path depending on frequency

7.5 Passing space for wheelchair users

A path whose surface width is less than 1 800 mm (see 7.4) and whose overall length is more than 50 m shall be provided with a passing place or places. Passing places should be a maximum of 25 m apart. This does not apply to a landing forming part of a sloped path, a ramp, steps or a stair.

Passing place for two people using wheelchairs shall be a minimum width of 1 800 mm for a minimum length of 2 000 mm (see examples in Figure 12).

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

Dimensions in millimetres

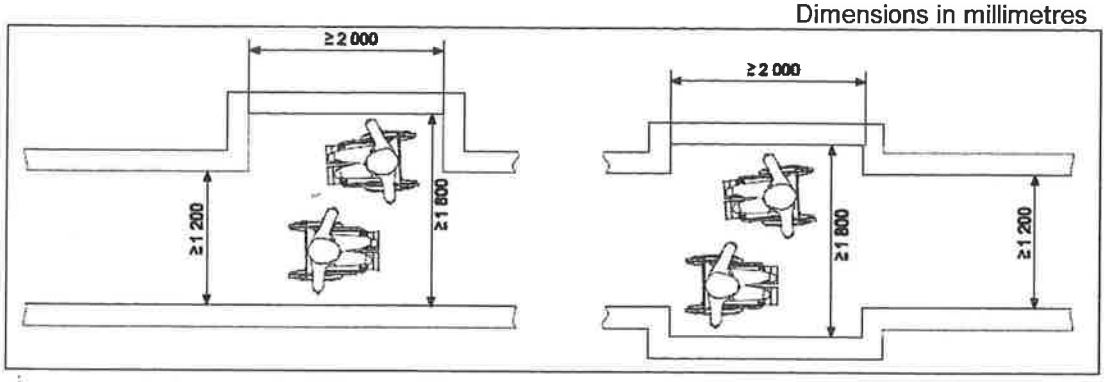


Figure 12. Examples for passing spaces for wheelchair users

7.6 Turning space for wheelchair users on landings

For changes of direction of more than 45° on the landings of the path to the building, the unobstructed manoeuvring space shall be at least 1 500 mm × 1 500 mm. See similar requirements for ramps in Clause 8.

If larger powered wheelchairs and scooters for outdoor use are to be considered, the outer radius of a turning space should be larger. In such cases, for changes of direction of more than 45° on the landings of the path to the building, the radius of the outer circle of the way shall be at least 1 900 mm for powered wheelchairs and scooters.

7.7 Path construction

The path shall be firm with an even and slip-resistant surface and should be free from drainage gratings.

Care shall be taken to ensure that adjacent surface materials do not display different slip resistance characteristics, particularly at the edges of changes of level or gradients.

7.8 Stepped path and stair

For ambulant people, a stepped path can provide a safer and more assuring means of access than a sloped path or a ramp.

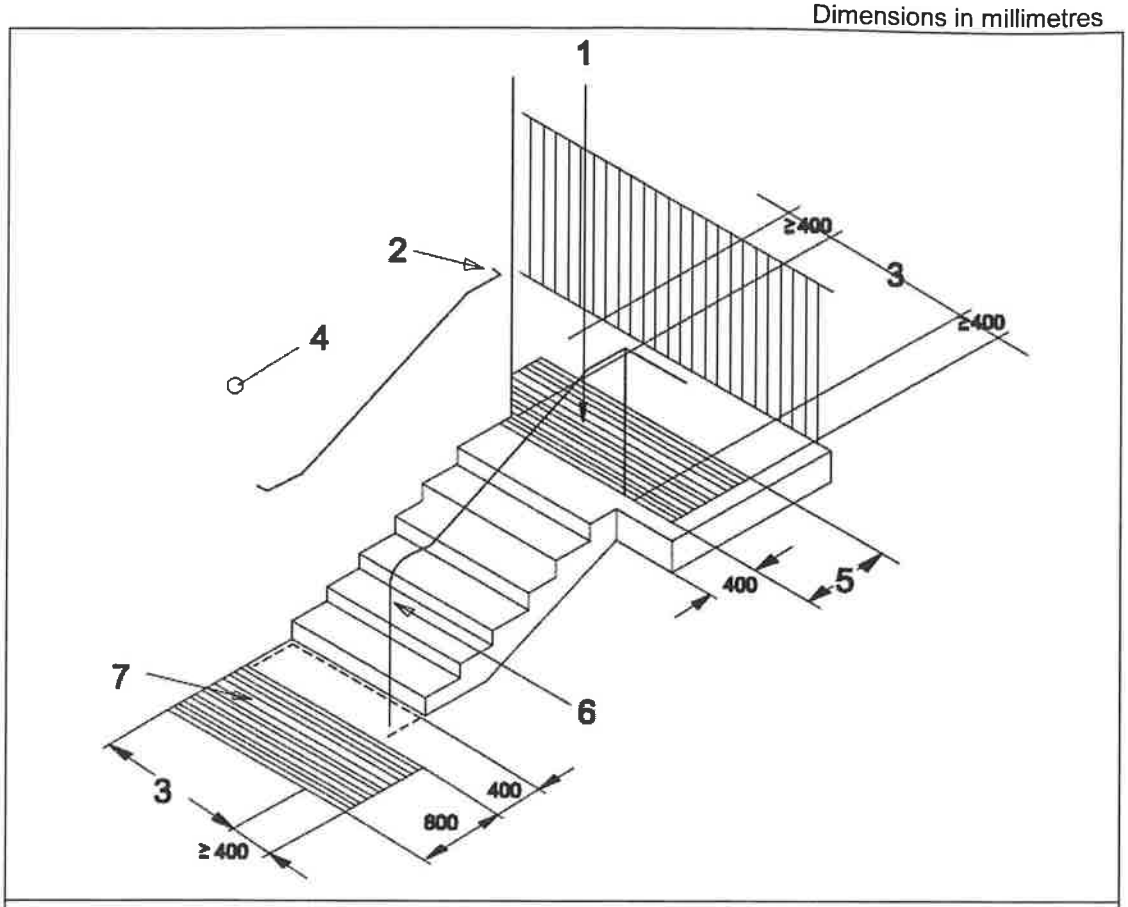
Wherever the rise of a ramp exceeds 300 mm, an additional flight of steps should also be provided.

An isolated single step is not acceptable.

Consider detailed requirements for stairs according to Figure 13.

Where required on a continuous accessible path of travel, tactile attention/warning indicators shall be located at both the top and bottom of stairways.

Dimensions in millimetres



Keys

1 tactile attention/warning surface at top of the stairs to extend at least 400 mm at each side of stairs to stop 400 mm from nosing
2 handrail fixed to side wall and terminated with a closed end at top and bottom
3 surface width of stair, at least 1 200 mm wide
4 side wall to staircase
5 800 mm when the approach is straight on and 400 mm when a conscious turn is needed to reach the step
6 handrail to be terminated in a way that reduces the risk of clothing being caught
7 tactile attention/warning surface at bottom of stairs

Figure 13. Stairs requirement

7.9 Width of stepped path and stair

The surface width of a 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 between handrails or any obstructions.

7.10 Landing of stepped path and stair

For requirements for landings see also 13.3.

7.11 Landings of sloped paths

For landings at the foot and the head of a sloped path, see also 8.4. If there is a door at the end of the landing of a sloped path, the manoeuvring area, door opening area and access to the door handle shall be provided.

7.12 Support and guidance by a handrail on paths

Where handrails and guards are used on paths, the requirements included in Clauses 9 and 14 should be considered.

Support and guidance by a handrail shall be provided on stepped paths:

a) a handrail shall be provided on each side of a flight of steps that consists of two or more risers;

b) a handrail shall be provided on both sides of a channel that may subdivide a flight of steps; and

c) a fixed handrail with Braille should be provided adjacent and at the same height as the escalators (see Figure 14).

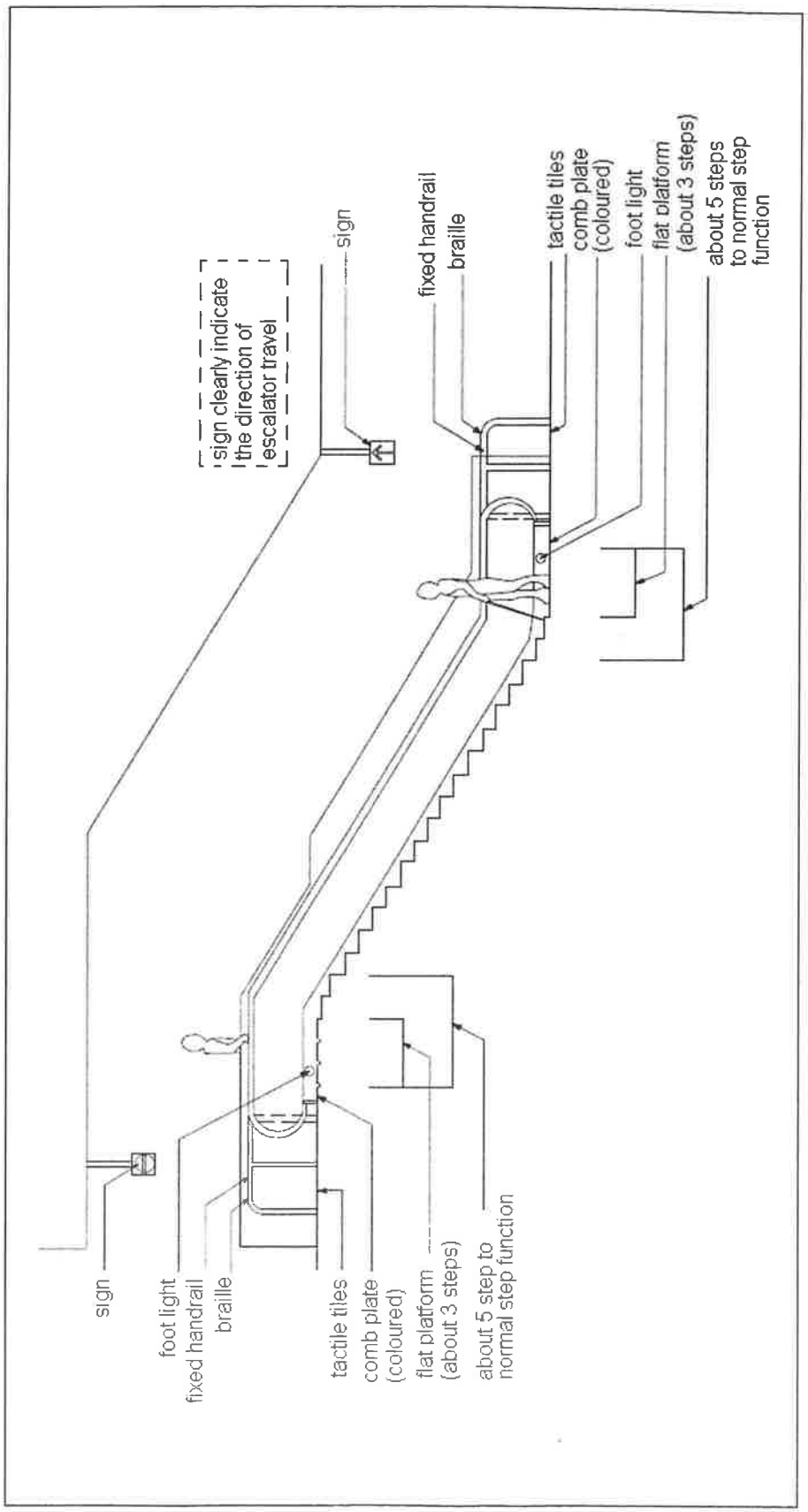


Figure 14. Fixed handrail for escalators

7.13 Drainage of access routes

The cross-fall of a level or sloped path, a stepped path, a ramp, or a landing, that is provided to permit drainage of surface water, should not exceed 1:50 except in exceptional circumstances.

A dished channel should be avoided within the boundaries of a path or ramp.

Dished channels shall have a maximum width of 150 mm and a maximum drop into gulley of 5 mm.

A drainage grating that is within the boundaries of a path or a ramp shall be set flush with the surface.

The top, bottom and landings of steps and ramps should be properly drained in order to avoid water flowing down steps and ramps.

7.14 Solitary obstacles in a path

Objects with a height lower than 1 000 mm can create a hazard for the visual impaired. Permanent equipment that cannot be located outside the boundaries of a path shall be:

a) designed to be easily seen with visual contrast to the background; and

b) shielded to protect against impact, and

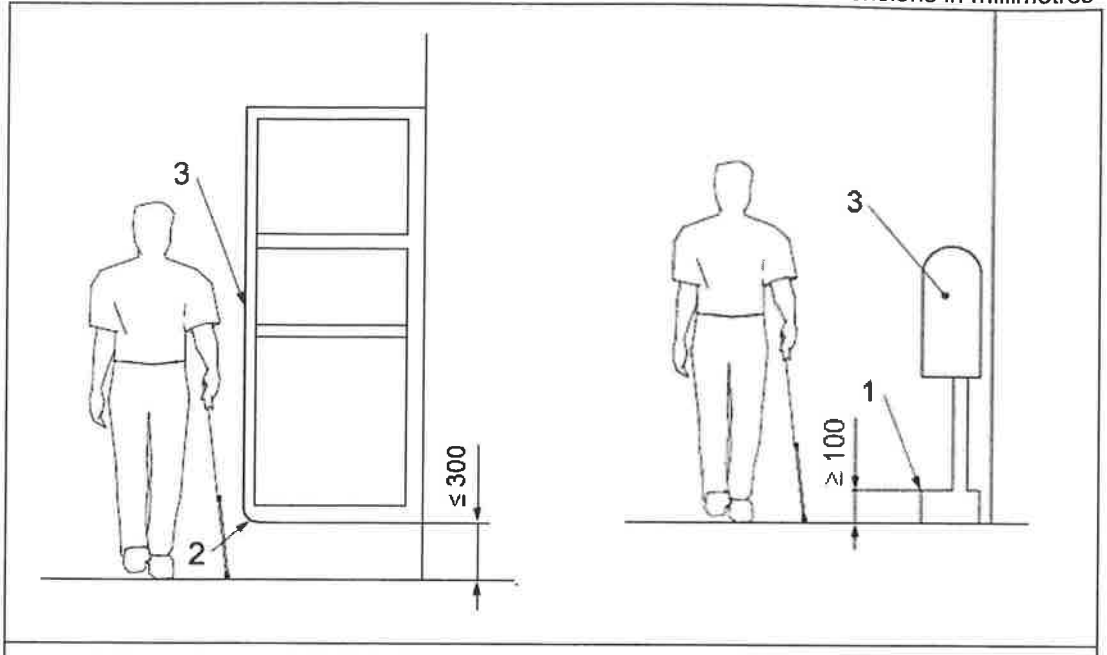
c) accompanied by a feature that warns of the presence of a potential hazard and is detectable for a person using a white cane or stick (see Figure 15).

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

Any objects projecting more than 100 mm between 300 mm and 2 100 mm above ground level into an access route shall be clearly visible and detectable with a cane (see Figure 15).

When a projecting obstacle exists, a protective guard shall be provided at ground level, under the projecting object such as a curb or fixed element at a height of 100 mm to 300 mm as cane detection. Cane detection shall not be set back more than 100 mm from the face of the projecting object. Wing walls, side partitions, alcoves or recesses are solutions for projecting elements where free space under the object is needed. Winged protection shall extend continuously between 300 mm and 1 000 mm above the floor and shall contrast visually with the background.

Dimensions in millimetres



Key

1 base plinth detectable with cane if a projecting object is more than 100 mm above floor level
2 winged protection between 300 mm and 1 000 mm above floor level, contrasting visually with the background and detectable with a cane
3 visual contrast

Figure 15. Solitary obstacles

8 Ramps

8.1 General

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.

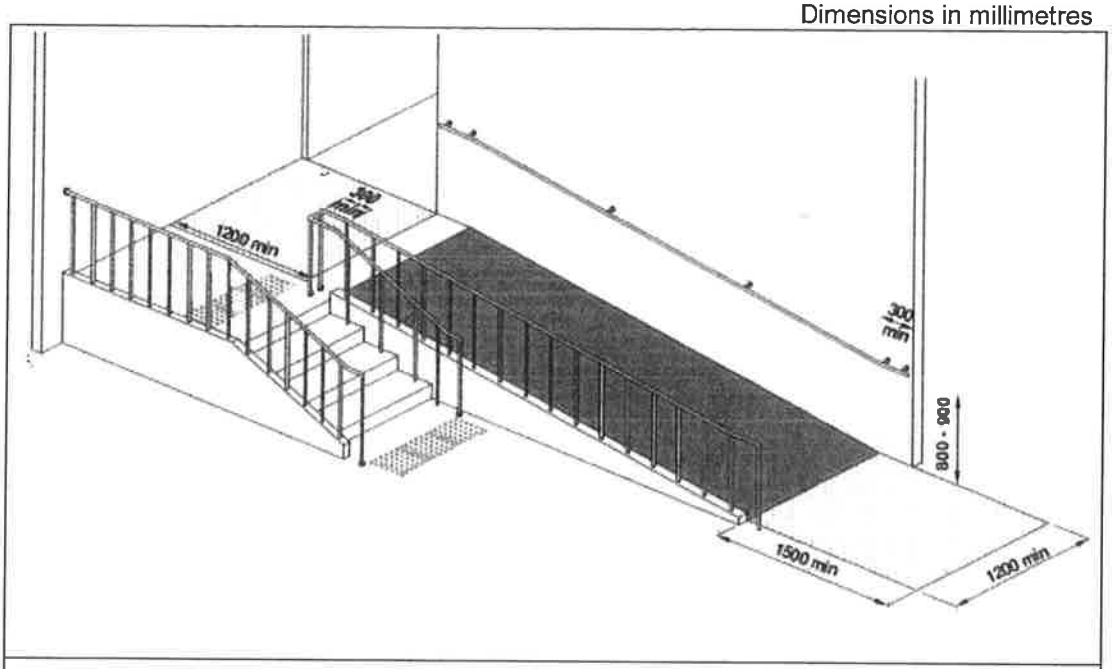
Ramps may be the only practical solution for people who cannot use steps or stairs, but other people may prefer to use stairs.

In addition to a ramp, a flight of steps should be provided if the change in level is more than 300 mm (see Figure 16).

In buildings of more than one storey, a lift should be provided (see 15.1).

Where required on a continuous accessible path of travel, tactile warning indicators should be located at both the top and bottom of ramps. See further detailed measures in 13.5.

Dimensions in millimetres

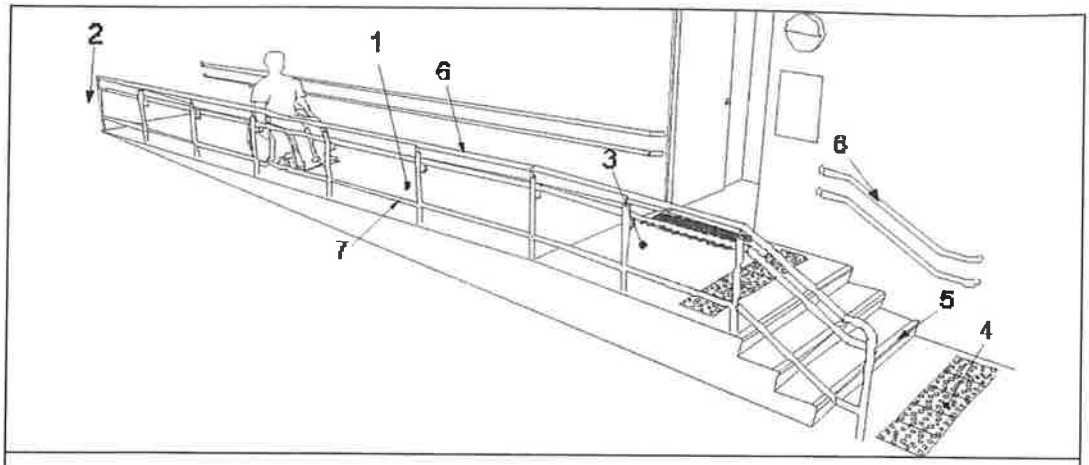


NOTES:

1. Ambulant disabled negotiate steps more easily and safety thus accessibility by both steps and ramps is preferred.

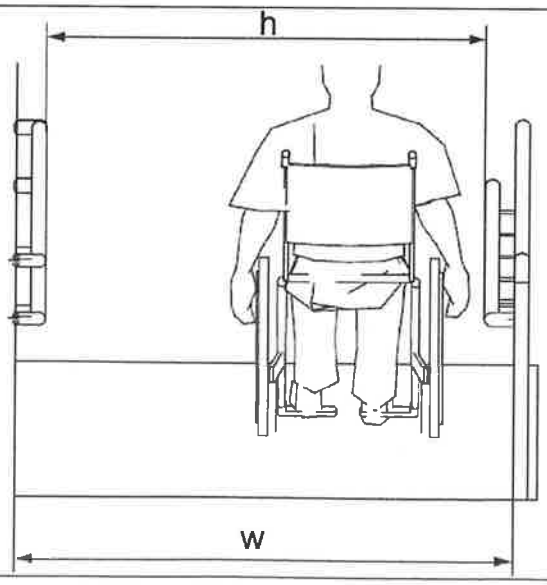
2. Where the change in level results in having a combination of multiple ramps and landings, other solutions should be considered.

Figure 16. Ramps with alternative stepped approach



Key

1 ramp surface (see Table 3 for maximum slope and length)
2 horizontal landing
3 horizontal landing
4 tactile walking surface indicator (TWSI) in front of stairs
5 complementary stairs with markings
6 handrails on both sides of ramp and stairs
7 upstand, minimum 150 mm



Key

h width between handrails
w width of ramp surface

Figure 17. Example of ramp with slope 1:20 and horizontal landings at beginning and end

8.2 Slope and length

The slope shall not exceed the maximums set out in Tables 3 and 4.

Table 3. Maximum slope and length of ramps

Max. rise (mm)	Max. slope	Max. slope (mm/m)	Max. length between landings (mm)	Outdoor use	Indoor use	Handrails required
≥ 500	1 in 20 (5.0 %)	50	6 000	yes	yes	see 8.5
460	1 in 19 (5.3 %)	53	6 000	yes	yes	see 8.5
420	1 in 18 (5.6 %)	56	6 000	yes	yes	see 8.5
385	1 in 17 (5.9 %)	59	6 000	yes	yes	see 8.5
350	1 in 16 (6.3 %)	63	5 600	yes	yes	see 8.5
315	1 in 15 (6.7 %)	67	4 500	yes	yes	see 8.5
280	1 in 14 (7.1 %)	71	4 000	yes	yes	see 8.5
245	1 in 13 (7.7 %)	77	3 000	yes	yes	see 8.5
210	1 in 12 (8.3 %)	83	2 500	yes	yes	see 8.5
180	1 in 11 (9.1 %)	91	2 000	curb ramps only	not recommended	no
150	1 in 10 (10.0 %)	100	1 500	curb ramps only	not recommended	no
110	1 in 9 (11.1 %)	111	1 000	curb ramps only	not recommended	no
75	1 in 8 (12.5 %)	125	600	curb ramps only	threshold ramps only	no

NOTE. A ramp with a gradient higher than 1:12 is difficult to use and can create a risk of an accident; it is therefore not suitable for independent use.

Table 4. Exceptional considerations in adaptation of urban areas or at the entrance of existing buildings

Max. rise (mm)	Max. slope	Max. slope (mm/m)	Max. length between landings (mm)	Exceptional considerations only	Handrails required
1 250	1 in 12 (8.3 %)	83	15 000	yes	see 8.5
1 150	1 in 11 (91 %)	91	12 650	yes	see 8.5
1 000	1 in 10 (10.0 %)	100	10 000	yes	see 8.5
750	1 in 9 (11.1 %)	111	6 750	yes	see 8.5
375	1 in 8 (12.5 %)	125	3 000	yes	see 8.5
35	1 in 8 (12.5 %)	125	280	threshold ramps only	no

Ramps should only be used in existing environments under special circumstances.

8.3 Width of ramps

The surface width of a ramp shall be not less than 1200 mm.

The unobstructed width of a ramp shall be not less than 1 000 mm between the handrails or any obstructions.

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

8.4 Landings of ramps

An end landing shall be provided at the foot and the head of a sloped path, a stepped path, or a ramp. The area of an end landing may be a part of the continuing path (see Figure 17).

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° shall be at least 1 500 mm measured on the centre line (see Figure 8).

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 shall also be at least 1 200 mm.

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

8.5 Support and guidance by handrail on ramps

For general requirements of handrails, Clause 14 and the following should be considered:

a) a handrail should be provided on each side of a ramp when the length of the ramp is 800 mm or less and there is an alternative stepped access;

b) a handrail shall be provided on each side of a ramp if the ramp exceeds 800 mm in length.The minimum distance between handrails shall be 1 000 mm.

8.6 Drainage of ramp

Consider the general requirements in 7.13.

8.7 Surface materials

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

9 Guarding along paths and ramps

Providing protection at the side of the path protects people who use wheelchairs and ambulant people from injuring themselves as the result of a fall. See examples of protection against falling in Figure 18. The requirement for paths and ramps are as follows.

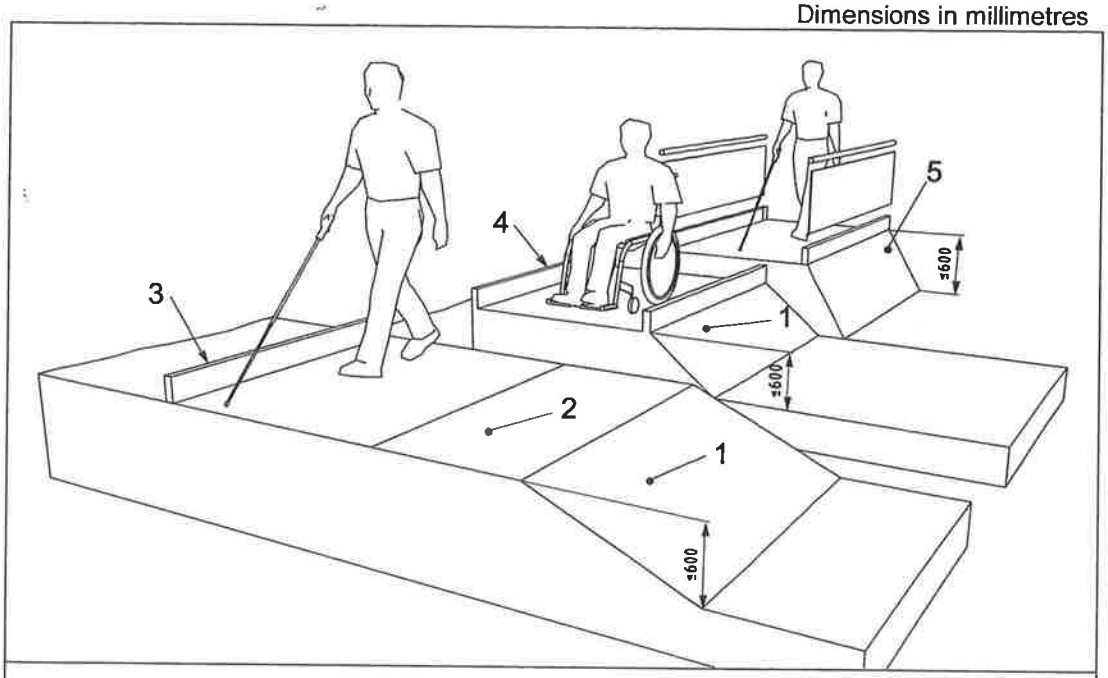
a) If a level or sloped path is bounded on one or both sides by terrain that slopes downwards by up to 30° from the horizontal, a firm and level margin of at least 600 mm shall be provided at the relevant side or sides.

b) If a sloped path or ramp is bounded on one or both sides by terrain that slopes downwards by 30° or more, an upstand of minimum height of 150 mm shall be provided at the relevant side or sides. Upstands shall have a clear visual contrast in relation to the ramp.

c) If a path, or a sloping path, stepped path, ramp, terrace or other unfenced platform rises more than 600 mm above the adjacent ground, it shall be provided with guarding. If the adjacent ground is firm and level with the path for 600 mm, no guard is needed.

Guarding shall be designed to discourage a user, particularly a child, from climbing on it.

Dimensions in millimetres



Key

1 slope less than 1:3
2 level margin min. 600 mm wide
3 upstand where the difference in level is 600 mm or less
4 upstand with a minimum clear visual contrast in relation to the path or ramp
5 upstand with guarding where the difference in level is greater than 600 mm

Figure 18. Examples of protection against falling

10 Building entrances and final fire exits

10.1 General

The entrance(s), including final fire exits, to a building shall be easy to locate, safe and convenient to use and have limited exposure to rain. Entrance doors shall be sufficiently high and wide, easy and intuitive to operate (see 18.1).

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

Entrance doors should be capable of resisting the forces of prevailing winds without opening unexpectedly. Conventional swing, sliding or bifold doors shall always be located adjacent to revolving doors for the purposes of unhindered access.

These requirements shall be met at the entrance(s) to and exit(s) from the building.

10.2 Identification

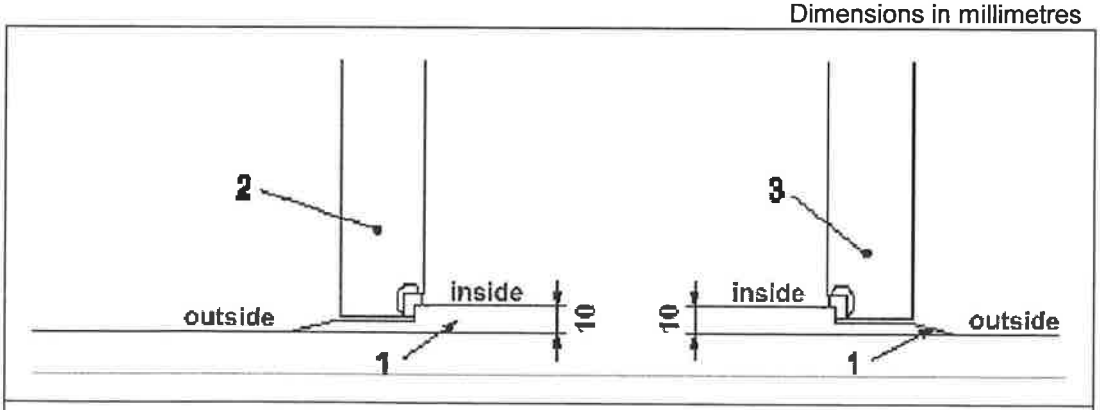
The main entrance to a building shall be identifiable from the boundary of the site and from any designated accessible parking spaces on the site. If the entrance cannot be easily identified, suitable means of visual and tactile wayfinding shall be provided.

10.3 Floor level at the entrance

Entrances into the building should be levelled. Any raised threshold shall not exceed 5 mm.

Where a raised threshold is necessary, it shall have maximum height of 5 mm, be bevelled down and have a clear visual contrast compared to the floor (see Figure 19).

Dimensions in millimetres



Key

1 bevelled threshold
2 door opening outwards
3 door opening inwards

Figure 19. Bevelled threshold

If the level of the entrance storey is above that of the surrounding ground, a suitable sloped or ramped approach and landing shall be provided immediately outside the main entrance.

Any permanent or temporary feature provided at floor level to limit incoming dirt or water should be set flush with the remainder of the floor or, if surface laid, should be regularly and properly maintained.

10.4 Main entrance doorway

Detailed requirements for doors are specified in Clause 18.

10.5 Doorway width

The minimum unobstructed width of an entrance doorway shall be not less than 900 mm as more space is required for a person using a powered wheelchair.

10.6 Clear height of a doorway

The minimum clear height of a doorway shall be not less than 2 100 mm.

10.7 Circulation space

In front of the door opening into the building, there should be a minimum horizontal manoeuvring space of 1 500 mm by 1 500 mm. Where turning 180° in a wheelchair may be required, there shall be a minimum of 1 600 mm by 2 150 mm. A clear space of not less than 600 mm at the latch side of the door is required to allow someone to operate the door handle (see Figure 20).

For alternative openings and constructions, see Annex C.

Dimensions in millimetres

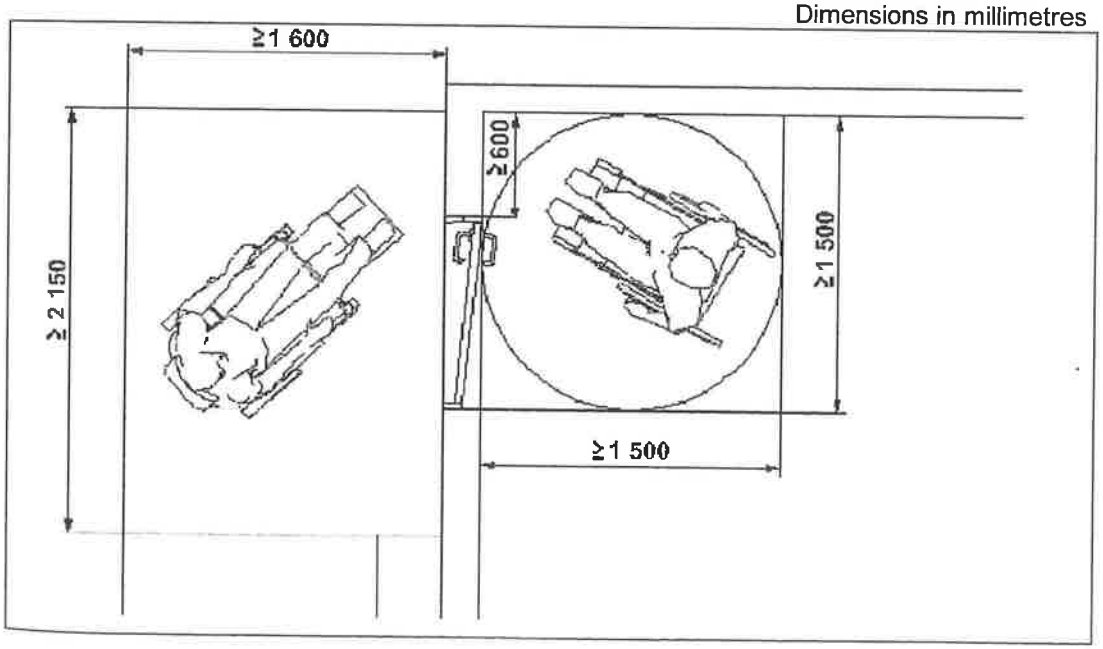


Figure 20. Circulation space at a single leaf swinging door

10.8 Lobbies

10.8.1 General

Lobbies shall allow people to enter the built environment without any hindrance or barriers. See subclause 18.1 for the design of doors.

10.8.2 Unobstructed manoeuvring space

The minimum unobstructed manoeuvring space between doors in an entrance lobby shall be not less than 1 500 mm free of the door swing (see Figure 21).

In single leaf swing doors, in the lobby, the door should swing outwards.

Dimensions in millimetres

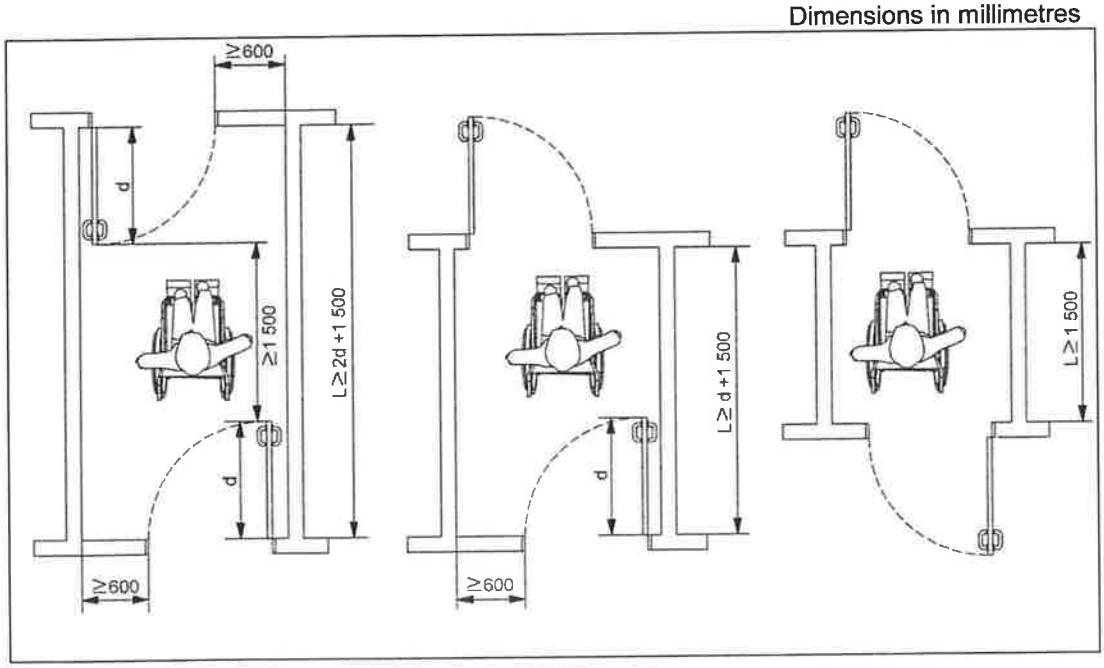


Figure 21. Minimum dimensions of lobbies with single leaf swing doors

10.9 Visibility through 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.

The requirements for viewing panels in Subclause 18.1.6 and for visual contrast in Subclause 18.1.7 should also be considered.

11 Horizontal circulation

11.1 General

The main horizontal circulation design shall be levelled on each storey in order to ensure that the building is accessible to all people. Horizontal circulation shall be without steps.

Where differences in level cannot be avoided, ramps or lifts shall be provided (see Clauses 8, 15 and 16).

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

In order to avoid a tripping hazard (especially during a fire evacuation), where a raised threshold is necessary at a door opening, its maximum height shall be 10 mm (see Figure 22), it shall be bevelled, and shall have a clear visual contrast with the floor.

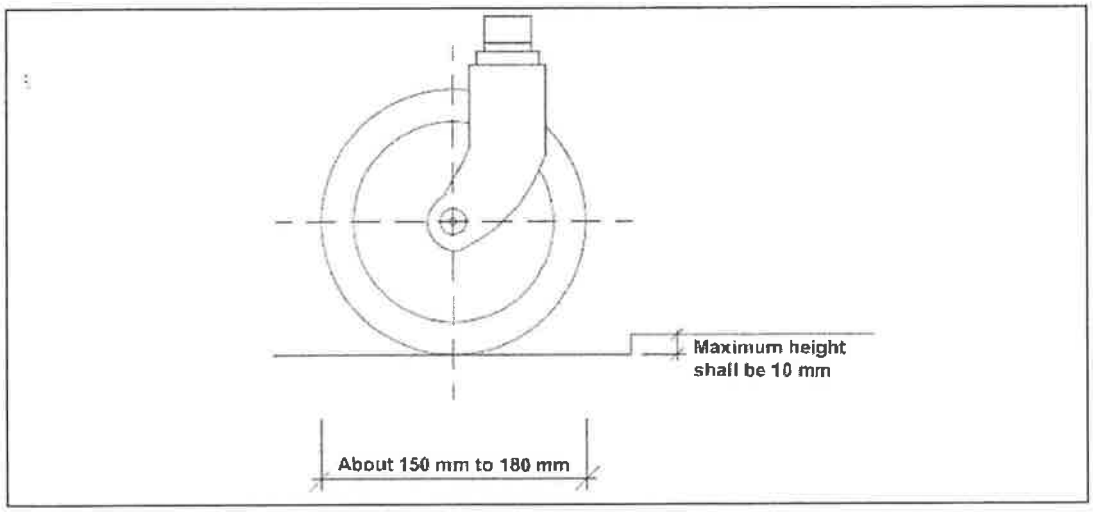


Figure 22. Maximum height of a raised threshold

Routes should preferably intersect at right angles to each other and be easy to follow. To facilitate visual impaired people, routes should have detectable delimitations and different visual contrast from the surroundings. For orientation and wayfinding in very complex buildings and across large areas, guidance can be provided by tactile walking surface indicator (TWSI) and visual, audible and tactile information, including egress and evacuation (see Clause 37).

Handrails can provide support for people with impaired mobility, guidance for people who are visual impaired people, and can also support Braille information or tactile information.

11.2 Internal passages

The minimum unobstructed width of corridors shall be 1 200 mm, with a preference for a width of 1 800 mm.

Where less than 1 800 mm wide, a corridor shall be provided with passing places, 1 800 mm wide and at least 1 800 mm in length at reasonable intervals. These dimensions shall be exclusive of handrails and any other projections, e.g. portable fire extinguishers, notice boards, etc.

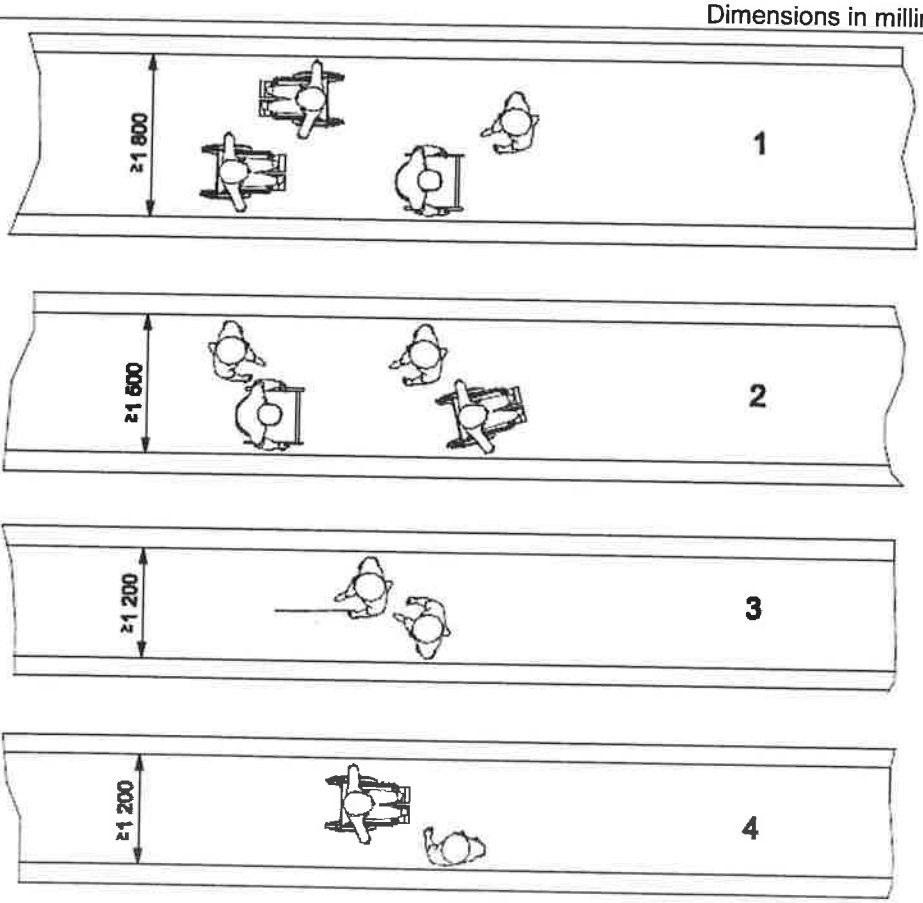
Adequate circulation space, where a doorway exists, shall be provided. Annex C gives advice on the provision of circulation space on each side of a doorway.

Intensity in use of the corridor shall be a criterion when establishing the minimum width and length of the corridor.

The width of passage used for escape is defined by other criteria (e.g. number of people, surface of premises); see also Annex D.

Changes of direction within a corridor shall have a turning circle with a diameter of 1 500 mm or more, clear of any obstructions (see Figure 23). The minimum clear height of corridors shall be 2 100 mm.

Dimensions in millimetres



Key

1 constant two-way traffic
2 frequent two-way traffic
3 infrequent two-way traffic
4 inadequate two-way traffic

Figure 23. Different corridor widths determined by intensity of use

Hanging objects on walls should be avoided, except when they comply with 7.14. The minimum unobstructed width shall remain 900 mm.

11.3 Turning space for 90° turn of a wheelchair in corridors

The manoeuvering zone required for a wheelchair to make a 90° turn shall be designed according to Figure 24.

It shall have no gradient, and it shall not be less than 1 200 mm wide and 1 200 mm long in the direction of travel.

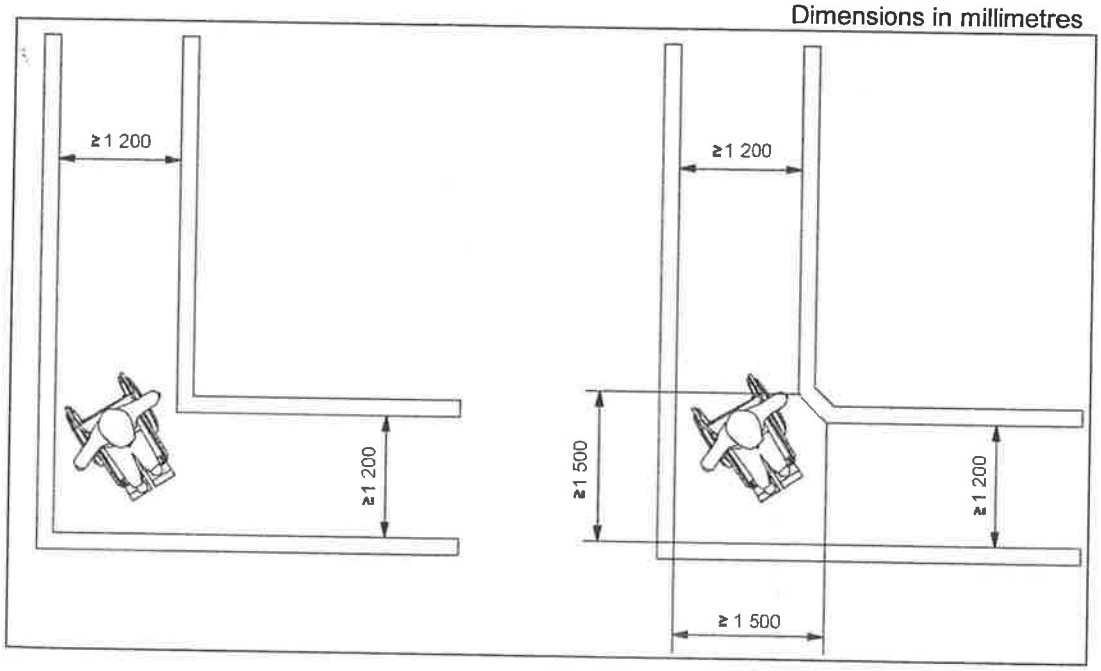


Figure 24. Minimum and recommended space required for a 90° turn

11.4 Circulation space for 180° wheelchair turn

The space required for a wheelchair to make a 180° turn shall be not less than 2 150 mm in the direction of travel and not less than 1 600 mm wide (see Figure 25).

11.5 Floors in corridors

Floor patterning that could be mistaken for steps, e.g. stripes, should not be used for floors in corridors.

Floors within a corridor should be levelled, wherever possible. If this is unavoidable, the slope of floors in corridors should be less steep than 1:20, unless the floor is designed as a ramp and includes landings, as necessary.

If there is a slope in the corridor floor, this may be identified by using a floor covering with visual contrast.

Guidance on the slip potential characteristics of floor finishes is given in Annex G.

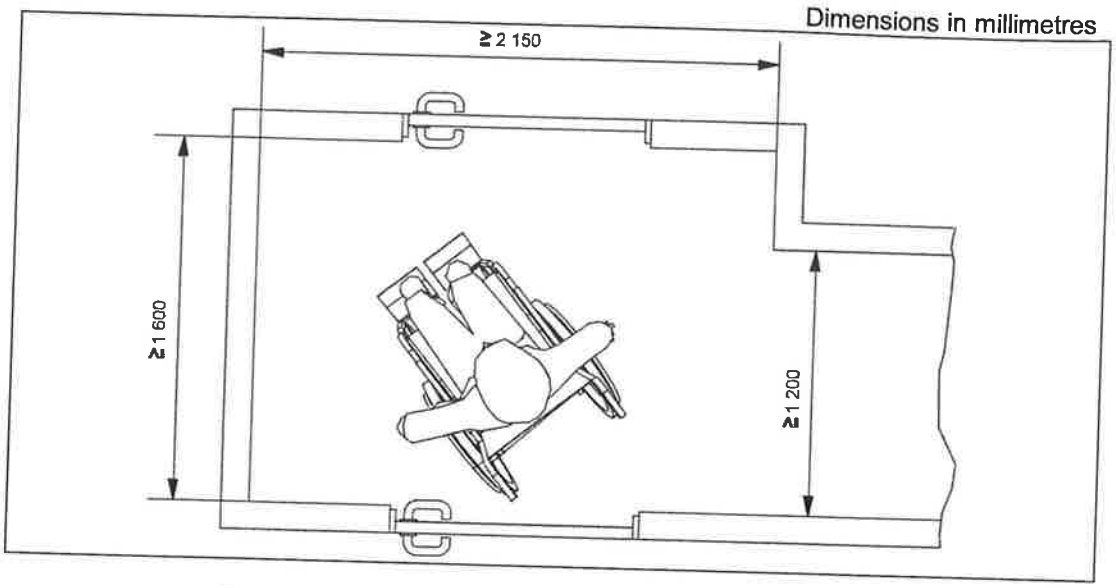


Figure 25. Space required for a 180° turn in a corridor

12 Vertical circulation

12.1 General

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

12.2 Ramps in buildings

General requirements for ramps are set out in Clause 8. Internal ramps should, if possible, be avoided. Where required, internal ramps shall be designed in accordance with the following additional criterias:

a) 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; and

b) in order to avoid trips and falls during a fire evacuation, a gradient of 1:15 (67 mm/m, 6.7 %) should be recommended within a building.

An internal ramp should have the lowest practical gradient which is 1:12.

The minimum illumination at the top and bottom of the ramp should be 200 lux and 150 lux in between the bottom and top. See lighting requirements in Clause 31.

13 Stairs

13.1 Rise and going of steps

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

For the purpose of safe assisted fire evacuation of people, the riser should not have a height greater than 180 mm, and the tread should be not less than 260 mm. Due to safety reasons and anthropometric differences, it may be recommended to increase the minimum depth of the tread.

Spiral and curved stairs are not recommended. Should spiral and curved stairs be used, the inside handrail should have the inside edge vertically parallel with the tread at a point where the depth of the tread is a minimum of 220 mm.

The riser of a step shall not be open if the spiral staircase is used for fire evacuation purposes.

The projection of a step nosing over the tread below shall be avoided but, if necessary, shall not be more than 25 mm. The nosing shall provide an uninterrupted transmission between riser and tread (see Figure 26).

A flight of steps shall not contain more than 16 risers.

The minimum illumination at the top and bottom of the flight should be 200 lux and 150 lux in between. See lighting requirements in Clause 31.

13.2 Minimum width of stair flights

The minimum width of a flight of stairs shall be 1 200 mm.

The minimum width between handrails shall be 1 000 mm.

To allow sufficient space for an evacuation chair to travel downstairs, while providing space for the purpose of accommodating contraflow, i.e. emergency access by firefighters rescue teams entering a building and towards a fire, while people are still evacuating from the building, the clear unobstructed width, exclusive of handrails and any other projections, e.g. portable fire extinguishers, notice boards, etc., of the flight of single- or multi-channelled stairs should be not less than 1 500 mm. The surface width of a flight of stairs should not be less than 1 700 mm.

13.3 Staircase landings

The area of a landing shall be clear of any obstruction including the path of the swing of a door or gate. Where there is a half landing or a 180° turn, it shall never be less than 1 500 mm wide in order to facilitate carrying a person on a stretcher. See Figure 27.

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

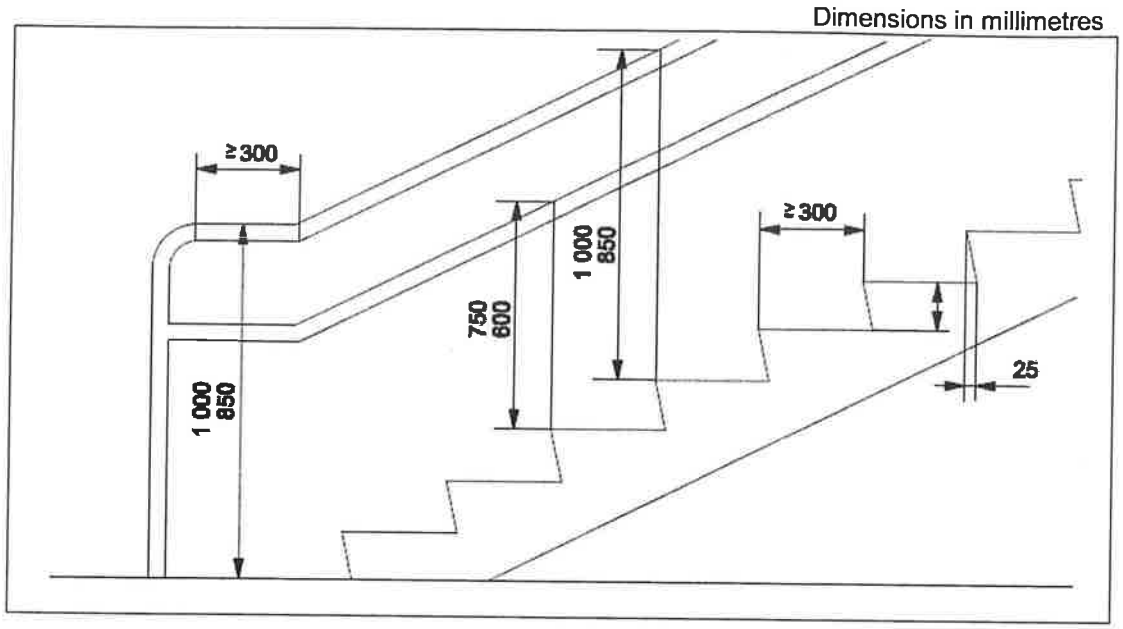


Figure 26. Recommended tread and riser of steps

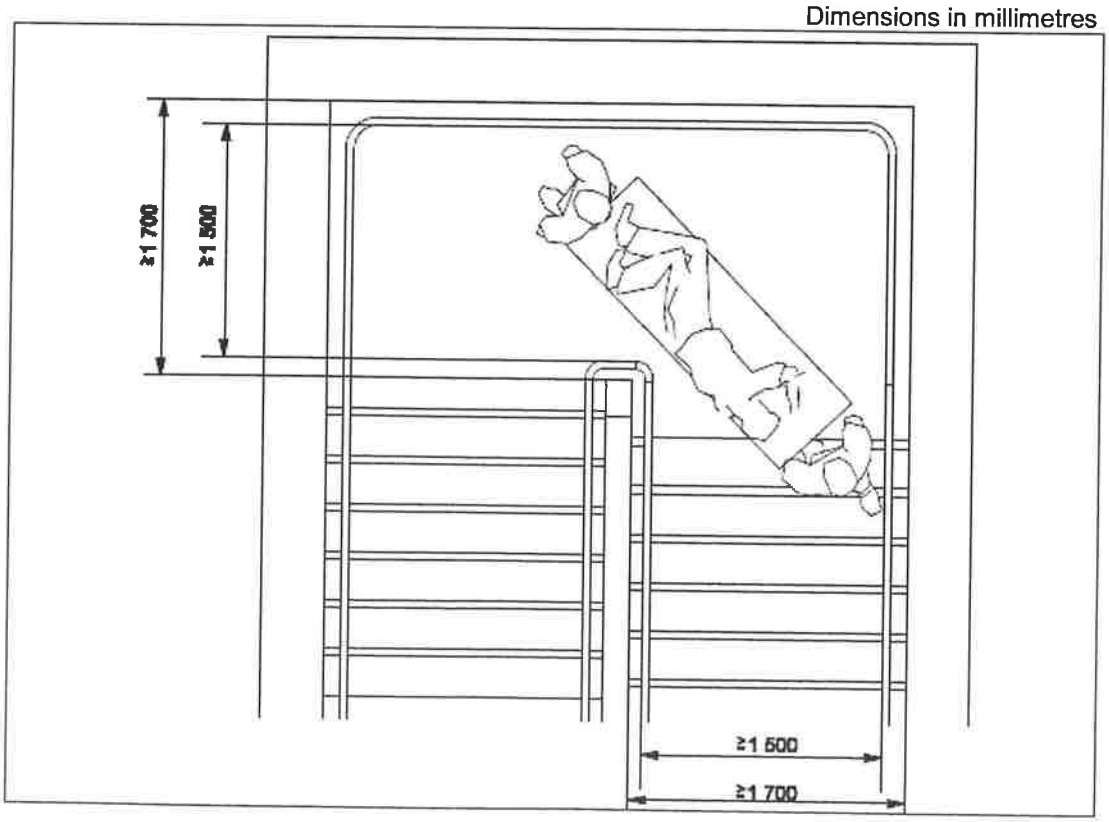


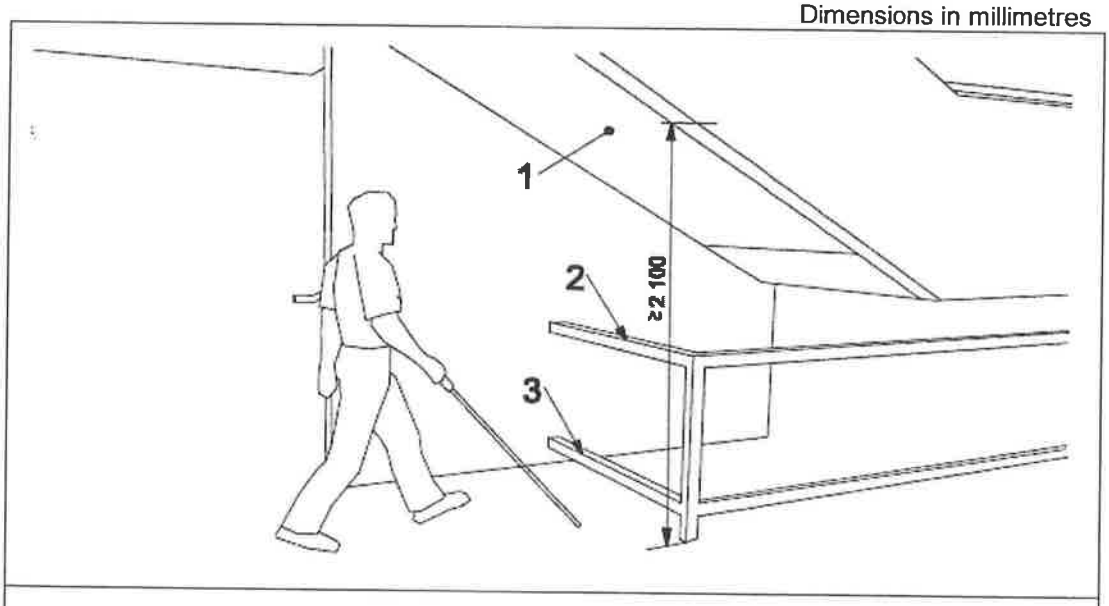
Figure 27. Example of stair and 180° landing for emergency access

13.4 Head clearance

Clear accessible height under stairs shall be a minimum of 2 100 mm or greater. If the clear height is less than 2 100 mm, a guard or other element shall be provided to shield against impact (see Figure 28).

