DIN 18 024 & 18 025

The development of barrier-free building in 1970s Germany

AR2A011 Architectural History Thesis (2020/21 Q3)
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I. Content

II. Introduction

Modern building standardisation and law today regularly takes accessibility into account. Thanks to this, people with physical disabilities are enabled to a large extend to move around in their private and public built environment without being dependant on external help.

Until the 1950s, standardisation in Germany and most European countries was largely concerned with anthropometric approaches which took measurements of the perfect male body as basis for architectural design. This meant that physically impaired people could not move independently in most buildings and were usually forced to live in special institutions. However, the reason for this discrimination was not rooted in standardisation itself but in the political and societal context.

This year (2021), the standard *CEN EN 17210:2021 Accessibility and usability of the built environment - Functional requirements* was published, which intends to set standards for accessibility of architecture at a European level. The standard comprises 295 pages and was prepared by an international committee in consultation with national institutes, including the German Institute for Standardisation. It is the first international standard on the topic of accessibility of the built environment at a European level. However, the beginnings of the standardisation process on the subject of accessibility in the built environment in Europe were initiated 50 years ago.

It was not until the 1970s that social and political changes step by step led to the elimination of barriers, just as the idea of inclusion was increasingly taken up. In the 1960s, civil rights movements inspired by those in America, drew attention to the problems of barriers in the built environment for people with disabilities. As a result, these problematic conditions were addressed politically in Germany for the first time and were also taken into account in standardisation. The norm *DIN 18 025 Part 1 dwellings for wheel chair users* was published in 1972 as one of the first standards in the national field in Europe. It initially focused on wheelchair users but can nevertheless be seen as the beginning of standardisation work on the subject of accessibility. As a result of further research, people became aware that barriers do not only affect disabled people but also other groups of people, e.g. children and elderly, and people who are temporarily hindered by barriers (e.g. by carrying loads). The following paper deals with this movement and studies the history of the development of two accessibility norms in 1970s Germany: DIN 18 025 and 18 024.

The central research question is:

What caused the introduction of the first standards for barrier-free building, DIN 18 024 and DIN 18 025 in 1970s Germany and how were these standards received at this time?

The hypothesis is that DIN 18 024 and DIN 18 025 resulted from an emancipatory movement of disabled people and had a large impact on building practice but also led to debate and criticism by affected people and operators or users of the standard which are architects and lawyers about its practical application.

Methodologically, I critically evaluate primary as well as secondary sources on the topic, dealing with the reason of the standards, their development, their effects on other works on standardisation and critique during its applicability.

The first chapter presents an introduction to architectural standards and the DIN Institute in general. It addresses the subquestions how standardisation in architecture developed and to what extent standardisation is relevant in the architectural context, particularly with regard to

the issue of barrier-free access. The chapter is based on literature research and my information from the website of the DIN institute.

The more recent background of the respective standards will be continued to be described in the second chapter. It deals with the question of how the standard developed in a socio-political and legal context and the information on the development procedure in the German Institute for Standardisation. In this part, in addition to secondary literature, I also use information gained from interviews with specialists related to Prof. Dieter P. Philippen who was involved in the standardisation process. Concerning the historical background, I further derive my information among other literature from some articles on disability history by Elsbeth Bösl who deals intensively with the socio-political part of the topic and other secondary literature. Moreover, I searched on websites of interest groups, the DIN and an archived website of the activist Gusti Steiner which were also useful sources of information.

The third chapter continues with a description of the role of the standard in their international context. It answers the question how the chosen DIN standards aimed to change the social position of impaired people or anyone being affected by the barriers of the built environment in Germany in 1970s. An important source for this chapter are the original first versions of the standards themselves. I could not find any article in the literature that particularly focuses on the standardisation of DIN 18 024 and 18 025 in retrospect. The DIN itself also told me that there is almost no archival information on these first standards and that lists of participants cannot be accessed due to data security. However, thanks to the provision of some journals that are no longer in print by Mr Ulrich van Triel who inherited them as part of a private archive from Professor Philippen, my personal communication with him and Klaus Buhmann and some other articles that incidentally deal with the topic, I was able to gather some information.

The fourth chapter finally deals with the reception and effects of the standards and deals with criticism and the reason for a later change and merging of the standards to one. Additionally to my resources from the literature from the archive, I also receive my information from a critique by Monika Fendl and Heinz-Peter Schmieg deriving from the time shortly before it came to merging the standards to one. The frequent critique on higher costs is mentioned but due to the scope of this paper not discussed in detail. Further information on this topic and solutions to reduce the costs can be found in Kirchhoff, Jacobs, and Metzler 1992 and Woerdemann 1986.

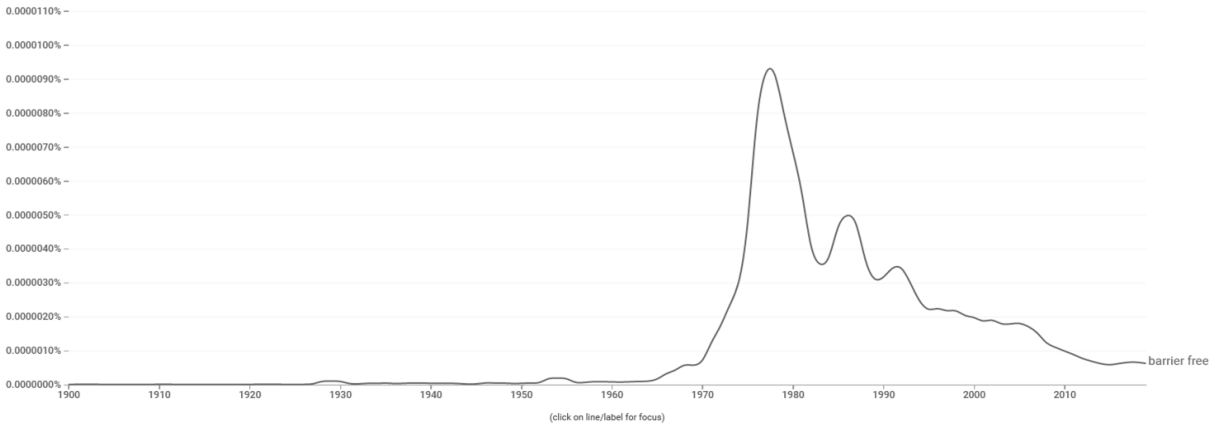

Figure 1: NGram viever: How frequently occurs the term barrier-free in research papers.

