Flooring Systems

E

Building New Solutions

Only from the secure feeling of a solid standpoint does one actually become entirely aware of one's strength and creative power. Because solid contact with the ground not only gives one staying power, it also imparts that intuitive, extreme trust that connects us human beings with the mother earth.

But not by a long shot is every step on new architectural territory also associated with risk or a limit to personal opportunities. Architects, planners and property developers alike have always distinguished themselves with the freedom to think in advance and dare to do something new – to visualise a new experience of life, or to do so in a symbiosis of form and function. Masterly architecture not only counts on contemporary fashions, but rather includes the well-being of and room to develop for future generations.

A down-to-earth and well thought out philosophy as well as the courage and skill to turn visions into realities – for many years Lindner experts have been dedicating themselves to the subject of floor systems. The objective defined is to develop and realise functional floor systems of solid standing and a maximum of constructional flexibility.

Perfect know-how and service-oriented thinking give architects and property developers the creative and planning freedom to adaptively live up to tomorrow's varied expectations upon residing and working.

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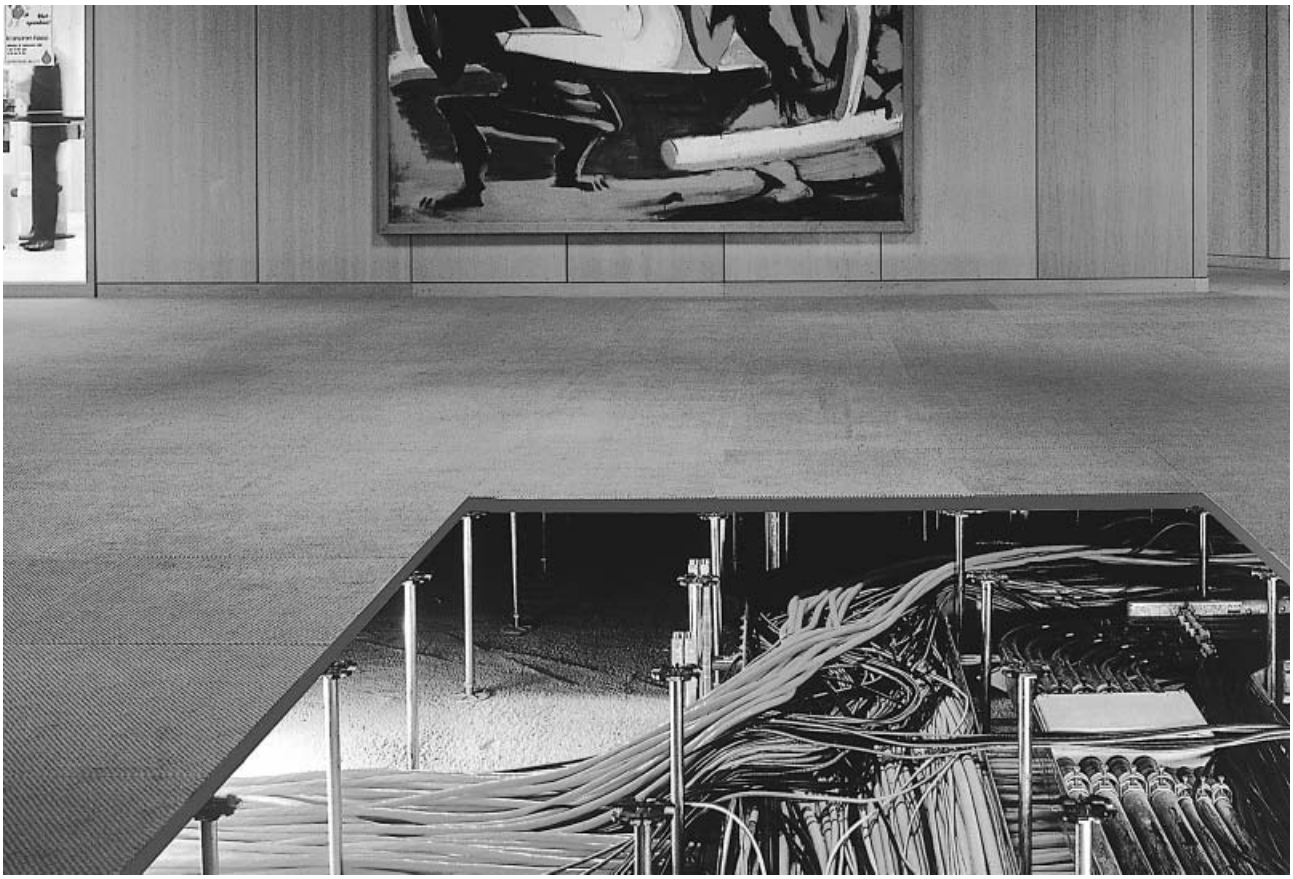
General Description

Fig. 1



By „raised flooring“ one means industrially prefabricated floor panels and pedestals that are installed by a dry construction method. Any of the panels supported on the pedestals can be taken up to access the floor cavity.

This principle of construction is primarily used for IT-rooms, transformer stations, offices, etc., or to put it briefly, wherever access to the entire installations is demanded without much involved and with full office and business operations.

Not only electrical installations can be accommodated in the floor cavity, but also those for water, waste water, pneumatic tube conveyors, compressed air, central vacuum cleaning systems, etc.

A very special advantage that can be ascribed to raised floors is that they can also assume air-conditioning-related tasks, such as ventilating via air diffusers, or with higher requirements regarding ventilation and airflow, via entire steel ventilation panels.

With the Goldbach/Norit raised flooring system from Lindner, construction heights up to 1250 mm and upon request more (which, for example, are necessary for auditoriums and control rooms) can be obtained as standard.

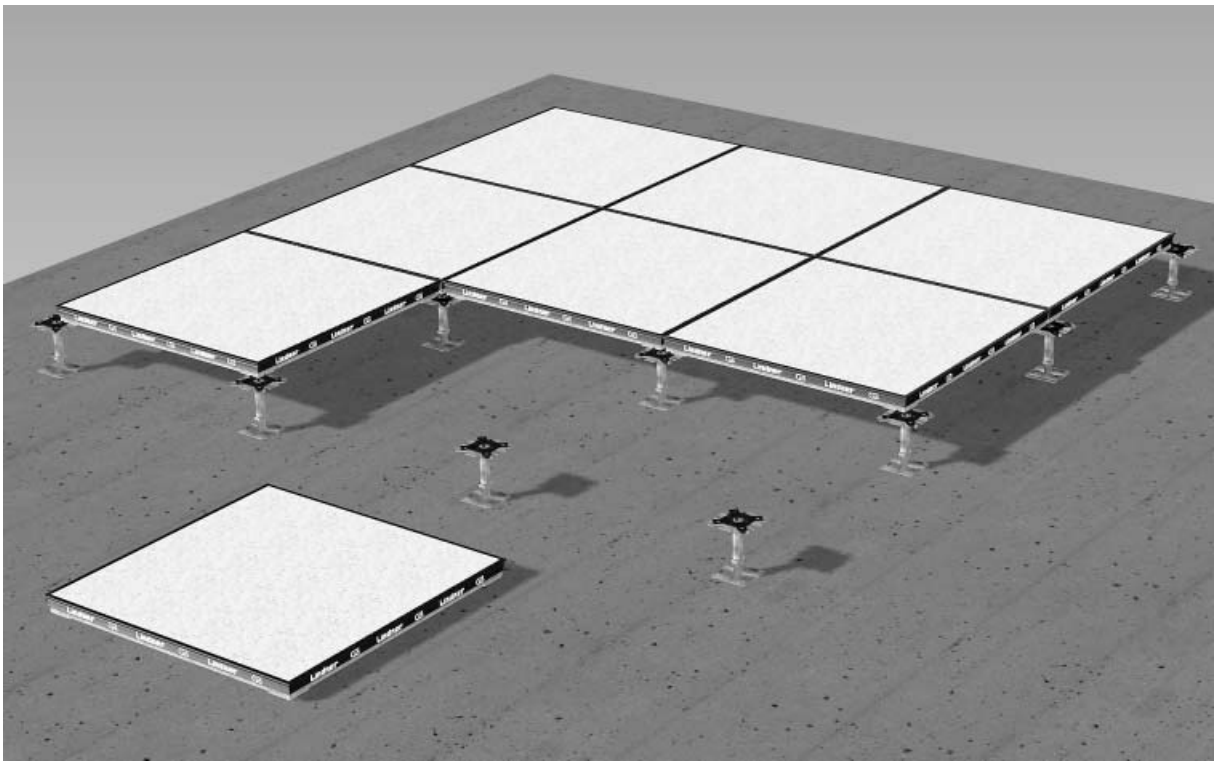
Raised flooring is made up of two main parts:

a) A substructure, consisting only of pedestals of different lengths, design and loading capacity or in combination with stringers.

b) A raised-floor panel consisting of various materials and floor coverings in a grid of 600 x 600 mm (also possible in special sizes upon request).

Lintec

Fig. 2 Steel panel with anhydrite filling



Lintec type raised floor panels are mineral-filled steel panels with edge trim (AK) or without (AS).

Range of use
- IT-rooms and switching centres
- Industrial rooms and factory rooms
- Training and research rooms
- Office and designing areas

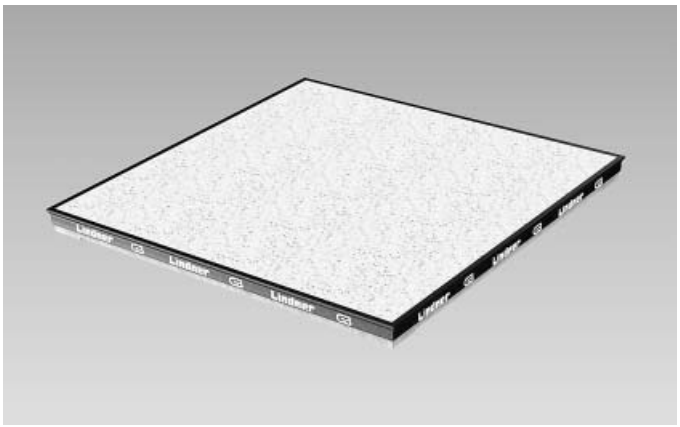
Special features
- Extremely high walking comfort
- Very good fireproofing and soundproofing properties
- Sturdy edge protection
- Elevated strength

Steel panel
The steel panel is formed of sheet that is Sendzimir-galvanised on both sides.
Crown-type anchors punched in the sides and in the bottom of the pan bind the panel to the filling.

