Access routes

Photo by Hertha Hurnhaus

Walkways and exterior circulation areas

"Walkways must be wide enough for wheelchair and walking-aid users, also in situations when they pass each other."

Protection target as defined by DIN 18040-1, Chapter 4.2.1 – Walkways, Traffic Areas

3.1 Basic geometry

Traffic and movement areas must be sized in reference to those users requiring the most space, i.e., wheelchair users and users of other walking aids, to ensure that outdoor facilities and buildings can be accessed and used accessibly.

A path width of at least 150 cm is sufficient if a passing spot measuring 180 × 180 cm is available after a stretch of 15 m. Passing spots with a 180 × 180 cm dimension suffice for two wheelchair users to pass each other. If space is not a problem, it is preferable to design paths with a width of 180 cm throughout their entire length.

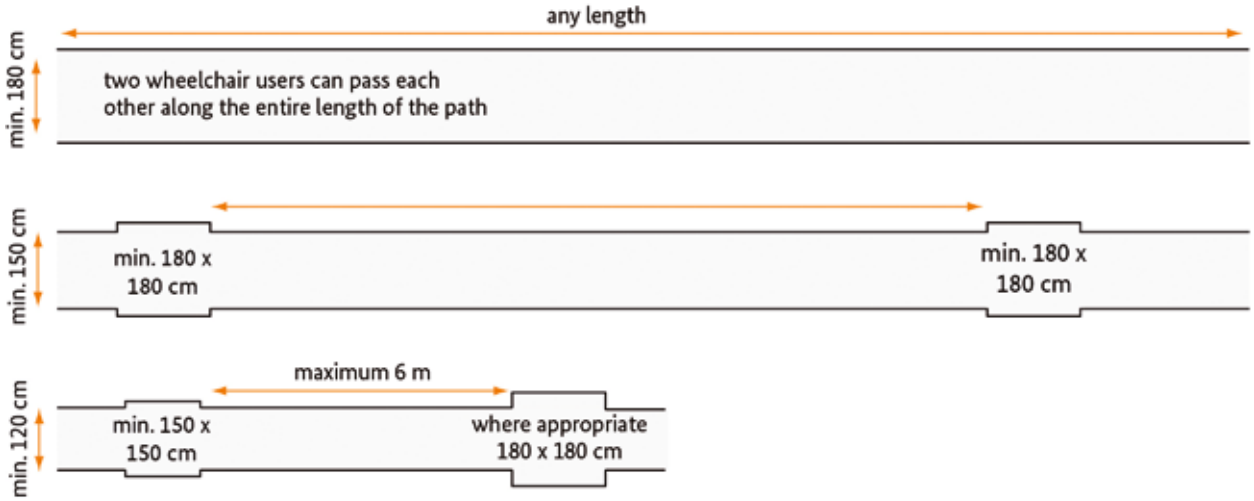
If wheelchair users are not likely to pass other wheelchair users but only other pedestrians, a minimum width of 150 cm is sufficient for the movement area. If no passing is likely, the necessary width can be reduced to 120 cm (e.g. for short paths up to a maximum length of 600 cm). In these cases, a movement area needs to be envisaged for changing directions or manoeuvring at the beginning and end of the path.

Whether a movement area is sufficiently sized or whether a passing spot is required depends on the situation and how frequented the path is, and thus these questions need to be decided upon in the individual case depending on actual needs.

Traffic areas need to provide headroom of at least 220 cm to ensure safety also for persons of tall stature.

Traffic areas equipped with guidance strips that consist of ground surface indicators require headroom of at least 230 cm (see » chapter 2.4 on guidance elements).

DIN 32984:2011-09, Chapter 5.2.1



Basic geometry of paths according to DIN 18040-1

ES EW A

3.2 Gradients

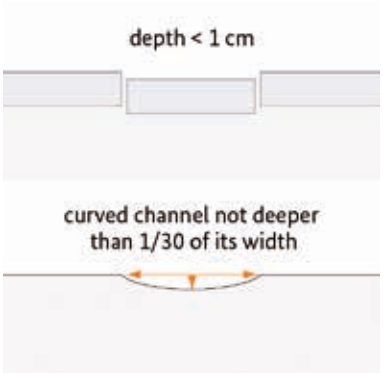
Gradients of up to 3% are the usual gradients for drainage purposes. Greater gradients constitute a special challenge for people with motor impairments. Gradients greater than 6% are not manageable without assistance or special provisions (such as electric wheelchairs).

Differences in elevation can be overcome by inclined circulation areas. The gradient of inclined surfaces should not be greater than 3% at immediate entrance points. At a length of under 10 m, the longfall gradient may be raised to 4%.

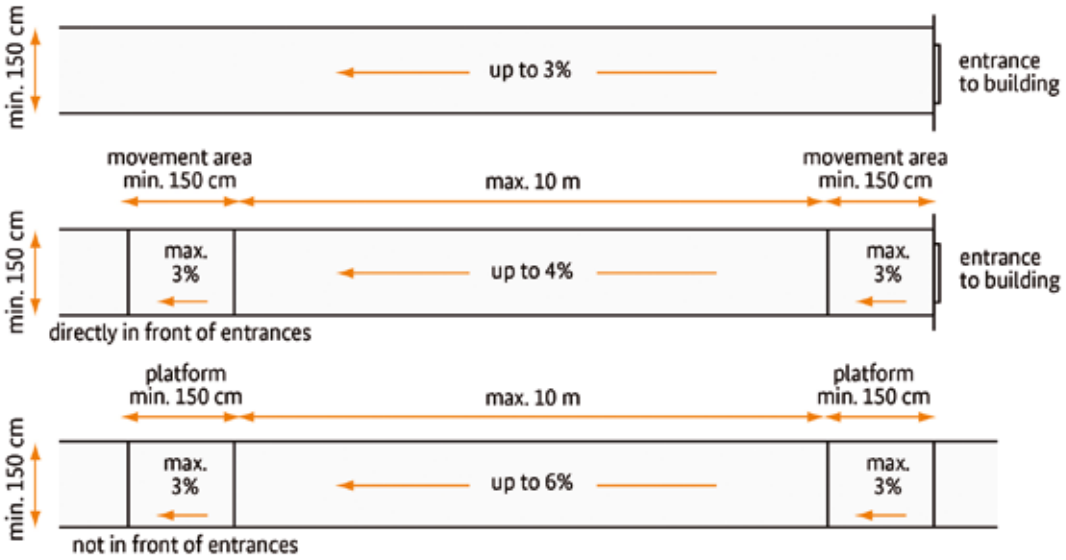
The longfall may have a gradient of up to 6%, if, after a walking length of not more than 10 m, an intermediate platform is installed and the circulation areas are not located immediately at an entrance or access spot. The longfall of intermediate platforms must not exceed 3%. An even movement area is to be provided in front of doors, with only the gradient required for drainage.

If inclined surfaces as described above are not sufficient as compensation for a difference in elevation, special measures such as ramps and, where appropriate, lifts become necessary (see » chapter 5 on interior and exterior ramps and » chapter 7 on lifts).

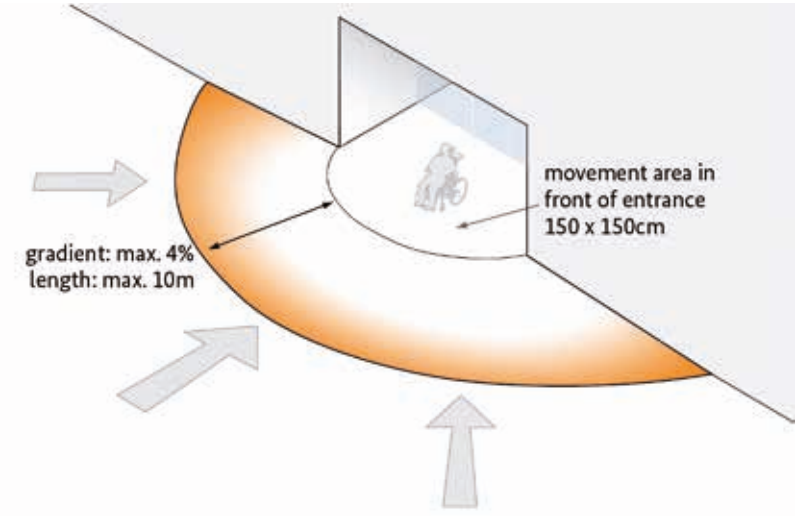
The draining of surface water on paths requires crossfalls in addition to longfalls. The crossfall should preferably be designed in a roof or concave design to prevent wheelchairs from drifting off the path. The crossfall gradient should not be greater than 2.5% (only 2% according to DIN 18024-1). The smaller the gradient, the more comfortable is the use of the path with wheelchairs and walking frames. The more even the selected surface, the lower the crossfall gradient can be without jeopardising the technical necessity of drainage.



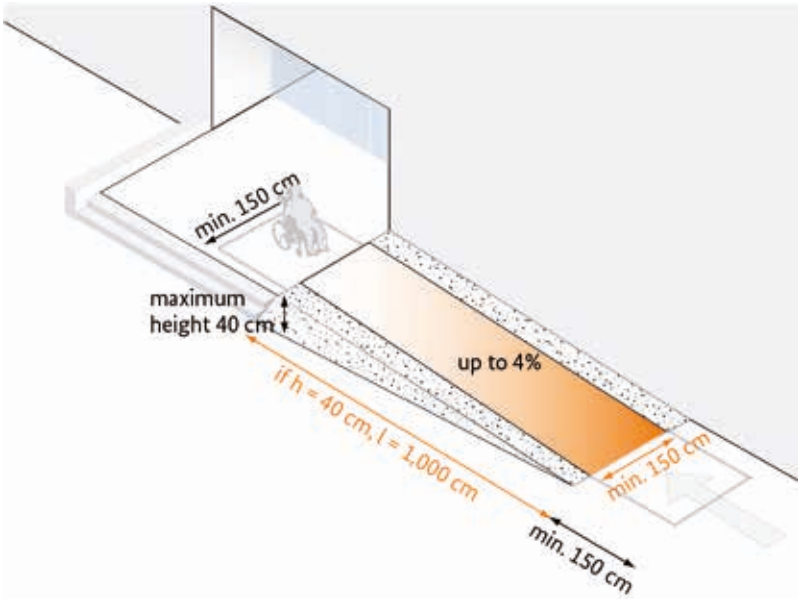
Examples of an accessible design for drainage and curved channels



Possible designs of inclined paths



Circulation area at entrance ≤ 4% at a maximum length of 10 m; if length >10 m maximum gradient 3%



Circulation area at entrance ≤ 4% at maximum length of 10 m; if length is greater than 10 m a maximum gradient of 3% is possible

EW A

3.3 Safety precautions against falling

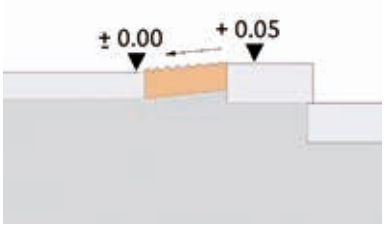
In contrast to ramps, inclined paths and circulation areas do not require raised kerbs (see » chapter 5 on interior and exterior ramps).

Safety measures or raised kerbs are not necessary for transitions to vertical fall hazards such as stairs or low copings and brick ledges at a height of up to 100 cm (check *Länder*-specific building regulations) if the path is sufficiently wide, clearly detectable, and free of fixtures.

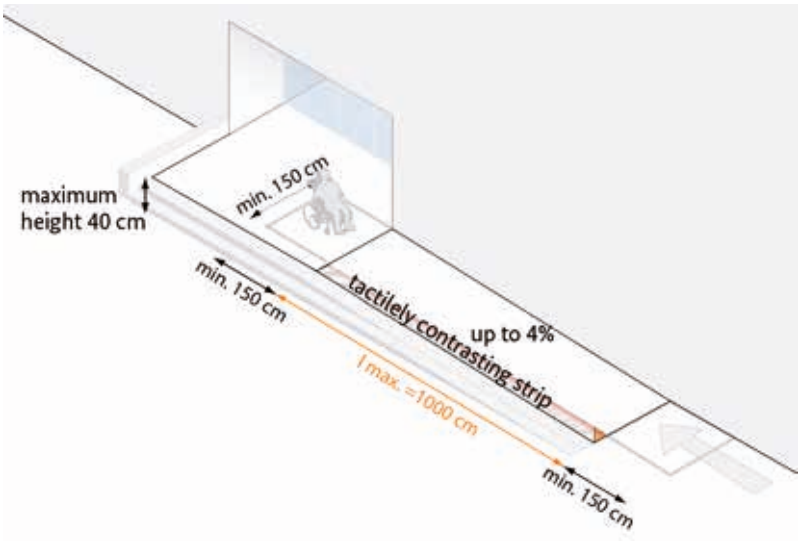
The lane's width depends on the location of the area and how frequented it is, but it should not be lower than a minimum of 150 cm (120 cm if the total length is 600 cm) (to be agreed upon in specific case).

Additional safety can be ensured for paths running parallel to fall hazards when they are designed according to the opposite-tilting principle. A strip of a minimum width of 30 cm is tilted opposite the inclined surface in order to provide a significant impediment for wheelchair users to drive onto it. At the same time, the strip needs to be designed in visual and tactile contrasts to the surrounding surface and stairs.

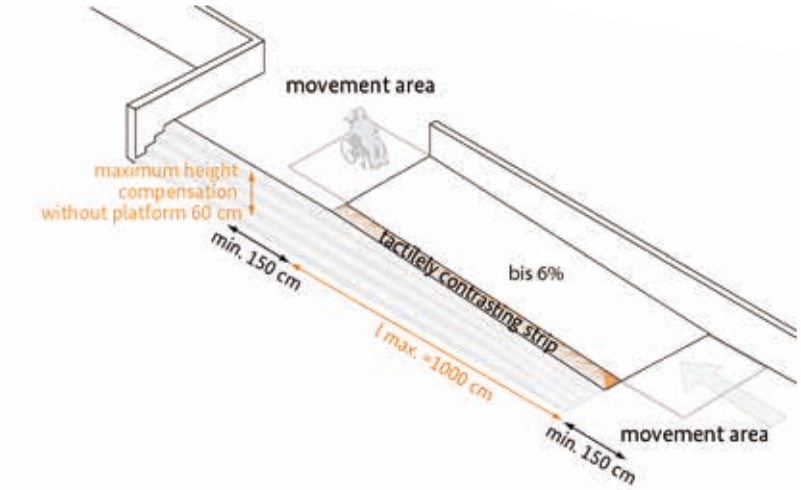
As an alternative, a kerb can be integrated as a safety precaution to prevent falls (see » chapter 5.3).



Safety measures for inclined circulation areas in an opposite-tilting design. The strips in tactile and visual contrasts need to be coordinated in each specific case, but their width should not fall below 30 cm.



Inclined circulation areas at an entrance in combination with stairs – gradient ≤ 4% with safety measures according to the opposite-tilting principle



Wider inclined circulation areas in combination with stairs – gradient ≤ 6%, total length of 10 m with intermediate platforms, with safety measures according to the opposite-tilting principle (in front of entrances the gradient should be lower than 4%)

1, 2 Inclined circulation areas – Dreikönigskirche Dresden

3 Inclined access routes – Bavarian horticultural show “Nature in Waldkirchen” 2007 (Rehwaldt Landschaftsarchitekten, Dresden)

4 Inclined access routes with raised kerbs – Bundeswehr Memorial, Berlin (Prof. Andreas Meck, München)

5 Inclined access routes with a gradient of 6% – Malteser Hospital and Nursing Home Berlin (bbz Landschaftsarchitekten Berlin, photo by Christo Libuda)

Corridors and horizontal circulation areas in interior spaces

"Corridors and other traffic spaces must be wide enough for wheelchair and walking-aid users, including for situations when they pass each other."

Protection target as defined by DIN 18040-1, Chapter 4.3.2

4.1 Need and structure

ES EW

The concept of interior access routes has a significant influence on a building's usability and on ensuring functioning workflows. The development of an overarching concept for circulation areas with regard to optimising interior workflows and to maintaining accessibility is a vital basis for sustainable building design. Sizing horizontal circulation areas adequately makes a building flexible for accessible use.

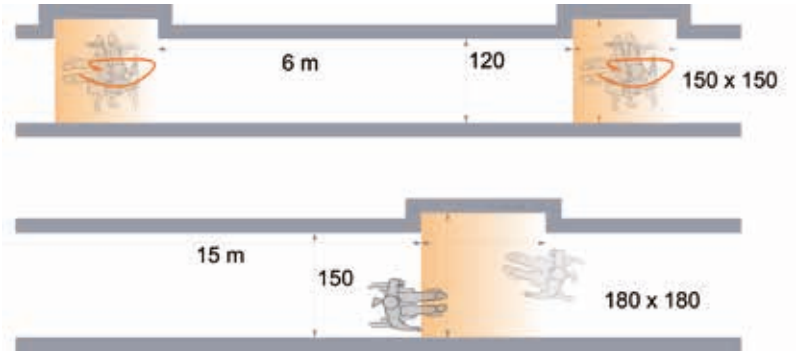
4.2 Basic geometry and space requirements

ES EW A

The longitudinal gradient of horizontal access routes must usually be below 3%. If their length is a maximum 10 m, the longitudinal gradient may be raised to 4%. Higher differences in elevation require ramps or lifts.

An international comparison revealed no requirements concerning the width of access routes for people using long canes or guide dogs.

The dimensioning of circulation areas is subject to varying requirements depending on the building's function. Structural components for fire prevention play a decisive role.



Geometry of interior circulation areas in accordance with DIN 18040-1

According to DIN 18040-1, corridors must be at least 150 cm wide for accessible use. The passages need to exhibit a clear width of 90 cm. After a maximum length of 15 m, spaces measuring at least 180×180 cm need to be envisaged for wheelchair and walking-aid users to pass each other. If the corridor is up to 6 m long, a width

VStättV

of 120 cm is permissible. In places of assembly, the width of the required corridors is calculated on the basis of the highest possible number of people gathered.

The required widths if wheelchair and walking-aid users are to be present are defined in a fire prevention concept.

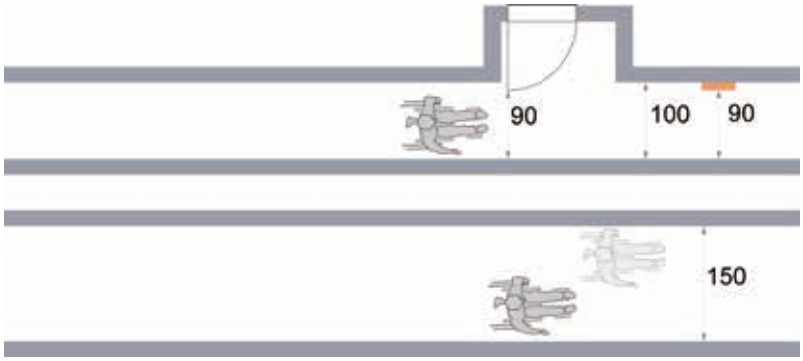
ASR V3a.2

In workplaces, the width of the corridors necessary is defined on the basis of the number of people working there. The minimum clear width for staff members using walking aids or wheelchairs is 100 cm for escape routes, a partial narrowing to 90 cm is permissible at workplaces with:

- up to five people for fixtures, facilities, and doors
- up to 20 people for doors.

