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Building construction — Accessibility and usability of the built environment

Cadre bâti — Accessibilité et usage de l'environnement bâti

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Foreword

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

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 16, *Accessibility and usability of the built environment*.

This second edition cancels and replaces the first edition (ISO 21542:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

a) document structure: a new hierarchy level has been introduced and the clauses have been assigned accordingly and partly resorted (e.g. Clause 5);

b) editorial revision of the Introduction and the Scope;

c) modification of the approach of exceptional considerations, which now only apply to existing buildings;

d) update of the normative references throughout the document;

e) revision of Clause 3 on terms and definitions according to the terminology used in the document and update of the sources;

f) restructuring of several (sub)clauses, especially those on:

   — orientation and information (5.1);

   — lighting (5.4);

   — acoustics (5.7);

   — paths to the building (6.3);

   — building entrances and final fire exits (6.5);

   — vertical and inclined lifting platforms (8.6);

- doorsets and windows (9.1);
- rooms and space within non-domestic buildings (Clause 10);

g) the provisions regarding tactile walking surface indicators (TWSI) have been adapted:

- ISO 23599:2019 has been widely referenced;
- a new subclause on tactile walking surface indicators has been introduced to 5.1;
- the annex on tactile walking surface indicators was revised and shortened;

h) revision of the provisions regarding visual contrast:

- the specifications in 5.3 have been revised and the relevant design factors were moved from the annex on human abilities and associated design considerations to it;
- a separate annex for the determination of the luminance contrast has been created;

i) complete revision and enlargement of the specifications on acoustics in 5.7 and emergency warning systems, signals and information in 5.8;

j) clarification and enlargement of the specifications on solitary obstacles in a path in 6.3.8;

k) complete revision of 6.4 on ramps and 8.5 on lifts;

l) enlargement of the specifications on control devices and signals (9.2) and drinking fountains (9.2.9);

m) revision of the clauses related to (fire) emergency evacuation:

- merger of the specifications related to (fire) emergency evacuation in Clause 11 but keeping the specifications on emergency warning systems in 5.8, on lifts used for evacuation in 8.5.8 and on fire-resisting doorsets 9.1.2;
- introduction of a subclause on emergency evacuation related building infrastructure;
- complete revision of the annex on fire prevention, protection, safety and evacuation (Annex D);

n) introduction of a new informative annex on housing (Annex A);

o) editorial revision of existing figures, removal of redundant figures and provision of new figures;

p) update of the Bibliography including the removal of national standards.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides essential requirements and necessary recommendations for the realization of a safe, inclusive, age-friendly and sustainable built environment that is accessible and usable by all.

The purpose of this document is to describe how a building should be designed, constructed, managed and maintained in order to enable people to: approach and enter the building; use the building's facilities, services and information networks; egress from the building under normal conditions; and evacuate the building during an emergency.

Accessibility and usability for all is a dynamic and continuously evolving concept – a fundamental attribute of a sustainable built environment. It is a process of interlinked actions and tasks in the everyday lives of people, which enables them to be educated, to get a job, to participate fully in a community, and to feel socially included. Just one barrier, physical or otherwise, to that participation can restrict, terminate and make void the whole process.

The intention of this document is to meet the needs of the broadest majority of people. This goal is achieved by agreement on minimum standards of provision that are generally accepted to accommodate human diversity and variation, in age, ability, and behaviour, common in every society.

When the infrastructure of accessibility and usability is fully and effectively in place, good building management practice and procedures are essential to maintain original as-built or as-adapted performance during the life cycle of the building and, in the event of a fire or other emergency incidents, to ensure that the intended safety strategy is successfully initiated and executed.

The principles of accessibility and usability for all are supported by Preamble Paragraph (g), and Articles 9, 10, 11, 12 and 19 of the United Nations (UN) Convention on the Rights of Persons with Disabilities. These principles are reinforced by

— the UN 2015-2030 Sustainable Development Framework Agenda, particularly Sustainable Development Goal 11: 'Sustainable Cities & Communities';

— the World Health Organization's 2016-2020 Global Strategy & Action Plan on Ageing & Health.

NOTE 1 The United Nations Convention on the Rights of Persons with Disabilities (CRPD), with its Optional Protocol, was adopted by the General Assembly on 13 December 2006. It came into force, i.e. it became an international legal instrument, on 3 May 2008. Full information can be found on the UN website: https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html.

NOTE 2 Protection of persons with disabilities during severe natural events, e.g. earthquakes, floods, landslides, typhoons and tsunamis, is dealt with under the Sendai Framework on Disaster Risk Reduction (2015 - 2030), which forms part of the UN Sustainable Development Framework Agenda.

If the design requirements and recommendations in this document are taken into consideration during the earliest stages of a new building design, the financial cost of providing accessibility and usability measures is minimal, and the completed building is safer and more user-friendly for every building user. For all existing buildings, effort should be made to meet the requirements to make them accessible and usable. It is also important to ensure that buildings of historical, architectural and cultural importance are accessible.

Where these design requirements are not considered, the socio-economic cost is considerable in terms of human rights violations and a significant reduction in building user safety and satisfaction.

ISO/IEC Guide 71, and its guidance document ISO/TR 22411, augment and assist in understanding the requirements of this document.

At present, consideration is being given to the development of further documents to especially deal with environments for children with disabilities and cultural heritage.

Building construction — Accessibility and usability of the built environment

IMPORTANT — The electronic file of this document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

1 Scope

This document specifies a range of requirements and recommendations for the elements of construction, building assemblies, components, fittings and products that relate to the design and constructional aspects of usability and accessibility of buildings, i.e. access to buildings, circulation within buildings, egress from buildings during normal conditions, and evacuation in the event of a fire.

This document also applies to the common spaces in multi-unit residential buildings. Recommendations regarding residential units are given in Annex A.

This document also contains provisions with respect to outdoor features directly concerned with access to a building or a group of buildings from a relevant site boundary, or between such a group of buildings within a common site. This document does not deal with elements of the external environment, such as public open spaces, whose function is self-contained and unrelated to the use of a specific building.

This document is applicable to new buildings and new work in existing buildings.

This document introduces the concept of 'exceptional considerations for existing buildings' for situations where it is exceptionally difficult to meet the requirements specified and, thus, impossible to provide full accessibility. By means of 'exceptional considerations for existing buildings', an acceptable, though restricted, level of accessibility is specified. An exceptional consideration for existing buildings is not to be applied in other situations or invoked in an unjustified manner, or as an excuse for not achieving a higher level of accessibility, where this is economically and/or technically feasible.

The dimensions stated in this document, relevant to the use of wheelchairs, are related to the footprint of commonly used wheelchair sizes and users as specified in ISO 7176-5 and ISO/TR 13570-2, 800 mm wide and 1 300 mm long.

This document is primarily written for adults with disabilities, but it includes some recommendations on specific accessibility needs of children.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC Guide 71, *Guide for addressing accessibility in standards*

ISO 4190-5:2006, *Lift (Elevator) installation — Part 5: Control devices, signals and additional fittings*

ISO 8100-1:2019, *Lifts for the transport of persons and goods — Part 1: Safety rules for the construction and installation of passenger and goods passenger lifts*

ISO 8100-30:2019, *Lifts for the transport of persons and goods — Part 30: Class I, II, III and VI lifts installation*

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

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

ISO 23599:2019, *Assistive products for blind and vision-impaired persons — Tactile walking surface indicators*

IEC 60118-4, *Electroacoustics — Hearing aids — Part 4: Induction-loop systems for hearing aid purposes – System performance requirements*

IEC 60268-16, *Sound system equipment — Part 16: Objective rating of speech intelligibility by speech transmission index*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
accessibility
provision of buildings or parts of buildings for people, regardless of their age, size, ability or disability, to be able to gain access to them, into them, to use them and exit from them

Note 1 to entry: 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.

3.2
area of rescue assistance
area of refuge
building space that has been designed for people to temporarily wait in safety and with confidence for further information, instructions, and evacuation assistance or rescue, without obstructing or interfering with the evacuation of others

3.3
attention pattern
TWSI (3.33) design, calling attention to a hazard only, or to hazards and decision points

[SOURCE: ISO 23599:2019, 3.1, modified — Note 1 to entry has been removed.]

3.4
built environment
external and internal environments and any element, component or fitting that is commissioned, designed, constructed and managed for use by people

Note 1 to entry: 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.

3.5
circulation space
unobstructed space necessary for access to, into and within and egress from any part of the *built environment* (3.4)

3.6
counterflow
emergency access by firefighters or rescue teams into a building and towards a fire, while building users are still moving away from the fire and being evacuated from the building

3.7
doorset
assembly consisting of a fixed part (door frame), one or more movable parts (door leaves), and their door furniture, the function of which is to allow or to prevent access and egress to a room or a building

Note 1 to entry: A doorset can also include, at floor level, a door saddle (also known as a sill or threshold).

3.8
fire compartment
enclosed space, which may be subdivided, separated from adjoining spaces by fire barriers

[SOURCE: ISO 13943:2017, 3.120]

3.9
fire emergency management plan
description of the fire emergency response procedures for an occupied building with the aim of ensuring the safety and health of all building users in the event of a fire emergency

Note 1 to entry: It includes information about the building's fire safety preparedness and prevention measures, the pre-emergency, emergency and post-emergency roles, duties and responsibilities assigned to building management personnel.

3.10
fire evacuation
planned and orderly phased movements to withdraw, or cause to withdraw, all users from a building via accessible routes to one or more accessible *places of safety* (3.20) in the event of a fire emergency

3.11
going
tread
tread depth
<stair> horizontal distance between two consecutive nosings

3.12
guiding pattern
TWSI (3.33) design, indicating a direction of travel or a landmark

[SOURCE: ISO 23599:2019, 3.8, modified — Note 1 to entry has been removed.]

3.13
handrail
component providing support and grip for users

[SOURCE: ISO 6707-1:2020, 3.3.2.75]

3.14
hearing enhancement system
piece of equipment, product system, hardware, software or service that is used to increase, maintain or improve hearing capabilities of individuals with *hearing impairments* (3.15)

Note 1 to entry: Hearing enhancement systems amplify audible communication and can be helpful to people who have hearing loss. They include a direct wire system, an *induction loop* (3.17) 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 can receive the signal from an induction loop system. Receivers can be equipped to be compatible with hearing aids.

3.15
hearing impairment
acoustic *perception* (3.27) ranging from hard of hearing to deafness

Note 1 to entry: "Deaf "refers to having little or no functional hearing, while "hard of hearing" refers to having a hearing loss that ranges from mild to profound.

3.16
impairment
limitation in body function or structure such as a significant deviation or loss which can be temporary or permanent, slight or severe and can fluctuate over time

3.17
induction loop
system that transmits an audio signal directly to a hearing aid

Note 1 to entry: The audio signal is transmitted via a magnetic field, greatly reducing background noise, competing sounds, reverberation and other acoustic distortions in order to improve the clarity of sound.

Note 2 to entry: IEC 60118-4 provides further information about induction loops for enhanced hearing.

[SOURCE: ISO 22259:2019, 3.20, modified — Note 2 to entry has been added.]

3.18
kerb ramp
construction, in the form of an inclined plane that makes it possible to pass from street level to a higher pedestrian path

3.19
landing
platform or part of a floor at the end of a flight of stairs or ramp or area providing access to a lift car at each level of use

[SOURCE: ISO 6707-1:2020, 3.3.5.23, modified — "of stairs" has been added.]

3.20
levelling accuracy
vertical distance between *lift* (3.21) car sill and *landing* (3.19) sill during loading or unloading of the lift car

[SOURCE: ISO 8100-1:2019, 3.25, modified — "lift" has been added twice.]

3.21
lift
elevator
permanent lifting equipment that serves defined levels of *landings* (3.19), comprising a compartment or cage, running at least partially between rigid vertical guides, or between guides whose inclination to the vertical is less than 15°

[SOURCE: ISO 6707-1:2020, 3.3.4.29]

3.22
lift evacuation system
system, including a vertical series of *lift* (3.21) lobbies and associated lift lobby doors, (a) lift well(s), and machinery spaces, that provides protection from fire effects for lift passengers, people waiting to use lifts, and lift equipment so that lifts can be used safely for egress

Note 1 to entry: This definition is based on NIST TN 1825.

3.23
lifting platform
appliance permanently installed to serve fixed *landing* (3.19) levels, comprising a guided platform whose dimensions and means of construction permit the access of passenger(s) with disabilities, with or without wheelchair(s)

Note 1 to entry: Lifting platforms can also be portable, e.g. as used in exhibitions. Portable lifting platforms are not covered by ISO 9386-1.

[SOURCE: ISO 9386-1:2000, 3.25, modified — "device" has been replaced by "appliance"; "disabled passenger(s)" has been replaced by "passenger(s) with disabilities"; the original Note 1 to entry has been removed; a new Note 1 to entry has been added.]

3.24
light reflectance value
LRV
proportion of visible light reflected by a surface, weighted for the sensitivity to light of the human eye

Note 1 to entry: The light reflectance value as used in this document is equivalent to CIE tristimulus Y as defined by CIE 15:2018.

Note 2 to entry: CIE Y10 is evaluated with reference to the standard illuminant CIE D65 and to the geometry dif/8° (diffuse illumination and observation at an angle of 8° by the normal to the sample), according to 10° CIE standard colorimetric observer. Further details on measurements of reflection are given in CIE 130:1998.

Note 3 to entry: 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.

3.25
luminance
intensity of light emitted or reflected by a surface element in a given direction divided by the area of the element in the same direction

Note 1 to entry: Luminance is given in cd/m^2.

Note 2 to entry: The intensity of light is the luminous flux per unit solid angle emitted or reflected by a surface element in a given direction. The projected area of the surface element is measured perpendicular to this direction.

3.26
luminance contrast
luminance (3.25) of one surface or component compared to the luminance of the background or adjoining surface

Note 1 to entry: The luminance contrast as used in this document is determined by the use of the Michelson formula (C_m) or the Weber formula (C_w) and is given in %.

Note 2 to entry: In this document, the equivalent for the required luminance contrast when using the Weber formula (C_w) is given in the tables and in brackets in the text.

3.27
perception
interpretation of sensory information by the brain and central nervous system with the aim of developing understanding prior to action

Note 1 to entry: Sensory information is of visual, auditory, olfactory, gustatory, tactile or of a proprioceptive nature.

3.28
persons with disabilities
persons having physical, mental, intellectual or sensory *impairments* (3.16) which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others

Note 1 to entry: In this document, persons with disabilities also refers to persons with temporary impairments.

[SOURCE: UNCRPD, 2006, Article 1, modified — "long-term" has been removed; Note 1 to entry has been added.]

3.29
place of relative safety
safe refuge
temporary location which is free from immediate danger from the effects of fire and smoke

Note 1 to entry: It is, for example, a place where *persons with disabilities* (3.28) can wait in relative safety for further assistance. It can also be a waiting area in high-rise buildings which gives people a chance to rest before continuing their escape to a *place of safety* (3.30).

[SOURCE: ISO 13943:2017, 3.333, modified — The preferred term "place of relative safety" has been added; "safe refuge" has been changed to an admitted term; in the Note 1 to entry "a wheelchair user" has been replaced by "persons with disabilities"; "and smoke" has been added.]

3.30
place of safety
location which is free from danger and from which it is possible to move freely without threat from a fire

Note 1 to entry: In the case of a building fire, it is typically a place outside the building.

Note 2 to entry: Places of safety within a building may be *places of relative safety* (3.29) before evacuation from the building.

Note 3 to entry: In a place of safety, medical care and attention can be provided or organized and people can be identified.

[SOURCE: ISO 13943:2017, 3.300, modified — The original Note 1 to entry has been removed; subsequent notes to entry have been renumbered; Note 3 to entry has been added.]

3.31
rise
vertical distance between the upper horizontal surfaces of two consecutive goings, or of a *landing* (3.19) and the next goings above or below it, or of a flight between consecutive landings

3.32
stopping accuracy
vertical distance between *lift* (3.21) car sill and *landing* (3.19) sill at the moment when a lift car is stopped by the control system at its destination floor and the doors reach their fully open position

[SOURCE: ISO 8100-1:2019, 3.58, modified — "lift" has been added twice.]

3.33
tactile walking surface indicator
TWSI
standardized raised tactile and visual pattern on the walking surface to provide information for persons with *vision impairments* (3.38)

3.34
unified glare rating
UGR
method to predict discomfort glare for indoor lighting systems

Note 1 to entry: This method is developed by CIE.

3.35
unobstructed width
available width for passage through a door opening, along a passageway, or other route element, clear of all obstructions

Note 1 to entry: The unobstructed width is measured when the door is opened 90°, or when a sliding or folding door is opened to its fullest extent.

Note 2 to entry: Clear opening width as defined in ISO 1804 is another concept, the smallest distance between rebates, which is different from unobstructed width.

3.36
usability
extent to which a system, product or space can be used to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[SOURCE: ISO 9241-11:2018, 3.1.1, modified – "service" has been replaced by "space"; Notes 1 and 2 to entry have been removed.]

3.37
visual contrast
visual *perception* (3.27) between two adjacent elements of a building

Note 1 to entry: Visual contrast can be obtained by a combination of *luminance contrast* (3.26) and colour contrast. Since people with impaired vision can rely only on luminance contrast, in this document *accessibility* (3.1) is evaluated in terms of luminance contrast.

3.38
vision impairment
visual impairment
permanent reduction of visual *perception* (3.27) ranging from partial sight to blindness depending on the residual functional sight

Note 1 to entry: In relation to *accessibility* (3.1) requirements, "partially sighted persons" means persons, who primarily use their (residual) sight, and "persons who are blind" means persons, who primarily rely on audible and tactile input, although they can also have a certain amount of visual perception.

3.39
wayfinding
information system provided to assist a person to pass through the *built environment* (3.4) towards a specific destination

Note 1 to entry: Wayfinding includes orienting oneself, knowing one's destination, following the best route, recognizing one's destination and finding one's way back out. Persons with *vision impairments* (3.38) benefit from audible and tactile information to facilitate wayfinding.

4 General design considerations

4.1 General

The requirements and recommendations in this document relate to principal human abilities that shall be considered when designing, constructing and managing a building and the wider built environment. See Annex G for a brief overview of principal human abilities.

When fully and effectively implemented, this document is of benefit to everyone, including:

— people with mobility impairments;

— people with vision impairments;

— people with hearing impairments;

— people with mental or cognitive impairments;

— people with hidden impairments, such as allergy and diminution of strength, stamina, and dexterity;

— people with multiple impairments;

— people with health conditions (including temporary ones);

— people with a diversity in age and stature, including young children and older people.

4.2 Key accessibility issues

Entering, using, leaving and evacuating buildings shall be safe and easy for everyone.

The main considerations for meeting this requirement are:

— pedestrian access into the site;

— designated cycle and motor vehicle parking spaces adjacent to the main entrance;

— accessible path(s) to entrances and exits;

— reduced travelling distances;

— suitable drop off point(s) adjacent to the main entrance;

— sufficient external lighting;

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

— accessible information at the entrance to the site;

— orientation, tactile and audio guidance to the entrance (detectable boundary of the path, difference in surface materials, TWSIs, etc.);

— level entrances and exits;

— intuitive and legible building layout;

— easy access to information desks, lifts and toilet compartments;

— unobstructed level circulation;

— spacious accessible lifts;

— accessible lifts capable of being used for independent (fire) evacuation;

— slip-resistant walking surfaces;

— wide door openings and easy door operation, sufficient manoeuvring space around doors to assist persons using a wheelchair;

— adequate manoeuvring space;

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

— good lighting;

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

— effective signage, including high-level, low-level and photoluminescent signage;

— important information communicated via multiple senses (visual, audible and tactile);

— good acoustics;

— hearing enhancement systems;

— intuitive, obvious accessible (fire) evacuation routes;

— stairs easy to use, facilitating safe assisted evacuation/rescue in fire emergencies;

— fire protected areas of rescue assistance near fire evacuation staircases;

— accessible floors of temporary refuge in high-rise buildings;

— fire prevention measures and management easily communicated to and capable of being implemented by all building users.

See Table 1 for examples of how these issues can be combined when planning a built environment.

Table 1 — Examples of key accessibility issues in the early stages of design

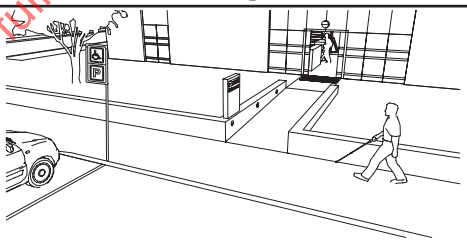
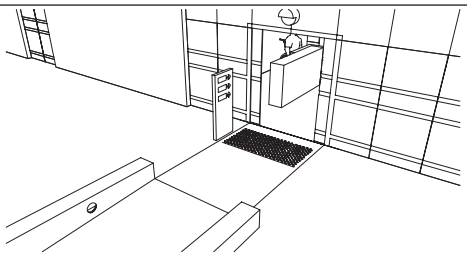
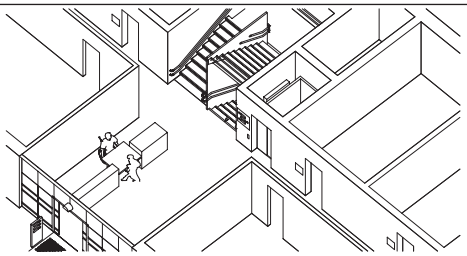
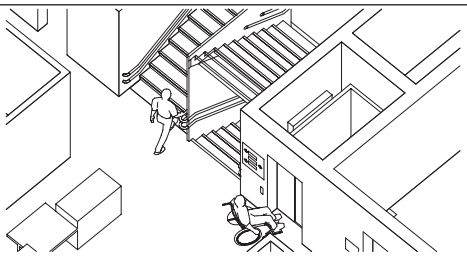
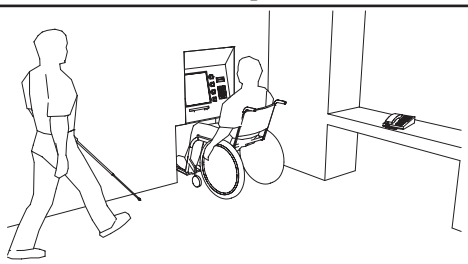
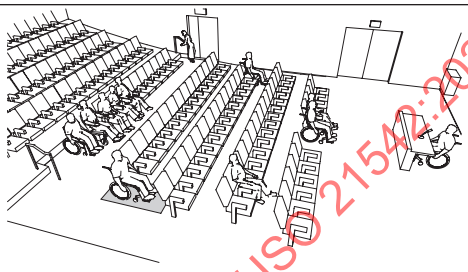
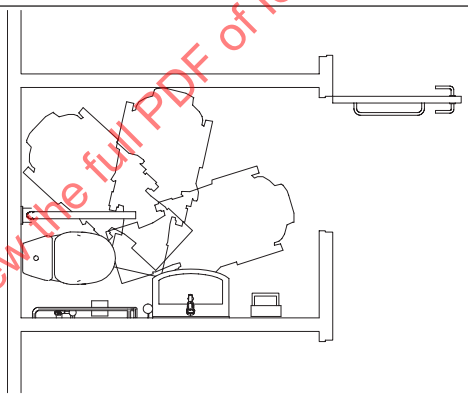
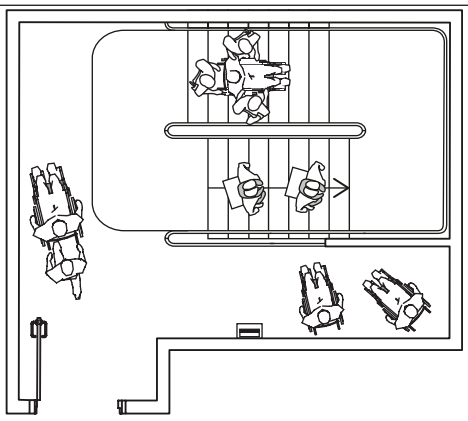
No.	Key accessibility issues	Example
1	Equitable approach to a building, e.g. designated parking, clear pedestrian routes separate from vehicles and cyclists, no steps or obstacles, short distances from parking and public transport, good signage, good lighting and good contrast. See 5.3 to 5.5 and 6.1 to 6.5.	
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 5.3 to 5.5, 6.6, 9.1 and 9.2.	
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 Clause 7, 9.1 and 9.3.	
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 5.3 to 5.5, 8.1, 8.3, 8.4, 8.5 and 8.7.	

Table 1 *(continued)*

No.	Key accessibility issues	Example
5	Equitable use of the same equipment and facilities, e.g. easy to understand and operate, adequate manoeuvring space and operating height, information via multiple senses. See 5.1, Clause 7, 9.2, 9.3 and 10.1.	
6	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 5.4, 5.5, 5.7, 10.3, 10.4, 10.10 and 10.11.	
7	Equitable use of toilet and sanitary facilities, e.g. good signage, adequate manoeuvring space, good transfer options, well-placed equipment, easy operation. See 5.1, 5.6 and 10.5.	
8	Important information via multiple senses, e.g. visual, audible and tactile. See 5.1 and 5.5.	
9	Equitable fire safety and evacuation procedures; accessible fire evacuation routes; areas of rescue assistance; places of relative safety; lift evacuation systems; floors of temporary refuge; easy-to-operate fire/smoke/heat resisting doorsets; multi-format fire emergency warning systems; linked, multi-format fire evacuation information; a buddy system. See 5.5, 5.6, 5.8, 6.4, Clause 7, 8.1, 8.3, 8.4, 8.5, 8.7, 9.1, 9.2, 10.5, Clauses 11 and 12, Annexes B and D.	

5 Orientation and information outside and inside of a building

5.1 Orientation and information

5.1.1 General

The built environment shall be designed, constructed and managed to facilitate orientation. Orientation means to find one's way and to reach one's destination, avoiding hazardous obstacles.

Information shall be provided at the entrance about the layout of the building, and at decision points about the current position within the building (e.g. building level), and/or possible destinations from that location.

Means to ensure satisfactory orientation conditions are:

— plan of the building layout, including tactile form;

— wayfinding and guided paths with TWSIs (see 5.1.4 and Annex B), and other physical support of information (see 6.3.2);

— signage (see 5.5) and symbols (see 5.6);

— visual contrast (see 5.3);

— choice of colours (see 5.3.4);

— surface materials (see 5.2);

— lighting (see 5.4);

— visual, audible and tactile information according to the principle of multiple senses (see 5.1.3).

Orientation is facilitated by differences in acoustics, materials, light and colour.

To assist partially sighted persons, routes to be followed should have a luminance contrast to the surroundings as specified in 5.3.

To assist in orientation and wayfinding, decision points such as entrances, staircases, lifts, etc. should be highlighted by provision of additional illumination, visual contrast and tactile information such as a change in material or tactile walking surface indicators.

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, persons with vision impairments need a tactile route or guiding pattern to follow (see Annex B).

In complex buildings, an audible beacon or transponder should be installed in addition to visual and tactile information to provide information at decision points.

See 6.3.8 for information on avoiding hazards of solitary obstacles in a path in the outdoor environment and in buildings.

5.1.2 Levels of information

Information shall be clear, concise, accurate and timely. Clear information is legible and easily understood and presupposes that people can distinguish between the different types of information that they receive.

Information can be divided into three levels:

— Level 1: safety information

— Level 2: general information

— Level 3: advertising information

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

Information should be complete and concise. Too much information is difficult for people to retain. Advertisement shall not be combined with the orientation information.

All information provided should be consistent and sequentially logical.

5.1.3 Principle of multiple 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 multiple senses.

Information in audible, visual, tactile and simple language formats should be provided where possible. At least one of the following combinations shall be provided:

— audible information to be supplemented by visual information for persons with hearing impairments;

— visual information to be supplemented by audible information plus tactile information where appropriate for persons with vision impairments.

The ambient noise level and the possibilities for positioning and detection of tactile information shall determine whether visual information needs to be supplemented either by audible or by tactile information or by both.

Information and communication technologies that provide information in a variety of formats (such as beacons, online support, two-way communication) can also be used, if they are in accessible formats.

Requirements for visual and tactile information are specified in 5.5, for acoustic information in 5.7.

5.1.4 Tactile walking surface indicators – TWSI

Specifications for dimensions and arrangement shall be according to ISO 23599.

TWSIs require a logical and self-explicative layout that includes tactile guidance routes and decision points from an access point to a destination point continuously. The layout of TWSI shall be simple and logical; and the use of the system shall be possible with a reasonable extent of preparation by users.

TWSI systems shall be clearly defined so that they consist of a combination of continuous tactile information regarding directional guidance, decision points and warning. The beginning of a TWSI system shall be clearly defined and easily locatable in conjunction with built and natural guiding elements.

TWSIs shall be positioned with the required distance to any obstacle or hazard as described in 6.3.8 to ensure safe use.

The implementation of TWSI systems for guidance shall facilitate orientation, wayfinding and shall provide decision points in indoor and outdoor environments.

TWSI for warning shall indicate the following types of hazards:

— level differences;

— steps and stairs (see 8.3.6);

— automatic swing doors (see 9.1.1.8);

— pedestrian crossings;

— platform edges.

TWSIs are no substitute for physical safety elements such as guards against falls or impact.

For TWSI dimensions (attention pattern and guiding pattern), see Annex B.

5.2 Floor and wall surfaces

Floor finishes shall be firm and slip-resistant under both dry and wet conditions.

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

To facilitate orientation, luminance contrast between floor and wall surfaces in accordance with 5.3 shall be provided. Providing different floor materials between circulation areas and areas with furniture supports orientation in large halls, shops or restaurants.

Highly contrasting floor patterns shall be avoided to prevent disorientation and interference with the detection of safety elements, e.g. visual warning line on stairs.

The surfaces should contribute to an acoustic environment that helps in orientation; see also 5.4 on lighting and 5.7 on acoustics.

5.3 Visual contrast

5.3.1 General

Visual perception of information, features or building elements requires appropriate luminance contrasts between an object and the background or adjacent surfaces. Appropriate luminance contrasts help persons with vision impairments to perceive information and identify elements for orientation and wayfinding. The appropriate luminance contrast value depends on the visual task to accomplish and is related to:

— dimension of the smallest detail relevant for interpretation;

— available time for detection, for instance, immediate perception of risks and warnings;

— lighting conditions (daylight, artificial lighting, or a combination of both).

The main feature of a surface, which is also related to individual abilities of partially sighted people to identify differences in colour, is luminance. Luminance is the amount of light emitted or reflected from a surface in the direction of the observer measured per unit projected area of the surface element. Luminance is often referred to as the brightness of a surface. Differences in hues (the nature of the colour) or chroma (the intensity of the colour) do not independently supply adequate visual contrasts, but they can complement luminance contrasts to help persons with good colour perception to perceive and identify a visual task.

NOTE 1 Some persons, in particular persons with vision impairments, are unable to perceive some or all colours. Nevertheless, most persons with no or limited colour vision can perceive luminance contrasts.

Clear discernible contrasts shall be provided to help detecting information, building elements or potential hazards and to facilitate orientation and wayfinding. It ensures equitable and safe use of a specific environment for all users. The provision of good lighting is essential to perceive visual contrast. Adequate illumination and minimum reflectance values of the lighter surface are required to provide sufficient luminance of surfaces and building elements in relation to the specific visual task to be accomplished. In general, when the level of illumination is low, a higher level of visual contrast is required to assist in the human perception of information, building elements or spatial design.

NOTE 2 The ability to perceive differences in contrasts increases with the illuminance that surrounds the visual task to be accomplished. The required minimum luminance contrast values consider the varying lighting conditions inside a building (combination of artificial lighting and daylight) and in outdoor environment (varying daylight during the course of the day and seasonal variations).

Luminance contrast in indoor and outdoor environment, in particular markings on the floor with safety functions, e.g. marking of the nosing of steps in a stairway, need regular maintenance so that the required luminance contrast is maintained throughout the life cycle of the building.

5.3.2 Luminance contrast

NOTE 1 In this document, the Michelson formula and the Weber formula are used for determining luminance contrast values. The Michelson contrast formula is most frequently used when it comes to calculating luminance contrasts of building elements. On the other hand, the Weber contrast formula is the most frequently used method for calculating contrast values for small elements such as symbols mounted on a larger surface.

Luminance contrasts, as defined in this document, shall be determined by use of the Michelson formula as shown in Formula (E.1), or the Weber formula as shown in Formula (E.2). A minimum luminance contrast value and a minimum light reflectance value for the lighter surface shall be provided in relation to the visual task, according to Table 2 for matte surface materials and Table 3 for glossy or shiny materials. Methods for the determination of luminance contrasts and light reflectance values (CIE Y-values) are outlined in Annex E.

NOTE 2 LRV values describe the reflection properties of surfaces. The only photometric quantity visible to the human eye is luminance. Scientifically accepted methods for describing visual contrast use luminance contrast. The Michelson and Weber formulae are summary descriptions of this luminance relation. These formulae can be used to determine the luminance contrast of two contrasting surfaces (measured on the object). The LRV value, equivalent to the CIE Y-values, can be used in the Michelson or Weber formula for approximation in planning. Both formulae take into account that the visual response never increases linearly with reflectance.

For lighting conditions that are lower than specified in Table 5 (see 5.4.6), the luminance contrast values should be higher than required in Table 2 for matte surface materials and Table 3 for glossy and shiny materials as the perception of visual contrast increases with better lighting conditions. Recommendations for lighting to facilitate wayfinding are given in 5.4.4.

Table 2 — Minimum luminance contrast values according to the visual task

Visual task	Minimum LRV[a] of the lighter surface (CIE Y)	Michelson contrast C_m [%]	Weber contrast C_w [%]
Large surface areas (i.e. walls, floors, doors, ceiling), elements and components to facilitate orientation (i.e. handrails, door furniture, tactile walking surface indicators, and visual indicators on glazed areas)	≥ 40	≥ 30	≥ 45
Potential hazards (i.e. visual indicator on steps, glazed areas), small items (i.e. switches and controls) and self-contrasting markings	≥ 50	≥ 60	≥ 75
Text information, i.e. signage	≥ 70	≥ 60	≥ 75

[a] The light reflectance value LRV, or CIE Y-value, 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.

Combinations of CIE Y-values that meet the requirements in Table 2 can be deduced from the graphs in Figures E.1, E.2 and E.3.

5.3.3 Luminance contrast of glossy or shiny materials

Reflecting materials with highly glossy or shiny surfaces shall not be used for visual indicators that highlight potential hazards. Reflections and glare from shiny surfaces can reduce visual contrast causing confusion for people with vision impairments.

Where reflecting materials with highly glossy or shiny surfaces are used for one or both surfaces of interest, e.g. brushed metal, a higher minimum luminance contrast value is required than for non-reflecting materials, see Table 3.

NOTE 1 Luminance of a glossy or shiny surface varies according to the viewing angle of the observer, position of light sources and the luminance of the surfaces that are reflected, for instance the observer's clothes, walls, light sources or other surfaces. Reflections can reduce the luminance contrast.

Table 3 provides requirements for minimum luminance contrast values for brushed metal, e.g. brushed stainless steel, as it is often used for various building elements, such as base plates of control devices, lift buttons, or as protection of door panels.

Table 3 — Minimum luminance contrast for brushed metal

Visual task	Minimum reflectance of the lighter surface	Michelson contrast C_m [%]	Weber contrast C_w [%]
Large surface areas (i.e. walls, floors, doors, ceiling), elements and components to facilitate orientation (i.e. base plates of controls, tactile walking surface indicators)	≥ 40	≥ 40	≥ 57
Small items necessary to enable use of building elements (i.e. control buttons, inscriptions on controls)	≥ 70	≥ 70	≥ 82

Where brushed metals are used for building elements with rounded profiles, e.g. inscriptions in tactile, door handles or handrails that facilitate wayfinding, luminance contrasts in Table 2 apply.

NOTE 2 In general, a luminance contrast is accomplished by the element itself as well as in conjunction with the surrounding surface. The convex surface of a rounded profile concentrates reflected light so that one side of the profile demonstrates a high luminance while the other side has a low luminance.

NOTE 3 Signs with backlight illumination provide an adequate luminance contrast in comparison to the surrounding surface that is made of brushed metal (i.e. control button).

5.3.4 Choice of colours and patterns

Colours should be used to help to identify doors, storeys or departments in a building and facilitate wayfinding. For combination of colours, it is recommended to combine darker colours at the edge of the colour spectrum, e.g. violet, blue, red, with brighter colours in the middle of the spectrum (yellow, green) as shown in Figure 1. However, combinations with red and green or blue and yellow should be avoided if the colour nuances have similar lightness or saturation. This is particularly essential to overcome the problems associated with anomalous colour vision or colour-vision deficiency (formerly called colour blindness or achromat in medical terms).

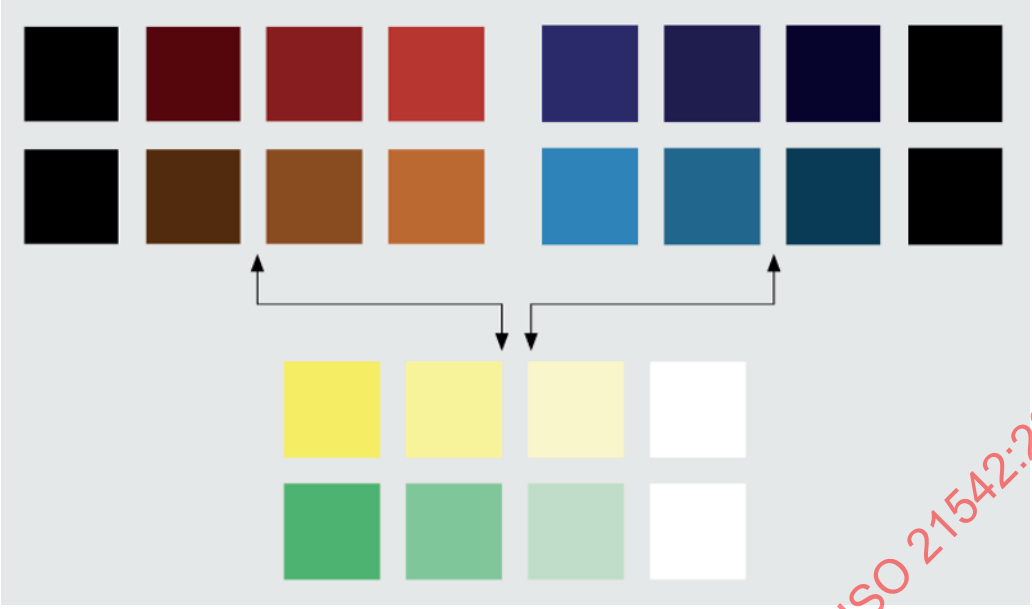


Figure 1 — Recommended combination of dark and light colours

To create a contrast between blue and yellow or red and green, a combination of dark blue with bright yellow, or a deep red with a pale green should be applied as this is easier to discern for the human eye than a combination of dark green with pale red or strong yellow tone with light blue tone.

Colours can be used for guidance such as for identification of a floor level or function of a room. In that case, they complement tactile and visual signs e.g. the number "2" for the second floor, see also 8.4.6 and 5.5.3.2.

Floor patterns shall avoid significant luminance contrast values between darker and lighter parts of the pattern and have a maximum of C_m = 20 % (C_w = 33 %).

NOTE High luminance contrast values of the floor pattern can be perceived as differences in heights, which can confuse people with cognitive or vision impairments. Highly contrasted floor patterns can cause some people to experience vertigo.

5.3.5 Relevant design factors

To emphasise spatial features and assist in orientation, certain factors should be considered in any design. The following are some examples.

— Appropriate luminance contrast should be used as cues to distinguish the boundaries of larger surfaces such as the floor, wall, door or ceiling.

— A floor-frieze (decorative stripe in the floor material) along the walls or skirting boards with appropriate luminance contrast can be used as an alternative to luminance contrast between walls and floor to provide an accurate impression of the size of a space.

— Adequate visual contrast shall be used to identify potential hazards such as steps, stairways, glazed doors or walls, bollards, etc.

— Adequate visual contrasts shall be used to highlight information for wayfinding such as signage, floor numbers, room indications, etc.

— Small elements such as control buttons (e.g. a light switch on a wall), inscriptions, symbols or graphic elements (e.g. on glazed doors or walls) require higher luminance contrast than larger elements such as floor surfaces, wall surfaces or door panels.

— Sufficient reserves in contrast values shall be provided at the time of the installation to counteract deterioration and maintenance to achieve and maintain minimum luminance contrast throughout the life cycle of building elements according to 5.3.1. Contrasts between elements or markings on floor surfaces are more often reduced by dirt or abrasion than contrasts between elements or markings on wall surfaces.

— Glare can reduce visual contrasts when contrasting elements are observed from an unfavourable viewing angle. A higher luminance contrast is required for reflecting materials than for matte surfaces.

— Reflections and glare from shiny surfaces can confuse people with vision impairments. Very shiny surfaces should not be used, since they can cause dazzling in conjunction with bright light, which prevents utilisation of residual vision. Dazzling can also cause pain for those with light-sensitive eyes.

To highlight the presence of a door, the following factors should be considered:

— The architrave should have visual contrast to the surrounding wall, in order to identify the presence of the door even when the door is open.

— Preferably both the door and the architrave should contrast with the surrounding wall.

— The ease with which persons with vision impairments can distinguish door-opening furniture against a background is influenced by their 3-D form (giving light and shade) and the shiny nature of the finish, whether metallic or non-metallic.

This list highlights only a few areas when luminance contrast should be considered. In addition, there are many more factors that can affect the selection and use of colours in environments.

Where adequate luminance contrast cannot be achieved by the building element itself, it is possible to realise contrast requirements by adding a contrasting stripe that circumscribes the element: a switch can be surrounded by a square or circle of colour that contrasts both with the switch and with the wall, a visual warning line on steps can be highlighted by a strip between the warning line and going of the step.

NOTE Information about colour contrast and perception has been published in several countries (e.g. Australia, Germany, Japan, UK, USA).

5.4 Lighting

5.4.1 General

The planning of artificial lighting should be coordinated with the planning of natural lighting, the choice of surfaces and colours.

Good artificial lighting is crucial for everyone, ensuring that people with limited vision can use buildings safely and conveniently, and that people with hearing impairments can read lips. For requirements for minimum illuminance in different areas, see Table 5.

Lighting conditions that support lipreading 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.

Lighting should not lead to glare or excessive contrast.

5.4.2 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, steps, signage, etc. shall be well lit artificially with minimum illuminance according to Table 5.

To avoid glare, the change in illuminance between two adjoining surfaces shall be limited to two levels on the illuminance scale as indicated in Table 4.

NOTE The levels on the illuminance scale represent the smallest significant difference for a change in illuminance that is just perceptible and effective in terms of visual performance.

Table 4 — Typical levels of an illuminance scale

Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Illuminance [lx]	20	30	50	75	100	150	200	300	500	750	1 000	1 500	2 000	3 000	5 000

Artificial lighting of entrances should provide a gradual change of the light level between the inside and the outside, taking into consideration the varying natural light during the course of the day.

5.4.3 Lighting inside buildings

It should be possible to shade windows from bright light.

Lighting should provide visual conditions consistent with the visual task, e.g. the perception of hazards, signs, elements for orientation, interpretation of sign language, etc.

Key factors are:

— level of illumination of horizontal and vertical surfaces;

— limitation of glare from a light source or reflections;

— uniformity and luminance distribution;

— direction of lighting and shading;

— colour rendering.

