

Accessibility and usability of the built environment — Functional requirements

National foreword

This British Standard is the UK implementation of EN 17210:2021.

The UK participation in its preparation was entrusted to Technical Committee B/559, Design of an Accessible and Inclusive Environment.

A list of organizations represented on this committee can be obtained on request to its committee manager.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English version

Accessibility and usability of the built environment - Functional requirements

Accessibilité et utilisabilité de l'environnement bâti -
Exigences fonctionnelles

Barrierefreiheit und Nutzbarkeit der gebauten
Umgebung - Funktionale Anforderungen

This European Standard was corrected and reissued by the CEN-CENELEC Management Centre on 17 February 2021.

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CEN and CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN and CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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**CEN-CENELEC Management Centre:
Rue de la Science 23, B-1040 Brussels**

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European foreword

This document (EN 17210:2021) has been prepared by the Joint Technical Committee CEN-CENELEC/JTC 11 “Accessibility in the built environment”, the secretariat of which is held by UNE.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2021 and conflicting national standards shall be withdrawn at the latest by January 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under Mandate M/420 given to CEN-CENELEC and ETSI by the European Commission and the European Free Trade Association in support of European accessibility requirements for public procurement in the built environment.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document has been developed in response to mandate M/420 of the European Commission, providing a standard for procurement of an accessible and usable built environment. The main goal of this document is to contribute to the implementation of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in Europe.

The functional requirements and recommendations in this document are formulated with qualitative terms and describe the objectives which have to be reached, based on the diversity that a wide range of users presents (goals for protection) and can be used as criteria for awarding public contracts (in support of the Public Procurement Directives) as well as for other purposes, i.e. for accessibility legislation. This document does not prescribe or describe how these functional requirements should be met and thus it is not intended that this document will conflict with national accessibility standards.

This document specifies a range of functional accessibility and usability requirements and recommendations for many of the elements of construction, assembly, interior settings, components and fittings, which comprise the built environment. These functional accessibility requirements relate to the constructional aspects of outdoor pedestrian and urban areas, approaches and access to buildings, indoor circulation and use of facilities within buildings, egress from buildings in the normal course of events, and evacuation in the event of an emergency.

The functional accessibility and usability requirements in this document are based on the widest range of user needs and target groups as identified in Phase I of Mandate M/420. These requirements support the diversity of all persons and a life-course perspective, i.e. persons with physical impairments, persons with sensory impairments, persons with allergies, persons with learning difficulties/cognitive impairments and persons with mental-ill-health, persons with age-related conditions, but also persons in different stages of life, as children, adults and older persons.

This document also specifies the functional accessibility and usability requirements and recommendations to enable the use of wheeled mobility devices in the built environment. The type of wheeled mobility devices to be facilitated, and consequently the amount of space to be allocated, may be determined by national standards or regulations and/or a procuring body may specify the provision of space for larger electric wheelchairs and mobility scooters in certain types of buildings.

For the purpose of this document, the term 'accessibility' refers to both 'accessibility and usability'.

For specific building uses (see Clauses 16 to 20), such as accommodation, cultural, leisure and sport use, administrative, service and employment buildings, and outdoor and urban areas and transport facilities, the basic functional accessibility requirements are supplemented by key requirements and recommendations supported by other related standards or guidance documents.

This document is based to a great extent on ISO 21542:2011 *Building construction – Accessibility and usability of the built environment* (under revision) and where not sufficient, supplemented with references to alternative and/or complementary documents (identified in Phase I of Mandate M/420).

This document is intended to assist primarily public procurers and also architects, engineers, facility managers, ergonomists and other stakeholders in their respective areas of work, enabling them to require, specify, design and assess conformity related to the accessibility of the built environment, using a common framework and a common language, thus ensuring accessibility for all.

As a general structure, explanations on the motives for the requirements and recommendations given in this document are given in previous short informative 'Rationale', understood as a background.

The technical performance criteria to fulfil the functional requirements given in this document, based on classes, detailed dimensions, etc. will be exemplified by a CEN-CENELEC Technical Report “*Accessibility and usability of the built environment - Technical performance criteria and specifications*” (TR 1), currently under development, and may also be determined by national building regulations, national standards, or any other national guidance.

Another CEN-CENELEC Technical Report (TR 2) on the assessment of conformity to the functional requirements given in this document and the technical specifications given in NWI JT011002 is currently also under development.

1 Scope

This document describes basic, minimum functional requirements and recommendations for an accessible and usable built environment, following "Design for All"/"Universal Design" principles which will facilitate equitable and safe use for a wide range of users, including persons with disabilities.

The requirements and recommendations given in this document are applicable across the full spectrum of the built environment.

These functional accessibility and usability requirements and recommendations are relevant to the design, construction, refurbishment or adaptation, and maintenance of built environments including outdoor pedestrian and urban areas.

NOTE 1 'Design for All' and 'Universal Design' share a similar inclusive design philosophy. "Universal Design" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal Design" does not exclude assistive devices for particular groups of persons with disabilities where this is needed.

NOTE 2 Terms such as "design for all", "universal design", "accessible design", "barrier-free design", "inclusive design" and "transgenerational design" are often used interchangeably with the same meaning.

NOTE 3 This document does not cover management and maintenance issues, but provides basic information in Annex B.

NOTE 4 All figures are provided as examples. They are described by their title and key and do not provide additional information. Some figures show negative examples to be avoided; these are identified by the insertion of a red cross on them. A list of all the figures included in this document is given in the informative Annex C.

NOTE 5 In the case of refurbishment or adaptations of existing buildings or infrastructures, a specific study including feasibility determines the extent to which the functional requirements and recommendations can be met.

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.

EN 54-23, *Fire detection and fire alarm systems - Part 23: Fire alarm devices - Visual alarm devices*

EN 81-20, *Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 20: Passenger and goods passenger lifts*

EN 81-70, *Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lifts - Part 70: Accessibility to lifts for persons including persons with disability*

EN 81-72, *Safety rules for the construction and installation of lifts - Particular applications for passenger and goods passenger lifts - Part 72: Firefighters lifts*

EN 115-1, *Safety of escalators and moving walks - Part 1: Construction and installation*

EN 12183, *Manual wheelchairs - Requirements and test methods*

EN 12184, *Electrically powered wheelchairs, scooters and their chargers - Requirements and test methods*

EN 13200-1, *Spectator facilities - Part 1: General characteristics for spectator viewing area*

EN 16005, *Power operated pedestrian doorsets - safety in use - requirements and test methods*

EN 301549, *Accessibility requirements for ICT products and services*

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

EN 81-76¹⁾, *Safety rules for the construction and installation of lifts - Particular applications for passengers and goods passenger lifts - Part 76: Evacuation of persons with disabilities using lifts*

CEN/TR 15894, *Building hardware - Door fittings for use by children, elderly and disabled people in domestic and public buildings - A guide for specifiers*

3 Terms and definitions

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

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

accessibility

provision of buildings, parts of buildings, or outdoor built environments for people, regardless of disability, age or gender, to be able to gain access to them, into them, to use them and exit from them

Note 1 to entry: Accessibility includes ease of independent approach, entry, evacuation and/or use of a building and its services and facilities, and outdoor spaces by all of the potential users with an assurance of person health, safety and welfare during the course of those activities.

[SOURCE: ISO 21542:2011, 3.2, modified]

3.2

accessible format

use of different presentations to make information accessible by the use of another sensory ability, e.g. visual information presented in audio and tactile formats; audio information presented in visual formats

3.3

access statement

report that provides a framework to demonstrate how accessibility for all users is delivered in a development and how design for all solutions have been adopted

3.4

area of rescue assistance

evacuation temporary refuge

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

Note 1 to entry: “Robust” means structurally hardened and resistant to mechanical damage during the fire and for a period of time afterwards, i.e. the cooling phase.

[SOURCE: ISO 21542:2011, 3.3]

1) Under preparation. Stage at the time of publication: prEN 81-76.

3.5

assistance dogs

dog, specifically trained to perform tasks to increase independence and to mitigate limitations of a person with a disability and permanently paired with this person

Note 1 to entry: In some countries an assistance dog is referred to as a service dog.

Note 2 to entry: Other animals can be used, but in this EN we use only “assistance dog”.

[SOURCE: CEN/TC 452 Approved Preliminary Work Item]

3.6

assisted evacuation

activity during an emergency when a designated person or persons provide(s) assistance to another person to leave a building or a specific part of the built environment and to reach a ‘place of safety’

[SOURCE: ISO 21542:2011, 3.4, modified]

3.7

assistive product

product especially produced or generally available, for preventing, compensating for, monitoring, relieving or neutralizing impairments, activity limitations and participation restrictions

EXAMPLE Devices, equipment, instruments, technology and software.

[SOURCE: ISO 21542:2011, 3.5]

3.8

assistive technology

assistive device

piece of equipment, product, system, hardware, software or service that is used to increase, maintain or improve functional capabilities of persons with disabilities

Note 1 to entry: This can be acquired commercially off-the-shelf, modified or customized. The term includes technical aids for persons with disabilities. Assistive devices do not eliminate an impairment but may lessen the difficulty a person has in carrying out a task or activity in specific environments.

[SOURCE: CEN-CENELEC Guide 6:2014, 2.16, modified]

3.9

attention pattern

design of Tactile Walking Surface Indicator, calling attention to a hazard only, or to hazards and decision points

Note 1 to entry: Attention patterns can be installed in the vicinity of pedestrian crossings, at-grade kerbs, railway platforms, stairs, ramps, escalators, travellers, elevators, etc.

[SOURCE: ISO 23599:2012, 2.1, modified]

3.10

audio description

verbal narration that conveys the visual description of a presentation or performance

[SOURCE: ISO 21542:2011, 3.7]

3.11**bariatric patients**

patients with large body weight requiring additional space and equipment to enable handling in health care settings

3.12**built environment**

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

[SOURCE: ISO 21542:2011, 3.10, modified]

3.13**changing places toilet**

room or facility with a toilet, hoist, basin, adult-sized changing bench and optional shower, for use by people with complex and multiple impairments who require the help of assistants

[SOURCE: BS 8300-2:2018, 18.6 modified]

3.14**circulation space**

unobstructed space available for people, including persons using mobility devices, to access, move around in, and exit from any part of the built environment

[SOURCE: ISO 21542:2011, 3.11, modified]

3.15**contraflow**

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

[SOURCE: ISO 21542:2011, 3.14]

3.16**disorientation**

permanent or temporary inability of people to orient themselves with regard to space, time and context in either the built environment or virtual environment

Note 1 to entry: Acute disorientation brought on by the use of alcohol, “social” drugs and some medicines, or dramatic alterations in a person's circumstances, e.g. involvement in a fire incident, is not uncommon. Long term progressive disorientation is a symptom of a variety of psychological and/or neurological disorders.

[SOURCE: ISO 21542:2011, 3.15]

3.17**evacuation lift**

lift designed to be used for the evacuation of persons with difficulty in using stairs, in automatic mode or under the direction of building management, trained evacuation assistant or rescue services

[SOURCE: EN 81-76:—²⁾, 3.3]

2) Under preparation. Stage at the time of publication: prEN 81-76:2019.

3.18

fire compartment

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

[SOURCE: ISO 13943:2017, 3.120]

3.19

fire engineering strategy

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

Note 1 to entry: Some “fire safety objectives” may be required by national legislation/regulations.

[SOURCE: ISO 21542:2011, 3.22]

3.20

fire prevention

measures intended to reduce the risk of an outbreak of fire in a building or outdoor built environment

Note 1 to entry: Fire prevention includes such secondary activities as fire research and education of the public concerning fire hazards.

[SOURCE: ISO 21542:2011, 3.23 modified]

3.21

fire resistance

ability of an element of building construction, component or structure, to fulfil for a stated period of time the required stability, integrity, thermal insulation and/or other expected duty specified, in a standard fire resistance test

[SOURCE: ISO 8421-2:1987, 1,24 and ISO 15541:2016, 3.1, modified]

3.22

fire resisting door

door, that is designed to resist the passage of heat, smoke and flame for a specified time during a fire

3.23

footpath

path for the exclusive use of pedestrians and users of mobility devices, which is not adjacent to a carriageway (road)

3.24

footway

part of the highway adjacent to the carriageway (road) on which the pedestrians and users of mobility devices have exclusive access

3.25

functional requirements

type and level of functionality that is required by the widest range of users of a facility

[SOURCE: ISO 15686-10:2010, 3.12, modified]

3.26**going**

⟨stair⟩ horizontal distance between two consecutive nosings, measured on the centre line

[SOURCE: ISO 21542:2011, 3.27]

3.27**going**

⟨ramp⟩ horizontal distance between the start and finish of a flight of a ramp

[SOURCE: ISO 21542:2011, 3.28]

3.28**guiding pattern**

design of tactile walking surface indicators to indicate a route from one place to another

Note 1 to entry: Guiding patterns can be used alone or in combination with attention pattern (3.8).