1. Architectural standardization

1.1. Architecture and the human body

Architecture inevitably has something to do with human measurements, because architects design buildings for people. For many years, they have therefore incorporated human measurements into architecture in various ways.

There is a long tradition to take the proportions of the human body as an ideal for architecture. Vitruvius is regarded as the very first author to deal with this method called anthropomorphism. At least, his *De architectura libri decem* is the first work on architecture and this topic to have survived from Roman antiquity. His *homo vitruvianus* is supposed to display the perfection of the human body by means of a geometrical analysis of human proportions and uses this as a basis for architecture (Schultz 2009, 5). Not only the idealized male but also the female body was analysed geometrically in this work as a model for Doric column forms.

These early studies of anthropomorphism all aimed at the aesthetic perfection of architecture. Ergonomics and usability were, if at all, only secondary concerns, which is why a perfected human body served as the model. In some cases, actual measurements of the human body were not even used to create this theory of proportions, but they were rather adapted from mathematical harmony (Schultz 2009, 6) therefore the bodies of people with disabilities, elderly or children played no role in the Vitruvian theory. Anthropomorphism is still affecting contemporary Architecture for harmonic reasons.

Anthropomorphism is to be distinguished from anthropometry. The latter developed together with the natural sciences during the Renaissance (Bartelmei and Günther 2008, 12). Instead of using human proportions as a model for architectural harmony, anthropometry is the study of human dimensions for practical design reasons. In the 1970's Germany, two of the most influential studies on anthropometry were the ones by Le Corbusier and the *Bauentwurfslehre* by Ernst Neufert.

The Modulor aimed precisely to develop an architectural measure that would serve as the basis for architectural standardized mass production. The basis was first the height of an average French man of 1.75m although this was later changed to 1.83m, the height of good-looking policemen in detective novels (Le Corbusier 2000, 56). This standardization idea of Le Corbusier arose in a historic context when people with disabilities were still separated from society, if not even worse such as in National Socialism, with which Le Corbusier sympathized (Leuschner 2009, 431). At this time also ergonomic studies were separated: Either they focussed on healthy bodies, like the Modulor did, or they dealt with bodies of physically impaired people mainly for the purpose of building special institutions.

In the same historic context in 1936, the building design doctrine of Ernst Neufert was published, who unless he was appointed by Albert Speer as commissioner for standardization issues in Nazi Germany, was not an advocate for fascist ideology ('BAUWELT - Der andere Neufert' n.d., n.p.). However also the Neufert mainly focussed on adult but young bodies without disabilities and only in the 2012 edition of his *Bauentwurfslehre*, which is still revised and updated by the Planungs AG Neufert, made accessibility and demographic change a main topic for the revision ('Der ewige Neufert' 2018, n.p.). This way the first editions of his book also aligned with the ambitions of the Third Reich.

However in the 1960s, anthropometric studies on the ergonomics of elderly and people with disabilities started with a more inclusive approach especially in Denmark, Sweden and the USA where Timothy Nugent was a leading researcher for accessibility standards (Guffey

2020, 441). Furthermore, in Great Britain Selwyn Goldsmith, an architect who was bound to a wheelchair after having had poliomyelitis, wrote the first extensive work on ergonomics of people with disabilities in Europe.

1.2. Metric systems and standards

First metric systems were derived from human measures like the German *Elle* and British *feet*. At the end of the 18th century, the French national assembly decided to have a common length measure to increase reliance and agreed on one that was based on scientific calculation of one ten millionth of a quarter of the earth's meridian. This length was called the meter.[1]

In the 19th century, standard sizes of - among others - building materials became a requirement to accommodate industrial mass production and international trade. Measures become standardized at national and supranational levels according to practical fabrication, cost saving and use. In architecture, this meant that human ergonomics were studied in terms of use, but had to be reduced to an average for mass production and cost savings. In the context of architecture standardisation was not only applied to the equipment but architects strived to achieve this at the level of the overall building design as can be seen in David Gilly's *Normalplänen* and Karl Friedrichs Schinkel's approaches of a standardised architecture.

Instead of working individually on a case-by-case basis, standard cases were defined. This was done on the basis of ergonomic and anthropometric studies. Since ergonomics did not take into account disabilities, the standards included barriers for people with such conditions.

1.3. The German Institute for Standardisation and their standards

The German Institute for Standardisation (Deutsches Institut für Normung in the following referred to as DIN), founded in 1917, is an independent research forum for standardisation in Germany and also acts on a worldwide level ('DIN-Norm' n.d., n.p.). On the basis of a contract with the state[2], the institute defines standards according to the so-called *state of the art* in research and publishes them in regularly updated publications.

Standards are drawn up by committees which consists out of various members. Generally, all those involved are interested in standardization for the benefit of the general public as well as science and commerce (Schmieg and Fendl 1999, 66). This in most cases means, that scientists and interest groups mostly take part but also manufacturers, representatives of service firms and consumers.

A DIN Standard is not part of binding law. Therefore their application is generally on a voluntary basis. Under certain circumstances however standards become binding or at least have an advantageous legal effect. This is either when contracting parties make them subject of their agreements or contract or when they fill out the legal term *state of the art* in directly binding law. In the latter case, following the standard does not lead to an exclusion of liability, but it does make it easier to prove correct behaviour according to the current state of the art when it comes to a lawsuit. Furthermore the DIN can be implemented or cited in the building law and administrative regulations of German federal states which also was the case in many of the states in terms of the early accessibility standards of the DIN ('DIN-Norm' n.d., n.p.).

[1] Today a meter is defined as the length which the light travels in a certain time in a vacuum.