Artificial lighting should give good colour rendering. Light sources with a colour rendering index $R_a > 80$ are recommended.

NOTE For safety colours see ISO 3864-1.

5.4.4 Lighting to facilitate wayfinding

Lighting should facilitate wayfinding; and building elements should be highlighted by increased illumination. The lighting should aid in the identification of building elements such as entrances, corridors, stairs, changes of level and workstations to assist in orientation and safety.

Time dependent switch devices shall be avoided. Lighting that switches off when people are still on ramps or stairs can put them in danger.

5.4.5 Controllable and adjustable lighting

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

Adjustable artificial lighting is recommended to suit individual needs.

5.4.6 Light levels in different areas

Good light levels shall be provided in hazardous areas such as on stairs or changes in levels along a route, as well as around doors and at communication or information systems.

Depending on the visual task, a minimum illuminance shall be provided permanently. Values for maintained minimum illuminance E_m shown in Table 5 give guidance for applications. E_m is the

maintained illuminance measured on the visual task, which can be horizontal (e.g. floor, desk) inclined or vertical (e.g. signage).

NOTE The maintained illuminance defines the minimum level before replacement of the illuminants; and cleaning of the luminaire is necessary.

Table 5 — Minimum illuminance in different areas

Different areas	E_m [lx]
Outdoor environments	20
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

5.4.7 Glare and shadows

For determination of uncomfortable glare levels caused by light sources, the unified glare rating (UGR) shall be applied.

The UGR value of maximum 22 in circulation areas and maximum 19 in habitable rooms is recommended; but it shall not exceed 25 for circulation areas and 22 for habitable rooms.

Lighting should not produce glare. The following measures can avoid glare and shadows:

— shielding or shading light sources;

— use of indirect lighting;

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

— providing corridors without windows at their end;

— choosing light colours for ceilings or walls and not placing light sources against dark surfaces.

In addition, the following should be avoided:

— on circulation areas, uplighters with light sources at floor or low-level conflicting with the visual field of users;

— 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.

NOTE Due to the increase of optical scatter in the eye, the effects of glare are exacerbated for older persons and for individuals with some types of vision 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).

5.5 Signage

5.5.1 General

Building design should be intuitive and obvious. In complex buildings, however, this cannot always be possible. The solution to this 'information gap' shall be provided by effective signage.

Graphical symbols and signs as provided by ISO 7000, ISO 7001, ISO 7010, ISO 16069 and ISO 28564-1 should be used in preference to text.

Signs should be legible for people with vision or cognitive impairments. Information with text should be supplemented with graphical symbols to facilitate comprehension. For graphical symbols, see 5.6.

Signs shall be provided with tactile characters and symbols and should be supplemented by Braille.

An excessive quantity of signs should be avoided. To avoid confusion, visual material (e.g. posters, timetables) should never be placed too close to wall-fixed signs.

5.5.2 Types of signs

The main types of signs are:

— orientation signs: sketches, plans, models, etc.;

— directional signs: directional information from point A to B such as arrows;

— functional signs: explanatory information;

— informative signs: purely informative, for example a name of a facility or room;

— signs for emergency exits.

5.5.3 Placement of signs

5.5.3.1 Outside of buildings

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 5.5.5.

5.5.3.2 Inside of buildings

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 5.3 and 5.5.13.

Directional signs should clearly guide 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 every time at every location where there is more than one possible destination.

Directional signage to washrooms should be provided in all parts of a precinct or building.

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

Floor numbers shall be located on each floor at the top and bottom of stairs, on handrails and on each side of the outer frame of each lift-car entrance on each floor and prominently displayed elsewhere so that they are visible from the lift car at each level.

5.5.4 Height and location of signs

Directional and functional signs should be located between 1 200 mm and 1 600 mm where they are easy to approach, to touch and read the raised signs with fingers (see 5.5.10 to 5.5.12).

Signs should be located where they are clearly visible to people who are seated, standing or walking.

Where a sign can be obstructed as in a crowded situation, there should be two signs; one at a height between 1 200 mm and 1 600 mm as specified above, and the other one as a complement that can be seen from a distance above other people's heads. The second sign should be placed at a height of at least 2 400 mm above the finished floor level (see Figure 2). Signboards fixed to the ceiling or projecting from walls shall comply with the requirements in 6.3.8.

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 3).

Dimensions in millimetres

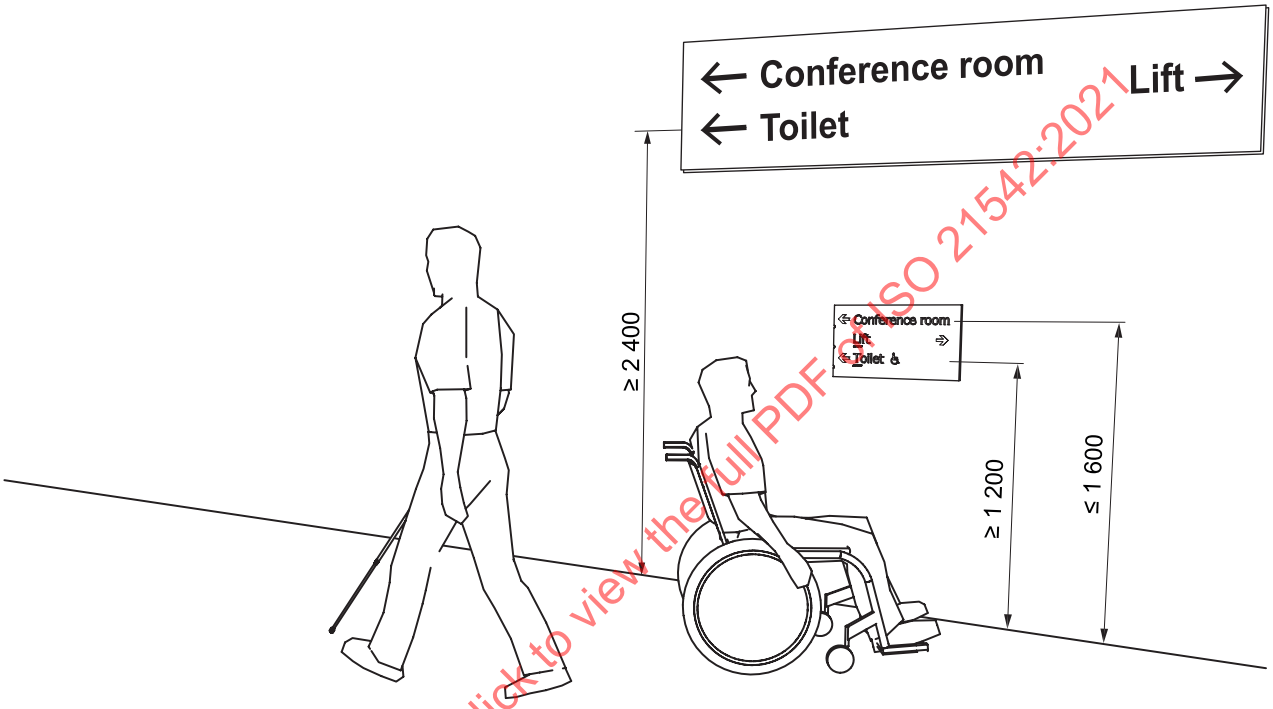


Figure 2 — Height of signs

Dimensions in millimetres

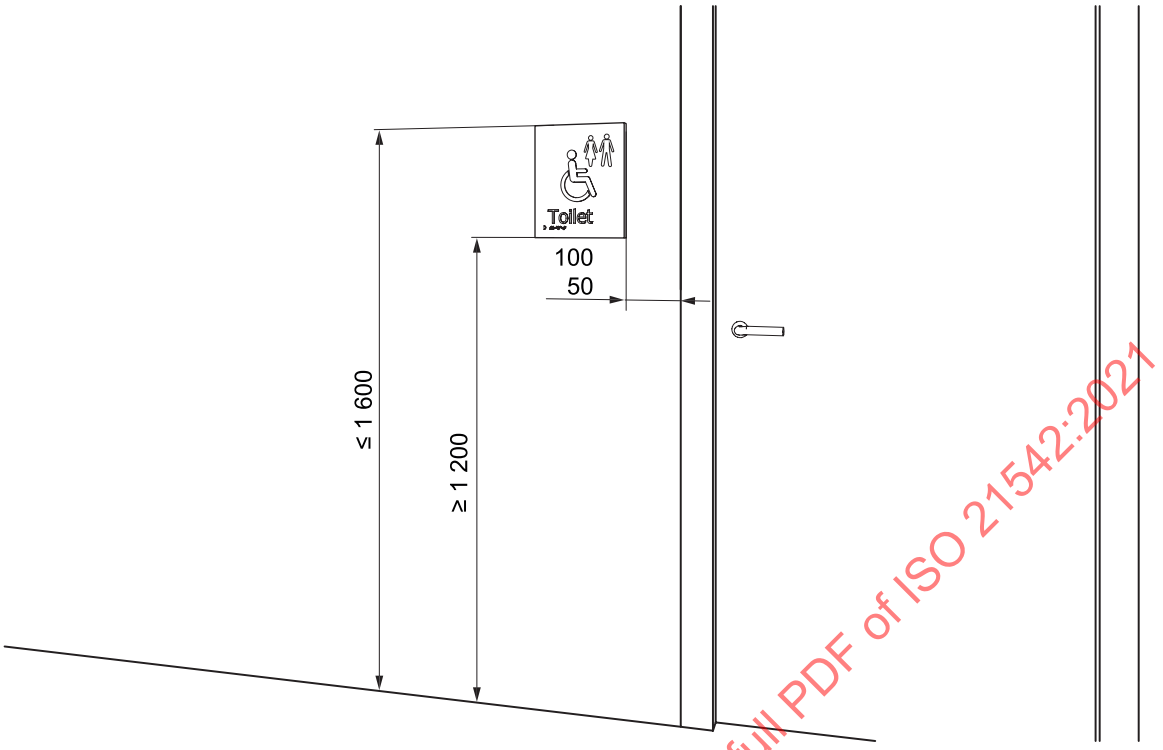


Figure 3 — Location of door signs on the latch side of the door

5.5.5 Font and size of lettering

The fonts shall 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 shall not be less than 15 mm.

It is recommended that messages of a single word 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 (left justified).

5.5.6 Luminance contrast

Minimum luminance contrast for small targets such as signs and inscriptions to signboards shall be $C_m \geq 60$ % ($C_w \geq 75$ %).

Signboards should have a minimum luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %) to the background, be uniform and monochrome.

See 5.3.4 regarding the choice of colours and patterns.

5.5.7 Glare and illumination

Existence of glare 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.

Signs should be well illuminated with no glare.

Signs can be luminescent or artificially lit.

5.5.8 Understandability

Signs should be readily understandable. They should be designed to use simple language and be easy to interpret. The message should be unambiguous.

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

5.5.9 Provision of raised tactile and Braille signs

Signs on panels in lifts, room numbers in hotels, doors to public toilets and signs indicating the presence of hazardous products shall have raised tactile accompanied by Braille (also see 5.5.4).

The preferred height of raised tactile information is between 1 100 mm and 1 600 mm above the floor level to allow an ergonomic hand position. Signs with tactile information placed at a lower height should be mounted at an angle from the horizontal (preferably 20° to 30°, maximum 45°). Signs with a height of more than 1 600 mm above floor level do not need to be tactile or with Braille.

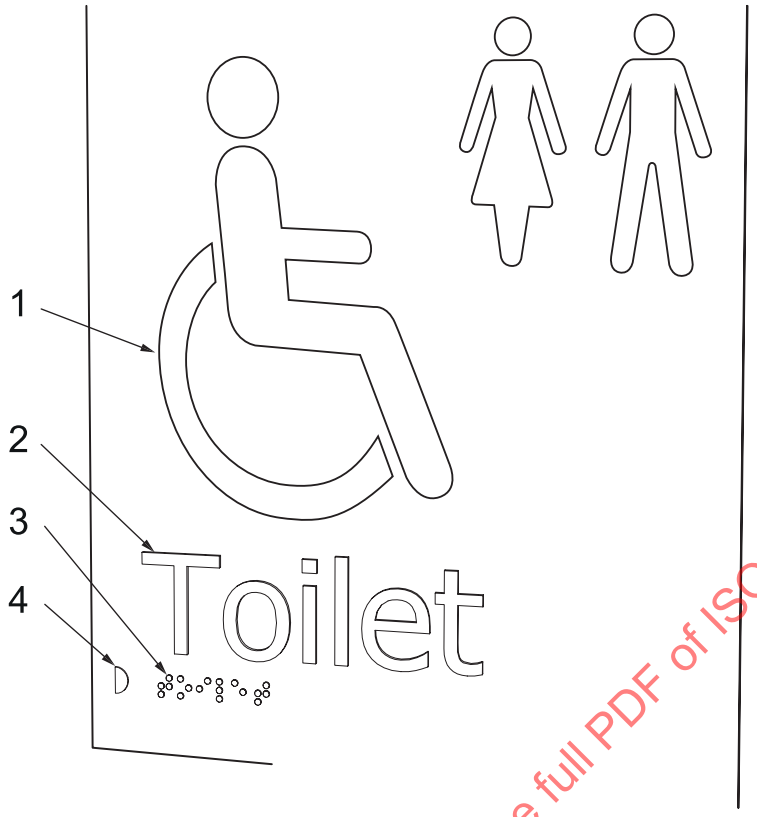
5.5.10 Tactile characters, figures, signs and graphical symbols

The height of tactile letters and (graphical) symbols shall be between 15 mm and 55 mm (see Figure 4).

The minimum rise shall be 0,8 mm; between 1 mm and 1,5 mm is preferred (see Figure 4).

The profile of the tactile characters should be shaped as a rounded upside-down turned letter 'V'. Block letters (sans serif) shall be used to convey tactile information.

NOTE Reading tactile characters takes much more time than reading Braille. Tactile characters are helpful to identify a small amount of information simultaneously detectable by vision, such as one or two words on a handrail or doorplate, numbers or letters on a button.



Key

1 tactile symbol, minimum rise of 0,8 mm, 1 mm to 1,5 mm preferred
2 raised lettering, height 15 mm to 55 mm, minimum rise of 0,8 mm, 1 mm to 1,5 mm rise is preferred
3 Braille text
4 Braille locator

Figure 4 — Example of raised tactile characters and symbols and Braille

5.5.11 Braille

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.

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.

5.5.12 Tactile symbols

Symbols applied on handrails, doors, maps or floor plans shall have a distinct and simple shape with a raised contour similar to tactile characters.

5.5.13 Tactile maps and floor plans

Tactile maps and floor plans should be located at the entrance(s) of buildings. Only essential information should be included on a tactile map or floor plan. Information about relevant fire safety infrastructure shall be included on the same map or 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 minimum illuminance of 350 lx without glare.

The key should be located at the bottom of the map and left justified. The use of a recessed Braille locator (see Figure 4) on the left-hand side assists in locating the legend.

The map shall be oriented with the building.

5.5.14 Information displays

If video and media information displays are used, they should be placed at a height according to 5.5.4; and their lettering, etc. should be in conformity with the recommendations in 5.5.5 to 5.5.8.

Glare from artificial and natural lighting on the screen shall be avoided by:

— positioning the display or the screen out of direct light; or

— shading the display or the screen.

A complementary audible information system should be provided.

5.6 Graphical symbols

Graphical symbols should be used in conjunction with building signage systems wherever possible.

NOTE 1 ISO 7000, ISO 7001 and ISO 7010 are the relevant standards regarding graphical symbols. These standards include graphical symbols relevant to accessibility and a selection is shown below (see Figures 5 to 8, and 11 to 14).

Graphical symbols shall:

— be highly contrasted with a minimum luminance contrast of $C_m \geq 60$ % ($C_w \geq 75$ %) and properly illuminated;

— be used on guides and directional signage.

Graphical symbols on directional and door signs should be tactile and be accompanied by raised lettering and Braille (see 5.5.9).

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 the formula $s = 0{,}09\ D$, applicable for a viewing distance of 1 000 mm to 10 000 mm.

The following facilities for persons with disabilities shall be clearly marked.

a) Those relating to people with mobility impairments:

   — car parking places (parking places, garages);

   — access and entrances without steps to buildings, especially where they are not identical with the main entrance;

   — accessible lifts, in cases where not all lifts are accessible;

   — lifting platforms and similar mounting devices;

   — accessible toilet rooms;

   — wheelchair viewing spaces and accessible seating;

   — accessible changing rooms.

b) Those relating to people with vision impairments:
   — guide dog facilities;
   — locations where audible and tactile information is provided.
c) Those relating to people with hearing impairments:
   — telephones and emergency call facilities, equipped with sound amplification;
   — public entrances to rooms and spaces;
   — counters with an induction loop system;
   — locations where a hearing enhancement system is provided.

Figure 5 — Accessible facility or entrance (ISO 7001-PI PF 006)

Figure 6 — Sloped or ramped access (ISO 7001-PI PF 022)

a)
Toilets — Accessible, female and male

b)
Toilets — Accessible, female

c)
Toilets — Accessible, male

NOTE These graphical symbols are a combination of ISO 7001-PI PF 006 and ISO 7001-PI PF 003, ISO 7001-PI PF 004 and ISO 7001-PI PF 005.

Figure 7 — Graphical symbols for accessible toilet rooms

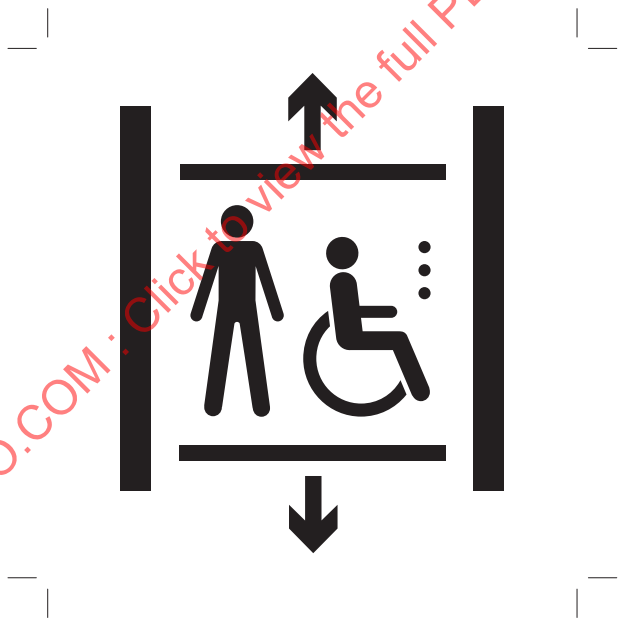


Figure 8 — Accessible lift (ISO 7001-PI PF 031)

NOTE This graphical symbol (ISO 7001-PI PF 031 modified) shows the background in safety green according to ISO 3864-1 and the other elements in white.

Figure 9 — Accessible lift to be used for evacuation

NOTE This figure is a combination sign, which, according to ISO 3864-1, is a sign that combines a safety sign (safety green) and one or more associated supplementary signs on the same rectangular carrier. The signs used in this figure are the following:

— Running man (centre of the combination sign): Use ISO 7010-E001 or ISO 7010-E002, depending on the direction to indicate (ISO 7010-E002 is the sign used in this figure).

— Arrow (left of ISO 7010-E001 or right of ISO 7010-E002): Supplementary arrow sign to be used with the emergency exit sign to indicate direction.

— Supplementary sign (opposite to the arrow) ISO 7001-PI PF 006 modified.

Figure 10 — Accessible emergency evacuation route

Figure 11 — Area of rescue assistance (ISO 7010-E024)

The international symbol for access for persons with hearing impairments as given in Figure 12 shall be used wherever a hearing enhancement system is available and where other accommodation for persons with hearing loss is provided.

Figure 12 — International symbol for access for persons with hearing impairment (ISO 7001-PI PF 048)

The international symbol of access for persons with hearing impairments with a "T" as given with Figure 13 indicates that a hearing enhancement system with a telecoil is present, for example in an induction loop system or a telephone.

NOTE 2 Supplementary text information can be: "T" for induction loop systems, "FM" for barrier-free radio frequency systems and "IR" for barrier-free infrared systems.

Figure 13 — International symbol for access for persons with hearing impairment equipped with T switch (ISO 7001-PI PF 072)

Figure 14 — International symbol for access for persons with vision impairments (ISO 7001-PI PF 051)

5.7 Acoustics

5.7.1 General

The acoustic environment in a building should be suitable for its users, and the parameters of noise and reverberation are among the most important issues that should be considered. Noise transmitted from outside of a room can make an audible message difficult to perceive, and long reverberation times in the room itself can transform sounds and voices into noise that blurs the primary signal. Both aspects apply to people in general and not only to people with hearing impairments but have a particular

impact on persons with hearing impairments who rely on their residual hearing and persons with vision impairments who rely on acoustic information for orientation.

Designing suitable acoustic environments shall consider the purpose and use of a room since the acoustic requirements of, for example, a concert hall differs considerably from an office room or a kindergarten.

Acoustic environments should support clarity of sound, and the calculation of acoustic properties is important in rooms where acoustic quality is crucial, and where noise reduction is required. Hard parallel structures shall be avoided. If that is not possible, sound absorption is necessary.

Acoustic environments should allow information with a high speech transmission index[1)].

Noise in rooms should be kept at a low level. Even small changes in a room can affect the acoustic environment. For example, appropriate selection of flooring materials, curtains or even furniture can positively affect the acoustic environment.

The functionality of the acoustic and electromagnetic environment shall support the use of hearing enhancement systems.

Information provided acoustically by systems such as a PA (personal announcer, a public address system or communication from a two-stage fire alarm system) should also be provided in a visual format and shall be connected to a hearing enhancement system.

This is especially important in transportation facilities and in health care facilities where important information is provided via aural communication.

Good lighting, colour and visual contrast also play an essential role enabling people with hearing impairments to lipread and interpret facial expressions. This applies to regular speech with other persons as well as understanding a sign language interpreter, or when using optical information devices in larger rooms. See 5.4 for specifications on lighting.

Graphical symbols regarding accessibility for persons with hearing impairments are shown in 5.6.

5.7.2 Control of noise

5.7.2.1 General

The acoustics of a room is closely related with its location in a building, the acoustic insulation of the building elements, and the sound absorption of the room surfaces and its furnishing.

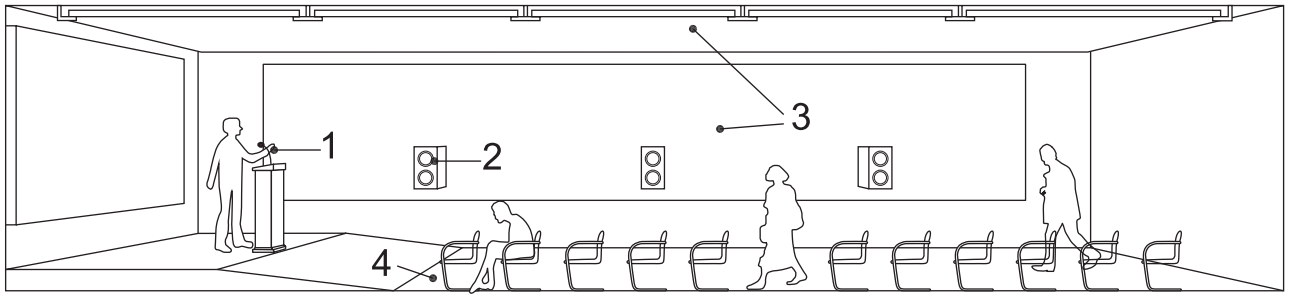
5.7.2.2 Sound absorption

Rooms should have adequate sound insulation and damping of noise from both outside and inside of a building. Lack of adequate sound absorption can lead to long reverberation times and a high level of background noise, resulting in very low speech intelligibility for persons with hearing impairments in particular.

The surfaces and shape of a room should be selected to absorb, disperse and reflect sound adequately. The selection of appropriate materials can reduce reverberations. See Figure 15 for an example.

In large buildings, designs should be considered that render sounds from secondary corridors different in quality from sounds in primary corridors (e.g. through changes in floor finishes). This helps persons with vision impairments to locate accessible paths of travel.

1) The speech transmission index (STI) is a metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel (see IEC 60268-16:2011, 3.3). The STI measures some physical characteristics of a transmission channel (a room, electro-acoustic equipment, telephone line, etc.), and expresses the ability of the channel to carry across the characteristics of a speech signal.



Key

1 music or speech source
2 sound amplification system
3 diffusive and absorptive surfaces
4 hearing enhancement system

Figure 15 — Example of conference room planned for shorter reverberation times and with features supporting good acoustics

5.7.2.3 Sound amplification

In outdoor and indoor environments, sound amplification shall be provided to ensure an adequate speech transmission quality, particularly in noisy environments.

In places where audible information is conveyed to a group of persons (e.g. at conferences, meetings, sports events, entertainment), suitable hearing enhancement systems shall be available.

5.7.2.4 Acoustic environment

All public areas shall have the following acoustic properties:

a) speech intelligibility in accordance with IEC 60268-16;

b) reverberation times not greater than that applicable to the particular use of the space.

5.7.3 Hearing enhancement

5.7.3.1 General

A hearing enhancement system fitted at an information point (see Figure 16) can significantly assist in communication for a person with a hearing disability who uses a personal hearing aid or has a cochlear implant. Hearing aids or cochlear implants can have a telecoil (T-switch) that allows the listener to receive the sound signal directly with an audio frequency induction loop system in accordance with IEC 60118-4.

Information on where to obtain receivers and how to use the hearing enhancement system shall be provided.

Rooms should have adequate reverberation times for the control of noise and for improved speech intelligibility.

Hearing enhancement systems should preferably be available throughout a facility but may be installed in a section of the room as long as it is clear where the system is in operation. Where an induction loop system or an FM (frequency modulation) system is provided, neck loops should be available for people who use hearing aids.

Hearing enhancement shall be provided in all of the following locations:

— in all internal and external areas with sound reinforcement, and all areas over 75 m^2 regardless of whether sound reinforcement is provided, e.g. public meeting rooms/areas (e.g. community centres, places of worship, function rooms and retirement living meeting areas), auditoria and school assembly areas, sporting venues and other arenas, theatres, rooms for judiciary purposes;

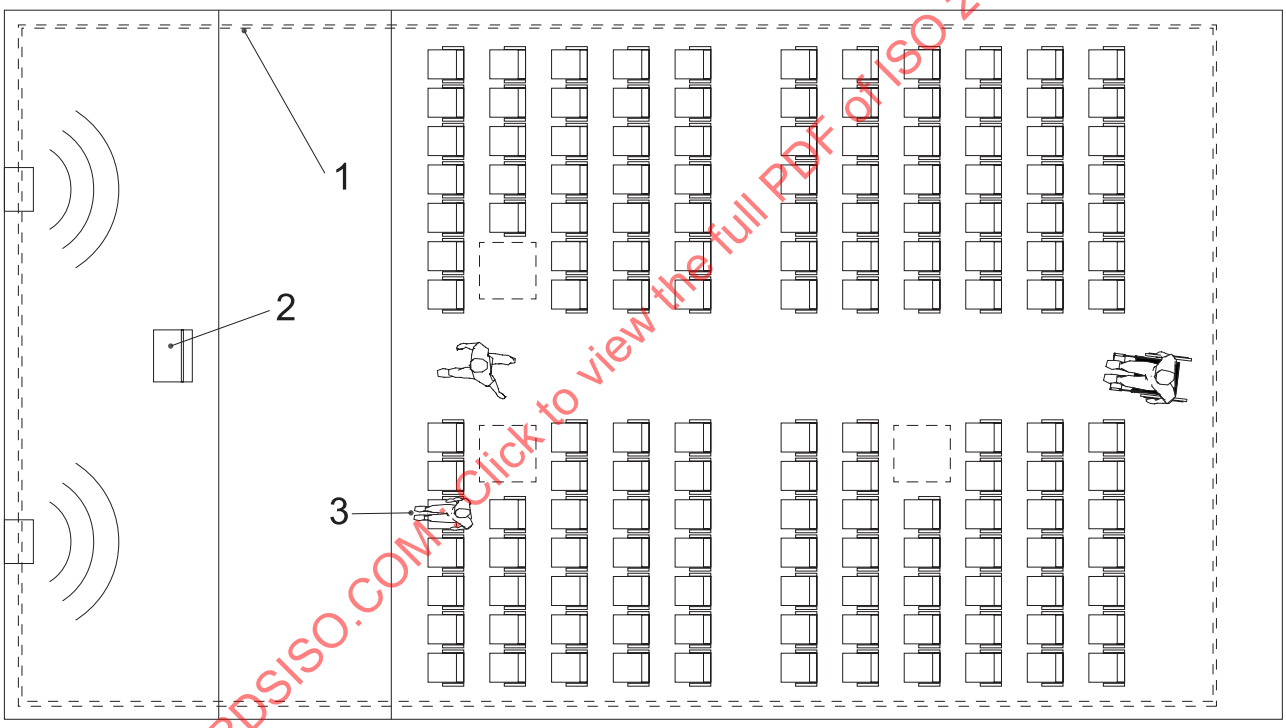
— public transport terminals/areas;

— health care facilities;

— at counters with or without screens, associated with service provision to the public (bank tellers, ticket windows etc.) and where there is a potential for interference during communication (e.g. noisy background);

— as part of security checkpoints and emergency warning intercom systems;

— as part of all public address, public announcements and audio-visual systems.



Key

1 hearing enhancements systems such as FM (frequency modulation), infrared or induction loop

2 microphone connected to audio enhancement system

3 person wearing hearing aid with built-in telecoil receiver

NOTE Persons with hearing disabilities often prefer to sit at the front of a lecture hall so that they can lipread.

Figure 16 — Example of hearing enhancement system conveying audible information in a lecture hall

5.7.3.2 Induction loop system application

Induction loop systems shall comply with IEC 60118-4.

The induction loop system shall be designed and installed to suit the room size and shape; and to control overspill.

Preferably the whole area should be covered. If it is not possible, a minimum of 20 % shall be covered for each class of seating and the area covered shall be near the lecture platform so that lipreading the speaker is possible.

The measuring distance for operational compliance shall be:

— at 1,2 m above floor level in the vertical field for fixed seating;

— at 1,2 m and 1,7 m above floor level in the vertical field for non-fixed seating.

5.7.3.3 Receivers

The number of receivers provided shall be a minimum of 15 % of the capacity of the area.

If only part of an area is covered, a map indicating the area covered by the hearing enhancement system shall be provided.

5.8 Emergency warning systems, signals and information

5.8.1 General

All warning systems installed in buildings shall be capable of warning all occupants; both audible and visual alarms are required.

NOTE It is possible that persons with hearing impairments cannot hear an audible alarm, in particular if the alarm is in the higher frequencies. As persons who are deaf or hard of hearing remove their hearing aids and cochlear implants when sleeping, there is a need for a visual alarm and/or a vibratory alarm to warn them.

5.8.2 Emergency warnings

Building warning systems shall be provided:

a) throughout a building, including in private offices, meeting rooms as well as washrooms and all noisy environments;

b) in conjunction with monitoring fire detection, warning, control and intercom systems.

Alert and warning devices, respectively, are also needed where audible communication is provided as part of a building management system, for example where a two-stage fire alarm system is provided. A visual text display shall accompany audible messaging. Video displays should also be considered.

Alert and warning, rescue devices and systems shall also be considered in the following locations:

— lift emergency communication (8.5.5.6);

— toilet room alarms (10.5.13 and 10.5.14);

— accessible bedrooms (10.6);

— areas of rescue assistance (11.4.5).

Other types of warnings such as vibrating devices (e.g. pagers, integrated mobile phones) can be used in individual cases.

5.8.3 Audible emergency warnings

Audible emergency signals with an output between 60 dB and 80 dB shall be provided to ensure full coverage within the building. Low-output audible signals shall be used for effectiveness. The sound output of signals shall be adapted to suit interior surroundings, e.g. in small spaces with hard surfaces.

Audio and visual messages shall be short and in plain language. Live messaging during an emergency is preferred over pre-recorded standard messages.

If an emergency warning inter-communication system is provided, it shall be connected to a hearing enhancement system.

5.8.4 Visual emergency warning signals

A sufficient number and distribution of strobes/beacons shall be provided throughout the areas and spaces in order to be readily visible under normal ambient lighting levels from all accessible locations.

Visual alarms shall consist of lights that

a) flash in conjunction with the audible emergency alarm;

b) have a slow flash rate no faster than one in every 2 s or 3 s;

c) are synchronized to flash in unison;

d) are placed so that a signal from at least one alarm is visible throughout any enclosed space;

e) are significantly brighter than the ambient light.

Visual alarms with overlapping signals shall be synchronized so that the observed combined flash pattern does not exceed the allowable frequency range. Visible warning beacons or strobes should not overlap in order to avoid photosensitivity seizures.

Visual signals that warn of a fire emergency shall have features different from other visual signals used in the premises.

5.8.5 Fire emergency warning systems

5.8.5.1 General

All fire emergency warning systems shall be provided in accordance with 5.8.1 to 5.8.4 to accommodate all people. See also Annex D.

Vibrating devices, such as pagers or mobile phones, can be integrated into a building's fire emergency warning system to provide an individual emergency alert (e.g. vibrating pagers or pillow vibrators connected to the fire alarm panel are effective to wake up a sleeping person).

To provide an individual emergency alert in fire events, the devices shall be integrated into a building's fire emergency warning system.

5.8.5.2 Audible fire emergency warning signals

In situations like complex buildings or crowded places, audio messages should be used to supplement audible alarm signals.

6 Approaching and entering a building or the built environment

6.1 General

Space should be provided for passenger drop-off points for taxis, public transport and for large vehicles such as vans, as near as possible to the main accessible entrance.

If there is a difference in level between the road and the footpath, a kerb ramp shall be provided to facilitate the drop-off of people close to the principal entrance of a building. This benefits persons using

a wheelchair, persons with children in strollers and others, e.g. older people who need assistance. For kerb ramps see Table 8 (6.4.2).

An appropriate tactile walking surface indicator (TWSI) should be provided to lead persons with vision impairments to the main entrance where no other clues indicate the path to the building (see example in Figure 20). See 5.1.4 for further specifications on TWSI.

6.2 Parking

6.2.1 Location of accessible parking spaces

The designated accessible parking spaces shall be located as near as possible to the principal entrance.

NOTE Maximum distance can be found in applicable legislation, e.g. national building regulations.

6.2.2 Number of designated accessible parking spaces

NOTE Minimum numbers of accessible parking spaces can be found in applicable legislation, e.g. national building regulations.

The following specifications on the minimum number of accessible parking spaces shall apply:

— in any parking area up to 10 parking spaces: at least one;

— up to 50 parking spaces: four;

— up to 100 parking spaces: eight;

— up to 150 parking spaces: twelve;

— over 200 parking spaces: sixteen, plus 4 for each additional 100.

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

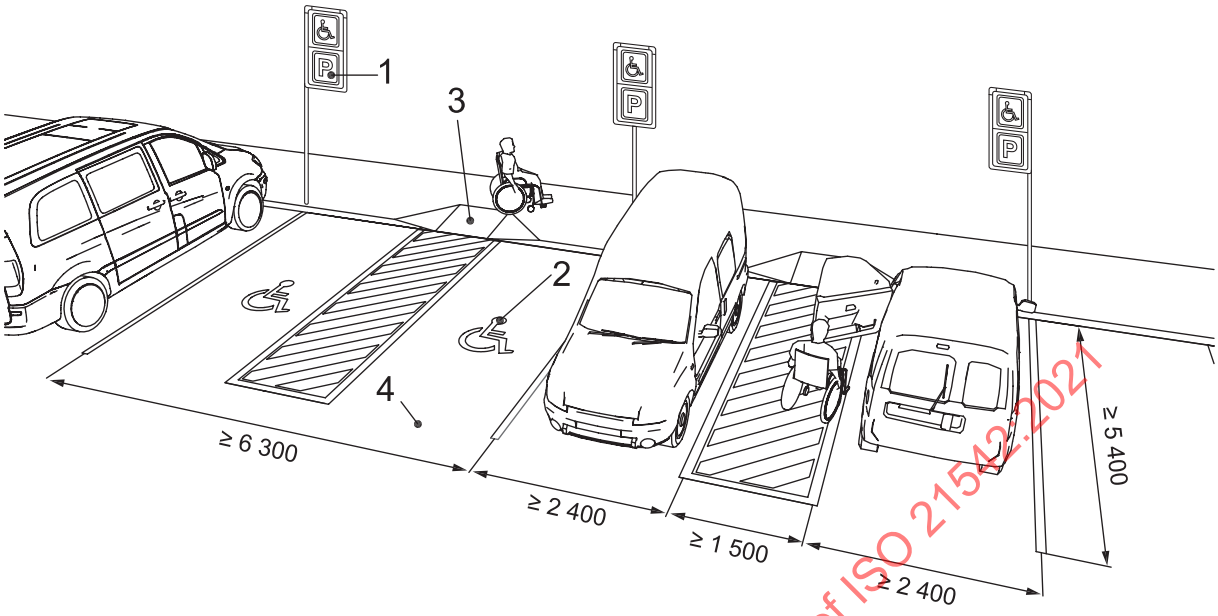
Depending on the use of the building, additional designated accessible parking spaces in accordance with 6.2.3 should be provided for vehicles carrying pushchairs or strollers and be marked with a stroller or pushchair symbol.

6.2.3 Dimensional requirements for car parking spaces

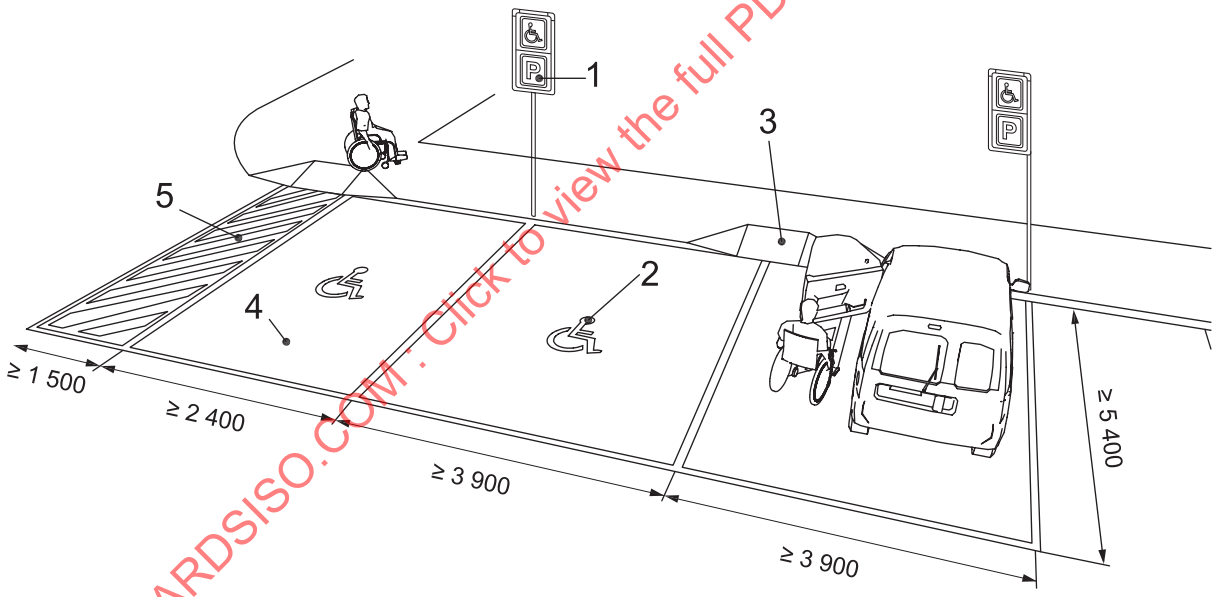
The minimum width of the parking space for a car shall be 2 400 mm and the minimum length shall be 5 400 mm. A designated car parking space shall also include an adjoining transfer area having a minimum width of 1 500 mm. This results in a minimum width of 3 900 mm for an accessible parking space if it is arranged in a row. Transfer areas may be positioned on an adjoining path provided the area is on the same plane. Transfer areas between accessible parking spaces may be shared, which then results in a minimum width of 6 300 mm, see Figure 17.

NOTE Persons using a wheelchair need a transfer area either on the left or the right side of their car. With shared transfer areas only one of the parking spaces allows parking forward; parking backwards can limit the access to the rear of the car.

Dimensions in millimetres



a) Example with shared manoeuvring spaces



b) Example without shared manoeuvring spaces

Key

1 vertical signage for accessible parking space(s) with 2 100 mm as minimum height of the lower edge
2 symbol of access on the ground
3 kerb ramp
4 firm ground
5 path to the kerb ramp that can also be used as a manoeuvring space

Figure 17 — Examples of designated accessible parking spaces

6.2.4 Dimensional requirements for parking spaces for wheelchair accessible vans

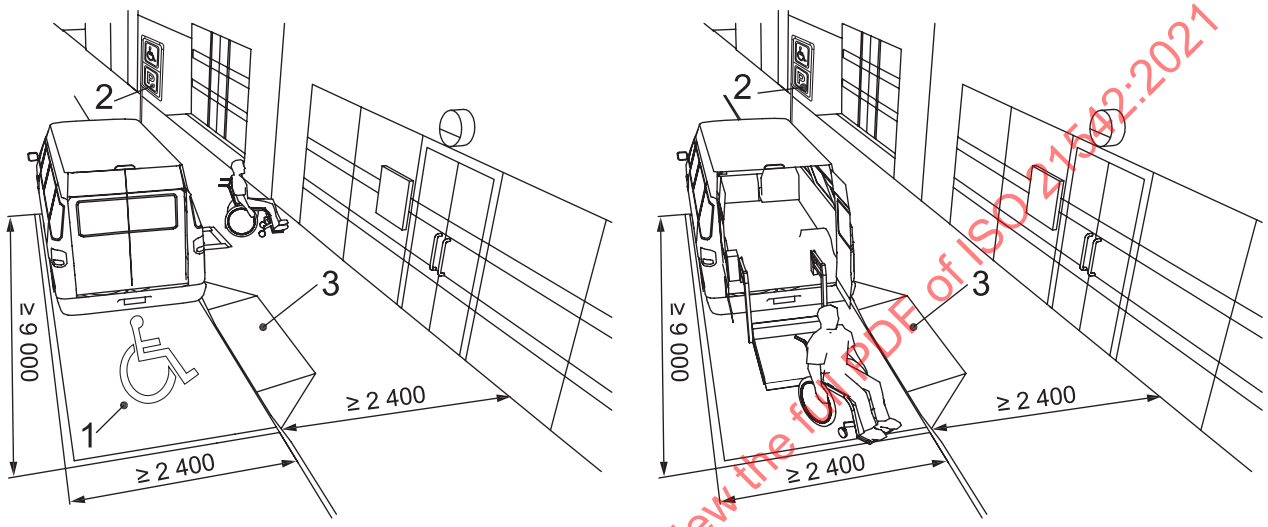
The size and design of accessible vehicles varies from country to country. Some are fitted with ramps or hoists at the side or at the rear.

The minimum width of the accessible parking space for a van shall have at least the same dimensions as for car parking spaces (6.2.3). Transfer areas between spaces can be shared.