[SOURCE: ISO 21542:2011, 3.29 modified]

3.29**handrail**

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

[SOURCE: ISO 6707-1:2017, 5.2.73 and ISO 21542:2011, 3.31]

3.30**hearing enhancement system**

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

[SOURCE: ISO 21542:2011, 3.32, modified]

3.31**kerb ramp**

construction, in the form of an inclined plane, that makes it possible to pass from road level to a footway

[SOURCE: ISO 21542:2011, 3.36, modified]

3.32**landing**

level platform, structure at the end of a flight of stairs or a ramp, or at the entrance to a lift car or to a lifting platform

[SOURCE: ISO 6707-1:2017, 3.3.5.23 and ISO 21542:2011, 3.38, modified]

3.33**levelling accuracy****<elevator/ lift installations>**

vertical distance between car sill and landing sill during loading or unloading of the car

[SOURCE: EN 81-20:2020, 3.25]

3.34

lifting platform

device, permanently installed, to serve predefined landings, comprising a guided platform, whose characteristics are primarily intended to permit the access of persons with impaired mobility

[SOURCE: prEN 81-41:2016; 3.19]

3.35

luminance

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

Note 1 to entry: The SI unit for luminance is candela per square metre (cd/m^2).

[SOURCE: ISO 6707-1:2017; 3.7.3.59 and. ISO 21542:2011, 3.43, modified]

3.36

main entrance

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

3.37

moving walk

power-driven installation for the conveyance of persons in which the user carrying surface remains parallel to its direction of motion and is uninterrupted

Note 1 to entry: Moving walks are machines - even when they are out of operation - and should not be used as a fixed access.

[SOURCE: EN 115-1:2017, 3.1.19]

3.38

multiple senses

principle of multiple senses

principle of considering various sensory abilities in design decisions to support and enable users to perceive information (e.g. seeing, hearing, touch))

3.39

nosing

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

[SOURCE: ISO 6707-1:2017, 3.3.5.30 and ISO 21542:2011, 3.46]

3.40

obstacle-free route

link between two or more public areas that can be navigated independently by persons with disabilities and reduced mobility

Note 1 to entry: This term is used in The Railway Interoperability Directive 2008/57/EC] and therefore defined in the TSI PRM standards series (see Clause 20 Transport facilities).

[SOURCE: EN 16587:2017, 3.1, modified]

3.41**pedestrian**

includes a person walking and a person using a wheelchair or other wheeled mobility device that is suitable for use on a footway or footpath

3.42**place of relative safety**

location of comparative safety which includes any place that puts an effective barrier (normally 30 minutes fire resistance) between the person escaping and a fire

3.43**place of safety**

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

[SOURCE: ISO 21542:2011, 3.48]

3.44**ramp**

inclined construction that provides access between two levels

[SOURCE: ISO 6707-1:2017, 3.3.5.33]

3.45**rise**

vertical distance between the horizontal upper surfaces of two consecutive treads, or between a tread and a floor, or a tread and a landing

[SOURCE: ISO 6707-1:2017, 3.7.2.56]

3.46**riser**

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

[SOURCE: ISO 6707-1:2017, 3.3.5.27]

3.47**Shared Space**

street or place designed for pedestrians, cyclists and drivers of motor-operated vehicles to co-use without conventional separation between them

3.48**stopping accuracy**

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

[SOURCE: EN 81-20:2020, 3.58]

3.49

Tactile Walking Surface Indicator

TWSI

standardized walking surface design used to provide information to blind or partially sighted persons

Note 1 to entry: A TWSI has a specific meaning conveyed by the profile design, for instance an attention pattern or a guiding pattern.

[SOURCE: ISO 23599:2012, 2.16, modified]

3.50

tread

horizontal component of a step

3.51

unobstructed width

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

[SOURCE: ISO 21542:2011, 3.60]

3.52

Universal Design

UD

design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design

Note 1 to entry: 'Universal Design' does not exclude the need of assistive devices for particular groups or persons with disabilities where relevant.

Note 2 to entry: Terms such as "Universal Design", "accessible design", "Design for All", "barrier-free design", "inclusive design" and "transgenerational design" are often used interchangeably with the same meaning.

[SOURCE: United Nations Convention on the Rights of Persons with Disabilities, Art. 2 [17], modified — Note 2 to entry has been added]

3.53

usability

extent to which a product, a service and the built environment can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[SOURCE: ISO 9241-11:2018, 3.1 and EN 17161:2019, 3.11]

3.54

user

person who interacts with a system, product, service or environment

[SOURCE: EN 17161:2019, 3.12 and ISO/TR 22411:2008, 3.3, modified]

3.55

visual contrast

perception of a difference, visually, between one surface or element of a building and an adjacent surface or element

3.56**vision impairment****visual impairment**

permanent reduction of visual perception ranging from partial sight/low vision to blindness depending on the residual functional sight

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

3.57**walkability**

extent to which the built environment is friendly to the presence of people who are walking or using a mobility device

3.58**wayfinding**

features in a building or outdoor built environment that facilitate orientation (knowing where you are in an environment) and navigation (planning and following a route from one place to another)

3.59**wheeled mobility device**

wheeled device to enable or assist the mobility of a person

Note 1 to entry: Wheeled mobility devices include manual and electric wheelchairs, mobility scooters, wheeled walkers, rollators, prams, pushchairs and buggies, etc.

Note 2 to entry: Wheelchairs and mobility scooters range in size, weight, and design and require different amounts of space to be used in the built environment. Larger scooters are traditionally used outdoor but may also be used in large public use buildings such as shopping centres, entertainment and leisure complexes, exhibition centres, large museums and so on. The space required will include space to manoeuvre and turn.

Note 3 to entry: It is not intended that wheeled mobility devices will include devices primarily for leisure use such as play scooters, hoverboards, segways.

Note 4 to entry: The type of wheeled mobility devices catered for may be determined by national standards and regulations.

4 Legal and policy background and associated benefits

4.1 European legal background

Accessibility to the built environment is essential for persons with disabilities and older persons to be able to exercise their rights and participate fully in society. In the international and legally binding UN Convention on the Rights of Persons with Disabilities (UNCRPD), accessibility is referred to as one of the general principles (Article 3). In particular, Article 9 addresses, among others, accessibility in the built environment, transportation, and information and communication, making specific reference to the role of standards to achieve its goals. Both the European Union (EU) and all its Member States have ratified the Convention and, as a consequence, need to comply with those requirements.

The Communication COM (2003) 650 "Equal Opportunities for People with Disabilities, a European Action Plan", which aims to achieve a sustainable and operational approach to disability issues in the enlarged Europe, identified as one of the four concrete priorities *"accessibility to the public built environment to improve participation in the work place and integration into the economy and society"*.

The Council RESOLUTION of 15 July 2003 on “Promoting the Employment and Social Integration of People with Disabilities” (2003/C 175/01) requests to *“remove barriers impeding the participation of people with disabilities in social life and, in particular, in working life, and prevent the setting up of new barriers through the promotion of ‘Design for All’”*.

The Communication from the European Commission COM(2010) 636 on an European Disability Strategy 2010-2020: “A Renewed Commitment to a Barrier-Free Europe” states that accessibility is a precondition for participation in society and in the economy and proposes to use legislative and other instruments, such as standardization, to optimize the accessibility of inter alia the built environment.

In addition, Article 19 of the Treaty on the Functioning of the European Union (TFEU) provides for measures against discrimination inter alia on the grounds of disability. The Equal Treatment in Employment Directive (2000/78) makes mandatory the principle of reasonable accommodation for employees with disabilities in employment and training.

According to the Public Procurement Directives (2014/24/EU) *“for all procurement which is intended for use by natural persons, whether general public or staff of the contracting authority or entity, the technical specifications are, except in duly justified cases, to be drawn up so as to take into account accessibility criteria for persons with disabilities or design for all users”*. It is also possible to integrate social considerations and specifically the use of ‘Design for All’ and accessibility requirements in the award criteria of the contract documentation for public bids. Several Member States are already using these possibilities.

Furthermore the European Accessibility Act Directive (2019) 882, on the Accessibility Requirements for Products and Services, contains accessibility requirements for the built environment in its Annex III and indicates that *“Member States may decide, in the light of national conditions, that the built environment used by clients of services covered by this Directive shall comply with the accessibility requirements set out in Annex III, in order to maximize their use by persons with disabilities”*.

4.2 Accessibility and usability, ‘Universal Design’ and ‘Design for All’

The UNCPRD (Article 9) refers to accessibility as a means to enable persons with disabilities to live independently and participate fully in all aspects of life. The convention states that *“States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas.”*

Accessibility and usability for everyone is achieved by considering the diversity of human abilities and their associated functional requirements as a basis of design. In this way, systems and solutions can be developed that suit the needs of diverse users, so all people regardless of their age, size or ability have access to the broadest range of systems and environments.

According to the UNCPRD Article 4 (General obligations), paragraph (f) refers to the obligation *“To undertake or promote research and development of universally designed goods, services, equipment and facilities, as defined in article 2 of the present Convention, which should require the minimum possible adaptation and the least cost to meet the specific needs of a person with disabilities, to promote their availability and use, and to promote ‘Universal Design’ (UD) in the development of standards and guidelines”*. ‘Universal Design’ means the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. As indicated in the UNCPRD *“Universal Design shall not exclude assistive devices for particular groups of persons with disabilities where this is needed”* (Article 2, Definitions).

This document emphasizes not only the importance of access to but also use of the built environment by persons with the widest range of abilities and characteristics.

In the same context, 'Design for All' is an approach to designing, developing and marketing mainstream products, services, systems and environments to be accessible and usable by as wide a range of users as possible. 'Design for All' also implies that mainstream products and services use interfaces which match those of technical aids, so allowing people with disabilities to access and use mainstream equipment.

NOTE The terms "Inclusive Design" and "Barrier-Free" are used in some regions to denote similar concepts related to accessibility in the built environment.

4.3 Mandate 473 and CEN-CENELEC Guide 6

The Standardization Mandate 473 to include 'Design for All' in relevant standardization initiatives issued by the European Commission in 2010 aims at addressing the inclusion of accessibility in the manufacturing process for goods and service provisions following a 'Design for All' approach. The objective of M/473 is to include accessibility following 'Design for All' principles in mainstream standards and provide a mechanism to address accessibility integrating 'Design for All' from the early stages of standard development, to its final publication.

In 2014 the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) adopted Guide 71 of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) as CEN-CENELEC Guide 6:2014.

This is the second edition of the Guide, retitled "Guide for addressing accessibility in standards", builds upon the edition published in 2001, titled "Guidelines for standards developers to address the needs of older persons and persons with disabilities". This edition takes account of developments in thinking and practice which have taken place since 2001 and takes a more inclusive approach.

CEN-CENELEC Guide 6 provides guidance to standards developers on addressing accessibility requirements and recommendations in standards that focus, whether directly or indirectly, on products, services and built environments used by people. CEN-CENELEC Guide 6 has been followed throughout the development of this document.

4.4 Accessibility contributing to safety

Requiring an accessible built environment not only ensures suitable access and comfort for persons with disabilities and a wider range of users but also contributes to their safety by creating an environment where particular consideration is taken to avoid and/or reduce risks.

Designing for safety includes minimizing the risk of making mistakes and reducing the need for excess exertion which may lead to strain or injury.

Poor design, as well as insufficient maintenance, can lead not only to accidents and injuries but as a consequence also to increasing health costs, especially in an ageing society.

4.5 Integrate accessibility at all stages of procurement, design, construction and conformity assessment

In order to achieve an accessible built environment, accessibility will be integrated into each stage throughout the development process. From setting the accessibility requirements in the procurement phase, establishing the business case and undertaking initial 'Feasibility Studies', right through design, construction and post-occupancy assessment, the principles of 'Universal Design' have to be addressed.

To achieve this aim, all stakeholders involved in the built environment, beginning with those who procure new buildings and places, have to take responsibility. An effective way of ensuring the integration of accessibility from the outset is to produce a clear 'Design for All' strategy, demonstrating to the client and all parties involved in the procurement and development, how the 'Universal Design' approach will be implemented throughout each stage of the project.

An 'Access Statement' is a useful tool to demonstrate how the principles of 'Universal Design' have been integrated into a development at each stage. It is a document which grows with the project and is updated as the project progresses. It can also be used to identify how accessibility should be maintained and managed post-completion and post-occupancy; and as a mechanism to assess conformity with the accessibility requirements in the procurement contract (see TR 2 for information on 'Conformity Assessment').

