



Federal Ministry for the  
Environment, Nature Conservation,  
Building and Nuclear Safety



# Guideline Accessibility in Building Design

# Imprint

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See page 211

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# Table of content

<b>Foreword .....</b>	5
<b>Introduction .....</b>	6
<b>The structure of the Guideline .....</b>	7
<b>Part A – Basic framework .....</b>	9
Legal basis .....	10
Summary of legal basis .....	17
<i>Baukultur</i> and historic monuments .....	22
Sustainable building .....	23
Cost efficiency .....	24
<b>Part B – RBBau Guidelines and accessibility requirements .....</b>	27
Introduction to Part B .....	28
RBBau Guidelines and accessibility requirements .....	30
Requirements planning .....	31
Analysis of alternatives to fulfil requirements .....	33
ES-Bau ACCESSIBILITY CONCEPT .....	34
EW-Bau ACCESSIBILITY PROOF .....	38
Detailed design phase .....	43
Construction phase .....	44
Hand-over of completed project and documentation .....	45
<b>Part C Areas of action .....</b>	49
Introduction to Part C .....	50
The requirements and special needs of people with disabilities ...	51
Protection targets according to DIN 18040-1 .....	54
How to use the Guideline .....	55
Overall concept .....	56
Access routes .....	90
Furnishings and fittings .....	134
Rooms .....	146
<b>Part D Reference project .....</b>	177
<b>Annex .....</b>	201
Glossary .....	202
Bibliography .....	207
List of images .....	209
Members of the research-supporting working group .....	210
Picture credits .....	211



## Foreword

For far too long, people with disabilities were excluded from a large part of our lives, above all from public life. I am delighted to see how much has changed in this regard. But it is still clear: we are far from having reached our goal. We intend to make it possible for every person with or without disabilities to live autonomously: at home, at work, and in every area of life in our society.

Autonomous living – this aim entails specific requirements for the built environment. As the German Building Minister this topic is very close to my heart. I find it important that the Federal Government set a good example. The Government has committed itself to consistent accessibility in all its construction projects. Accessibility means building without barriers for anyone, including people with motor, visual, auditory, and cognitive impairments. Accessible buildings need to be easy to find, provide barrier-free access, and above all, they need to be easy to use. This applies both to new buildings and to existing ones, including their access routes and outdoor facilities.

This Guideline is intended to serve as a manual for the work of the federal building authorities, developers, planners, and users of other public buildings and workplaces, in other words, for everyone intending to build without barriers. It illustrates what specifically needs to be taken into account in terms of accessibility in building design. By explaining areas of action in detail and describing a reference project, the Guideline shows what integrated planning means and exactly what individual and practicable solutions can look like.



A handwritten signature in black ink that reads "Barbara Hendricks". The signature is fluid and cursive, with "Barbara" on the first line and "Hendricks" on the second line.

**Dr Barbara Hendricks**

Federal Minister for the Environment, Nature Conservation,  
Building and Nuclear Safety

# Introduction

According to the Federal Statistical Office, there are seven million people with severe disabilities living in Germany, which corresponds to a share of about 8.9% of the entire population. Most of these people are older than 55, one third are even older than 75.

In the light of demographic developments we can expect a continuous increase in the number of people with various types of impairments.

Progress in medicine and the development of technical aids, navigation and communication possibilities will certainly be able to compensate for many impairments, but an accessibly designed environment taking into account the needs of all its users will remain imperative in the future as well. We are already benefitting from implemented accessibility planning and barrier-free building. These need to become second nature.

The Guideline Accessibility in Building Design is tailored to decision-makers, users, the staff of building authorities at Federal and *Länder* levels, and freelance architects, landscape architects, interior designers, and other planners commissioned to construct buildings or outdoor facilities in accordance with the Guidelines for Federal Construction Measures (*Richtlinien für die Durchführung von Bauaufgaben des Bundes*, RBBau).

# The structure of the Guideline

Accessibility planning and barrier-free building are characterised by complexity. This is true not only for their varying areas of use and the related requirements, but also for each phase of the planning procedure. Sometimes several legal standards apply at the same time. At other times they only apply to individual parts of the building. The responsibilities and competences throughout the entire process are not always regulated consistently, instead they may change or lie with several authorities.

The Guideline Accessibility in Building Design outlines the existing basic framework and explains how to integrate accessibility planning and barrier-free building into planning and implementation processes in accordance with the Guidelines for Federal Construction Measures (*Richtlinien für die Durchführung von Bauaufgaben des Bundes*, RBBau). This approach is the basis for the structure of the guideline, which is as follows:

## **Part A – Basic framework**

A summary of the legal basis illustrates and explains how accessibility planning and barrier-free building are anchored in applicable legislation. The other basic principles and standards described in this section show where accessibility planning and barrier-free building touch upon other specialist disciplines.

## **Part B – RBBau Guidelines and accessibility requirements**

The Guideline embeds accessibility in building design into the entire procedure from requirements planning to implementation, showing respective responsibilities and levels of involvement. The Guideline defines the minimum contents with regard to accessibility that are required for each step in the planning process.

## **Part C – Areas of action**

The requirements for accessibility planning and barrier-free building are structured by area of action: depending on the individual building task and the procedural status these can be of varying significance. Moreover, the different areas of action refer to the special needs of people with specific impairments. This part of the Guideline is intended as an aid to structure procedures according to RBBau Guidelines and as a checklist.

**The illustrations are pictures of built examples intended as inspiration for the different areas of action. However, it is possible that deviations from the requirements can be found in individual details of the solutions presented.**

## **Part D – Description of a reference project**

The last section uses a fictitious project to illustrate how the Guideline Accessibility in Building Design can be used in the different phases of a procedure according to RBBau Guidelines.



Photo by Jörn Lehmann

## Part A – Basic framework

Legal basis .....	10
Summary of legal basis .....	17
<i>Baukultur</i> and historic monuments .....	22
Sustainable building.....	23
Cost efficiency .....	24

# Legal basis

Accessibility planning and barrier-free building are determined in their complexity by various sets of laws and regulations, e.g., social legislation or building laws as part of public law. The following legal foundations are significant in general terms, though not directly linked to planning and building:

## **Basic Law for the Federal Republic of Germany**

The basis for accessibility in building design is laid out in Article 3, paragraph 3, sentence 2 of the Basic Law for the Federal Republic of Germany:

**“No person shall be disfavoured because of disability.”**

## **The UN Convention on the Rights of Persons with Disabilities**

was adopted by the United Nations on 13 December 2006 and ratified in Germany on 26 March 2009. Article 9 calls for comprehensive accessibility.

**“[...] to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities [...]” (Article 1 Convention on the Rights of Persons with Disabilities).**

The following legal foundations are significant for buildings for which the Federal Government is responsible:

## **Act on Equal Opportunities for Persons with Disabilities**

→ The Act on Equal Opportunities for Persons with Disabilities (*Behindertengleichstellungsgesetz, BGG*) does not assign responsibilities. The Federal Government's aim to voluntary commitment is noteworthy.

According to the BGG, generally accepted good engineering practice is to be applied.

The definition of accessibility is based on the Act on Equal Opportunities for Persons with Disabilities (*Behindertengleichstellungsgesetz, BGG*) of 27 April 2002, last amended through Article 12 G of 19 December 2007. Accessibility is described in § 4:

**“Buildings and other structures, means of transport, technical devices, information processing systems, acoustic and visual information sources and communications equipment are considered accessible if people with disabilities have access to them and can use them as customary, without particular impediments, and basically without assistance.”**

This act applies to the federal level – the *Länder* have set up their own equal opportunities laws with differences in some details. According to § 8 on establishing accessibility in the areas of building and transport:

**“[...] non-military buildings to be newly built or subject to major modifications and additions for which the Federal Government is responsible, including federal authorities, institutions, and foundations under public law, need to be designed accessibly in accordance with generally accepted good engineering practice. Deviations are permissible if a different solution fulfils accessibility requirements to the same extent [...]”**

### **Model Building Regulation (*Musterbauordnung, MBO*) and *Länder* Building Regulations**

The Model Building Regulation was developed by the Conference of Building Ministers and serves as the basis for developing *Länder*-specific building regulations. However, in some cases the chapters on accessibility differ significantly in individual *Länder*. This is true, for example, with regard to areas of application and provisions on disproportionate extra expenditure.

The Model Building Regulation 2002, last amended by the decision of the Conference of Building Ministers in 2012, defines accessibility in § 2 under item (9):

**“Structures are considered accessible if people with disabilities have access to them and can use them as customary, without particular impediment, and generally without assistance.”**

Accessibility to those parts of buildings and structures that are generally open to the public and are used for visitor and user traffic are defined in § 50 MBO. A distinction is made between rooms and installations regularly used for their intended purpose that only need to be accessible to the extent required, and toilets and obligatory parking spaces for visitors and users that need to be barrier-free and provided in sufficient numbers:

**§ 50 Accessibility in Building Design (2) “Structures that are publicly accessible must be barrier-free in the sections open to general visitor and user traffic. This applies in particular to 1. buildings offering cultural and educational services, 2. sports and leisure facilities, 3. health service facilities, 4. office, administrative and court buildings, 5. sales,**

→ The architect designing the project is in particular responsible for compliance with those accessibility requirements of the building regulation that apply only to publicly accessible areas of a structure or building.

The building control authority in the context of planning approval or inspection procedures decides on deviations, or, in case of special installations, on facilitations or special requirements.

catering, and hotel facilities, 6. parking spaces, garages, and public toilets. Rooms and installations to be used for their intended purpose only need to be accessible to the extent needed, while accessible toilets and parking spaces for visitors and users need to be provided in sufficient number.”

A definition of so-called disproportionate extra expenditure can be found in § 50 MBO, paragraph (4):

In Berlin, for example, additional costs that exceed 20% of the total costs of a building project are considered disproportionate extra expenditure. (Commentary on Berlin Building Regulation, 2006).

“Paragraphs 1 and 2 do not apply if the requirement cannot be fulfilled without disproportionate expenditure due to difficult terrain, the construction of a lift that would not serve any other purpose, inappropriate structures already built, or regarding the safety of people with disabilities or older people.”

This provision allows for deviations that are particularly necessary for older buildings. It has found its way into the Building Regulations of the *Länder*. No uniform amount has been fixed for what constitutes disproportionate extra expenditure in relation to the total costs of a building project. According to § 51 MBO on special installations

“special requirements may arise depending on the individual case [...]. Facilitations may be permitted so long as legal regulations do not apply due to the special nature or use of the structures or buildings or because of special requirements.”

The requirements and facilitations may also extend to issues of barrier-free usability.

Dimensional requirements in the case of barrier-free lifts are listed under § 39.

## Generally accepted good engineering practice

The Federal Government wishes to advise of the following DIN standards and technical guidelines in constructing accessible buildings as generally accepted good engineering practice (as of February 2014; please check for updates):

DIN: standard by *Deutsches Institut für Normung* (German National Standard)

VDI: standard by *Verband Deutscher Ingenieure* / Association of German Engineers

- DIN 18040-1:2010-10 Construction of Accessible Buildings – Design Principles – Part 1: Publicly Accessible Buildings: these

“[...] apply to new constructions and shall be applied to the planning of modifications and modernisations mutatis mutandis [...]”

- DIN 18040-2:2011-09 Construction of Accessible Buildings – Design Principles – Part 2: Dwellings
- DIN 18024-1:1998-01 Barrier-free Built Environment (streets, squares, paths, public transport, recreation areas and playgrounds)
- DIN 18040-3, 05-2013, draft available
- DIN EN 81-70; 2005-09 Safety Rules for the Construction and Installation of Lifts
- DIN 1450:1993-07 Lettering – Legibility
- DIN 18041:2004-05 Acoustical quality in small to medium-sized rooms
- DIN 32975:2009-12 Designing Visual Information in the Public Area for Accessible Use
- DIN 32984:2011-10 Ground Surface Indicators in Public Areas
- DIN 32976 Braille: 2007-08 – Requirements and Dimensions
- DIN Technical Report 124: Products in Design for All (2002)
- DIN Technical Report 142: Orientation Systems in Open Buildings (2005)
- DIN 18065:2011-06: Stairs in Buildings – Terminology, Measuring Rules, Main Dimensions
- VDI 6008 Sheet 1:2012-12: Barrier-free Buildings for Living – Requirements and Fundamentals
- VDI 6008 Blatt 2:2012-12: Barrier-free Buildings for Living – Aspects of Sanitary Installation
- VDI 6008 Blatt 3:2014-01: Barrier-free Buildings for Living – Aspects of Electrical Installation and Building Automation
- VDI 6000 Blatt 2:2007-11: Provision and Installation of Sanitary Facilities - Workplaces and work stations
- VDI 6000 Blatt 3:2011-06: Provision and Installation of Sanitary Facilities – Public Buildings and Areas
- VDI 6000 Blatt 6:2006-11: Provision and Installation of Sanitary Facilities – Kindergarten, Day-Care Centres, Schools

## Technical construction regulations

Technical construction regulations are the technical rules imposed by publication by the highest building control authority of the *Land* in question and are thus applicable. Deviations from these technical construction regulations are permissible if a different solution fulfils the general requirements of the *Land* regulation to the same extent.

→ The developer and the architect are particularly responsible for compliance with technical construction regulations; involvement of the building control authority is not envisaged.

**“Only those technical rules are adopted that are vital for fulfilling the principal requirements of the building regulations. Building control authorities are free, however, to resort to other generally accepted good engineering practice that has not been adopted in their decisions to specify abstract legal concepts.”**

DIN 18040-1 was not introduced in its entirety into the list of model technical construction regulations. When imposing their regulations, many *Länder* followed the example of restricted applicability, though with deviations in individual regulations. However, DIN 18040-1 has not yet been made applicable in all the *Länder* (as of February 2014).

## Special construction guidelines/model guidelines

[www.bauministerkonferenz.de](http://www.bauministerkonferenz.de)  
for information in German, follow this path: Startseite → Öffentlicher Bereich → Mustervorschriften → Mustererlasse Bauaufsicht / Bautechnik

are published by the Standing Conference of the Federal State Ministers and Senators responsible for Urban Development, Building and Housing (*Konferenz der für Städtebau, Bau- und Wohnungswesen zuständigen Minister und Senatoren der Länder*, ARGEBAU).

The following guidelines are of significance, for example, for accessibility:

- Model Ordinance on Places of Assembly (*Muster-Versammlungsstättenverordnung*, MVStättV), June 2005 version, last amended in February 2010; here, for example, the provisions on space for wheelchair users are relevant
- Model Guidelines for High-Rise Buildings (*Muster-Hochhaus-Richtlinie*, MHHR), April 2008 version, containing provisions for rescuing people with disabilities
- Model Ordinance on Garages (*Muster-Garagenverordnung*, M-GarVO) Ordinance on the construction and operation of garages and parking spaces of May 1993, last amended by decisions of 30 May 2008, containing provisions on parking space dimensions for people with disabilities.

## Integration agreement according to § 83 SGB IX

→ Employers together with the body representing employees with severe disabilities are in particular responsible for compliance with the requirements of the integration agreement, which may concern all areas of a building.  
They will take decisions on the extent of accessible design and on exemptions.

People with disabilities are especially dependent on solidarity and support from others and their understanding. The integration of people with disabilities into the labour market and vocational training is a precondition for equal participation in life as defined in Article 3 paragraph 3 sentence 2 of the German Basic Law. The public sector needs to act as a role model in complying with legal obligations to promote and secure equality in participation, especially in the field of work.

According to Social Code, Book IX (*Sozialgesetzbuch IX*, SGB IX), private and public sector employers with an average of at least 20 employees need to employ people with severe disabilities for a

minimum of 5% of these jobs. The targeted employment quota is higher for federal institutions and authorities. Each employer concludes a binding integration agreement with the respective body representing employees with severe disabilities and other pertinent representatives in cooperation with the employer's commissioner in accordance with § 83 SGB IX:

**“The agreement contains regulations related to integrating people with severe disabilities, especially with regard to human resource management, work station design, the working environment, work organisation, working hours, and regulations about the implementation of the above in the private and the public sector.”**

Ensuring appropriate barrier-free workplaces and apprenticeships is an important element of such an agreement, as is the necessity to have pertinent organisational units in place. The integration agreements define how representatives of people with severe disabilities, staff councils, or other representatives appointed by the employer need to be involved early on in planning new construction or modification measures. The agreements may contain very specific requirements for accessibility design in buildings.

The need for accessible workplaces is identified by the user of the building/employer in accordance with the applicable integration agreement as part of developing a decision-making document (*Entscheidungsunterlage*, ES-Bau) under Sample 13, RBBau Guidelines on space requirements.

## Ordinance on Workplaces and Technical Rules for Workplaces

Regulations for workplaces are defined in the Ordinance on Workplaces (*Arbeitsstättenverordnung*) of 2004:

**§ 3a (2) “Should the employer have people with disabilities in his staff, he is to set up and operate the workplace in such a way as to take into consideration the special needs of these employees in terms of occupational health and safety. This applies in particular to an accessible design of the workplace including doors, traffic routes, escape routes, emergency exits, stairs, orientation systems, washrooms and toilets.”**

The Technical Rules for Workplaces (*Technische Regeln für Arbeitsstätten*, ASR), in contrast, describe state-of-the-art technology, occupational health and safety and industrial hygiene standards, as well as other sound findings of ergonomic analysis on setting up

→ The employer in coordination with the supervising authority for health and safety at the workplace is responsible for implementing and establishing the necessary measures.

and operating workplaces. The requirements contained in them can be fulfilled in different ways from the ones presented here so long as occupational health and safety are ensured to the same extent. The individual needs of the employees with disabilities are the decisive factor. Compensatory measures need to be offered to counter-balance sensory or motor impairments. Accessible design of workplaces is defined in ASR V3a.2 of August 2012 as follows:

**“When it comes to occupational health and safety, accessibility design becomes necessary where people with disabilities are employed. When assessing the potential risks for the accessible design of the workplace, the impacts of the disability and resulting individual needs must be taken into consideration. The areas of the workplace to which employees with disabilities need to have access must be designed without barriers.”**

Upon involving a medical report or opinion, an accessible design is not necessary if:

**“[...] employees with a disability are not capable of executing the required functions and cannot acquire any such skills either.”**

Complementary requirements in ASR A1.3 on safety and health labeling and ASR A2.3 on escape routes and emergency exits, evacuation and rescue plans constitute part of this technical rule.

## Summary of legal basis

The legal framework depends on the individual building project, which then determine the competences and responsibilities. The following graphs illustrate four different measures with their respective legal foundations and responsibilities. They are intended to explain how the above can change depending on the building project, yet sometimes overlap.

Publicly accessible areas in:

- buildings offering cultural and educational services
- sports and leisure facilities
- health service facilities
- office, administrative and court buildings
- sales facilities, catering and hotel facilities
- parking lots, garages and public toilets

are defined in § 50 MBO as general areas used for visitor and user traffic such as:

- entrance areas and lobbies
- cloak-rooms
- sales rooms
- public toilets
- offices open to the public
- counters and waiting rooms
- press and reception areas
- rooms for accommodation and catering
- exhibition and conference halls
- reading rooms, library spaces
- class rooms and conference rooms
- sports rooms
- and their access routes.

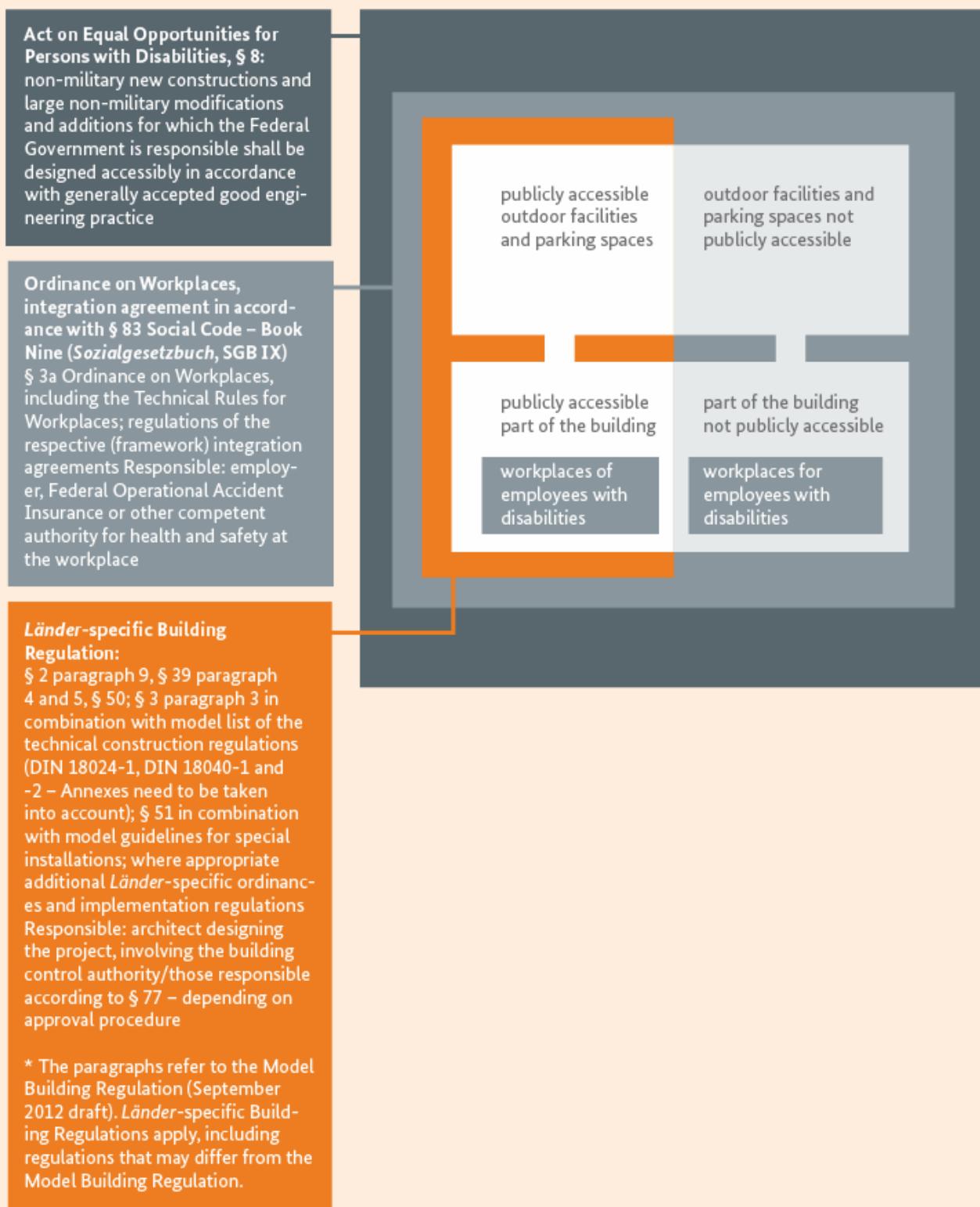
Areas that are not publicly accessible are mainly used as workplaces. Workplaces are defined as places the employees need for executing their jobs, such as:

- working rooms (such as offices and laboratories)
- meeting and conference rooms
- warehouses, machine and side rooms
- break rooms and staff rooms
- pantries and cafeterias
- sanitary and first-aid rooms
- internal access routes (traffic routes, ramps, stairs, doors, escape routes, emergency exits).

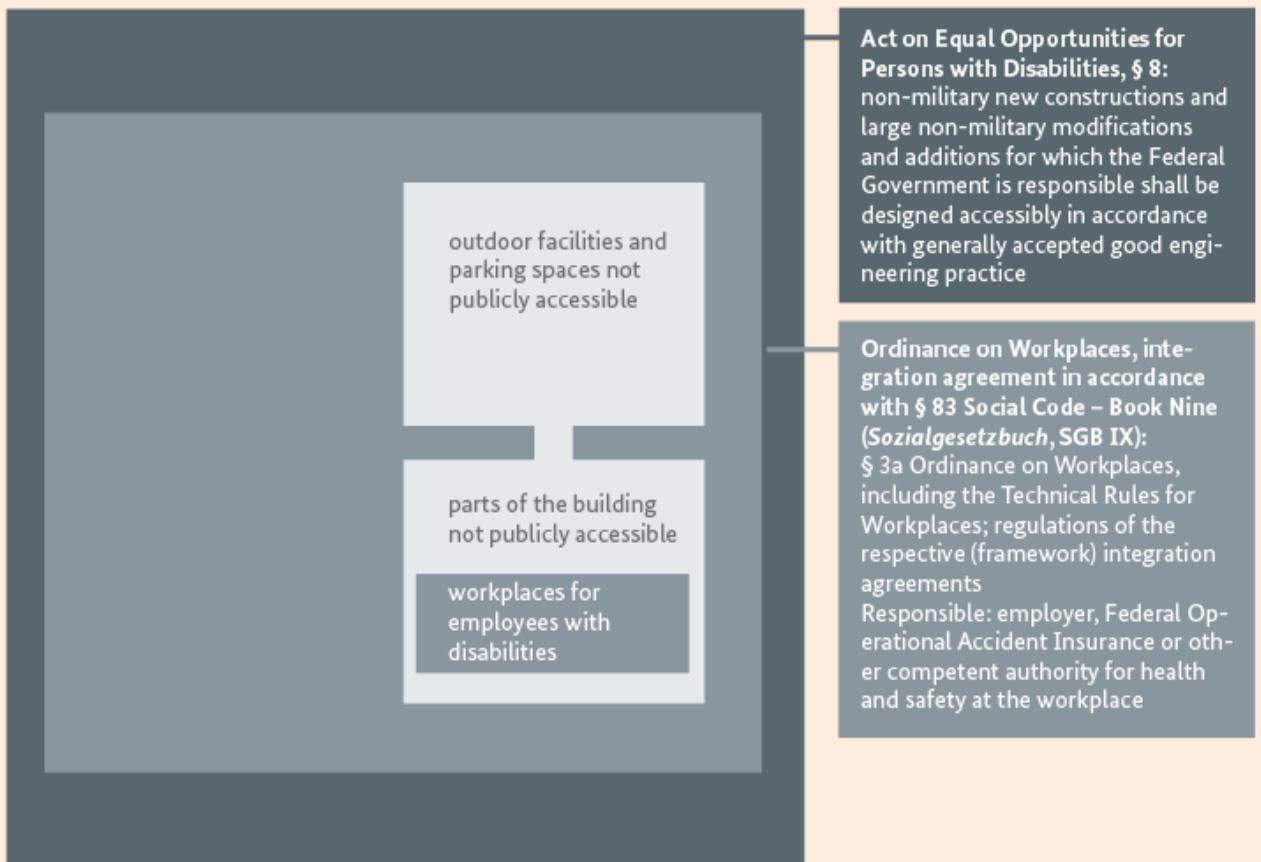
**It is important that those involved and responsible for a project have an understanding of the legal basis and responsibilities right from the beginning of a building project. Clear responsibilities are especially important when it comes to decisions on deviations from accessibility requirements.**

**In a publicly accessible part of a building which also serves as a workplace, for example, a deviation needs to be assessed and decided by those responsible for the construction in accordance with the building code as well as by those responsible for health and safety at the workplace and for § 83 SGB IX. This case would also constitute a deviation from § 8 BGG.**

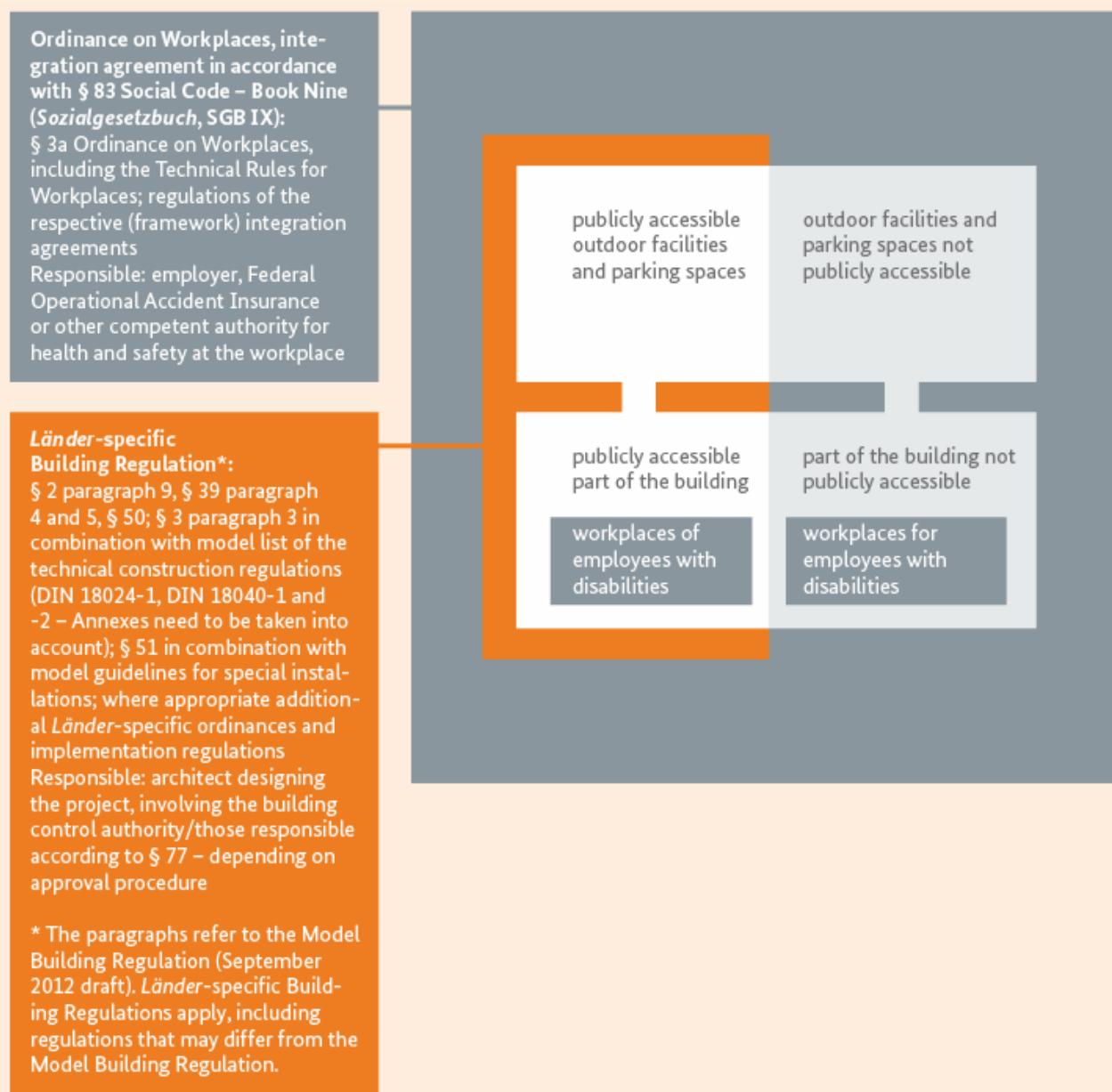
## Non-military small new constructions (Section D RBBau Guidelines) and non-military large new constructions, modifications, and additions (Section E RBBau Guidelines) with publicly accessible parts



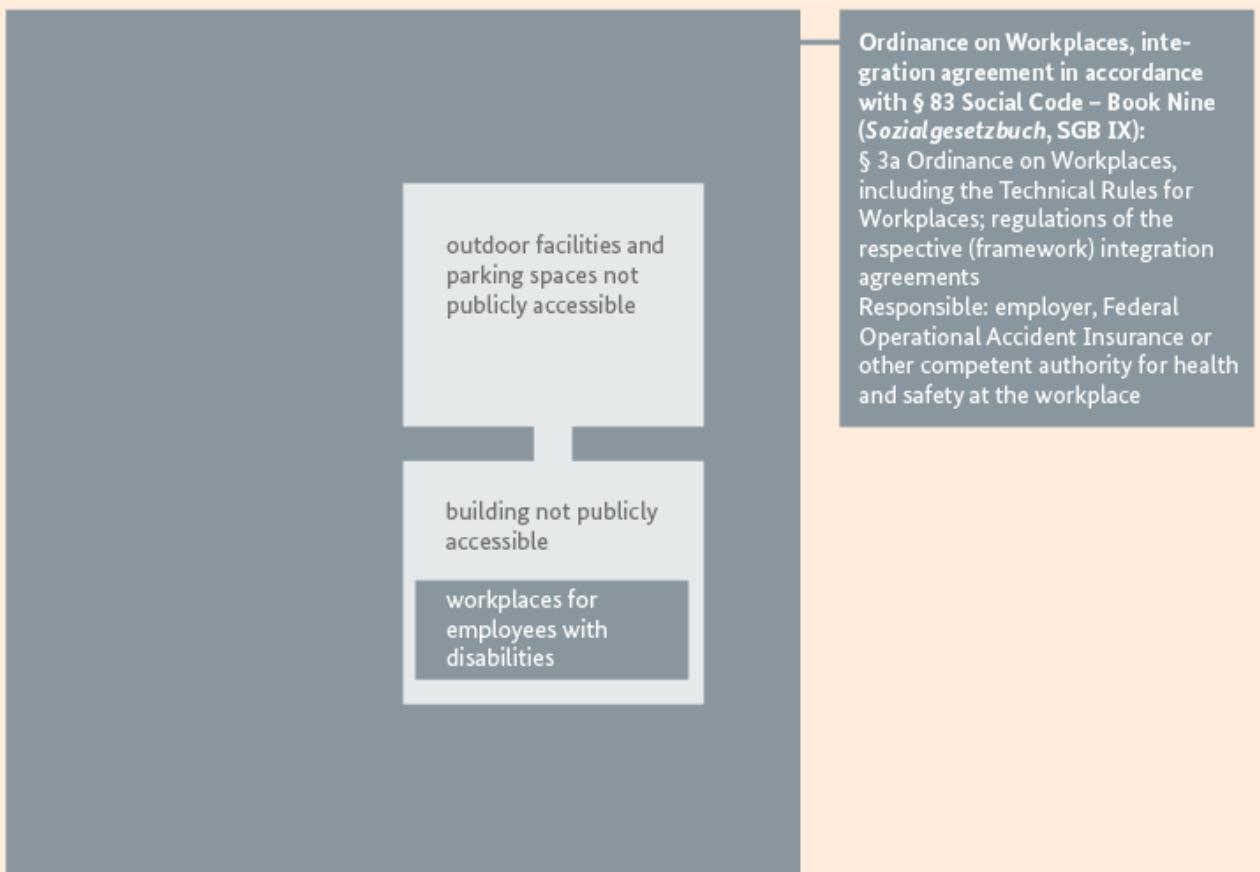
## Non-military small new constructions (Section D RBBau Guidelines) and non-military large new constructions, modifications, and additions (Section E RBBau Guidelines) without publicly accessible parts



## Non-military small modifications and additions (Section D RBBau Guidelines) with publicly accessible parts



## Non-military small modifications and additions (Section D RBBau Guidelines) without publicly accessible parts



## *Baukultur* and historic monuments

[www.bundesstiftung-baukultur.de](http://www.bundesstiftung-baukultur.de)

The term *Baukultur* describes a responsible way of introducing man-made changes to the natural or built environment. The Federal Government aims to promote and improve the quality of the built environment, in particular with regard to including accessibility in a cost-efficient way in architectural concepts and open space planning. To design plans that enable participation as a fundamental right is a creative challenge for planners.