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

Dimensions in millimetres



Key

1 min. 2 100 mm clear height
2 guard against impact
3 guard detectable with cane, maximum 300 mm above floor

Figure 28. Clear height under stairs

13.5 Visual and tactile warnings

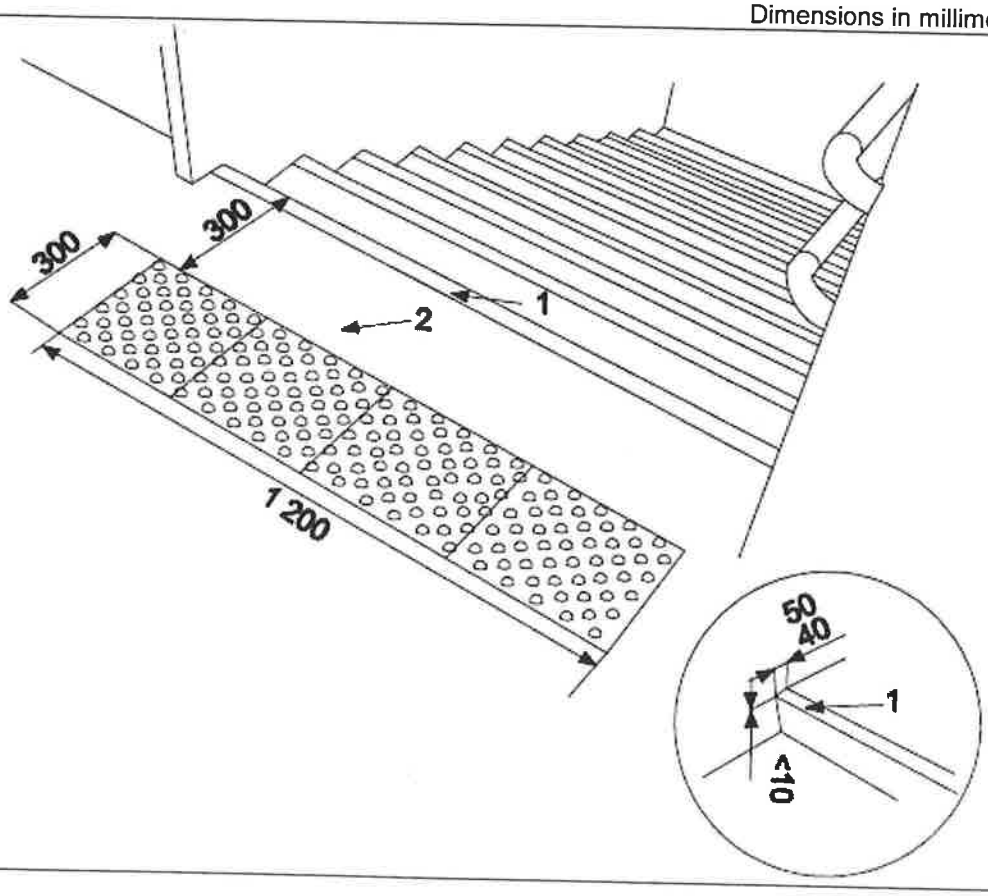
There shall be a clear visual contrast between landings and the top and bottom step of a flight of stairs. Preferably, a visual warning line with a single strip of 40 mm to 50 mm without a break shall be provided on the front edge of the tread and may return down the riser for a maximum of 10 mm. The visual indicator on the tread may be set back a maximum of 15 mm from the front of the nosing. As an alternative solution, a visual warning line with a width between 50 mm and 100 mm shall be provided on the tread of the first and the last step of the flight. See Figure 29.

Where a stair is in an open area, a tactile attention/warning pattern may be beneficial. The systematic use of tactile warning on any stair can be referred to statutory requirement. However, where different materials are used for the flights and landings of a stair, care should be taken to ensure that their frictional characteristics are similar in order to minimise the risk of stumbling.

Where tactile attention/warning patterns are used, they should be provided on the landings at the top and bottom of every flight of stairs across the whole width of the stair. The tactile attention/warning pattern should have a depth of between 300 mm ending 300 mm before the front edge of the first down tread step. For dimensions of attention/warning patterns see Figures 29, 30, 31, 32 and Annex A.

Where tactile attention/warning patterns are used at the top and bottom of stairs, the attention/warning pattern shall not reduce visual detection of the first and the last step of the flight.

Dimensions in millimetres



Key

1 visual warning line
2 tactile warning surface indicator (TWSI) with max. height of pattern 5 mm
w full width of stairs

Figure 29. Tactile walking surface indicator (TWSI) and visual indicator

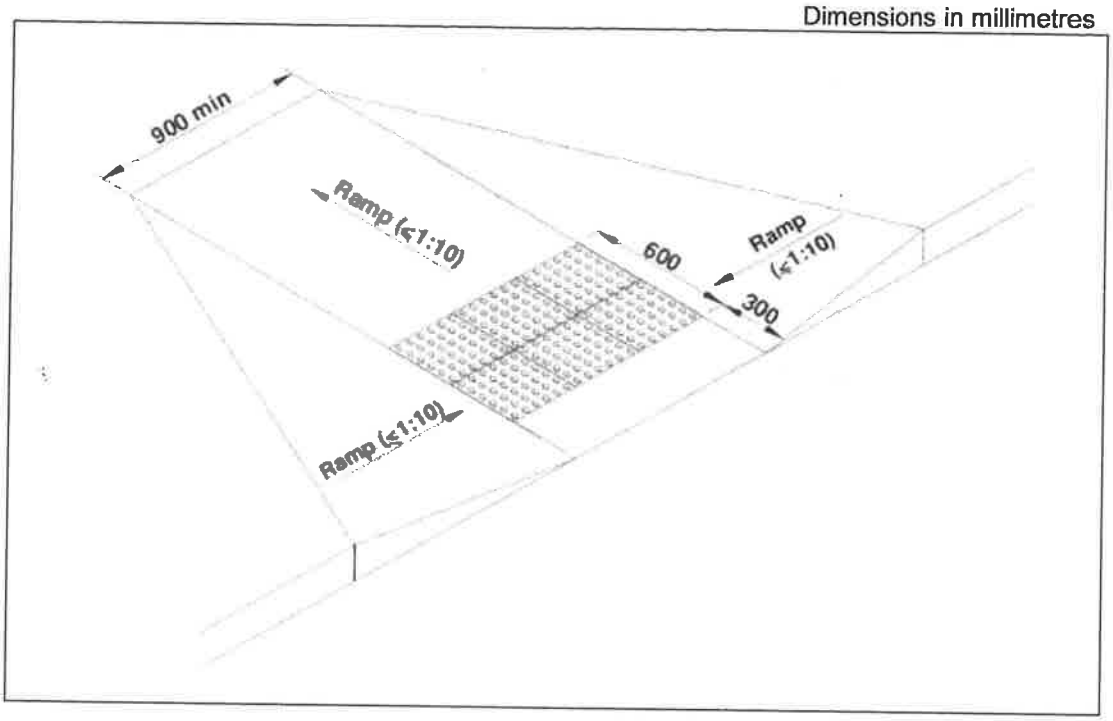


Figure 30. Kerb ramp with flared sides

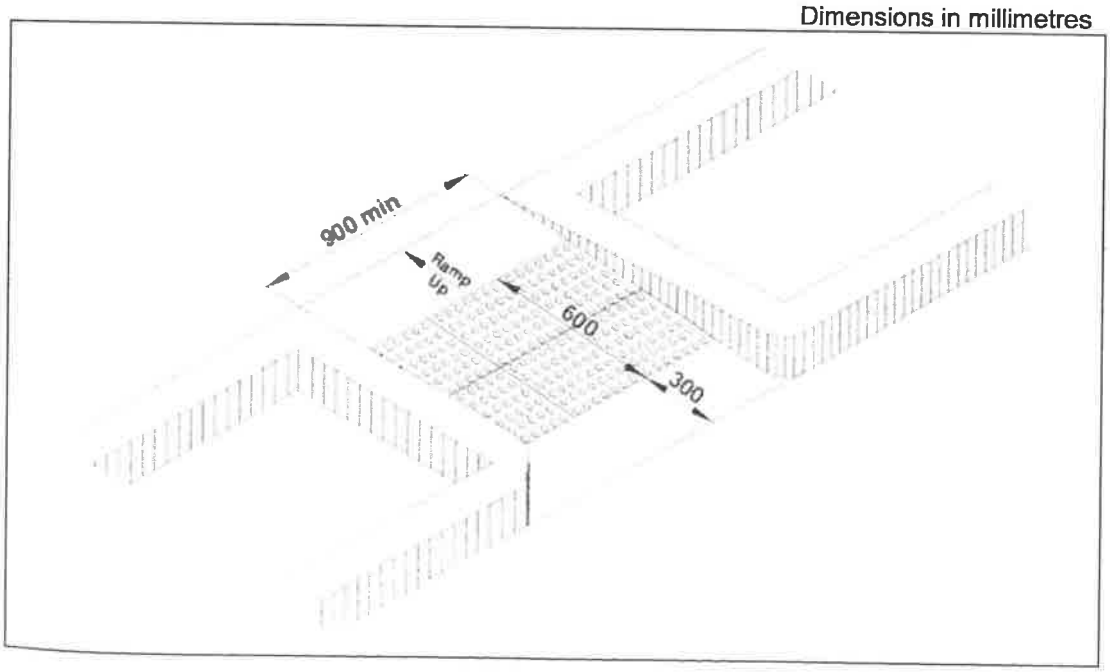


Figure 31. Kerb ramp with returned/continuous kerbs

Dimensions in millimetres

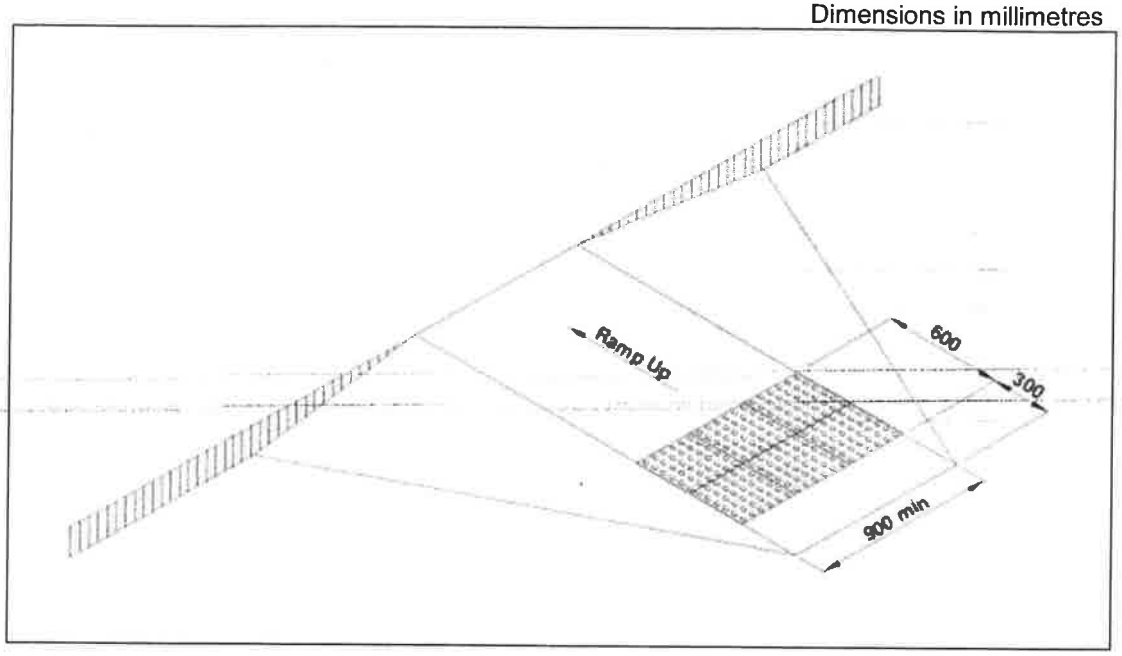


Figure 32. Kerb ramp with built-up/extended kerbs (example for heritage area)

13.6 Guards along stairs

If a stair rises more than 600 mm above the adjacent ground, it shall be provided with guards from that point on (see Clause 9).

14 Handrails

14.1 General

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

Handrails shall be provided for stepped and sloped paths, ramps and stairs and lift cars according to the requirements given in 14.2 to 14.7.

Handrails shall be securely fixed and rigid. The fastenings and the materials shall be able to withstand a minimum point load, both vertical and horizontal of 150 kg.

14.2 Provision of handrails

A handrail shall be provided on both sides of all flights of stairs, and a central handrail should be provided when the unobstructed width of the stairs exceeds 2 700 mm, provided that an unobstructed width of at least 1 500 mm is provided on one side.

Exceptional considerations for existing buildings: a handrail should be provided on both sides of the flight of stairs (principal difficulties arise in relation to heritage buildings).

14.3 Profile of a handrail

A handrail should:

a) have a rounded profile that can be inscribed into a 45 mm circle, and subscribed to a 35 mm diameter circle. The radius of the rounded edges shall be minimum 15 mm;

b) be located to provide a minimum clear space of 40 mm from an adjacent wall or other obstruction;

c) have an overall projection from any side obstruction of not more than 100 mm;

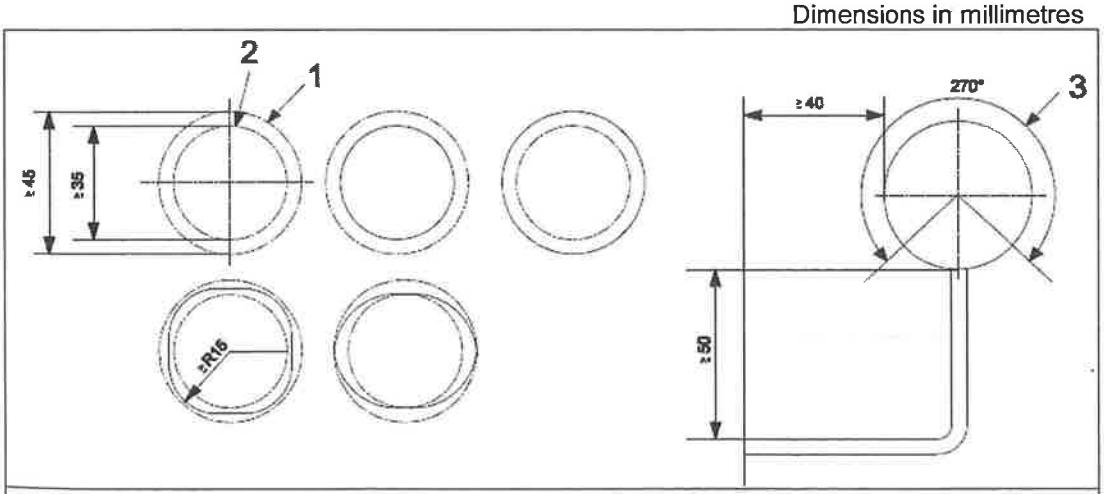
d) have the top 270° arc of the handrail clear along its full length;

e) have a minimum of 50 mm clearance under the 270° arc along the full length of the handrail for finger indentation; and

f) have a surface that is smooth but provides adequate resistance to hand slippage.

A wide and relatively flat-topped surface on a handrail provides better support than a regularly curved one. Graspability is better on a handrail that does not require significant hand and finger joint movement. For these reasons, the use of a handrail that is elliptical is preferred.

Dimensions in millimetres



Key

1 maximum inscribed circle for handrail profile
2 minimum subscribed circle for profile
3 minimum 50 mm clearance under top 270° arc along full length of handrail

Figure 33. Examples of handrail profiles, support and clearance

14.4 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.

14.5 Height of a handrail

The height to the top of a handrail shall be between 850 mm and 1 000 mm above the surface of a ramp, the pitch line of a stair, and the surface of a landing.

A second handrail, with a lower profile than the first one, shall be provided. The height to the top of the second handrail should be between 600 mm and 750 mm above the surface of a ramp, the pitch line of a stair, and the surface of a landing.

14.6 Horizontal extension of a handrail

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

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.

The end of the horizontal extension should be turned towards the wall on the closed side of the ramp or stairs, or be turned down and terminate at the floor or ground level.

This provision supports people with mobility impairment and limits the risk of clothing being caught.

14.7 Visual and tactile information

The minimum visual contrast of a handrail to the adjacent background, e.g. a wall, shall comply with the requirements outlined in Clause 33.

Braille, raised text or tactile symbols shall be unobtrusively and permanently fitted or fixed to handrails as an important source of information for people who have visual impairment, e.g. indication of floor number, direction of fire evacuation, location of final fire exits, etc.

Visual and tactile information should be provided according to 7.2, and Clauses 31, 33, 37 and 38.

15 Lifts

15.1 General comments

All accessible levels of a building shall be accessible with ramps or lifts. Lifts are preferable, and shall be accessible for all people, including people with disabilities. The minimum inner dimensions of cars are given in 15.2.

A space for an accessible lift with a minimum internal lift car size of 1 100 mm × 1 400 mm of 630 kg with a mirror located in the opposite of the lift door should be provided for later adaptation.

There is a wide range of accessible lifts for persons in different lift classes, such as general purpose lifts, health care lifts, including hospitals and nursing homes and intensive use lifts for high-rise buildings.

15.2 Inner dimensions of cars

The following accessibility requirements shall apply. Inner dimensions of cars shall fulfil minimum accessibility requirements.

The minimum inner dimensions of cars which are accessible for a wheelchair user and an accompanying person are 1 100 mm × 1 400 mm with a mirror located in the opposite of the lift door. A minimum unobstructed entrance width of 900 mm shall be provided on the narrow side of the car (see Figure 34).

If a trolley with a stretcher is considered, the minimum inner dimensions of cars shall be 1 200 mm × 2 300 mm. A minimum unobstructed entrance width of 1 100 mm shall be provided on the narrow side of the car (see Figure 34).

If an entrance is provided on two adjacent sides, the minimum inner dimensions of cars shall be 1 600 mm × 1 400 mm, with a 900 mm unobstructed door width (see Figure 34).

Dimensions in millimetres

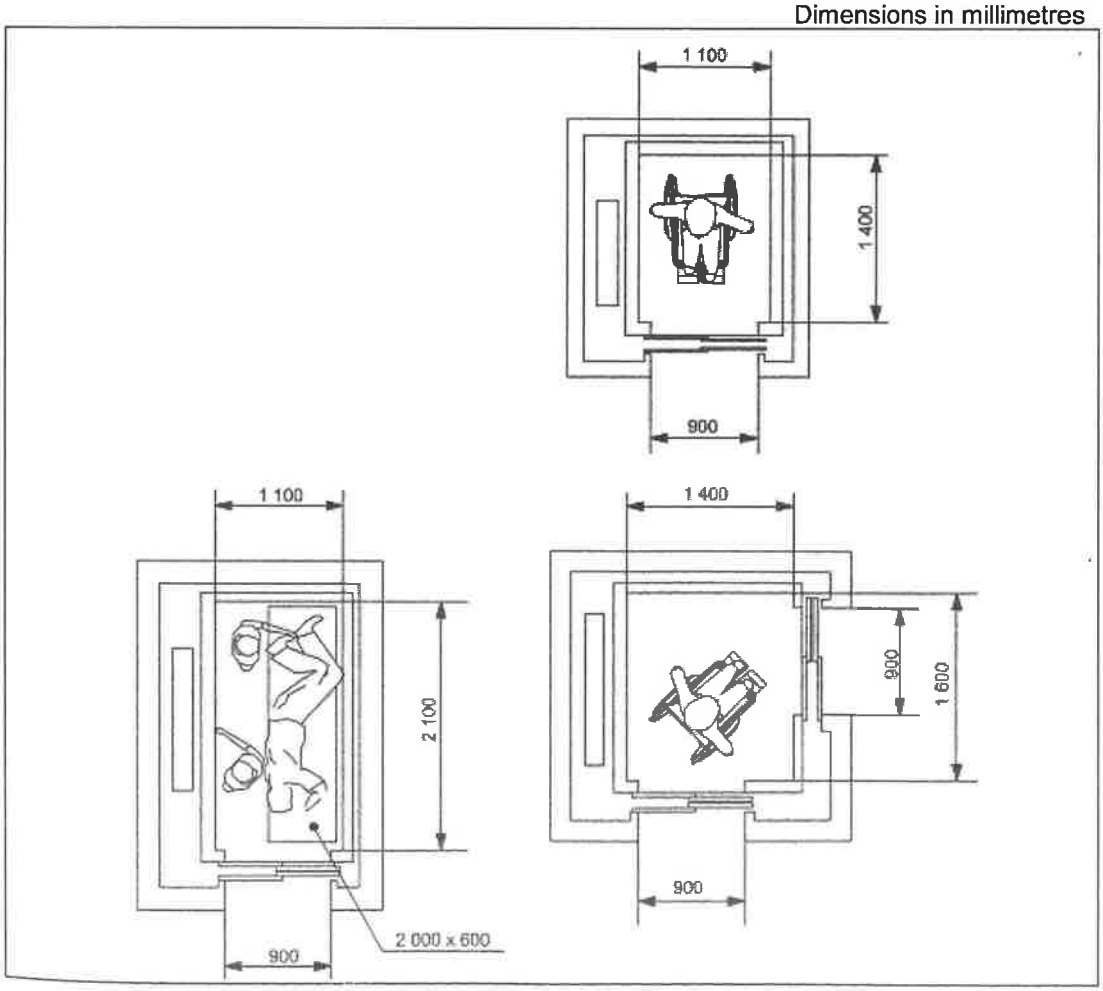
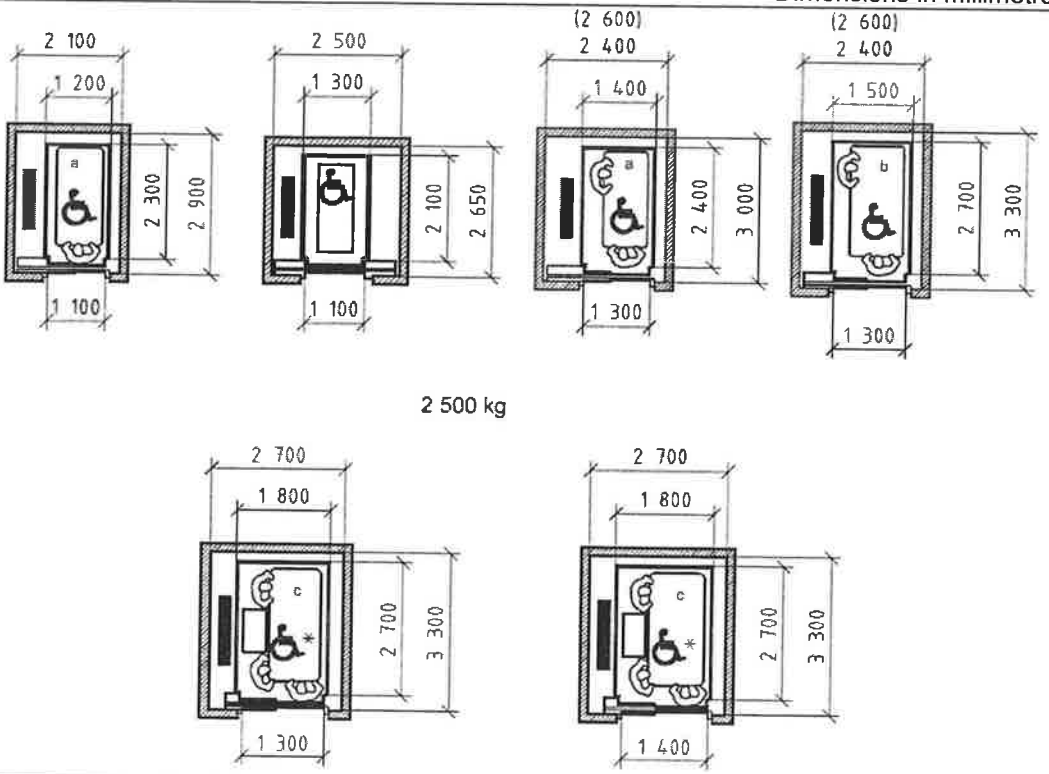


Figure 34. Examples of lifts accommodating one person in a wheelchair, a person on a stretcher and a person performing a 90° turn between two adjacent lift doors

Figure 35 describes many additional accessible lift cars, e.g. to facilitate transporting a stretcher or bed. They are clearly marked with the wheelchair or bed symbol. All these accessible lifts allow full manoeuvrability for people with wheelchair and walking aids.

Dimensions in millimetres



The car height shall be 2 300 mm. The entrance height shall be 2 100 mm.

NOTES:

1. Lifts suitable for speeds up to and including 2.5 m/s.

2. Well dimensions shown in brackets are valid for side acting hydraulic lifts.

3. Lifts marked thus * allow full manoeuvrability (3-point turn) of a wheelchair.

4. Even though counterweights are shown in the diagrams, the dimensions apply to all lifts irrespective of the drive system.

5. 1 275 kg lift with centre-opening doors is for use in conjunction with other cars of similar door design in a group and allows the accommodation of a stretcher 600 mm to 2 000 mm.

a Bed dimensions 900 mm x 2 000 mm.

b Bed dimensions 1 000 mm x 2 300 mm.

c Bed dimensions 1 000 mm x 2 300 mm, with additional instruments.

Figure 35. Health-care lifts

15.3 Lift car entrance - Door opening

Accessibility of the landing is required on all eligible floors.

The unobstructed entrance width shall be at least 900 mm.

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

The colour and tone of the lift entrances should contrast with the surrounding wall finishes (see Clause 33).

The door opening time shall be adjustable to suit the conditions where the lift is installed (normally between 2 s and 20 s). A mechanism to increase this time shall be installed to be customised by a user with mobility impairments (e.g. by means of a button outside the car to call the lift to the floor for it to arrive with extended door opening time, and a button marked with a wheelchair symbol inside the car with the same purpose). There should not be any obstruction to the call button e.g dustbin.

A presence sensor 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 minimises the likelihood of physical contact between the user and the leading edges of the closing panel(s).

Sufficient manoeuvring space outside the lift entrance shall be provided according to 19.3 and B.6.1 (see Figure 25). The manoeuvring space should not be in any circulation route nor directly opposite to any stair circulation. If a stair is situated opposite the entrance, the distance to the stair shall be at least 2 000 mm to allow safe manoeuvring (see Figure 36). The manoeuvring area shall be adequately lit with a minimum illumination of 100 lux.

Dimensions in millimetres

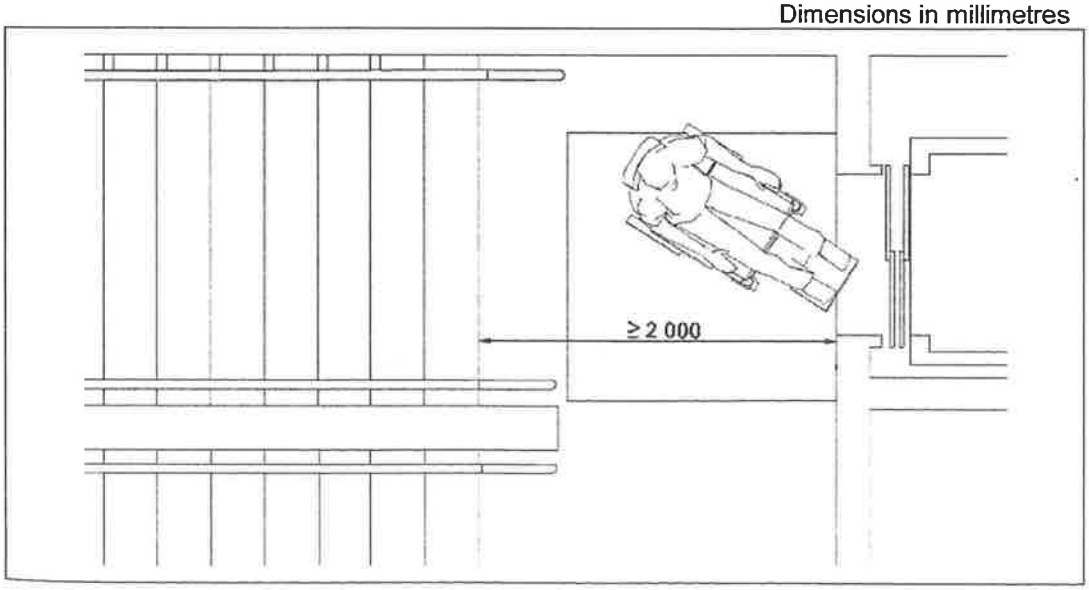


Figure 36. Manoeuvring space outside the car door opposite a stair

In order to aid in location of the lift entrance, a distinguishable floor surface of approximately 1 500 mm × 1 500 mm should be installed outside the doors. This could be obtained by means of a change of colour or floor finish. Changes in floor finish should be flush.

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; it is recommended to provide one handrail on each car wall. Handrails may be interrupted at the car operating panel(s) if it is required to gain access to lift controls.

The gripping part of the handrail shall:

a) be in a perimeter of between 100 mm and 160 mm;

b) have a minimum dimension of 40 mm;

c) have a maximum dimension of 50 mm; and

d) have no sharp edges.

The height to the top of the handrail shall be between 800 mm and 900 mm above the floor; a height of 850 mm ± 25 mm is recommended.

The free space between the wall and the gripping part shall be between 35 mm and 45 mm; 50 mm is recommended. 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 the handrails shall be closed and turned towards the wall to minimise the risk of injury.

15.4.2 Seat

Where a fold-up seat is provided, it shall have:

a) a top height from the floor of 500 mm ± 20 mm;

b) a depth of 300 mm to 400 mm;

c) a width of 400 mm to 500 mm; and

d) an ability to support a minimum load of 150 kg; where 200 kg is recommended, considering the increasing number of obese people in the worldwide population.

15.4.3 Mirror or mirrored wall within the car

In case of a car size of 1 100 mm × 1 400 mm where a wheelchair user cannot turn around, a device (e.g. a small mirror) shall be installed to enable the user to observe obstacles behind when moving backwards out of the car. If a glass mirror is used it shall be made of safety glass.

If any wall of the car is substantially mirrored or covered with a reflective surface, measures shall be taken to avoid creating optical confusion (e.g. by means of 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, matte finish in a colour and tone contrasting with the floor.

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

The floor of the car should have a similar surface characteristic to the landing floor. The control buttons shall be equipped with Braille and be of contrasting design to the surrounding wall in order to locate them easily.

15.4.5 Allergic materials

Surface materials that a user can be allergic to include nickel, chromium, cobalt and natural or synthetic rubber; these materials should be avoided in buttons, controls, handles or handrails (see Annex B).

15.4.6 Lighting

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

15.4.7 Emergency warnings

The car shall have an alarm device (two-way communication system) permanently connected to a manned security point according to the following:

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

b) a minimum operating force of 2.5 N shall be required to operate the alarm;

c) the device shall provide visual and audible information feedback for passengers confirming the followings:

   i) the alarm has been sent, using a yellow enlightened bell-shaped symbol; and

   ii) the alarm has been received, voice communication established, using the green enlightened symbol consisting of two heads.

d) emergency text number should be provided at the lift panel inside the car for hearing impaired person to communicate for assistance during emergency; and

e) a unique shape button with Braille for the visual impaired to identify and to activate an emergency call.

15.4.8 Stopping/levelling accuracy

The stopping accuracy of the car shall be ± 10 mm and a levelling accuracy of ± 20 mm shall be maintained.

Voice indicator for the visual impaired announcing the floor level shall be provided.

15.5 Control devices and signals

Where it is intended to provide accessibility for all, controls should be placed within a defined area. Landing controls should be placed at a minimum distance of 500 mm from any adjacent corner or wall. Car controls should be placed at a minimum distance of 400 mm from any adjacent corner or wall. Both landing controls and car controls should be placed between 900 mm and 1 200 mm above floor level, preferably 1 100 mm. The controls can be placed either vertically or horizontally within this area.

In buildings with a small number of floors and a high number of wheelchair users, placing the controls horizontally can be helpful.

In buildings with a small number of floors, it is recommended to use 25 mm × 25 mm square buttons or 30 mm circular buttons with raised tactile letters, whether they are placed vertically or horizontally.

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

Lift call buttons shall be placed at a fixed location:

a) in the case where there is only one lift, the call buttons should be placed on the right only; and

b) in cases where there are more than one lift placed side by side, the call buttons should be placed in between the lifts.

Dimensions in millimetres

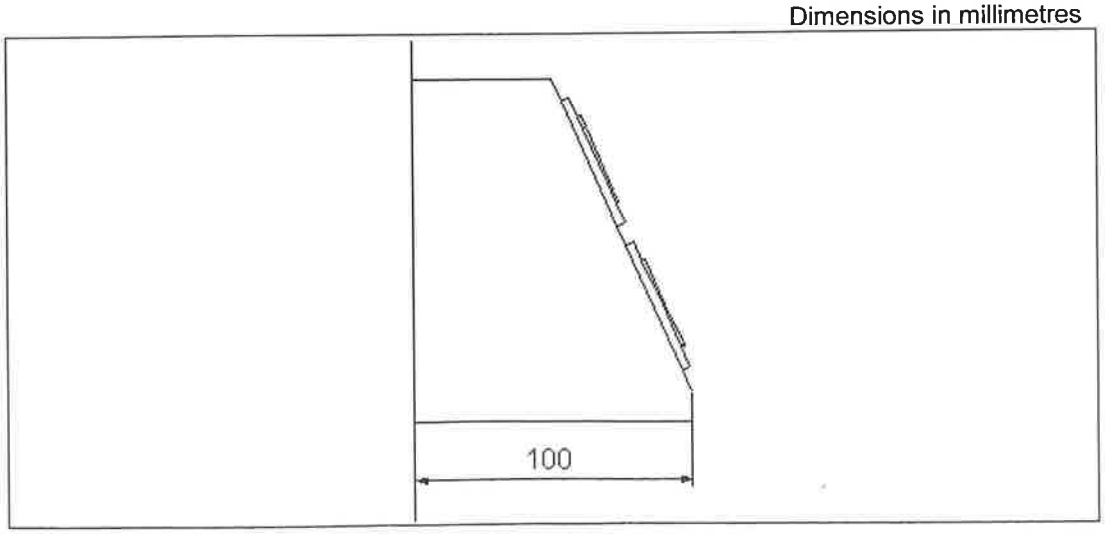
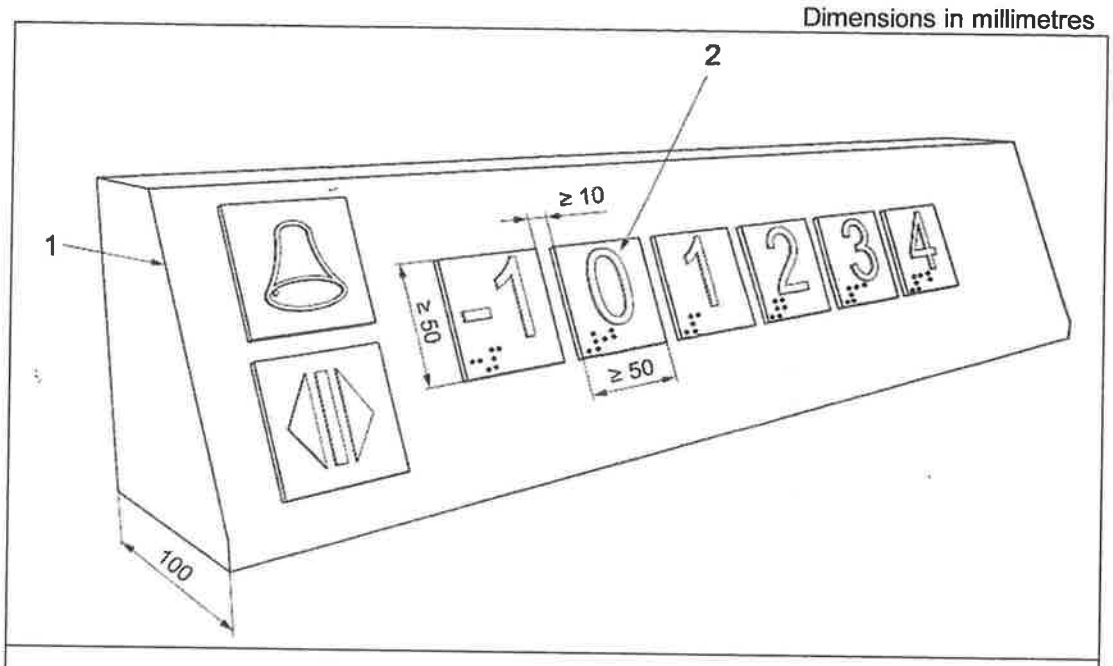


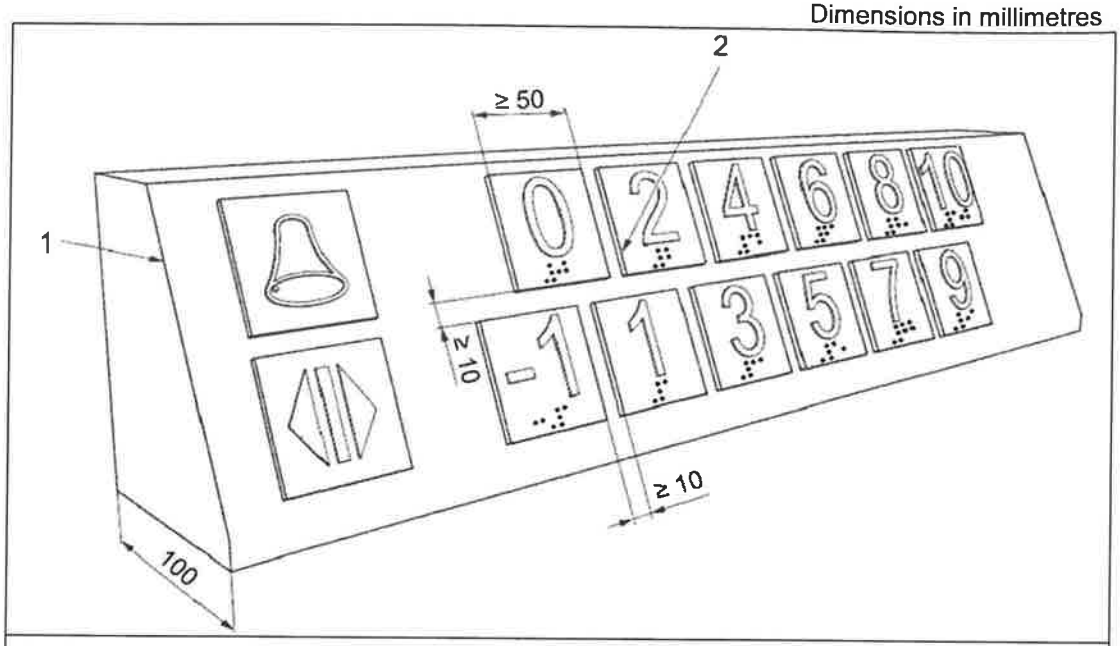
Figure 37. Horizontal car controls, XL type - Side view



Key

1 single row arrangement on inclined surface
2 square 50 mm × 50 mm or round push button with raised tactile letters and Braille

Figure 38. Example of arrangement of a single row of square or round push buttons



Key

1 two row arrangement on inclined surface
2 square 50 mm × 50 mm or round push button with raised tactile letters

Figure 39. Example of arrangement of two rows of square or round push buttons

15.6 Use of lifts for fire evacuation

A fundamental objective of fire engineering design for evacuation is that there shall be alternative, safe and intuitive evacuation routes away from the scene of a fire, which can occur at any time and in any part of a building; these evacuation routes shall be available to all building users.

Manual handling of wheelchairs occupied by their users in a fire evacuation staircase, even with adequate training for everyone directly and indirectly involved, is hazardous for the person in the wheelchair and for those people giving assistance. The weight of an average unoccupied powered wheelchair, alone, makes manual handling impractical. Evacuation chair devices (see 36.4) can allow vertical movement on stairs of people with mobility impairments. Some evacuation chairs require a wheelchair user to transfer out of their own chair into the evacuation chair. This transfer operation requires manual handling (e.g. handling of one work colleague by others), and there is a risk of injury during the transfer process or if the wheelchair user uses an oxygen tube, or has a catheter or a colostomy bag. The transfer can also infringe the independence and dignity of the individual concerned.

All lifts in new buildings should comply to statutory requirement on fire requirement for evacuation.

It is essential that any lift used for evacuation can continue to operate effectively and safely, under strict management, for a specified time during a fire.

Firefighting lifts may be used for the evacuation of building users up until the time that firefighters arrive at the building and take control of the lifts. Prior liaison and pre-planning with local fire authorities is always necessary to agree on suitable procedures with regard to the use of the lifts.

All lifts used for evacuation should be easily accessible, clearly identifiable and be suitably protected from the increase of smoke, heat and flame. The controls for the lift shall be located in the areas where users shall wait and this area shall be designed to ensure a tenable environment provided during the entire time that the evacuation is taking place.

Lifts should not be used for evacuation unless built for this purpose and suitably protected by the building design.

The location of lifts in a building, preferably outside a central position on plan, should always be considered in relation to their supporting fire evacuation staircases, with associated areas of rescue assistance, and direct protected access to final fire exits leading to places of safety remote from the building.

See also Clause 36, and consider Clause D.3.

16 Vertical and inclined lifting platforms

16.1 General application

Vertical and inclined lifting platforms shall be able to be used safely, independently and also with an accompanying person. All control devices shall also be accessible and usable for powered wheelchair and walking aids users.

Exceptional considerations for existing buildings, if it is impossible to install an accessible lift according to Clause 15 in an existing building, vertical or inclined lifting platforms shall be provided.

16.2 Platform dimensions

The minimum dimension of the platform shall be 1 100 mm × 1 400 mm for the use of manual and powered wheelchairs with assistance.

Exceptional considerations for existing buildings, in existing buildings and conservation area of minor public importance and with few visitors, where sufficient space is not available, other dimensions may be considered, e.g. 900 mm × 1 400 mm or 800 mm × 1 250 mm.

16.3 Vertical lifting platforms

If 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.

Dimensions in millimetres

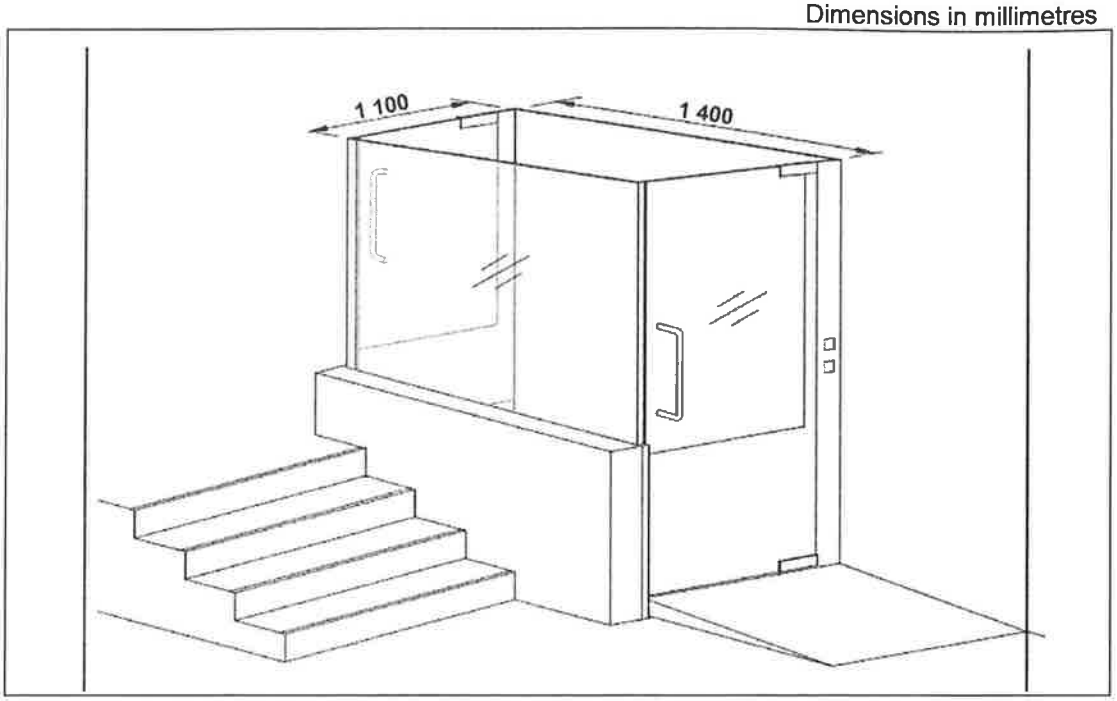


Figure 40. Platform lift

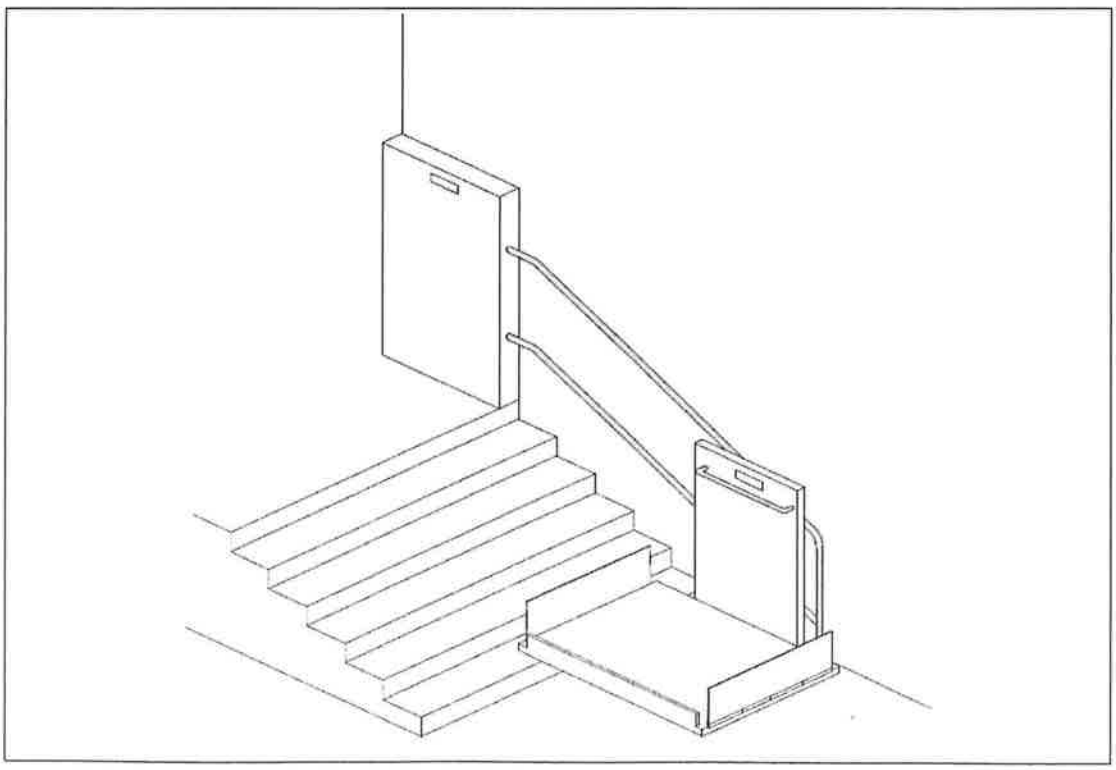


Figure 41. Wheelchair stairlift

17 Escalators and moving walks

Escalators and moving walks are very common in public buildings. They can greatly facilitate circulation for all building users in large, extensive and complex modern building types.

However, the location of escalators and moving walks should always be considered in relation to the position of adjacent fire protected lift shafts and lobbies, staircases and their associated areas of rescue assistance.

During normal periods of maintenance and servicing, escalators and moving walks will not be operational. In no circumstances should the movement of escalators be reversed. Whenever there are two escalators side by side, uniformity should be adhered by keeping left.

In the event of a fire emergency, building users attempting to evacuate usually tend to re-trace their routes of entry, whatever the nature of the hazard and wherever it is located. It should be assumed that the electrical supply to escalators and moving walks is terminated or turned off during such emergencies.

For important reasons of safety, therefore, inclined moving walks should comply with the requirements for ramps in buildings (see 8.2).

For important reasons of safety, special warning notices and indicators shall be provided at the top and bottom of escalators where step rises reduce suddenly and dramatically when not operational. See Figures 42 and 43.

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.

Safety shall be the prime consideration when choosing or installing escalators and moving walks.

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

Persons with a wheelchair generally cannot use horizontal walkways. An inclination of up to six degrees will exclude a majority of wheelchair users from using a horizontal walkway independently.

A surface of the escalator that contrasts visually with the approach and the use of audible signals or pre-recorded messages that indicate the start and finish of the escalator help visual impaired people.

Signs should be provided to indicate the location of other facilities, such as lifts, and these facilities should be in close proximity to the escalators and moving walks and be easy to find. Moving walks shall be free of projecting objects and obstacles up to a height of 2 100 mm.

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

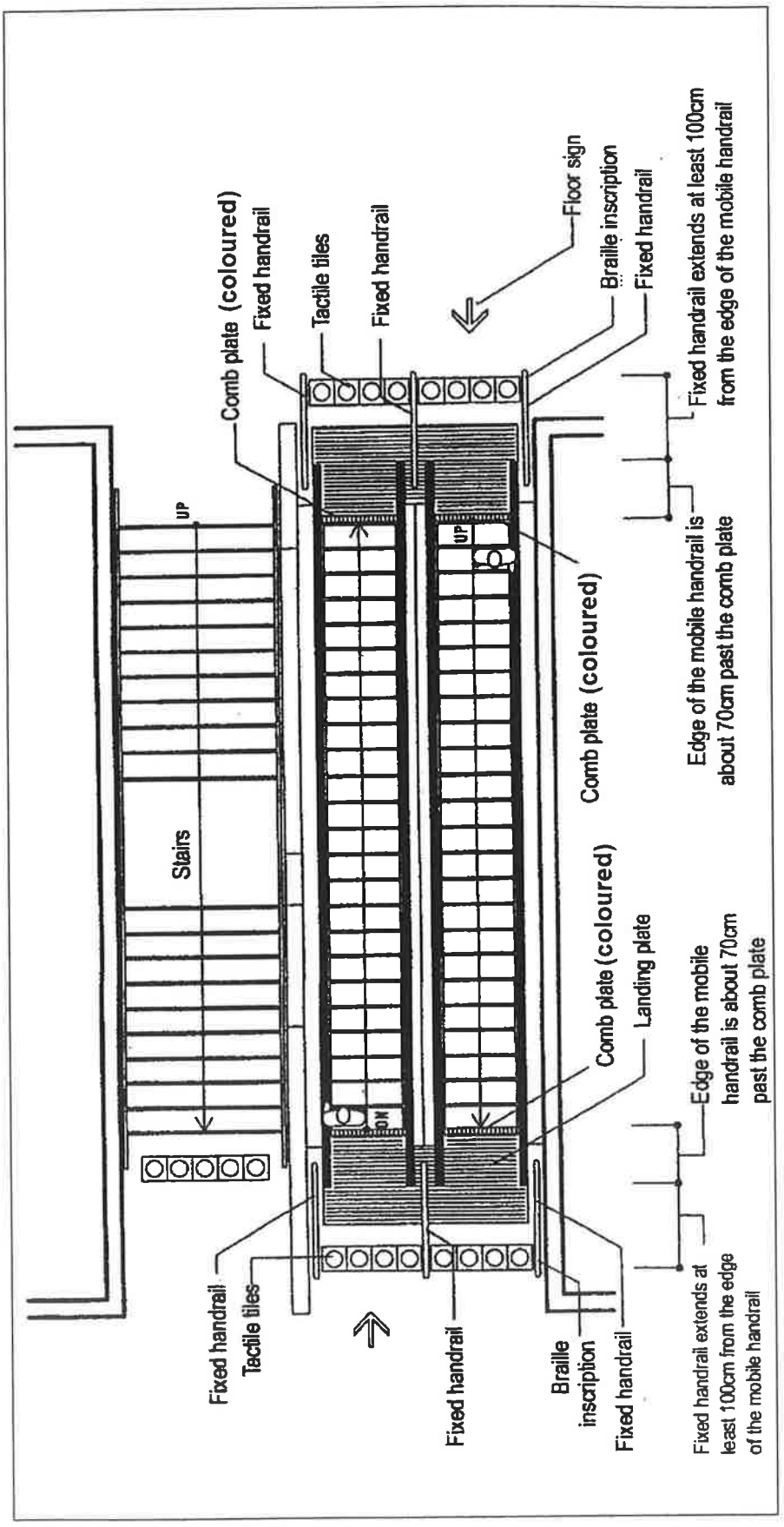


Figure 42. Example of design standards for escalators (plan view)

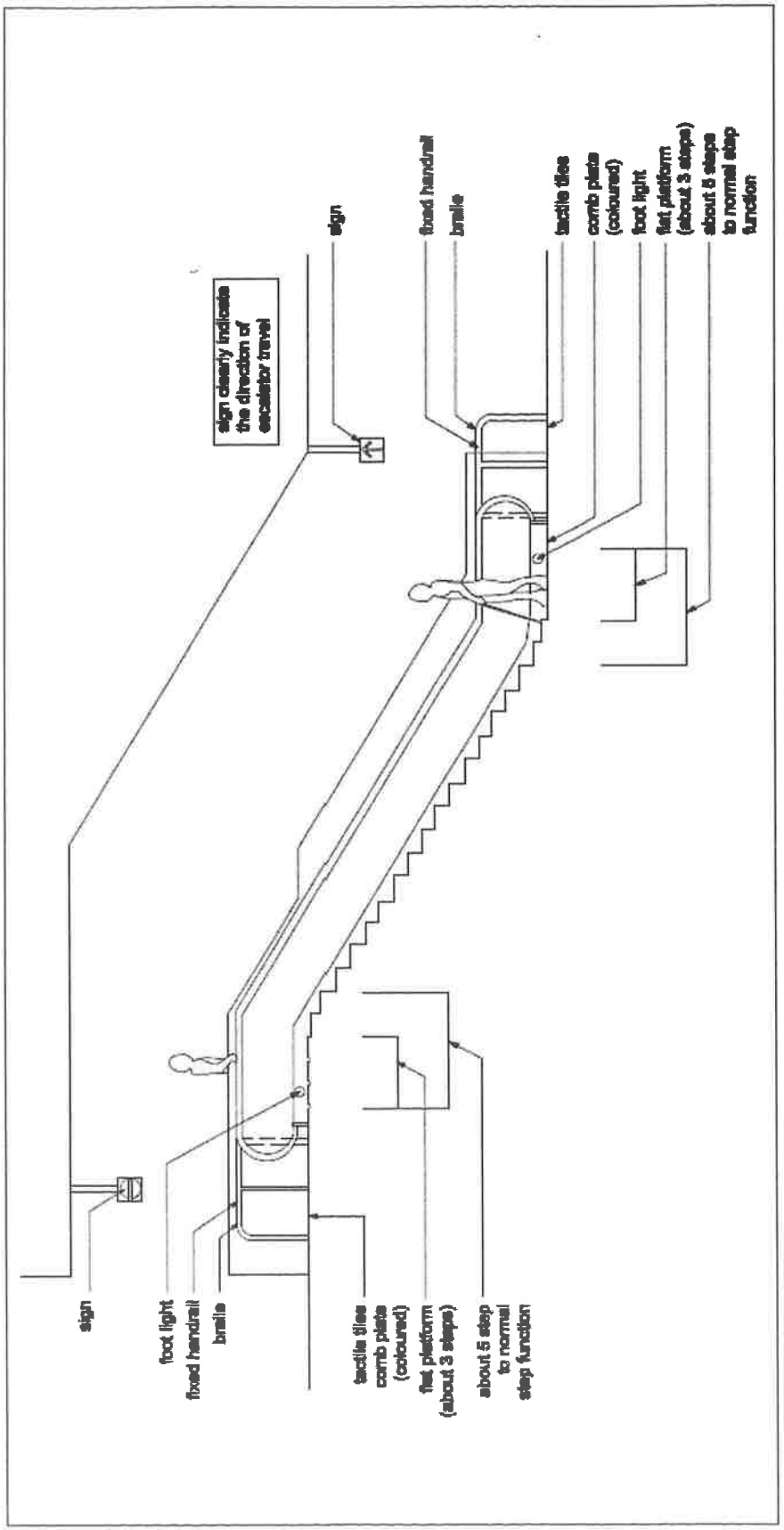


Figure 43. Example of design standards for escalators (side view)

18 Doors and windows

18.1 Doors and door furniture

18.1.1 General

General requirements for entrance doorways are given in 10.5.

Doorways shall be designed in accordance with the following additional criterias:

a) unobstructed width of doors shall be minimum of 850 mm; 900 mm or more is recommended;

b) clear height of doorways shall be at least 2 100 mm (compare with 10.6);

c) a level threshold is recommended for internal and external doors;

d) where a raised threshold is provided, it shall have a maximum height of 10 mm be bevelled when higher than 5 mm and contrast visually with the adjacent floor;

e) level manoeuvring area on either side of the door (see Figures 20 and 21); and

f) if any door is opening towards a descending stair, the minimum safe distance for manoeuvring should be 2 000 mm, including doorswing, to minimise the risk for wheelchair users (see also 13.3 on landings).

18.1.2 Unobstructed width of doorways

Every doorway except those to toilet facilities should have an opening of not less than 900 mm clear. In case of double leaf door, at least one leaf should have the minimum opening of not less than 900 mm clear. Building such as hospital and sport complexes should have the minimum of opening of not less than 1 000 mm clear.

The minimum unobstructed width of a doorway on a continuous accessible path of travel shall be 800 mm for retrofitting and conservation area when measured from the face of the door (see Figure 44); 850 mm or more is recommended. Consider detailed information and alternatives in Annex C.

The maximum distance from the handle of the door leaf to the wall surface shall not exceed 250 mm.

Design, installation and maintenance of sliding doors should be specially considered.

Dimensions in millimetres

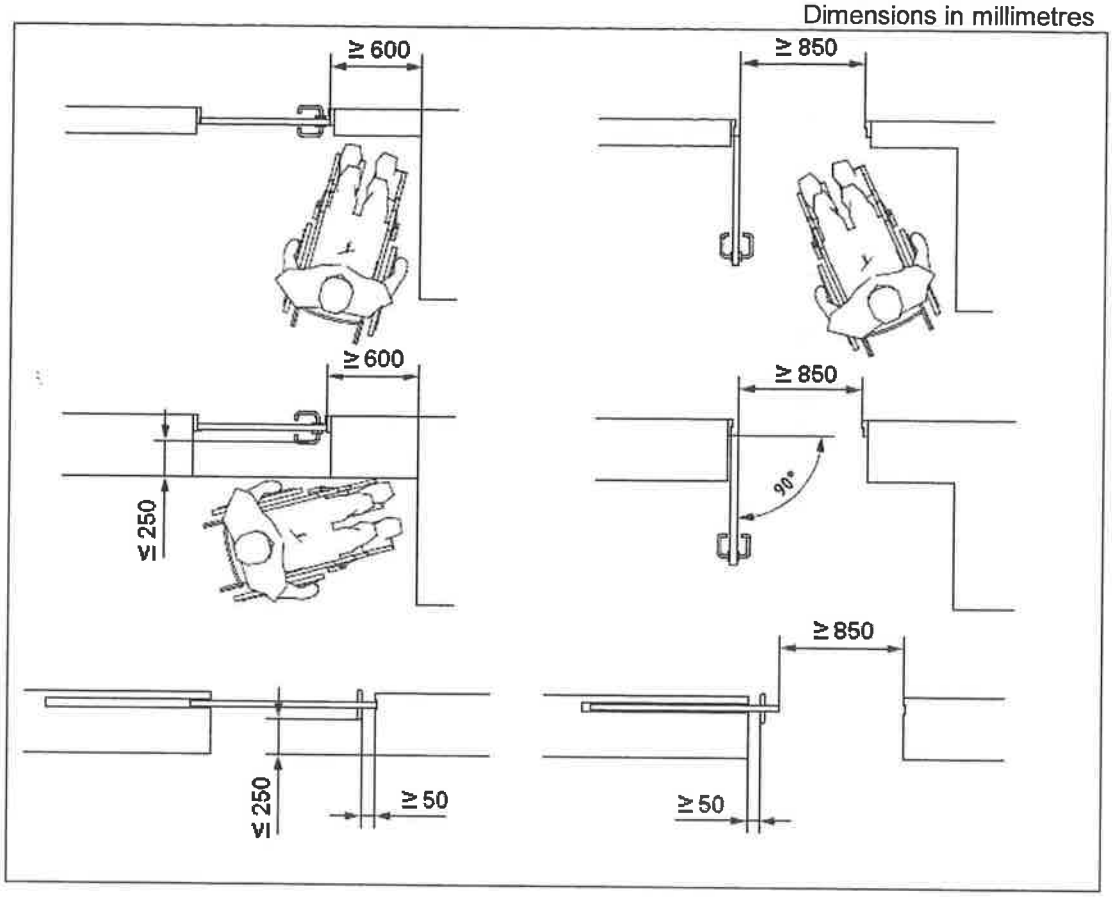


Figure 44. Unobstructed width of swinging and sliding doors

18.1.3 Position of a door

A manoeuvring 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; 700 mm or more is recommended.