ASR V3a.2

For rescue routes where other wheelchair or walking-aid users may be passed, a minimum width of 150 cm is required along escape routes.



Width of escape routes according to ASR V3a.2

The usable headroom of traffic areas must not fall below 2.20 m, with the exceptions of clear widths for stair passages (2.00 m) and doors (2.05 m). Possible obstacles must be secured against walking beneath them. A visual marking does not suffice.

4.3 Location and detection

Corridors and horizontal access routes are to be included in overall orientation and guidance systems.

Glass walls and walls with large glass panels must be equipped with visually contrasting marking strips over the entire width of about 40 to 70 cm and at a height of 120 to 160 cm. The marking strips need to be designed in such a way as to be effective even with changing backgrounds and light conditions. The recommended height of the safety markings is 8 cm each.

1 Horizontal access routes – Dobbertin Monastery (Mikolaiczyk Kessler Kirsten, photo by the Heritage Conservation Office of Mecklenburg Western Pomerania, A. Bötefür)

2 Marking of sliding glass partition walls – Düsseldorf Local and Regional Court (agn Niederberghaus & Partner GmbH)

3 Entrance marking, handrail as orientation aid – Tyrol Centre for the Blind and Visually Impaired (Architekt DI Mayerhofer, architektur-ps, photo by Magdalena Possert)

Interior and exterior ramps

"Ramps must be easy and safe to use."

Protection target as defined by DIN 18040-1, Chapter 4.3.8 – Ramps

5.1 Need and structure

ES EW

In interior spaces, ramps need to be installed if access routes exhibit a gradient of 4%. In exterior spaces, if necessary, gradients of up to 6% can be overcome by inclined paths.

Ramps should be used for entry into buildings for a maximum of up to 100 cm difference in elevation. Cf. "Berlin – Design for all – Öffentlich zugängliche Gebäude", 2012

Overcoming a change of elevation by inclined paths usually incurs fewer costs, and often enables better integration into the overall design (see » chapter 3 on walkways and outer circulation areas).

As a general rule, a review is necessary whether ramps can ensure accessibility in the planned situation or whether, as an alternative or additionally, lifts need to be installed.

The aim should be to offer identical routing for all users to as great an extent as possible. In a combination with stairs, the beginning and end of a ramp should be placed close to the beginning and end of stairs.

It is not permissible to place stairs leading downwards opposite ramps.

In cramped space conditions, the distance between stairs leading downwards and an opposite ramp should be a minimum of 3 m, analogous to requirements for lifts.

5.2 Basic geometry

ES EW

Ramps must have a usable centre width of 120 cm. Depending on the construction design, a larger width should be envisaged to include handrails and raised kerbs.

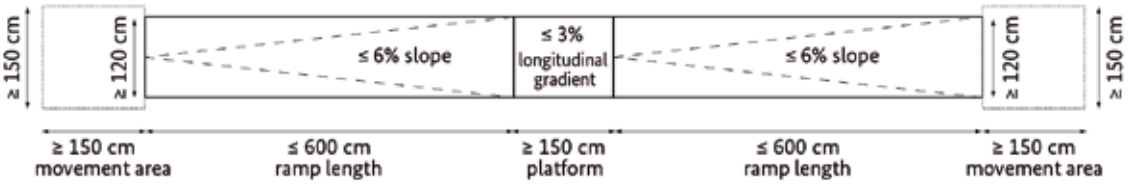
The longitudinal gradient of ramps must not exceed 6%. The ramp should not be longer than 600 cm. The maximum height that can be overcome by a ramp without a platform is 36 cm.

An international comparison revealed a minimum length of platforms of 140 cm, in Ireland only 100 cm (BBR 2009).

Ramps longer than 600 cm shall be equipped with intermediate platforms of at least 150 cm in usable length. The body of ramps and platforms may not exhibit any cross slope. In exterior spaces, a gradient of 1% to a maximum of 3% should be envisaged for platforms for drainage purposes.

Movement areas measuring 150 × 150 cm are to be envisaged for the beginning and end of ramps.

Calculating ramp length



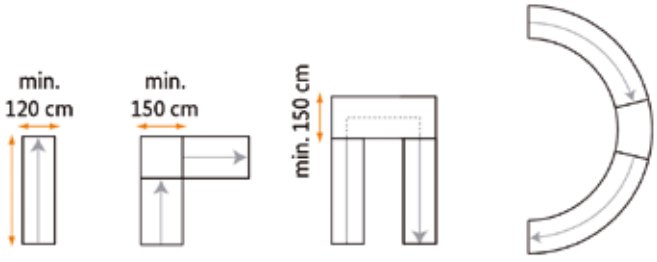
Basic values as defined by DIN 18040-1

Δh	difference in elevation	Length of inclined surface: l = Δ h (m) / g (%)
g	gradient	number of platforms of a length of 1.50 m: n = (l / 6) -1
l	ramp length	(if necessary, rounded up)
lg	total length	total ramp length: lg= l + (n × 1.50 m) + (2 × 1.50 m)
n	number of platforms	
m	meter 2009	

Outline of ramp surface

The ramp should have a simple, and, if possible, straight-line design.

No fixtures, such as bollards or railings or parts, should protrude into required movement areas as they could compromise their function. However, movement areas may overlap (e.g., between two opposite ramps, when staircase and ramp have the same starting point and destination).

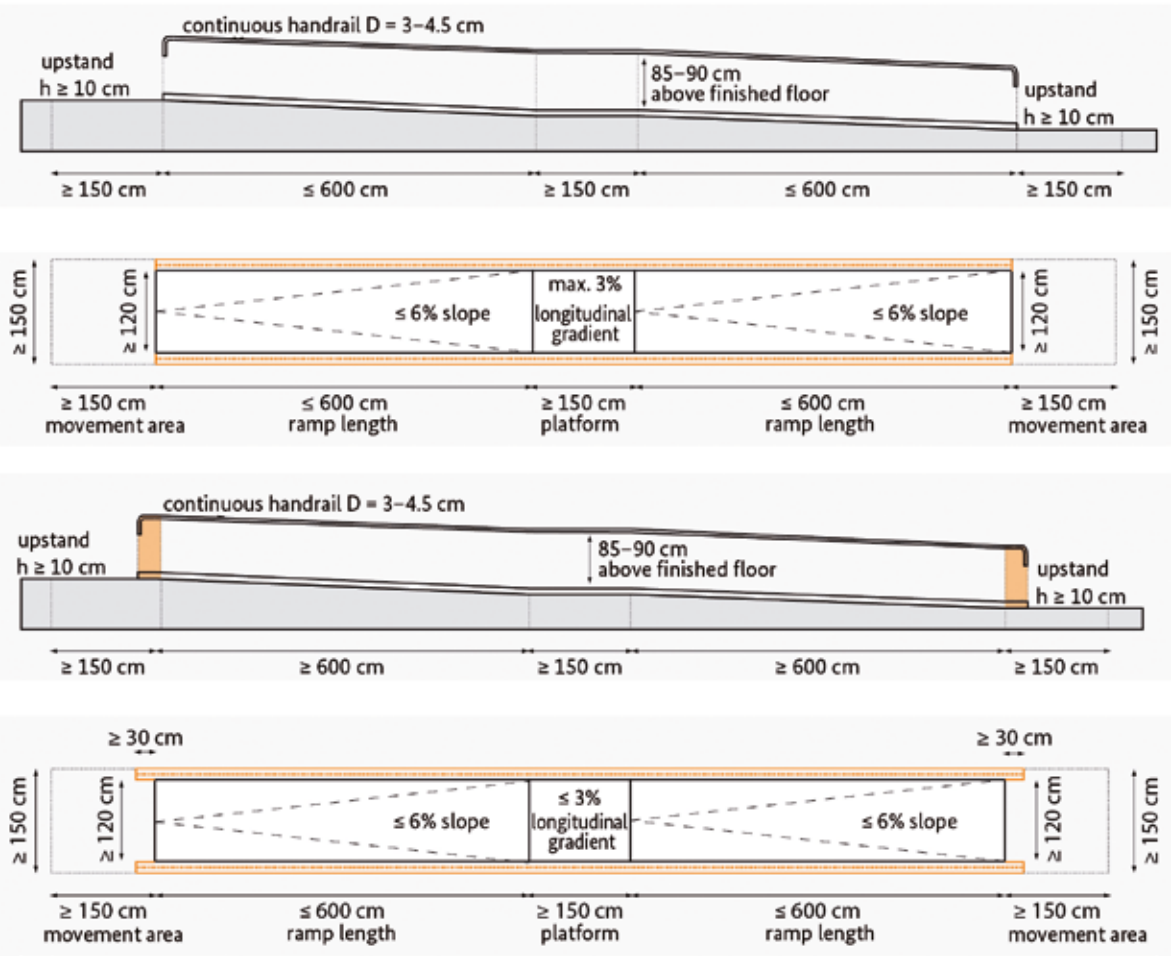


Design variations of ramps

5.3 Raised kerbs and handrails

EW A

Basic values of handrails and raised kerbs as defined by DIN 18040-1
(interior and exterior spaces of circulation areas of buildings)



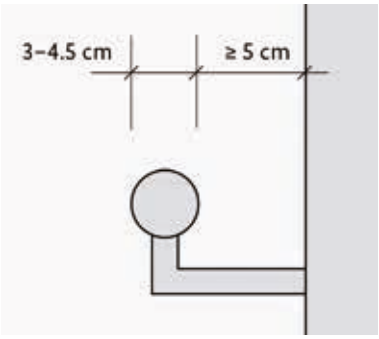
Raised kerbs

Raised kerbs are to be placed at a height of 10 cm on both sides of a ramp's length. If the ramp's edge connects to a wall or stringers, raised kerbs are not necessary.

In exterior spaces, raised kerbs are not necessary for inclined circulation areas (see » chapter 3).

Basic values for handrails and raised kerbs can be found in DIN 18024-1 (Construction of Accessible Buildings – Part 1: Streets, Squares, Paths, Public Traffic and Green Areas, And Playgrounds). The requirement for handrails to extend 30 cm beyond the end of a ramp no longer exists in DIN 18040-1.

A raised kerb can be installed at broad ramps on the basis of the opposite-tilting principle (see » Chapter 3).



Measurements for a handrail – brackets on its reverse side

Handrails

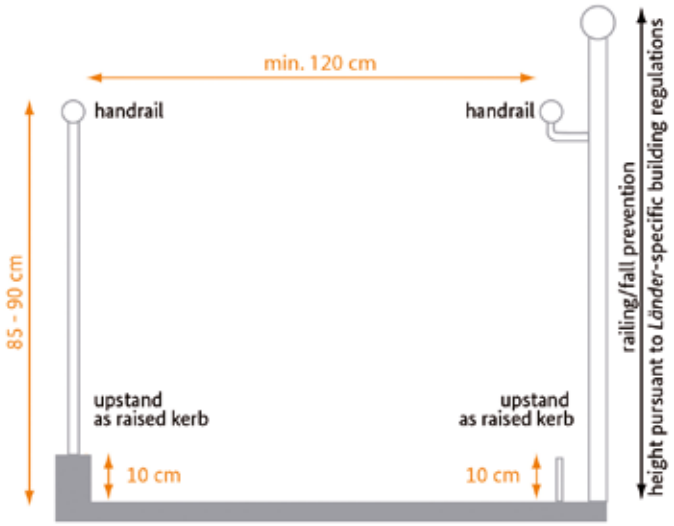
Handrails should be installed seamlessly on both sides of a ramp (along the length of the ramp and on platforms).

It is important to take into consideration that handrails will be used especially by people with motor impairments who do not use wheelchairs or walking frames. This user group is often capable of using stairs without accessible design, especially when walking upwards. Should there be an accessible staircase next to a ramp, including handrails on both sides, and if the differences in elevation are negligible, it suffices to install a handrail on only one side.

The upper edge of the handrail needs to be placed at a height of about 85 to 90 cm above the surface of the ramp or platform. Handrails should have an injury-proof design, be easy to grip, and have no-slip surfaces. Their diameter should be 3 to 4.5 cm and they should be fastened on brackets on their reverse sides.

A clear space of a minimum of 5 cm should be envisaged between them and adjacent built structures or lateral walls. Handrails protruding into a room should have a rounded end piece.

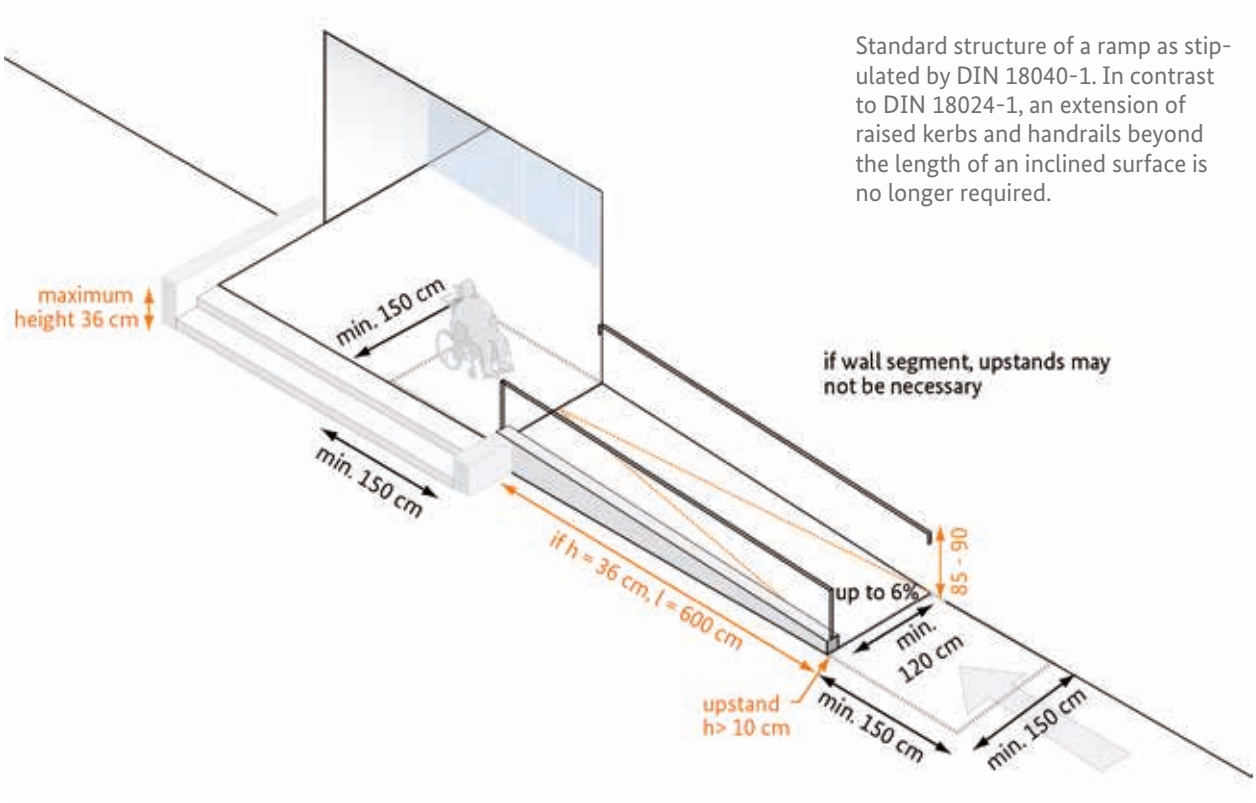
An international comparison revealed that, in general, two handrails are required, one at a height of about 60 to 75 cm and another at 85 to 100 cm (cf. ISO FDIS 21542, 2011).



Raised kerbs and handrails as defined by DIN 18040-1 (amended)

Upstands in the form of kerbs and handrails as part of a balustrade with upstands made of flat steel.

Different solutions may become necessary for heritage buildings; decisions need to be coordinated on site. At transitions to fall hazards, handrails can be combined with safety measures to prevent falls. *Länder*-specific building regulations as well as the regulations of accident insurance companies need to be taken into consideration.



Standard structure of a ramp as stipulated by DIN 18040-1. In contrast to DIN 18024-1, an extension of raised kerbs and handrails beyond the length of an inclined surface is no longer required.

5.4 Orientation aids at ramps

EW A

Handrails should be equipped with tactile information to help orientation, such as information on the floor of the building and what routing to follow.

Hazard warning surfaces of a minimum depth of 60 cm are to be placed in front of ramps with a gradient greater than 6%.

DIN 32984:2011-10, Chapter 5.7.1

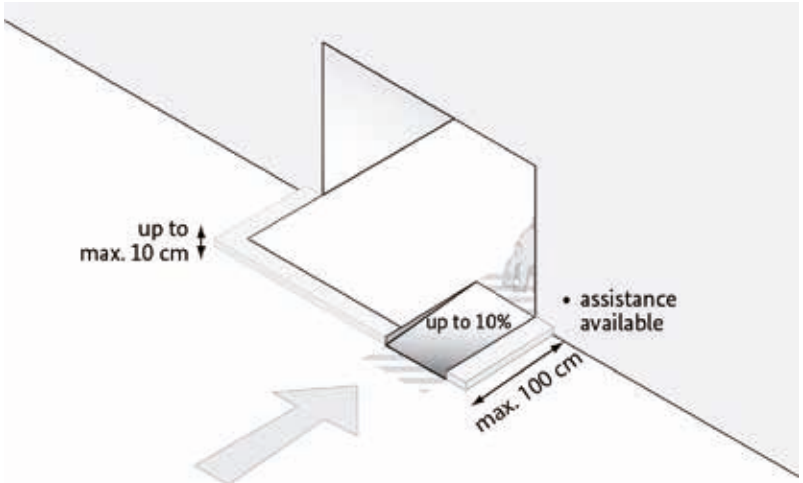
See » chapter 6.5 on handrails at stairs for further information on handrails.

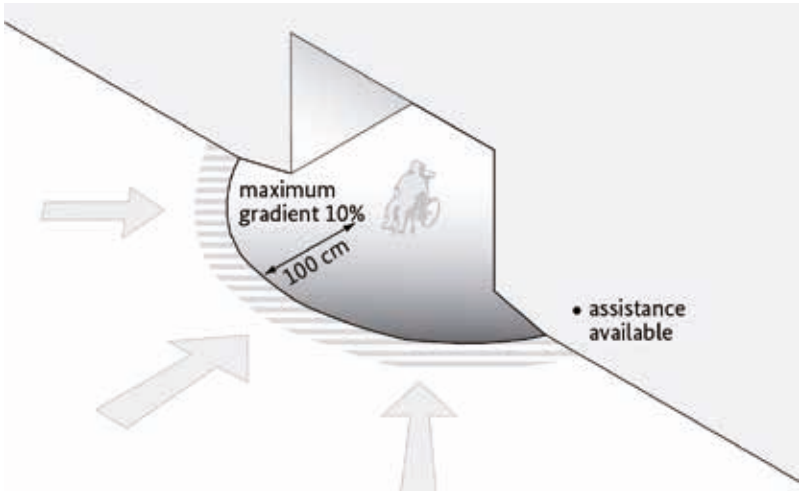
Special shapes/non-regular solutions for ramp lengths of up to 100 cm

The solutions described below do not correspond to the requirements of DIN 18040-1 and can be adopted as exceptions in specific cases.