Accessibility in a historical context requires looking for creative and tailor-made solutions that do not necessarily oppose the interests of protecting heritage sites. A modern use of a historic building developed in accordance with heritage protection rules constitutes an indisputable quality in the light of demographic developments.

By creatively combining the requirements of accessibility planning and barrier-free building with heritage protection regulations, the aim is to achieve a barrier-free and integrated basic concept for a building project without major changes to the fabric of a building. A system of communication among every one involved in the procedure is a precondition to finding good solutions.

# Sustainable building

Accessibility is one element of sustainable building. As such it is a self-evident feature of a viable built environment.

[www.nachhaltigesbauen.de](http://www.nachhaltigesbauen.de)

According to the Guideline for Sustainable Building for Federal Buildings, sustainable building aims to construct and operate buildings in such a way that they are viable economically and ecologically, and in terms of urban and social developments. The Guideline for Sustainable Building generally describes, defines, and explains the objectives.

The criteria of the assessment system for sustainable building for federal buildings (*Nachhaltiges Bauen für Bundesgebäude*, BNB) reflect the complexity of the planning processes. The assessment system describes the individual assessment criteria in detail. As a case in point the evaluation system for newly to-be-built office and administrative buildings (Federal Ministry of Transport, Building and Urban Development 2011) considers non-compliance with DIN 18040-1 on publicly accessible areas a criterion for exclusion of a proposal. However, the person carrying out the assessment is free to take into account solutions enabling barrier-free use in other ways.

The assessment system for sustainable building covers the quality of publicly accessible areas and workplaces. Above-average accessibility will be recognised. The possibilities provided by the project to make an office building usable and accessible to every person are definitive.

Assessment systems are currently being tested or developed for additional types of buildings and will be updated and published on a regular basis (as of February 2014).

## Cost efficiency

Research project of the ETH Zurich,  
Chair for Architecture and Construction  
Management on disability adapted  
building – implementation problems in  
the planning process, 2004.

The cost intensity of barrier-free building is often over-estimated. Accessibility in built environments provides an added value for everyone and enhances user convenience.

Studies carried out in Switzerland have proved that the costs for accessibility in new building projects (public buildings, workplaces) above a total construction cost of three million euros amount to a maximum of 0.5% of that sum. Two thirds of these costs are incurred by measures that constitute an added value for everyone. Only one third is used for specific measures for people with special needs. For smaller new constructions, the study found that accessibility costs constitute 1.5 to 4% of the total costs. Higher extra costs of up to 15% of the building sum have been identified for smaller-scale modifications. However, the extra costs for structural measures as compensation for sensory disabilities amounted to only about 3% of the total cost of the building project.

Generally speaking, smart, integrated planning can help reduce the costs considerably. When planned right from the start and implemented, conclusive concepts that are retrofittable reduce increased costs or cost-intensive modifications in the future.



9/16. fan. wird jeder grau. Niemand ist jedes

# Part B – RBBau Guidelines and accessibility requirements

<b>Introduction to Part B.....</b>	<b>28</b>
<b>RBBau Guidelines and accessibility requirements.....</b>	<b>30</b>
<b>Requirements planning.....</b>	<b>31</b>
<b>Analysis of alternatives to fulfil requirements .....</b>	<b>33</b>
<b>ES-Bau ACCESSIBILITY CONCEPT .....</b>	<b>34</b>
<b>EW-Bau ACCESSIBILITY PROOF .....</b>	<b>38</b>
<b>Detailed design phase.....</b>	<b>43</b>
<b>Construction phase .....</b>	<b>44</b>
<b>Hand-over of completed project and documentation .....</b>	<b>45</b>

## Introduction to Part B

The Guidelines for Federal Construction Measures (RBBau Guidelines) apply to measures for which the Federal Government is responsible. As stipulated by RBBau Guidelines, each procedure is broken down into individual steps: requirements planning, analysis of alternatives to fulfil requirements, qualification for construction-related decision-making document (*Entscheidungsunterlage-Bau*, ES-Bau), construction-related draft document (*Entwurfsunterlage-Bau*, EW-Bau), detailed design phase, construction and handing over of completed project or documentation. Each of the individual steps are concluded with a documented or approved status report.

On the basis of RBBau Guidelines, the Guideline Accessibility in Building Design provides a structure for the accessibility procedure ranging from requirements planning to implementation, and it allocates responsibilities.

It defines minimum accessibility in terms of implementation and equipment for federal buildings that are publicly accessible and accommodate workplaces, and the associated outdoor facilities. This minimum accessibility content needs to be provided for each and every step in the planning procedure. Part C of the Guideline provides a structural outline and is intended to serve as a checklist.

In essence, the Guideline aims to embed accessibility requirements into the procedure throughout and to offer stakeholders help in implementing them. The obligation to set up ACCESSIBILITY CONCEPTS/PROOFS at the same time as each procedural step in accordance with the requirements defined below is an essential component. Such an approach is also useful for transparently depicting decisions on accessibility measures. The protection targets as defined by DIN 18040-1 can be used as a basis for developing solutions that are neither explicitly described in the DIN standard, nor are shown in images or texts in the present Guideline.

The structure suggested by the Guideline with respect to developing ACCESSIBILITY CONCEPTS/PROOFS follows the areas of action laid out in Part C. This approach enables a simple and systematic review as well as a description of how accessibility requirements have been taken into consideration. Since the planning and construction requirements for each area of action correlate to the individual steps of the procedure, their significance for each step can be identified easily; only specific paragraphs must be consulted, depending on the procedural phase. The obligation to provide CONCEPTS and PROOFS confirming ACCESSIBILITY on the basis of approved requirements planning in accordance with Clause 2.2.1.3 Section E RBBau Guidelines needs to be included in contracts with freelancers. These services usually do not qualify as Additional Services according to the Official Scale of Fees for Services by Architects and Engineers (*Honorarordnung für Architekten und Ingenieure*, HOAI) so long as they are required in the course of fulfilling public regulations and legal standards or generally accepted good engineering practice. The question whether the preparation of texts and/or plans proving that accessibility requirements have been adhered to constitutes a service exceeding the basic services covered by HOAI needs to be reviewed in individual cases.

The opening clause of the protection targets assumes that planners and those involved in the construction phase have extensive background knowledge in accessibility planning and barrier-free building. The Guideline cannot cover every aspect of the complex issue in all its details. If clarification is needed, or if the building project is complex, additional assistance centres may be consulted, such as the coordination centres of municipal authorities, the information centres of the Chambers of Architects in the different *Länder*, or competence centres. Representative bodies of people with disabilities and their associations should also be included in the coordination processes on a consultative basis.

# RBBau Guidelines and accessibility requirements

procedural steps pursuant to RBBau Guidelines	including accessibility	who is responsible
<b>ES</b>	<b>ES-Bau (decision-making document)</b> → cf. HOAI: LP 1 and for some parts LP 2	
requirements planning pursuant to Clause 2.2.1 Section E RBBau Guidelines	reviewing accessibility requirements in requirements planning	<b>user</b> (involving owner, building authority)
analysing alternatives to fulfil requirements pursuant to Clause 2.2.2 Section E RBBau Guidelines	reviewing accessibility requirements in analysis of alternatives	<b>owner</b> (involving building authority)
qualifying for ES-Bau pursuant to Clause 2.2.3 Section E RBBau Guidelines	developing: ACCESSIBILITY CONCEPT	<b>building authority</b>
<b>EW</b>	<b>EW-Bau (construction-related draft document)</b> → cf. HOAI: LP 2, 3, and 4; for some parts LP 5	
pursuant to Clause 3 Section E RBBau Guidelines planning pre-draft, draft, application documents	compiling: ACCESSIBILITY PROOF	<b>building authority</b>
<b>A</b>	<b>detailed design phase</b> → cf. HOAI: LP 5 and 6	
pursuant to Clause 4 Section E RBBau Guidelines detailed design work, specification lists	updating: ACCESSIBILITY PROOF	<b>building authority</b>
<b>construction</b> → cf. HOAI: LP 7 and 8		
pursuant to Section G RBBau Guidelines construction supervision	controlling compliance with: ACCESSIBILITY PROOF documentation of necessary deviations during construction	<b>building authority</b>
<b>hand-over and documentation</b> → cf. HOAI: LP 9		
pursuant to Section H RBBau Guidelines documentation	preparing: hand-over and documentation	<b>building authority</b>

# Requirements planning

A review of all the requirements marked **ES** in Part C of the Guideline Accessibility in Building Design is recommended for taking accessibility adequately into consideration in accordance with Clause 2.2.1 Section E RBBau Guidelines on large-scale new constructions, modifications, and additions. Furthermore, the following aspects need to be covered:

- identifying the necessity for publicly accessible areas and workplaces
- establishing special requirements on accessibility design with regard to workplaces in coordination with the representative bodies of people with severe disabilities
- illustrating accessibility requirements in the space requirement plan (cf. Sample 13 RBBau Guidelines) on workplaces and publicly accessible areas; the needed increase of 10 to 12% space for the areas in question needs to be reviewed
- requirements on the building plot, such as location of accesses, topography
- requirements on external access, such as barrier-free connection to public and private transport, number of barrier-free parking spaces needed for publicly accessible areas and workplaces
- requirements on the quality of internal access, vertical and horizontal access (publicly accessible areas, workplaces)
- required number of accessible sanitary rooms in publicly accessible areas and workplaces
- quality of the space required – establishing which rooms require special accessible design
- establishing requirements on the accessibility of outdoor spaces other than those used for access or waiting



→ The user is responsible for requirements planning.

In the context of requirements planning, the user is to turn to the building authority, involving the commissioning agency responsible for the project, if specialist advice or support is needed with regard to structural accessibility issues.

As outlined in the integration agreements, the representative bodies for people with severe disabilities, staff councils, or other employer representatives need to be included early on.

## Small new constructions, modifications, and additions

As new constructions, modifications, and additions of a small scale may also bring about significant structural changes, an assessment is recommended as to whether the planned building task affects any accessibility requirement laid out in this Guideline. The assessment should be carried out when identifying the need for a new construction, modification, or addition in accordance with Sec-

tion D RBBau Guidelines. If this proves to be the case, a procedure analogous to large new constructions, modifications, and additions should be pursued.

If necessary, the requirements marked **ES** in Part C of the Guideline Accessibility in Building Design should be examined. The aspects described above need to be adapted to the building task in question and reviewed accordingly.

# Analysis of alternatives to fulfil requirements

In the context of analysing alternatives to fulfil the requirements in accordance with Clause 2.2.2 Section E RBBau Guidelines, all the requirements marked ES in Part C of the Guideline Accessibility in Building Design need to be juxtaposed understandably with the requirements planned for the specific user at a comparable level of detail.

Alternatives to be analysed can be the following:

- new construction to be commissioned by the agency owning the property
- modifications and additions to be commissioned by the agency owning the property (including potential modifications that may be needed to ensure accessibility)
- purchasing existing built structures
- new construction, modifications, or additions as public private partnerships
- renting, leasing, or renting to buy buildings

→ The agency commissioning the building project is responsible for the analysis of alternatives. This agency needs to turn to the building authority for specialist advice and support in the analysis of alternatives to fulfil accessibility requirements in accordance with the established requirements planning. The representative body for people with disabilities of the building's user needs to be involved.

## **Construction in existing buildings – Modifications**

In the case of existing buildings, existing deviations from the protection targets of the Guideline Accessibility in Building Design need to be described and the need for the modifications identified.

When existing buildings are purchased, rented, rented to buy, or leased, it is particularly important to review not only the requirements marked **ES** in the Guideline Accessibility in Building Design, but also those marked **EW**. Only in this way is it possible to assess early on whether the protection targets can be met.

An analysis of alternatives may require feasibility studies or planning services. They can clarify whether the property enables an accessible use as defined in the requirements planning, and whether accessibility measures would be in line with heritage conservation requirements.

## **Deviations from accessibility requirements**

The permissibility of deviations needs to be coordinated with those responsible (e.g. employer or competent authority) and needs to be documented.

# ES-Bau ACCESSIBILITY CONCEPT



→ The building authority is responsible for completing documentation.

For the variants of renting, renting to buy, leasing, and public private partnerships and in the case of construction projects eligible for grants, it is also recommended to develop an ACCESSIBILITY CONCEPT in accordance with the Guideline Accessibility in Building Design.

The ACCESSIBILITY CONCEPT is developed on the basis of the planning status established for the individual planning task. The textual explanation and the level of planning detail are to be adapted to the dimension of the specific decision-making document ES-Bau.

Once the decision is taken to commission a project, the ACCESSIBILITY CONCEPT needs to be developed as follows when qualifying for ES-Bau (construction-related decision-making document) according to Clause 2.2.3 Section E RBBau Guidelines:

## **Large new constructions, modifications, and additions**

The ACCESSIBILITY CONCEPT calls for verified compliance with all the requirements marked **ES** in the Guideline Accessibility in Building Design for both new constructions and existing buildings.

## **Small new constructions, modifications, and additions**

An ACCESSIBILITY CONCEPT is recommended as even small new constructions, modifications, and additions may bring about significant structural changes. If a review in accordance with Section D RBBau Guidelines in the context of identifying the need for a new construction, modifications, and additions finds that the accessibility requirements described in the Guideline will not be affected, no ACCESSIBILITY CONCEPT is required.

Where warranted, the ACCESSIBILITY CONCEPT calls for verified compliance with all the requirements marked **ES** in the Guideline Accessibility in Building Design. The level of detail to which compliance needs to be demonstrated is to be adapted to the respective building task.

## **Deviations from accessibility requirements**

The permissibility of deviations needs to be coordinated with those responsible (e.g. employer or competent authority) and needs to be documented.

## **ACCESSIBILITY CONCEPT**

The ACCESSIBILITY CONCEPT must be described in text and graphically illustrated. Following the Guideline's areas of action, it needs to prove that the requirements of the Guideline Accessibility in Building Design have been respected.

## **Exemplary structure of textual explanation**

The structure of the textual explanation needs to fit the dimension and the respective requirements of a specific building task. The textual part is to be prepared according to the following structure or the structure of Part C of the Guideline (where applicable, with a distinction between publicly accessible areas and workplaces):

**Overall concept**

- integration into the urban environment
- orientation and guidance systems

**Access**

- overall concept of vertical and horizontal access to publicly accessible areas and workplaces
- transition between exterior/interior

**Furnishings and fittings**

- overall concept of the furnishings and fittings in publicly accessible areas, workplaces, and the exterior space (where applicable, with a distinction between publicly accessible and not publicly accessible areas)

**Rooms**

- publicly accessible areas
- workplaces
- sanitary rooms
- rooms requiring special accessible design

**Graphical illustration**

The graphic illustration is based on the core drawings and graphs required for this procedural phase in accordance with Clause 1.4 Section F RBBau Guidelines or Service Phase 2 (*Leistungsphase 2, LP 2*) according to the HOAI scale. The level of detail is to be adapted to the specific building task.

The ACCESSIBILITY CONCEPT legend needs to be taken into account. It needs to be adapted to what is required for the specific building task in question.

	publicly accessible areas		accessible information counter
	workplaces		communication aid
	shared routing visitors		accessible toilets
	separate routing visitors with impairments		accessible bathrooms
	separate routing visitors without impairments		special requirements TBS (technical building services)
	shared routing staff		accessible workplace (A for <i>Arbeitsstätte</i> )
	separate routing staff with impairments		
	separate routing staff without impairments		
	accessible public transport stop or station		
	accessible parking space		
	accessible ramp		
	accessible staircase		
	accessible lift		
	threshold-free transition exterior/interior		
	special requirements for fire prevention		

Example of legend  
ACCESSIBILITY CONCEPT

The sample legend provides orientation when developing a graphical ACCESSIBILITY CONCEPT and can be adapted to the project in question. Not all the symbols need to be used so long as the plan's readability is ensured in other ways.

The following components usually need to be taken into consideration for a graphical illustration of the concept:

- illustrating the property's connections to public transport (documenting accessibility and where applicable, clarification whether modification measures can be implemented) on a copy from the cadastral register including neighbouring buildings at a 1:1,000/1:5,000 scale (cf. Clause 1.4.6 Section F RBBau Guidelines).
- graphical illustrations of the planning concept (cf. Clause 1.4.7 Section F RBBau Guidelines) including a diagrammatic layout of the entry level and the outdoor facilities using colour to highlight how visitors and staff with and without impairments are guided from the public transport stop or station and/or the parking spaces to the barrier-free, vertical access area or stair access.
- illustrating how accessible parking spaces are allocated to the entrances.
- illustrating the grade elevation needed for understanding and proving accessibility.
- illustrating the areas defined as publicly accessible areas and as accessible workplaces in requirements planning.
- illustrating barrier-free access to all floors that have publicly accessible areas and accessible workplaces.
- marking the areas with special requirements for accessibility design.
- marking barrier-free sanitary rooms in publicly accessible areas and in areas designated for accessible workplaces.
- illustrating exterior spaces intended for accessible use according to requirements planning.

# EW-Bau ACCESSIBILITY PROOF



When preparing the construction-related document (*Entwurfsunterlage-Bau, EW-Bau*) in accordance with Clause 3 Section E RBBau Guidelines, the ACCESSIBILITY PROOF needs to be compiled as follows:

**The building authority is responsible for drafting EW-Bau.**

**Contracted freelancers are responsible for developing an approvable planning scheme.**

**For the variants of renting, renting to buy, leasing, and public private partnerships and in the case of construction projects eligible for grants, it is also recommended to develop an ACCESSIBILITY PROOF in accordance with the Guideline Accessibility in Building Design.**

## **Large new constructions, modifications, and additions**

The ACCESSIBILITY PROOF requires verified compliance with all the requirements marked **EW** in the Guideline Accessibility in Building Design for both, new constructions and existing buildings.

## **Small new constructions, modifications, and additions**

An ACCESSIBILITY PROOF is recommended as even small new constructions, modifications, and additions may bring about significant structural changes. If, when determining the need for a new construction, modifications, and additions in accordance with Section D RBBau Guidelines, a review finds that the accessibility requirements described in the Guideline will not be affected, no ACCESSIBILITY PROOF is required. The PROOF's level of detail is to be adapted to the respective building task.

## **Deviations from accessibility requirements**

The permissibility of deviations needs to be coordinated with those responsible (e.g. employer or competent authority) and needs to be documented.

## **Awarding freelance contracts**

Planning services for large new constructions, modifications, and additions are usually subcontracted to freelancers. The result of accessibility-related requirements planning and, if available, the ACCESSIBILITY CONCEPT of ES-Bau needs to be handed over and explained to the freelancers.

The Guideline Accessibility in Building Design stipulates the ACCESSIBILITY PROOF to be compiled by freelancers.

## **Competitions**

According to Clause 3.4 Section E RBBau Guidelines, design competitions are held for significant construction measures in order to promote *Baukultur*. Depending on the detail of the competition, the accessibility-related requirements planning, and, if available, the ACCESSIBILITY CONCEPT should be part of the tender either in their entirety or in excerpts, to the extent they are relevant for the services that are the subject of the competition. Services to help develop the ACCESSIBILITY CONCEPT could also be required in the tendering process, depending on its scope. The PROOF needs to be provided in the course of drafting EW-Bau.

## **ACCESSIBILITY PROOF**

The ACCESSIBILITY PROOF must be provided in text and graphically illustrated. Following the Guideline's areas of action, it needs to prove that the requirements of the Guideline Accessibility in Building Design have been respected. The textual part is to be adapted to the following structure, which in turn corresponds to the areas of action in Part C.

### **Exemplary structure of textual explanation**

(where appropriate, with a distinction between publicly accessible areas and workplaces)

#### **Overall concept**

1. Integration into the urban environment
2. Orientation and guidance systems

#### **Access**

3. Walkways and circulation areas
4. Corridors and horizontal access areas
5. Interior and exterior ramps
6. Interior and exterior stairs and steps
7. Lifts
8. Interior and exterior doors
9. Emergency alarm and evacuation

#### **Furnishings and fittings**

10. Service counters, cash registers, controls, assistance centres, waiting halls
11. Interior and exterior furniture and fixtures
12. Operational elements and communications systems
13. Windows and glass surfaces

#### **Rooms**

14. Exterior spaces
15. Lobby/entrance
16. Storage space for wheelchairs, cloak-rooms
17. Event halls
18. Museums and exhibitions
19. Rooms for catering and kitchenettes
20. Sanitary installations
21. Office workplaces, laboratories
22. Accommodation

	space requirement 150 × 150 cm and space requirement 130 × 90 cm (plotted to scale)		ground materials, exterior, contrasts, tactile and visual
	passage width 90 cm (plotted to scale)		stair marking
	accessible lift Type 2 110 × 140 cm (plotted to scale)		guidance strip
	special requirements for fire prevention		hazard warning surfaces
	threshold-free transition exterior/interior		accessible drains/drainage
	special requirements TBS (technical building services)		other guidance elements
	accessible information counter		visual guidance system, floor
	audio induction loops, radio and infrared systems		visual guidance system, wall or handrails
	automatic sliding door or revolving door (plotted to scale)		tactile guidance system, floor
	revolving door with push-button system (plotted to scale)		tactile guidance system, wall or handrails
	door with hold-open device (plotted to scale)		guidance system, acoustic
	accessible seat (plotted to scale)		guidance system, lighting
	flooring materials, interior, surface contrasts, interior, tactile and visual		
	surface contrasts, exterior: tactile		
	ground materials, exterior: accessible		

Example of a legend  
**ACCESSIBILITY PROOF**

The sample legend provides orientation when developing a graphical ACCESSIBILITY PROOF and can be adapted to the project in question.  
Not all the symbols need to be used so long as the plan's readability is ensured in other ways.

### Graphical illustration

The graphical illustration is based on the core drawings and graphs required for this procedural phase in accordance with Clause 2.4 Section F RBBau Guidelines (corresponding to LP 2, 3, 4, and where applicable, LP 5 of the HOAI scale depending on the level of detail of the explanation agreed in the contract). The level of detail corresponds to the planning phase and, if necessary, is to be adapted to the specific building task.

The ACCESSIBILITY PROOF legend needs to be taken into account. It needs to be adapted to what is required for the specific building task in question.

To show proof for individual details of solutions, it suffices to refer to the drawings required for this procedural phase, provided that they unequivocally demonstrate that accessibility requirements have been fulfilled. The following components usually need to be taken into consideration for a graphical illustration of the concept:

- illustrating the property's connections to public transport (documenting accessibility and where applicable, clarification whether modification measures can be implemented) on a copy from the cadastral register including neighbouring buildings at a 1:1,000/1:5,000 scale (cf. Clause 1.4.6 Section F RBBau Guidelines).
- graphical illustration of the planning concept as a location map at an appropriate scale, including the floor plan of the entry level and the outdoor facilities, using colour to highlight how visitors and staff with and without impairments are guided from the public transport stop or station and/or the parking spaces to the barrier-free vertical access areas or stair access.
- illustrating the areas defined as publicly accessible areas and as accessible workplaces in requirements planning.
- illustrating barrier-free access to all floors that have publicly accessible areas and accessible workplaces.
- illustrating how accessible parking spaces are allocated to the entrances and proving that the required number of parking spaces has been provided.
- proving compliance with the requirements on accessible topography and technically needed drainage by stating the heights or contour lines and gradient changes.

- illustrating orientation and guidance systems, where necessary, at an appropriate scale and in their guidance details
- illustrating the rooms with special requirements for accessibility design and pertinent measures to be taken (where appropriate, integrating the illustration of technical building services).
- illustrating barrier-free sanitary rooms in publicly accessible areas and in the areas designated for accessible workplaces.
- illustrating the measures envisaged for exterior spaces intended for accessible use according to requirements planning.
- material specification where they are relevant for understanding the accessibility design, explained in text for interior and exterior spaces and, where appropriate, complemented with photographic representations.

# Detailed design phase

## **Large new constructions, modifications, and additions**

Accessibility-related detailed design work in accordance with Clause 4 Section E RBBau Guidelines becomes necessary when, for instance, customised solutions are developed for listed buildings, or when adaptations arise due to further development during the detailed design phase or due to changes vis-à-vis EW-Bau.



→ The building authority and the architect designing the project are responsible.

Accessibility is demonstrated by updating and expanding the ACCESSIBILITY PROOF when drafting EW-Bau, in texts and plans, at the scales required for the detailed design phase in accordance with Clause 3 Section F RBBau Guidelines. To show proof of individual details of solutions, it suffices to refer to the drawings required for this procedural phase (in accordance with Clause 3 Section F RBBau Guidelines and LP 5, HOAI), provided that they unequivocally illustrate that accessibility requirements have been fulfilled.

## **Small new constructions, modifications, and additions**

When planning small new constructions in accordance with Clause 3 Section D RBBau Guidelines, the procedure applies mutatis mutandis. The same is true for modifications and additions if an ACCESSIBILITY PROOF has been compiled.

## **Deviations from accessibility requirements**

The permissibility of deviations needs to be coordinated with those responsible (e.g. employer or competent authority) and needs to be documented. In the case of publicly accessible buildings, a supplement to the regulatory construction permit may become necessary.

Samples of customised material or design solutions should be produced prior to or at the latest upon awarding the contract. The customised solution will be implemented only after the sample has been approved.

## Construction phase

→ The building authority and the architect designing the project are responsible.

During construction, compliance with the requirements of the ACCESSIBILITY PROOF is monitored in the context of construction supervision. Any changes or adaptations that may be necessary need to be documented.

### Deviations from accessibility requirements

The permissibility of deviations needs to be coordinated with those responsible (e.g. employer or competent authority) and needs to be documented.

In the case of publicly accessible buildings, a supplement to the regulatory construction permit may become necessary.

# Hand-over of completed project and documentation

When parts of the project or the entire project are handed over in accordance with Clause 1.3 Section H RBBau Guidelines, compliance with the requirements from the ACCESSIBILITY PROOF needs to be taken into account and documented as part of a joint written record. The representative body for people with disabilities of the building's future users needs to be involved.

→ The building authority and the architect designing the project are responsible.

The core drawings and graphs required for this procedural phase according to Clause 1.4 Section H RBBau Guidelines can be used for graphically illustrating compliance with the requirements from the ACCESSIBILITY PROOF.

The following illustrations are required, at least as a summary at the same scale as in EW-Bau, so that accessibility requirements fulfilled during construction can also be taken into account during follow-up maintenance measures. A review is necessary in order to assess whether the illustrations from the ACCESSIBILITY PROOF of EW-Bau or the detailed design phase can be updated. The ACCESSIBILITY PROOF legend needs to be taken into account. In individual cases, it can be adapted to the particular requirements of a specific building task.

- graphical illustration of the planning concept as a location map at an appropriate scale, including the floor plan of the entry level and the outdoor facilities, using colour to highlight how visitors and staff with and without impairments are guided from the public transport stop or station and/or the parking spaces to the barrier-free vertical access areas or stair access.
- illustrating the areas defined as publicly accessible areas and as accessible workplaces in requirements planning.
- illustrating barrier-free access to all floors that have publicly accessible areas and accessible workplaces.
- illustrating the installation of orientation and guidance systems where applicable.
- illustrating how accessible parking spaces are allocated to the entrances and proving that the required number of parking spaces has been provided.
- illustrating compliance with requirements on accessible topography.

- illustrating rooms in which special accessibility measures have been implemented.
- illustrating barrier-free sanitary rooms in publicly accessible areas and in the areas designated for accessible workplaces.

The textual explanation may be complemented by an update of the ACCESSIBILITY PROOF in individual cases, where appropriate. The changes, decisions, and adaptations implemented during construction are to be documented.

For workplaces, a compilation of the rules on health and safety at the workplace and on accident prevention need to be included in the dossier.





Photo by Barbara Aumüller

## Part C – Areas of action

The requirements and special needs of people with disabilities . . . . .	51
Protection targets according to DIN 18040-1 . . . . .	54
How to use the Guideline . . . . .	55
 Overall concept . . . . .	56
1. Integration into the urban environment . . . . .	57
2. Orientation and guidance systems . . . . .	64
 Access routes . . . . .	90
3. Walkways and exterior circulation areas . . . . .	91
4. Corridors and horizontal circulation areas in interior spaces . . . . .	97
5. Interior and exterior ramps . . . . .	101
6. Interior and exterior stairs and steps . . . . .	109
7. Lifts . . . . .	120
8. Doors . . . . .	125
9. Emergency alarm and evacuation . . . . .	132
 Furnishings and fittings . . . . .	134
10. Service counters, cash registers, controls, assistance centres, waiting halls . . . . .	135
11. Interior and exterior furniture and fixtures . . . . .	139
12. Operational elements and communications systems . . . . .	143
13. Windows and glass surfaces . . . . .	145
 Rooms . . . . .	146
14. Exterior spaces . . . . .	147
15. Entrance and lobby . . . . .	149
16. Wheelchair parking and cloakrooms . . . . .	151
17. Event halls . . . . .	152
18. Museums and exhibitions . . . . .	157
19. Rooms for catering and kitchenettes . . . . .	160
20. Sanitary installations . . . . .	162
21. Office workplaces . . . . .	170
22. Accommodation . . . . .	174

## Introduction to Part C

On the basis of DIN 18040-1, accessibility requirements are divided into the following areas of action: overall concept, access routes, furnishings and fittings, and rooms. The Guideline also takes into consideration and refers to pertinent aspects of generally accepted good engineering.

It thus provides an overview of the accessibility requirements current at the time it was published. When applying the Guideline, especially planners and companies carrying out contracts are not, however, released from their responsibility to consult other relevant standards.

As the areas of action can be of varying significance or no significance at all for specific building projects, the Guideline is structured by area of action and provides a fast and organised overview of the requirements to be taken into account depending on the planning or building task.

The planning and building requirements in each area of action are described in correlation to the planning procedure so that their significance for the respective planning phase is easily recognisable (» instructions for use page 55).

As outlined in the » table on page 30, the steps in a procedure according to RBBau Guidelines are based on the Official Scale of Fees for Services by Architects and Engineers (*Honorarordnung für Architekten und Ingenieure*, HOAI) mutatis mutandis. The table lists the individual services covered by HOAI. This makes a simple transfer possible when the Guideline is used for other public buildings, work places, and outdoor facilities for which the Federal Government is not responsible.

# The requirements and special needs of people with disabilities

“[...] takes into consideration especially the needs of persons with visual impairments, blind persons, persons with hearing impairments (deafness, late-onset deafness, hard of hearing) or with motor impairments, and persons using mobility aids and wheelchairs. Other groups, such as persons of short or tall stature, persons with cognitive impairments, older persons, children, and persons with baby carriages or luggage, will benefit from some of the requirements of this standard.”

Preface DIN 18040-1:2010-10

People have varying types of impairments, which in turn impose a wide range of requirements on their surroundings. The special needs of people with impairments were studied on the basis of DIN 18040-1 in order to be able to define planning and building requirements. Four groups of requirements for a built environment have been identified in this process.

In the illustrations for individual areas of action the specific impairments are indicated by pictograms. This approach has led to a system that can be used for developing CONCEPTS and PROOFS OF ACCESSIBILITY depending on the requirements posed by the impairments in question.





### **Motor impairment, poor stamina and anthropometry**

This user group comprises people who:

- are permanently or temporarily restricted in their physical movement, especially in using arms, legs, and hands,
- use mobility aids or wheelchairs,
- are of short or tall stature,
- do not display standard anthropometry, such as children
- show weakness due to age,
- are carrying baby carriages or luggage.

The impairments above primarily generate the need for more space and the avoidance of thresholds. Particular importance should be attached to concepts for horizontal and vertical access. Geometric specifications such as passage width or height of operational elements need to be taken into consideration. Another area of action aims at easy-to-use devices requiring acceptable levels of physical strength and stamina.



### **Visual impairment**

The ability to see of visually impaired people is significantly restricted, but visual orientation and information are still possible. In contrast, blind people have no or almost no vision. They depend primarily on their tactile and auditory senses for orientation and information. If necessary, they use a cane or a guide dog.

The structural needs of these two user groups mainly concern orientation and guidance systems, and avoiding dangerous situations and obstacles. In the case of visual impairments, the use of contrasts and light is essential, while haptic, tactile, and auditory measures can be employed for blind people. The information and guidance systems need to be consistent and must not be interrupted. It is especially important to convey information on the basis of a bi-sensory principle. As outlined in » chapter 2.1 it is important to know whether visually impaired people frequent a building on a regular basis or rarely or one time only, and how familiar they may be with the building's structure, as, depending on this, the type of orientation can be provided differently.

## Cognitive impairment

This user group comprises people with mental disabilities such as learning disabilities but also older people and people suffering from dementia. This group is increasing in terms of numbers very quickly due to demographic developments. This group is characterised by impairments with regard to memory, thinking, orientation, comprehension, numeracy, learning, speech, and powers of judgment.



With age, some people show signs of a slow-down of their thinking processes, which may lead to a slow-down of their actions.

Structural areas of action mainly focus on orientation: structured access routes, clear and manageable floor plan design, easily understandable orientation systems and unambiguous allocation of functions. Any information should be conveyed in simple language.

