ACCESS FLOORING IN BUILDINGS

SAFETY GUIDLINES
FOR ACCESS FLOORING

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Bundesverband Systemböden e.V

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With these safety guidelines, the Bundesverband Systemböden e.V (German association of flooring systems) is establishing a standard in safety technology, which is a necessary precondition for the manufacture of access floors and for the safety in use.

Access flooring systems are designed and manufactured in accordance with the safety requirements and are undergoing constant technological development. For this reason, the technical requirements which are the subject of the safety guidelines must be regularly brought in line with the state of the art in technology.

Only access flooring systems which, above and beyond complying with the usual manufacturing standards, meet the requirements for safety technology of the Bundesverband Systemböden with regard to their design and stability, materials and processing, and thus durability, are awarded with the BVS safety certificate for access floors.

The safety standard is under constant supervision by the manufacturers continuos factory control plus regular external supervision by independent test institutes and experts commissioned by the Bundesverband.

This monitoring of safety standards ensures that the necessary criteria for the safety in use are complied with, thus establishing reliable guidelines for the selection of access floors.

The installation of access floors which has been awarded with the safety certificate gives the user or client the guarantee that he is complying to the highest degree possible with the very latest standards with regard to safety, liability and the protection of labour.

These guidelines are under constant revision to keep pace with the state of the art in technical progress. The latest version can be obtained from the Bundesverband Systemböden, Düsseldorf.

Bundesverband Systemböden e.V.

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Safety guidelines for access floors

The safety guidelines for access floors lays down requirements with regard to the safety and suitability of access flooring systems and with regard to the construction and production of access flooring elements.

1. General

1.1 Field of application

These safety guidelines apply, for example, to access floors used

- in offices and administrative areas,
- in EDP centres and peripheral rooms,
- in work shops and work rooms for manufacture,
- in combination with hollow floor systems.
-

1.2 Explanation of terms

Access flooring system
A system used in the interior of buildings, which, under the whole of its area, incorporates an easily accessible installation cavity to accommodate all installations, all incoming and outgoing lines. This system uses ready-produced, modular components. The access flooring system consists by linking (assembly in buildings) these individual components to an unite area.

Access flooring element
The access flooring element is the smallest portable module of the access flooring system. The access flooring element consists basically of a access flooring panel and a substructure. The substructure, in turn, basically consists of four pedestals and the corresponding supporting elements or pedestal head caps. The substructure may also comprise horizontal reinforcing elements, such as stringers.

Access flooring components
In particular, access flooring consists of components such as

- access flooring panels, with or without floor covering;
- access flooring pedestals for varying construction heights;
- access flooring stringers, for load-bearing and/or sealing and/or reinforcing purposes;
- other system equipment such as pedestal head caps/ support elements, adhesive, linkage elements, bridging elements.

1.3 General premises

Where installed, access flooring is by its nature subject to constant stress. Therefore, its elements must fulfil certain preconditions. There follows a description of the required characteristics and preconditions. The customer is required to pass on any information on special requirements, particularly if these relate to safety specifications in the outset to ensure that the design and construction of the access flooring meet the individual requirements in each case. A specialist engineer should be involved in both planning and installation in order to co-ordinate the special requirements of the job in hand and the observation of the relevant safety standards.

1.4 Materials

The characteristics of the finished product depend on the characteristics of the materials used. These materials must be suited to the purpose to which they are applied. Fluctuations in dimension or characteristics as a result of changes in temperature and/or humidity may be specific to the material, in which case they are given physical factors and are appropriate to state-of-the-art technology. Adaption to the ambient climatic conditions has to be taken in account during planing and construction. Thus, a minimum level of safety can be guaranteed.
Access flooring components can, for example, be made of

- organic materials
- materials of mineral origin,
- materials of metallic origin,
- synthetic materials,

or of combinations of different materials.

1.5 Quality of materials

All materials used shall be subject to quality testing during production and processing, in order to ensure a constant level of product safety. At the least, test self certificates in accordance with DIN 50049 will be required.

1.6 Hazardous substances

The materials must conform to legal requirements with regard to Dangerous Materials Act (GeFStoffV) and other applicable regulations and laws, e.g. all panels comprising timber-derived products must at least comply to emission grade E1.

1.7 Climatic conditions

As standard, the materials used in the access flooring components are intended to fulfil the requirements for use under normal climatic conditions. (Temperatures of 15 - 25°C at a relative air humidity of 40-65%).

1.8 Special measures

For example, if the climatic conditions are expected to deviate from the normal climatic conditions for access floors, there are special safety precautions which are to be taken or can be arranged on request.
If, for example, the flooring is used where corrosive liquids, gases or radiation are to be expected, appropriate measures to ensure the safety of the access flooring system must be taken.

1.9 Special access flooring panels

In the case of special access flooring panels, special characteristics can be specified. These must be considered separately from the point of view of safety. Such special panels are, for example, cut-out panels, panels in association with electrical equipment, ventilation panels and panels whose length of the edges deviate from the grid of the system or from the normal rectangular shape.

1.10 Test conditions

The test procedures described in these guidelines are carried out on the manufacturer's premises or in testing laboratories under predefined test conditions. This is necessary that test results are exact and reproducible.
To evaluate individual test results, a confidence level of 95% is required.

1.11 Safety-relevant industrial standards and guidelines

- DIN 1052 - timber structures, design and construction
- DIN 1055 - design loads in construction engineering
- DIN ISO 1101 - form and site tolerance
- DIN 4102 - fire behaviour of building materials and components
- DIN 4103 - internal non-loadbearing partitions
- DIN 4109 - soundinsolation in buildings, requirements and verification
- DIN 4149 - building structures in German seismic areas
- DIN 18 202 - dimensional tolerance in building construction, - buildings
- DIN 18 299 - general regulations for building work
- DIN 18 334 - carpentry and joinery work
- DIN 18 331 - concrete- and reinforced concrete work
- DIN 18 353 - floor screed works
- DIN 18 365 - work on floor coverings
- DIN 50 014 - air-conditioning equipment and its application
- DIN 50 021 - spray-mist testing with various sodium chloride solutions
- DIN 50 049 - issuing works test certificates
- DIN 50 960 - electro-plating and chemical coatings; designations and specifications