This space is necessary to allow opening of the door by a wheelchair user or a walking frame user. This requirement does not apply where automatic doors are provided.

18.1.4 Operating force

When the operating force needed to open the door is greater than 25 N, an automatic opening door is recommended.

People with impaired mobility often experience difficulties when using self-closing doors. The force required to open doors should be 25 N.

Buildings for public use should preferably have automatic doors or controlled door closing devices with a hold-open device. An alternative option is the use of dual powered controlled door closing devices with electromagnetic retention for higher power spring.

18.1.5 Glazed doors and glazed areas

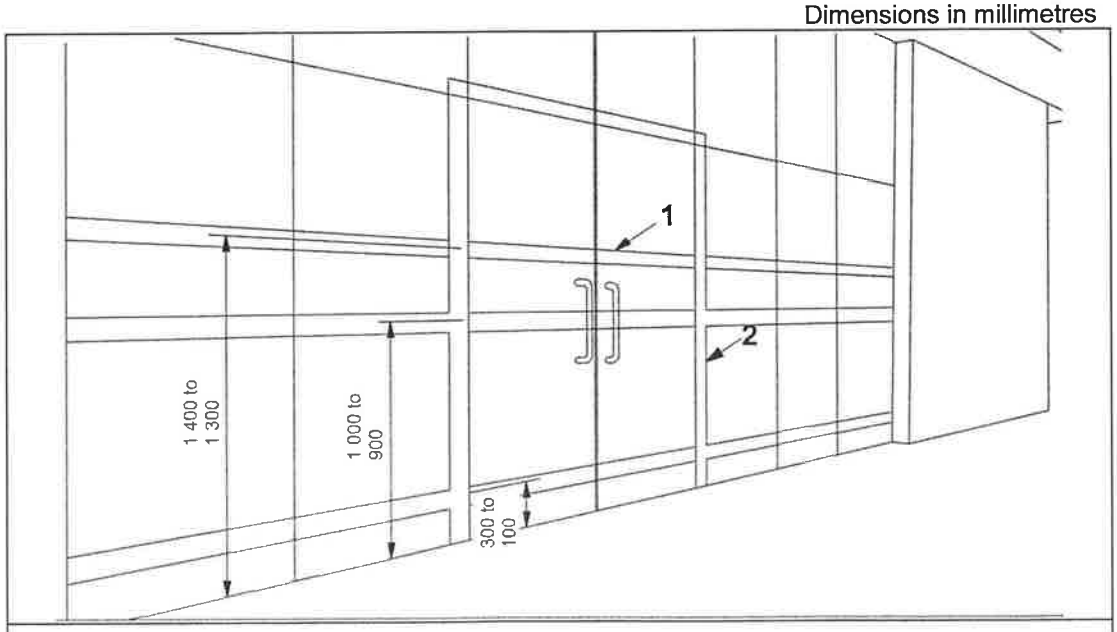
Glazed (glass) walls and fully glazed doors shall be clearly marked with visual indicators (see Figure 45). Large glazed areas close to circulation spaces could be mistaken for openings. Glazed walls, doors and other areas of full height glazing are very disorientating for visual impaired people. The reflections from these surfaces can be particularly confusing.

Uninterrupted visual indicators of at least 75 mm height with a clear visual contrast to the background shall be placed at a height of 900 mm to 1 000 mm and 1 300 mm to 1 400 mm above floor level. An additional visual indicator placed at a height of 100 mm to 300 mm is recommended (see Figure 45). Clear visual indicators consisting of two separate colours are recommended to enable lighting conditions and backgrounds to be taken into account.

Glass that is silvered or highly reflective should be avoided and any free-standing edges of glazed screens should have a strip contrasting visually with the surroundings against which they are seen.

The visual impaired can have a depth of field limitation, which results in them looking down at an angle of 45° to 50°. This also allows them to choose a safe path of travel. When they are within 1 000 mm to 1 500 mm from a fully glazed door or sidelight, they are able to detect the visual barrier at a height of 900 mm to 1 000 mm, provided the visual contrast criteria have been applied to the background. The background in all cases is the circulation space on the opposite side of the door.

Dimensions in millimetres



Key

1 visual marking, minimum width 75 mm, two separate colours with a clear visual contrast are recommended
2 visual marking on door frame, minimum width 50 mm

Figure 45. Markings on glazed doors

18.1.6 Viewing panels in doors

If viewing panels are provided, they shall comply with the following requirements (see also Figure 46, examples of doors with glazed viewing panels):

a) the lower edge of the glazed panel shall be not more than 600 mm above the finished floor;

b) the upper edge of the glazed panel shall be not less than 1 600 mm above the finished floor;

c) in width, the glazed panel shall start not more than 200 mm from the latch edge of the door, and the glazing shall be not less than 150 mm wide; and

d) the glazed panel may be subdivided by narrow construction cross-sections of a maximum width of 200 mm.

Dimensions in millimetres

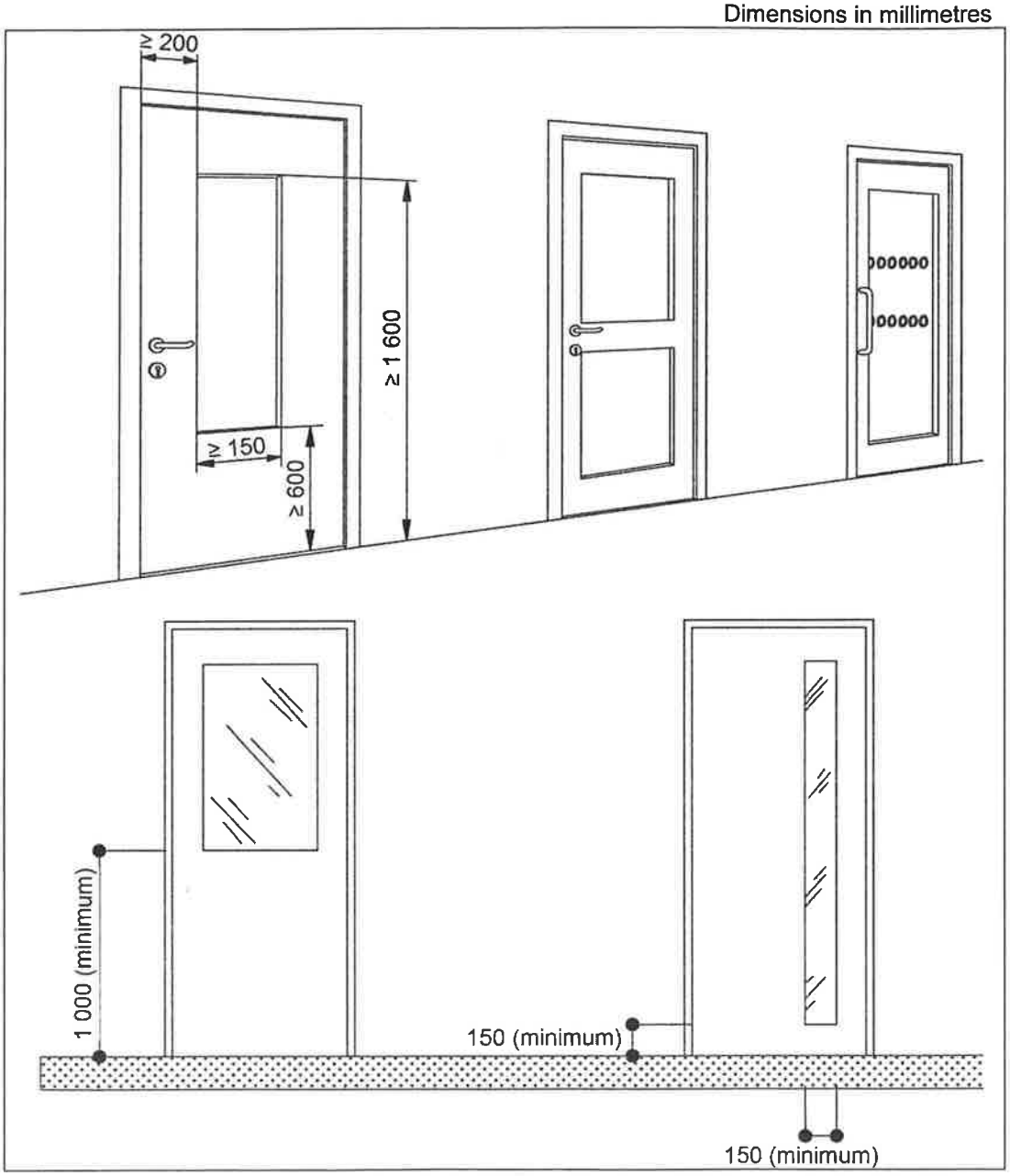
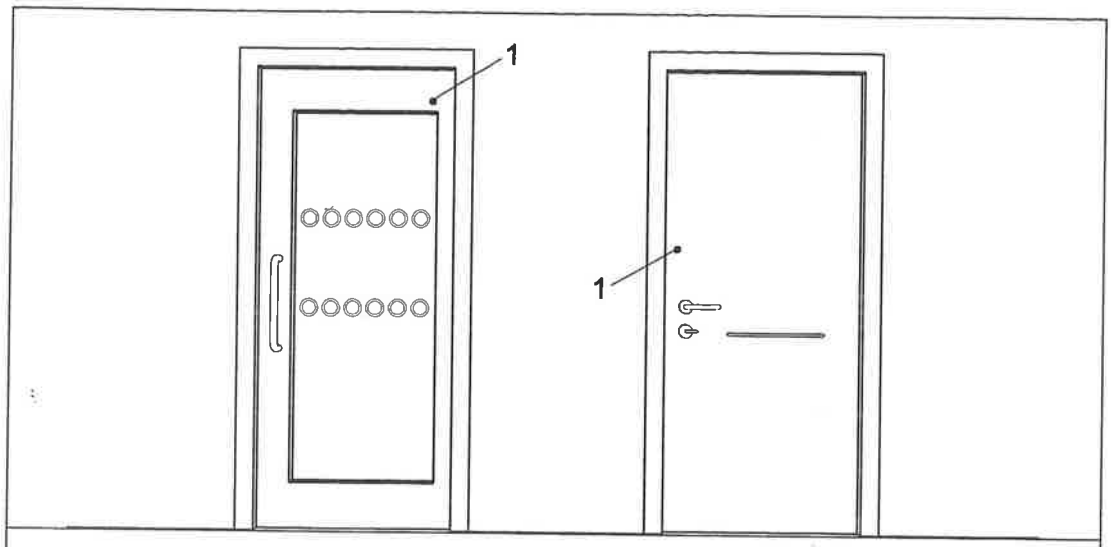


Figure 46. Examples of doors with glazed viewing panels

18.1.7 Visual contrast of doors to the wall

Doors forming part of an accessible path of travel shall have a clear visual contrast to the surrounding wall.

There should be a clear visual contrast between the door leaf and the handle.



Key

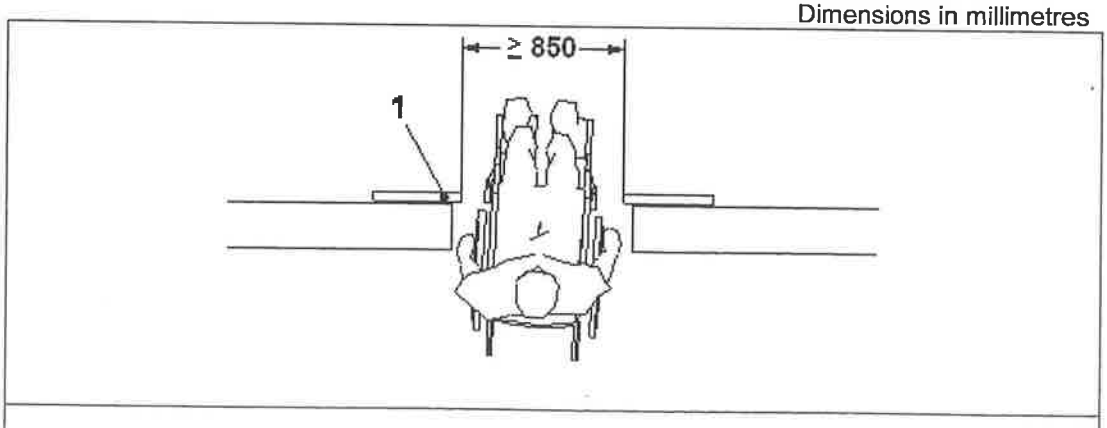
1 clear visual contrast of door and wall

Figure 47. Door with sufficient visual contrast

18.1.8 Automatic opening doors

The minimum unobstructed width shall be at least 850 mm. In narrow spaces, automatic sliding doors can be preferable. All automatic doors should be capable of remaining totally open (at least 90° in the case of hinged doors) without manual support (see 34.3 and Figure 48).

Dimensions in millimetres



Key

1 automatic sliding door

Figure 48. Automatic sliding door

18.1.9 Powered swing door

A powered swing door shall be:

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

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

c) capable of being used manually in the event of electrical failure.

18.1.10 Revolving door

Where a revolving door is used, a complementary accessible door should be provided immediately adjacent to the revolving door and available for use at all times. The accessible door could be a swing, sliding or folding door, and be automatic, manual or power-operated. It should be clearly identified and signed to show that it is accessible (see Figure 49).

Unless of significant size and power-operated, revolving doors are not suitable and present particular difficulties to ambulant disabled people and visual impaired people, wheelchair users, and people with young children (see Figure 49). Revolving doors are generally not suitable for use as fire exits.

A revolving door shall be large enough to allow safe passage and accommodation for a wheelchair user and a companion.

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

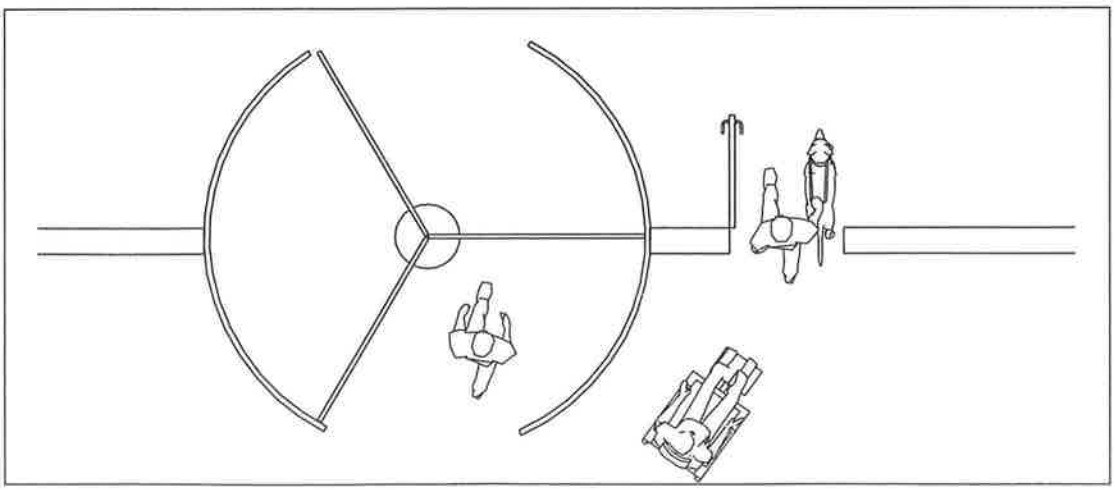


Figure 49. Revolving door accompanied by door suitable for people who walk slowly, use a wheelchair or visual impaired

18.1.11 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.

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

18.1.12 Door furniture

Door locks, door handles, bells and other devices for gaining entry to a place shall be easy to locate, identify, reach and use, and shall be operable with only one hand. Door furniture shall be located between 800 mm and 1 000 mm in height, preferably 900 mm (consider B.6.3 and B.6.4 also). D-lever handles are preferred. See Figure 80.

Adequate clear space shall be available on either side of the doors to enable people in wheelchairs to access the door controls and pass through. Consider 18.1.2 and Figures 20 and 21.

18.1.13 Glazed walls and screens

Glazed walls and glazed screens should be marked as stated in 18.1.5.

18.2 Fire resisting doorsets

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

Where the weight of fire resisting doorsets may cause difficulties for people with mobility impairments, devices can be used (where permitted by statutory requirement on local fire) to hold open these doors during normal use and close automatically when an emergency alarm is raised. Care should be taken to ensure that the opening force of these doors does not prevent them being used by people with mobility impairments during evacuations.

See 18.1 for the detailed requirements and recommendations concerning any doorset in a building.

18.3 Windows and window hardware

18.3.1 Restriction on opening

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

18.3.2 Manoeuvrability of hardware and shutters

Windows should be easy to open and close. It should be possible to open and close the windows with only one hand.

Windows that are easy to open may need safety devices that prevent children from falling out.

Hardware, shutters and switches for remote control should be placed between 800 mm and 1 100 mm above the floor (see Figure 50).

Dimensions in millimetres

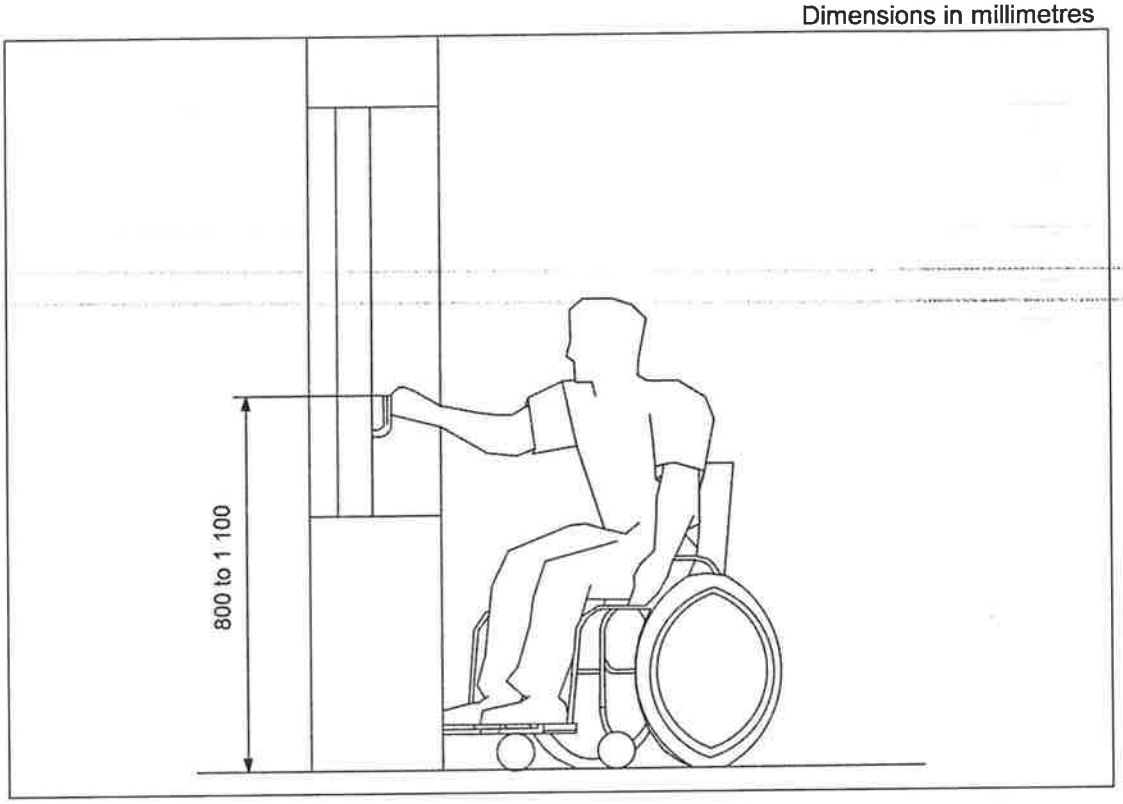


Figure 50. Heights of hardware and shutters

18.3.3 Height of the window

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

For safety reasons, guards should be considered, according to statutory requirement.

18.3.4 Visual indication of glazed areas

Consider the requirements stated in 18.1.5 and 33.

19 Reception areas, counters, desks and ticket offices

19.1 Hearing and lip-reading

Reception areas, counters, ticket offices, especially in noisy environments or those equipped with a separating security screen, shall have at least one position fitted with a hearing enhancement system (e.g. induction loop system) to assist hearing-aid users, as described in Clause 30, and be clearly marked with the appropriate symbol (see Clause 39).

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

19.2 Location

Counters and reception desks should be located and clearly identified so that they are easily recognisable from a building entrance. Information reception areas should be positioned near the main entrance. Wayfinding specified in Clause 7.2 and orientation specified in Clause 37 should also be considered.

Carpets or entrance flooring systems or tactile walking surface indicator (TWSI) can help in locating reception counters for people who have visual impairment. Such products should be designed to minimise trip and slip hazards.

19.3 Space to manoeuvre

Counters, desks and ticket offices should be accessible to wheelchair users on both sides. A clear manoeuvring space at least 1 500 mm square shall be provided in front of the counter on the receptionist's side and on the visitor's side; 1 800 mm square is preferred.

19.4 Height

The counter level shall be between 740 mm to 800 mm from the floor. Clear knee space underneath shall be minimum 700 mm (see also Figure 51).

Reception desks where writing is done by the visitor (for example at hotel receptions) should allow frontal approach by wheelchair users with space to provide clearance for wheelchair user's knees. The counter level shall be between 740 mm to 800 mm from the floor. The clear knee space underneath shall be at least 700 mm (see Figure 51). At least a part of the desk should also be at a height suitable as a writing place for standing people, between 950 mm and 1 100 mm (see Figure 51).

Dimensions in millimetres

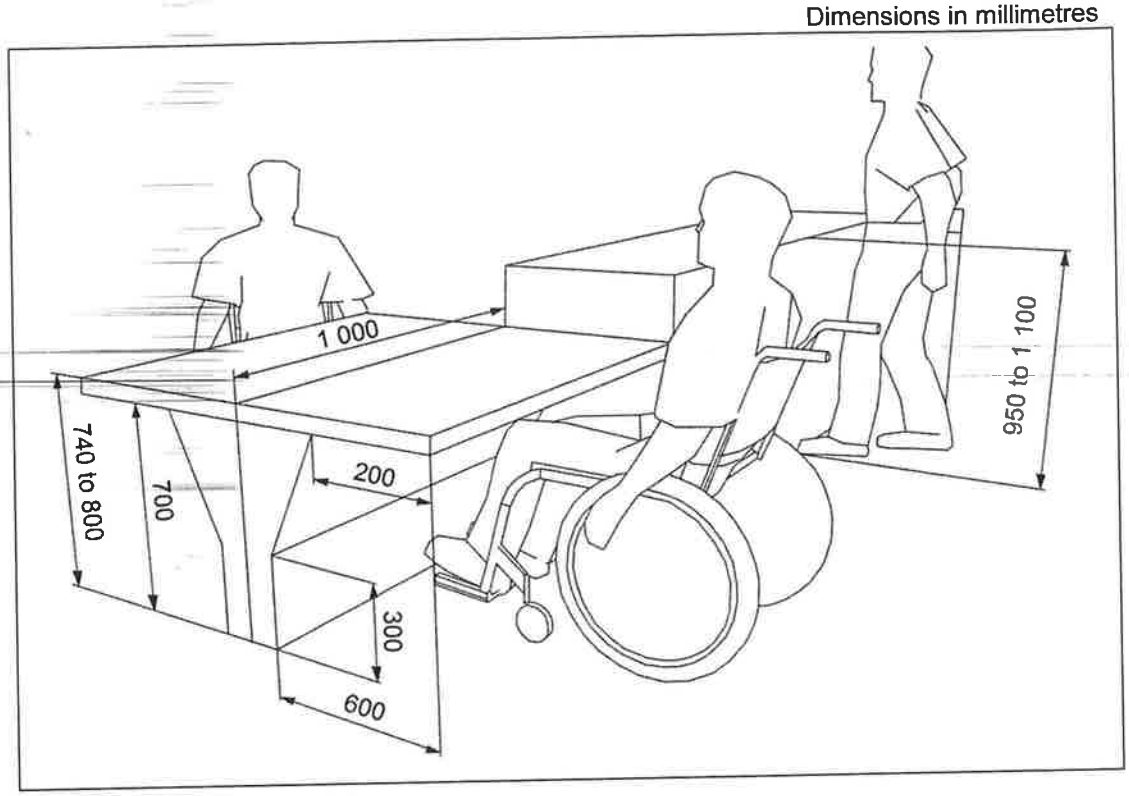


Figure 51. Heights of counters suitable for wheelchair users and people standing

19.5 Lighting

To facilitate lip reading, lighting should provide even illumination.

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 to 450 lux.

19.6 Ticket systems

If a queue number ticket system is used, it shall be suitably designed to be accessible. All control devices shall be located according to Clause 34, B.6.3 and B.6.4 should be considered. All necessary information shall be given in simple wording with sufficient visual contrast and based on the two-sense-principle (consider Clauses 30, 33 and 34). The ticket machine and the calling system shall provide visual and audible output.

20 Auditoriums, concert halls, sports arenas, theaters and similar seating

20.1 Hearing enhancement systems

A hearing enhancement system shall be provided. The system shall also be provided on the stage/platform. Consider the requirements stated in Clause 30.

20.2 Lighting for sign language interpretation

Adequate provision should be made to facilitate sign language and lip reading. Lighting on the faces and hands of presenters and people signing should be provided at an angle of 45° to 50° from horizontal at ceiling level for people with a hearing impairment to be able to read the presenter's lips and the signer's lips and hands. A suitable contrasting backdrop should be provided, to assist in reading the presenter's lips and hands.

20.3 Designated seating areas for wheelchair users

At least 1 % of seats shall be designated as seating areas (see 22.1) for wheelchairs users, with a minimum of two.

From 51 seats up, it is recommended to rate the designated seating areas with the following ways:

a) a total seats of 51 to 100, minimum three designated seating areas for wheelchair users;

b) a total seats of 101 to 200, minimum four designated seating areas for wheelchair users; and

c) one additional seating area should be provided for every two hundred additional seats or part there of.

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 lift up to allow people to transfer from the wheelchair onto a seat. To accommodate groups of wheelchair users, in an auditorium with fixed seats, a minimum of 15 seats shall be foldable or removable to increase the number of designated areas for wheelchair users when necessary.

Some seats should be wider in order to allow larger size people to sit properly.

20.4 Access to stage and backstage

Access to the stage and to the backstage area shall be provided in new buildings. Adequate provision should be made to direct the user to the designated spaces.

20.5 Row and seat numbers

The row and seat numbers should be legible to people who have impaired visual. They should be tactile, of adequate size and have enough visual contrast to the background on which they are mounted. The requirements given in Clauses 33 and 38 should also be considered.

20.6 Accessible changing rooms

At least one accessible changing room for each gender shall be provided, 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 Clause 25.

A fixed bench should be set at a height of 400 mm to 480 mm above floor level. The anthropometric differences in the population worldwide may require lower or higher heights of toilet seats.

The bench should be no less than 500 mm wide × 2 000 mm in length, and be 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 × 1 500 mm shall be beside the bench.

Benches, locker handles and other furnishings should offer good colour and tonal contrast to their backgrounds. Non-slip floor surfaces should be used, and good lighting as well as matte finished surfaces and furnishings should be provided.

A call bell may be provided in accordance with Clause 34.

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

21 Conference rooms and meeting rooms

Consider the requirements for accessible sanitary facilities in Clause 25 and sufficient acoustic provision in Clause 30. A sound augmentation system should be provided. Reverberation time for speech, music, etc., should be considered.

All equipment in conference rooms shall be usable by people chairing or participating in the meeting and shall be at a height between 800 mm to 1 100 mm. See also 34.2.

22 Viewing spaces in assembly areas

22.1 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 (see Figure 52):

a) at least 900 mm × 1 400 mm;

b) the depth of the row shall be minimum 2 400 mm;

c) clear and level surface;

d) sufficient manoeuvring space;

e) spaces for several wheelchair users shall be provided. They shall be located beside regular seating rows, for the wheelchair user to be able to stay by his/her accompanying person, if relevant; and

f) it is recommended that the armrest on the seats at the end of the row lift up to allow wheelchair users to transfer from the wheelchair onto a seat.

Some seats should be provided with foldable armrests, considering transferences (see 20.3); some other seats should be wider, considering larger size people.

Dimensions in millimetres

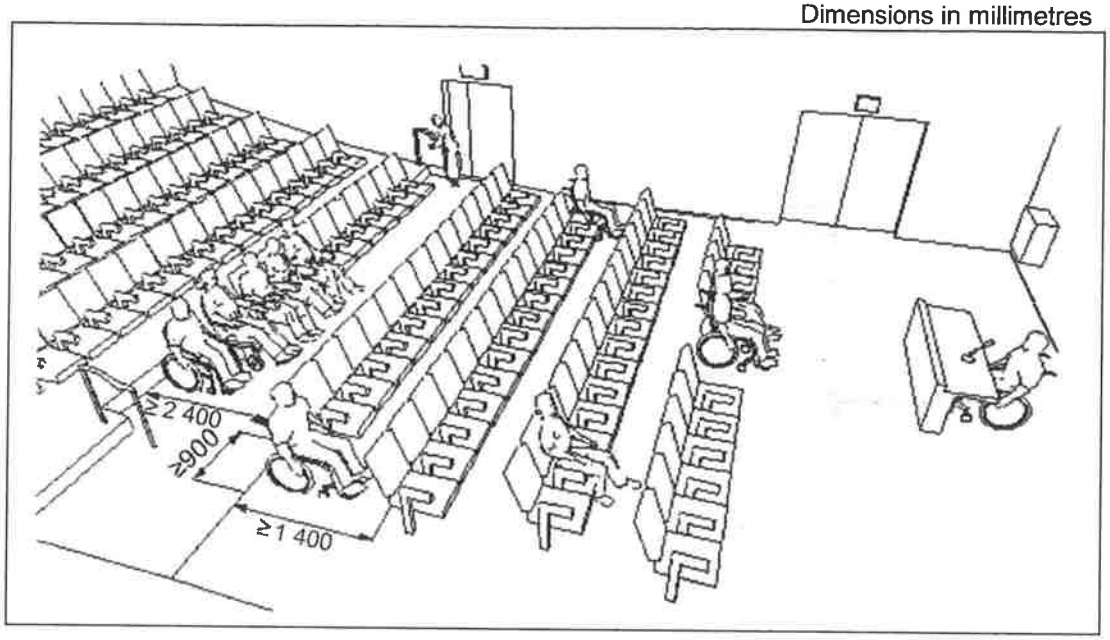


Figure 52. Examples of viewing spaces for wheelchair users

22.2 Sight lines

Wheelchair user viewing spaces shall provide viewing spaces that are:

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

b) 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 (see Clause 38.5).

23 Kiosks, food courts, restaurants and etc.

In restaurants a minimum of 10 % of the tables shall be usable by wheelchair users according to 35.3. In eating area with higher counter shall not be more than 10 % shall not be more than 800 mm height, and shall have an unobstructed lateral access for wheelchair users.

Sufficient manoeuvring space between tables and the route to the accessible sanitary facilities shall be provided (consider Clauses 4, 10, 18.1, 25 and B.6.1).

Consider the acoustic recommendations in Clause 30.

24 Terraces, verandas and balconies

Terraces, verandas and balconies shall be accessible to all people, including people with mobility impairments, in accordance with 10.7.

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

Walking surfaces shall be slip resistant.

25 Toilet

25.1 General

The requirements contained in this sub-clause apply to buildings in use by the public, for example hotels, work places, public buildings and buildings used for sport and recreation activities.

Toilet rooms and sanitary facilities shall be designed to accommodate a variety of users (see Figure 53). Public toilet facilities shall provide for the needs of people of all genders, for parents and children, for people with disabilities and their carers in all gender combinations. Refer to MS 2015: Part 1.

For the purpose of this standard, the following shall apply:

a) at least one wheelchair accessible toilet room shall be provided; and

b) the wheelchair accessible toilet room shall always contain a washhand basin.

Accessible toilet rooms shall be indicated with proper toilet signages that are readable and legible for people who have visual or mental impairments. (Please refer Clause 38). Examples of toilet signages are as shown from Figures 91 to 93.

An emergency assistance alarm, including a reset control, shall be provided in all accessible toilet and sanitary rooms. (Please refer 25.14)

25.2 WC compartments for ambulant disabled people

These compartments meet the needs of ambulant disabled people who require support. This type of compartment is not for the majority of people who use wheelchairs (see Figure 54). Where located in a single-sex washroom, hand washing facilities will be available communally. Where this is a standalone facility, hand washing facilities shall be provided either in a space adjacent to the WC compartment or in a compartment enlarged to accommodate a wash hand basin.

WC compartments for ambulant disabled people shall have the following characteristics:

a) toilet seat height, depth and distance to wall should comply with 25.6;

b) clear manoeuvring space in front of the toilet should be minimum 900 mm × 900 mm;

c) the door of toilet should open outwards, with a minimum unobstructed width of 800 mm for elderly residential and hospital/clinic;

d) grab rails on both sides of toilet; and

e) independent water supply beside toilet seat, and floor drain where necessary.

Dimensions in millimetres

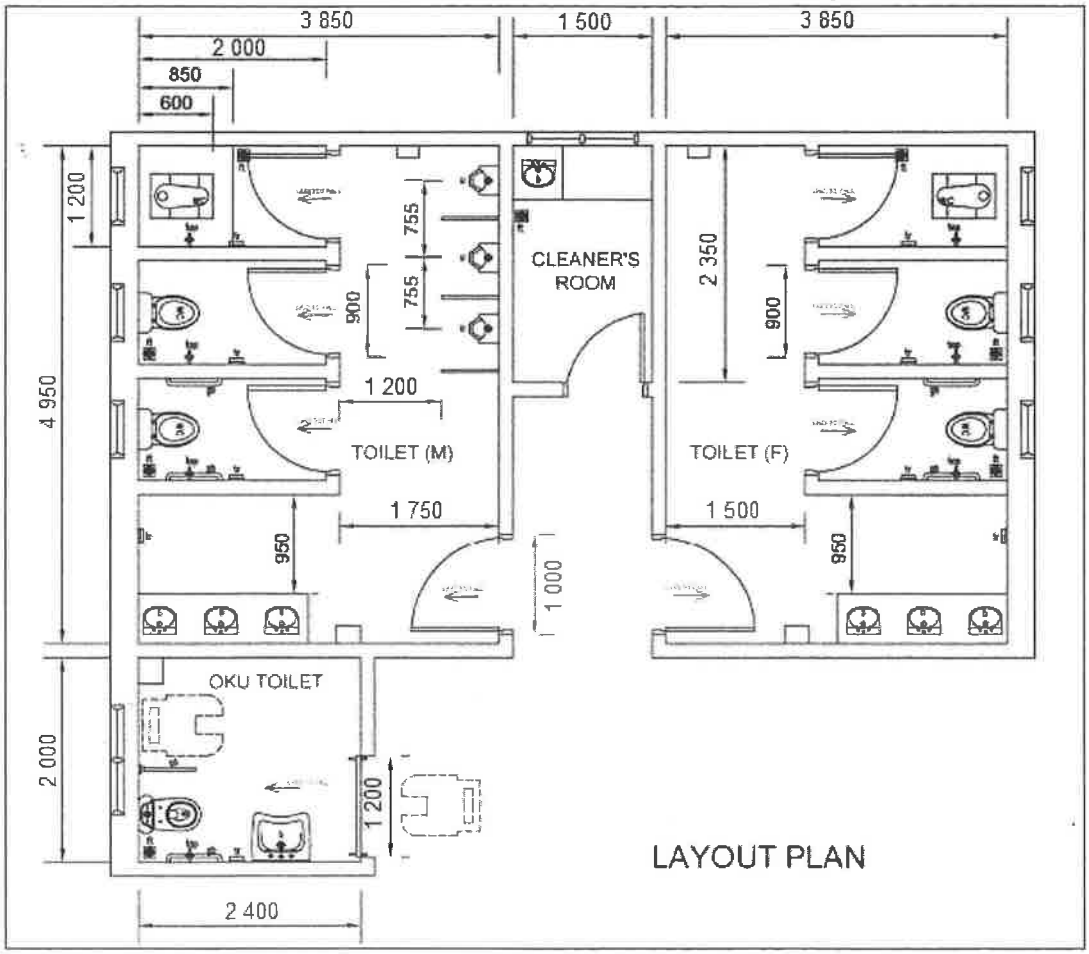


Figure 53. Male, female, cleaner's room and accessible toilet - Layout plan

25.3 Wheelchair user accessible toilet cubicle

Fixtures and fittings in sanitary facilities shall visually contrast with the items and surface on which they are positioned. Flushing system shall be lever type and position at the right hand side of the cistern while in a seated position.

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

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

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

Dimensions in millimetres

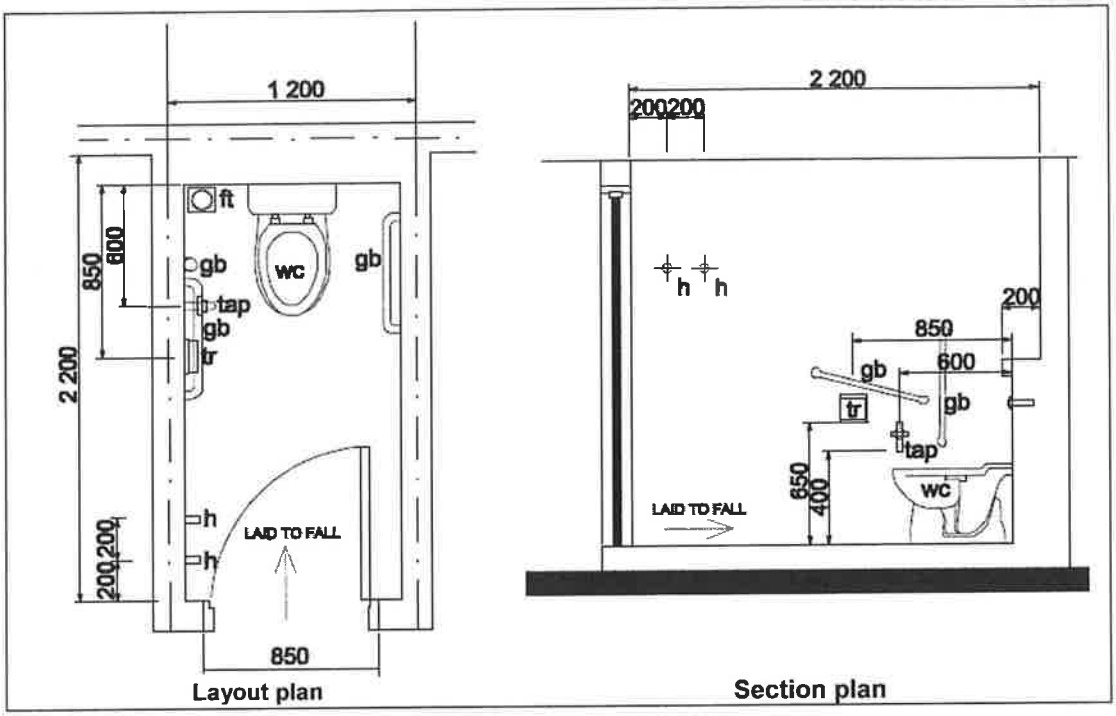


Figure 54. Ambulant toilet

25.4 Accessible toilet for wheelchair user

25.4.1 General

The dimensions for wheelchair user accessible toilet rooms depend on the functions they shall meet. This standard gives the characteristics and requirements for the three types (A, B, C) of toilets most commonly used in the world (refer Figures 56 until 62).

The clear manoeuvring space of the toilet room shall allow frontal, oblique and lateral transfer.

Type A allows right and left lateral transfer, and may be more suitable when assistance is needed. Types B and C only allow one side transfer.

When more than one accessible corner toilet type B or C is planned, a choice of layouts suitable for left hand and right hand transfer should be provided. Layout of wheelchair user accessible toilet rooms shall provide toilets usable by both genders.

The clear manoeuvring space at floor level in front of the toilet seat and the washbasin shall be 1 500 mm × 1 500 mm, except for type C where 300 mm under the washbasin is accepted as part of the total manoeuvring space.

The minimum free clearance beside the toilet seat shall be 900 mm; 1 200 mm is preferred for lateral transfer and assistance.

The minimum dimensions for an accessible toilet are 1 700 mm width and 2 200 mm depth.

In existing buildings and exceptional conditions, if the measures given above cannot be achieved due to technical reasons, the manoeuvring space at floor level may be reduced, It should be recognised that such a reduction limits the number of people who can use these toilet.

Feet and inches	Nominal conversion based on 1 inch: 25 mm, 6 inch: 150 mm, 12 inch: 300 mm	More exact conversion based on 1 inch: 25.2 mm	
	(mm)	(mm)	
7 ft 0 inch	2100	2132	
			2040: Standard door heights
6 ft 6 inch		1981	1981:
6 ft 0 inch	1800	1828	
5 ft 6 inch	1650	1663	
5 ft 0 inch	1500	1524	1500: Nominal wheelchair turning circle - 180°/360°
			1400: Max. controls height
4 ft 6 inch	1350	1361	
4 ft 0 inch	1200	1219	1200: Nominal wheelchair turning - 90°
3 ft 9 inch	1125	1134	
3 ft 6 inch	1050	1060	
3 ft 3 inch	1000	982	1000: General controls height
3 ft 0 inch	900	914	
2 ft 9 inch	825	832	800: Clear opening widths of doorways
2 ft 6 inch	790	762	750:
2 ft 3 inch	675	680	
2 ft 0 inch	600	610	
1 ft 9 inch	525	529	
1 ft 6 inch	450	454	
1 ft 3 inch	375	378	
1 ft 0 inch	300	304	
9 inch	225	228	
6 inch	150	152	
3 inch	75	76	

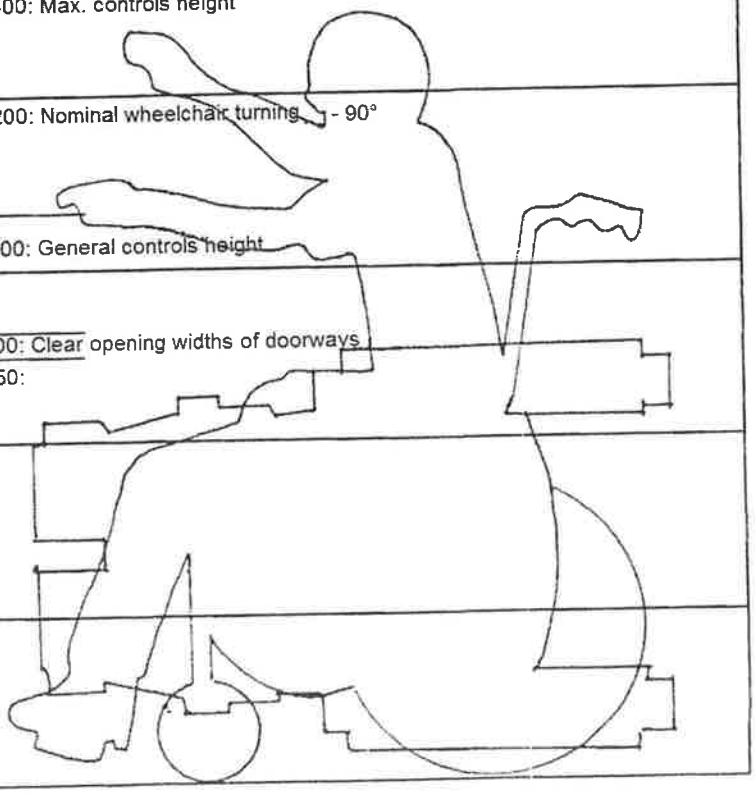


Figure 55. The anthropometric height for wheelchair users

25.4.2 Type A toilet with lateral transfer from both sides

Type A toilet with lateral transfer from both sides (see Figures 56 and 57) shall have the following characteristics:

a) lateral transfer from both sides;

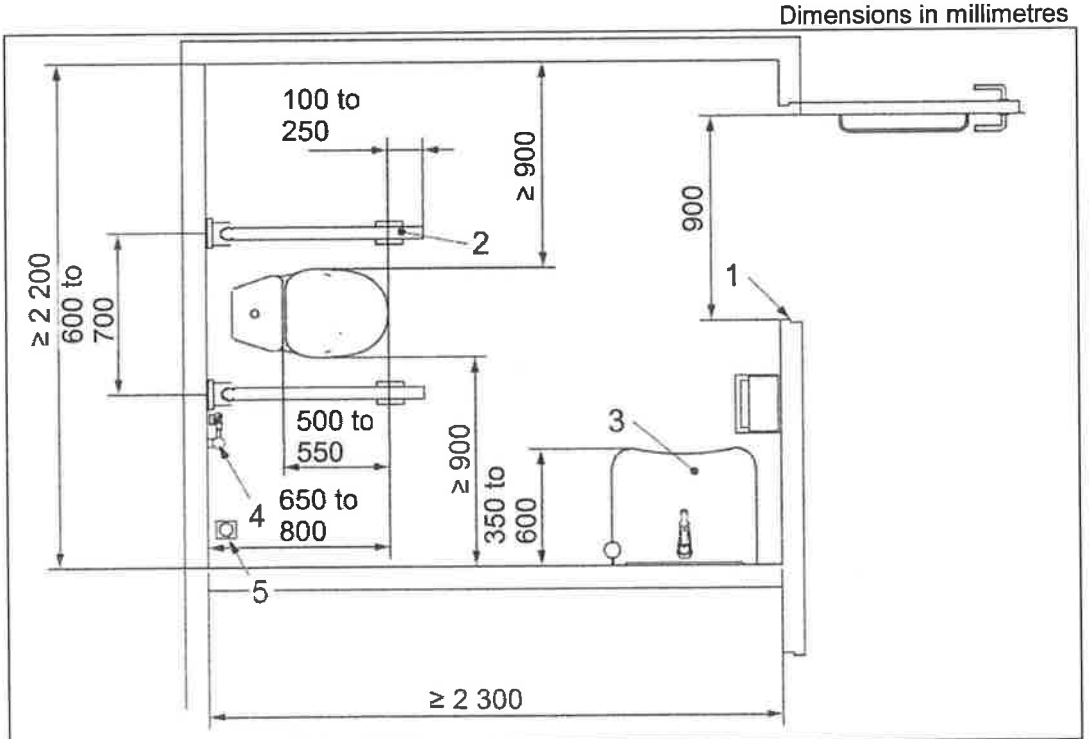
b) manoeuvring space uninterrupted by washbasin and pan;

c) independent water supply beside toilet seat;

d) horizontal grab rails at both sides; and

e) toilet paper dispensers on both folding grab rails.

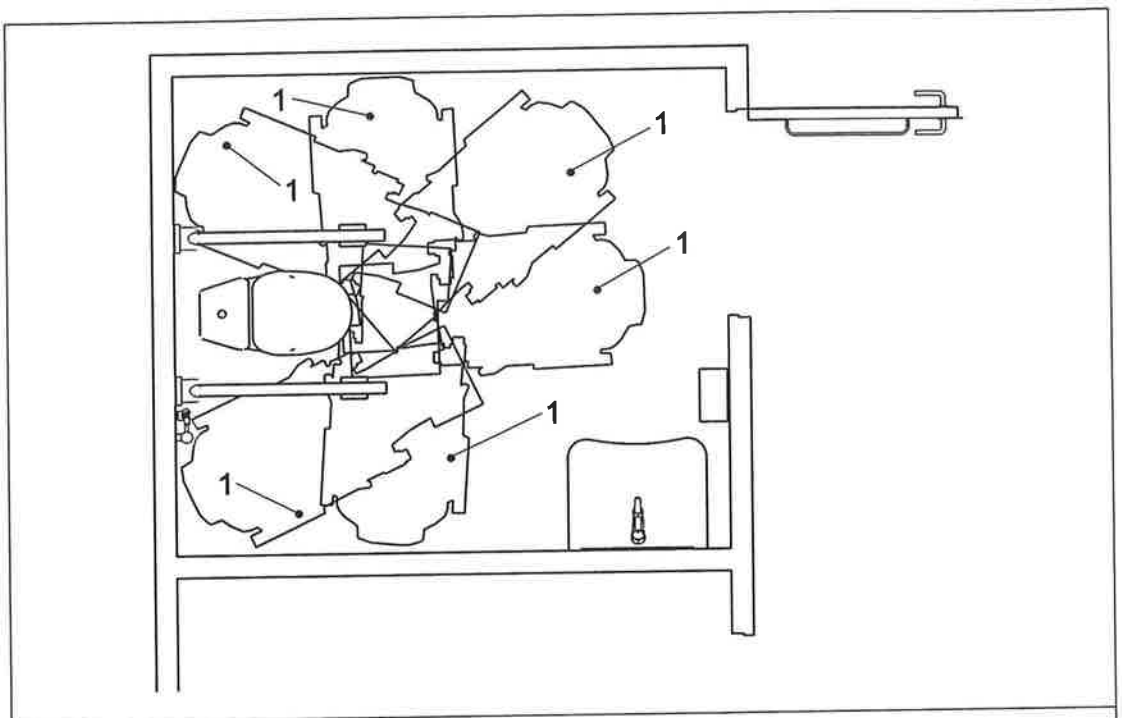
Dimensions in millimetres



Key

1 minimum 900 mm
2 foldable grab rails, both sides
3 washbasin
4 independent water supply - good water pressure
5 floor trap

Figure 56. Example of Type A toilet - Lateral transfer from both sides



Key

1 possible transfer positions

Figure 57. Type A toilet room transfer options

25.4.3 Type B corner toilet

Type B corner toilet (see Figures 58 and 59) shall have the following characteristics:

a) lateral transfer only from one side;

b) manoeuvring space uninterrupted by washbasin and pan;

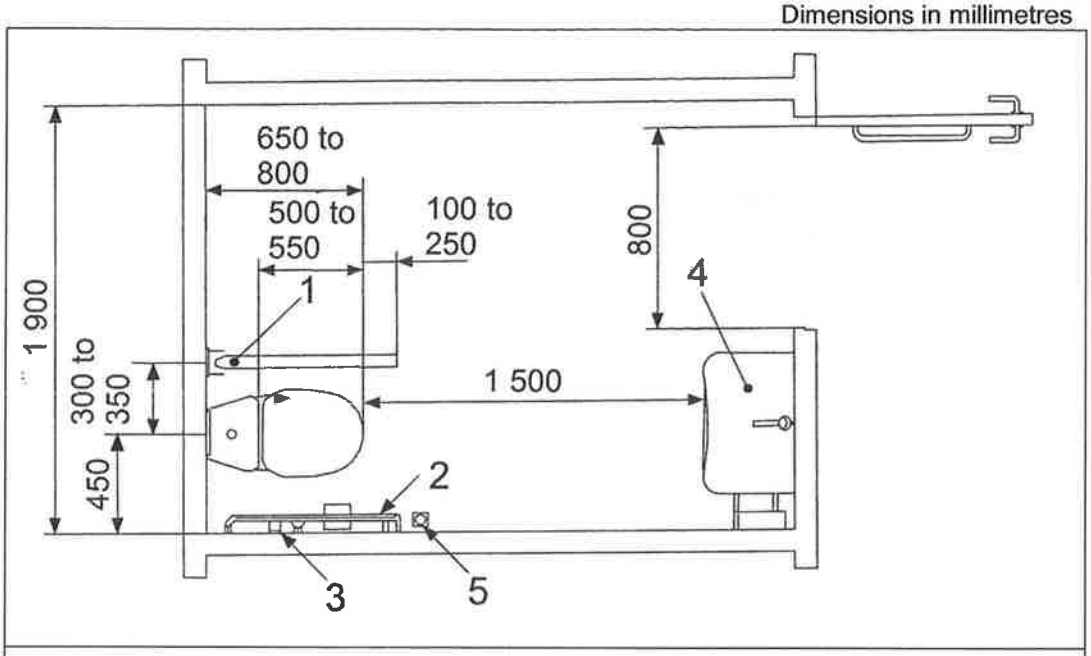
c) independent water supply beside toilet seat;

d) vertical grab rail beside the toilet seat for getting up and sitting down (slanted grab bars are not preferred);

e) toilet paper dispenser fixed on the wall beside the toilet seat; and

f) foldable grab rail.

Dimensions in millimetres

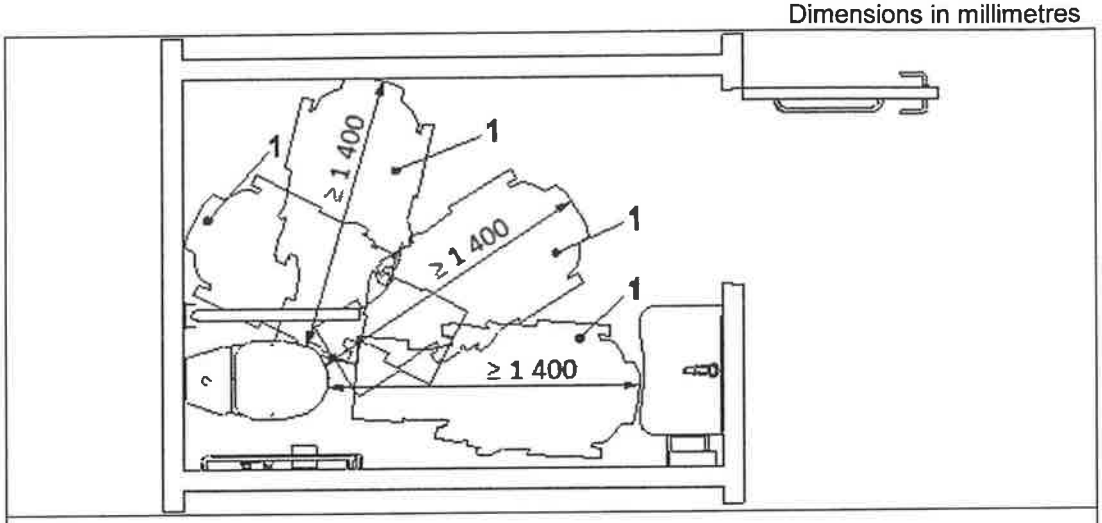


Key

1 foldable grab rail
2 grab rail on wall
3 independent water supply - good water pressure
4 washbasin
5 floor trap

Figure 58. Example of Type B large corner toilet cubicle

Dimensions in millimetres



Key

1 possible transfer positions

Figure 59. Type B toilet room transfer options

25.4.4 Type C toilet

Type C toilet (see Figures 60 and 61) shall have the following characteristics:

a) lateral transfer only from one side;

b) manoeuvring space reduced by washbasin;

c) independent water supply beside toilet seat, with floor drain where necessary;

d) ability to reach small wash hand basin when seated on toilet;

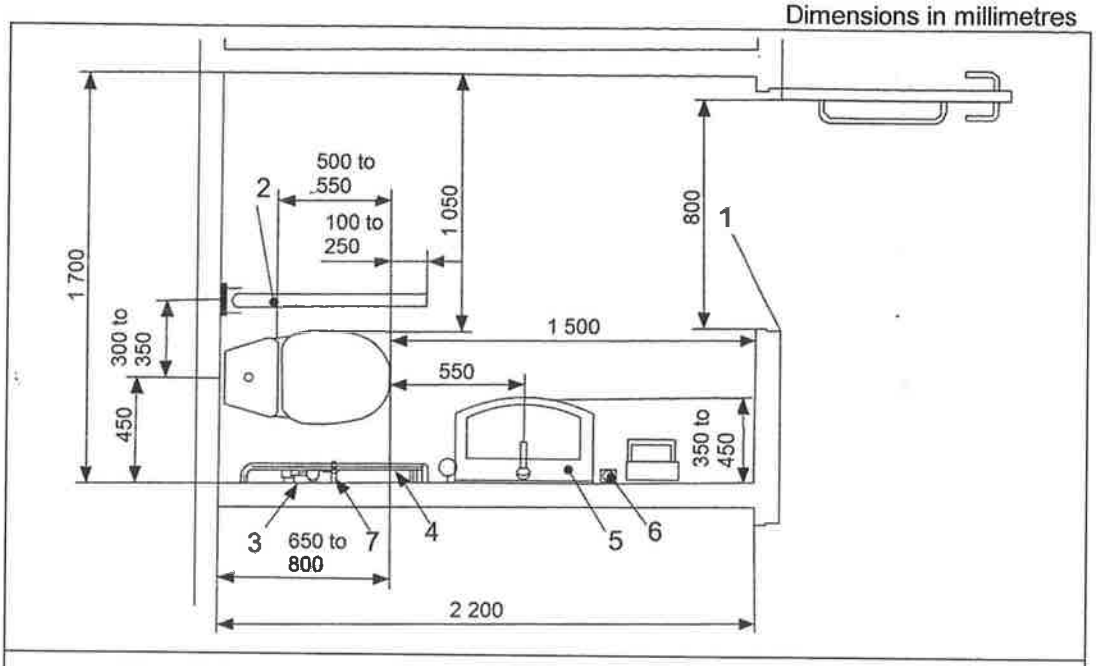
e) horizontal grab rail on wall beside the toilet seat;

f) vertical grab rail on wall beside the toilet seat for getting up and sitting down (slanted grab bars are not preferred);

g) foldable grab rail; and

h) toilet paper dispenser fixed on the wall beside the toilet seat.