## Auditory impairment

This user group consists of people whose hearing is significantly restricted as well as people who have lost their sense of hearing altogether. Sign language is often used as a means of communication. In Germany, sign language was officially recognised in 2002 through the Equal Opportunities for People with Disabilities Act (*Behindertengleichstellungsgesetz*, BGG, § 6).



Structural interventions that compensate for these impairments focus on careful consideration of acoustics in a building, for example, reducing background noise, or using supporting technology such as audio induction loops. However, using consistent lighting is also helpful here, for example, to make sure that the sign language interpreter can be clearly seen.

Generally speaking, a bi-sensory approach is especially important when conveying information.

## Protection targets according to DIN 18040-1

The introduction of the term “protection target” into accessibility planning and barrier-free building indicates a pioneering change in possibilities, and is a creative challenge for planners.

The standard does not define specific solutions but the final outcomes that are to be achieved. As the standard **“[...] applies to new buildings and shall be used for planning modifications and modernisations mutatis mutandis [...]”**, the possibility to achieve the protection targets in existing buildings in different ways is realistic as a reference to current practice.

This Guideline describes the protection targets and solutions of the DIN standard, and also additional potential solutions that are intended as inspiration. In parallel, requirements from other countries are also outlined, as are alternatives that can be found in specialist literature. The photographs of built examples show creative implementations that combine accessibility and *Baukultur*.

# How to use the Guideline

The following distinctions are made in the formatting of each chapter for an easy application of the Guideline:

**“Original text of the protection target according to DIN 18040-1”**

**Protection target according to DIN 18040-1**

## Headlines as part of the overall outline

**Text according to DIN 18040-1**

**Text according to other legal standards**

**Possible solutions according to DIN 18040-1 or other legal standards**

Solutions suggested by the authors Explanations  
Comments by authors, special notes, recommendations

**Reference to standards other than DIN 18040-1**

» Reference to other areas of action

**Reference to foreign standards, other sources**

Image captioning



Motor impairment, poor physical strength and anthropometry



Visual impairment



Auditory impairment



Cognitive impairment



To be taken into account

- during requirements planning
- during analysis of alternatives for coverage of requirements
- during ACCESSIBILITY CONCEPT – qualification for ES-Bau



To be taken into account for PROOF OF ACCESSIBILITY – compiling EW-Bau



To be taken into account during detailed design phase

# Overall concept

- 
- 1. Integration into the urban environment ..... 57
  - 2. Orientation and guidance systems ..... 64

ALBRECHTSBURG MEISSEN

# Integration into the urban environment

**"Access and entrance areas must be easy to find and provide barrier-free access."**

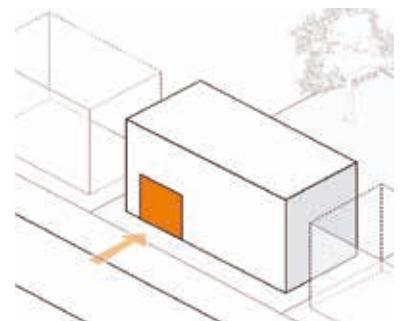
Protection target as defined by DIN 18040-1, Chapter 4.2.3 – Access and Entrance Areas

## 1.1 Location of access and entrance areas

In the context of a given starting situation in an urban environment, it should be ensured that the main entrance to a building is easy to locate, laid out clearly, and provides simple orientation.

An unambiguous and cogent architectural shape and positioning of a main entrance as part of urban design as well as clear and simple routing are decisive factors.

For visitors, the entrance area is the first impression they have of a building. It should be considered the building's business card and planned with particular care.



Entrance area in high-contrast design



## 1.2 Access and location

Shared routing is to be aimed at for:

- routes for all visitors from the public space or the parking areas up to the main entrance without stairs or thresholds and
- routes for all staff members from the public space and the parking areas up to the main/staff entrance without stairs and thresholds.

Entrance areas may be easier to locate if the entrance is designed with high visual contrasts.

People with sensory impairments will be able to find the entrance and get their orientation if tactile and visual guidance aids are placed in the circulation areas for them to use. These should be embedded into existing barrier-free systems and be part of an overall concept. Furthermore, the distances to be covered should be kept small. In addition to floors with a tactile structure, ground surface indicators can be used (see » chapter 2 on orientation and guidance systems). Acoustic or electronic information may be employed as guidance elements in individual cases.

If no structural solution can be implemented to enable persons with restricted mobility to access a building without assistance, an intercom system and corresponding arrangements for access are permissible as an interim solution. The intercom system shall be accessible and marked in accordance with » Chapter 12 on operational elements and communications systems.

Danger spots such as crossings, stairs and steep ramps must be equipped with warnings and safety markings. All in all, the design should be clear and intuitive and avoid additional risks.

Tactile models and general information systems providing more than hazard prevention information should be included.

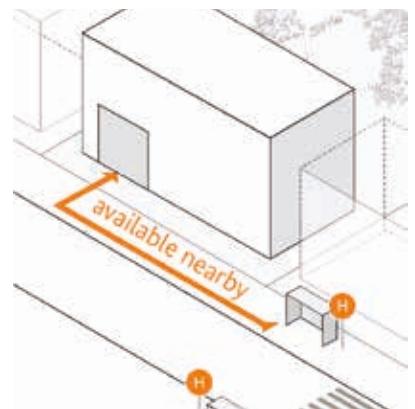
### 1.3 Public transport connections

The buildings should have a barrier-free access to public transport facilities nearby. The instructions on barrier-free access apply (see » chapter 2 on orientation and guidance systems and » chapter 3 on walkways and circulation areas). This means the following elements for access to public transport stops and stations:

- ground level entry
- continuous visual and tactile routing
- visual, and if applicable, acoustic information systems with enhanced contrasts
- dropped kerbs at crossings
- if necessary, check implementation with municipality and public transport operators.

A distance of 100 meters from the parking area to the building is considered reasonable (Implementation Rule on parking spaces, Building Regulation Berlin). When considering the needs of users who rely on public transport, a nearby public transport stop or station shall also be aimed for.

If no accessible stop can be made available, the site/building is not optimally suited for use as a place with a predominantly public function. Should the building be intended not for public use but primarily for workplaces, an agreement has to be reached with the future user and the representative body for people with disabilities as to whether the site/building is suitable for the intended use.



Barrier-free connection to public transport should be available nearby.

**Implementation Rule on Parking Spaces (AV Stellplätze) Building Regulation Berlin, 2007**

**Protection target as defined by  
DIN 18040-1, Chapter 4.2.2 – Parking  
Spaces**



**“Designated parking spaces for people with disabilities need to be marked accordingly and should be located in close proximity to barrier-free access points.”**

## 1.4 Private transport connections

A direct connection from the parking space to the main entrance of the building should be ensured, using shared routing if possible for all visitors and employees. The areas where wheelchair users might need to cross the premises should be placed where they are best suited, and coordinated with the desired location of the entrances.

**Parking spaces spanning 3.50 meters in width and 5.00 meters in length should be located near barrier-free access points and clearly marked.**

Parking spaces of 2.00 meters in width may also be possible if additional free space measuring  $1.50 \times 1.50$  meters is available for getting into and out of the vehicle, such as a walkway.

The barrier-free parking spaces should be marked in such a way as to be visible even in difficult weather conditions (snow), also outside public road environments.

**DIN 18024-1:1998-01, Chapter 16**

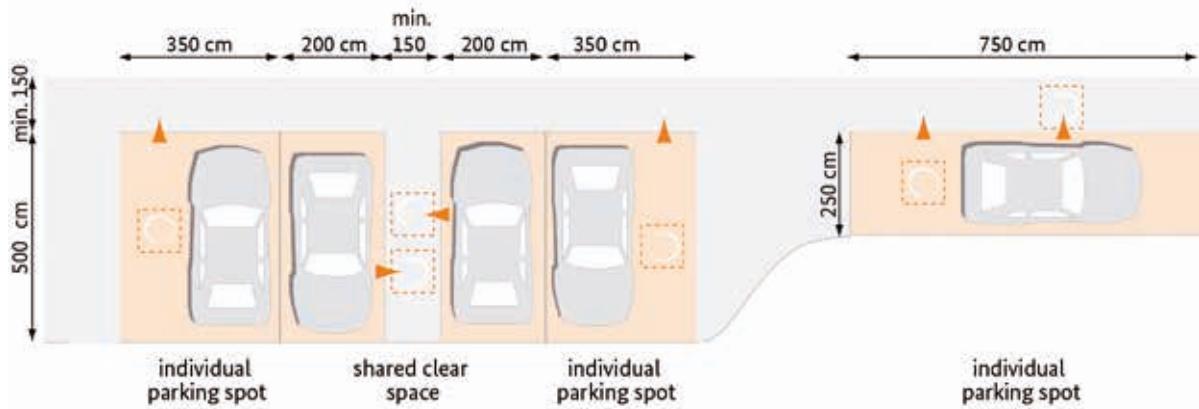
**According to DIN 18024-1, parking spaces for parallel parking need to be 2.50 m wide and 7.50 m long. Parking spaces for vans need to provide a minimum height of 2.50 m and be of a minimum width of 3.50 m and a minimum length of 7.50 m.**

The parking space should meet neighbouring circulation area either at the same level or via a dropped kerb.

The respective Building Regulations or Special Installations Ordinances of the *Länder* define how many parking spaces are required.

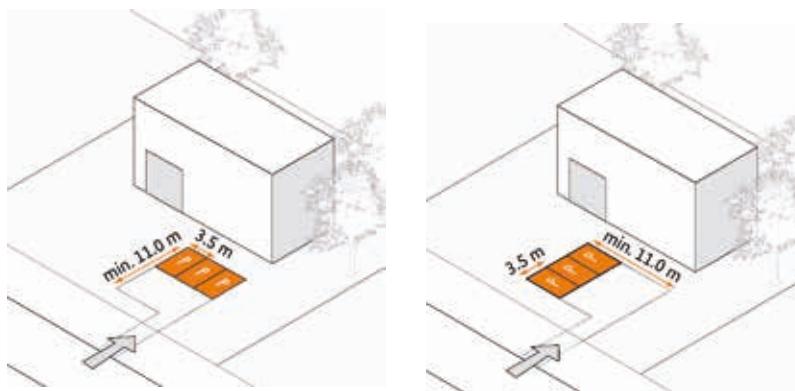
**Implementation Rule On Parking  
Spaces (AV Stellplätze) of Building  
Regulation Berlin, 2007**

**For public institutions, the Implementation Rule On Parking Spaces of Berlin's Building Regulation stipulates 1 parking space per 200 visitors (a minimum of 1 parking space for 100 visitors), or 1 parking space per  $2,000 \text{ m}^2$  gross floor space (1 parking space for  $1,000 \text{ m}^2$ ).**



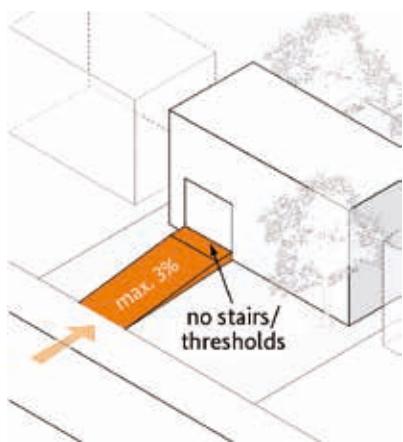
Basic geometry of parking spaces

In case of controlled access gates, a minimum width of 90 cm for wheelchair users needs to be ensured. This area is to be marked for blind or visually impaired people by means of ground elements in high-contrast optical or tactile design.



Space required for parking spaces

Because more time is expected to be needed for getting into and out of a vehicle, parking spaces sheltered from rain (under roofs or in underground car parks) are the preferred option.



Topography for accessibility of entrances

## 1.5 Initial topography

**The topography should enable the joint use of the main entrance without stairs or thresholds for every visitor and member of staff and enable shared routing without stairs or thresholds from a public transport stop or station or the parking spaces to the main entrance.**

For the given topographic situation, a review should be carried out whether entrances and exits other than the main entrance can also be used step-free, i.e., whether the entire exterior space of a building can be designed accessibly. The latter is obligatory if the exterior space is used not only by the staff during breaks, but also as an escape route, or is intended to be used by visitors (for museums and schools, for instance).

If the topography shows a gradient of less than 3%, step-free routing can usually be implemented without any problems in the future entrance area.

**If access routes are up to 10.0 m long, gradients of up to 4% are feasible (see » chapter 3.2 on gradients of walkways and exterior circulation areas).**

If the gradient is greater than 3%, the impacts of the topography need to be reviewed in the analysis of alternatives in accordance with Clause 2.2.2. Section E RBBau Guidelines. Higher investment costs may ensue.

Lifts are usually the more comfortable solution for existing buildings already equipped with stairs over a height of more than 100 cm (6 to 7 steps) (see » chapter 7 on lifts).

- 1 Entrance area of the convent building at the monastery of Dobbertin (Kloster Dobbertin Mikolaiczky Kessler Kirsten, photo by the Heritage Conservation Office of Mecklenburg Western Pomerania, A. Bötefür)
- 2 High-contrast marking of parking space – Ehrenbreitenstein Fortress (Büro Topotek 1, Berlin, photo by Hanns Joosten)
- 3 Incline for access to entrance – Thuringian Land Administrative Office Weimar (Hartmann + Helm Planungsgesellschaft mbH)



# Orientation and guidance systems

**Protection target as defined by  
DIN 18040-1, Chapter 4.4 – Warning/  
Orientation/Information/Guidance  
and 4.4.1 – Basics**

**“Information on building use, such as warnings or orientation or guidance information, needs to be appropriate for use by people with sensory impairments.”**



## 2.1 Need and structure

As a general principle for federal buildings, shared routing for all users is to be aimed for. Orientation and guidance systems are an essential aid for people with sensory or cognitive impairments as well as other users to guide them safely and without confusion from their starting point to their destination. The system to be used should be harmonised and consistent, so that it is easy to understand, thus facilitating comprehension and orientation.

The starting points and destinations and the need for orientation and guidance systems should be identified already early on in the planning process. The measures can be ranked according to a specific hierarchy. Orientation and guidance systems may be designed differently depending on whether people with visual impairments frequent a building on a regular basis or rarely or just on a one-off basis and how familiar they are with the building's structure. If visually impaired members of staff are familiar with the premises, they may require only little support for their orientation. In contrast, for visitor traffic a consistent orientation system should be installed.

If orientation and guidance systems are developed during an early planning phase, a sophisticated design may be developed that matches the overall style. These solutions often do not require ground surface indicators.

**A bi-sensory approach is the basis for conveying information to people with sensory impairments, i. e., information is conveyed using at least two senses. Information may be conveyed in tactile, visual and/or acoustic ways.**

**Designing orientation and guidance systems with high-contrast tactile or visual elements helps people with sensory impairments to notice and use them. Important information and warnings need to be especially prominent and easy to find (» chapter 2.5 on visual perception, materials, and visual contrasts and 2.6 on tactile perception, materials, and tactile contrasts).**

A range of guidance systems may be employed and also combined with one another:

- linear systems, preferably where clear and simple guidance is needed from one point to another. If a guidance system is more complex and covers parallel routes to different destinations, additional supporting guiding elements or good preliminary information must be provided.
- guidance systems from one distinctive point to another make sense when the structures of the building or the exterior space offer a manageable scope and only one point needs to stand out – such as marking an entrance along a long corridor. In this case, the surfaces do not need to be designed with visual contrasts.

## 2.2 Exterior guidance systems



For the exterior of federal buildings the installation of orientation and guidance systems is aimed to extend from:

- existing orientation and guidance systems
- public transport stops and stations, and parking spaces
- property access

up to the entrance points to the buildings. Additional sources of information, such as tactile systems, are also to be included. The transition from the exterior to the interior should be a particular focus. In general, an interruption of orientation systems (e.g. in the vestibule area) is to be avoided (» chapter 15 on entrances and lobbies).

Exterior guidance systems can consist of so-called other guidance elements and/or ground surface indicators (» chapter 2.4 on guidance elements). The guidance element of choice needs to be integrated into an overarching orientation and guidance system, should one be in place already (e.g. on a university campus).

When developing a guidance system, it is important to use guidance elements in a recurring, comprehensible, and unambiguous way, thus facilitating orientation.

Orientation in the exterior space can be facilitated for every user by the following measures:

- clearly structured design
- easily recognisable room structure
- comprehensible routing
- sightlines and openness
- establishing clear orientation points.



### 2.3 Interior guidance systems

For the interior of federal buildings, orientation and guidance systems are to be planned for the stretches between:

- entrance area and information counters
- information counters and vertical access

DIN 32984:2011-10, Chapter 6.3

According to DIN 32984 additional guidance systems need to be provided for the routes:

- between information counters and waiting areas
- between information counters and (accessible) toilets
- from the lobby to rooms open to the public, such as Citizen Centres, centres for assistance, and centres for application and appeals support (in administrative and court buildings)
- to important annexes and branches (in large administrative building complexes)
- between cash desks and cloakrooms in cultural facilities and museums
- within non-public areas/workplaces
- between the entrance area and vertical access.

The guidance systems are to be developed on the basis of the guidance elements described in » chapter 2.4.

A simple basic structure of a building can be crucial for orientation purposes.

Orientation within a building can be facilitated by:

- a comprehensible routing, including straight lines and right angles as much as possible
- sightlines and openness
- clear hierarchy of rooms and spaces
- establishing clear orientation points

Rooms with a width of up to 8 m usually do not require an additional guidance system as outlined in DIN 32984.

DIN 32984:2011-10, Chapter 6.3

## 2.4 Exterior and interior guidance systems



### Advance information – website

Important information on the building and access routes, including public transport, should be made available on an accessible website for people with sensory impairments so that they can inform themselves before they visit a public building.

### Advance information – tactile plans and models

Advance information is the starting point of any orientation system. This can be provided, for instance, in the form of a tactile layout plan. Tactile models can, for instance, be useful for conveying information on historic buildings and monuments.

### Sign posts and labelling

Written information for tactile perception should always be provided both in an embossed pyramid writing style and in Braille. A sans-serif style is to be used for embossed texts. The information is to be installed according to the provisions of the guidelines for tactile writing systems by the German association for visually impaired and blind people (Deutscher Blinden- und Sehbehindertenverband, DBSV). The information will be easier to find if its content is standardised and placed in comprehensible uniform locations.

German association for visually impaired and blind people (*Deutscher Blinden- und Sehbehindertenverband, DBSV*) – Guidelines for tactile writing systems, 2007

### Other guidance elements

Developing orientation and guidance systems is a complex process which needs to be adapted to the specific circumstances. They consist not only of special guidance elements forming a closed system: in the interior space of buildings walls, room dimensions, acoustic conditions, lighting, boundaries such as skirting boards and change of surface material, or readily noticeable pieces of furniture can also serve as guidance elements. In the exterior space, guidance systems can consist of exterior walls, low copings and brick ledges, fences, or drainage elements. Most importantly, the elements need to be easy to comprehend and clearly identifiable.

### **Interior guidance elements**

In interior spaces, the guidance character of the elements can be ensured via tactile or visual information and contrasts.

### **High-contrast design in interior spaces**

The boundaries of rooms are easier to be perceived by visually impaired people when contrasts are used in designing interior spaces. High-contrast skirting boards and doorframes may also be useful.

### **Tactile information on balustrades and handrails**

Tactile information (in Braille, embossed letters, or easy-to-understand symbols) can be incorporated into handrails for the purpose of orientation, such as information on the floor of the building or what routing to follow. These pointers are to be installed on the outer side of the handrail at the beginning and end of ramps and staircases.

It is important to ensure that the handrail pointers are always found on a specific spot on the handrail: for stairs, preferably on the slanted part of the handrail on the right side, directly above the first and last tread. Handrails can also be employed at horizontal levels such as in corridors.

### **Interior zoning**

A range of floor materials with different tactile and visual surfaces can be used for interior zoning as they can for exterior zoning. They can help to delineate obstacle-free movement areas from areas for furniture and opening doors. The wall design can be included as an additional aid.

### **Interior hazard warning surfaces**

Walls in existing buildings can be retrofitted with applied or milled grooves and ridges.

DIN 32984:2011-10

The width comprises 3 to 4 ridges. According to DIN 32984, a difference of 2 to 3 mm in height is sufficient for smooth floor surfaces in the interior of buildings to be detected by a long cane.

If possible, the use of ground surface indicators is to be avoided in interior spaces.

### Exterior guidance elements

In exterior spaces, guidance elements can be employed as guiding lines, offering orientation for people with sensory impairments and ensuring consistent tactile detection of paths. Continuous ledges along walls, brick benches, lawn edges, drainage channels, as well as changes in surface materials that are clearly discernible for tactile, visual, and, where appropriate, auditory perception can fulfil that function.

DIN 32984:2011-10, Chapter 5.9.4

When high-contrast tactile ground structures are used, the changing of materials must be recognisable as a consistent guiding line. Recognition can be ensured when different materials and surface finishing are used (» chapter 2.5 on visual perception, materials, and visual contrasts, » chapter 2.6 on tactile perception, materials, and tactile contrasts).

DIN 32984:2011-10, Chapter 5.1



Examples of guiding lines in exterior spaces

The consistency of guiding lines must not be harmed by fixtures or temporary utilisation, such as temporary furnishing or signage.

DIN 32984:2011-10, Chapter 5.9.4

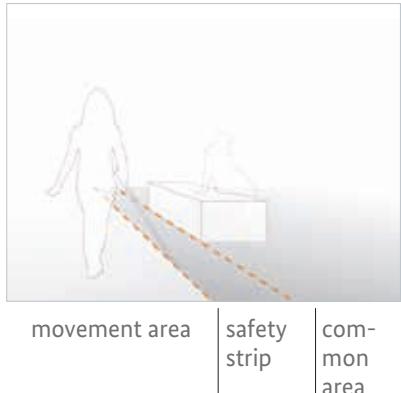
### Zoning of exterior open spaces

Large open spaces such as squares or paths wider than 8 m may be difficult for the orientation of people with sensory impairments.

DIN 32984:2011-10, Chapter 5.9.5

Structuring these areas in areas for moving (movement areas) and common areas is beneficial for the orientation of people with sensory disabilities, and at the same time for all other users.

Movement areas should be free of fixtures and obstacles. Furniture is to be envisaged exclusively for common areas. On both sides of movement areas, a 60 cm-wide segment of the common area should be kept free of fixtures and obstacles to the extent possible and serve as a safety strip.



Surfaces in movement and common areas should be designed with tactile, visual, and, where appropriate, acoustic contrasts to ensure their function for guidance and warning (» chapter 2.5 on visual perception, materials, and visual contrasts and » chapter 2.7 on auditory perception).

A high-contrast design of common areas, as well as their fittings and fixtures and important orientation points, makes them easier to recognise. Selective orientation elements can be placed along paths to aid orientation, and in special case they can make visual high-contrast ground surfaces superfluous.

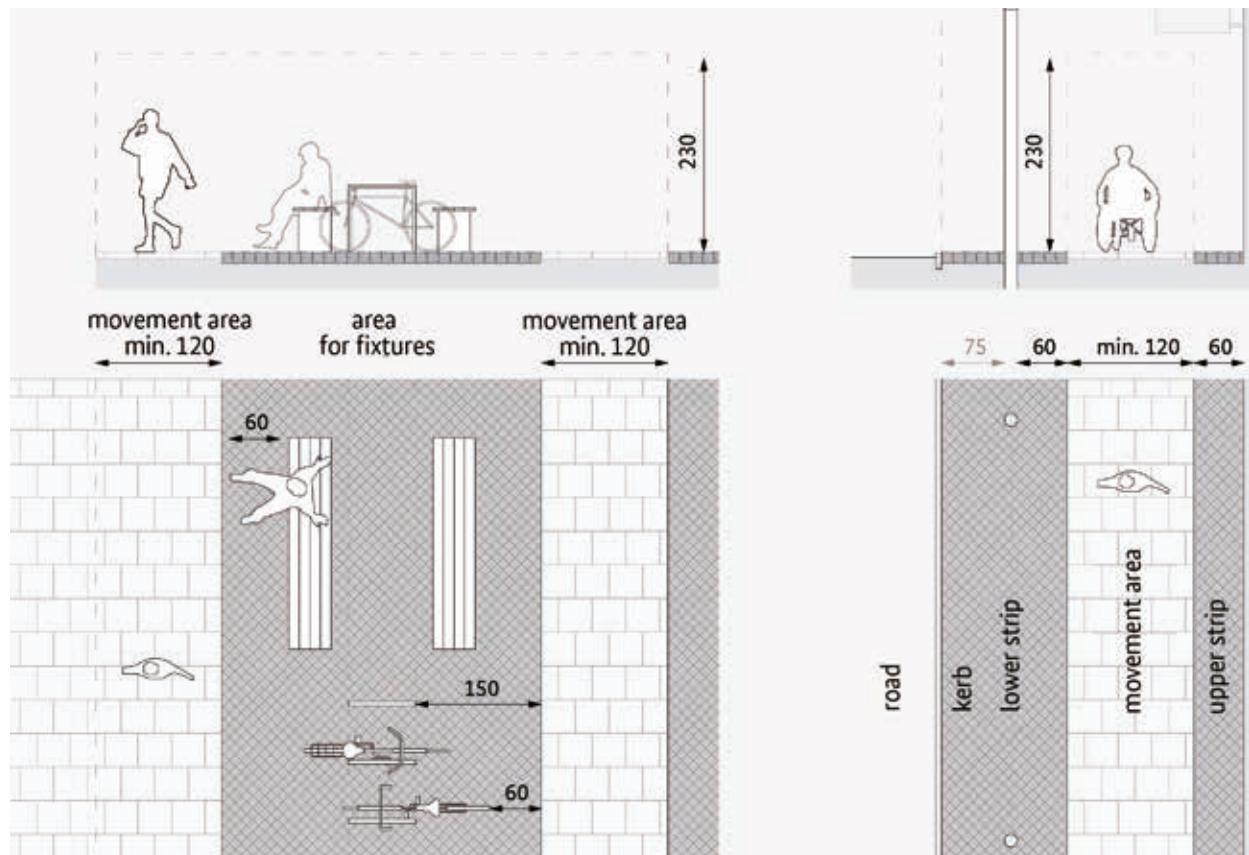


Illustration left: example of structuring an open space, i.e., of an area with mixed traffic, including access routes and common area.

Illustration right: zoning paths with upper and lower strip; for information on required dimensions for walkways and circulation areas see » chapter 3 on walkways and circulation areas.

### Zoning areas with car and deliveries traffic

Depending on the traffic volume and when one type of traffic is to be given priority it may become necessary to create a safety distance and separate the access routes for cyclists or cars or deliveries from access routes for pedestrians and wheelchair users.

The width of the safety distance (50 cm minimum) depends on the traffic volume. If the traffic areas do not differ in level, an additional dividing strip with visual and tactile contrasts of a width of 30 cm may become necessary, should the risk potential be high.

DIN 32984:2011-10, Chapter 5.9.3

This can be achieved, for example, when pavements next to roads boast an upper strip and a lower strip with the walkway in the middle (» figure page 70 right). Upper and lower strips need to be designed with visual and tactile contrasts to the walkway. By doing so, common areas and safety distances to adjacent types of use can be clearly delineated and at the same time consistent and comprehensible guidance elements are offered.

DIN 32984:2011-10, Chapter 5.9.3

### Exterior kerbs

Kerbs are used to differentiate safe access routes from hazardous areas such as roads. Kerbs designed with tactile and visual contrasts are therefore an important orientation element and a guiding line for the longitudinal orientation of people with sensory impairments in exterior spaces. As exterior delineation elements, kerbs should preferably be designed with a minimum height of 6 cm, and have a clearly detectable edge in visual contrast to the surface and no pronounced rounding to ensure optimal recognition by long cane users.

DIN 32984:2011-10, Chapter 5.9.2

Kerbs higher than 3 cm placed in movement areas generally constitute an obstacle for wheelchair users. They need to be lowered to that height at crossings. For safe pedestrian and wheelchair use, it is beneficial to have step-free transitions if possible and as much level ground as possible. This is a reason why using kerbs in designing squares, walkways, and streets on the premises of federal buildings should be considered with care.

### Zoning of paths in exterior public green areas

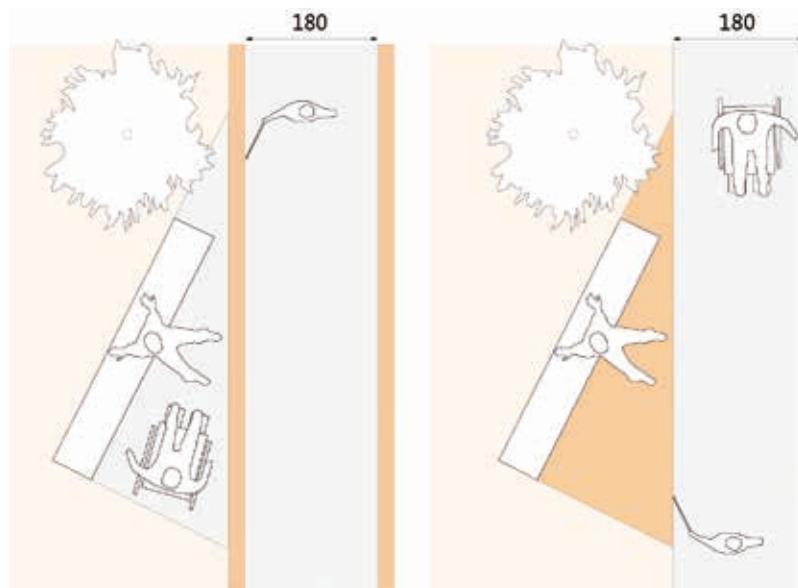
Boundaries between a path's surface and a planted area can be used as guidance elements for people with sensory impairments.

**DIN 18040-1 recommends a height of 3 cm for kerbs and a visual contrast to the surrounding surface to make them easy and safe to find.**

As a boundary to planted areas, kerbs of 3 cm have a negative impact with regard to a sustainable design for exterior spaces because they impede surface water from draining and seeping into adjacent planted areas. They are not well suited for zoning paved areas because they are a risk for people with motor impairments who may trip over them, and they may already constitute an obstacle for wheelchair users.

If paths in public green areas have a visually and tactiley contrasting design compared to surrounding planted spaces, the difference in surface between path and vegetation can be recognised by people with sensory impairments and thus used as a guidance element. Adjacent common areas should be designed in accordance with the zoning scheme in a different tactile and visual design. Additional fixtures such as lampposts should not be placed on the paths but on the green areas or on a side strip recognisable for visual and tactile perception.

Accessibly designed fixtures (see » chapter 11 on interior and exterior furniture and fixtures) can be used in open, square-like spaces according to the same principle as other distinctive points when their design provides sufficient contrasts.



Left: example of a path designed with side strips in tactile and visual contrasts and an adjacent common area on one side

Right: common area designed in tactile and visual contrasts. The transition between path and vegetation/common area is recognisable as a guiding line.

### Exterior ground surface indicators

Ground surface indicators can be used as guidance systems if no consistent orientation and guidance system can be implemented using the guidance elements for exterior spaces described in this chapter. They can also be used in cases of hazardous or poorly visible locations. Ground surface indicators consist of a standardised sequence of structural ground elements with a high tactile, visual, and where appropriate, acoustic contrast to the surrounding flooring.

DIN 32984:2011-10

Ground surface indicators convey unambiguous information using few, clearly defined structures that can be perceived with the help of a long cane.

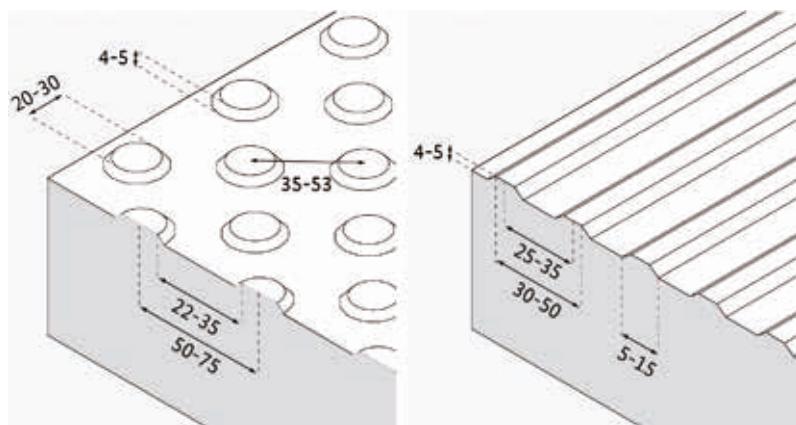
DIN 32984:2011-10, Chapter 4.2

There are two types of ground profiles:

- ribbed slabs as guidance strips within paths and for orientation in the surrounding space or to show direction
- studded slabs to indicate hazardous situations, as hazard warning surfaces or to indicate situations requiring a decision.

For safety reasons, ground surface indicators may not be installed on streets and roads.

DIN 32984:2011-10, Chapter 5.1



Dimensions of ribbed and studded slabs for exterior spaces.  
In interior spaces unexpected raised surfaces can easily cause tripping.  
Should an application of ground surface indicators be planned, flatter studs and ribs (2 to 3 mm) are to be taken.

Depending on what function the indicators are to have, DIN 32984 offers a range of solutions for different applications. Guidance strips and hazard warning surfaces are described here; more information on hazard warning surfaces can also be found in » chapter 6.4 on orientation aids on stairs and single steps.

DIN 32984:2011-10

**DIN 32984:2011-10, Chapter 5.2.1****Exterior guidance strips**

Guidance strips consist of ribbed slabs running in the direction of pedestrian travel; they serve as guidance along a path. The ribbed slabs should be 30 to 60 cm wide. A distance of 60 cm is to be maintained on both sides of the strip to the edge of roads or fixtures such as lampposts, sculptures, and such like. As an alternative to guidance strips, other guidance elements can be used to design guiding lines (see graph below).

**DIN 32984:2011-10, Chapter 5.2.1**

Guidance strips should be installed at a distance of 120 cm to fixtures such as benches, as their use requires more space. At bicycle stands, a distance of 120 cm is to be ensured from the maximum parking position of the bicycle.