For multi-purpose vehicles with hoists or lifts an additional area beside the van and/or at the rear of the van of at least 2 400 mm is needed. The dedicated parking space in this case shall be 4 800 mm wide (if getting on/off sideways), and 9 000 mm long (see different types of designated parking spaces in Figures 17 and 18).

Alternatively, a parking space of 2 400 mm wide and 9 000 mm long along a footpath can be used, provided the footpath is at least 2 400 mm wide as shown in Figure 18.

Dimensions in millimetres



a)
Example with an auxiliary movable ramp at the side

b)
Example with auxiliary hoist at the back

Key

1 symbol of access on the ground
2 vertical signage for accessible parking space(s) with 2 100 mm as minimum height of the lower edge
3 kerb ramp joined to the manoeuvring space

Figure 18 — Example of accessible parking space along a footpath

6.2.5 Signage

The locations of the designated accessible parking spaces shall be clearly signposted at the entrance to the building site or car park with information providing direction to designated accessible parking spaces and to other accessible facilities. Directional arrows combined with the international symbol of access as shown with Figure 5 shall be used.

Designated accessible parking spaces shall be marked on the ground and with a vertical sign to indicate the location of the designated accessible parking spaces with the international symbol for access as shown with Figure 5. The height of the signboard shall be in accordance with 6.3.8. The positioning of signage shall be in accordance with 5.5.4. The vertical sign should not create a hazard nor obstruct the manoeuvring space at the car doors (see Figure 18) and the rear door.

See 5.5 for further specifications on signage.

6.2.6 Surface characteristics of accessible parking spaces

The accessible parking space shall be on firm and level ground with no variation of the 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 surface with a gradient of less than 1 in 50 in any direction.

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

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

The kerb ramp width should be a minimum of 1 000 mm. The gradient of the kerb ramp shall be designed and constructed in accordance with the requirements for ramps as specified in 6.4 and Table 8.

The accessible path to the kerb ramp should be marked with hatching painted on the road surface to prevent people from parking in this area (see Figure 17).

Kerb ramps shall have a slip-resistant surface.

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 (TWSI, attention pattern). See 5.1.4 and Annex B for further information.

6.2.8 Accessible indoor parking spaces

6.2.8.1 General

The minimum requirements specified in 6.2.1, 6.2.2 and 6.2.4 to 6.2.6 apply to indoor parking facilities as well. The dimensions of parking spaces and transfer areas in 6.2.3 are recommended. The minimum dimension for indoor parking spaces including a lateral transfer area shall have a width of 3 500 mm with a length of 5 000 mm for a single car space and a width of 5 500 mm with a length of 5 000 mm for two spaces with a shared lateral transfer area.

6.2.8.2 Signage

Signage should be posted at the entrance to all indoor parking areas indicating the location of the designated accessible parking spaces. Where no designated accessible indoor parking spaces are provided, early information shall be given outside of the parking facility in addition to information at the entrance.

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

6.2.8.3 Location of designated accessible parking spaces

Designated accessible parking spaces should be located at the same level as the principal entrance and other entrances to the building or buildings served by the car park.

When not located on the same level, a suitable passenger lift or separated ramp shall be installed to provide access from the parking spaces to the principal 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 should be as close as possible to the entrances/lifts.

6.2.8.4 Height of clearance

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

The information on the clear height of the indoor parking spaces shall be provided at the entrance outside of the parking facility.

6.2.9 Parking control

Contact-free payment solutions, e.g. via mobile apps or license plate scanning, are recommended.

If a payment machine is provided, it shall comply with the specifications in 9.2.2 and 9.2.7.

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

6.2.10 Storage spaces for powered wheelchairs, scooters and other mobility aids

Storage spaces reserved for people who use powered wheelchairs, scooters, shop riders or the like shall be located near the main entrance, and preferably roofed.

The dimensions of a storage space shall include area for storing and getting out of the vehicle. Each space shall measure 1 750 mm × 2 000 mm. The reversing zone shall be at a minimum 2 300 mm in depth.

Storage spaces shall have a power socket provided for charging batteries at an operating height between 800 mm and 1 100 mm.

6.2.11 Storage facilities for buggies and cycles

In designing bike storage facilities, the following are required:

— The total depth for cycle and manoeuvring area shall be at least 3 500 mm.

— Cycle storage facilities shall also accommodate tandems and tricycles.

— Parking facilities for buggies shall be dimensioned for a buggy size of at least 600 mm × 1 500 mm.

6.2.12 Drop-off areas

Vehicle drop-off areas should be a minimum of 9 000 mm in length, have a minimum width of 2 400 mm and be served by a kerb ramp (see Figure 18).

6.3 Paths to the building

6.3.1 General

The path(s) or route(s) to a building from the boundary of the site or from the parking area shall be designed and constructed to enable everyone to approach, enter, egress from or evacuate the building safely and with ease (see Figure 19). This also applies to the access between buildings.

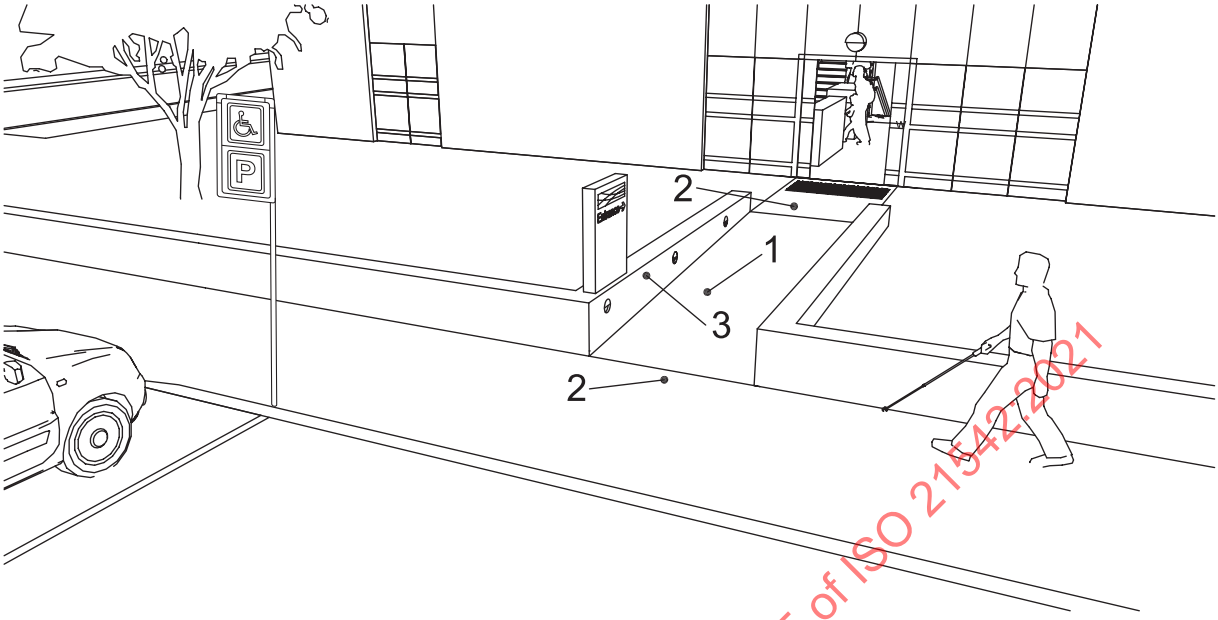
The path(s) to, around and between buildings should be level and firm. A sloped path on an accessible route to a building should be designed as specified in 6.4 on ramps.

The path(s) shall have a slip-resistant surface and should be free from drainage gratings.

Adjacent surface materials shall not display different slip resistance characteristics, particularly at the edges of changes of level or gradients as the change in slip resistance can cause trips and falls.

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

For specifications on protection against falling within a path, see 6.5.



Key

1 sloping path (for gradients steeper than 1 in 20 (5 %), specifications on ramps apply.)
2 horizontal landing at both ends of sloping path, intermediate landings spaced according to Table 2
3 wall as tactile clue on direction

Figure 19 — Example of sloping path

6.3.2 Wayfinding, guided path and other physical information

Indication on the location and nature of the path(s) to the building shall be made at the entrance(s) to the site and from any parking space and at decision points within the site.

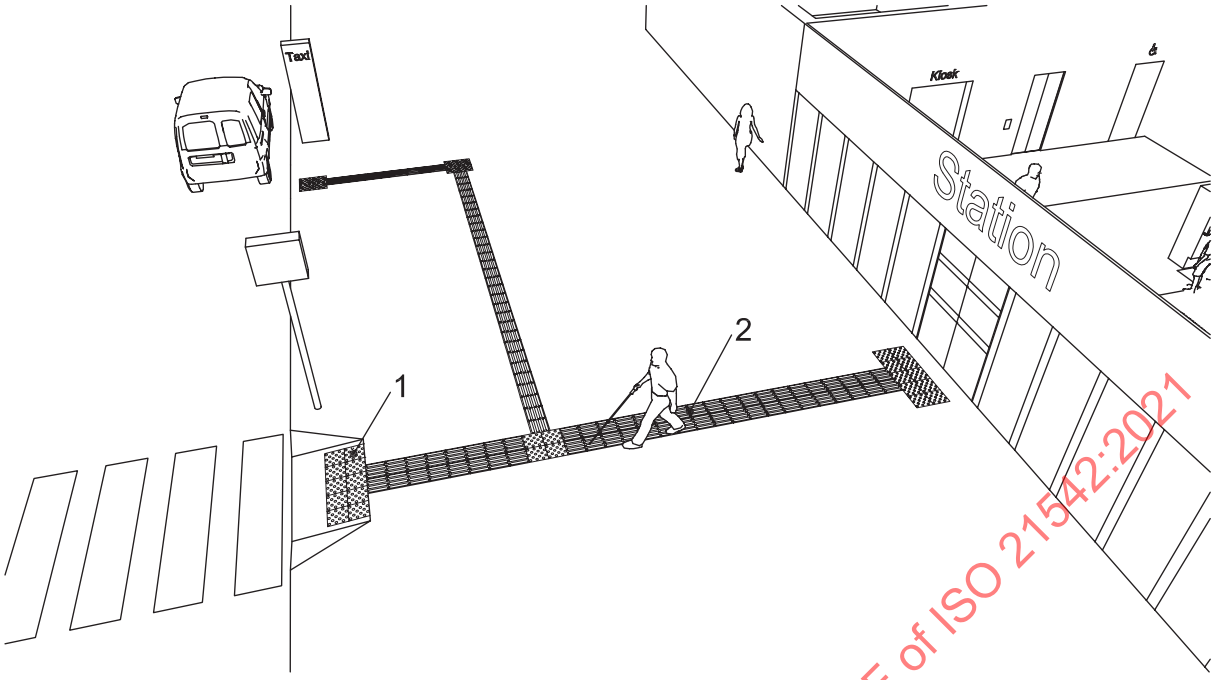
Orientation can be facilitated by differences in acoustics, surface material, light and colour. The design should indicate the location of the building facilities, making it clearly visible and easily detectable.

To assist in orientation and wayfinding in complex buildings and sites, the specifications of Clause 5 for visual, audible and tactile information shall be considered according to the principle of multiple senses (see 5.1.3).

Tactile walking surface indicators shall be used to indicate the directional orientation especially where no other clues indicate the path to the building. Across large or open areas, persons who are blind or partially sighted need a tactile route or guiding line to follow (see 5.1.4).

Additional illumination and visual contrast and tactile information, such as a change in material or tactile walking surface indicators according to ISO 23599 (see 5.1.4), shall be provided at key decision points to assist in orientation and wayfinding.

To assist persons with vision impairments with some residual vision, routes to be followed shall have at least a minimum luminance contrast to the surroundings as specified in 5.3.



Key

1 TWSI pattern for warning according to ISO 23599

2 TWSI pattern for guidance

Figure 20 — Example of tactile walking surface indicators used in open area

Where hazards such as stairs, escalators and moving walks cannot be avoided on the direct line of pedestrian travel, visual and tactile warnings shall be provided.

NOTE 1 Tactile floor coverings as well as tactile walking surface indicators can help in locating entrance doors, counters, etc.

NOTE 2 Sound-producing objects (such as ticking wall clocks and fountains) can support wayfinding for persons with vision impairments in addition to tactile information. These provisions are beneficial to people with a combination of sensory impairments.

6.3.3 Width of the path and passing and turning spaces for persons using a wheelchair

The unobstructed width of a path shall be

a) at least 1 800 mm for constant two-way traffic;

b) at least 1 500 mm for frequent two-way traffic;

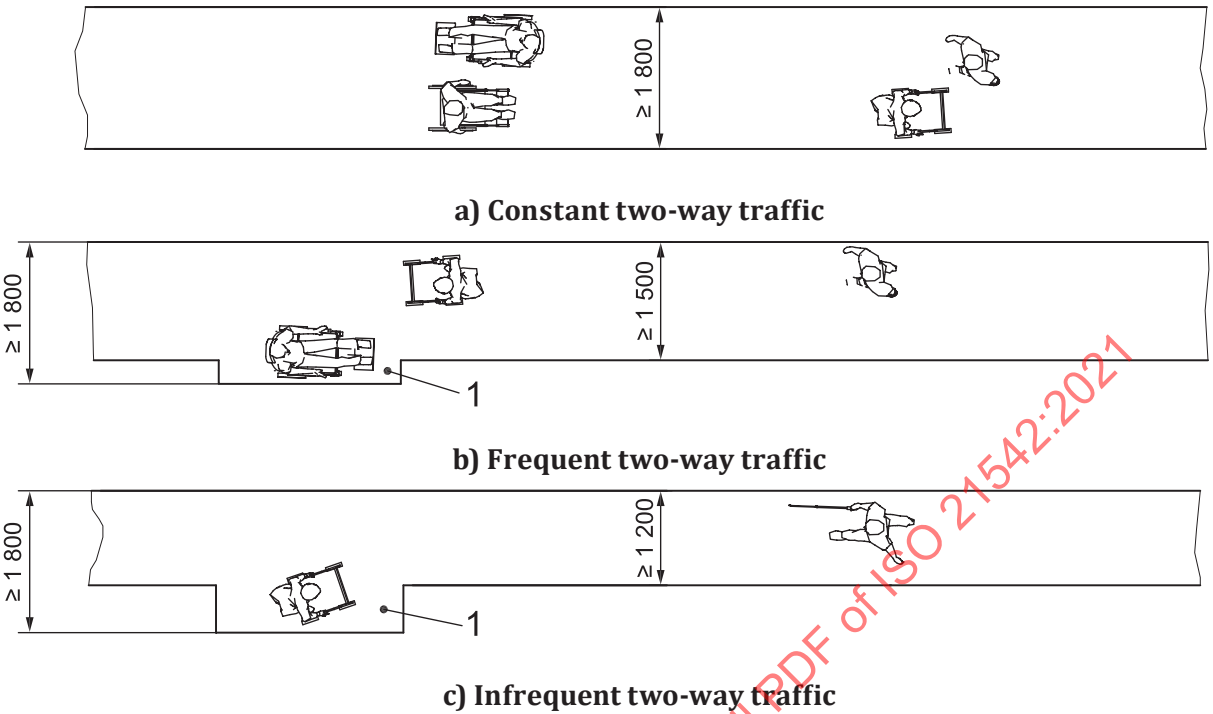
c) at least 1 200 mm for infrequent two-way traffic.

Paths with a width less than 1 800 mm shall be provided with a passing and turning space for persons using a wheelchair at intervals of not more than 20 000 mm. A passing and turning space shall have a resulting width of at least 1 800 mm and a length of at least 2 000 mm. Figure 21 shows the different paths with widths depending on the frequency of use and with passing and turning spaces. Figure 22 shows examples for the design of passing and turning spaces for persons using a wheelchair.

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

G.6 specifies the space requirements of persons using a wheelchair for changes of directions. A range of wheelchair types and sizes shall be considered for the design of the spaces.

Dimensions in millimetres



Key

1 passing and turning space

Figure 21 — Different surface widths of the path depending on frequency of use

Dimensions in millimetres

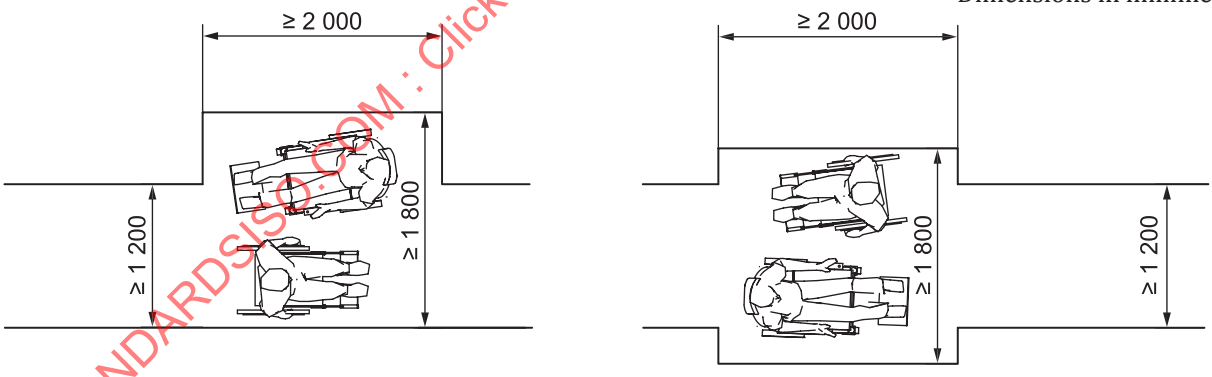


Figure 22 — Examples of passing and turning spaces for persons using a wheelchair

When there is a change of direction of more than 45° of the path to the building, an unobstructed manoeuvring space of at least 1 500 mm × 1 500 mm shall be provided.

If larger powered wheelchairs and scooters for outdoor use are to be considered for changes of direction of more than 45° of the path to the building, the radius of the outer circle of the way shall be at least 2 000 mm.

6.3.4 Stepped path and stairs

For people with reduced mobility, a stepped path can sometimes provide a safer, shorter distance than a ramp. A flight of steps should also be provided in accordance with 6.4.1.

To avoid trip and fall accidents, an isolated single step is not acceptable in any context.

Requirements for stairs, e.g. rise, going, width and landings, are set in 8.3.

6.3.5 Landings of sloped paths

For landings at the foot and the head of a sloped path, see 6.4.4. 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 considered (see 9.1 on doors).

6.3.6 Handrail support and guidance on paths

Where handrails are used on paths, the requirements in 8.4 shall be considered.

6.3.7 Drainage of access and egress routes

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

The cross-fall provided to permit drainage of surface water on a level or sloped path, a stepped path, a ramp, or a landing, should not exceed 1 in 50 (2 %) unless exceptional circumstances make it unavoidable.

A dished channel should not be constructed within the boundaries of a path or ramp.

Where required, dished channels shall have a maximum width of 150 mm and a maximum drop into gulley of 5 mm.

Drainage gratings that are within the boundaries of a path or ramp shall be set flush with the surface and shall have narrow openings, perpendicular to the pedestrian path of travel in order to avoid trapping a wheelchair wheel or the tips of canes.

6.3.8 Obstacles in a path

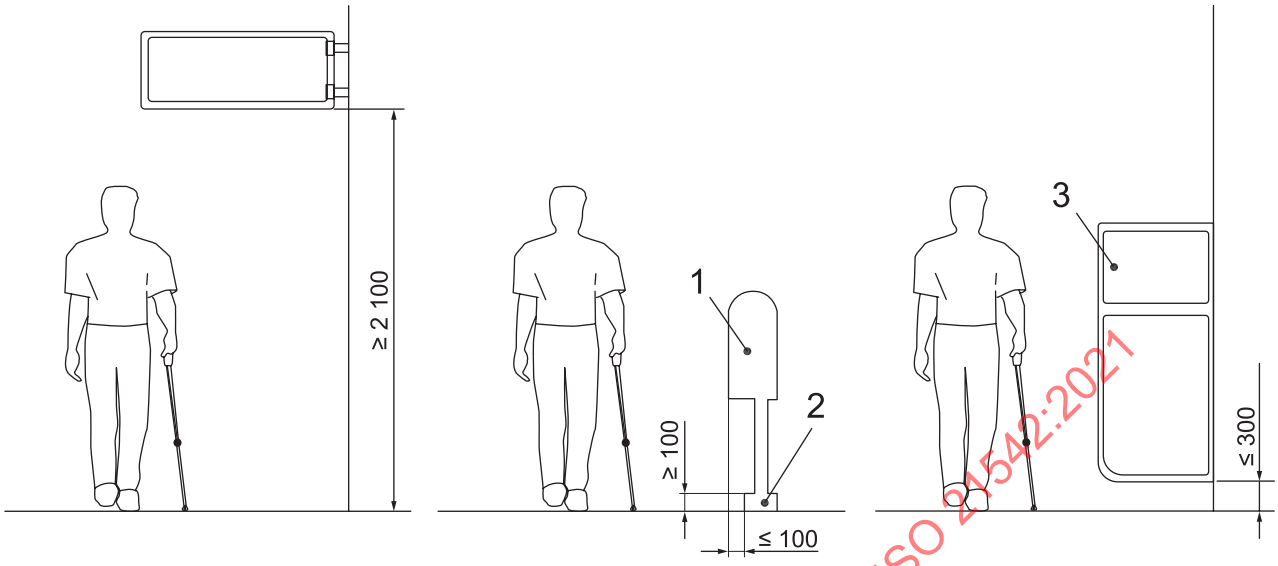
Obstacles, such as objects or signs mounted on walls, bollards, columns or free-standing supports along the walking path should be avoided. Any objects standing within access routes or projecting more than 100 mm into the movement space between 300 mm and 2 100 mm above the finished floor level shall be detectable with a cane and shall be clearly visible with a minimum luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %) to the background. Objects projecting into the upper space of a path, e.g. signs, shall be mounted not lower than 2 100 mm above the finished floor level (see Figure 23 a)). Objects with a height lower than 1 000 mm can create a hazard for people with vision impairments. Permanent equipment/fittings that cannot be located outside the boundaries of a path shall be designed to be easily seen, shielded to protect against impact, and 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 23 b)).

Where free-standing posts or columns within access routes are needed, they shall be clearly marked with visual indicators. The visual indicators shall have a minimum height of 75 mm and shall be placed at a height between 900 mm to 1 000 mm and 1 500 mm to 1 600 mm on the objects.

In the case of a projecting obstacle, a protective guard such as a kerb or a fixed element shall be provided on the ground, directly under the projecting object, with a height of at least 100 mm to allow cane detection (see Figure 23 b)). The distance between the protective guard and the outline of the horizontal projection of the object on the ground shall not exceed 100 mm.

Where free space under the object is needed, winged protection like wing walls, side partitions, alcoves or recesses can be used to allow cane detection of the projecting object. The bottom edges of the wing protection shall not be higher than 300 mm above the finished floor level (see Figure 23 c)). The winged protection shall extend continuously up to 1 000 mm above the finished floor level and shall contrast visually with the background.

Dimensions in millimetres



a) **b)** **c)**

Key

1 projecting object having a luminance contrast to background of $C_m \geq 30$ % ($C_w \geq 45$ %)

2 base plinth detectable by cane to protect projecting objects with a minimum height of 100 mm

3 winged protection

Figure 23 — Solitary obstacles

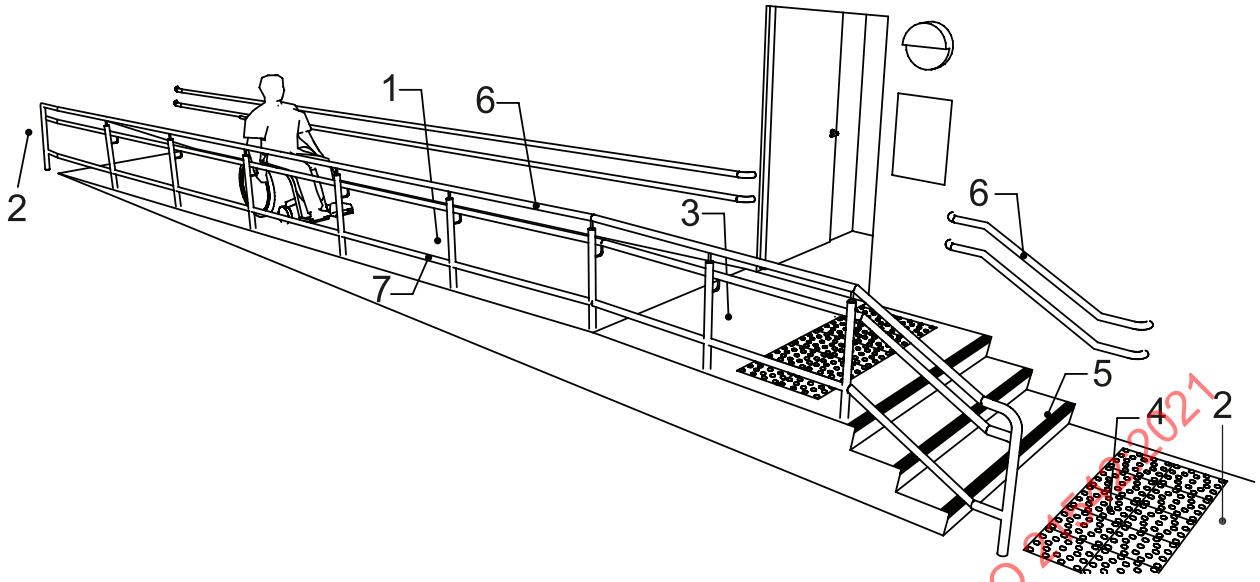
6.4 Ramps

6.4.1 General

Ramps can provide an accessible route between changes of level. A ramp with the appropriate gradient can provide accessibility under certain conditions without requiring a lifting device.

Ramps can be the only practical solution for some people who cannot use steps or stairs, while other people can have problems using ramps.

In addition to a ramp, a flight of steps should be provided if the ramp is steeper than 1 in 20 (5 %) and the change in level is more than 300 mm (see Figure 24)



Key

1 ramp surface (see Table 6 for maximum gradient and length)
2 lower horizontal landing
3 upper horizontal landing
4 tactile walking surface indicator in front of stairs
5 stairs with markings
6 handrails on both sides of ramp and stairs
7 guardrail preventing persons using a wheelchair falling off the path in accordance with 6.5

Figure 24 — Example of ramp with horizontal landings at beginning and end

6.4.2 Slope and length

Maximum values for three different types of ramps are given in Tables 6, 7 and 8.

Ramps shall be dimensioned with the lowest slope possible. A gentler slope provides a higher level of accessibility than a steeper slope with intermediate landings. The higher the rise, the gentler the gradient shall be.

The length, the rise and the slope of a ramp are interrelated. The slope of a ramp results from the quotient of the rise and its length.

The values shown in Table 6 apply in any new construction or existing building adaptation work.

A gradient of less than 1 in 20 (5 %) is preferred for ramps leading to the entrance and for those within the buildings.

Where a gradient of maximum 1 in 20 (5 %) cannot be applied, it is possible to increase the gradient to a maximum of 1 in 12 (8,33 %) according to Table 6, but the lowest possible gradient shall be applied. The arrangement of landings shall not increase the gradient of the ramp. Where multiple runs of ramps are provided in sequence and in one location, the gradient of each ramp run should be the same.

A ramp with a higher gradient than 1 in 12 (8,33 %) can be difficult or impossible to use for some persons with disabilities and the gradient can create an increased risk of personal injury due to fall or tripping.

Exceptional considerations for existing buildings: Table 7 specifies values for dimensioning ramps that may only be used under existing conditions or during the adaptation of existing buildings.

For kerb ramps, Table 8 applies.

NOTE Thresholds at the entrance of buildings are specified in 6.6.2.

Table 6 — Ramps

Gradient [a]		Maximum length (horizontal projection between landings) [a] [b]	Calculated rise according to gradient and length values [a] [b]	Handrails required
Rise in length	[%]	[mm]	[mm]	
Less than 1 in 20	Less than 5 %	No limit	No limit	No
1 in 20	5 %	10 000	500	See 6.4.5
1 in 19	5,26 %	9 500	500	
1 in 18	5,56 %	9 000	500	
1 in 17	5,88 %	8 500	500	
1 in 16,67	6 %	7 500	450	
1 in 16	6,25 %	6 000	375	
1 in 15	6,67 %	4 500	300	
1 in 14,29	7 %	3 750	263	
1 in 14	7,14 %	3 500	250	
1 in 13	7,69 %	2 800	215	
1 in 12,50	8 %	2 500	200	
1 in 12	8,33 %	2 260	188	

[a] An intermediate value may be calculated by interpolating data.

[b] From 1 in 17 (5,88 %) to 1 in 12 (8,33 %) of the slope, the following formula can be used as an easier way to obtain intermediate length, d, or rise, Δh, values (in mm): $d = \Delta h \times 20 - 1\,500$.

Table 7 — Exceptional considerations for ramps in existing buildings

Gradient [a]		Maximum length (horizontal projection between landings) [a]	Calculated rise according to gradient and length values [a]	Handrails required
Rise in length	[%]	[mm]	[mm]	
1 in 12	8,33 %	15 000	1 250	See 6.4.5
1 in 11	9,1 %	12 650	1 150	
1 in 10	10,0 %	10 000	1 000	
1 in 9	11,1 %	6 750	750	
1 in 8	12,5 %	3 000	375	

[a] An intermediate value may be calculated by interpolating data.

Table 8 — Kerb ramps

Gradient [a]		Maximum length (horizontal projection between landings) [a]	Calculated rise according to gradient and length values [a]	Handrails required
Rise in length	[%]	[mm]	[mm]	
1 in 11	9,1 %	1 980	180	No
1 in 10	10,0 %	1 500	150	
1 in 9	11,1 %	990	110	
1 in 8	12,5 %	600	75	

[a] An intermediate value may be calculated by interpolating data.

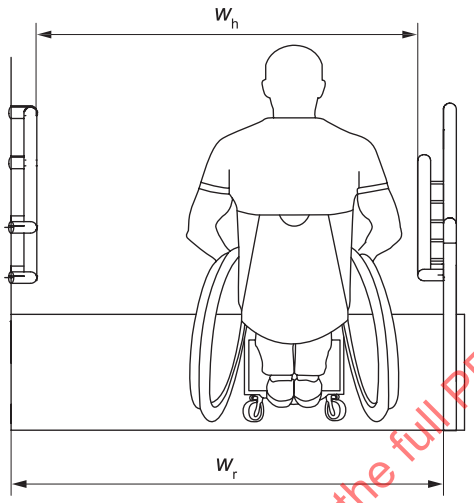
6.4.3 Width of ramps

The surface width of a ramp shall be in accordance with 6.3.3 regarding width of a path.

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

Exceptional considerations for existing buildings: The unobstructed width of a ramp shall not be less than 900 mm.

Figure 25 shows the surface width of a ramp and the unobstructed width between handrails.



Key

w_h width between handrails

w_r width of ramp surface

Figure 25 — Example of surface width of a ramp and the unobstructed width between handrails

6.4.4 Landings of ramps

An end landing shall be provided at the foot and the head of a stepped path or a ramp. The length of an end landing and an intermediate landing shall not be less than 1 500 mm. The area of an end landing may be a part of the continuing path (see Figure 24).

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 24).

Exceptional considerations for existing buildings: The length of an end landing and an intermediate landing shall not be less than 1 200 mm.

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

6.4.5 Handrail support and guidance by handrails on ramps

For general requirements of handrails, 8.4 and the following apply.

a) For ramps with a gradient of 1 in 20 or steeper and a length of more than 800 mm, handrails shall be provided on both sides of the ramp.

b) For ramps with a gradient of 1 in 20 or steeper and a length of 800 mm or less, a handrail shall be provided at least on one side of the ramp.

c) For ramps with a gradient of less than 1 in 20 and for kerb ramps, handrails are not required.

d) Horizontal extensions of a handrail shall be provided in accordance with 8.4.5.

For protection from falling from a ramp, see 6.5.

6.4.6 Drainage of ramps

Consider the general requirements in 6.3.7.

6.4.7 Surface materials

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

6.5 Protection along paths and ramps

Providing guarding at the sides of a path protects persons using a wheelchair and ambulant persons from injuring themselves as the result of a fall. See examples of protection against falling in Figure 26.

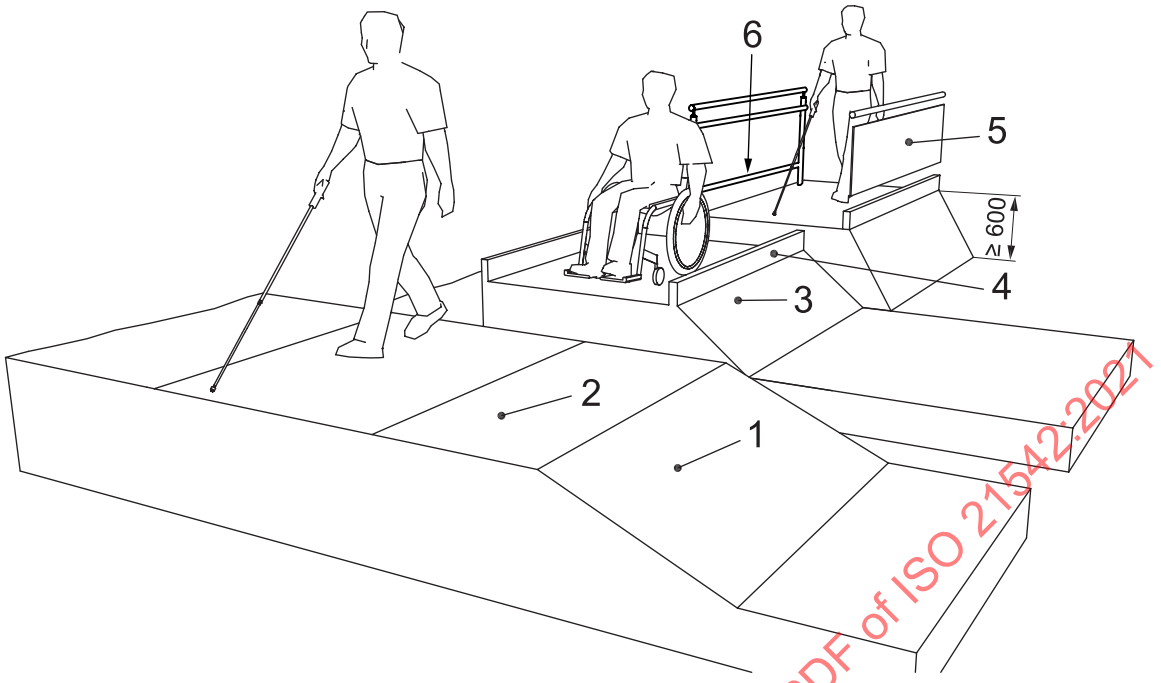
If a path or sloped path is bounded on one or both sides by terrain that slopes downwards by up to 30° from the horizontal, a firm and level margin of at least 600 mm shall be provided at the relevant side or sides. In this case, no upstand/guarding is necessary. An upstand is needed if the margin is less than 600 mm.

If a path, sloped path or ramp is bounded on one or both sides by terrain that slopes downwards by more than 30°, an upstand with a minimum height of 150 mm shall be provided at every relevant side. Upstands shall have a luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %) in relation to the ramp.

If a path, a sloping path, a stepped path, a ramp, a terrace or any other unfenced platform rises more than 600 mm above the adjacent ground, it shall be provided with guarding including an upstand or including a tapping/kerb rail with a maximum height of 300 mm.

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

Dimensions in millimetres



Key

1 downwards slope up to 30°

2 level margin, minimum width of 600 mm

3 downwards slope greater than 30°

4 upstand, minimum height of 150 mm, minimum luminance contrast $C_m \geq 30$ % ($C_w \geq 45$ %) in relation to the path or ramp

5 guarding including an upstand

6 tapping/kerb rail at a maximum height of 300 mm

Figure 26 — Examples of protection against falling

6.6 Building entrances and final fire exits

6.6.1 General

The principal 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 signage shall be provided.

The entrance(s) to a building, including final fire exits, shall be easy to locate, safe and easy to use, and be protected from exposure to rain and snow. Entrance and final fire exit doors shall be sufficiently wide, and easy and intuitive to operate. See 9.1.1 for relevant requirements for entrance doors.

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

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

Except when necessary to maintain security or privacy, a building entrance and final fire exit doors shall be designed to permit visual awareness of the layout immediately beyond, by means of high and

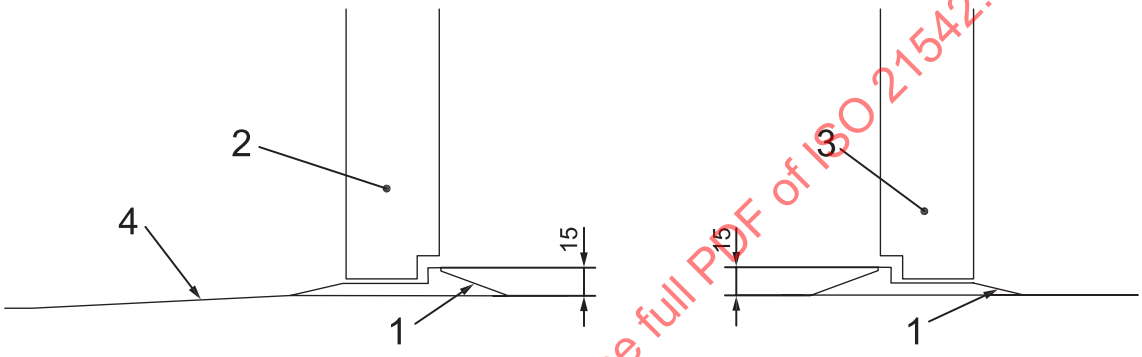
low-level vision panels in the door leaf. Refer to 9.1.1.5 on viewing panels in doors and of 9.1.1.6 on visual contrast of doors and door furniture to the wall.

Final fire exit doors in the context of fire evacuation are shown in Clause 11.

6.6.2 Thresholds at entrances and final fire exits

Entrances into a building and final fire exits shall be level. At entrance and final fire exit doors, when required for thermal insulation and/or airtightness, a high degree of overlap between door leaf and threshold can be necessary, resulting in a relatively small clearance between landing and door leaf. Where a raised threshold is necessary, it shall have a maximum height of 15 mm and be bevelled down (see Figure 27). Raised thresholds shall have a minimum luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %) compared to the floor.

Dimensions in millimetres



Key

1 bevelled threshold
2 door opening outwards
3 door opening inwards
4 short ramp allowed

Figure 27 — Bevelled threshold

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 a regularly serviced flooring type with rubber backing and bevelled edges to maintain surface adhesiveness and prevent folding or crinkling.

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 principal entrance.

6.6.3 Circulation space at entrance doors and final fire exits

In front of the door opening into the building, there shall be a minimum horizontal manoeuvring space of 1 500 mm × 1 500 mm. Where turning 180° in a wheelchair is required, there shall be a minimum of 1 500 mm × 2 000 mm. On the side to which the door opens, a clear space of at least 600 mm (700 mm recommended) is required at the latch side of the door to allow someone to operate the door handle (see Figure 28).

Annex C shows the circulation spaces needed at doorways for different types of doors.

General design considerations for wheelchairs including requirements on different types of wheelchairs are given in G.6.

Dimensions in millimetres

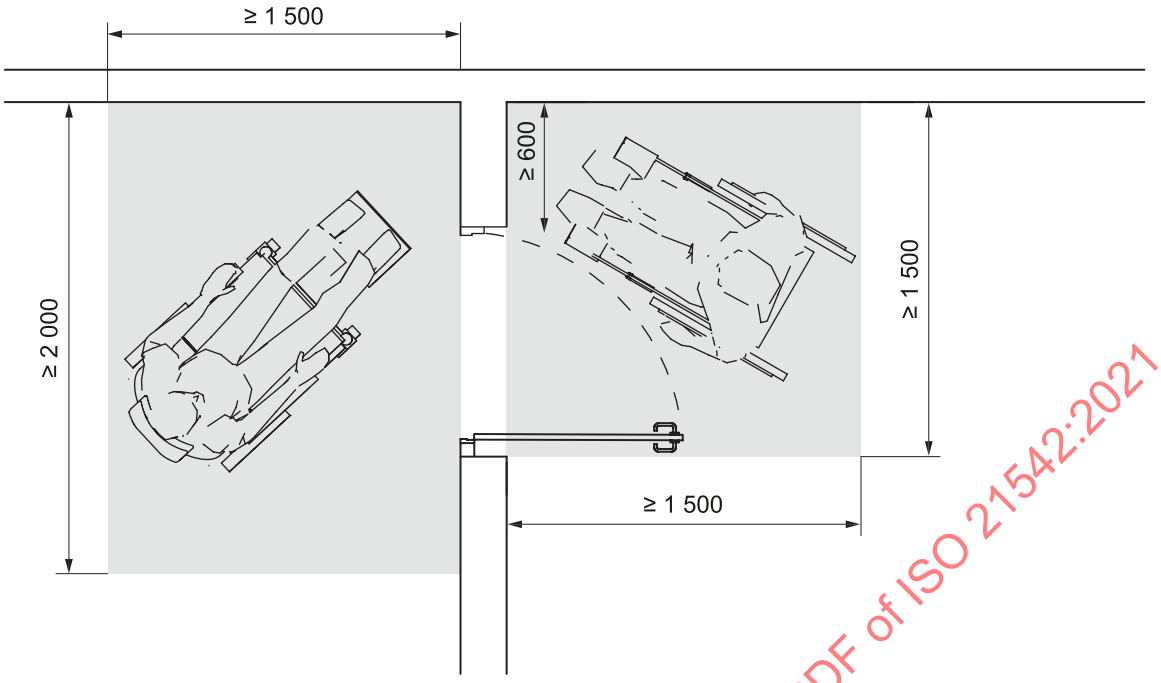


Figure 28 — Circulation space at a swing door

6.6.4 Space requirements between doors in series and in vestibules

Vestibules shall allow people to enter and exit a building without any hindrance or barriers.

The minimum unobstructed manoeuvring space between doors shall not be less than 1 500 mm free of the door swing (see Figure 29).

In the vestibule, single swing doors should swing in the exit direction.

Dimensions in millimetres

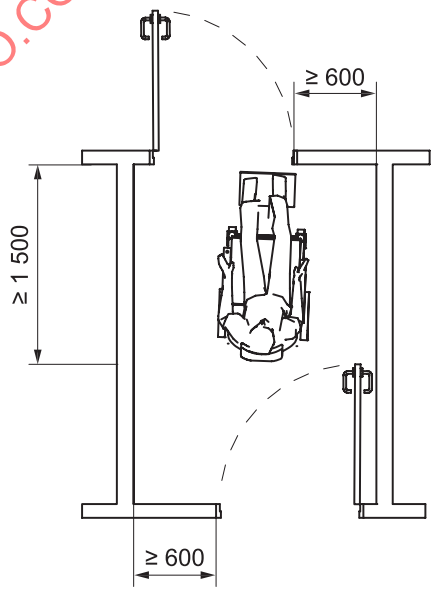


Figure 29 — Minimum dimensions between swing doors in series

7 Horizontal circulation in a building

7.1 Internal circulation routes and manoeuvring spaces

7.1.1 General

The main horizontal circulation shall be level on each storey. Horizontal circulation shall be without steps. Where differences in level are unavoidable, ramps as specified in 8.2 or lifts as specified in 8.5 shall be provided.