Mineral filling
The filling is a type of gypsum with especially good strength properties, which has low expansion and shrinkage coefficients.
Gypsum materials are ideal for fireproofing tasks, because when heated, the crystallised water bound in it (so-called "water of crystallisation“) is released, cooling the panel.

Lintec AK

Fig. 3



Design of edge
A deep-drawn steel panel, with edge trim applied by factory.

Material made of plastic compound

The edge trim protection guarantees:
- High dimensional accuracy because, after being filled, the panel is processed exactly to length, width and thickness.

- A high degree of tightness of the panel joints, increased sound insulation

- Protection of the gap at the joint when cleaning the floors and protection against corrosion

- The floor covering is supported at the critical edge area up to the most outer border, providing assurance against detachment and damage

- Simple to take apart and reassemble the floor panel due to the edge's new type of shaping

- Impact-resistant design of edge; interlocking attachment with the floor panel

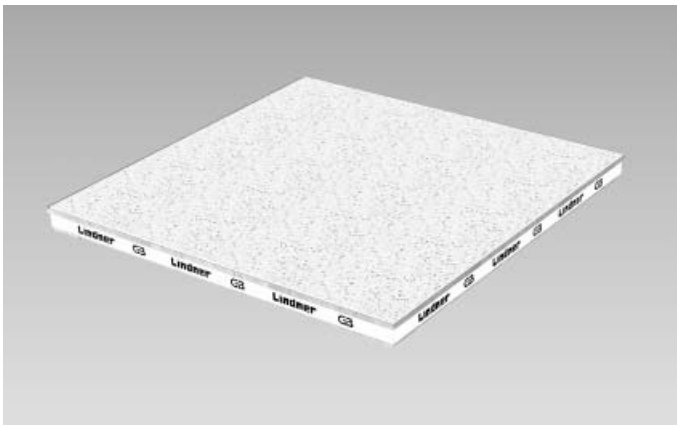
- Protected design of corner due to welding of the edge trim profiled section in a mitre joint

Floor coverings
Basically all common raised floor coverings are suited; see also the "Floor Coverings" index.

When applying loosely laid floor coverings, we recommend providing the support panels with an appropriate coating.

Lintec AS

Fig. 4

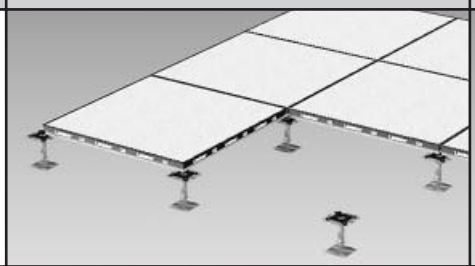
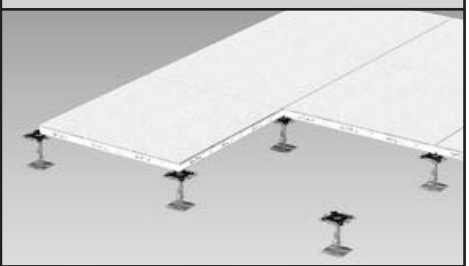


Design of edge
A sturdy, shockproof steel edge made of galvanised steel sheet

Floor coverings
Loosely laid tiles

When applying loosely laid floor coverings, we recommend providing the support panels with an appropriate coating.

Raised Flooring
Lintec: System Specifications

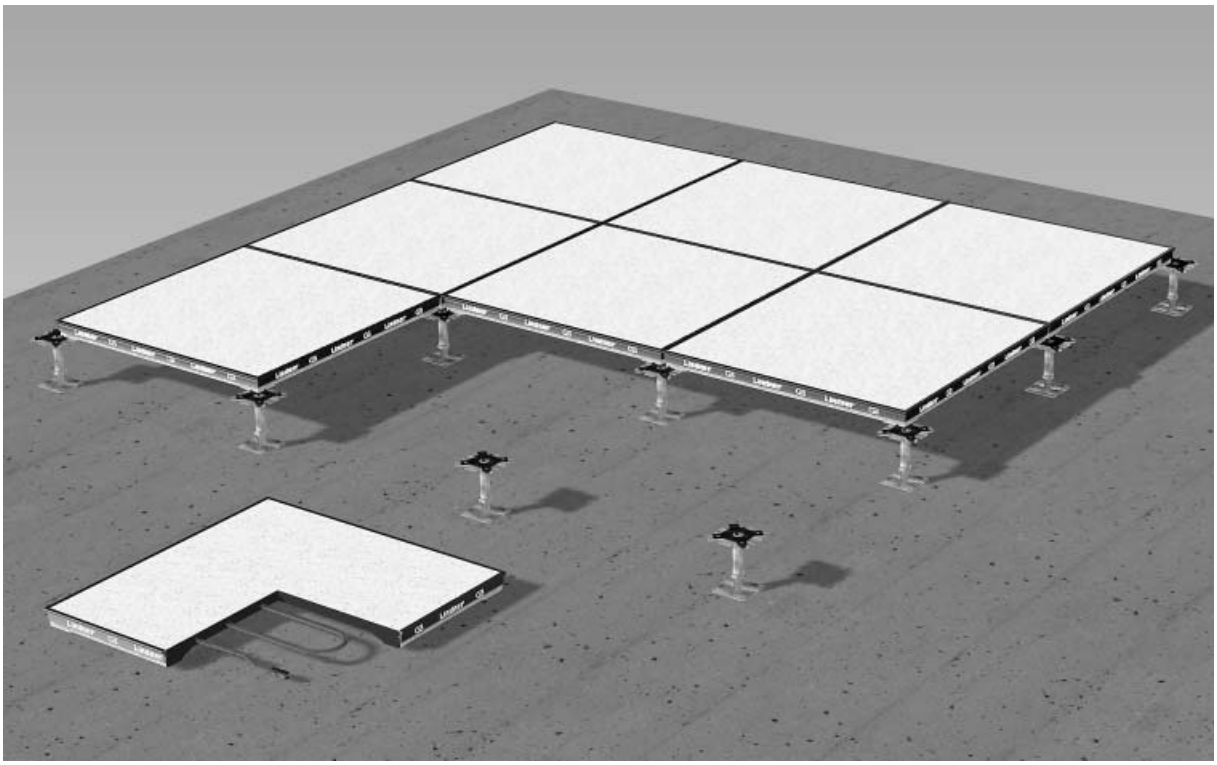
System designation	Lintec	Lintec
Type	AK x M	AS x M
Illustration		
Panel / Material	Mineral-filled steel panel with edge trim	Mineral-filled steel panel with steel edge
Dimensions	600 x 600 mm	
Thickness	38.5 mm	
Weight [1]	65 kg/m²	
Substructure for construction height > 500 mm	Steel pedestals RO stringers	
Construction height [2]	70 - 1250 mm, finished floor height	
Loading capacity	See “STATICS” Supplement	
Fireproofing		
Building-materials rating of the panel	A (non-combustible)	A (non-combustible)
Fire-resistance rating [3]	F30	–
Soundproofing [4]	without covering / with covering (improvement = 25 dB)	with covering (improvement = 28 dB)
Degree of longitudinal sound reduction	57 dB / –	55 dB
Airborne Sound Reduction index	– / 62 dB (improvement = 28 dB)	62 dB
Footfall sound level index assessed	67 dB / 45 dB	43 dB
Degree of improvement of footfall sound	17 dB / 25 dB (22 dB) [5]	25 dB
Suitability of covering	Textile coverings, Elastic coverings, Loosely laid tiles, Stone	Loosely laid tiles
Electric conductivity [6]	≥ 5 x 10^6 Ω	

1) With 150 mm finished floor height
2) Special heights available on request
3) Fire-resistance period for the support panel
4) VDI 3762 must be complied with
5) With footfall sound insulating plates
6) The floor covering influences these values.

Subject to change without notice.

Thermofloor

Fig. 5



Steel panel
The steel panel is formed of steel sheet that is Sendzimir-galvanised on both sides.
Crown-type anchors punched in the sides and in the bottom of the pan bind to the panel to the filling.

Mineral filling
The filling is a type of gypsum with especially good strength properties, which has low expansion and shrinkage coefficients.
The slight covering of flooring screed enables a quick reaction and thus efficient and ecological use of energy.

Copper heat exchanger
The entire surface of the tube casing of the array of copper tubing being in the mineral filling brings about the Thermofloor's great heating and cooling capacity. Using quick-connectors, individual thermo-panels are connected to the supply line by means of flexible plastic pipes that are impervious to oxygen.

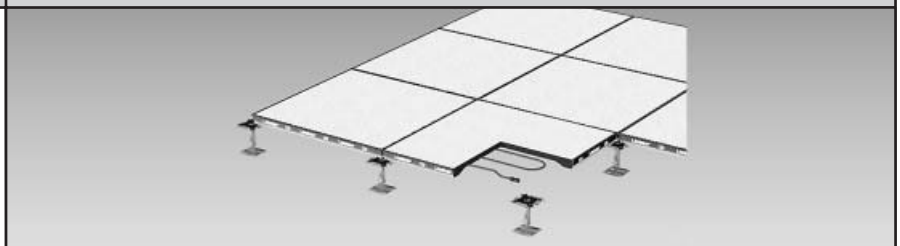
Design of edge
There is an edge trim applied by the factory to a deep-drawn steel panel. In addition to exact dimensional accuracy, this guarantees a high degree of leakproofness for the panel abutments.

Insulation
As an option, thermal insulation can be installed in the cavity.

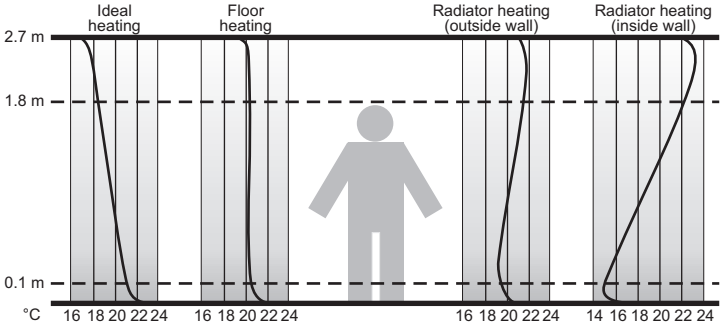
Floor coverings
Basically all common raised floor coverings are suited that are suitable for floor heating; see also the „Floor Coverings" index.