**DIN 32984:2011-10, Chapter 3.1.2.6**

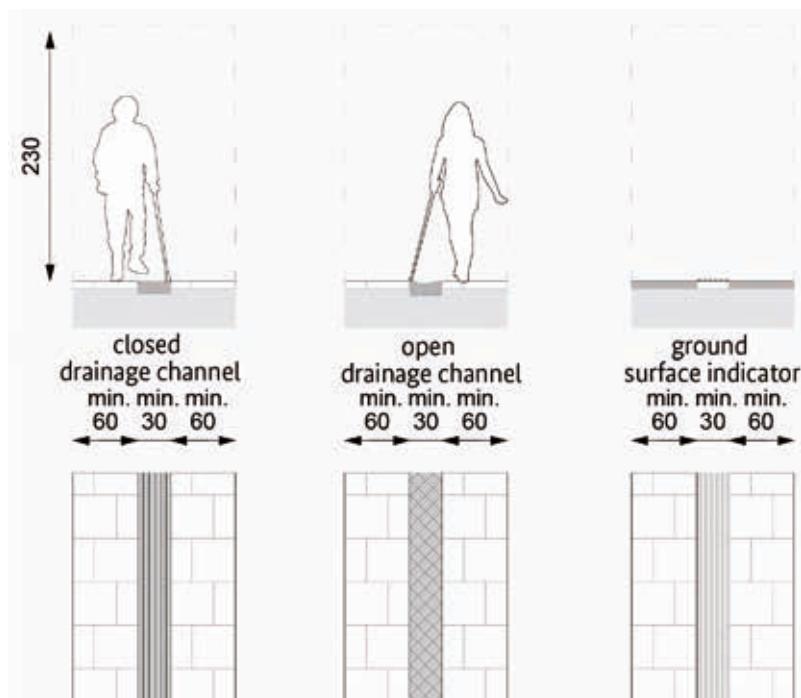
The headroom above the movement area (guidance strip with movement spaces of 60 cm on both sides) must be a minimum of 230 cm.

**Exterior hazard warning surfaces**

Hazard warning surfaces point out a change of level and other hazards and obstacles. They consist of studded slabs and are placed where heightened attention is required.

Examples of the use of ground surface indicators and alternative solutions with other guidance elements  
 (» exterior guidance elements)

Visual and tactile contrasts also need to be taken into consideration when using other guidance elements  
 (» chapter 2.5 on visual perception, materials, and visual contrasts).



## 2.5 Visual perception, materials, and visual contrasts for interior and exterior spaces



### Visual contrasts

Visual contrasts play a crucial role for detecting elements in interior and exterior spaces. The detectability of stairs, fixtures, parking spaces, and orientation systems for people with sensory impairments is based mainly on visual and tactile contrasts (chapter » 2.6 on tactile perception, materials, and tactile contrasts).

**Elements envisaged for providing guidance should feature a visual contrast to their surrounding environment.**

The element fulfilling a guidance function should be of a light colour material because light colours can be recognised better by people with poor eyesight.

Detectability usually increases with the intensity of the contrast. However, maximising contrasts does not automatically generate better recognition as it becomes harder to distinguish between important and unimportant information. The contrasts should be appropriate for the individual situation and the specific application.

**Specular reflection is to be avoided.**

Warnings should always be marked more prominently than guidance elements. Especially in complex traffic situations, such as heavily frequented transitions between interior and exterior spaces or when other traffic flows are crossed, particularly clear contrasts may be required. Floorings should exhibit a visual contrast to furnishings and fixtures in order to improve orientation.

**The contrasts need to be permanent and stable. Weathering and pollution are to be avoided and, where necessary, remedied (see also » chapter 2.6 on tactile perception, materials, and tactile contrasts).**

DIN 32984:2011-10, Chapter 3.1.2.6

DIN 32975:2009-12, Chapter 4.3.3.1

### Luminance contrast

An object's difference in brightness from its surrounding as perceived by the human eye is called the luminance contrast. Luminance contrasts can be utilised for establishing visual contrasts.

Colours can support the perception of luminance contrasts but cannot be substituted for it.

It is important to note that some surface materials in exterior spaces change their colour and brightness with moisture. Luminance contrasts should be ensured in all weather conditions. (see also » side note page 78).

DIN 32975:2009-12, Chapter 4.2.2

### Luminance contrast in guidance elements

A sufficient luminance contrast is achieved when areas next to one another display a luminance contrast ratio greater than 0.4 in absolute terms.

The required luminance contrast may vary depending on the specific building task. A large light-coloured and smooth material used on access routes in an exterior space may cause too much reflection when the sun is shining, thus causing a discomforting blinding effect.

Furthermore, overly high contrasts may be confusing to people with cognitive impairments (such as people suffering from dementia).

DIN 32975:2009-12, Chapter 4.2.3

Illumination may also play an important role when selecting luminance contrasts of materials. Ensuring good lighting conditions can have a significant impact on the contrast ratio.

A decision on luminance contrasts should be reviewed and developed in relation to the specific project. Their impact on the overall design and *Baukultur* should be taken into account, especially for existing buildings.

### Luminance contrasts for ground surface indicators

According to DIN 32975, Chapter 4.2.2, the absolute value of luminance contrasts should also be at least 0.4 for ground surface indicators. Additionally, the lighter coloured material used in the combination: ground surface indicators and surrounding surface should exhibit a reflection degree of at least 0.5.

DIN 32975:2009-12, Chapter 4.2.2

The reflection degree indicates how much of the incident light is reflected. Only very light colours fulfil the required reflection ratio of 0.5. This is why ground surface indicators are mostly white.

This restricts the range of possible materials to select from and can lead to unsatisfying results with regard to the overall design and *Baukultur*.

This requirement is therefore to be applied exclusively in especially hazardous situations

### Luminance contrasts for stairs and ramps

Information on the contrasts to be used for stairs and ramps can be found in separate chapters (see » chapter 5.4 on orientation aids at ramps and » chapter 6.4 on orientation aids on stairs).

### Luminance contrast for warnings

A luminance ratio of 0.7 is required for displaying information on hazards, warnings, and any written information.

DIN 32975:2009-12, Chapter 4.2.2

## Side note

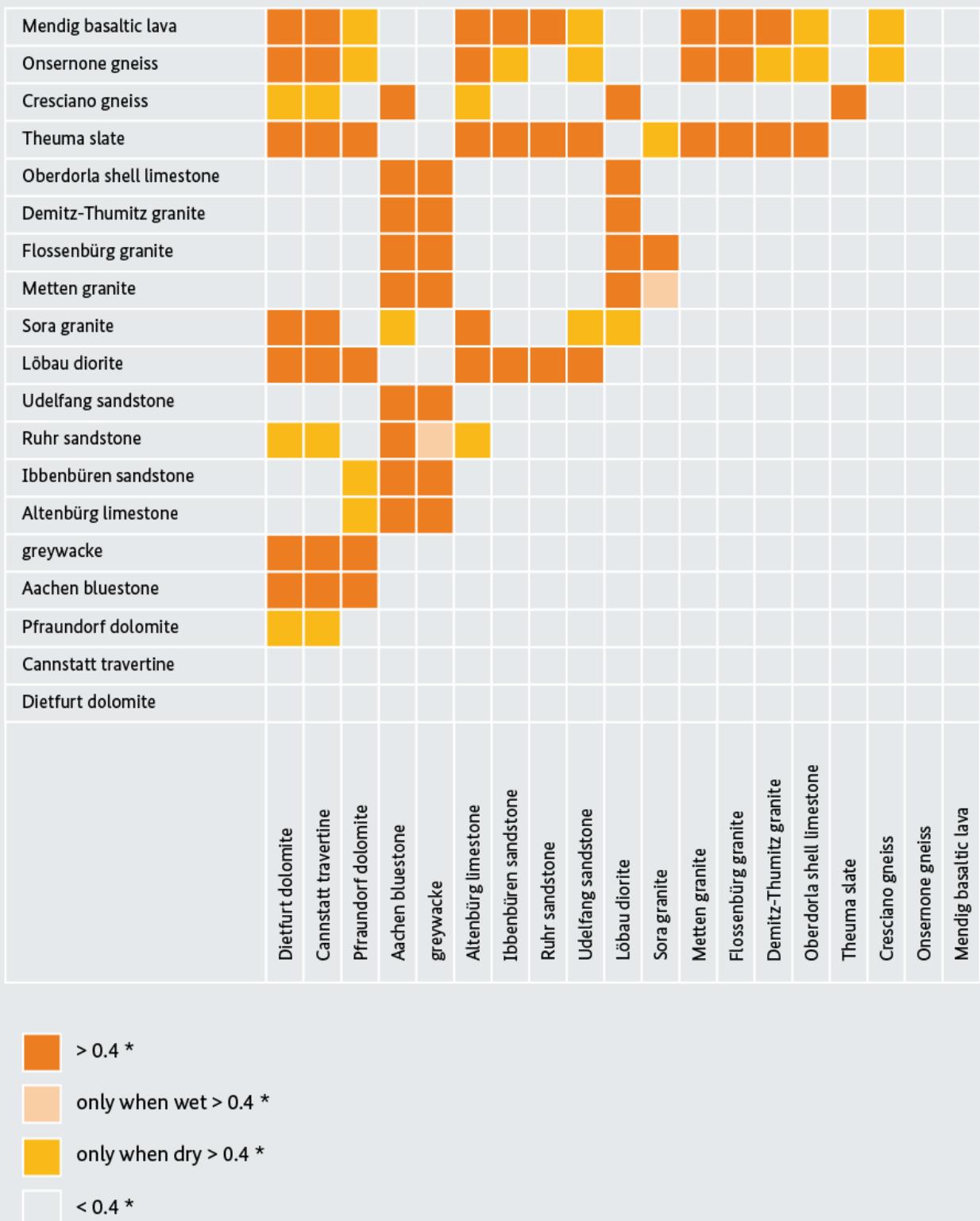
The following overview shows exemplary values of luminance ratios for a selection of natural stones of German origin which may also be used for exterior spaces.

A luminance camera was used for taking measurements under practical conditions (indirect sunlight) but not adapted for standardisation. They were carried out as benchmark measurements at the Technische Universität Dresden (specialisation area Landscaping in collaboration with the Perception Lab/Light Technology at the Traffic and Transportation Psychology Chair).

Due to the measurement conditions and the natural stones' variations in colour, the ratios provided serve only as a rough point of reference. Should a standard-conform proof be required in a specific case, these measures cannot be substituted for this proof. It has become clear that some combinations of materials are likely to reach a luminance ratio of 0.4. This luminance ratio is required for other guidance elements and can be fulfilled with various combinations of natural stone materials. In contrast, the minimum reflection ratio of 0.5 may be present only in very few material combinations.

Almost every material changes its brightness when wet. In many cases, this drastically reduces the luminance contrast. As a matter of principle, the luminance contrast of the materials used should be analysed in samples under dry and wet conditions.

\* The ratios offer a rough reference and can be significantly different in practice. Should a standard-conform proof be required in an individual case, these measures cannot be substituted for this proof. Standardised tests can be carried out in accordance with DIN 32984 Item 4.3.3.2 on the identification of luminance contrast by measuring the luminance and the reflection ratio under laboratory conditions. These tests are offered by specialised laboratories and universities.





## 2.6 Tactile perception, materials, and tactile contrasts for interior and exterior spaces

The surfaces of paths and circulation areas must be even and solid so that people with motor impairments (such as wheelchair users) can use them safely and without any problems in all weather conditions.

The broad range of possible materials for interior and exterior spaces can be integrated into accessibility design concepts. The flooring should have surfaces boasting tactile and visual contrasts to surrounding structural components to improve orientation within a room (see » chapter 2.5 on visual perception, materials, and visual contrasts).

### Materials and tactile contrasts in exterior spaces

All the materials customarily used for constructing paths are suited for use in orientation and guidance systems, with the prerequisite that their surface properties be adapted to the intended function. A tactile contrast can be achieved when the surfaces selected are of varying materials and processes, as well as the width and direction of joints.

DIN 32984:2011-10, – Chapter 5.9.1

The tactile requirements for such surface design apply both to guidance elements and ground surface indicators: the structures need to be safely detectable by a long cane and, if possible, also when walking on them. The different materials are built in flush with one another as to avoid edges that may cause tripping.

DIN 32984:2011-10, – Chapter 4.3.2

As a general rule, smooth and large formats are suited for access routes, while rougher and smaller ones are better for common areas. Pavement surfaces that are rich in joints or chamfered may reduce the detectability of guiding lines. (see » chapter 2.4 on guidance elements).



Sawn stone pavement (left) and rough stone pavement (centre), example of path zoning using natural stone paving and slab surfaces (right)

function	basic principles for surfaces	colour	suitable materials	surface	notes
<b>access routes</b>	even sturdy large formats	light, diffuse reflection	slabs and cobblestone made of natural stone or concrete clinker paving concrete surfaces coloured or split mastix asphalt surfaces water-bound surfaces	<b>natural stone:</b> hammered, flame-finished, rough-cut, sandblasted <b>concrete:</b> polished*, finely blasted, finely sanded	low number of joints, joint direction changes towards surfaces of common areas, upper and lower edges
		dark, low reflection	slabs and cobblestone made of natural stone or concrete clinker paving concrete surfaces asphalt surfaces water-bound surfaces	<b>clinker:</b> untreated, peeled, finely sanded	
<b>common area/ surrounding area/additional area</b>	small formats, rough	light	natural stone paving concrete paving clinker paving water-bound surfaces	<b>natural stone:</b> naturally rough, rough, hammered <b>concrete:</b> roughly washly, roughly hammered	high number of joints, joint direction changes towards movement area surface
		dark	natural stone paving concrete paving clinker paving water-bound surfaces lawn	<b>clinker:</b> roughly sanded, rough hand-finish	

### Materials and tactile contrasts in interior spaces

The broad range of possible materials for interior spaces is to be included in accessible design concepts. When used on floors, walls, handrails, and furnishings, the varying haptic qualities of the materials can be made detectable by long cane, hands, and feet.

Even relatively small but well thought-through changes in material can contribute to a self-explanatory zoning of an interior space, e.g. varying floor constructions with the same upper material may be perceived as very different from each other. Areas exhibiting complex patterns can be confusing and should therefore be used only with caution.

### Exterior anti-skid surfaces

DIN 18040-1 stipulates Assessment Group R 9 for skid-resistant surfaces of floors in interior spaces (see » interior anti-skid surfaces).

There are no special instructions for measuring skid resistance in exterior spaces. As changing weather conditions can result in heightened hazards due to moisture, a value of R 10 and R11 (analogous to ASR A1.5/1.2) should be planned for.

The table is intended to facilitate the selection of surface combinations that can be visually or tactiley perceived. Materials consisting of concrete and natural stones can be used for both movement and common areas. Clearly detectable tactile and visual contrasts are crucial (see also » chapter 2.5 on visual perception, materials, and visual contrasts). Suitable surface materials should be chosen so as to ensure a tactile as well as a visual contrast between traffic areas and common areas.

See also ASR A1.5/1.2

**Specification Sheet on Skid Resistance of Pavement and Slab Surfaces for Pedestrian Travel**

Skid resistance in exterior spaces is traditionally defined on the basis of micro- and macro-roughness. The “Specification Sheet on Skid Resistance of Pavement and Slab Surfaces for Pedestrian Travel” (Merkblatt über den Rutschwiderstand von Pflaster- und Plattenbelägen für den Fußgängerverkehr) provides information on the skid resistances of different surfaces directly after they have been placed and after 12 months of use.

surface	average value micro-roughness $\leq 1$ year	average value micro-roughness $\geq 1$ year	time of efflux macro-roughness $\leq 1$ year	time of efflux macro-roughness $\geq 1$ year
concrete paving	59.0	65.9	2–30	2–106
natural stone paving	62.3	47.3	2–15	5–600
clinker paving	59.8	46.2	31–87	26–500
concrete slabs, unpolished	64.6	56.2	3–19	2–43
concrete slabs, polished	44.8	51.7	>1,000	>1,000
natural stone slabs, unpolished	67.1	49.8	2–11	7–180
natural stone slabs, polished	29.8	34.0	>1,000	>1,000

The table shows measurements of a range of surface materials. The micro-roughness should be at a value of 55 and higher (SRT value). A macro-roughness (AM value) greater than 40 can compensate to some extent for a deficit in micro-roughness. Micro-roughness (SRT measurement) and macro-roughness (AM measurement) of floor surfaces as defined by the Road and Transport Research Association (*Forschungsgesellschaft für Straßen- und Verkehrswesen, FGSV*) 1997

See also ASR A1.5/1.2

The extensive range in the micro-roughness of natural stone surfaces can be explained by the great variety of material properties and processing methods. Flame-finished, hammered, or sandblast-ed surfaces, depending on the type and shape of the natural stone used, usually exhibit the skid resistance value required for exterior spaces.

The skid resistance of clinker and concrete products can be im-proved by micro-rough structures that are incorporated into the surfaces during manufacturing.

### Skid resistance in interior spaces

When designing the surface of floors, it is important to adhere to the Assessment Groups corresponding to the respective skid hazard. R 9 as stipulated by ASR A1.5/1.2 is for the most part sufficient in interior spaces. The requirements for sanitary rooms, kitchens, and specific work areas range between Assessment Groups R 10 and R 13.

Specular reflections and blinding effects should be avoided.

Floor surfaces that have a smooth and slippery appearance may be a hazard because of their psychological effect.

## 2.7 Auditory perception



Acoustic information and voice communication must be provided in such a way as to be perceived by people with auditory impairments. For this to be the case, it is necessary to fulfil basic acoustics prerequisites.

**Optimum room acoustics are the result of the interaction among room geometry, room size, room characteristics, and the total background noise level.**

DIN 18041:2004-05

Taking into account the size of rooms and the distance from where voice communication or other acoustic signals originate, rooms are divided into

DIN 18041:2004-05

- rooms with auditory communication over medium and greater distances (conference halls, court rooms, council chambers, banqueting halls, class rooms, seminar and meeting rooms, university lecture halls, group activity rooms, sports and swimming halls). Small rooms with a volume of about 250 m<sup>3</sup> usually do not require additional sound systems, whereas these are necessary for medium-sized and small rooms with volumes of about 250 to 5,000 m<sup>3</sup>.
- rooms with auditory communication over small distances, such as restaurants, cellular offices, offices for use by more than one person, open-plan offices, reading rooms and circulation counters in libraries, lobbies, exhibition halls, and staircases.

### Noise level

The difference between wanted signals and background noise must amount to at least 10 dB to ensure accessible perception. The aim should not be to enhance the wanted signal, but, if possible, to reduce background noise. The sound pressure level of background noise due to structural circumstances should not exceed 30 dB, as otherwise people with auditory impairments will not be able to understand communication over greater distances (5 to 8 m) and will have problems understanding complex texts or texts in foreign languages. The background noise level may be minimised by reducing the following factors:

DIN 18041:2004-05

- exterior noise (by installing new windows, positioning the room adequately within the building, and implementing structural noise insulation measures in accordance with DIN 4109)
- background noise from the audience (reducing the noise of moving chairs)
- background noise emanating from technical equipment, e.g., by using low-noise products in working rooms.

Ensuring a room acoustics quality appropriate for the specific type of utilisation of the rooms is an important criterion, even within the assessment system for sustainable building. The requirements of the technical profile of the Assessment System for Sustainable Building (*Bewertungssystems Nachhaltiges Bauen, BNB*) for office and administrative buildings *BNB\_BN 3.1.4* correspond to the following level of detail.

DIN 18041:2004-05

**Room size and room geometry**

Room geometry influences room acoustics. When no acoustic measures are envisaged, round, elliptical, and certain trapezoid shapes of rooms are to be avoided. The same is true for concave walls and ceilings. In addition to room geometry, the properties of the walls and the ceiling influence the direction and control of sound waves in rooms.

It is important to ensure that the path length difference between the direct sound that is generated in the sightline to the sound's source and the sound that is reflected from walls or the ceiling is less than 17 m. This is accomplished when the surface of walls that are farther than 9 m away from the sound's source are designed to improve room acoustics. Parallel walls are to be avoided in rooms where music is presented. The proportions of the length and the width of the room compared to its height are to be maintained, and overly low ceilings avoided.

DIN 18041:2004-05

**Reverberation time**

Acoustics can be improved by means of low reverberation times. Information on the ideal maximum reverberation time in relation to room size and room utilisation can be found in DIN 18041:2004-05. Moreover, for the benefit of people with auditory impairments and/or cognitive impairments and for communication in a language other than one's native language, the aim should be to achieve a sound reverberation time 20% lower than that stipulated here.

DIN 18041:2004-05

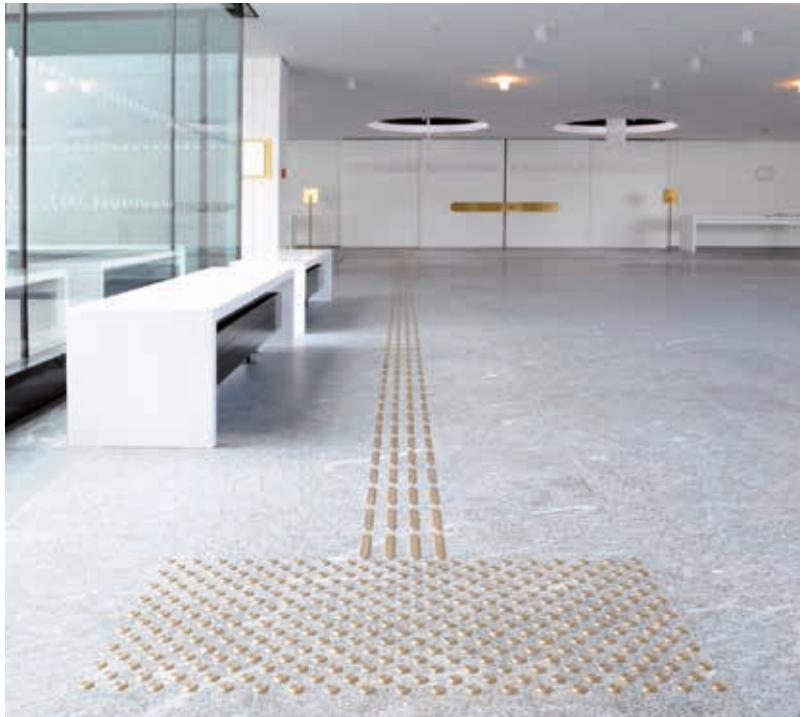
**Sound absorption measures**

Sound absorption measures are required to achieve appropriate sound acoustics, even in rooms with speech communication over short distances.

**Acoustic guidance systems**

Orientation and guidance systems can also consist of auditory elements. Acoustic guidance can be provided, for instance, by changed sounds when walking or tapping the ground with a long cane. Using acoustic spots (fountains, music, signals) is another possibility. They can constitute a guidance system by being used in a sequence of guidance elements or complementary to other systems. Additionally, audio and video guides as well as a variety of personal radio systems are part of accessible guidance systems.

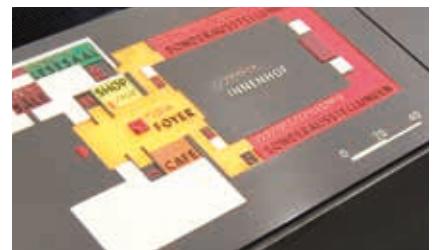
**The use of acoustic guidance systems is essential for alarms and warnings (see » chapter 9 on emergency alarm and evacuation and » chapter 20 on sanitary installations).**



1 Design of a tactile paving system for the blind – State Theatre of Darmstadt (modifications planned by +Ragnarsdóttir+Oei, CBF tactile paving system, photo by Barbara Aumüller)

2 Advance information – Dresden Hygiene Museum

3 Floor markings – Federal Environment Agency Dessau (sauerbruch hutton architekten, ST raum a Landschaftsarchitekten, photo by Markus Bredt)





1, 2 Zoning principle for movement and common areas – Warburg (Lohaus Carl Landschaftsarchitekten)

3, 4 Movement areas with drainage channels in visual and tactile contrasts – Bergisch-Gladbach pedestrian zone ([f] landschaftsarchitektur)

5 Guidance using other guidance elements such as hedges and edges of house walls – Wollmarkthof Augsburg (Topotek 1, Berlin, Hanns Joosten)

6 Kerbs as guiding lines and placement of lamps outside access routes – River promenade at Konrad Adenauer Ufer (RMP Stephan Lenzen Landschaftsarchitekten)



## 2.8 Exterior illumination



Consistent basic illumination is required for any time of day or night and all weather conditions to ensure safe detectability. It is the basis without which the luminance contrasts described in » chapter 2.5 on visual perception, materials, and visual contrast cannot work.

The material, illumination method and light intensity need to be coordinated during the development so that blinding effects and specular reflections are ruled out.

The colour of the light used needs to be coordinated with optically contrasting elements that may have already been installed for warning and guidance.

Lamps must not become obstacles and therefore need to be designed according to the rules for fixtures and furnishings (see » chapter 11 on interior and exterior fixtures and furnishings). They should be installed outside access routes or safety zones.

### Access routes

Access routes should have consistent good-quality illumination to ensure a clear recognition of paths.

**The illumination of traffic areas is regulated in DIN 13201-1.**

DIN 13201-1:2005-11

It is not recommended to apply this standard to access routes for wheelchair users and pedestrians as the standard applies to areas of motorised traffic. Rigid application may in some cases result in overly intense illumination.

Maximum brightness does not ensure optimum visibility. The illumination needs to be adapted to the individual situation and, if necessary, tested in sample lighting in situ as to take into consideration the influence of the material's colouring and of surrounding wood plants and fixtures.

Orientation is supported by placing individual lamps in a straight line along the path in a regular sequence.

An international comparison has revealed that the illumination of ramps is a general requirement (BBR 2009).



### Stairs and ramps

Important areas as well as dangerous or complex traffic situations (crossings, stairs, ramps) require additional accentuation. It is important to ensure that they are detected early. Contrasts need to be permanently perceivable (see also » chapter 2.5 on visual perception, materials, and visual contrasts).

The formation of shadows is to be reduced to a minimum because shadows can cause contrasts to be perceived incorrectly. The formation of hard shadows on stairs is to be avoided in particular.

## 2.9 Interior illumination

The illumination of rooms depends on their use. Flexible and cost-efficient lighting systems are to be preferred.

**Illumination should be free of blinding effects and shadows.**

Illumination requirements vary greatly. Much higher nominal light intensity (greater than 1,000 lux) may be required for people with visual impairments, but also for those with auditory impairments. This is why it makes sense to enable more than one setting so that the light intensity can be adapted to the use at a given time.

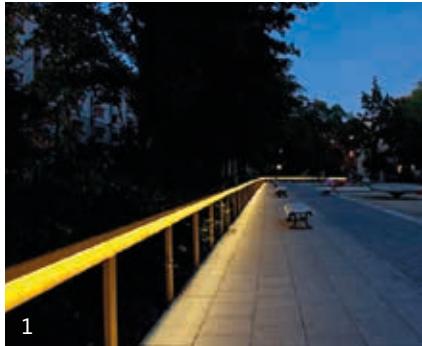
Greater light intensities are also required in workplaces:

- when employing older staff as compared to younger staff for the same visual task
- when adjacent areas show stark light-dark differences
- to accentuate accident black spots.

Spot lighting can contribute to structuring a room and to marking priority spots.

**ASR A3.4**

**Stipulations on the illumination of workplaces can be found in ASR A3.4.**



1

1 Illuminated guidance strips on handrail – Nauener Platz Berlin (Planung.Freiraum Lichtplanung Studio Dinnebier, photo by Andreas [FranzXaver]Süß Fotografien)

2 Guidance system consisting of illuminated arrows and floor dots – Mercedes Benz Museum Stuttgart (knoll.neues.grün)



2

# Access routes

3. Walkways and exterior circulation areas .....	91
4. Corridors and horizontal circulation areas in interior spaces ...	97
5. Interior and exterior ramps.....	101
6. Interior and exterior stairs and steps .....	109
7. Lifts.....	120
8. Doors .....	125
9. Emergency alarm and evacuation .....	132



# 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.

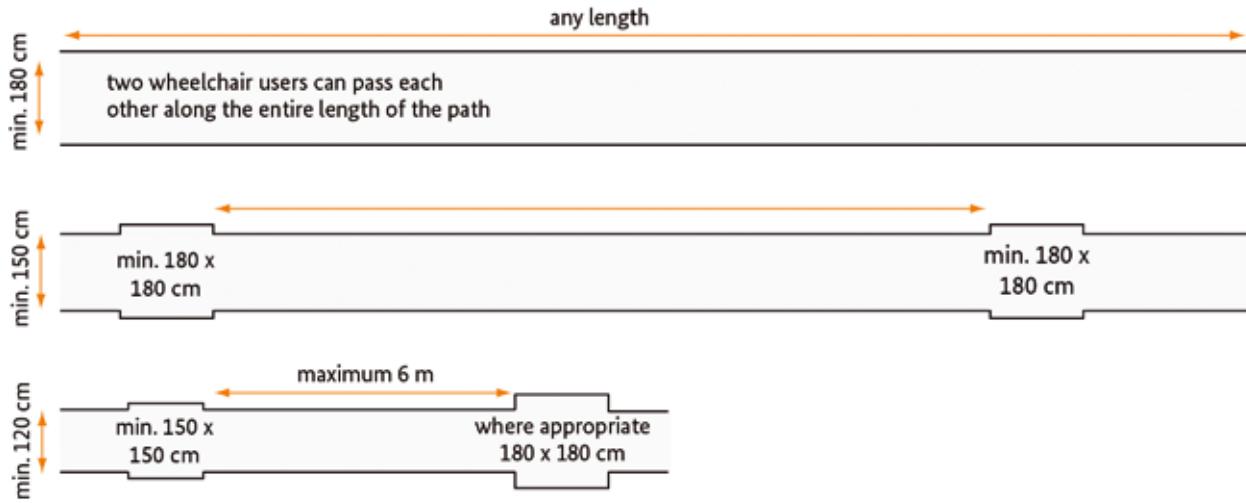
If wheelchair users are not likely to pass other wheelchair users but only other pedestrians, a minimum width of 150 cm is sufficient for the movement area. If no passing is likely, the necessary width can be reduced to 120 cm (e.g. for short paths up to a maximum length of 600 cm). In these cases, a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



### 3.2 Gradients

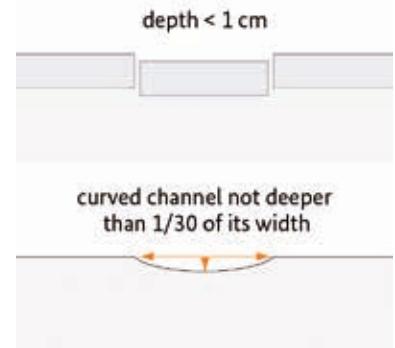
Gradients of up to 3% are the usual gradients for drainage purposes. Greater gradients constitute a special challenge for people with motor impairments. Gradients greater than 6% are not manageable without assistance or special provisions (such as electric wheelchairs).

**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%.**

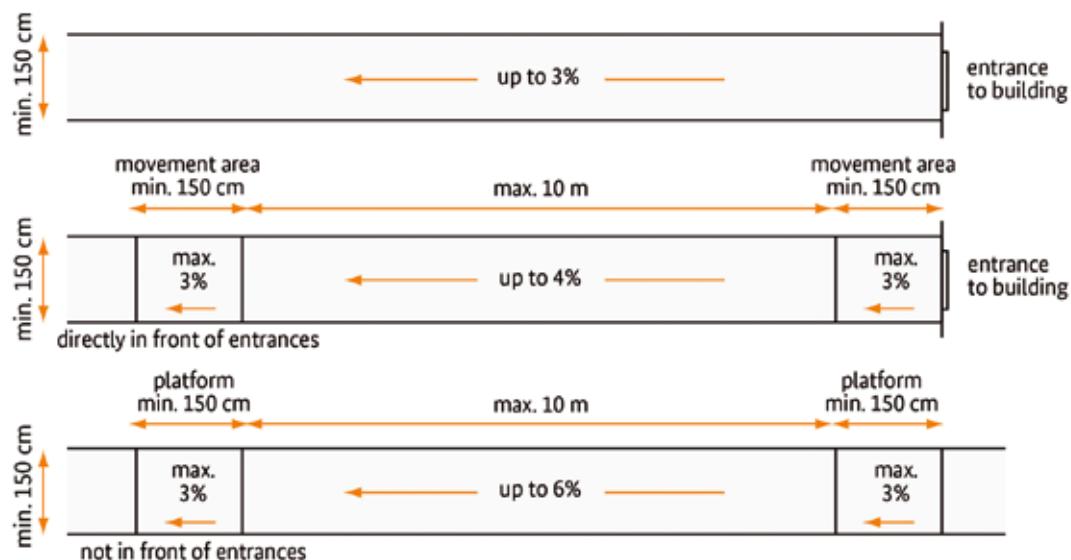
**The longfall may have a gradient of up to 6%, if, after a walking length of not more than 10 m, an intermediate platform is installed and the circulation areas are not located immediately at an entrance or access spot. The longfall of intermediate platforms must not exceed 3%. An even movement area 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).

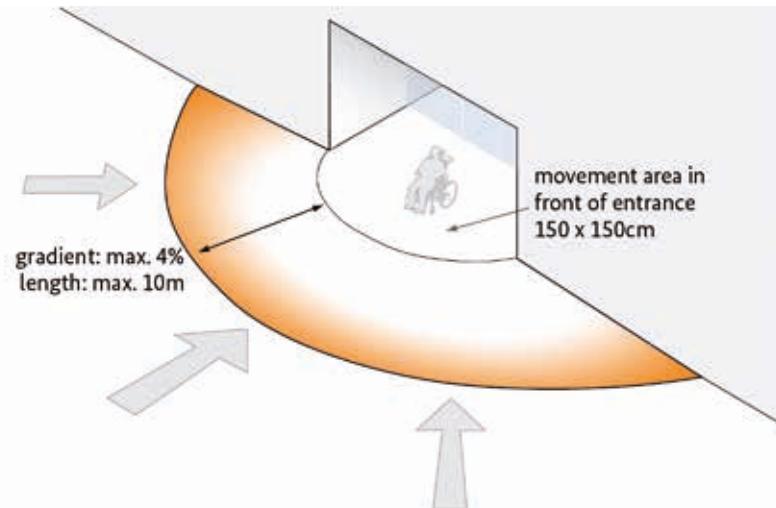
The draining of surface water on paths requires crossfalls in addition to longfalls. The crossfall should preferably be designed in a roof or concave design to prevent wheelchairs from drifting off the path. The crossfall gradient should not be greater than 2.5% (only 2% according to DIN 18024-1). The 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.