[2] Normenvertrag: Vertrag zwischen der Bundesrepuhlik Deutschland, vertreten durch den Bundesminisler für Wirtschaft, und dem DIN Deutsches Institut fiir Normung e. V., vertreten durch dessen Präsidenten. Bonn: 5.6.1975 ergänzt durch den Bundesminister ftir Wirtschaft am 26. I. 1984 und durch das DIN Deutsches Institut für Normung e. V. am 15. 2.1984.

Concerning the topicality of standards it has to be mentioned that the standards are not only written by a panel of experts but are also regularly checked in five-year intervals (‘DIN-Norm’ n.d., n.p.).

In the legal field, the standard is not the only source for defining how things should normally be done and look like, but is merely tell what has to be done and what characteristics have to be met at least or as a minimum (Schmieg and Fendl 1999, 66).

2. Background

The concept of barrier-free building is preceded by the idea of building for people with disabilities. To build dwellings which dealt particularly with the ergonomics of people with disabilities was pursued until about the 1980s. This approach did not yet include the complete removal of built barriers but focused mainly on special housing. Nevertheless, this approach was already one step towards equality through self-determined housing. However, before the concept of construction changed to the idea of building equally for people with and without disabilities, the first step was to change society's understanding of living with disabilities.

2.1. International context

American influences

The first country to publish a standard for accessability of the built environment were the USA: 1961 the *American National Standards Institute (ANSI) A117.1 Accessible and Usable Buildings and Facilities* was released (WBDG n.d., n.p.).

In America universal design started playing a role after the Vietnam War. This was due to the fact that after the war, war-disabled persons were to continue to participate in working life. The Rehabilitation Act of 1973 not only established a legal framework for people with and without disabilities, but also laid the foundation for a barrier-free environment. This law initially applied only to institutions that were funded by or directly related to the state, but the subsequent Americans with Disabilities Act (ADA) of 1990 further expanded the scope of application (‘A Guide to Disability Rights Laws’ n.d.). In America, the disability rights movement had already begun in the 1960s and had served as a model for the German social movement for an accessible built environment.

Accessibility in Europe

While America had already published a standard for barrier-free buildings at the beginning of the 1960s, it took another 10 years for the DIN standard to be introduced in Germany as the first of its kind in Europe. In comparison with other European countries, German standardization published the respective DIN standards at an early stage. However, Germany was not the first country to deal with the topic of equal acessability in the built environment: developments were also evident in other countries in Europe, which introduced accessibility because of an inclusive way of thinking: In particular, the idea of *normalization*[3] in the Nordic countries and numerous legislative measures in England are worth mentioning (Smith and Preiser 2011, 452). Both developments also referred to the equal rights of people with and without disabilities in the built environment. Also concerning the early analysis of the ergonomics of disabled people for equality in architecture, Etienne Grandjean (Switzerland) and Selwyn Goldsmith (England), among others, have already done research in the 1960s.

[3] Normalization means that people with disabilities should be enabled to live a normal life. It concerns the world of school and work, culture, religiosity, sports, sexuality and leisure. In Denmark and Sweden it developed already in the 40s.(‘Inklumat’ n.d.).

However, according to several sources, DIN is one of the first, if not the first standardization in Europe and has also been used as a basis for such standards in other countries (Marx and Philippen 1989, 17; Lee, S. Chung, and Park 2016, 5; Loeschcke, Marx, and Pourat 2011, 3).

2.2. Historical social and polictical background in Germany

Until the 1970s, German disability policy described disability primarily as an individual, functional deficit in relation to a person's earning capacity and productivity. This can be seen in a definition by the German Federal Ministry of the Interior from 1958: “A person is considered to be disabled *if he is unable to perform an appropriate activity* either due to congenital deformity or damage or due to injury or illness […]. He is more or less impaired in performance[…].”[4] (Bösl 2009, 41 emphasis added) This former description looked for the problem of disability in the individual, and so the treatment was also based on the individual. It was only through various developments and milestones, as well as the formation of committed interest groups, which will be dealt with in the following chapter, that the built environment was identified as *disabling*.

Post War periods: Awareness through the war damaged and the broadening of the term

After the First World War, the rehabilitation paradigm was implemented into the German state welfare system because of the people who were injured in the war period. Thus in the time before National Socialism there was already a program that guaranteed a pension, care and a social insurance on the basis of the German principle of social welfare (Bösl 2010, 2) [5].

Nonetheless, in principle a model was pursued that continued to exclude disabled people and only guaranteed monetary support and medical treatment. The aim was not to eliminate barriers but to cure or restore the body as much as possible and provide the person with work which was seen as elementary for the psychic health and a liveable live. This image of a *helpless creature* was strongly criticised by the organizations of war-damaged in the 50s and 60s who saw their dysfunction rather as a heroic sacrifice but as a status of helplessness. Unless they had a strong lobby their claims were hardly recognized (Bösl 2010, 2).

It is well known that the rights of people with congenital disabilities were largely disregarded during the Second World War and many were murdered. It took fifteen years after the Second World War for the politics to not particularly take victims of the wars and accidents into account when dealing with accessible building after the Second World War, but also people with hereditary disabilities. Moreover also intellectual and psychic illnesses were more and more discovered which led to an even further enlargement of the term *disability*.

First political awareness for inequality

In 1969 Willi Brand was the first Federal Chancellor to explicitly address the situation of disabled people his social-liberal federal government had announced to start a reform process and a “decade of rehabilitation”[6] (Bösl 2010, 3).

One of the keywords of the coalition of the Social Democratic Party and the Free Democratic Party which was elected in 1974 was the equality of opportunities. Representatives of the ministerial bureaucracy, politics and experts now demanded, for example, the removal of

[4] „Als behindert gilt ein Mensch, der entweder aufgrund angeborener Missbildung bzw. Beschädigung oder durch Verletzung oder Krankheit […] eine angemessene Tätigkeit nicht ausüben kann. Er ist mehr oder minder leistungsgestört […].“ Bundesministerium des Innern (BMI) Abt. Va1, letter to section. Va2, 12. 8. 1958, federal archive (BArch) B 106 8414 as cited in Bösl 2009,41.

[5] Sozialstaatlichkeit.