A specialist such as an 'Access Advisor' can facilitate the preparation of an effective 'Design for All' strategy and 'Access Statement' and help to ensure the achievement of good practice in accessibility. Further guidance on the role of 'Access Advisors' is provided in TR 2).

4.6 Accessibility consultation

In publicly funded and used projects it is good practice for authorities to consult and engage with local and non-residents people as the future users of a new development or public space. Such consultation can enable consideration of proposals and design standards, including accessibility requirements, and can enable the local community to influence the proposal, drawing on local experiences and perceptions.

This can be managed with a consultative group representing a wide range of the local community, users and potential users of a development, including the range of people with disabilities. If a specialist 'Access Advisor' is involved, they can help to facilitate this accessibility consultation and ensure the requirements and aspirations of the user representatives are conveyed clearly to the design team. Consultation strategies to enable full participation can consider the accessibility of consultative documents, plans and models and visual aids such as slides and videos; meeting times, venues and links to parking and public transport; informal and formal consultation meetings; and provision of feedback to demonstrate the value placed on engaging with the community. This local consultation may be supplemented by wider engagement with national and regional accessibility organizations.

4.7 Accessibility: Contributing to health and wellbeing

In the context of designing for health and well-being, the 'Universal Design' approach aims to contribute to a better quality of life by improving human performance, health, wellness and social participation. Designing environments that support health and wellness is increasingly important considering the demographic shift towards an aging population, the increasing numbers of people who are obese and those with sedentary lifestyles. Planning strategies and designs that promote for example, the "walkability" and "cyclability/bikeability" of urban areas encourage walking and exercise and reduce reliance on vehicles, therefore reducing air pollution and traffic accidents.

4.8 Accessibility planning as an overall strategic issue

Incorporating the principles of 'Universal Design' in all urban planning strategies³ provides an overall sustainable concept to achieve accessibility in all planning and design stages of new constructions, redevelopment projects, and maintenance.

Urban planning, and the design and redesign of public spaces, pedestrian routes, transport services, and urban furniture, as well as public and private infrastructure, is supported by ongoing collaboration between all the city players. Architects, engineers, planners, 'Access Advisors', and citizen-user representatives will together achieve a more accessible, safe and comfortable user-friendly built environment.

At an early planning stage, the topography of an area and the network of pedestrian routes should be considered to plan accessible routes with lowest gradient as possible. For new building developments, the location of buildings and their entrances within a site, car parking and public transport stops can be planned to enable pedestrian routes to be as accessible as possible.

3) "Public Places Urban Spaces: The Dimensions of Urban Design (Carmona et al 2003)" and see also UN Habitat III: The New Urban Agenda, <http://habitat3.org/the-new-urban-agenda/>

4.9 Accessibility: Economic and social benefit^{4), 5)}

As well as social responsibility, there are wider benefits of implementing increased accessibility. This includes a larger pool of potential staff, members and volunteers; and providing access for all increased diversity of the potential market and therefore has potential monetary benefits.

'Universal Design' can remove barriers to enable persons with disabilities and older people to live as independently as possible. This enables equal opportunities and a society and economy supporting the Social Model of Disability.

Through procurement and construction of accessible buildings and environments persons with disabilities and older people will be empowered to be active and participate in society, thus releasing their vast spending power and contributing to the economy. Businesses that are accessible and usable will not only attract the custom of persons with disabilities and older people but also accompanying family and friends.

4.10 Accessibility and the sustainable built environment⁶⁾

Sustainable development is a fundamental and overarching objective of the EU, enshrined in Article 2 of the Treaty of Lisbon on European Union. It combines economic growth, social cohesion and environmental protection. The UN Convention on the Rights of Persons with Disabilities (UNCRPD) highlights the importance of mainstreaming disability issues as an integral part of sustainable development strategies. The Sustainable Development Goals (SDG) from the United Nations are also applicable in all EU Member States. The Brundtland report (1987) "Our common future" initiated these discussions and development.

The European Consensus on Development, a blueprint for aligning the Union's development policy with the "2030 Global Agenda for Sustainable Development", reiterates the EU's commitment to a human rights-based approach to development, and to promote the rights of persons with disabilities.

Integrating 'Universal Design' in the procurement, design, construction, management and use of the built environment contributes to sustainability, providing buildings and spaces that are accessible and usable for all and adaptable for future use and user requirements. Designing for the whole human life-cycle promotes social inclusion and cohesion. The functionality of an accessible built environment is more flexible, and the infrastructure is more sustainable as there is less need for expensive adaptations at a later stage that may be costly in economic and environmental terms.

4) The value of design fact finder report – Design Council UK 2006;
https://www.designcouncil.org.uk/sites/default/files/asset/document/TheValueOfDesignFactfinder_Design_Council.pdf;

"The value of good design: How building and spaces create economic and social value;
<https://www.designcouncil.org.uk/sites/default/files/asset/document/the-value-of-good-design.pdf>

Social value and Design of the Built environment, 2017:
<http://www.socialvalueuk.org/app/uploads/2017/12/social-value-and-design-of-the-built-environment-v-02-oct-2017.pdf>

5) Employers Forum on Disability Survey, UK (82 % of customers with disabilities in the UK have taken their business to a more accessible competitor)

6) Back to Our Common Future Sustainable Development in the 21st century (SD21) project Summary for policymakers:

https://sustainabledevelopment.un.org/content/documents/UN-DESA_Back_Common_Future_En.pdf

Transforming our world: the 2030 Agenda for Sustainable Development:
<https://sustainabledevelopment.un.org/post2015/transformingourworld/>

Furthermore, the Communication from the Commission COM (2020) 98 on A new Circular Economy Action Plan for a cleaner and more competitive Europe indicates that “*ensuring the accessibility of certain products and services⁷⁾ next to contributing to social inclusion can have the added benefit of increasing product durability and reusability*”.

5 Diversity of users and design considerations

5.1 Diversity of users

The prime objective in designing, constructing and managing the accessible built environment is to ensure that it is accessible and usable for the intended users in an equitable manner. Such an environment can satisfy the needs of any person without compromising those of another. Persons with disabilities and older persons are often excluded from participation because of barriers in the environment design. They need to be considered in all stages of design, construction, management and operation of the built environment.

In order to define design parameters for an accessible and usable built environment it is necessary to consider the diversity of human abilities and characteristics, and consequent accessibility requirements of the intended users of the built environment.

The ‘Universal Design’ approach – The 7 Principles of ‘Universal Design’⁸⁾ - supports the designer in creating solutions that are suitable for the widest range of users, by focusing on seven design principles that should be considered in the design solution: simple and intuitive use, flexibility in use, size and space for approach and use, perceptible information, low physical effort, tolerance for error, and equitable use. Thus, UD acts a useful tool for joining the variety of requirements for human abilities and characteristics to be met through single, unified, ‘Universal Design’ solutions, which benefit the widest range of users to the greatest extent possible. For specific instances where a holistic design solution cannot satisfy the specific requirements of some users, for example persons who may use assistive technologies for mobility or communication, the Design-for-All approach indicates that solutions should also be capable of interfacing with assistive technologies (or similar systems) in order to provide accessible solutions for all potential users.

The abilities and characteristics of people change as they advance from childhood to old age and vary substantially among persons in any particular age group. Activity limitations and participation restrictions can be experienced by all people and can be the result of unsuccessful interaction between persons with impairments or health conditions and barriers such as personal and environmental factors. Health conditions (e.g. circulatory, respiratory, neurological), impairments in body functions and structures and related limitations can be temporary or permanent, visible or not visible, and generally increase with age. It is important to recognize that sensory, physical and cognitive limitations vary from comparatively minor (such as mild hearing loss, mild seeing impairment, mild mobility impairment or mild memory loss) to significant limitations (such as deafness, blindness, paralysis or significant memory loss).

Although some impairments are minor in nature, combinations of impairments can impose significant limitations, as is often the case in ageing. While not all older persons have impairments, the prevalence of disability or limitations is highest among this demographic group. It is also important to recognize that children with disabilities can have specific requirements based on their impairments; in addition to their general needs and preferences that are similar to those of other children, for example related to their stage of cognitive, physical and communication development.

7) Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the Accessibility Requirements for Products and Services, OJ L 151, 7.6.2019, p. 70.

8) The 7 Principles of Universal Design have been developed in 1997 in the North Carolina State University; see Centre for Excellence in Universal Design; <http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/>

Figure 1 illustrates the diversity of users referred to above.

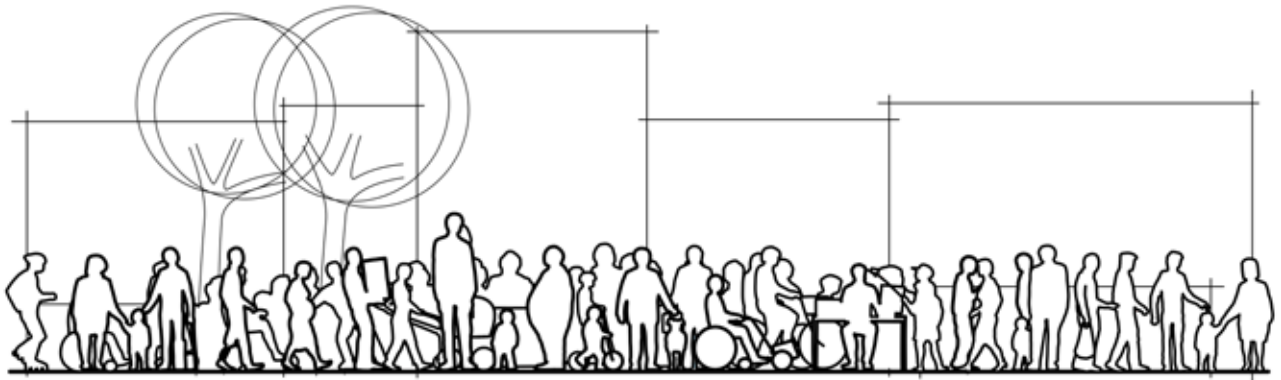


Figure 1 — Abilities and characteristics of people change from childhood to old age and vary substantially among persons

5.2 Human abilities and design parameters

5.2.1 General

CEN-CENELEC Guide 6 describes the diversity of human abilities and characteristics, the associated impairments and limitations along with examples of the relevant design considerations to facilitate accessibility for users. Guide 6 has developed 11 accessibility goals that are based on and similar to ‘The 7 Principles on Universal Design’. Following CEN-CENELEC Guide 6, these are summarized below, also indicating users who especially benefit from these design considerations.

5.2.2 Sensory abilities and characteristics

5.2.2.1 Rationale

Sensory impairments and limitations can range from slight impairment to complete loss of function. In addition, adverse environmental conditions or other situational factors may affect the sensory abilities of all users in a given situation.

5.2.2.2 Design considerations

Design considerations that can facilitate accessibility for persons with reduced sensory functions include, for example:

a) Seeing functions:

- multiple means of information presentation using audible, tactile and visual (text and / or pictures) formats;
- tactile controls as people with impaired vision, especially those who are totally blind, have difficulty using touch screen control pads without tactile features;
- appropriate size, visual contrast, form, luminance, lighting and viewing distance in relation to context of use;
- avoidance of glare, use of solar shading products (e.g. blinds, curtains etc.) to control daylight;
- visual contrast to draw attention to steps and potentially dangerous places;

- Tactile Walking Surface Indicators (TWSI) that draw attention to stairs, platform edges and pedestrian crossings;
- traffic lights equipped with acoustic signals to indicate when pedestrians can cross streets safely;
- accommodation of, and compatibility with, relevant assistive products and assistive technology.

b) Hearing functions:

- multiple means of information presentation such as visual (text and / or pictures) or tactile to supplement or substitute for auditory information;
- wide enough circulation spaces to allow persons to use sign language;
- volume of background music/visual media kept below conversion level;
- an acoustic environment that reduces background sounds and promotes sound that is important to be heard, for instance through choice of ceiling, wall and floor surfaces;
- assistive listening devices or communication systems such as induction loops, infrared or radio systems; clearly signed where available.

c) Touch functions:

- avoidance of sharp surfaces and edges and extremely hot/cold surfaces that will be an increased risk to persons with reduced touch function;
- multiple means of information presentation such as visual and / or auditory information to supplement or substitute for tactile information;
- alerting persons about the presence of, for instance, dangerous chemicals they would otherwise smell.

d) Taste functions and smell functions:

- multiple means of information presentation to supplement or substitute for information gained by taste and smell functions;
- visual and auditory signals to alert persons to the presence of smoke or dangerous chemicals.