- DIN 50 961 - electro-plating
- DIN 50 981 - magnetic procedures for measuring the thickness of non-ferromagnetic layers on ferromagnetic material
- DIN 51 953 - testing of organic floor coverings, testing the conductance
- DIN 51 963 - testing of organic floor coverings, cycle testing
- DIN 52 210 - test in building acoustics, airborne and inpact sound insolation
- DIN 54 345 - testing textiles, electrostatic performance
- DIN 68 771 - sub-floors of wood chipboard
- DIN V ENV 1991-2-1 - basics of supporting framework design
- VDI 3762 - soundproofing with access and hollow flooring
- Manual for hollow flooring from the Bundesverband Systemböden
- Safety guidelines for hollow flooring from the Bundesverband Systemböden
- MBO Musterbauordnung (sample building ordinance)
- LBO Landesbauordnung (regional building ordinance)
- NFPA 99
- VDE 0100 Part 610
- RAL-RG 725/3 -electrical properties of elastic and textile floor coverings
- EU Construction Products Directive (CPD)
- Application-specific requirements and guidelines such as for clean rooms, shipbuilding, shelters etc.. in as far as relevant for a building

2. Safety requirements

2.1 Safety requirements for the access flooring element

2.1.1 Design load

With regard to stability and strain, access floors have to be approached under aspects which differ from those of normal static because of the special static characteristics of access flooring. In general, it is not the area load which are decisive for the safety of a access floor, but the point load.

The principle of design load is:

load spacing > modular dimension

Loads where the points of load application are closer together than the modular dimension (grid) are to be taken together and their sum used for the calculation of the point load.

The access floor is assigned to the individual load classes on the basis of its static properties.

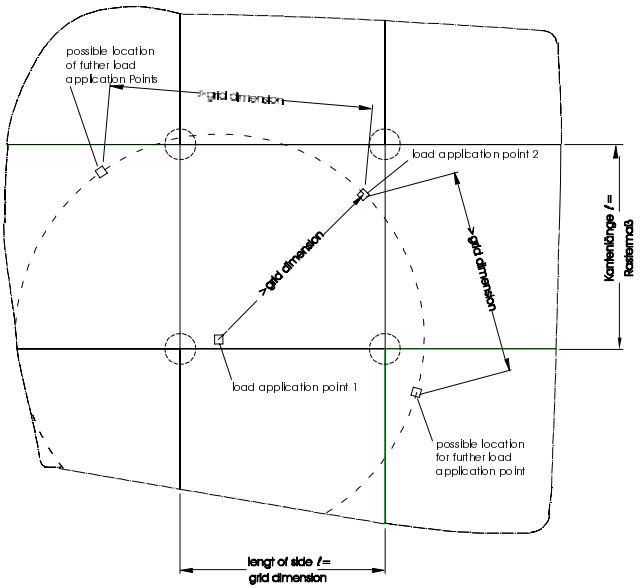


Figure 1 : Position of possible load application points

When transporting articles with lift-trucks, fork-lift trucks and similar vehicles, point loads are caused by their wheels. In the movement sequence, this is no longer a static but a dynamic load. For calculation purposes, the oscillation coefficient in accordance with DIN 1055 must be taken into account:

point load to be applied = effective point load x oscillation coefficient φ

Following DIN 1055, the following oscillation coefficients can be applied:

manually operated transport devices: oscillation coefficient φ = 1.3

motor-driven transport devices: oscillation coefficient φ = 1.5

Note:

Depending on the use, load states may occur which require oscillation coefficients of φ ≧2.0.

In addition, the wheel construction and the wheel material also have a decisive influence on the oscillation coefficient. This must be taken into consideration when planning.

2.1.2 Load grades

Load grade	Nominal point load [N]	Safety load [1] [N]	Examples of application
2	2000	4000	Offices which are not used by many people.
3	3000	6000	Normal office areas, telephone exchanges, lecture theatres, school and treatment rooms, clean rooms
4	4000	8000	commercial EDP rooms and adjacent rooms, engineering offices, clean rooms
5	5000	10000	EDP rooms and office rooms with special requirements or which are frequented by many people, printing rooms, industrial floors in light industry, storerooms, workshops in light industry, clean rooms
6 [2]	6000	12000	Floors in rooms where industrial trucks are used, industrial and workshop floors, strongrooms, clean rooms

[1] Taking safety value ν = 2 into account

[2] For access flooring in individual cases with special requirements, further load grades can be defined. For these load grades the ration is: Load grade (integer values) x 100 N = nominal point load

Table 1 : Classification of load grades

2.1.3 Requirements to the load bearing capacity of access flooring elements

The load bearing capacity is of decisive importance for the safety of a access flooring element. The load bearing capacity is tested on the access flooring element in the testing laboratory.

In use, the components of a access flooring system should never be exposed to loads which reach their borderline values. The maximum value is predefined by the static nominal point load.

A safety coefficient ν of 2 is required for a access flooring element, i.e. the safety load corresponds to the double nominal point load. The ultimate load determined by laboratory testing must be $\geq$ safety load.

2.1.4 Test procedure

2.1.4.1 Test sequence

For testing, the access flooring panel is laid on the substructure of the specific access flooring system. The pedestals are firmly fixed to the base. The testing height is determined by the maximum nominal height and the maximum permissible adjustment range. The load is applied to the access flooring element via a indentor with an edge length of 25 x 25 mm. The edges which have contact with the material may be rounded to a maximum radius of 2 mm. During testing, the load is increased continuously with a load increase of 100 N/s $\pm$ 10 N/s.

The load is applied to points

- I-1 in the centre of the panel
- I-2 in the centre of the edge of the panel
- I-3 in the area close to the panel corners
- I-4 in the area of a ribbed field (field area)
- II-5 simultaneously in the are of the panel corner and on the diagonal of the panel

or at any point the institute carrying out the test well founded defined as the weakest point on the access flooring element. The institute will state its reasons for the selection of this point. (see also Figure 2)

If the system used means that it is problematical to apply the load at one of the preselected load application points, the testing institute may choose to apply the load at a point in the direct vicinity of the preselected load application point.