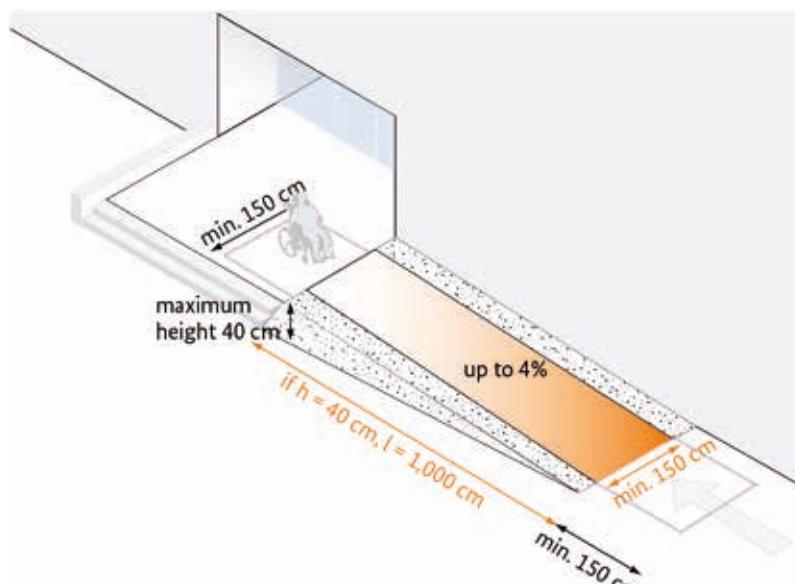
Examples of an accessible design for drainage and curved channels



Possible designs of inclined paths



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



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



### 3.3 Safety precautions against falling

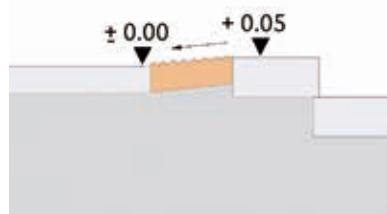
In contrast to ramps, inclined paths and circulation areas do not require raised kerbs (see » chapter 5 on interior and exterior ramps).

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.

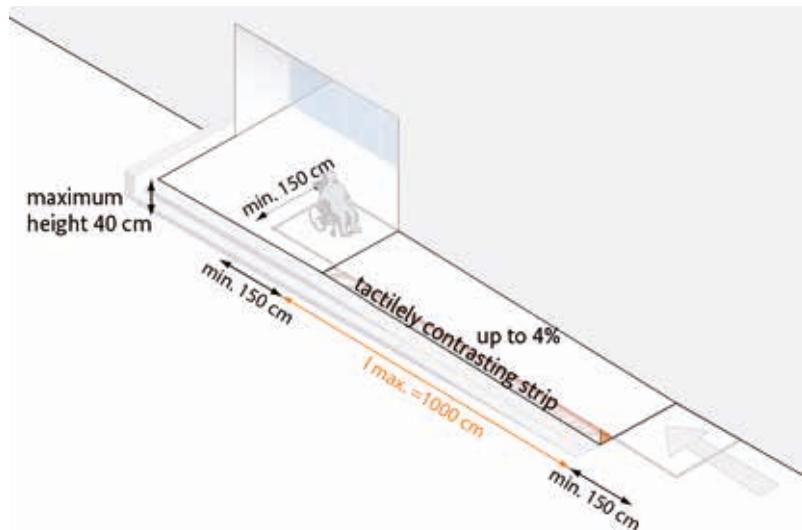
The lane's width depends on the location of the area and how frequented it is, but it should not be lower than a minimum of 150 cm (120 cm if the total length is 600 cm) (to be agreed upon in specific case).

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.

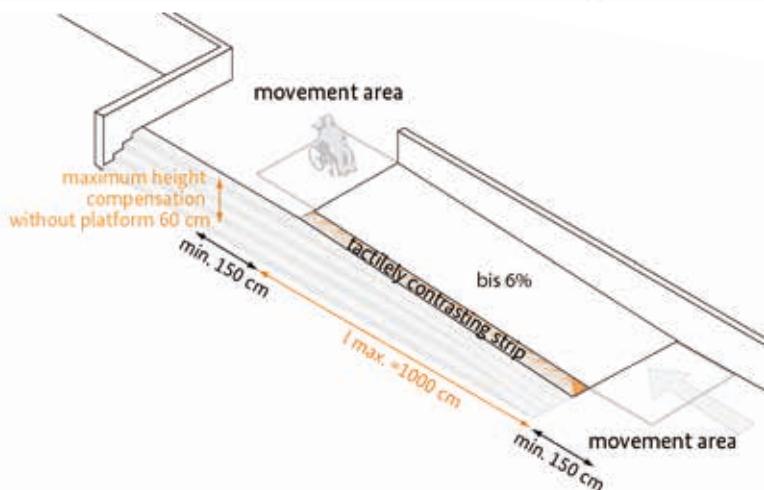
As an alternative, a kerb can be integrated as a safety precaution to prevent falls (see » chapter 5.3).



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  $\leq 4\%$  with safety measures according to the opposite-tilting principle



Wider inclined circulation areas in combination with stairs – gradient  $\leq 6\%$ , 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

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.



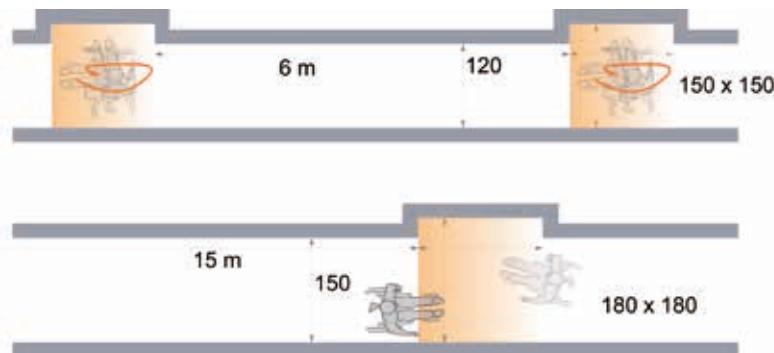
## 4.2 Basic geometry and space requirements

**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.**



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.

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



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 x 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**

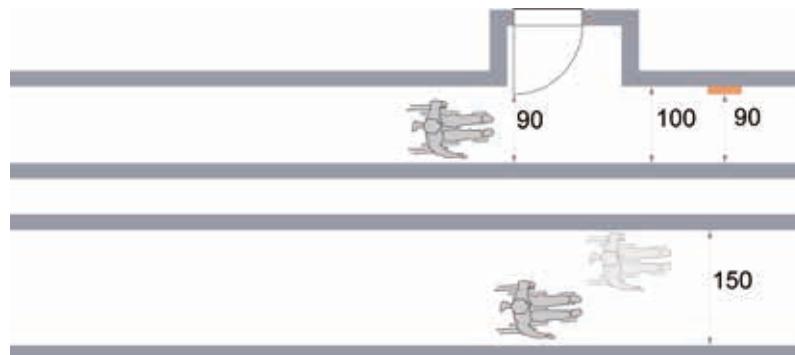
In workplaces, the width of the corridors necessary is defined on the basis of the number of people working there. The minimum clear width for staff members using walking aids or wheelchairs is 100 cm for escape routes, a partial narrowing to 90 cm is permissible at workplaces with:

- 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 (Mikolaiczky 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

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.

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



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.

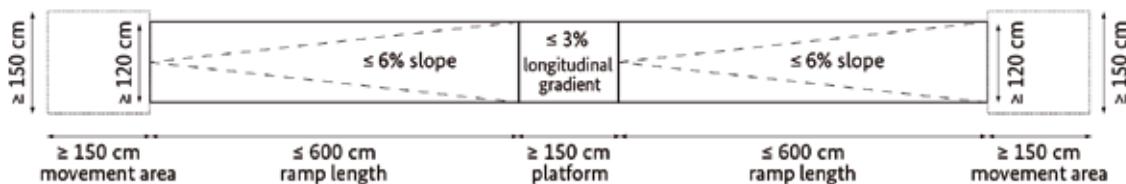
The longitudinal gradient of ramps must not exceed 6%. The ramp should not be longer than 600 cm. The maximum height that can be overcome by a ramp without a platform is 36 cm.

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

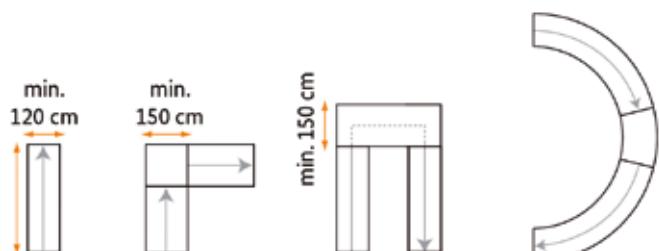
$\Delta h$	difference in elevation	Length of inclined surface: $l = \Delta h \text{ (m)} / g \text{ (%)}$
$g$	gradient	number of platforms of a length of 1.50 m: $n = (l / 6) - 1$
$l$	ramp length	(if necessary, rounded up)
$lg$	total length	total ramp length: $lg = l + (n \times 1.50 \text{ m}) + (2 \times 1.50 \text{ m})$
$n$	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).

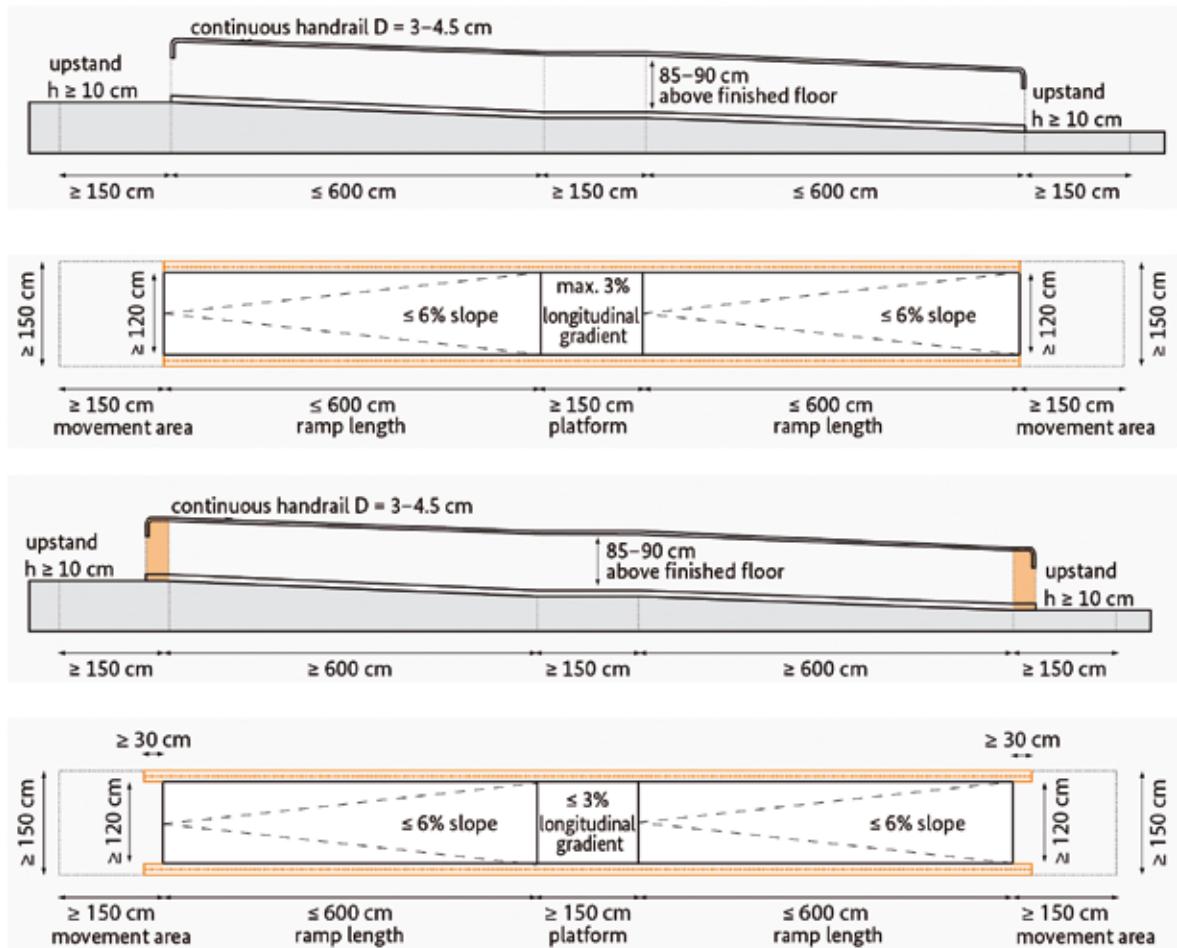
Design variations of ramps



## 5.3 Raised kerbs and handrails



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



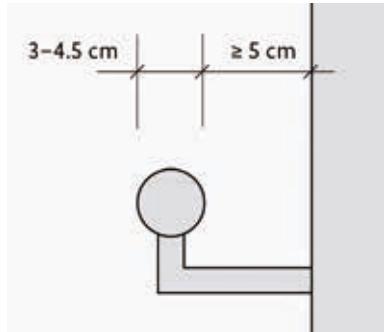
### Raised kerbs

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 18040-1 (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.**

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).

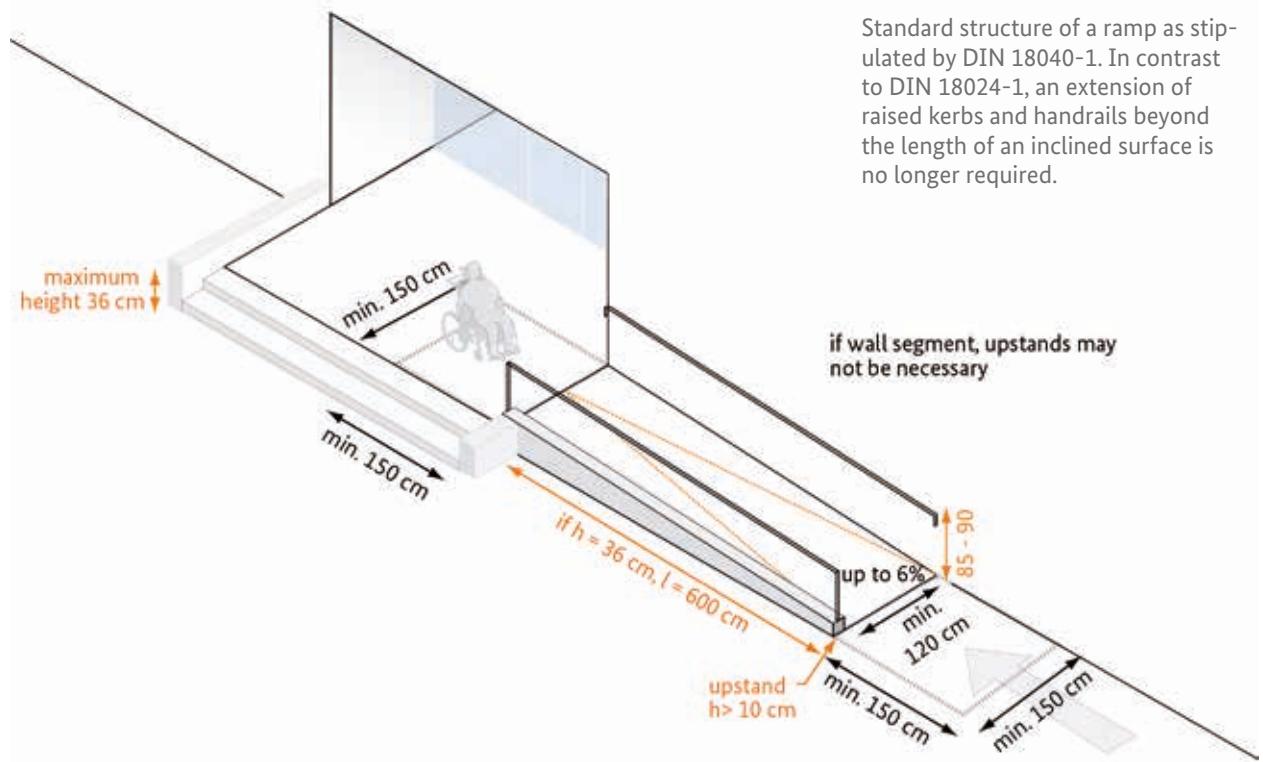
A clear space of a minimum of 5 cm should be envisaged between them and adjacent built structures or lateral walls. Handrails protruding into a room should have a rounded end piece.

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.



## 5.4 Orientation aids at ramps



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

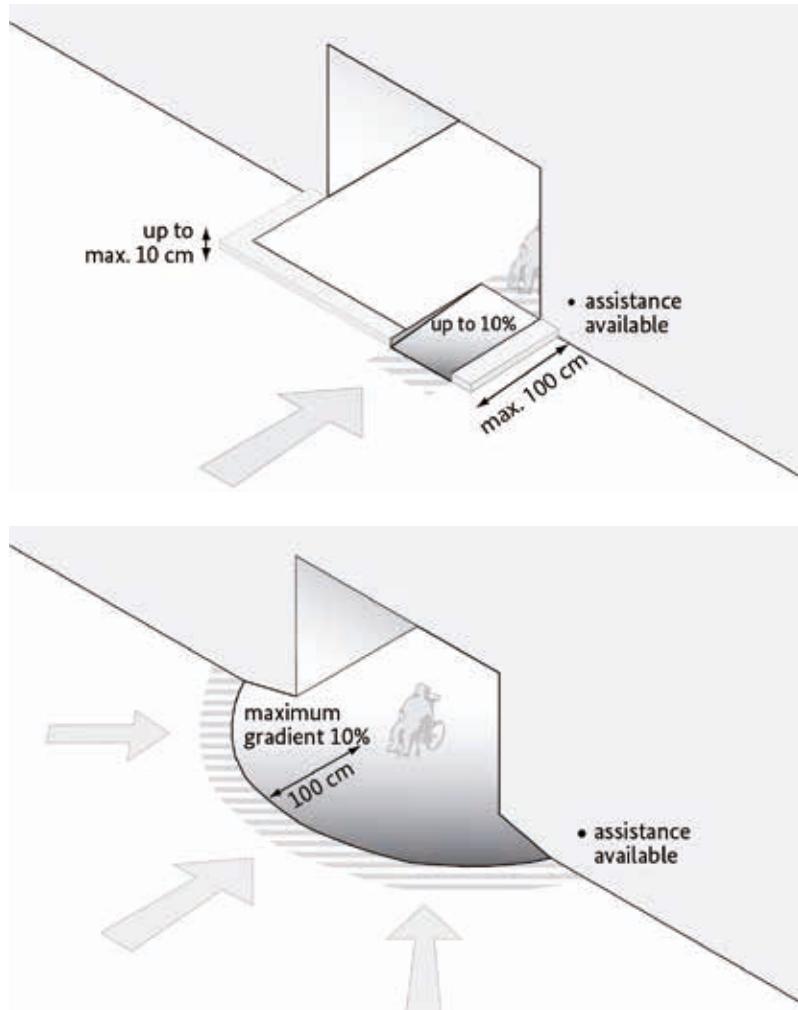
See » chapter 6.5 on handrails at stairs for further information on handrails.

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:  
 $2s + a = 59\text{--}65 \text{ cm}$  (=step size).

DIN 18065:2011-06, Chapter 6.1.2

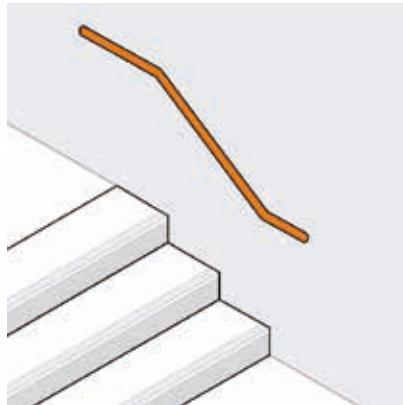
For stairways that are necessary, a landing needs to be envisaged after a maximum of 18 rises.

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

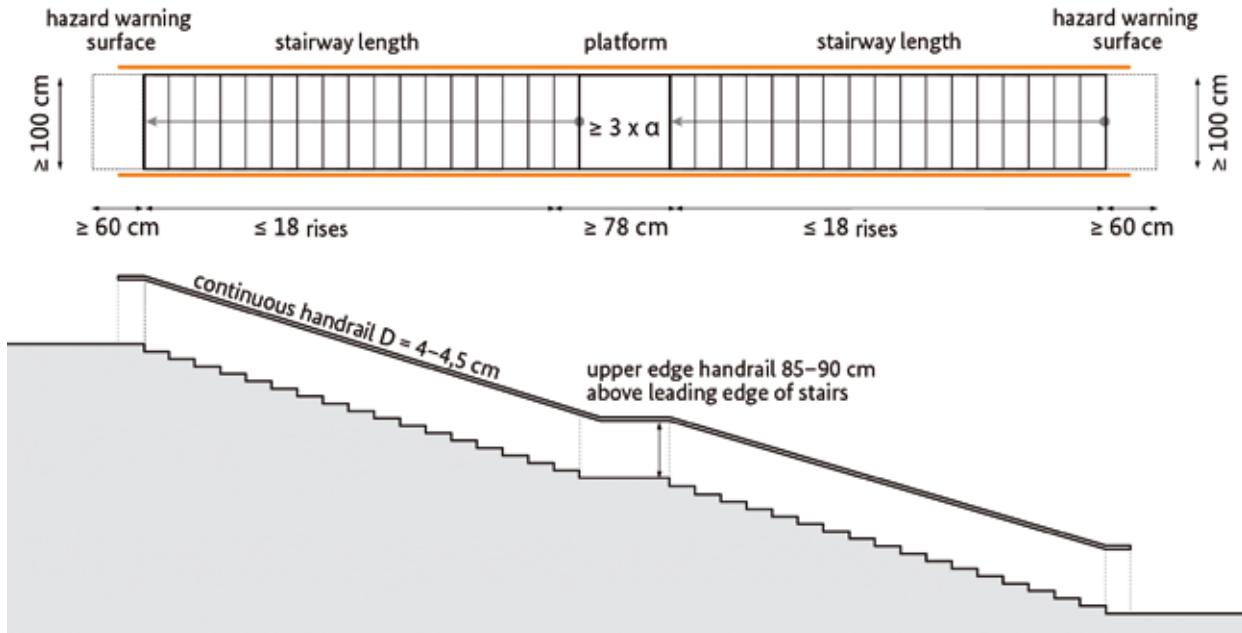
**A landing must provide space for 3 treads ( $3 \times a$ ) of the same length as the treads of the flight of stairs.**



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

The length of a landing is usually calculated in practice using the formula  $L = a + (n \times 63\text{--}65 \text{ cm})$  where ( $a$ ) stands for the tread actually selected and ( $n$ ) for the number of step lengths 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.



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

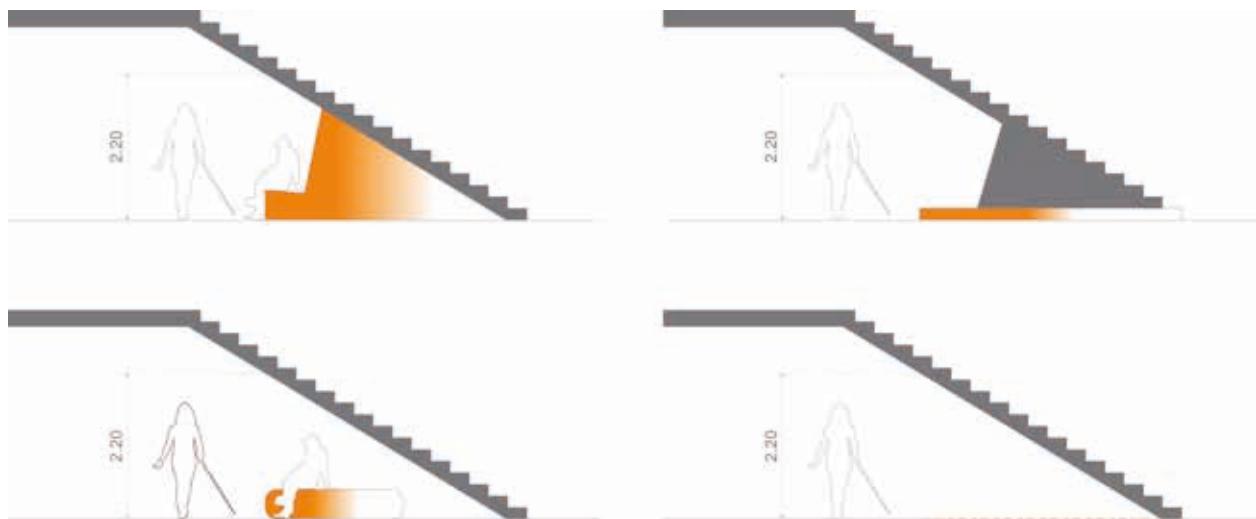
Measured from the leading edge of a step, the clear passage height of a stairway must be a minimum of 2.00 m. Moreover, there should be no possibility to walk under stairs.

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

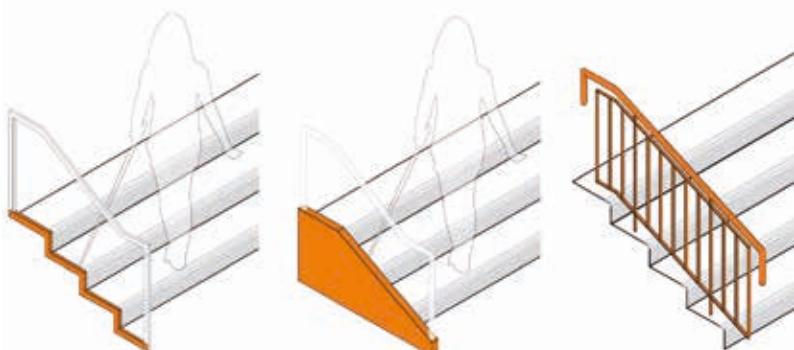


Possibilities to prevent people from walking beneath stairs. Visual and tactile markings (bottom right) alone do not suffice in publicly accessible areas.

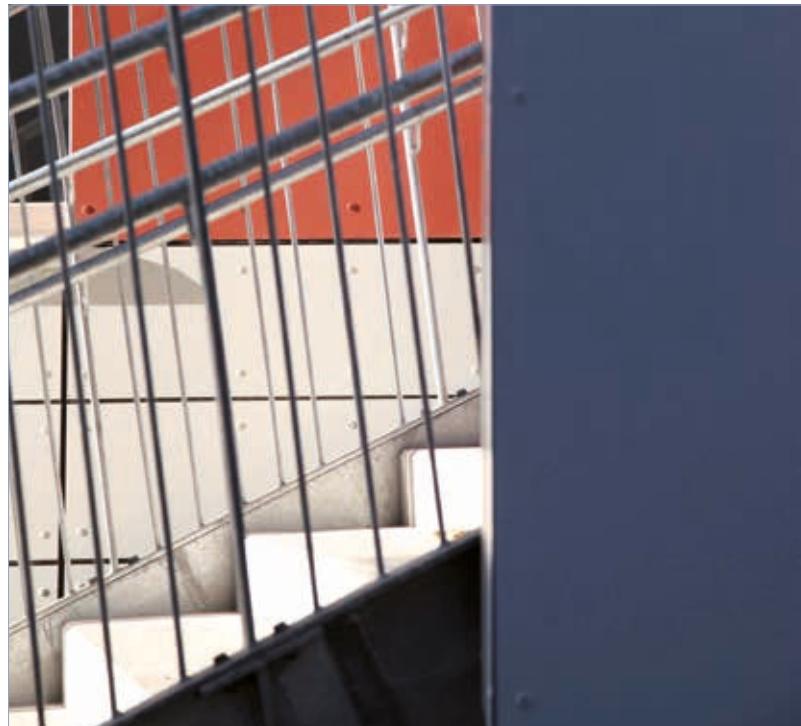
Kerbs, for example, may be used to prevent walking aids and canes from slipping at open ends of treads.

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)

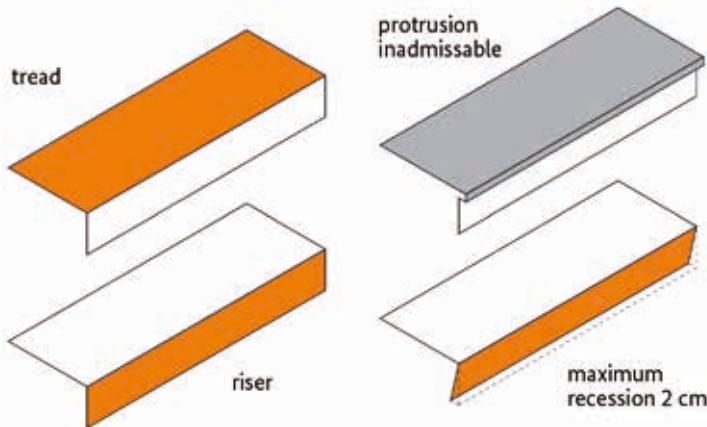


### 6.3 Steps



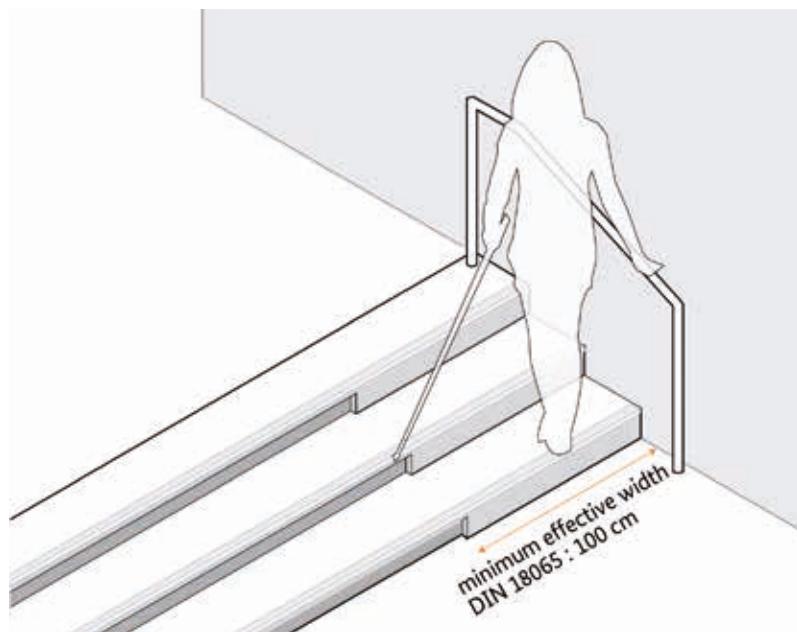
Necessary steps must consist of treads and risers, and treads may not protrude over risers.

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.

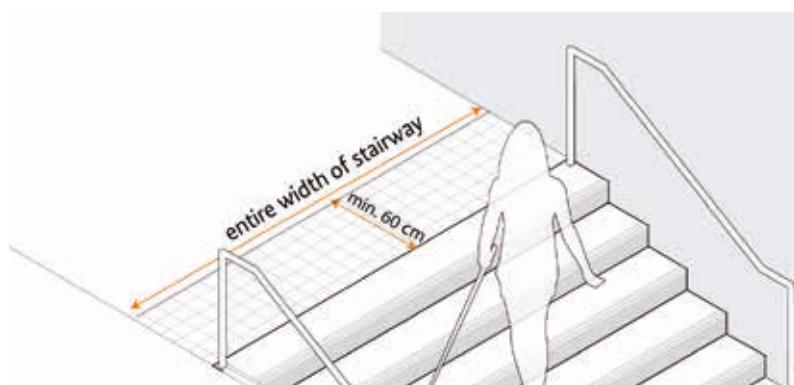
### Hazard warning surfaces

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 tactiley perceptible 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 gratings 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.

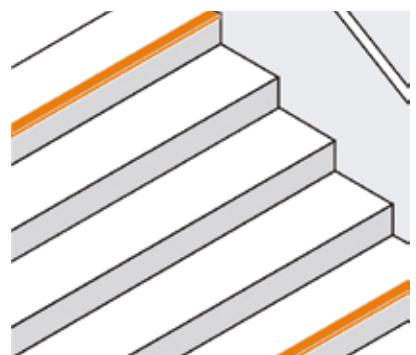
When walking upwards a standing person should always be able to see the marking on both the tread and the riser. If both markings begin at the leading edge, it may become hard to see where the edge of each step is. This is why, for example, in heritage buildings, the marking of risers may be dispensable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

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.

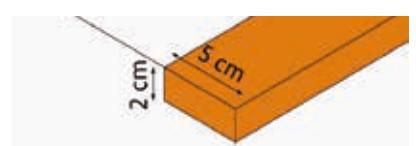
It is important to ensure a luminance contrast of at least 0.4 between the marking of the edges of steps and connecting floor materials (see » chapter 2.5 on visual perception, materials, and visual contrasts).



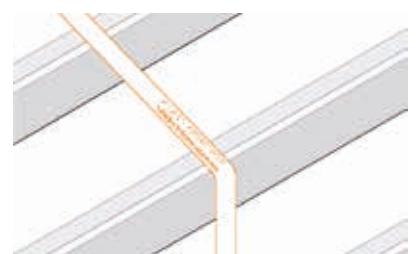
Example of marking steps as defined by DIN 18040-1



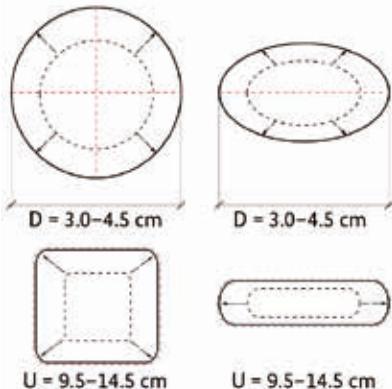
Marking on first and last step



Marking as an inlay



Tactile information on a handrail



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

**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).**

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

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

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.