Persons that benefit from the above design considerations include, for example:

- persons who are blind or permanently partially sighted, persons who are colour blind, persons with a temporary vision impairment due to, for example, migraines, injury, vertigo, or forgotten spectacles;
- persons in dark or smoke-filled environments due to, for example, power cuts, fire or accidents;
- persons who are deaf or have hearing impairment;
- persons in noisy environments;
- persons with impaired touch functions;
- persons with impairments or limitations of taste and smell functions;

- older persons with decreased sensory functions;
- persons whose first language may not be of the country they are in.

5.2.3 Immunological system functions: Allergies and hypersensitivity

5.2.3.1 Rationale

Impairments and limitations in the immunological system can range from mild or annoying to life-threatening reactions. Adverse environmental conditions can also lead to similar reactions in persons without specific immunological conditions.

5.2.3.2 Design considerations

Design considerations that can facilitate accessibility for persons with immunological system impairments and limitations include, for example:

- use of materials, finishes and plants that do not cause allergic reactions and avoidance of those that do;
- ventilation systems that filter out respiratory allergens;
- avoidance of dust-collecting surfaces and furnishings in public areas;
- availability of “allergy-free” areas such as smoke-free and allergy-free rooms in hotels, and animal-free areas in public transport facilities.

Persons that benefit from the above design considerations include, for example persons:

- who have allergic reactions or hypersensitivities to substances related to either contact, food or respiration;
- carrying out activities in indoor environments, with exposure to poor indoor climate conditions;
- exposed to adverse conditions affecting respiration e.g. smoke, or noxious gases due to accidents.

5.2.4 Physical abilities and characteristics

5.2.4.1 Rationale

Physical impairments and limitations can range from slight impairment to complete loss of function. In addition, adverse environmental conditions or other situational factors may affect the physical abilities of all users in a given situation.

5.2.4.2 Design considerations

Design considerations that can facilitate accessibility for persons with reduced physical functions include, for example:

- a) Body size; upper and lower body movement: manoeuvring and reaching, dexterity and manipulation; strength and endurance:
 - clear and logical layout; key rooms, facilities or spaces designed so they are easy to find, for example reception desk visible from the entrance;
 - simple, intuitive design of circulation and evacuation routes;
 - adequate space for moving, manoeuvring and turning wheeled mobility devices through 90, 180 and 360 degrees, as appropriate, with or without assistance;

- provision of passing places where routes are narrow, for example for two persons using wheelchairs being able to pass each other in opposite directions;
- frontal and lateral space for reaching objects or activating controls and switches for persons of different stature and seated persons;
- knee space under desks, tables, counters and washbasins for seated persons;
- provision of clear lines of sight and visual indicators on glazing at different eye levels for persons of different stature and seated persons;
- provision of dual height counters, displays and controls for persons of different stature and seated persons;
- avoidance of sudden changes in surface level, obstacles, bumps or protrusions and excessive and poor positioning of street furniture;
- adequate height for head clearance including control and maintenance of overhanging trees and shrubs;
- adequate space, for example in rest areas space adjacent to seats, for persons using a wheeled mobility device, pushchair or a person with an assistance dog;
- step-free accessible routes and/or ramps with gentle slopes requiring low effort;
- rest areas with seating provided at regular intervals;
- minimal operating force required, for instance to open doors;
- door handles and locks, windows and light controls etc. that are easy to operate, including with one hand, a closed fist, or an elbow;
- handrails and grabrails for support that are easy to grip, placed on both sides of ramps, stairs, toilets etc. for persons with reduced function or strength to one side;
- grip sizes for handrails, door handles and grab rails that accommodate variations in user sizes and shapes;
- non-slippery surface that aids gripping and manipulating for persons with limited dexterity.

b) Voice and speech functions:

- provision of alternative means to use of interactive voice systems and intercom systems, such as real-time text.

Persons that benefit from the above design considerations include, for example:

- persons with walking difficulties, using crutches, persons using prostheses persons with injuries, pregnant women;
- persons using wheeled mobility devices, parents with pushchairs, persons with wheeled luggage etc.;
- persons who may be distracted while walking when using a device;
- persons with reduced dexterity, strength, stamina, or balance problems including small children and older persons;
- persons with temporarily reduced dexterity due to injury. e.g. cut a finger or twisted wrist;

- persons who are short, tall, or obese, persons carrying large objects or holding an umbrella;
- persons needing space for assistive products, assistance dogs or mobility devices;
- persons with impaired voice and speech function.

5.2.5 Cognitive abilities

5.2.5.1 Rationale

Cognition and related cognitive impairments are complex and dependent on a number of mental functions including: global mental functions such as intellect, consciousness, energy and motivation; specific mental functions, such as perception, attention, memory, learning, reasoning, decision making; affective (emotional) functions. Adverse environmental conditions, such as high levels of environmental stimuli (e.g. flashing lights, crowds of persons), can overwhelm or confuse persons and reduce cognitive function.

5.2.5.2 Design considerations

Design considerations that can facilitate accessibility for persons with various cognitive abilities or impairments include, for example:

- clear and logical layout; key rooms, facilities or spaces designed so they are easy to find, for example reception desk visible from the entrance;
- simple, intuitive design of circulation and evacuation routes;
- architectural features that convey the activity of spaces;
- doors and controls designed so that their operation is intuitive, for example whether they are push, pull or sliding doors;
- signs that use plain language and universally recognizable pictograms and symbols, placed where there is a choice of direction;
- wayfinding cues that are easy to follow, e.g. tactile, graphic, audible, sensory such as smell with plants and planting or architectural;
- availability of quiet areas, regular access to daylight, fresh air from outside and nature, and minimal clutter to promote mental health and well-being.

Persons that benefit from the above design considerations include, for example:

- persons with learning difficulties, problems understanding, processing or using information;
- persons on the autism spectrum;
- person with dementia;
- persons with short term memory loss;
- persons with dyslexia;
- persons with temporary reduced cognitive ability due to illness or extreme tiredness;
- persons lacking in concentration;
- persons who do not understand the local language, and people who are first time users of a very complex, busy environment.

5.3 Key areas for accessibility and usability of the built environment

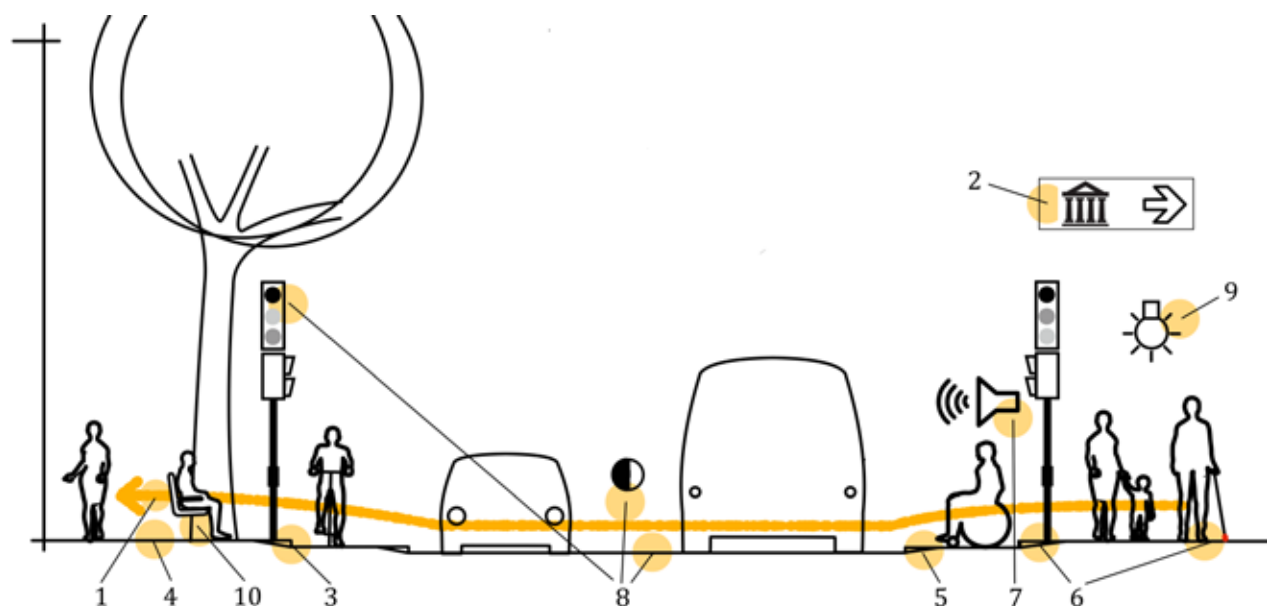
5.3.1 General

Functional requirements for accessibility and usability apply to the design of many key areas of the built environment. To give an overview, design considerations that are often included are presented here, with examples according to context. The context may involve moving around in pedestrian areas, approaching buildings, using entrances, circulating horizontally and vertically, using rooms, using equipment, using sanitary rooms, evacuating in case of emergency, or of accessing information.

5.3.2 Accessible and usable pedestrian areas

Main design considerations may include separate pedestrian and vehicular areas, good wayfinding signage, step-free accessible routes, pedestrian crossings, audible and tactile guidance, good visual contrast and lighting, resting places at intervals.

See Figure 2 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

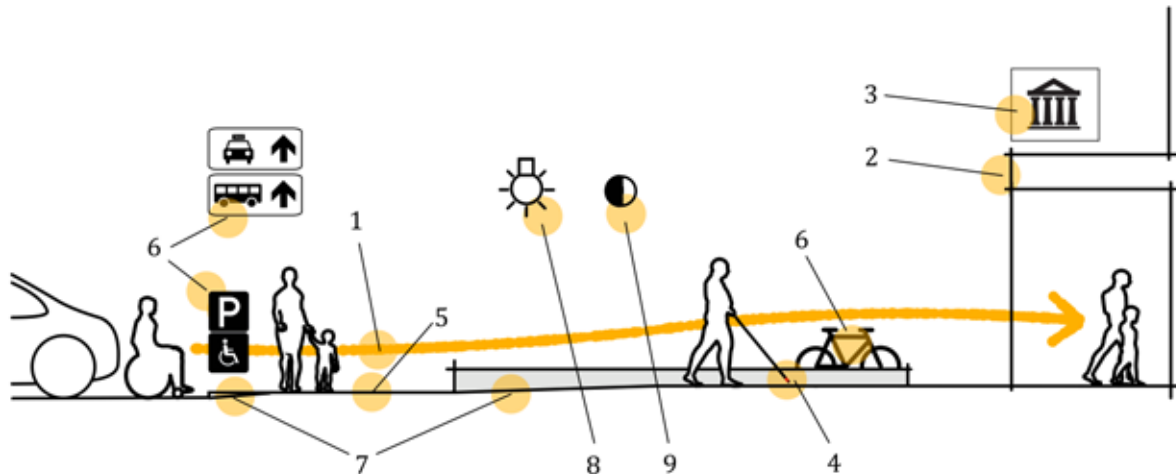
- 1 accessible route in pedestrian area and road crossing
- 2 good wayfinding signage, e.g. signs with clearly legible text and numbers, directional wayfinding signage
- 3 separate pedestrian, cycling and vehicular areas, e.g. kerbs, guarding or tactile surfaces
- 4 even, firm and slip-resistant surfaces
- 5 step-free accessible routes and pedestrian crossings, e.g. kerb ramps
- 6 tactile guidance, e.g. guidance and warning surfaces, tactile signals at crossings
- 7 audible guidance, e.g. audible signals at pedestrian crossings
- 8 good visual contrast, e.g. white markings on dark road surface, high lighting levels in traffic lights
- 9 good lighting, e.g. lighting on footways and crossings
- 10 resting places at regular intervals along pedestrian areas

Figure 2 — Examples of main design considerations for accessible and usable pedestrian areas

5.3.3 Accessible and usable approach to a building

Main design considerations may include easy to locate entrance, good signage, clear pedestrian routes separate from vehicles and cyclists, short distances from parking and public transport, designated parking, no steps or obstacles, good lighting and good visual contrast.