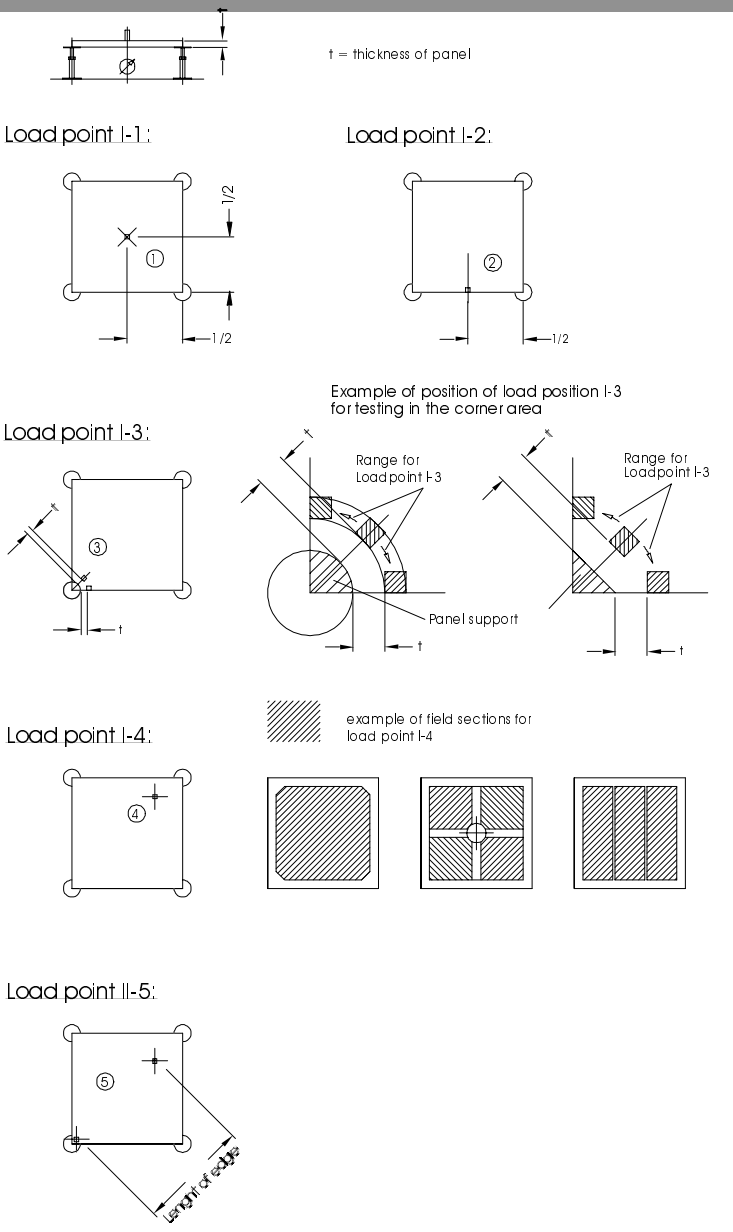


Figure 2: Load application points I-1 to II-5

2.1.4.2 Testing

Measurements are taken to ascertain whether the safety load is reached at the load application points defined in 2.1.4.1.

To effect testing, an preloading of up to the nominal point load is applied and the panel then relieved.

The load is increased continuously until the nominal point load is increased by the value of the safety coefficient.

For load application point I-2, the vertical movement of the access flooring panel under the nominal point load is measured and documented, starting from the original position.

2.2 Safety requirements for access flooring panels

2.2.1 Dimensional accuracy

2.2.1.1. General information

The dimensional accuracy of access flooring panels is relevant to the safety as the overall surface of the panels will not hold together correctly if the panels do not fit together properly. Also, there is a danger of stumbling as a result of height differences due to e.g. deviations in thickness.

When checking the dimensional accuracy, the following geometrical measurements are taken on access flooring panels during or immediately after manufacture. Shape and position tolerance levels are defined in accordance with DIN ISO 1101.

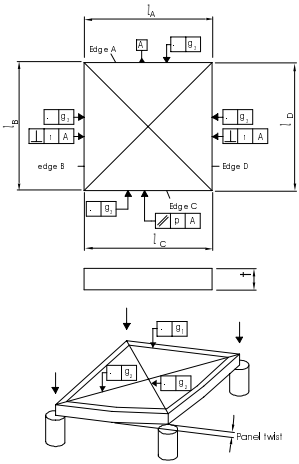


Figure 3: Dimensions of a access flooring panel

2.2.1.2 Requirements

	Symbols	Column 1 [mm]	Column 2 [mm]
DIMENSIONS RELATING TO SIZE			
1. Lenght of sides	$l_A ... l_D$	± 0,3 (± 0,4)	± 0,4 (± 0,6)
2. Squaring of the faces B and D to side edge A 	r	0,4 (0,5)	0,6 (0,7)
3. Parallelism of face C to face A 	p	0,4(0,5)	0,6(0,7)
4. Straightness of the four faces in the area of the panel touching edges 	g_3	0,3 (0,5)	0,5 (0,7)
DIMENSIONS RELATING TO THICKNESS			
5. Panel thickness at the contact corners*)	t	± 0,3	± 0,5
6. panel twist on one corner *)	v	0,5 (0,8)	0,8 (1,0)
7. Straightness of the upper panel surface at the edges *) 	g_1	0,5 (0,8)	0,8(1,0)
8. Straightness of the upper panel surface in the area of the diagonals *) 	g_2	0,9 (1,4)	1,2 (1,8)

- Measurement tolerance levels for floor panels with edge lengths of 500 mm to 650 mm
- Measurement tolerance levels for edge lengths > 650 in brackets
- *) without influence from the floor coverings
- COLUMN 1 Special measurement tolerance levels with increased optical requirements (for e.g. application of floor coverings which emphasise seams)
- COLUMN 2 Safety-relevant measurement tolerance levels (for example, application of textile floor coverings and coverings which cover seams)

Table 2 : Dimensional tolerances

2.2.1.3 Test procedure

The mesurements are taken using appropriate gauges and measuring devices. In accordance with the general rules of measurement, the applied measuring instruments should show an accuracy of less than 10% of the measurement tolerance levels as defined in table 2.

2.2.2. Deflection

2.2.2.1 Requirements

The geometrical positions of the load application points are shown in 2.1.4.

The maximum deflection at load application point I -2 (middle of panel edge) has to be as following:

l/ /300 $\geq$ average value of deflection measurements $\leq$ 2.5 mm, where l = length of panel edge.

The maximum deflection at load application point I -1 (centre of panel) has to be as following:

l_a /300 $\geq$ average value of deflection measurements $\leq$ 3.5 mm, where l_a = length of panel diagonal.

2.2.2.2 Test procedure

During testing, the access flooring panels lie on solid support blocks arranged in one level surface. The bearing surface is formed by the 90° section of a steel cylinder with a diameter of 90 mm as a corner support.