If ramps at workplaces cannot be implemented according to the regulations, steeper ramps may work, where appropriate, if, for example, the staff are given electric wheelchairs to use. These are able to manage gradients of up to 20%. At ramp lengths of up to 100 cm, gradients of up to 10% are permissible provided that there is the possibility to call for assistance (see also » chapter 12 on operational elements and communications systems).

Mobile ramps can be used as temporary solutions if the availability of assistance can be ensured at all times.





1, 2 Handrail with upstands and a view of the portal – Hygiene Museum Dresden (Peter Kulka Architektur Dresden together with Blume Landschaftsarchitekten, Dresden)

3 Dual ramp with a handrail each – TU-Dresden, modification and modernisation of the lecture hall centre Trefftz-Bau (Heinle, Wischer und Partner, Freie Architekten, photo by Roland Halbe)

4 Ramp installation – Carl Maria von Weber Music College, Dresden

1 Ramp with low gradient as a main element for access – Regensburg Institute for the Blind (Georg • Scheel • Wetzel Architekten, photo by Stefan Müller)

2 Ramp installation – Federal Foundation of *Baukultur* Berlin (Weidinger Landschaftsarchitekten, Berlin)

Interior and exterior stairs and steps

"Stairs can be used accessibly by people with restricted mobility and by blind people and people with visual impairments if they exhibit the following properties."

Protection target as defined by DIN 18040-1, Chapter 4.3.6.1- Basics

6.1 Need and structure

A flight of stairs is an uninterrupted series of at least three steps as a connection between two different planes.

A stairway cannot constitute an accessible, vertical connection on its own. It can, however, be safely used in part by people with motor impairments as well as blind people and people with visual impairments.

DIN 18065:2011-06, Kapitel 3.5

6.2 Basic geometry

Flights of stairs need to be straight. Bends are permissible only if the diameter of the wellhole is greater than 200 cm.

Generally speaking, stairways required by law (as part of escape routes) must comply with the following requirements:

DIN 18065:2011-06, Chapter 6.1

- usable width of a minimum of 100 cm (considerably wider depending on how frequented they are)
- rise (s for *Steigung*) 14 cm minimum, 19 cm maximum (rises ranging between 14 to 17 cm have worked well in exterior spaces)
- tread (a for *Auftritt*) 26 cm minimum, 37 cm maximum.

Treads narrower than 26 cm may not always provide enough room for the full length and width of feet and are therefore to be avoided if possible.

For planning the rise ratio usually the increment rule applies: $2s + a = 59–65$ cm (=step size).

DIN 18065:2011-06, Chapter 6.1.2

For stairways that are necessary, a landing needs to be envisaged after a maximum of 18 rises.

DIN 18065:2011-06, Chapter 6.3

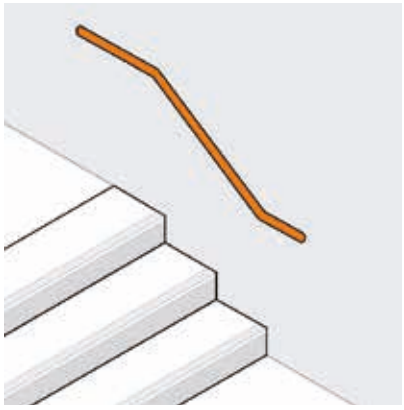
In exterior spaces, when the flights of stairs are long, a greater number of landings should be included for convenience.

DIN 18065:2011-06, Chapter 6.3.4

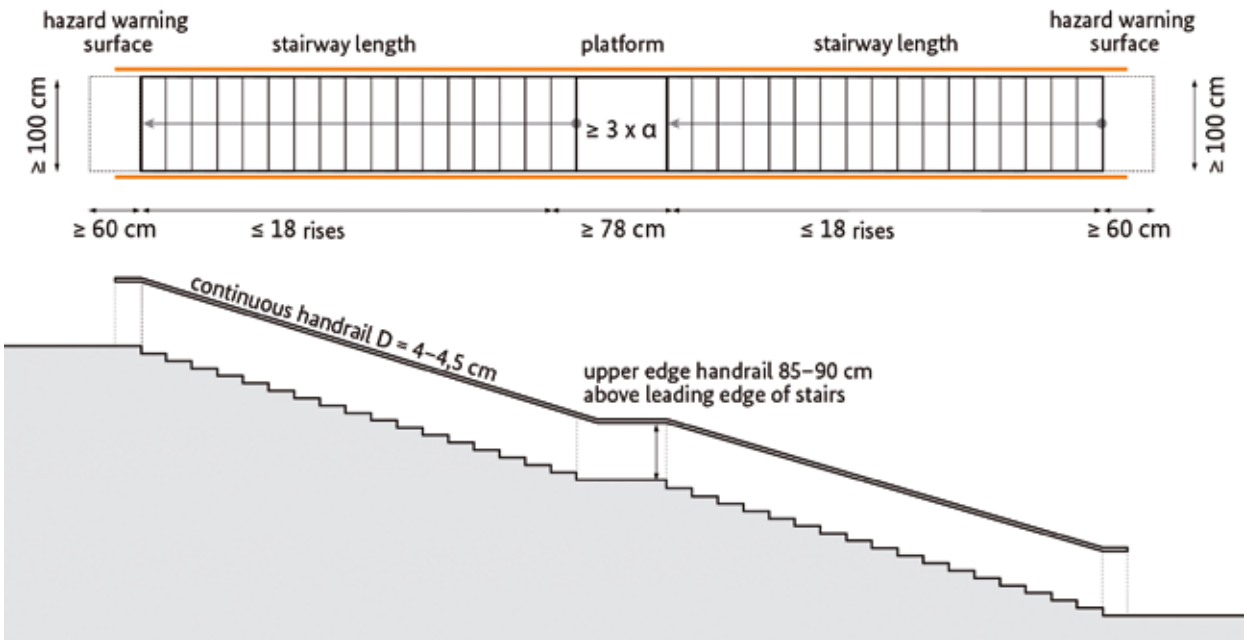
A landing must provide space for 3 treads (3 × a) of the same length as the treads of the flight of stairs.

The length of a landing is usually calculated in practice using the formula L = a + (n × 63–65 cm) where (a) stands for the tread actually selected and (n) for the number of step lenghts on the landing.

Potential fall hazards should be secured by railings along the entire length of the flight of stairs and the landing. Further provisions can be found in *Länder*-specific regulations and the regulations of accident insurance companies.



A stairway consists of at least one flight of stairs (three rises).



Basic geometry of stairways as defined by DIN 18040-1 and DIN 18065

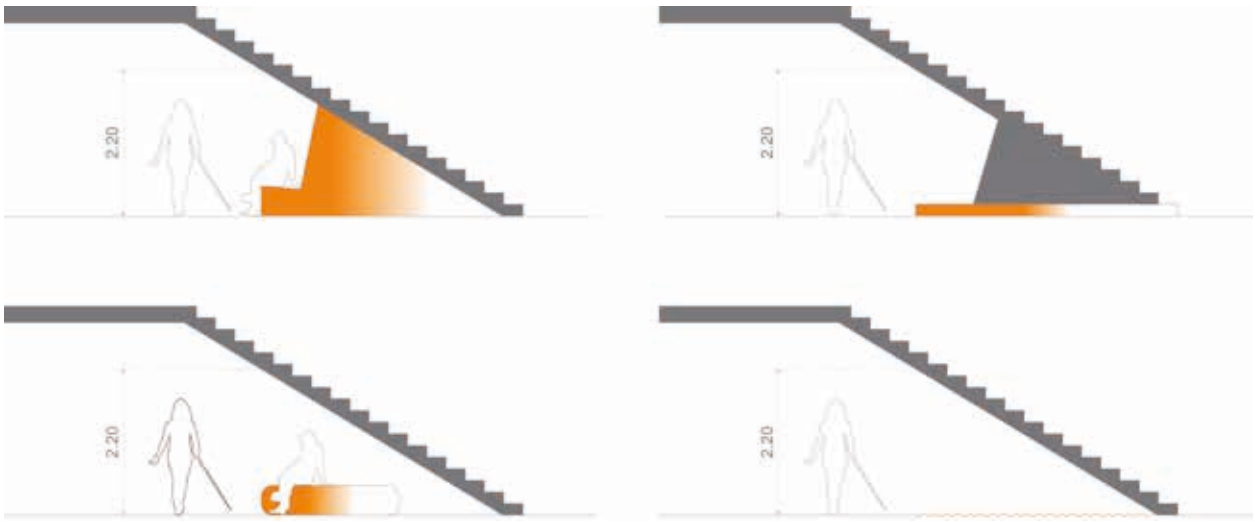
Measured from the leading edge of a step, the clear passage height of a stairway must be a minimum of 2.00 m. Moreover, there should be no possibility to walk under stairs.

DIN 18065:2011-06, Chapter 6.4

Areas below stairs that do not have a usable height of at least 2.20 m need to be secured to prevent walking beneath them. Exceptions are clear passage heights of stairs and doors, as they require lower passage heights (see » chapter 8 on doors).

A visual and contrasting marking does not suffice for areas beneath stairs in publicly accessible areas. The following measures, for instance, can protect people from walking beneath stairs, especially people with visual impairments:

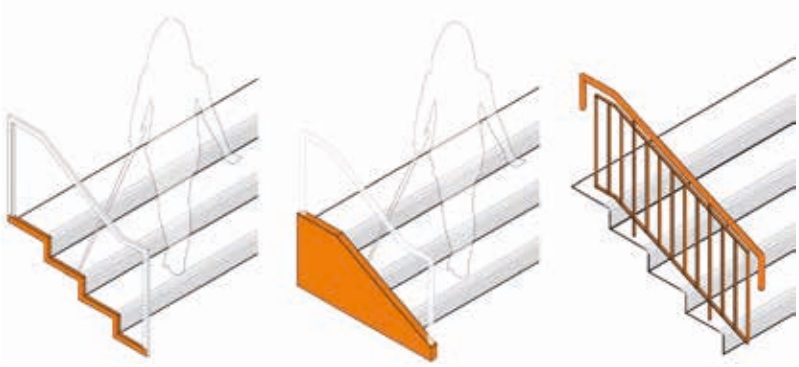
- a corresponding design of the stair construction
- installing a sitting space
- installing non-movable furniture



Possibilities to prevent people from walking beneath stairs. Visual and tactile markings (bottom right) alone do not suffice in publicly accessible areas.

Kerbs, for example, may be used to prevent walking aids and canes from slipping at open ends of treads.

However, it is important to note that especially in exterior spaces kerbs will make drainage and cleaning of the stairs difficult. If a balustrade is installed over the steps as protection against fall hazards, it will also prevent walking aids and canes from slipping.



Measures against slipping of walking aids in the form of side kerbs, stringers, and balustrade

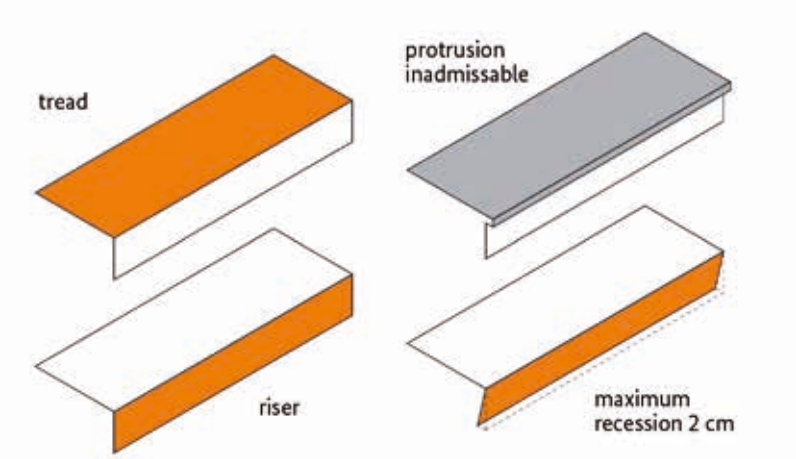
Side kerbs balustrade Day Care Centre Reichelstraße 5, Leipzig (raumleipzig architekten)

6.3 Steps

EW A

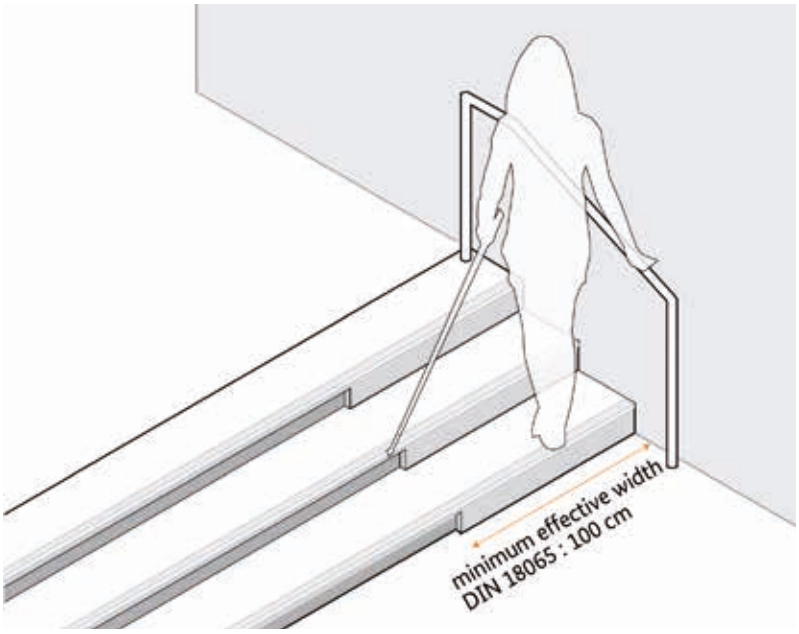
Necessary steps must consist of treads and risers, and treads may not protrude over risers.

Risers may recede 2 cm when their edges are slanted (receding).



Sketch of treads/risers, protruding treads, receding risers

The sizes of risers and treads should not vary, neither in height nor depth, within a flight of stairs of necessary staircases. Single steps are to be avoided.



Example of a solution for receding steps exceeding the minimum width required by DIN 18065

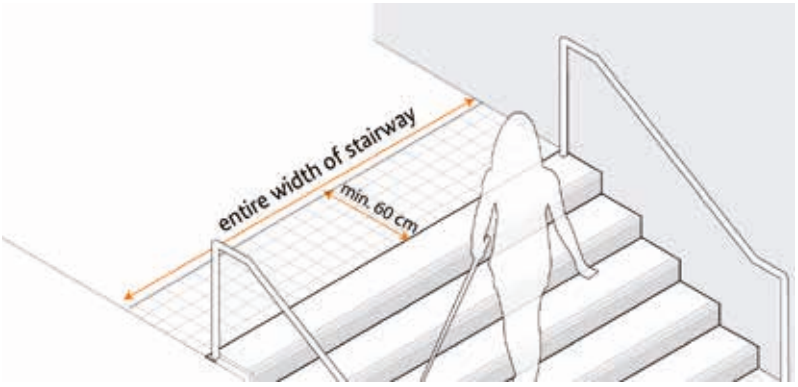
6.4 Orientation aids on stairs and single steps

Especially on stairs, the fall hazard is higher for blind people and people with visual impairments and during intense traffic volume. When planning accessible staircases, special care should be dedicated to visual and tactile design for these situations.

Hazard warning surfaces
Stairs and single steps that are located in an open space or that do not immediately result from a structural context, constitute an especially hazardous situation. To minimise the risk of hazards, hazard warning surfaces of a minimum depth of 60 cm are to be installed above the top tread and below the lowest tread along the entire width of the stairs.

The design of hazard warning surfaces exhibits tactile contrasts to their surroundings. This can be accomplished by modifying the floor structures, for instance by using varying roughness or material and by means of tactilely perceivable changes of joint direction and/or width, and also by using ground surface indicators (see » chapter 2.4 on guidance elements).
A visually contrasting design is not to be used so as not to disturb the visual accentuation of the leading edge of the stairs.

Should the location of stairs be evident through the structural context (staircases), or if the bottom point of a stairway is clearly detectable on the basis of other guidance elements, hazard warning surfaces are not necessary.



Placement of hazard warning surfaces in front of stairs

DIN 32984:2009-10, Chapter 5.7.1

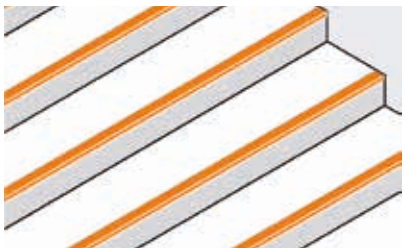
If flights of stairs have more than one landing longer than 3.50 m, they require additional hazard warning surfaces. If drainage and

snow grates are built in without any distance to the top or the lowest step and are at least 60 cm deep along the entire width of the stairs, they can be substituted for hazard warning surfaces.

DIN 32984:2009-10, Chapter 5.9.8

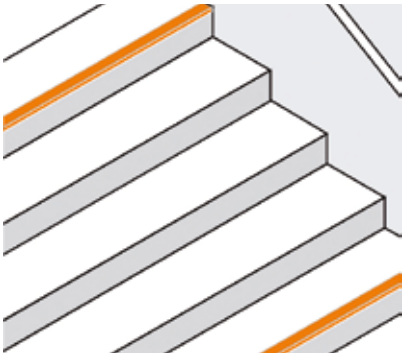
Step markings

A marking of each step is required when the stairway has up to three steps and in case of free-standing stairs. In the case of staircases and not free-standing stairs, a marking of the first and last steps suffices. Markings on the leading edge of stairs constitute a visual contrast to both treads and risers as well as to landings. They should begin at the leading edge and be 4 to 5 cm on treads and 1 to 2 cm on risers. They thus form a visual contrast to both treads and risers and landings, and support the clear perception of edges when looked at from above and from below.



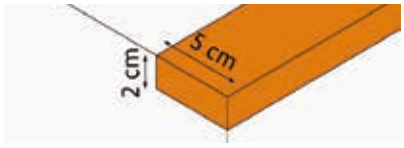
Example of marking steps as defined by DIN 18040-1

When walking upwards a standing person should always be able to see the marking on both the tread and the riser. If both marking begin at the leading edge, it may become hard to see where the edge of each step is. This is why, for example, in heritage buildings, the marking of risers may be dispensable or can possibly be reduced to minor accentuation.