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

Horizontal circulation routes/corridors shall be designed to avoid problems of congestion and merging during regular use and in an emergency, and to facilitate counterflow, e.g. by firefighters or rescue teams. Fire evacuation routes, including final fire exits that open directly to the exterior, shall be accessible.

Circulation routes should preferably intersect at right angles to each other and be easy to follow. To facilitate people with vision impairments, circulation routes should be detectable, with a visual contrast to adjacent walls. For orientation and wayfinding in very complex buildings and across large areas, guidance can be provided by directional tactile walking surface indicators and visual, audible and tactile information, including information for egress and fire evacuation (see 5.1 on orientation and information and 5.8 on emergency warning system, signals and information).

7.1.2 Internal circulation routes/corridors

The requirements for the width of paths and passing spaces as specified in 6.3.3 apply. The minimum clear, unobstructed width of corridors shall be 1 200 mm, with at least 1 500 mm recommended.

The minimum clear, unobstructed width of corridors shall be free of handrails and any other projections, e.g. portable fire extinguishers or radiators, notice boards, coat hooks. The specifications of 6.3.8 on solitary obstacles in a path apply accordingly.

Exceptional considerations for existing buildings: The width of short straight passages of maximum 2 000 mm in length may be reduced to 900 mm.

The minimum clear height of circulation routes and corridors shall be 2 400 mm.

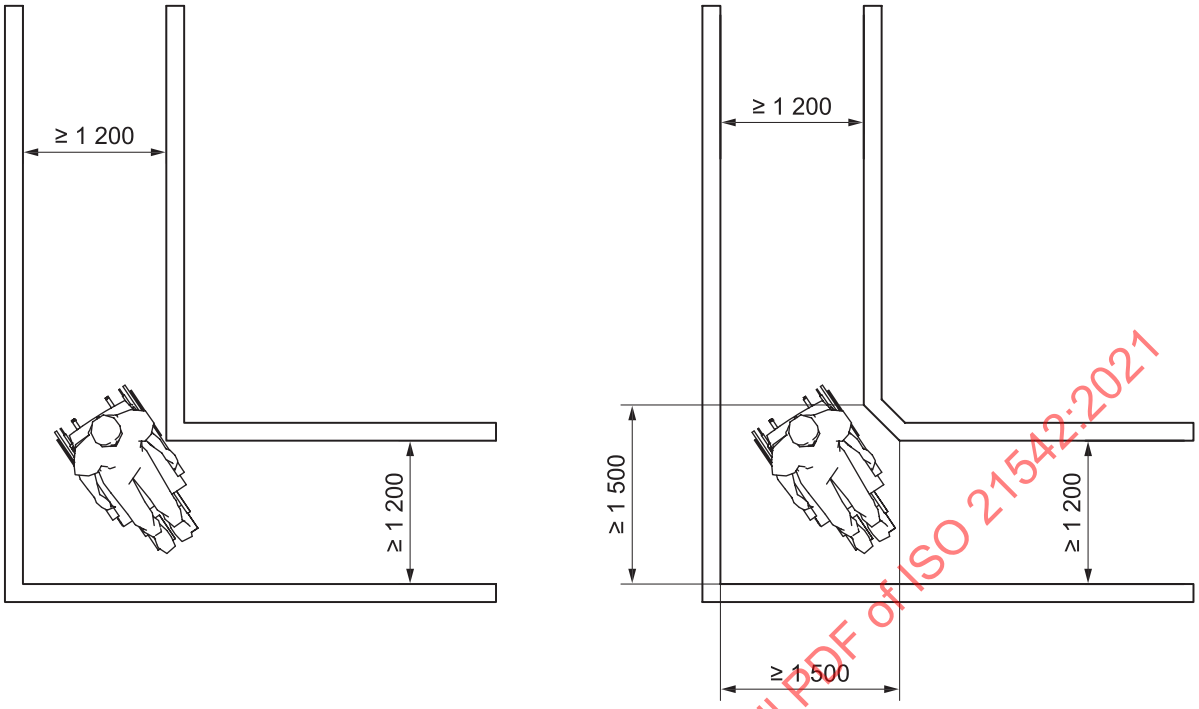
7.1.3 Turning space for 90° turn of a wheelchair in corridors

Where there is a change of direction in a corridor, a turning space with a diameter of at least 1 200 mm shall be provided; a diameter of 1 500 mm is recommended for ease of turning (see Figure 30).

The turning space shall be level.

Exceptional considerations for existing buildings: The manoeuvring space required for a wheelchair to make a 90° turn may be reduced to a diameter of 1 000 mm.

Dimensions in millimetres



a) Minimum space **b) Recommended space**

Figure 30 — Minimum and recommended space required for a 90° turn

7.1.4 Turning space for 180° wheelchair turn

The available space for a wheelchair to make a 180° turn shall not be less than 2 000 mm in the direction of travel and not less than 1 500 mm wide (see Figure 31).

Exceptional considerations for existing buildings: The width and the length of the space required for a wheelchair to make a 180° turn may be reduced to 1 200 mm.

For landing dimensions, see 8.3.3.

Dimensions in millimetres

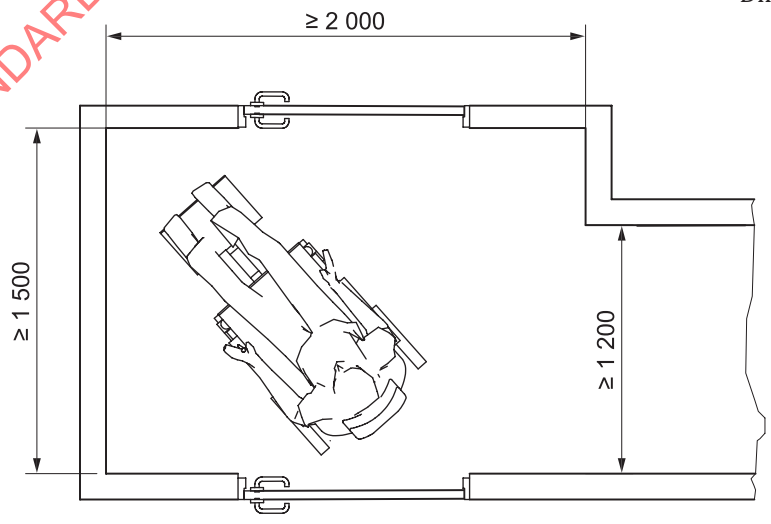


Figure 31 — Space required for a 180° turn in a corridor

7.2 Moving walks

The provisions on moving walks as specified in 8.7 apply accordingly.

8 Vertical circulation in a building

8.1 General

All floor levels shall be accessible by lifts, ramps or have level access along routes or thresholds. This does not apply to any part of a building that is used solely to enable the building, and any of its services or fittings to be inspected, repaired or maintained.

Vertical circulation routes within buildings shall be designed, constructed and managed so that they can be easily found, understood and used by everyone. Vertical circulation includes the provision of ramps (8.2), stairs (8.3), lifts (8.5), lifting platforms (8.6), escalators and moving walks (8.7). Where necessary for safety or identification of vertical circulation routes, TWSIs (see 5.1.4) shall be installed.

Vertical circulation routes shall be designed to avoid problems of congestion during a fire emergency, and to facilitate counterflow. Vertical fire evacuation routes shall be accessible, see 11.4.4.

8.2 Ramps in buildings

General requirements for ramps are set out in 6.4. Internal ramps should be avoided. Where required, internal ramps shall be designed in accordance with the following additional criteria:

— if a series of ramps is provided rising more than 2 000 mm in total, an accessible lift should be installed nearby;

— a gradient of 1 in 16,67 (6 %) should be the maximum within a building in order to avoid trips and falls during a fire evacuation.

The minimum illumination at the top and bottom of the ramp shall be 200 lx and 150 lx in between. For specifications on lighting, see 5.4.

8.3 Stairs

8.3.1 General

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

Spiral and curved stairs should be avoided.

The minimum illumination at the top and bottom of the flight shall be 200 lx and 150 lx in between. Luminaires shall be positioned and shaded to avoid glare. For requirements on lighting, see 5.4.

8.3.2 Rise and going of steps

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

The riser of a step shall not be open.

The minimum going of the step shall be 260 mm, and the maximum rise shall be 180 mm. For safe fire evacuation, the rise of a step should not be higher than 150 mm, and the going of a step should not be less than 300 mm. Due to safety reasons and anthropometric differences, it is recommended to increase the going rather than reduce the rise.

The sum of the going and twice the rise of a step should be between 600 mm and 660 mm.

The projection of a step nosing over the going below should be avoided to eliminate a tripping hazard, but, if necessary, shall not be more than 25 mm. The nosing shall provide an uninterrupted transmission between the riser and going (see Figure 32).

Dimensions in millimetres

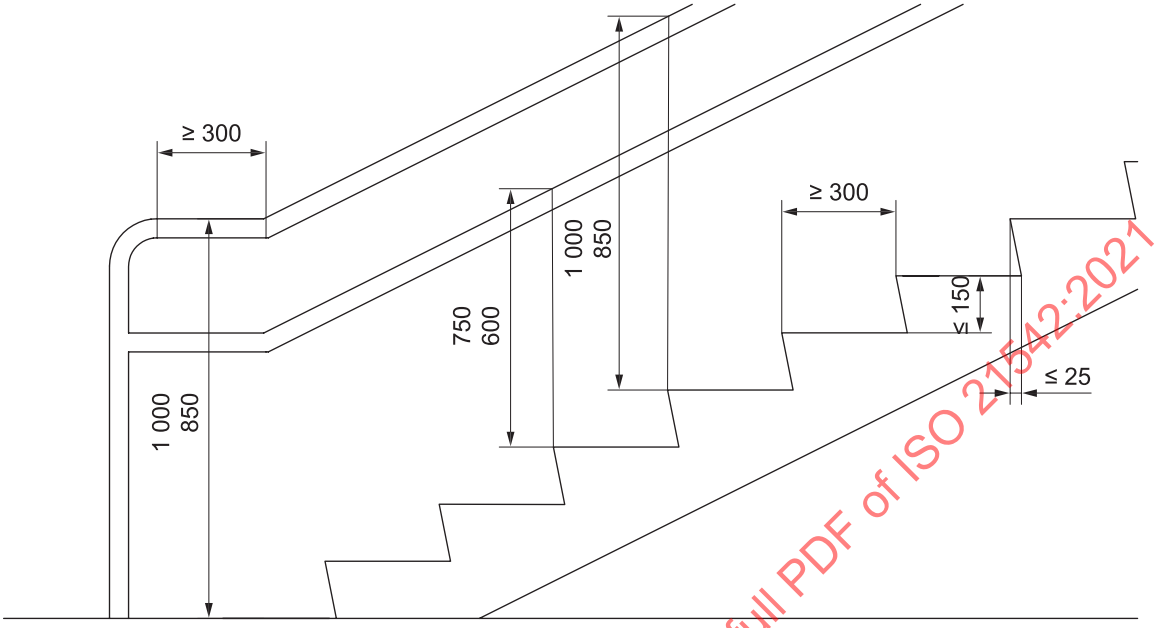


Figure 32 — Recommended dimensions for going and rise of steps and heights of dual handrails

8.3.3 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.

Exceptional considerations for existing buildings: The minimum width of a flight of stairs may be reduced to 900 mm and the minimum width between handrails may be reduced to 800 mm.

The minimum width of evacuation staircases between the handrails should be 1 500 mm to allow sufficient space for a person using a wheelchair to be manually lifted downstairs, while also providing reasonable space for the purpose of counterflow circulation.

8.3.4 Staircase landings

The area of a landing shall be free from 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 33).

In order to minimize the risk of any hazardous situations in the case of doors opening towards a descending stair, e.g. a person falling down the stairs, the minimum safe distance between door openings and descending stairs should be 2 000 mm.

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

Dimensions in millimetres

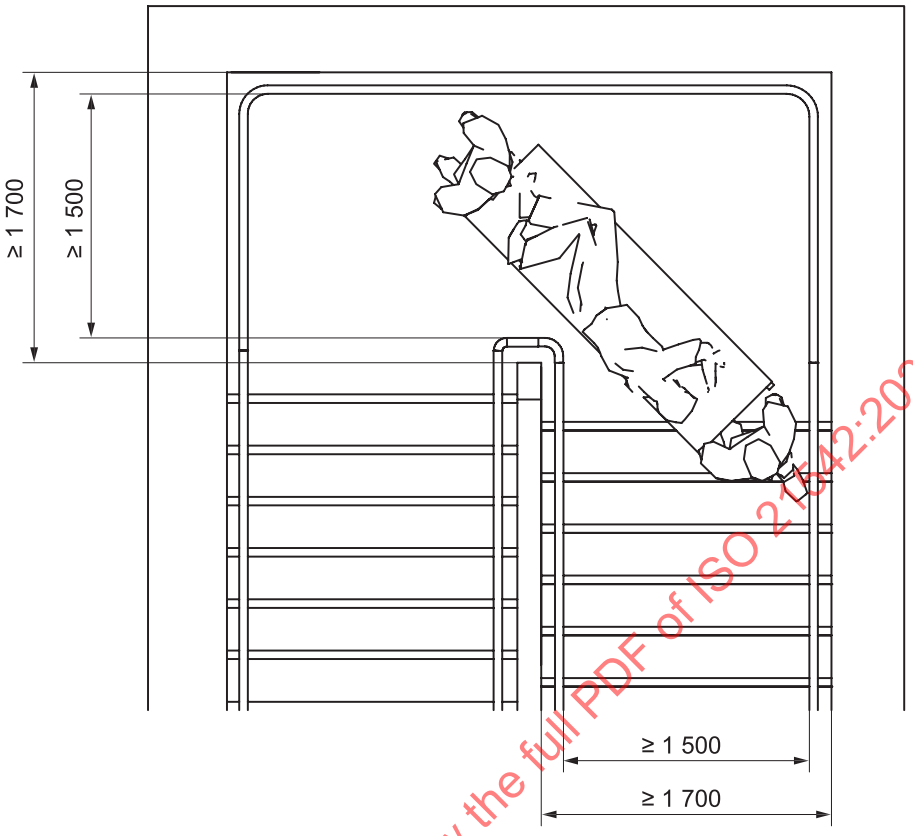


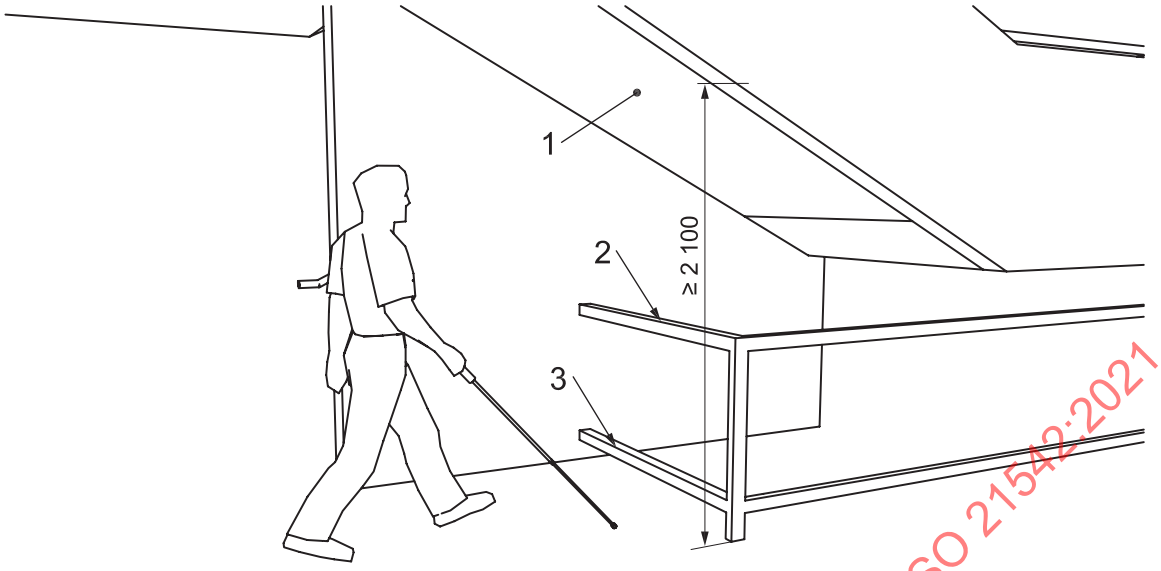
Figure 33 — Example of stair and 180° landing for emergency access

8.3.5 Head clearance

Clear accessible height under stairs shall be at least 2 100 mm. If the clear height is less than 2 100 mm, a guard or other element shall be provided to shield against impact (see Figure 34).

Head clearance on the stair shall be at least 2 100 mm.

Dimensions in millimetres



Key

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

Figure 34 — Clear height under stairs

8.3.6 Visual and tactile warnings

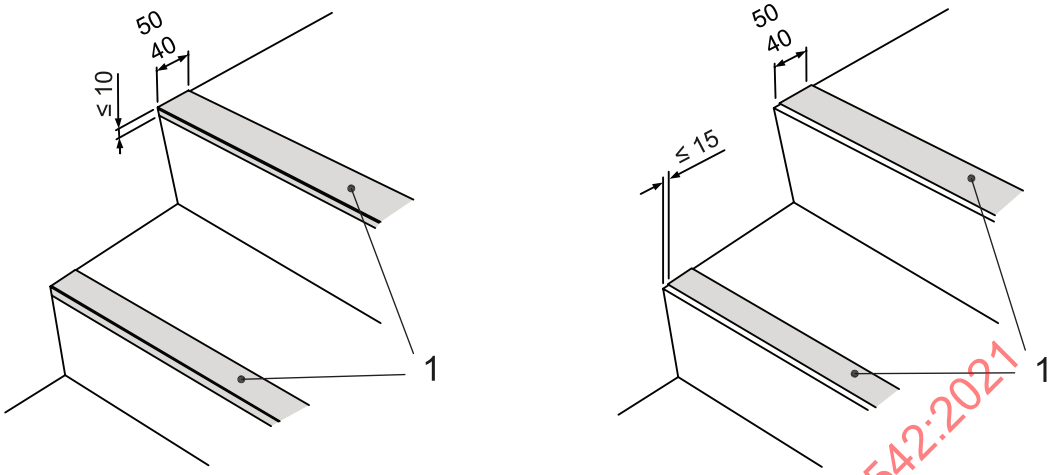
Visual contrast shall be provided to distinguish the steps and the landings of stairs. A continuous visual warning line of 40 mm to 50 mm with a minimum luminance contrast of $C_m \geq 60$ % ($C_w \geq 75$ %) shall be provided on the front edge over the full width of the going of each step. The warning line may also run along the upper edge of the riser with a width of up to 10 mm. The visual indicator on the going may be set back a maximum of 15 mm from the front of the nosing (see Figure 35). As an alternative, a visual warning line with a width between 50 mm and 100 mm may be provided only on the going of the first and the last step of the flight.

Where tactile attention patterns are used, they should be provided on the landings at the top and bottom of every flight of stairs across the whole width of the stair. The attention pattern should have a depth of between 600 mm and 900 mm and be set back between 300 mm to 500 mm from the edge of the top stair nosing and between 100 mm and 500 mm from the bottom riser. The distance between the TWSI at the bottom of a flight of stairs and the first riser shall be different from the depth of the going to avoid potential confusion. For dimensions of TWSIs, see Figure 36 and Annex B.

Where a flight of stairs is in an open area within a building, a TWSI should be installed at the top landing according to 5.1.4. 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 minimize the risk of stumbling, tripping or slipping.

Where attention patterns are used at the top and bottom of stairs, the TWSI may not cause visual confusion of the first and the last step of the flight.

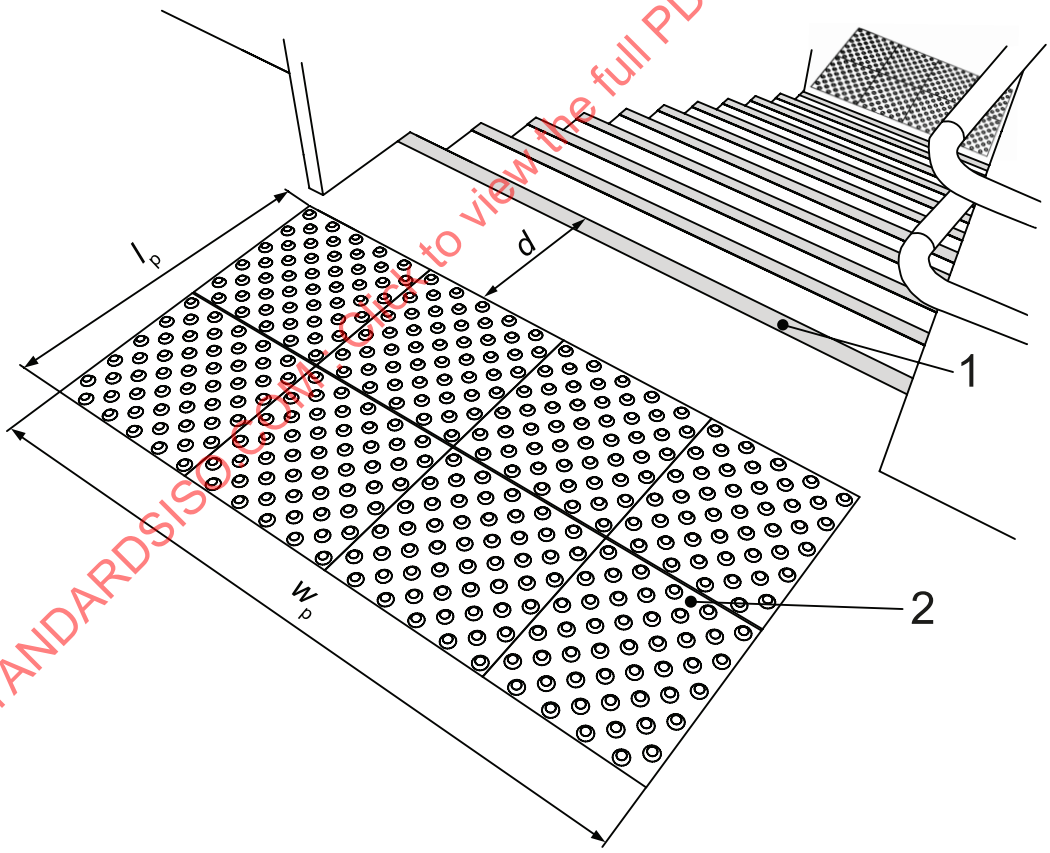
Dimensions in millimetres



Key

1 visual warning line

Figure 35 — Visual indicator on stairs



Key

1 visual warning line

2 attention pattern with maximum height of profile of 5 mm

d distance between TWSI and edge of the stair at the top, between 300 mm and 500 mm

l_p length of TWSI, between 600 mm and 900 mm

w_p width of TWSI

Figure 36 — Tactile walking surface indicator (TWSI)

8.3.7 Handrails and guards along stairs

A handrail in accordance with 8.4 shall always be installed on both sides of all flights of stairs.

When the unobstructed width of the stairs exceeds 2 700 mm, a central handrail should be installed ensuring an unobstructed width of 1 500 mm on at least one side of the central handrail.

If a stair rises more than 600 mm above the adjacent floor level, it shall be provided with guards as specified in 6.5 from that point on in addition to the handrails.

Should spiral or curved stairs be used, the inside handrail should be placed vertically parallel with the going at a point where it has a minimum length of 220 mm.

8.4 Handrails

8.4.1 General

A handrail provides a means of support and guidance for building users. A handrail helps most people going up or down a flight of steps or a ramp and during an emergency evacuation.

Handrails shall be provided for stepped and sloped paths, ramps and stairs according to the requirements given in 8.4.2 to 8.4.7.

An additional handrail, for use by children, people of short stature and persons using a wheelchair (on ramps), at a lower height than the first one, shall be provided.

Handrails shall have a visual contrast to the background and shall provide tactile information for orientation and wayfinding within the building.

8.4.2 Characteristics of a handrail

The cross-section of handrails shall be a rounded profile with not less than 32 mm or greater than 45 mm in any dimension; the edges shall be rounded with a minimum radius of 15 mm. For a second additional lower handrail, the cross-section shall be a rounded profile with a diameter not less than 25 mm or greater than 32 mm in any dimension; in the case of ramps, the profile of lower handrails may be greater depending on the users of the building.

A handrail shall:

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

b) have a maximum overall projection of not more than 100 mm from any side obstruction;

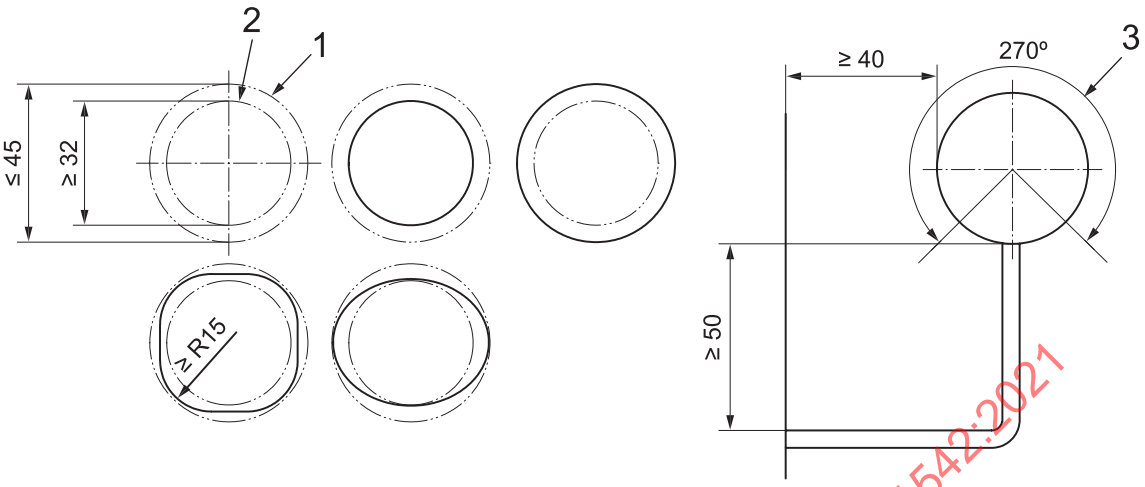
c) have the top 270° arc of the handrail clear along its full length;

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

e) have a smooth surface that provides adequate resistance to hand slippage.

Figure 37 provides examples of handrail profiles, support and clearance.

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 37 — Examples of handrail profiles, support and clearance

8.4.3 Continuity of a handrail

Handrails shall be continuous throughout the full length of a flight of stairs, a ramp, stepped path and intermediate landings, except where they intercept with a doorway or path of travel.

8.4.4 Height of a handrail

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

The height of an additional lower handrail shall be between 600 mm and 750 mm above the floor level of a ramp, the pitch line of a stair, and the surface of a landing.

8.4.5 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 or turn through 180°.

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

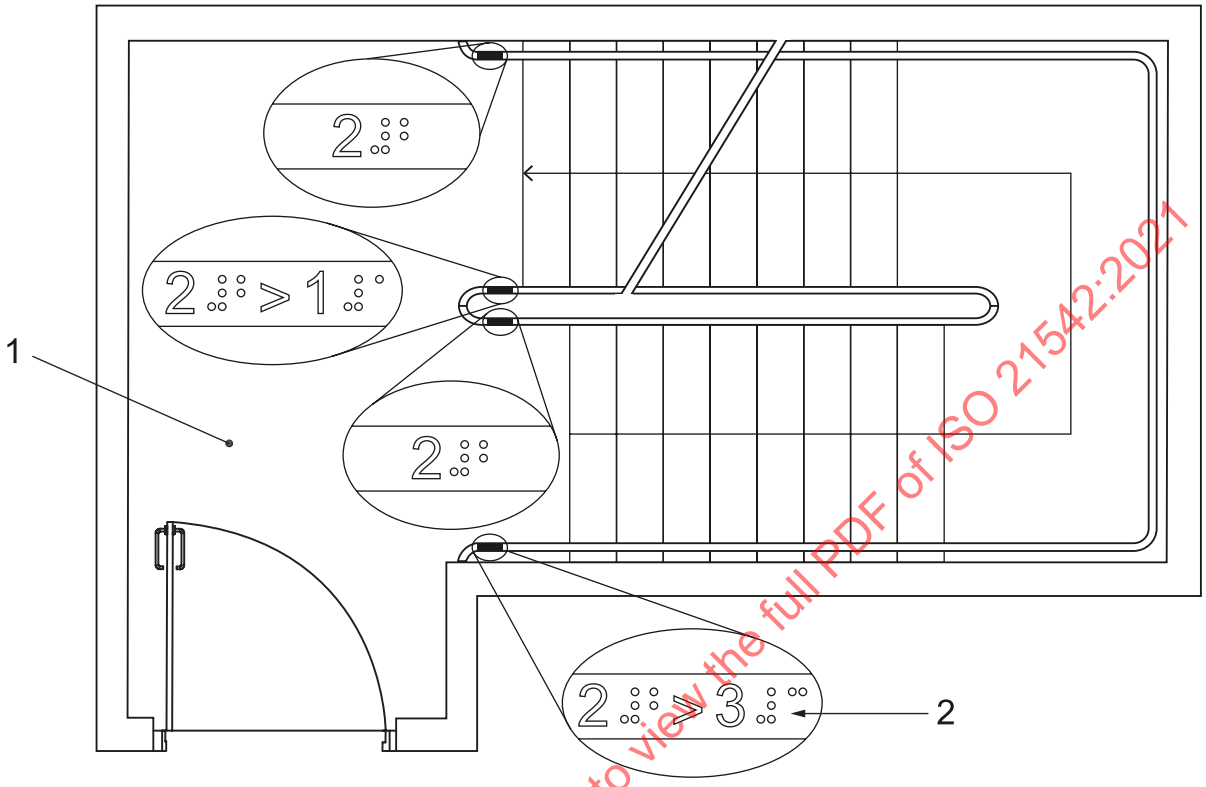
8.4.6 Visual and tactile information

The minimum visual contrast of a handrail to the adjacent background, e.g. a wall, shall comply with the requirements in 5.3.

Raised text or tactile characters/symbols together with Braille shall be unobtrusively and permanently fitted or fixed at the beginning and at the end of every handrail on stairs (horizontal extension) indicating

at least the floor number as an important source of information for people with vision impairments. In case of stairs on an evacuation route, the exit direction for evacuation should be provided as well. The tactile information shall be short and easy to understand. Directional information can include arrows.

Figure 38 shows examples of visual and tactile information on handrails.



Key

1 platform of the second floor

2 information on current floor and the floor to be reached by the stairs as tactile characters and in Braille

NOTE Information is readable by touch and its orientation corresponds to the direction of travel.

Figure 38 — Example of tactile information on handrails

Visual and tactile information should be provided according to 5.1, 5.3, 5.4, 5.5 and 6.3.2.

8.4.7 Mechanical resistance

Handrails shall be securely fixed and rigid. The fastenings and the materials shall be able to withstand a minimum point load of 1,7 kN, both vertically and horizontally.

8.5 Lifts

8.5.1 General

In a building with more than two storeys, a lift shall be provided. For buildings with only two storeys, a lift should be provided.

Passenger lifts shall be accessible.

The minimum required internal lift car size varies depending on the situation and use of the building and shall at least allow the transport of a person using a wheelchair and a companion, see Figure 40.

Dimensional requirements for accessible lifts shall comply with ISO 8100-30.

In a group of lifts, the accessible lift(s) shall be marked with the graphical symbol as shown in Figure 8. Lifts that may be used for fire evacuation shall be marked with the graphical symbol as shown in Figure 9.

Exceptional considerations for existing buildings: If it is not possible to install an accessible lift in an existing building with dimensions according to 8.5.4, the following alternatives shall be provided:

— a lift with smaller inner car dimensions as specified in 8.5.4 (exceptional consideration);

— vertical or inclined lifting platforms in accordance with 8.6.

8.5.2 Approach and access to the lift

An accessible landing is required on every storey to be reached by an accessible lift. The colour and tone of the lift entrance doors should contrast with the surrounding wall finishes. See 5.3 for further information on design aspects of visual contrast.

In complex buildings or wide halls, tactile walking surface indicators should be provided to identify the location of a lift entrance and give guidance to the landing control devices. In less complex buildings, a distinguishable floor surface in front of the lift entrance of approximately 1 500 mm × 1 500 mm should be installed.

The manoeuvring space in front of the lift entrance shall be at least 1 500 mm × 1 500 mm (see Figure 39).

Exceptional considerations for existing buildings: The minimum manoeuvring space may be reduced but shall not be less than 1 200 mm × 1 200 mm.

The manoeuvring space should not be in any circulation route or directly opposite to any stair circulation. If a stair is situated opposite the entrance, the distance to a descending stair shall be at least 2 000 mm to allow safe manoeuvring. The specifications on minimum distance from landing control devices to an adjacent corner as in 8.5.7 shall be considered. For locations with high traffic, the size of the manoeuvring space shall accommodate at least two people using mobility devices.

The manoeuvring area shall be adequately lit with a minimum illumination of 100 lx.

If fully glazed doors are used on lifts, marking of the doors shall be in accordance with 9.1.1.4.

Dimensions in millimetres

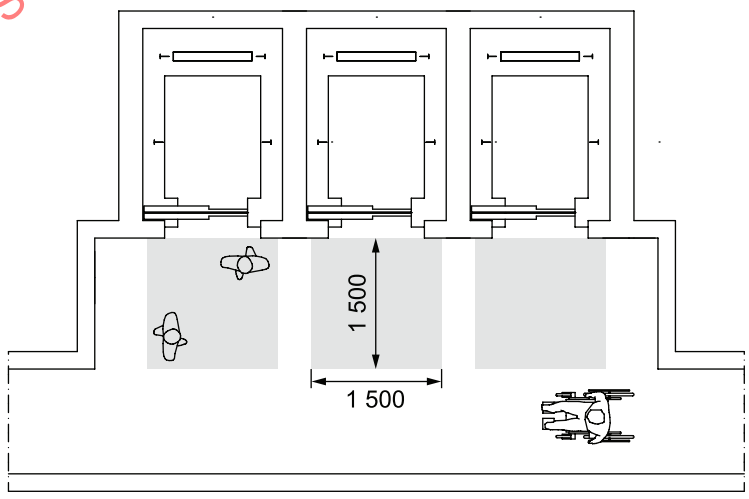


Figure 39 — Manoeuvring space in front of a group of lifts

8.5.3 Lift car entrance — Door opening

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

The dwell time, i.e. the time the lift doors remain open,

— shall be at least 8 s; or

— may be less than 8 s, where an accessibility button as part of the landing controls is provided to increase the dwell time to an appropriate value specified depending on the site conditions, e.g. whether it is a single lift or a group of lifts where more time is needed to manoeuvre and move to the assigned lift.

For presence sensor devices, e.g. light curtains, ISO 8100-1:2019, 5.3.6.2.2.1 applies.

8.5.4 Entrance width and inner dimensions of cars

Requirements for the size of accessible lifts are stated in ISO 8100-30 as lifts "accessible for wheelchairs". Inner dimensions of cars shall be according to ISO 8100-30 (see Figure 40).

NOTE 1 According to ISO 8100-30:2019, 3.3.1 and 3.3.2, the clear inner dimensions of lifts according to ISO 8100-30 can be lower due to decorative or protective panels.

NOTE 2 The requirements of ISO 8100-30 give dimensions for a wide range of accessible lifts in different lift classes: Class I – General purpose lifts, Class III – Health care lifts, including hospitals and nursing homes and Class VI – Intensive use lifts for high-rise buildings.

The minimum inner dimensions of cars that are accessible for a person using a wheelchair and an accompanying person shall be 1 100 mm × 1 400 mm. A minimum unobstructed entrance width of 900 mm shall be provided on the narrow side of the car (see Figure 40 a)). See also ISO 8100-30:2019, Figures 5 and 6, Series B.

Where access for wheelchairs and equipment for outdoor use such as hand-bikes, tracks/tracking motors, or scooters is required, the dimension shall be increased to 1 100 mm × 2 100 mm.

If entrances are provided on two adjacent sides, the minimum inner dimensions of the car shall be 1 600 mm × 1 400 mm, with a 900 mm unobstructed door width (see Figure 40 c)).

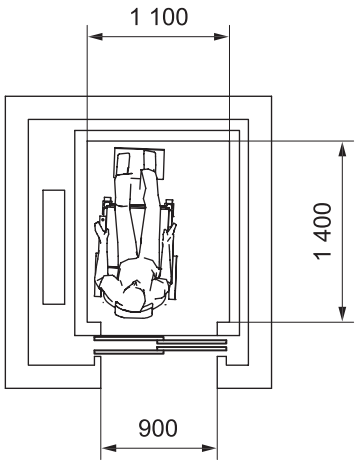
NOTE 3 ISO 8100-30 does not cover adjacent doors on lift cars.

If a stretcher is considered, the minimum inner dimensions of cars shall be 1 100 mm × 2 100 mm. A minimum unobstructed entrance width of 900 mm shall be provided on the narrow side of the car (see Figure 40 b)). Consider ISO 8100-30: 2019, Figure 5, Series B.

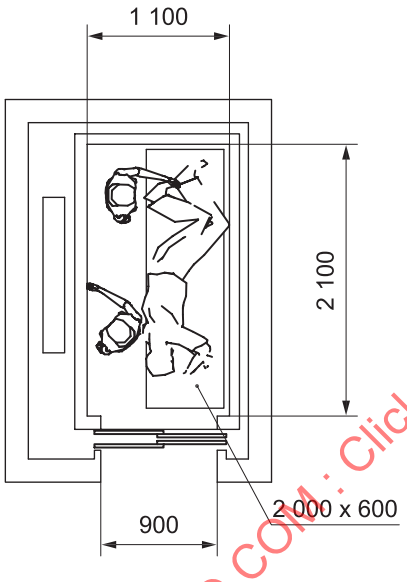
NOTE 4 ISO 8100-30:2019, Figure 9 describes many additional accessible lift cars, e.g. to facilitate transporting a bed. They are clearly marked with the international symbol for access or bed symbol. All these accessible lifts allow full manoeuvrability for persons using a wheelchair and walking aids.

Exceptional consideration for existing buildings: For lifts with one entrance or two entrances on opposite sides, the minimal car size may be 1 000 mm × 1 300 mm.

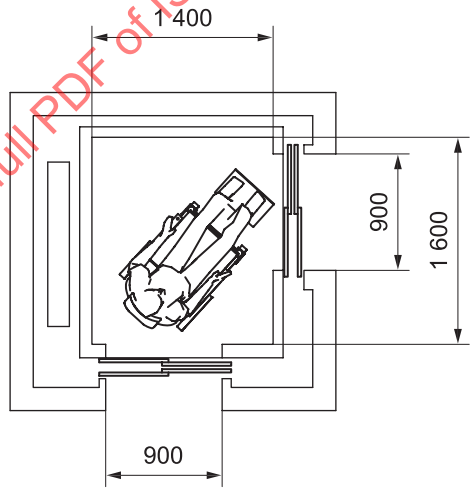
Dimensions in millimetres



a) Minimum dimensions of an accessible lift



b) Minimum dimensions of a lift suitable for a stretcher



c) Minimum dimensions of a lift with two adjacent doors

Figure 40 — Minimum dimensions of different types of accessible lifts

8.5.5 Equipment in the car

8.5.5.1 Handrail

At least one handrail shall be provided in the car and should be fixed horizontally on the same wall as the car operating panel; it is recommended to provide one handrail on each wall. Handrails may be interrupted at the car operating panel(s).

The gripping part of the handrail shall have:

— a minimum diameter of 30 mm, whereas 35 mm is recommended;

— a maximum diameter of 45 mm;

— no sharp edges.

The height to the top of the handrail shall be between 800 mm and 950 mm above floor level; a height of (850 ± 25) mm is preferable.

The free space between the wall and the gripping part shall be at least 35 mm, whereas 40 mm is recommended.

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

8.5.5.2 Seat

Where a foldable seat (tip up seat) is provided, it shall have:

— a top height from the floor of (500 ± 20) mm and should be adjustable;

— a depth between 400 mm and 500 mm;

— a width between 500 mm and 600 mm.

The seat should be usable for people with a weight of up to 150 kg. In the immediate vicinity of the seat, a plate with the information on the maximum permissible weight given in tactile characters and Braille should be attached.

8.5.5.3 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 and the landing floors should have similar slip-resistant characteristics.

NOTE A lift floor with a high light reflectance value reassures partially sighted people that they are not stepping into an open lift shaft.

8.5.5.4 Mirror or mirrored wall within the car

Where a person using a wheelchair cannot turn around, a mirror or a mirrored wall shall be installed to enable the person 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).

8.5.5.5 Lighting

Internal car lighting shall be uniformly distributed and provide a minimum level of illumination of 100 lx at floor level, and 200 lx on control devices. The use of spotlights should be avoided.

8.5.5.6 Emergency communication

Emergency communication shall comply with the requirements of ISO 4190-5:2006, 3.3.2.

The car shall have an alarm device (two-way communication system) that initiates the connection to a rescue service at all times according to the following:

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

b) The operating force of the alarm button shall be between 2,5 N and 5 N.

c) The two-way communication system shall provide visual and audible information feedback for passengers, consisting of

— a yellow graphical symbol in accordance with ISO 4190-5:2006, Table C.1, No. 1, illuminated from initiation of the alarm until the end of the alarm;

— an audible signal from initiation of the alarm until the voice communication is established; the audible signal shall comply with 5.8.2;

— a green graphical symbol in accordance with ISO 4190-5:2006, Table C.1, No. 8, illuminating during voice communication;

— a text display that shows the same information as given audibly.

8.5.6 Stopping/Levelling accuracy

In accordance with ISO 8100-1, the stopping accuracy of the car shall be ±10 mm and a levelling accuracy of ±20 mm shall be maintained.

8.5.7 Control devices and signals

8.5.7.1 General

The control buttons shall comply with ISO 4190-5, be detectable by touch and have a contrasting design to the surrounding wall to be easily located. Braille shall be applied in addition to tactile characters and symbols.

Signs and signals, such as for confirmation of operation of controls, arrival or position of the car, and for information about floor levels, shall be provided according to the principle of multiple senses (see 5.1.3).

A voice message shall inform persons with vision impairments which floor they are at, whether the door is opening or closing, and whether the lift is going up or down.

The number of buttons, the size of the active part of the buttons, the minimum distance between the tactile characters/symbols and the Braille symbols as well as the requirements/recommendations on the horizontal and vertical placement of the controls shall be considered when deciding on the appropriate design of the button panels.

Touch screen buttons may only be used when additional control devices detectable by touch are provided as well.

NOTE Touchscreens combined with an accessibility button and an acoustic menu for activation of a call do not provide independent use of lifts.

8.5.7.2 Landing controls

Landing controls shall be in accordance with ISO 4190-5:2006, 3.2.1 and B.2, respectively.

NOTE ISO 4190-5:2006, Annex B contains “particular requirements” to increase accessibility for persons with disabilities – particularly persons using a wheelchair. The specifications of ISO 4190-5:2006, B.2 partially replace those from ISO 4190-5:2006, 3.2.1.

In addition to the specifications of ISO 4190-5:2006, 3.2.1 and B.2, the following apply.

a) Landing controls should be placed at a minimum distance of 700 mm from any adjacent corner or wall.

b) The depth of any recess where the button(s) may be located (wall or door frame) shall be limited to 250 mm.