See Figure 3 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

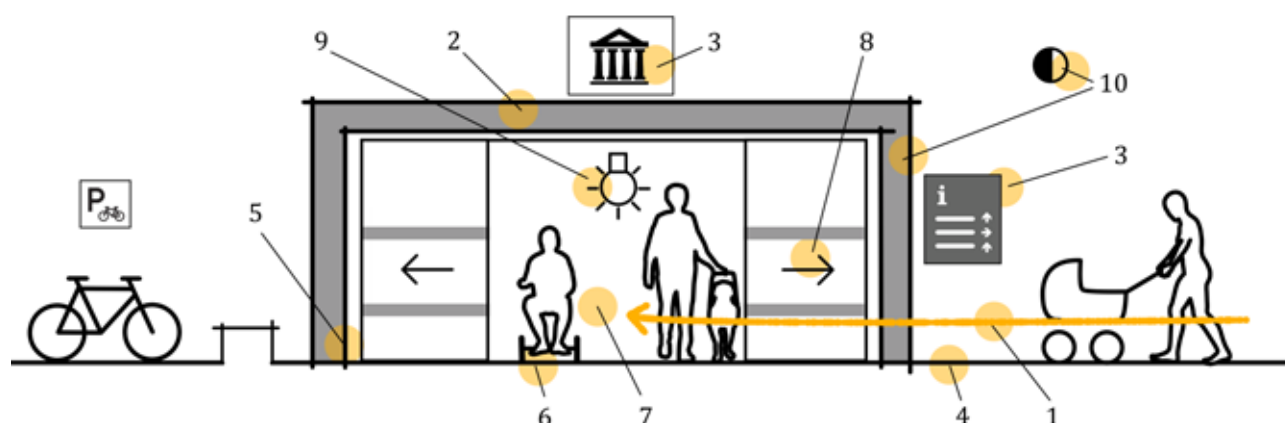
- 1 accessible route for approach to building
- 2 easy to locate, e.g. entrance visible from approach route
- 3 good wayfinding signage, use of fonts and symbols clearly legible at a distance
- 4 clear pedestrian routes separate from vehicles and cyclists, e.g. separation by kerb or architectural features
- 5 even, firm and slip-resistant surfaces
- 6 short distances from parking to entrances, e.g. designated parking places for cars, vans and bicycles
- 7 no steps or obstacles, e.g. level access or use of ramps
- 8 good lighting, e.g. highlighting of main routes, non-glare
- 9 good visual contrast, e.g. visual contrast between path and adjacent area, signage with good contrast

Figure 3 — Examples of main design considerations for accessible and usable approach to a building

5.3.4 Accessible and usable entrances

Main design considerations may include easy to locate entrances, good signage, no steps or obstacles, adequate manoeuvring space in front of doors, wide openings, easy to operate doors, tactile marking of doors, good lighting and good visual contrast.

See Figure 4 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

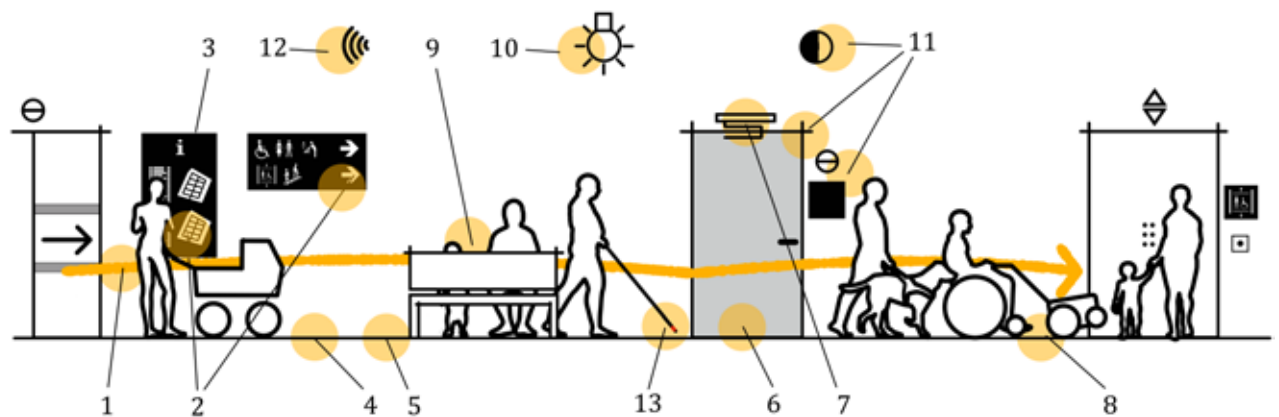
- 1 accessible route to entrances and exits
- 2 easy to locate, e.g. directly visible from approach route, architectural features enhancing entrance
- 3 good wayfinding signage, e.g. directional guidance towards entrances
- 4 no steps or obstacles, level or ramped routes available
- 5 tactile marking of doors, e.g. architectural features, tactile walking surfaces
- 6 adequate manoeuvring space in front of doors, e.g. turning space for users of wheeled mobility devices
- 7 wide openings, e.g. doors with space for larger wheeled mobility devices
- 8 easy to operate doors, e.g. self-opening or requiring low force
- 9 good lighting, e.g. enhanced lighting on entrances
- 10 good visual contrast, e.g. entrance doors contrasting to adjacent wall

Figure 4 — Examples of main design considerations for accessible and usable entrances

5.3.5 Accessible and usable routes in horizontal circulation

Main design considerations may include good signage, clear layout, no steps and obstacles, wide openings, easy to operate doors, adequate manoeuvring space in front of doors, resting places, good lighting and good visual contrast and a concept for a tactile orientation through the building.

See Figure 5 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

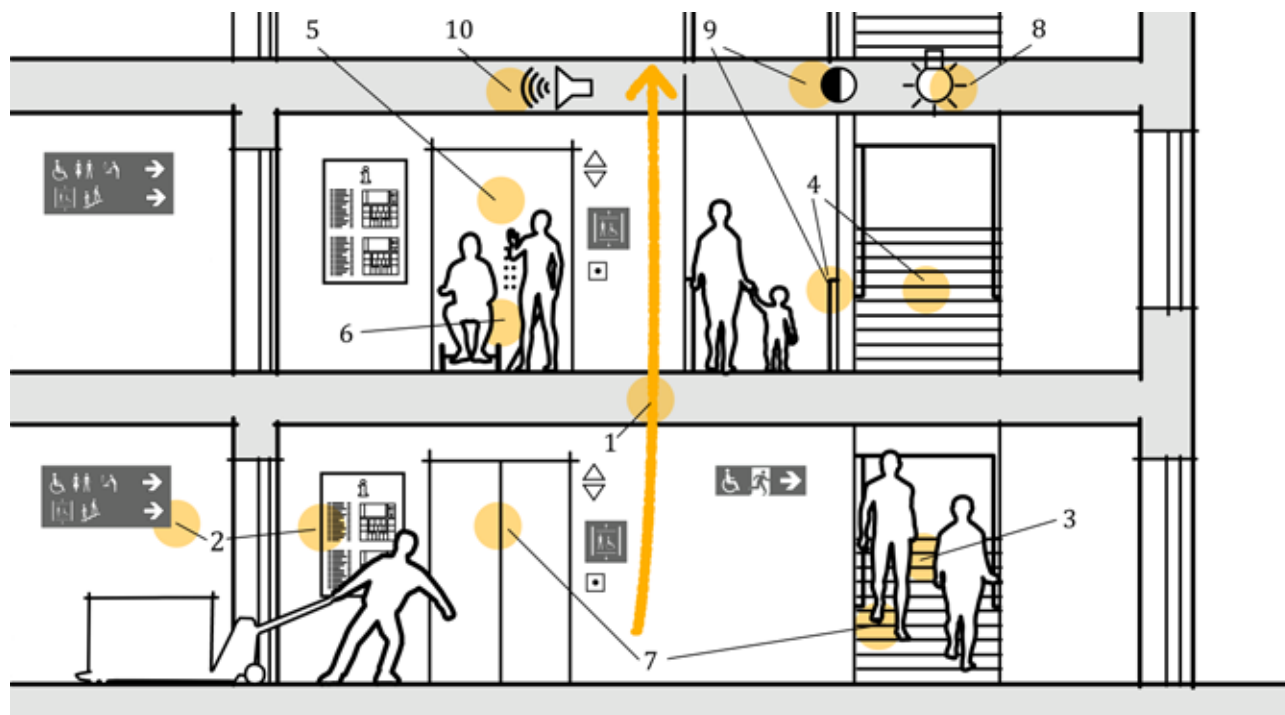
- 1 accessible route on floors with horizontal circulation
- 2 good wayfinding signage, e.g. directional information signs
- 3 clear layout, e.g. simple layout, low number of options on change of direction
- 4 no steps or obstacles, e.g. level or ramped routes available
- 5 slip-resistant surfaces
- 6 wide openings, e.g. door widths and corridors accommodating larger wheeled mobility devices
- 7 easy to operate doors, e.g. automatic opening or adjusted to low closing force
- 8 adequate manoeuvring space in front of doors, e.g. 180° turn possible in larger wheeled mobility devices
- 9 resting places, e.g. seating available at regular intervals
- 10 good lighting, e.g. good daylight and artificial lighting, directional guidance along routes
- 11 good visual contrast, e.g. between walls, floors and doors
- 12 good acoustics, e.g. adequate speech transmission
- 13 tactile guidance through building, e.g. use of walls, tactile information and tactile controls

Figure 5 — Examples of main design considerations for accessible and usable routes in horizontal circulation

5.3.6 Accessible and usable routes in vertical circulation

Main design considerations may include easy to locate, good signage, safe stairs, spacious lifts with easy operation, good lighting and good visual contrast.

See Figure 6 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



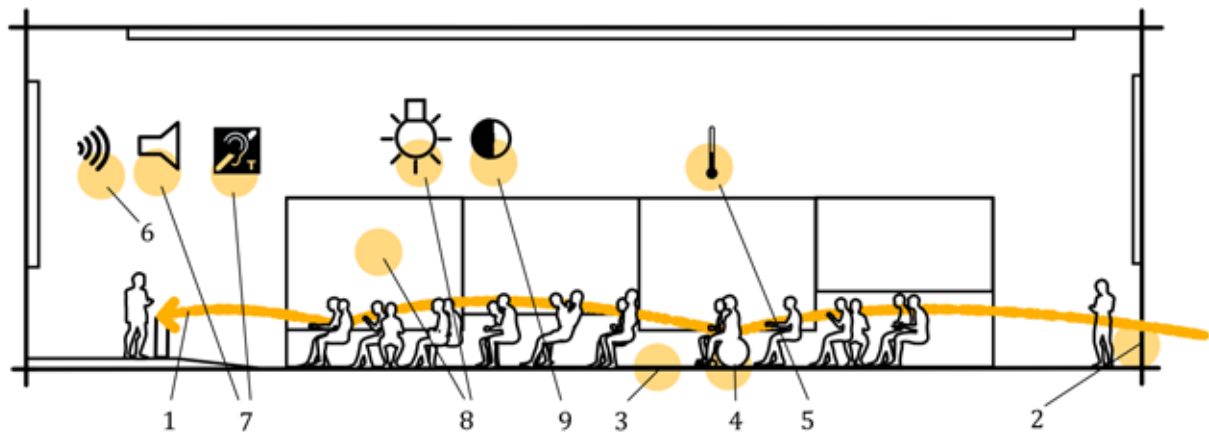
Key

- 1 accessible route, e.g. lifts for vertical circulation
- 2 good wayfinding signage
- 3 adequate width of the stair
- 4 safe stairs, e.g. rise and going of appropriate size, handrails located correctly
- 5 easy to operate, e.g. controls at a height suitable for seated and standing people, audible feedback, tactile buttons, hearing enhancement systems
- 6 spacious lifts, e.g. room for wheeled mobility devices, ambulance stretchers
- 7 easy to locate, e.g. obvious placement of stairs and lifts in circulations routes
- 8 good lighting, e.g. higher lighting levels on stairs, ramps and entrances to lifts
- 9 good visual contrast, e.g. step nosings, handrails and lift controls clearly distinguishable from background
- 10 good acoustics, e.g. adequate speech transmission

Figure 6 — Examples of main design considerations for accessible and usable routes in vertical circulation

5.3.7 Accessible and usable rooms

Main design considerations may include adequate circulation space, different seating options, a good indoor climate, good acoustics and hearing enhancement systems, good lighting and good visual contrast. See Figure 7 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

- 1 accessible route in room
- 2 adequate door widths, space for users of wheeled mobility devices
- 3 adequate circulation space, e.g. manoeuvring space for walking aids, wheeled mobility devices
- 4 different seating options for people using wheeled mobility devices, e.g. among fixed seating, together with accompanying persons
- 5 good indoor climate, e.g. temperature, humidity and air quality
- 6 good acoustics, e.g. low noise levels, good speech intelligibility
- 7 good sound and hearing enhancement systems in relevant rooms
- 8 good lighting, e.g. good daylight, adequate artificial lighting
- 9 good visual contrast, e.g. differences between walls, floors and doors

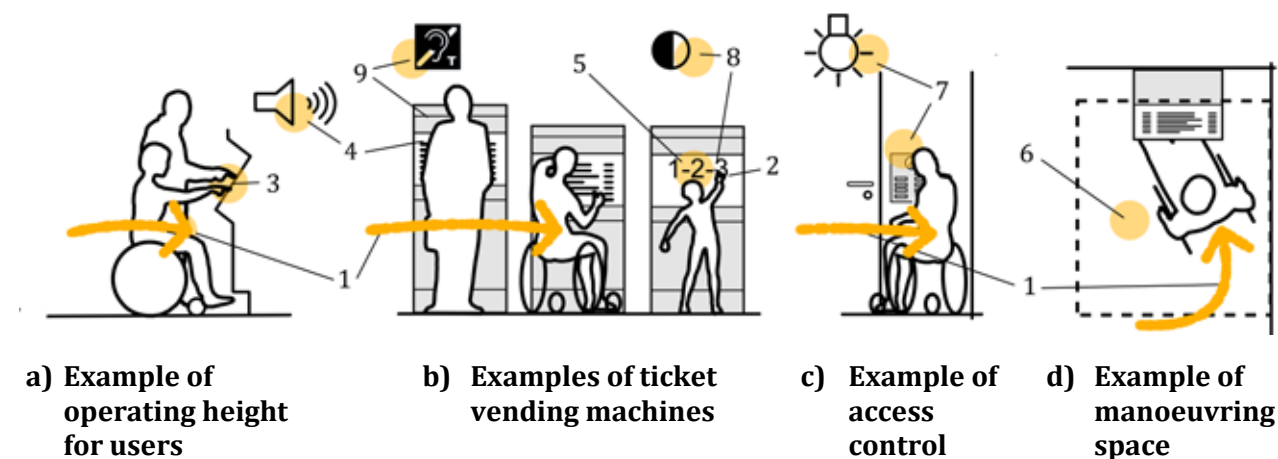
Figure 7 — Examples of main design considerations for accessible and usable rooms

5.3.8 Accessible and usable equipment and facilities

Main design considerations may include easy to understand and operate, adequate manoeuvring space and operating height, information via multiple senses and tactile operating controls.