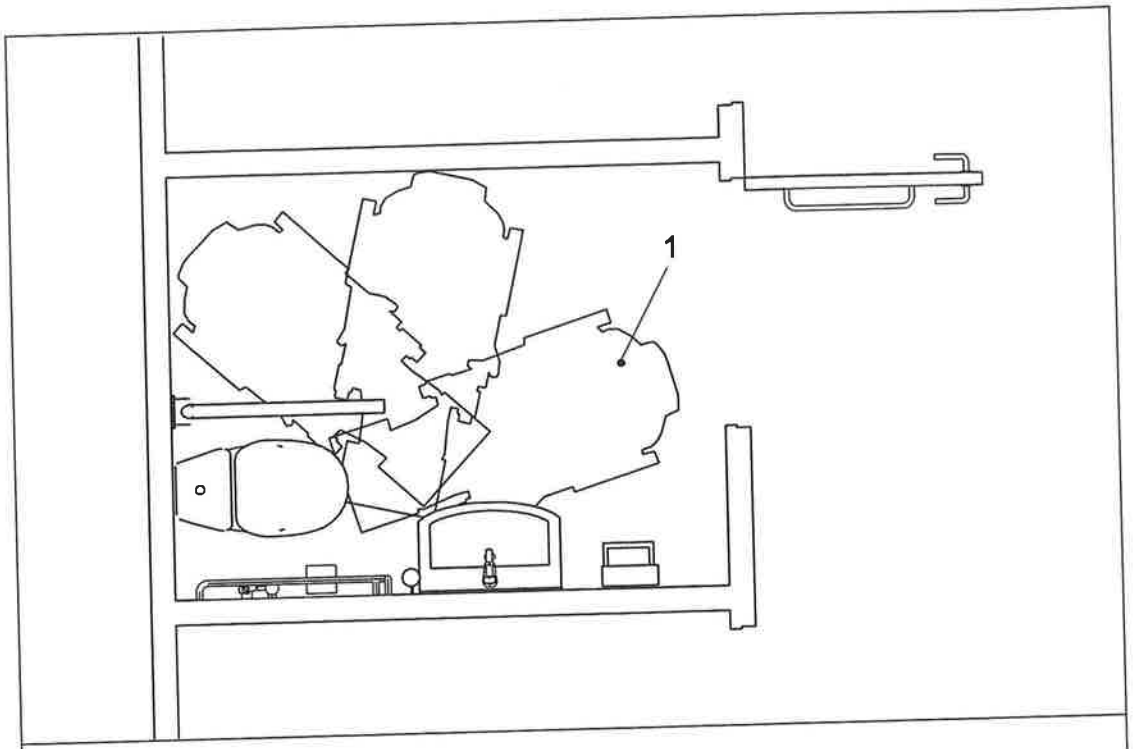
Dimensions in millimetres



Key

1 minimum 800 mm (850 mm recommended)
2 foldable grab rail
3 independent water supply - good water pressure
4 grab rail on wall
5 wash basin
6 floor trap
7 water hose

Figure 60. Example of Type C small corner toilet



Key

1 possible transfer positions

Figure 61. Type C toilet transfer options

25.5 Toilet room doors

Toilet room doors shall comply with the specifications indicated in subclause 18.1 above.

The door shall have an unobstructed clear width of at least 800 mm and it shall be easy to open and close. The door all is opened outwards. If the door opens inwards, there shall be a way to open the door, or remove it, from the outside.

Door closer shall be set to be easily used by the disable person. It is recommended to use sliding door.

25.6 Toilet seat

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

NOTE. Toilet seats with a height of more than 460 mm may cause a problem of instability when sitting on the toilet seat. Toilet seats of less than 460 mm may cause a problem of transfer getting back to the wheelchair.

The minimum distance from the edge of the toilet seat to the rear wall shall be between 650 mm and 800 mm (see Figures 56, 58 and 60).

The minimum distance of a corner toilet from the pan to the adjacent wall shall be 250 mm (see Figure 58). The minimum distance from the centre line of a corner toilet to the adjacent wall shall be 450 mm (see Figures 58 and 60).

If a backrest is provided, the distance from the seat to the backrest shall range between 500 mm and 550 mm.

Toilets for children shall have a distance from the centre line to the adjacent wall between 305 mm to 380 mm. The toilet seat height shall be between 205 mm to 380 mm.

25.7 Grab rails

On both sides of a toilet, a grab rail (whether drop-down or fixed to the wall) shall be provided at a distance between 300 mm to 350 mm from the centre of the toilet. The minimum distance from the wall shall be 40 mm.

On the sides where a lateral transfer is possible, a foldable grab rail (drop-down support rail) shall be provided at a height of 200 mm to 300 mm above the toilet seat. Grab rails shall withstand minimum 1 kN force from any direction, with 1.7 kN as a recommendation. The length of the foldable grab rail shall overlap the front edge of the toilet seat in between 100 mm and 250 mm. The positioning of a foldable grab rail shall allow access from a wheelchair when folded up.

Where a wall is beside the toilet, a horizontal grab rail shall be provided at a height of 200 mm to 300 mm above the toilet seat, and a vertical grab rail shall exceed from the horizontal grab rail to a height of 1 700 mm above floor level. The grab rail shall extend a distance of minimum 150 mm to the front edge of the toilet seat (see Figure 62).

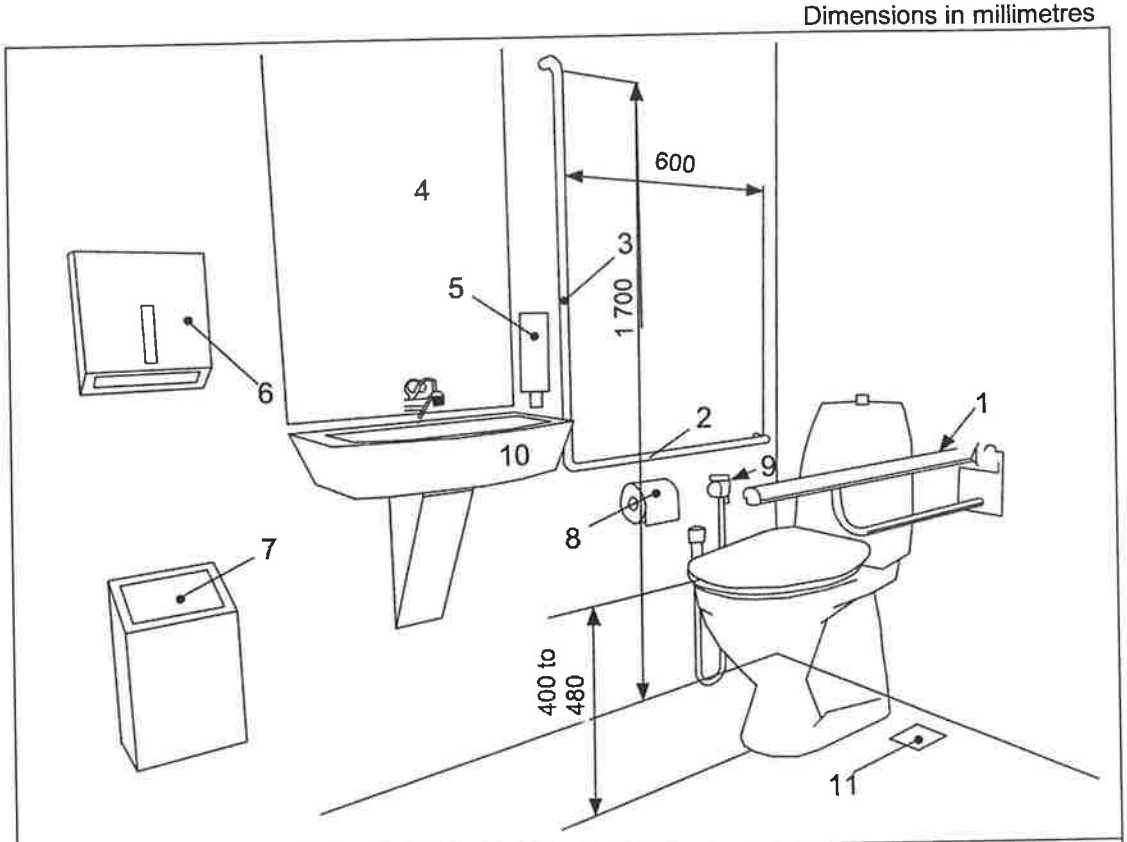
The horizontal grab rail shall be uninterrupted for its full length.

The grab rail height for toilets for children shall be between 510 mm to 635 mm.

Grab rails shall have a circular profile of not less than 35 mm and not more than 50 mm diameter.

The positioning of accessories such as hand towel, soap, waste bin, etc., shall not hamper the use of the grab rail.

Dimensions in millimetres



Key

1 drop down support rail at seat height plus 200 mm to 300 mm
2 wall mounted horizontal grab rail at seat height plus 200 mm to 300 mm
3 wall mounted vertical grab rail
4 mirror, top height minimum 1 900 mm, bottom height max. 900 mm above floor
5 soap dispenser 800 mm to 1 100 mm above floor
6 towels or dryer 800 mm to 1 100 mm above floor
7 waste bin
8 toilet paper dispenser 600 mm to 700 mm above floor
9 independent water supply
10 small finger rinse basin maximum 350 mm projection
11 floor trap

Figure 62. Positioning of grab rails, water supply and toilet paper in Type C corner toilet

25.8 Toilet paper

Dispensers for toilet paper shall be reachable from the toilet seat, either under the grab rail or on the side-wall of a corner toilet at a height between 600 mm to 700 mm from the floor (see Figure 62).

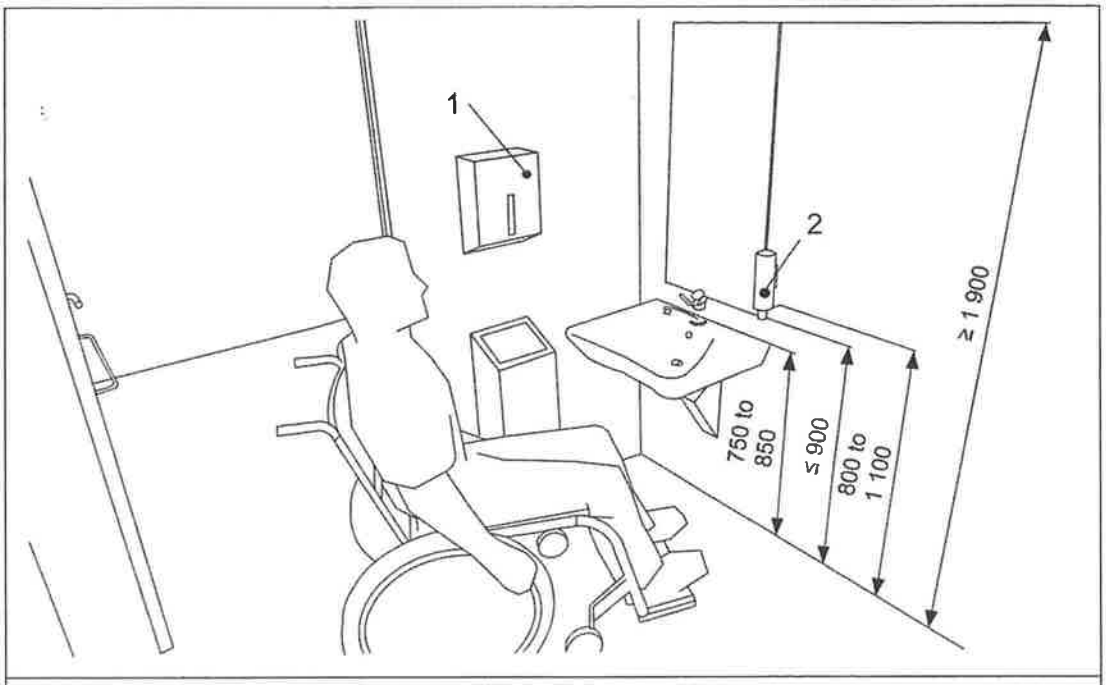
25.9 Washbasin

A washbasin shall be provided within an accessible toilet room (see Figure 63).

The positioning of a washbasin shall allow access from a wheelchair.

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

Dimensions in millimetres



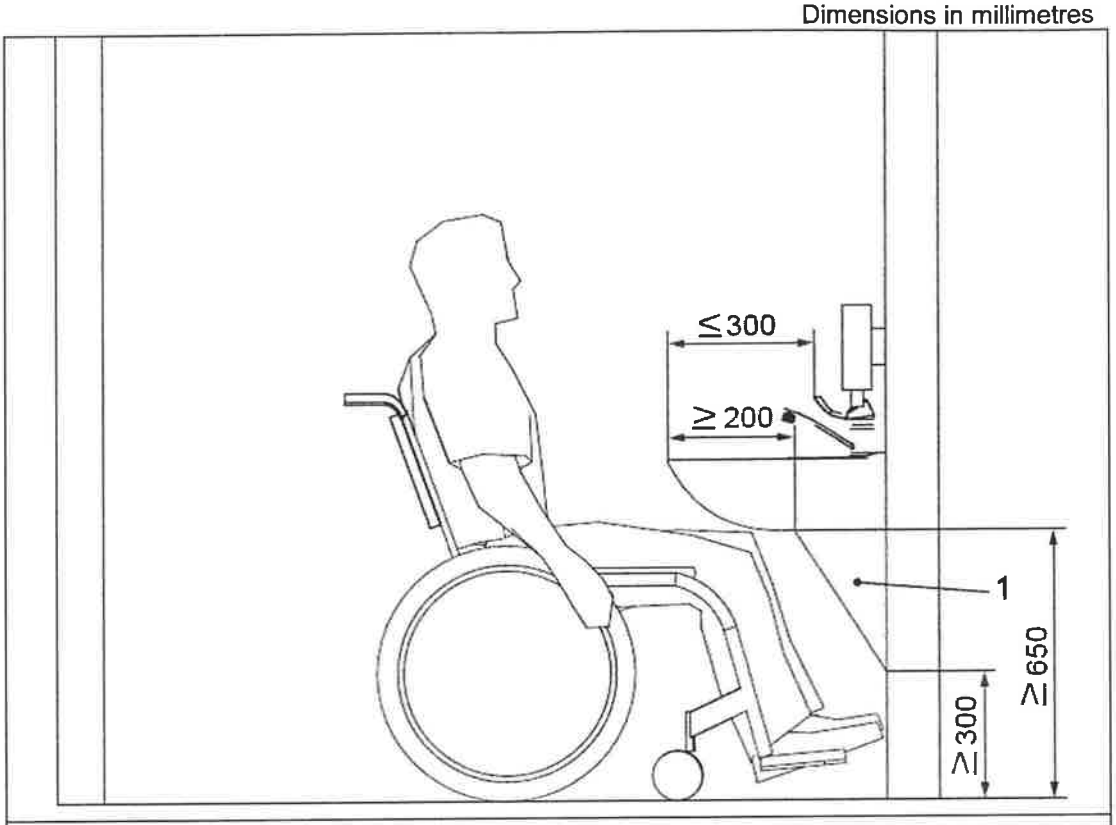
Key

1 paper towels, from 800 mm to 1 100 mm of above floor level
2 soap dispenser

Figure 63. Placement of washbasin and mirror above the washbasin with distance of sanitary appliance

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 at least 300 mm high shall be provided (see Figure 64).

Dimensions in millimetres



Key

1 concealed piping

Figure 64. Washbasin with knee/toe clearance

In front of the washbasin, a space shall be allowed for a frontal or oblique approach by a wheelchair.

The front edge of the washbasin shall be located within a distance of 350 mm to 600 mm from the wall according to Figure 56.

The reaching distance to the tap control shall be a maximum of 300 mm, according to Figure 64.

The mirror above the washbasin shall be positioned at a maximum of 900 mm above the floor, up to a height of 1 900 mm (see Figure 63). If a second mirror is provided, the maximum height above the floor should be 600 mm, up to 1850 mm.

A shelf with minimum dimensions of 200 mm × 400 mm shall be provided near the washbasin at a height of 850 mm, or combined with the washbasin.

Where a smaller washbasin size of 350 mm to 400 mm is being used, the distance from the WC pan to the middle of the washbasin shall be of 550 mm (see Figure 60).

25.10 Water supply

An independent water supply (hand-held shower) shall be provided next to the toilet. An alternative such as a combination bidet and rear side pan/built-in bidet can be installed.

25.11 Taps and bidet

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

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

25.12 Urinals

For all wall hung urinals fitted in the washroom, at least one of these shall be set at a height to the bottom rim of the urinal between 600 mm and 750 mm and equipped with a vertical grab rail.

For all wall hung urinals fitted in the washroom, at least one of these shall have its rim set at a height of 380 mm for wheelchair users and at least one shall have its rim set at a height of 500 mm for standing users. When installed, both shall be equipped with a vertical grab rail.

This wall hung urinal shall be set clear above the floor level, without any raised access platform and with a clear floor area in front of the urinal of at least 750 mm wide and 1 200 mm deep as shown in Figure 65.

Dimension in millimetres

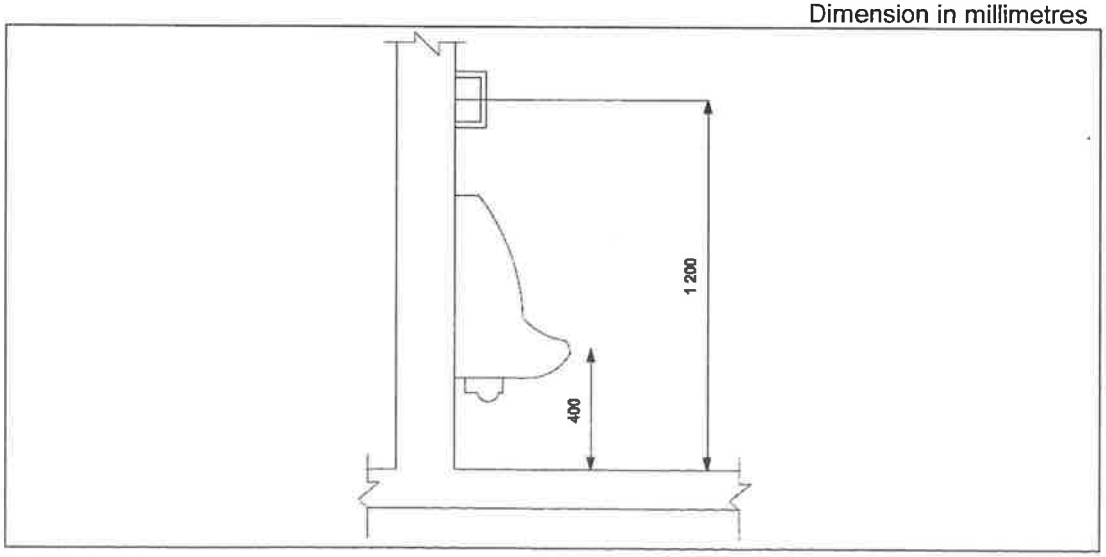


Figure 65. Wall hung urinals

Urinals should contrast visually with the wall to which they are attached.

25.13 Other fittings

All other fittings, e.g. the water tank, hand dryer, hand-held shower, etc., shall be set at a height between 800 mm to 1 100 mm. Coat hooks shall be set at heights of 1 050 mm and 1 400 mm.

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

Doors should preferably open outwards.

Optional, needle boxes to safely dispose of needles (for example, from diabetes patients) shall be provided.

If a sanitary bin is supplied, it should be reachable from the toilet seat. Sanitary bins with non-touch opening devices are preferred.

25.14 Alarm

An assistance alarm, which can be reached from changing or shower seats, from the WC and by a person lying on the floor, shall be provided in all accessible toilets and accessible sanitary rooms. This alarm should be connected to an emergency help point, or where a member of staff can assist.

Visual and audible feedback shall be provided to indicate that, when the alarm has been operated, the emergency assistance call has been acknowledged and action has been taken. It should take the form of a pull cord, coloured red, with two red bangles of 50 mm diameter, one set at a height between 800 mm and 1 100 mm and the other set at 100 mm above floor level.

A reset control shall be provided for use if the alarm is activated by mistake. It shall be reachable from a wheelchair and, where relevant, from the WC, the tip-up seat in a shower or changing facility, or the bed in an accessible bedroom. The reset control shall be easy to operate and located with its bottom edge between 800 mm and 1100 mm above floor level. For a corner toilet room, the reset button shall be above the fixed horizontal grab rail beside the toilet paper holder.

The marking of the reset control shall be both visible and tactile.

25.15 Emergency warning alarm

A visual emergency alarm shall be provided to alert people who are deaf or hard of hearing in the event of an emergency (see Clause 32).

25.16 Shower

Showers can be used by people with different disabilities and different supporting aids, for instance, wheelchair users, ambulant disabled people, etc., using their own wheelchairs or special shower chairs.

The shower area shall have level entry and have no fixed elements that prevent front and side access (see Figure 66).

The wet showering area should be 900 mm × 1 300 mm, with a transfer area of also 900 mm × 1 300 mm.

The floor in the shower recess area shall have a gradient between 1:50 and 1:60 sloping to a floor drain. The area outside the shower recess shall have a gradient between 1:70 and 1:80 draining towards the shower recess. The transition into the shower recess shall be level without a step down or a kerb.

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

The shower shall be fitted with an easily operable foldable seat that folds in an upward direction. If a foldable seat is provided, its minimum size shall be 450 mm × 450 mm, and, when folded down, have its top surface set between 400 mm and 480 mm above floor level and spaced a maximum of 40 mm from the rear wall. The fastenings for grab rails and the construction of the foldable seat shall be able to withstand a force of 1.1 kN applied at any position and in any direction.

Shower wheelchairs are sometimes used instead of foldable shower seats.

The foldable shower seat shall have the following features:

a) self-draining;

b) slip-resistant and stable; and

c) foldable in an upwards direction; when folded, it shall not present a hazard and the grab rail shall be accessible from the foldable seat.

d) rounded front corners (radius 10 mm to 15 mm); and

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

Dimensions in millimetres

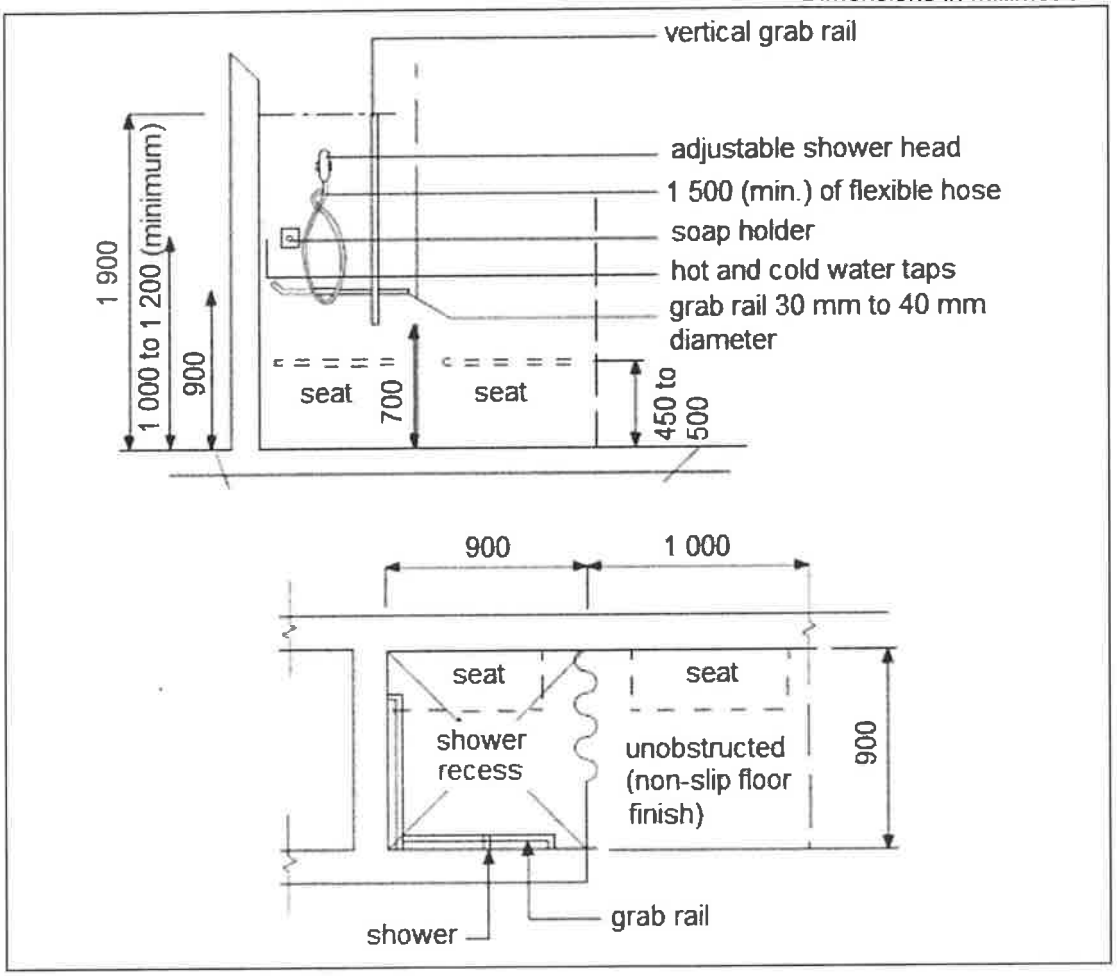


Figure 66. Shower facilities

The foldable seat should preferably be height adjustable.

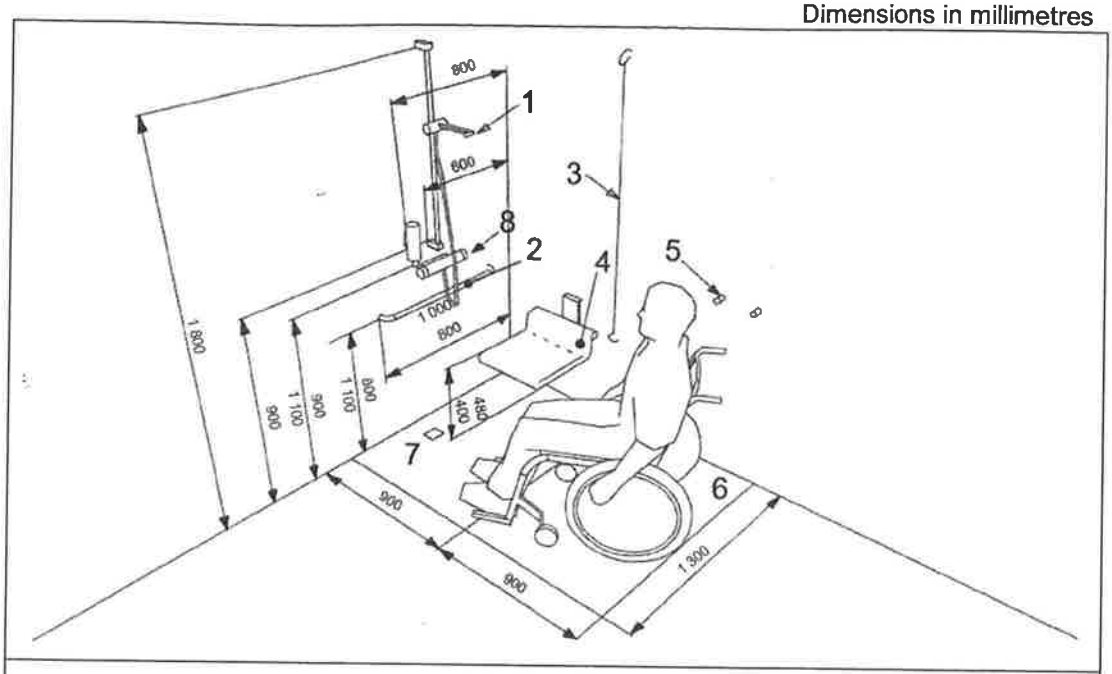
Grab rails shall be set according to Clause 25.7 above and Figure 62. The shower area shall be fitted with at least one vertical grab rail which may hold the flexible shower head. The length of the flexible shower hose shall be a minimum 1 200 mm. The handheld shower head shall be provided between 1 000 mm and 1 800 mm above the finished floor. The shower hose fitting shall be a minimum 1 300 mm above floor level.

Shower controls and folding shower seat shall be set according to Figure 67.

If the shower is combined with an accessible toilet, the manoeuvring areas may overlap, as shown in Figure 67.

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

Dimensions in millimetres



Key

1 hand-held shower head
2 horizontal grab rail
3 vertical grab rail
4 foldable shower seat
5 towel hooks
6 transfer area
7 wet showering area with gradient 1:50 to 1:60 with a floor trap
8 shower controls

Figure 67. Example of a shower place with grab rails, adjustable shower head and folding seat

25.17 Individual shower room

A free space at least 1300 mm × 900 mm shall be provided on the clear side of the foldable shower seat, to allow access from a wheelchair, in addition to the manoeuvring space of 1500 mm.

The screening of a shower recess shall be either a curtain or a door system that maintains the required circulation and manoeuvring space and does not interfere with the level entry.

A shower head support grab rail shall be fixed on the wall in the position as shown in Figure 67.

A hand held detachable shower head shall be provided with a flexible hose of minimum length 1 200 mm, and it shall be able to reach within 100 mm of the shower floor.

An adjustable shower head holder shall be provided to support the shower head, and shall:

a) be installed on the shower head holder support grab rail as shown in Figure 67;

b) allow the graspable portion of the shower head to be positioned at various angles and heights; and

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

The fastenings, materials and construction of the seat shall 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 as shown in Figure 67. All other devices, e.g. taps, soap holder, shall be situated in an accessible range between 900 mm to 1 100 mm.

25.18 Bathrooms

This subclause applies to buildings that provide bathing facilities, such as hotels, motels, hostels and sports buildings, where baths may be an alternative or a supplement to showers (see Figures 68, 69, 70 and 71).

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 limitations. If more than one accessible bedroom is provided, a choice of shower or bath and a choice of right or left hand transfer to the toilet and shower or bath shall be provided.

All accessible bathrooms shall always contain an accessible toilet.

En suite facilities shall 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 shall be provided in close proximity to the accessible bedrooms.

The minimum overall dimensions of a bathroom intended principally for independent use, incorporating a corner toilet and a large basin, shall be as shown in Figures 68, 70 and 71.

In bathrooms with a toilet that is intended for independent use, the direction of transfer to both the bath and toilet shall be consistent.

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

Auxiliary grab rails shall be located in accordance with Figure 69.

Exceptional considerations in existing buildings: If the measures given above cannot be achieved due to technical reasons, the manoeuvring space at floor level may be reduced to a minimum clearance besides the toilet seat of 800 mm × 1 200 mm and a clear manoeuvring space diameter of 1 200 mm. However, it should be recognised that such a reduction may limit the use to wheelchair users with small chairs.

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

Dimensions in millimetres

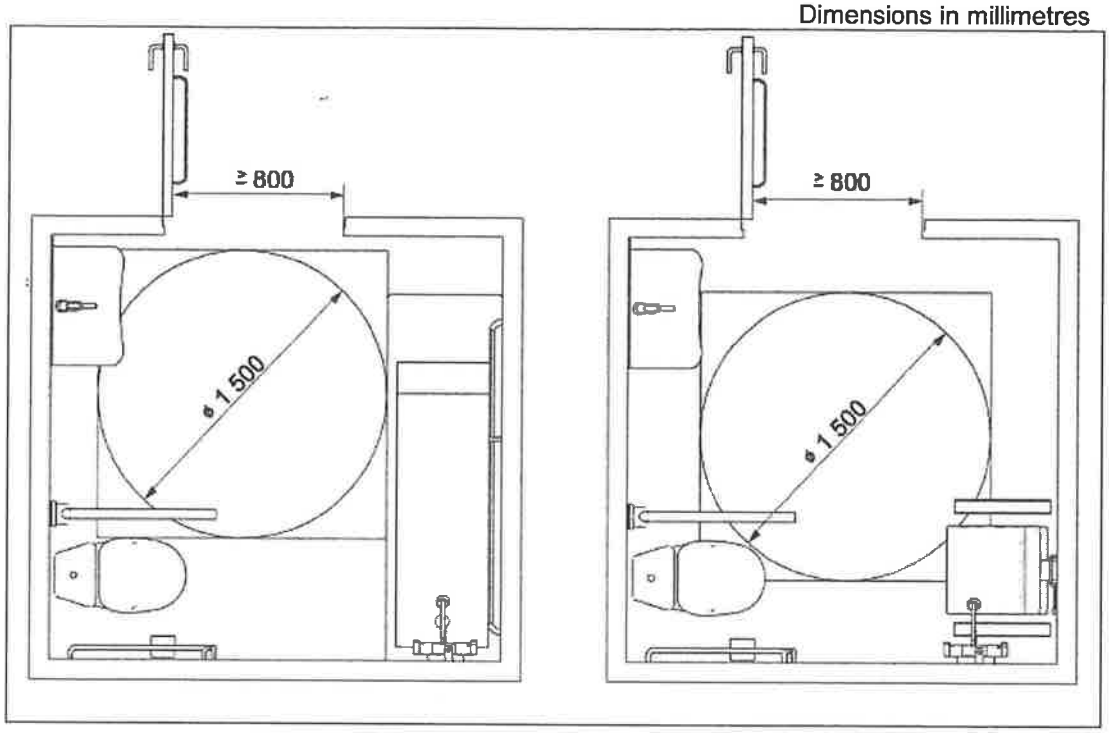
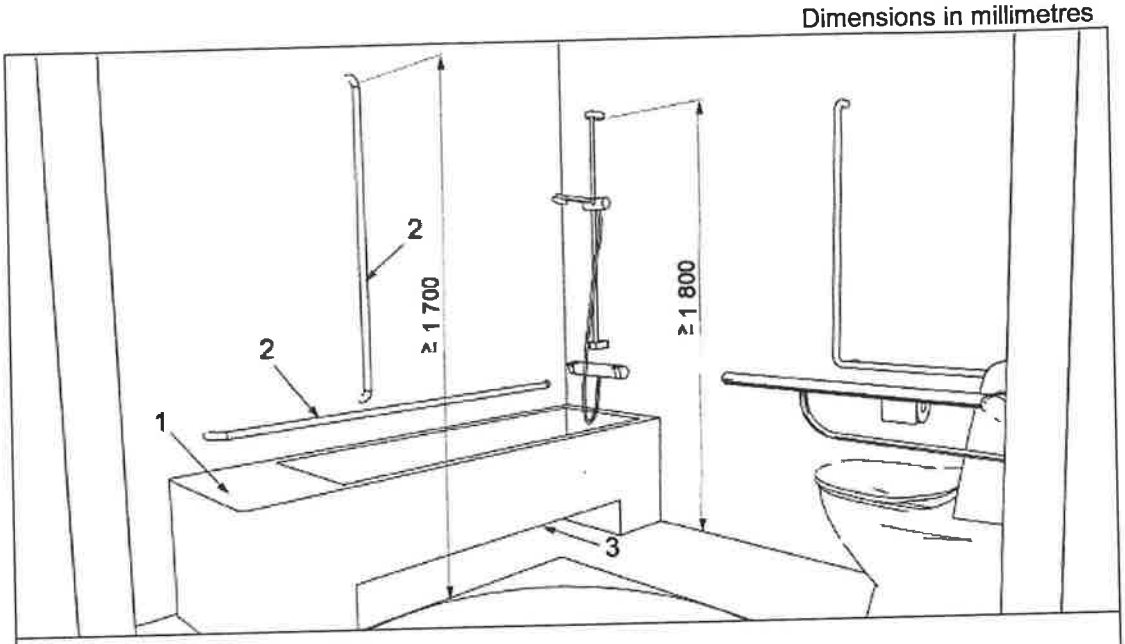


Figure 68. Examples of a bathroom with bathtub and shower for independent use with a corner WC

Dimensions in millimetres

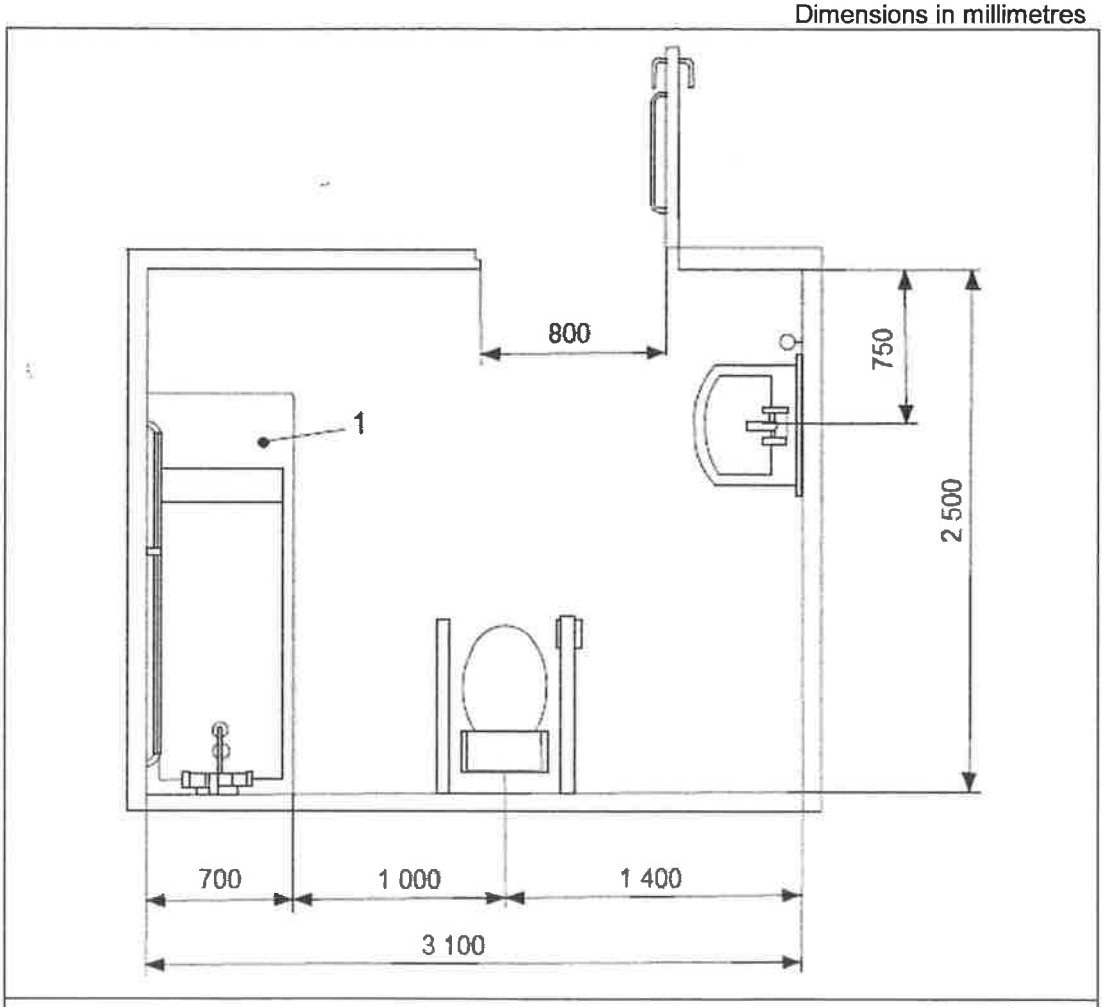


Key

1 transfer area
2 grab rail
3 opening for hoist

Figure 69. Example of grab rails and transfer facilities surrounding the bathtub

Dimensions in millimetres

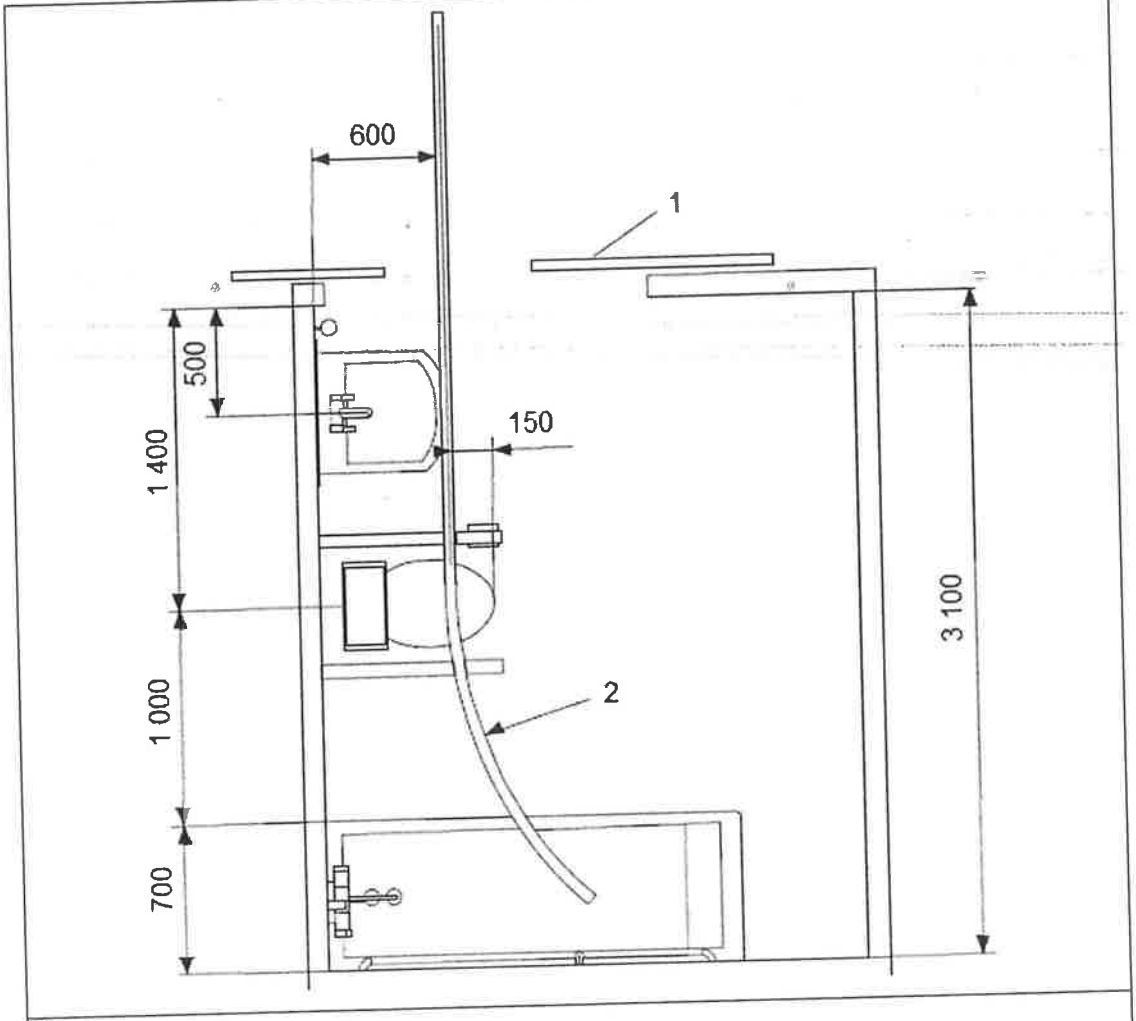


Key

1 transfer area

Figure 70. Example of a bathroom for assisted use of bathtub and peninsular WC

Dimensions in millimetres



Key

1 unequal sliding doors
2 ceiling mounted track hoist

Figure 71. Example of a bathroom with a ceiling mounted tracked hoist for independent or assisted use

26 Accessible bedrooms in non-residential buildings

The access to accessible bedrooms in non-residential buildings (i.e. hotels, guesthouses, etc.) shall comply with the requirements outlined in this standard, in particular with Clauses 4 and 5. The minimum number of one accessible bedroom in non-domestic buildings shall be provided. At least one accessible bedroom should be provided for every twenty standard bedrooms.

Rooms accessible for wheelchair users shall be designed for two beds. If a single bedroom accessible for wheelchair users is provided, a queen size bed is preferred, 1 500 mm width × 2 000 mm length.

Free space on at least one of the long sides of the bed shall be provided. This space should be 1 500 mm, and shall not be less than 1 200 mm. At the foot of the bed, at least 1 200 mm is required (see Figures 72 and 73).

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

Sufficient clear manoeuvring space is needed to gain access to facilities, including the shower. There should be a bench for luggage at a height between 450 mm to 650 mm.

The minimum height of a bed shall be between 450 mm to 500 mm.

For communication for people with hearing, vision and cognitive limitations (see Clause 30 and Annex B).

Visual and audible alarm systems shall be accessible to warn people with visual and hearing impairments; see Clause 32 for fire emergency warnings.

See Figures 68 to 71 for details of an accessible bathroom. Manoeuvring space of a minimum 1 500 mm × 1 500 mm allows front facing or side transfers by wheelchair users.

Dimensions in millimetres

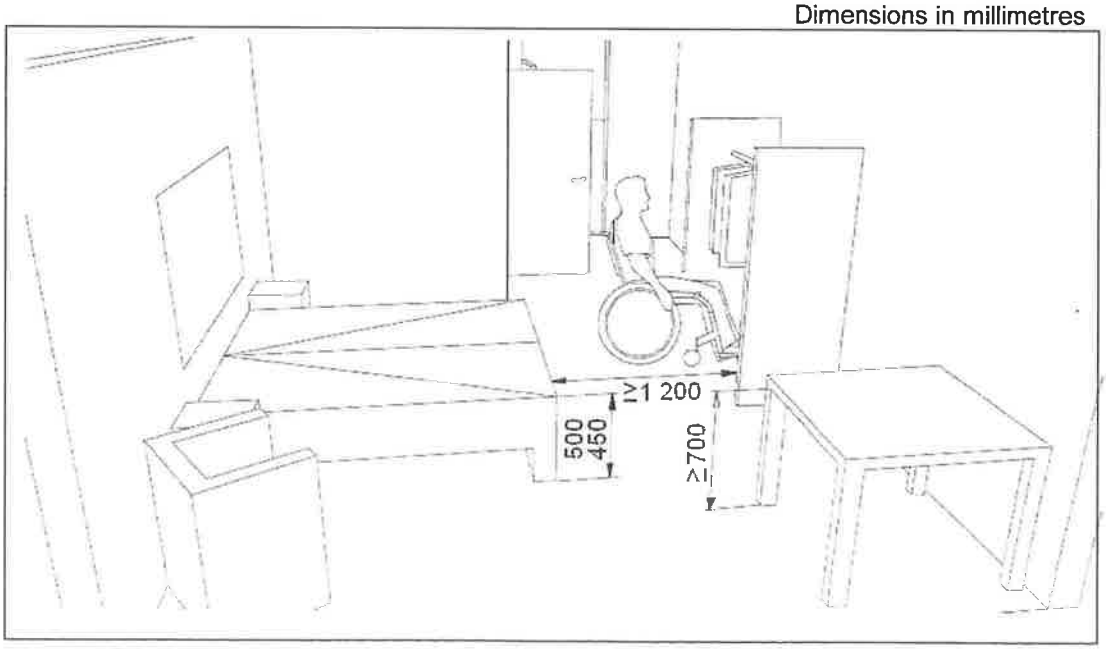
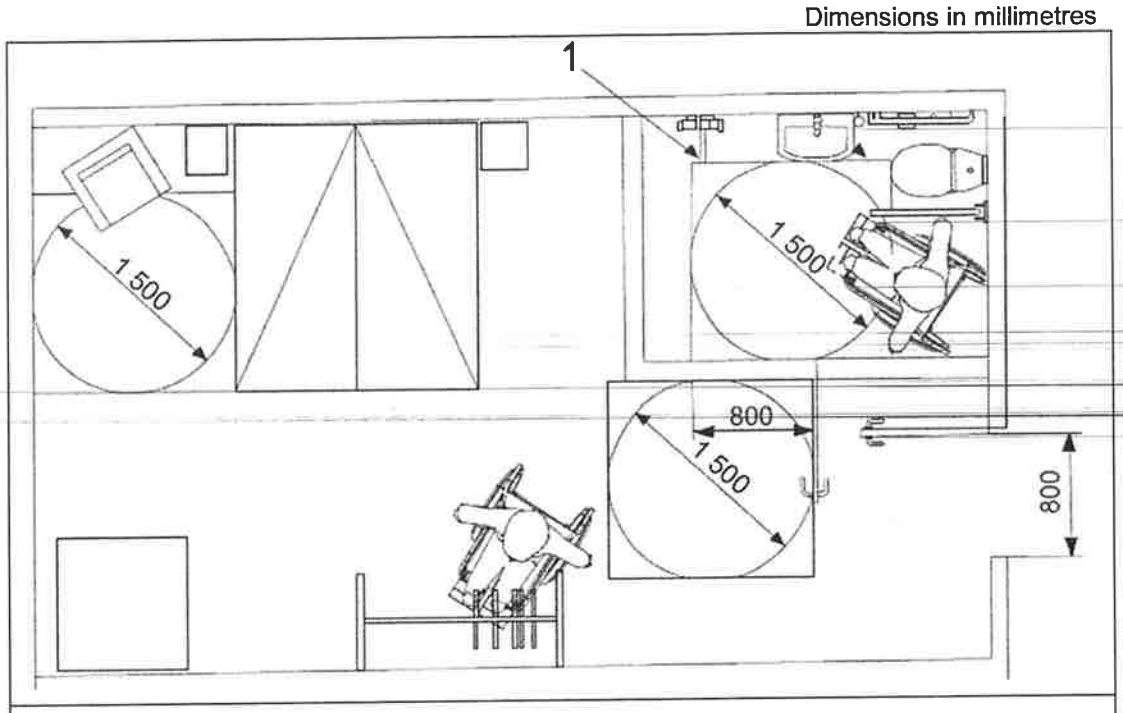


Figure 72. Example of space allowances for accessible bedroom



Key

1 shower area

Figure 73. Example of space allowances for accessible bedroom and bathroom

27 Kitchen areas

Kitchen areas shall take into account general design considerations stated in Clause 4, manoeuvring space (see B.6.1 and B.6.2), slip resistant walking surface and accessible height of controls and devices (see 34.2).

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

A section of the shelves should be within reaching distance for a wheelchair user, between 500 mm and 1 100 mm above floor surface or preferably with adjustable height.

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

28 Storage areas

The minimum manoeuvring space (see B.6.1) and reachability for wheelchair users (see B.6.3) 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 the floor.

If a door is provided, it should open outwards.

29 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 the inappropriate use of floor and wall finishes and the location of mirrors and glazing should be avoided.

The surfaces should contribute to an acoustic environment that helps in orientation; see also Clauses 30 and 31.

30 Acoustic environment

30.1 General

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

Many people with some degree of hearing loss have assistive devices to amplify sound, such as hearing aids or cochlear implants.

However, if the acoustic environment is not supportive of these devices, they do not work effectively. In addition, many people who have a mild or temporary hearing loss and do not have assistive devices may not be able to access information or communicate effectively.

Most people with hearing loss and people without hearing loss rely on sight to lip read or interpret facial expressions; therefore where the acoustic environment is regarded as important, suitable lighting, colour and visual contrast should be considered to benefit all building users.

Information normally conveyed in visual form may not be accessible to people who are blind or partially sighted. This information should also be conveyed audibly; the clarity (speech transmission index) of this information is affected by the acoustic environment.

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

30.2 Acoustic requirements

People with hearing impairments have particular difficulty in making out sounds and words in noisy environments. Adequate sound insulation should minimise noise from both outside and inside the building. Noise can often be "mitigated", for example, by introducing a buffer zone between a meeting area and extraneous noise, or partitioning a restaurant.

The acoustics in a room are essentially connected with its location in the building and with the acoustic insulation of the building elements. The distribution of noise within the room itself and from exterior sources depends on the sound absorption of the surrounding surfaces and furnishing of the room. The calculation of acoustic absorption is significant in rooms where acoustic quality is important and also where noise reduction is required.

Good acoustics shall be achieved by optimising the reverberation time, by considering the use/purpose of the room and by ensuring a low background noise level. The optimum reverberation time of a room should be determined having regard to the volume and the intended purpose of the room.

The geometry and shape of the room, as well as the distribution of sound absorbing and reflecting surfaces, are important. Surfaces that absorb sound should be carefully selected, as well as surfaces that reflect it. To develop an effective acoustic environment, sound absorbent surfaces can be used on floors and ceilings.

The optimum reverberation times for communication, speech only or music performance are different and depend on the size and shape of the room.

30.3 Hearing enhancement systems

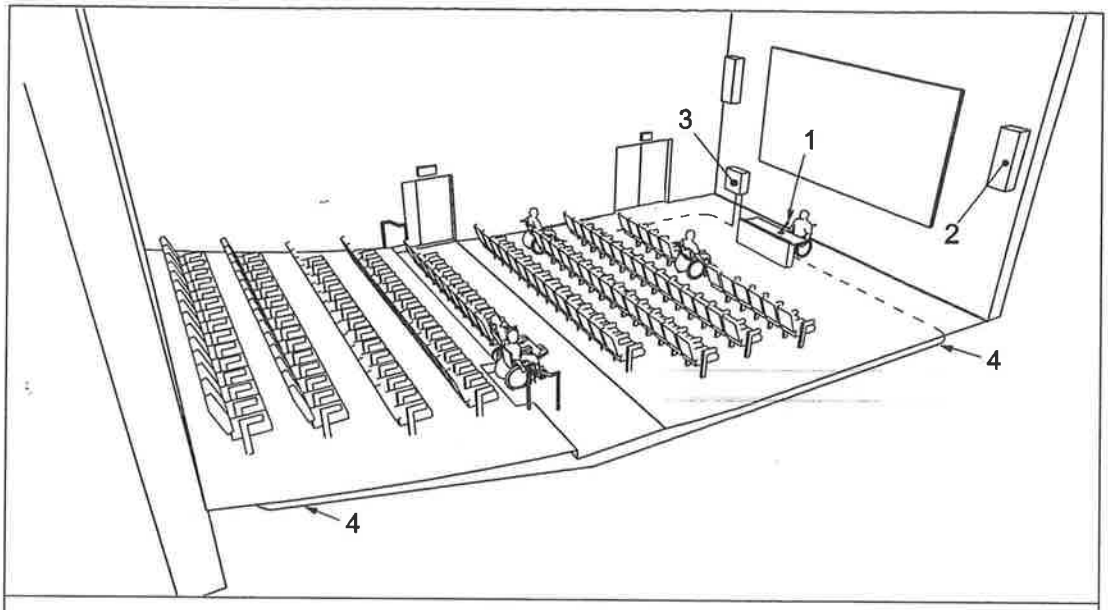
A hearing enhancement system fitted at an information point can significantly assist communication for a person with a hearing impairment who uses a personal hearing aid, or has a cochlear implant. Hearing aids or cochlear implants may have a Telecoil (T-switch) which allows the listener to receive the sound signal directly.

Hearing enhancement systems amplify audible communication and can be helpful to people who have a hearing impairment. They include a direct wire system, an inductive loop system, an infrared system, or 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.

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

All seats, including the front scene, should be covered by hearing enhancement systems like induction loops. Portable hearing enhancement systems can be an alternative.

An example of induction loops system is shown in Figure 74.



Key

1 microphone
2 loudspeakers
3 induction loop amplifier
4 induction loop

Figure 74. Example of induction loop system in conference room

31 Lighting

31.1 General

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 schemes, and to facilitate orientation (see Clause 37). The lighting should not lead to glare or excessive contrast.

31.2 External lighting

The routes to and around a building shall have sufficient artificial lighting to facilitate awareness of changes of level or gradient. The positioning of lights should not cause glare, reflection or shadows. Ramps, entrances, steps, signage, etc., should be well lit artificially, with an illuminance of at least 100 lux.

31.3 Natural lighting

It should be possible to shade windows from bright light. For the location of windows (see 31.4 to 31.9 and 18.3.3).

31.4 Artificial lighting

Lighting should provide visual conditions consistent with the visual task, orientation and safety.

Key factors are as follows:

a) level of illumination of horizontal and vertical surfaces;

b) limitation of glare from a light source or reflections;

c) uniformity and luminance distribution;

d) direction of lighting and shading; and

e) colour rendering.

Artificial lighting should gives good colour rendering. Light sources with a colour rendering index Ra are recommended.

Good artificial lighting where needed is crucial for everyone, ensuring that visual impaired people are able to use buildings safely and conveniently, and that people with hearing impairments are able to lip read.

31.5 Lighting to facilitate wayfinding

Lighting should facilitate wayfinding: building elements should be marked by increased illumination. The lighting in critical locations such as entrances, corridors, stairs, changes of level and workstations should facilitate their identification (see 31.3).

Time dependent switch devices shall have a progressive switch off to reach the next switch. An automatic switch on detection system shall cover the complete surface of ramps and stairs. Sensor lighting shall provide sufficient time necessary for users to travel safely along ramps. Lighting, which switches off when people are still on ramps or stairs should be avoided.

Ramps and stairs are the most hazardous places for falls.

31.6 Controllable and adjustable lighting

All lighting, including natural light, should be controllable to avoid glare.

Artificial lighting may be adjustable to suit individual needs.

31.7 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 communication or information systems.

A minimum light level should be provided according to the visual task as shown in Table 5.

Table 5. Minimum light level in different areas

Different areas	E minimum (lux)
Horizontal surfaces indoors	100
Stairs, ramps, escalators, moving walks	150 to 200
Habitable spaces	300 to 500
Visual task with small details or low contrast	1 000

31.8 Lighting in auditoriums

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

31.9 Glare and shadows

Lighting should not produce glare. Glare and shadows can be avoided by the followings:

a) shielding or shading light sources;

b) use of indirect lighting;

c) appropriate location of light source in relation to the direction of vision and to the object that is to be observed;

d) use of light sources at floor or low level, and not using uplighters;

e) avoidance of windows at the end of corridors;

f) avoidance of light sources against dark surfaces by choosing light colours for ceilings or walls; and

g) 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.

Due to the increase of optical scatter in the eye, the effects of glare are exacerbated for elderly people 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).

32 Fire emergency warning systems, signals and information

32.1 General

In all building types, a reliable and effective fire warning system is essential.

Nowadays, available technologies enable warnings to be communicated simultaneously by sounder, light strobe, voice message and individual tactile sensation by vibration.

Alarm systems should be designed to accommodate people with hearing impairments. Visual strobe alarms should be provided, particularly in isolated areas (bathrooms, meeting rooms) and noisy areas.

Room layouts, lighting levels and furniture arrangements shall be considered to ensure that these alarms are visible. A strobe frequency of 0.5 Hz to 4 Hz minimises the risk of triggering a reaction from a person with epilepsy. Care should be taken to ensure that overlapping strobes do not combine to result in a higher frequency of flashing. Vibrating devices such as pagers or mobile phones can be integrated with alarm systems to provide an individual alarm.

32.2 Light warning signals

Light strobes/beacons should be clearly visible. Light strobes should be located in washrooms and in other locations within buildings where people are apt to be alone and also in noisy environments.

A larger number of strobes/beacons with low output should be specified, never a small number of strobes/beacons with high output as these produce glare causing confusion and disorientation among building users. Adapt light output of strobes/beacons to suit the use of particular areas.

For light strobes/beacons, a slow rate of flash should be ensured (e.g. once every two seconds) in order to avoid epileptic seizures. Most importantly, the flash of one strobe/beacon should be synchronised with the flashes of all other light strobes/beacons in view.

32.3 Acoustic warning systems

A larger number of sounders between 85 dB to 95 dB with low output should be specified, never a small number of sounders with high output which only leads to confusion and disorientation among building users.

Vocal messages should be short and should contain appropriate warning information which is easily assimilated. The speaker should be distinct and easy to understand. In today's multi-cultural built environment, messages should be given in at least two different languages.

33 Visual contrast

33.1 General

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.

A minimum difference in LRV shall be provided in relation to the visual task. Additionally, one of the two surfaces should have an LRV value of minimum 30 points for example door furniture and others can be referred to Table 6.

The minimum difference in the LRV shall be achieved and maintained throughout the life of the building elements. Deterioration and maintenance shall be considered at installation.

For lighting conditions lower than specified in this standard, the difference in LRVs should be higher. Refer to 31.4 for extra illumination to mark important areas or details.

The perception of visual contrast increases with better lighting conditions.

Reflections and glare from shiny surfaces can reduce visual contrast and can confuse people with visual impairments.

For door hardware (i.e. the elements and components to facilitate opening and closing doors) a difference in LRV between the product and its background of at least 15 points and a minimum light reflectance value of 30 points for one of the two surfaces is acceptable.