When applying loosely laid floor coverings, we recommend providing the support panels with an appropriate coating.

Raised Flooring
Thermofloor: System Specifications

System designation	Thermofloor	
Type	Thermofloor x M	
Illustration		
Panel / Material	Mineral-filled steel panel with set of copper tubing and edge trim	
Dimension	600 x 600 mm	
Thickness	38.5 mm	
Heating capacity [1]	approx. 85 W/m²	
Cooling capacity [2]	approx. 50 W/m²	
Weight [3]	65 kg/m²	
Substructure For construction height > 500 mm	Steel pedestals RO stringers	
Construction heights [4]	70 - 1250 mm, finished floor height	
Loading capacity rating	See “STATICS” supplement	
Fireproofing Building-materials rating of the panel	A (non-combustible)	
Soundproofing [5]	without floor covering	with floor covering (improvement = 25 dB)
Degree of longitudinal sound reduction	57 dB	–
Airborne Sound Reduction index	–	62 dB (improvement = 28 dB)
Footfall sound level index assessed	67 dB	45 dB
Degree of improvement of footfall sound	17 dB	25 dB (improvement = 22 dB) [6]
Suitability of covering [7]	Textile coverings, Elastic coverings, Loosely laid tiles, Stone	
Elektric conductivity [8]	≥ 5 x 10^6 Ω	

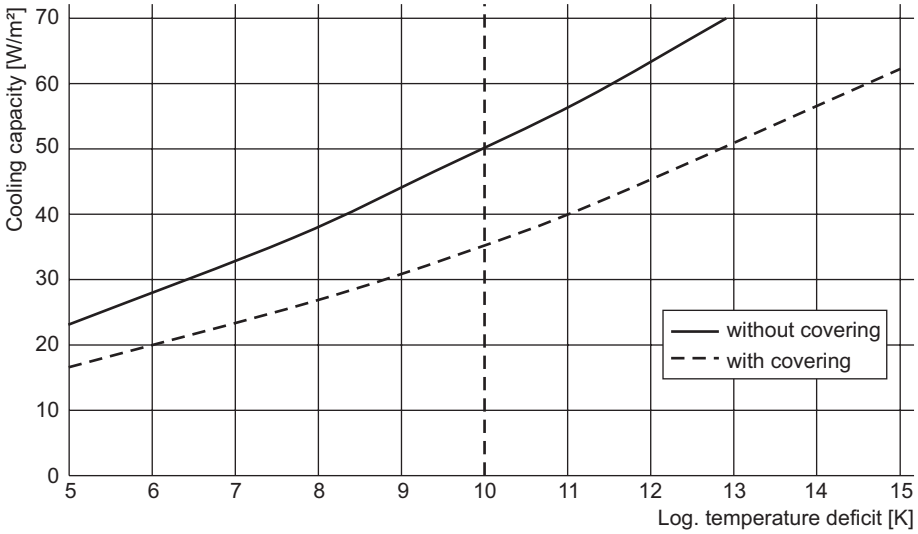
1) EN 1264-1, dt = 11.1 K
2) DIN 4715-1, dt = 10 K
3) With 150-mm finished floor height
4) Special heights available on request
5) VDI 3762 must be complied with
6) With footfall sound insulating plates
7) Suitability for floor heating, provided no direction-oriented coverings
8) The floor covering influences these values.



In light of the temperature curves shown below for various types of heating, it becomes evident that the curve for under-floor heating systems best approximates theoretically ideal heating. The positive effect is also boosted by the pleasant radiant heat.

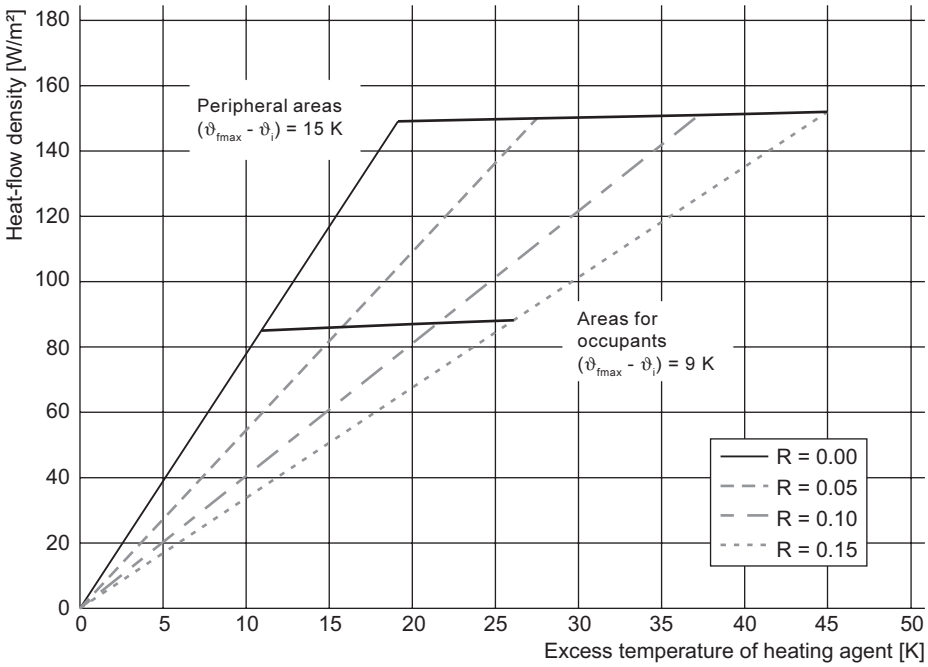
Source:
Bundesverband Flächenheizung e. V.
(Federal radiant panel heating Association, a registered association)

Fig. 6 Cooling capacity according to DIN 4715-1



	Without covering	With covering
Cooling capacity	50 W/m²	35 W/m²
Temperature deficit	10 K	10 K

Fig. 7 Heat-flow density in accordance with EN 1264-1/3, DIN 4725-4

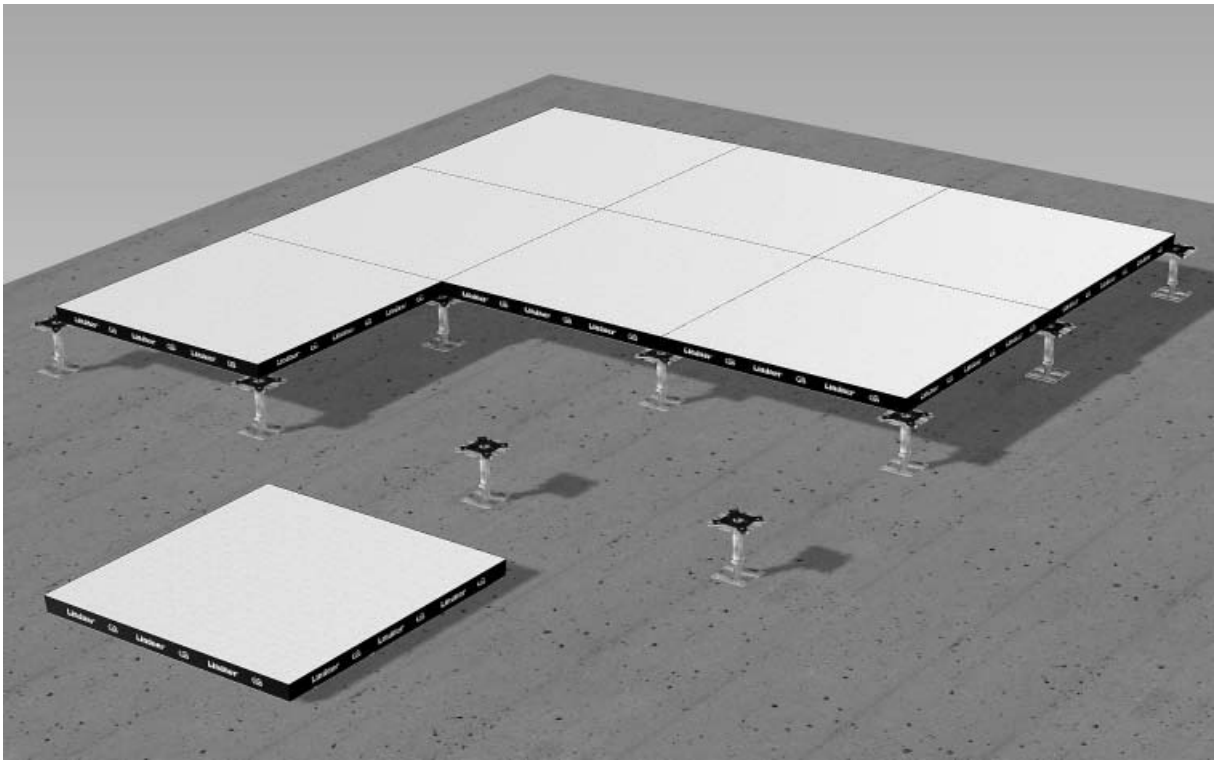


Heat-flow density (without covering): 85 W/m²
Excess temperature of heating agent: 11.1 K

Temperature lag $R_{\lambda,covering}$ [m²K/w] (reference values)
Carpet: 0.07 - 0.23
Ceramic tiles: 0.02
PVC: 0.01

Nortec

Fig. 8



Nortec type raised flooring panels consist of a calcium sulphate material. Steel sheet can be applied to the bottom side to increase load bearing capacity. The edges are available with or without edge trim and are inclined for easier laying of the panel system.

Range of use
- IT-rooms and switching centres
- Industrial rooms and factory rooms
- Training and research rooms
- Office and designing areas

Special features
- Great strength
- Stringers enable extra loading

Calcium sulphate panel
The support elements used have been specially developed for use with raised flooring. The main component of these panels are gypsum and high-quality cellulose fibres.

Various thicknesses of the panel as well as special formats round off the Nortec line of products. To be able to manufacture standard raised floor panels with extra static requirements, and do so without increasing the thickness of the panels, a special manufacturing process was developed to meet rising requirements.