Deflection is measured in the centre of the load application on the underside of the access flooring panel and when the nominal point load is reached.

The load is applied to the access flooring element via an indentor with an edge length of 25 x 25 mm. The edges of the indentor which contact the surface of the panel may be rounded to a maximum radius of 2 mm. The load is increased continuously during the test, with a load increase of 100 N/s $\pm$ 10 N/s.

In the case of ribbed access flooring panels, a measuring frame may be used to measure the degree of deflection, as shown in Figure 4.

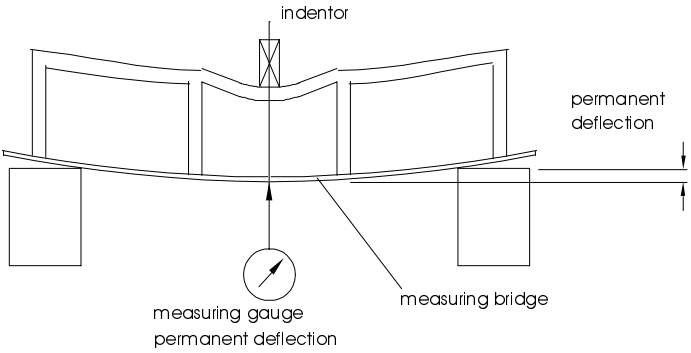


Figure 4: Measurement of deflection on ribbed panels

If stringers are used to increase the load strength of the access flooring panel to be tested, these stringers must be included in the test for deflection.

2.2.3 Permanent deflection and permanent local deformation

2.2.3.1 Requirements

Permanent deflection [mm]	Permanent local deformation [mm]
0,5	0,8
applies to all panel types	applies to panels with ribbed supporting structure

Table 3: Maximum values for permanent deflection and permanent local deformation after removal of the nominal point load

2.2.3.2 Testing for permanent deflection

The nominal point load is applied to the access flooring panels at the critical load point for deflection and for a period of 15 minutes.

The deflection is measured in the centre of the load application point on the underside of the access flooring panel and when the static nominal point load is reached.

The load is applied to the access flooring panel via a indentor with an edge length of 25 x 25 mm. The edges of the testing stamp which contact the panel may be rounded to a maximum radius of 2 mm.

The load has to be increased continuously during the test, with a load increase of 100 N/s $\pm$ 10 N/s.

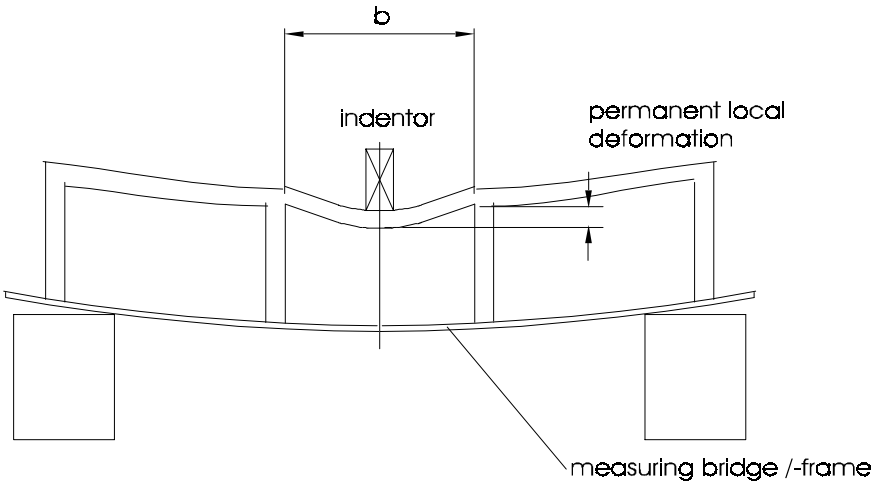
In the case of ribbed access flooring panels, a measuring bridge can be used to measure the deflection, as shown in Figure 4.

The permanent deflection is measured 5 Minutes after the load is released. The maximum permissible values are listed in table 3.

2.2.3.3 Testing for permanent local deformation

It is only necessary to measure the degree of permanent localised deformation on access flooring panels of ribbed construction.

Testing is carried out at the most critical load point for deformation in a field section. The nominal point load is applied to the access flooring panel for a period of 15 minutes via the indentor (see 2.2.3.2). The permanent local deformation is measured 5 minutes after the load has been released. The base dimension b of the measuring device corresponds to the clearance between, for example, ridges. The maximum permissible tolerance level is listed in table 3.



b = clearance between the ridges

Figure 5 : Measuring the degree of permanent localised deformation

2.2.4 Corrosion - proofing for access flooring panels

2.2.4.1 Requirements

In order to guarantee continual compliance with the safety requirements, all corroding materials in the access flooring panels must be corrosion - proofed.

The corrosion - proofing must fulfil the following requirements:

The quality of the corrosion-proofing must correspond to a 5 µm electropaneld zinc coat with any chromating (designation X in accordance with DIN 50960 Part 1). This corrosion-proofing should be in accordance with an expected stress of stage 1 (light), in compliance with DIN 50961.

For normal applications, materials of non-ferrous metals like, for example, aluminium, copper or brass alloys as well as stainless steels need no additional corrosion-proofing.

Zinc plating

Zinc plating and chromatised zinc plating with a thickness which deviates from the requirements are to be considered as equivalent, without corrosion testing, if the duration as defined in DIN 50961 table 1 of the salt spray testing of this plating in accordance with DIN 50021 SS is at least 48 hours.

Alternative protection

All corrosion protection procedures are permissible in as far as they comply with the above-listed requirements in the degree of protection they offer. This must be ascertained and documented in the initial testing stage. The effectivity of the protection is tested using a testing body by salt spray testing in accordance with DIN 50021 - SS with a test duration of 48 hours. The aim of this test is to ascertain the necessary thickness of the plating for the alternative protection process. A list of permissible types of protection with the corresponding plating thicknesses will be drawn up by the testing institute.

Special requirements

For special application areas, special measures must be defined and tested in each case. Such special application areas are, for example, developing rooms for photographic and film material, laboratories, testing rooms, clean rooms, rooms with special requirements.

Exceptions

Thread surfaces, fuse elements and standardised parts such as nuts, spring

washers, serrated lock washers, sheet metal counternuts, crown gears etc.. must be have verifiably received the corrosion-proofing which is usual for such mass-produced parts (galvanising, black finishing etc..). No testing is carried out. The use of such parts is documented in the test report.