Door hardware is normally positioned at the same height on a door and is either on the left or right side. This makes the location of door hardware easier than other features. In addition, the three-dimensional features of door hardware create shadows and bright spots, which further enhance their location.

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

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.

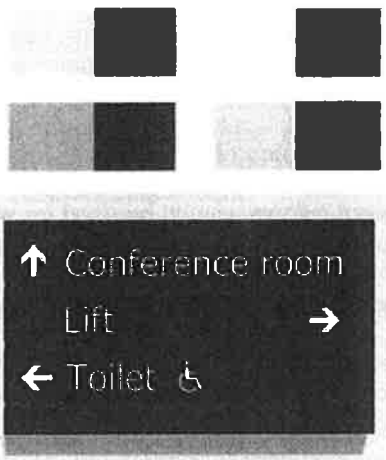
33.2 Choice of colours and patterns

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 minimum difference in LRV according to 33.1. Combinations of red and green tones should be avoided.

Different storeys should be marked with clearly defined large numbers relating to the floor (i.e. "2" for the second floor, and so on) both in the stairwells to assist those evacuating and at the lift and stair lobbies on each level.

Colour coding floors may not be practical from a long term maintenance perspective.

Table 6. Minimum difference in LRV according to the visual task

Visual task	Difference on the LRV scale	Approximate examples of contrasting colours
Large surface areas (i.e. walls, floors, ceiling), elements and components to facilitate orientation (i.e. handrails, switches and controls, tactile walking surface indicators, and visual indicators on glazed areas)	≥ 30 points	
Potential hazards and self contrasting markings (i.e. visual indicator on steps) and text information (i.e. signage)	≥ 70 points	

34 Equipment, controls and switches

34.1 General

The design and construction of operating controls and devices should be such as to enable them to be operated safely and independently by everybody.

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

a) door handles and locks;

b) lever, mixer or cross-head taps;

c) activation devices;

d) window openers and locks; and

e) electrical outlets and switches.

Controls shall be easy to use, e.g. by hands-free operation or by using the elbow. Minimum manual effort should be required, as for opening and closing doors.

All switches and controls shall be easy to understand without requiring specialised knowledge. Sufficient lighting of the control devices and all relevant information should be provided (see 38.6, 38.7 and 38.8).

Lever type door knobs are suitable for people with mobility impairment, for people of small stature or less strength, and for children.

The use of photoluminiscent pictogram signs shall be provided.

34.2 Location, heights and distances

Devices, controls, etc., shall be installed at an accessible height for reaching and operating, between 800 mm and 1 100 mm above floor level and shall be located a minimum of 600 mm from any internal corner, preferably 700 mm. For detailed requirements see also 38.3 and 38.8.

As an exception, electrical wall socket outlets, telephone points and television sockets could be located at a minimum height of 400 mm above floor level.

Control devices (radiator valves, fuse boxes, switches, push-buttons, intercoms, etc.) shall be installed between 800 mm and 1 100 mm above floor level and they shall be located a minimum of 600 mm from any internal corner.

Requirements and recommendations on lifts landing controls and car controls can be found in 15.3 and 15.4.

Control devices combined with text or figures should be positioned with 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, e.g. a panel in lift.

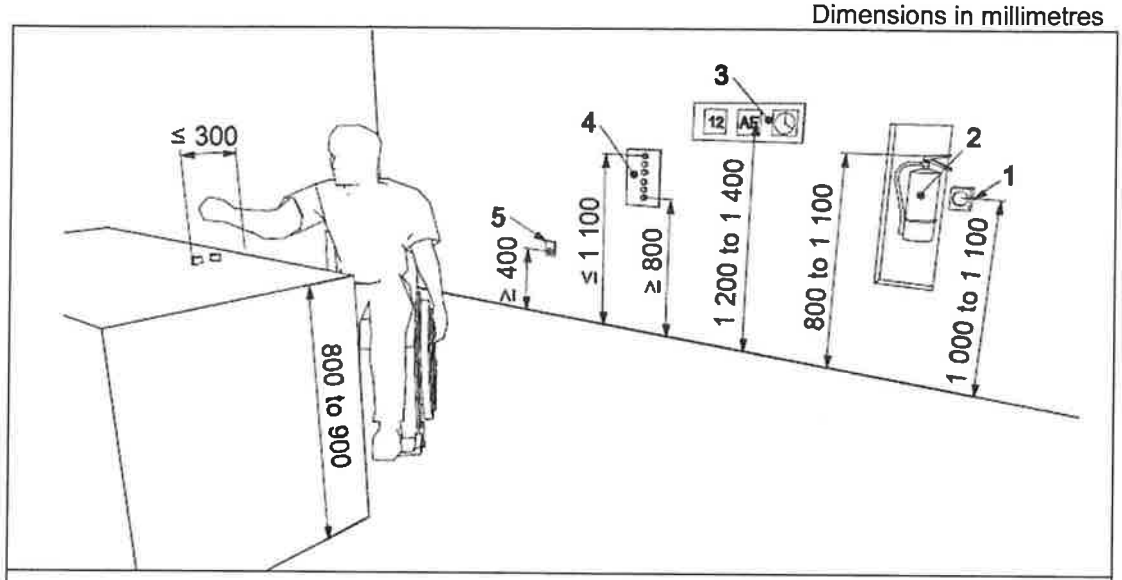
Control devices placed on a horizontal surface should be placed at a height between 800 mm and 900 mm and within 300 mm from the edge of the surface.

Socket outlets, including those for telephone or television, should be located not less than 400 mm but not more than 1 000 mm from the floor.

Meter indicators should be located between 1 200 mm and 1 400 mm from the floor.

Heights of switches, socket outlets, meter indicator and controls on a horizontal surface are illustrated in Figure 75.

Dimensions in millimetres



Key

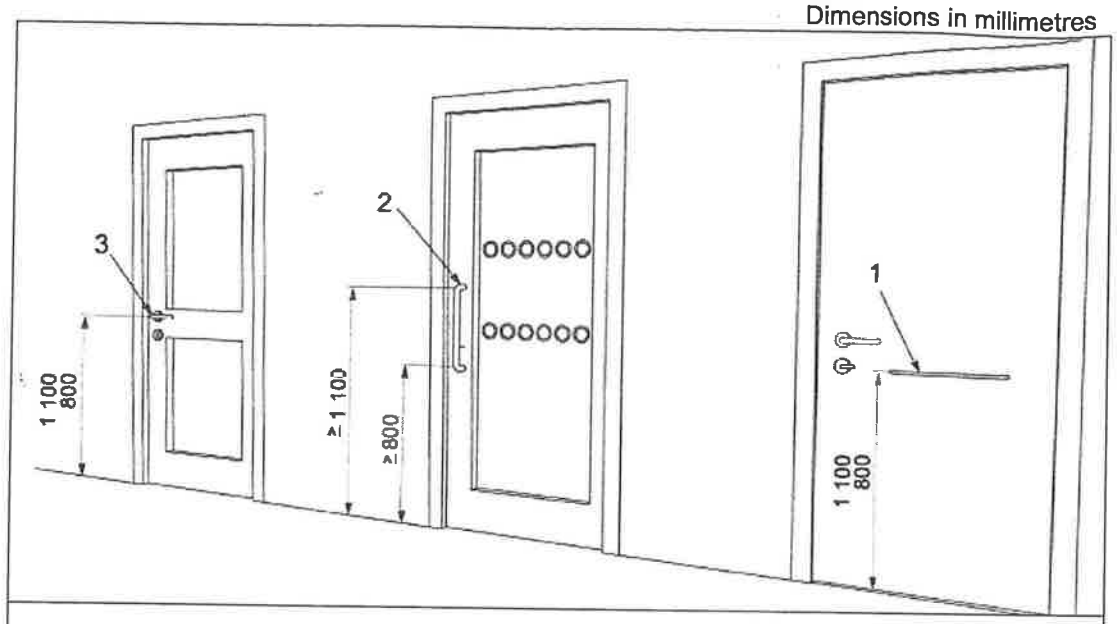
1 fire alarm, call point
2 fire extinguisher
3 meter indicators
4 control devices
5 socket outlets
6 control on horizontal surface

Figure 75. Heights of switches, socket outlets, meter indicators and controls on a horizontal surface

Door handles should be placed according to Figure 76. In this figure, the figure on the left shows the height of a handle for pushing or pulling the door, the middle figure shows a vertical door handle, and the figure on the right shows an example of a pull rail that might allow a wheelchair user to close the door behind him, for example, in a toilet.

If fire and safety related, all controls should be intuitive and obvious to use. A fire extinguisher should have a maximum weight of 5 kg or 6 L or even less.

Fire alarm calls should be located between 1 000 mm and 1 100 mm above floor level.



Key

1 horizontal pull rail, toilet room door
2 vertical handle
3 lever type handle

Figure 76. Door handle types and heights

34.2.1 Door handles

Door handles, as illustrated in Figure 77, with the following characteristics are recommended:

a) push-pull mechanisms that do not require grasping;

b) lever handles should be used on latched doors;

c) U-shaped door handles that reduce the risk of catching on clothing or injury from the exposed lever end;

d) should contrast with the colour of the door;

e) Lever type door handle is suitable as it provides adequate grip for persons with impaired hand functions; and

f) door handles should be at a consistent height throughout the building.

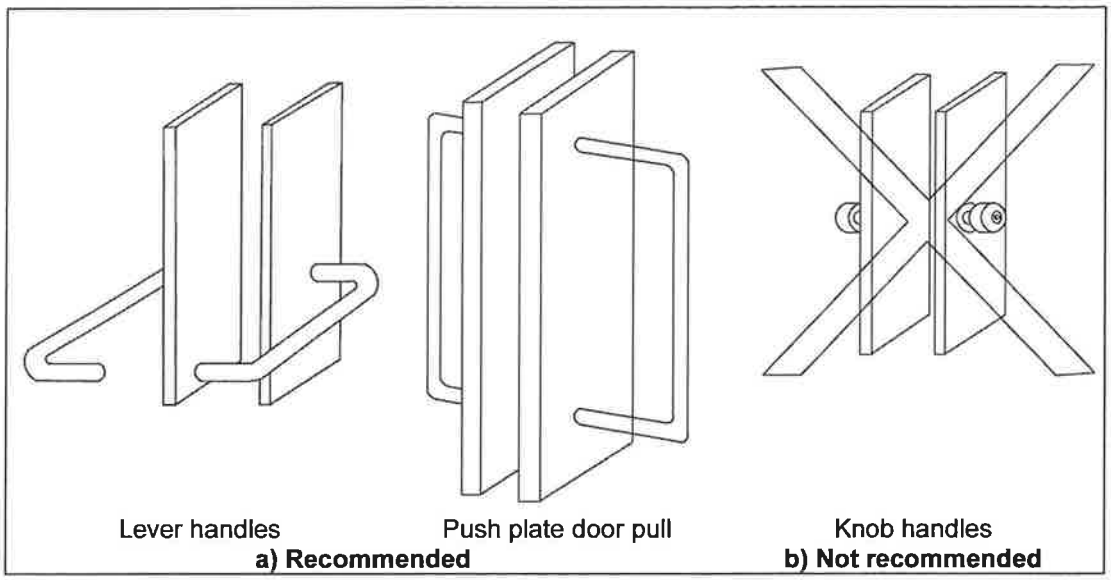
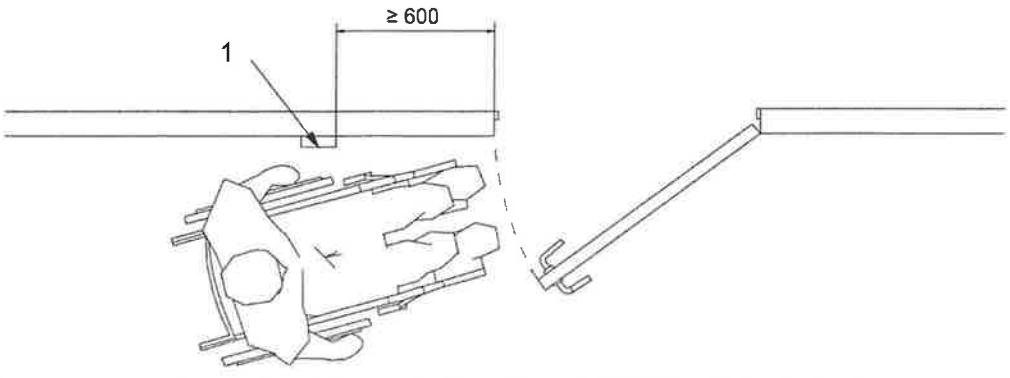


Figure 77. Examples of handles

34.3 Location of controls from walls, corners and opening doors

The minimum distance of the centre of switches and devices to control doors or windows, etc., shall be 600 mm from any internal corner or any projecting element (see Figure 78) and the recommended distance is 700 mm.

Dimensions in millimetres



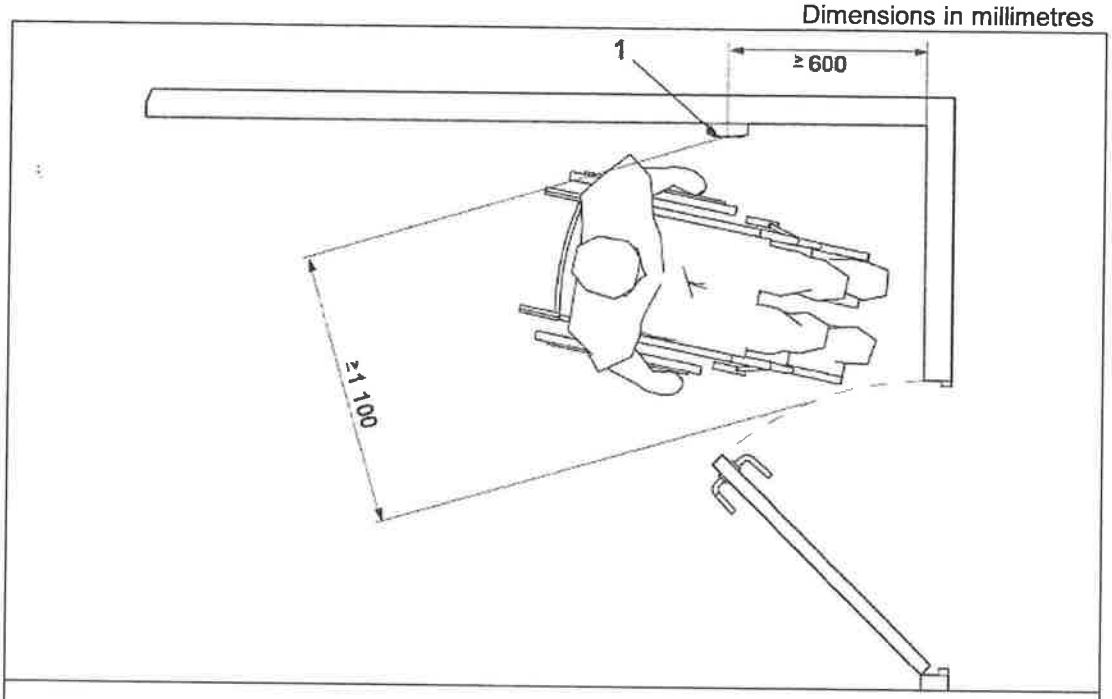
Key

1 door control, access control

Figure 78. Position of door and access controls

Controls for powered door openers to hinged doors should be located so that the doors do not interfere with wheelchairs, canes, 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 79). The opening time shall be sufficient for a person using wheelchair or assisting devices to pass through the door safely before it closes.

Dimensions in millimetres



Key

1 door control, access control

Figure 79. Distance of controls for powered door openers

34.4 Operation

To help people with reduced impaired visual, electrical switches should have large push plates.

Grab bars for door or window handles should be at least 300 mm long.

Lever handles should be 25 mm in diameter; "D-Lever" handles are preferred (see Figure 80).

A vertical bar for sliding doors should be 40 mm to 50 mm in diameter. The clearance between the bar and the wall should be 50 mm to 60 mm.

The backset of a latch/lock should be a minimum of 30 mm. Other door furniture should be 30 mm from the door edge.

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 to 5.0 N.

Dimensions in millimetres

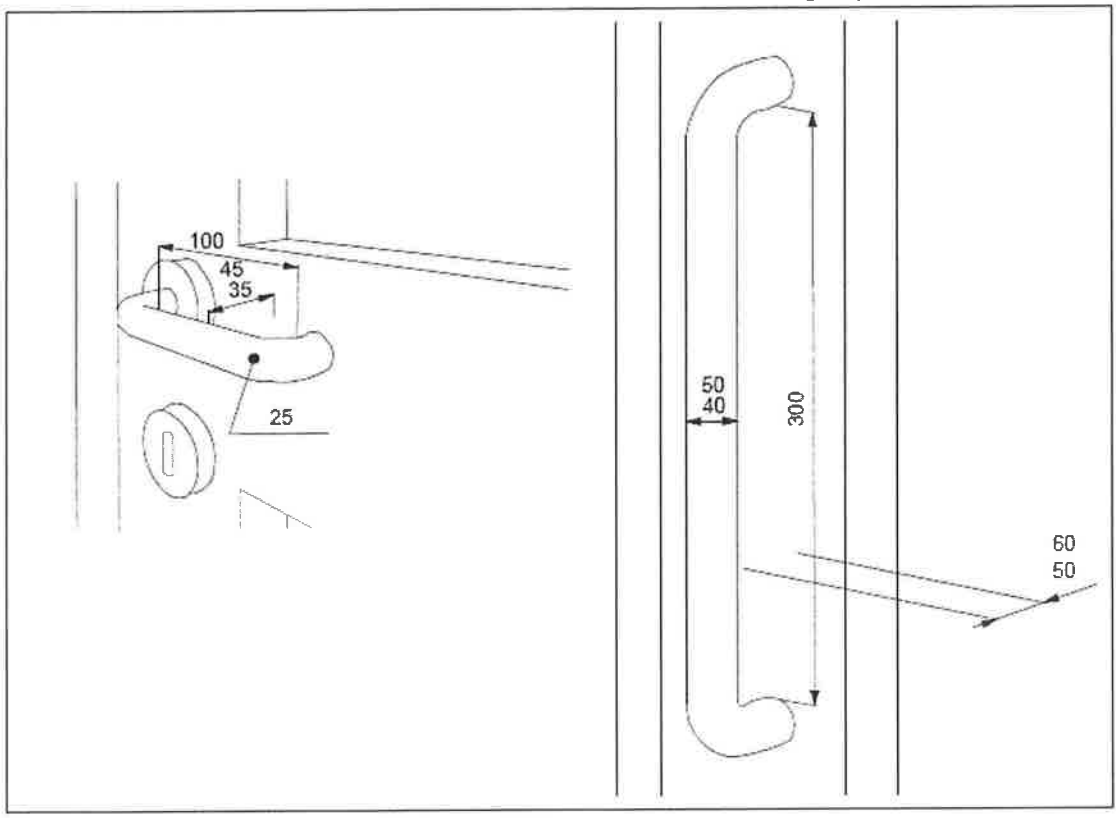


Figure 80. Examples of D-lever and vertical door handles

34.5 Identification

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

34.6 Usability

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

34.7 Telephones

Telephones shall be on a clear accessible route with approach from the front or the side (see B.6.1). All information should be provided in at least two of visual, oral and tactile forms. The telephone keypad shall have a tactile point on the number five.

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

Control devices shall be at a maximum height of 1 100 mm. A clear space underneath shall be provided for wheelchair-user's knees (see Figure 81). At least one telephone in any group should fulfil these conditions and be equipped with a magnetic field and text display.

Side protection shall be considered according to 7.14 and 7.15.

Dimensions in millimetres

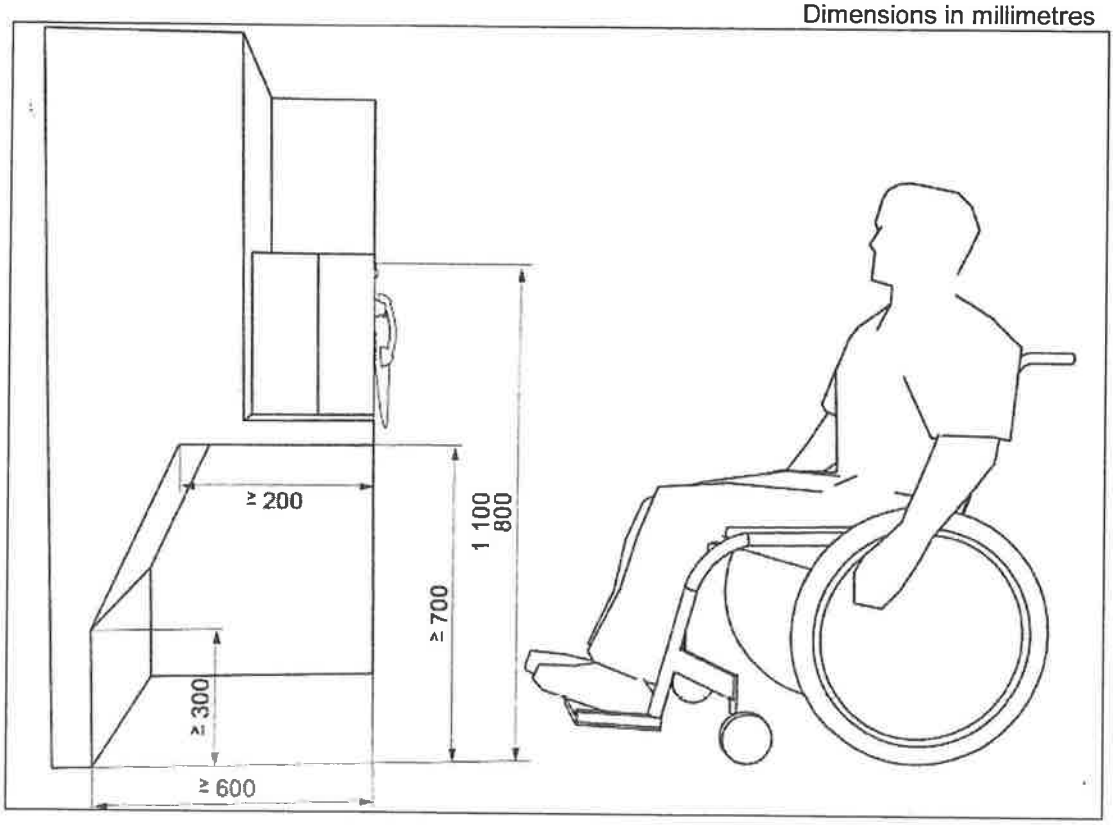


Figure 81. Height of telephone controls for wheelchair users

34.8 Card access, dispensing machines and automatic teller machines (ATMs), etc.

Machines for dispensing money, tickets or small goods should be accessible and should be located on an accessible level. The approach to dispensers should be clear and unobstructed, at least 900 mm wide. A knee space a minimum of 700 mm in height and a minimum 600 mm in depth and 900 mm in width should be provided to ease access for wheelchair users (see Figure 82).

Touch screen ticket dispensers at train/bus stations, etc., should not be the only type of ticket dispenser, as they are inaccessible to people with impaired visual.

The clear area immediately in front of the machine should be at least 1 500 mm × 1 500 mm, to allow a wheelchair user to approach the controls sideways, and to turn around after use and to provide some privacy.

The operation of the machine should be easy to understand.

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

Card access shall:

a) have a slot:

   i) located at a height of between 800 mm to 1 100 mm above the floor;

   ii) with its edge bevelled; and

   iii) colour-contrasted with the surrounding surface.

b) include tactile graphic symbols on the surrounding surface that:

   i) represent the card; and

   ii) identify the orientation of the card insertion.

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

The keypad shall:

a) be located at a height between 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; and

d) if numeric, be of a type whose buttons have a raised dot on number five which:

   i) is 0.7 ± 0.1 mm high;

   ii) has a base diameter of 1.5 mm; and

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

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

The approach to dispensers should be clear and unobstructed, at least 900 mm. A knee space of minimum 700 mm (h) x minimum 600 mm (d) x 900 mm (w) should be provided to ease access for wheelchair users (refer to Figure 82).

All said machines should be equipped with screen readers so that the visually impaired can operate independently. Use version of the ATM that provide a jack for headphone to ensure privacy.

In cases where such machines are operated by counter clerks, information such as new balance should be announced automatically.

For touch screen machines, there should be an option for alternative buttons.

The clear area immediately in front of the machine should be minimum 1 500 mm x 1 500 mm to allow wheelchair user to approach the controls sideways, and to turn around after use and to provide some privacy.

Dimensions in millimetres

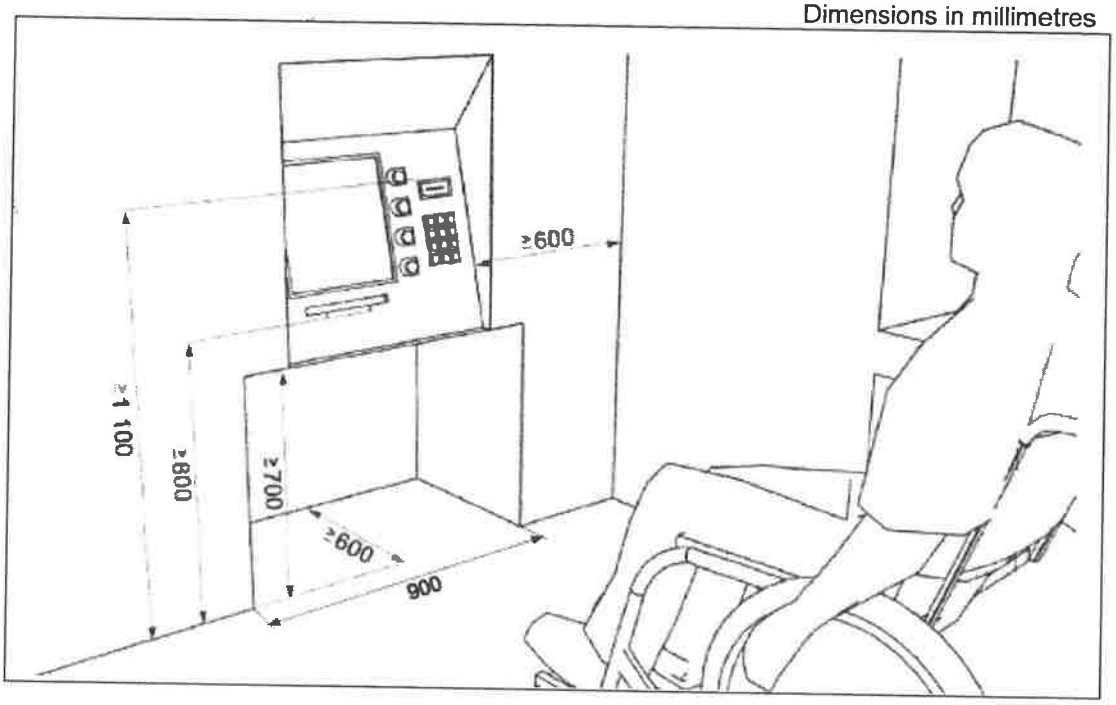


Figure 82. Example of a vending machine

34.9 Security access systems

Security access systems shall be designed in accordance with B.6 to meet the needs of everyone. This includes the requirements for manoeuvring space and for controls which can be reached comfortably. See 34.8 for requirements relating to card access and keypads.

Accessible security systems are available and should be utilised. Security access systems should be usable by everyone. Biometric systems (e.g. retinal or palm scanners) cannot accommodate all users.

34.10 Drinking fountains

Drinking fountains should be provided according to 34.1 and 34.2 at heights suitable for both standing and seated users.

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

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 shall be operable with one hand with an operating force of not more than 19.5 N.

34.11 Refuse bins

Refuse bins should be fully accessible and easy to use for everybody.

35 Furnishing

35.1 General

Seating facilities should be provided in public buildings to provide people with a place to wait and to rest.

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

Seats should be designed with armrests to facilitate sitting down and standing up. The seats should also have back rests (see Figure 83).

35.2 Seating in waiting areas

A range of different types of seating should be provided complying with the followings (see Figure 83):

a) seat height from 400 mm to 450 mm;

b) back support height from 700 mm to 800 mm;

c) seat depth from 400 mm to 500 mm;

d) angle of seat to backrest from 100° to 105°;

e) armrest height from 200 mm to 300 mm above seat;

f) armrest set back from front of seat ≤ 75 mm; and

g) a minimum 150 mm set back under the seat for feet when standing up.

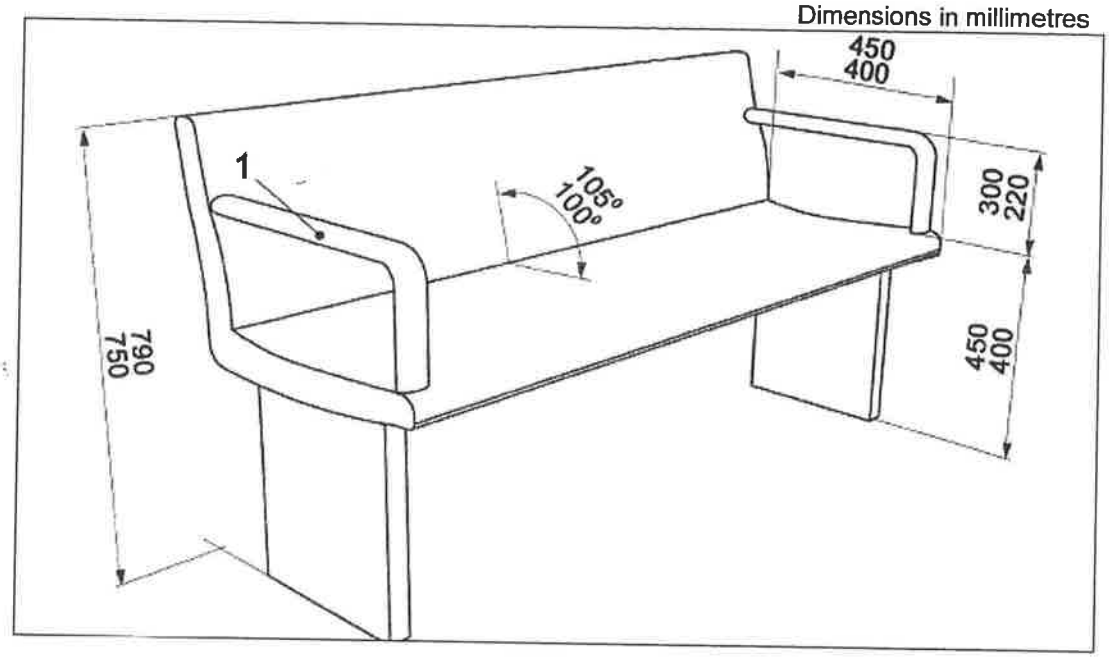


Figure 83. Example of a bench with armrests and back support

35.3 Seating at desks, tables, etc.

To allow a frontal approach with a wheelchair to a table, desk, counter, telephone, etc., an unobstructed space shall be provided with a minimum free height of 700 mm, minimum free depth of 600 mm and minimum width of 900 mm to accommodate knees underneath. For footrests, a minimum height of 300 mm is required (see Figure 84).

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

Dimensions in millimetres

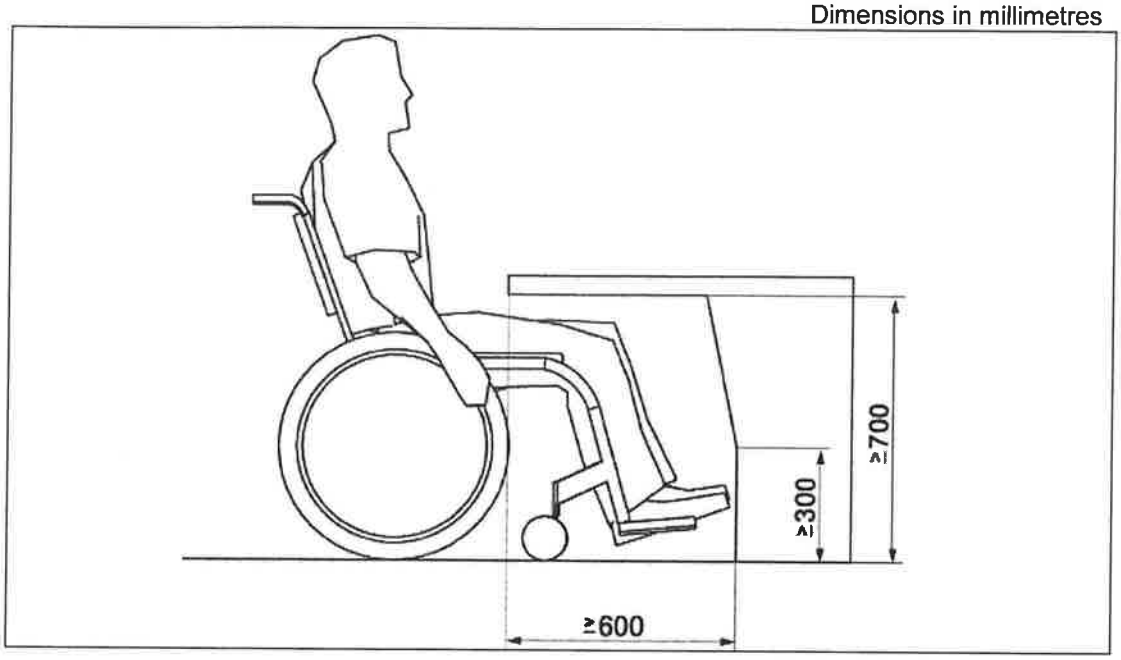


Figure 84. Table and desk height for wheelchair users

36 Fire safety, protection and evacuation for all

36.1 Fire engineering design objectives

In order to adequately protect people with activity limitations and/or people with impaired senses in a fire emergency, e.g. frail older people, people with disabilities, children and women in the later stages of pregnancy, fire engineering design objectives should be developed. The two critical design objectives are:

a) Protect people from fire in any of the following locations, when relevant:

   i) in a place of safety, located a safe distance from a building, or a place of relative safety within a building, for example, an area of rescue assistance adjoining a vertical evacuation route;

   ii) during independent or assisted evacuation to a place of safety or a place of relative safety; and

   iii) in situ when no evacuation is possible, for example, in the case of health facilities, using small fire compartments;

b) A building with an uncontrolled fire should remain structurally stable in every compartment or space where people remain, including:

   i) people waiting in areas of rescue assistance or a place of relative safety;

   ii) people engaged in evacuation or providing assistance for assisted evacuation; and

iii) people located in any space outside the building that would be threatened by structural collapse or in any space between the building and a place of safety.

36.2 Principles of fire evacuation for all

It is a fundamental objective of fire engineering design for evacuation that there shall be alternative, safe and intuitive evacuation routes away from the scene of a fire, which can occur at any time and in any part of a building; these evacuation routes shall be available to all building users.

The principles of fire evacuation for all are as follows:

a) protection and evacuation for all should be incorporated at a sufficiently early stage in the architectural design process;

b) vertical evacuation or evacuation to a place of safety, which will tend to be further away than a place of relative safety, is more stressful than horizontal evacuation of areas as needed, particularly for people with mobility impairments;

c) the fire engineering strategy needs to specify which occupants, based on abilities and other characteristics, are to be evacuated to a 'place of safety' and which to a 'place of relative safety;

d) the fire engineering strategy needs to specify, based on fire size, location and rate of growth, which areas are to be evacuated and when vertical evacuation is necessary;

e) designated lifts in new buildings should be capable of being used for people evacuation in a fire situation; and

f) designated lifts in existing buildings, when being replaced or undergoing a major overhaul, should be made capable of being used for people evacuation in a fire situation (see 15.6 for more guidance).

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

36.3 Assisted fire evacuation

36.3.1 General

A fire engineering strategy is needed that will indicate what is required so that every occupant can be protected from fire, from their location when fire begins through their evacuation and at their location after evacuation, in accordance with accepted principles of fire evacuation for all.

Included in these principles are that the features of the building should support successful evacuation and every occupant, whatever his or her abilities, should be able to evacuate independently to the maximum degree possible. However, independent evacuation may not be possible for all occupants, particularly in the case of existing buildings. For those occupants who need assisted evacuation, there should be a strategy for the provision of assisted evacuation, and there may need to be areas of rescue assistance.

36.3.2 Areas of rescue assistance

It is essential that movement to and from each area of rescue assistance (see 3.3) does not encroach on the evacuation travel space of the staircase. Door leaves should also not open into or over this evacuation space.

There may be competition between staircase evacuees and people using the area of rescue assistance (and reduced ability to achieve objectives) if the evacuation travel space of the staircase overlaps the space used for movement to and from an area of rescue assistance (see Figure 85).

Fire evacuation routes, including all areas of rescue assistance, shall be kept clear at all times.

An area of rescue assistance should be of sufficient size to cope with expected needs in a fire emergency. For example, if there are only two evacuation staircases on a floor in a building (on opposite sides), each area of rescue assistance should be designed to cater for the expected needs of the full floor.

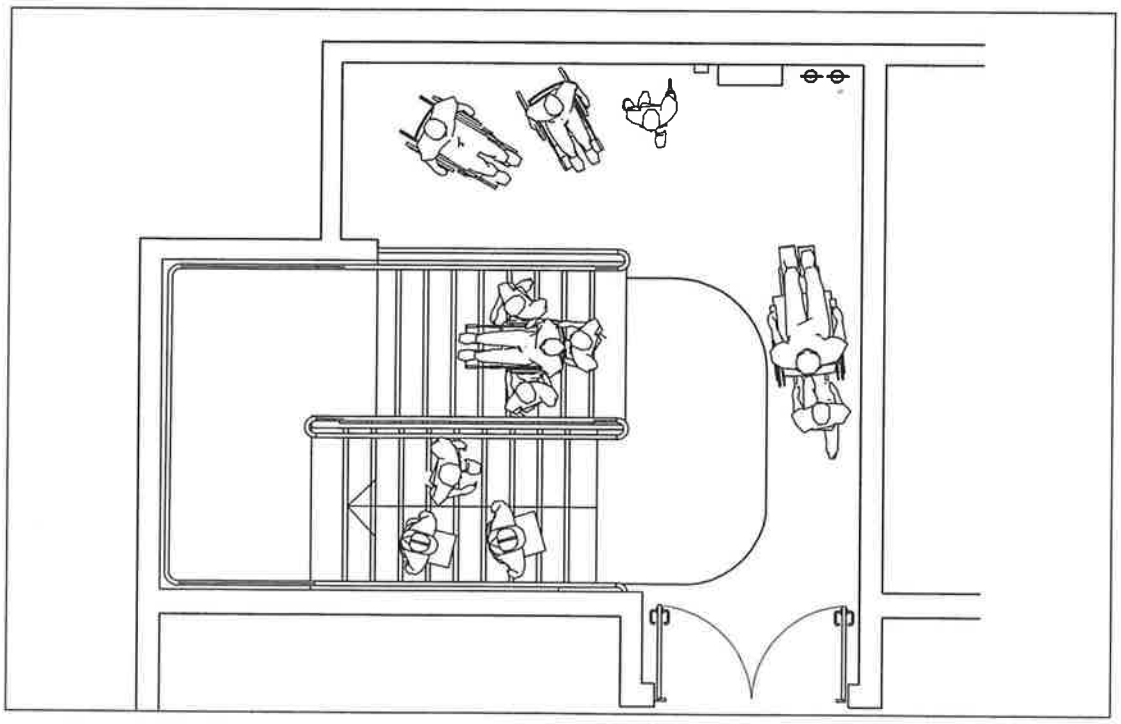


Figure 85. Example of fire evacuation staircase with an adjoining area of rescue assistance

An area of rescue assistance in a building should:

a) be provided on every floor of a building;

b) adjoin every evacuation staircase;

c) include space for persons in wheelchairs;

d) have good lighting and be clearly indicated with good signage;

e) be fitted with an accessible and reliable independent communication system fitted at a height of 800 mm to 1 100 mm above floor level, facilitating direct contact with a person in the designated control room for the building;

f) be of sufficient size for the storage of an evacuation chair and a manual fire alarm call point, a fire evacuation supply kit containing, for example, smoke hoods, suitable gloves to protect a person's hands from debris when pushing his/her manual wheelchair, etc.; and

g) be marked with good signage.

Communication systems at areas of rescue assistance should provide visual feedback to people with hearing impairments that their location has been noted. The control point for the communication systems should be of a robust design to avoid risk of confusion about the location of building users. Where a signal board is used, this should be engraved or otherwise permanently marked to identify the particular building location, and should not rely on sticky labels or translation tables.

36.4 Evacuation chairs

Evacuation chairs should be capable of:

a) being safely and easily operated;

b) carrying people of high weight (up to 150 kg);

c) going up and down staircases;

d) travelling long distances horizontally and externally; and

e) compensating for any challenging features of a particular environment, such as narrow or unusually shaped staircases or evacuation paths over rough ground.

36.5 Emerging fire evacuation technologies

Emerging fire evacuation technologies could include:

a) intelligent evacuation management systems; and

b) directional sounders for locating fire exits on each floor of a building which may be obscured by smoke.

36.6 Fire defence plan

A fire defence plan elaborates the particular fire engineering strategy which has been developed for a specific building. It is usually in hard copy and/or electronic format and comprises fire engineering drawings, descriptive text, fire safety related product/system information, with supporting calculations and fire test data.

The fire defence plan shall demonstrate a proper consideration for the fire safety, protection and evacuation of the users of the building (occupants, visitors and other users) and who may or may not have a health condition or impairment.

37 Orientation and information

37.1 General

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.

Suitable provision shall be made at the entrance to the building and at decision points within the building to describe the location and nature of the building. In very complex buildings, visual, audible and tactile information should be provided.

Means to achieving satisfactory orientation conditions are as follows:

a) planning layouts;

b) wayfinding and guided paths with TACTILE WALKING SURFACE INDICATOR (TWSI) (see 7.2 and Annex A), other physical support of information (see Clause 33);

c) signage (see Clause 38) and symbols (see Clause 39);

d) visual contrast (see Clause 33);

e) choice of colours (see 33.2);

f) avoiding surfaces which might make orientation more difficult;

g) lighting (see Clause 31); and

h) visual, audible and tactile information according to the two-sense principle (see 37.2).

Orientation should be facilitated by differences in acoustics, material, light and colour. The design should indicate the use of the building elements.

To facilitate people with visual impairments who have some residual vision, routes to be followed should have a difference in luminance to the surroundings (see Clause 33).

Additional illumination or visual contrast and tactile information, such as a change in material or tactile walking surface indicators, should be provided at decision points such as entrances, staircases, lifts, etc., to assist orientation and wayfinding.

Tactile walking surface indicators should be used to indicate directional orientation information where no other clues indicate the path of travel. Across large areas, halls and complex buildings, blind people need a tactile route or guiding line to follow (see Annex A).

In complex buildings, an audible beacon should be installed in addition to visual and tactile information to provide information on decision points.

To avoid hazards in buildings and in the outdoor environment. See Clause 4.

37.2 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:

a) audible/tactile information for people with visual impairments, and

b) visual information for people with hearing impairments.

37.3 Audible information

Consideration should be given to provide suitable amplification and acoustic conditions; the message should be easily understandable and unambiguous. See also the principle of two senses in 37.2.

Public address systems should be clearly audible and equipped with a hearing enhancement system as described in Clause 30.

Emergency information and warning systems are described in 15.4.7, 25.14 and 25.15 and in Annex D.

37.4 Levels of information

Information should be clear, concise, accurate and timely. Clarity of information can be defined as information that is legible and easily understood. Clarity of information therefore presupposes that people are able to distinguish between the different types of information that they receive.

Information can be divided into three levels:

a) Level 1: Safety information;

b) Level 2: General information; and

c) Level 3: Advertising information.

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

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

All information provided should be accurate and consistent.

38 Signage

38.1 General

Signs should be readable and legible for people who have visual or mental impairments. Well-illuminated, clear and readable signs shall be placed at a consistent height. For heights, see 38.4.

Information with text should be supplemented with graphical symbols to facilitate comprehension for everyone. For graphical symbols see Clause 39.

Signs should be provided in relief, embossed and Braille (see 38.10).

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

An excessive quantity of signs in close proximity should be avoided, as well as visual material placed too close to wall fixed signs (e.g. posters, timetables, etc.).

Where Braille is used as a complementary or independent feature to tactile signs it should be easy to locate.

38.2 Main types of signs

The main types of signs are:

a) orientation signs: sketches, plans, models, etc ;

b) directional signs: directional information from point A to B;

c) functional signs: explanatory information;

d) informative signs: purely informative, for example a name; and

e) signs for emergency exits (see Annex D).

38.3 Placement of signs

38.3.1 Placement outside the building

Informative 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 38.5

Communication systems e.g. intercom, shall also be placed on the latch side and preferably in a range of 1 000 mm to 1 200 mm above ground level.

38.3.2 Placement in the building

Orientation signs should be located in accessible places adjacent to, but not directly in, main access routes so that they can be examined without disturbance.

In public buildings there should be an orientation plan immediately inside the main entrance. This plan should follow all relevant design criteria stated in Clauses 4 and 33.

Directional signs should clearly direct people to the facilities. 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 change in the traffic direction.

Directional signage to washrooms should be provided in all parts of a building.

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

Floor numbers shall be located on each floor at top and bottom of stairs, on handrails and on each side of the outer frame of each lift-car entrance on each floor and clearly displayed elsewhere so they are visible from the lift car at each level.

38.4 Height and location of signs

Directional and functional signs should be located below 1 600 mm where they are easy to approach, to touch and read the raised signs with the fingers (see 38.10 to 38.12).

Signs should be located where they are clearly visible to people who are seated, standing or walking.

Signs should be placed between 1 200 mm and 1 600 mm from the floor or ground surface. It should be possible to approach the sign to be read from a short distance. (see Figure 86).

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

Where there is sufficient space, door signs shall be located on the latch side of the door within 50 mm to 100 mm of the architrave (see Figure 87).

Dimensions in millimetres

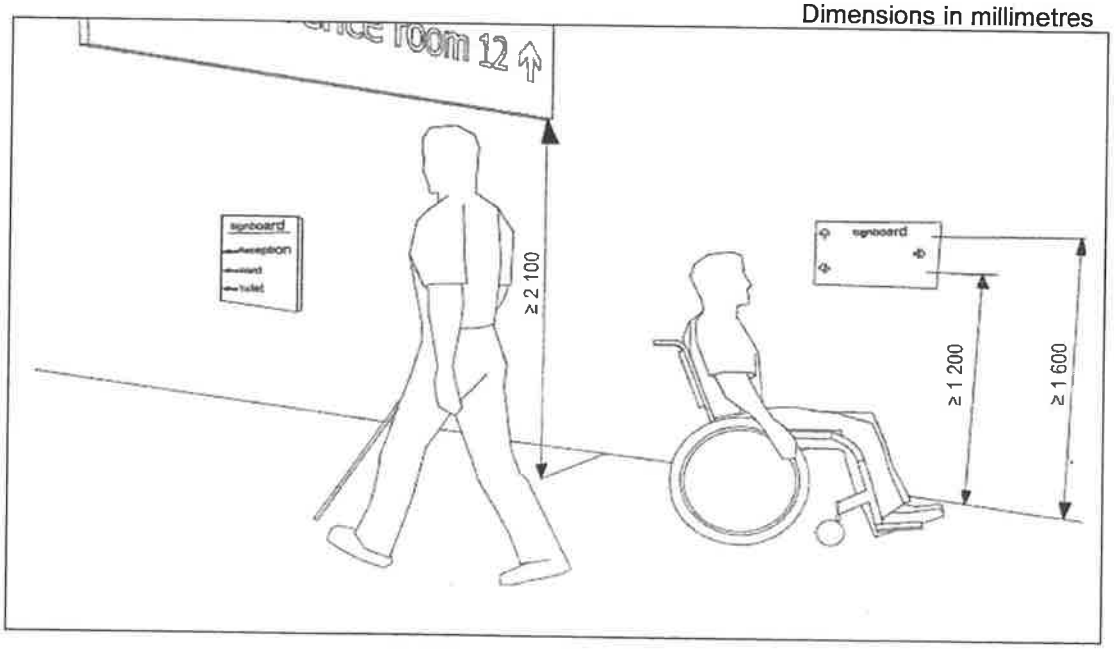


Figure 86. Height of signs

Dimensions in millimetres

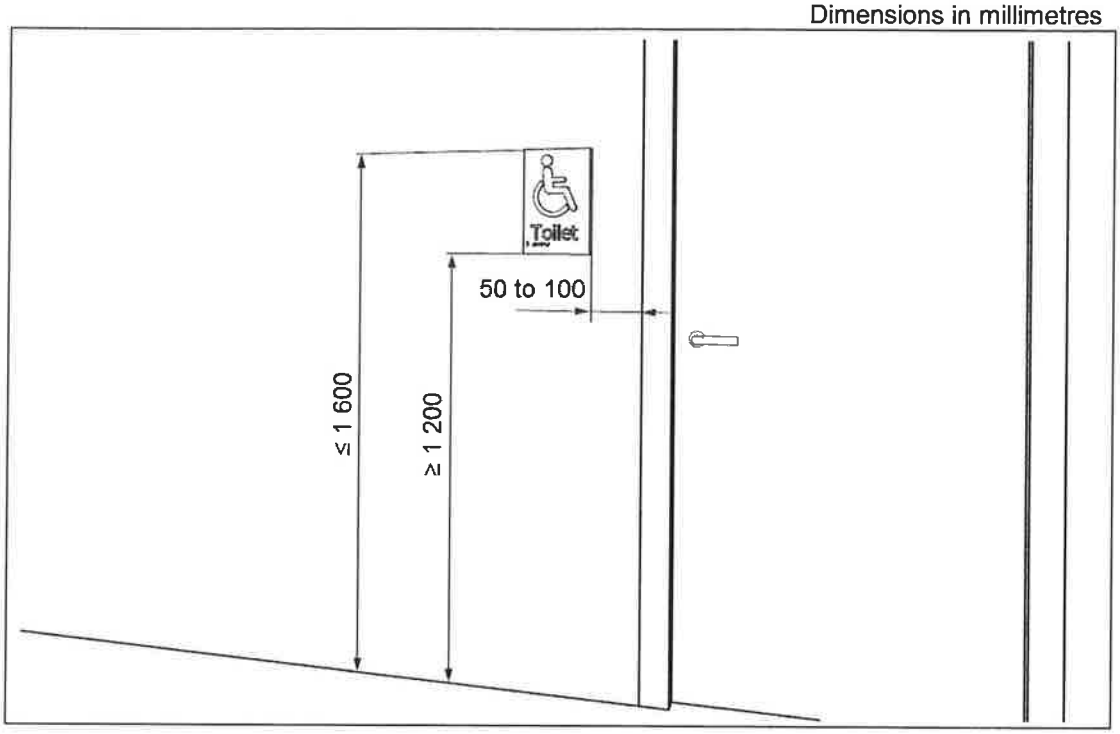


Figure 87. Location of door signs on the latch side of the door

38.5 Font and size of lettering

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

The letter height depends on the reading distance. A letter height between 20 mm and 30 mm for each metre of viewing distance is preferred. The letter height should not be less than 15 mm.

It is recommended that messages of single words or groups of words begin with an upper case letter and continue with lower case letters (sentence case).

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

Signs with a single word may be centre justified.

38.6 Differences in LRVs

Minimum difference in LRVs for small targets, such as signs and inscriptions, to signboards, should be 60 points.

Signboards should have a minimum difference in LRVs from the background of 30 points.

Red-green combination should be avoided. Difficulties in perception can also appear when using the colours green, olive green, yellow, orange, pink and red.

38.7 Glare free

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

38.8 Illumination

Signs should be well illuminated with no glare.

Signs can be luminescent or artificially lit.

38.9 Understandable

Signs should be readily understandable. 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.

38.10 Provision of raised tactile and Braille signs

Signs on panels in lifts, room numbers of rooms in hotels, doors to public toilets and so on shall be raised tactile and include Braille (also see 38.4).

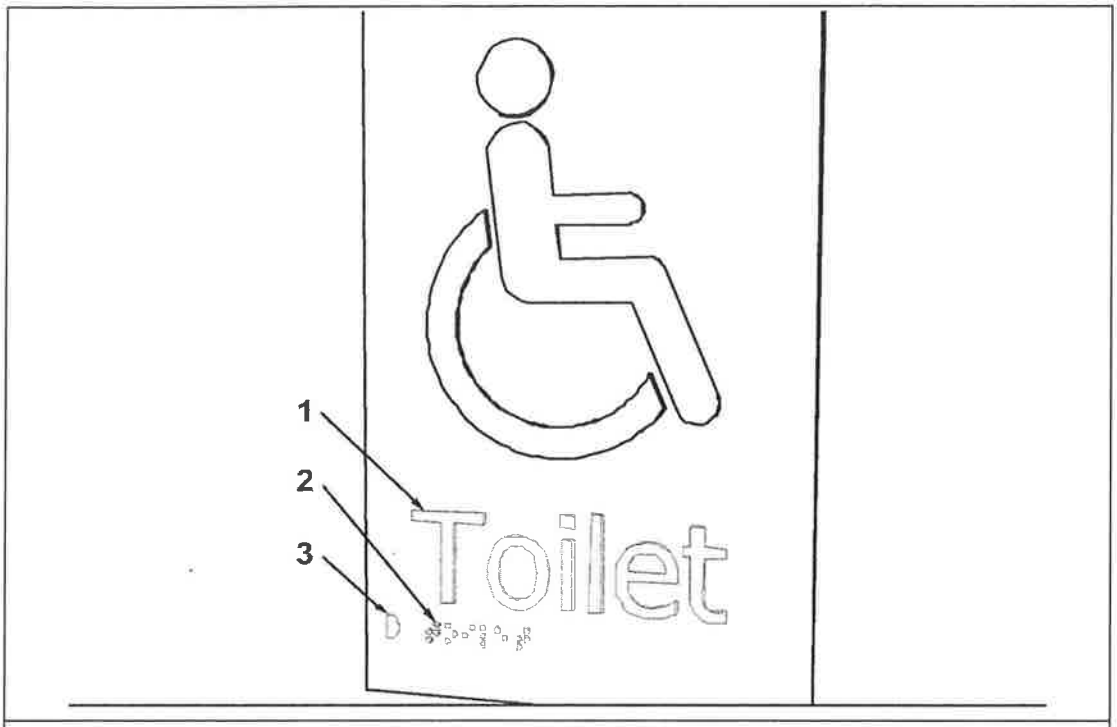
The preferred height of raised tactile information is between 1 200 mm and 1 600 mm. Signs with tactile information placed at a lower height should be mounted at an angle from the horizontal (preferably 20° to 30°, maximum 45°).

38.11 Tactile letters, figures, signs and graphical symbols

The height of letters, figures, signs and graphical symbols shall be between 15 mm and 55 mm (see Figure 88).

The minimum height of its relief shall be 0.8 mm; a height between 1 mm and 1.5 mm is preferred (see Figure 88).

The profile of the relief should be shaped as a rounded upside-down turned letter V.



Key

1 raised tactile letters and graphical symbols, height 15 mm to 55 mm, minimum relief 0.8 mm (1 mm to 1.5 mm relief is preferred)
2 Braille text
3 Braille locator

Figure 88. Details of raised tactile signs and Braille

38.12 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 on the left margin shall be horizontally aligned with the first line of Braille text.

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

38.13 Tactile symbols

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

38.14 Tactile maps and floor plans

Only essential information should be included on a tactile map or floor plan.

Tactile maps shall be angled between 20° to 30° from the horizontal for ease of reading, and the bottom edge shall be at a minimum height of 900 mm. The map should have a level of illumination between 350 lux and 450 lux, without glare.

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

The map shall be orientated with the building.

38.15 Information displays

If video and media information displays are used, they should be placed at a height according to 38.4 and their lettering, etc., should be in conformity with the recommendations above.

Glare from artificial and natural lighting on the screen shall be avoided by:

a) positioning the display or the screen out of direct light; or

b) shading the display or the screen.

A complementary audible information system should be provided.

39 Graphical symbols

Graphical symbols relevant to accessibility and selection are shown in Figures 89, 90 and 94.

Graphical symbols should be used in conjunction with building signage systems wherever possible.

Graphical symbols shall:

a) be highly contrasted with a minimum difference in LRV of 60 points and properly illuminated; and

b) be used on guides and directional signage.

Graphical symbols on directional and door signs should be tactile, and should be accompanied by raised lettering and Braille (see 38.13). Signs above a height of 1 600 mm do not need to be tactile, nor to include raised lettering or Braille information.

The size of graphical symbols is dependent on the viewing distance (D). The minimum size of the inner outline of the frame of graphical symbols (s) can be derived from formula $s = 0.09\ D$, applicable for a viewing distance of 1 000 mm to 10 000 mm.

The following accessible graphical symbols shall be used to denote particular components of a facility. The following facilities for disabled persons shall be marked as:

a) those relating to people with mobility impairments:

   i) car parking places (parking places, garages);

   ii) access and entrances without steps to buildings, especially where they are not identical with the main entrance;

iii) accessible lifts, in cases where not all lifts are accessible; lifting platforms and similar mounting devices;

iv) accessible sanitary rooms;

v) wheelchair viewing spaces and accessible seating;

vi) changing rooms; and

vii) steps or hoists providing access to swimming pools.

b) those relating to people with visual impairments, locations where audible and tactile information is provided;

c) those relating to people with hearing impairments:

i) telephones and emergency call facilities, equipped with sound amplification; and

ii) provision of an assistive listening system.

Figure 89. Accessible facility or entrance

Figure 90. Sloped or ramped access

Figure 91. Toilets - Accessible female and male

Figure 92. Toilets - Accessible female

Figure 93. Toilets - Accessible male

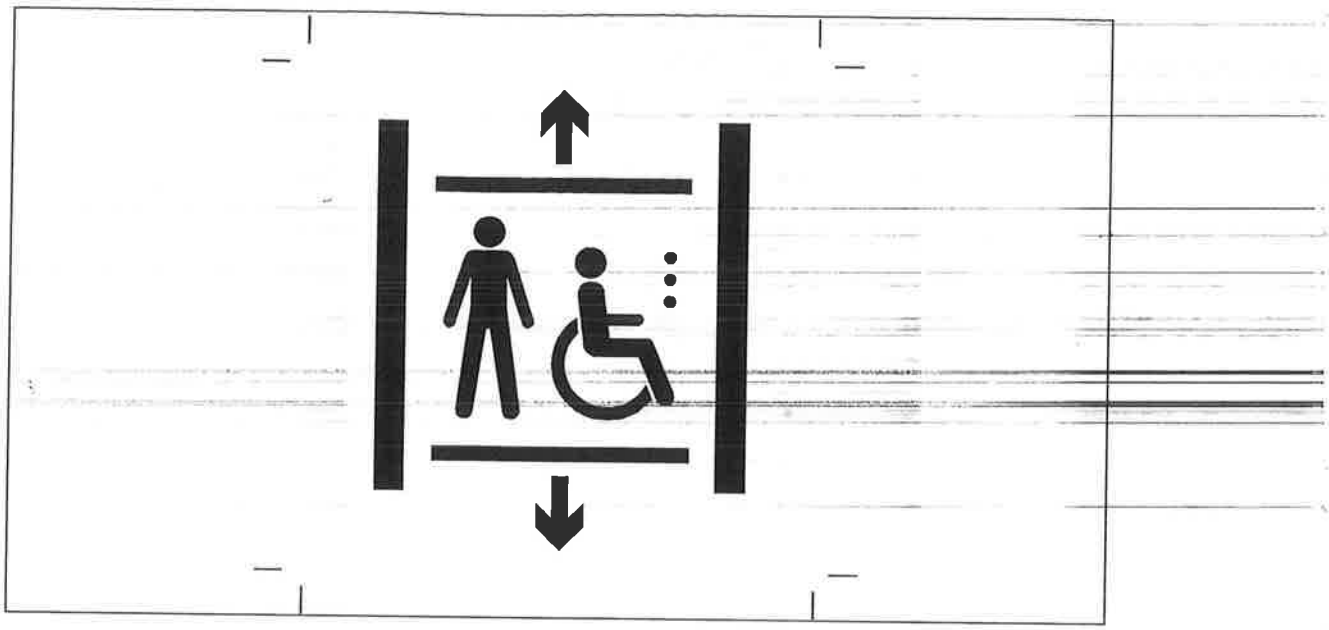


Figure 94. Accessible lift

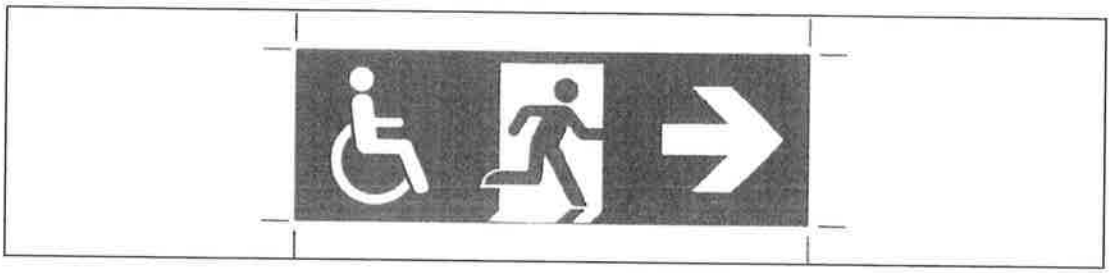


Figure 95. Accessible emergency exit route

40 Management and maintenance issues

Effective management of the built environment is essential to ensure that a building can be used by everyone. Management policies and procedures will be required to ensure that accessibility is maintained on an ongoing basis.