Design of the edges
The edges of the panels are inclined down at 5°, which enables simple removal and exchanging from the finished floor.

As an option, the panels can be jacketed with a high-quality plastic compound edge, which enables a defined electrostatic conductivity.

Floor coverings
Basically all common raised floor coverings are suited; see also the "Floor Coverings“ index.

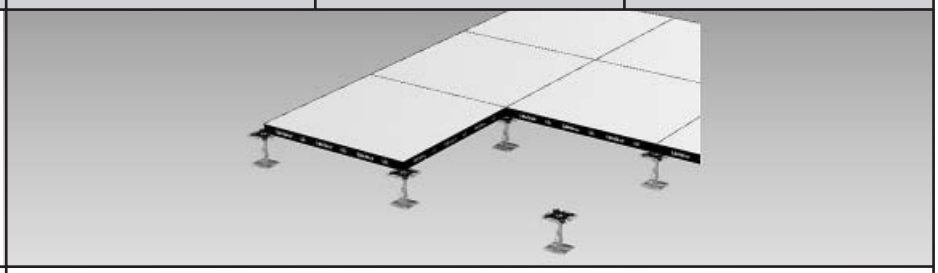
In the standard design, the edge is, with elastic coverings, pulled up to the upper surface of the covering (exception: knobby floor coverings).

When applying loosely laid floor coverings, we recommend providing the support panels with an appropriate coating.

TESTED & RECOMMENDED BY THE

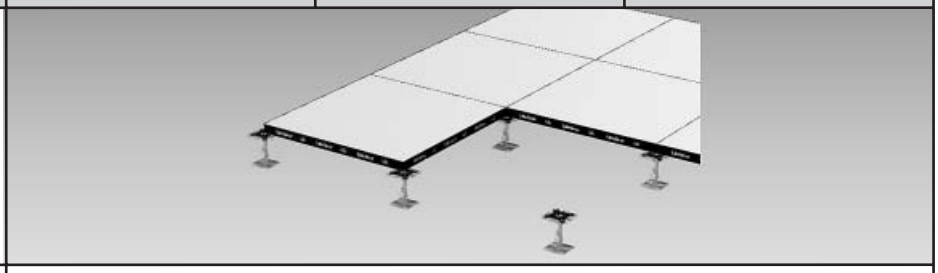
GEPRÜFT UND EMPFOHLEN VOM INSTITUT FÜR BAUBIOLOGIE ROSENHEIM GmbH
IBR
Health and ecological aspects were also considered for recommendations of the product.An examination was carried out for: lindane, pentachlorphenol, formaldehyde, heavy metals, and more

Raised Flooring
Nortec: System Specifications

System designation	Nortec	Nortec	Nortec
Type	S 24 ST x M	S 30 x M	S 30 ST x M
Illustration			
Panel / Material	Calcium Sulphate Panel, optionally with edge trim		
	With steel sheet on bottom side	–	With steel sheet on bottom side
Dimensions	600 x 600 mm		
Thickness	24.5 mm	30 mm	30.5 mm
Weight [1]	43 kg/m²	48 kg/m²	52 kg/m²
Substructure for construction height > 500 mm	Steel pedestals RO stringers		
Construction height [2]	60 - 1250 mm	70 - 1250 mm	
Loading capacity rating	See “STATICS” supplement		
Fireproofing			
Building-materials rating of the panel	A (non-combustible)		
Fire-resistance rating [3]	F30		
Soundproofing [4]	Without floor covering	With floor covering (improvement = 25 dB)	
Degree of longitudinal sound reduction	48 dB	–	
Airborne Sound Reduction index	–	62 dB (improvement = 28 dB)	
Footfall sound level index assessed	–	47 dB	
Degree of improvement of footfall sound	–	22 dB	
Suitability of covering	Textile coverings, Elastic coverings, Loosely laid tiles, parquet, HPL		Textile coverings, Elastic coverings, Loosely laid tiles, parquet, stone, HPL
Electric conductivity [6]	≥ 10^6 Ω		

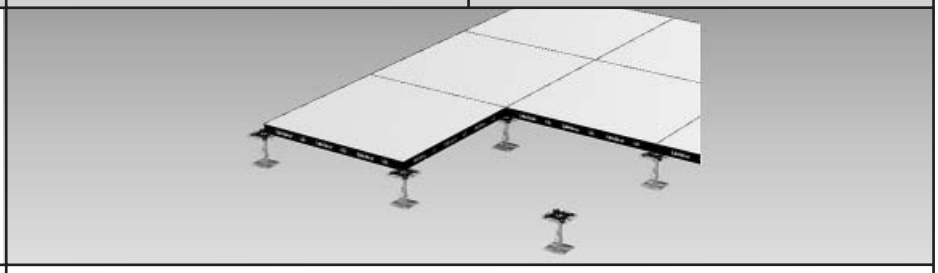
1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with; values tested with the 30-mm panel
5) The floor covering influences these values.

Raised Flooring
Nortec: System Specifications

System designation	Nortec	Nortec	Nortec
Type	S 36 x M	L 38 x M	S 36 ST x H
Illustration			
Panel / Material	Calcium Sulphate Panel, optionally with edge trim	–	With steel sheet on bottom side
Dimensions	600 x 600 mm		
Thickness	36 mm	38 mm	36.5 mm
Weight [1]	57 kg/m²	60 kg/m²	61 kg/m²
Substructure for construction height > 500 mm	Steel pedestals RO stringers		
Construction height [2]	70 - 1250 mm		
Loading capacity rating	See “STATICS” supplement		
Fireproofing			
Building-materials rating of the panel	A (non-combustible)		
Fire-resistance rating [3]	F60		
Soundproofing [4]	Without floor covering		With floor covering (Improvement = 25 dB)
Degree of longitudinal sound reduction	49 dB		–
Airborne Sound Reduction index	–		62 dB (Improvement = 28 dB)
Footfall sound level index assessed	70 dB		51 dB
Degree of improvement of footfall sound	14 dB (26 dB) [5]		24 dB (32 dB) [5]
Suitability of covering	Textile coverings, elastic coverings, loosely laid tiles, parquet, stone, HPL		
Electric conductivity [6]	$\geq 10^6\ \Omega$		

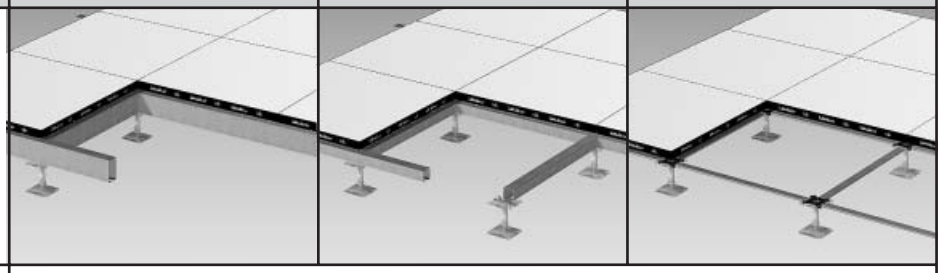
1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with; values tested with the 36-mm panel
5) With footfall sound insulating plate
6) The floor covering influences these values.

Raised Flooring
Nortec: System Specifications

System designation	Nortec	Nortec
Type	H 38 x H	X 40 x H
Illustration		
Panel / Material	Calcium Sulphate Panel, optionally with edge trim	
Dimensions	600 x 600 mm	
Thickness	38 mm	40 mm
Weight [1]	60 kg/m²	63 kg/m²
Substructure for construction height > 500 mm	Steel pedestals RO stringers	
Construction height [2]	70 - 1250 mm	
Loading capacity rating	See “STATICS” supplement	
Fireproofing Building-materials rating of the panel Fire-resistance rating [3]	 A (non-combustible) F60	
Soundproofing [4] Degree of longitudinal sound reduction Airborne Sound Reduction index Footfall sound level index assessed Degree of improvement of footfall sound	Without floor covering 49 dB – 70 dB 14 dB (26 dB) [5]	With floor covering (improvement = 25 dB) – 62 dB (improvement = 28 dB) 51 dB 24 dB (32 dB) [5]
Suitability of covering	Textile coverings, elastic coverings, loosely laid tiles, parquet, stone, HPL	
Electric conductivity [6]	$\geq 10^6\ \Omega$	

1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with; values tested with the 36-mm panel
5) With footfall sound insulating plate
6) The floor covering influences these values.

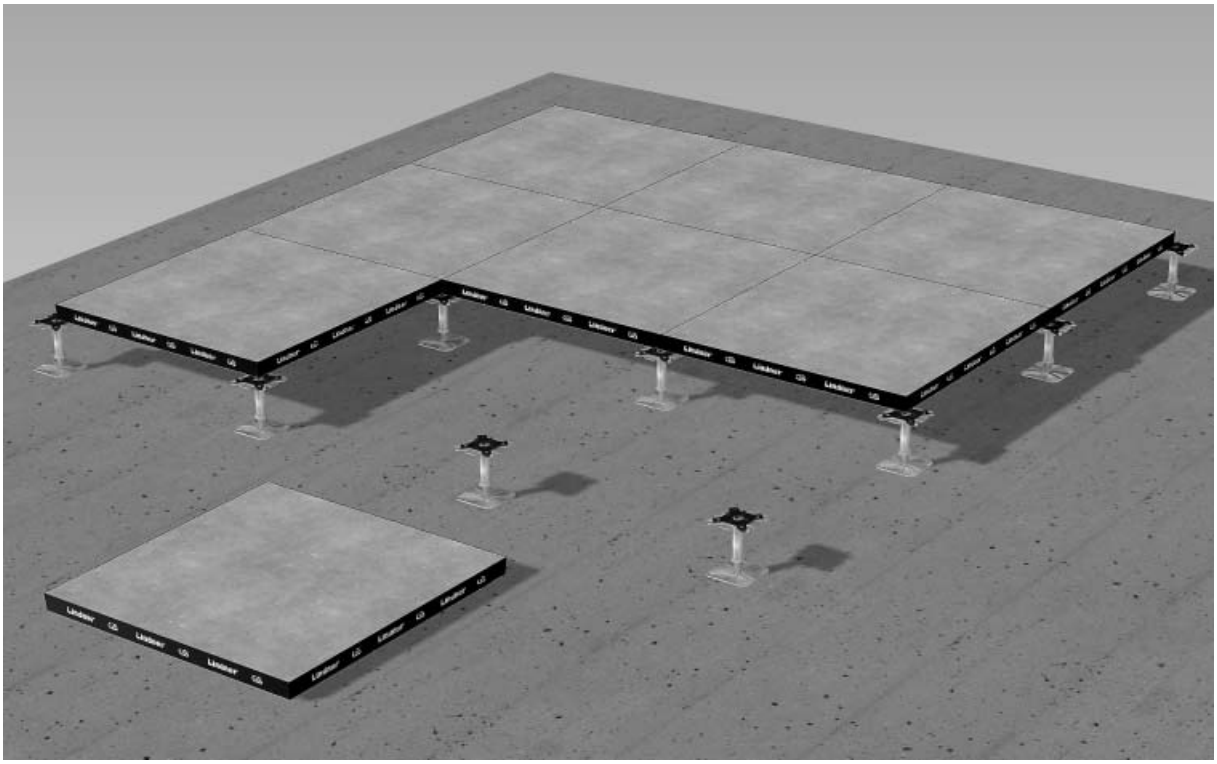
Raised Flooring
Nortec: System Specifications