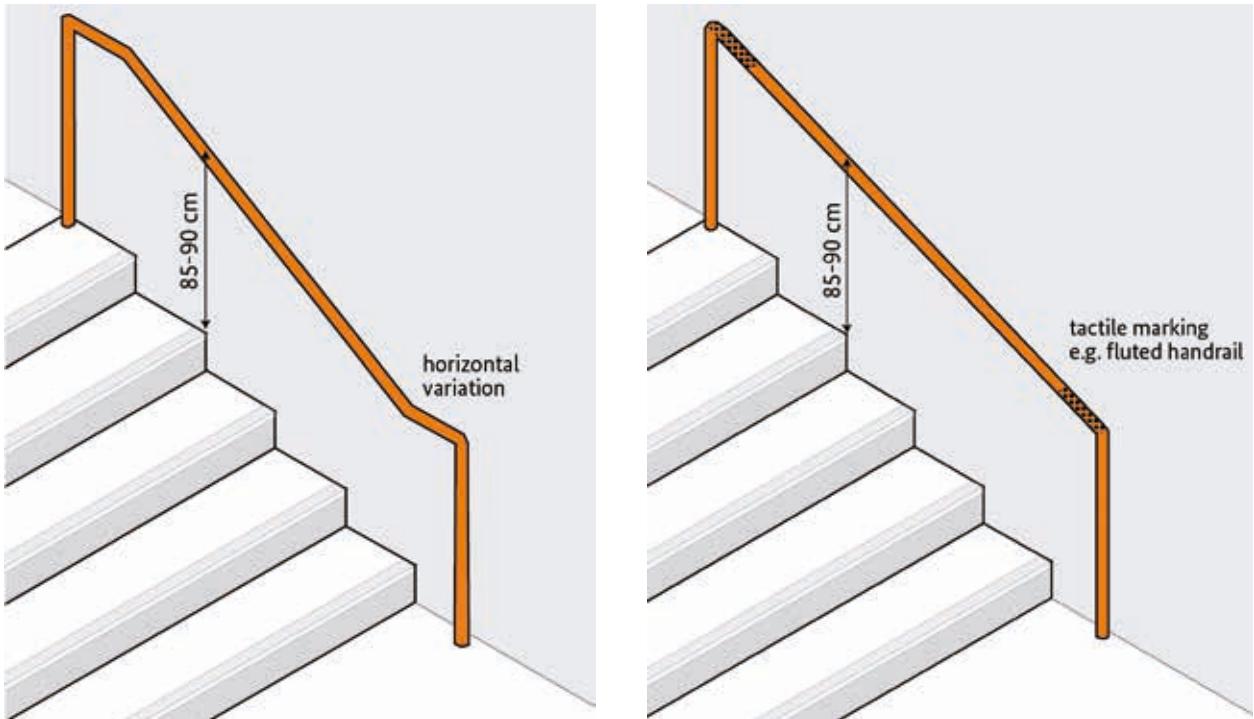
If stairs are wider than 500 cm, an additional middle handrail should be envisaged for necessary stairs.

**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.**

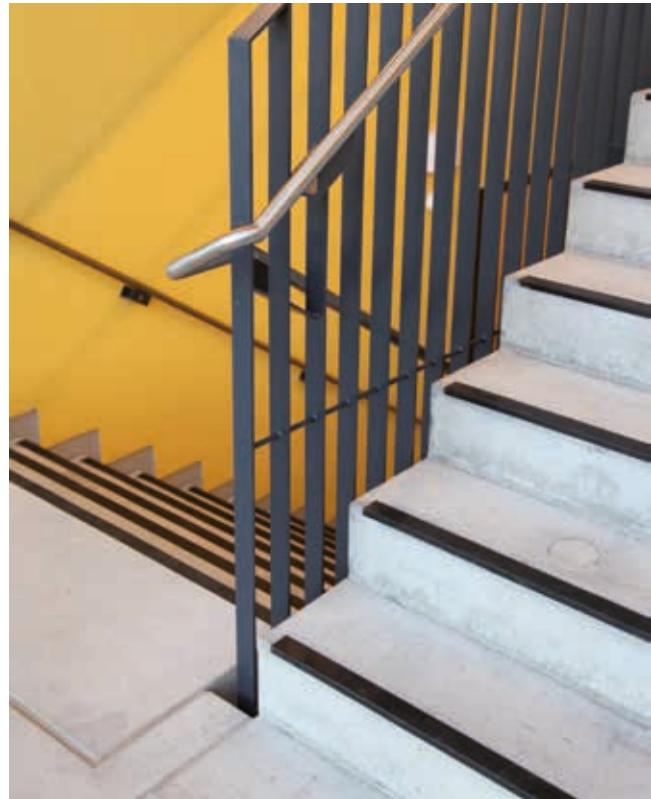
Regulations on safety precautions against falls can be found in Länder-specific building regulations and regulations of accident insurance companies.

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

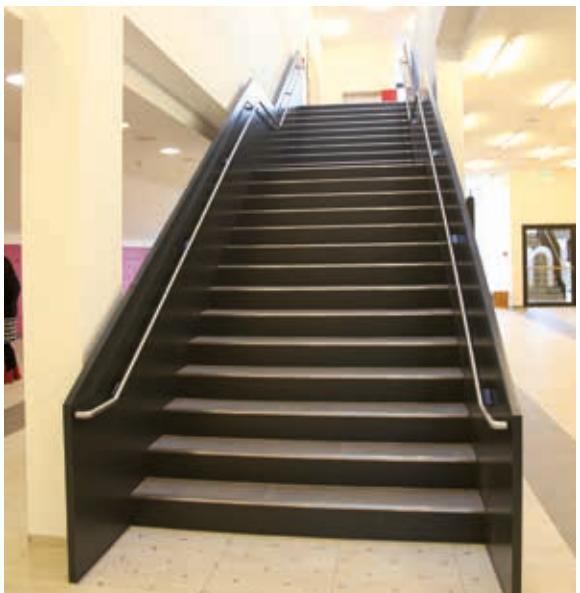
For more information on orientation aids on handrails see » chapter 6.4 on orientation aids on stairs and single steps



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



## 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.



DIN EN 81-70:2005-09

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

DIN EN 81-41:2011-09

## 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.**

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

Lift doors are at least 90 cm wide.

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

A movement area measuring  $150 \times 150$  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:

- 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.

DIN EN 81-70:2005-09

**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  $150 \times 150$  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  $50 \times 50$  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 tactiley 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



2



3



4



5

# Doors

**“Doors must be clearly perceptible, 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

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

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.

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.**

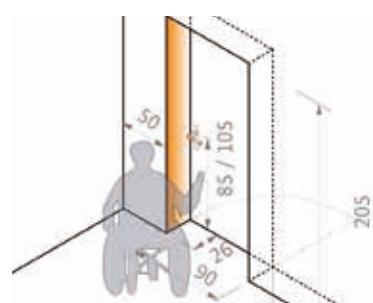
In vestibule areas, a sufficient movement area needs to be envisaged for turning around (150 x 150 cm), even for doors opening inwards. A coupling mechanism of door controls could also be an option.

**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).**



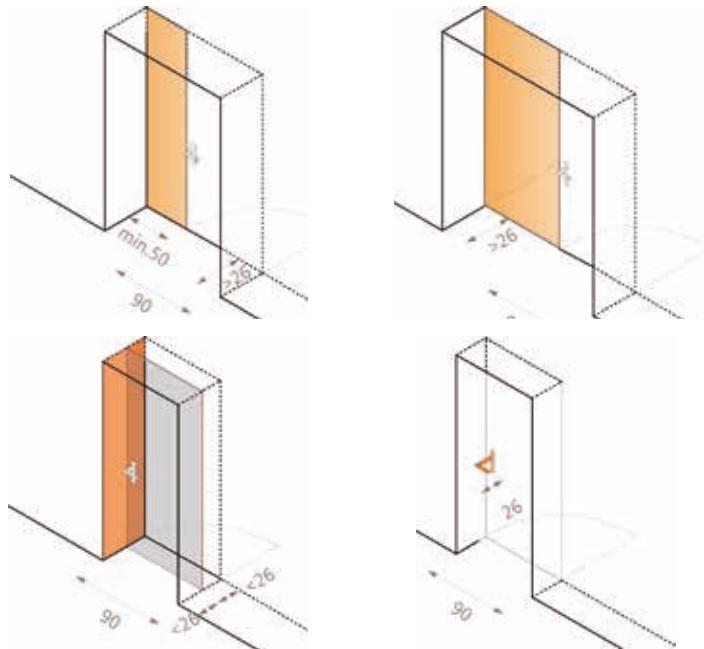
An international comparison revealed a passage width of 80 cm, but in this case the door leaves must exhibit an opening angle of 90° (BBR, 2009).

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



Door measurements

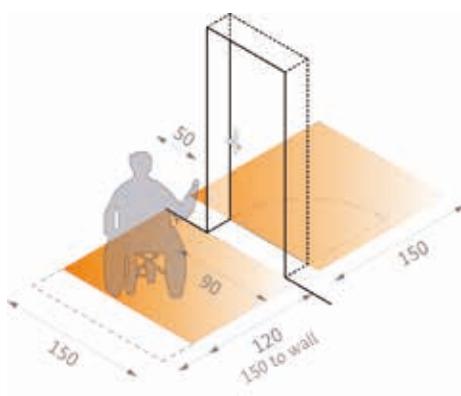
Compensation possibilities for low reveals: side leaf of a width of 50 cm and double-leaf door



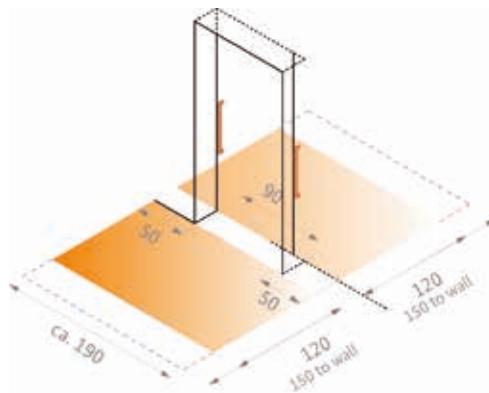
Compensation possibilities for low reveals: block frames and low door handles

### Movement areas – manually operated doors

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

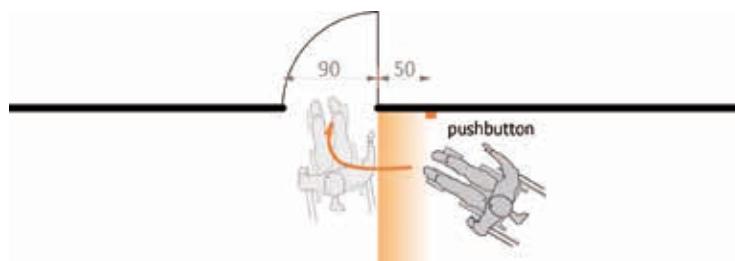


Movement area in front of a manually operated sliding door

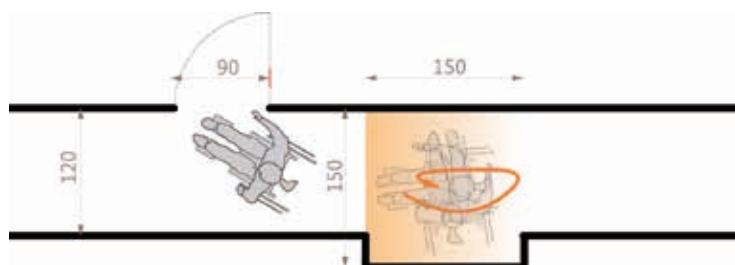


### Movement areas – automatic doors

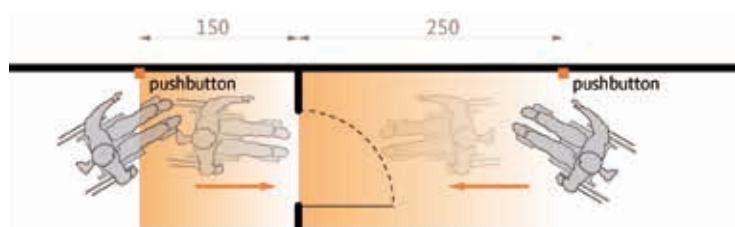
The movement areas (distance between button and vertical door edge) on the lock side of automatic door systems should be designed as follows:



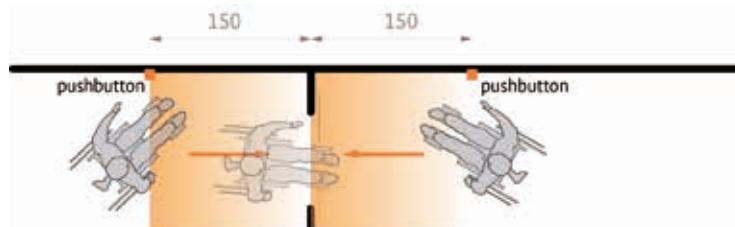
For hinged and pivoted doors and a lateral approach of 50 cm



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 perceptible 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.

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.

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.

#### **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.**

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.

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



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).

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

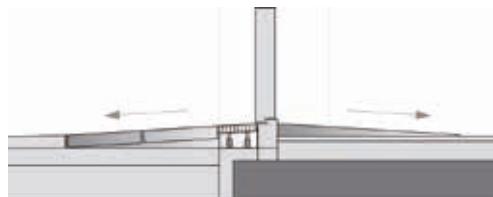
**DIN 18195:2011-12 Guidelines for Flat Roofs (*Flachdachrichtlinie, ZvDH*)**

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.

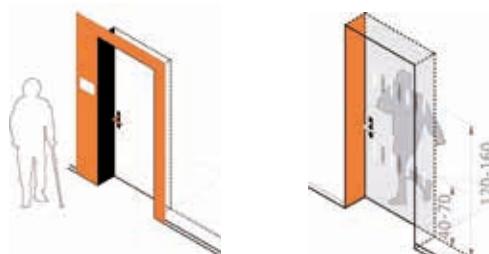


## 8.5 Location and detection

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 tactiley, 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



2

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



3

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)



4

# 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.



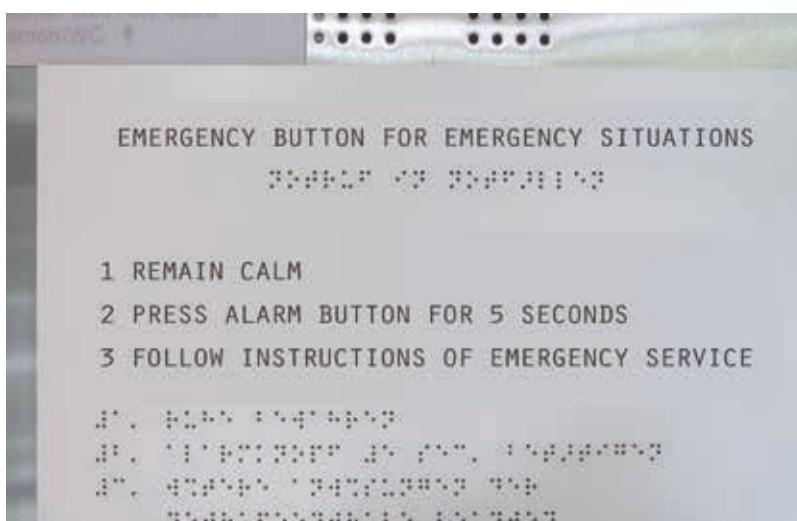
## 9.2 Specific measures

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 perceptible 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 work-places 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 wheel-chair 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

- |  |     |
|--|-----|
| 10. Service counters, cash registers, controls, assistance centres,<br>waiting halls . . . . . | 135 |
| 11. Interior and exterior furniture and fixtures. . . . .                                      | 139 |
| 12. Operational elements and communications systems . . . . .                                  | 143 |
| 13. Windows and glass surfaces . . . . .   | 145 |

## BEWEGUNG MOTION

Viele Bewegungen vollziehen sich unwillkürlich; die einen im Körperinneren verborgen wie Herzschlag und Darmperistaltik, andere äußerlich sichtbar wie der Lidschlag oder die Atembewegung des Brustkorbs. Die willentliche Bewegung von Muskulatur und Skelett dient vor allem der Fortbewegung und den alltäglichen Verrichtungen. Bewegung fördert die Gesundheit, sie lässt sich analysieren und optimieren. Bewegung beeinflusst unsere Wahrnehmung des Raums, in Gestalt von Gestik und Mimik ist sie Teil der Persönlichkeit und der Kommunikation mit anderen Menschen.

Many movements take place involuntarily. Some of them, such as the heartbeat and intestinal peristalsis, are concealed within the body. Others, such as blinking and the respiratory motion of the chest, are externally visible. The voluntary motion of muscles and the skeleton primarily serves the purpose of locomotion and everyday tasks. Movement is conducive to health and can be analyzed and optimized. Movement influences our perception of space. In the form of gestures and facial expressions, it is part of personality and of communication with other people.



# 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

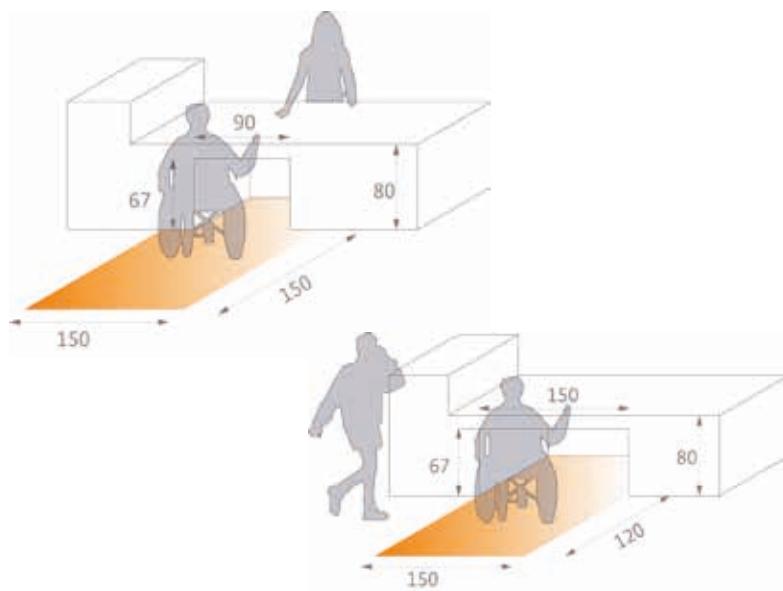
## 10.1 Need and structure

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

The movement areas in front of a counter, cash desk, service centre, or controls should usually measure  $150 \times 150$  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  $150 \times 150$  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

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

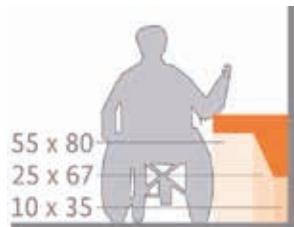
When designing security control gates (screening installations) a review is necessary as to whether it makes sense for wheelchair users and other people with restricted mobility to use them. Suitable solutions need to be developed and, where appropriate, organisational measures offered.

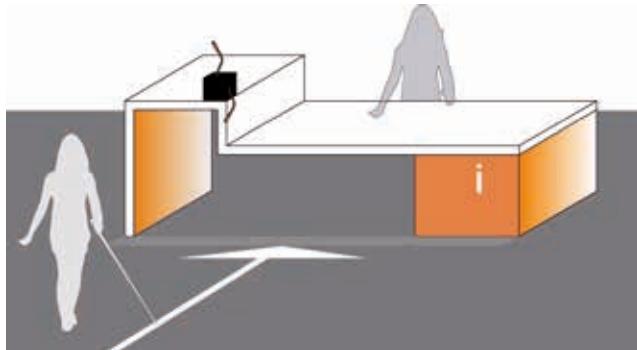
At counters, customers as well as staff should have the possibility to stand or to sit.

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





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.



#### **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.

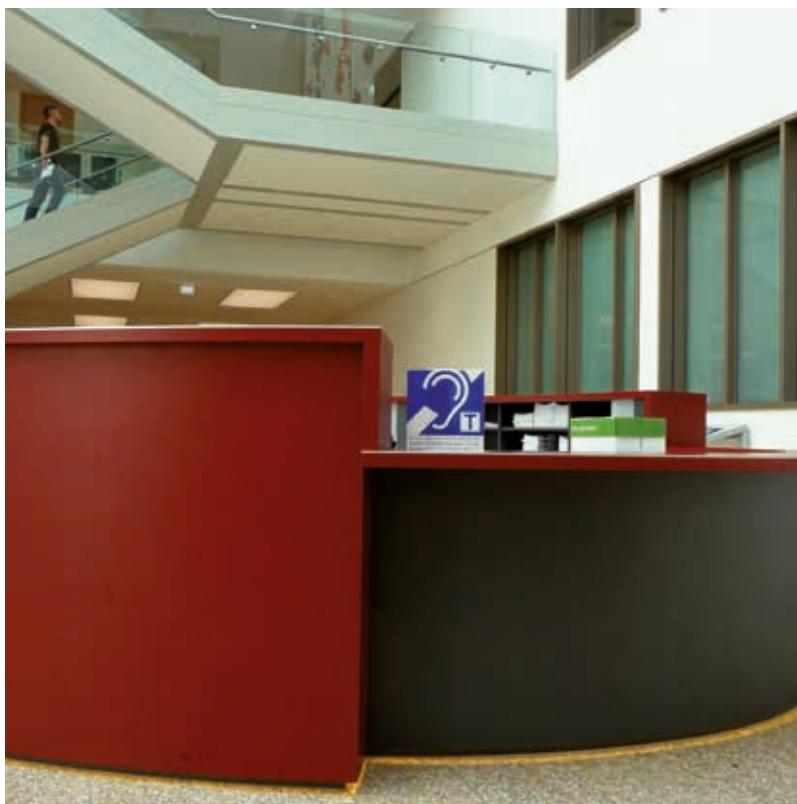
If needed, mobile induction loop systems can be used.

#### **10.4 Location and detection**

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



- 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.



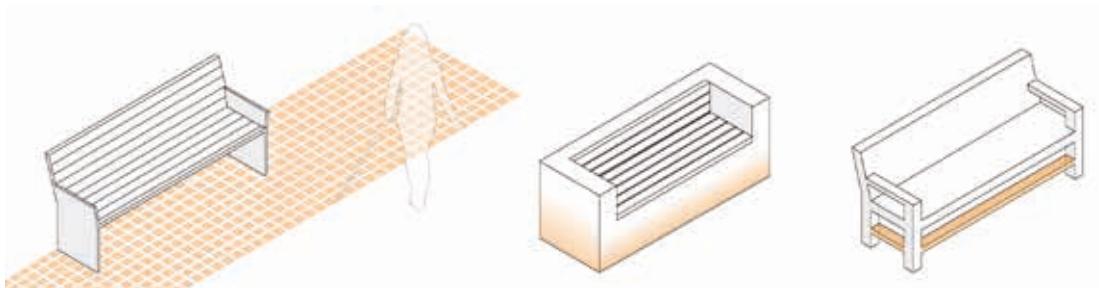
### 11.3 Perceiving and detecting

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.

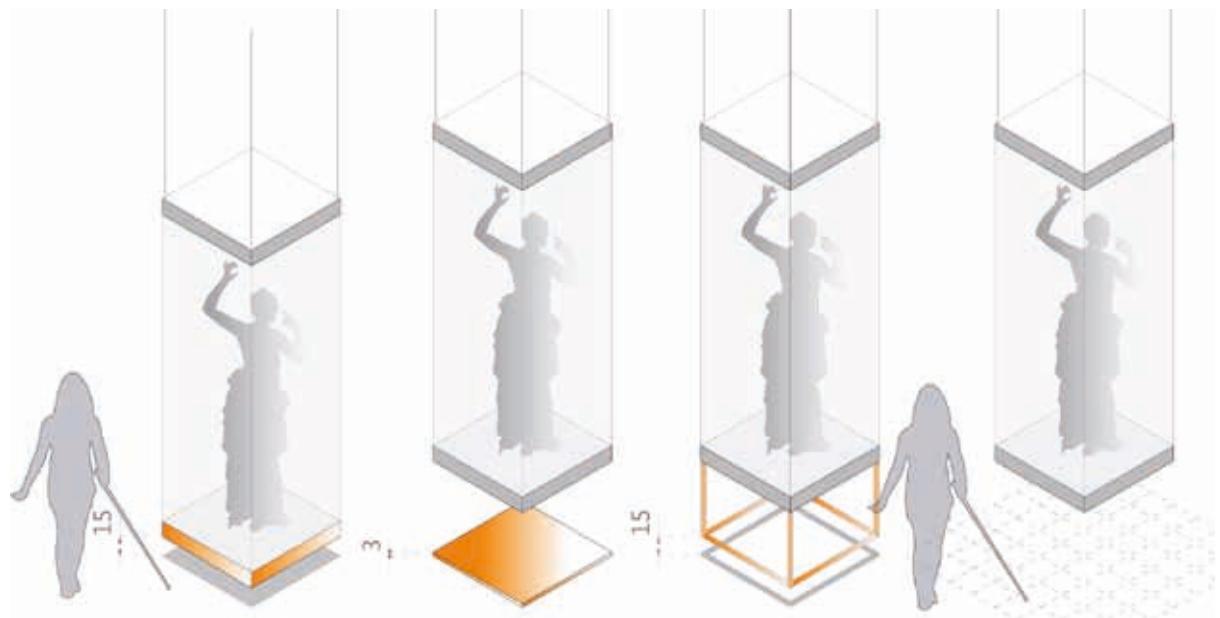
Marking a fully-covered area by a contrasting design in combination with a change of surface that is clearly tactilely perceivable may be substituted, for instance, for bases or baseboards beneath benches and suspended public litter bins.

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



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).

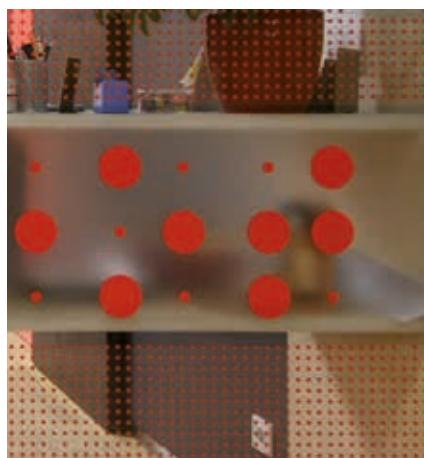


1

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 Schönbrunnsgasse Graz (Architekt DI Martin Strobl, photo by Pavel Lupač)

3 Bench with space for leaving walking frames – Retirement Home Borken (brandenfels Landschaftsarchitektur, 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  $150 \times 50$  cm or  $150 \times 120$  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.

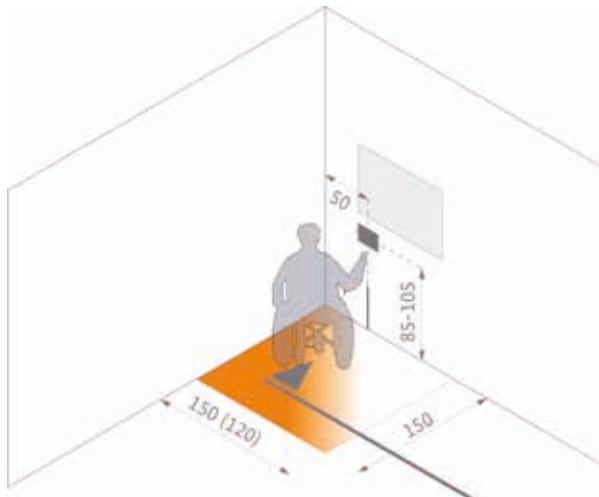
Spot lighting can be used for additional support.

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 auditory 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.

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.



DIN 18040-2:2011-09

DIN EN 13115

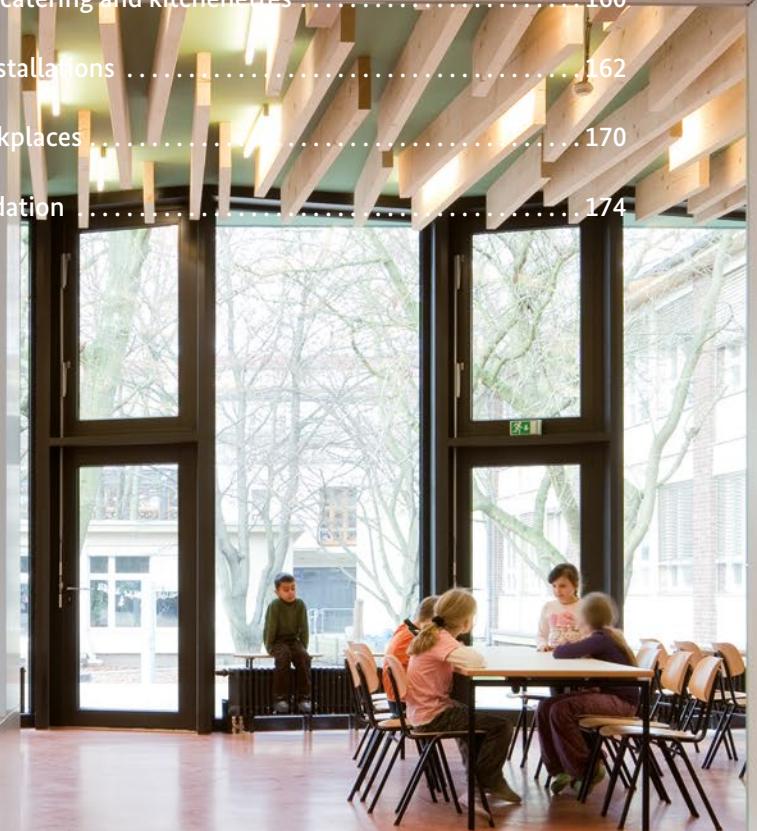
## 13.4 Detection

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



# Rooms

14. Exterior spaces .....	147
15. Entrance and lobby .....	149
16. Wheelchair parking and cloakrooms .....	151
17. Event halls .....	152
18. Museums and exhibitions .....	157
19. Rooms for catering and kitchenettes .....	160
20. Sanitary installations .....	162
21. Office workplaces .....	170
22. Accommodation .....	174



# 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 tactiley 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



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



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



**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

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.

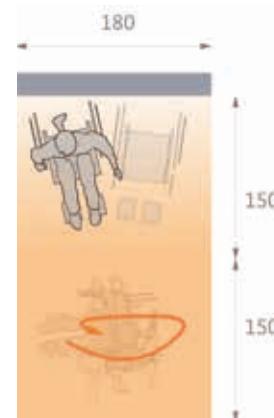


## 16.2 Geometry

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.

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.



Space requirement for switching wheelchairs

## 16.3 Usability, usage

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.”



## 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

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.

**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 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



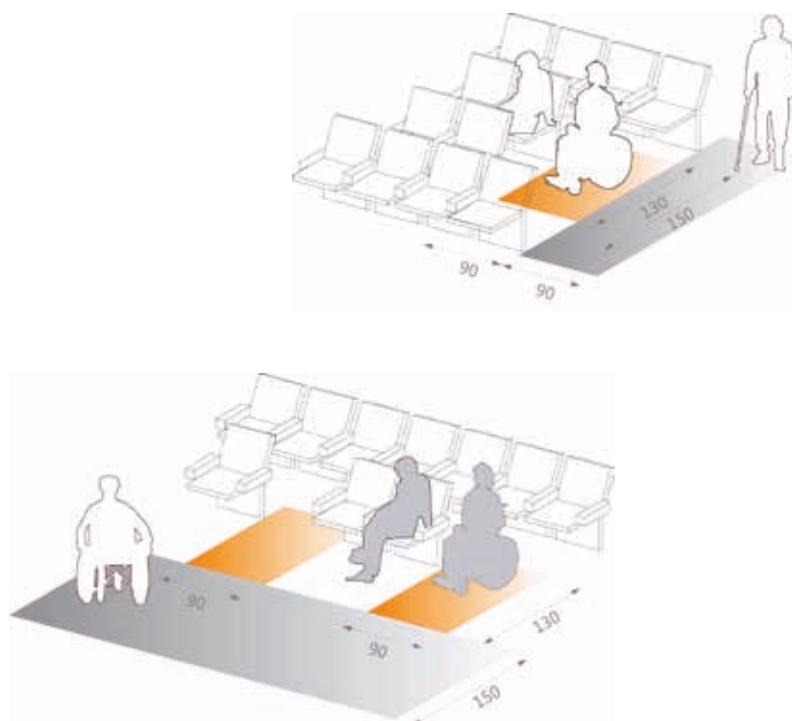
## 17.2 Basic geometry and space requirements

**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

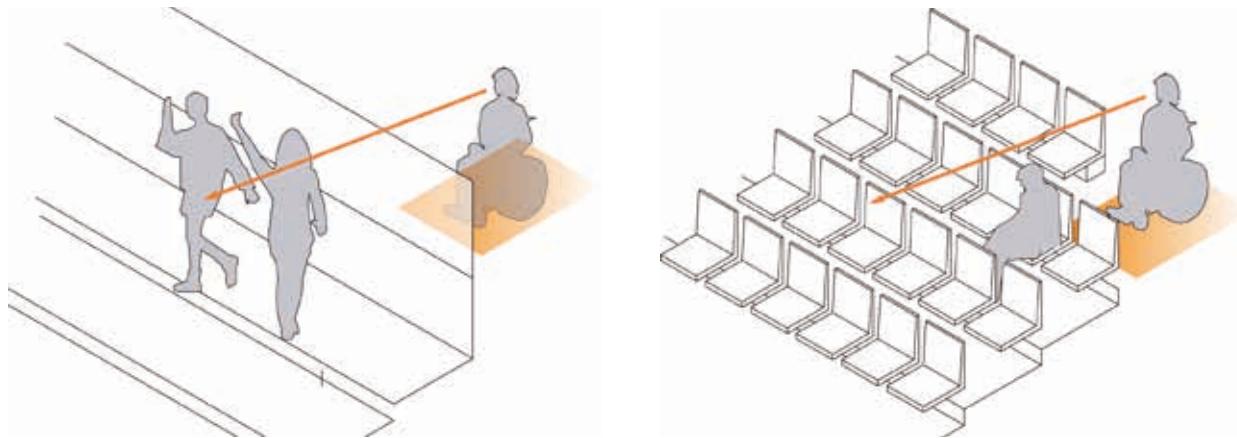
Spaces for wheelchair users in large event halls should be offered at varying price ranges.