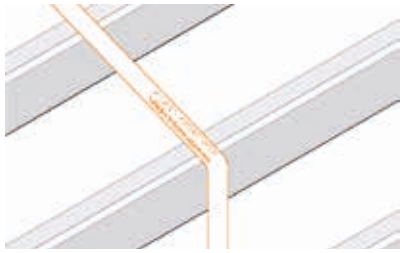
Marking on first and last step

The markings can be provided as patterns, ornaments, inlays, and milled plastic components. It is important to opt for durable, sturdy solutions. Concrete edges already manufactured in a different colour may be used, for example, when planning a new construction. When using natural stone, box-shaped reliefs can be incorporated on a leading edge (inlays). As a retrofitting measure, milled recesses or plastic components can be applied to mark leading edges. Additional no-slip profiles on the edges of the individual steps will increase safety. Marking stairs beyond the minimum length of handrails may be unnecessary if the position of the stairs within the structural context is comprehensible without ambiguity.



Marking as an inlay

It is important to ensure a luminance contrast of at least 0.4 between the marking of the edges of steps and connecting floor materials (see » chapter 2.5 on visual perception, materials, and visual contrasts).



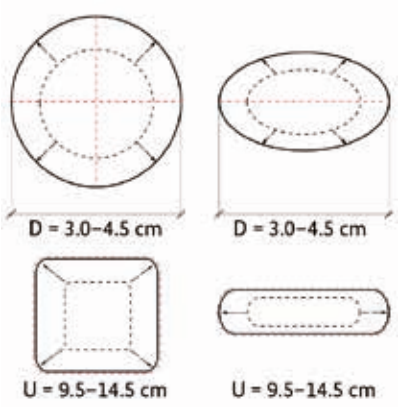
Tactile information on a handrail

Handrails should include tactile information (e.g. in Braille) to support orientation such as information on the floor of a building and what routing to follow. This information should be applied at the beginning and end of a flight of stairs to the part of the handrail that does not face the stairs. It is important to ensure that the information can always be found in the same spot on the handrail, preferably on the slanted part of the handrail on the right side, directly above the first and last treads.

6.5 Handrails at stairs

EW A

Handrails are to be installed on both sides of stairs and landings to ensure safe support when using them.



Recommended cross sections of handrails at stairs. Square and steel profiles should have rounded edges.

The upper edge of a handrail must be placed at a height of about 85 to 90 cm above the leading edge of steps or the upper edge of the finished floor level of the landing. This height should be maintained even when handrails are combined with a higher balustrade.

Round handrails should have a diameter of 3 to 4.5 cm.

Analogously, a perimeter of 9.5–14.5 cm can be used as a basis for the measurements of square shapes and steel bar profiles.

Handrails must extend at least 30 cm beyond the beginning or end of a stairway.

If stairs are wider than 500 cm, an additional middle handrail should be envisaged for necessary stairs.

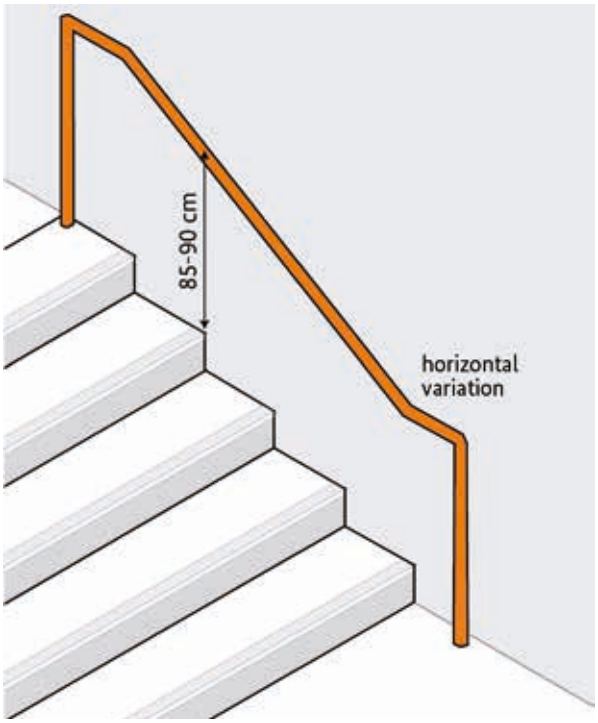
Brackets for fastening handrails should be placed on their reverse sides; the end pieces of handrails protruding into an open space need to be rounded.

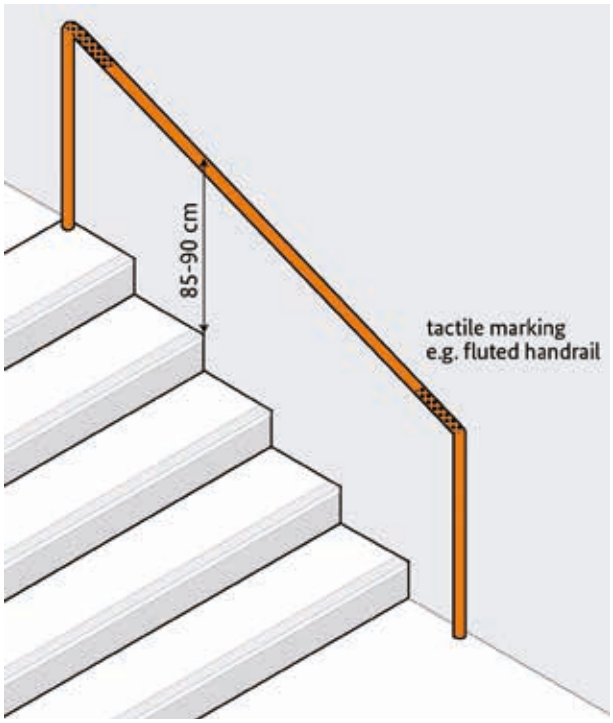
Regulations on safety precautions against falls can be found in *Länder*-specific building regulations and regulations of accident insurance companies.

For this reason, handrails should exhibit a clear visual contrast.

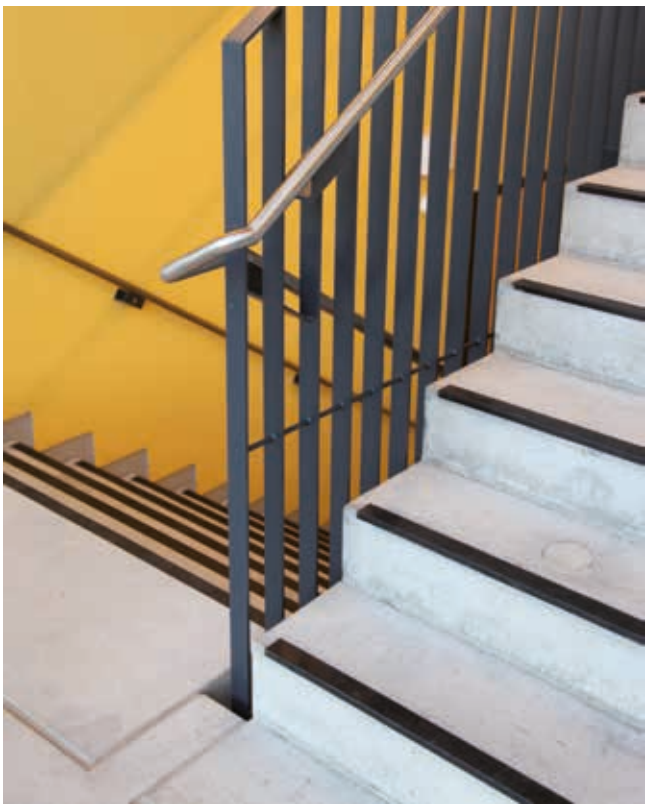
Deviations may be accepted in heritage buildings depending on the individual situation. An international comparison revealed that often two handrails are required at different heights: one at a height of 60–75 cm and another at 85–100 cm (BBR 2009).

For more information on orientation aids on handrails
see » chapter 6.4 on orientation aids on stairs and single steps





Handrail at a stairway: 30 cm protrusion is necessary for the beginning and end of stairs. The horizontal design as required by DIN 18040-1 is not necessary in specific cases when a different tactile marking is used on the handrail (e.g. fluted handrails).

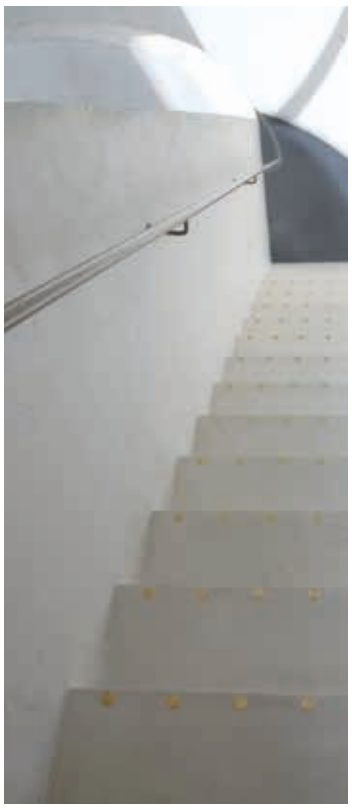


1 Marking leading edges by means of inlays – Washingtonplatz Berlin (Büro Kiefer, Berlin)

2 Marking of leading edges – Ehrenbreitenstein Fortress
(TOPOTEK 1, Berlin, photo by Hanns Joosten)

3, 4 Stairs with visually contrasting marking on steps – Lecture Hall Centre PPS, RWTH Aachen
(HH+F ARCHITEKTEN)

5 Extended handrail with rounded end piece – Centre for Energy Technology of TU Dresden
(knerer und lang Architekten Dresden)



1 Marking on stairs to match tactile paving system for the blind – State Theatre of Darmstadt (modifications planned by Lederer+Ragnarsdóttir+Oei, CBF tactile paving system, photo by Michael Müller)

2 Information on handrail in Braille and pyramid writing style – Training Academy of the Financial of Fiscal Administration Authority North Rhine-Westphalia Bonn (NRW building and property management)

3 Stair zone design by using varying materials – Local and Regional Court Düsseldorf (agn Niederberghaus & Partner GmbH)

4 Middle handrail and step marking and design using varying floor surfaces – 101. Mittelschule Dresden (Klinkenbusch + Kunze, photo by Volker Kreidler)

Lifts

ES EW

7.1 Need and structure

Lifts are the most important element of barrier-free access within a building. As the aim is to establish identical routing for all users to the extent possible, the location of lifts should be coordinated with the other elements of vertical access (stairs).

The door of the lift may not be placed opposite stairs leading downwards and if it is, a distance of at least 300 cm is to be maintained.

In multi-storey buildings that are not publicly accessible, and for which accessibility is not currently foreseen, potential retrofitting is to be taken into consideration.

If a lift cannot be installed in an existing building, it is also possible to use vertical platform lifts, which, where appropriate, may be integrated into stairways. Autonomous usage is to be preferred for this type of platform.

In exterior spaces, platform lifts require less space and are thus to be considered if space is scarce, or as an addition to or replacement of ramps.

Lifting platforms integrated into a stairway may be used particularly in representative entrance lobbies.

ES EW A

7.2 Basic geometry and space requirements

In publicly accessible areas, lifts should correspond to at least Type 2 as defined by DIN EN 81-70:2005-09, Table 1.

DIN EN 81-70:2005-09

Lift cabins usually have clear interior dimensions of 110 × 140 cm. This type of lift can transport one person in an electric or manual wheelchair and one accompanying person.

The minimum size of lift cabins with diagonally opposite exits is stipulated by the Berlin Senate (Design for all, 2012) as 140 × 160 cm; in Austria, 150 × 150 cm are required (Accessibility Guidelines for Buildings, implementation of new standards, 2009).

Lift doors are at least 90 cm wide.

The size of the platform of vertical platform lifts must be 90 × 140 cm if an accompanying person is also to be transported; if exits are located on diagonally opposite sides it needs to be 110 × 140 cm.

DIN EN 81-41:2011-09

A movement area measuring 150 × 150 cm is to be kept free in front of lifts, but this may overlap with other traffic areas.

It is important to ensure a width of passage at least 90 cm leading up to the waiting area.

Necessary movement areas in front of lifting platforms/lifts in exterior spaces may not be part of heavily frequented pedestrian traffic areas. In exterior spaces, the usable depth should be enlarged to 2.00 m in order to reach a broad user groups. This will also enable the transport of baby carriages and bicycles.

A lateral distance of 50 cm must be taken into consideration from the axis of the operational elements to the room corners.

A call button and additional operational elements need to be installed at a height of 85 cm.

7.3 Cage components

An accessible lift cabin needs to be equipped with the following components:

DIN EN 81-70:2005-09

- a handrail on one side that is as uninterrupted as possible at a height of 85 cm, with a diameter of 3 to 4.5 cm
- a mirror opposite the door for situations when a wheelchair user needs to reverse out of the lift, or some other device to help wheelchair users to notice obstacles behind them
- where appropriate, a fold-down seat, at a height between 48 cm and 52 cm, with a carrying capacity of 100 kg.

Illumination (minimum 100 lux) and the surface of materials are to be selected in such a way as not to cause irritations.

If a reflective surface is used for the interior lining of the cabin, a minimum distance of 30 cm needs to be maintained to the floor.

7.4 Usability

In exterior spaces, lifts and lifting platforms require sufficient illumination for safety reasons.

DIN EN 81-70:2005-09, Annex E

A contrasting design in accordance with » chapter 2.5 is obligatory. An area of 150 × 150 cm in front of the lift door designed in optical and/or tactile contrasts can make lifts easier to locate.

The operational elements are to be designed in accordance with » chapter 12 on operational elements. Especially in the cabin's interior, it is important to comply with geometric specifications to ensure that the operational elements are easy to reach (ca. 50 cm lateral approach area, see » chapter 8.2 on doors).

The commands must be confirmed acoustically and optically, even when activated repeatedly.

DIN EN 81-70:2005-09, Annex G

The control devices should be extra large (XL) in design in accordance with DIN EN 81-70 Annex G, both inside the cabin and on every floor. The button should measure at least 50 × 50 mm or have a diameter of 50 mm. There should be 10 mm of space between the buttons. They should always be sequenced from left to right. Figures and symbols need to be applied to the buttons in a contrasting design and should measure 30 to 40 mm.

DIN EN 81-70:2005-09, Annex E

The writing should be in a tactilely perceivable, embossed style (0.8 mm minimum). Letters should be at least 15 mm high and in contrasting design. Information in Braille may also be added.

Complementary to visual displays, voice announcements are recommended for conveying information.

1, 2 Lifting platform integrated into stairs – Folkoperan Stockholm (photo by Guldmann)

3 Outdoor lift – Former Local Court, Town Hall, Malchow (Autzen & Reimers, photo by the Heritage Conservation Office of Mecklenburg Western Pomerania, A. Bötefür)

1 Integration of a visitors lift into the complex geometry of a medieval castle – Albrechtsburg near Meißen (DD1 Architekten, photo by Petra Steiner)

2–5 Integration of a lifting platform into a historical flight of stairs at Albrechtsburg near Meißen. As an anti-trap safety measure, the lifting platform was framed with a sensor strip to switch off the mechanism upon accidental contact (Raum und Bau GmbH, photos by Alexander Krippstädt).

Doors

"Doors must be clearly perceivable, easy to open and close, and safe to pass through."

Protection target as defined by DIN 18040-1, Chapter 4.3.3

8.1 Need and structure

ES EW

The planning of doors may significantly influence the quality of access to a building. This is why the quality of door systems and additional technical requirements should be decided upon early on.

The main entrance doors are to be usable for every one. An accessible design should be targeted with regard to the main entrance.

Swing doors opening in both directions are to be avoided. They cannot be the only access point leading into the building.

8.2 Basic geometry and space requirements

ES EW A

The width of a wheelchair is described in DIN 18040-1 as measuring 70 cm. The remaining 20 cm are the space requirement for the wheelchair user's hands in self-operated wheelchairs.

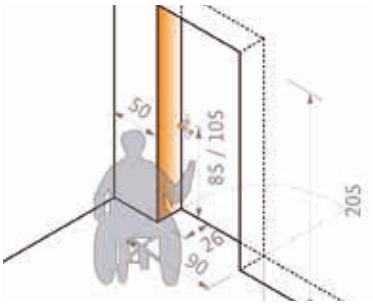
An international comparison revealed a passage width of 80 cm, but in this case the door leaves must exhibit an opening angle of 90° (BBR, 2009).

A door has the following minimum measurements:
headroom 205 cm
clear width 90 cm

For doors operated manually and for operational elements, a lateral approach space of 50 cm (distance from the centre of the lock) must be maintained to enable the series of movements needed for opening doors.

A lateral approach space of 60 cm – roughly the width of walking frames – is recommended for users of walking frames (BBR, 2009).

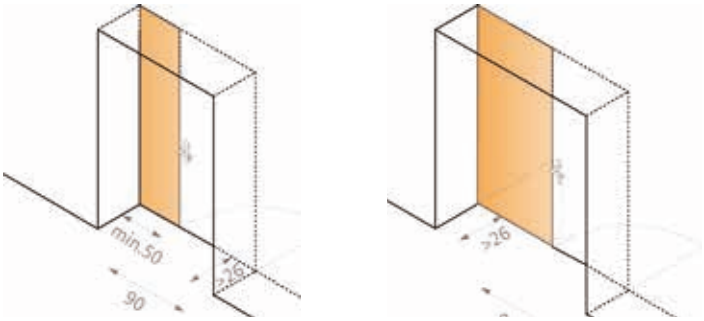
In vestibule areas, a sufficient movement area needs to be envisaged for turning around (150 x 150 cm), even for doors opening inwards. A coupling mechanism of door controls could also be an option.



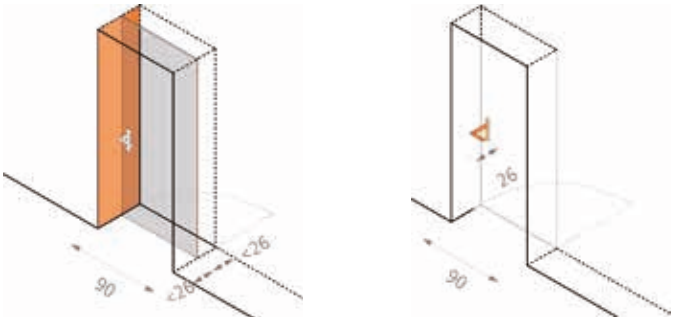
Door measurements

For the wheelchair user to be able to reach the door handle, the reveal depth must be a maximum of 26 cm, or else the door's usability must be ensured in a different way. If no other possibility exists, automatic door systems can be retrofitted (button at a height of 85 cm).