[6] „Jahrzehnt der Rehabilitation“ Bundesministerium für Arbeit und Sozialordnung (BMA) Walter Arendt, Rede zur Gründung des Vereins Haus der Behinderten Bonn e. V., Manuskript, 29. 10. 1973, BArch B 189 28091 as cited in Bösl 2010,3.

obstacles in the built environment as a new area of responsibility for rehabilitation. Instead of focussing on the individuum, the idea was to adapt societal and environmental conditions. The removal of obstacles was ideally and financially supported. Due to limited scope of competence in law, the technical standard as object of general recognition came into focus. Nonetheless, disability was still tried to be solved mainly with technical help for the individual (Bösl 2010, 4).

Political activism and disability rights movements

Despite all this, the associations of disabled people that began to emerge in 1968 strived for cooperation and drew attention to the dismantling of everyday barriers at the local level. A key initiator of one of these disability rights movements in the 1970s in Germany was Gusti Steiner and his non-impaired companion Ernst Klee. In the seventies, they organised several actions against disability discrimination in the society. The movement began with the adult education centre course *Coping with the Environment*[7], which was taught by the initiators. This course was particularly concerned with creating awareness for architectural barriers. It was criticized that especially these barriers actually make impaired people *disabled* by not enabling them to use certain parts of the city like unimpaired people (Gusti Steiner 2006, n.p.).

During this time, social science also increasingly dealt with the topic, thus representing another approach to the individual medical view. Sociology attested that the way disabled people have been treated up to now has driven them into social dependence. Society, not the illness itself, was seen as responsible for the exclusion and guardianship (Bösl 2010, 7).

Nevertheless, it was to take until 2006 until the equality of disabled and non-disabled people was legally embodied with the participation of affected members of the legal profession.

Paralympic games in Heidelberg

Figure 2: Stamp for the Paralympic Games.

Another event that brought the issue of building barrier-free to the political agenda was certainly the Paralympics in Heidelberg in 1972. Due to organisational problems, the games could not take place as originally planned in Munich, which was also the venue of the Olympic Games that year (Streppelhoff and Westermann 2014, 81–89). However, through previous cooperation with the clinic in Heidelberg, neurologist Dr. Ludwig Gutmann, who had initiated the first Paralympic Games twelve years earlier (paralympic.org n.d., n.p.), was able to find a new host venue. But the city's accessibility still left much to be desired at that time (Streppelhoff and Westermann 2014, 81–89).

However, when the reconstruction measures exceeded previous cost expectations, the federal government intervened, not wanting the Paralympics to fail because of the rising costs (Streppelhoff and Westermann 2014, 86).

Unfortunately, hardly any recognisable sustainable changes in society regarding the engagement for people with disabilities are to be seen in the years immediately after the event. Nonetheless, the Paralympics had once again drawn the

[7] "Bewältigung der Umwelt" (Gusti Steiner 2006).

attention of politicians and the German Sports Confederation to the problems of the built environment. Additionally, the Games had by then also contributed to slowly bringing the issue of accessibility into focus on an international level (Streppelhoff and Westermann 2014, 91–95).

2.3. From design for the disabled to barrier-free building

Building for the disabled was a preceding development to barrier-free building. The tradition of building according to antropometry has a long tradition (see previous chapter), but until the middle of the 20th century, it rarely took into account other bodies than that of a young adult healthy person. First analyses of the ergonomics of people with disabilities initially led to special facilities and institutions (special schools and workshops for the handicapped) being designed with their ergonomics in mind. A topic that was only gradually added was that of inclusion. This, however, is about allowing people with and without disabilities to live in the same environment on an equal status. Thus, the building can be oriented neither only to one or the other ergonomics but must be universal. However, the first efforts of the building sector for people with disabilities in the seventies were not yet fully geared towards accessibility, but concentrated on the barrier-free construction of special dwellings.

The term barrier-free building is not to be understood as a substitute for handicapped-accessible building, because it goes even further: The term alone includes the concern of all people who are limited by their environment. This can be also children as well as persons limited by temporary conditions e.g. shortly after an operation or even only when carrying loads or pushing carts of any kind. At the same time, the realization of the barrier-free environment also contributes to the inclusion of people with disabilities, because they do not have to limit themselves to special solutions. Another factor that is also considered a predecessor and part of accessibility is building for the elderly and preventively adaptable living space. In guides to the standards discussed here, demographic change - regardless of disability - is also cited as a reason for the need for accessibility (Philippen 1998, 14). Thus, the focus of the term barrier-free is not on speciality (for people with disabilities) but on multifunctionality for all human ergonomics cases.

3. The DIN 18 024 and DIN 18 025

The first edition of the DIN standards related to physical disabilities from the 1970s listed here still referred specifically to people with disabilities and the elderly. This was changed in later versions and the title also changed to *barrier-free building*.

> *DIN 18 025 Wohnungen für Schwerbehinderte, Planungsgrundlagen, official translation: dwellings for disabled persons; design principles*
>
> *Blatt 1: Wohnungen für Rollstuhlbenutzer (1972), official translation: dwellings for wheel chair users*
> *Blatt 2: Blinde und wesentlich Sehbehinderte (1974), official translation: dwellings for blind persons and those having essential difficultiy in seeing*

DIN 18 024 Bauliche Maßnahmen für Behinderte und alte Menschen im öffentlichen Bereich. Planungsgrundlagen, official translation: Construction measures for disabled persons and old human beings in the public field; design principles

Blatt 1: Straßen, Plätze und Wege (1974), official translation: Construction measures for disabled persons and old human beings in the public field; design principles, streets, places and ways
Blatt 2: Öffentlich zugängliche Gebäude (1976), official translation: Construction measures for disabled persons and old human beings in the public field; public accessible buildings

In the following text they are referred to without the full name or only by the translated title.

3.1. Development and aims

The DIN 18 024 and DIN 18 025 have been developed by the *Standards Committee for Construction*[8] and the more specific Working Committee *Severely Disabled Persons in the Public Sector and Dwellings for Severely Disabled*[9]. For the DIN 18 024 Part 2 also the Standards Committee Mechanical Engineering participated.