2.2.4.2 Procedure for testing

The thickness of the layers on all components used in the construction must be measured to establish whether the required degree of corrosion-proofing is given. The thickness of the layers is measured in various places spread evenly over the component part. The average layer thickness must be equivalent to at least the required thickness, depending on the type of protection, in each measuring location.

Measurements are taken using a measuring device which works according to the principles of magnetic measuring. (DIN 50 981).

2.2.5 Floor coverings

2.2.5.1 General information

Peeling floor coverings represent a hazard. This means that the adhesion of the floor covering is a safety-relevant criterion. The adhesion of the floor coverings must comply with the stipulations of DIN 18365 'Work on floor coverings', and the coverings must retain their essential basic properties after processing. The individual characteristics of the floor coverings when used for their intended purpose must be adapted to conform to the special requirements for use with access flooring systems, and self certificates in accordance with DIN 50049 must be obtained from the manufacturer to attest that this has been done. The floor coverings used must conform at least to the relevant product and material standards in each case.

Textile floor coverings

Due to the great variety of manufacturing processes, materials and dyeing methods for floor coverings and the special requirements placed on them when they are applied to access flooring panels and in their subsequent use in conjunction with such panels, it must be established that the coverings are suitable for use on access floors.

Safety requirements for textile floor coverings:

a) The dimensional stability of the coverings once they have been glued down must be retained after appropriate cleaning.
b) Coverings with foam backings are not permissible.
c) The backing must be firmly linked with the back of the covering.
d) Peeling values of > 0.8 N/mm must be possible without the backing splitting.

Elastic floor coverings

As in the case of the textile floor coverings, the various materials (PVC, caoutchouc, linoleum etc..) must be firmly glued to the access flooring panels.

The dimensional deviation when the floor coverings before application are tested in accordance with DIN 51 963 (three measuring cycles at 80° C) must not be more than 0.1%.

Other floor coverings

Some floor coverings used on access floors cannot be evaluated in the course of a generally valid safety assessment. Such floor coverings are, for example,:

natural and synthetic stone
HPL (laminated covering)
parquet flooring
flexible covering
ceramic coverings
metal-layered flooring

For these materials, the suitability must be tested for each individual case, paying attention to the relevant material standards (or, where appropriate, with reference to the individual project.

2.2.5.2 Requirements with regard to gluing

The test for resistance to peeling examines the suitability of adhesive methods for textile and elastic floor coverings.

The resistance to peeling (arithmetical average) of a access flooring panel (two test strips) must be at least 0.8 N/mm. Each individual test strip must have a resistance of $\geq$ 0.65 N/mm. Over a measured lenght of 100 mm, the average value of the resistance to peeling may not drop below 0.4 N/mm.

2.2.5.3 Testing the resistance to peeling

In order to assess the resistance to peeling, two test strips are cut from the access flooring panel to be tested, as shown in Figure 6.

The strips are of the following size:

width of strip b = 50 mm
length of strip s$\geq$ 0.5 x edge length l

The arrows in Figure 6 show the direction in which peeling is effected during the test.

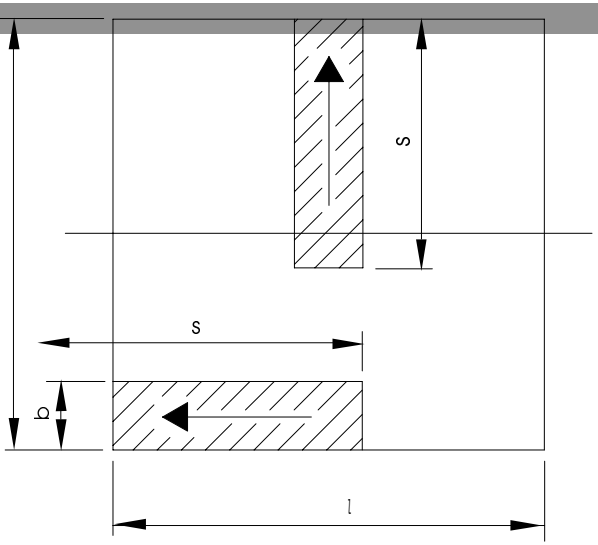


Figure 6 : Arrangement of the test strips from a access flooring panel for testing of the resistance to peeling

During the test, the test strip is peeled off perpendicular to the access flooring panel at a constant sped of 100 mm/min ± 10 mm/min and the peeling force measured continuously over the whole length of the test strip. The average resistance to peeling for one test strip can then be calculated as follows:

$$\text{average peel resistance} = \frac{\text{average peeling force}}{\text{width of test strip}}$$

2.3 Safety requirements for the substructure

2.3.1 General information

The requirements on the components of the substructure listed hereafter particularly safety characteristics.

In use, each access flooring system must absorb and conduct vertical and horizontal forces. When setting the requirements the type of construction must be taken into consideration.

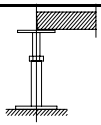
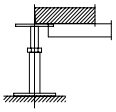
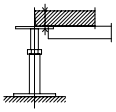
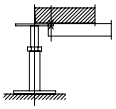
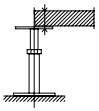
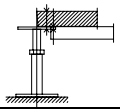
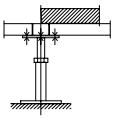
Components Arrangement	Components	Mechanical link	Fixing of pedestals	Type of construction
	Access floor panel	Loose laying panel	Fixed pedestal	1
	Access floor panel Stringer	Loose laying panel stringer connected	Fixed pedestal	2
	Access floor panel Stringer	Access flooring panel non-positively linked, stringer connected	Fixed pedestal pedestal loose	3.1 4.1
	Access floor panel Stringer	Access flooring-panel lying loose, stringer linked non-positively	Fixed pedestal pedestal loose	3.2 4.2
	Access floor panel	Access flooring panel, linked non-positively	Fixed pedestal pedestal loose	3.3 4.3
	Access floor panel Stringer	Access flooring panel and stringer linked non-positively	Fixed pedestal pedestal loose	3.4 4.4
	Access floor panel loose laying Stringer	Access floor panel loose laying, pedestal and stringer form a non-positively linked surface	pedestal loose or fixed	5

Table 4: Examples of types of buildings for substructures

2.3.2 Vertical eccentric load on the substructure

2.3.2.1 Requirements

Testing at the nominal point load is defined as a safety characteristic independent of the element test, in order to allow for substructure testing to accompany the construction process.