Compensation possibilities for low reveals: side leaf of a width of 50 cm and double-leaf door

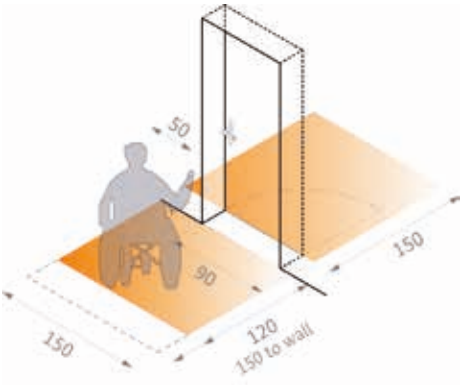


Compensation possibilities for low reveals: block frames and low door handles

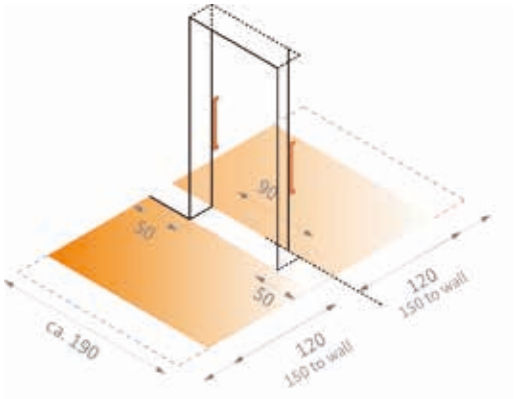


Movement areas – manually operated doors

Movement area in front of a manually operated hinged and pivoted door

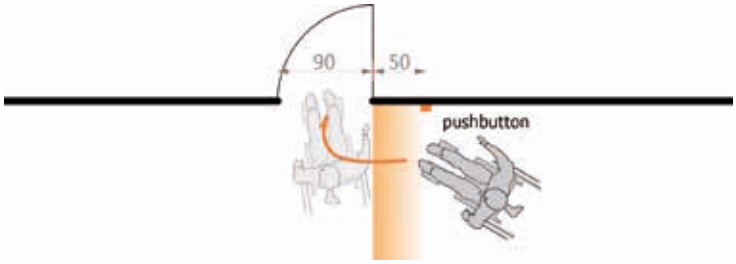


Movement area in front of a manually operated sliding door

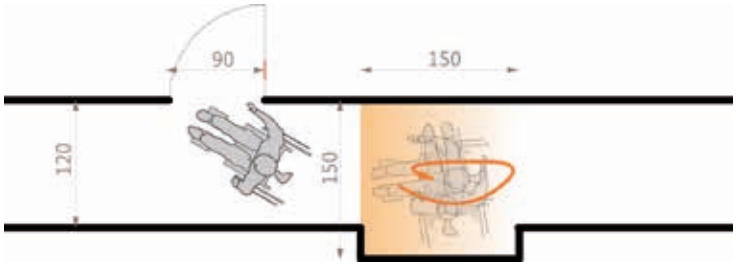


Movement areas – automatic doors

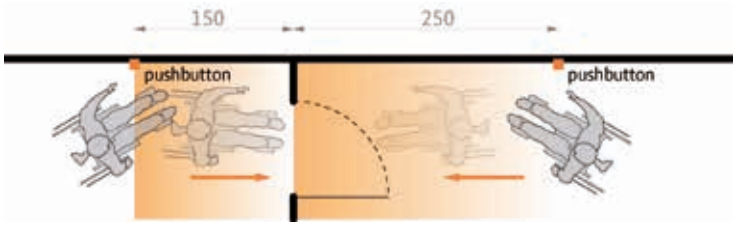
The movement areas (distance between button and vertical door edge) on the lock side of automatic door systems should be designed as follows:



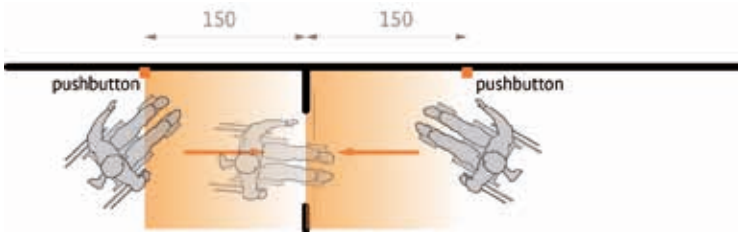
For hinged and pivoted doors and a lateral approach of 50 cm



If the movement area is small, a review is necessary as to whether it is possible for wheelchair users to turn around in immediate proximity to the door in accordance with DIN 18040-1, Chapter 3.2.2.



For revolving doors and a frontal approach, a minimum of 250 cm is required in the opening direction and 150 cm in the closing direction. At such a distance, the door is hardly perceivable as a reference point and needs to be clearly outlined.



For sliding doors 150 cm on both sides

8.3 Usability

The entrance doors to buildings should open and close automatically. They may be operated by sensors or manually, depending on how the building is used. The possibility of communications systems is to be taken into consideration in accessibility planning. If intercom systems are installed, an optical light signal is to be used, for instance, to indicate that the other side is listening.

A visual signal to indicate that the door is opening is to be used for manually operated doors with an automatic release of the door latch.

Swing doors opening in both directions such as café doors are to be avoided. These doors cannot constitute accessible doors leading into a building. Additional revolving or sliding doors are to be envisaged. If swing doors opening in both directions are in place, they need to be equipped with a closing mechanism to prevent them from swinging through.

DIN 32984:2011-10

Revolving doors are to be secured with a 60 cm-deep hazard warning surface across the entire width of the doorway at a distance of 30 cm. A 60 cm-deep hazard warning surface is to be installed along the width of the door in front of automatically opening swing doors at a 30 cm distance from the opened door leaf. Guidance systems and guidance strips may not lead towards these doors but rather to manually operable or automatic sliding doors.

Manually operated doors

DIN EN 12217:2010-11

It must be possible to open manually operated doors with little effort (operating forces and moments according to category 3 of DIN EN 12217). If this cannot be ensured, automatic door systems need to be used.

Door closers should preferably consist of continuously variable closing force (ratchet door closing mechanism).

Hold-open devices may be installed for heavy fire doors. It is important to ensure that they do not protrude into movement areas.

Automatic doors

The doors of the main access routes are preferably to be equipped with automatic door systems.

DIN 18650-1:2010-02
DIN 18650-2:2010-02

Safety distances, delay times due to closing processes, and acoustic signals for blind people and people with visual impairments need to be taken into consideration when installing automatic door systems.

Moreover, the impacts on usability by people with cognitive impairments should be considered and clear information should be provided on the function, and the processes should be easily understandable.

Door handles and door button

Depending on the building's type of use, door handles are to be installed at a height of 85 or 105 cm (height of centre of rotation, centre of spindle hole). Handles always need to be at a height of 85 cm for accessible bathrooms.

As a matter of principle, a height of 105 cm of door handles is better for use by the general public. Their continuous installation at a height of 85 cm, as described in DIN 18040-1, needs to be reviewed depending on the building's type of use.

Buttons are to be installed at a height of 85 cm.

Handle sets must have a convenient grip design. Curved or u-shaped handles are to be preferred. Turning and recessed handles are to be avoided (exception: sports halls). The most suitable types are vertically curved handles as they enable various grip heights.

Horizontally curved handles, for instance in sanitary rooms, facilitate the closing of doors.

8.4 Thresholds

Accessible thresholds for transitions to exterior spaces are special constructions.

Bottom doorstops and thresholds are not permissible. If they are indispensable for technical reasons, they must be a maximum of 2 cm high.

Regulations concerning health and safety at the workplace define a difference in elevation of 4 mm in floors as a tripping hazard (ASR A1.5/1.2).

Any thresholds (including those lower than 2 cm) located in the area of entrance or exit doors and also inner doors are to be avoided to the extent possible as they can cause tripping and are difficult to be climbed over when using a walking frame.

The risk of water seeping into the building, for example during snowdrifts, is a major problem in designing threshold-free transitions from exterior to interior spaces.

An international comparison revealed a permissible threshold height of up to 3 cm for exterior doors (BBR, 2009).

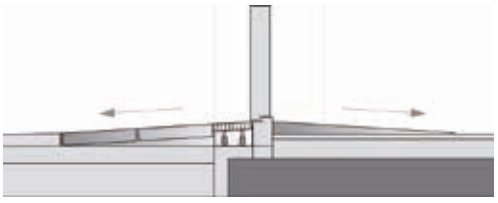
A distance of 15 cm is specified in the Guidelines for Flat Roofs (*Flachdachrichtlinie*) as the difference in height between water-bearing levels and swelling structural components. This requirement can be compensated, however, by for example applying

DIN 18195:2011-12 Guidelines for Flat Roofs (*Flachdachrichtlinie*, ZvDH)

the following measures according to state-of-the-art technology:

- roofing or recesses in buildings
- careful installation of weather sealing
- clamping profiles
- constant water discharge in door area
- drainage channels over the entire door width using metal grate covers (minimum permeability 50%)
- dual and, if necessary, drained magnet seals

The exterior incline must always lead away from the door.

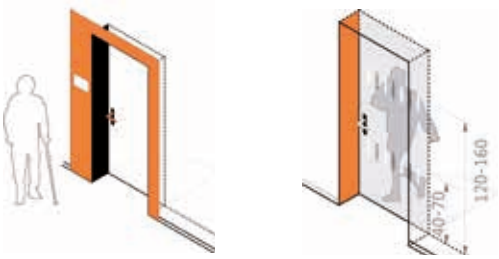


Raising floor surfaces helps to overcome smaller differences in elevation in older buildings; the gradient should not exceed 4%. Gradients of up to 6% may be considered in individual cases.

8.5 Location and detection

Doors and their function must be easy to find and detectable by blind people and people with visual impairments. Door leaves and doorframes must be clearly identifiable tactilely, for example, by means of their material.

The doors' marking must be unambiguous and fit into the overarching information and guidance system of the entire building.



High-contrast door design and marking of glass doors

Contrasting marking strips need to be applied to the entire width at 40 to 70 cm and 120 to 160 cm heights to mark doors made entirely of glass and glass surfaces. The markings must be effective even with changing backgrounds and light conditions. The recommended height of safety markings is 8 cm each.

1 Door as a connecting element – Institute for the Blind Regensburg (Georg • Scheel • Wetzel Architekten, photo by Stefan Müller)

2 Retrofitted automatic sliding door in the heritage protection context. The historical door remains open throughout the day and can thus be experienced. It is closed when opening hours are over. – Meißen, Albrechtsburg (Raum und Bau GmbH, photo by Lothar Sprenger)

3 Marking of glass doors – Local and Regional Court Düsseldorf (agn Niederberghaus & Partner GmbH)

4 Interior door thresholds have been slanted – Meißen, Albrechtsburg (Raum und Bau GmbH)

Emergency alarm and evacuation

Protection target as defined by DIN 18040-1, Chapter 4.7

"Fire prevention concepts need to take into consideration the needs of people with motor and sensory impairments."

9.1 Need and structure

The specific aspects of precautionary fire protection with regard to people with impairments need to be integrated into the planning process in a timely manner.

In the light of a given location and the principles of a fire prevention concept, clarification is needed as to whether the aim is to make provisions for people to rescue themselves; whether in-house measures suffice; or whether a rescue through third party assistance is to be ensured.

LBO
ASR A2.3
ASR V 3a.2

Pertinent regulations of *Länder*-specific building regulations and Special Installations Regulations must be respected. In addition to the regulations of *Länder*-specific building regulations, for workplaces ASR A2.3 and ASR V 3a.2 need to be taken into consideration.

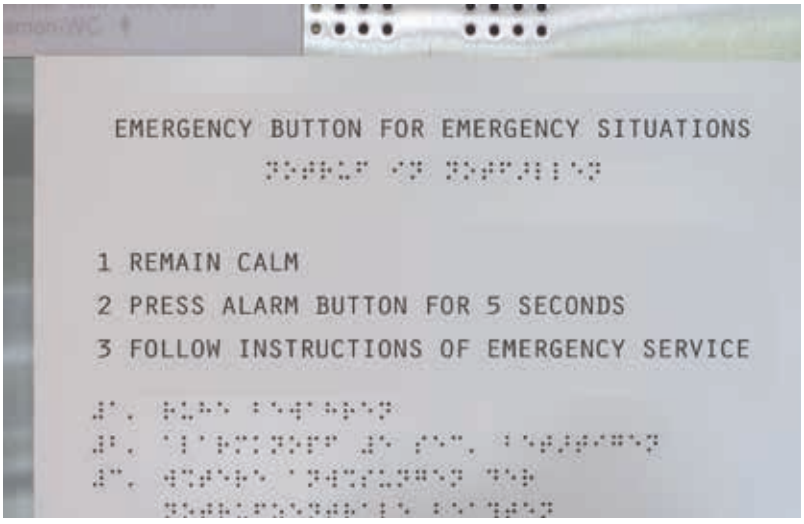
9.2 Specific measures

Special requirements for people with impairments can be taken into account by applying the following, specific measures in addition to a range of structural, in-house, and organisational precautions:

ASR V 3a.2

- continuous compliance with the bi-sensory principle
- installation of additional acoustic systems, such as voice announcements to indicate the direction of escape
- safe waiting areas for people who are not capable of rescuing themselves and have to wait for rescue from others. If these waiting areas are placed in staircases, it is important to ensure that the minimum width of escape routes is not jeopardised by them.
- installing optical warning signals in rooms in which people with auditory impairments may be present, such as public toilets

- **preparing tactilely perceivable escape and rescue plans in Braille or embossed writing style for people with visual impairment** ASR V 3a.2
- **complying with sufficiently sized widths of escape routes for workplaces as outlined in chapter 4.2**
- **in workplaces: keeping movement areas clear and complying with instructions according to » chapters 8.2 and 8.3 with regard to doors along escape routes**
- **rescue plans need to be placed where they can be seen by wheelchair users and persons of short stature**
- emergency assembly points should be designed in such a way as to be reachable by every one.



Training Academy of the Financial of Fiscal Administration Authority North Rhine-Westphalia Bonn (NRW building and property management)

Furnishings and fittings

Service counters, cash registers, controls, assistance centres, waiting halls

"At service counters, cash registers, controls and in similar situations, at least one unit needs to be accessible and usable for blind people and people with visual impairments, people with impaired hearing, and wheelchair users."

Protection target as defined by DIN 18040-1, Chapter 4.6

10.1 Need and structure

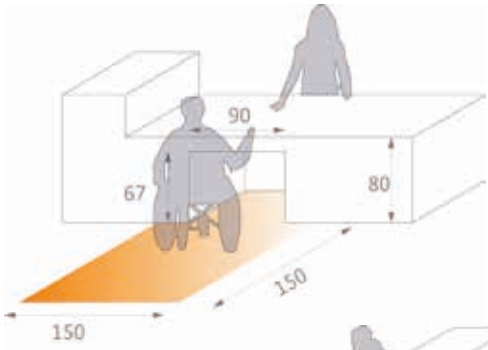
ES EW

Service and information counters must be usable by all people with impairments accordingly. Particular importance should be attached to making them easy to find. The number of accessible assistance desks and waiting rooms needs to be defined according to how they are used, but there should always be at least one accessible desk.

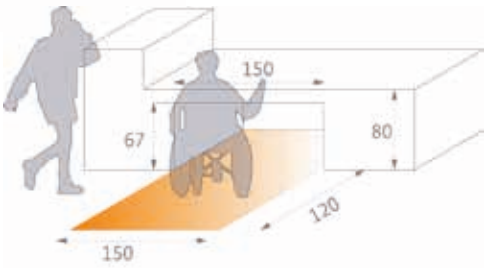
10.2 Basic geometry and space requirements

ES EW A

The movement areas in front of a counter, cash desk, service centre, or controls should usually measure 150 × 150 cm for manoeuvring. At counters with a clear space beneath them that is 150 cm wide, a depth of 120 cm suffices.



Movement area if the counter has a 90 cm-wide clear space below



Movement area if a counter has a 150 cm-wide clear space below

Passages must have a usable width of at least 90 cm. A movement area of at least 150 × 150 cm needs to be envisaged in front of and behind passages.

Turnstiles cannot be the only type of controlled access. At the same time, accessible passages that are at least 90 cm wide need to be provided. Gate posts must exhibit a sufficient distance to each other (at least 90 cm) so that wheelchair users can easily pass through them. This also applies to situations where planters are used as posts.

In waiting rooms, spaces are to be reserved for wheelchair users. The space requirements can be found in the provisions for seminar rooms.

10.3 Usability

ES EW A

Guard barriers should have a tactilely perceivable edge (e.g. frame barriers). Chain elements are to be avoided as these cannot be detected by a long cane and are easily overlooked.

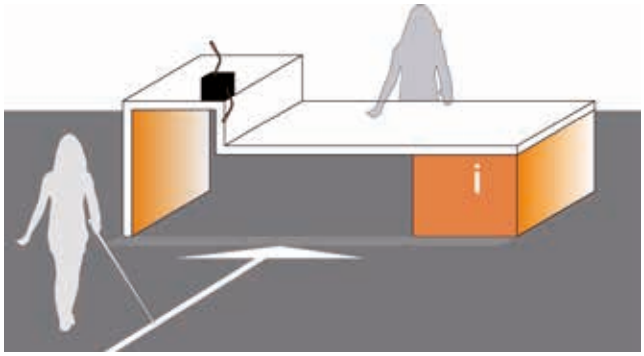
When designing security control gates (screening installations) a review is necessary as to whether it makes sense for wheelchair users and other people with restricted mobility to use them. Suitable solutions need to be developed and, where appropriate, organisational measures offered.

At counters, customers as well as staff should have the possibility to stand or to sit.

An international comparison revealed clear below-counter spaces that are 75 to 80 cm wide, 68 to 70 cm high, and 20.5 to 60 cm deep (BBR 2009).

Frontal communication is enabled for a wheelchair user if the clear below-counter space is 90 cm wide and 55 cm deep. A clear below-counter space height of 67 cm can be reduced further if its depth is at least 30 cm. It can be as low as 35 cm at a depth of 55 cm.

Geometric specifications for usability of below-desk space



Important information must be conveyed using two senses (bi-sensory principle). Ticket numbers in waiting rooms should be called with optical as well as acoustical signals.

Service counters with closed glass windows and intercom systems located in noisy environments or requiring privacy should be equipped with locally limited audio induction loop systems and marked with standardised pictograms. Background noises are to be avoided or minimised by means of suitable acoustic measures.

Microphones for visitors should be fixed at an optimal position (near the speaker's mouth) at the counter.

If needed, mobile induction loop systems can be used.

10.4 Location and detection

For details on contrasting design and integration into guidance systems see » chapters 2.3 and 2.5.

Guidance systems and contrasting design

Pictogram for an audio induction loop system as defined by DIN EN 60118-4: by substituting "FM" or "IR" for the letter "T" in the bottom right corner of the pictogram, similar symbols can be used to mark radio or infra red transmission systems.

1 Controlled access at visitors lift at Albrechtsburg near Meißen, access on the ground floor (DD1 Architekten)

2 Information counters at various heights and audio induction loop systems – Local and Regional Court Düsseldorf (agn Niederberghaus & Partner GmbH)

Interior and exterior furniture and fixtures

**"Components such as signs, glass cases, fire extinguishers, and telephone hoods may not protrude into rooms, thus reducing usable widths and heights.
If protrusions cannot be avoided, they need to be designed in such a way that blind people and people with visual impairments can detect them as obstacles in time."**

Protection target as defined by DIN 18040-1, Chapter 4.5.4

11.1 Need and structure

In a building's interior, furniture and fixtures consist of, for instance, glass cases, signs, fire extinguishers, seating, or exhibits. In exterior spaces they comprise signs, seating, bicycle stands as well as posts and bollards, planters, and stand-up displays. As a general rule, these components must be usable accessibly.