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.



DIN 18041:2004-05

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.

### 17.3 Information and communication aids

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  $250 \text{ m}^3$  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.

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



2

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)



3

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



4

# 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 accessible 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.

## 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.



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/](http://www.lmb.museum/de/)  
 For information in German, follow this path: Startseite → Fach-und-Arbeitsgruppen → AG Barrierefreiheit in Ausstellungen



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.



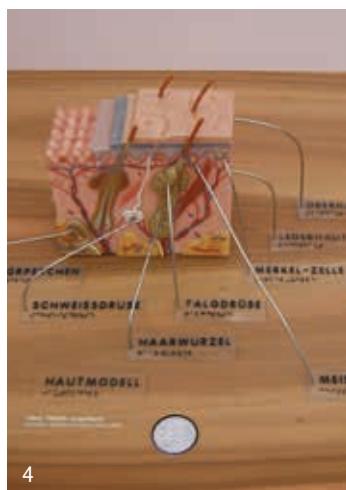
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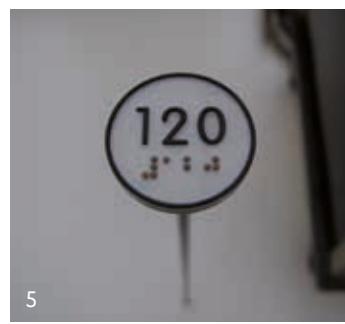
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3



4



5



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  $150 \times 150$  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  $150 \times 150$  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  $90 \times 55$  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.”



## 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

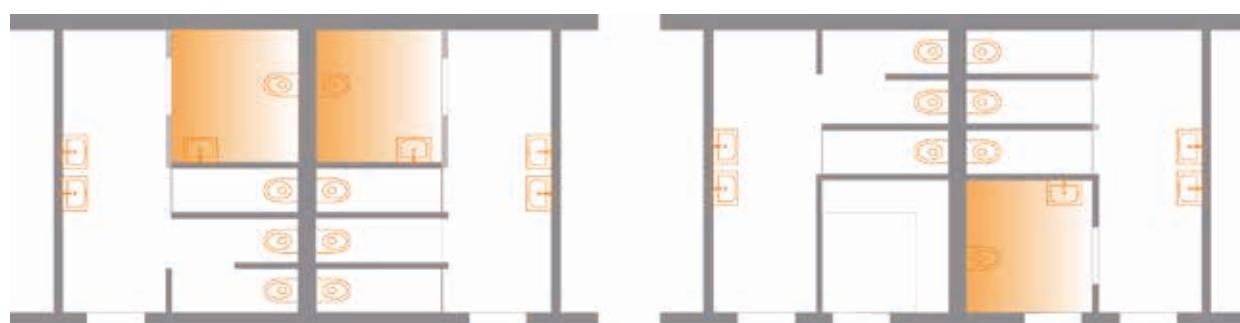
VDI 6000 Part 3 recommends the following number of necessary toilets:

- 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.**

## 20.2 Basic geometry and space requirements

**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.**

Sliding doors may be possible as an alternative.

**Movement areas of at least  $150 \times 150$  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).

ArbStättVO  
VDI 6000 Blatt 2



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

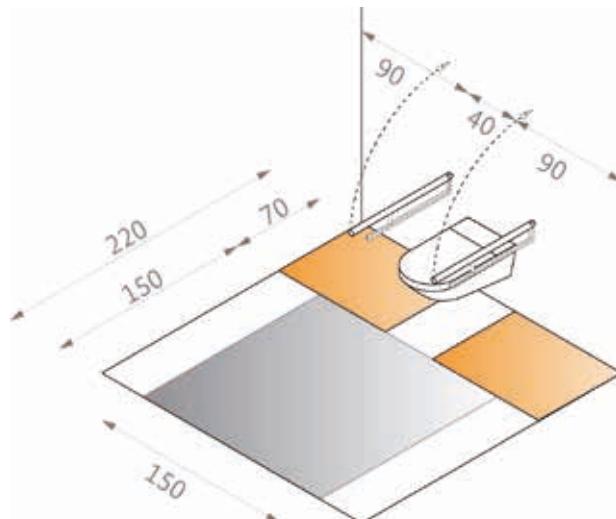


Space requirements for toilets with washstand or washbasin

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.

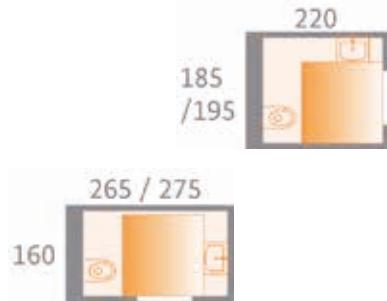
Geometric specifications for toilets



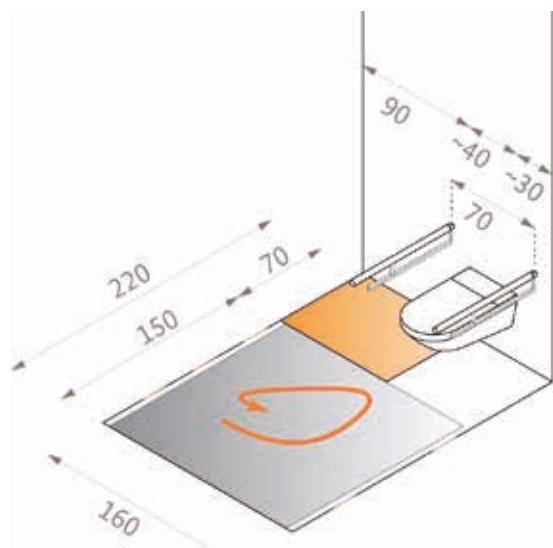
Approachability from both sides can be compensated for as follows:

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

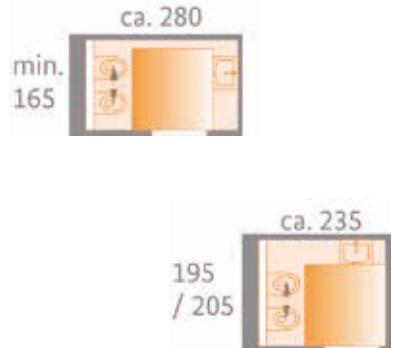
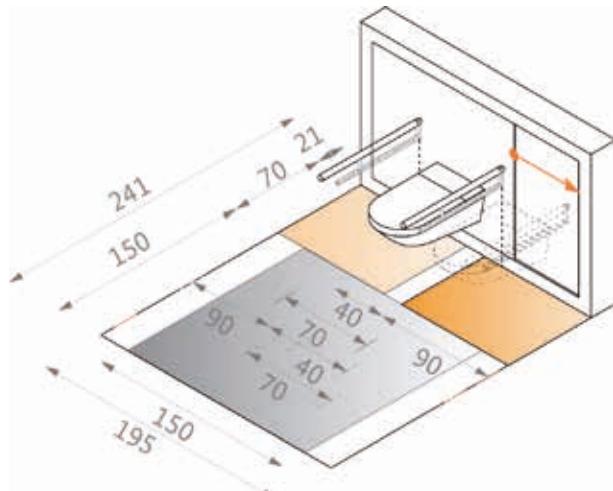
The toilets should be marked correspondingly.



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



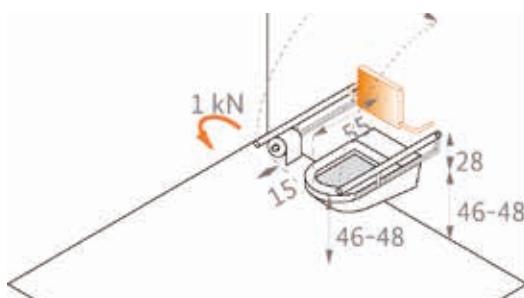
- technically, by means of movable, electronically driven toilet facility



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

### 20.3 Toilets

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.



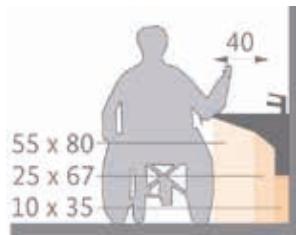
## 20.5 Washstands

**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



**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

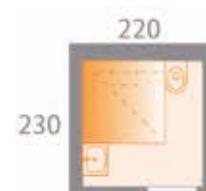
**Operational elements such as shower fittings and showerheads are to be installed at a height of 85 cm. If mounted on top of each other, they can be positioned at heights up to 105 cm.**

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.**

**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.**



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



## 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 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 analogously in an accessible design, subject to specific requirements.

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

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.

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.

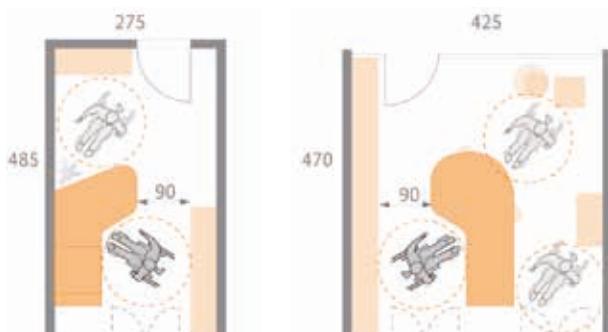
Accessible design refers not only to the workplace itself but includes additional rooms and facilities the employees use, such as:

- 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

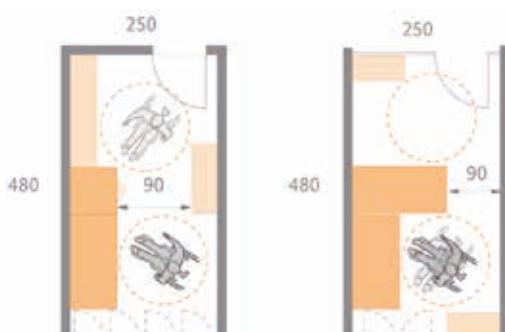


According to the upper limits for business rooms in federal authorities as outlined in Sample 13 RBBau Guidelines, the space requirement for workplaces for employees needing mobility aids or using wheelchairs may be 10 to 12% greater than for conventional workplaces. It is important to note, however, 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 adhere to standard axis values of about 1.30/1.35 m, and if appropriate furniture is provided, a space of 12 m<sup>2</sup> 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



## Need and structure

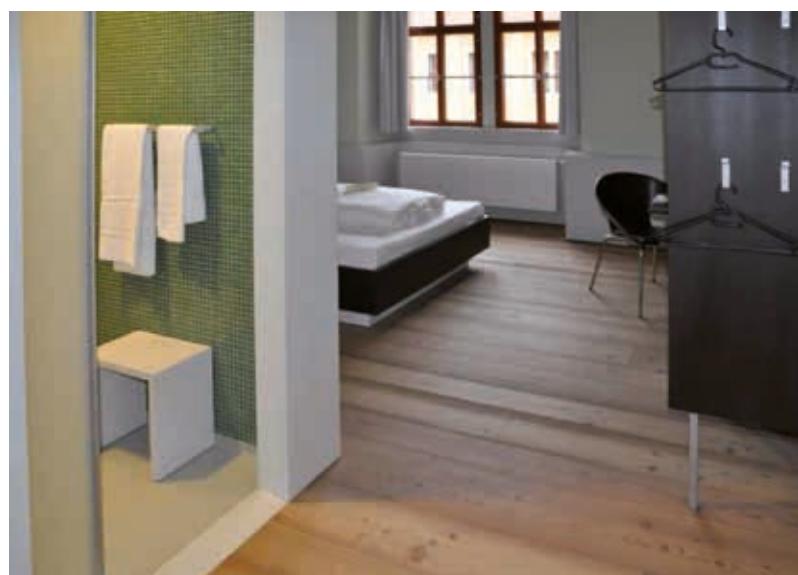
Before planning begins, it is necessary to define for which users accessible accommodation is to be built and how many rooms are necessary. The criteria for accessible design of guest rooms should be based on the impairments of the intended users. Offering generally accessible guest rooms has not proved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

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.

During requirements planning the number of accessible rooms needs to be defined for wheelchair users (space requirement:  $150 \times 150$  cm), for people using mobility aids such as walking frames (space requirement:  $120 \times 120$  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.



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.

Beds can be placed along the wall.



DIN 18040-2:2011-09

## 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.





## Part D – Reference project

Introduction to Part D.....	178
Requirements planning .....	180
ES-Bau ACCESSIBILITY CONCEPT .....	182
EW -Bau ACCESSIBILITY PROOF.....	192

## Introduction to Part D

The example of a fictitious project is used to illustrate how the Guideline Accessibility in Building Design can be applied in the different procedural phases of the RBBau Guidelines.

The starting point is the construction of a visitors centre for a federal foundation as an idealised and typical Federal Government building project. The building project is located in a topographically uneven plot in the city centre and its space allocation plan envisages public areas and workplaces as well as utilising the exterior surroundings. It thus affects a number of the areas of action outlined in Part C of the Guideline, and comprehensively illustrates the requirements for accessibility in building design.

In accordance with Part B of the Guideline, reference excerpts of the CONCEPT and PROOF to confirm ACCESSIBILITY will be presented as text and graphically describing the procedural steps of requirements planning, ES-Bau, and EW-Bau. The samples given in Part B of the Guideline will be used to structure textual explanations and are plotted to scale as a basis for the legends of the graphical illustrations.

The reference project described below provides orientation for developing an ACCESSIBILITY CONCEPT to qualify for ES-Bau at a level of detail that corresponds to a completed pre-draft planning process (LP 2 on the HOAI scale).

The ACCESSIBILITY CONCEPT is developed on the basis of the planning status established for the individual planning task. The level of detail needs to be adapted to the scope of services agreed upon. Should, for example, only part of the services necessary for a pre-draft be commissioned, the level of presentation detail may be reduced accordingly.

The reference project described below provides orientation for compiling an ACCESSIBILITY PROOF in the context of preparing EW-Bau at the level of detail that corresponds to the preparation of planning application documents extended to include parts of the detailed planning phase (EW-Bau, LP 4, and in some cases LP 5 on the HOAI scale).

The ACCESSIBILITY PROOF is compiled on the basis of the planning status established for the individual planning task. The level of detail needs to be adapted to the services agreed upon.



Visualisation of reference project

# Requirements planning

## Building plot, topography

Because of the public impact intended with the building's function, a building plot in the city of Z should be chosen that is close to its centre and makes the building easy to find. It is important to ensure that at least access routes to the main entrance and the planned catering area can be barrier-free.

## Exterior access routes

Accessible connections need to be ensured for public transport and private transport options.

One accessible parking space should be available each for publicly accessible areas and workplaces.

## Publicly accessible area

The entire publicly accessible area needs to be designed barrier-free.

### Access routes

Horizontal as well as vertical access needs to be designed accessibly. Particular emphasis should be placed on the needs of precautionary fire protection (widths of rescue routes).

### Space requirements

Festlegung von Räumen mit besonderen Anforderungen an die barrierefreie Gestaltung:

- **Lobby, information counter ( $35 \text{ m}^2$ )**, no additional space needed  
The lobby and the information counter need to be designed accessibly. The aim is to position the information counter where visual contact to the main entrance, vertical access routes, and the entrance to the multi-purpose hall and the library can be ensured. Sitting areas need to be integrated. The lobby needs to have an accessible reception counter equipped with a mobile audio induction loop system and a tactile plan.
- **Multi-purpose hall ( $110 \text{ m}^2$ )**, no additional space needed  
Room acoustics comply with the requirements of DIN 18041 concerning voice communication over medium distances. At least one quarter of the potential audience space needs to be equipped with an audio induction loop system or comparable technology. An illumination intensity of 1000 lux must be possible. Stages need to be easy to reach accessibly.
- **Cloakroom ( $15 \text{ m}^2$ )**, no additional space needed  
The cloakroom must be fit for accessible use.
- **Library ( $100 \text{ m}^2$ )**, no additional space needed  
The outline of the library should enable the use of daylight as much as possible. Illumination intensity of 1000 lux must be possible. Room acoustics comply with the requirements of DIN 18041 concerning voice communication over short distances.

- **Reading garden (150 m<sup>2</sup>)**, no additional space needed

A nearby, accessible reading garden is to be added to the library.

- **Sanitary rooms (5.1 m<sup>2</sup>)**, 70% additional space needed

In public areas, one accessible toilet, approachable from both sides for wheelchair users and including a washbasin, is to be envisaged in accordance with the Ordinance on Places of Assembly (*Versammlungsstättenverordnung*) and VDI 6000 Part 3 (up to 300 visitor seats). This sanitary room needs to be installed at a central location within the building, preferably close to the multi-purpose hall. All quality requirements are obligatory. The requirements with regard to emergency alarms for visitors with auditory impairments need to be taken into account.

- **Guest apartment (45 m<sup>2</sup>)**, 29% additional space needed

The guest apartment is to be designed accessibly and fit for wheelchair use.

- **Catering and restaurant area (55 m<sup>2</sup>)**, no additional space needed

needs to be accessible. Specific measures for people with sensory impairments need to be taken into account.

- **Accessible terrace (50 m<sup>2</sup>)**, no additional space needed

can be used for small receptions with direct access from the library or restaurant area.

A total of 3.4% additional space is required for the building's interior; no additional space is needed for its exterior.

## Workplaces

On the basis of Integration Agreement XX, there needs to be a 15% share of people with disabilities the staff working at the foundation. The catering area is not expected to have employees with special requirements for the built environment.

All workplaces at the foundation need to have an accessible design to enable recruitment flexibility. The additional space needed for usable floor areas (*Nutzfläche*, NF) (\*) needs to be based on the function of each room. The additional space needed for gross floor areas (*Bruttogrundfläche*, BGF) amounts to 5.8%. Additional adaptations can be implemented by deploying suitable furnishings and fittings in individual cases.

- **single room, management (19.80 m<sup>2</sup>)** \* 10%
- **single room, secretariat (18 m<sup>2</sup>)** \* 20%
- **office for four to five employees (40 m<sup>2</sup>)** \* 11%
- **archive (20 m<sup>2</sup>)**, no additional space needed
- **meeting room (10 m<sup>2</sup>)**, no additional space needed
- **storage room (6 m<sup>2</sup>)**, no additional space needed
- **kitchenette (15 m<sup>2</sup>)**, \* 10%

Horizontal and vertical access routes need to be designed accessibly. Special importance is to be attached to issues of precautionary fire protection. Traffic areas are to be designed as communication zones to the extent possible. The width of circulation areas may not fall below 1.50 m.

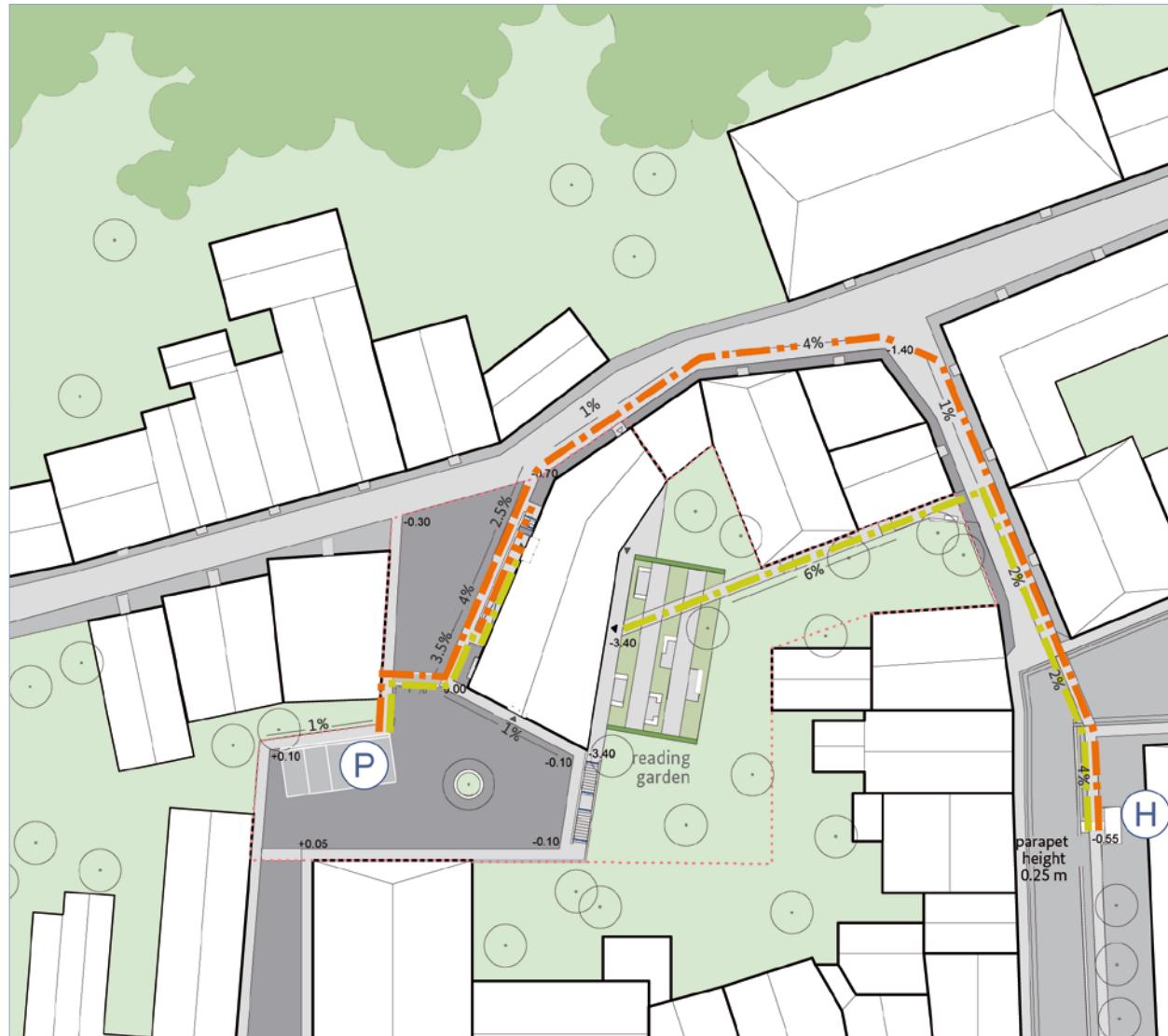
### Sanitary rooms (9 m<sup>2</sup>)

70% additional space needed  
According to VDI 6000 Part 2, an accessible sanitary installation including a toilet approachable from both sides for wheelchair users and a washbasin are to be envisaged for areas designated for workplaces. To enable retrofitting, this room needs to be planned to provide sufficient space for a stretcher bed. Moreover, the possibility to retrofit a shower to be reachable from the toilet seat needs to be reviewed. The spaces for the shower and the stretcher bed may overlap. Integration Agreement XX does not specify requirements for kitchen personnel rooms.

# ES-Bau ACCESSIBILITY CONCEPT

Layout plan, ACCESSIBILITY CONCEPT, scale 1:750

 accessible parking spaces	 accessible public transport stop or station
 shared routing visitors	 shared routing staff
 separate routing visitors with impairments	 separate routing staff with impairments
 separate routing visitors without impairments	 separate routing staff without impairments



## Overall concept

### Integration into the urban environment

#### » Chapters 1.1, 1.2, 1.3, 1.4, and 1.5

The foundation is located in the centre of Z on the edge of its pedestrian zone. The entrance to the foundation will be positioned to be clearly visible from the pedestrian zone as a place of welcome.

There is an accessible bus stop at a distance of 130 m. As the public street environment is also designed accessibly, from there people with motor and sensory impairments can reach the library without impediments. Moreover, the accessible design of a path leading through the garden to the basement of the building offers the foundation staff a short and comfortable walk from the bus stop to their place of work.

Private transport connections are ensured from the south through Z Lane, which, according to the local development plan, allows access to residents and for deliveries. Accordingly, two accessible parking spaces are available in the courtyard as envisaged in requirements planning. The topography at the outset is characterised by uneven terrain and these topographic starting conditions have been used to provide an even-ground entry into the garden from the basement floor, and to slightly raise the ground floor. As a result, the main entrance can be reached via an accessible stairs-ramp combination.

### Orientation and guidance systems

#### » Chapters 2.1, 2.2, 2.3

The centre of city Z already has a consistent orientation and guidance system in place, taking into account the needs of people with sensory and cognitive impairments.

It has been planned that the foundation's courtyard will be open to the public, and this is why

its design is based on the public orientation and guidance system. The existing orientation and guidance system follows a clear zoning approach and separates zones for movement/access from those for furnishings and fittings and installations.

This zoning principle is picked up again in the newly built "city courtyard" by walkways establishing links to the main entrance, the café, and the accessible parking spaces. In analogy to the existing materials, a visually contrasting design is envisaged to differentiate between walkways and common areas. This enables a clear delineation of areas that need to be kept clear of temporary furniture for outdoor cafeteria dining.

Shared routing is also continued in the building's interior spaces. A clear layout structure significantly facilitates intuitive orientation. The components of vertical access (stairs, lift) are positioned next to each other. The starting and destination points are the same on every floor. The colours and materials used and appropriate illumination are additional factors supporting orientation, thus making it possible to dispense with a separate guidance system for people with visual impairments. A tactile floor plan of the building including information on escape routes is integrated into the structure of the information counter.

Visitors are guided from the main entrance, which is located on the ground floor of the square, to the information counter and from here to vertical access points and to the multi-purpose hall. The guidance system for the garden floor includes the route from the vertical access to the library. Visitors to the café can also use the café entrance. The employees of the foundation may enter the building through the main entrance on the square or through the garden.

Floor plan, garden floor, ACCESSIBILITY CONCEPT, scale 1:200



## Exterior spaces

### Walkways and exterior circulation areas

#### » Chapters 3.1 and 3.2

The concept for access is simple and easy to follow and leads directly to the entrances. As a matter of principle, shared routing is offered to all users of the building. Additionally, there is the option to access the building through the garden where there is a separate, staff-only entrance that is also designed accessibly.

The width of the walkways in the courtyard is 1.20 cm and has been chosen as a comfortable width for pedestrians as well as for users of wheelchairs and walking frames. There is a sufficient amount of space wide enough for them to pass each other. In the garden, a width of 1.50 m to 2.00 m has been provided on the main path and all side paths and terraces. This ensures comfortable manoeuvring space for wheelchair users. Because of the topography of the building plot, path gradients can consistently be kept below 3% or in some stretches below 4% in the “city courtyard”. The main entrance requires a ramp as described below.

The main garden path providing alternative routing from the bus stop can be designed as an inclined walkway with gradients of up to 6% (including, for instance, resting platforms every 10 m). This is justifiable, as this path is not the primary access route to the main entrance.

### Exterior ramps

#### » Chapters 5.1 and 5.2

A straight ramp length at a width of 1.50 m is envisaged for barrier-free access to the main entrance. It compensates for a difference in elevation of 24 cm. A minimum distance of 3 m is maintained to the stairs opposite the ramp leading downwards.

## Exterior stairs

### » Chapters 6.1 and 6.2

An accessible stairway is envisaged opposite the ramp. The elevation of the “city courtyard” is 3.30 m higher than the garden. This difference is compensated with an accessibly designed stairway. Additional ramp access has not been considered because of the great difference in elevation. During opening hours, the lift inside the building may also be used.

## Exterior fixtures

### » Chapter 11.1

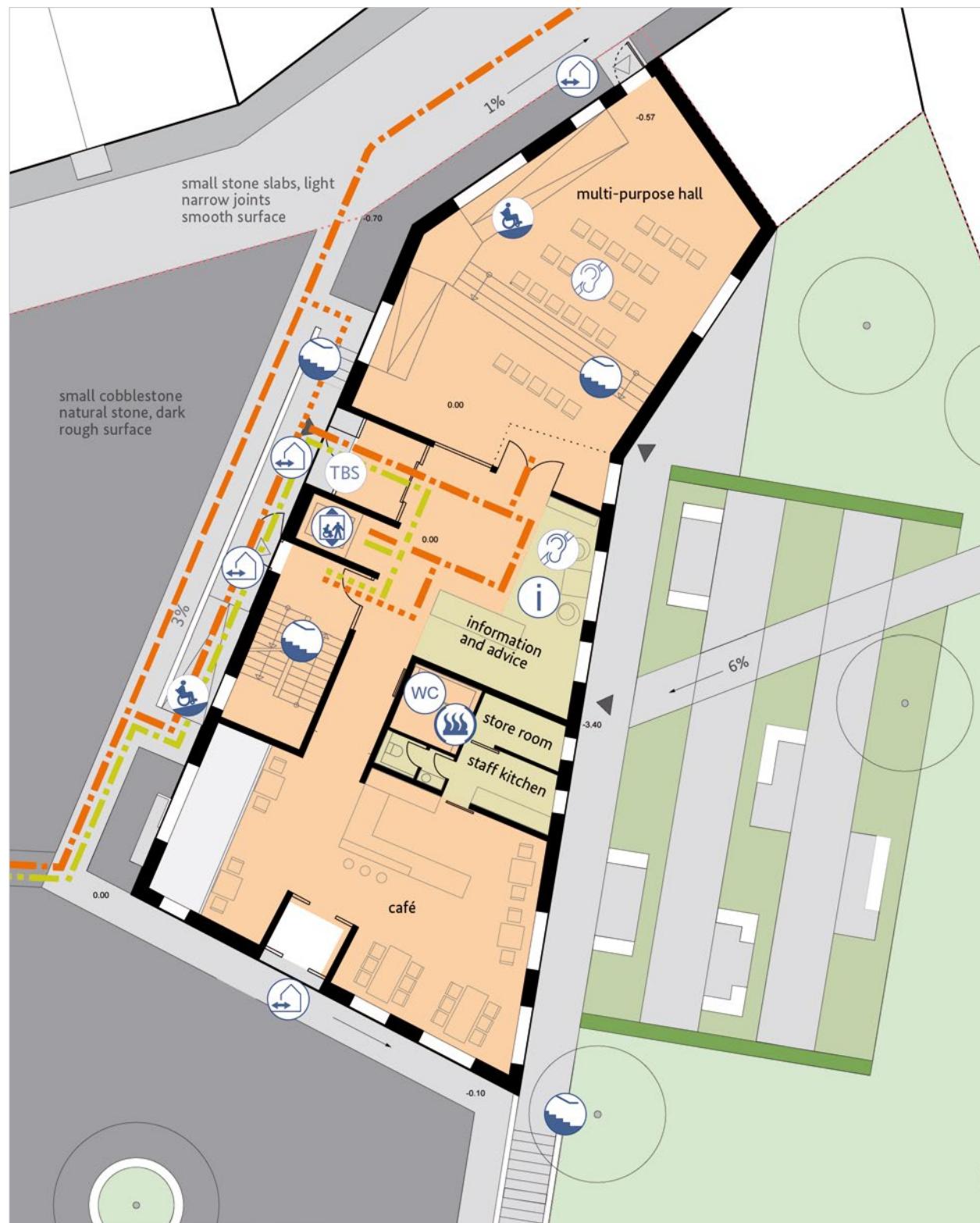
Illumination is envisaged for the exterior space, especially the publicly accessible courtyard. Accessible seating is provided in the exterior space in both the courtyard and the garden.

## Special-purpose exterior spaces

### » Chapters 15.1 and 15.2

An accessible reading garden is to be added to the library as stipulated by requirements planning. This garden is positioned directly in front of the library located on the basement floor. The geometric outline of the garden consists of cut hedges where sitting niches have been integrated in some places. According to the planning concept, these sitting areas will be designed so as to be comfortably usable for wheelchair users as well. The basic geometry takes into account necessary manoeuvring and movement areas.

Floor plan, ground floor, ACCESSIBILITY CONCEPT, scale: 1:200



## Interior spaces

The access route concept is simple and readily understandable. The idea of shared routing is implemented in the building's interior by giving the elements of vertical access (stairs, lift) identical starting and destination points on every floor. Horizontal circulation areas have a generous design and overlap with resting and communication areas.

### Corridors and interior circulation areas

#### » Chapters 4.1 and 4.2

Horizontal circulation areas are adequately sized. The main traffic routes have a width of at least 1.80 m. Usable clear heights of 2.20 m are not reduced by any fixtures.

### Interior ramps

#### » Chapters 5.1 and 5.2

The multi-purpose hall has been designed to comprise two levels as an adaptation to the surrounding terrain. The two levels have a difference in elevation of 57 cm, and are connected by an accessible ramp.

### Interior stairs

#### » Chapters 6.1 and 6.2

A continuous staircase connects all three floors. The clear width of passage is 120 cm. Each flight of stairs is to have an accessible design. It is not possible to walk beneath the stairs on the garden floor. The free-standing stairway leading into the event hall is designed in clear visual and haptic contrasts to the surrounding surfaces, enabling a clear marking of the stairs as free-standing components of the room.

### Lifts

#### » Chapters 7.1 and 7.2

A lift designed as Type 2 in accordance with DIN 80-71 connects all three floors. The lift is equipped with a system for acoustic announcements.

## Doors

### » Chapters 8.1, 8.2, and 8.4

As a general rule, the clear passage width of doors is 90 cm. The only exceptions are doors in areas for catering personnel (see requirements planning decision) and the technical room on the garden floor. The heights of doors depend on their design and vary between 205 cm and 235 cm. As the reveal depths of doors to the outside exceed 26 cm, technical compensation measures are used, and a 50 cm-wide lateral movement area is kept clear for manually operated doors.

All doors along the sketched-out routing are equipped with automatic door systems, activation buttons, or hold-open devices. The doors on each floor leading to the staircase can be an exception as it can be assumed that people with motor impairments will use the lift instead.

Transitions between interior and exterior spaces need to be designed without thresholds. This applies to both the ground floor area and the connection to the garden.

## Emergency alarm and evacuation

### » Chapters 9.1 and 9.2

Alarm systems for people with auditory impairments are based on the bi-sensory principle. Employees can be alerted through their mobile devices. Publicly accessible toilets are equipped with optical alarm systems. Specific organisational measures need to be taken for the evacuation of employees from the first floor. A safe area has been installed within the staircase as a temporary waiting area for people using walking aids or wheelchairs.