The standardization period began as early as 1969. These standards were among the first of their kind and they were considered a "pioneering achievement"[10]. Furthermore they were therefore used extensively for the preparation of standards in other countries and were used on an international level as a guiding standard work (Marx and Philippen 1989, 17).

Prof. Dieter P. Philippen was significantly involved in the preparation of the standard (Philippen 1998, 5 Preface of Sozialverband Reichsbund). The professor of medical technology, who researched human ergonomics, especially in the context of disabilities, had studied in the USA, which influenced his idea of a world without barriers. Additionally, he ensured that mainly representatives of disability associations and other consumers were represented at the first version of the standards. This prevented some standards from being rejected simply because of the cost to manufacturers. While, as already described in the previous chapter, the focus in Germany in the post-war period was primarily on financially and medically caring for people with disabilities, in America the focus was on so-called *universal design* – an approach similar to term *barrier-free* which was later mainly used in Europe (personal communication 2021, n.p.).

Having the American model in mind, the goal of the German standards was also to create an environment in which no person experiences obstacles due to their physical condition. Therefore, much emphasis was placed on researching the movement patterns of the elderly and people with disabilities. In the first edition however the emphasize still also particularly laid on the design for disabled also if the aim was to achieve equality. Thus, the title still referred to people with disabilities, although the specifications made the flat habitable for most other people as well. In the revised edition the term *barrier-free* was then also used in the title. The standards not only recognized disabled people as hindered by their environment: they

[8] Fachnormenausschuß Bauwesen.

[9] Arbeitsausschuß Schwerbehinderte im öffentlichen Bereich und Schwerbehindertenwohnungen.

[10] „Die ursprünglich 1969 - 1974 erstellten DIN Normen 18024 und 18025 sind international als Pionierleistung anerkannt und sind in großem Umfang als Grundlage für spezifische Bestimmungen in vielen Ländern herangezogen worden."(Marx and Philippen 1989, 17).

also were an example of a joint European idea of how to improve the requirements for old age and impaired people on the urban- and single dwelling scale. This way it should enable everybody to use their environment in a self-sustained and -determined way (Philippen 1991, 125). While the first editions of the standards were specialised for certain types of disabilities and elderly people, further editions aimed at accessibility for all. Organizations and representatives of 4 million inhabitants signed the resolution in which DIN 18 025 became valid. The slogan for the paper was short and easy to remember: “barrier-free for all people” (Philippen 1991, 126).

3.2. Content of the first edition

DIN 18 024 Blatt 1 (November 1974)

The standard aims primarily to improve the living conditions and participation of the elderly and people with disabilities. Demographic change in particular was also taken into account here. The increasing age of the elderly and the direct correlation between age and illness-related injury make this standard even more important. This is also shown by the following current statistics (Figure 3, 4). It is noteworthy that almost 90 percent of all disabilities are first caused by an illness or accident and that the probability of suffering of the diseased increases with age.

The introduction of the standard further speaks of a “rehumanization of urbanism” and the “creation of a more humane environment”[11]. In addition, the safety of those affected in the public sphere is also in the foreground. The advantages are thus also intended to benefit other groups of people, such as those with baby carriers or carrying loads. The application area are both new buildings and conversions. Individual sections deal with sidewalks, curb heights, crosswalks, public telephones, and signs.

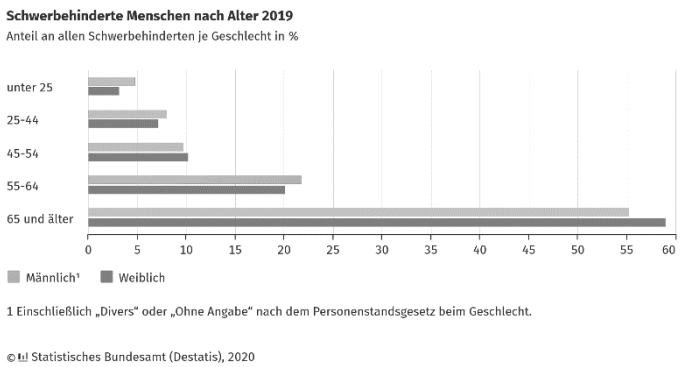

Figure 3: Amount of disabled people in different age groups (Source: Statistisches Bundesamt (Destatis), 2020)

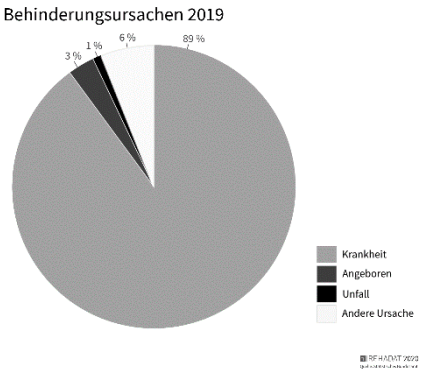

Figure 4: Reason for Disability (Source: Rehadat Statistik)

[11] „Die Vermeidung und Beseitigung baulicher Hindernisse trägt, über die spezielle Aufgabe der Rehabilitation und Integration hinaus, ganz allgemein zur Rehumanisierung des Städtebaus und zur Schaffung einer menschengerechten Umwelt wesentlich bei.“ (DIN 1984, 76)

DIN 18 024 Blatt 2 (April 1976)

Unlike Sheet 1, Part 2 refers to all buildings open to the public. The formulation *open to public* is to be interpreted in a broad way: According to DIN 18 024 II No.1, also parts of buildings are affected if only they are accessible to the public. Thereafter, it offers an exemplary enumeration of various buildings that belong to public buildings. The standard regulates access to buildings, parking spaces for cars, universal design within the building, telephones, sanitary facilities and signs.

DIN 18 025 Blatt 1 (January 1972)

This standard still contained special housing forms, which were later considered obsolete. This was due to the fact that many requirements had also been adopted in other DIN standards by the end of the 20th century and only wet rooms and bedrooms differed (Philippen 1998, 20).

First, wheelchair users are defined as people who are dependent on vehicles both outdoors and indoors. It is first noted that, because of the larger movement areas, dwellings for wheelchair users have larger minimum dimensions than those that do not rely on a wheelchair. In addition, the reach of people with disabilities is limited, so storage areas must be sized differently. By making all rooms of an apartment accessible to the wheelchair user, he or she can participate normally in the multi-person household. For people living alone, following the proposals of the DIN makes an assistant largely unnecessary.