Annex E identifies the key areas for attention.

Annex A
(normative)

Tactile walking surface indicators (TWSIs)

A.1 General

When persons with visual impairments travel alone, they may encounter problems and dangers in various situations. In order to avoid obstacles and obtain information about their locations, these pedestrians travelling alone use all the available information, including tactile information, long canes and through the soles of their shoes. Tactile walking surface indicators (TWSIs) have been developed to assist the movement of persons with visual impairments.

The tactile walking surface indicators (TWSIs) are used to assist persons with visual impairments travelling alone. These TWSIs should be designed and installed based on a simple, logical, and consistent layout. This allows tactile indicators to not only facilitate the movement of persons with visual impairments through familiar places, but also support their movement and space recognition in places they are visiting for the first time.

Currently, several TWSIs that convey different information are used; however, the capability of detecting differences in tactile patterns through their shoes or by means of a long cane varies depending on the individual. Therefore, it is necessary that empirical and experiential research be used to ensure that TWSIs can be detected and recognised by potential users. To achieve maximum effect in conveying information, it is important that they are installed in a flat, smooth surface where persons with visual impairments can identify them without interference from any irregular walking surface.

It is also necessary to ensure that persons with low visual as well as persons who are blind can effectively use TWSIs. For this purpose, TWSIs should be easily detectable by the visual impaired. This is achieved through the application of a minimum visual contrast between the TWSIs and the surrounding pavement or floor surface.

While TWSIs shall be effective for persons with visual impairments, it is necessary to ensure that the surface structure and materials used are not detrimental to other pedestrians, including those having mobility impairments.

This annex specifies two types of TWSIs: attention/warning indicators and guiding indicators. Tactile attention/warning indicators may be installed at the vicinity of pedestrian crosswalks, the platforms of railway stations, and both the top and bottom of stairs and ramps, and in front of escalators, travelators and lifts, and the like to ensure safety. Tactile guiding indicators may be used in combination with attention/warning indicators in order to indicate the walking route where no other tactual information is available to get from one place to another.

At present, patterns and installation methods of TWSIs vary from country to country. This annex specifies the basic criteria for detectability and how to differentiate between each type of pattern used, and provides some examples.

A.2 Application

Tactile walking surface indicators (TWSIs) are installed in pedestrian facilities throughout the built environment where there is a situation that is not highlighted by any other feature detectable by persons with visual impairment.

A.3 Detection and discrimination

A.3.1 Tactile contrast

TWSIs shall be detectable from surrounding or adjacent surfaces through the soles of the shoes and/or by the long white cane. Adjoining surfaces shall be smooth, to enable detection and discrimination of TWSIs.

When attention/warning patterns and guiding patterns are combined, it is necessary that persons with visual impairment be able to clearly identify both of them.

A.3.2 Visual contrast

TWSIs shall be readily detectable and discriminable from the surrounding or adjacent paving surfaces using low vision. Visual contrast is defined in 3.63 and is assisted by good illumination.

The effective area of the TWSIs should have a high visual contrast with the immediate surrounding pedestrian surface in both wet and dry conditions. The difference in light reflectance or CIE Y-value between TWSIs and their immediate surrounding surface shall be greater than 30 points for integrated units and greater than 40 points for discrete units, with a minimum reflectance value of the lighter surface of 50 points.

Where TWSIs are used for hazards, the minimum difference in light reflectance value should be 50 points and the reflectance value of the lighter surface minimum 60 points.

When the required luminance contrasts between two surfaces, for example between TWSIs and surrounding surface, cannot be achieved, the addition of a compliant contrasting continuous band of minimum 100 mm in width adjoining to the TWSIs shall be used.

For methods for determination of visual contrast, see Clause B.7.

As persons with vision loss often have a colour deficiency, colour difference is only used to supplement visual contrast.

A.3.3 Prevention of tripping

TWSIs have a maximum height above the surrounding pavement or floor surface of 5 mm ± 1 mm. They shall have bevelled or rounded edges to reduce the likelihood of tripping and to enhance safety and negotiability for people with mobility impairments.

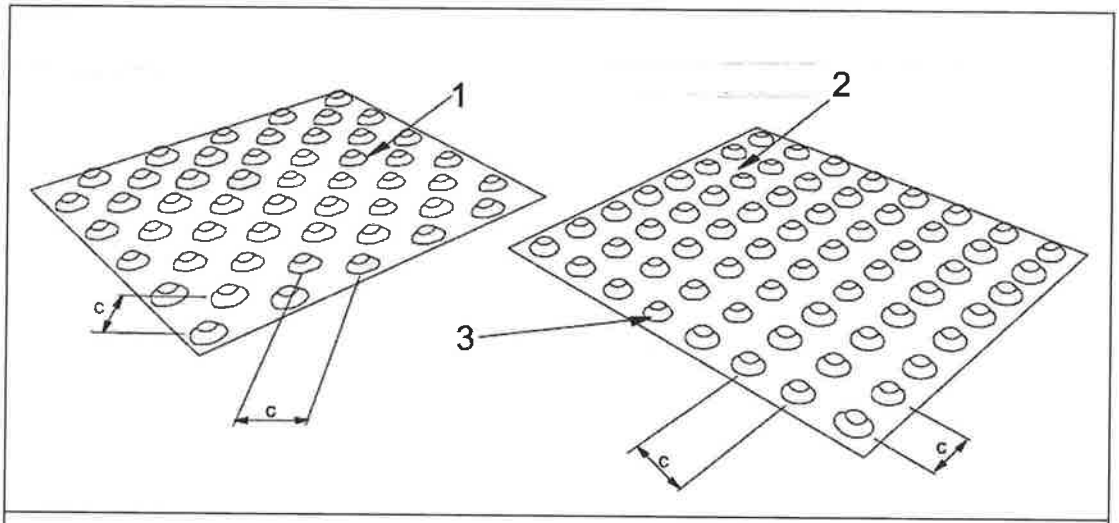
A.4 Requirements for attention/warning pattern

A.4.1 Arrangement

The attention/warning pattern should be constructed of truncated cones or domes arranged in a square grid or in diagonal rows (see Figures A.1 and A.2).

A.4.2 Height

The height of truncated cones or domes shall be 5 mm to 6 mm (see Figure A.1).



Key

1 cones arranged in diagonal rows
2 cones arranged in square grid
3 truncated cone [height 4 mm to 5 mm, top diameter 12 mm to 25 mm, base diameter = top diameter plus 10 mm ± 1 mm]
c centre spacing

Figure A.1. Arrangement, spacing and dimensions of truncated cones

A.4.3 Specification for truncated cones

A.4.3.1 Diameter of truncated cones

The top diameter of truncated cones should be between 12 mm and 25 mm, and the diameter of the lower base of truncated cones should be 10 mm ± 1 mm greater than the diameter of the top (see Figure A.1).

A.4.3.2 Spacing of truncated cones

The distance between the centres of adjacent truncated cones should be in relation to the top diameter as shown in Table A1.

Table A.1. Spacing in relation to top diameter of truncated cones

Top diameter of truncated cones (mm)	Centre spacing (mm)
12	42 to 61
15	45 to 63
18	48 to 65
20	52 to 68
25	55 to 70

NOTES:

1. Within the range of centre spacing, the maximum spacing provides a larger gap between the truncated cones, which improves detectability under foot while the minimum spacing provides a smaller gap, which improves detectability by long cane used by persons with visual impairment.

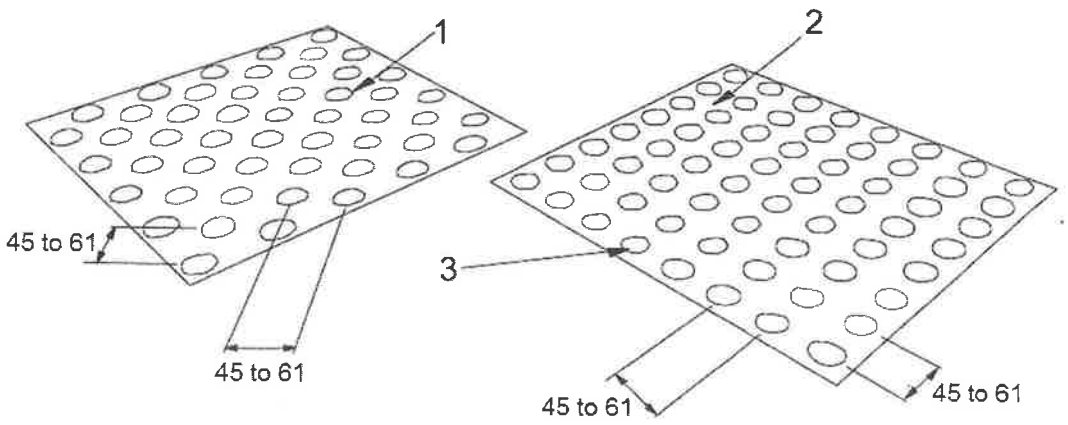
2. The spacing refers to the shortest distance between the centres of two adjacent truncated cones which may be parallel or at 45° to the border of the tactile area depending on whether the truncated cones are arranged in a square grid or in diagonal rows.

A.4.4 Specifications for domes

A.4.4.1 Diameter of domes

The diameter of the base of domes should be between 25 mm and 35 mm (see Figure A.2).

Dimensions in millimetres



Key

1 domes arranged in diagonal rows
2 domes arranged in a square grid
3 dome height 4 mm to 5 mm, base diameter 25 mm to 35 mm

Figure A.2. Arrangement, spacing and dimensions of domes

A.4.4.2 Spacing of domes

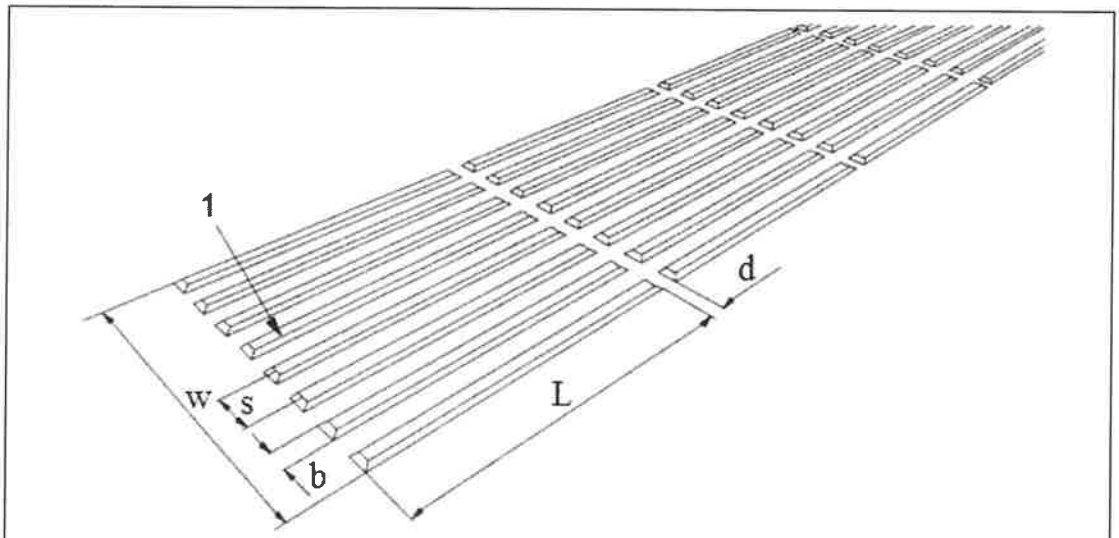
The distance between the centres of adjacent domes should be between 45 mm and 61 mm (see Figure A.2).

NOTE. Within the range of centre spacing, the maximum spacing provides a larger gap between the domes, which improves detectability under foot while the minimum spacing provides a smaller gap, which improves detectability by long cane used by persons with visual impairment.

A.5 Requirements for guiding pattern

A.5.1 Arrangement

A guiding pattern should be constructed of parallel flat-topped bars, ribs or sinusoidal rib pattern (see Figures A.3, A.4 and A.5).



Key

1 flat-topped elongated bars, height 4 mm to 5 mm, bevelled
s spacing of ribs
b width at base
L minimum 270 mm
W minimum 250 mm
d minimum 30 mm

Figure A.3. Spacing and dimensions of flat-topped elongated bars

A.5.2 Specifications for flat-topped elongated bars

A.5.2.1 Height of flat-topped elongated bars

The height of flat-topped elongated bars shall be 4 mm to 5 mm (see Figure A.3).

A.5.2.2 Width of flat-topped elongated bars

The width of the top of flat-topped elongated bars should be between 17 mm and 30 mm. The width of the base should be 10 mm ± 1 mm wider than the top (see Figure A.3).

A.5.2.3 Spacing of flat-toped elongated bars

The distance between the axes of adjacent flat-topped elongated bars should be in relation to the top width as shown in Table A.2.

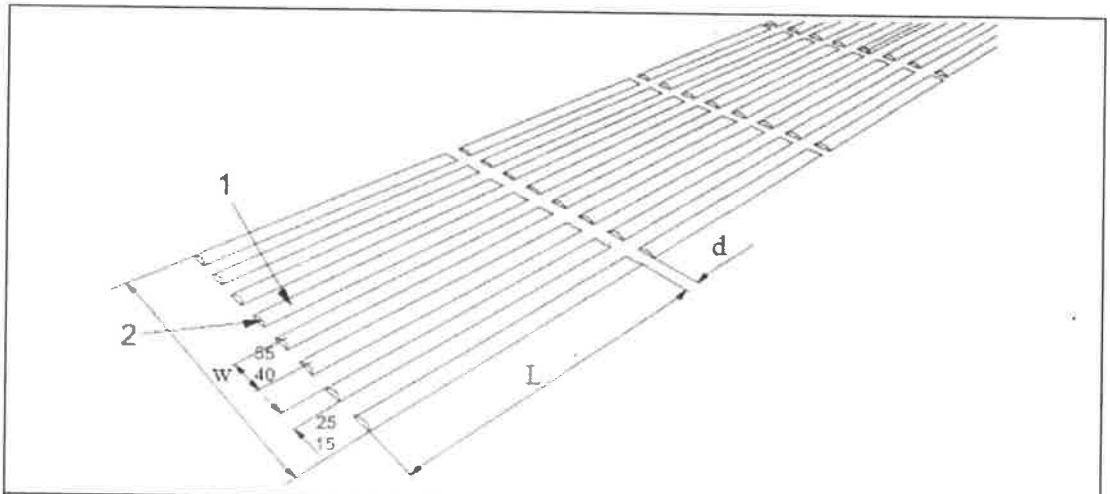
Table A.2. Spacing in relation to the width of the top of flat-topped elongated bars

Width of flat-topped elongated bars (mm)	Spacing (mm)
17	57-78
20	60-80
25	65-83
30	70-85

A.5.3 Specifications for rib pattern

A.5.3.1 Height of ribs

The height of ribs shall be 4 mm to 5 mm (see Figure A.4).



Key

1 ribs, height 4 mm to 5 mm
2 bevelled
d drainage gap 20 mm to 30 mm
L minimum 270 mm
w minimum 250 mm

Figure A.4. Spacing and dimensions rib pattern

A.5.3.2 Width of ribs

The width of the base of ribs should be between 15 mm and 25 mm.

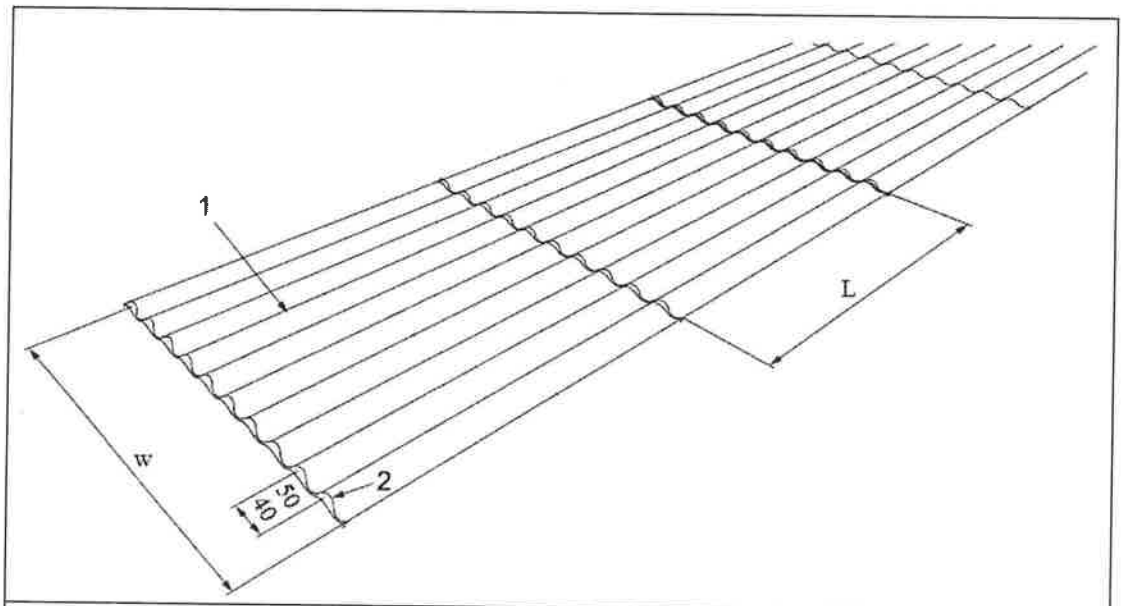
A.5.3.3 Spacing of ribs

The distance between the axes of two adjacent ribs should be 40 mm to 55 mm.

A.5.4 Specifications for sinuously ribbed pattern

A.5.4.1 Height of wave crests

The difference in level between the wave crest and the wave trough of a sinuously ribbed pattern shall be 4 mm to 5 mm (see Figure A.5).



Key

1 sinuously ribbed pattern, height 4 mm to 5 mm
2 bevelled
L minimum 270 mm
w minimum 250 mm

Figure A.5. Spacing and dimensions of sinuously ribbed pattern

A.5.4.2 Spacing between wave crests

The distance between the axes of two adjacent wave crests of sinuously ribbed pattern should be 40 mm to 52 mm.

A.5.5 Length

The length of flat-topped elongated bars, ribs or sinusoidal rib pattern should be more than 300 mm. Where there is a risk of water ponding, a drainage gap of between 20 mm to 30 mm shall be provided. At the ends and any interruption of the flat-topped elongated bars, ribs or sinusoidal rib pattern shall be bevelled to negate the possibility of tripping. To maintain the continuity of the guiding pattern, gaps should not be more than 30 mm wide.

NOTE. It is easier to follow guiding patterns that are as continuous as possible.

A.6 Materials

Tactile indicators shall be made of materials that are durable, and should maintain the required visual contrast.

They shall be slip resistant. Careful attention should be given to the selection of materials for tactile walking surface indicators (TWSIs) to ensure they are not and do not appear to be slippery.

A.7 Installation

A.7.1 General

This clause shows the basic principles and specifications for installation of tactile walking surface indicators (TWSIs), and provides examples of applications.

Statutory requirements for the installation of tactile walking surface indicators (TWSIs) shall take into consideration existing national conditions, design requirements for the accessible built environment.

Minimum depth and width dimensions for installation of tactile walking surface indicators (TWSIs) may need to be increased for safety, because this increases the probability of detection.

When tactile walking surface indicators (TWSIs) are installed, the base surface of the tactile walking surface indicators (TWSIs) should be less than 3 mm above the surrounding ground or floor surface so that they do not cause a tripping hazard.

Tactile walking surface indicators (TWSIs) should be fixed so that there is no likelihood of edges lifting.

A.7.2 Principles for installation of tactile walking surface indicators (TWSIs)

When used as a system to aid orientation and safety, guiding and attention/warning patterns should be used in a logical, sequential manner, with beginning and end points, between which intersections, decision points or hazards are indicated.

Tactile walking surface indicators (TWSIs) may also be used individually to indicate hazards or locations.

A.7.3 Principles for installation of attention/warning patterns

Effective depth and width of attention/warning patterns shall be a minimum of 300 mm.

When an attention/warning pattern is used to indicate a hazard, it should be extended the full width of the hazard, from each direction from which the hazard can be approached, and should be set back a minimum distance of 300 mm from the hazard.

NOTE. The definition of hazard varies by situation and by country.

When an attention/warning pattern is used to indicate a decision point, the effective width and depth shall be a minimum of 300 mm by 300 mm.

Annex B
(normative)

Human abilities and associated design considerations

B.1 General

The prime objective in designing, constructing and managing the accessible built environment is to ensure that it satisfies 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 of health and safety. In many instances, the use by specific individuals of assistive products assists them in using the built environment.

Every effort should be made to address constraints such as limitations of space or topography on the development of new environments that suit everyone's needs. Different constraints are likely to be encountered when attempting to modify the layout and structure of an existing building or external environment. However, as many as possible of the individual provisions within this standard should be adopted, whether the environment is newly constructed or an existing one 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 from person to person. Diversity is normal. However, some differences may be heightened through age or social condition, be congenital or result from accident or illness. Disability may be temporary or permanent, or in transition.

B.2 Physical abilities

B.2.1 General

Physical faculties include walking, balance, handling, pulling, pushing, lifting and reaching. Many activities involve simultaneous use of more than one of these skills.

B.2.2 Walking

For some people walking on the level or up gradients is difficult. Some people may have a limited range of motion or may use a mobility device such as a wheelchair or a walker. They may need to stop frequently, to regain strength or catch their breath.

In addressing the needs of people with walking limitations, the principal design considerations include the followings:

a) a clear unobstructed path of travel and an appropriate width;

b) the proximity of facilities to one another;

c) the ease of incline of gradients and of the pitch of steps and stairs;

d) the availability of seats;

e) the number of steps in a flight;

f) optional means of travel from one level to another;

g) the provision of handrails on both sides; and

h) the evenness, firmness and slip-resistance of walking surfaces.

To prepare for emergencies, egress needs to be established by planning architectural and evacuation strategies. Specific accommodation and management systems need to be planned to provide assisted means of egress in the event of emergency (see Annex D).

B.2.3 Balance

People with difficulty in balancing are expected to benefit from controls within easy reach.

A surface which a person may stumble against or walk into should be designed to limit abrasion.

B.2.4 Handling

Handling involves the use of one or both hands. Some people are 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 shall be designed to be graspable. Their circumference of the supporting structure and stability are critical.

Manipulation involves the moving, turning and twisting of components with a hand or hands. For those who have limited manipulation abilities, size and shape and ease of movement are critical.

Manipulation by using a pushing, pulling or pressing action using a clenched fist, or by using the wrist or the elbow, is preferred.

B.2.5 Strength and endurance

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

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

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

B.2.6 Lifting

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

B.2.7 Reaching

Telephones, desks, counters and work surfaces, electrical and other service controls, taps, door and window furniture shall be positioned within reach. Comfortable reach ranges should be considered to ensure use by a greater number of people.

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 not likely to either need precision or to be frequent and that can involve stretching or bending from the waist.

Having components within easy reach is particularly important for those with more severe limitations in mobility.

For wheelchair users, the reach range is limited depending on the seated position. Where reach is across a desk or worktop the range is limited by presence or design of the wheelchair's arms.

The reach range is also dependent on the height of the person, the use of their arms and balance and mobility of the upper body.

B.2.8 Speech

Speech is the expression of thoughts by means of articulate sounds. Where two-way communication is required, the built environment should be designed to facilitate communication with information in visual and audible formats, with adequate illumination and appropriate alarm systems.

B.3 Sensory abilities

B.3.1 General

Sensory abilities 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.3.2 Sight

Vision allows an individual to be aware of the luminance of surfaces and objects and their form, size and colour.

For people who are blind or have severe visual impairment, the provision of suitable tactile walking surface indicators (TWSIs) and tactile or acoustic warnings at hazardous locations shall provide information on using the built environment and shall limit the risk of injury. The built environment can be designed for orientation by providing sound cues and tactile cues.

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

An effective visual contrast between surfaces or objects helps to identify critical locations.

Simple and clear images should be used.

Visual contrast between adjacent surfaces and components should be carefully considered.

An environment that accommodates a broad range of visual characteristics should have the followings:

a) a simple, logical and easily understood arrangement, preferably with intersecting routes at right angles to each other;

b) an easily discernible system of "wayfinding";

c) visual contrast between adjacent objects and surfaces where it is necessary to provide important information;

d) choices of colour that satisfy the needs of those with anomalous colour vision;

e) appropriate warnings of the edge of abrupt changes of level or the existence of obstructions;

f) no reflections from floor and wall finishes;

g) careful placement of mirrors and glazing, to prevent dazzling and confusion;

h) a suitable level of lighting, free of glare; and

i) complementary audible information.

B.3.3 Hearing

Hearing allows an 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 contributes to an effective means of communication and information. A low level of background noise is essential.

Hearing enhancement 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 information that complements oral information concerning fire and other emergencies is especially important.

The selection of structural and surface materials can make a substantial difference in audibility. Auditoriums, meeting rooms and reception areas can benefit from additional sound enhancement such as a hearing enhancement system.

The careful design of illumination can assist in communication such as lip reading and sign language.

Most people with hearing impairments use a hearing aid which amplifies all sounds caught by the microphone, making communications very difficult in noisy environments.

B.3.4 Touch

Touch stimulates the perception of an object through physical contact. For those individuals who use touch in the built environment, it is important to consider the selection of surfaces that do not cause distress or injury.

Surfaces shall be free of abrasions and not cause an allergic reaction. Some metals may cause adverse reactions when touched so their use should be carefully explored.

B.4 Mental abilities

B.4.1 General

Mental faculties include those processes that are carried out in the mind of the individual. They include cognition, intellect, interpretation, learning and memory. To provide a usable environment for the population at large, all means of communication should have an immediate impact and be easily understood.

B.4.2 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.4.3 Intellect

Intellect is the faculty of reasoning and understanding objectively, especially with regard to abstract matters.

B.4.4 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. A failure to recognise words and their meanings may adversely affect an individual's ability to move successfully and safely in the built environment.

B.4.6 Memory

Memory is the ability to remember information. As people age, some find it increasingly difficult to absorb new information so changes in the environment should be carefully considered before implementation.

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.

Special design considerations should be considered as follows:

a) simple and clear planning layout; key rooms or spaces designed so they are easy to find;

b) whenever changes are undertaken, clear and simple information with respect to the new layouts should be provided;

c) self-explanatory environment; design should indicate the use of the built environment or elements in it; unnecessary complexity should be avoided;

d) simple, intuitive design of circulation routes;

e) doors designed so that their operation is intuitive, whether they are push, pull or sliding doors;

f) text signage that uses plain language;

g) aural and visual messages which are conspicuous, concise, comprehensible and relatively frequent;

h) wayfinding plans or maps that clearly indicate the person's position in the building or facility, and which do not include extraneous information;

i) wayfinding cues that are easy to follow, e.g. tactile, graphic, audible or architectural;

j) directional and other information which combines text with universally recognisable symbols;

k) signs with graphics; and

l) in areas where key cards are used for access, such as hotels, the need for fine motor control and precise timing of the swipe of the card in the reader should be minimised.

B.5 Additional factors

B.5.1 Accommodating the developing child

An element of risk is an essential part of a child's development. It is important to ensure that the built environment is safe for children.

B.5.2 Accommodating ageing adults

The life span within the human population is increasing. We expect more and more to maintain an economic and social life within both the public and private domains as we age. However, many human faculties are in marked decline as we age and familiarity with a particular environment is an aid.

B.5.3 Diversity of stature

There is a wide diversity of stature within the human population. Predominantly, this has to do with the average height of people in various parts of the world. 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 do not unduly inconvenience other individuals.

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.

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 of some populations. It remains to be seen whether this leads to demands for an increase in specific spatial and stability standards. These matters are beyond the scope of this standard.

B.6 General design considerations for wheelchair users

B.6.1 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.

The dimensions of 800 mm wide and 1 300 mm long stated in this standard are related to the footprint of commonly used wheelchair sizes and users (see Figure B.1).

Dimensions in millimetres

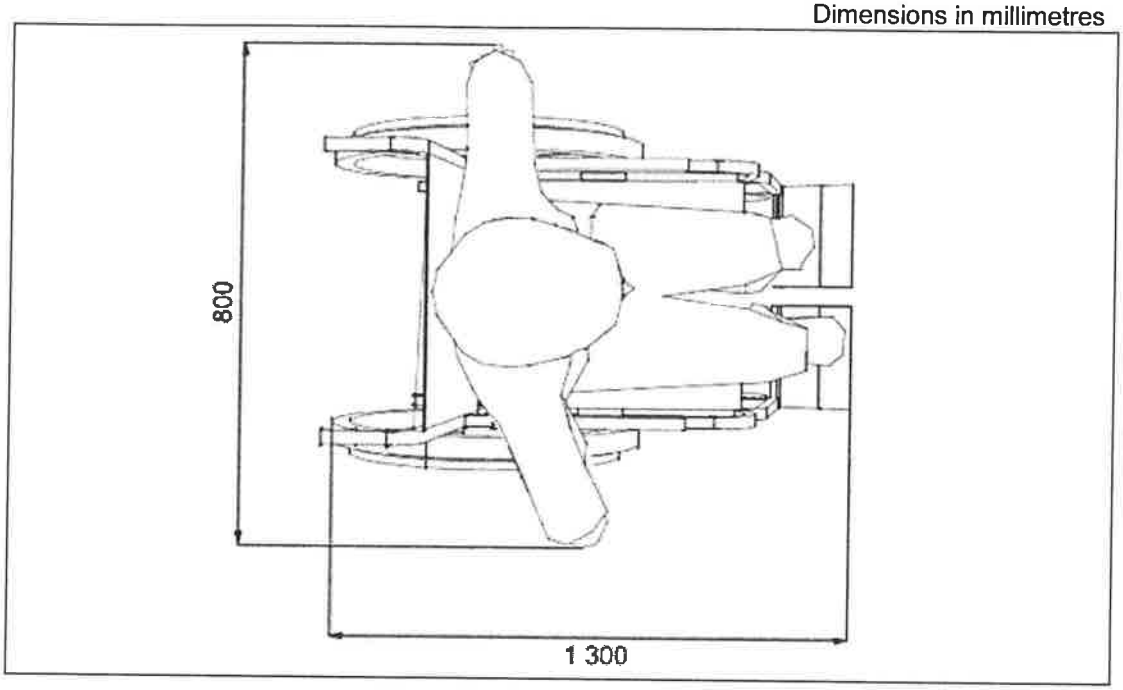


Figure B.1 Footprint of a wheelchair user

B.6.2 Space allowance for wheelchair users

Wheelchairs have different dimensions and space requirements depending on the user and the type of wheelchair. The type of wheelchair used is dependent on whether the wheelchair is to be used outdoors or indoors.

This standard does not cater for people who need special adaptations to their wheelchair, for example, if 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.

The circulation space requirements of wheelchair users should be established by taking into account the maximum overall dimensions of the wheelchair as shown in Figure B.1.

When wheelchairs are pushed, the total length occupied by the chair and occupant is 1 500 mm, when stationary and 1 750 mm when moving.

To propel a manual wheelchair, a clearance of not less than 50 mm, and preferably 100 mm, is needed. Over longer travel distances, additional space may be required.

The area required for turning is dependent on the ability of the user to manoeuvre the wheelchair. Often turning is done with several movements with the wheelchair, including reversing. The area needed is dependent on the number of backing operations.

Figure B.2 gives examples of simplified 180° space requirements of persons in different types of wheelchairs.

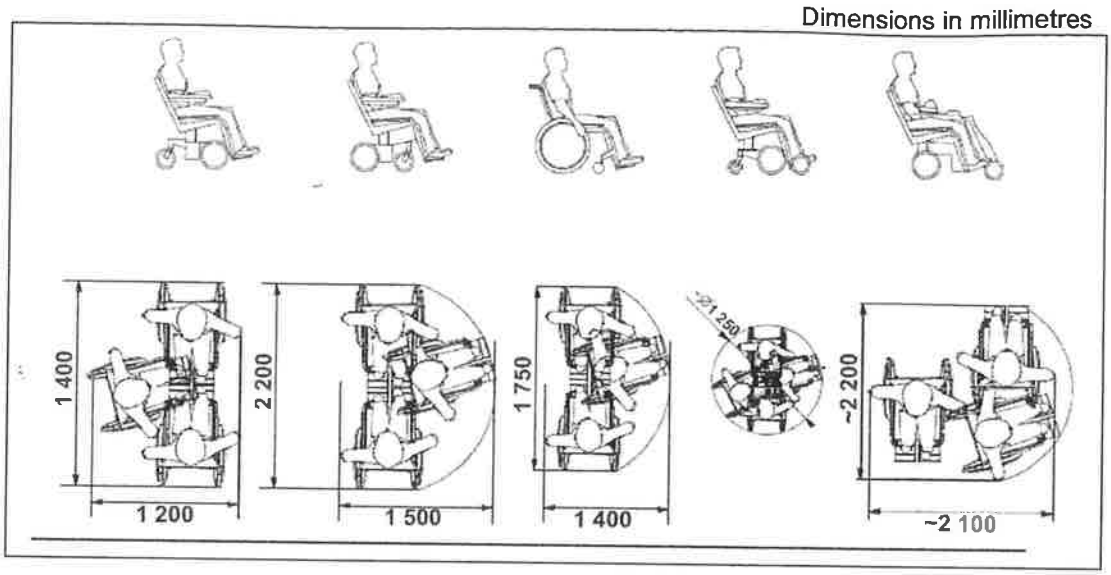


Figure B.2. Examples of simplified 180° space requirements of persons in different types of wheelchairs

B.6.3 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 limited mobility in their arms or limited balance makes it difficult to lean forward without risk of falling from the wheelchair.

The comfortable reach of a wheelchair user is between 400 mm to 1 100 mm above floor level and a maximum side reach of 250 mm from the outer side of the wheelchair.

To allow front approach to elements by wheelchair users, sufficient space should be provided below the element to allow for the wheelchair user's knees and preferably the armrests of the wheelchair.

B.6.4 Reach of users seated in wheelchairs - Distance from corner and other barriers

The ability to reach anything in the corner of a room is limited by the wheels or the foot rest of the wheelchair.

The maximum distance a wheelchair user can reach towards any wall or corner depends on the size of the wheelchair and the person's mobility in the arms.

B.6.5 Space around elements to provide reachability

A manoeuvring space of 1 500 mm diameter should be provided where needed.

A minimum unobstructed width for side approach of at least 900 mm should be provided.

B.6.6 Space to provide clearance for wheelchair user's knees

At desks and counters, tables or public telephones, sufficient space should be provided below the item in question to provide clearance for the wheelchair user's knees and, preferably, the wheelchair armrests so as to allow maximum reach.

Where only knee space is required (as in the case of washbasins and counters), the space under the work surface 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.6.7 Convenient height of worktops

For wheelchair users, the height of worktops should be between 740 mm and 800 mm.

B.6.8 Eye level

The eye level of a seated person is between 990 mm and 1 250 mm. This dimension should be taken into account in elements such as windows, information desks, counters, glazed doors and mirrors.

B.7 Visual contrast

B.7.1 General

Appropriate use of visual contrast between adjacent colours and/or surfaces allows persons with visual impairments to gather the information they need but also assists all users to move around, identify features and communicate with others.

People with visual impairments may be unable to perceive some or all colours. However many visually impaired people can perceive light and dark. The main feature of a surface, which appears to be strongly correlated with the ability of partially sighted people to identify differences in colour, is the amount of light the surface reflects, or its light reflectance value (LRV). Differences in hue (the nature of the colour) or chroma (the intensity of the colour) alone do not provide adequate visual contrast.

The provision of good lighting is essential for the perception of visual contrast. Adequate illumination is required to provide an adequate LRV sometimes called the Luminous Reflectance Value as defined as CIE Y. In general, where the level of illumination is low, a higher level of visual contrast is required.

It is for reasons of weathering, plus variations in lighting levels (e.g. in strong sunlight or after dark) that, externally, differences in LRV should be assessed in the same way as they are under controlled internal conditions. However, it is still considered good practice to adopt the recommended LRV differences, as shown in Table 5, in the external environment.

The exterior and interior environment, particularly markings, should be well maintained.

B.8 Indoor air quality (IAQ)

Poor indoor air quality (IAQ), an important factor in relation to building related ill health (also known as "sick building syndrome"), can cause serious health impairments and severely restrict a person's participation in everyday activities, e.g. work.

Symptoms and signs may include the followings:

a) irritation of eyes, nose and throat;

b) respiratory infections and cough;

c) voice hoarseness and wheezing;

d) asthma;

e) dry mucous membrane and skin;

f) erythema (reddening or inflammation of the skin);

g) lethargy;

h) mental fatigue and poor concentration;

i) headache;

j) stress;

k) hypersensitivity reactions, i.e. allergies;

l) nausea and dizziness; and

m) cancer.

These symptoms and signs are present in the population at large, but are distinguished by being more prevalent in some building users, as a group, when compared with others. The symptoms and signs may disappear, or may be reduced in intensity, when an affected person leaves the building. It is not necessary for everyone in a building to be affected before building related ill health is suspected.

The indoor pollutants considered include human bio-effluents, which have often been the principal consideration in air quality and ventilation design, but also the groups and sources of pollutants which can reasonably be anticipated to occur in the building during its long life cycle.

These pollutants, depending on the sources present, may include the followings:

a) volatile organic compounds (VOCs) and other organics, such as formaldehyde;

b) environmental tobacco smoke (ETS);

c) natural radon, consisting of a number of different isotopes, an invisible radioactive gas found in the soils under buildings, water supplies to buildings and in the air;

d) other inorganic gases, such as carbon monoxide (CO), the oxides of nitrogen (NOx), and low-level ozone (smog) which is formed when NOx and VOCs react in the presence of sunlight;

e) viable particles, including viruses, bacteria and fungal spores;

f) non-viable biological pollutants, such as particles of mites or fungi and their metabolic products; and

g) non-viable particles, such as dusts and fibres.

B.9 Allergy related materials

Buildings and their installations shall be designed so that necessary conditions for less allergy related materials in rooms which are in frequent use by human beings are created and determined on the basis of the intended use of the room. People with allergies or certain sensitiveness are more dependent on good air quality with less pollutants or unpleasant smells and allergy related materials than other persons.

The use of materials with high emission levels is to be avoided. Materials that do not emit large quantities of pollutants or emissions should be selected.

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

Avoid perfumed products and implement a "scent-free" policy including for example soap used on toilets and scent-free cleaning products or such additives in the climatic system. Devices that emit scents should be avoided.

Annex C
(informative)

Circulation spaces at doorways

C.1 General

On every accessible path of travel, sufficient circulation spaces should be provided in both directions at doorways.

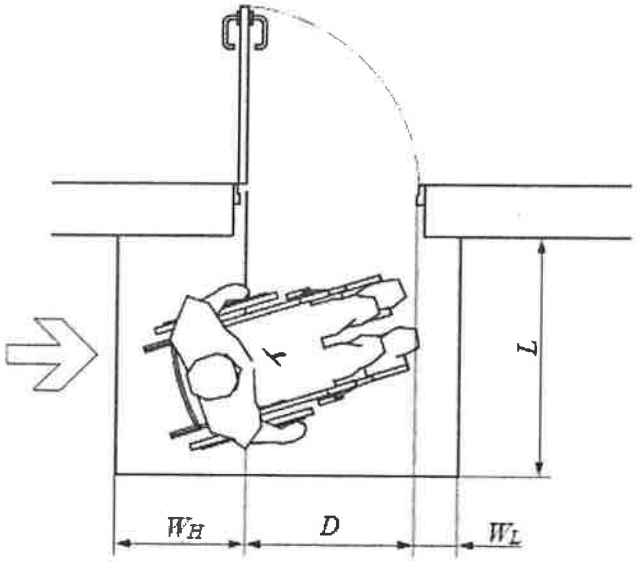
Basic guidance on the minimum horizontal manoeuvring space of an entrance doorway is given in 10.7. This annex provides alternative openings and constructions. Recommendations are given for swinging doors, as well as for sliding doors, and the way of approaching the door is considered.

According to 18.1.3, a manoeuvring space of 700 mm should be provided between the leading edge of the door and the wall that is perpendicular to the doorway, other dimensions are considered in this annex, because it provides alternative solutions. Nevertheless, when stating the compliment with this standard, the requirements given in 18.1.3 should always be fulfilled.

C.2 Swinging doors

The clear circulation space at doorways with swinging doors is based on the unobstructed width of the doorway (D). The clear circulation space should not be less than the dimensions specified in Figures C.1 to C.8 for the appropriate unobstructed width (D).

Dimensions in millimetres

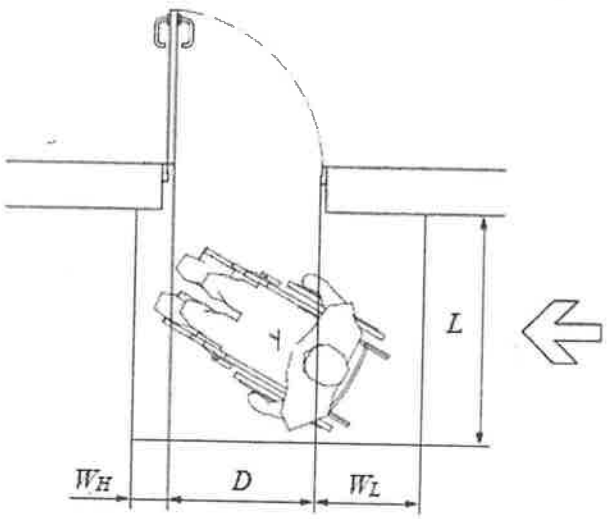


Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm)[a] W_L
800 (retrofitting)	1 260	610	340
850	1 220	560	340
900	1 185	510	340
950	1 160	460	340
1 000	1 140	410	340

[a] Informative only. See requirements given in 18.1.3.

Figure C.1. Circulation spaces at doorways with swinging doors - Hinge-side approach: door opens away from user

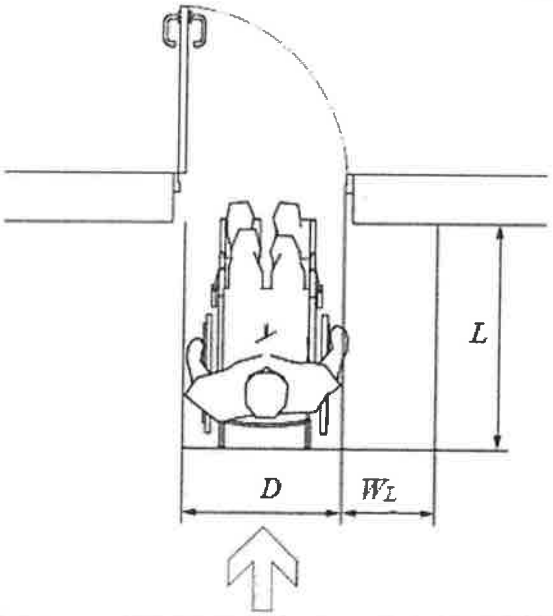
Dimensions in millimetres



Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm) W_L
800 (retrofitting)	1 270	200	660
850	1 240	240	660
900	1 210	190	660
950	1 175	140	660
1 000	1 155	90	660

Figure C.2. Circulation spaces at doorways with swinging doors - Latch-side approach: door opens away from user

Dimensions in millimetres

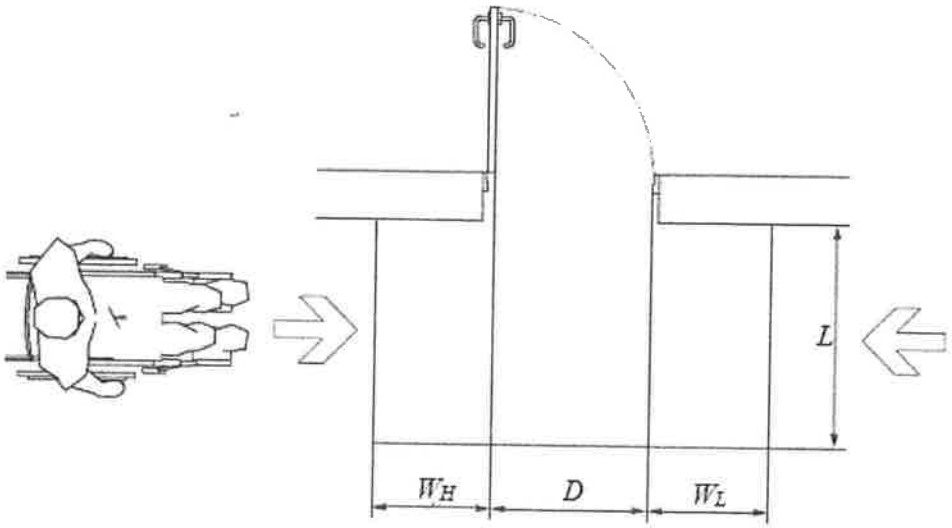


Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm)[a] W_L
800 (retrofitting)	1 450	0	510
850	1 450	0	510
900	1 450	0	510
950	1 450	0	510
1 000	1 450	0	510

[a] Informative only. See requirements given in 18.1.3.

Figure C.3. Circulation spaces at doorways with swinging doors - Front approach: door opens away from user

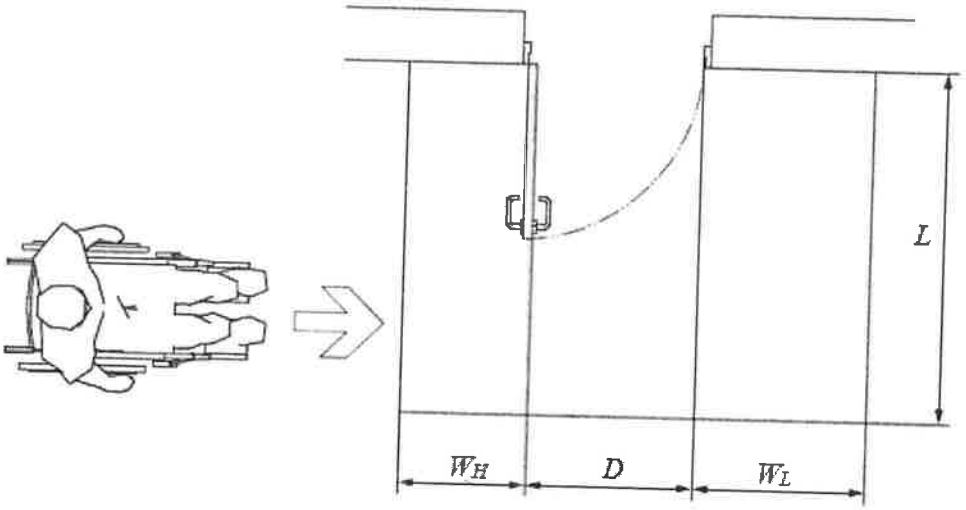
Dimensions in millimetres



Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm) W_L
800 (retrofitting)	1 270	610	660
850	1 240	560	660
900	1 210	510	660
950	1 175	450	660
1 000	1 155	410	660

Figure C.4. Circulation spaces at doorways with swinging doors - Either approach: door opens away from user

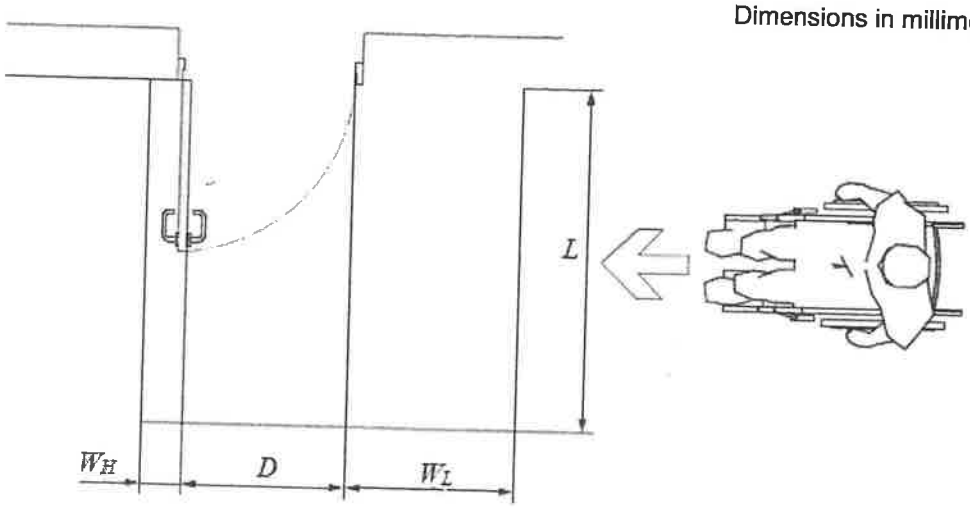
Dimensions in millimetres



Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm) W_L
800 (retrofitting)	1 670	670	900
850	1 670	660	900
900	1 670	610	900
950	1 670	560	900
1 000	1 670	510	900

Figure C.5. Circulation spaces at doorways with swinging doors - Hinge-side approach: door opens towards user

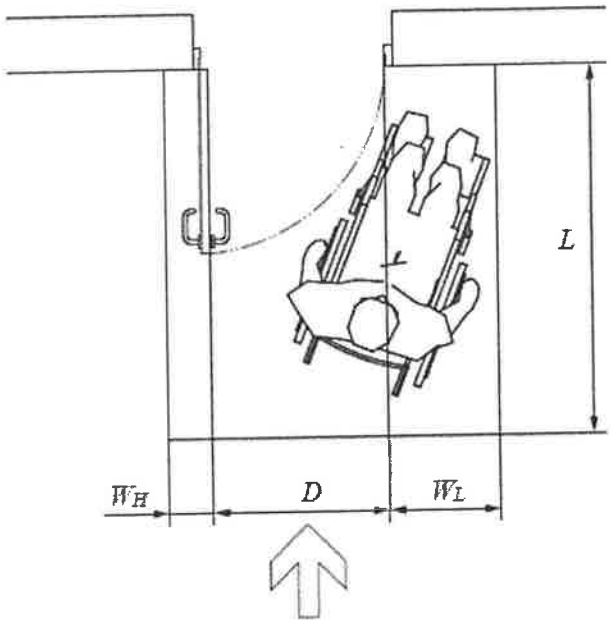
Dimensions in millimetres



Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm) W_L
800 (retrofitting)	1 670	110	900
850	1 670	110	900
900	1 670	110	900
950	1 670	110	900
1 000	1 670	110	900

Figure C.6. Circulation spaces at doorways with swinging doors - Latch-side approach: door opens towards user

Dimensions in millimetres

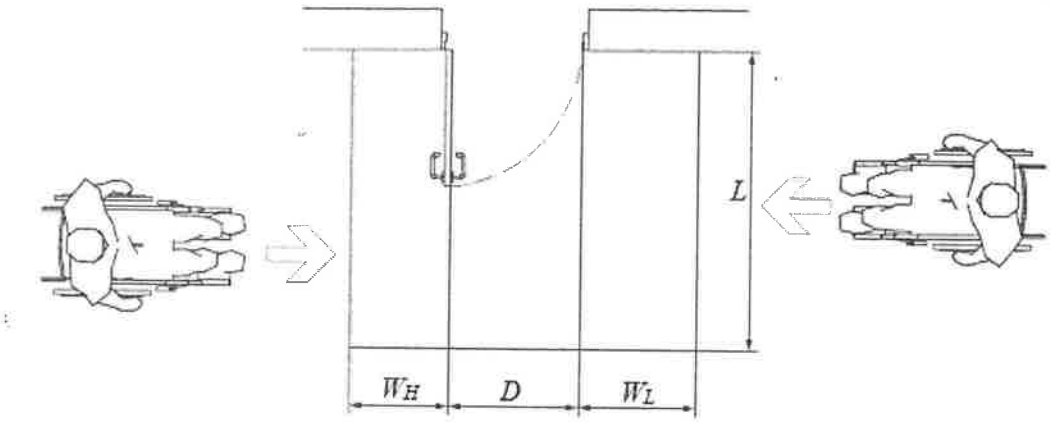


Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm)[a] W_L
800 (retrofitting)	1 450	110	530
850	1 450	110	530
900	1 450	110	530
950	1 450	110	530
1 000	1 450	110	530

[a] Informative only. See requirements given in 18.1.3.

Figure C.7. Circulation spaces at doorways with swinging doors - Front approach: door opens towards user

Dimensions in millimetres



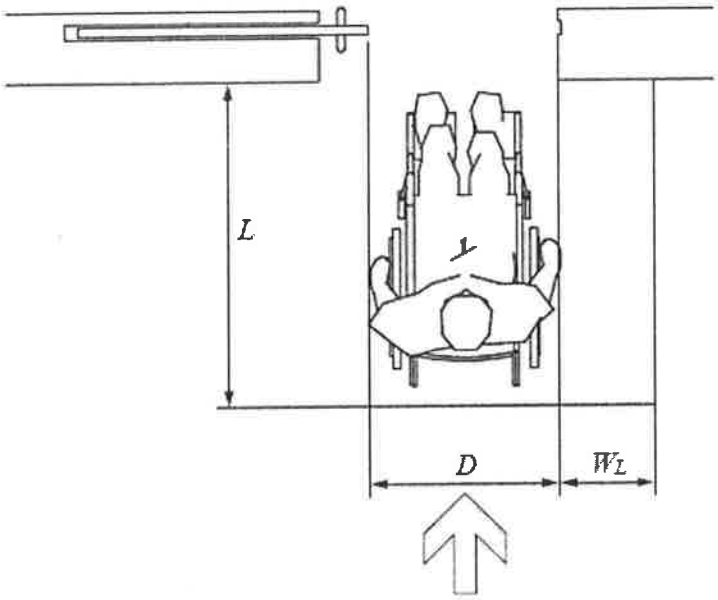
Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm) W_L
800 (retrofitting)	1 670	710	900
850	1 670	660	900
900	1 670	610	900
950	1 670	560	900
1 000	1 670	510	900

Figure C.8. Circulation spaces at doorways with swinging doors - Either approach: door opens towards user

C.3 Sliding doors

The clear circulation space at doorways with sliding doors is based on the unobstructed width of the doorway (D). The clear circulation space should not be less than the dimensions specified in Figures C.9 to C.12 for the appropriate unobstructed width (D).

Dimensions in millimetres

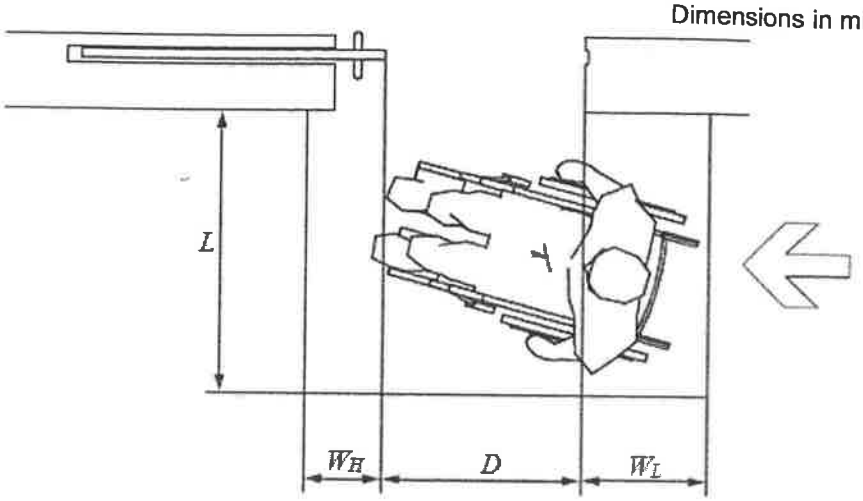


Dimension (mm) *D*	Dimension (mm) *L*	Dimension (mm) W_H	Dimension (mm)[a] W_L
800 (retrofitting)	1 450	0	530
850	1 450	0	530
900	1 450	0	530
950	1 450	0	530
1 000	1 450	0	530

[a] Informative only. See requirements given in 18.1.3.

Figure C.9. Circulation spaces at doorways with sliding doors - Front approach

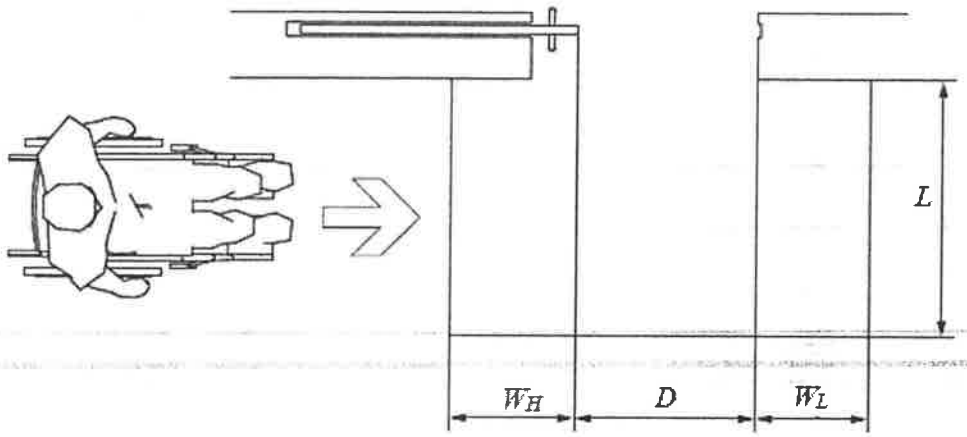
Dimensions in millimetres



Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm) W_L
800 (retrofitting)	1 230	190	660
850	1 230	185	660
900	1 230	180	660
950	1 230	180	660
1 000	1 230	180	660

Figure C.10. Circulation spaces at doorways with sliding doors - Latch-side approach

Dimensions in millimetres

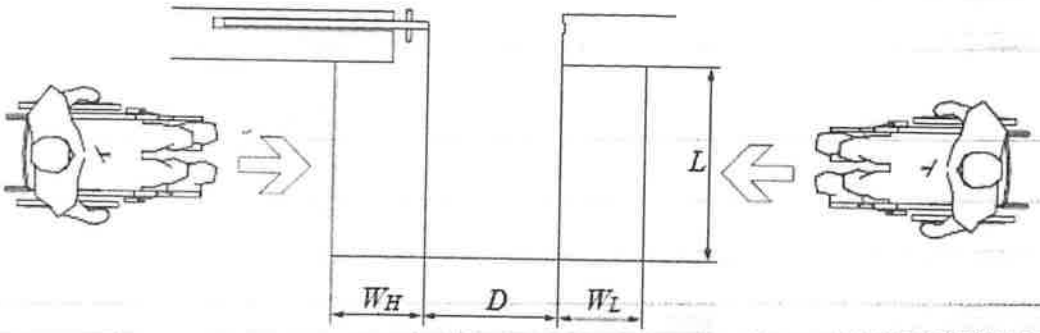


Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm)[a] W_L
800 (retrofitting)	1 280	710	395
850	1 280	660	395
900	1 280	610	395
950	1 280	560	395
1 000	1 280	510	395

[a] Informative only. See requirements given in 18.1.3.