The function of movement and circulation areas may not be compromised by furniture and fixtures.

Special attention should be paid to guidance systems for people with visual impairments. Furniture and fixtures must preferably be positioned outside movement areas and, if necessary, be surrounded with a safety area (» chapter 2.4 on guidance elements).

Seating is an important element for furnishing interior and exterior spaces. People with restricted stamina need resting possibilities in regular intervals. In exterior spaces seating should be made available in foreseeable distances along longer paths. A sufficient number of seating areas is to be envisaged for a building's interior space as well. These are of special significance in museums, lobbies, waiting areas, and libraries.

11.2 Basic geometry and space requirements

Movement areas that are to be kept clear for wheelchair users and people using mobility aids need to be taken into consideration in accordance with » chapters 3.1 and 4.2.

In addition to seating, a resting area for wheelchair users is to be envisaged. It should be at least 90 cm wide and accessible. In buildings that are frequented to a greater extent by older visitors, areas for parking walking frames may be envisaged and placed next to seats.

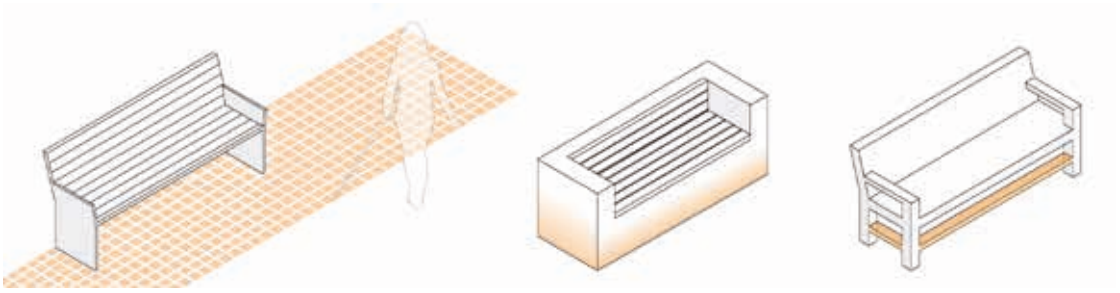
11.3 Perceiving and detecting

Furniture and fixtures may not constitute a hazard and must be perceivable in a timely manner by blind people and people with visual impairments.

According to ISO 21542, fittings and fixtures must end 30 cm above the floor (Accessibility Guidelines for Buildings, implementation of new standards, 2009).

Blind people are capable of detecting objects if they exhibit the following properties:

- extend to the floor,
- end at a maximum of 15 cm above the floor,
- are placed on a detectable (minimum of 3 cm high) plinth projecting the outline of the object
- or have a detectable baseboard at a maximum height of 15 cm.



Examples of accessible designs for benches; marked by a fully-covered contrasting surrounding area, tactilely perceivable base leading down to the ground, or with a tactilely perceivable baseboard.

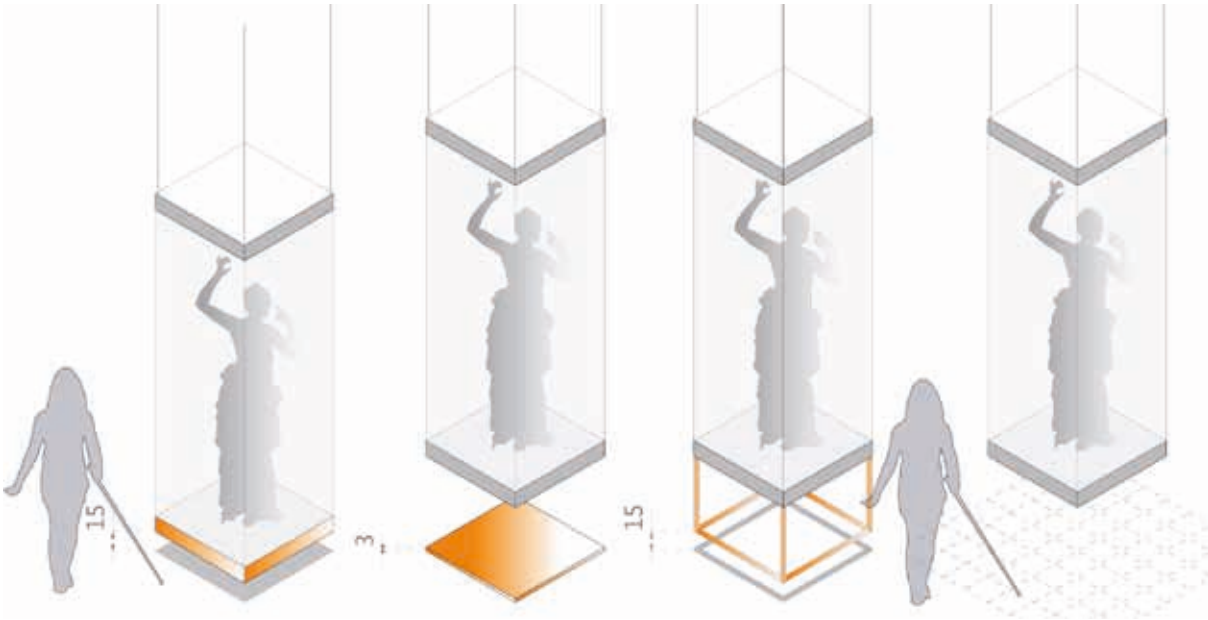
Marking a fully-covered area by a contrasting design in combination with a change of surface that is clearly tactilely perceivable may be substituted, for instance, for bases or baseboards beneath benches and suspended public litter bins.

The posts on which public litter bins are mounted may not protrude into circulation areas.

DIN 32975:2009-12

A contrasting design must be ensured for people with visual impairments (see » chapter 2.5 on visual perception, materials, and visual contrasts).

Transparent furniture and fixtures as well as glass surfaces must be marked by contrasting strips over their entire width at heights of 40 to 70 cm and 120 to 160 cm in such a way that the marking strips are effective even with changing backgrounds and light conditions. The recommended height of safety markings is 8 cm each.



Examples of designing fittings and fixtures

11.4 Usability

EW A

The seating height of seats should be between 45 and 47 cm. Armrests and backrests are to be preferred for at least some seats in a sitting area. Backrests inclined towards the seat surface at an angle of 105° are the most suitable.

The seat surface should be horizontal but not inclined towards the backrest as to make it easier for people with motor impairments to stand up.

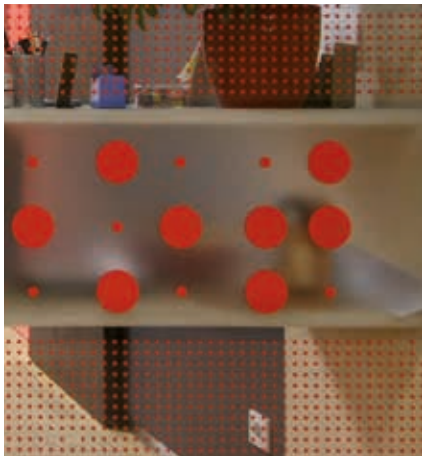
Armrests are ideally located at a height of 65 to 70 cm above the floor. Rounded edges on the seats enable comfortable sitting. Next to the seats a resting area for wheelchair users should be envisaged to enable communication. It should measure 90 × 130 cm and be accessible (» chapter 17 on event halls).

The usable height of furniture and fixtures needs to be adapted ergonomically to users. A comfortable height of 85 cm can be taken as a basis (see » chapter 12.1 – operational elements and communications systems).

1 Height-adjustable sitting area/wardrobe – Institute for the Blind Regensburg (Georg • Scheel • Wetzel Architekten, photo by Stefan Müller)

2 Marking on glass surface – Crèche Schönbrunngasse Graz (Architekt DI Martin Strobl, photo by Pavel Lupač)

3 Bench with space for leaving walking frames – Retirement Home Borken (brandenfels Landschafts-architektur, photo by Andreas Hasenkamp)



Operational elements and communications systems

"Operational elements and communications systems that are necessary for the public's use of the building in accordance with its intended purpose need to be detectable, reachable, and usable accessibly."

Protection target as defined by DIN 18040-1, Chapter 4.5.1

12.1 Reachability

In order to ensure that the operational elements are easy to reach, the requirements of all users need to be taken into consideration:

- step-free access
- a movement area of 150 × 50 cm or 150 × 120 cm (when there is no need to change direction) and a lateral approach width of 50 cm
- a clear below-desk space at a height of 15 cm for frontal approach
- grip/operating height of 85 cm. When several operational elements are placed on top of each other, they can be positioned at heights ranging from 85 cm to 105 cm.

if operational elements are installed in alcoves, their reachability needs to be examined.

12.2 Usability

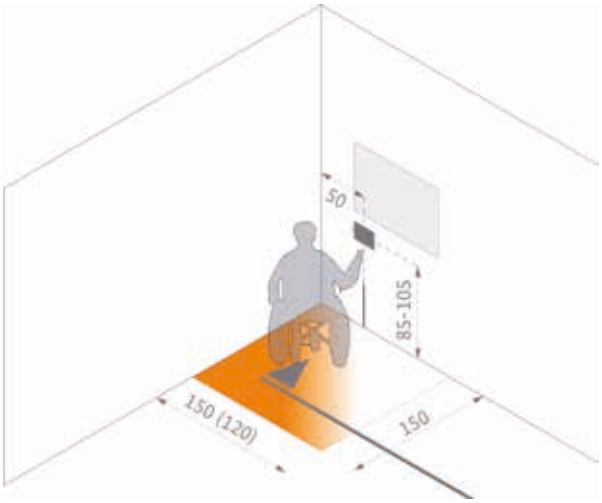
In order to make operational elements easy to find, they should always be installed at the same spots. The elements themselves need to be designed in accordance with the bi-sensory principle. They should boast optical contrasts and, in addition, must be detectable tactilely or acoustically.

Spot lighting can be used for additional support.

In the case of tactilely detectable systems, it must be ensured that they cannot be activated accidentally. Sensors, touchscreens, or contact-free operational elements are not suitable when used exclusively.

The maximum operating force necessary should range between 2.5 and 5 N. Complicated series of movements are to be avoided. A clear acoustic, optical, and, where appropriate, haptic signal should be used to indicate that an operation has been activated.

Communications systems such as emergency call points and intercom systems must be included in the accessible design of a building.



Geometric specifications for operational elements

As a general rule, the bi-sensory principle is to be applied.

For intercom systems, the readiness of the other side to listen should be indicated, for instance, by a light signal so that people with uditory impairments understand when to speak. Preferably, systems should be installed where the user signal is automatically adjusted to the background noise level (see » chapter 2.7 on auditory perception).

Manually operated doors with an electrical release of the door latch should be equipped with an optical signal to indicate the release.

The software integrated into operational elements is to be designed in such a way as to be accessible to people with varying capabilities. This also applies, moreover, to advance information on the website of an authority or institution (Ordinance on Accessible Information Technology, *Barrierefreie Informationstechnik-Verordnung*, BITV 2.0)

Operating instructions must be easy to find and to read. The eye level of wheelchair users and children is to be taken into consideration (about 120 cm).

When planning for a specific person, for example in designing a workplace, integrated systems can contribute to significantly greater user convenience. The operation of door and window opening systems, lighting controls, air conditioning, sun shields, and heating could be adapted to the abilities of the employee in question and be activated by a radio-controlled device or PC or manual switch.

Windows and glass surfaces

"The employees must be able to open, close, adjust, and fix in a desired position windows, skylights, and air conditioning systems. These may not be built in such a way as to constitute a hazard for the staff when opened."

ArbStättv, Annex, Item 1.6 (1)

13.1 Structure

An accessible design and structure of windows is important in rooms where users stay for a longer period of time and open and close the windows themselves. This applies, for instance, to workplaces and to places of accommodation.

Analogously to private homes (DIN 18040-2:2011-09), at least one window in a room may be designed accessibly.

DIN 18040-2:2011-09

13.2 Geometry

The eye level of a sitting person (including wheelchair users) is at a height of about 120 cm. This is of significance for workplaces.

An unobstructed view to the outside is possible if parapets are transparent starting at a height of 60 cm.

DIN 18040-2:2011-09

13.3 Usability, usage

In analogy to » chapter 12 on operational elements, window handles to be used by wheelchair users need to be positioned at a height ranging between 85 and 105 cm. The effort necessary should be kept as low as possible; the operating force of manual operations may amount to a maximum of 30 N, the maximum moment is 5 Nm.

DIN 18040-2:2011-09
DIN EN 13115

Where appropriate, radio controls can be used, for instance, to operate skylights. Window controls could be designed as part of an integrated control system.

Sufficient shielding from the sun needs to be planned for.
A motor-driven operation is to be preferred also in this case.

13.4 Detection

Glass fronts need to be marked analogously to » chapter 11.3 on interior and exterior furniture and fixtures.

Rooms

Photo by Werner Hutmacher

Exterior spaces

14.1 Need and structure

The need for exterior spaces and the requirements for their use need to be defined in the context of requirements planning depending on the type of building. As a general rule, the design of exterior spaces designated for use by visitors and staff should also enable accessible use.

Accessible design of exterior spaces offers staff and visitors possibilities for relaxation and stress relief as well as opportunities for informal social contacts and communication.

The information below on accessible design focuses on essential aspects concerning the characteristics of routing arrangements and common areas.

The basic composition of exterior space design is not dealt with here in detail but is naturally subject to the creativity of landscape architects.

14.2 Usability

Generally speaking, a clear design and comprehensible delineations based on vegetation or structural components support good orientation in exterior spaces. For people with visual impairments and for blind people, orientation can be supported by clear routing and by using uniform materials, for instance, on main paths.

Providing a circular path designed with a uniformed surface that is connected threshold-free to the building, may even encourage the employees to go for a walk during their breaks.

The use of large-scale spaces is facilitated for people with varying physical conditions when more than one path length is offered as well as sitting and common areas.

Depending on the layout of exterior spaces, it may make sense to design paths other than the main paths in different materials so that differing routing options can be marked.

Areas to take a rest should be placed in regular intervals in distances that make them visible from one to the next. The number of seats depends on the space available and the expected number of people using them. In addition to sitting areas, spaces should be allocated for parking wheelchairs, walking frames, and baby carriages.

Terraces and common areas should have a direct connection to the building and be reachable without thresholds. They should be positioned and structured so as to not disturb crossing traffic flows.

Information on possible guidance elements can be found in:
» chapter 3.1 on the basic geometry of circulation areas,
» chapters 2.5 and 2.6 on materials,
» chapter 11 on furnishings and fixtures and seating.

14.3 Orientation aids

Exterior spaces should be fitted with an orientation and guidance system consisting of other guidance elements. In exterior spaces, visually and tactilely contrasting transitions from path surfaces to planted areas (shrubs, hedges, lawns) can serve as guiding lines. Ground surface indicators are usually not necessary as guiding lines (» chapters 2.2 and 2.4).

Common areas and fixtures should be clearly detectable on the basis of their visually contrasting design (» chapter 2.5).

Entrance and lobby

15.1 Need and structure

ES EW

Entrance areas and lobbies are a building's business card and constitute a publicly accessible area. Preferably, shared routing should be continued. Visitors should be able to gain an overview of the building's layout, receive information, and be routed onwards.

Integrating lobbies and entrance areas into overarching guidance systems is obligatory. Placing tactile information and layout plans should be envisaged as a natural part of guidance systems in lobbies.

Facilities, especially service and information counters, must be adapted to be usable for all people with impairments. Special attention should be paid to how easy they are to find. The number of accessible service desks and waiting rooms depends on the building's function, but at least one desk should be designed accessibly (» chapter 10).

Lobbies are defined as reception and break areas for visitors and at the same time as assembly halls.

VStättV

Should lobbies be used for events, measures to improve their acoustics need to be considered in accordance with » chapter 17 on event halls.

15.2 Basic geometry and space requirements

ES EW A

Sizing requirements for movement areas can be found in » chapter 10.2 on service counters, cash registers, controls, assistance centres, and waiting rooms.

In waiting rooms, designated spaces should be reserved for wheelchair users. Space requirements can be found in » chapter 17 on event halls.

15.3 Guidance systems in entrance areas and lobbies

EW A

The necessity to equip entrance areas with guidance systems depends on their basic function, design and size, and the general layout of the premises. If the entrance space is wider than about 8 m, guidance systems become necessary.

DIN 32984:2011-1, Chapter 6.1

1 Shared routing – TU-Dresden, modification and modernisation of lecture hall centre Trefftz-Bau (Heinle, Wischer und Partner, Freie Architekten, photo by Roland Halbe)

2 Entrance area with guidance system leading towards tactile floor plan – Training Academy of the Financial of Fiscal Administration Authority North Rhine-Westphalia Bonn (NRW building and property management)

3 Entrance area design, one tactile guiding line suffices due to the accentuated colourful design of the entrance area up to access routes (Léon Wohlhage Wernik Architekten, photo by Christian Richters)

Wheelchair parking and cloakrooms

"In buildings that can only be used when wheelchairs are switched, parking areas for wheelchairs need to be envisaged."

Protection target as defined by DIN 18040-1, Chapter 4.3.9

16.1 Need and structure

ES EW

Wheelchair parking spaces need to be planned for buildings in which people spend longer periods of time, such as workplaces and places of accommodation, as well as places where wheelchairs can be rented (e. g. museums), or where they are switched (sports facilities).

They can be placed near the entrance area, immediately at the workplace or in the hotel room.

16.2 Geometry

ES EW A

For switching wheelchairs, an area is to be kept clear which is 180 cm wide and 150 cm deep and connects with a movement area of the same size.

Space requirement for switching wheelchairs

Passage widths and movement areas in cloakrooms need to be designed in accordance with » chapter 4.2 and » chapter 11.2. It needs to be ensured that the movement areas for wheelchair users and people using mobility aids are not reduced because of the furniture.

Sufficient space needs to be envisaged, where appropriate, for wheelchairs and mobile sitting aids to be rented. Their size needs to be defined depending on the types of wheelchairs used. For a foldable mechanical wheelchair, an area measuring 120 × 35 cm is sufficient, for an electric wheelchair an area of 120 × 70 cm needs to be kept clear.

16.3 Usability, usage

EW A

Recharging facilities (electrical sockets) need to be available for electric wheelchairs and scooters.

Cloakrooms should be designed in such a way as to be reachable by wheelchair users, persons of short stature, and children. Coat hooks and hanging rails need to be installed at various heights.

Event halls

Protection target as defined by DIN 18040-1, Chapter 5.2

"In rooms with audience seating, spaces should be reserved for wheelchair users and, if necessary, accompanying persons. In assembly, training, and seminar rooms, people with sensory impairments must have support available to perceive information accessibly."