First, the terms furnishings, equipment, storage areas and movement areas are defined. After this, minimum dimensions for living rooms, outdoor areas (e.g. balcony), corridors and storage areas are specified. Nr. 3 and 4 deal with the floor space and equipment of bedrooms and kitchens, utility rooms and sanitary rooms. This is followed by the distances and movement areas, as well as special requirements for the equipment. Finally, access to the apartment is also dealt with, which forms the junction between DIN 18 024 and 18 025.

DIN 18 025 Blatt 2 (July 1974)

The second part of this standard refers to visual impairments. The visual impairment is limiting in a different way than being bound to the wheelchair. People comprehend their environment with up to 90% vision when they have full sight (Stadt Hagen 2006, 22). Therefore, it is important that another partial standard addresses this disability. However, the structure of the standard is similar to that of Part 1. First, minimum dimensions of various spaces are given. It is also interesting to note that blind people in Germany are already entitled to additional living space since this standard. After that, the floor space in bedrooms and the equipment and floor space in kitchens, utility rooms and sanitary rooms are mentioned. This is followed by spacing and movement areas and then general requirements for equipment and, as in Part 1, finally the access to the house and apartment.

4. Reception and effects

4.1. Legal practice effects

As already mentioned, the DIN standards were on the one hand a novelty in its field as a legally - at least indirectly - binding standard. However, it was also adopted to a large extent in regional legislation (DIN 1984, 119–21). In the case of it being cited or implemented into the administrative requirements, this means that the standards are not only a guiding reference but even a judicial requirement.

A compilation of international standards from 1989 also shows that the European standards that followed the German standard have many similarities with it. The author also points out that the German standard was used as a basis for specific regulations in other countries. One difference, however, was in the length and precision of the standards. While the German standard was quite compact and flexible, international standards often contained detailed explanations and drawings. Furthermore, there were major inconsistencies in the treatment of existing buildings in the different countries (Marx and Philippen 1989, 110–18).

In the context of architecture, DIN standards are, so to say, the link in communication between law and architecture. They also facilitate communication and planning in other areas of construction. Further, the DIN Institute openly admits to practicing industrial politics. As such, markets are shaped for products, making it easier for those that conform to the standard but also excluding some players from the market (Oswalt 2018, 19). Considering this amount of influence in the context of architecture, it is therefore particularly important that barrier-free design is considered in standardization. Standardization communicates how things are *usually done*. This means that if there is no contractual concretization a building has to be designed not to exclude people through certain barriers. If this is not the case it requires that there at least has to be some justification why barriers are necessary. For a long time, accessibility was not the standard so this was not the case. Also today it is still a point of discussion when it comes e.g. a rivalry in a project between heritage protection arguments and disability/universal design (personal communication 2021, n.p.).

However when the first standards for barrier-free building were discussed, making accessibility a universal standard for some firms meant costly changes and economic losses. For example, production lines of building product manufacturers had to be partially changed in order to comply with the standards. Moreover, charitable associations, which also benefited economically from the lack of independence of, among others, disabled and elderly people, lost customers. Some therefore tried to make accessibility standardization more difficult. For this reason, an attempt was made in the committee of the DIN 18 024 and 18 025 to minimise the influence on the of these companies on the standards as far as possible in order to enable a turnaround in this area of social grievances (personal communication 2021, n.p.).

4.2. Effects on literature for architectural practitioners and research

> *“Through the development of these planning standards, for the first time the numerous but widely spread domestic and foreign material on handicapped-accessible construction was systematically processed and integrated into the specifications of the standards for the general housing construction. The group of standards 18 024/18 025 was already unanimously accepted by the experts in the design phase and is today the starting point and reference point not only for the*

> *entire technical literature, but also for the practical planning and execution of handicapped-accessible buildings"*[12]

That is what Brohm and Juster (1976, 24) write in a publication of the Federal Ministry for Regional Planning, Building and Urban Development[13].

As the first European planning standard in this field, the standard indeed influenced German and international specialist literature. For example, they were adopted in the Neufert, which is also recognized beyond the borders of Germany as an architectural literary work most practitioners and students in the field of architecture and the built environment know. The standards in later versions were also explained in several books that enlarged on the implementation and proposed examples of floor plans or commented and explained the aims of and reasons for the DIN Standards. This is e.g. the case in *Die Wohnsituation der Körperbehinderten in der Bundesrepublik Deutschland* by J. Brohm and K. Juster from 1976 and *Lebensraumplanung und Haustechnik der Gemeinsamkeit* by D.P. Philippen from 1980 on a later version of the standard or the comment: *Der barrierefreie Lebensraum für alle Menschen – Leitfaden nach DIN 18 024 Teil 1 und Teil 2* by D.P. Philippen from 1998.

4.3. Effects on literature about architecture for a broader public

Not only literature for architectural professionals but also literature for a larger public was published to explain the aims of the standard such as in the *Spaziergang durch einen barrierefreien Lebensraum*, which is still updated and is now published in its fourth edition. It is a booklet that tells a story about five people with or without different kinds of disabilities and at different ages walking through a town where all barriers of different kinds have been removed (Philippen n.d.). The fact that accessibility had officially found its way into standardization and legislation was a step toward the elimination of social ills that had been raised in the civil rights movements of the 1960s. Nonetheless it just marked the beginning of a long way to an barrier-free environment which still is not entirely achieved.

4.4. Reception in the building practice

In social housing in particular, the DIN standard facilitated the design of barrier-free housing. Projects according to DIN were subsidised (Kirchhoff, Jacobs, and Metzler 1992, VII). However a frequently discussed point was still the increased costs due to the higher requirements. In a study by Woerdemann (1986), various housing projects were examined for cost savings in special forms of housing. The study came to the conclusion that, on the one hand the design of floorplans could be more flexible in the standard to compensate the additional floor space(e.g. space could be saved on the floor space for a table in the bedroom and only one bathroom would be suitable for the disabled in family flats is sufficient for everyone) and on the other hand that the users themselves are prepared to take over the costs to install additional equipment such as grab bars themselves. Additionally, uniform door widths could lead to savings through series production (Woerdemann 1986, 157–59).