Destination control systems allow floor selection on the landing; they don't provide accessibility of lifts in buildings open to the public as persons with disabilities can have difficulties using them. They increase complexity considerably, and persons with disabilities may need introduction and training on-site. If destination control is provided, personal assistance shall be provided. To provide a minimum level of accessibility in buildings open to the public, special provisions for destination control systems shall be taken such as a set of control buttons installed on the wall between two lifts of a lift group, one control button for each destination (floor level/door) or a key pad. Identification of the assigned lift car, preferably close to the activated control device, shall be supported by visual and acoustic guidance.

8.5.7.3 Car controls

Car controls shall be in accordance with ISO 4190-5:2006, 3.2.2 and B.3, respectively. In addition, the following apply.

a) Car controls shall be placed at a minimum distance of 400 mm (700 mm recommended, if possible) from any corner.

b) The centre line of the car control buttons should be placed between 800 mm and 1 100 mm above floor level.

NOTE ISO 4190-5:2006 requires the centre lines of every button to be placed between 890 mm and 1 220 mm above floor level. This does not provide full accessibility.

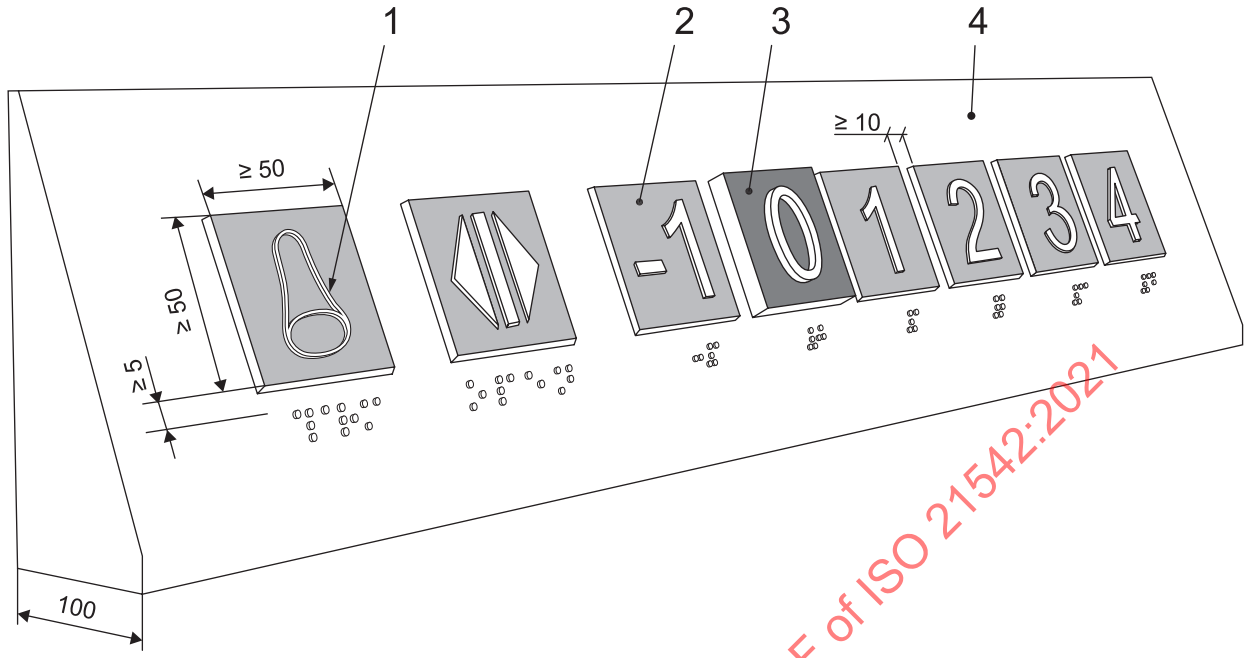
Buttons for each function, such as floor selection, alarm, door opening, shall be detectable and identifiable by vision and by touch. Lift control buttons shall provide a luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %) between the button and the face plate or car wall (see requirements for small items according to 5.3, Tables 2 and 3). The destination shall be indicated in tactile characters and symbols with a luminance contrast of $C_m \geq 60$ % ($C_w \geq 75$ %) and be positioned on the button or on its left side.

In buildings with a small number of floors, i.e., small number of buttons, it is recommended to use 50 mm × 50 mm square buttons or 50 mm circular buttons with raised tactile characters/symbols, in either vertical or horizontal button layout.

An example for a horizontal arrangement of the car controls with large square buttons is given in Figure 41. An example for a vertical arrangement of the car controls is given in Figure 42.

To provide control within the required reach range, a keypad system according to ISO 4190-5:2006, Annex A, can be provided in buildings with a large number of floors.

Dimensions in millimetres

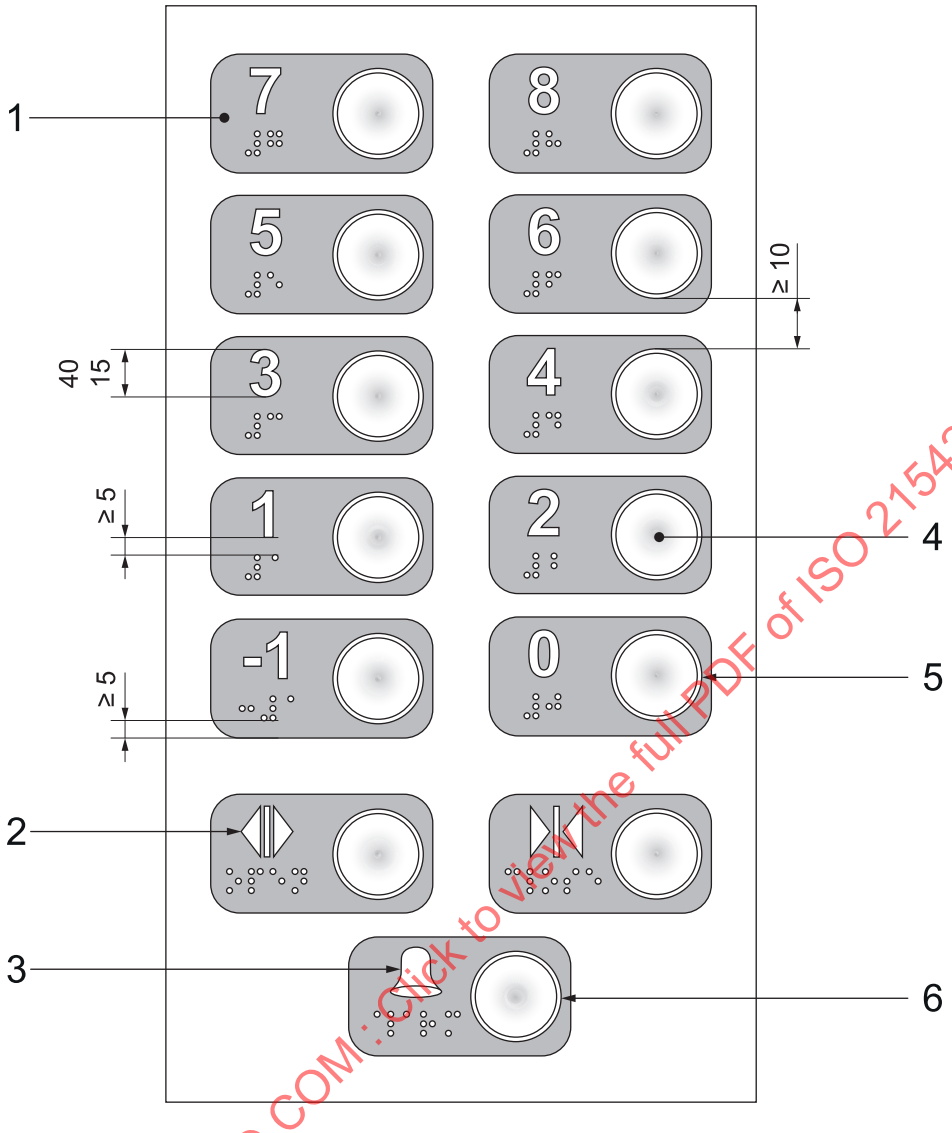


Key

1 alarm bell as tactile symbol in yellow colour
2 square 50 mm × 50 mm push button with visual contrast to the panel and the raised tactile character/symbol
3 ground floor button with higher rise and different colour
4 inclined surface

Figure 41 — Example of a horizontal arrangement of a single row of square push buttons with tactile characters on and Braille under the buttons

Dimensions in millimetres



Key

1 visual contrast to the face plate
2 tactile symbols with visual contrast to the background
3 alarm bell as tactile symbol in yellow colour
4 round push button with visual contrast between the button and the background
5 ring around the button that provides operating feedback (i.e. lights up when pushed)
6 yellow ring around the button

Figure 42 — Example of a vertical arrangement of round push buttons with tactile and Braille symbols on the left side of the buttons

8.5.8 Lifts used for evacuation

The number and size of lifts usable for evacuation should be determined according to the building's conditions and features like size, layout, number of stories, the use(s) of the buildings, number of occupants, predictable number (and type) of occupants with disabilities.

At least one of the lifts in new buildings shall be usable for evacuation in an emergency. If lifts in existing buildings undergo a major overhaul, or if they are replaced, they should be made usable for this purpose.

For building design considerations of automatic lift evacuation specifications, see ISO/TS 18870:2014, Annex A.

Lifts used for fire evacuation shall have a fire-protected electrical supply separate from the main building electrical supply, in order to ensure that they can continue to operate without interruption during an emergency.

For further specifications on lifts for fire evacuation, see 11.4.4.

8.6 Vertical and inclined lifting platforms

Vertical and inclined lifting platforms shall be safely and independently usable by all people with or without an accompanying person. All control devices shall be accessible and usable for all. Continuous pressure on the buttons should not be required.

Safety bars shall be provided in lifting platforms as protection from falling.

Sufficient manoeuvring space outside the lifting platform entrance shall be provided according to 8.5.2 and G.6.1.

The minimum dimension of the vertical lifting platform shall be 1 100 mm × 1 400 mm for manual and powered wheelchairs together with an assistant even when doors are located at 90° relative to each other.

The minimum dimension of an inclined lifting platform shall be 900 mm × 1 250 mm.

Exceptional considerations for existing buildings: Where sufficient space is not available, smaller dimensions for lifting platforms may be considered, with a minimum of 800 mm × 1 250 mm for vertical lifting platforms only valid with one or opposite entrances and a single wheelchair, or 750 mm × 900 mm for inclined lifting platforms.

In accordance with ISO 9386-1, the rated load for vertical lifting platforms shall be at least 250 kg; the design of the platform shall be based on a load of not less than 210 kg/m^2 of the clear floor area. In accordance with ISO 9386-2, the rated load for inclined lifting platforms shall be at least 225 kg.

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, solid and continuous.

See ISO 9386-1 and ISO 9386-2 for further information on lifting platforms.

8.7 Escalators and moving walks

Escalators and horizontal/inclined moving walks are common in public buildings. Persons using a wheelchair cannot generally use inclined moving walks independently. Steeper slopes exclude the majority of persons using a wheelchair. Since escalators and moving walks are not accessible for all users, an accessible lift shall also be provided near the escalator/moving walk for vertical circulation.

The location of escalators and horizontal/inclined moving walks shall always be considered in relation to the position of adjacent fire protected lift shafts and lobbies, and fire evacuation staircases with their adjoining areas of rescue assistance. Combined with fire safety signage, this facilitates evacuation when building users are not familiar with their surroundings

During periods of maintenance of escalators and moving walks, guards that are detectable by vision and by touch shall warn persons with disabilities.

The floor surface of the escalator shall contrast visually with the approach; alternatively, a contrasting step nosing shall be provided.

TWSIs should be provided at the top and bottom of escalators or moving walks.

Audible signals with voice messages, which indicate the start and finish of the escalator and moving walks, are of great assistance to persons with disabilities.

Escalators and moving walks shall be free of projecting objects and obstacles up to a height of 2 300 mm.

A minimum illumination level of 100 lx shall be provided on escalators and horizontal/inclined moving walks.

A device shall be provided to stop the escalator or moving walks in the event of an emergency. It shall be placed in a conspicuous and easily reachable position at least at or near each landing of the escalator or moving walk, and in the middle if it is longer.

9 Components of a building and building equipment

9.1 Doorsets and windows

9.1.1 Doors and door furniture

9.1.1.1 General

The unobstructed width of door openings shall be at least 800 mm (see Figure 43); 850 mm or more is recommended. For building entrance doors as well as for final fire exit doorways, the unobstructed width shall be 850 mm.

The clear height of door openings shall be at least 2 000 mm.

A level threshold is recommended. Where a raised threshold is provided, it shall have a maximum height of 15 mm, be bevelled when higher than 5 mm (see Figure 27) and contrast visually with the adjacent floor.

A level manoeuvring area for persons using a wheelchair on each side of the door opening shall be provided (see Figures 28 and 29). Annex C shows the circulation spaces needed at doorways for different types of doors. General design considerations for wheelchairs including space requirements on different types of wheelchairs are given in G.6.

Dimensions in millimetres

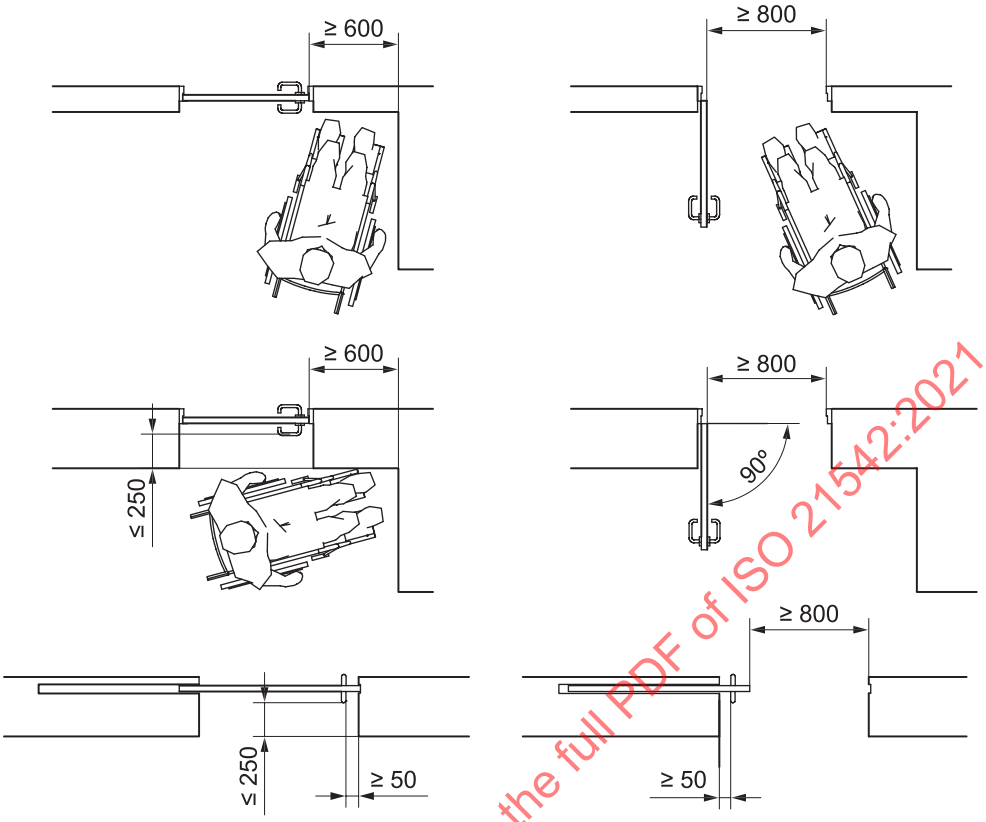


Figure 43 — Unobstructed width of swinging and sliding doorsets

9.1.1.2 Position of a doorway

As shown in Figure 43, a manoeuvring space of at least 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 person using a wheelchair or a walking frame user. This requirement does not apply where automatic doors are provided.

The maximum distance from the handle of the door leaf to the wall surface shall not exceed 250 mm (see Figure 43).

9.1.1.3 Opening force

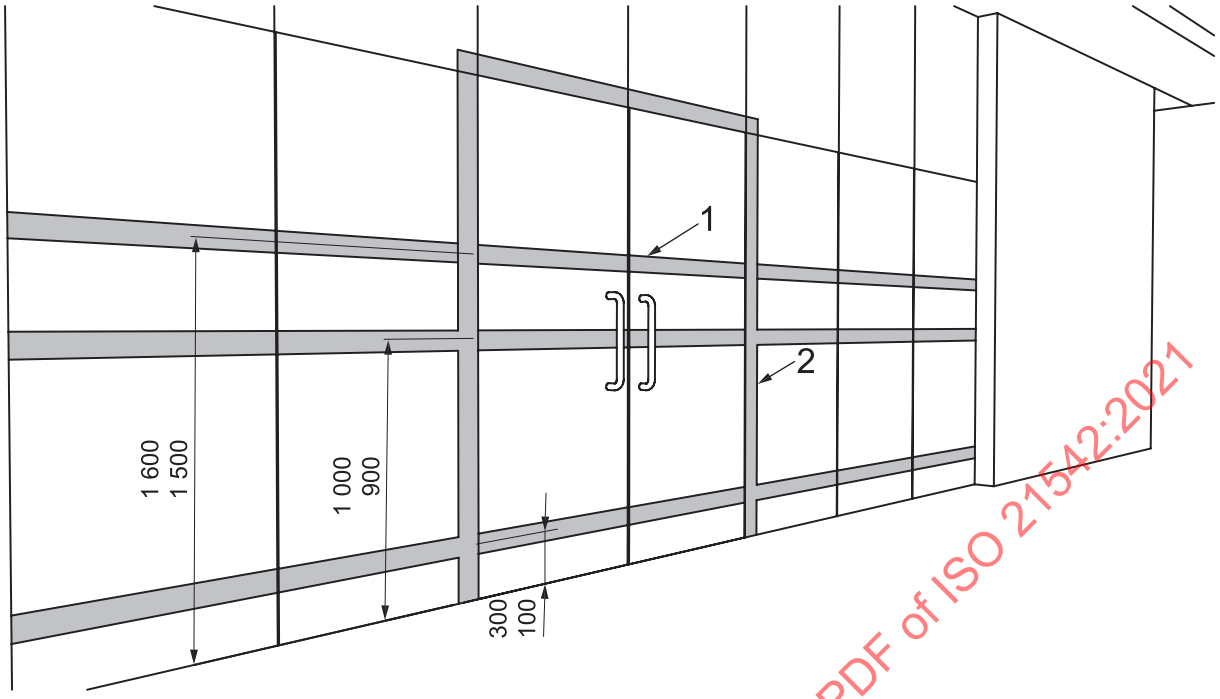
As persons with disabilities often experience great difficulty when trying to open ordinary doors fitted with self-closing devices, the maximum force required to open the door shall be 25 N; it is recommended not to exceed 15 N. In public buildings, self-closing doors should be fitted with a manually operated automatic door opener. In case the mechanism does not work, required manual opening force shall be 25 N, preferably 15 N.

When the force needed to open a door is greater than 25 N, a door that opens automatically as specified in 9.1.1.7 shall be used.

9.1.1.4 Glazed doorsets, walls and areas

Glazed (glass) walls and fully glazed doors shall be clearly marked with visual indicators (see Figure 44) because large glazed areas close to circulation spaces can be mistaken for openings. Glazed walls, doors and other areas of full height glazing are very disorientating for partially sighted people. The reflections from these surfaces can also be confusing.

Dimensions in millimetres



Key

1 visual indicator, minimum width 75 mm, minimum luminance contrast $C_m \geq 30$ % ($C_w \geq 45$ %), two separate colours with a luminance contrast $C_m \geq 60$ % ($C_w \geq 75$ %) are recommended

2 visual marking on door frame, minimum width 50 mm

Figure 44 — Markings on glazed doors

Uninterrupted visual indicators of at least 75 mm height with a minimum luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %) to the background shall be placed at a height of 900 mm to 1 000 mm and 1 500 mm to 1 600 mm above floor level. An additional visual indicator placed at a height of 100 mm to 300 mm is recommended (see Figure 44). Visual indicators consisting of two separate colours with a minimum luminance contrast of $C_m \geq 60$ % ($C_w \geq 75$%) are recommended to enable lighting conditions and backgrounds to be taken into account.

Mirrored or highly reflective glass 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.

NOTE Partially sighted persons can have a limitation in depth of field, which results in looking down at an angle of 45° to 50°. When they are within 1 000 mm to 1 500 mm from a fully glazed door or sidelight, they can 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 glass.

9.1.1.5 Viewing panels in door leaves

If viewing panels are provided, they shall comply with the following requirements (see Figure 45):

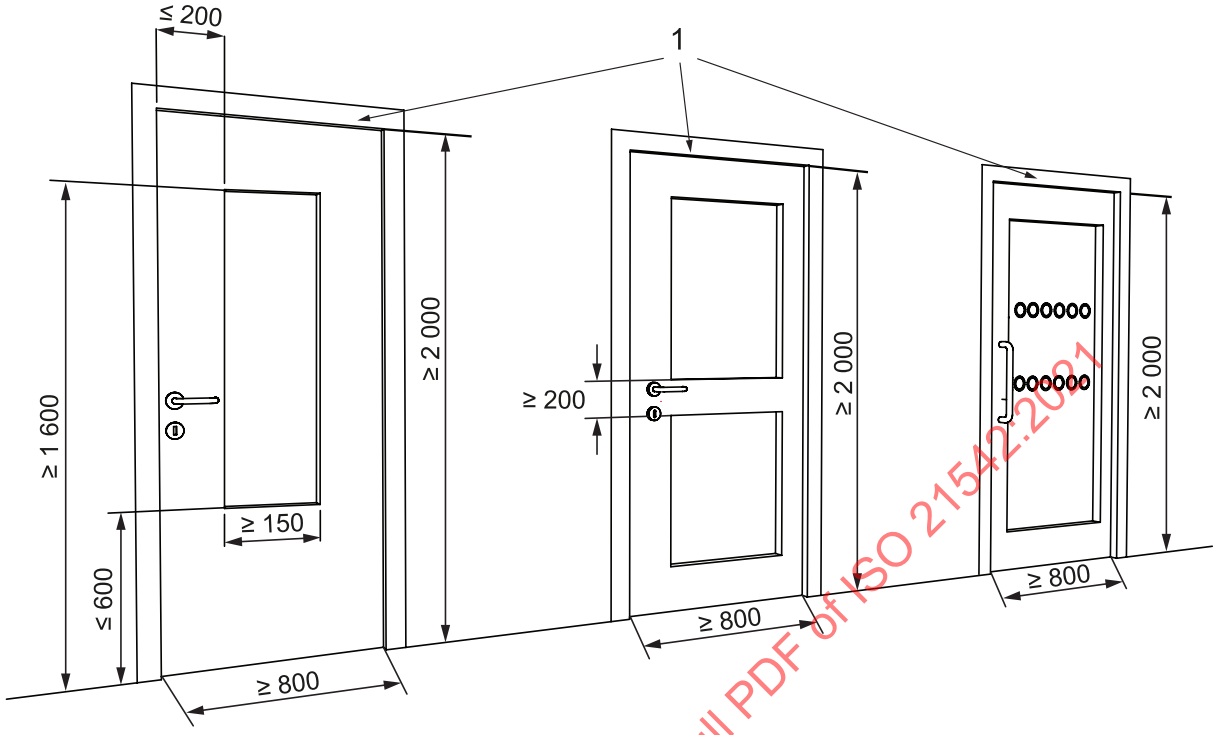
— the lower edge of the glazed panel shall not be more than 600 mm above floor level;

— the upper edge of the glazed panel shall not be less than 1 600 mm above floor level;

— in width, the glazed panel shall start no more than 200 mm from the latch edge of the door, and the glazing shall not be less than 150 mm wide;

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

Dimensions in millimetres



Key

1 minimum luminance contrast $C_m \geq 30$ % ($C_w \geq 45$ %) to door frame and wall

Figure 45 — Examples of doors with glazed viewing panels

9.1.1.6 Visual contrast of doorsets and door furniture with walls

Doors forming part of an accessible path of travel shall have a luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %) to doorframe and the surrounding wall, as described in 5.3.

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

If this is impossible to achieve, a marking of at least 50 mm width (e.g. around the frame of the door), with a different visual contrast from the wall (with a minimum luminance contrast of $C_m \geq 30$ % ($C_w \geq 45$ %)) shall surround all the perimeter of the door (see Figure 45).

There should be a visual contrast between the door leaf and the handle of $C_m \geq 30$ % ($C_w \geq 45$ %).

9.1.1.7 Automatic opening doors

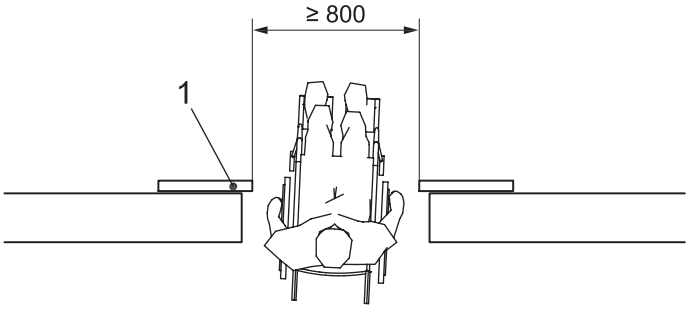
The minimum unobstructed width of automatic opening doors shall be at least 800 mm as shown in Figure 46, with 850 mm recommended. In narrow spaces, automatic sliding doors are preferable. All automatic doors should be capable of remaining totally open (at least 90° in the case of hinged doors) without manual support.

An automatic sliding or folding door shall be fitted with a sensor to prevent it from coming into contact with any user and causing injury. The sensor shall also be capable of preventing contact with anything that is being pushed, pulled or otherwise being transported through the doorway.

The sensor fitted to an automatic sliding or folding door shall activate the opening mechanism in sufficient time so as not to obstruct circulation flow or create a collision hazard.

In the event of an emergency, automatic opening doors that are not used as fire-resisting doorsets shall open automatically and remain in that open position for the duration of the emergency.

Dimensions in millimetres



Key

1 automatic sliding door

Figure 46 — Automatic sliding door

9.1.1.8 Powered swing door

A powered swing door shall be:

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

— fitted with a return delay mechanism that allows sufficient time for safe passage;

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

9.1.1.9 Revolving door

Unless of significant size and power-operated, revolving doors are not suitable and present particular difficulties to ambulant persons with disabilities, partially sighted people, people with assistance dogs, persons using a wheelchair, and people with young children (see Figure 47). Revolving doors are generally unsuitable for persons with vision impairments.

Where a revolving door is used, an accessible door shall be provided immediately adjacent to the revolving door and usable at all times. The accessible door can be a swing, sliding or folding door (see Figure 47). It should be clearly identified and signed to show that it is accessible.

A revolving door shall be large enough to accommodate and allow safe passage of a person using a wheelchair with a companion.

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

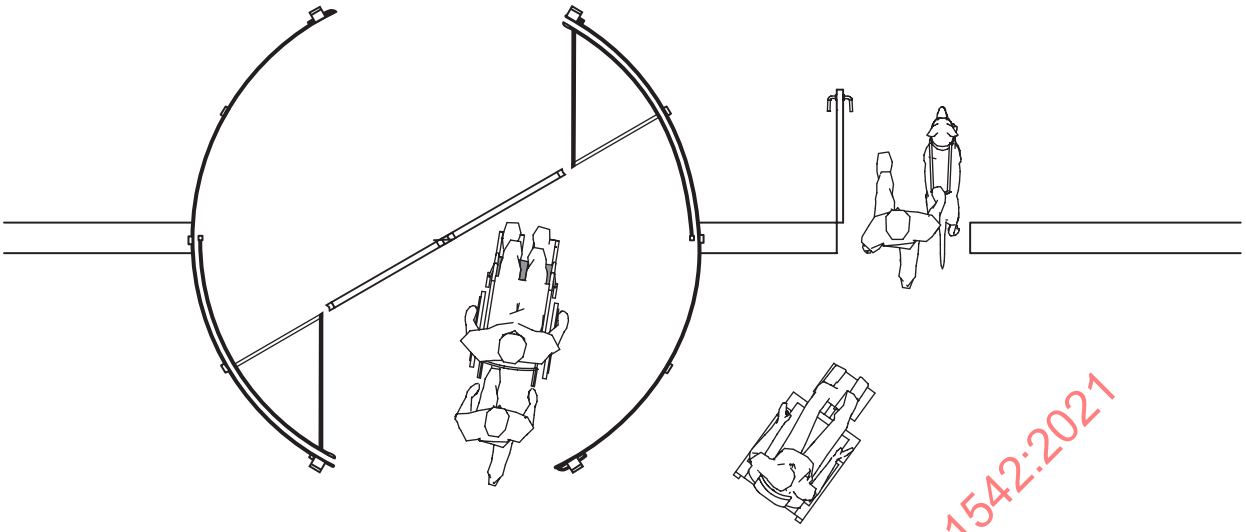


Figure 47 — Revolving door accompanied by supplementary accessible door

9.1.1.10 Door furniture and controls

9.1.1.10.1 General

Door locks, door handles, bells and other devices for gaining entry shall be easy to locate, identify, reach and be operable with only one hand and shall comply with 9.2.3. Door furniture shall be located between 800 mm and 1 100 mm in height, preferably 900 mm (consider G.6.3 and G.6.4 also).

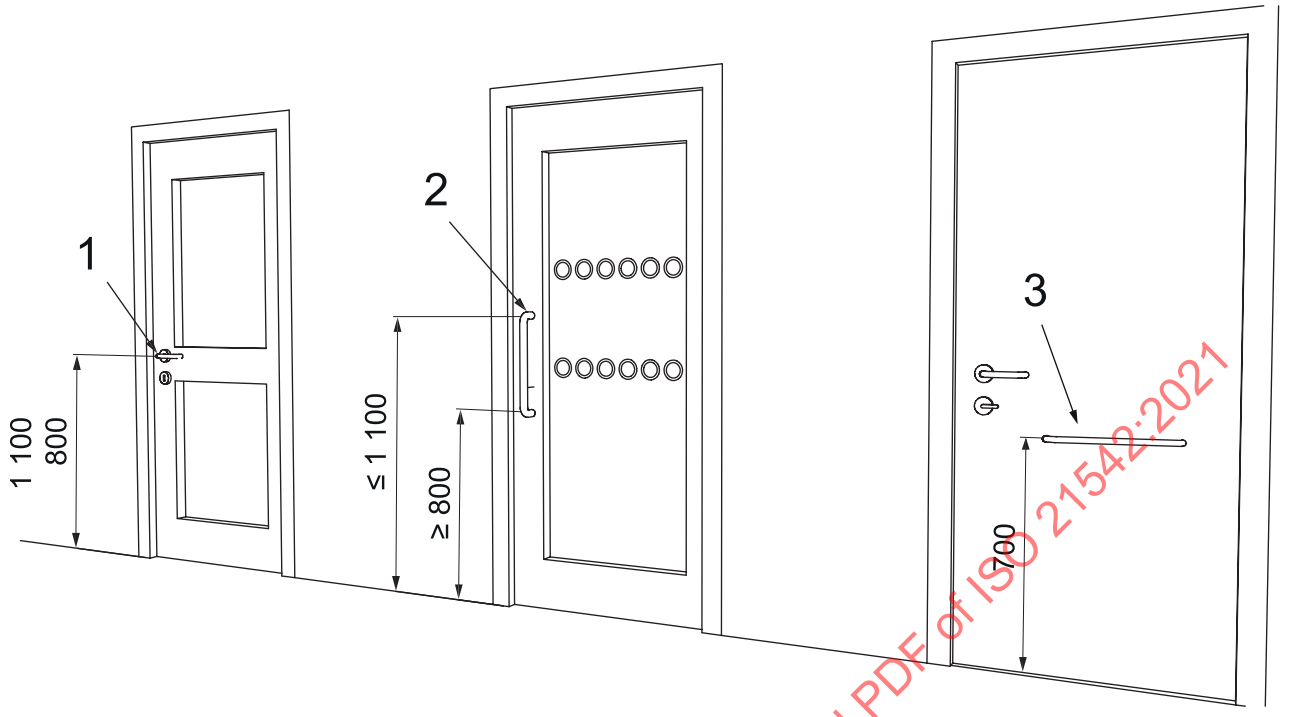
Minimum manual effort should be required when opening and closing any doors.

Round or oval type doorknobs are not suitable for operation by persons with disabilities.

9.1.1.10.2 Door handles

Door handles should be placed according to Figure 48. In Figure 48, the door on the left shows the height of a handle for pushing or pulling the door, the door in the middle shows a vertical door handle, and the door on the right shows an example of a pull rail that can allow a person using a wheelchair to close the door behind him, for example, in a toilet stall.

Dimensions in millimetres



Key

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

Figure 48 — Door handle types and heights

Grab bars and door handles should be at least 80 mm long.

Lever handles should be between 19 mm and 25 mm in diameter; “D-Lever” handles are preferred (see Figure 49).

A vertical bar for sliding doors should be 30 mm to 50 mm in diameter. The clearance between the bar and the wall should be 45 mm to 65 mm with a length of at least 300 mm.

The setback of a latch/lock should be a minimum of 30 mm. Other door furniture should be 30 mm from the door edge.

Dimensions in millimetres

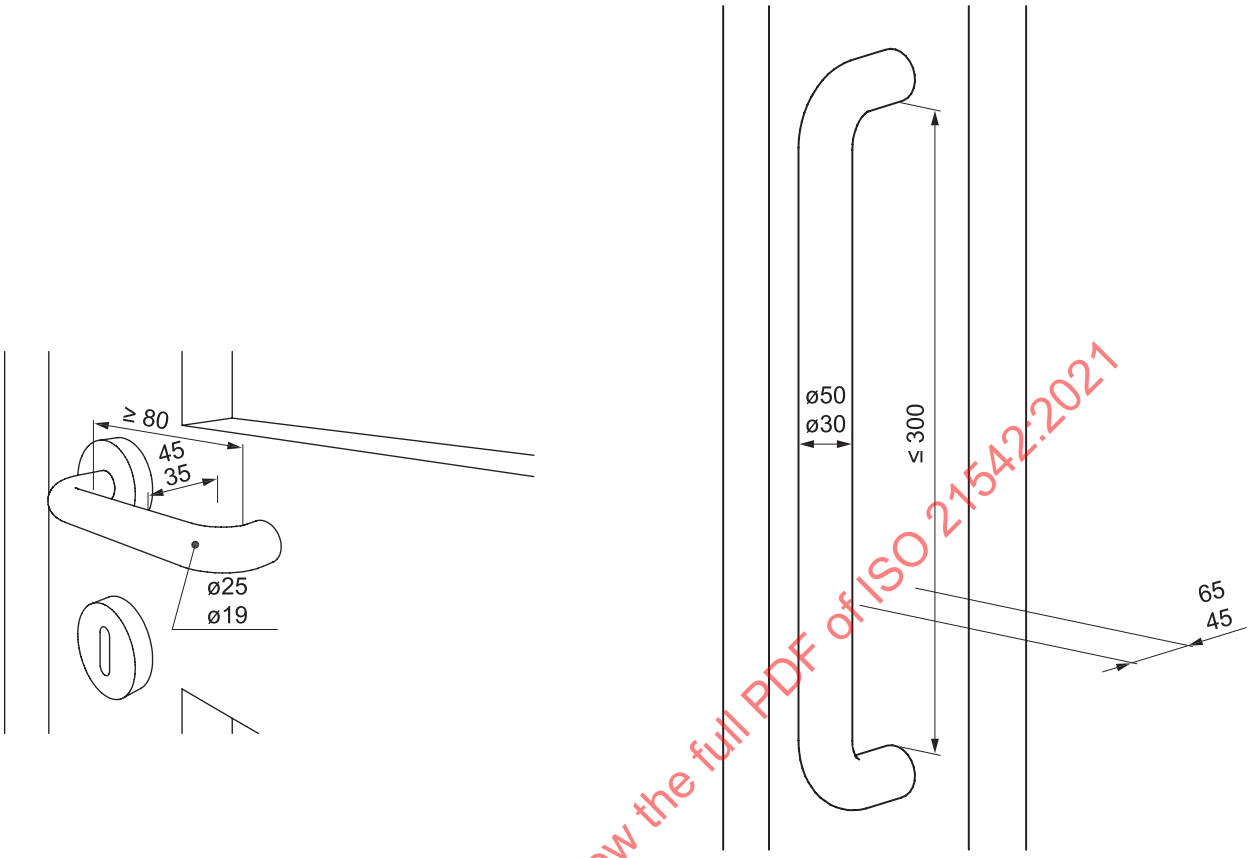


Figure 49 — Examples of D-lever and vertical door handles

9.1.1.10.3 Positioning of door opening controls

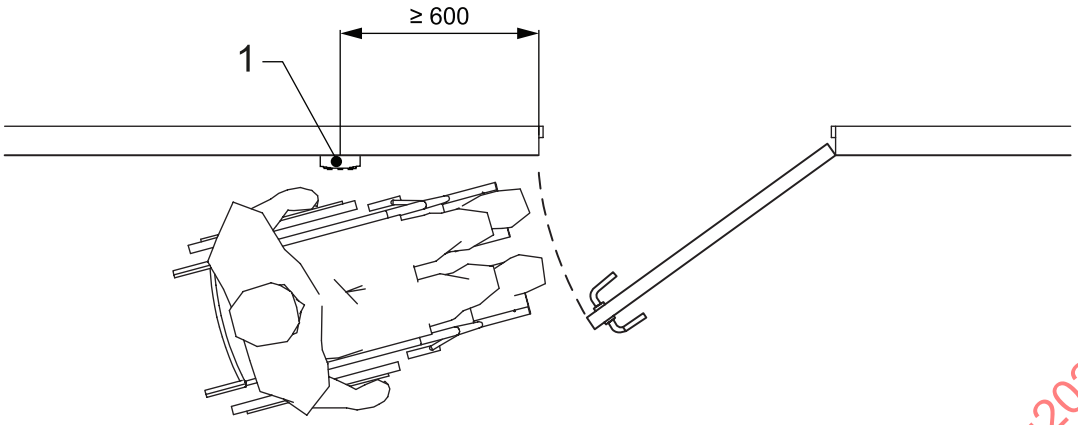
Controls for powered door openers to hinged doors should be located so that the moving door leaf does not interfere with wheelchairs, canes, walking aids, etc.

The minimum distance between the centre line of the door opening controls and the edge of a swing door shall be 600 mm (see Figure 50).

The minimum distance from the centre line of switches and devices to control doors, shall be 600 mm from any internal corner or any projecting element (see Figure 51); 700 mm is preferred.

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 persons using a wheelchair, scooters or other assistive devices (see Figure 51). The opening time shall be sufficient for a person using a wheelchair or assistive devices to pass through the door safely before it closes.

Dimensions in millimetres

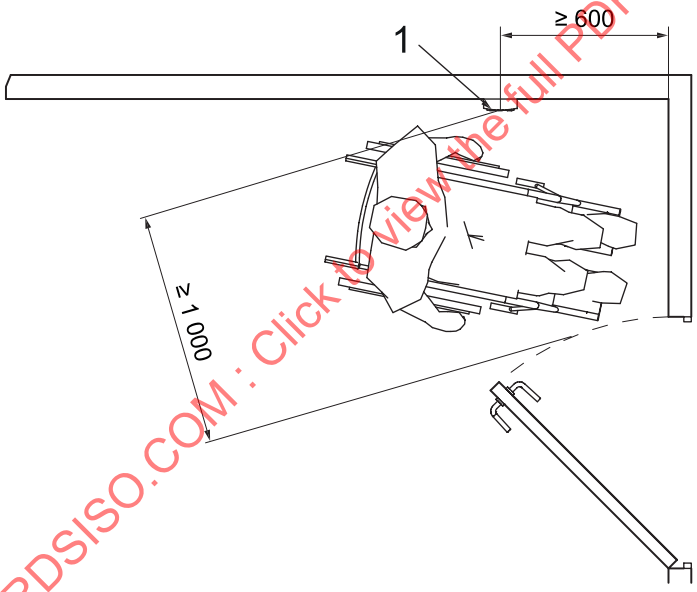


Key

1 door control, access control

Figure 50 — Positioning of door opening controls

Dimensions in millimetres



Key

1 door control, access control

Figure 51 — Distance of controls for powered door openers

9.1.2 Fire-resisting doorsets

9.1.2.1 General

During a fire, a fire-resisting doorset protects building users from the ingress of heat, smoke and flame while waiting in its near vicinity, for example in an area of rescue assistance.

Buildings, especially those used by the general public, should preferably be fitted with automatic self-closing fire-resisting doorsets linked to the building's fire emergency warning system. Whenever a fire is detected in a building, consideration shall be given to the unimpeded evacuation of persons with disabilities. For this reason, the closing of fire-resisting doorsets should be phased in different stages where practicable.

The door leaf shall be easy, intuitive and obvious for everyone to open, whatever its configuration, dimensions or door furniture.

9.1.2.2 Opening force of fire-resisting doorsets

The maximum force required to open a door leaf in a fire-resisting doorset shall be 25 N; it is recommended not to exceed 15 N. When the force needed to open a door is greater than 25 N, a door that opens automatically shall be used.

9.1.3 Windows and window furniture

9.1.3.1 Restriction on opening

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

9.1.3.2 Usability of window furniture and shutters

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

Windows easy to open shall be equipped with 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 floor level.

Window handles should be at least 80 mm long.

9.1.3.3 Lower edge of the glazing of the window

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

Guards and opening restrictions should be considered for lower windows to prevent potential falling.

9.1.3.4 Visual indication of glazed areas

The requirements on glazed doorsets and glazed areas as in 9.1.1.4 and on visual contrast as in 5.3 apply accordingly.

9.2 Equipment, controls and switches

9.2.1 General

The design, construction and installation of operating controls and devices shall facilitate safe and independent operation by all building users.

NOTE Touch-screen devices are not usable for persons with vision impairments.

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

— lever, mixer or crosshead taps;

— activation devices;

— electric outlets and switches;

— door and window locks.

Controls shall be easy to use, e.g. by hands-free operation or by using the elbow, arm or clenched fist. Switches should be large rocker type throughout.

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

Sufficient lighting shall be provided on control devices and their relevant information. Sufficient contrast shall also be provided to detect operating elements and to read signs and symbols (see 5.3 to 5.5).

9.2.2 Location, heights and distances

Devices and controls shall be positioned, installed and designed consistently throughout the building to facilitate identification. If necessary, TWSI should be installed for detection.

Control devices shall be located between 800 mm and 1 100 mm above floor level and a minimum of 600 mm from any internal corner.

As an exception, electrical wall socket outlets, including telephone points and TV sockets should be located at a minimum 400 mm and maximum 1 000 mm above floor level.

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 easy to read and operate.