With eccentric loading with the nominal point load, the plastic deformation of the pedestal head must not exceed 0.3mm (measured at a distance of 45 mm from the centre of the pedestal head). For substructure of construction type 5, there is no such requirement.

In addition, the permanent change in length of the pedestal must be smaller than 0.3 mm.

Testing

To test the substructure, the pedestals are tested as one construction component, standing free at maximum nominal height and the highest permissible adjustment range. The base panel is fixed firmly to the testing device.

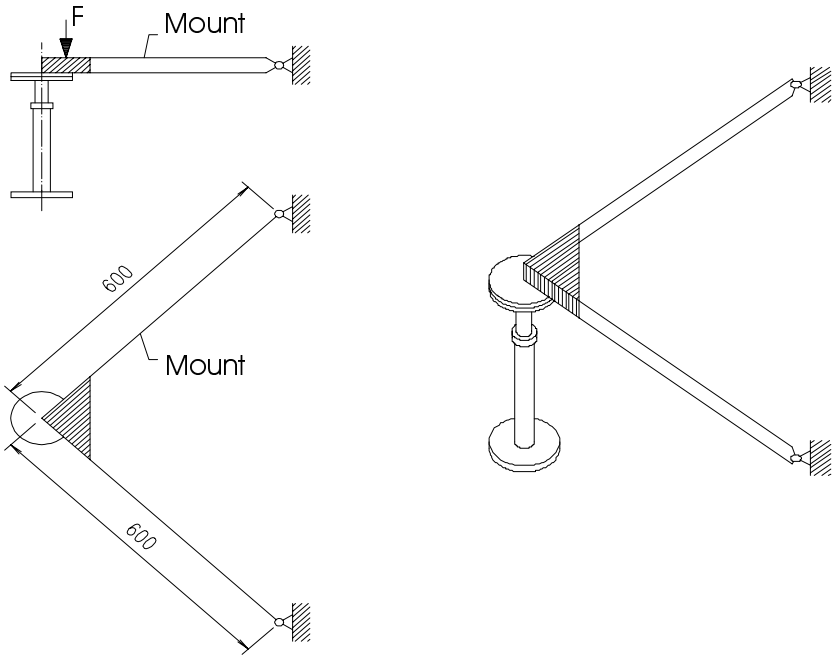


Figure 7: Testing the vertical eccentric load

In order to test the vertical eccentric load, the nominal point load is applied to the pedestal via a testing stamp and a jointed, bearing-mounted mount. Any supported elements or pedestal-head pads are included in the test.

The load is applied centrally via a 50 x 50 mm testing stamp which is positioned on the corner of the load application panel (holder). A 20 mm rubber element with a hardness of 60° Shore D is inserted between the load application panel and the pedestal head.

The load is increased continuously at 100 N/s + 10 N/s, until the stated nominal point load is reached.
After the application of the load, the permanent length change is in the middle of the pedestal and the plastic deformation of the pedestal head are measured. The change in the measurement is defined before and after the application of the nominal point load.

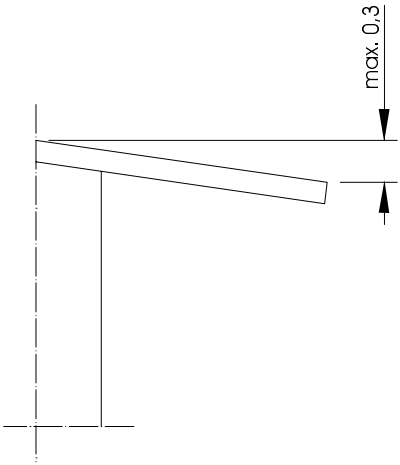


Figure 8 : An example of possible plastic deformation of the pedestal head

2.3.3 Horizontal load on the pedestals

2.3.3.1 Requirements

In practical use, every access flooring system is loaded horizontaly. The force can be applied to the system via the access flooring panel or via the substructure.

The requirements under horizontal load serve exclusively to evaluate the static strength of the components, not of the composite adhesive strength of the normal attachment of the components to the raw floor in assembly.
Table 4 shows a selection of different types of building.

Load grade	Horizontal nominal load F_h [N]	Reduction coefficient for type 1	2	3,4 u. 5
2	60	1,0	0,5	0
3	90	1,0	0,5	0
4	120	1,0	0,5	0
5	150	1,0	0,5	0
6 and higher	Nominal point load x 0,03	1,0	0,5	0

Table 5: Horizontal loads and reduction coefficients, depending on

The horizontal nominal testing load F_p is calculated on the basis of the nominal horizontal load F_h x reduction coefficient.
The permanent deformation (crookedness) after the application of the nominal horizontal testing load must be < 1% in average of a test batch.
The safety coefficient in the direction of the horizontal load must be at least 2.
In the case of substructures of building type 1, the maximum deflection A_L of the pedestal head must not exceed D/2 at double nominal horizontal load F_h. (D = diameter of the pedestal head; in the case of rectangular pedestal heads, the smaller value applies).

Necessary tests	types 1	2	3,4 und 5
1. The application of nominal horizontal testing load F_p	√	√	
2. The measurement of the permanent deformation after loading	√	√	
3. The application of the 2-fold nominal horizontal load Fp	√	√	
4. The measurement of the deflection at the pedestal head	√		
5. Testing of the cohesion of the individual components under 2-fold nominal horizontal load F_h			√

Table 6: Testing depending on the type of building

2.3.3.2 Testing

The pedestals are to be tested free-standing as a total construction part at maximum nominal height and the highest permissible adjustment range. The base panel is firmly fixed to the testing device. The size of the nominal horizontal testing load F_p is determined according to load grade and the type of building, in accordance with table 5. The load is effective on the pedestal head.

The necessary tests are listed in table 6.

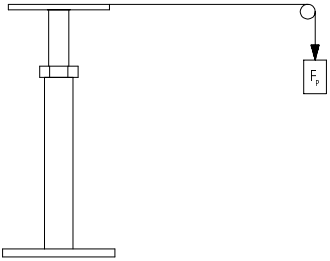


Figure 9 : Testing under the nominal horizontal testing load F_p

In the case of access flooring systems for buildings of type 3, 4 and 5, with form-fit or non-positive linking of the individual components for the transmission of horizontal forces, these links are tested under 2-fold nominal horizontal testing load F_h. The link (e.g. screw, stop catch.....) must not fail under this load.