ES EW

17.1 Need and structure

For measures to make the use of seminar, training, and event halls accessible, the following issues need to be defined or clarified during requirements planning:

- the number of spaces for wheelchair users and accompanying persons
- the number of spaces for people with restricted mobility and for persons of tall stature
- the need for information and communications aids
- the necessity to integrate their location into guidance systems.

VStättV

According to the Ordinance on Places of Assembly (*Versammlungsstättenverordnung*, VStättV), 1% of the space for visitors must be reserved for wheelchair users, and at least two spaces on even-ground standing areas. These spaces are to be indicated in seating plans and escape route plans.

Easy barrier-free access to the rooms and a spatial proximity to service facilities (e. g. toilets) need to be taken into consideration.

The linear formula for calculating the necessary space does not always correspond to the actual need on site. If the rooms are small, they require more wheelchair spaces, while the number indicated for large event halls appears to be significantly greater than has proved necessary in practice.

The location of the rooms and their impact on vertical access within the building and in connection to exterior spaces may greatly influence the design of fire prevention concepts

ES EW A

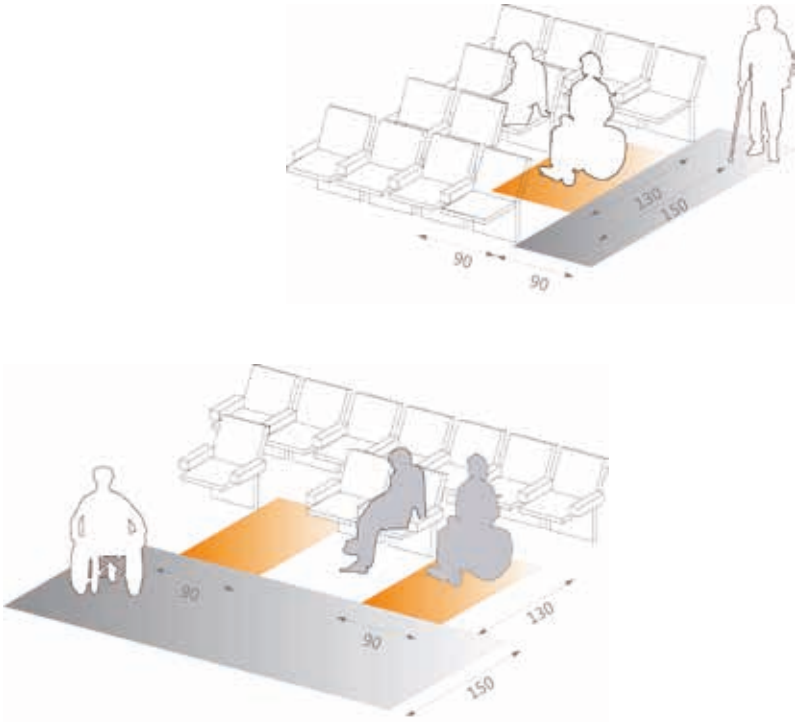
17.2 Basic geometry and space requirements

The following areas need to be envisaged for wheelchair users in case of fixed seating:

- For reverse or frontal approach, a standing area of a depth of at least 130 cm and a width of 90 cm, and an additional 150 cm-deep movement area need to be reserved.
- For lateral approach, a standing area of a depth of at least 150 cm and a width of 90 cm, and a lateral movement area of a minimum width of 90 cm need to be reserved.

Access routes and movement areas may overlap.

The spaces for wheelchair users are to be located between or next to seats for accompanying persons.



Space requirement for fixed seating

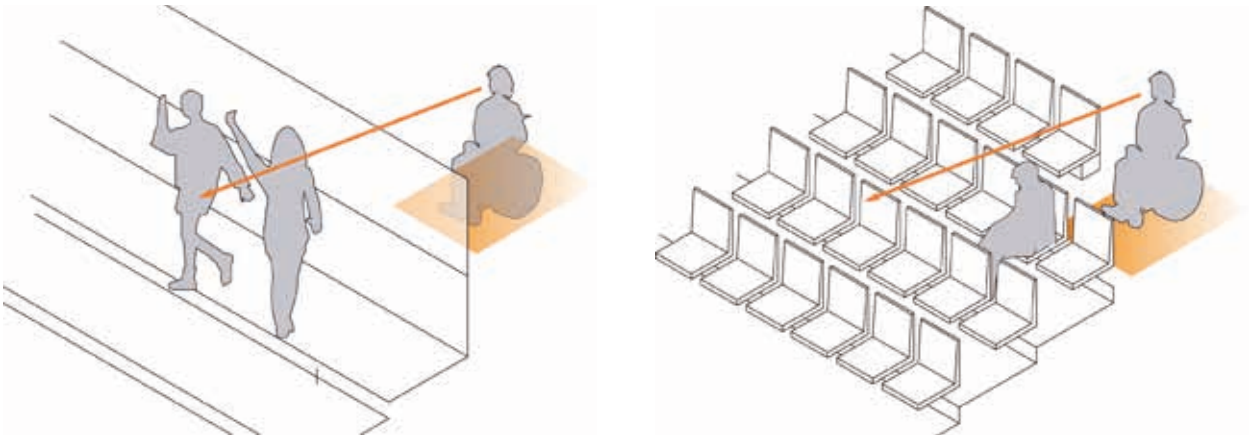
Spaces for wheelchair users in large event halls should be offered at varying price ranges.

In the case of fixed tables a clear below-table space is to be envisaged for wheelchair approach. The geometric requirements for making these spaces usable can be found in » chapter 10.

Seats offering more legroom are to be envisaged for people with walking impairments and people of tall stature.

Spaces for wheelchair users should have an adequate view of the stage areas. Maintaining a sightline needs to be ensured, especially when it can be expected that people will be standing or jumping up.

DIN EN 13200-1:2011-04
Spectator Facilities



Sightline for standing and sitting spaces

When parapets are placed in front of seating areas, it is important to ensure that they do not restrict the view.

Barrier-free accessibility of stages and raised platforms (e.g., seats for judges in court rooms) needs to be ensured. If there are several rooms serving the same purpose, an accessible design should be enabled for a certain number of these rooms; at least one room per unit should be accessible.

Rostrums need to be height-adjustable and have a clear space beneath them so that people of various anthropometry can use them while standing up or sitting.

17.3 Information and communication aids

ES EW A

DIN 18041:2004-05

People with hearing impairments should also be capable of engaging in voice communication. This objective entails increased structural requirements and room acoustics requirements. Optimised room acoustics are obligatory (see » chapter 2.7).

Rooms larger than roughly 250 m³ usually require electro-acoustic enhancement systems for voice speech. Separate transmission systems, such as audio induction loops, must be installed for people with hearing impairments.

Installation costs for audio induction loop systems are relatively low compared to other systems (infra red, radio systems).
No multi-channel transmission is possible in this case, and this would be needed, for example, for interpreters.

The question needs to be examined whether transmission systems need to be installed across the entire auditorium space.

A room's function and its overall structural conditions will provide the basis for selecting the appropriate type of transmission (induction, radio, infrared): great metal losses due, for instance, to reinforcing concrete structures may disrupt induction loop transmissions. Once a suitable system has been selected, a review is necessary as to where structural expansions or modifications are possible at a later stage. FM and infrared systems are best suited when working with interpreters.

Induction systems are to be planned in such a way as to avoid horizontal and vertical overlaps in the transmission of voice communication and to prevent them from interfering with other technical systems (such as loudspeaker systems).

These rooms need to be clearly marked using the pictogram for audio induction loop systems. If not all the areas within a room can be covered, this needs to be indicated clearly. Where appropriate, mobile systems may be made available.

The space designated for a sign-language interpreter must be clearly visible and well lit.

Where appropriate, projections may be used to show sign-language interpreters or the mouths of speakers, and speech-to-text interpretation.

Writing and reading areas for people with visual impairments require appropriate illumination. This illumination should be free of blinding effects.

The illumination concept needs to be designed sustainably. Flexible systems should be considered, for instance, so that they can be used in varying situations. It is also important to note that stronger light (over 1,000 lux) needs to be envisaged for people with visual impairments.

17.4 Location and detection

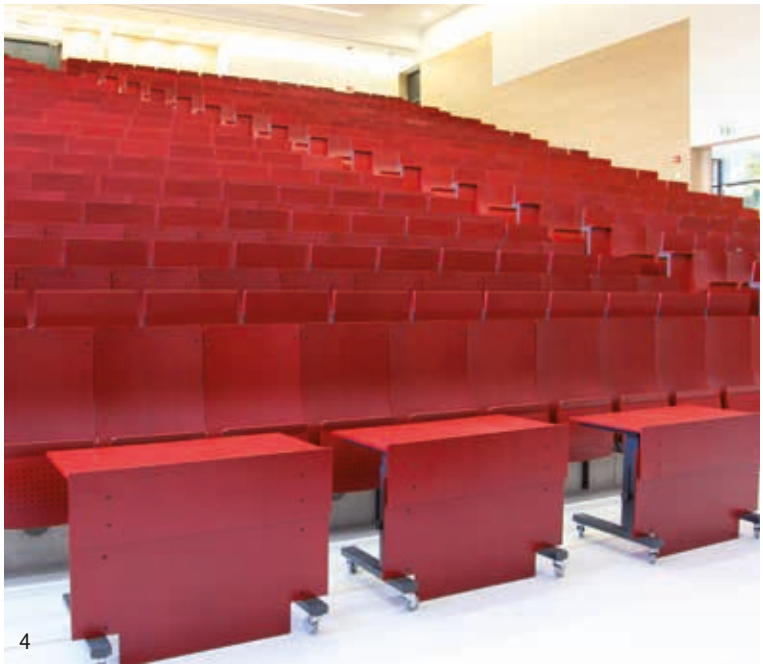
See » chapter 2.5 for information on contrasting design and integration into guidance systems.

1 University lecture hall with audio induction loop system, flexible illumination concept, and height-adjustable rostrum – Paul Ehrlich Institute Langen (Angela Fritsch Architekten, photo by Prof. Dieter Leistner)

2 Court room with audio induction loop system and a judges' gallery reachable by ramp – Local and Regional Court Düsseldorf (agn Niederberghaus & Partner GmbH)

3 Acoustic design of a school cafeteria – Schule auf dem Tempelhofer Feld, Berlin (ludloff+ ludloff Architekten BDA, photo by Werner Hutmacher)

4 Spaces reserved for wheelchair users – Lecture Hall Centre PPS, RWTH Aachen (HH+F Architekten)



Museums and exhibitions

18.1 Need and structure

Exhibition halls and museums need to be designed in such a way as to be usable for all visitors. The basic requirements for accessible design of publicly accessibly areas remain untouched. There are additional, specific requirements that result from the specific function of exhibition halls.

It is important to ensure a simple, understandable sequence of rooms, and robust, accessible concepts for access routes providing a certain flexibility. Furthermore, accessible museum education concepts need to be supported by structural and technical components to the extent possible.

During requirements planning the following elements need to be defined:

- accessibility of exhibition rooms, including compensation measures if accessibility cannot be ensured (video transmissions)
- need for offering specialised services
- designing advance information
- concept for guidance systems
- possibilities to perceive the exhibits by using other senses
- need for compensation technology
- acoustics and illumination requirements
- connection to outdoor exhibition areas.

The location of the rooms and their impact on vertical access within the building and in connection to exterior spaces may greatly influence the design of fire prevention concepts.

Additional information on basics can be found in the check list on developing and designing accessible exhibitions compiled by the Regional Association of Museums of Berlin (*Landesverband der Museen zu Berlin*, LMB):
www.lmb.museum/de/
For information in German, follow this path: *Startseite → Fach-und-Arbeitsgruppen → AG Barrierefreiheit in Ausstellungen*

18.2 Basic geometry and space requirements

Movement areas and passage widths need to be designed in accordance with the requirements described in » chapters 10 and 11.

18.3 Usability

is important to note that the requirements for making exhibits accessible for people with restricted mobility may be contradictory to the safety requirements for people with visual impairments. Compromises need to be found to fulfil all needs to the extent possible.

Furnishings and fittings need to be designed as outlined in » chapter 11. If possible, compensation possibilities should be offered for sensory impairments. These could consist, for example, of tactile objects.

Information should be conveyed on the basis of the bi-sensory principle, i. e., using more than one sense. Reflections and blending effects are to be avoided.

Exhibits and objects to be operated should boast a clear space beneath them for wheelchair approach.

The exhibits are to be placed in such a manner that children and persons of short stature as well as wheelchair users can look at them. Where appropriate, height-adjustable fittings are to be preferred.

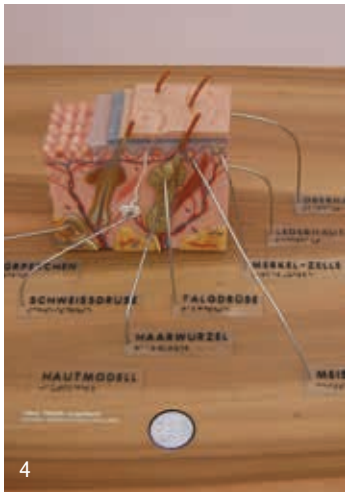
18.4 Guidance systems in exhibition areas

The system to guide visitors through an exhibition shall combine information on the building with content on the exhibition and museum education. The guidance systems for museums are therefore to be designed with great care in a coordinated approach among various disciplines. People with cognitive impairments are also to be included in the concepts. The systems should be selected on the basis of the best technology available. Audio and video guides could be used, for instance, to support the systems, as they can provide information for spatial orientation as well as museum content. Video guides (in sign language) can be employed for conveying information for people with auditory impairments. The latter could also be provided with the possibility to connect their personal receivers to the exhibition's guidance system.

The information chain should be continuous. As a starting point for the information chain, tactile information in the form of tactile models or raised-relief plans are suitable for blind people and people with visual impairments to perceive the building's outline and the exhibition.

Labelling is to be designed in sufficiently sized letters and contrasts (» chapter 2.5).

Information should be conveyed in easy language.



1 Tactile model – Aachen Cathedral

2 Tactile model – Art Gallery Graz (photo by Pavel Lupač)

3 Glass cases with clear spaces beneath them – Albrechtsburg Meißen

4–6 Hygiene Museum Dresden (Peter Kulka Architekten)

Rooms
for catering and kitchenettes

19.1 Need and structure

Rooms used for catering usually are publicly accessible areas. Kitchenettes and internal cafeterias, however, are part of workplaces and need to be designed accessibly as well.

19.2 Basic geometry and space requirements

A clear width of passage for wheelchair users and people using mobility aids may not fall below 90 cm. An area of 150 × 150 cm for changing direction must be made available at an appropriate location.

DIN 18040-2:2011-09

On the basis of DIN 18040-2, a movement area measuring 150 × 150 cm needs to be envisaged in front of kitchen counters.

19.3 Usability

Flexible seating is to be preferred. Clear spaces below tables and counters necessary for wheelchair approach need to measure 90 × 55 cm. In fixed seating surroundings, spaces need to be reserved for wheelchair users (see » chapter 10).

Rooms for catering should not be equipped solely with stand-up tables and bar stools. A side-by-side use by people with and without impairments can be supported by furniture design.

DIN 18040-2:2011-09

On the basis of DIN 18040-2, kitchen sinks and, where appropriate, stovetops should be installed in kitchenettes at a height of 67 cm with a space beneath them for wheelchair approach. Hot water from the tap may not exceed 45 °C.

Where appropriate, height-adjustable kitchen counter tops can be used, or counter tops that are fixed can be installed at different heights. The reachability of high and low kitchen cupboards needs to be considered.

19.4 Location and detection

See » chapter 2.5 for information on high-contrast design.

A zoning of the areas is recommended.

1, 2 Accessible stand-up table – Outdoor area of the cafeteria at the Paul Ehrlich Institute Langen (Angela Fritsch Architekten, photo by Grote, PEI)

3 Tactile paving system, furniture, and window markings – Cafeteria of the Centre for the Blind and for People with Visual Impairments Innsbruck (Architekt DI Mayrhofer, architektur.ps; photo Magdalena Possert)

4 Accessible service counter of cafeteria – Paul Ehrlich Institute Langen (Angela Fritsch Architekten, photo by Prof. Dieter Leistner)

Sanitary installations

Protection target as defined by DIN 18040-1, Chapter 5.2

"Accessible sanitary rooms need to be designed so as to be usable for their intended purpose by wheelchair users, people using walking frames, and blind people and people with visual impairments."

ES EW

20.1 Need and structure

The necessary number of accessible sanitary installations is to be defined in the context of requirements planning on the basis of *Länder*-specific building regulations or special regulations, and in coordination with the user of the building.

VstättV

In places of assembly, the number of suitable, step-free toilets for wheelchair users depends on the number of spaces reserved for wheelchair users. For every 10 spaces designated for wheelchair users (per 1,000 visitor seats) there must be one toilet; as a general rule, at least one accessible toilet must be available.

VDI 6000 Blatt 3

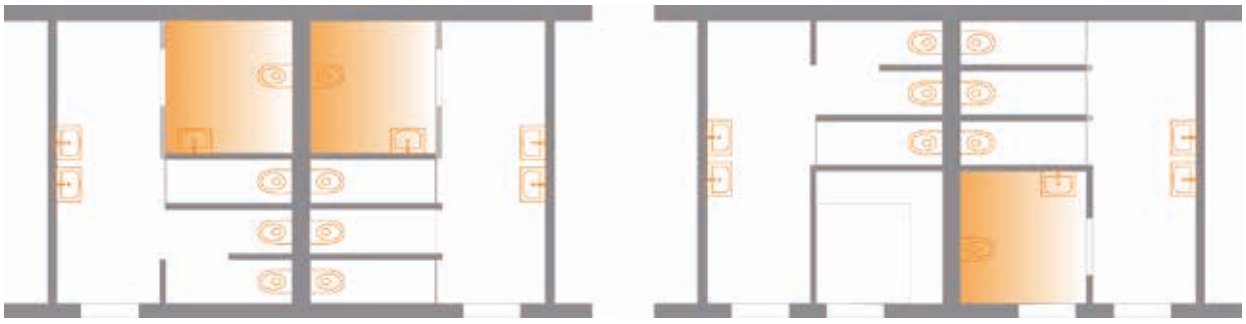
VDI 6000 Part 3 recommends the following number of necessary toilets:

- 25 to 300 visitor seats — 1 cubicle
- 500 to 1,000 visitor seats — 2 cubicles
- 1,500 to 3,000 visitor seats — 4 cubicles
- 4,000 to 6,000 visitor seats — 6 cubicles

Accessible toilets can either be integrated into gender-specific areas or positioned separately as gender-neutral units.

Positioning accessible toilets in a gender-neutral area is beneficial for persons requiring assistance and for families. A combination with a baby-changing room is recommended.

Integration of accessible sanitary rooms into sanitary installations



Moreover, in the light of demographic developments, sanitary installations should be offered that correspond to the needs of users with restricted stamina or motor and sensory impairments. It is important to consider the handling of forearm support crutches, the installation of additional handholds, and high-contrast design. Anthropometric diversity also needs to be taken into consideration (children, persons of short stature, old people with impaired stamina).