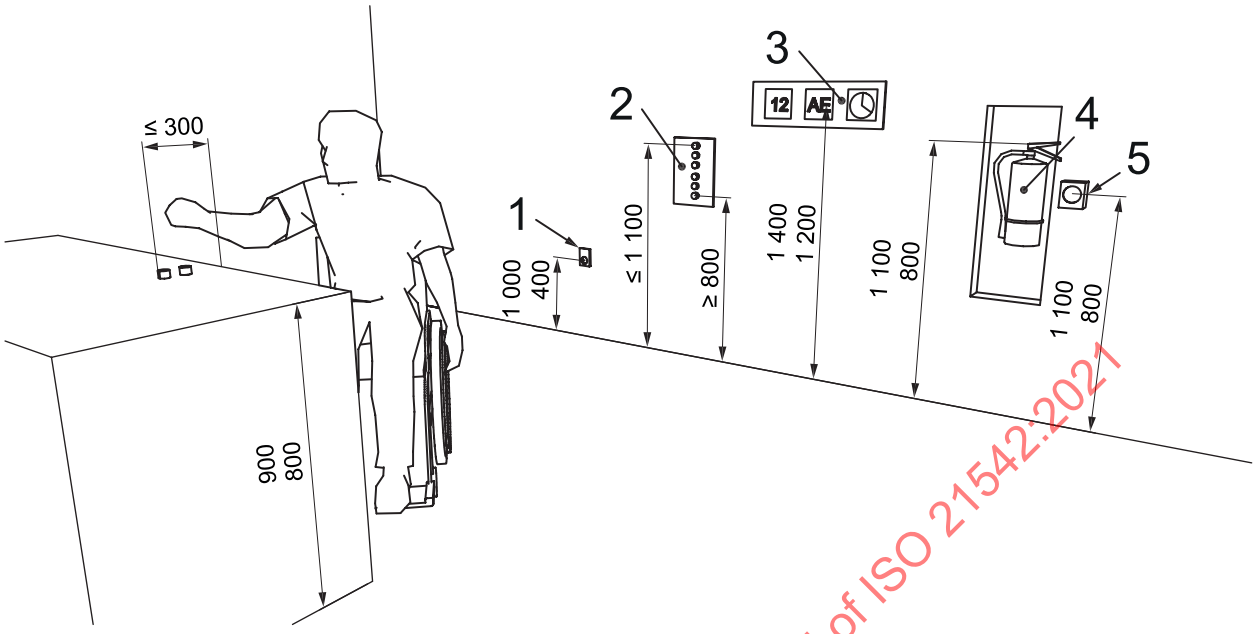
Control devices placed on a horizontal surface should be placed at a height between 800 mm and 900 mm and within 300 mm from the edge of the surface.

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

Heights of switches, socket outlets, reading controls and controls on a horizontal surface are illustrated in Figure 52.

Fire alarm activators shall be accessible and intuitive to operate; they shall be located between 800 mm and 1 100 mm above floor level.

Dimensions in millimetres



Key

1 socket outlets
2 control devices
3 meter indicators
4 maximum height of recessed portable fire extinguisher handle
5 fire alarm activator

Figure 52 — Heights of switches, socket outlets, reading controls, fire safety fittings and controls on a horizontal surface

9.2.3 Operation

To help people with reduced dexterity or impaired vision, electrical switches should have large push plates. Suitable clearance should be provided between adjacent fixtures and fittings to prevent accidental operation.

Operating force of control buttons and push plates should be 2,5 N to 5 N.

9.2.4 Identification

Operating controls and devices shall be identifiable by the principle of multiple senses according to 5.1.3.

Essential information on operating controls and devices shall be provided in visually contrasting raised tactile and in Braille.

9.2.5 Usability and consistency in design

Control devices for similar functions should have a similar design and activation mechanism and should be consistent within the building. Control devices for different functions should be different.

9.2.6 Intercoms and telephones

Telephones shall be on a clear accessible route with approach from the front or the side (see G.6.1). Side protection shall comply with the requirements of 6.3.8.

Public telephones should be located beside the access route and should be easily detectable by people with vision impairments. At least one telephone in any group should be equipped with a magnetic field and text display.

All information should be provided according to the principle of multiple senses (see 5.1.3). The telephone keypad shall have a raised dot on the number five.

Control devices shall be at a maximum height of 1 100 mm. A clear space underneath shall be provided for the knees of a person using a wheelchair. The depth of the clear space should be ≥ 600 mm but shall be at least the depth of the device (see Figure 53).

Dimensions in millimetres

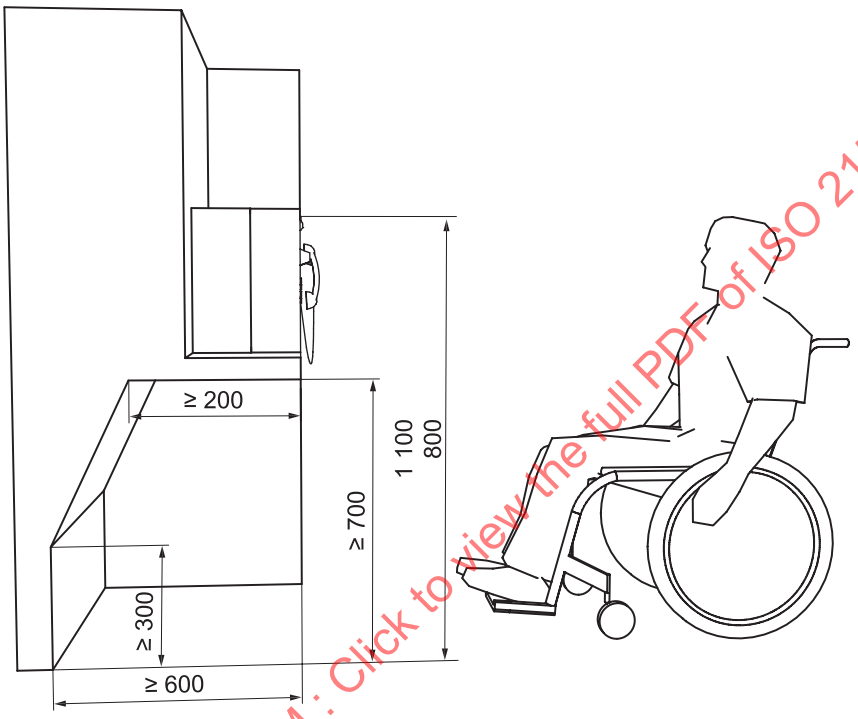


Figure 53 — Example of a wall-mounted intercom system usable for persons using a wheelchair

9.2.7 Card and vending machines

Where machines for dispensing money, tickets or small goods are provided, at least one shall be accessible according to the following requirements:

— be located on an accessible path of travel;

— have a clear area immediately in front of the machine of at least 1 500 mm × 1 500 mm to allow a person using a wheelchair approach the controls sideways and to turn around after use as well as to provide some privacy;

— have a clear and unobstructed approach, at least 900 mm wide;

— have a knee space with a minimum of 700 mm in height and a minimum 600 mm in depth and 900 mm in width for easy access for persons using a wheelchair (see Figure 54).

Touch screen ticket dispensers at train and bus stations, etc. shall not be the only service available, because they are inaccessible to people with impaired vision.

The operation of the machine shall be easy to understand.

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

Card access shall:

a) have a slot

- located at a height between 800 mm and 1 100 mm above the finished floor level, preferably between 800 mm and 900 mm;
- with its edge bevelled;
- with a luminance contrast to the surrounding surface;

b) include tactile graphic symbols on the surrounding surface that

- represent the card;
- 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:

1) be located at a height between 800 mm to 1 100 mm from the floor;

2) have a luminance contrast to the surrounding surface;

3) if numeric, be of a type whose buttons have a raised dot on the number five, which:

- is (0,7 ± 0,1) mm high;
- has a base 1,5 mm in diameter;

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

The keys should be readable from both standing and seated positions.

All functions shall be available through a keypad. The corresponding key shall be shown on the screen (for persons using a wheelchair) and communicated by an audible guidance (for persons with vision impairments).

Dimensions in millimetres

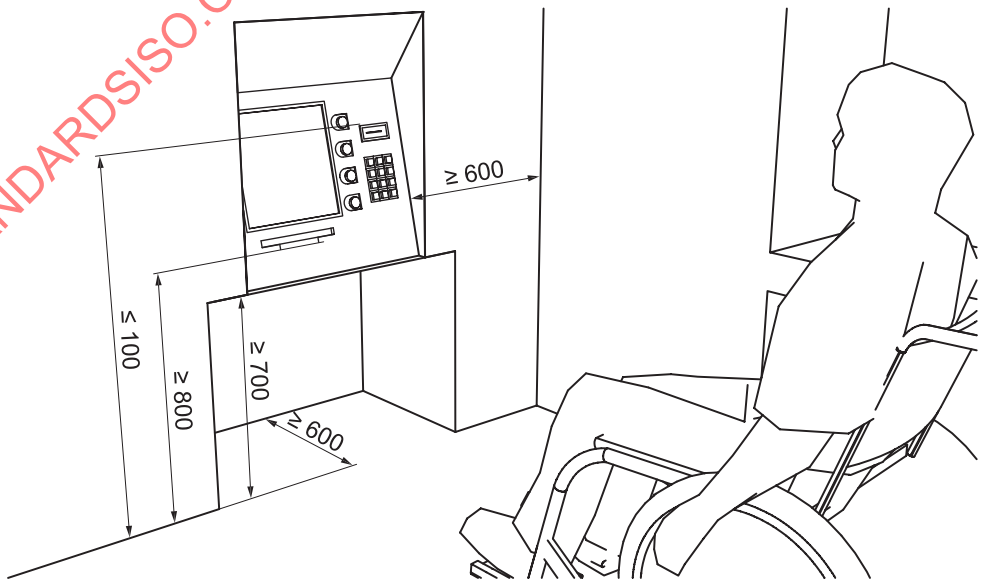


Figure 54 — Example of an accessible ATM

9.2.8 Security access systems

Security access systems shall be designed in accordance with G.6 to meet the needs of everyone. This includes the requirements for manoeuvring space and for controls that can be reached comfortably.

Accessible security systems should be available and utilized. Biometric systems (e.g. retinal or palm scanners) cannot accommodate all users.

9.2.9 Drinking fountains

Drinking fountains suitable for both standing and seated users should be provided. Where only one drinking fountain is provided, it shall be accessible for persons using a wheelchair.

Spout outlets of drinking fountains for standing persons shall be at a height between 950 mm and 1 050 mm. For persons using a wheelchair and for children, the spout shall be at a height between 750 mm and 800 mm and have a distance of not more than 90 mm from the front edge of the fountain.

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.

For persons using a wheelchair, a side approach to the fountain shall be possible and drinking fountain units shall have a manoeuvring space of 1 500 mm in diameter in front of the unit. Knee and toe clearance complying with Figure 53 shall be provided.

Drinking fountains shall be in accordance with 6.3.8 and should be recessed where possible.

9.2.10 Waste disposals and containers

Waste disposals and containers shall be fully accessible and easy to use according to the following requirements:

— be positioned along an accessible path of travel;

— be in accordance with 6.3.8;

— to be operable not only by a foot pedal;

— have an insertion height of lower than 1 100 mm.

9.3 Furnishing

9.3.1 General

A variety of seating facilities should be provided in public buildings to offer people with a place to wait and rest.

The seats (including reserved areas for persons using a wheelchair) should be placed outside 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 55).

9.3.2 Seating in waiting areas

A range of different types of seating should be provided complying with the following (see Figure 55):

— seat height 400 mm to 480 mm;

— back support height 750 mm to 790 mm;

— seat depth 400 mm to 450 mm;

— angle of seat to backrest 100° to 105°;

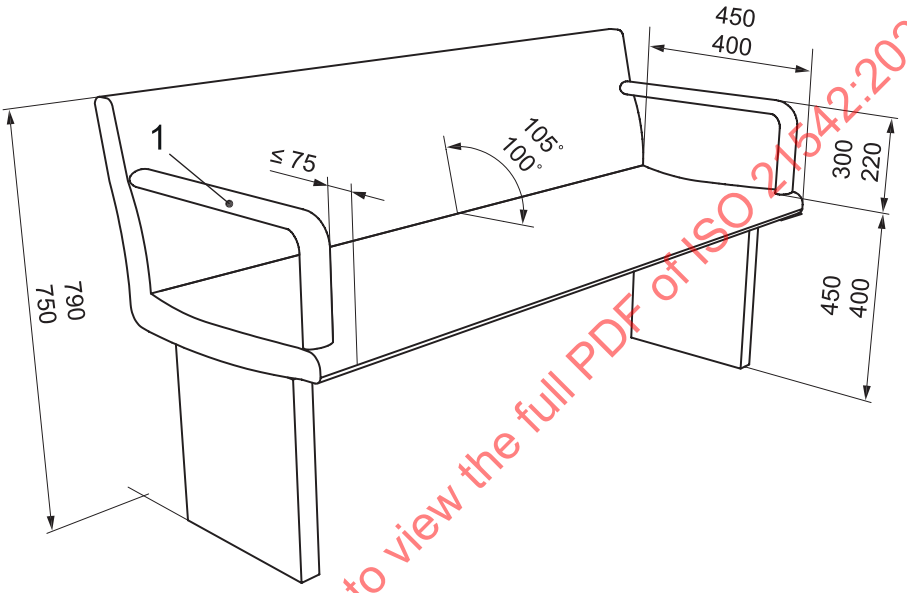
— armrest height 220 mm to 300 mm above seat;

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

— a minimum 150 mm set back under the seat for feet to assist in standing up;

— omittance of the armrests on some benches to allow lateral transfer from wheelchairs.

Dimensions in millimetres



Key

1 armrests to be omitted on some benches to allow lateral transfer from wheelchairs

Figure 55 — Example of a bench with armrests and back support

9.3.3 Seating at desks or tables

To allow frontal approach for a person using 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 their knees. For the feet, a minimum clearance of 300 mm in height is required (see Figure 56).

If tables with fixed seats are used, there shall be a place with no fixed seating for at least one person in a wheelchair at the table.

Dimensions in millimetres

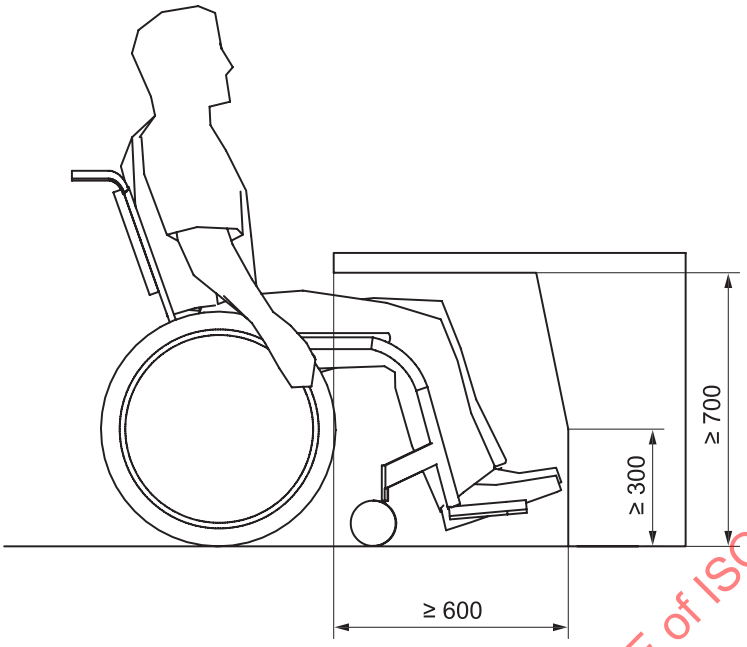


Figure 56 — Table and desk height for persons using a wheelchair

10 Rooms and spaces within non-domestic buildings

NOTE For information regarding domestic buildings, see Annex A.

10.1 Reception areas, counters, desks and ticket offices

10.1.1 General

Counters and reception desks should be located and clearly identified to be easily recognisable from a building entrance. Information/reception areas should be positioned near the main entrance. Wayfinding specified in 6.3.2 and orientation specified in 5.1 should also be considered.

Carpets or entrance flooring systems or tactile walking surface indicators from the main entrance can help in locating reception counters for people with vision impairments. They should be designed to minimize trip and slip hazards.

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

General design requirements for colour and visual contrast as specified in 5.3 should be considered.

10.1.2 Space to manoeuvre

Counters, desks and ticket offices should be accessible to persons using a wheelchair. A clear manoeuvring space at least 1 500 mm in diameter shall be provided with 1 800 mm square preferred on both sides, i.e. for customer and staff.

10.1.3 Height

Reception desks where writing is done (e.g. at hotel receptions) should allow frontal approach by persons in a wheelchair with space to provide clearance for the knees. The counter level shall be between 740 mm to 800 mm from the floor. Clear knee space underneath shall be minimum 700 mm

from the floor. At least a part of the desk should be suitable as a writing place for standing people at a height between 950 mm and 1 100 mm (see also Figure 57).

Dimensions in millimetres

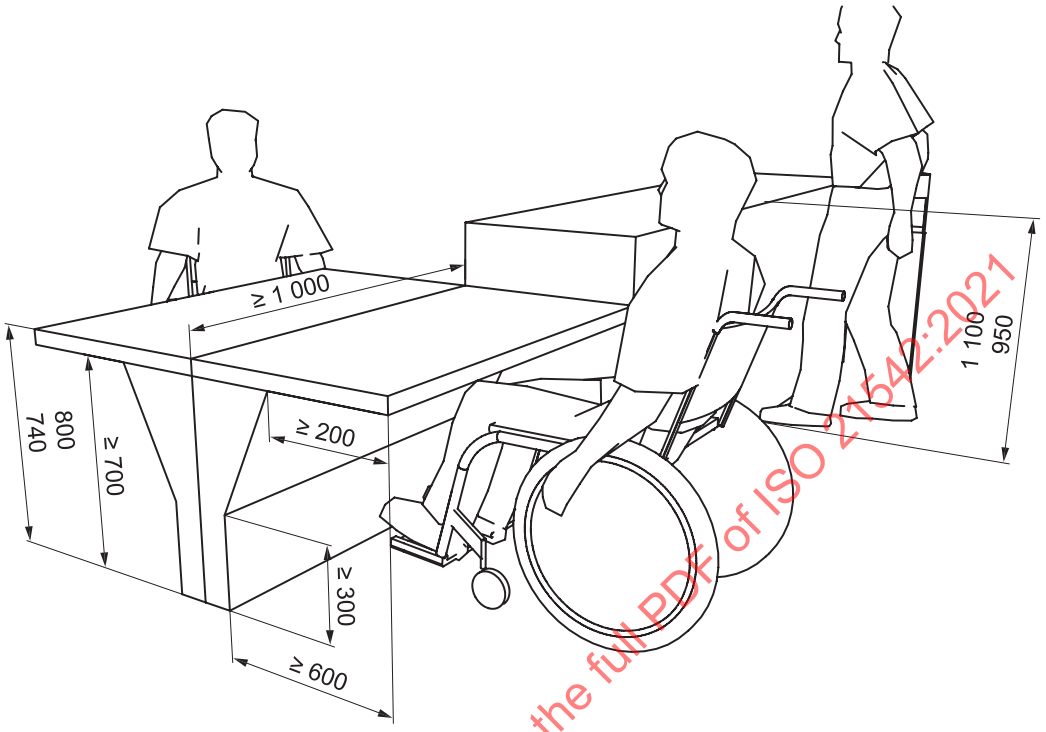


Figure 57 — Heights of counters suitable for persons using a wheelchair and persons standing

10.1.4 Lighting

To facilitate lipreading, lighting should provide even illumination.

The reading and writing surfaces at counters, desks and ticket offices shall be illuminated with a minimum of 350 lx, preferably 500 lx or more. In the room, a level of at least 200 lx shall be provided.

10.1.5 Hearing and lipreading

Reception areas, counters and ticket offices, shall have at least one position for the same service fitted with a hearing enhancement system (e.g. induction loop system as described in 5.7) to assist persons with hearing impairment and be clearly marked with the appropriate symbol as specified in 5.6. This is essential especially in noisy environments and places equipped with a separating security screen.

Counters equipped with a service screen or service counters in front of windows where bright sunshine causes the user's face to be in shadow shall be avoided as these situations make it difficult to lipread. Counters equipped with a service screen are particularly difficult. Reflections and glare should be avoided.

10.1.6 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 9.2 (see also G.6.3 and G.6.4). All necessary information shall be given in simple wording with sufficient visual contrast and based on the principle of multiple senses (see 5.1.3, 5.3, 5.7 and 9.2). The ticket machine and the calling system shall provide visual and audible output.

10.2 Cloakroom

A mirror should be usable from a standing and a sitting position.

Armrests are required for any chair provided to assist people to sit down and stand up (see also 9.3).

Coat hooks should be set at different heights: some at 850 mm, some at 1 100 mm and others at 1 800 mm.

10.3 Conference rooms and meeting rooms

All equipment in conference rooms shall be usable by people chairing or participating in the meeting and any devices or controls shall be at a height between 800 mm to 1 100 mm. See also 9.2.2 on location, heights and distances of equipment, controls and switches and 10.4 regarding auditoriums.

See requirements in 5.7 for acoustic provisions. A hearing enhancement system shall be provided.

NOTE Reverberation time for speech, music, etc. can be found in applicable legislation, e.g. national building regulations.

10.4 Auditoriums, concert halls, sports arenas, viewing spaces in assembly areas and similar

10.4.1 General

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

See 10.12.1 for specification on space needs for persons using a guide or assistance dog.

10.4.2 Hearing enhancement systems

In auditoriums, concert halls and sports arenas, a hearing enhancement system in accordance with 5.7.3 shall be provided for the audience and on the stage/platform.

10.4.3 Lighting for sign language interpretation

Adequate provision should be made to facilitate sign language and lipreading. 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. This enables people with hearing impairment to read the presenter's lips and the signer's lips and hands. To assist in reading the presenter's lips and hands, a suitable contrasting backdrop should be provided.

10.4.4 Designated seating spaces for persons using a wheelchair

For seating areas up to 200 persons, at least 2 seating spaces shall be designated for persons using a wheelchair. For seating areas of more than 200 persons, one additional designated seating space for every further two hundred seats or part thereof shall be provided.

However, it is recommended to provide designated seating spaces for persons using a wheelchair as follows:

— up to total 50 seats, a minimum of two;

— total seats 51 to 100, a minimum of three;

— total seats 101 to 200, a minimum of four;

— total seats more than 200, one additional designated seating space for every further two hundred seats or part thereof.

These spaces should be integrated among other seats in different areas of the auditorium to provide choice of location; but it shall be possible that two persons using wheelchairs can sit next to each other.

The armrest on the seats at the end of rows should be capable of being lifted up to allow people to transfer from the wheelchair onto a seat. The placement of unoccupied wheelchairs should be possible without obstructing access and egress to/from the further seats in these rows. To accommodate groups of persons using a wheelchair in an auditorium with fixed seats, a minimum of 15 seats shall be foldable or removable to increase the number of designated spaces for persons using a wheelchair.

Adjacent to each seat for persons using a wheelchair, a seat shall be provided for an accompanying person and/or assistant. To accommodate groups of persons using a wheelchair and their accompanying persons, designated areas should be created to host both groups in a flexible number of users.

The floor area for a wheelchair viewing space shall be connected to an accessible path of travel; and the viewing space shall (see Figure 58):

— be at least 900 mm in width and 1 400 mm in depth;

— have the depth of the row with a minimum of 2 400 mm;

— have a clear and level surface;

— provide sufficient manoeuvring space in accordance with G.6.2.

Dimensions in millimetres

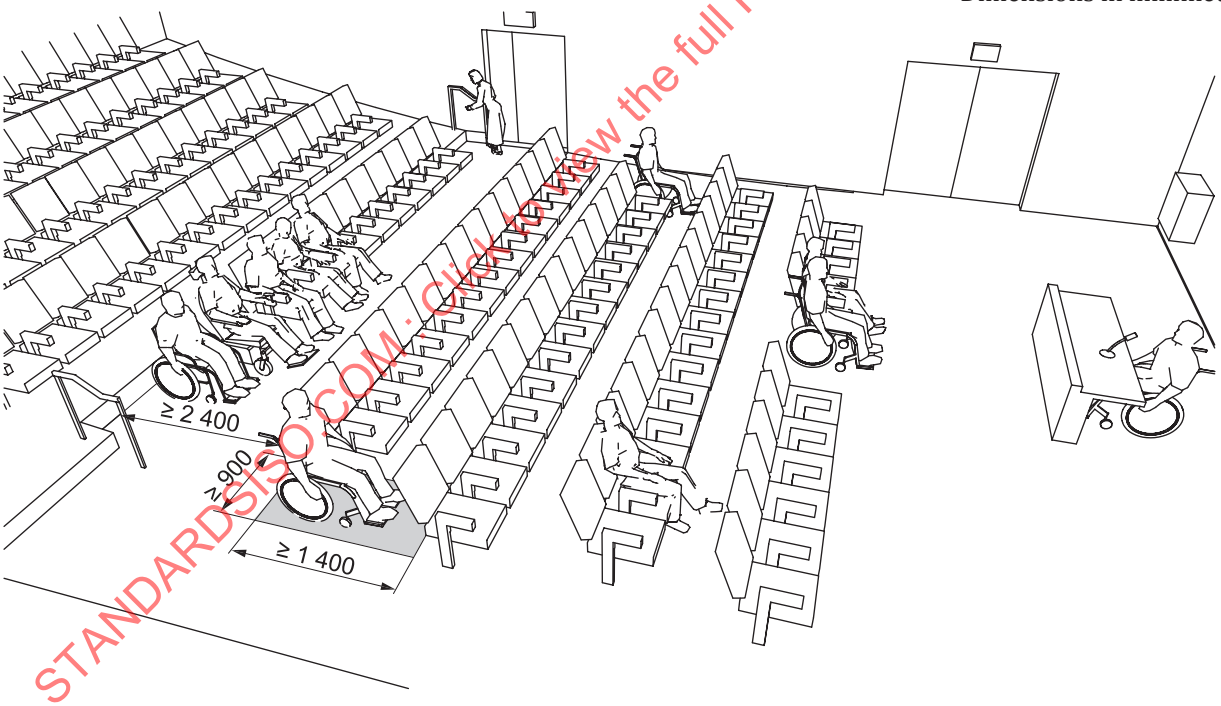


Figure 58 — Examples of viewing spaces for persons using a wheelchair

10.4.5 Lines of sight over seated and standing spectators

Lines of sight for persons using a wheelchair shall be comparable to those for all viewing positions, i.e. over the heads or over the shoulders and between the heads in the first row in front of their seats. They shall not be reduced or obstructed by standing spectators, either temporarily or constantly.

10.4.6 Row and seat numbers

The row and seat numbers should be legible to people with impaired vision. They should be tactile, of adequate size and have enough visual contrast to the background. The requirements given in 5.3 on visual contrast and 5.5 on signage shall be considered.

10.4.7 Access to stage and backstage

Access for persons using a wheelchair to the stage and to the backstage area shall be provided with accompanying directional signage.

10.5 Toilet rooms, sanitary rooms and bathrooms

10.5.1 General

The requirements contained in this subclause apply to buildings used by the public, for example hotels, workplaces, and buildings used for sport and recreation activities.

Sanitary facilities shall be designed to accommodate a variety of users including persons with colostomy.

There are a variety of approaches in providing wheelchair accessible toilet rooms. They shall be carefully selected.

The following shall apply:

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

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

The number and type of toilet rooms (lateral transfer from two sides or corner toilet) can vary, depending on the type and use of the building and circumstances in which unisex or single sex provision would be acceptable.

NOTE The required number and type of toilet rooms for a building type or a type of usage can be found in applicable legislation, e.g. national building regulations.

Accessible toilets usable by both sexes allow the greatest flexibility for people who require assistance.

Signage shall be done as specified in 5.5. Figure 7 shows the graphical symbols to be used for indicating accessible toilet rooms.

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

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

Timed illumination operated through motion detectors or buttons should be avoided in toilet rooms, sanitary rooms and bathrooms.

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

10.5.2 WC compartments for ambulant persons with disabilities

These compartments meet the needs of ambulant persons with disabilities who require support by grabrails. Because of the limited space of this type of compartment as shown in Figure 59, it is not for persons using a wheelchair. Where located in a single-sex washroom, hand washing facilities may 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.

Recommendations for the design of WC compartments for ambulant persons with disabilities are as follows:

— toilet seat height, depth and distance to the wall should comply with 10.5.5;

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

— grab rails on both sides of the toilet in accordance with 10.5.6;

— where necessary, independent water supply in accordance with 10.5.9 beside the toilet seat, and floor drain.

Dimensions in millimetres

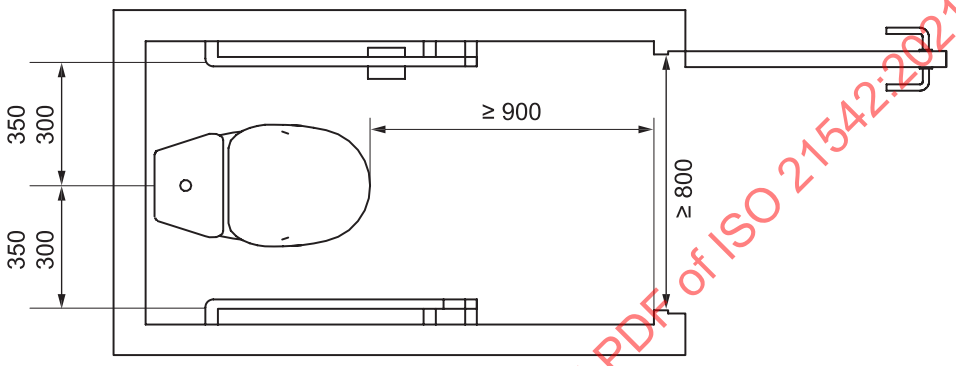


Figure 59 — WC compartment for ambulant persons with disabilities

10.5.3 Dimensions for wheelchair accessible toilet rooms

10.5.3.1 General

The dimensions of toilet rooms accessible for persons using a wheelchair depend on functions to be met. The characteristics and requirements for three types (A, B and C) of toilets are given.

NOTE 1 The priority of functions to be met and a recommendation on the type of toilet room for different building types and which type is acceptable for existing buildings can be found in applicable legislation, e.g. national building regulations.

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

Type A allows right and left lateral transfer and can be more suitable when assistance is needed. Types B and C allow only one side transfer, which can reduce the number of possible users.

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. The layout of toilet rooms accessible for persons using a wheelchair should provide unisex toilets.

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 transfer with assistance.

NOTE 2 The minimum clearance of 900 mm accommodates only 65 % of the persons using a wheelchair, clearance of 1 200 mm accommodates 90 % of all persons using a wheelchair including those with powered wheelchairs.

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

Exceptional considerations for existing buildings: The minimum clearance beside the toilet seat of 800 mm and clear manoeuvring space of 1 200 mm diameter may be provided but this limits the number of people who can use the toilet room.

10.5.3.2 Type A toilet room with lateral transfer from both sides

The characteristics are as follows (see Figures 60 and 61):

— lateral transfer from both sides;

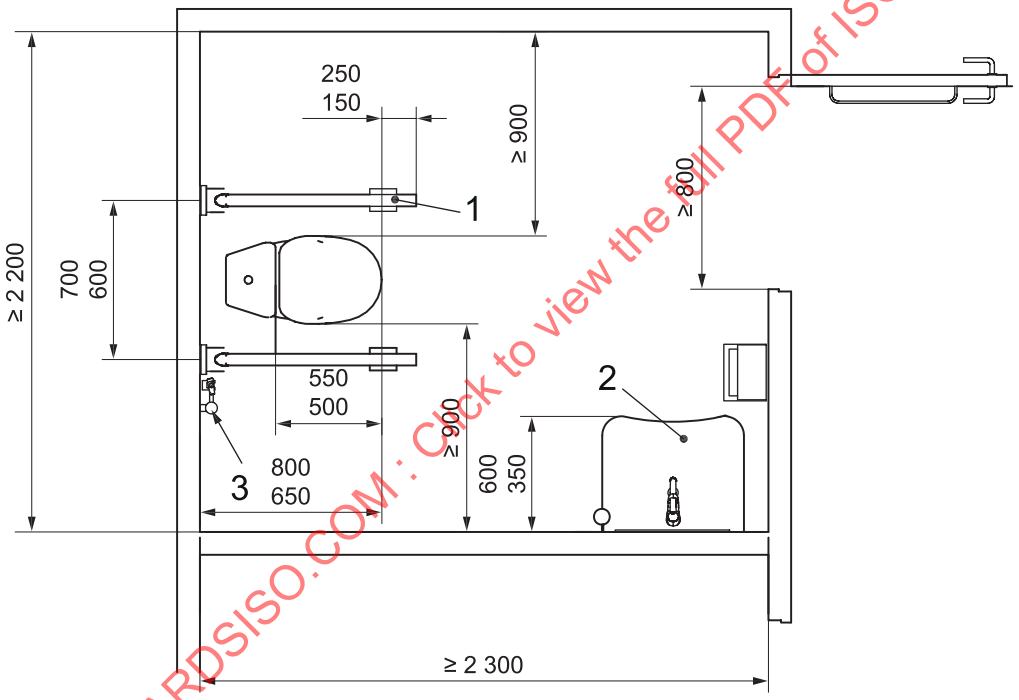
— manoeuvring space uninterrupted by washbasin and pan;

— independent water supply in accordance with 10.5.9 beside toilet seat, with floor drain where necessary;

— horizontal foldable grab rails on both sides;

— toilet paper dispensers on both folding grab rails.

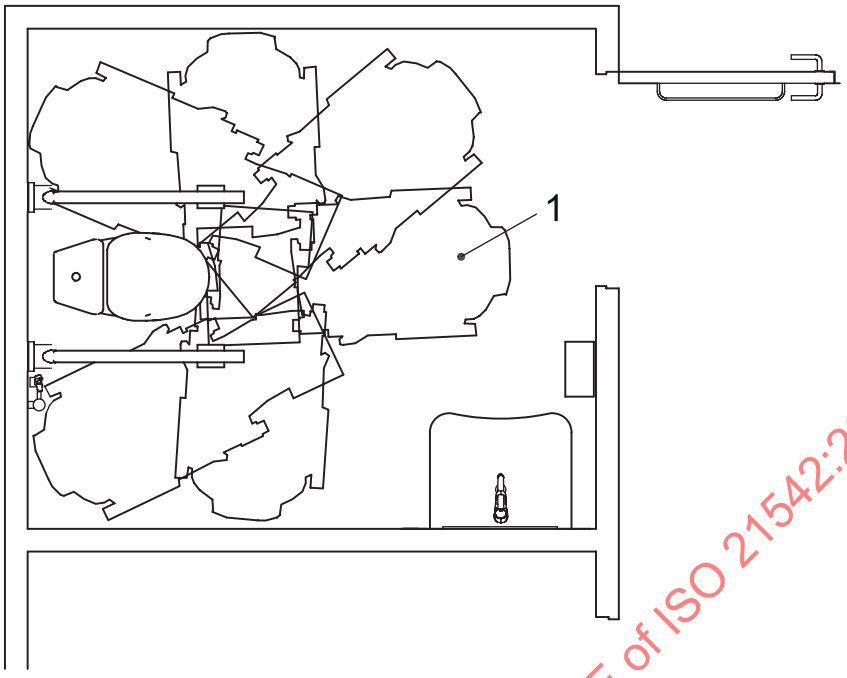
Dimensions in millimetres



Key

1 foldable grab rails, both sides
2 washbasin
3 independent water supply in accordance with 10.5.9

Figure 60 — Example of type A toilet room — Lateral transfer from both sides



Key

1 possible transfer positions

Figure 61 — Type A toilet room transfer options

10.5.3.3 Type B corner toilet room

The characteristics are as follows (see Figures 62 and 63):

— lateral transfer from one side only;

— manoeuvring space uninterrupted by washbasin and pan;

— independent water supply in accordance with 10.5.9 beside toilet seat, with floor drain where necessary;

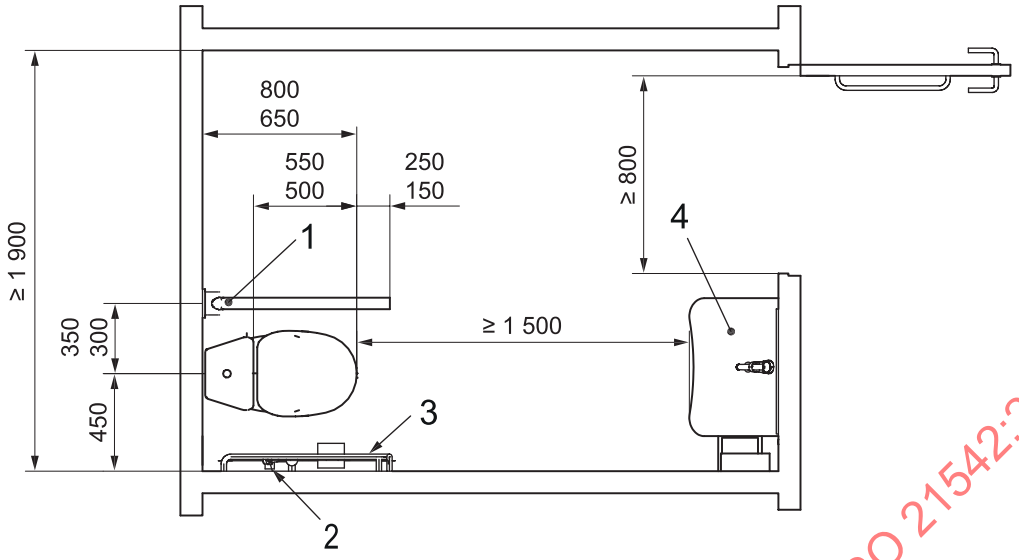
— horizontal grab rail on wall beside the toilet seat;

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

— foldable grab rail;

— toilet paper dispenser fixed on the wall beside the toilet seat.

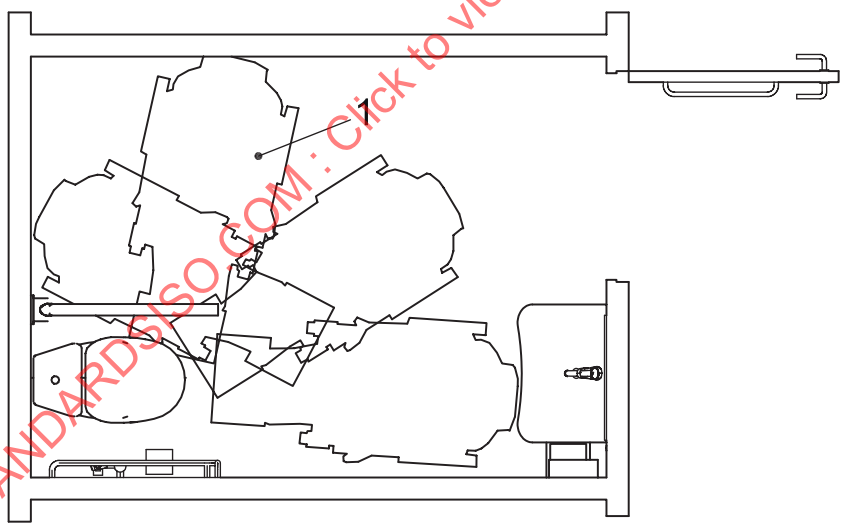
Dimensions in millimetres



Key

1 foldable grab rail
2 independent water supply in accordance with 10.5.9
3 grab rail on wall (L-shape)
4 washbasin

Figure 62 — Example of type B large corner toilet room



Key

1 possible transfer positions

Figure 63 — Type B toilet room transfer options

10.5.3.4 Type C toilet room

The characteristics are as follows (see Figures 64 and 65):

— lateral transfer from one side only;

— manoeuvring space reduced by the washbasin;

— independent water supply in accordance with 10.5.9 beside toilet seat, with floor drain where necessary;

— ability to reach small hand washbasin when seated on the toilet;

NOTE Some people require a wash basin nearby the toilet in order to maintain a sterile environment.

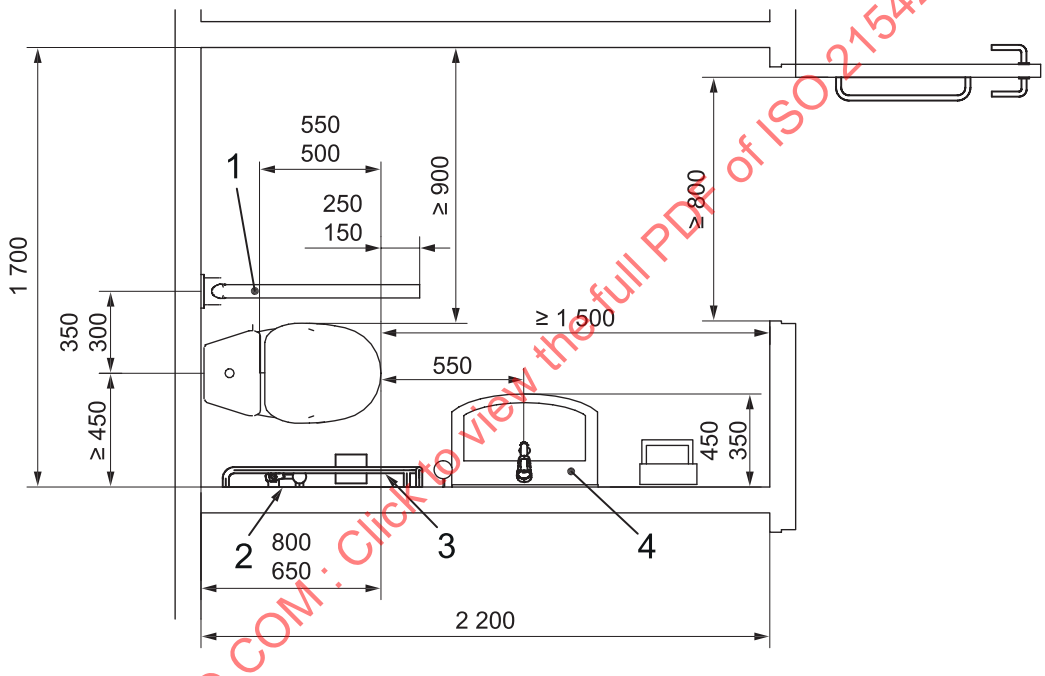
— horizontal grab rail on the wall beside the toilet seat;

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

— foldable grab rail;

— toilet paper dispenser fixed on the wall beside the toilet seat.

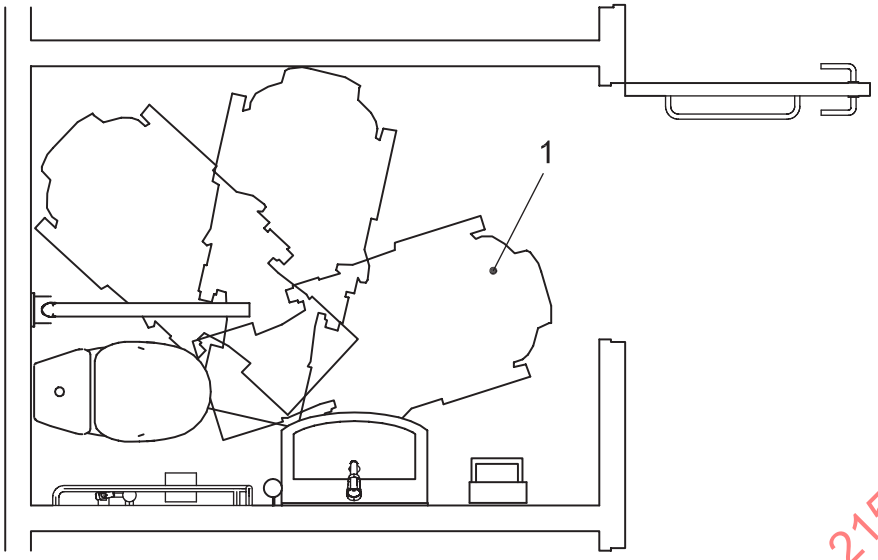
Dimensions in millimetres



Key

1 foldable grab rail
2 independent water supply in accordance with 10.5.9
3 grab rail on wall (L-shape)
4 washbasin

Figure 64 — Example of type C small corner toilet room



Key

1 possible transfer positions

Figure 65 — Type C toilet room transfer options

10.5.4 Toilet room doors

Toilet room doors shall comply with the specifications indicated in 9.1.1 and Figure 48.