Figure C.11. Circulation spaces at doorways with sliding doors - Slide-side approach

Dimensions in millimetres



Dimension (mm) D	Dimension (mm) L	Dimension (mm) W_H	Dimension (mm) W_L
800 (retrofitting)	1 280	710	660
850	1 280	660	660
900	1 280	610	660
950	1 280	560	660
1 000	1 280	510	660

Figure C.12. Circulation spaces at doorways with sliding doors - Either approach

Annex D
(normative)

Fire safety and assisted evacuation for all in buildings

D.1 Fire safety, protection and evacuation for all

D.1.1 Human behaviour in fire emergencies

The "real" people who use "real" buildings every day of every week, in all parts of the world, have widely differing ranges of human abilities and activity limitations. They are different from each other, and they react differently in a fire emergency.

All building users should be made aware of evacuation procedures.

Meaningful consultation with every person known to occupy or use a building, for the purposes of receiving his or her active co-operation and obtaining his or her informed consent (involving a personal representative, if required), is an essential component of adequate pre-planning and preparation for a fire emergency.

Warnings of any fire incident in a building should be communicated as soon as is practicable after the initiation of a fire incident and should continue for the full duration of the incident. Warnings should be informative, and be easily assimilated in a form (e.g. oral, written, Braille) and language understood by the people using the building.

D.1.2 Building design for accessibility and reliability

Accessibility design guidelines should be applied to the design of all fire evacuation routes, horizontal and vertical, inside the building and externally to a place of safety (see 3.48).

As some people with mobility impairments may potentially have to wait for assistance in a building which is on fire, the fire protection measures and fire management systems in an occupied building should be reliable. In other words, when assessing the ability of a design to achieve the stated objectives for all populations, the evaluation should consider the reliability of every element as well as its presence or absence and its effectiveness.

NOTE. Ten percent of people using the building (occupants, visitors and other users) may have an impairment (visual or hearing, physical function, mental, cognitive or psychological, with some impairments not being identifiable, e.g. in the case of anosognosia).

Throughout the duration of a fire incident and for a specified period afterwards, the accessibility of available fire evacuation routes, inside the building and externally to a "place of safety", should be maintained. When assessing the ability of a design to achieve the stated objectives, the evaluation should consider the potential for loss of evacuation route availability or capacity as a result of other actions, including firefighter access, rescue, and fire fighting operations.

D.2 Assisted evacuation and rescue from buildings - Rescue techniques

Fire fighters have two principal functions as follows:

a) rescuing people who are trapped in buildings, or who for some reason cannot independently evacuate a building which is on fire, and

b) fighting fires.

People with disabilities are participating more and more, and in ever increasing numbers, in mainstream society. It is recommended that firefighters receive training in how best to rescue a person with a disability from a building, using procedures and equipment which should not cause further harm or injury to that person.

Manual handling of wheelchairs occupied by their users in a fire evacuation staircase, even with adequate training for everyone directly and indirectly involved, is hazardous for the person in the wheelchair and those people giving assistance.

Local fire authorities should ensure that they possess the necessary equipment to rescue people with a wide range of impairments, and that specialised rescue equipment is regularly serviced and maintained. Every fire authority should have an 'accessible' and 'reliable' emergency call system which is available at all times to the public.

It is essential that every firefighter be fully aware of this important public safety issue, and be regularly trained in the necessary rescue procedures involving people with a wide range of impairments.

D.3 Management of fire evacuation lifts in buildings

Designated lift to be used for the fire evacuation of people with activity limitations and/or with impaired senses should be operated under the strict direction and control of building management.

It is essential that the lift be able to continue to operate effectively and safely for a specified time during a fire, and that it is taken only to those floors where it is necessary for building personnel to evacuate a person by lift.

For such a management system to work properly, a suitable number of trained and experienced "fire wardens" should be designated on each floor of a building. They should be competent to carry out their duties in a fire emergency, and should be available at all times when the building is occupied.

Designated lift used for fire evacuation should be fitted with an accessible and reliable communications system, which facilitates direct contact with a person in the main fire and security centre for the building.

If an evacuation lift fails to arrive at a floor landing, or access to it on any floor is obstructed by fire and/or smoke, an evacuation staircase should be used. Should the lift remain safe to use, it may only be necessary to descend to the floor below the fire using an evacuation staircase, and from there continue the descent by lift.

D.4 Evacuation skills and self protection from fire in buildings

A "skill" is the ability of a person, resulting from adequate training and regular practice, to carry out complex, well-organised patterns of behaviour efficiently and adaptively, in order to achieve some end or goal.

Building users should be skilled for evacuation to a "place of safety", which is at a safe distance from the building (see 3.48). Non-emergency/test evacuations should be carried out sufficiently often to equip building users with this skill.

Fire protection measures and human management systems are never 100 % reliable. It is necessary, therefore, especially for people with activity limitations and/or impaired senses, to be familiar with necessary guidelines for self-protection in the event of a fire emergency.

Annex E
(normative)

Management and maintenance issues

E.1 General

The following management, maintenance, communication and policy issues are important factors in ensuring that a building is easily accessed and used by disabled people.

E.2 External issues

The following external issues shall be ensured:

a) keeping external routes, including tactile ground surface indicators, steps and ramps, clean, unobstructed and free of surface water, dead leaves, lichen, debris, etc.

b) in car parking areas: ensuring that designated spaces are not being used by non-disabled motorists;

c) where possible, allocating specific designated parking spaces to individual employees, marked by name or number;

d) checking side-hung doors accompanying revolving doors to ensure they are not kept locked; and

e) making available auxiliary aids such as portable ramps, and removing them when not in use.

E.1.2 Internal issues

The following internal issues shall be ensured:

a) that wheelchair spaces are available in seating areas;

b) that staff understand the management issues relating to disabled people, including emergency procedures;

c) ensuring that storage, planters, bins, etc., do not obstruct circulation space, WCs or lift call buttons;

d) ensuring that cleaning and polishing does not produce a slippery surface;

e) ensuring that trip hazards, such as at junctions between floor surfaces, are removed;

f) ensuring access between moveable tables in refreshment areas;

g) ensuring that in sanitary facilities, written instructions on the use of equipment is displayed beside each item;

h) ensuring in sanitary facilities, that information is available on the type of sling connector and the types of sling that are compatible with their installed hoist and track;

i) ensuring that a procedure is set up to respond to alarm calls from sanitary accommodation;

j) ensuring that waterproof mattress covers can be made available for use in accessible bedrooms;

k) ensuring that, where floor sockets are provided (e.g. in meeting rooms), access to sockets is also available at desk level;

l) ensuring that any temporary barriers that are used to channel customers to reception or serving points, and whose configuration needs to be changed frequently, have a semi-rigid top barrier (e.g. a spring-loaded band) which contrasts visually with the background against which it is seen;

m) ensuring that assistance is made available to carry trays where needed in refreshment areas; and

n) ensuring that suitable arrangements are made for assistance dogs while their owners are using leisure facilities.

E.4 Maintenance issues

The following maintenance issues shall be ensured:

a) maintaining doors, door closers and building hardware, including checking that the opening forces of self-closing doors are within acceptable limits;

b) maintaining access control systems;

c) checking floor surfaces, matting, surface-mounted carpets, etc., re-fixing to the floor where necessary, and replacing where damaged or worn (particularly at entrances to buildings). Avoid locating surface-mounted door mats in front of toilet doors and all doors;

d) maintaining hearing enhancement systems;

e) maintaining sanitary fittings, including checking that toilet seats are securely fixed, cleaning tap nozzles to ensure correct water flow, emptying and cleaning bins, and keeping equipment clean;

f) that adjustable shower heads are lowered to be ready for the next user;

g) that emergency assistance pull cords are kept fully extended and in working order at all times;

h) checking the mountings of all grab rails, and the mechanism of drop-down rails, re-fixing or replacing where necessary;

i) servicing of all types of lifts and hoists;

j) ensuring that facilities, such as lifts, hoists, etc., are in working order between servicing schedules, and providing alternative arrangements in case of facilities being out of order;

k) maintaining ventilation and heating equipment;

l) replacing defunct light bulbs and flickering fluorescent tubes quickly. Toilet room should be well lighted and avoid using sensor for the lighting;

m) keeping windows, lamps and blinds clean to maximise lighting; and

n) open drains, especially deep ones, are hazardous to the visual impaired. Therefore, they should be covered at all times.

E.5 Communication issues

The following communication issues shall be ensured:

a) providing of information on strobe lighting prior to entry;

b) removing and/or changing of signage as necessary, e.g. when departments relocate;

c) providing of accurate information on facilities prior to arrival;

d) providing of audio description services;

e) providing of all relevant literature, and reviewing/revising it when necessary;

f) that a permanently manned position is available for the emergency lift telephone communications;

g) updating of maps of buildings following changes; and

h) replacing of signs correctly after decoration.

E.6 Policy issues

The following policy issues shall be ensured:

a) allocating and reviewing of parking spaces;

b) changing of signs when departments move;

c) review of the number of disabled people attending and needing facilities;

d) reviewing the number of instruments supporting infra red systems;

e) adopting a signage policy;

f) having the loop position always manned in branches;

g) providing portable ramps;

h) arranging audits of journeys made by visitors;

i) instructing accessibility audits;

j) ensuring that services are provided when facilities such as lifts break down;

k) ensuring that responsibilities are defined within the organisation;

l) ensuring that accessibility improvements are picked up whenever possible during maintenance and refurbishment work;

m) reviewing and improving evacuation procedures;

n) training of staff;

o) reviewing all policies, procedures and practices periodically;

p) reviewing the provision of auxiliary aids; and

q) considering the impact of background noise (e.g. music, equipment, ventilation) on people with a range of sensory conditions (hearing, vision, autism). This is especially important in areas where voice communication is necessary, such as reception, meeting and learning spaces.

Annex F
(informative)

Design guidelines for children with disabilities

F.1 Application

F.1.1 These guidelines are intended to apply to buildings or premises, such as kindergartens, pre-schools or primary schools, where children are the principal or predominant users.

F.1.2 Where such buildings or premises are required to be made accessible to children with disabilities, it is recommended that the provisions and facilities should be designed in accordance with the details and specifications in these design guidelines.

F.2 Interpretation

F.2.1 The term "children with disabilities" in the context of this standard should be taken to mean children between the ages of 3 to 12 who are:

a) wheelchair bound; or

b) ambulant disabled.

F.2.2 The specifications contained in this annex are based on anthropometrics for children with disabilities.

F.3 Handrails/grab bars

F.3.1 A second set of handrails should be provided at approach ramps and staircases at an appropriate height to assist children with disabilities and help prevent accidents.

F.3.2 The handrails should be fixed at a maximum height of 700 mm measured vertically from the ramp surface or pitch line of the stairs to the top of the handrails.

F.3.3 Where grab bars are required, the height should meet the need of specific age groups as recommended in Table F.1.

Table F.1. Grab bar height

Age (years)	Height of grab bar (mm)
3 to 6	450 to 580
7 to 12	580 to 700

F.3.4 The grab bars should have a diameter between 30 mm to 35 mm or any shape that provides an equivalent gripping surface.

F.4 Seating space

F.4.1 Clear floor space

F.4.1.1 Seating space, such as those provided at counters, tables, or work surfaces for children in wheelchairs should have a clear floor space 900 mm wide by 1 200 mm deep.

F.4.2 Clear knee space

F.4.2.1 Where a forward approach is used, a clear knee space of at least 700 mm wide by 400 mm deep by 680 mm high should be provided.

F.4.3 Counter tops

F.4.3.1 Writing surface or service counters should be at a height between 700 mm to 780 mm from the floor.

F.5 Drinking fountain

F.5.1 The spout opening of a drinking fountain should be located at the front of the unit between 740 mm to 780 mm from the floor or ground surface.

F.6 Sanitary provision

F.6.1 Water closet compartment

F.6.1.1 Water closets should comply with the requirements of clause 4.7. The distance between the centre line of the water closet to the adjacent wall shall comply with Table F.2.

Table F.2. Water closet centre line

Age (years)	Centre line (mm)
3 to 6	300 to 350
7 to 12	350 to 450

F.6.2 Height of water closet seat

F.6.2.1 The height of water closet seat for the ambulant disabled should comply with Table F.3:

Table F.3. Toilet seat height

Age (years)	Centre line (mm)
3 to 6	290 to 400
7 to 12	400 to 450

F.6.2.2 The height of water closet seat of 450 mm to 480 mm is recommended for wheelchair users to facilitate transfer.

F.6.3 Application of specifications

F.6.3.1 The specifications of one age group should be applied consistently in the installation of a water closet and related elements.

NOTE. The specifications for water closets suitable for children with disabilities should reflect the difference in size, stature and reach of children aged 3 to 12.

F.6.4 Water closets grab bars

F.6.4.1 Water closets should be provided with grab bars that comply with the following requirements:

a) one horizontal grab bar to be mounted at a height between 260 mm and 280 mm from the top of the water closet seat or at a height between 680 mm to 740 mm above the floor level on the side wall closest to the water closet and extending from the rear wall to at least 450 mm in front of the water closet seat;

b) one flip-up grab bar to be mounted on the side of the compartment adjacent to the water closet at a height between 680 mm to 740mm above the floor level when lowered from the wall and 360 mm to 400 mm to the centre line of the water closet;

c) a vertical or oblique bar of 400 mm to 500 mm long should be provided on the side wall closest to the water closet and the lower end should be at a height of 650 mm from the floor and 450 mm in front of the water closet seat; and

d) another horizontal grab bar to be mounted on the wall behind the water closet at a height between 680 mm and 740 mm and be at least 750 mm long.

F.6.5 Urinal

F.6.5.1 At least one urinal mounted at a height of not more than 400 mm from the finished floor level, as illustrated in Figure F.1, should be provided for young children.

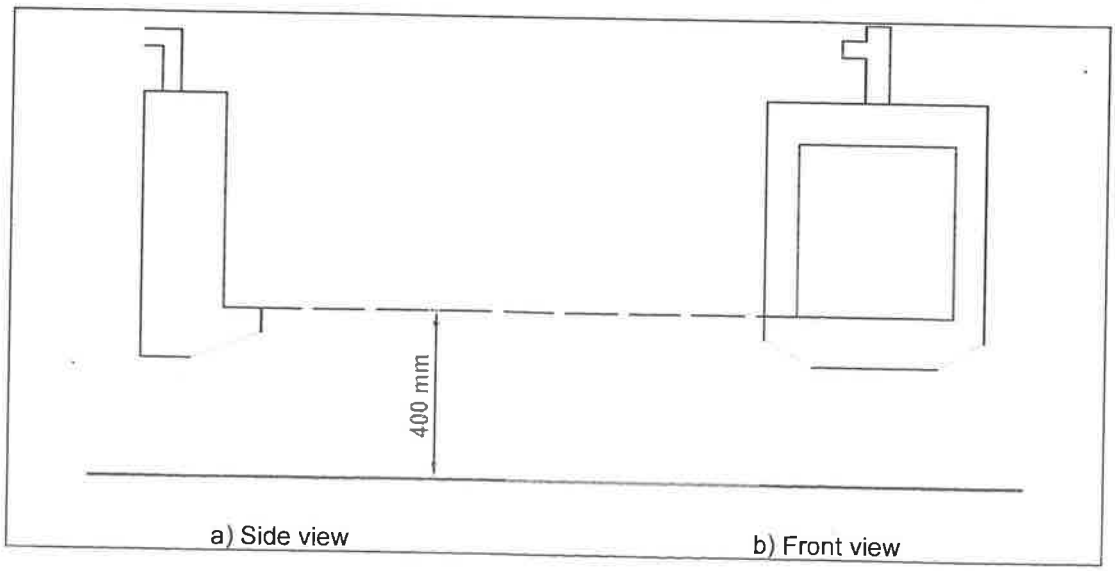


Figure F.1. Urinal for ambulant disabled

F.6.6 Wash basin

F.6.6.1 The wash basin for wheelchair users should have a knee clearance of at least 700 mm wide, 400 mm deep and 680 mm high and the rim or counter surface of the wash basin should not be higher than 780 mm.

F.6.6.2 The height of the wash basin for ambulant disabled should not be higher than 550 mm.

F.6.6.3 A wash basin with adjustable height is more appropriate to serve the needs of different age groups.

F.6.7 Mirror

F.6.7.1 If a mirror is to be provided for both ambulant disabled and wheelchair users, the height from the floor level to the top most edge should be at least 1 900 mm high.

F.6.7.2 A clear floor space of 900 mm by 1 200 mm for a forward approach should be provided in front of the full-length mirror. No door should swing into this clear floor space.

NOTE. A single full-length mirror should be able to accommodate all people, including children and adults.

F.6.7.3 The bottom edge of the reflecting surface of the mirror should be no higher than 800 mm above the finished floor level or at the lowest mounting height permitted by fixtures and related elements.

F.7 Children's reach range

F.7.1 Where building elements, such as coat hooks, lockers, or controls and operating mechanisms are designed for use by children with disabilities the dimensions in Tables F.4 and F.5 should provide guidance on reach ranges for children according to their age groups. These dimensions apply to either forward or side reaches.

Table F.4. Forward reach

Age (years)	Reach (low)	Reach (high)
3 to 6	500	900 to 1 000
7 to 12	400	1000 to 1 100

Table F.5. Side reach

Age (years)	Reach (low)	Reach (high)
3 to 6	500	960 to 1 070
7 to 12	400	1 070 to 1 170

F.8 Lift

F.8.1 Lift control panel

F.8.1.1 The lift control panel for children with disabilities should be placed at a height between 800 mm and 1 000 mm from the floor level.

F.9 Public telephone

F.9.1 Height

F.9.1.1 The height of the operable parts of a telephone should be between the height of 800 mm to 1 000 mm.

F.10 Tuckshop/canteen

F.10.1 Height of tables or counters

F.10.1.1 The top of accessible tables and counters should be positioned from 700 mm to 780 mm above the finished floor level or ground.

F.10.2 Seating

F.10.2.1 If seating spaces for wheelchair users are provided at fixed tables or counters, a clear floor space of 900 mm by 1 200 mm should be provided.

F.10.3 Knee clearance

F.10.3.1 A clear knee space of at least 700 mm wide by 400 mm deep by 680 mm high should be provided.

F.11 Computer room

F11.1 Computer table

F.11.1.1 A clear knee space of at least 700 mm wide, 400 mm deep, 680 mm high should be provided.

F.11.1.2 A table with adjustable height is recommended. The computer's central processing unit, monitor, printer should be within the reach of the user in accordance with Tables F.4 and F.5.

F.12 Library

F.12.1 Door/entrance

F.12.1.1 Where revolving doors or turnstiles are provided at an accessible entrance or along an accessible route, an auxiliary side-hung door or accessible gate should respectively be provided adjacent to the revolving doors or turnstiles.

F.12.2 Table and counter

F.12.2.1 An accessible table and counter with a clear knee space of at least 700 mm wide by 400 mm deep by 680 mm high should be provided.

F.12.2.2 The top of accessible table and counter should be from 700 mm to 780 mm above the finish floor level or ground.

F.12.2.3 A table with adjustable height is recommended.

Annex G
(informative)

Design guidelines for person with visual impairment

G.1 Introduction

G.1.1 Where buildings are required to be made accessible, qualified persons and designers are encouraged to adopt the recommendations in these guidelines to help create a conducive environment to meet the needs of persons with visual impairment. It will enable them to move about independently with safety and dignity.

G.1.2 The orientation and mobility of persons with visual impairment will be greatly enhanced by introducing the concept of:

a) visual contrast in building interiors; and

b) tactile ground surface indicators.

G.2 Visual contrast in building interiors

G.2.1 Visual loss and contrast

G.2.1.1 Partial loss of visually impaired can make it very difficult to navigate in and around the built environment, especially in unfamiliar settings. While excessive contrast can create problems of glare, inadequate contrast can make it difficult for persons with low visually impaired to discern objects or details in the environment.

G.2.2 Contrast and interior space

G.2.2.1 Safe and independent use of internal spaces can be greatly enhanced by incorporating effective contrast between building elements, particularly emphasising those elements that need to be identified, operated or interpreted.

G.2.2.2 Walls and ceilings should be finished in plain colours (not complex patterns, which can be confusing) of light tones (to help diffuse light around the room) and matt finishes (to avoid unwanted glare or reflection).

G.2.2.3 Floors should also be relatively plain (both to avoid confusion and to allow easy location of dropped objects), not glossy and a mid-tone to contrast with walls (for example when viewed through an open doorway).

G.2.2.4 Doors should also be a mid-tone to contrast with walls, and skirtings, architraves and door-frames should be a dark tone to help define surface junctions and openings while contrasting with floors, walls and doors.

G.2.2.5 Door handles, light-switches, lift buttons, coat hooks and similar elements should all contrast strongly with their backgrounds. This can be achieved either by having a dark element against a light background or by mounting a light toned operating element on a dark panel, which itself contrasts with a light background.

G.2.2.6 Soft furnishings (for curtains, chairs etc) should contrast with both walls and floors. Introduction of a simple pattern can add life and homeliness to a room but strong patterns can make it difficult to locate spectacles, keys or similar objects placed on the patterned surface.

G.2.3 Types of contrast

G.2.3.1 Contrast refers to perceptible differences between different regions of an image or scene. There are two fundamental types of contrast as follows:

a) luminance or brightness contrast, and

b) colour contrast.

G.2.4 Luminance contrast

G.2.4.1 Luminance contrast is a measure of the relative amounts of light that are reflected from surfaces. Two quite differently coloured surfaces may have a similar luminance.

G.2.4.2 A 30 % difference in luminance is generally the minimum discernible by a person with partial sight. Black and white have a 100 % luminance contrast. Grey and black or grey and white have a 50 % luminance contrast as shown in Figure G.1.

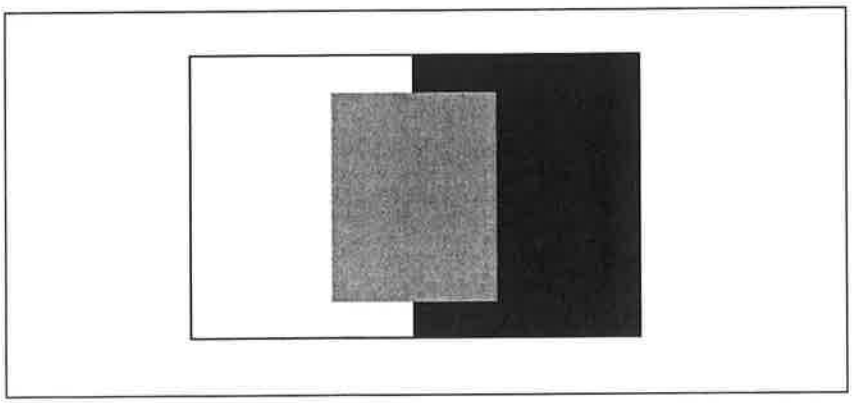


Figure G.1. Effective luminance contrast

G.2.5 Colour contrast

G.2.5.1 Ageing and sight loss diminish the sensitivity of colour perception. Colours that contrast sharply to someone with normal vision may be less distinguishable to a person with low vision.

G.2.5.2 Colours can contrast on the basis of their lightness, saturation or hue. Designers can help to compensate for vision deficits by making colours differ more dramatically in all three attributes. In this context:

a) lightness measures the relative amount of light reflected from a colour;

b) saturation relates to its intensity; and

c) hue refers to elementary colour names, that is red, green, blue, etc.

G.2.5.3 Effective design will maximise lightness differences between foreground and background objects, and avoid using colours of similar lightness adjacent to one another, even if they differ in saturation or hue.

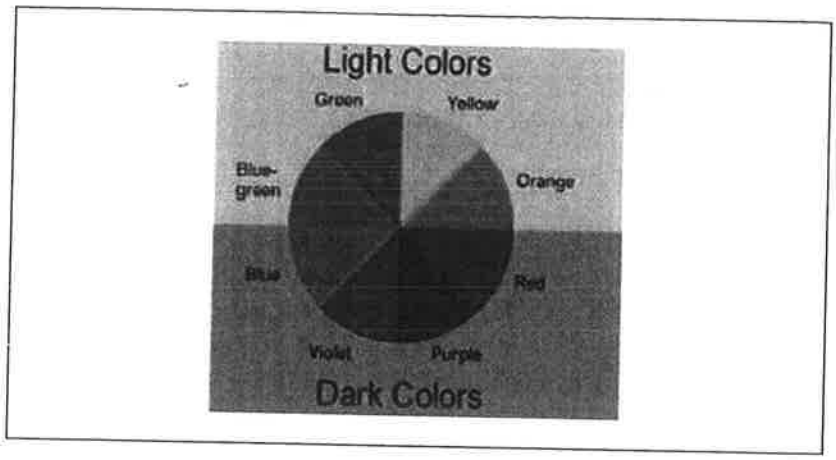


Figure G.2. The hue circle

G.2.5.4 Dark colours from the bottom half of the hue circle contrast best against light colours from the top half. Avoid viewing light colours from the bottom half against dark colours from the top half as shown in Figure G.2. Lightness is the most important attribute in making contrast more effective.

G.2.5.5 Avoid contrasting hues from adjacent parts of the hue circle, especially if the colours do not contrast sharply in lightness as shown in Figure G.3.

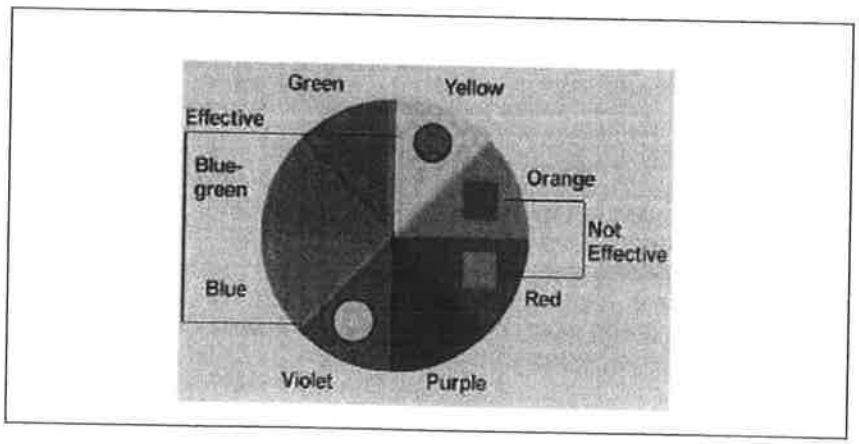


Figure G.3. Effective hue contrast

G.2.5.6 Congenital and acquired colour deficits also make it difficult to discriminate between colours on the basis of saturation. Slate blue, for example, is a desaturated colour because it is similar to grey. A deep blue, even if it has the same lightness as slate blue, has greater saturation as shown in Figure G.4.

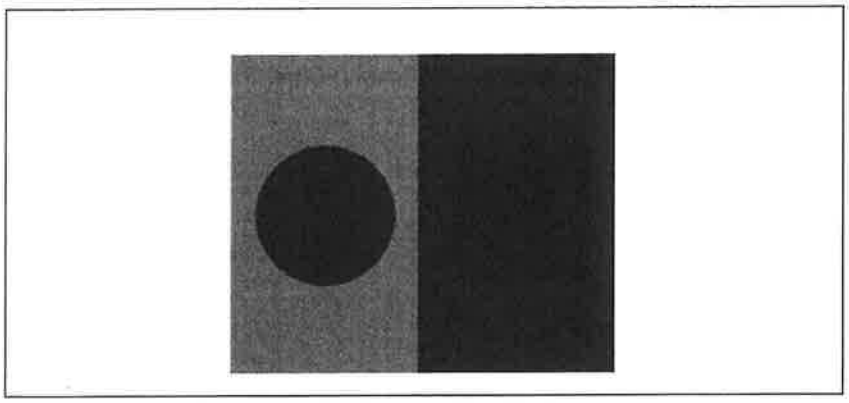


Figure G.4. Saturation contrast

G.2.5.7 To someone with partial sight, the left-hand panel may appear like the righthand panel appears to a person with normal colour vision.

G.2.6 Glare

G.2.6.1 Excessive luminance contrast between interior elements can create glare. Windows, light fittings and reflective surfaces can all impact negatively on vision if not designed appropriately.

G.2.6.2 Direct glare can be minimised by ensuring that strong light sources, such as windows and light fittings are effectively screened.

G.2.6.3 Reflected glare can be reduced by eliminating reflective surfaces especially on floors and walls and by attention to the location of light sources relative to mirrors, glazing and the like.

G.2.7 Lighting

G.2.7.1 Contrast will only be of assistance to people with sight deficits if there is an appropriate quantity and quality of illumination with which to view the contrasting elements. At low light levels, the perception of contrast diminishes.

G.2.7.2 Lighting levels should generally be relatively uniform and about 25 % higher for people with low vision. Strong directional lighting casts shadows that can mask contrasting surfaces. Significant fluctuations in illumination level can reduce visibility due to the slower adaptive response of the eye in someone with low vision.

G.3 Tactile ground surface indicators

G.3.1 Mobility

G.3.1.1 People who are blind or visually impaired strive to maintain the highest possible level of independence. Many people who are blind have some small amount of residual vision and all people with visual impairment will use whatever vision they have, together with other techniques, to find their way around.

G.3.1.2 Some individuals will choose to travel with a sighted guide while others will choose to travel independently. For those who choose to travel independently, continual and extensive use is made of physical or other sensory cues, landmarks and mind maps.

G.3.2 Physical cues

G.3.2.1 Physical structures such as buildings, walls, fences and kerbs can act as cues to assist independent travel. A person using a white cane may be able to follow a fence line from one point to another assuming there is an appropriate clear way immediately adjacent to the fence. Intermittent contact between the fence and the white cane helps to keep the person on the correct line.

G.3.2.2 Physical cues can be identified either by use of a white cane, under foot, or sometimes by eco-location.

G.3.3 Other sensory cues

G.3.3.1 People with low vision are well experienced at gathering and interpreting information from sources other than by sight. In the light of restricted access to visual cues, people with low vision place a much greater emphasis on information obtained via other avenues including touch, sound and smell. Tactile and audible information can be gathered to substitute or enhance visual information. Such information may be provided deliberately or may already occur in a given environment. Where the presence of such information is insufficient to provide adequate assistance, the deliberate provision of additional tactile or audible information may have to be considered.

G.3.4 Landmarks

G.3.4.1 The concept of landmarks is a very important one. By definition, landmarks are unique features in a given location. As such they can be used to assist with orientation. Knowing the location of a landmark and the layout of its immediate surroundings will help those with low vision to orientate to the location and assist their mobility to and through the area.

G.3.5 Mind maps

G.3.5.1 People with low vision make extensive use of mind maps. Even where high quality access features have been provided, it will still be necessary for someone who is blind to be familiar with the location before they would be able to access it independently. Having been to the location with a sighted guide, or had it described to them, the person can build a mind map for future reference. This is a very common form of orientation and mobility technique.

G.3.6 Clear continuous accessible path of travel

G.3.6.1 In essence, a clear continuous accessible path of travel is one that provides a dedicated pedestrian space which is free from barriers, hazards or obstructions.

G.3.6.2 People who are blind or visually impaired, like disabled persons, are looking for access which is predictable, logical and barrier free. If a clear continuous accessible path of travel can be provided to and through a given environment it will greatly enhance independent travel.

G.3.7 Types of tactile ground surface indicator

G.3.7.1 This is one form of tactile indicators which, in essence, provide the blind or visually impaired a physical cue. It is detectable either under foot or by the use of a white cane.

Tactile ground surface indicator is only one source, amongst many, of orientation information. Unlike some other tactile indicators which are basically generic in nature, tactile ground surface indicators have a specific function and impart specific information about the immediate surroundings.

G.3.7.2 Tactile ground surface indicators act as, and is interpreted as, landmarks. There are two types of tactile ground surface indicators as follows:

a) warning indicator; and

b) directional indicator.

G.3.8 Warning indicator

G.3.8.1 Warning indicator, as the name suggests, warn of either a hazard or a destination. For example, a warning indicator near the edge of a staircase landing warns of the edge of the landing which otherwise would pose a significant hazard to a pedestrian with low vision. As the person approaches the edge, the tactile warning treatment will be identified either by the white cane or under foot thus warning of an impending drop to the staircase.

G.3.8.2 The dimensions of a warning indicator are shown in Figure G.5.

G.3.9 Directional indicator

G.3.9.1 Directional indicator is used to direct the user from one point to another along a safe path of travel. It is only required when there are insufficient cues from other sources to achieve the same result. For example, a directional indicator may be used in an open pedestrian plaza to indicate a clear path of travel in the absence of any other cues.

G.3.9.2 The dimensions of a directional indicator are shown in Figure G.6.

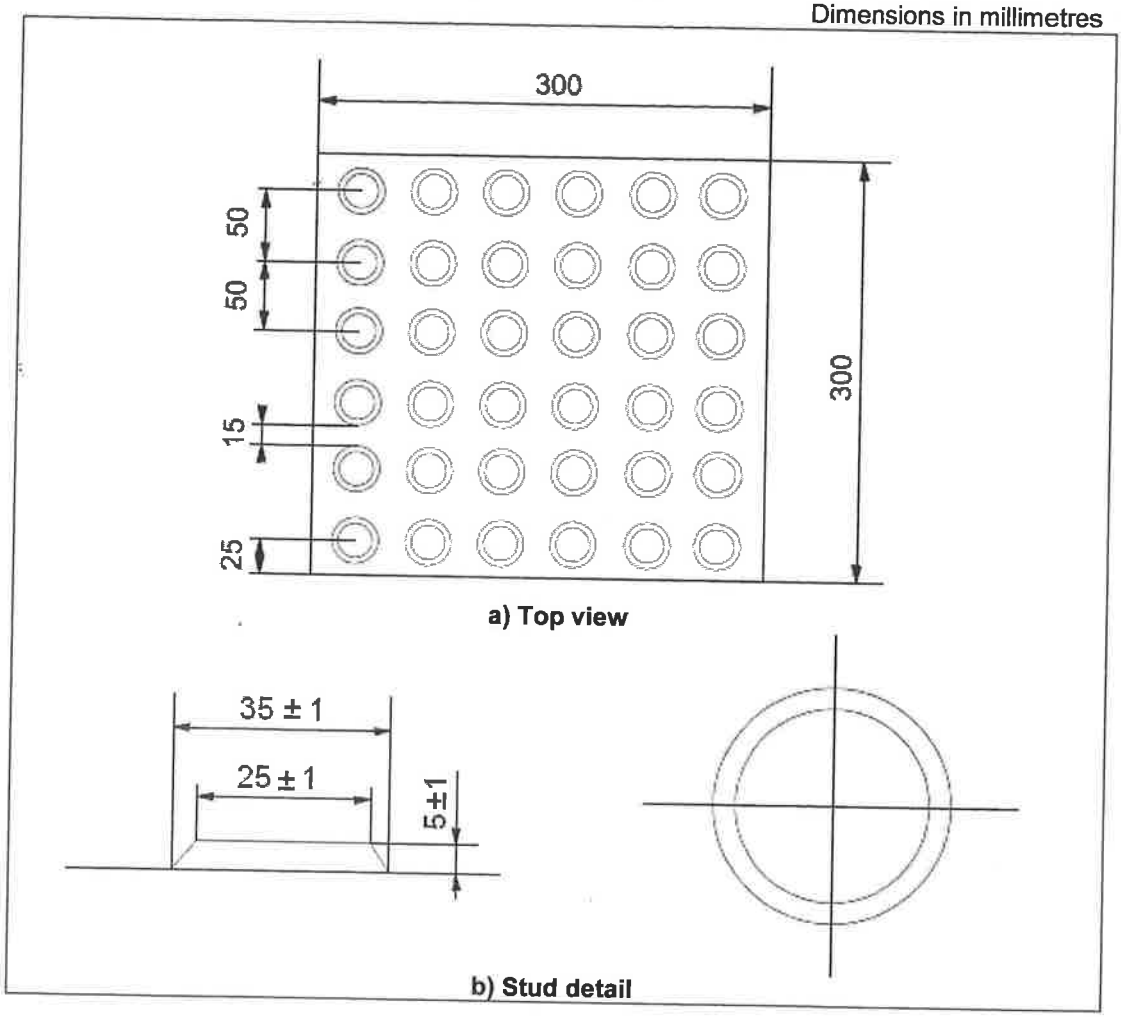


Figure G.5. Warning indicator

Dimensions in millimetres

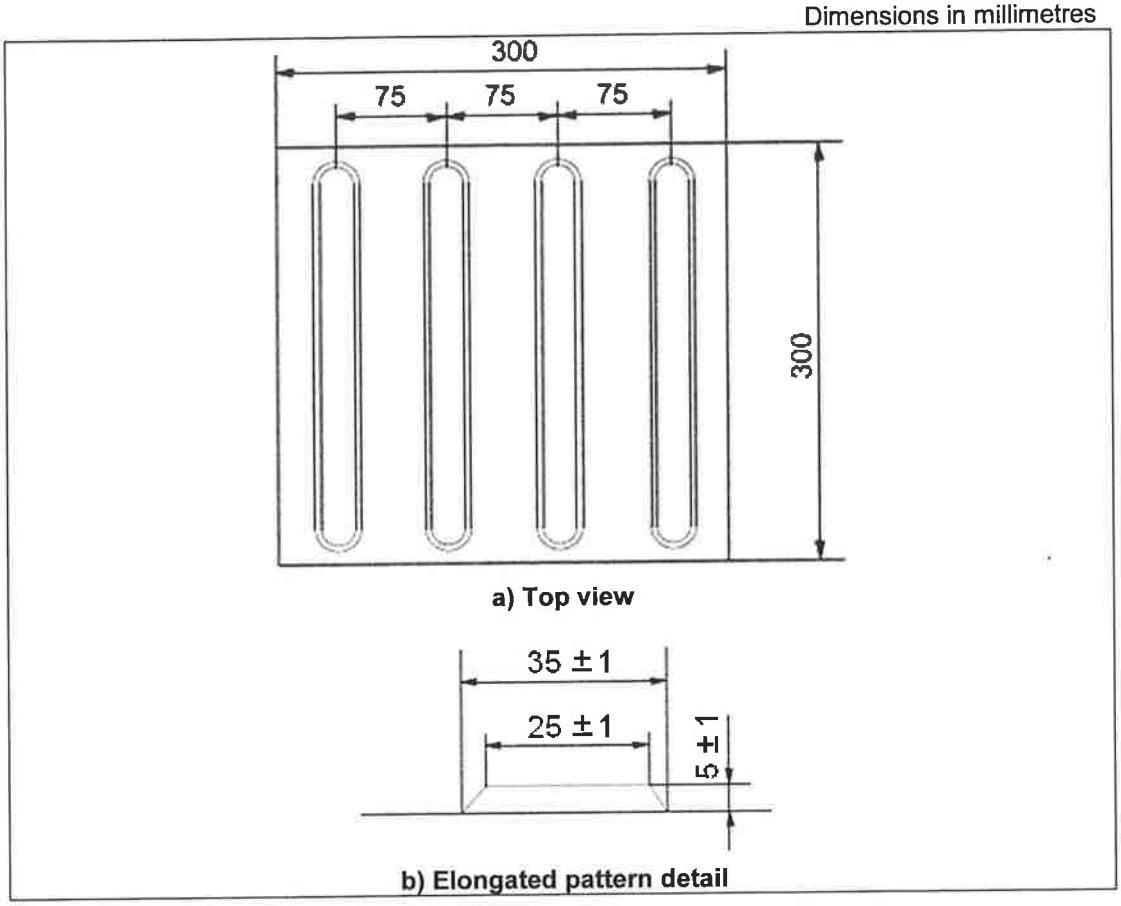


Figure G.6. Directional indicator

G.3.10 Position of tactile ground surface indicator

G.3.10.1 The decision to apply tactile ground surface indicator will always have to be made in light of the particular circumstances applicable at any given site. In making such decision, consideration should be given to the orientation and mobility strategies and techniques adopted by people with low vision (such as those discussed above) and the potential hazards and barriers existing at a given location. However, there are some obvious situations where tactile ground surface indicator shall be applied.

G.3.10.2 Warning treatment may be required at:

a) hazardous locations, such as steps, stairs, railway platforms, pedestrian crossings and wharves; and

b) destinations to provide information about the location of amenities such as ticketing machines, phone booths and the like.

G.3.10.3 Directional treatment may be required to assist with the followings:

a) direction, that is, to indicate a clear continuous accessible path of travel; and

b) location, that is, to provide assistance to locate a target such as a pedestrian crossing, entrance to a public building, ticketing machine or phone booth.

G.3.11 Principles of application

G.3.11.1 When considering the application of tactile ground surface indicator, four major principles should be taken into consideration.

G.3.12 Minimalist application

G.3.12.1 Tactile ground surface indicator acts as landmarks. As such, its application shall be targeted and minimised as far as possible. Widespread ad hoc application of tactile ground surface indicator will confuse rather than inform and will compromise the effectiveness of the specific cue being provided.

G.3.13 Dimensions

G.3.13.1 The dimensions of the treatment are critical. Remembering that tactile ground surface indicator will be identified under foot, it is important to ensure that a minimum depth of treatment is applied. To be detectable under foot, the treatment should make contact with the ball of the foot. To ensure this will always occur, treatments should have a minimum depth of 600 mm in the direction of travel. This dimension applies to both warning and direction treatments at their initial point of identification.

G.3.14 Colour and luminance contrast

G.3.14.1 Tactile ground surface indicator should be coloured and luminance contrasted against their surrounding surfaces. This will greatly assist those using their residual vision to move around.

G.3.14.2 Many people with low vision also have difficulty distinguishing between different colours particularly if they appear next to each other. For example, the "tomato effect", that is red on green, does not provide adequate luminance contrast and as such will be extremely difficult to identify. For this reason, a minimum luminance contrast of 30 % is required to fulfill this principle.

G.3.15 Orientation and position

G.3.15.1 In general a warning treatment should be applied perpendicular, which is at 90°, to the line of approach or to the target object. In addition, a warning treatment should be set back 300 mm from the hazard or target object.

G.3.15.2 A directional treatment is usually applied along the center line of the indicated path of travel and should provide a minimum clear width on either side of at least 800 mm in which there is no obstacle or obstruction.

G.4 Application of tactile ground surface indicator

G.4.1 Pedestrian crossings and kerb ramps

G.4.1.1 Tactile ground surface indicators should be applied at pedestrian crossings as illustrated in Figure G.7 a).

G.4.1.2 Tactile ground surface indicators should be applied at kerb ramps as illustrated in Figure G.7 b).

Dimensions in millimetres

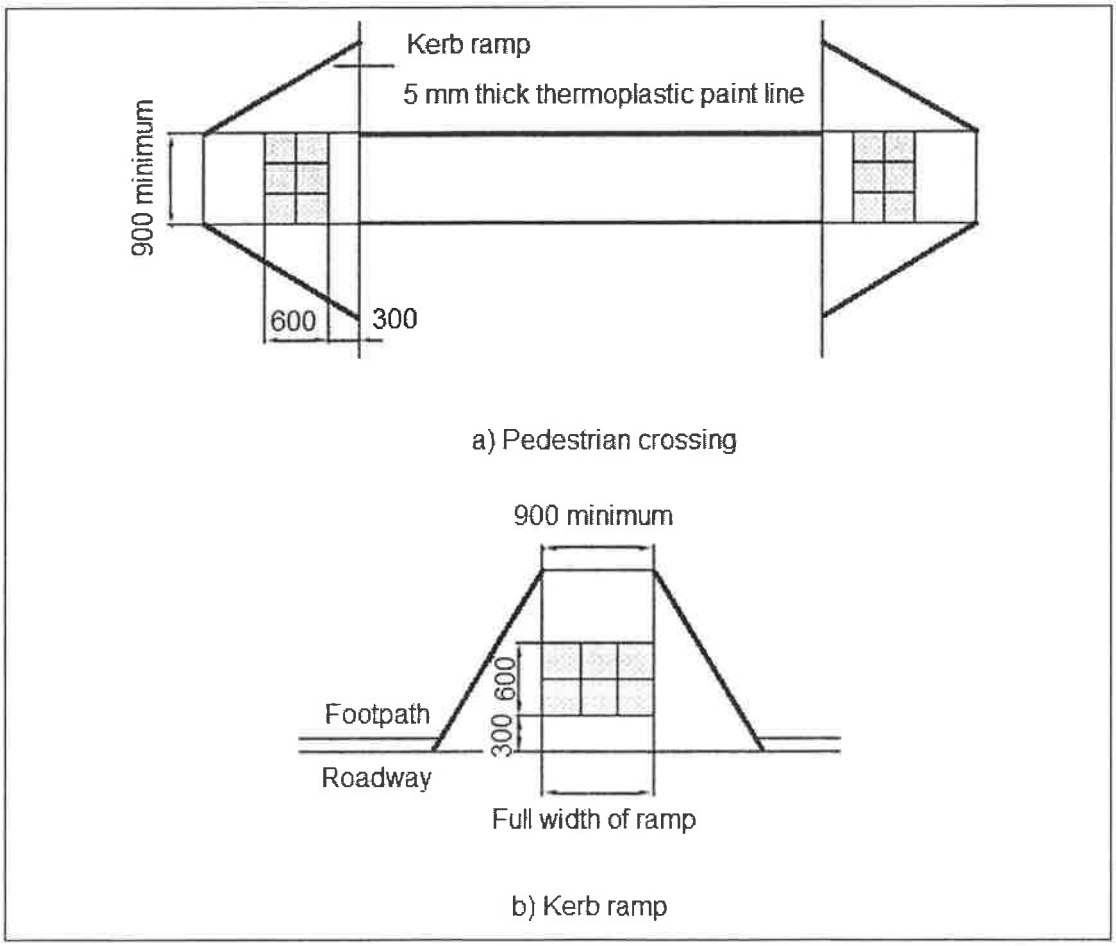


Figure G.7. Application of tactile ground surface indicators

G.4.2 Stairs, steps, escalators and passenger conveyors

G.4.2.1 Tactile ground surface indicators should be applied to stairs, steps, escalators and passenger conveyors as illustrated in Figure G.8.

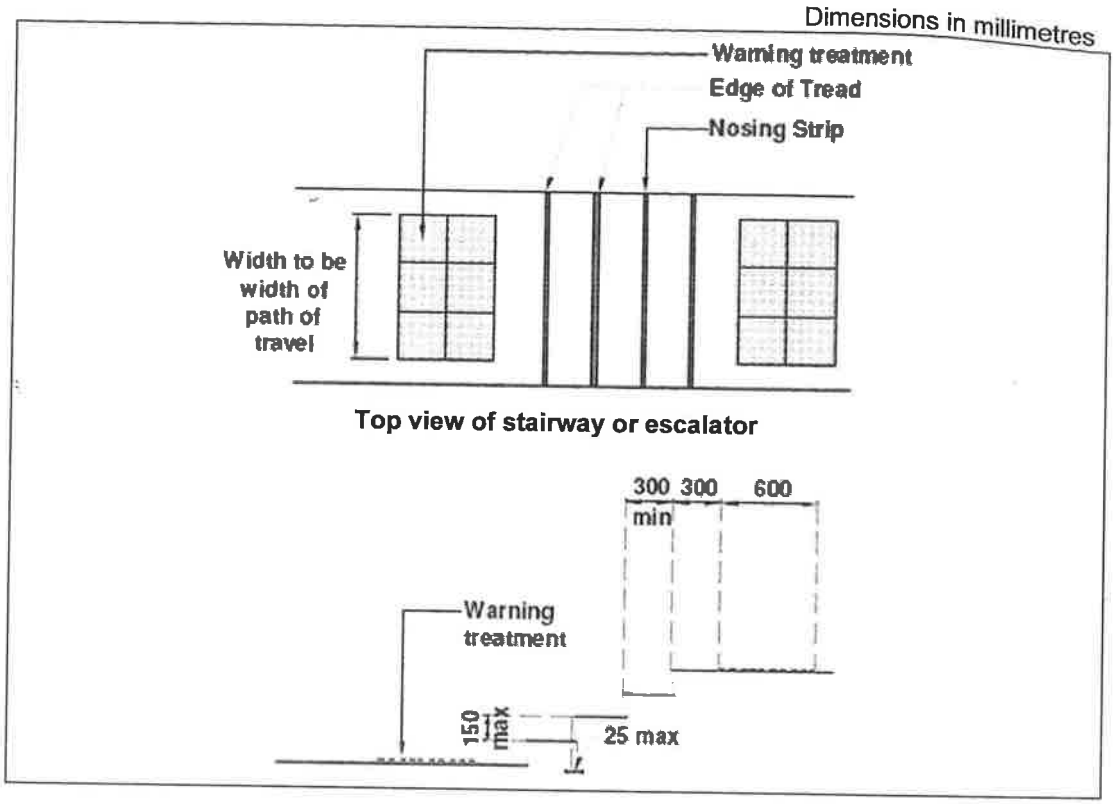


Figure G.8. Stairs, steps, escalators and passenger conveyors

G.4.3 Flush pedestrian vehicular way

G.4.3.1 Tactile ground surface indicators should be applied to flush pedestrian vehicular way as illustrated in Figure G.9.

Dimensions in millimetres

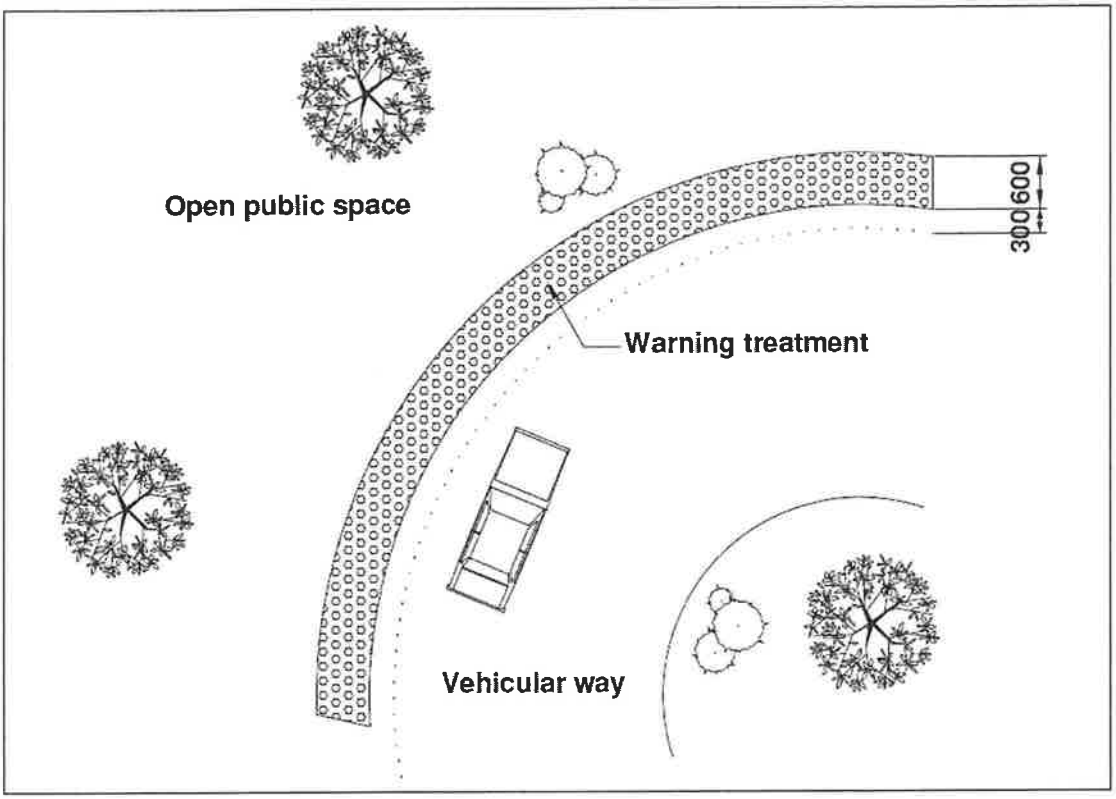


Figure G.9. Flush pedestrian vehicular way

G.4.4 Tactile guidance strips

G.4.4.1 Tactile guidance strips to guide persons with visual impairment around buildings should be applied as illustrated in Figure F.10.

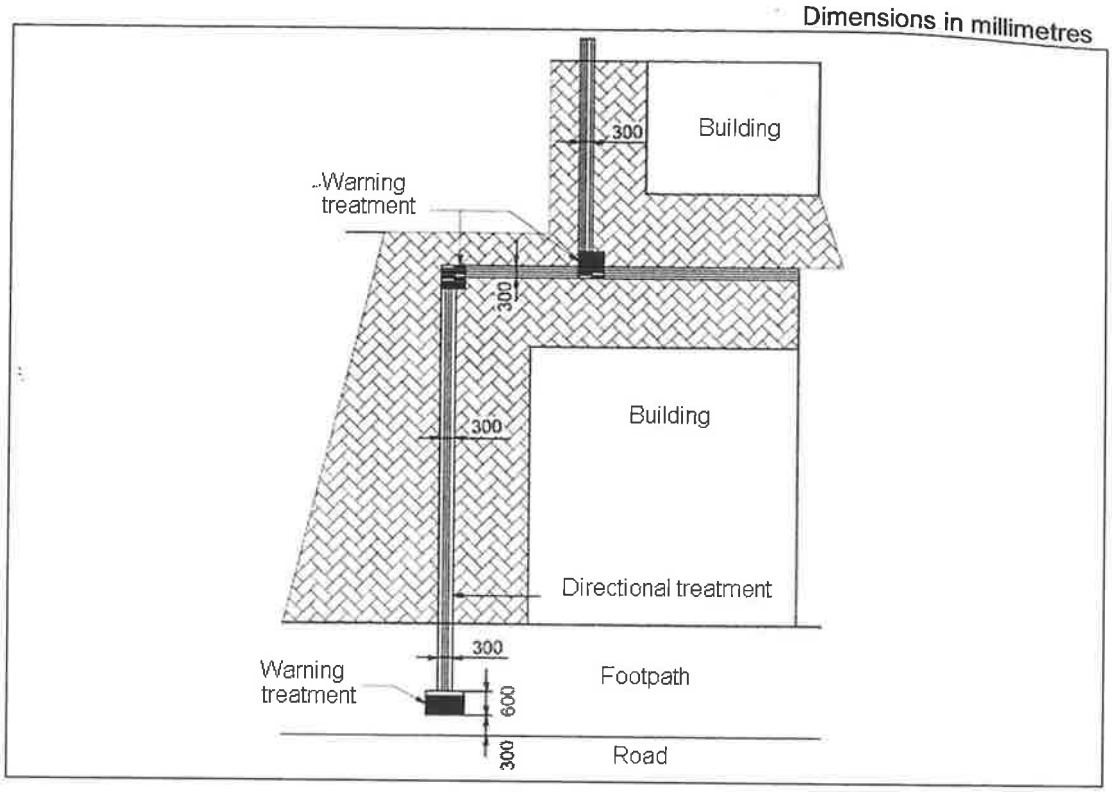


Figure G.10. Tactile guidance strips

G.4.5 Materials

G.4.5.1 Tactile ground surface indicators are produced in a range of materials including concrete, ceramic, rubber, cork, steel and various resins. Some types are supplied in a tile format while others are applied with a spray-on technique.

G.4.5.2 When making a judgement as to which type to use, consideration should be given to the following:

a) internal versus external applications;

b) new versus retrofit application; and

c) availability and installation requirements.

G.4.6 Impact of tactile ground surface indicators on other pedestrians

G.4.6.1 A considerable amount of research has taken place to support the dimensional requirement for tactile ground surface indicators. This research has confirmed that the provision of tactile ground surface indicators at a dimensional height of 5 mm is sufficient to impart adequate tactile information whilst at the same time not adversely impacting on other pedestrians. The 5 mm pavement variance is generally accepted to be within the tolerances for pedestrian facilities.

Annex H
(informative)

Design guidelines for elderly

H.1 General

H.1.1 The elderly-friendly homes and environment should be designed so that people can stay in them for a lifetime if they wish, even when they are old and frail. Some of the examples of structural design features such as level flooring, at least one large toilet which can accommodate a wheelchair user and doors which are wide enough for a wheelchair to pass through, if not incorporated, would become difficult or expensive to modify after the erection of the building.

H.1.2 The concept of "Ageing-in-Place" is now accepted as fundamental to housing design. If properly designed and equipped the family apartment, as well as the smaller one- or two-person unit can sustain people well into old age. In many cases this can prevent or delay the disruptive and expensive need for elderlys living in apartments not designed for use by elderly to move to more suitable places like nursing homes or sheltered care homes should they become less mobile.

H.2 Ageing and safety

H.2.1 Throughout the life of a person, his level of ability increase and then decline sometimes dramatically, but more often in a progressive manner. Ageing does not necessarily bring disability but various impairments will reduce abilities in sight, hearing, mobility, stamina and balance as well as increased difficulty in gripping and manipulating controls, keys and other every day tasks. All these can affect an elderly in differing combinations and degrees of severity with implications on personal safety, mobility and convenience.

H.2.2 Ageing is a gradual process and these physical changes often occur almost imperceptibly so that an individual may not be aware of the potential risks of some of his habitual actions. For instance, many elderlys will unthinkingly put themselves at risk by walking on shiny and slippery floor surfaces with wet feet, even though this could lead to a serious fall. Similarly, a combination of low vision and slow reaction time could lead to tripping over a step or threshold to a room, particularly in low lighting conditions.

H.3 Falls in the home

H.3.1 A fall can be a very serious occurrence for an elderly. When a younger person trips, he is usually able to recover his balance, whereas an elderly will have less balance and slower reaction times. He may fall awkwardly, so causing injury. Most significantly, injuries may take much longer to heal in elderlys. An accident to a frail elderly can cause permanent disability or even fatality from secondary causes.

H.3.2 Fear of falling or of being embarrassed about their reduced ability to perform everyday activities may cause people to become inhibited from going out, unaccompanied, in public. At worst this may lead to withdrawal from social contact, frustration, loss of sense of purpose and reduced quality of life.