NOTE People with impaired vision, especially those who are totally blind, have difficulties to use touch screen control pads without tactile features. Consider also EN 301549.

See Figure 8 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

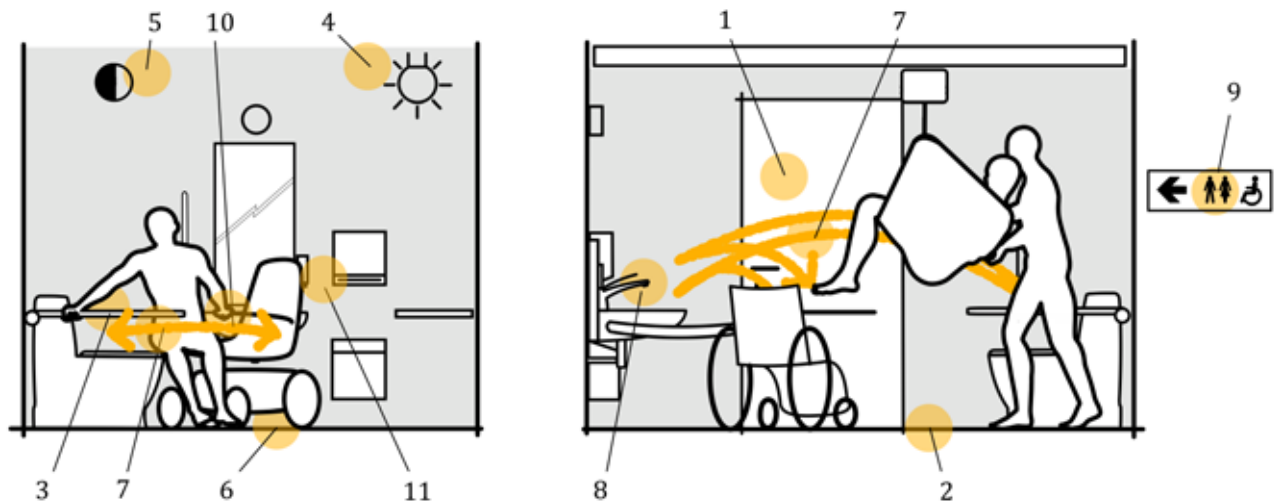
- 1 accessible route to equipment, e.g. ATM, ticket vending machine, access control
- 2 easy to understand and operate, e.g. simplified controls and user interface
- 3 adequate operating height, e.g. usable for children, seated persons, tall adults
- 4 information via multiple senses, e.g. audible, tactile, visual
- 5 clearly legible text, e.g. including raised letters, braille, good visual contrast, multiple language options
- 6 manoeuvring space for people using wheeled mobility devices
- 7 good lighting, e.g. lighting on access control interfaces
- 8 good visual contrast, e.g. non-reflecting screens, controls contrasting with background, shielded from direct sunlight
- 9 assistive hearing systems, e.g. call points and phones

Figure 8 — Examples of main design considerations for accessible and usable equipment and facilities

5.3.9 Accessible and usable toilets and sanitary facilities

Main design considerations may include good signage, adequate manoeuvring and transfer space, slip-resistance, good transfer options, usable equipment, easy operation, good lighting and visual contrast. Consider also the load-bearing capacities of the structures where accessibility devices have to be installed.

See Figure 9 a) and b) for a selection of contextual examples and refer to the relevant clauses of this document for more details.



a) Toilet for independent use

b) Changing places type sanitary room

Key

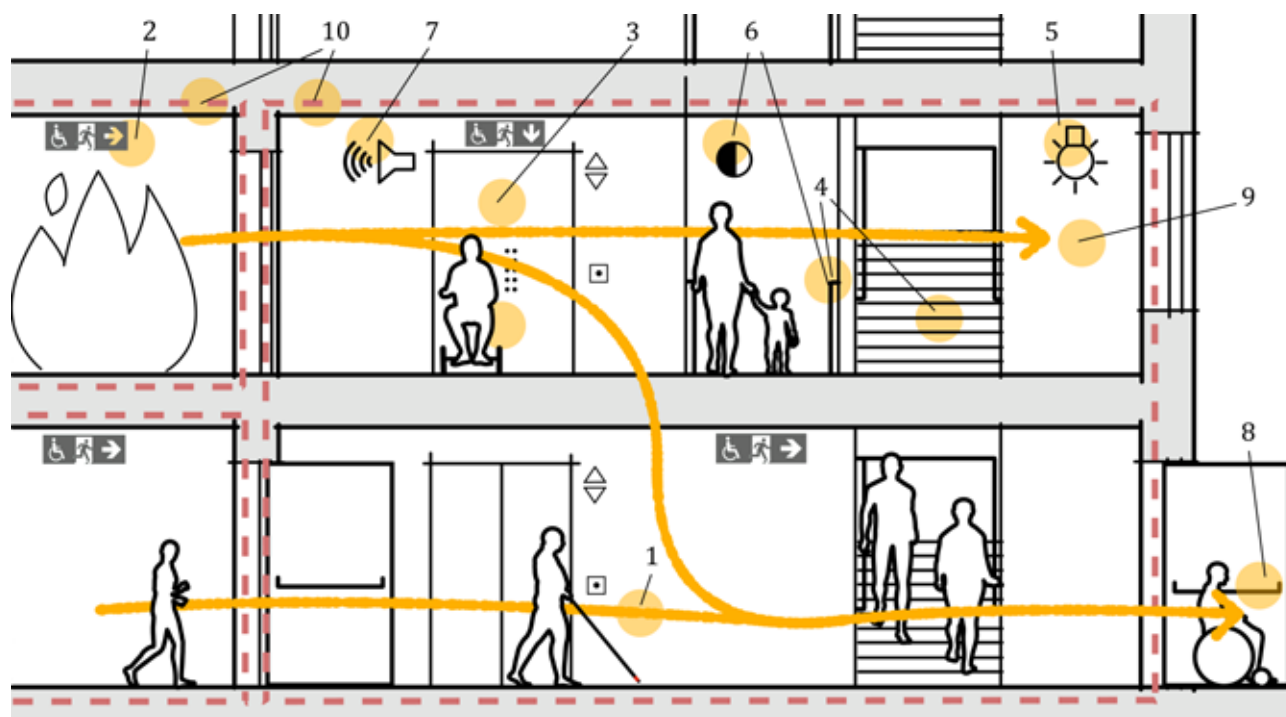
- 1 wide door openings, e.g. accommodating users of larger wheeled mobility devices
- 2 slip-resistant floors
- 3 usable equipment, e.g. grab rails, knee and toe space under wash basin
- 4 good lighting, e.g. general lighting and lighting around mirrors
- 5 good visual contrast, e.g. equipment in room visually contrasting with walls
- 6 adequate manoeuvring space, e.g. in front of door, inside room and on one or both sides of toilet
- 7 good transfer options, e.g. frontal, oblique and sideways transfer possible from a wheeled mobility device using handrails, or, for changing places facilities a hoist.
- 8 easy operation, e.g. door handle, door lock, tap, flush buttons and amenities operable with a closed fist
- 9 good signage, e.g. using directional wayfinding signage, standardized symbols, tactile and with good visual contrast
- 10 washbasin accessible from seated position on WC
- 11 adequate heights of sanitary equipment and controls

Figure 9 — Examples of main design considerations for accessible and usable toilets and sanitary facilities

5.3.10 Accessible and usable exits and evacuation routes, concepts for emergency planning/fire evacuation for all

Main design considerations may include accessible evacuation routes, no steps and obstacles, good signage, fire protected lifts, firefighters lifts or evacuation lifts, or more than one horizontally located safe fire compartment in the building, good lighting, good visual contrast, areas of rescue assistance, good fire safety, protection and evacuation.

See Figure 10 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

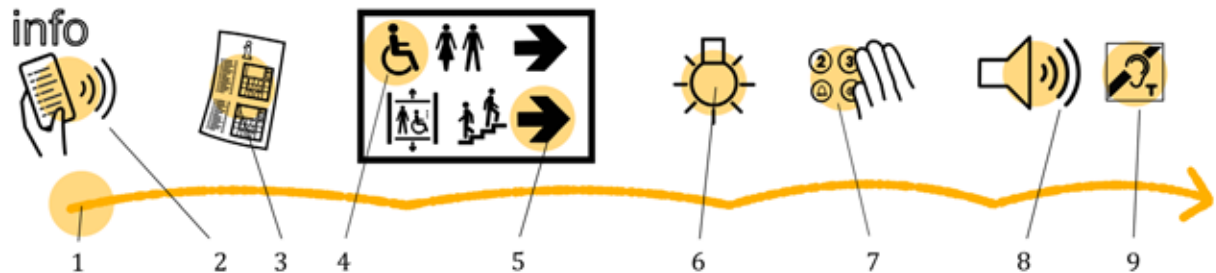
- 1 accessible emergency evacuation route, e.g. no steps and obstacles
- 2 good wayfinding signage, e.g. directional guidance to step-free evacuation
- 3 fire protected lifts, e.g. firefighters lifts or evacuation lifts allowing independent operation by evacuating persons
- 4 safe stairs, e.g. handrails continuous over landings, consistent dimensions of steps and goings
- 5 good lighting, e.g. visual alarms, directional lighting along evacuation routes
- 6 good visual contrast, e.g. contrast of handrails to background, high contrast emergency signage
- 7 audible alarms and information
- 8 easy to operate doors and equipment in evacuation routes
- 9 area of rescue assistance
- 10 separate fire compartments

Figure 10 — Examples of main design considerations for accessible and usable exit and evacuation routes; concepts for fire evacuation for all

5.3.11 Accessible and usable information via multiple senses

Main design considerations may include accessible web pages, apps, print, audible and tactile formats, signage with standardized symbols, good visual contrast and lighting.

See also Figure 11 for a selection of contextual examples and refer to the relevant clauses of this document for more details.