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[12] „Durch Erarbeitung dieser Planungsnormen wurde erstmals das zahlreiche, aber verstreute in- und ausländische Material über behindeungs-gerechtes Bauen systematisch aufbereitet und in die Festlegungen der allgemeinen Wohnungsbau-Planungsnormen eingeordnet. Die Normengruppe 18 024/18 025 wurde bereits in der Entwurfsphase von der Fachwelt einhellig anerkannt und ist heute Ausgangs- und Bezugspunkt nicht nur für die gesamte Fachliteratur, sondern auch für die praktische Planung und Ausführung behinderten-gerechten Bauten."(Brohm and Juster 1976, 24)

[13] Schriftenreihe des Bundesministeriums für Raumordnung, Bauwesen und Städtebau.

The Schammatdorf housing project in Trier stands out as one of the examined case studies: 41 of 118 housing units have already been designed barrier-free according to DIN 18 025 and can also be occupied by severely disabled persons (Woerdemann 1986, 69). They are organized in groups of houses in order to motivate the inhabitants to help each other as can be seen in Figure 5.

However, the study also makes clear that the 18 025 was not understood as general standard but a special form of housing. The other social housing projects also have significantly fewer flats according to DIN 18 025 compared to the Schammatdorf. The paper shows that the reason for this is that the larger living spaces and additional fittings exceeded the minimum standard applicable at the time and this led to a rise in costs that many people didn't want or weren't able to afford. However, it is seen that the measures benefit not only people with disabilities but also people without disabilities and that for people who depend on the additional equipment and size the self-determined living would save money compared to a living in care home (Woerdemann 1986, 30).

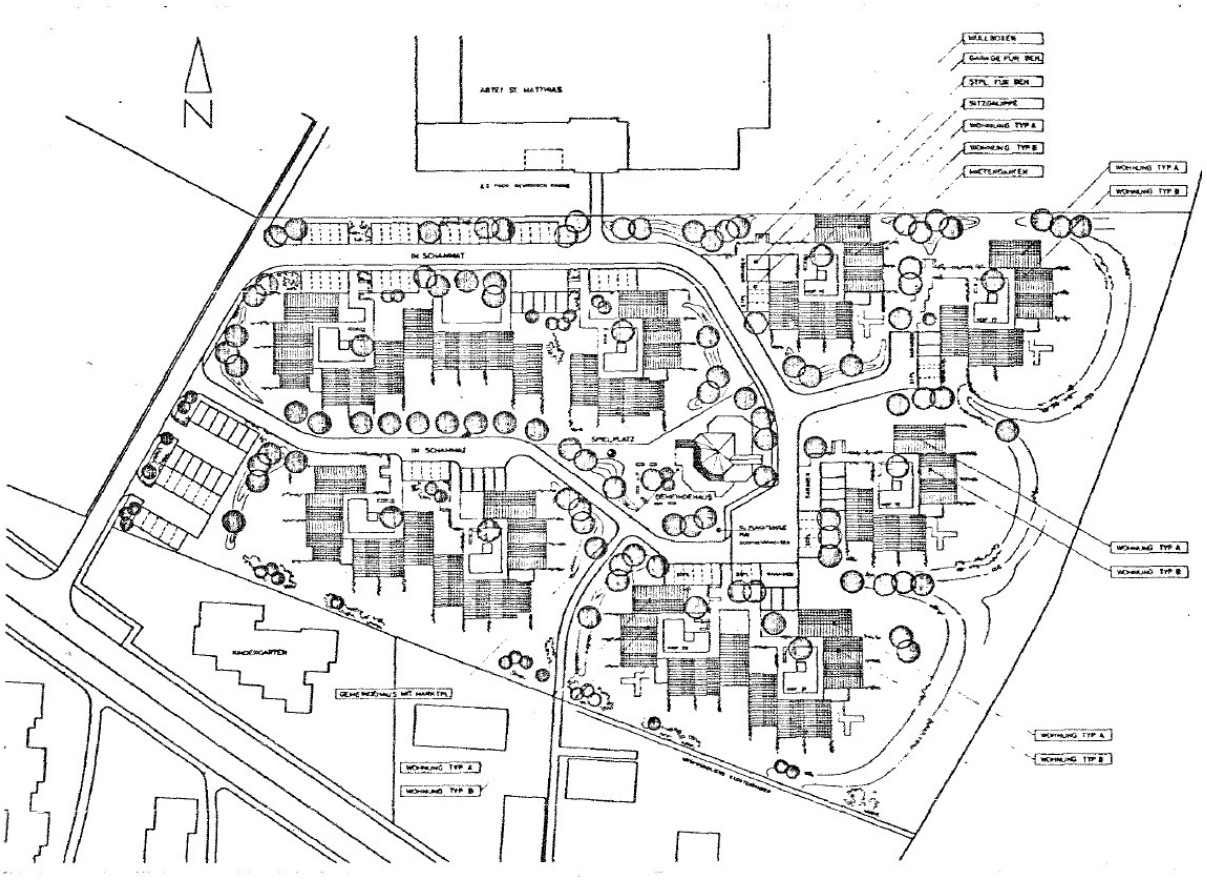

Figure 5: Plan of the Schammatdorf as shown in Woerdemann (1986, 73).

4.5. Critique and changes

The standard already had many supporters in the run-up to publication (Brohm and Juster 1976, 24), but in view of the fact that it was the first of this kind of a standard, there were also some suggestions for improvement after publication and even after the publication of improved editions.

Accuracy of terms

Criticism was voiced in particular with regard to the definition of the terms *housing* and the *barrier-free*:

Housing is treated here primarily as the material living space. The social contacts, which are connected with the dwelling are hardly taken into account, Schmieg and Fendl criticise (Schmieg and Fendl 1999, 67). This could be relevant e.g. in a multi-storey building where only the ground floor is barrier-free. To visit the neighbours on the upper floors would not be possible this way.