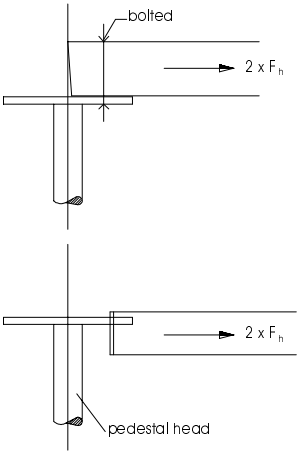


Figure 10 : Example of form-fit and non-positive links

2.3.4 Protection against corrosion

2.3.4.1 Requirements

All materials which are at risk from corrosion on access flooring panels must be corrosion-proofed. This is necessary to maintain the safety-relevant component characteristics. The following are the requirements for corrosion-proofing.

The quality of the corrosion-proofing for the maintenance of product safety must correspond to an electropaneld zinc coating with a thickness of 8 µm with any

chromating (designation X in accordance with DIN 50960 Part 1). This corrosion-proofing is equivalent to an expected corrosion level of stage 2 (moderate) in accordance with DIN 50961.
For normal applications, materials of non-ferrous metals such as aluminium, copper and messing alloys and stainless steel need no additional corrosion-proofing.

Zinc plating
Zinc platings and chromatised zinc platings of thicknesses other than those required are to be considered as equivalent without corrosion testing, if the testing period stated in table 1 of DIN 50961 for the salt spray test in accordance with DIN 50021 is at least 72 hours.

Alternative protection
All corrosion protection procedures are permissible in as far as they comply with the above-listed requirements in the degree of protection they offer. This must be ascertained and documented in the initial testing stage. The effectivity of the protection is tested using a testing body by salt spray testing in accordance with DIN 50021 - SS with a test duration of 72 hours. The aim of this test is to ascertain the necessary thickness of the plating for the alternative protection. A list of permissible types of protection with the corresponding plating thicknesses will be drawn up by the testing institute.

Special requirements
For special application areas, special measures must be defined and tested in each case. Such special application areas are, for example, developing rooms for photographic and film material, laboratories, testing floors, clean rooms, rooms with special requirements.

Exceptions
Thread surfaces, fuse elements and standardised parts such as nuts, spring washers, serrated lock washers, sheet metal counternuts, crown gears etc.. must be have verifiably received the corrosion-proofing which is usual for such mass-produced parts (galvanising, black finishing etc..). No testing is carried out. The use of such parts is documented in the test report.

2.3.4.2 Testing
The thickness of the layers on all components used in the construction must be measured to establish whether the required degree of corrosion-proofing is given. The

thickness of the layers is measured in various places spread evenly over the component part. The average layer thickness must be equivalent to at least the required thickness, depending on the type of protection, in each measuring location.
Measurements are taken using a measuring device which works according to the principles of magnetic measuring. (DIN 50 981).

2.4 Electrostatics

2.4.1 Requirements

The requirements with regard to the electrostatic properties of access floors are to be laid down separately for each area of application.
For example, limit values for derivation ability are also predetermined by the manufacturers of electronic equipment.
In defined areas, special requirements will have to be fixed with regard to the insulating properties of the floor constructions.
For requirements with regard to insulating properties, see VDE 0100 Part 610.

2.4.2 Procedure for testing

The testing regulations are laid down in DIN 51 953 for elastic coverings and in DIN 54 345 for textile coverings; for the site border resistance in VDE 0100 Part 610.
The measurements are read on the floor panel including the substructure. For measurement, the panel is laid on four pedestals of the substructure. Conducting pad elements or pedestal head pads are to be inserted between the floor panel and the pedestals as they are when they are laid down in the building.
Tests are carried out in the laboratory in a standard operating environment in accordance with DIN 50014 - 23/50 - 2 (23° C room temperature; 50% relative air humidity).

The climatic conditions during measurement are recorded in the test report.
All other test conditions are described in the standards listed above and in the following chapters.

2.4.2.1 Testing for the earth diversion resistance R_E and R_{EF}
Measurements are to be taken at at least five positions on the floor panel.
Figure 11 shows the test set-up for laboratory testing.

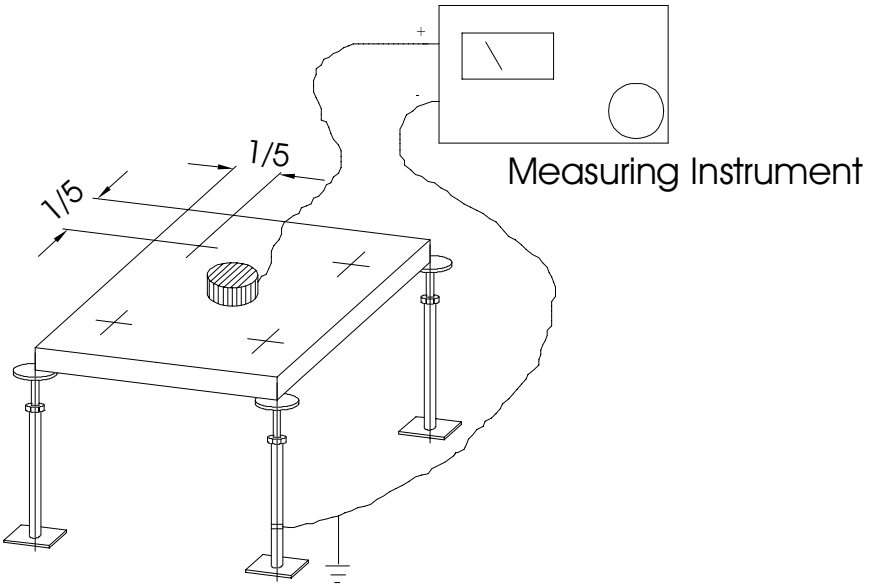


Figure 11 : Test set-up for testing the earth diversion resistance

2.4.2.2 Testing the resistance at the site border RST

Figure 12 shows the test set-up for laboratory tests on access flooring elements with measurements taken in the centre of the panel.