System designation	Nortec	Nortec	Nortec
Type	S 36 x H 12 + CM	S 36 x H + CL	S 36 ST x H + RM
Illustration			
Panel / Material	Calcium Sulphate Panel, optionally with edge trim		With steel sheet on bottom side
Dimensions	600 x 600 mm		
Thickness	36 mm		36.5 mm
Weight [1]	67 kg/m²	64 kg/m²	63 kg/m²
Substructure	Steel pedestals with CM stringers 600 x 1200 mm grid	Steel pedestals with CL stringers	Steel pedestals with RM stringers
Construction height [2]	140 - 1250 mm	100 - 1250 mm	80 - 1250 mm
Loading capacity rating	See “STATICS” supplement		
Fireproofing Building-materials rating of the panel Fire-resistance rating [3]	 A (non-combustible) F60		
Soundproofing [4] Degree of longitudinal sound reduction Airborne Sound Reduction index Footfall sound level index assessed Degree of improvement of footfall sound	Without floor covering 49 dB – 70 dB 14 dB (26 dB) [5]	With floor covering (improvement = 25 dB) – 62 dB (improvement = 28 dB) 51 dB 24 dB (32 dB) [5]	
Suitability of covering	Textile coverings, elastic coverings, loosely laid tiles, parquet, stone, HPL		
Electric conductivity [6]	$\geq 10^6\ \Omega$		

1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with; values tested with the 36-mm panel
5) With footfall sound insulating plate
6) The floor covering influences these values.

Ligna

Fig. 9



Ligna raised floor panels are made of special high density chipboard. To increase loading, steel sheet can be applied to the bottom. To facilitate laying the panels into the finished floor, the edges are inclined and glued with edge trim.

Range of use
- IT-rooms and switching centres
- Industrial rooms and factory rooms
- Training and research rooms
- Office and design areas

Special features
- Low weight of system
- Stringers make it possible to increase loading
- Graphitied chipboard-product panels to improve conductivity.

Chipboard-product panels
High-density chipboard-product panels are used as the support material. The panels used always meet the E1-requirements regarding formaldehyde emissions.

Standard chipboard-product panels have normal conductivity. Requirements regarding a higher degree of conductivity can be achieved by a special design for support panel (all E-types). Conductive components are added to such chipboard-product panels.

Note: The floor covering determines the overall conductivity.

Coating on the bottom side
The thin-gage aluminium sheet with all the AL-types is for protection against moisture on the bottom of the panel.

This does not increase the strength of the high-density wood composite panels.

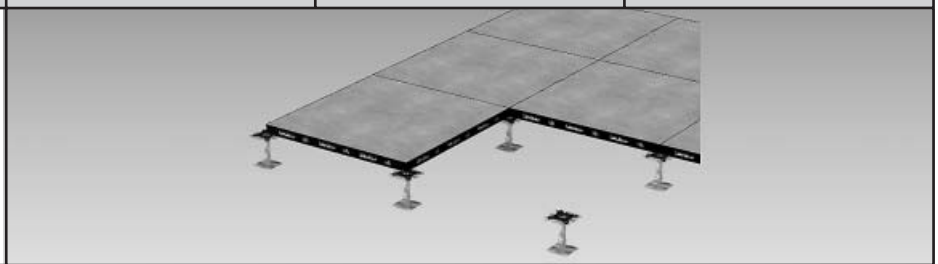
Design of edge
The edges of the panels are inclined at 5°, making it simple to remove and exchange them.

Plastic edge trim goes all the way round, guaranteeing fireproofing and the best possible sealing of the joints.

Coverings
Basically all common raised floor coverings are suited; see also the "Floor Coverings“ index.

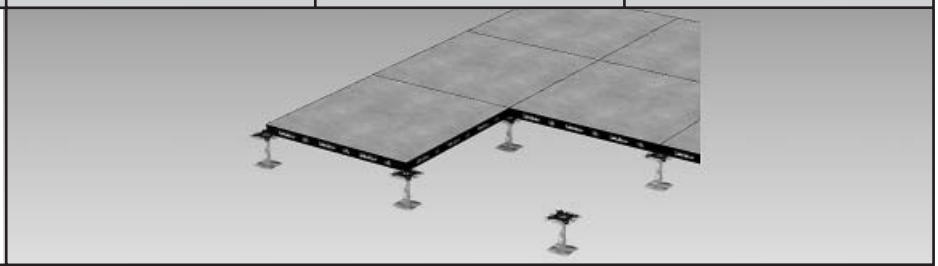
In the standard design, the edge is, with elastic coverings, pulled up to the upper surface of the covering (exception: knobby floor coverings). When loosely laid tiles are used, we recommend providing the floor panel with an appropriate coating.

Raised Flooring
Ligna: System Specifications

System designation	Ligna	Ligna	Ligna
Type	B 30 ST x M	K 38 AL x M	K 38 ST x M
Illustration			
Panel / Material	E1 chipboard-product panel; with edge trim		
	With steel sheet on bottom side	With thin-gage aluminium sheet on bottom side	With steel sheet on bottom side
Dimensions	600 x 600 mm		
Thickness	30.5 mm	38 mm	38.5 mm
Weight [1]	26 kg/m²	29 kg/m²	30 kg/m²
Substructure for construction height > 500 mm	Steel pedestals RO stringers		
Construction height [2]	70 - 1250 mm		
Loading capacity rating	See “STATICS” supplement		
Fireproofing			
Building-materials rating of the panel	–	B (difficult to ignite)	
Fire-resistance rating [3]		F30	
Soundproofing [4]	Without floor covering		
Degree of longitudinal sound reduction	49 dB		
Airborne Sound Reduction index	62 dB		
Footfall sound level index assessed	63 dB		
Degree of improvement of footfall sound	16 dB		
Suitability of covering	Textile coverings, elastic coverings, loosely laid tiles, parquet, stone, HPL		
Electric conductivity [6]	$\geq 10^6\ \Omega$		

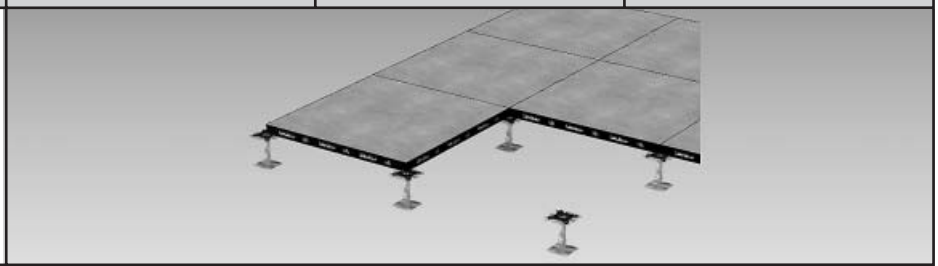
1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with; values tested with the 36-mm panel
5) The floor covering influences these values.

Raised Flooring
Ligna: System Specifications

System designation	Ligna	Ligna	Ligna
Type	H 38 AL x M	S 38 AL x M	S 38 ST x M
Illustration			
Panel / Material	E1 chipboard-product panel; with edge trim at the perimeter With thin-gage aluminium sheet on bottom side		With steel sheet on bottom side
Dimensions	600 x 600 mm		
Thickness	38 mm		38.5 mm
Weight	31 kg/m²		
Substructure [1] for construction height > 500 mm	Steel pedestals RO stringers		
Construction height [2]	70 - 1250 mm		
Loading capacity rating	See “STATICS” supplement		
Fireproofing Building-materials rating of the panel Fire-resistance rating [3]	B (difficult to ignite) F30		
Soundproofing [4] Degree of longitudinal sound reduction	Without floor covering 49 dB	With floor covering (improvement = 28 dB) 60 dB [5]	Without floor covering 49 dB
			With floor covering 52 dB (improvement=28 dB)
Airborne Sound Reduction index	62 dB	–	62 dB
			–
Footfall sound level index assessed	63 dB	–	64 dB
			52 dB (improvement=25 dB)
Degree of improvement of footfall sound	16 dB	–	16 dB
			–
Suitability of covering	Textile coverings, elastic coverings, loosely laid tiles, parquet, HPL		
Electric conductivity [6]	$\geq 10^6\ \Omega$		

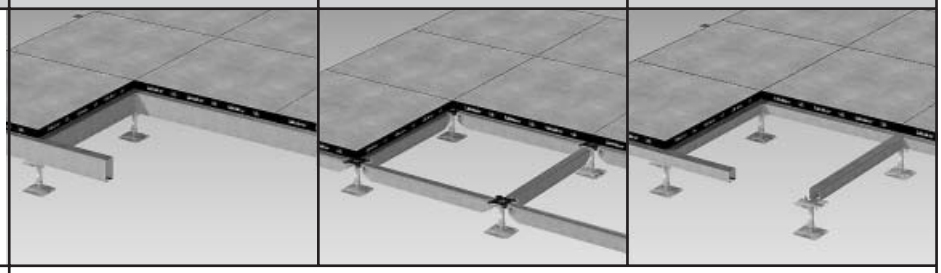
1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with
5) With mineral fibre bulkhead
6) The floor covering influences these values.