Toilet doors shall not open inwards. If the door opens inwards, there shall be a way to open the door, from the outside (i.e., 180° hinge).

There should be no openings under or above the door.

Inside the toilet space, a horizontal pull handle on outward opening doors shall be provided at a height of 700 mm above the floor.

10.5.5 Toilet seat

The top of the toilet seat shall be between 400 mm and 480 mm above the floor. The anthropometric differences in the population worldwide can require lower or higher toilet seats.

NOTE Higher toilet seats can cause a problem of instability when sitting on the toilet seat. Lower toilet seats can cause a problem transferring back to the wheelchair.

The toilet seat (toilet rim) should be continuous and uninterrupted at the front.

The minimum distance from the edge of the toilet seat to the rear wall should be between 650 mm and 800 mm (see Figures 60, 62 and 64).

The minimum distance from the centreline of a corner toilet to the adjacent wall should be 450 mm (see Figures 62 and 64).

If a backrest is provided, the distance from the front tip of the seat to the backrest should range between 500 mm and 550 mm.

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

10.5.6 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 and 350 mm from the centre of the toilet to the centreline of the grabrail. The minimum distance from the wall shall be 40 mm. Grab rails shall have a circular profile of not less than 32 mm and not more than 45 mm in diameter.

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 of force from any direction, with 1,7 kN recommended. The foldable grab rail should extend beyond the front edge of the toilet seat between 150 mm and 250 mm. The positioning of a foldable grab rail should allow access from a wheelchair when folded up.

Where a wall is beside the toilet, a horizontal grab rail shall be provided at a height of 200 mm to 300 mm above the toilet seat, and a vertical grab rail shall extend from the horizontal grab rail to a height of 1 500 mm above floor level. The horizontal grab rail shall project between 150 mm and 250 mm beyond the front edge of the toilet seat (see Figures 62 and 64).

The horizontal grab rail shall be uninterrupted for its full length of at least 600 mm (see Figure 66).

The grab rail height for toilets for children should be between 460 mm to 635 mm. The height of the grab rail shall be aligned with the height of the toilet seat.

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

10.5.7 Toilet paper dispensers

Dispensers for toilet paper shall be reachable from the toilet seat, either under the grab rail or on the sidewall of a corner toilet at a height between 600 mm to 700 mm from the floor (see Figure 66). Conflict with the handrail shall be avoided.

10.5.8 Washbasin

A washbasin shall be provided within an accessible toilet room (see Figure 67).

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

The top of the washbasin should be located between 820 mm and 850 mm from the floor.

The differences in stature of the population worldwide can require lower or higher heights of washbasins.

NOTE Appropriate heights for washbasins can be found in applicable legislation, e.g. national building regulations.

The minimum depth of the washbasin shall be between 450 mm and 600 mm. 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 68).

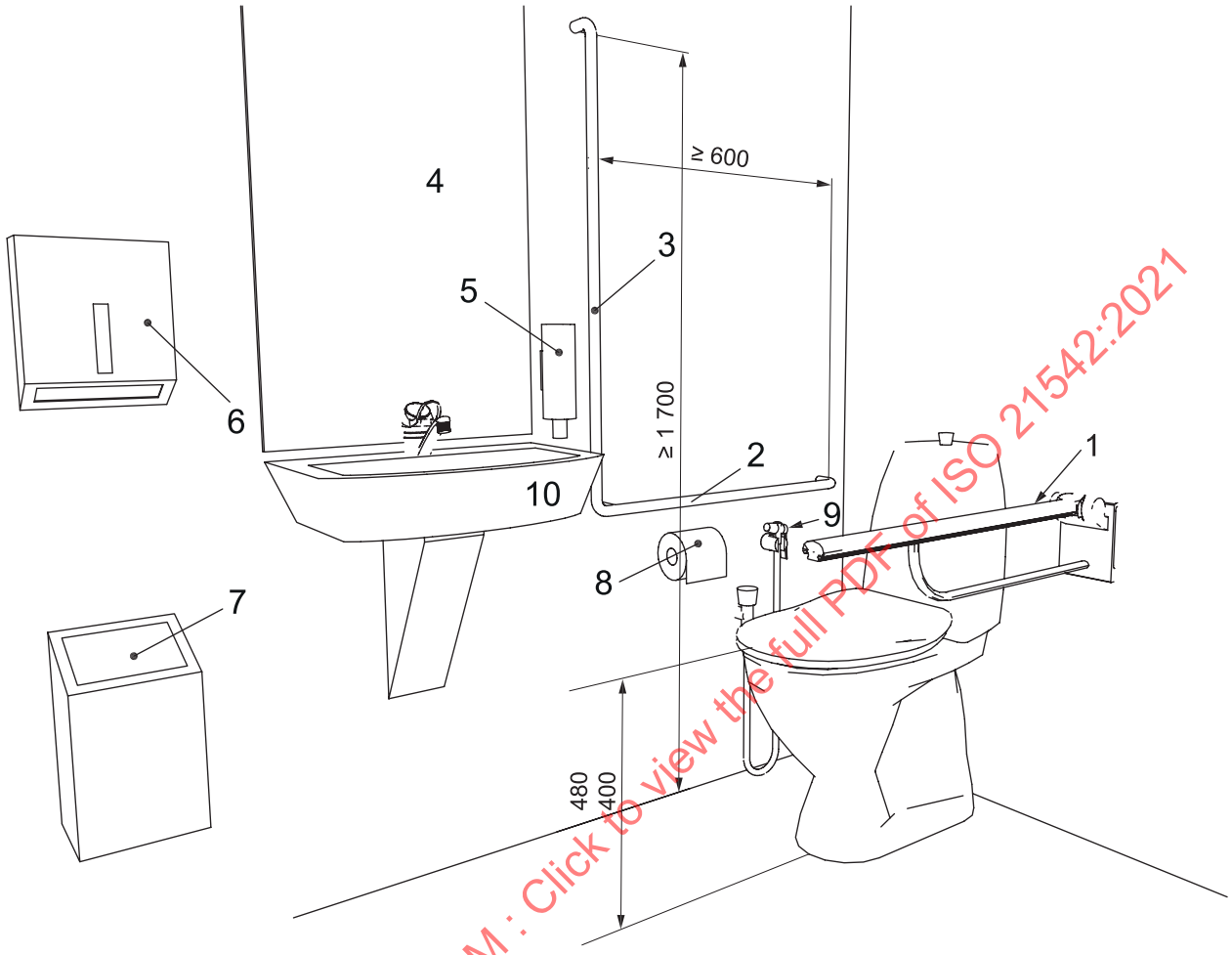
In some countries, a smaller washbasin (350 mm to 450 mm) is widely used, with a distance from the pan to the middle of the washbasin of 550 mm, as shown in Figure 64.

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

The mirror above the washbasin shall be positioned from 900 mm or less above the floor, up to a height of at least 1 900 mm (see Figure 69). If a second independent mirror is provided, the maximum height above the floor should be 600 mm, up to 1 900 mm.

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

Dimensions in millimetres

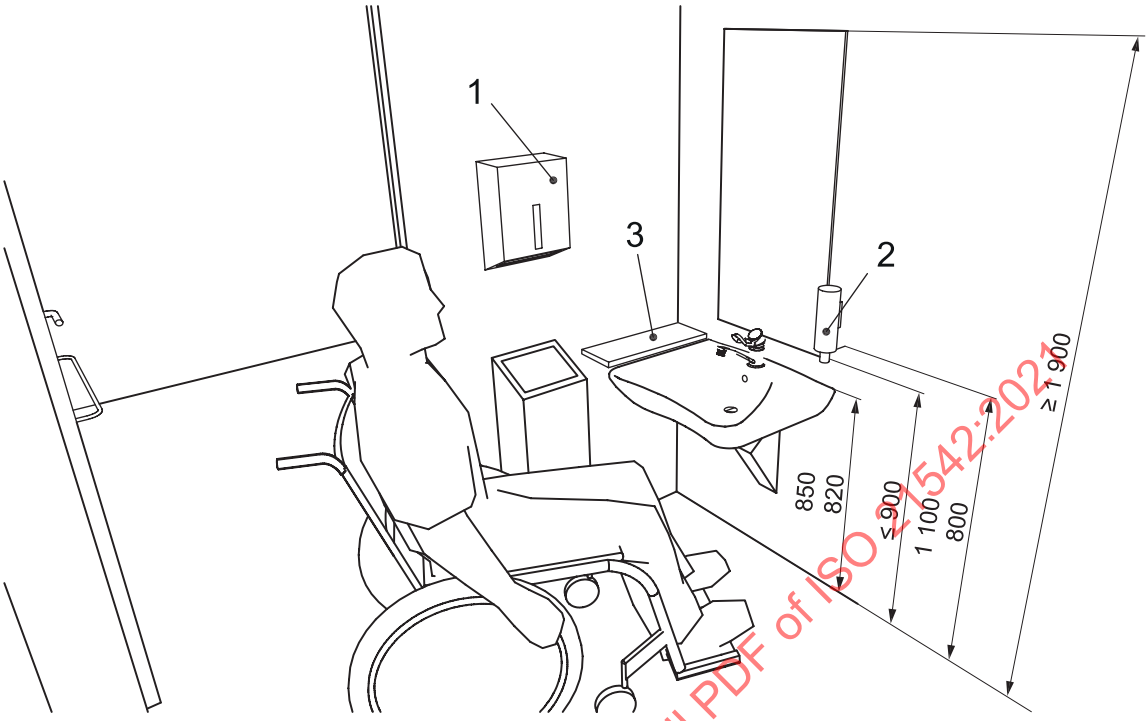


Key

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 maximum 900 mm above floor
5 soap dispenser 800 mm to 1 100 mm above floor (operable part)
6 towels or dryer 800 mm to 1 100 mm above floor (operable part)
7 waste bin
8 toilet paper dispenser 600 mm to 700 mm above floor
9 independent water supply in accordance with 10.5.9
10 small finger rinse basin with a projection between 350 mm and 450 mm

Figure 66 — Positioning of grab rails, water supply and toilet paper in type C corner toilet

Dimensions in millimetres

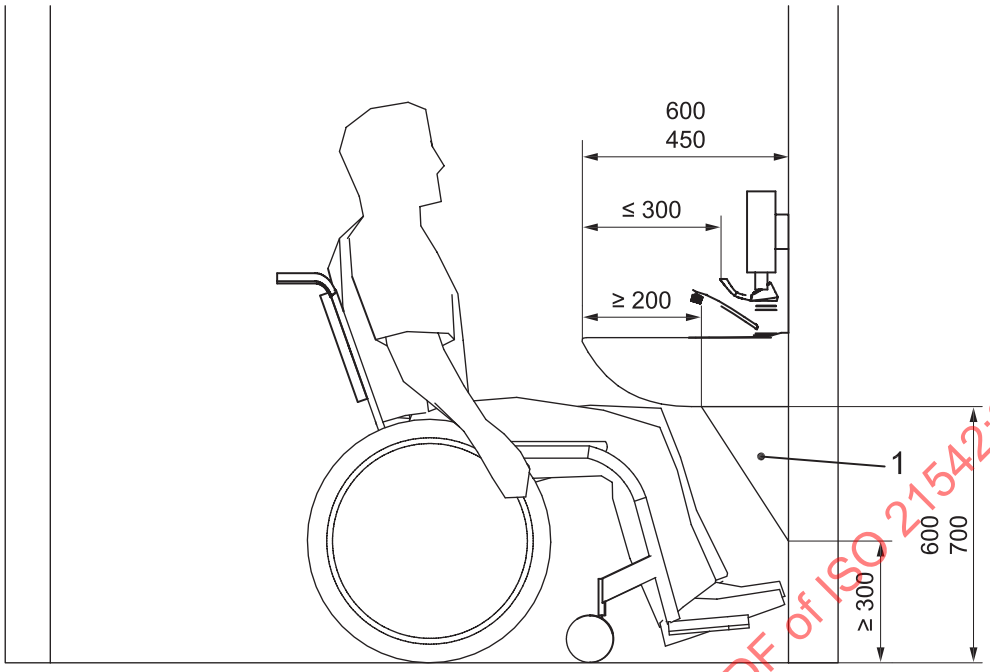


Key

1 paper towels, 800 mm to 1 100 mm above floor
2 soap dispenser
3 shelf

Figure 67 — Placement of washbasin and associated fittings and fixtures

Dimensions in millimetres



Key

1 concealed piping

Figure 68 — Washbasin with knee and toe clearance

10.5.9 Water supply

An independent water supply (hand-held shower on flexible hose) shall be provided next to the toilet with the shower head located between 600 mm to 700 mm above the floor and 300 mm from the rear wall. An alternative may be installed such as a combination bidet and rear side pan/built-in bidet.

10.5.10 Taps

Taps should be mixer, lever or sensor operated to aid operation. The reaching distance to the tap control from the front of the washbasin shall be a maximum of 300 mm, as shown in Figure 68.

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.

10.5.11 Urinals

When wall hung urinals are fitted in the washroom,

— at least one of these should be set at a height to the bottom rim of the urinal between 600 mm and 750 mm and equipped with a vertical grab rail;

— at least one of these should have its rim set at a height of 380 mm for persons using a wheelchair, equipped with a vertical grab rail;

— at least one should have its rim set at a height of 500 mm for standing users, equipped with a vertical grab rail.

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

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

10.5.12 Other fittings

All other fittings, e.g. the hot water unit, hand dryer, hand-held shower, should be accessible and be fixed/installed at a height between 800 mm to 1 100 mm. Coat hooks should be fixed at heights between 1 050 mm and 1 400 mm.

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

Sharp boxes for safe disposal of needles (e.g. from diabetes patients) should 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.

Non-touch soap dispensers and hand dryers are preferred.

10.5.13 Assistance 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 to a staff member who can assist.

When the alarm has been operated, visual and audible feedback should be provided to indicate that the emergency assistance call has been acknowledged and action has been taken.

NOTE Typical examples of assistance alarms are a push button and a pull cord. A usual configuration of the pull cord is red-coloured, 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. The reset control shall be easy to operate and located with its bottom edge between 800 mm and 1 100 mm above floor level.

For a corner toilet room, the reset button should be above the fixed horizontal grab rail beside the toilet paper holder.

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

10.5.14 Fire emergency warning devices

In the restricted and isolated spaces of accessible toilets/bathrooms, an audible and visual fire emergency warning device in accordance with 5.8.5, having sound and light output, shall be provided. More than one device can be required in the same accessible toilet/bathroom in order to alert all users.

10.5.15 Showers

10.5.15.1 General

Showers shall be arranged to be usable by people with different abilities and different supporting aids, for instance, persons using a wheelchair, ambulant persons with disabilities, using their own wheelchairs or shower chairs.

If two or more shower recesses are provided, at least one shall be designed for left-hand use and at least one for right-hand use.

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

The shower area shall have level entry and have no fixed elements that prevent front and side access.

The screening of a shower recess shall be either a curtain or a door system that ensures the required circulation and manoeuvring space without interfering level entry.

The floor in the shower recess shall have a gradient between 1 in 50 (2 %) and 1 in 60 (1,67 %) sloping to a floor drain. The area outside shall have a gradient between 1 in 70 (1,43 %) and 1 in 80 (1,25 %) draining towards the shower recess. The transition into the shower recess shall be level without a step or a kerb.

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

A shower head support grab rail shall be fixed on the wall in the position as shown in Figure 69 (600 mm from the corner end).

A hand-held detachable shower head shall be provided with a flexible hose of a minimum length of 1 200 mm.

An adjustable shower head holder shall be provided. It shall

— be installed on grab rail as shown in Figure 69;

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

All other devices, e.g. taps, soap holder, shall be situated in an accessible range between 900 mm to 1 100 mm above floor level.

If the shower is combined with an accessible toilet, the manoeuvring areas may overlap, as shown in Figure 70.

10.5.15.2 Shower seat

The shower should be fitted with an easily operable foldable seat that folds upwards. 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.

The foldable seat shall have the following features:

— self-draining;

— slip-resistant and stable seating surface;

— when folded, it shall not present a hazard and the grab rail shall be accessible from the foldable seat.

In addition, the foldable seat should have the following features:

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

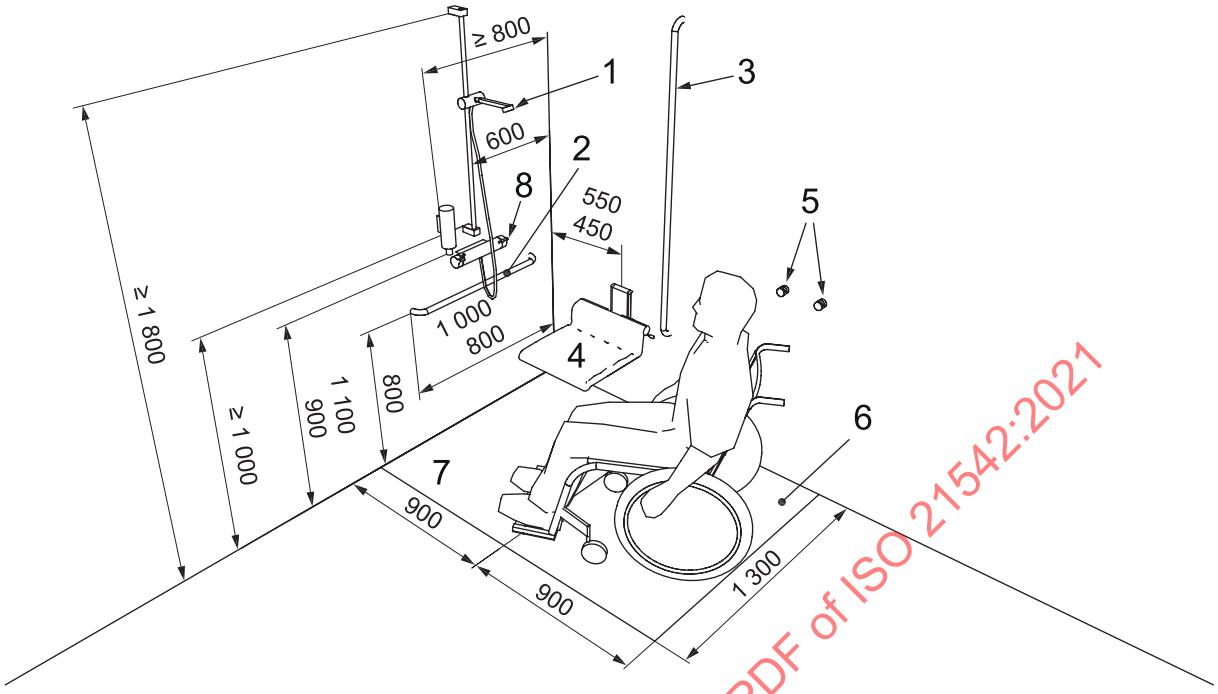
— rounded top edges (minimum radius of 2 mm to 3 mm).

The foldable seat should preferably be height adjustable.

All devices used for the shower situation shall be reachable from a position sitting on the shower seat.

Shower wheelchairs are sometimes used instead of shower seats, in which case the above requirements on foldable seat do not apply.

Dimensions in millimetres



Key

1 hand-held shower head, adjustable in height
2 horizontal grab rail
3 vertical grab rail
4 foldable shower seat with a height of the sitting surface between 400 mm and 480 mm
5 towel hooks
6 transfer area
7 wet showering area with gradient 1 in 50 to 1 in 60
8 shower controls

Figure 69 — Example of a shower place with grab rails, adjustable shower head and folding seat

10.5.15.3 Individual shower rooms

If an individual shower room is provided, a free space of at least 1 300 mm × 900 mm shall be provided on the clear side of the foldable seat, to allow access from a wheelchair, in addition to the manoeuvring space of 1 500 mm × 1 500 mm.

Exceptional considerations for existing buildings: If an individual shower room is provided, a free space, in addition to the manoeuvring space, of at least 1 200 mm × 800 mm shall be provided on the clear side of the foldable seat, to allow access from a wheelchair. Both spaces may overlap.

10.5.16 Bathrooms

All accessible bathrooms should always contain an accessible toilet.

The minimum overall dimensions of a bathroom intended principally for independent use, incorporating a corner toilet or a peninsular toilet and a large wash basin, should be as shown in Figures 70 and 72. Figure 72 also includes an example of a ceiling mounted tracked hoist for assisted use.

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

Additional grab rails should be located as shown in Figure 71.

Exceptional considerations for existing buildings: 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 diameter of 1 200 mm.

NOTE To make a bathtub accessible for users of a bath lift or hoist, a free unobstructed space under the bathtub is needed as shown in Figure 71.

Dimensions in millimetres

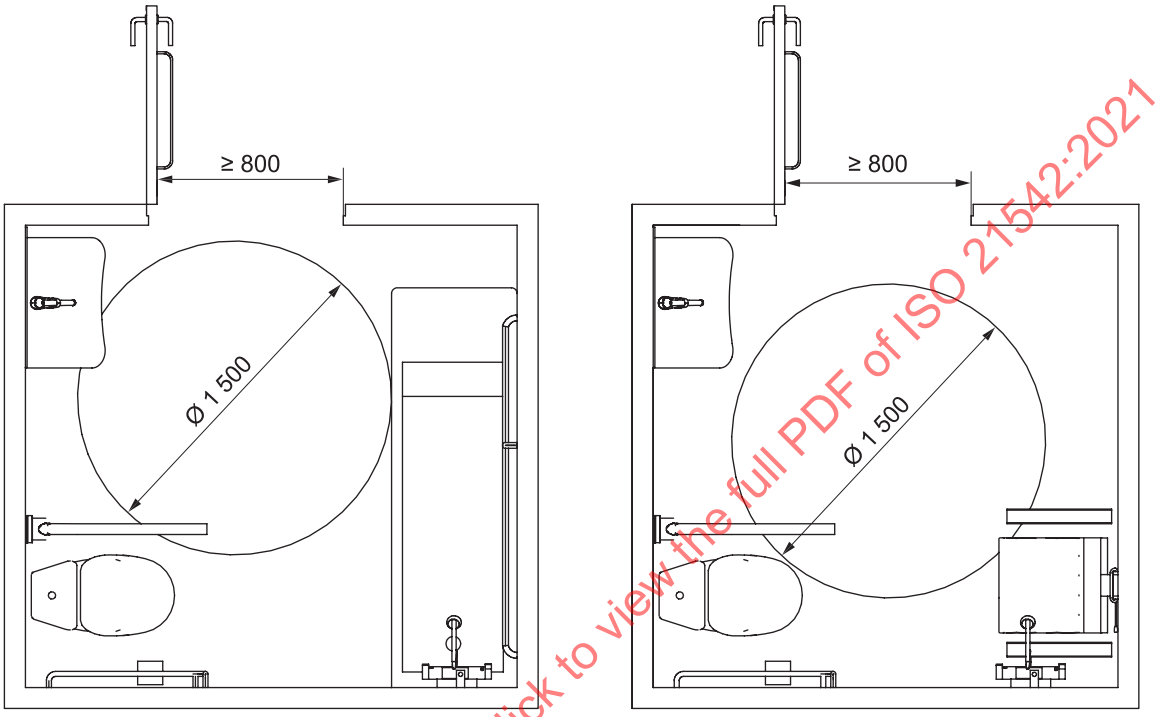
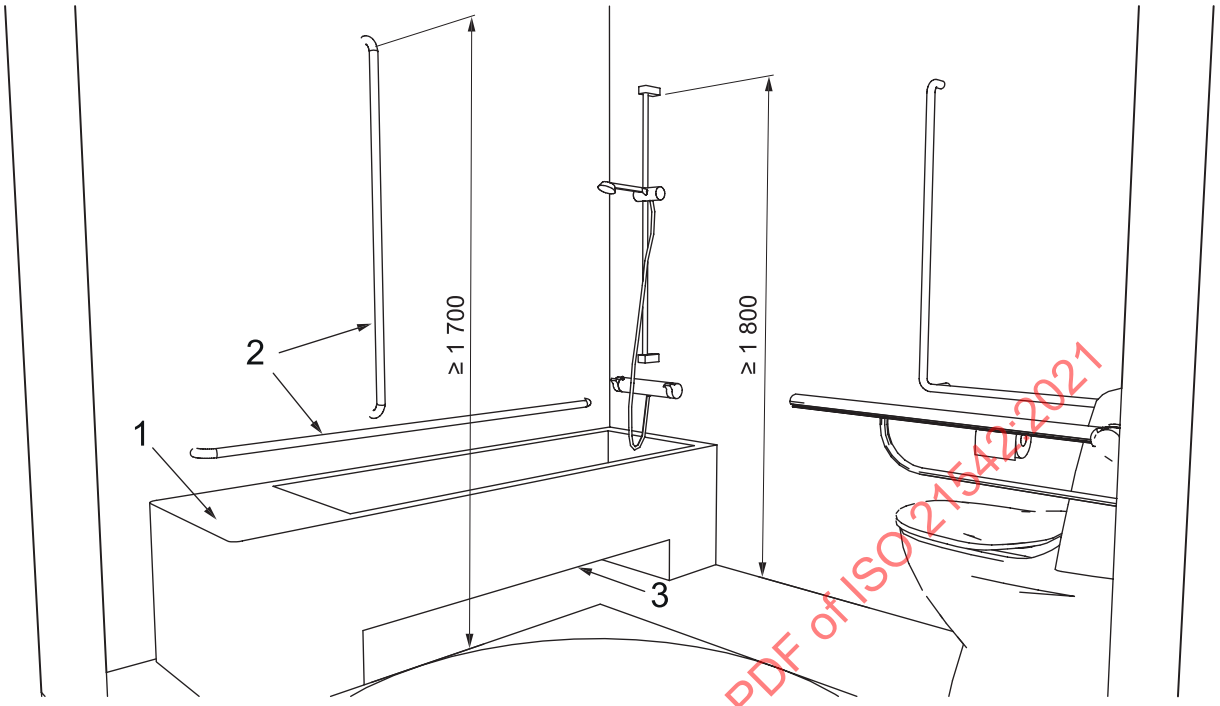


Figure 70 — Examples of a bathroom with bathtub or shower for independent use with corner WC

Dimensions in millimetres

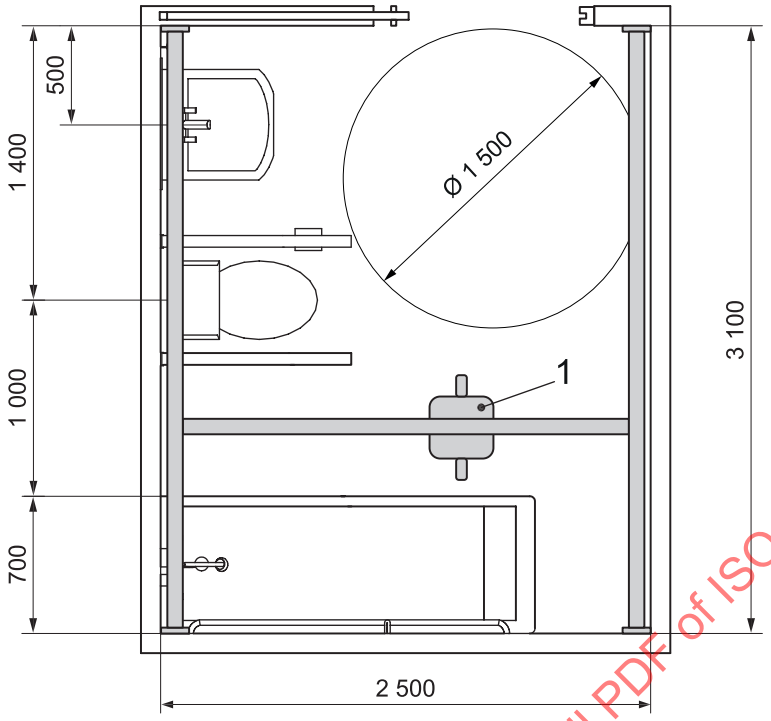


Key

1 transfer area
2 grab rail
3 opening for manual hoist

Figure 71 — Example of grab rails and transfer facilities surrounding the bathtub

Dimensions in millimetres



Key

1 ceiling-mounted track hoist

Figure 72 — Example of a bathroom with a ceiling mounted tracked hoist for assisted use

10.6 Accessible bedrooms

Accessible bedrooms in non-domestic buildings (i.e. hotels, guesthouses, etc.) shall comply with the requirements outlined in this document, in particular with Clause 4 and 6.1. At least one accessible bedroom should be provided for every twenty standard bedrooms or fraction.

Double rooms accessible for persons using a wheelchair should be designed so that they can accommodate either two large single beds each 1 000 mm × 2 000 mm (width × length), or a bed 1 500 mm × 2 000 mm (width × length) as a preferred option.

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

The minimum height of a bed measured at the top of the mattress shall be between 450 mm and 500 mm. An open space of at least 200 mm between the floor and the structure of the bed should be provided to facilitate the use of a manual hoist.

Sufficient clear manoeuvring space is needed to gain access to facilities and controls, including the shower and thermostat.

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

If only one accessible bedroom for persons with disabilities is provided, it should be arranged as a room that includes an accessible toilet, wash basin and shower room rather than a bathroom since many persons with disabilities can only independently use a shower. If more than one accessible bedroom is provided, a choice of shower or bath and a choice of right-hand or left-hand transfer space to the toilet and shower or bath should be provided. When more than one bathroom for independent use incorporating a corner toilet is planned, a layout choice of left-hand and right-hand transfer should be provided.

En-suite facilities should be chosen as the preferred solution for accessible bedrooms even when they are not generally provided for guests or residents in a hotel, motel or nursing home. If this is not possible, an accessible combined shower and toilet facility should be provided near the accessible bedrooms.

For communication for people with hearing, vision and cognitive impairments, see 5.7 on acoustics and Annex G on human abilities and associated design considerations.

Visual and audible alarm systems shall be accessible to people with vision and hearing impairments. See 5.8 for specifications on emergency warnings.

Dimensions in millimetres

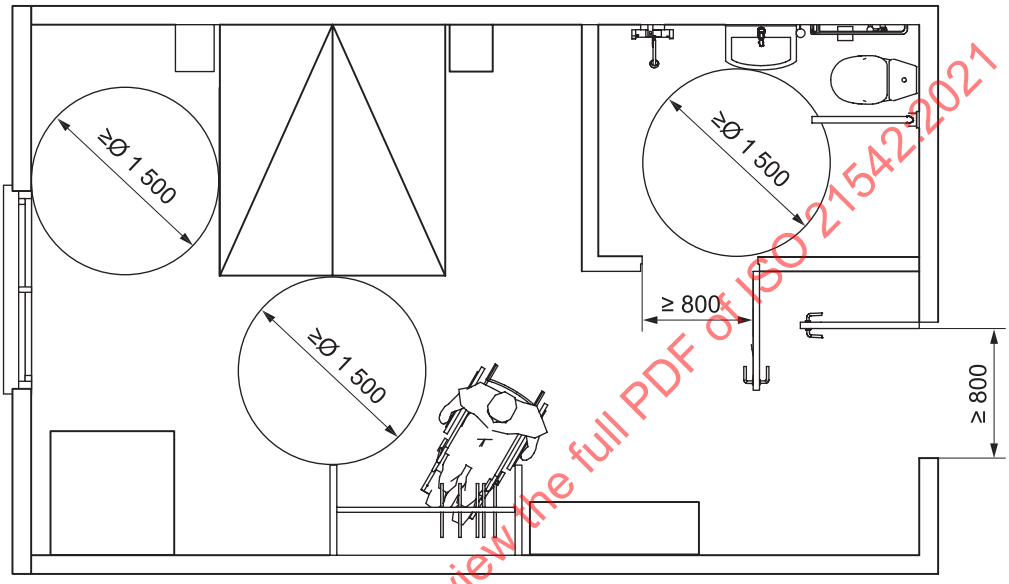


Figure 73 — Example of space allowances for accessible bedroom and bathroom

10.7 Accessible changing rooms

The minimum number of accessible changing rooms can vary depending on the type and use of the building.

NOTE Minimum numbers of accessible changing rooms can be found in applicable legislation, e.g. national building regulations.

Toilet rooms provided alongside accessible changing rooms shall be designed and constructed in accordance with 10.5.

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 can require lower or higher heights. The bench should be no less than 500 mm in depth and 2 000 mm in length and be provided with a grab rail at a height of 750 mm above the floor. The grab rail shall have a circular profile of not less than 32 mm and not more than 45 mm in diameter and a clear distance of at least 40 mm to the wall.

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

Coat hooks should be set at different heights: 850 mm to 1 100 mm, and at least one additional hook at 1 800 mm.

Coat hooks, benches, locker handles, and other furnishings should offer luminance contrast in accordance with 10.3. Slip-resistant floor surfaces should be used, and good lighting as well as matte finished surfaces and furnishings should be provided.

The provision of a call bell shall be in accordance with 9.2 and 10.5.13.

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

10.8 Kitchen areas

The design of kitchen areas shall consider the general design considerations as specified in Clause 4, the required manoeuvring spaces as specified in G.6.1 and G.6.2 and the accessible height of controls and devices as specified in 9.2.2.

Kitchen areas shall have a slip-resistant walking surface.

Essential kitchen appliances (oven, refrigerator, etc.) shall be usable by persons both standing and sitting in a wheelchair, and a worktop should be located beside all appliances. Microwaves shall be placed on the counter and an electrical outlet provided within reach.

A section of the shelves should be within reachable distance for a person using a wheelchair, between 500 mm and 1 100 mm above floor.

The sink taps should be easy to operate with one hand. The sink should be reachable for a person using a wheelchair 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.

10.9 Storage areas

The minimum manoeuvring space (see G.6.1) and reachability for persons using a wheelchair (see G.6.3) should be taken into consideration when designing and constructing a storage area.

A section of the shelves should be within reachable distance for a person using a wheelchair, i.e. in a height between 500 mm and 1 100 mm above the floor.

If a door is provided, it should open outwards.

10.10 Terraces, verandas and balconies

Terraces, verandas and balconies shall be accessible with a maximum threshold of 15 mm.

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

Walking surfaces shall be slip-resistant.

10.11 Bars, pubs and restaurants

In restaurants, a minimum of 25 % of the tables shall be usable by persons using a wheelchair in accordance with the specifications of 9.3.3 regarding seating at tables. In bars, a minimum of 25 % of bar counters shall be no more than 800 mm in height and shall have an unobstructed lateral access for persons using a wheelchair.

Sufficient manoeuvring space between tables and the route to accessible sanitary facilities shall be provided considering the specifications in G.6.

Consider the acoustic recommendations in 5.7.

General design requirements for colour and visual contrast as described in 5.3 should be considered as well.

10.12 Facilities for guide and other assistance dogs

10.12.1 General

In waiting rooms and other seating areas such as theatres and spectator facilities, some seats should be located so that a guide or assistance dog can accompany its owner and rest on the side, in front of or under the seat.

10.12.2 Relief facilities for guide and assistance dogs

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

A secure area should be provided close to the building for use as a dog relief facility. The dog relief area should be at least 3 000 mm × 4 000 mm with a 1 200 mm high secure fence. The entrance gate to the enclosed area should have an easy-to-operate and secure catch. The surface area should be concrete with a smooth finish to assist in cleaning and should have a slight fall of 3,5 % to assist in drainage. It is recommended to provide a waste bin and a supply of plastic bags, close to the entrance. An accessible sign in Braille and large print saying "Relief area for assistance dogs only" should be displayed. The area should be cleaned regularly and well maintained.

11 Fire safety and evacuation

11.1 General

Access to a building and egress or evacuation from it shall be considered together.

A fire can occur in any part of a building at any time. Reliable protection of people with disabilities is achieved by equitable fire prevention and fire safety measures, building user/occupant practices, independent fire evacuation procedures and, when necessary, assisted evacuation and firefighter rescue.

Alternative, intuitive, clear, unobstructed, safe and accessible evacuation routes, both horizontal and vertical, away from the scene of a fire shall be available to all building users.

In all situations, independent emergency evacuation by persons with disabilities is preferred over situations where assistance by others is required. The components that comprise emergency evacuation shall include:

— emergency warning systems that communicate simultaneously as specified in 5.8;

— building fire compartmentation to ensure that alternative zones, both horizontal and vertical are available to building users;

— signage that clearly identifies emergency evacuation routes from all parts of the building.

Evacuation routes shall lead persons to:

— places of relative safety;

— areas of rescue assistance;

— fire protected lift lobbies and lifts;

— fire protected stairs;

— the final fire exits;

— eventually, place of safety.

While fire is the most common reason for emergency evacuation, other situations including gas leaks, bomb threats etc. can also require emergency evacuation with the use of the same evacuation paths/routes. Building management should be aware that in instances other than fire emergencies, the fire brigade may not be available to assist with evacuations.

Annex D gives information on fire prevention, protection, safety and evacuation.

11.2 Design objectives

The specific objectives for the design of fire safety and evacuation are:

a) protection of people from fire to be provided at each location:

   — along routes used during independent or assisted evacuation to a place of relative safety or to the final fire exit and the place of safety;

   — at places of relative safety within a building, i.e. areas of rescue assistance adjoining vertical evacuation routes, and at places of safety;

   — at fire compartments when no immediate evacuation is possible, for example, in the case of healthcare facilities;

b) provision of sufficient space on all evacuation routes and at places of relative safety, considering:

   — the intended building user's profile, if known at the time of the design but, if unknown, at least an area equivalent to accommodate two persons using a wheelchair;

   — the size and fit-out of the areas and provisions necessary for accommodating building users with disabilities including areas of rescue assistance, lift lobbies and, where necessary, floors of temporary refuge.

11.3 Principles of fire evacuation

The design for protected evacuation routes should be incorporated at the early stages of the architectural design process. The fire engineering strategy needs to specify which occupants, based on abilities and other characteristics, are to be evacuated to which place of safety or place of relative safety. As the location of fires cannot be predicted, alternative evacuation routes available to all building users shall be provided within buildings.

The main principles of fire evacuation are as follows.

a) Alarms and information

   Warning, the first important issue in case of emergency, shall be accessible. Requirements on emergency warning systems are specified in 5.8.

b) Orientation

   To orient oneself and to quickly find an accessible evacuation route is important in an emergency situation. 5.1 and 5.5 specify requirements on orientation, information and signage.

c) Accessible movement to a place of relative safety or to a place of safety

   Routes to a place of relative safety or to a place of safety that allow for independent evacuation shall be provided. As independent vertical evacuation can be more difficult for some persons with disabilities, horizontal evacuation routes leading to a place of relative safety or to an area of rescue assistance shall also be considered.

   Regarding vertical evacuation routes, see requirements in 8.2 on ramps, 8.3 on stairs and 8.5.8 on lifts.

The sufficient number of places of relative safety or places of safety depends on the size and extent of a building.

d) Assisted evacuation from a place of relative safety or an area of rescue assistance

Where there are no safe options for independent vertical movement of persons with disabilities, it can be necessary to wait at places of relative safety or in areas of rescue assistance until the fire services or evacuation assistance arrive and complete the evacuation. See D.6 for fire evacuation practices.

11.4 Emergency evacuation related building infrastructure

11.4.1 Overview on essential building infrastructure

The elements of the building infrastructure in the context of fire evacuation are addressed in 11.4.2 to 11.4.8. The building infrastructure elements and their interrelations are defined in a fire defence plan.

11.4.2 Emergency evacuation routes

Emergency evacuation routes shall be accessible and should be protected from heat, smoke, flames and structural collapse.

Emergency evacuation routes, including fire-resisting doorsets (see 9.1.2) and final fire exits that open directly to the exterior, shall be accessible and usable by all building users. See Clause 6 on horizontal circulation, Clause 8 on vertical circulation and 9.1 on doorsets and windows.

In the event of a fire emergency, many building users attempting to evacuate try to retrace their routes of entry into a building, whatever the nature of the fire hazard and wherever it is located. The symbol for the accessible egress route (Figure 10) shall be provided throughout the building. Static escalators and moving walks shall not be used as an evacuation route. On static inclined moving walks, for example, the wheels of a large wheelchairs can engage with floor surface tracks, preventing any forward movement, and the evacuation route would be blocked for everybody else.

11.4.3 Places of relative safety

A place of relative safety facilitates progressive horizontal evacuation on a floor where there is an outbreak of fire. It can be adjacent to the fire source in the next fire compartment. If the fire spreads beyond the original zone, people move to the next fire compartment and, thus, the place of relative safety changes.

11.4.4 Lift evacuation systems

Lifts used for evacuation should be accessed via fire-protected areas and located adjacent to fire-protected evacuation staircases and areas of rescue assistance.

Lift lobbies, meeting the requirements of areas of rescue assistance (see 11.4.5), shall be provided on every floor served by the lift(s).

Lifts used for independent evacuation shall be in accordance with 8.5.

The lift well shall be protected from fire but also from the ingress of water.

Firefighter lifts may be used for evacuation of building users up until the time firefighters arrive at the building and take control of those lifts. Prior liaison and pre-planning with local fire services is always necessary if firefighting lifts are to be used for the evacuation of building users.

NOTE prEN 81-76:2019 specifies additional alternative evacuation modes.