The number and positioning of accessible sanitary rooms in workplaces should be planned flexibly to enable sustainable use and thus user-specific modifications at a later point in time.

As a general rule, accessible toilets and washrooms are to be placed near accessible workplaces. For large toilet facilities, VDI 6000 Part 2 stipulates cubicles with a washbasin and full-length mirror for people with anus praeter devices, unless there is a separate toilet cubicle for people with restricted mobility.

ArbStättVO
VDI 6000 Blatt 2

20.2 Basic geometry and space requirements

ES | EW | A |  | | | |

Hinged and pivoted doors of sanitary rooms may not open inwards. If a door becomes blocked because of a fall, for instance, it must be possible to unlock and open it from the outside.

An international comparison revealed that specifications on the opening direction of doors depend on the size of sanitary rooms (BBR 2009).

Sliding doors may be possible as an alternative.

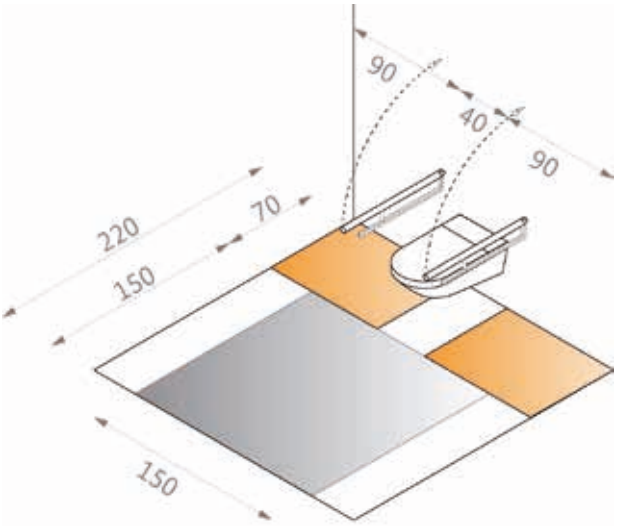
Movement areas of at least 150 × 150 cm need to be envisaged in front of sanitary installations. Movement areas may overlap. A washstand or washbasin needs to be available in each accessible toilet. The necessary movement areas need to be taken into consideration depending on the structural design.

The necessity of loungers to provide people with restricted mobility the possibility to change needs to be reviewed (see » chapter 20.7).

Space requirements for toilets with washstand or washbasin

An international comparison revealed the movement area to be 65 cm deep and 80 cm wide. Approachability from both sides is not explicitly required or defined as a more stringent standard (BBR 2009).

The toilet bowl must be approachable from both sides. For this to be the case, a movement area of a depth of 70 cm (from the leading edge of the bowl to the back wall) and a width of 90 cm is required.



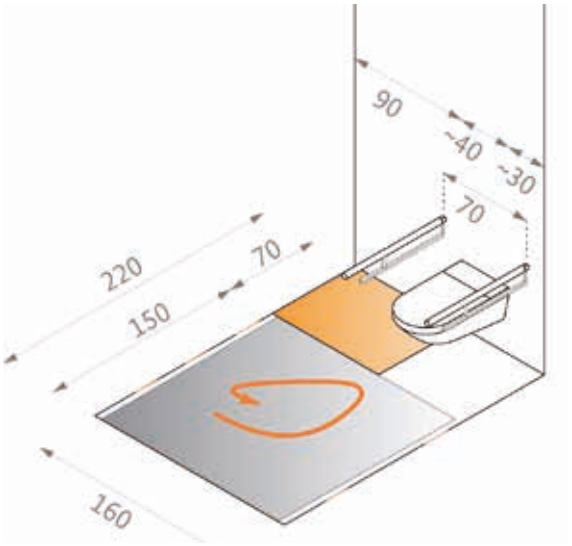
Geometric specifications for toilets

Approachability from both sides can be compensated for as follows:

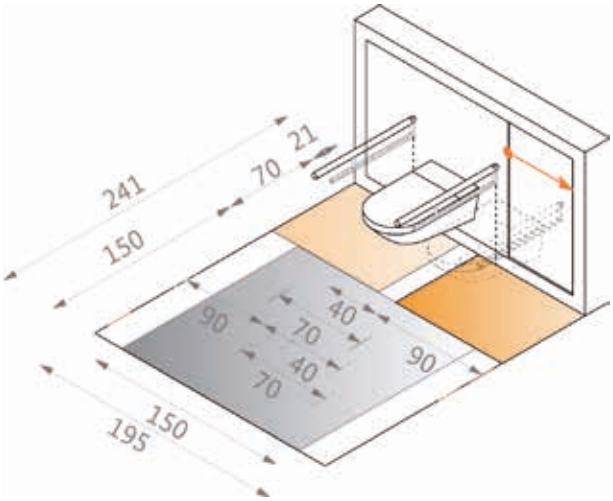
- **spatially, if there is another toilet with an inverted layout nearby**

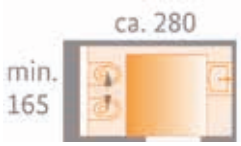
The toilets should be marked correspondingly.

Space requirements of a toilet with washstand or washbasin for one-sided approach



- technically, by means of movable, electronically driven toilet facility



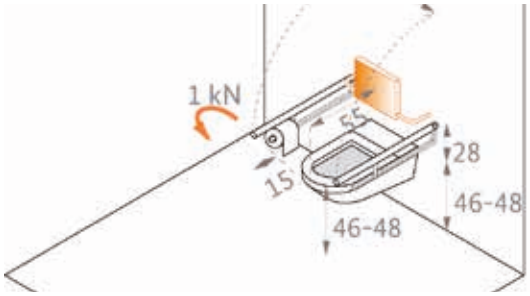


Movement areas for movable toilets; the wall depth of this special construction needs to be taken into consideration.

20.3 Toilets

EW A

The fittings of accessible toilets should include a self-closing waste bin to be operated with one hand. Toilet bowls are to be mounted at a height between 46 to 48 cm (upper edge including seat). A suitable backrest (not toilet cover) needs to be placed 55 cm behind the leading edge of the toilet.



Geometric specifications for toilets

Support rails:

- are to be installed on both sides, with a clear distance of 65 to 70 cm and an upper edge height of 28 cm above seat height.
- are to be foldable into individually chosen positions using little effort; folding may be facilitated by spring loads.
- protrude 15 cm over leading edge of toilet
- the fastening on the front side of the rail needs to withstand a point load of 1 kN.

An international comparison revealed a point load of up to 1.7 kN (BBR 2009). According to VDI 6008 2, 1.5 kN need to be taken into account.

For toilets designed for one-sided approach, support rails may be installed on walls, preferably in an angular shape. For people using forearm support crutches, holders on foldable support rails are helpful. Forearm support crutches can be leaned against the wall while using the toilet at toilets with one-sided approach.

Flushes and toilet paper holders must be within reach from a sitting position.

Flushing can be activated in the following ways:

- manually, by pressing a button on the support rail
- contact-free by sensor; in this case accidental activation must be excluded.

Preferably, toilet paper holders are to be integrated into support rails.

20.4 Urinals

In large toilet installations, at least one urinal should be installed at a height of 50 cm for children and persons of short stature.

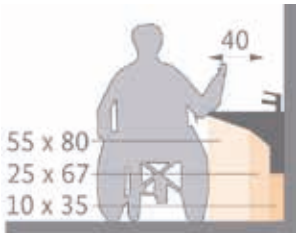
20.5 Washstands

Washstands need to have a clear space beneath them so that the upper body of the wheelchair user can extend over the front edge of the washstand and the wheelchair user can use the taps from this position.

Necessary legroom needs to be at least 90 cm wide for this variation.

Washbasins without stand only need a clear space of a 45 cm depth beneath them.

The mirror above the washbasin must be usable from both a sitting position and while standing up. This can be accomplished by installing a flexible mirror or a higher, fixed mirror (at least 100 cm high).



Geometric specifications for clear spaces beneath washbasins for wheelchair approachability

Water taps must be designed as single-lever or contact-less taps. Contact-less taps may only be used in combination with a temperature-controlled system. To avoid burning, the water temperature at the tap may not be higher than 45 °C.

20.6 Showers

EW A

Showers must be designed threshold-free; the maximum elevation may be 2 cm, preferably as a slanted surface.

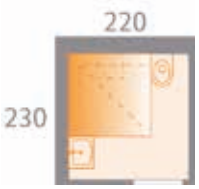
The shower pan must be coated with a Class B slip-resistant surface (suitable for barefoot use) in accordance with GUV-I 8527. Adjacent areas must be designed on the basis of at least Assessment Group 10 according to ASR A1.5/1.2.

GUV-I 8527

Operational elements such as shower fittings and showerheads are to be installed at a height of 85 cm. If mounted on top of each other, they can be positioned at heights up to 105 cm.

The installation of vertical grab bars is recommended.

Single-lever shower mixers are easy to operate and must be designed so as not to be a hazard for blind people and people with visual impairments.



Space requirements for a sanitary room including shower, toilet and washstand

Fold-down shower seats must be at least 45 cm deep and installed at a height between 46 and 48 cm. Folding support rails as part of the seat unit are to be mounted on the basis of the same geometric requirements as toilets.

Transparent shower partitions need to be marked as described in » chapter 11.3.

20.7 Loungers

As loungers need to be available to offer people with restricted mobility the possibility to change clothes and catheters, their placement in workplaces needs to be reviewed and planned as necessary. They can be placed in a sanitary installation or sanitary room, provided that it has a washbasin in it.

According to DIN 18040-1 loungers need to be available in sanitary rooms of service stations on motorways and sports facilities.

Loungers are 180 cm long, 90 cm wide and 46 cm high. A 150 cm-deep movement area is to be kept clear in front of the loungers. Foldable stretcher beds are possible.

20.8 Emergency call and emergency alarm systems

In toilets, a visually contrasting and tactile detectable emergency call system must be installed near the toilet bowl. It must be possible to activate the emergency call device while sitting on the toilet or lying on the floor. The devices must be detectable and easy to find for blind people.

Emergency alerts in case of fire should be provided in accordance with the bi-sensory principle (see » chapter 9).

In public areas, a visual alert is recommended; for workplaces vibration alerting at personal receivers may be used.

20.9 Location and detection

Sanitary rooms need to be marked unambiguously for blind users and users with visual impairments. Furnishings and fittings must be clearly detectable in visual contrast to their surroundings.

The integration of the location of sanitary rooms into orientation and guidance systems is described in » chapter 2.3.

1


2


3

1 Signage – Local and Regional Court Düsseldorf (agn Niederberghaus & Partner GmbH)

2 High-contrast design – Ettersburg Castle (Gildehaus.reich architekten BDA and Architekturbüro Dr. Lutz Krause)

3 Forearm walking support crutches in holder – Therapy and Prevention Centre (Vera Schmitz, efficientia)

4 Accessible toilet – State Theatre of Darmstadt (modifications planned by Lederer+Ragnarsdóttir+Oei, CBF tactile paving system, photo by Michael Müller)

Office workplaces

ASR V3a.2, Accessible Design of Workplaces 2012

"A workplace is designed accessibly when structural components, means of transport, tools, information processing systems, acoustic, visual, and tactile information sources and communications systems can be accessed and used by staff with disabilities in their customary manner without particular impediments, and in principle without assistance."

§ 83 SGB IX

21.1 Need and structure

The requirements for workplaces in terms of quality and quantity need to be defined by the requesting agency on the basis of an integration agreement in accordance with § 83 SGB IX.

Integration agreements stipulate that workplaces are to be adapted specifically to the individual employees and their impairments. A prerequisite for that is the employees' ability to execute the necessary functions or to acquire the necessary skills.

Additional workplaces such as laboratories can be planned analoguously in an accessible design, subject to specific requirements.

Should generally accessible workplaces be envisaged, an overarching concept must be developed to ensure that individual adaptations can be performed easily at a later stage. This overarching concept comprises, for instance, access routes, sufficient passage widths, sufficient space, and retrofittable technology.

The assessment system for sustainable building stipulates the aim to plan 95% of all workplaces for accessible use.

In the context of a given spatial situation, especially in existing buildings, solutions are to be sought to provide as many workplaces as possible within a part of a building that is designed accessibly.

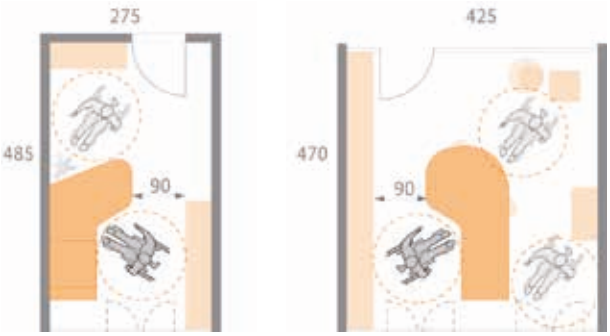
Accessible design refers not only to the workplace itself but includes additional rooms and facilities the employees use, such as:

- meeting and conference rooms
- break rooms and staff rooms, kitchenettes and cafeterias
- sanitary rooms (nearby) and first-aid rooms
- internal access routes (traffic routes, ramps, stairs, doors, escape routes, emergency exits)
- where appropriate, wheelchair parking spaces, auxiliary rooms (copying machine, EDP).

21.2 Basic geometry and space requirements

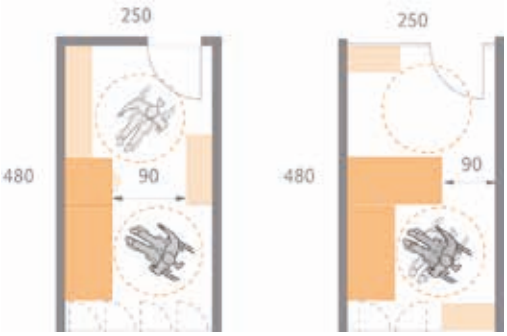
ES EW A

According to the upper limits for business rooms in federal authorities as outlined in Sample 13 RBBau Guidelines, the space requirement for workplaces for employees needing mobility aids or using wheelchairs may be 10 to 12% greater than for conventional workplaces. It is important to note, however, that the space requirements depend on room geometry, window systems, and furniture properties.



Geometric specifications for office rooms

In existing buildings or when it is necessary to adhered to standard axis values of about 1.30/1.35 m, and if appropriate furniture is provided, a space of 12 m² may suffice for an office room. Shelves that may not be easily reachable can be compensated, for example, with mobile filing cabinets.



Geometric specifications for office rooms with adapted furnishing

Moreover, the widths of passage through doors, door heights, and movement areas in front of furniture and technical devices need to be taken into account as already outlined in » chapters 8, 10, 12, and 13.

21.3 Usability

A workplace's design is based on optimised workflows. For employees in wheelchairs, office furniture should be placed at a 90° angle, so they need only to turn around.

For wheelchair users, a clear below-desk space is necessary for approachability as outlined in » chapter 10.3. Height-adjustable desks and worktops enable adaptation to the individual needs of all employees.

The heights and management of operational elements are described in » chapter 12.3.

Pull-out cabinets and cabinets with roll-up or sliding doors are to be preferred in office furniture. A maximum grab height of about 140 cm is to be maintained.

A review is necessary as to the heights where devices that may be needed should be installed. Fixed, structurally integrated worktops should not be used, if possible, because they do not offer any flexibility.

Communications systems for employees with auditory impairments are to be installed in individual cases as required. It is important to ensure that other rooms, such as meeting and conference rooms, are equipped accordingly.

Workplace windows need to be planned as described in » chapter 13. Sufficient sun shielding is to be taken into consideration.

21.4 Location, detection, warning

A high-contrast design is obligatory for workplaces.

Door labels need to be adapted to individual needs and may be provided, for instance, in Braille or in an embossed writing style.

The necessity for the location of the workplaces to be integrated into guidance systems needs to be reviewed. It is important to note that employees with visual impairments may be familiar with the premises as is customary and may require support only at specific points.

All information concerning health and safety at the workplace, such as labelling, announcements, marking, and signage needs to be provided on the basis of the bi-sensory principle: ASR V3a.2

- tactile or acoustic signals need to be substituted for visual signals for employees who cannot see them
- tactile signals (vibration of radio device) or visual signals need to be substituted for acoustic signals for employees who cannot hear them. For persons of short stature and wheelchair users, information needs to be positioned at suitable heights (120 to 140 cm).

Requirements for escape and rescue plans, rescue routes and emergency exits can be found in » chapter 9.

Accommodation

ES EW

Need and structure

Before planning begins, it is necessary to define for which users accessible accommodation is to be built and how many rooms are necessary. The criteria for accessible design of guest rooms should be based on the impairments of the intended users. Offering generally accessible guest rooms has not proved practical.

During requirements planning the number of accessible rooms needs to defined for wheelchair users (space requirement: 150 × 150 cm), for people using mobility aids such as walking frames (space requirement: 120 × 120 cm) and for those with motor impairments. All rooms should be usable for guests with visual impairments and guests with auditory impairments.

For the accommodation of people using wheelchairs, Specifications 2 of DIN 18040-2 can be used.

Five user groups have been identified on the basis of set objectives for standardised registration, evaluation, and description of accessible offers in hotels and restaurants:

- Category A: for guests with walking impairments who sometimes rely on wheelchairs, including non-motor-driven ones, or walking aids
- Category B: for guests who permanently rely on wheelchairs
- Category C: for guests with visual impairments or blind guests
- Category D: for guests with hearing impairments or hearing loss
- Category E indicates that all the requirements for Categories A to D are fulfilled.

Room fit for wheelchair use – Ettersburg Castle (Gildehaus.reich architekten BDA and Architekturbüro Dr. Lutz Krause)

22.2 Basic geometry and space requirements

For guests using mobility aids or wheelchairs the requirements for wheelchair approachability can be found in » chapter 10 on service counters, cash registers, controls, assistance centres, and waiting rooms and » chapter 20 on sanitary rooms.

In analogy to DIN 18040-2, a movement area of at least 150 cm needs to be kept clear along the length of the bed and another that is 20 cm wide on the opposite side.

DIN 18040-2:2011-09

Beds can be placed along the wall.

22.3 Usability

For guests using mobility aids or wheelchairs, clear spaces beneath pieces of furniture are obligatory to ensure wheelchair approachability as outlined in » chapter 10 on service counters, cash registers, controls, assistance centres, and waiting rooms.

Operational elements are to be installed in accordance with the specifications in » chapter 12 on operational elements and communications systems.

Technical systems such as accessible telephones and mobile or fixed audio induction loop systems that can be connected to audio devices need to be available for guests with auditory impairments.

Sanitary rooms need to be designed as outlined in » chapter 20 on sanitary rooms.

22.4 Location, detection, warning

Contrasting design is to be adhered to as outlined in » chapter 2.4.
The location of guest rooms for people with visual impairments can be integrated into guidance systems.

It needs to be ensured that alarms can be perceived by guests with auditory impairments. In sanitary rooms, for instance, this can be accomplished by using optical signals. In bedrooms, alarms can be coupled to hearing aid systems or accessible telephone systems, or pillows with integrated vibration alerts. Where appropriate, organisational measures may be necessary.