Floor plan, upper floor, ACCESSIBILITY CONCEPT, scale: 1:200



## **Service counters, cash registers, controls, assistance centres, and waiting rooms**

### **» Chapters 10.1, 10.2, and 10.3**

An accessible information counter is located in the entrance lobby. An audio induction loop system is available for visitors with auditory impairments.

## **Operational elements and communications systems**

### **» Chapter 12.2**

Intercom systems have been installed at the main entrance door on the ground floor and on the garden floor (exit: information counter and secretariat, first floor)

## **Windows and glass surfaces**

### **» Chapters 13.1 and 13.2**

Window parapets are 120 cm high in workplaces. The garden floor has wall-length windows in the library and the guest apartment.

## **Entrance and lobby**

### **» Chapters 15.1 and 15.2**

Publicly accessible areas: the entrance area is generously sized as it also serves as the lobby of the multi-purpose hall. Visitors using mobility aids have sufficient movement areas. Moreover, the lobby is fitted with an accessible information counter.

The materials and colours used support the concept for guiding guests from the entrance to the information counter, and from here to the event room and to vertical access points.

## **Wheelchair parking spaces and cloakrooms**

### **» Chapters 16.1 and 16.2**

Publicly accessible areas: an appropriately sized cloakroom is located on the garden floor.

Workplaces: Employees using wheelchairs can decide themselves whether to switch from their street wheelchair to another for indoor use. A flexible area has been planned within the open access zone in front of the workplaces, which may be used, for instance, for switching wheelchairs, if necessary, or as a small meeting corner.

## **Event halls**

### **» Chapters 17.1, 17.2, and 17.3**

Publicly accessible areas: the small event and exhibition hall with flexible functions has been designed accessibly. Reachability has been ensured by an accessible ramp connecting the two levels. The seating is not fixed but flexible; the position of the stage is variable.

This results in the possibility to offer a number of seats as needed for wheelchair users, their accompanying persons, and for people with walking aids. Room acoustics allow for a reduced reverberation time of 20% to improve audio quality for a better understanding. In the middle of the room, an area measuring  $4.50 \times 4.50$  m is equipped with an audio induction loop.

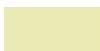
## **Hospitality**

### **» Chapters 19.1 and 19.2**

Publicly accessible areas: All rooms belonging to the café have been designed with sufficient movement areas. The counter has an integrated section that is lower and offers a clear space below it so that it can be used by sitting people and wheelchair users.

Workplaces: The kitchenettes have been designed accessibly.

## Legend ACCESSIBILITY CONCEPT, scale: 1:200

	publicly accessible areas		accessible information counter
	workplaces		communication aid
	shared routing visitors		accessible toilets
	separate routing visitors with impairments		accessible bathrooms
	separate routing visitors without impairments		special requirements TBS (technical building services)
	shared routing staff		accessible workplace (A for Arbeitsstätte)
	separate routing staff with impairments		
	separate routing staff without impairments		
	accessible public transport stop or station		
	accessible parking space		
	accessible ramp		
	accessible staircase		
	accessible lift		
	threshold-free transition exterior/interior		
	special requirements for fire prevention		

**Sanitary installations****» Chapters 20.1 and 20.2**

Publicly accessible areas: in accordance with requirements planning, one accessible sanitary room has been envisaged including a toilet approachable from both sides for wheelchair users. The gender-neutral solution has been preferred.

Space requirements: 220 × 220 cm.

Workplaces: in accordance with requirements planning, one gender-neutral, accessible toilet approachable from both sides for wheelchair users and space for a stretcher bed has been envisaged. The toilet was positioned close to the accessible workplaces.

Minimum space requirements: 220 × 320 cm.

**Office workplaces****» Chapters 21.1 and 21.2**

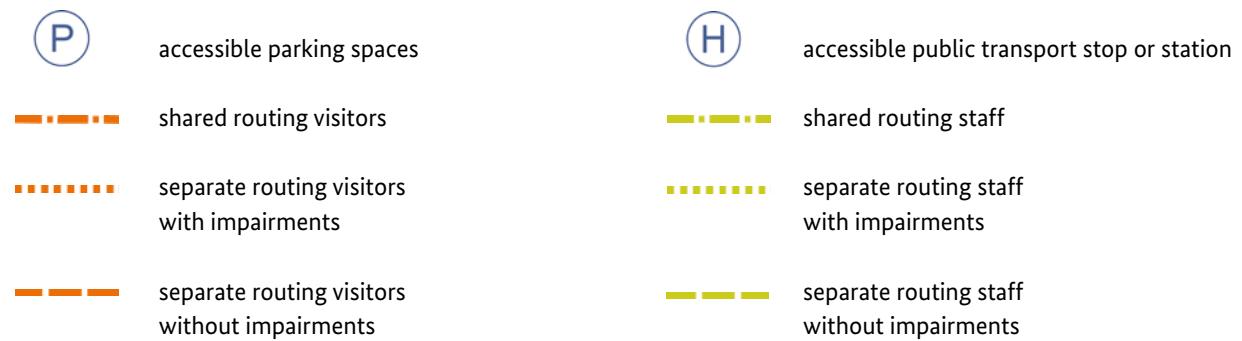
Workplaces: in accordance with requirements planning, every workplace can be used by employees with mobility impairments. Circulation areas are intended to serve as communication zones and accordingly, have been sized generously and designed flexibly.

**Accommodation****» Chapters 22.1 and 22.2**

The guest apartment on the garden floor is fit for accessible use. Space requirements and suitable furnishings and fittings have been taken into account.

# EW-Bau ACCESSIBILITY PROOF

Layout plan, ACCESSIBILITY PROOF, scale: 1:750



## Overall concept

### Integration into the urban environment

- » **Chapters 1.1, 1.2, 1.3, 1.4, and 1.5**
- cf. ACCESSIBILITY CONCEPT

### Orientation and guidance systems

- » **Chapter 2.1**
- cf. ACCESSIBILITY CONCEPT

The centre of city Z already has a consistent orientation and guidance system in place, taking into account the needs of people with sensory and cognitive impairments.

As the courtyard belonging to the foundation is envisaged to be open to the public, its design has been based on the public orientation and guidance system.

The existing orientation and guidance system follows a clear zoning approach and separates zones for movement/access from those for furnishings and fittings and installations.

This zoning principle is picked up again in the newly built “city courtyard” by walkways establishing links to the main entrance, the café, and to the accessible parking spaces. In analogy to the existing materials, a visually contrasting design is envisaged to differentiate between walkways and common areas. This enables a clear delineation of areas that need to be kept clear of temporary furniture for outdoor cafeteria dining.

### Guidance elements

- » **Chapter 2.4**

The change in materials used for walkways and other areas on the square is designed with visual and tactile contrasts and is developed as a consistent guiding line in the “city courtyard” for people with sensory and cognitive impairments. The guiding lines connect with those in the pedestrian

zone that are of analogous design, and thus make up a continuous and consistent guidance system.

In the garden square, the transition between the path surface and lawn and hedge areas has been developed as a continuous guiding line.

### Visual perception, materials, and visual contrasts

- » **Chapter 2.5**

In the “city courtyard” the walkways have been designed in a light-coloured granite material while anthracite-coloured granite was used for outdoor dining areas and installations.

In the garden, there is a clearly perceivable visual contrast between planted areas and the light-coloured surface of the garden path.

### Tactile perception, materials, and tactile contrasts

- » **Chapter 2.6**

The walkways have been planned as large-format granite slabs with relatively narrow joints. Common areas have been designed with small cobblestones with naturally rough surfaces as a clear tactile contrast to the slabs.

A line of sawed small cobblestones has been integrated into the square to link the accessible parking spaces to the main entrance. In the garden, the structural difference between planted areas and the garden paths made of smooth, enzyme-bound granite can be perceived tactiley.

### Exterior illumination

- » **Chapter 2.8**

The illumination of walkways is provided by wall-mounted lamps at a height of 3.50 m. With the selection of LED bulbs, the light intensity can be adapted to actual lighting conditions at any given time.



## Transition exterior/interior

### » Chapters 1.1 and 8.4

The entrance doors are an important element of the guidance system. They have been accentuated in their shapes and frames by the light-coloured natural stone, and can be detected intuitively. The main entrance door is controlled by a motion sensor, which supports finding the direction towards the building. In the vestibule area, the scraper mat is integrated into the material and colour concept and part of the guidance system. All thresholds are designed to enable even access. To avoid rainwater from being swept through the door by wind, the threshold and scraper zones have been combined with even drainage channels.

## Interior guidance system

### » Chapter 2.3

cf. ACCESSIBILITY CONCEPT

## Interior guidance elements

### » Chapter 2.4

#### • Floor surfaces concept

The most important elements of the guidance system are the zoning of the floor materials, their colours and luminance. The oak parquet flooring (luminance ...) has been combined with an anthracite-coloured linoleum flooring (luminance ...). The wood stairs are made of massive oak of the same colour as the oak flooring. The difference in the flooring can be perceived not only visually but also tactiley. A brass profile has been used for the transition between the two materials, which can be detected by a long cane (see detail 05.01.19).

#### • High-contrast wall design

refers to the following elements supporting guidance:

the colours have been chosen for the wall design as follows: (RAL colour ...), door frames and skirting boards almost white (RAL ...), door leave differentiated on the basis of their significance: important doors (RAL...), secondary doors (RAL...).

#### • Markings on handrails of stairs

are part of the orientation system and indicate the specific floor of the building.

#### • Tactile floor plans

have been integrated into the information counter at a scale of 1:100.

## Interior illumination

### » Chapter 2.9

The illumination concept supports the structuring of rooms. The changes of flooring materials are marked with spot lighting. The lobby area has consistent lighting encompassing its entire space. The information counter uses 1,000 lux and is perceived as the brightest area in the lobby. Shadow formation and blinding effects have been minimised accordingly.

## Exterior spaces (excerpt)

## Walkways and exterior circulation areas

The concept for access is simple and easy to follow and leads directly to the entrances. As a matter of principle, shared routing is offered to all users of the building. Additionally, there is the option to access the building through the garden where there is a separate, staff-only entrance that is also designed accessibly.

## Basic geometry and space requirements

### » Chapter 3.1

The width of the walkways in the courtyard is 1.20 cm and has been chosen as a comfortable width for pedestrians as well as for users of wheelchairs and walking frames. There is a sufficient amount of space wide enough for them to pass each other.

In the garden, a width of 1.50 m to 2.00 m has been provided on the main path and all side paths and terraces. This ensures comfortable manoeuvring space for wheelchair users.

## Legend ACCESSIBILITY PROOF, scale 1:150

	space requirement 150 × 150 cm and space requirement 130 × 90 cm (plotted to scale)		ground materials, exterior, contrasts, tactile and visual
	passage width 90 cm (plotted to scale)		stair marking
	accessible lift Type 2 110 × 140 cm (plotted to scale)		hazard warning surfaces
	special requirements for fire prevention		accessible drains/drainage
	threshold-free transition exterior/interior		other guidance elements
	special requirements TBS (technical building services)		tactile guidance system, floor
	accessible information counter		tactile guidance system, wall or handrails
	communication aids		guidance system, lighting
	automatic sliding door or hinged and pivoted door (plotted to scale)		
	hinged and pivoted door with pushbutton system (plotted to scale)		
	door with hold-open device (plotted to scale)		
	accessible seat (plotted to scale)		
	flooring materials, interior, surface contrasts, interior, tactile and visual		
	surface contrasts, exterior: tactile		
	ground materials, exterior: accessible		

## **Gradients of walkways and access routes**

### **» Chapter 3.2**

Because of the topography of the building plot, path gradients can consistently be kept below 3% or in some stretches below 4% in the “city courtyard”. A ramp is required for the main entrance.

Because of the even surface of the used sawed granite slabs, the crossfall can be reduced to 1.5% on one side, enabling comfortable use with wheelchairs and walking frames.

An accessible profile was used for the curved drainage channel. The main garden path providing alternative routing from the bus stop can be designed as an inclined walkway with gradients of up to 6%. This is justifiable, as it is not the primary access route to the main entrance. Resting platforms have been placed at 10 m intervals. The crossfall needed for drainage has been provided with a concave profile with a 2% gradient enabling drainage into the vegetation.

## **Exterior skid-resistance**

### **» Chapter 2.6**

Skid resistance can be ensured for the proposed surfaces in both the “city courtyard” and the garden.

## **Exterior ramps**

### **» Chapters 5.1, 5.2, 5.3, and 5.4**

A straight ramp length at a width of 1.50 m is envisaged for barrier-free access to the main entrance. It compensates for a difference in elevation of 24 cm over a length of 4.10 m at a gradient of 6%. On both sides of the ramp, handrails have been placed at grip height. Upstands can be dispensed with as this function is taken over by the house wall, or more precisely a wall segment. The criteria for accessible ramps have been fulfilled. A minimum distance of 3 m is maintained to the stairs opposite the ramp leading downwards.

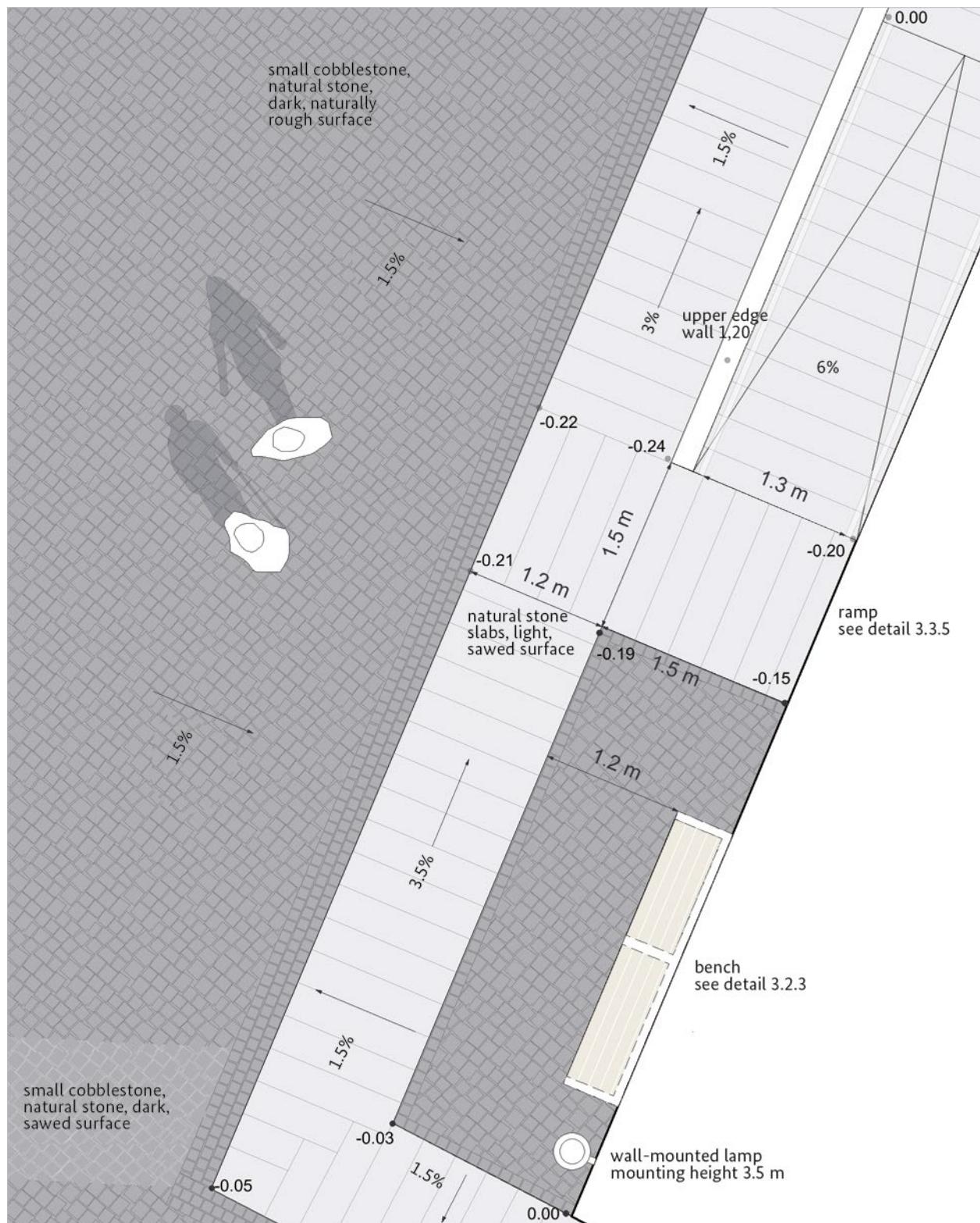
## **Exterior stairs**

### **» Chapters 6.1, 6.2, 6.3, 6.4, and 6.5**

An accessible stairway has been placed opposite the ramp. The treads have been designed with contrasting marking on their upper side. As the four steps can be seen well from below, markings on the risers are not necessary. Handrails have been installed on both sides. As the stairway connects with walls on both sides, there are no open ends requiring anti-slip safety measures. A tactilely contrasting hazard warning surface has been installed at the top of the stairway. There is a difference in elevation of 3.30 m between the “city courtyard” and the garden. This difference has been compensated for by an accessible stairway. For more comfortable use, a landing has been integrated into the stairs comprising 22 steps in total. In analogy to the stairs at the main entrance, the top and bottom steps have been equipped with a tread marking. Handrails have been installed on both sides of the stairway; a tactilely contrasting hazard warning surface has been placed at the end of the stairway.

Additional ramp access has not been considered because of the great difference in elevation. During opening hours, the lift inside the building may also be used.

Guidance detail ACCESSIBILITY PROOF, scale 1:20



## **Exterior fixtures**

### **» Chapters 11.1, 11.2, 11.4, and 11.4**

Accessible seating is provided in the exterior spaces in both the courtyard and the garden. Comfortable benches with backrests and armrests have been chosen for the "city courtyard". The model developed for the pedestrian zones is picked up again here.

Along the paths in the reading garden, the hedges have tactilely and visually perceptible sitting niches integrated into them. Seating is provided for very diverse user groups. This is why some of the offered possibilities for sitting or lying have backrests and some do not, some are positioned opposite each other, others in a line. The niches also provide space for one or two wheelchairs.

## **Special-purpose exterior spaces**

### **» Chapters 15.1, 15.2, and 15.3**

An accessible reading garden is to be added to the library as stipulated by requirements planning. This garden is positioned directly in front of terrace of the library located on the basement floor. The geometric outline of the garden consists of cut hedges where sitting niches have been integrated in some places. According to the planning concept, these sitting areas have been designed so as to be comfortably usable for wheelchair users as well. The basic geometry takes into account necessary manoeuvring and movement areas.

## **Interior spaces (excerpt)**

### **Sanitary installation, ground floor**

#### **Need and structure**

##### **» Chapter 20.1**

An accessible sanitary installation has been placed centrally on the ground floor between the lobby and the café area.

## **Basic geometry and space requirements**

### **» Chapter 20.2**

cf. ACCESSIBILITY CONCEPT

The door is designed as a sliding door with a clear width of passage of 90 cm. In accordance with DIN 4109, the  $R_w$  value for sound insulation is 27 dB.

## **Toilets**

### **» Chapter 20.3**

The toilet is approachable from both sides for wheelchair users and equipped with foldable support rails, backrest, and an integrated flushing system. The holder for toilet paper is reachable from a sitting position.

## **Wash area**

### **» Chapter 20.5**

The washbasin has a clear space below for wheelchair approach. All other fittings are also accessible. A mirror has been placed directly above the washstand, and it is 100 cm high.

## **Emergency call and emergency alarm systems**

### **» Chapter 20.8**

It is possible to activate the emergency call from the toilets or from the floor. An additional possibility to activate the emergency call is provided by a pull cord located next to the washbasins. The activation of the signal is indicated optically and acoustically. An alarm notification light is located on the outside of the toilet installation next to the door and another on the lobby wall, where it can be seen from the information counter. An optical alarm by strobe light has been ensured for people with auditory impairments.

## **Location and detection**

### **» Chapter 20.9**

In compliance with the design concept, the visual marking of doors is placed on the door leaves. Information for blind users is integrated into the door handle (vertical handlebar) (see detail X).



Photo by Stefan Müller

## Annex

Glossary .....	202
Bibliography.....	207
List of images .....	209
Members of the research-supporting working group .....	210
Picture credits .....	211

# Glossary

<b>access routes/circulation areas</b>	movement areas in interior and exterior spaces
<b>anthropometry</b>	determination and application of measurements of the human body
<b>architectural acoustics</b>	the transmission of sound among adjacent spaces or between interior and exterior spaces
<b>audio induction loop</b>	technical installation enabling users of hearing aids to receive noise-free audio signals by wireless means
<b>auditory</b>	stimuli perceived using the sense of hearing
<b>auditory perception</b>	perception of sound using the sense of hearing
<b>balustrade</b>	protective railing designed to prevent falls
<b>Baukultur</b>	taking into consideration aesthetic requirements at the same time as ecological and economic qualities aligned with specific socio-cultural requirements
<b>bi-sensory principle</b>	conveying information by using at least two senses; information can be conveyed tactiley, visually, and/or acoustically, such as optical and acoustic alarms activated at the same time
<b>Braille</b>	a system of writing for blind people in which characters are represented by patterns of raised dots that are felt with the fingertips
<b>checklist</b>	list to review completeness of qualitative and quantitative requirements
<b>cognitive impairment</b>	deficit in cognitive abilities
<b>common areas</b>	areas outside access routes in interior and exterior spaces where people spend time
<b>ES-Bau</b>	construction-related decision-making document pursuant to the Guidelines for Federal Construction Measures (RBBau Guidelines)
<b>escape routes</b>	traffic routes on which special requirements are to be imposed, to be followed for escape from potentially hazardous locations, and usually also used for rescuing personnel; rescue routes lead outdoors or towards a safe area
<b>EW-Bau</b>	construction-related draft document pursuant to the Guidelines for Federal Construction Measures (RBBau Guidelines)

<b>exterior space</b>	undeveloped part of the building to which staff and/or visitors have access
<b>ground surface indicators</b>	ground element with a high tactile, visual, and, where appropriate acoustic contrast to surrounding surfaces (DIN 32984)
<b>guidance strip</b>	tactilely detectable strip for guidance on access routes made of ribbed slabs running in longitudinal direction
<b>guiding line</b>	orientation line consisting of other guidance elements used by blind and visually impaired people for routing purposes, such as the delineation of walkways facing away from roads (inner guiding line) and facing towards roads (outer guiding line)
<b>handrail</b>	rail to be grasped for support and guidance located at grip height
<b>hazard warning surface</b>	warning surface indicating changes of ground level, hazards, and obstacles, and conveying the message “proceed with caution”
<b>integration agreement</b>	agreement to control in-company integration pursuant to § 83 SGB IX, which in accordance with German law is adopted by the employer and the representative body of employees with severe disabilities and the works or staff council
<b>interior space</b>	area in a building's interior, accessible to staff and/or visitors depending on its function
<b>light intensity</b>	coefficient of amount of light falling on a certain area and the size of this area
<b>location strip</b>	an area of ground surface indicators covering the width of a walkway or path to indicate lateral destinations (DIN 32984)
<b>long cane</b>	also white cane – mobility tool used by blind people to tactilely detect obstacles in their immediate surroundings
<b>lower strip</b>	section on one side of a walkway with a different surface; lower strips are on the edge facing towards the road
<b>luminance contrast</b>	an object's difference in brightness from its surroundings as perceived by the human eye
<b>macro-roughness</b>	comprises roughness components with a horizontal expansion greater than 0.50 mm; roughness components of up to 10 mm have a positive influence on the friction between shoe sole and floor surface

<b>micro-roughness</b>	comprises roughness components with a horizontal expansion below 0.50 mm; up to 0.01 mm it has a strong influence on the friction between shoe sole and floor surface
<b>Model Building Regulation</b>	framework regulations as a basis for <i>Länder</i> -specific building regulations, published by the Standing Conference of the 16 Federal State Ministers and Senators responsible for Urban Development, Building and Housing ( <i>Konferenz der für Städtebau, Bau- und Wohnungswesen zuständigen Minister und Senatoren der Länder, ARGEBAU</i> )
<b>motor impairments</b>	restricted physical movement, especially in using arms, legs, and hands; use of mobility aids or wheelchairs may be necessary
<b>movement area</b>	area needed to use buildings and structures in accordance with space requirements, e.g., by wheelchairs, walking aids, walking frames
<b>necessary stairway</b>	stairway required as part of rescue routes pursuant to official regulations (such as <i>Länder</i> -specific building regulations) (DIN 18065)
<b>open stairway</b>	stairway without risers in contrast to closed stairway (with risers) pursuant to DIN 18065-1
<b>operating force</b>	effort necessary to use operational elements and doors as well as engage/release and lock/unlock fittings with a key or a pushbutton
<b>operating height</b>	height at which an operational element can be reached accessibly
<b>operational elements</b>	handles, pushbuttons, switches, keyboards, buttons, coin and card slots, to be operated primarily by hand
<b>orientation aid</b>	information supporting everyone, especially people with sensory impairments in using the built environment
<b>other guidance element</b>	component of the built environment that can be perceived clearly by blind and visually impaired people and is suitable for routing and orientation purposes as well as for delineating walkways (DIN 32984)
<b>passing spot</b>	area wide enough for two wheelchair users to pass each other
<b>places of assembly</b>	pursuant to § 2 MVStättV structural installations or part of structural installations designated for the simultaneous presence of a number of people during events
<b>PPP procedure</b>	public private partnership procedure

<b>protection target</b>	defines the minimum level to which requirements for any measure need to be fulfilled; protection targets may be achieved differently than stipulated by the standard in question
<b>RBBau Guidelines</b>	Guidelines for Federal Construction Measures
<b>reflection ratio</b>	ratio of reflected light compared to incident light
<b>reveal</b>	the side between a window frame or a doorframe and the outer surface of a wall
<b>reverberation</b>	persistence of the reflected sound after a sound is produced in a closed room
<b>reverberation time</b>	the time it takes for a sound produced in a closed room to be reduced by 60 dB
<b>ribbed slab</b>	surface with ribbed, oblong raised parts running parallel to ground surface indicators
<b>risers</b>	vertical or nearly vertical part of stairs between individual steps/treads (DIN 18065-1)
<b>room acoustics</b>	acoustic properties within a room
<b>sensory impairment</b>	restricted use of senses, e.g., sense of hearing or seeing
<b>skid prevention/skid resistance</b>	combination of adhesive and tribological characteristics to effect resistance against slipping on floor surfaces
<b>special installations</b>	special-design or special-purpose installations pursuant to § 51 Model Building Regulation
<b>stamina</b>	physical capability
<b>studded slab</b>	surface with a regular sequence of raised studs
<b>tactile</b>	perception of mechanical impressions with the sense of touch
<b>tactile model</b>	three-dimensional, simplified reproduction at a reduced scale of structures and parts of structures to improve orientation on the basis of tactile perception
<b>tread</b>	horizontal or nearly horizontal part of stairs/steps (DIN 18065-1)

<b>upper strip</b>	section on one side of a walkway with a different surface; upper strip is on the edge facing away from the road
<b>upstands</b>	component installed on both sides of a ramp (e.g. raised kerbs) to prevent wheelchair or walking frame users from driving onto it
<b>visual</b>	stimuli perceived with the eye (sense of seeing)
<b>workplace</b>	work rooms and other places within a building or outside, located on the premises of a firm or on a construction site, envisaged as places of work or places accessed by staff during their work (Ordinance on Workplaces, <i>Arbeitsstättenverordnung</i> , ArbStättVO)

# Bibliography

BBR 2007

Federal Office for Building and Regional Planning  
*Bundesamt für Bauwesen und Raumordnung*  
 (publ.): "Barrierefrei! – Leitfaden zur Umsetzung von Barrierefreiheit in Bauten des Bundes", 2007

BBR 2005

Federal Office for Building and Regional Planning  
*Bundesamt für Bauwesen und Raumordnung*  
 (publ.): "Technische Grundsätze zum barrierefreien Bauen", 2005

BBR 2009

Federal Office for Building and Regional Planning  
*Bundesamt für Bauwesen und Raumordnung*  
 (publ.): "Leitfaden barrierefreies Bauen, Umsetzung der neuen Normen", 2009

BMVBS 2013

Federal Ministry of Transport, Building and Urban Development  
*Bundesministerium für Verkehr, Bau und Stadtentwicklung* (publ.): "Leitfaden Nachhaltiges Bauen", 2013

BMVBS 2013

Federal Ministry of Transport, Building and Urban Development  
*Bundesministerium für Verkehr, Bau und Stadtentwicklung* (publ.): "Richtlinien für die Durchführung von Bauaufgaben des Bundes (RBBau)", 2013  
[www.bmvbs.de](http://www.bmvbs.de)

SenStadtUm 2010

Senate Department for Urban Development, Berlin  
*Senatsverwaltung für Stadtentwicklung Berlin*:  
 "Design for all – Öffentlicher Freiraum Berlin", Kulturbuch Verlag GmbH, Berlin, 2010

SenStadtUm 2012

Senate Department for Urban Development, Berlin  
*Senatsverwaltung für Stadtentwicklung Berlin*:  
 "Berlin – Design for all – Öffentlich zugängliche Gebäude", 2012

HBVA 2011

Road and Transport Research Association  
*Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV)*: "Hinweise für barrierefreie Verkehrsanlagen (HBVA)", 2011

FGSV 1997

Road and Transport Association  
*Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV)*: "Merkblatt über den Rutschwiderstand von Pflaster- und Plattenbelägen für den Fußgängerverkehr", 1997

AV Stellplätze

Implementation regulation concerning § 50 of the Building Regulation Berlin (*Bauordnung für Berlin, BauO Bln*) on parking spaces for vehicles of people with severe walking disabilities and wheelchair users and parking for bicycles, 2007  
*Ausführungsvorschriften zu § 50 der Bauordnung für Berlin (BauO Bln) über Stellplätze für Kraftfahrzeuge für schwer Gehbehinderte und Behinderte im Rollstuhl und Abstellmöglichkeiten für Fahrräder*

BITV 2.0

Ordinance on Barrier-Free Information Technology pursuant to the Act on Equal Opportunities for Persons with Disabilities  
*Verordnung zur Schaffung barrierefreier Informationstechnik nach dem Behindertengleichstellungsgesetz (Barrierefreie-Informationstechnik-Verordnung)*, 2011

ISO FDIS 21542

International Organization for Standardization (ISO): "ISO FDIS 21542 – Building construction – Accessibility and usability of the built environment", 2011

ZVDH 2012

Central Association of the German Roofing Trade Zentralverband des Deutschen Dachdeckerverbands, ZVDH (publ.): "Regeln für Dächer mit Abdichtungen – Flachdachrichtlinien 2011", 2012

RAU 2008

Rau, Ulrike (publ.): "Barrierefrei – Bauen für die Zukunft: Bewegungsräume optimieren – intuitiver Gebrauch – kontrastreich gestalten", Bauwerk Verlag 2008

BEHLING 2009

Behling, Klaus: "Anforderungen an die Profile und den Einsatz von Bodenindikatoren im öffentlichen Raum", 2009, online publication on [www.dbsv.org](http://www.dbsv.org), last updated: 01 January 2013

BÖHRINGER 2011

Böhringer, Dietmar: "Barrierefreie Gestaltung von Kontrasten und Schriften", Fraunhofer Irb Verlag, Stuttgart 2011

## List of images

Front cover

Landscape park and atrium of the Federal Environment Agency, Dessau (sauerbruch hutton architekten, ST raum a. Landschaftarchitektur, photo by Marcus Bredt)

Page 8

Administrative Centre Malchow, accessible connection between the listed former townhall building and the listed local court (Autzen & Reimers Architekten BDA, photo by Jörn Lehmann)

Page 26

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

Page 48

Staircase of the State Theatre Darmstadt (modifications planned by +Ragnarsdóttir+Oei, CBF tactile paving system, photo by Barbara Aumüller)

Page 56

New castle entrance, Albrechtsburg Castle Meißen (Architekturbüro Raum und Bau GmbH, photo by Lothar Sprenger)

Page 90

Ramp access, Festival Arena in the Roman Quarry, Austria, St. Margarethen (AllesWirdGut – Architektur ZT GmbH, photo by Hertha Hurnhaus)

Page 134

Impressions of the Hygiene Museum Dresden

Page 146

School cafeteria of Schule auf dem Tempelhofer Feld, Berlin, (ludloff + ludloff Architekten BDA, photo by Werner Hutmacher)

Pages 176 and 179

The reference project was based on a draft developed by Marius Drauschke at the Chair of Social and Healthcare Buildings, summer semester 2012

Visualisations were developed by Marius Drauschke, Hermann Fliegel, and Benjamin Welscher.

Page 200

Entrance at the Regensburg Institute for the Blind (Georg • Scheel • Wetzel Architekten, photo by Stefan Müller)

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## Picture credits

	Page
Marcus Bredt.....	Front cover, 85
Federal Government/Sandra Steins .....	5
Heritage Conservation Office of Mecklenburg Western Pomerania, A. Bötefür .....	63, 100, 123
Barbara Aumüller.....	49, 85
[f] landschaftsarchitektur .....	86
Groh .....	96
Grote, Paul Ehrlich Institute .....	161
Guldmann .....	123
Roland Halbe .....	107, 150
Andreas Hasenkam .....	142
Hertha Hurnhaus .....	90
Werner Hutmacher .....	146, 156
Hanns Joosten .....	63, 86, 118,
knoll.neues.grün.....	89
Volker Kreidler .....	119
Alexander Krippstädt .....	124
Jörg Lehmann .....	8
Prof. Dieter Leistner .....	156, 161
Christo Libuda .....	96
Pavel Lupač.....	142, 159
Michael Müller.....	119, 169
Stefan Müller .....	108, 131, 142, 200
Magdalena Possert .....	100, 161
Rehwald Landschaftsarchitekten .....	96
Christian Richters .....	150
RMP Stephan Lenzen Landschaftsarchitekten .....	86
Vera Schmitz, efficientia .....	169
Lothar Sprenger .....	56, 131
Petra Steiner .....	26, 124
Foundation Ettersburg Castle .....	169, 174
Andreas [FritzXaver] Süß .....	89
Weidinger Landschaftsarchitekten .....	108

All other photos are from the archives of the authors.