11.4.5 Areas of rescue assistance adjoining fire evacuation staircases

An area of rescue assistance in a building shall:

— be provided on every floor of a building above ground floor, whether the building has an active fire suppression system or not;

— adjoin and be visible from every fire evacuation staircase, for firefighters to quickly check whether anybody is waiting there;

— be protected from heat, smoke and structural collapse during and after a fire;

— be sufficiently large to accommodate a number of potential users during a fire emergency, i.e. it shall accommodate more than one person using a wheelchair, with a recommended width of 1 500 mm;

— have good regular lighting, which is permanently on, supplemented by emergency lighting;

— have directional signage (Figure 10) indicating the route to the area of rescue assistance;

— be clearly marked with the graphical symbol as shown in Figure 11;

— be constantly monitored visually from a fire emergency control room;

— be clearly marked with linked floor tactile warning/directional indicators, and other relevant information;

— be fitted with an accessible two-way audio-visual communication system installed at a height between 800 mm and 1 200 mm above floor level, facilitating direct contact with a person in the fire emergency control room, and having a hearing enhancement system; the two-way communication system shall provide visual and audible information feedback confirming that the alarm has been sent, and it has been received;

— be of sufficient size for the storage of an evacuation chair (see D.6.4) or similar devices;

— be kept clear of obstacles and non-essential building contents; door leaves, duct covers, etc. shall not open into or over the evacuation travel space on staircases;

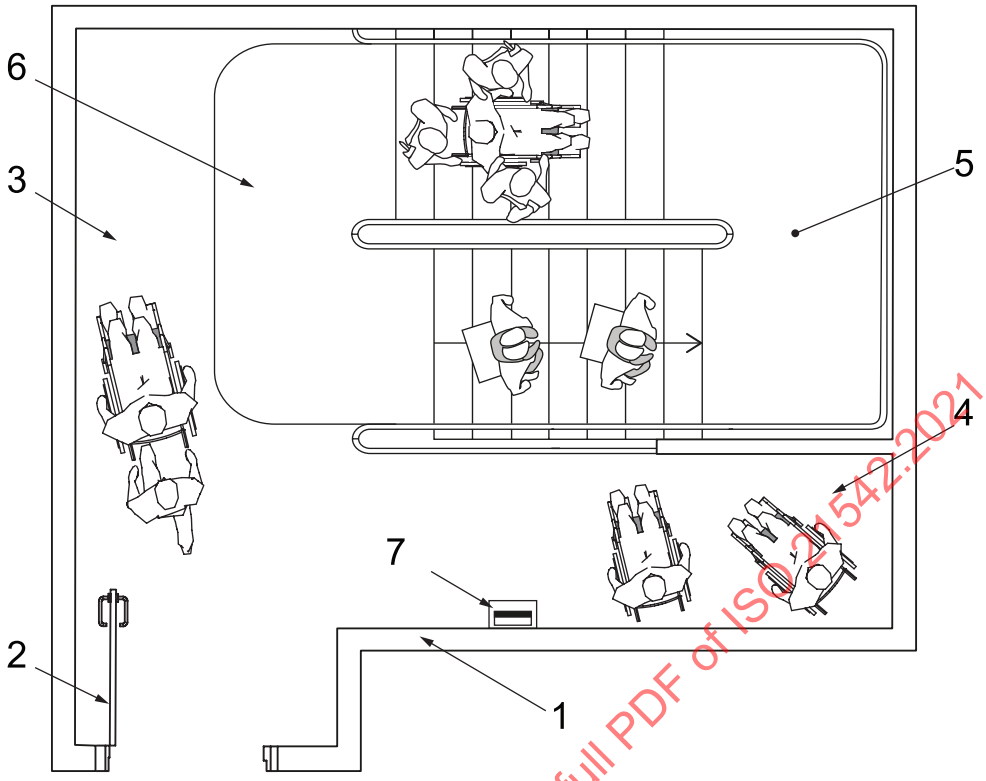
— have a design ensuring that movement to and from each area of rescue assistance does not encroach upon the evacuation travel space of other building users;

NOTE 1 The reasonable space associated with an area of rescue assistance also helps to minimize the serious problem of 'merging' i.e. new people trying to join an existing evacuation flow (see Figure 74).

— be fitted with a first-aid kit, a drinking water supply, and 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;

— be regularly serviced and properly maintained.

NOTE 2 Specifications on areas of rescue assistance can be found in applicable legislation, e.g. national building regulations.



Key

1 structurally robust, hard construction, i.e. reinforced concrete

2 recessed fire/smoke/heat resisting doorset, avoiding evacuation travel space when the doors are open

3 movement to and from area of rescue assistance, avoiding evacuation travel space

4 area of rescue assistance, with reasonable provision of space for potential users/occupants, with a recommended clear unobstructed width of 1 500 mm

5 fire evacuation staircase with a recommended clear unobstructed width of 1 500 mm between leading edges of handrails

6 staircase evacuation travel space

7 first-aid kit, drinking water supply, fire evacuation kit and manual fire alarm activator

Figure 74 — Fire evacuation staircase with adjoining area of rescue assistance

11.4.6 Fire evacuation staircases

See 8.3 on stairs and 8.4 on handrails.

When used for fire evacuation, the minimum clear unobstructed width of a staircase should be 1 500 mm between the leading edge of the handrails on both sides.

Where lift evacuation systems are provided in a building, fire evacuation staircases shall open off/into fire protected lift lobbies.

11.4.7 Floors of temporary refuge

A floor of temporary refuge is an open, structurally robust floor/storey in a high-rise building:

— having an exceptionally low level of fire hazard and risk;

— fitted with a fire suppression system (e.g. using water mist);

— serviced by accessible lifts used for evacuation usable during a fire emergency.

It is designed and constructed to halt the spread of heat and smoke beyond the floor/storey above or below. It is intended as a place of temporary respite, rest and relative safety for building users before continuing with evacuation, and as a forward command and control base for firefighters.

NOTE There are many fire safety issues associated with high-rise buildings. Evacuation by staircases alone can take many hours. Passive fire protection of staircases is not always reliable even if supplemented by active pressurization to prevent smoke ingress. Ascending stairs with heavy equipment can be arduous for fire fighters, so a floor of temporary refuge can also serve them.

Appropriate aids, equipment, signage and means of communication equal to 11.4.5 shall be provided on these floors.

11.4.8 Final fire exit doors and fire-resisting doors

Horizontal evacuation routes leading to a 'place of safety' or a 'place of relative safety' have to ensure independent evacuation. Fire-resisting doors and final fire exit doors shall be easy to use (see 9.1.1 and 9.1.2).

The requirements on entrance doors as in 6.6 apply to final fire exits doors as well.

11.4.9 Fire safety plans

A fire safety plan elaborates the particular fire safety, protection and evacuation strategy that has been developed for a specific building at design stage.

A fire safety plan shall demonstrate a proper consideration of fire safety, protection and evacuation of all building users, with particular and integrated focus on persons with disabilities.

12 Management and maintenance issues

Effective and reliable management of a building is essential to ensuring that a building remains accessible and fire safe for building users throughout its life cycle.

Annex F identifies important areas for attention.

Annex A
(informative)

Housing

A.1 General

It is essential for dwellings to be designed, constructed and maintained to enable its residents to live with comfort, whatever their abilities. It can be impossible, however, to know the actual ability of a specific resident of a dwelling in advance. The concept of adaptable dwelling is that it is designed at the planning stage by incorporating accessible structural features to make it usable for a wide range of users.

An adaptable dwelling is also designed to allow for certain additional adaptations to be made in the future to enable it to become more accessible and usable in respect to changing needs of its residents. To make sure that this is possible, both the pre- and post-adapted designs should be confirmed at the design stage to ensure that all services and structures are in place allowing inexpensive changes to enable accessibility if and when required.

The adaptability includes a step-free access to the dwelling as well as to service rooms such as laundry and indoor parking, if provided.

Accessible structural features include adequate width of doors, corridors and walkways, as well as minimum accessibility requirements for the dimension of, at least, the living room, one kitchen, one bathroom and one bedroom. While the design may not provide full accessibility from the beginning, it allows a choice of accessible features or fittings to be adjusted or added, if needed, to better accommodate arising accessibility requirements of residents.

All necessary functions should be accessible at entry level of every dwelling. Necessary dwelling functions at entry level are defined as the main entrance area, living room, kitchen, at least one bedroom (double-bed bedroom), one bathroom, access to laundry equipment, storage space, and outdoor sitting areas (if applicable).

NOTE The essential functions vary depending on the cultural context – in some countries, washing machines, for example, are not privately owned but placed in public space and their use is shared.

Dwelling units that extend over several levels (e.g. terraced houses) can present a challenge. It is therefore of major importance to include particular accessibility characteristics when planning a new building. This reduces the need to remove structural parts when capability of the users become somewhat impaired.

There are several ways to ensure accessibility when the dwelling has two or more storeys, for example:

— in dwelling units with small footprints, the bedroom at entry level can be planned as a possible adaptation and be shown in the building plans as a dotted line solution;

— location of a future lift, vertical or inclined lifting platform including the structural framing and the electrical wiring can be provided initially to enable later installation.

A.2 Access routes to residential buildings

External paths of travel to principal building entries and links to every resident dwelling should be accessible.

For dimensioning of access to residential buildings, see Clauses 8 and 9.

For lighting in residential buildings, see 5.4.

A.3 Building entrance

A.3.1 General

A residential building with a common entrance for more than one unit should have a space reserved for wheelchairs, rollators, mobility aids and buggies in the common areas or in the dwelling unit's entry or in a storage room at entrance level.

See 6.2.10 and 6.2.11 for further specification on storage spaces and facilities.

A.3.2 Post boxes

Where there are several post boxes in residential buildings, at least half of them should have an operating height between 500 mm and 1 100 mm above floor level.

Post boxes should be well marked and easy to use.

A.3.3 Doorbell systems and intercom systems

Doorbells should be easy to locate and operate.

Bell pushes should be positioned between 800 mm and 1 100 mm above floor level.

Text for information, name and apartment number etc. should have sufficient font size and visual contrast to the background.

The surface of doorbell panels should not be reflecting.

The intercom system should provide for a two-way communication system (audio-visual).

See 8.2 for information about accessibility of equipment, controls and switches.

A.4 Layout of dwellings

A.4.1 General

A dwelling unit should have a plan layout with sufficient dimensions and be equipped to accommodate flexible use in various stages of life.

Spaces should be arranged to allow a person using a wheelchair to operate equipment comfortably.

A.4.2 Parking spaces

For detailed information and requirements concerning designated accessible parking spaces, see 6.2.

A.4.3 Entrance area

The entrance area of a dwelling should provide a clear passage outside the furniture zone and have space for a turning circle of 1 500 mm outside the door's swing radius.

A.4.4 Internal corridors

Corridors within dwellings should be designed so that all persons can go through, and open, close and enter the doorways.

Enough space should be provided for turning a wheelchair at the ends of corridors. It can be accomplished using the space in adjacent rooms.

For detailed information concerning corridors, see 7.1.2.

A.4.5 Kitchen

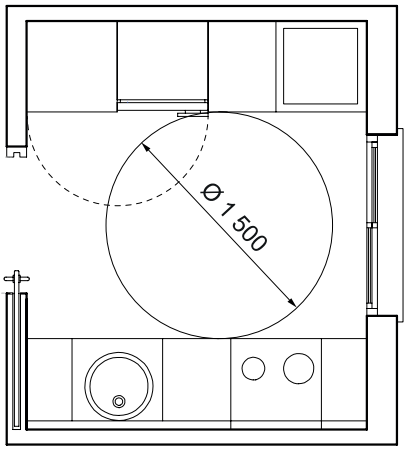
The placement of refrigerators, water sinks, and cooking facilities should accommodate necessary operating and turning space for a person using a wheelchair. The kitchen should be planned with a size and layout to provide worktop space next to the refrigerator, cook top and sink. See Figure A.1 for examples for furnishing principles in kitchens. The turning circle for persons using a wheelchair has a diameter of 1 500 mm.

Between sink and cooking stove there shall be a worktop that allows removal of cupboards underneath to adapt the worktop to be accessible for persons using a wheelchair.

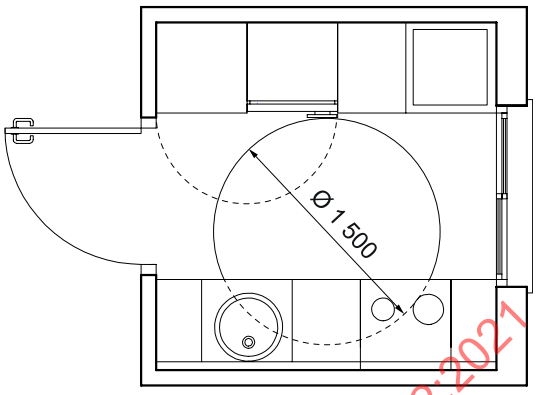
For smaller kitchens it is recommended to provide a door opening outwards that does not limit the turning space needed by persons using a wheelchair.

See also 10.8 on kitchen areas.

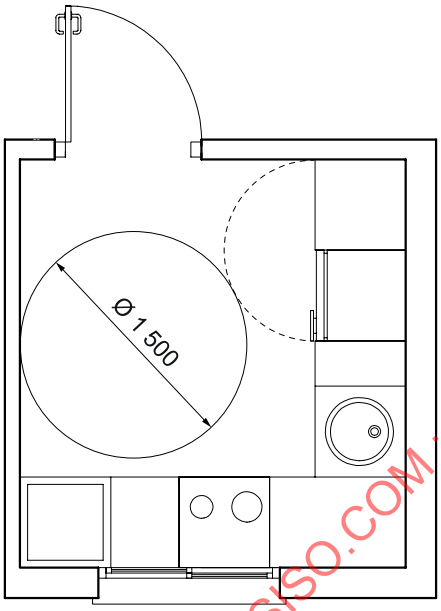
Dimensions in millimetres



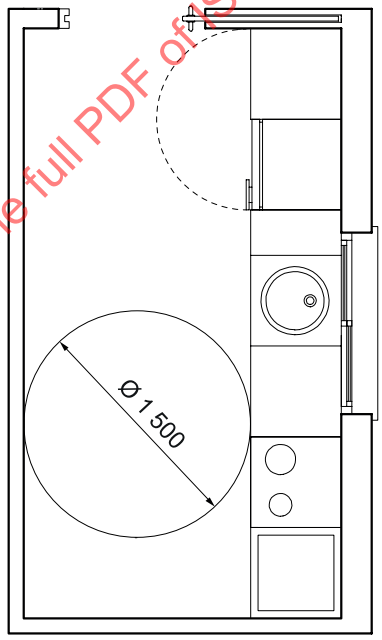
a) Two-line furnishing layout



b) Two-line furnishing layout with knee space under counter



c) 90° furnishing layout



d) One-line furnishing layout

Figure A.1 — Examples of furnishing principles for kitchens

A.4.6 Living room

The living room should accommodate a turning circle of 1 500 mm for persons using a wheelchair and floor area for furnishing and attain a minimum passage width of 900 mm to an openable window, door to the balcony/outside space and any other adjoining rooms.

A.4.7 Bedroom

Dimensions in millimetres

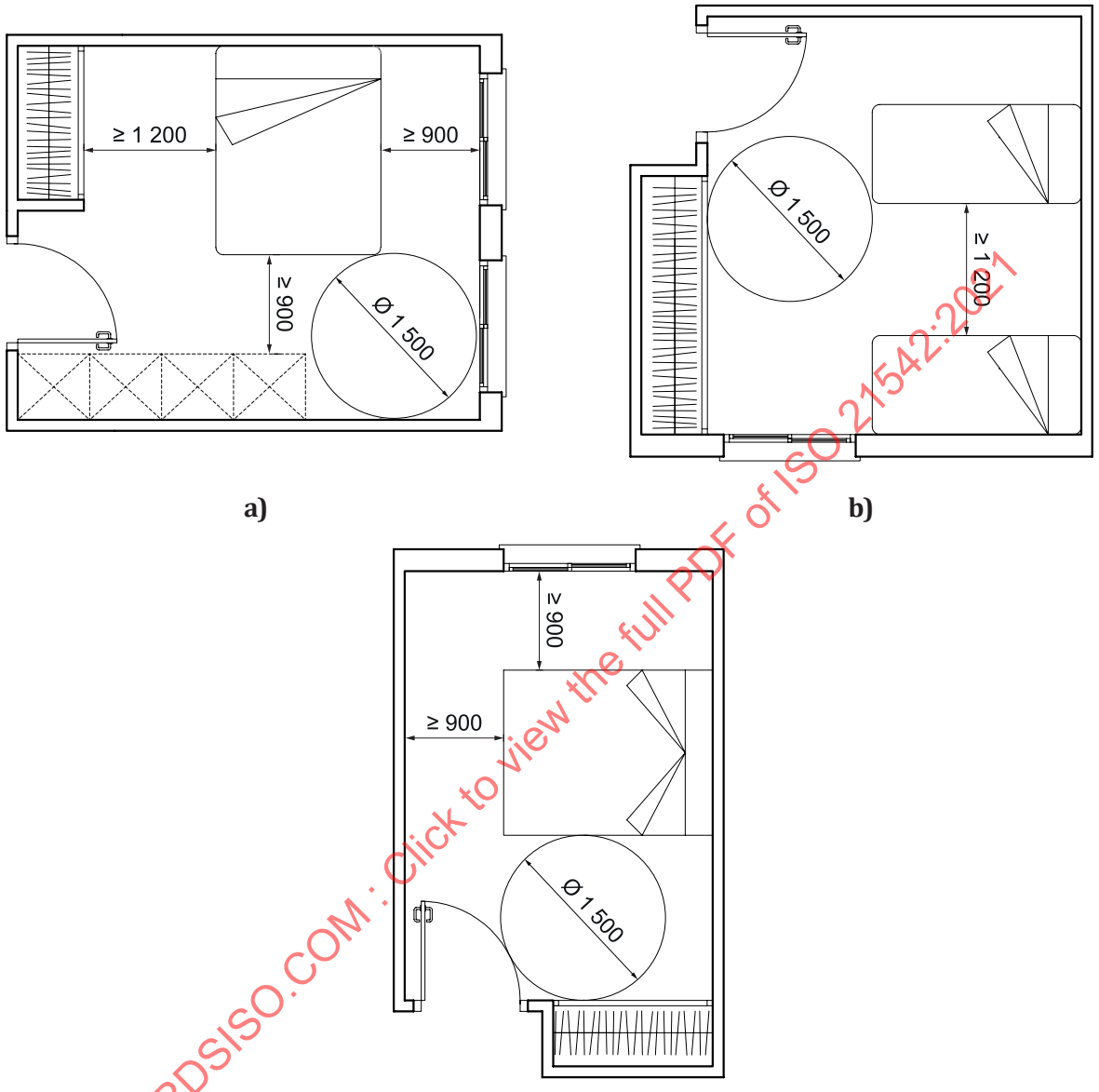


Figure A.2 — Examples of furnishing principles for bedrooms

The manoeuvring space within a bedroom should provide the following dimensions and characteristics (see Figure A.2):

— a turning circle of 1 500 mm for a wheelchair;

— a minimum passage width of 900 mm between all fixed elements in the room, including the access to an openable window;

— a minimum width of 1 200mm with a width of 1 500 mm recommended to allow wheelchair access to one long side of the bed;

— a manoeuvring space of 1 500 mm width in front of wardrobe and 900 mm in front of wardrobes with sliding doors, respectively.

For further information about accessibility in bedrooms, see 10.6.

A.4.8 Bathroom and laundry room

Bathrooms should be planned with a size and layout to provide space necessary for installations such as WC, washbasin, shower, bathtub, laundry machine and/or tumble dryer. There are several configurations depending on which installations are in the room. The bathroom should accommodate necessary operating turning space for a person using a wheelchair. Hinged door shall be swinging outwards from the room.

When designing bathrooms, the following shall be taken into account:

— space for an unobstructed turning circle with a diameter of 1 500 mm outside the furniture zone;

— provision of a washbasin in rooms with a WC;

— sufficient strength in the walls to enable installation of accessories such as armrests, handles or fold down seats;

— contrasting colours between floor and wall and between surfaces and fittings;

— enough clearance for a wheelchair on at least one side of the WC;

— the location of the WC considering alternative transfer positions from wheelchair to toilet seat including the positioning of the grabrails;

— a shower tap with a single handle, a thermostat mounted at reachable height above floor level and the shower head adjustable in height;

— no steps or edges in relation to the surrounding floor in walk-in/wheel-in showers;

— slip-resistant floors.

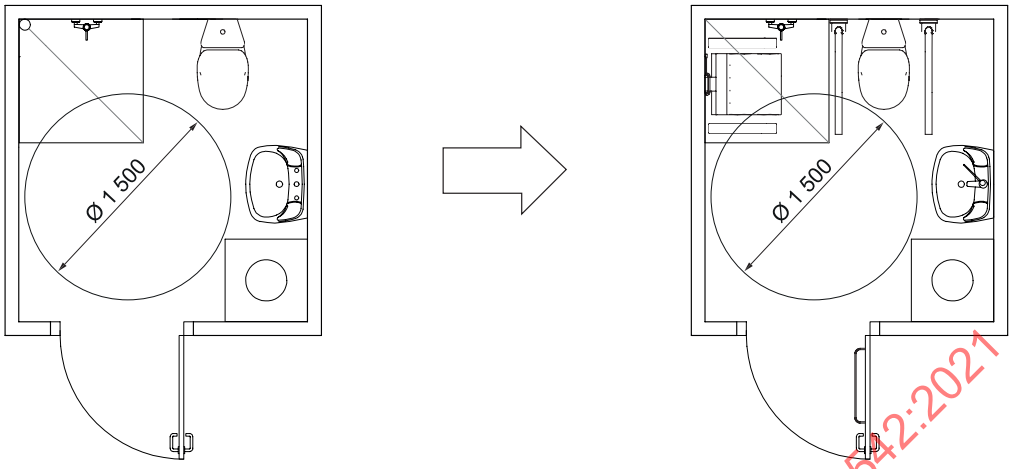
The washing machine or tumble dryer should either have space and hook-up facilities in an accessible bathroom or a separate accessible laundry room should be provided.

Examples for adapting existing bathrooms, removing bathtub and introducing shower are given in Figure A.3.

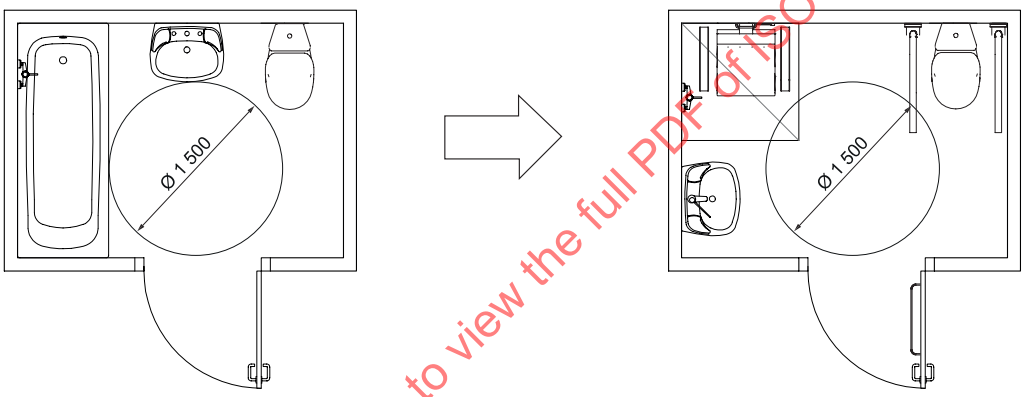
See 10.5 for information about accessibility in bathrooms and toilet rooms.

NOTE Specifications on bathrooms can be found in applicable legislation, e.g. national building regulations.

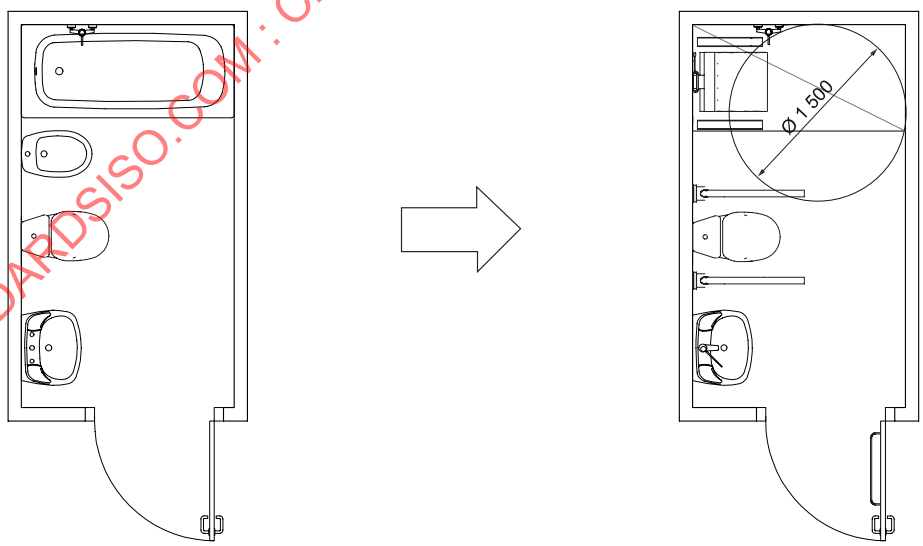
Dimensions in millimetres



a) Existing bathroom with shower and solitary WC



b) Existing bathroom with bathtub and corner WC



c) Existing bathroom with bathtub and solitary WC

Figure A.3 — Examples for the adaption of existing bathrooms

A.4.9 Storage rooms

Interior storage rooms shall be designed with step-free and outward-opening or sliding doors. The storage room shall be designed to be accessible for a wide range of users.

A.4.10 Balconies, terraces and outdoor spaces

Balconies, terraces, roof-terraces, set-back terraces, patios and verandas should be designed to be accessible and usable for persons with reduced mobility.

For larger balconies and terraces serving as a primary private outdoor space:

— the floor shall have an unobstructed turning circle of 1 500 mm outside the furniture zone;

— there should be no level difference between outdoor and indoor;

— any thresholds should not be higher than 25 mm above floor level and be bevelled, where a maximum of 15 mm is recommended;

— floor surfaces should be slip-resistant.

For smaller balconies and terraces not complying with the requirements and recommendations above, it may be adequate if there is enough space on the balcony or terrace for a person using a wheelchair to go outside, and then reverse back when returning inside.

For critical dimensions regarding doors, see 9.1.1.1.

Annex B
(informative)

Tactile walking surface indicators (TWSI)

B.1 General

This annex defines basic principles to be applied when orientation systems containing tactile walking surface indicators (TWSI) are implemented in the indoor or outdoor environment. ISO 23599 specifies further requirements for TWSIs such as dimensions, arrangement and height of profiles.

B.2 Functionality and application of TWSI systems

B.2.1 General

Orientation systems aim at indicating pathways for people with vision impairments so that an autonomous and safe mobility for this group is guaranteed. TWSI systems supply a continuous guidance from an access point to destination and draw users' attention to potential hazards in the built environment. TWSI systems shall be planned in a logical manner with knowledge of the place; and they are not completely exhaustive.

B.2.2 Environmental context

The built environment requires a clear and structured organisation with detectable buildings and identifiable pathways. The design shall provide support for orientation and wayfinding based on the principle of detection with multiple senses (see 5.1.3). TWSIs shall be provided in the absence of built or natural elements and landmarks such as walls, edges, curbs, changes in floor covering, which can supply cues for wayfinding and orientation. TWSIs shall also be provided where guidance is required in transport facilities. They shall be applied to a reasonable extent.

B.3 Detection of TWSI elements

B.3.1 General

To collect information about the surrounding physical environment and to detect guiding elements such as TWSI, persons with vision impairments use a white cane. By sweeping the cane from one side to the other in front of them, information is picked up by the head of the stick. Additionally, tactile structures on the floor provide information through the soles of the shoes. The sound produced by the white cane striking the structures also provides acoustic feedback supporting their perception.

Visual detection of TWSI is required for different reasons:

— to facilitate identification of the TWSI system;

— to support the warning function of tactile warning elements;

— to provide guidance and warning for persons with reduced visual capacities.

Visual detection of TWSI is beneficial also for other groups of users giving guidance and warning, reducing the risk of stumbling to a minimum and calling the attention of sighted persons not to put obstacles on the TWSI elements.

B.3.2 Tactile contrast

TWSIs shall be clearly discernible from their surrounding surface. The adjacent surfaces shall be smooth and free of any tactile structure disturbing detection.

The profile of the tactile patterns and the materials used for TWSI shall be determined so that the risk for falling, slipping or stumbling is reduced to a minimum.

TWSIs shall have a maximum height above the surrounding pavement or floor surface of 5 mm. They shall have bevelled or rounded edges to enhance safety and negotiability for people with mobility impairments.

In the case of combining different patterns, e.g. for guidance, landmarks and warning, persons with vision impairments shall be able to distinguish the different profiles and identify their meaning. Patterns, arrangements, dimensions and height of profiles according to ISO 23599 provide good recognisability.

In the selection of materials, attention shall be paid to hold a high quality of TWSI profiles over time.

B.3.3 Visual contrast

TWSIs shall be easily detectable and clearly discernible visually from the adjacent surface or other surrounding surfaces. Luminance contrast values according to 5.3 shall be provided as well as sufficient illumination (see 5.4).

Adjacent surfaces or other surrounding surfaces shall be free of any pattern that can conflict with the TWSI system.

B.4 Implementation of TWSI patterns

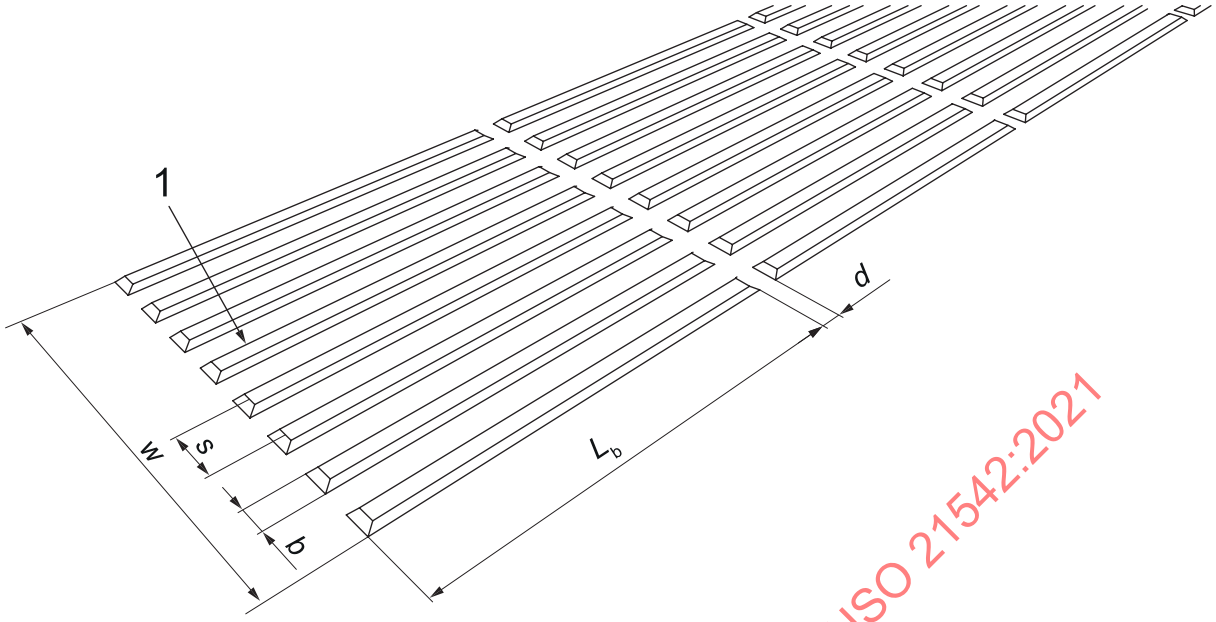
B.4.1 General

The implementation of TWSI systems can vary from one country to another. Common for all TWSI systems are that they supply guidance, attention raising and warnings by use of a combination of TWSI patterns.

Depending on the context, TWSI for guidance and warning both promote orientation and wayfinding as well as safety. For instance, at pedestrian crossings TWSI systems lead people with vision impairments to the correct position for a safe crossing of the road.

B.4.2 Guiding pattern

To clearly indicate a directional cue, TWSI patterns for guidance shall consist of elongated bars. Figure B.1 gives an example for this type of guiding pattern.



Key

1 flat-topped elongated bars, height 4 mm to 5 mm, bevelled

s spacing of ribs, dimension according to ISO 23599 depending on the width at the base

b width at base, between 27 mm and 40 mm

L_b minimum 270 mm

w minimum 250 mm

d minimum 30 mm

Figure B.1 — Example and ranges for dimensions of TWSI with guiding function

B.4.3 Attention pattern

TWSI patterns for attention raising or warning shall be clearly distinguishable from patterns for guidance.

They can be used to indicate:

— beginning and end of a guiding system;

— decision points within a system of TWSI patterns for guidance;

— important points, e.g. the holding position of a vehicle in public transport stations;

— particular hazards.

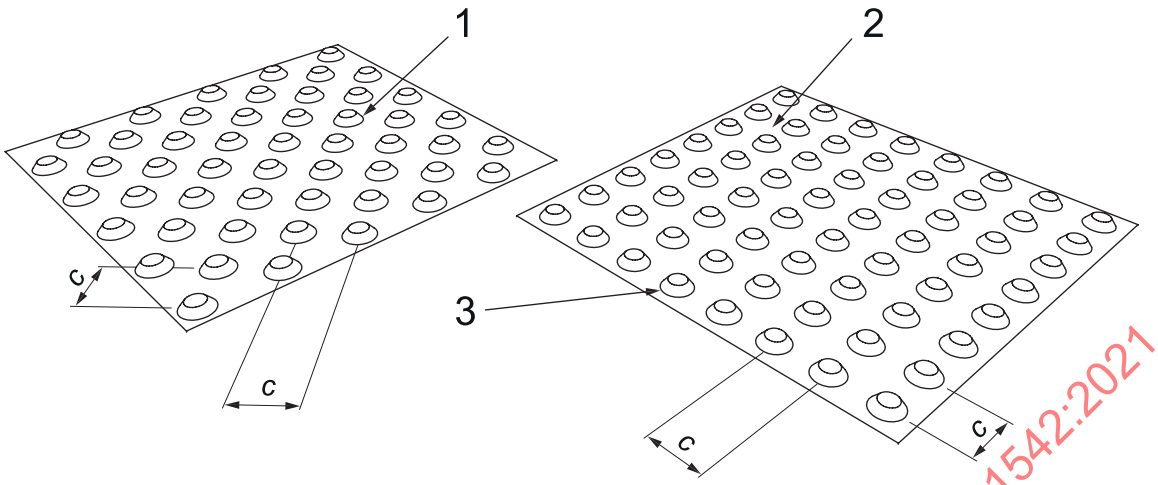
NOTE 1 Common patterns used for warning are truncated domes or cones. To raise attention, e.g. at the beginning and end of a guiding system, diversion of guidance lines or decision points, in addition to truncated domes or cones, arrangements with elongated bars can also be used. This helps to differentiate between warning of hazards and decision points when they are nearby.

NOTE 2 For identification of a diversion or intersection within a TWSI system for guidance, it can be substituted by its interruption, i.e. empty fields without tactile marking, to indicate the decision point.

TWSI attention patterns shall be positioned perpendicular to the walking direction and extend over the full effective width of the indicated element.

Attention pattern domes should not be used for any purpose other than those specified in this document.

Figure B.2 shows an TWSI with warning function.



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 ± 1) mm)

c centre spacing

Figure B.2 — Examples and ranges for dimensions of TWSI with warning function

B.4.4 Complementary information

Provision of additional information (e.g. acoustic guidance, beacons, tactile maps, tactile signage) can be applied to support the interpretation of TWSI systems (see 5.1).

Annex C
(informative)

Circulation spaces at doorways

C.1 General

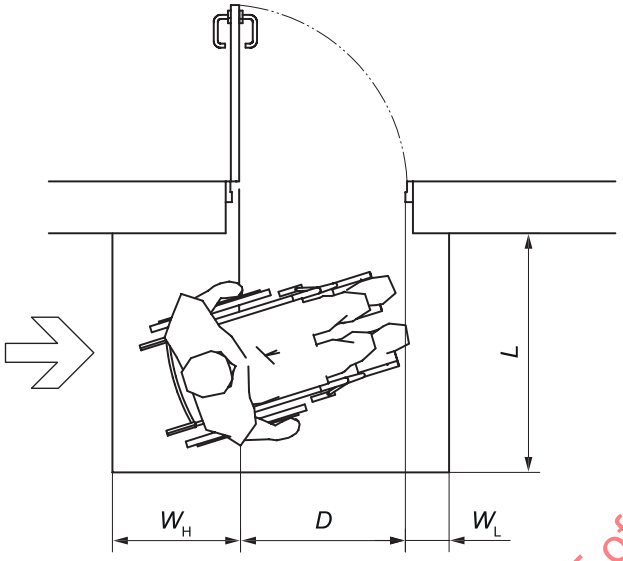
On every accessible path of travel, sufficient circulation spaces should be provided in both directions at doorways.

Basic guidance on the minimum horizontal manoeuvring space of an entrance doorway is given in 6.6.3. 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 9.1.1.2, a manoeuvring space of not less than 600 mm shall 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.

C.2 Swinging doors

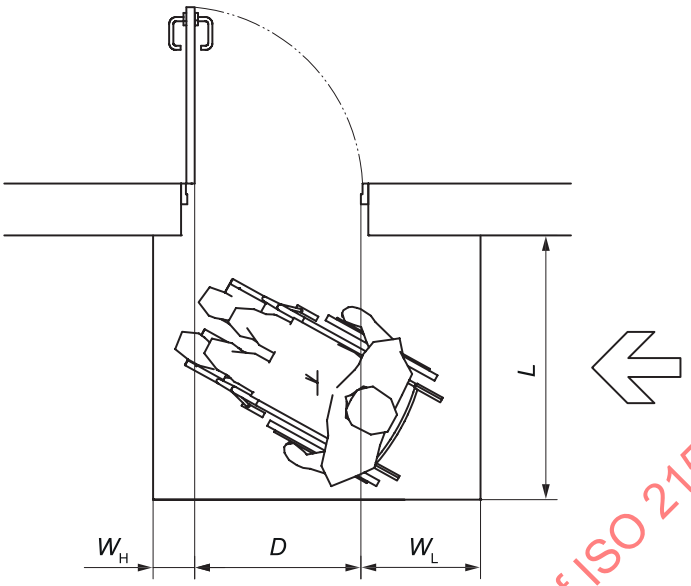
The clear circulation space at doorways with swinging doors is based on the unobstructed width of the doorway (*D*). The clear circulation space should not be less than the dimensions specified in Figures C.1 to C.8 for the appropriate unobstructed width (*D*).



Dimension D [mm]	Dimension L [mm]	Dimension W_H [mm]	Dimension[a] W_L [mm]
800	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

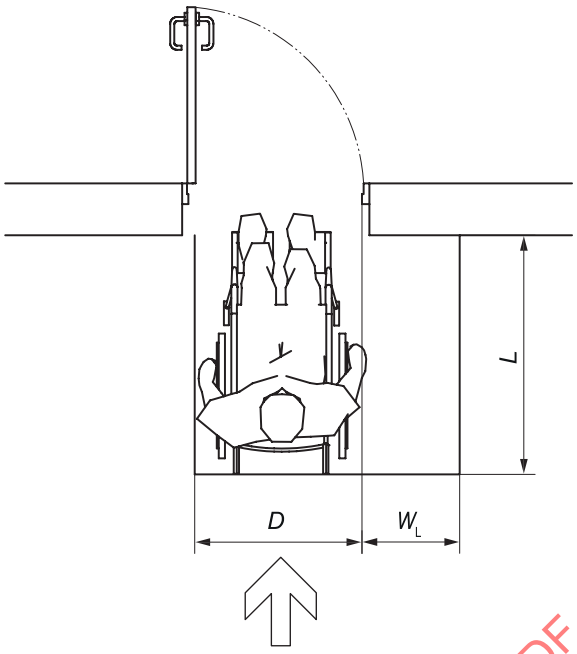
[a] Informative only. See requirements given in 9.1.1.2.

Figure C.1 — Circulation spaces at doorways with swinging doors — Hinge-side approach: door opens away from user



Dimension D [mm]	Dimension L [mm]	Dimension W_H [mm]	Dimension W_L [mm]
800	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

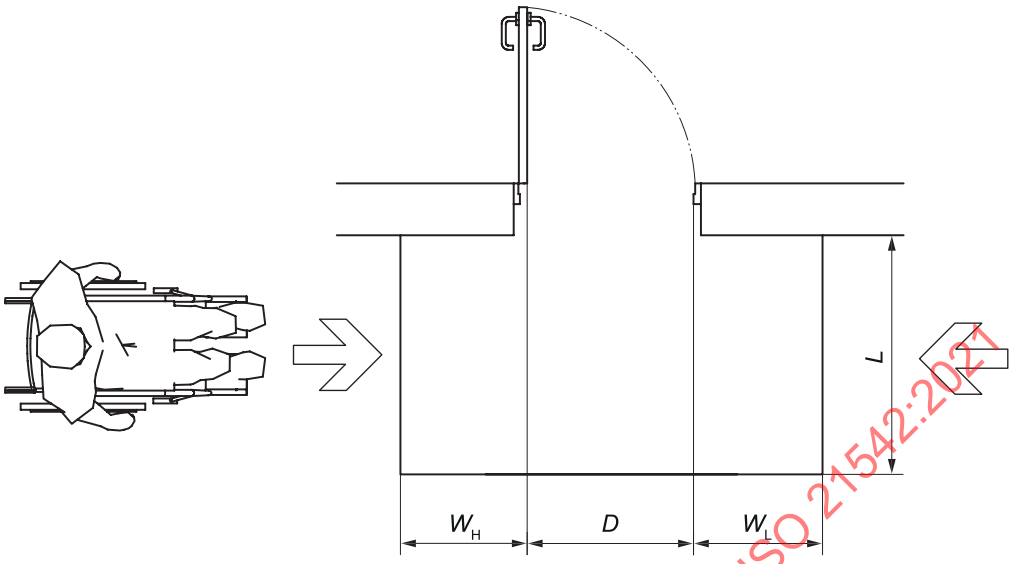
Figure C.2 — Circulation spaces at doorways with swinging doors — Latch-side approach: door opens away from user



Dimension D [mm]	Dimension L [mm]	Dimension W_H [mm]	Dimension[a] W_L [mm]
800	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

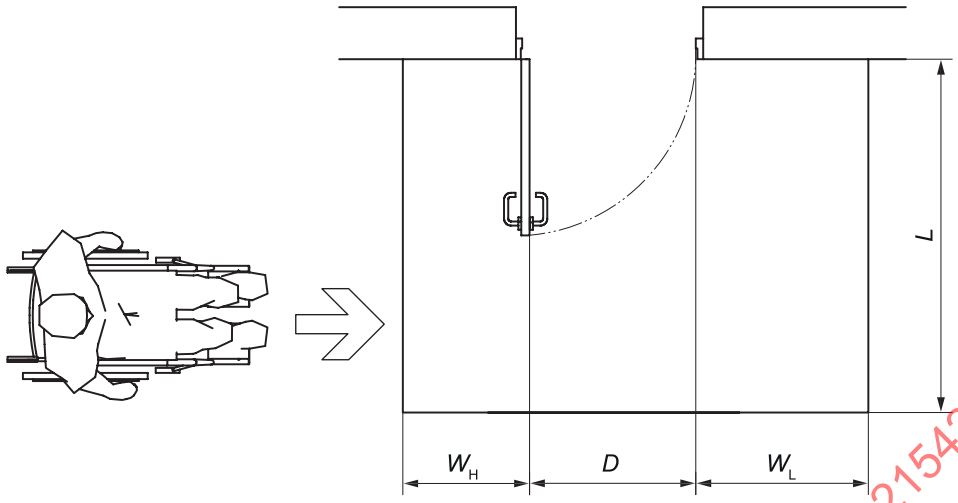
[a] Informative only. See requirements given in 9.1.1.2.

Figure C.3 — Circulation spaces at doorways with swinging doors — Front approach: door opens away from user



Dimension D [mm]	Dimension L [mm]	Dimension W_H [mm]	Dimension W_L [mm]
800	1 270	610	660
850	1 240	560	660
900	1 210	510	660
950	1 175	450	660
1 000	1 155	80	660

Figure C.4 — Circulation spaces at doorways with swinging doors — Either approach: door opens away from user



Dimension D [mm]	Dimension L [mm]	Dimension W_H [mm]	Dimension W_L [mm]
800	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