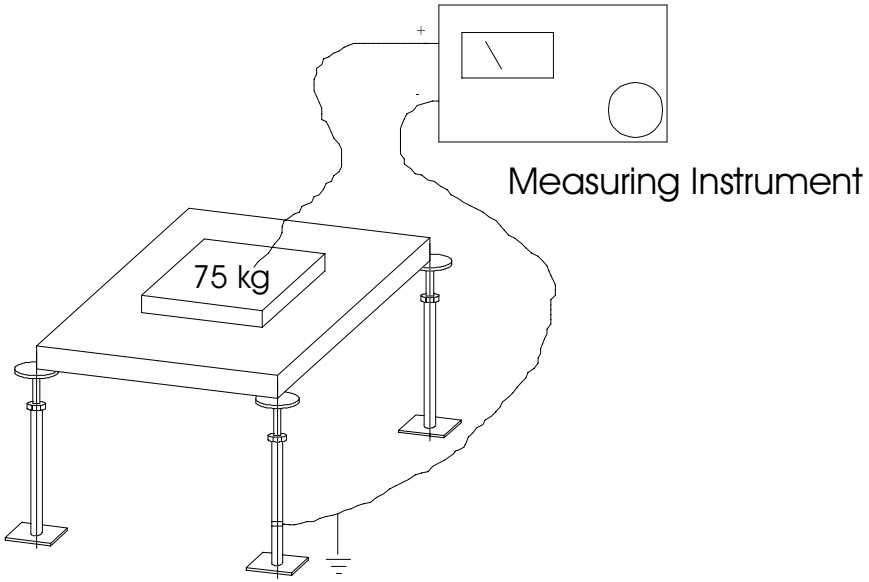


Figure 12 : Test set-up for testing the resistance at the site border

2.5 Fire protection

Fire protection is laid down in DIN 4102.

The class of building material defines the combustibility of building materials and the possible spreading of fire in the material.

The fire resistance classification defines the resistance of a component to the passage of fire, combustion gases and heat over a specified period of time, for the purpose of personal safety and in order to keep avenues of escape and rescue open.

2.5.1 Requirements

General requirements can be found, for example, in the respective regional building regulations and the guidelines 'fire-protection requirements for cavity floors and access flooring'.

2.5.1.1 Combustibility

Classification according to a class of building materials combustibility is effected in accordance with DIN 4102. The class of combustibility can be recorded on the safety certificate.

2.5.1.2 Fire resistance

This is attested via test certificate issued by official and authorised agencies. The classification of fire resistance can be recorded on the safety certificate.

2.5.2 Testing

Testing of the fire-protection qualities is carried out in accordance with the established standards and guidelines and in authorised institutes.

2.6 Acoustics

The relevance of soundproofing for safety is documented in the general and specific noise protection requirements.

Access flooring cushions airborne and footfall sound. The requirements are laid down in DIN 4109 and concrete planning stipulations or regulations. The classification of concrete numerical values is based on laboratory evidence and can be included in the safety certificate as values for horizontal and vertical airborne and footfall sound.

2.7 Hygiene

Access flooring constructions include cavities which are partly isolated from the room and exterior air.

In order to fulfil the necessary hygiene requirements, it should be ensured that the relative air humidity in these floor cavities is one average less than 80%.

3. Qualification for the safety certificate

For initial and external testing, the Bundesverband Systemböden commissions neutral experts or recognised testing institutes.

3.1 Safety certificate

The certification commission of the Bundesverband Systemböden e. V. awards and can withdraw the safety certificate.

All details are subject to the procedures of the certification commission.

3.2 Application, declaration of obligation

With the application for a safety certificate, the applicant also submits a binding and unrestricted declaration that the access flooring system specified in the application fulfils all requirements with reference to safety in accordance with these guidelines.

3.3 Initial testing

The access flooring system for which a safety certificate has been applied for is to be subjected to initial testing on the instructions of the certification commission in consultation with the testing institute.
The certification commission orders the initial testing.
The testing official will draw up a report on the initial test. The applicant and the certification commission receive one copy each.
The certification commission makes its decision on whether the safety requirements are fulfilled on the basis of this test report.

3.4 Monitoring by the manufacturer

Each applicant awarded a safety certificate is responsible for ensuring that the safety guidelines are complied with. To do so, supervision measures which are appropriate in their number, frequency and scope must be taken. Such measures are to be carefully documented. The records are to be kept for 5 years and to be submitted during monitoring arranged for by the association.

3.5 Third body control

The Bundesverband Systemböden e. V. enters into a supervision contract with a neutral expert or a recognised testing institute to carry out the independent monitoring.
This independent monitoring comprises inspections to evaluate whether the monitoring by the manufacturer himself is effected continually and correctly, whether the monitoring is documented and whether the necessary evaluations are carried out.
The testing institute submits a report to the certification commission.

	Initial testing[2]	Independent monitoring[1]
	By a neutral testing agency commissioned by the Bundesverband Systemböden e.V.	By a neutral testing agency commissioned by the Bundesverband Systemböden e.V.
Access flooring element Safety point load	in accordance with article 2.1	annual inspection
Access flooring panel Dimensional accuracy	in accordance with article 2.2.1.3	annual inspection
Access flooring panel Deflection	in accordance with article 2.2.2.2	annual inspection
Access flooring panel local deformation	in accordance with article 2.2.3.3	annual inspection
Access flooring panel Corrosion-proofing	in accordance with article 2.2.4.2	annual inspection
Access flooring panel Finish of floor coverings	in accordance with article 2.2.5	annual inspection
Substructure vertical eccentric load	in accordance with article 2.3.2.2	annual inspection
Substructure Horizontal load on the pedestals	in accordance with article 2.3.3.2	annual inspection
Substructure Corrosion-proofing	in accordance with article 2.3.4.2	annual inspection
Electrostatics	in accordance with article 2.4.2	verification that construction continues in compliance with the requirements
Fire protection	proof to be provided in accordance with DIN 4102	verification that construction continues in compliance with the requirements
Soundproofing	proof to be provided in accordance with DIN 4109	verification that construction continues in compliance with the requirements

[1] Inspection of records of monitoring by the manufacturer

[2] 3 tests per test characteristic of the access flooring system to be tested

Table 7 : Supervision measures

3.6 Test reports

The test methods and procedures are to be recorded, if necessary, in the form of drawings.

The test reports should contain:

- Name of manufacturing company
- Test object and description of material, type
- Test criterion
- Test apparatus, test procedure
- Details of extraction and number of test samples
- Readings, if necessary with intermediate values
- Evaluation and results
- Date of test and location of test

If the results of the test do not comply with the required values, a repeat test is to be carried out at an interval specified by the certification commission.

3.7 Designation

Access flooring which complies with the requirements of these safety guidelines are awarded the following stamp:

The safety certificate is used exclusively in accordance with the instructions for the application and the use of the safety certificate of the Bundesverband Systemböden e.V..