Key

- 1 accessible route
- 2 accessible formats, e.g. accessible web pages, apps
- 3 large print, e.g. information available in large print upon request
- 4 good signage, e.g. clearly legible fonts and symbols with good visual contrast
- 5 use of standardized symbols, e.g. ISO pictograms
- 6 good lighting, e.g. adequately lit signage
- 7 tactile formats, e.g. raised letters, Braille, tactile warning systems
- 8 audible formats, e.g. text-to-speech, audible warning signals
- 9 audible information through induction loop

Figure 11 — Examples of main design considerations for accessible and usable information via multiple senses

6 Wayfinding

6.1 Wayfinding, orientation and navigation

6.1.1 Rationale

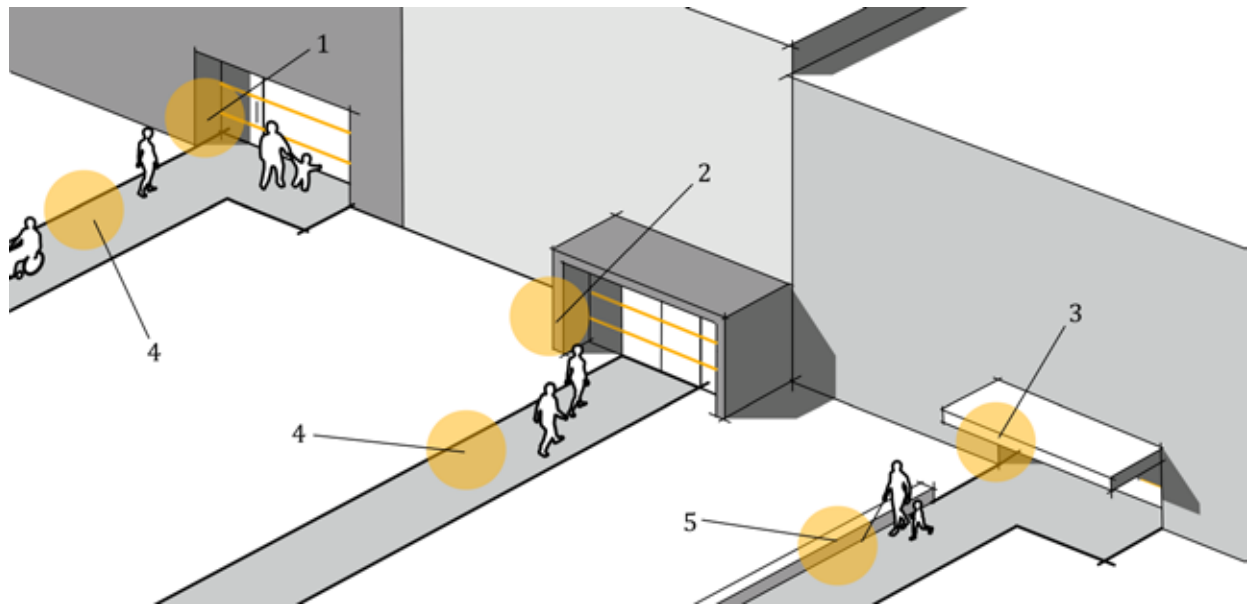
Wayfinding describes a system whereby appropriate information is provided to assist a person to pass through the built environment towards a specific destination. Wayfinding relates to features of the built environment that help with orientation (knowing where you are in an environment, your position and direction) and navigation (planning and following a route and avoiding obstacles along the route). This will include buildings and outdoor spaces with well-planned layouts and logical routes and the provision of wayfinding cues such as the location of landmarks and distinctive acoustics, materials, light conditions, and colour of spaces and routes which help to facilitate orientation.

6.1.2 General

The built environment shall be designed, constructed and managed to facilitate wayfinding, orientation and navigation. Appropriate measures may include some or all of the following, which are described in more detail in the rest of Clause 6:

- well-planned logical layouts which promote key elements such as entrances, receptions, sanitary facilities, etc.,
- good lighting conditions with additional illumination at decision points such as accessible routes, entrances, staircases, lifts, etc.,
- clear information, provided in a range of formats using the senses sight, hearing, touch and, where appropriate, smell, to be accessible to people with sensory impairments using the principle of multiple senses,
- use of visual contrast,
- use of tactile guidance or Tactile Walking Surface Indicators (TWSI),
- colour coded routes,
- appropriate provision of wayfinding signages,
- avoiding surfaces which might make orientation more difficult,
- architectural and urban design features to differentiate spaces and provide landmarks.

See also Figure 12.



Key

- 1 recessed entrance as visual and tactile marking of door
- 2 porch as visual and tactile marking of entrance
- 3 canopy as visual marking of entrance, recessed part as tactile clue
- 4 tactile edge and visual contrast as guidance towards entrance door
- 5 wall as tactile guidance element towards entrance

Figure 12 — Examples of architectural features to facilitate locating entrances

6.2 Wayfinding information

6.2.1 Rationale

Information that is clear, concise, accurate and timely is an essential part of a wayfinding system. Clarity of information can be defined as information that is legible and easily understood. Clarity of information therefore presupposes that people are able to distinguish between the different types of information that they receive.

Information can be divided into four levels:

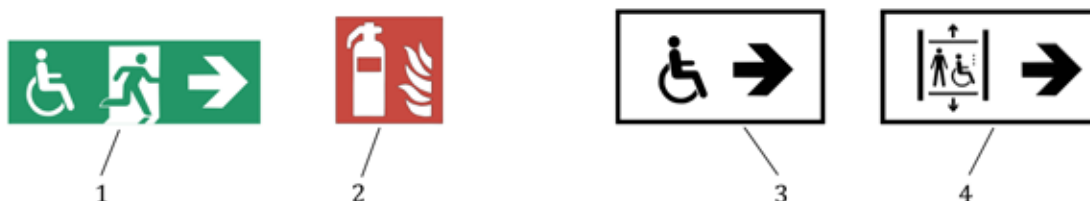
- level 1: safety information such as evacuation routes;
- level 2: directional and location information for wayfinding;
- level 3: general and instructional information such as opening hours and how to use;
- level 4: advertising information (not further presented in this document).

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

6.2.2 General

The following requirements apply:

- a) Wayfinding information shall be easy to find and perceive, clear, concise, accurate and timely.
- b) The provision of safety information shall be the highest priority with respect to their perception, followed by information for wayfinding, then general and instructional information. These shall stand out from advertising information. See Figure 13 a) and b). Furthermore, the related safety information, signage used in Figure 13, needs to be aligned with the respective standard ISO 7010 “Graphical symbols – Safety colours and safety signs – Registered safety signs”.



a) Examples of safety information signage

b) Examples of wayfinding information signage

Key

- 1 accessible evacuation route combination signage
- 2 fire extinguisher signage
- 3 accessible route or accessible toilet signage
- 4 accessible lift signage

Figure 13 — Examples of safety and wayfinding signage

- c) Information shall be easy to understand, avoiding ambiguous terms.
- d) Where information is repeated along a route the message and terminology shall be consistent.
- e) Information should be complete but concise. Too much information is difficult for people to retain.
- f) To be accessible for all, information shall be provided through alternative formats, such as audible, visual or tactile using the principle of multiple senses.
- g) Recognizable symbols, icons and pictograms should be used along with text.

6.3 Visual contrast

6.3.1 Rationale

Appropriate use of visual contrast between adjacent surfaces, between key features and the background, and on glazing, assists all users, including partially sighted persons, to move around safely and identify features.

Some people are unable to perceive some or all colours. Most people, including partially sighted persons, can perceive light and dark, and this may be used to achieve visual contrast.

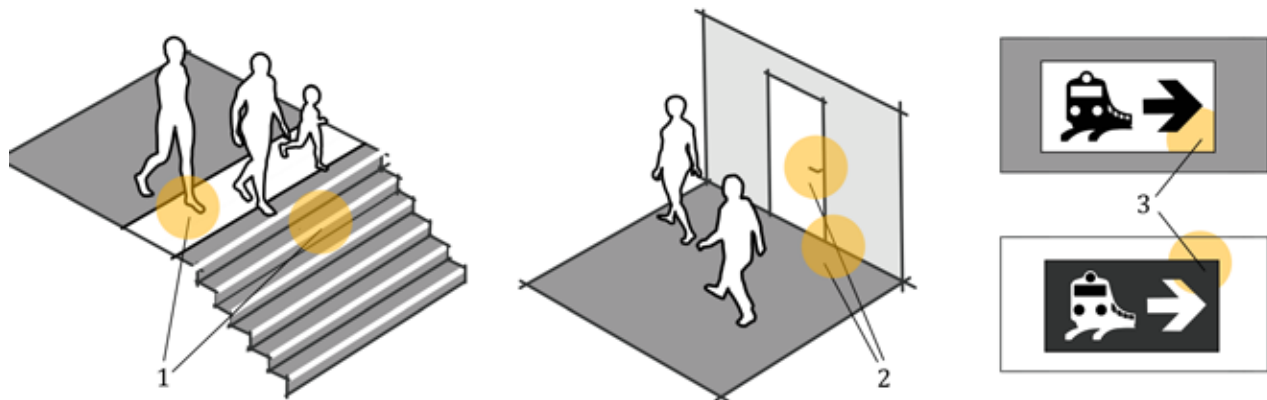
The perception of visual contrast is affected by the quality of light (e.g. daylight and artificial lighting).

6.3.2 General

Different levels of visual contrast shall be provided to support users' information and wayfinding needs:

- a) Moderate visual contrast to facilitate orientation and navigation:
 - between large surface areas (floor, walls, ceilings and doors);
 - between doors and door frames (including entrances which cannot be easily identified);
 - on door hardware (i.e. the elements and components to facilitate opening and closing doors);
 - between a handrail and the adjacent background, e.g. a wall;
 - on fixtures and fittings in sanitary facilities.
- b) High visual contrast to highlight potential hazards and safety issues, such as:
 - to indicate potential hazards (e.g. unavoidable free-standing posts or columns within accessible routes);
 - on glazed (glass) walls, fully glazed doors and any free-standing edges of glazed screens;
 - on the nosing of steps;
 - between the surface of an escalator and its approach.
- c) High visual contrast to facilitate reading of signs, information and instructions:
 - on text and symbol information on signs;
 - on name plates for doors;
 - on characters on small controls and operating mechanisms.

See also Figure 14 a), b) and c) for example use of visual contrast.



- a) Example of high visual contrast b) Example of moderate visual contrast c) Examples of high visual contrast in signage

Key

- 1 high visual contrast light on dark marking for hazards, e.g. stairs
- 2 moderate visual contrast between floor, lighter wall, darker door frame and door for orientation purposes
- 3 legible signs with dark signboards on light walls, light signboards on dark walls, very dark pictograms on light background, or opposite.

NOTE Asphalt can appear lighter over time and visual contrast may be reduced. Starting with a very high visual contrast will enable visual contrast to be maintained for longer.

Figure 14 — Example use of visual contrast for safety marking, orientation and legibility

6.3.3 Achieving and maintaining visual contrast

The following requirements and recommendation apply:

- a) An appropriate level of visual contrast shall be achieved and maintained throughout the life of the building elements.
- b) A higher level of visual contrast shall be provided and maintained:

- in safety situations, e.g. railway platform, and step nosing;
- to highlight small items such as text, characters and symbols on signs, particularly for characters on small control buttons and operating mechanisms, these shall have a very clear high visual contrast;

NOTE 1 Light characters on a dark background or dark characters on light background have a very clear high visual contrast.

- where the level of illumination is low.

- c) Visually contrasting floor patterns that resemble steps or holes, and overly decorative patterns that can be disorientating should be avoided.

NOTE 2 In the outdoor environment, weathering and variations in lighting levels (e.g. in strong sunlight or artificially lit after dark) can impact the visual contrast.

6.3.4 Lighting and wayfinding

The following requirements apply:

- a) Lighting shall be adequate for the nature and activity of spaces.
- b) Lighting shall highlight the main route to follow (as people tend to follow light).

6.3.5 Visual indicators on glazing

6.3.5.1 Rationale

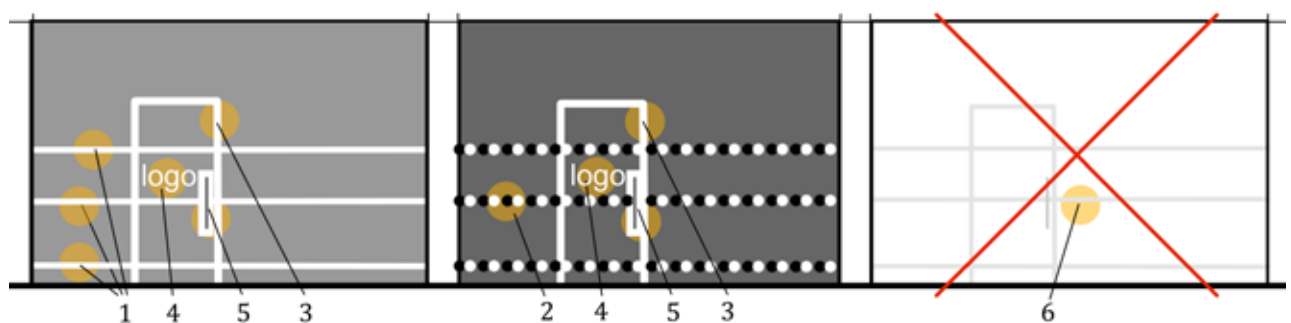
Large glazed wall areas may be mistaken for openings and people can accidentally walk into them. Glazed walls, doors and other areas of full height glazing can be very disorientating, particularly for partially sighted persons. The reflections from these surfaces can be particularly confusing.

6.3.5.2 General

The following requirements and recommendations apply:

- a) Glazed doors and panels shall have clear permanent markings, in the form of visual indicators, to avoid accidental collisions.
- b) The use of highly reflective glass should be avoided.

See also 9.3.11 Glazed doors and panels for more details and Figure 15 for examples of visual indicators in glazing.