Barrier-free as discussed before, is a term that actually means a design that is not focused only on disabled people but is a design that is not excluding them by removing barriers in the built environment. Therefore it seemed surprising that in the first editions of the DIN *accessibility for wheelchair users* was explicitly mentioned, against the background that barrier-free is not to be equated straight with handicapped-accessible (van Triel and Lehn 2017). If buildings were designed especially for wheelchair users it would reduce the effect of the standard only to a small percentage of apartments and does not achieve the real goal of universal housing according to the criticism.

Instead of proposing standards that only take certain disabilities into account Schmieg and Fendl (1999,76) propose to instead divide the regulations into different building phases: Thus, there should be a distinction between e.g. mandatory sizes of rooms and a lift for the vertical circulation in the first phase of construction to be observed unchangeable provisions that are helpful to all people even with disabilities and additional flexible equipment adaptable to the individual form of disability.

However, it should also be mentioned that commentaries issued in addition to the standard may have defined the terms in more detail. Nevertheless, criticism is appropriate if the standard is to be understood as a record of the state of the art. For then it is not comprehensible that all supplements are necessary for understanding.

Intermediate space

The second problem was that the scope of DIN 18 025 ends at the front door of the residential building and DIN 18 024 only refers to the public space. Thus, semi-public and semi-private spaces are neglected and can still exclude people due to barriers that occur there. Although there is a note of the basic reachability of the apartment, this does not go far enough, according to the review (Schmieg and Fendl 1999, 67).

As also was proposed in the article of Schmieg and Fendl this was counteracted in 2010 to 2014 by the merging of both standards in the later standard DIN 18 040 Parts 1-3. Here, for example, in 18 040 Part 1, the associated outdoor facilities are added to the scope.

Inflexible measurements

While on the one hand the definitions are perceived as too vague, on the other hand the opposite is the case with the measurements. For the critics, the standard is perceived as too rigid (Schmieg and Fendl 1999, 68). This is remarkable because the standard seems to have

been designed to be extra flexible: Thus Philippen writes “Contrary to what one would expect from norm works, these new approaches are helpful as advisory documents and, moreover, flexible as well as creatively supportive”[14] (Philippen 1995, 19). In the assessment, it is of great importance to what extent the standards are seen as mandatory, for example through legal binding.

Implementation and further development

Criticism was also expressed with regard to the implementation of the standard. Problems exist here, for example, in the application of the standard with other regulations, law and interests such as for example the protection of historical monuments. Since the standard is not legally binding, compliance with the standard becomes a political decision in some cases (van Triel and Lehn 2017, 16).

Schmieg & Fendl (1999, 71) also call for a self-realization of the state for the consistent application of the new DIN standards in construction activity in the public sector.

In order to deal with the critics, since 1998, there was the approach to merge the two first DIN standards into one which was dealt with under the name the DIN 18 030. When there was the opposition proceeding for this new joint standard however there was no agreement found. Therefore the committee started working on a new version and finally came with the DIN 18040 which is currently applicable.

[14] "Anders als man das von Normwerken erwartet, sind diese neuen Ansätze hilfreich als Beratungsunterlagen und darüber hinaus flexibel sowie kreativ fördernd." (Philippen 1995, 19)

III. Conclusion

A finding of this study was that the aim of the movement from which the DIN 18 024 and 18 025 emerged was equality through the built environment for all people, although the first edition of the standard still focused on special forms of housing. This is because of the fact, that the idea of accessibility developed particularly through the emancipation of people with disabilities. Later, however, accessibility struggled to distinguish itself from the concept of purely disability- or even only wheelchair-accessible building. It can also be seen in the criticism that precisely this further development of the standard (namely to a more universal approach) was desired.

In its evolution, the standard was at all times directly connected to socio-political movements, architectural developments in the field of dwellings, and legal equality. Three stages can be seen in this evolution:

The first stage begins with the social rethinking inspired mainly by the American movements after the Vietnam War. Through this, political attention developed on the inequality in self-determination of people with disabilities caused by the barriers in the built environment.

The second stage is the one on which the first edition of the standard was published: the consideration of this inequality through a special standard for a living environment that should enable people with disabilities to live a largely self-determined life.

The third stage is the one on which the standard developed further. It is characterized by the realisation that more people than just those with disabilities are affected by barriers in the built environment. It was found that the standards were still too specialised, particularly regarding the fact that also demographic changes made it necessary to change the built environment and therefore to expand the standard. As a result the DIN 18 024 and 18 025 were further developed until they were merged to the DIN 18 040 and since this stage had *barrier-free design* also stated in its title.

In practice the DIN was, next to private construction projects, mainly used as a guide for special forms of housing. This was above all for cost reasons as the minimum requirements for a living exceeded the ones for a regular social housing.

To directly relate the findings above to the hypothesis given in the introduction of this paper, the DIN standards in fact had an effect on architecture practice through law and guiding literature and also on the society. The standards meant a rethinking in architecture, which from then on took into account that people with disabilities could live a more self-determined life. In addition, the beginnings of reacting on demographic change can be seen.

For all people who were affected by the built barriers, especially people with disabilities, the standardisation has improved many things, even if the path to a completely barrier-free environment is still far from complete. In a way, the DIN standards of the 1970s were ahead of their time, because the greatest developments in this area in Europe were only in the 1980s and 1990s, and at European level such a standard has only now been published.

Contemporary building practice and its standardisation derived to an extent from classical anthropometric traditions that originally idealized the body for designing purposes. Today, instead of idealizing, the development of ergonomic knowledge and human measures of everybody in different situations and ages should be taken into account. In the future, it will be important that all those involved in financing, planning, construction and renovation of buildings, and especially architects, are sensitised to the issue of barrier-free building. Informing more about this topic is crucial, because a standard or any legal obligation does not

directly create understanding for the necessity of this topic. This lack of understanding that barrier-free building does effect everybody is recognizable in the fact that the concept of barrier-free design is still often confused with that of design for people with disabilities. Further the misunderstanding is why many people do not feel addressed. Consequently, accessibility is often put on the back burner or is not fully thought through in design.

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