Raised Flooring
Ligna: System Specifications

System designation	Ligna	Ligna	Ligna
Type	HE 38 AL x M	SE 38 AL x M	SE 38 ST x M
Illustration			
Panel / Material	E1 chipboard-product panel; conductive additive; with edge trim at the perimeter		With steel sheet on bottom side
	With thin-gage aluminium sheet on bottom side		
Dimensions	600 x 600 mm		
Thickness	38 mm		38.5 mm
Weight [1]	31 kg/m²		
Substructure for construction height > 500 mm	Steel pedestals RO stringers		
Construction height [2]	70 - 1250 mm		
Loading capacity rating	See “STATICS” supplement		
Fireproofing Building-materials rating of the panel	B (difficult to ignite)		
Fire-resistance rating [3]	F30		
Soundproofing [4]	Without floor covering	With floor covering (improvement = 28 dB)	Without floor covering / With floor covering
Degree of longitudinal sound reduction	49 dB	60 dB [5]	49 dB / 52 dB (improvement=28 dB)
Airborne Sound Reduction index	62 dB	–	62 dB / –
Footfall sound level index assessed	63 dB	–	64 dB / 52 dB (improvement=25 dB)
Degree of improvement of footfall sound	16 dB	–	16 dB / –
Suitability of covering	Textile coverings, elastic coverings, loosely laid tiles, parquet, HPL		
Electric conductivity [6]	≥ 10^6 Ω		

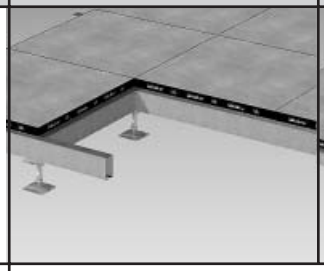
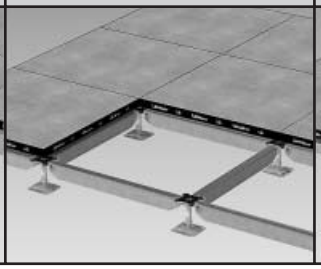
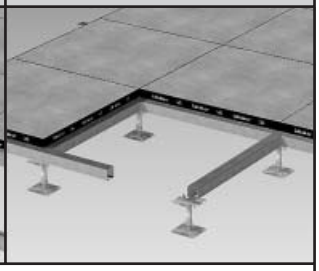
1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with
5) With mineral fibre bulkhead
6) The floor covering influences these values.

Raised Flooring
Ligna: System Specifications

System designation	Ligna	Ligna	Ligna
Type	S 38 ST x H 12 + CM	S 38 ST x H + RM	S 38 ST x H + CL
Illustration			
Panel / Material	E1 chipboard-product panel; with edge trim at the perimeter, steel sheet on bottom side		
Dimensions	600 x 600 mm		
Thickness	38.5 mm		
Weight [1]	43 kg/m²	36 kg/m²	40 kg/m²
Substructure	Steel pedestals CM stringers 600 x 1200 mm grid	Steel pedestals RM stringers	Steel pedestals CL stringers
Construction height [2]	140 - 1250 mm	80 - 1250 mm	100 - 1250 mm
Loading capacity rating	See “STATICS” supplement		
Fireproofing Building-materials rating of the panel Fire-resistance rating [3]	 B1 (difficult to ignite) F30		
Soundproofing [4]	Without floor covering	With floor covering	
Degree of longitudinal sound reduction	49 dB	52 dB (improvement = 28 dB)	
Airborne Sound Reduction index	62 dB	–	
Footfall sound level index assessed	64 dB	52 dB (improvement = 25 dB)	
Degree of improvement of footfall sound	16 dB	–	
Suitability of covering	Textile coverings, elastic coverings, parquet, stone, loosely laid floor covering, HPL		
Electric conductivity [5]	$\geq 10^6\ \Omega$		

1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with; values tested with the 36-mm panel
5) The floor covering influences these values.

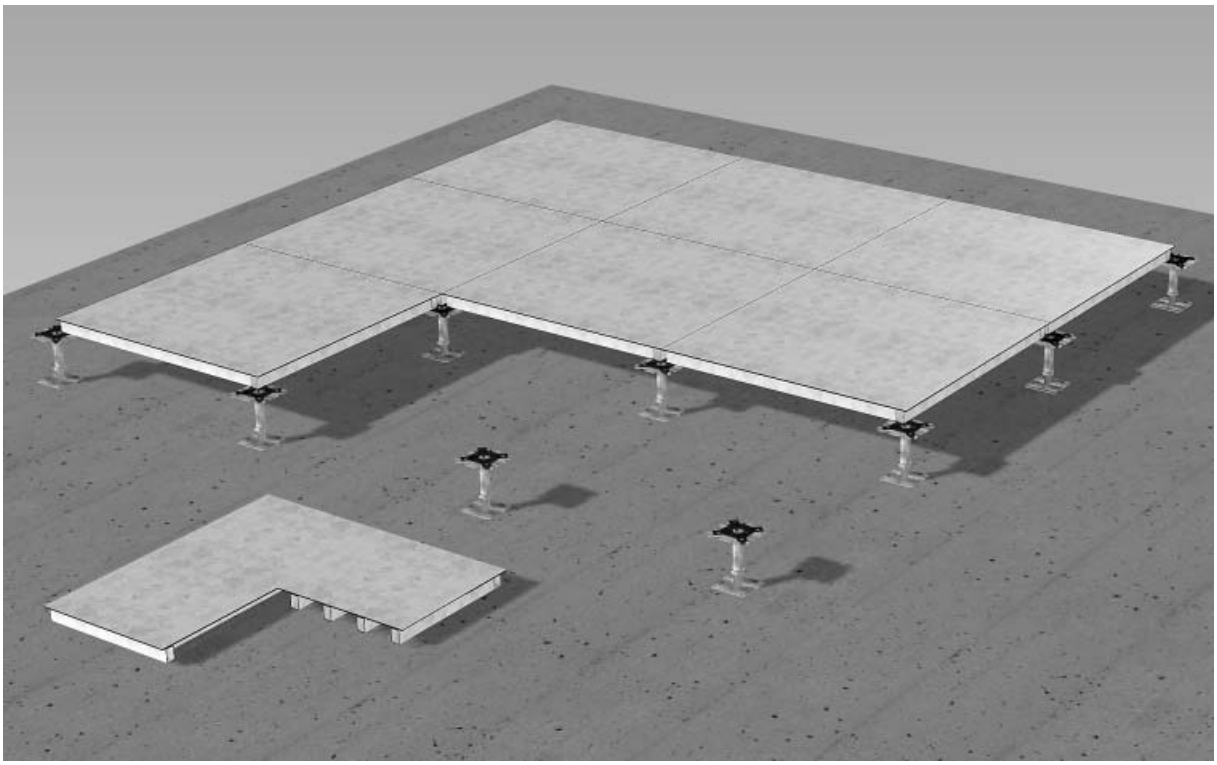
Raised Flooring
Ligna: System Specifications

System designation	Ligna	Ligna	Ligna
Type	SE 38 ST x H 12 + CM	SE 38 ST x H + RM	SE 38 ST x H + CL
Illustration			
Panel / Material	E1 chipboard-product panel; conductive additive; with edge trim, steel sheet on bottom side		
Dimensions	600 x 600 mm		
Thickness	38.5 mm		
Weight [1]	43 kg/m²	36 kg/m²	40 kg/m²
Substructure	Steel pedestals CM stringers 600 x 1200 mm grid	Steel pedestals RM stringers	Steel pedestals CL stringers
Construction height [2]	140 - 1250 mm	80 - 1250 mm	100 - 1250 mm
Loading capacity rating	See “STATICS” supplement		
Fireproofing Building-materials rating of the panel Fire-resistance rating [3]	 B1 (difficult to ignite) F30		
Soundproofing [4]	Without floor covering	With floor covering	
Degree of longitudinal sound reduction	49 dB	52 dB (improvement = 28 dB)	
Airborne Sound Reduction index	62 dB	–	
Footfall sound level index assessed	64 dB	52 dB (improvement = 25 dB)	
Degree of improvement of footfall sound	16 dB	–	
Suitability of covering	Textile coverings, elastic coverings, parquet, stone, loosely laid floor covering, HPL		
Electric conductivity [5]	≥ 10^6 Ω		

1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance rating for the support panel
4) VDI 3762 must be complied with; values tested with the 36-mm panel
5) The floor covering influences these values.

Ventec

Fig. 10



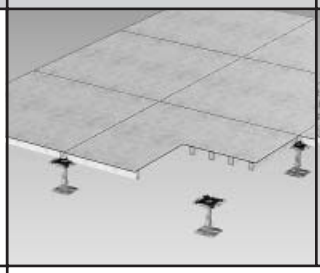
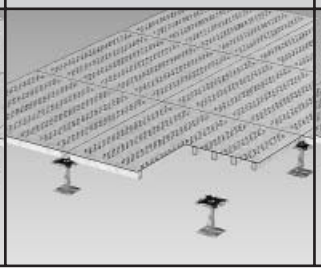
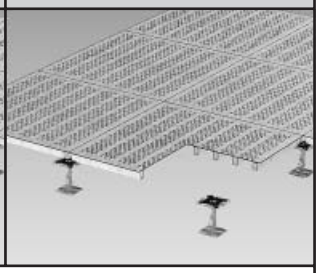
The Ventec (V) support panel consists of a welded tubular frame construction with a powder-coated, conductive surface. Steel panels can be perforated to heat or air-condition a room. Round holes (R) with various diameters and slots (L) with four or six rows make invisible ventilation possible with floor coverings suited for diffusing air.