H.4 Advantages of considerate design

H.4.1 Considerate design for safety and accessibility, making the home environment more suitable for elderlys, can bring the following benefits:

a) increase convenience and make everyday tasks easier, both for the elderly and their carers;

b) reduce accidents in and around the home, thus saving on medical and social costs and prolonging the well-being of the individual;

c) promote personal independence in daily living, without fear of accidents;

d) encourage elderlys to "ageing-in-place" without having to move out to nursing homes or other special housing until absolutely necessary;

e) allow individuals to continue to live in their own homes, even if they become disabled and have to use an assistive device such as a wheelchair, a walking frame, crutches and the like; and

f) allow for "visitability". Although the residents of a dwelling may not need wheelchair accessibility, this is worth providing because it allows for their friends and relatives to visit, whatever their disabilities or needs. The concept of visitability can also enhance the future value of the property, because it will be attractive to a wider market of potential purchasers, once the concept of "ageing-in-place" becomes a norm.

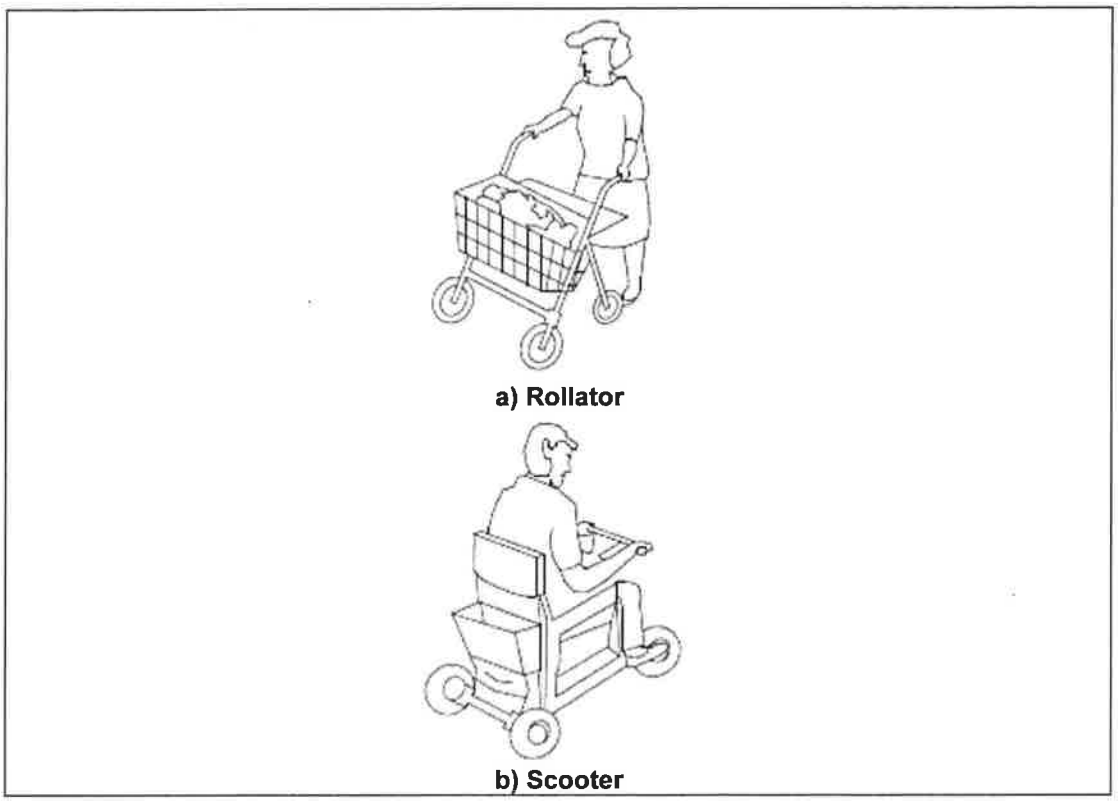
H.5 Mobility

H.5.1 Moving about by walking is one of the most common and natural activities that people enjoy every day. But for an elderly it should not be taken for granted that this will be easy. An elderly may be unstable in their gait, or be unable to see their path clearly, or be unable to recognise changes in level of floor surfaces.

H.5.2 Decreased stamina from medical conditions and frailty in old age will restrict the distances that a person can comfortably walk, particularly if there are ramps and stairs. Provision of resting places on stair landings for instance, may be desirable features.

H.5.3 Many people use "assistive devices" or "mobility aids" to help them move about more safely. These may take the form of walking sticks, zimmer frames, crutches, rollators (for ambulant disabled) or wheelchairs for those who are unable or find it difficult to walk unaided.

H.5.4 Space for parking a wheelchair, rollator or other devices should be provided close to the entrance. In future many elderlys may use motorised scooters, in which case, suitable power points should be provided for battery charging. A rollator or motorised scooter is illustrated in Figure H.1.



a) Rollator

b) Scooter

Figure H.1. Scooter or rollator

H.6.1 Falls account for many serious accidents in homes. Most of these accidents can be avoided if designers or owners observe simple rules for safety in the built environment by reducing potential obstacles or barriers and providing adequate handrails and grab bars.

H.6.2 When elderlys trip even over a small obstacle or slip on a wet or smooth floor they may not be able to recover their balance. If there is no handrail or grab bar to provide support, they might fall and seriously injure themselves.

H.7 Design considerations

H.7.1 Barrier-free and level floors

H.7.1.1 Wherever possible, the design should avoid changes in floor level, such as door thresholds, steps and stairways or kerbs and small ramps, which could cause tripping. In practice, most changes in floor level are unnecessary and may be eliminated by intelligent design in the form of scupper drains covered with gratings and floor surfaces graded to a gentle fall away from door opening.

H.7.1.2 Where changes in level are unavoidable, handrails or grab bars should be provided, no matter how slight the level change may seem.

H.7.1.3 Stairs should be designed in accordance with this standard, providing correctly dimensioned handrails, contrasting colours or tones for stair nosings, both in public buildings and in private developments.

H.7.2 Floor surfaces

H.7.2.1 Floor surfaces should comply with this standard. Shiny and reflective floors using granite, marble, glazed tiles and the like are not recommended as they could be hazardous especially when they are wet or greasy, or if they have been highly polished. Floor surfaces of kitchen, bathroom and toilet are particularly hazardous, as these may be slippery when wet with soap solution. Non-slip floor surfaces are safer for use and should be specified.

H.7.2.2 Open jointed pavers or aeration concrete blocks should be avoided at external open spaces or vehicle parks where pedestrians are expected to walk. The voids in aeration concrete blocks can catch the foot or walking aids and cause injury or a fall especially when an older person who is ambulant may already be unstable.

H.7.3 Controls and operating mechanisms

H.7.3.1 Bending, stretching and stooping may cause an elderly to fall. These risks can be minimised or avoided by having controls and operating mechanisms mounted at heights as recommended in this standard or at same level as door handles.

H.7.3.2 Cupboards at high or low level may be hazardous for elderlys to reach with safety. Any shelf at a height that would require a person to stand on a stool or chair shall be avoided.

H.7.3.3 Leaning out of windows to open or close them or to hang out laundry poles can also be dangerous. Alternative methods should be considered when designing and specifying components including alternative methods for cleaning windows.

H.7.3.4 For some elderlys, gripping, turning and manipulating taps, switches, door handles and many controls can be painful or difficult. Rocker switches, lever-type controls and handles should always be used. Where these are placed in awkward positions requiring reaching such as at low or high level or across worktops, they may be hard to operate and should be avoided.

H.7.3.5 Controls may also be difficult for elderlys to see and understand how to operate. Contrasting colours and larger numerals or letters are recommended.

H.7.4 Lighting and services

H.7.4.1 An elderly will normally require about 2 to 3 times more illumination than a younger person and other aspects of eyesight may also become less reliable in older age.

H.7.4.2 Lighting levels of access routes, especially steps and stairways, should allow for persons with visual impairment to carry out every day tasks and to identify edges of steps, changes in level and other barriers as described in this standard.

H.7.4.3 Alternative light sources should be provided to illuminate any space so that if one lamp fails there is adequate light until proper replacement can be carried out.

H.7.4.4 Double-switching will mean that an occupant does not have to cross the room in the dark to turn the light on or off. Bedside switching is also recommended as a high proportion of elderlys will need to use the toilet during the night.

H.7.4.5 Motion-sensor lights that will light up upon detection of body motion to reduce the hassle for the elderly to walk all the way to the end to turn on the light can be considered as an alternative lighting option.

H.7.4.6 Adequate illumination levels at different parts of the home including its surrounding should be in accordance with the recommendations specified in this standard.

H.7.5 Design to prevent accidents

H.7.5.1 Even with the best-designed home environment, accidents may happen. If they do, sensitive design may prevent an accident turning into a tragedy. Once elderlys have fallen, they may find it difficult to get up by themselves. If they are alone, this situation can be serious as they may need assistance and possibly medical treatment.

H.7.5.2 Outward opening of doors to bathrooms and toilets can make it easier for a rescuer to enter if a person has fallen and is lying behind the door. Specifying locks and latches to bathrooms and toilets which can be opened from outside with a coin will allow for assistance in case of emergency.

H.7.5.3 By providing emergency alarm system in the bathroom and by the bedside, operated by a floor-length pull-chord and connected to a bell or other signal in a warden's room and/or in the corridor outside the front door, a resident can summon help in an emergency.

H.7.6 Space standards

H.7.6.1 A well designed home of the future will provide adequate space for potential wheelchair use should any of the occupants become disabled. This should include doorways wide enough to allow a wheelchair to pass through and space for turning in bathrooms, kitchens and living rooms and to move around the bedroom.

H.7.6.2 For bathrooms and toilets, consideration should be given to allowing space at the side of the water closet for elderlys to transfer from a wheelchair or to be assisted by their carer. Grab bars should be installed to facilitate transfer.

H.7.6.3 Adequate legroom should be provided under tables, worktops, wash basins and sinks for wheelchair users, giving consideration as to how they may be able to use the kitchen.

H.8 Top ten design points

H.8.1 The following are minimum provisions recommended in design for elderlys:

a) barrier-free access without steps, thresholds or kerbs, wherever possible;

b) non-slip floor finishes throughout especially where water may accumulate;

c) grab bars, especially in showers, toilets and walking areas such as corridors, or provision should be made for these to be mounted in future;

d) switches, handles and controls at reachable heights preferably at same level with door handles;

e) lever handles to doors and cupboards, door keys, lever taps and controls that can be used by older persons with limited grip;

f) circulation space and door widths should be adequate to allow a wheelchair to be used;

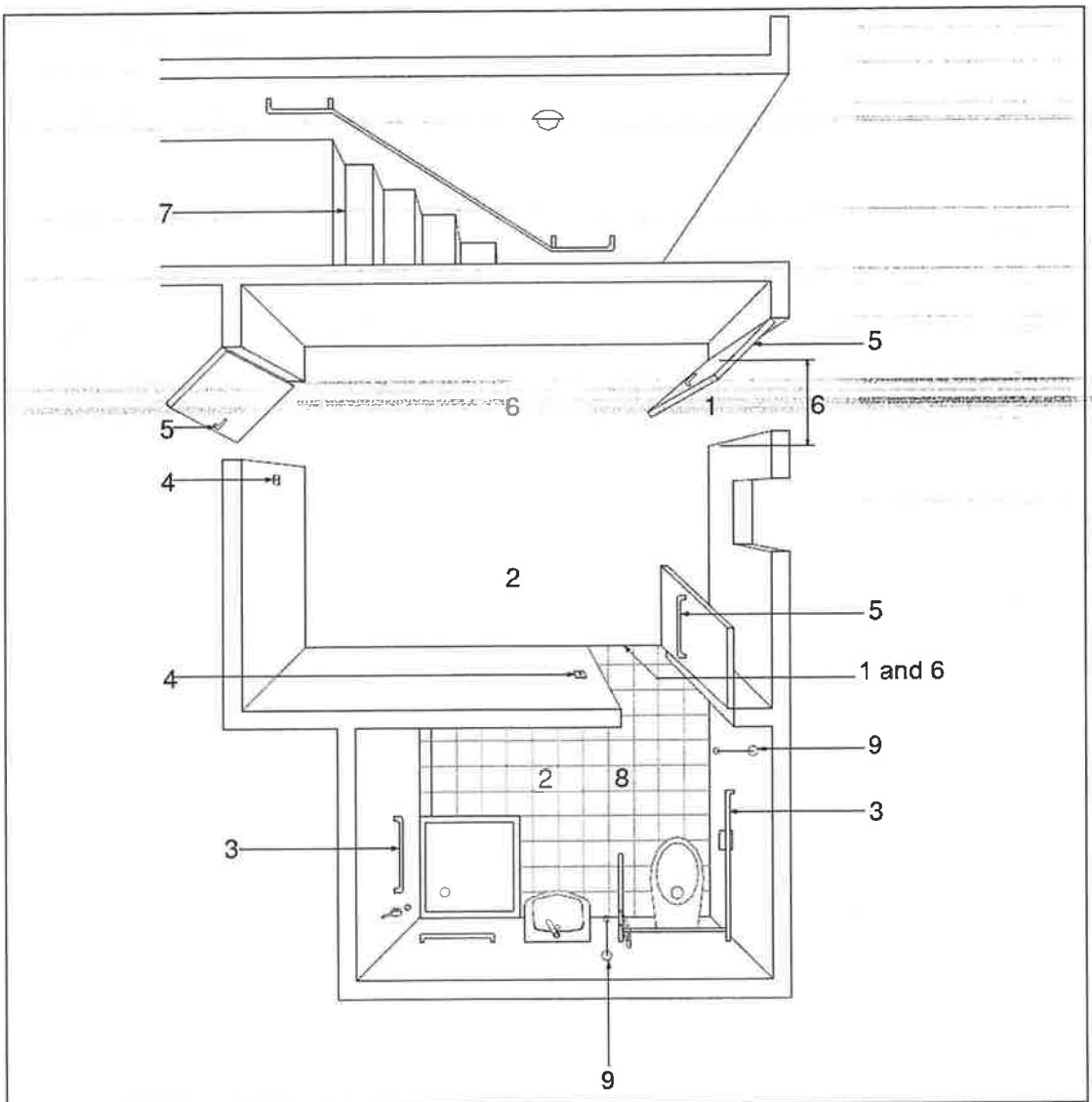
g) staircase should be adequately designed including profile of treads and provision of handrails at both sides of stairways. There should be clear definition of nosings by colour contrast and adequate lighting should be provided at a recommended level of 200 lux in corridors or on stairways;

h) in toilet design, pedestal type water closet seats are the preferred choice rather than the squat type and outward opening of toilet door and adequate space to accommodate a wheelchair and helper;

i) potentially dangerous activities such as hanging of laundry out of windows, standing on furniture to reach shelves or to carry out home maintenance should be eliminated or reduced in the design; and

j) emergency alarm systems with pull-cord extending to floor should be provided in bathrooms and bedrooms.

H.8.2 The layout of a house suitably designed for older persons is illustrated in Figure H.2.



Key:

1 barrier-free access without steps, thresholds or kerbs
2 non-slip floor finishes
3 grab bars
4 switches, handles and controls at reachable heights
5 lever handles
6 circulation space
7 staircase
8 pedestal type water closet seats
9 emergency alarm system

Figure H.2. Layout of house suitable for aged

Annex J
(informative)

Design guidelines for family friendly facilities

J.1 Application

J.1.1 This annex contains guidelines for the design of family-friendly facilities or features in buildings. Although it does not form a mandatory part of this standard it is recommended for adoption so as to build a family-friendly environment.

J.1.2 The design guidelines are intended to apply to the following buildings which are places where families are likely to congregate:

a) shopping complexes and supermarkets;

b) places of public resort;

c) sports complexes and public swimming pools;

d) restaurants and eating establishments;

e) markets and hawker or food centres;

f) transport interchanges and passenger terminals;

g) recreational parks; and

h) other public places.

J.2 Recommended facilities

J.2.1 The following are the minimum recommended facilities or features that will satisfactorily serve the needs of families with infants or young children aged 12 years and below:

a) child-friendly sanitary facilities;

b) child protection seat;

c) family room;

d) seating or resting areas;

e) children's activity corner or playroom;

f) locker provision for prams and other heavy belongings;

g) stroller and wheelchair rental facility;

h) flexible arrangement of tables and chairs;

i) socket outlets;

j) dustbin; and

k) lighting 100 - 200 lux.

J.3 Design considerations

J.3.1 Child-friendly sanitary facilities

J.3.1.1 The following sanitary facilities should be provided in the toilets for use by young children:

a) at least one water-closet complying with J.3.1.2;

b) at least one urinal complying with J.3.1.3; and

c) at least one wash basin complying with J.3.1.4.

J.3.1.2 Water closet

J.3.1.2.1 Where a squatting-type water closet is not provided, at least one child-sized pedestal-type water closet, as illustrated in Figure J.1, should be provided in each of the male and female toilets for young children. The recommended height of the water closet seat to the finished floor level should be 350 mm.

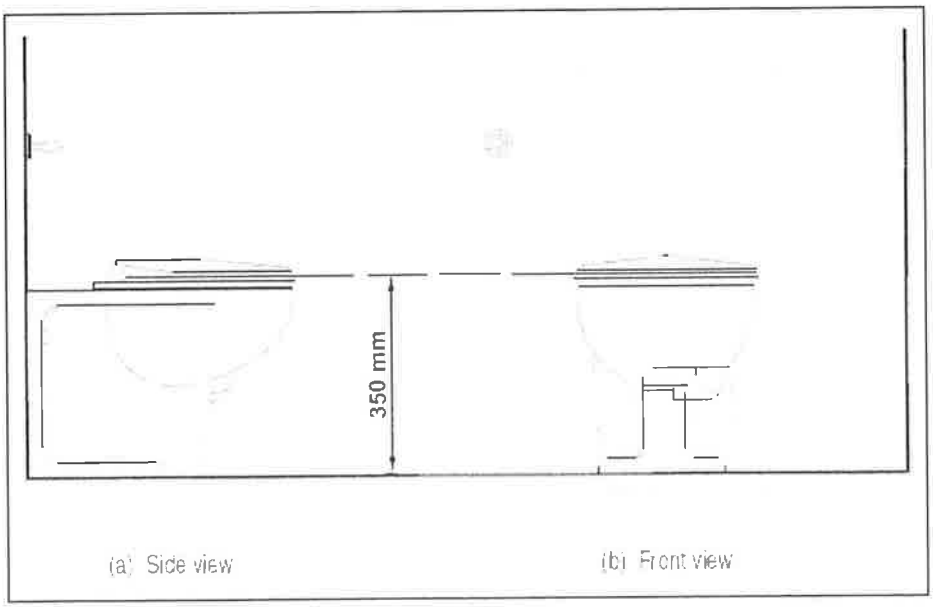


Figure J.1. Water closet for young children

J.3.1.2.2 Alternatively, a seat adaptor with a small seat cover suitable for use by young children may be provided. The hanger holding the seat cover should be mounted at a level that is easily accessible to young children. A portable and stable stool should also be provided as stepper for young children who may not reach the water closet.

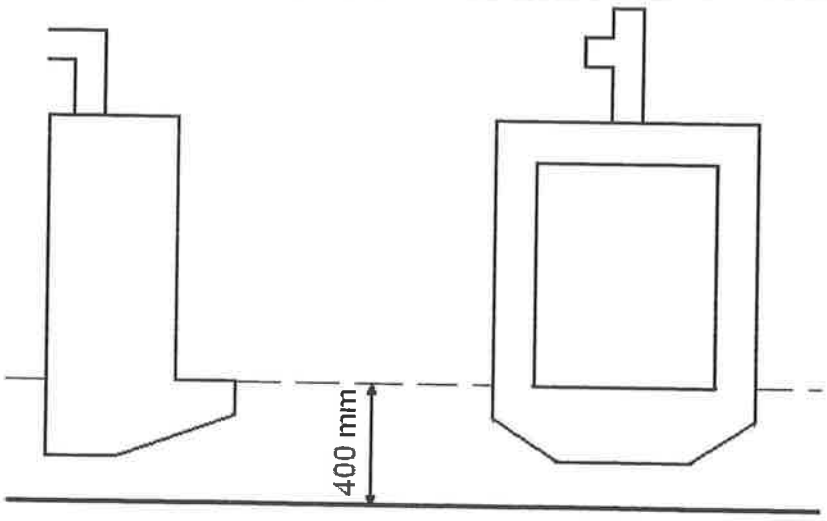
J.3.1.2.3 Grab bars should be provided on both sides of the water closet to provide support for young children.

J.3.1.2.4 The water closet compartment should be provided with bath liquid dispenser and a flexible hose with water spray head as some parents or guardians may need to clean their child.

NOTE. A child-friendly water closet need not be provided if a water closet for children with disabilities has been provided in accordance with Clause F.6 of Appendix F.

J.3.1.3 Urinal

J.3.1.3.1 At least one urinal mounted at a height of about 400 mm from the finished floor level, as illustrated in Figure J.2, should be provided in the male toilets for young children.



a) Side view **b) Front view**

NOTE. Where squatting-type water closet is provided in the male toilet, a urinal for young children may be dispensed with.

Figure J.2. Urinal for young children

J.3.1.4 Wash basin

J.3.1.4.1 A child-sized wash basin should be provided to enable young children to wash their hands without assistance. The wash basin should be equipped with a lever type or automatic stop taps. The height of the wash basin should be about 550 mm as illustrated in Figure J.3.

Dimensions in millimetres

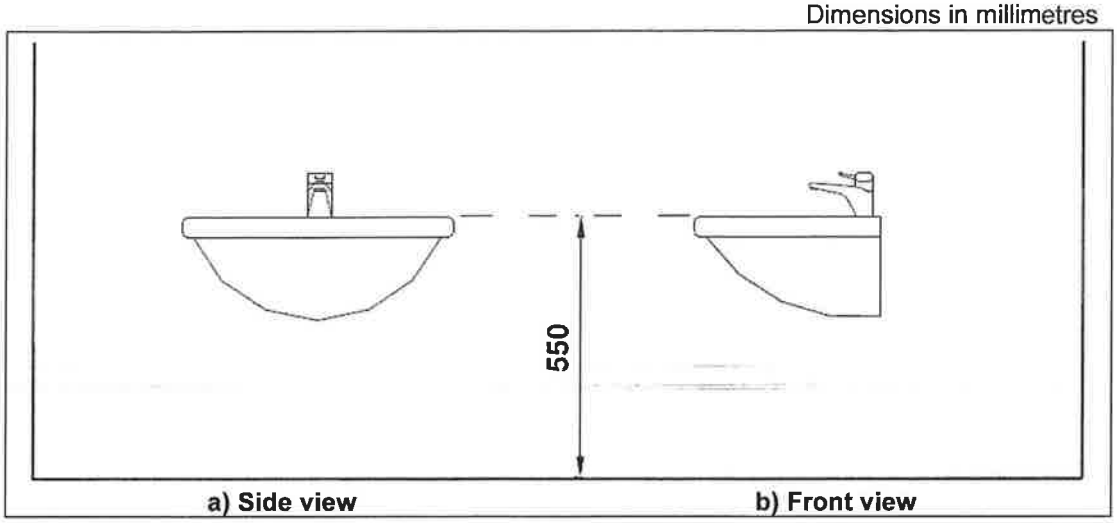


Figure J.3. Wash basin for young children

J.3.1.5 Floor finish

J.3.1.5.1 Toilets or washrooms should be provided with non-slip flooring to ensure the safety of children.

J.3.2 Child Protection Seat

J.3.2.1 A child protection seat, as illustrated in Figure J.4, should:

a) be equipped with straps that can be extended over shoulders and between legs to ensure the safety of a baby; and

b) preferably be mounted on solid wall for stability.

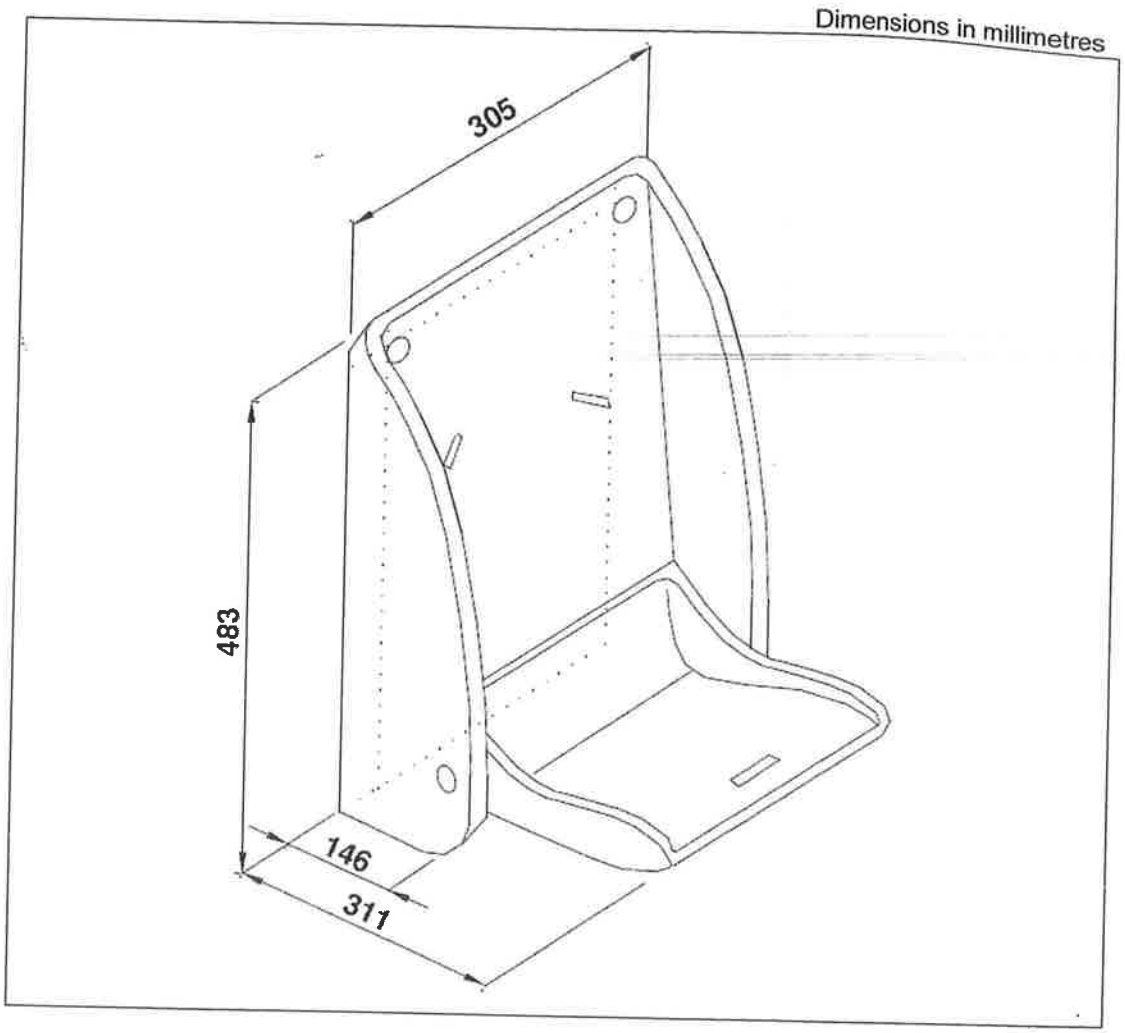


Figure J.4. Flap-type child protection seat

J.3.2.2 A child protection seat should be provided in one of the water closet compartments in both male and female toilets, as shown in Figure J.5, to allow parents to seat their baby safely in the restroom with them.

Dimensions in millimetres

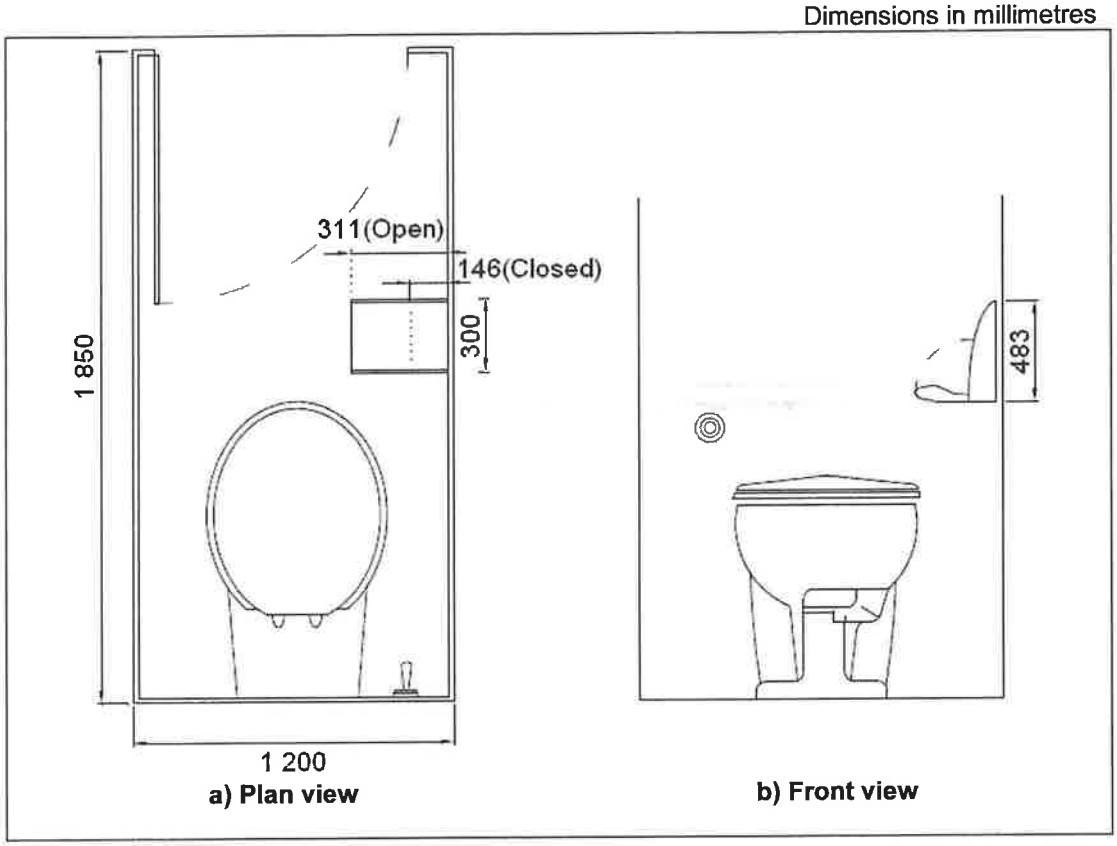


Figure J.5. Child protection seat in water closet compartment

J.3.2.3 Alternatively, a child protection seat can be installed in individual washrooms for persons with disabilities, as illustrated in Figure J.6. A flaptype seat is recommended to avoid causing obstruction to wheelchair users.

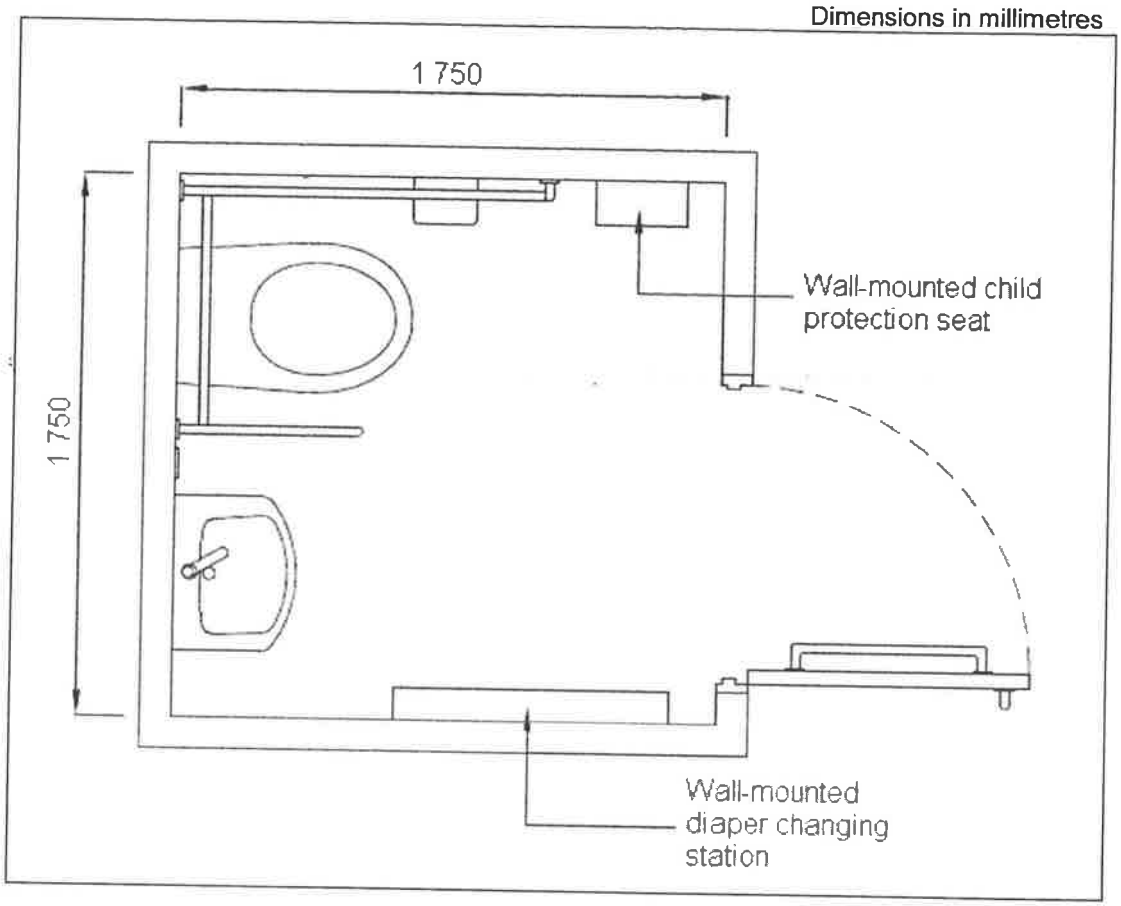


Figure J.6. Child protection seat and diaper changing station in individual washroom

J.3.3 Family room

J.3.3.1 At least one family room with breastfeeding and diaper changing facilities should be provided in shopping centres and other recreational or entertainment areas. The family room should preferably be located near toilets and equipped with the following:

a) a sink with liquid detergent and paper towels;

b) a dispenser for hot and cold water;

c) rest area for parents and young children;

d) a vending machine for beverage and diaper;

e) refrigerator with freezer;

f) notice board for messages; and

g) magazines for reading.

J.3.3.2 Breastfeeding area

J.3.3.2.1 A separate breastfeeding room with door-lock is preferred and should be made available to breastfeeding mothers only.

J.3.3.2.2 Alternatively, an area in the family room separated by curtains should be made available for breastfeeding mothers.

J.3.3.2.3 Comfortable seating, preferably of the armchair-type, should be provided for the convenience of the mothers.

J.3.3.3 Diaper-changing station

J.3.3.3.1 Where a family room is not provided, a diaper-changing station should be provided in both the male and female toilets or in individual washrooms for persons with disabilities so that both fathers and mothers can use the facility.

J.3.3.3.2 The diaper changing station should be stable with safety straps and barriers length-wise to ensure the safety of the infants. If it is to be located in individual washrooms, a flap-type station is recommended to save space and to avoid causing obstruction to wheelchair users.

J.3.3.3.3 The recommended dimensions of a diaper-changing station, in the closed position, are 889 mm in length by 508 mm in height and 102 mm in thickness as illustrated in Figure J.7.

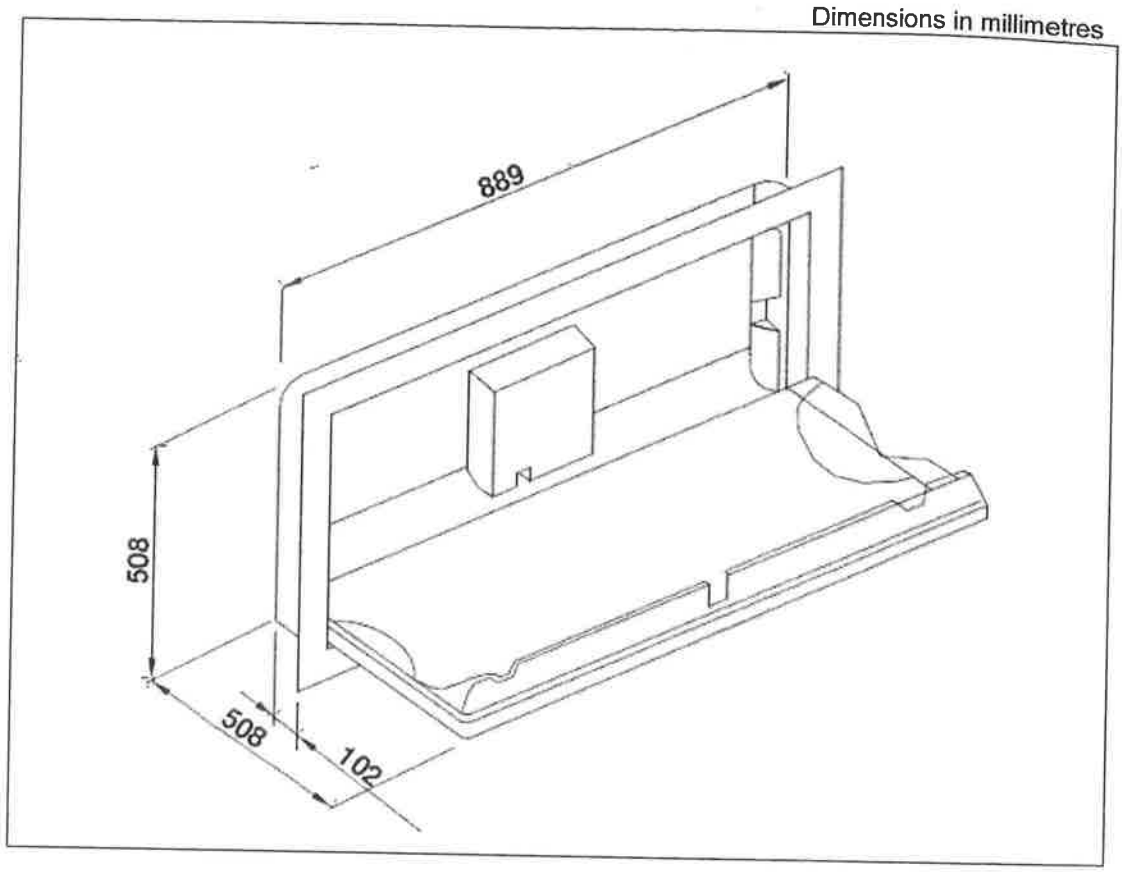


Figure J.7. Flap-type diaper changing station

J.3.4 Seating or resting area

J.3.4.1 Ample seating or resting areas should be provided in shopping centres and other recreational or entertainment areas for parents and their young children.

J.3.5 Children's activity corner or playroom

J.3.5.1 Outdoor or indoor play equipment for children of various ages should be provided. The floor surface of the children's play area should be cushioned or shock-proofed to ensure the safety of the children.

J.3.5.2 Ample seats should also be provided near the play equipment for parents supervising their children.

J.3.6 Locker provision for pram and other heavy belongings

J.3.6.1 Pram depository service or lockers big enough to accommodate prams should be provided at the main entrance of shopping centres and other recreational or entertainment areas to allow families to deposit their pram and other heavy belongings. Pram lockers should not be less than 1 000 mm in height, 500 mm in width and 500 mm in depth as illustrated in Figure J.8.

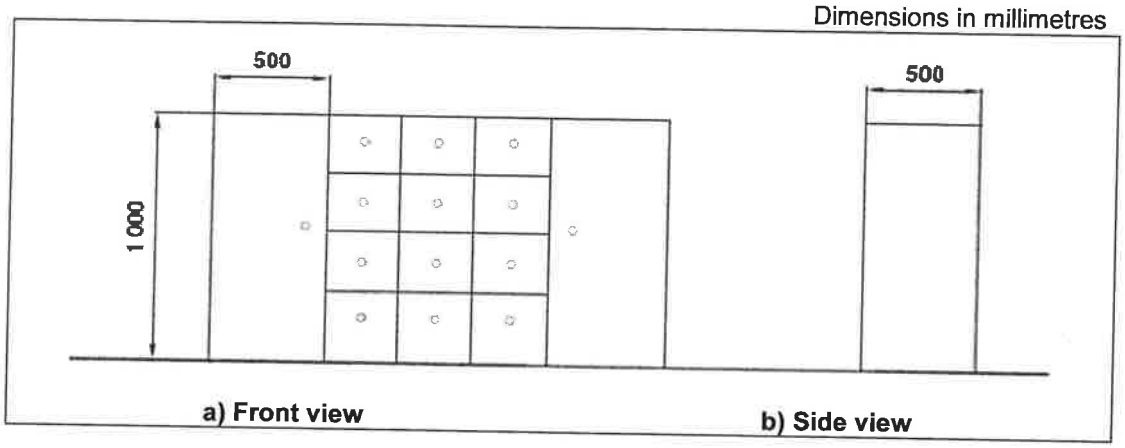


Figure J.8. Locker for pram

J.3.7 Pram and wheelchair rental facility

J.3.7.1 Renting of prams and child buggies and wheelchairs in shopping centres, supermarkets or other recreational or entertainment areas should be considered where applicable.

NOTE. Provision of prams and child buggies in these areas would help to make it easier for families with infants and young children to move around the premises and provision of wheelchairs would help the elderly and ambulant disabled.

J.3.8 Flexible arrangement of tables and chairs

J.3.8.1 A variety of table and chair arrangements or flexible arrangement of tables and chairs should be provided in eating outlets or establishments to cater to groups of different sizes.

J.3.8.2 Where fixed seating is provided, adequate space should be provided between the seats to accommodate a baby-chair.

J.3.8.3 Baby-chairs

J.3.8.3.1 Adequate baby chairs with side and backrests, and a safety belt or T-bar should be provided in eating places.

J.3.8.3.2 The baby-chairs should be stable and preferably be portable.

NOTE. Family-friendly facilities should be well maintained to ensure that they are clean and hygienic and are safe for young children's use.

Annex K
(informative)

Design guidelines for parks and open spaces

K.1 General

K.1.1 Pavements, footways and pedestrian areas should have surfaces that are stable, firm, level, slip-resistant and free from water ponding.

K.1.2 Routes should be well lit with average 5 lux and clearly defined using texture and visual contrasts.

K.1.3 All routes used by pedestrians should be at minimum between 1 500 mm to 1 800 mm. Greater width may be required where there is large pedestrian flow. Where there are obstacles on the route, the minimum width between obstacles should be 1 000 mm. All routes should have minimum headroom of 2 000 mm.

K.1.4 Routes should be level. If there is a change in level, the preferred gradient for any ramp is not to exceed 1:20. Where the gradient is steeper than 1:20, it should be designed as ramped access according to clause 3.3. If steps are necessary to address steep gradient of the route, an alternative accessible ramp should be considered so that facilities could be reached either via steps or ramp depending on the needs of people of varying abilities.

K.1.5 Where possible, drainage gratings should be located off the accessible routes. Slots in gratings should not be greater than 12 mm wide and placed at right angles to dominant direction of travel. Gaps in paving, if provided, should not exceed 10 mm.

K.2 Graduated difficulty of access

K.2.1 A system of graduated difficulty of access should be applied in outdoor recreational areas. A wide variety of trail types, each characterised by a degree of difficulty to negotiate should be provided whenever possible. By providing a diversity of trail types (with varying surfaces, widths, slopes, cross-slopes, lengths, edges, number of rest stops, etc.), a wider spectrum of opportunity with diverse experiences can be provided that will accommodate or challenge all people regardless of their abilities.

K.2.2 A good system of signage should enable one to choose for oneself the type of experience or degree of challenge desired. In this regard, it is not necessary that all facilities be totally accessible. Some may be difficult to negotiate even for the fittest individuals. The main objective is to provide greater diversity in trail types, based on an understanding of the wide variation of ability in people. Such a system does not compromise the recreational experience for anyone, and it also has the advantage of not always segregating the able-bodied from those who are not.

K.2.3 However, the guideline that follows describe the standards that applies for the lowest difficulty.

K.2.4 Whenever possible, a park/site/project should provide at least one trail of the lowest difficulty level that traverse the entire park/site/project.

K.2.5 Railing should be mandatory for the trail and lowest difficulty level.

K.3 Outdoor steps

K.3.1 Where steps are provided, it should have a minimum of two steps. Three steps are preferred to ensure clear legibility of the grade change. The length of landing should be at least 1 500 mm. Longer landings should be multiples of 1 500 mm i.e. 1 500, 3 000, 4 500, etc. The height between landings should be kept to a maximum of 1 500 mm to allow a view of the next higher landing.

K.3.2 The riser and its corresponding tread for outdoor steps are recommended as shown in Table K.1.

Table K.1. Risers and treads

Riser (mm)	Tread (mm)
100	450
120	410
125	400
130	390
135	380
140	370
145	360
150	350

K.3.3 However, the recommended cut-off riser height for park or open space should be 130 mm and below for lowest difficulty level. Riser up to 150 mm and above is considered average difficulty level.

K.3.4 All nosing should be visible with permanent contrasting material to ensure that tread edge is clearly visible in descent.

K.3.5 Handrails should be provided however short the flight of steps. It should be easy and comfortable to grip. Preferably, it should have a circular section of 35 mm to 45 mm in diameter. The vertical height to the top of the handrail should be between 800 mm and 900 mm measured from the pitch line. Handrails should extend 300 mm beyond the top and bottom steps to allow people especially elderly to steady themselves before ascending or descending the flight of steps.

K.4 Parks furniture

K.4.1 All parks furniture along the route when people need them such as seats, dustbins, advertising boards, artworks, etc should be carefully sited to avoid obstruction or hazard to pedestrians.

K.4.2 Sufficient seats should be provided along pedestrian routes at designated areas. There should be space for wheelchairs or pushchairs alongside the provided seating. Some seating should have armrests and backrest to give support to people when rising.

K.4.3 In situation where near toilet, amenities area, at end of steps and activity zones such as children playground etc, extra consideration to be exercised on furniture placement to prevent any obstruction or hazards to users.

K.4.4 All parks furniture design should integrate universal and user friendly factor. It should be in light color, ease of maintenance, comfortable and durable. All furniture should be of non-absorptive materials to promote rapid drying and lastly to prevent ponding.

K.5 Kerb cuts

There should be no shrubs planted at an area 3 m away from kerb cuts on both sides of the road crossing to ensure visibility of wheelchair users and children by motorists.

K.6 Parks vegetation

Plant selection and maintenance should be as follows:

a) Old and dying tress should be felled for safety reasons.

b) Jutting tree branches should be cut back to ensure a minimum clear headroom of 2 m.

c) Tree roots can cause unevenness in paths, particularly if the underlying substrate is compacted and the roots are therefore confined to the shallow zone just beneath a path.

d) Thorny plants should be avoided along pedestrian walkways and at all public spaces.

e) Raised beds should be not more than 600 mm in height.

K.7 Accessible parking lot

K.7.1 Carpark lots for the disabled should be located near to either adequately sheltered information points or pedestrian entrances which allow easy movement for people with disabilities.

K.7.2 Accessible pedestrian entrances should be physically separated from vehicles gaining access.

K.8 Amenities

K.8.1 Public toilets should be provided and located near to the main areas of attraction, e.g. BBQ and picnic areas, playground area or other such use. At least one accessible toilet should be made available for wheelchair users.

K.8.2 Barbecue and picnic areas, if provided, should be accessible by all people.

K.8.3 Shelters should be provided to protect against the weather. It should be accessible for those with mobility equipment, e.g. pushchairs, wheelchairs and the like.

Bibliography

[1] ISO 128-30, *Technical drawings - General principles of presentation - Part 30: Basic conventions for views*

[2] ISO 128-34, *Technical drawings - General principles of presentation - Part 34: Views on mechanical engineering drawings*

[3] ISO 128-40, *Technical drawings - General principles of presentation - Part 40: Basic conventions for cuts and sections*

[4] ISO 128-44, *Technical drawings - General principles of presentation - Part 44: Sections on mechanical engineering drawings*

[5] ISO 690, *Information and documentation - Guidelines for bibliographic references and citations to information resources*

[6] ISO 1804, *Doors - Terminology*

[7] ISO 3846, *Hydrometry - Open channel flow measurement using rectangular broad-crested weirs*

[8] ISO 3864-1, *Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs and safety markings*

[9] ISO 6707-1, *Building and civil engineering - Vocabulary - Part 1: General terms*

[10] ISO 7000, *Graphic symbols for use on equipment - Index and synopsis*

[11] ISO 7001, *Graphical symbols - Public information symbols*

[12] ISO 7010, *Graphical symbols - Safety colours and safety signs - Registered safety signs*

[13] ISO 7730, *Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria*

[14] ISO 9999, *Assistive products for persons with disability - Classification and terminology*

[15] ISO/IEC TR 10000-1, *Information technology - Framework and taxonomy of International Standardized Profiles - Part 1: General principles and documentation framework*

[16] ISO 10241-1, *Terminological entries in standards - Part 1: General requirements and examples of presentation*

[17] ISO 10241-2, *Terminological entries in standards - Part 2: Adoption of standardized terminological entries*

Bibliography *(continued)*

[18] ISO 13943, *Fire safety - Vocabulary*

[19] ISO 16069, *Graphical symbols - Safety signs - Safety way guidance systems (SWGS)*

[20] ISO/TR 16738, *Fire-safety engineering - Technical information on methods for evaluating behaviour and movement of people*

[21] ISO 16813, *Building environment design - Indoor environment - General principles*

[22] ISO 16814, *Building environment design - Indoor air quality - Methods of expressing the quality of indoor air for human occupancy*

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

[24] ISO/TR 257423), *Lifts (elevators) - Study of the methods used for fire testing lift landing doors*

[25] ISO/TR 25743, *Lifts (elevators) - Study of the use of lifts for evacuation during an emergency*

[26] ISO 23599, *Products for the blind and visual impaired persons - Tactile walking surface indicators*

[27] ISO 28564-1, *Public information guidance systems - Part 1: Design principles and element requirements for location plans, maps and diagrams*

[28] ISO 80000-1, *Quantities and units - Part 1: General*

[29] IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

[30] IEC 60118-4, *Electroacoustics - Hearing aids - Part 4: Induction loop systems for hearing aid purposes - Magnetic field strength*

[31] EN 81-40, *Safety rules for the construction and installation of lifts - Special lifts for the transport of persons and goods - Part 40: Stairlifts and inclined lifting platforms intended for persons with impaired mobility*

[32] EN 81-41, *Safety rules for the construction and installation of lifts - Special lifts for the transport of persons and goods - Part 41: Vertical lifting platforms intended for use by persons with impaired mobility*

[33] EN 81-70, *Safety rules for the construction and installation of lifts - Particular applications for passenger and good passenger lifts - Part 70: Accessibility to lifts for persons including persons with disability*

[34] EN 115-1, *Safety of escalators and moving walks - Part 1: Construction and installation*

Bibliography *(continued)*

[35] EN 1865, *Patient handling equipment used in road ambulances*

[36] EN 12217, *Doors - Operating forces - Requirements and classification*

[37] CEN/TS 81-82, *Safety rules for the construction and installation of lifts - Existing lifts - Part 82: Improvement of the accessibility of existing lifts for persons including persons with disability*

[38] AS 1428.1, Draft 04019, *Design for access and mobility - General requirements for access - New building work*

[39] AS 1428.4, *Design for access and mobility - Tactile indicators*

[40] AS 1428.5, Draft 07014, *Design for access and mobility - Communication for people who are deaf or hearing impaired*

[41] BS 5395-1, *Code of practice for the design of stairs with straight flights and winders*

[42] BS 6180, *Barriers in and about buildings - Code of practice*

[43] BS 8300, *Design of buildings and their approaches to meet the needs of disabled people - Code of practice*

[44] BS 8493, *Light reflectance value (LRV) of a surface - Method of test*

[45] BS 9999, *Code of practice for fire safety in the design, management and use of buildings*

[46] DIN 18024-1, *Barrier-free built environment - Part 1: Streets, squares, paths, public transport, recreation areas and playgrounds - Design principles*

[47] DIN 18024-2, *Construction of accessible buildings - Part 2: Publicly accessible buildings and workplaces, design principles*

[48] DIN 18025-1, *Accessible dwellings; dwellings for wheel chair users, design principles*

[49] DIN 18025-2, *Accessible dwellings; design principles*

[50] DIN 18041, *Acoustic quality in small to medium-sized rooms*

[51] GUIA UNIT 200, *Accesibilidad de las personas el entorno edificado - Niveles de accesibilidad recomendados*

[52] *Garis panduan rekabentuk sejagat di taman awam*, Jabatan Lanskap Negara, Malaysia

[53] NBR 9050, *Acessibilidade a edificações, mobiliário, espaços e equipamentos urbanos*

[54] ÖNORM B 1600, *Building without barriers - Design principles*

Bibliography *(continued)*

[55] ÖNORM B 1601, *Special buildings for handicapped and old persons - Design principles*

[56] ÖNORM B 1602, *Barrier-free buildings for teaching and training and possible accompanying facilities (together with ÖNORM B 1600)*

[57] ÖNORM B 1603, *Barrier-free buildings for tourism - Design principles (together with ÖNORM B 1600)*

[58] ÖNORM B 1610, *Barrier-free buildings and installations - Requirements for evaluation of accessibility*

[59] UNE 41500:2001 IN, *Accesibilidad en la edificación y el urbanismo. Criterios generales de diseño (Accessibility in building and urbanism. General criteria of design)*

[60] UNE 41501, *Símbolo de accesibilidad para la movilidad. Reglas y grados de uso (Symbol of accessibility for mobility. Rules and grades of use)*

[61] UNE 41510, *Accesibilidad en el urbanismo (Accessibility in urbanism)*

[62] UNE 41512, *Accesibilidad en las playas y en su entorno (Accessibility in beaches and in their environment)*

[63] UNE 41513, *Itinerarios urbanos accesibles en casos de obras en la calle (Accessible urban itineraries in cases of urban works)*

[64] UNE 41520, *Accesibilidad en la edificación. Espacios de comunicación horizontal (Accessibility in building. Horizontal communication elements)*

[65] UNE 41522, *Accesibilidad en la edificación. Accesos a los edificios (Accessibility in building. Accesses to the buildings)*

[66] UNE 41523, *Accesibilidad en la edificación. Espacios higiénico-sanitarios (Accessibility in building. Sanitary spaces)*

[67] UNE 41524, *Accesibilidad en la edificación. Reglas generales de diseño de los espacios y elementos que forman el edificio. Relación, dotación y uso (Accessibility in building. General design rules for the spaces and elements in buildings. Links, equipment and use)*

[68] UNIT 200, *Accesibilidad de las personas al medio físico. Criterios y requisitos generales de diseño para un entorno edificado accessible*

[69] UNIT 906, *Accesibilidad del las personas al medio físico - Símbolo gráfico - Características generales (COPANT 1614)*

[70] UNIT NM 313, *Ascensores de pasajeros - Seguridad para la construcción e instalación - Requisitos particulares para la accesibilidad de las personas, incluyendo las personas con discapacidad (COPANT 1629)*

Bibliography *(concluded)*

[71] SN 521 500, *Obstacle free buildings*

[72] EUROPEAN UNION, *Council Decision concerning the conclusion, by the European Community, of the United Nations Convention on the Rights of Persons with Disabilities, OJ L 23, 27.1.2010*

[73] EUROPEAN UNION, *Resolution of the Council of the European Union and the representatives of the Governments of the Member States, meeting within the Council of 17 March 2008 on the situation of persons with disabilities in the European Union, OJ C 75, 26.3.2008*

[74] FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), UNITED STATES FIRE ADMINISTRATION, *Orientation Manual for First Responders on the Evacuation of People with Disabilities, FA-235,* August 2002

[75] UN WORLD HEALTH ORGANIZATION, *International Classification of Functioning, Disability and Health (ICF)*

[76] UN WORLD HEALTH ORGANIZATION, *International Classification of Impairment, Disability and Handicap (ICIH-2)*

[77] UN WORLD HEALTH ORGANIZATION, *Older persons in emergencies*, August 2006

[78] BRIGHT, K and COOK, G., *"Project Rainbow. A research project to provide colour and contrast design guidance for internal built environments", The Chartered Institute of Building Occasional Paper No. 57, The Chartered Institute of Building*, 1999, ISBN 1 85380 084 8

[79] BRIGHT, K and COOK, G, *'The Colour, Light and Contrast Manual', Wiley- Blackwell 2010*, ISBN 978-1-4051-9504-1

[80] *Guidance on the Implications of the ISO Global Relevance Policy for CEN Standardization*, 2005

Acknowledgments

Members of Technical Committee on Building Design and Construction

Ar Steven Thang Boon Ann (Chairman)	Pertubuhan Akitek Malaysia
Mr Luqmanul Hakim Tarmizi (Secretary)	SIRIM Berhad
Haji Yahaya Ariffin	IKRAM QA Services Sdn Bhd
Mr Wan Mohamad Zaidi Wan Isa/ Mr Zulkafli Sidek/ Mr Shaharudin Tuan Ali	Jabatan Bomba dan Penyelamat Malaysia
Ar Yong Razidah Rashid/ Ms Norlina Awang	Jabatan Kerja Raya Malaysia
Mr Quah Beng Teong	Master Builders Association Malaysia
Ms Siti Aisah Md Lasim	Suruhanjaya Perkhidmatan Air Negara
Mr Mustaffa Al Bakri Saidin	Syarikat Perumahan Negara Berhad
Ir David Ng Shiu Yuen	The Institution of Engineers, Malaysia
Brig Gen Sr Haji Mohd Amin Mohd Din	The Institution of Surveyors, Malaysia
Assoc Prof Jamaluddin Mohd Aris	Universiti Teknologi MARA

Members of Working Group on Accessibility for Disabled Person

Dato'Sri Prof Ar Dr Asiah Abd. Rahim (Chairman)	Universiti Islam Antarabangsa Malaysia
Ms Nadiah Mohamed (Secretary)	SIRIM Berhad
Mr Chuang Kuang Hong	Construction Industry Development Board Malaysia
Ms Sharifah Junidah Syed Omar/ Mr Tan Kim Bock @ Steven	Dewan Bandaraya Kuala Lumpur
Dr Hajjah Asiah Haji Ibrahim	Hospital Rehabilitasi Cheras
Ms Ch'ng Gaik Bee @ Dalilah Bee Abdullah	Independent
Mr Abdul Hadi Abdullah	Jabatan Bomba dan Penyelamat Malaysia
Ms Yeoh Joo Ai	Jabatan Kebajikan Masyarakat Malaysia
Ms Aminah Abdul Rahman	Jabatan Kerajaan Tempatan
Ar Yong Razidah Rashid/ Ar S. Thulasaidas	Jabatan Kerja Raya Malaysia
Ms Suraya Dahlan	Jabatan Perancangan Bandar dan Desa
Mr Muhammad Fairuz Abdullah	Malaysian Association for the Blind
Mr Mohamad Sazali Shaari	Malaysian Federation of the Deaf
Mr Miskan Kasiman	Persatuan Orang-orang Cacat Anggota Malaysia
Dr Ruzita Mohd Amin/ Dr Aniza Abu Bakar	Universiti Islam Antarabangsa Malaysia
Dr Hazreena Hussein	Universiti Malaya (Jabatan Seni Bina)

Acknowledgments *(continued)*

Co-opted members

Ms Nur Amirah Abdul Samad/ Mr Che Raiskandar Che Rahim/ Ms Shukra Mohd Nadzar/ Ms Saleha Hanim Mastura Mohd Nasir/ Ms Normawati Ahmad/ Mr Aiman Badrulhisham	Universiti Islam Antarabangsa Malaysia