Key

- 1 visual indicators at a range of heights
- 2 visually self-contrasting band
- 3 marking of door opening
- 4 logo as example differentiation of door from glazed wall
- 5 marking of door handle side
- 6 incorrect solution: light visual indicators on light background

Figure 15 — Examples of visual indicators on glazing

6.4 Tactile information

6.4.1 Rationale

Vision impaired people rely on a range of tactile built environment elements, such as walls, edges, kerbs, and handrails. Tactile information or tactile contrast enables information to be detected by touch, generally with the fingers/hands or underfoot. Examples include the provision of tactile embossed information on signs and control buttons; tactile maps and models; tactile markings or symbols to provide information, such as on handrails to indicate the last step or the floor level, or on the underside

of a road crossing control post to inform users when the signal changes and it is safe to cross; and a change in floor surface underfoot to provide information, guidance, or warning of hazards.

6.4.2 General

Where tactile information or contrast is provided the following requirements apply:

- a) It shall be detectable, including persons with reduced touch sensitivity.
- b) The tactile feature shall be embossed and have a rounded profile with no sharp edges to cause injury, or undue discomfort.

NOTE Engraved information might pose a problem to certain user groups.

- c) Tactile information shall be provided consistently and located in a logical and sequential manner.
- d) A tactile feature shall be made of materials that are durable and maintain the required tactile and visual contrast.

6.4.3 Tactile floor surface

6.4.3.1 Rationale

A difference in floor surface such as between grass and tarmac or between carpet and hard flooring can indicate a path to follow or different zones such as a walking route adjacent to seating areas. A specific type of tactile surface on a walking route, known as a Tactile Walking Surface Indicator (TWSI), provides a warning, guidance or information for blind persons when not clearly provided by natural or built elements such as a distinct natural path edge or a kerb upstand. Examples of use include a warning at the approach to pedestrian crossings where the footway is flush with the road; at the approach to steps; to warn of obstacles on a route; to provide guidance in open areas; to indicate stops and boarding points for public transport; or to indicate the location of a facility such as outside a lift door

6.4.3.2 Tactile Walking Surface indicators (TWSI)

Where a TWSI is provided the following requirements apply:

- a) The TWSI shall be detectable (through the soles of shoes and by a cane) from surrounding or adjacent surfaces, including by persons with reduced sensitivity in their feet; while not causing undue discomfort when walked on.
- b) The TWSI shall have a visual contrast to adjacent surfaces to provide additional identification.
- c) It shall be of adequate depth in the direction of travel to be detected and enable appropriate response by the users, such as stopping and turning.
- d) The surface shall be slip resistant and not appear to be slippery.
- e) Different slip resistances between the TWSI and adjacent surfaces should be avoided.
- f) When more than one type of TWSI is used, the difference between these surfaces shall be clearly detectable.

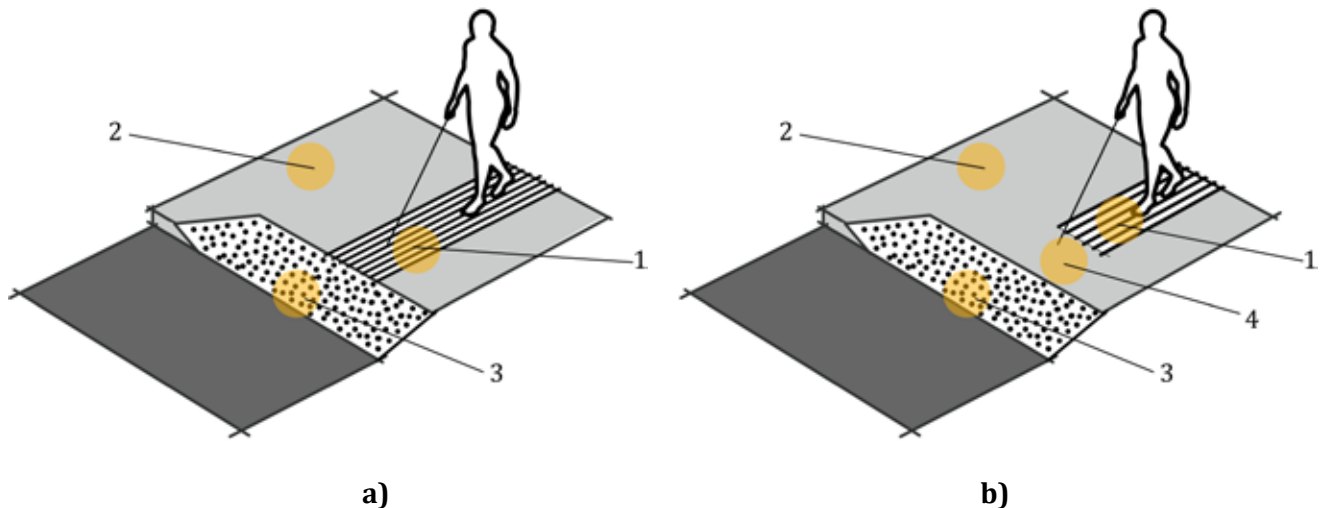
NOTE 1 A gap between the two surfaces can aid detection.

- g) When a change in TWSI is part of a wayfinding system the information shall be consistent with other wayfinding information.

NOTE 2 Tactile Walking Surfaces Indicators (TWSI) are standardized surfaces with specific messages for warning, guidance, etc. ISO 23599: 2012 sets out key principles for their effective use.

NOTE 3 The provision of TWSIs differs between countries and can be determined by national regulations or standards; including when to provide, the design, profile and layout of the surfaces.

See Figure 16 a) and b) for example of visual contrast in TWSI.



Key

- 1 TWSI with guiding pattern featuring difference in tactile feedback and visual contrast to adjacent surface
- 2 adjacent surface with adequate visual and tactile contrast
- 3 TWSI with attention pattern featuring difference in tactile feedback to guiding pattern and adjacent surface
- 4 gap between guiding pattern and attention pattern as used in some countries

NOTE This figure shows two examples of TWSI used in some countries.

Figure 16 — Examples of tactile and visual contrast in walking surfaces as used in some countries

6.4.4 Tactile maps, models and floor plans

The following requirements and recommendation apply:

- a) Tactile maps, models and plans shall be signalled by a TWSI or other tactile information or signage.
- b) Tactile maps, models and plans shall be placed at a height and angle to enable them to be easily read with a finger.
- c) They shall be well lit, without glare or shadows.
- d) Braille and raised tactile information applied on a tactile map, model or plan shall be easy to locate and read.
- e) Only essential information should be included on a tactile map, model or floor plan.

NOTE See also ISO 19028, *Accessible design – Information contents, figuration and display methods of tactile guide maps* for more details.

6.5 Audible information and hearing enhancement

6.5.1 Rationale

Appropriate use of audible information within the environment, along with written information, enables users to communicate effectively and identify key features to assist with their use and wayfinding.

Hearing enhancement systems support audible communication and can be helpful to persons with hearing impairment.

6.5.2 General

The following requirements apply:

- a) Audible information shall be provided:
 - to indicate potential hazardous situations, if applicable in addition to tactile information (e.g. railroad crossing, trams) (see 6.4 Tactile Information);
 - for emergency assistance alarms (e.g. lifts, toilets, hotel rooms);
 - in addition to visual information (e.g. ticket queueing systems, information displays).
- b) Audible information shall be clear, easily understandable and unambiguous.
- c) Public address systems shall allow the speech to be clearly audible and shall be complemented with a hearing enhancement system.
- d) Interactive elements such as intercom entry systems or emergency call shall be both audible and visual.
- e) Digital Information Systems that supply a wireless access to a wayfinding system for use with personal assistive technology shall clearly indicate whether this can be used with public receivers provided by the premises, and/or personal devices such as mobile phones.

6.5.3 Hearing enhancement

The following requirements and recommendations apply:

- a) A hearing enhancement system shall be installed in rooms and spaces used for meetings, lectures, classes, performances, spectator sport or films.
- b) Acoustic design considerations should be applied to reduce intruding and background noise.

NOTE 1 For reasons of privacy hearing enhancement systems can be needed, even if the acoustic environment is appropriate. See also EN 60118-4.

- c) A hearing enhancement system should be installed at service or reception counters.

NOTE 2 Hearing enhancement systems are convenient in noisy environments and public spaces (for service and reception counters).

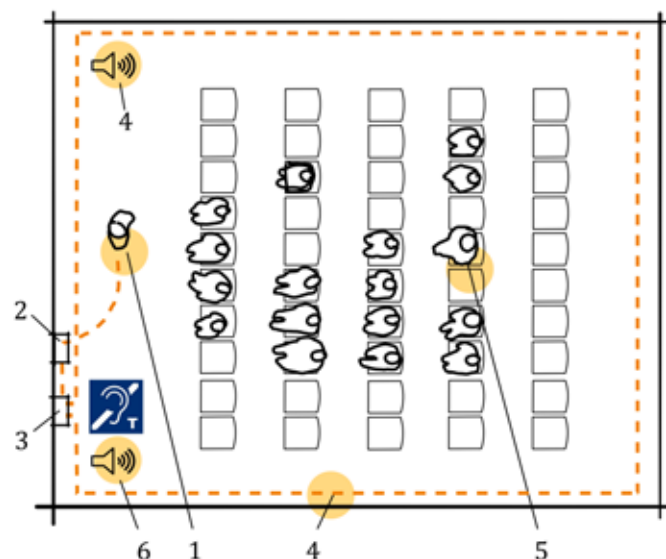
- d) Rooms or spaces with a person hearing enhancement to existing sound system in each room, such as an induction loop, should clearly indicate this with the appropriate pictogram sign.
- e) Induction loops shall comply with the technical values given in EN 60118-4.

- f) An inductive coupler and additional volume control to adjust amplification should be fitted into the circuitry of all public or visitor payphones and entry phones.
- g) Telephones that are suitable for use by hearing aid users and hearing enhancement systems should be identified by the appropriate 'T-switch'.

NOTE 3 Hearing enhancement systems include a direct wire system, an inductive loop system, an infrared system, a radio frequency system, and a WIFI system. All of these systems transmit a signal. Special-purpose receivers are required for infrared and radio frequency systems, while hearing aids equipped with a T-switch are capable of receiving the signal from an induction loop system. Receivers can be equipped to be compatible with hearing aids.

NOTE 4 Wi-Fi system consists of streaming an audio source connected to a Wi-Fi access point or Wi-Fi infrastructure to transmit the sound signal. The audio stream is received via a Wi-Fi enabled device (smart phone, tablet, etc.) from which the user listens to the sound through their earbuds or similar receiver.

See also Figure 17.



Key

- 1 microphone connected to amplifier system
- 2 amplifier system
- 3 inductive loop amplifier
- 4 inductive loop, connected to an inductive loop amplifier paired with the amplifier system
- 5 person wearing hearing aid with built-in telecoil receiver
- 6 loudspeaker connected to amplifier system

Figure 17 — Example of inductive loop system in conference room

6.6 Signage

6.6.1 Rationale

In addition to directing people to facilities, signs are useful to identify routes that are accessible. They can provide information to assist people in planning and navigating their route, including distances and gradients, where appropriate.

The main types of signs are:

- orientation signs: sketches, plans, models, etc.;
- directional signs: directional information from point A to B;
- functional signs: explanatory information;
- informative signs: purely informative, for example a name;
- signs for emergency exits.

6.6.2 General

The following requirements and recommendations apply:

- a) Signs shall be easy to read and understand.
- b) Signs shall have raised tactile and Braille, where appropriate.
- c) Signs shall be made of robust materials and be easy to change, clean and repair.
- d) Easily understood and universally accepted pictograms and icons should be used on signs. See ISO 7000, ISO 7001, EN ISO 7010, ISO 16069 and ISO 28564-1.

6.6.3 Placement of signs

The following requirements and recommendations apply:

- a) Signs shall be located where they are clearly identifiable and visible.
- b) Orientation signs and plans for buildings and outdoor environments shall be located in accessible places adjacent to, but not directly in, main accessible routes so that they can be examined without disturbance.
- c) For information and functional signs, it shall be possible to approach the sign to be read from a short distance.
- d) Directional signs shall be located where route decisions are made and constitute a logical orientation sequence from the starting point to different points of destination.
- e) Directional signs should be repeated, not too often, but every time there is a possibility of alteration in the direction of travel.

6.6.4 Placement of signs in the outdoor environment

In addition to 6.6.3 Placement of signs, the following requirements and recommendations apply:

- a) Signs should be clear of sight triangles for drivers so that they do not block views for turning vehicles.
- b) Any directional sign that encourage pedestrians to cross a street should be placed near to a safe designated crossing point.
- c) Signs for pedestrians should be placed where they can be clearly seen from pedestrian routes and shall not be located where they may form an obstacle, or where they might be obscured and missed, for example on low level walls or within shrubbery or hidden by vehicles.