Range of application
- Industrial and factory rooms
- Training and research rooms
- Office and designing areas

Special features
- High degree of stability
- Very rigid panels
- Very thin panels
- Moisture-resistant
- Very strong
- Very high degree of conductivity

Floor coverings
- Linoleum, PVC, rubber, Flex
- Tufting, woven textile fabric, needled felt

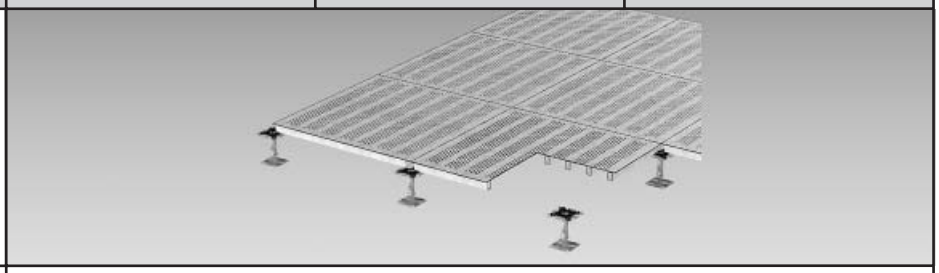
Raised Flooring
Ventec: System Specifications

System designation	Ventec	Ventec	Ventec
Type	M 38 V x H	M 38 L 15 x H	M 38 L 23 x H
Illustration			
Panel / Material	Welded tubular frame construction with powder-coated, conductive surface		
	–	Perforation for ventilation Slots	
Dimensions	600 x 600 mm		
Thickness [1]	38.5 mm		
Weight [2]	43 kg/m²		
Substructure with construction height > 500 mm	Steel pedestals RO stringers		
Construction heights [3]	70 - 1250 mm		
Loading capacity rating	see “STATICS” supplement		
Fireproofing Building-materials rating of the panel	A (non-combustible)		
Free air percentage	–	15 %	23 %
Suitability of covering	Textile coverings, elastic coverings, loosely laid tiles	Elastic coverings with perforation, textile coverings and loosely laid tiles with perforation or suitability for diffusing air	
Electric conductivity [4]	≥ 5 x 10^5 Ω		

1) Other panel thicknesses available on request
2) With 150-mm finished floor height, without floor covering
3) Special heights available on request
4) The floor covering influences these values.

Subject to change without notice.

Raised Flooring
Ventec: System Specifications

System designation	Ventec	Ventec	Ventec
Type	S 36 R 15 x M	S 36 R 24 x M	S 36 R 38 x M
Illustration			
Panel / Material	Welded tubular frame construction with powder-coated, conductive surface Perforation for ventilation Round holes		
Dimensions	600 x 600 mm		
Thickness [1]	36 mm		
Weight [2]	43 kg/m²		
Substructure with construction height > 500 mm	Steel pedestals RO stringers		
Construction heights [3]	70 - 1250 mm		
Loading capacity rating	see “STATICS” supplement		
Fireproofing Building-materials rating of the panel	A (non-combustible)		
Free air percentage	15 %	24 %	38 %
Suitability of covering	Elastic coverings with perforation, textile coverings and loosely laid tiles with perforation or suitability for diffusing air		
Electric conductivity [4]	≥ 5 x 10^5 Ω		

1) Other panel thicknesses available on request
2) With 150-mm finished floor height, without floor covering
3) Special heights available on request
4) The floor covering influences these values.

Subject to change without notice.

Fig. 11 The Ventec M 38 L 15 with perforation

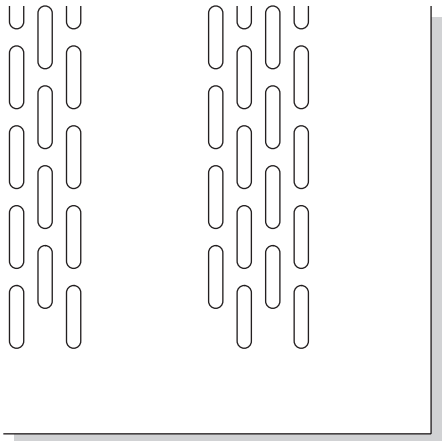


Fig. 12 The Ventec M 38 L 15 *without* floor covering

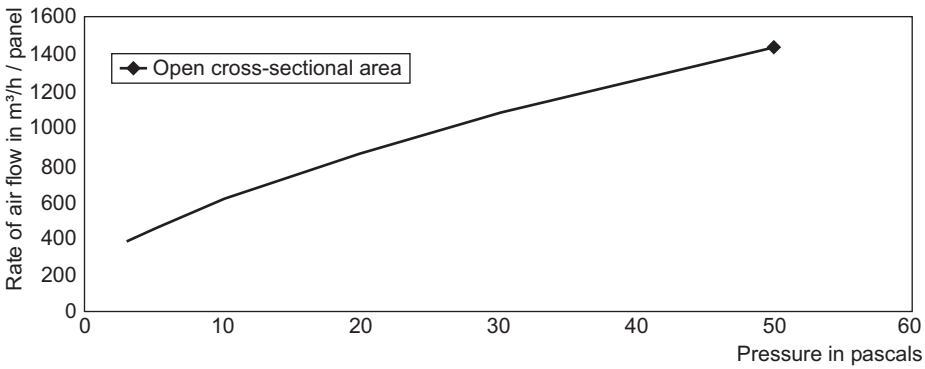


Fig. 13 The Ventec M 38 L 15 *with* floor covering

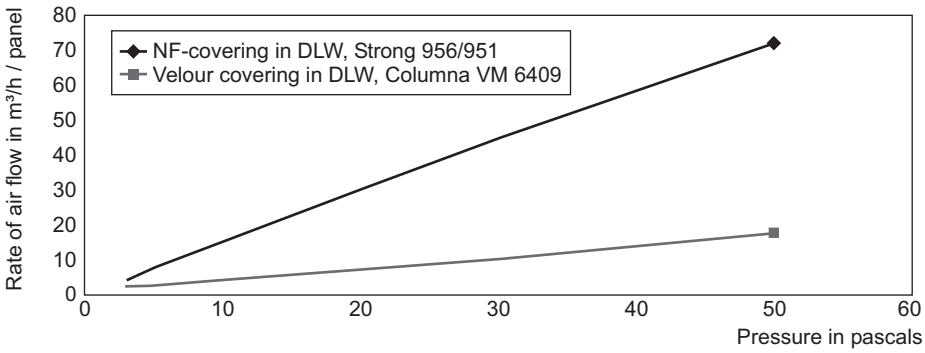


Fig. 14 The Ventec M 38 L 23 with perforation

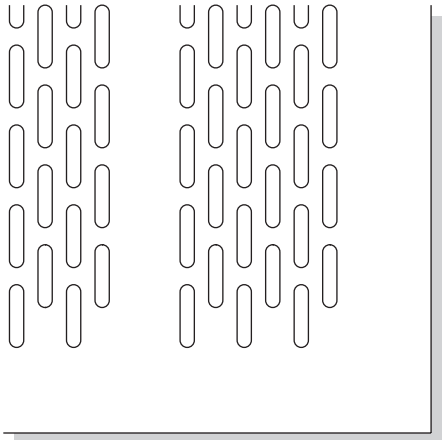


Fig. 15 The Ventec M 38 L 23 *without* floor covering

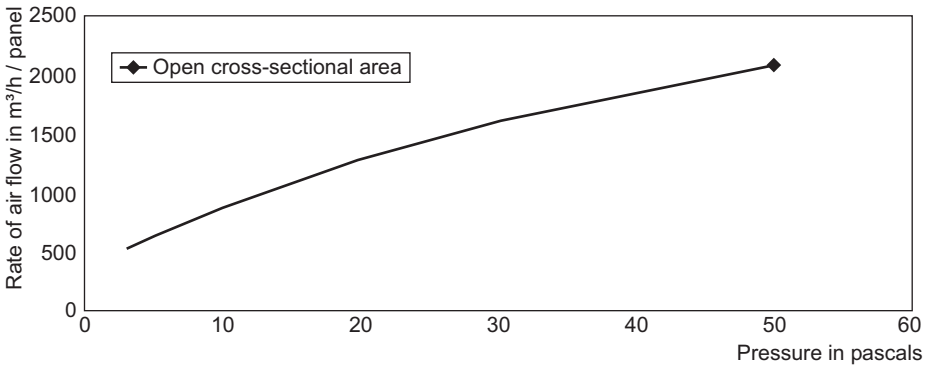


Fig. 16 The Ventec M 38 L 23 *with* floor covering

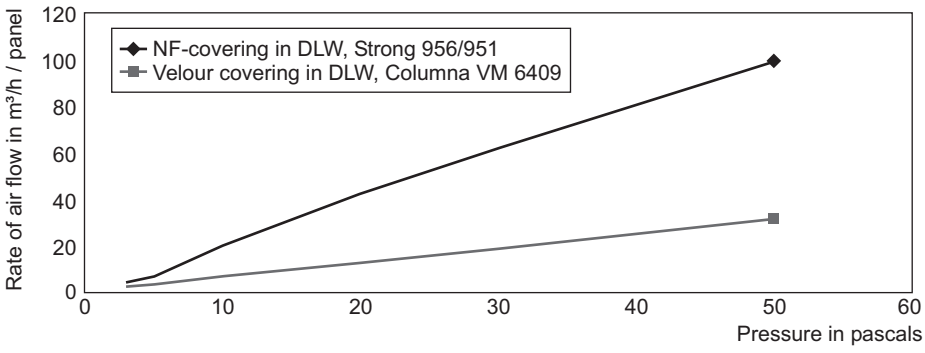


Fig. 17 The Ventec S 36 R 15 with 8-mm diameter of perforation

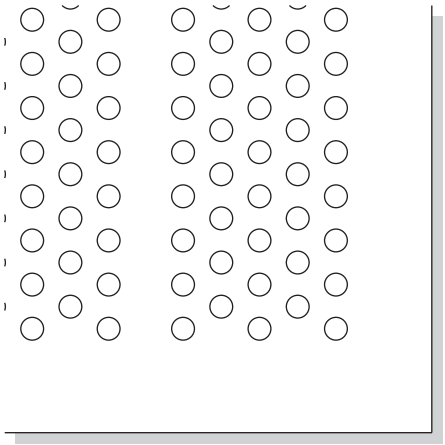


Fig. 18 The Ventec S 36 R 15 *without* floor covering

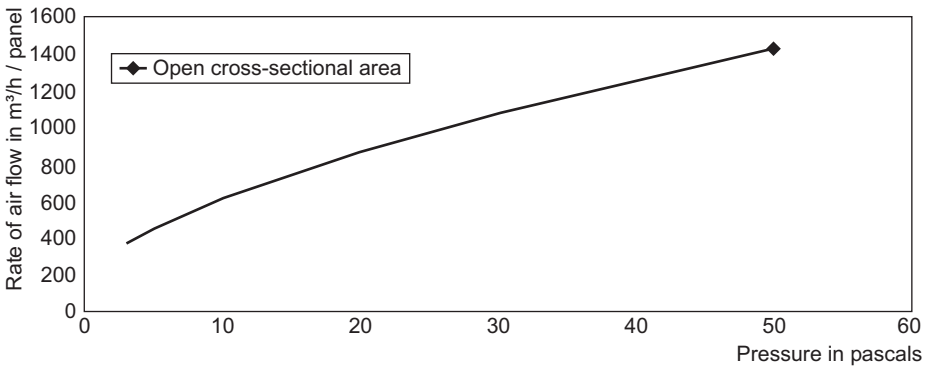


Fig. 20 The Ventec S 36 R 24 with 10-mm diameter of perforation

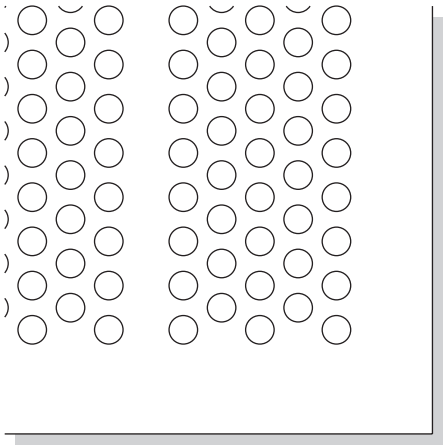


Fig. 21 The Ventec S 36 R 24 *without* floor covering

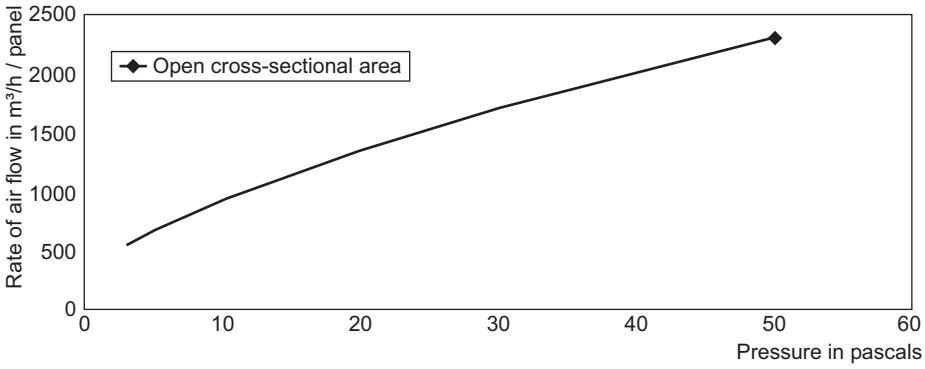


Fig. 23 The Ventec S 36 R 28 with 12-mm diameter of perforation

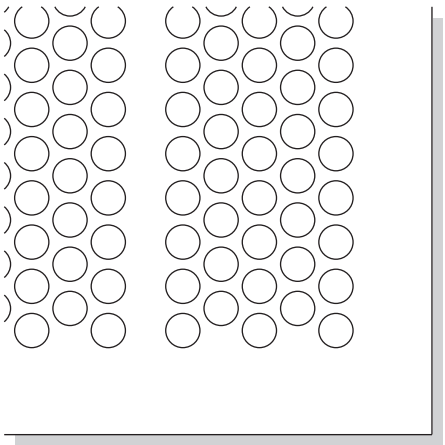


Fig. 24 The Ventec S 36 R 38 *without* floor covering

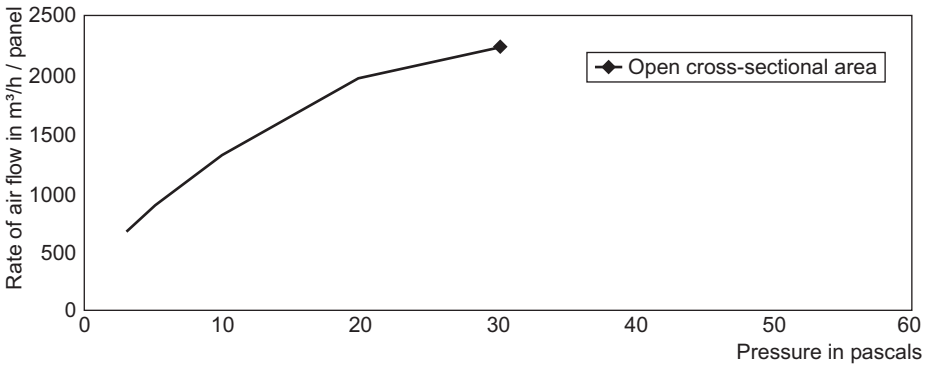


Fig. 19 The Ventec S 36 R 15 *with* floor covering

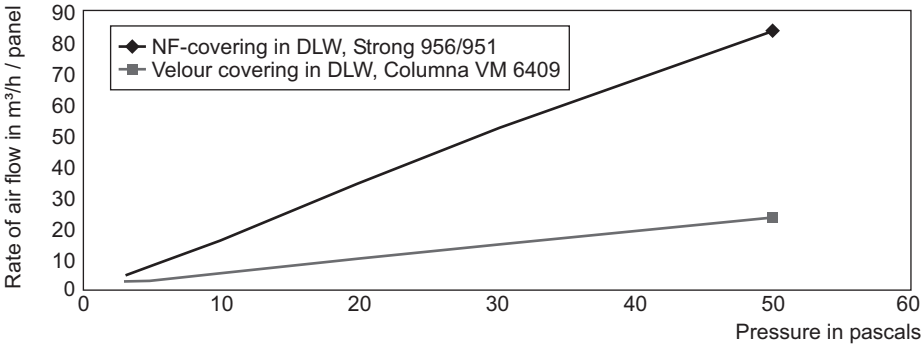


Fig. 22 The Ventec S 36 R 24 *with* floor covering

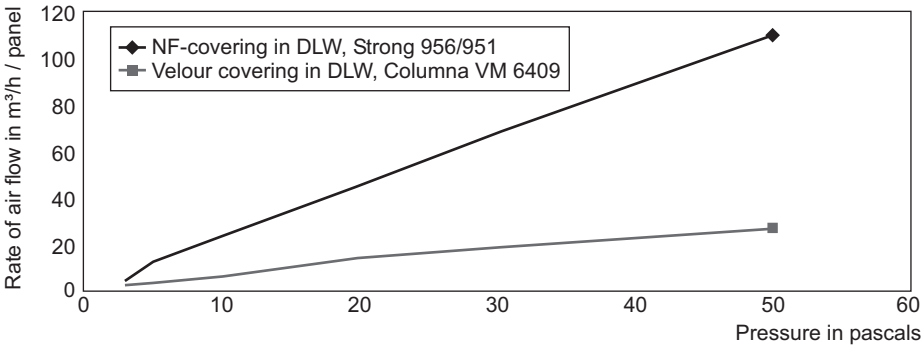


Fig. 25 The Ventec S 36 R 38 *with* floor covering

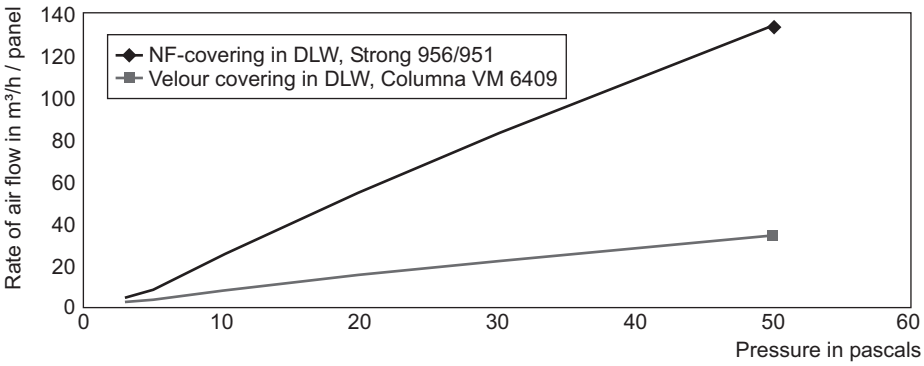
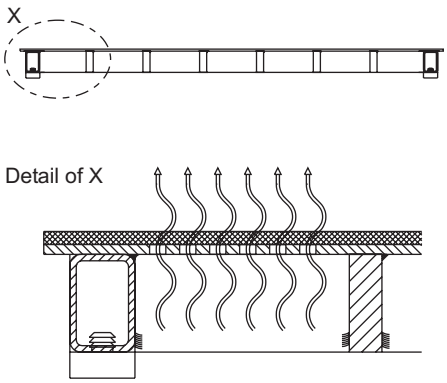


Fig. 26

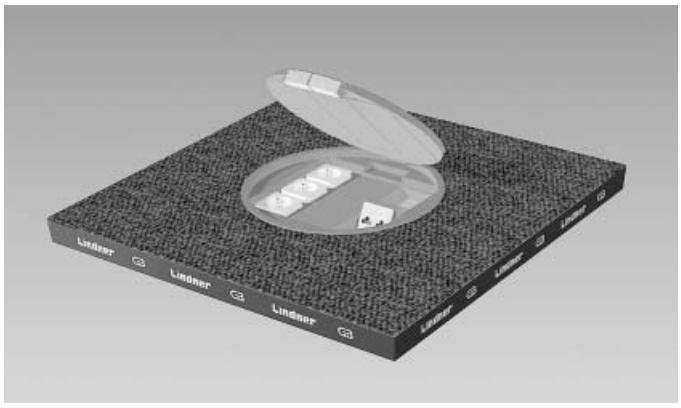


When a room is ventilated through raised flooring, this is usually evident due to vent inserts, drilled holes and the like on the top of the raised flooring. This is where raised flooring with seepage ventilation differs from standard systems.

The design of the floor covering used for this enables air to flow through without perforation directly through the covering. Be sure the floor covering is especially suited.

Note:
To prevent a pattern of the perforation from forming in the floor covering due to soiling, the ventilation filters have to be replaced sufficiently often, the surface of the structural floor has to be appropriate and competent maintenance of the system is necessary.

Fig. 27

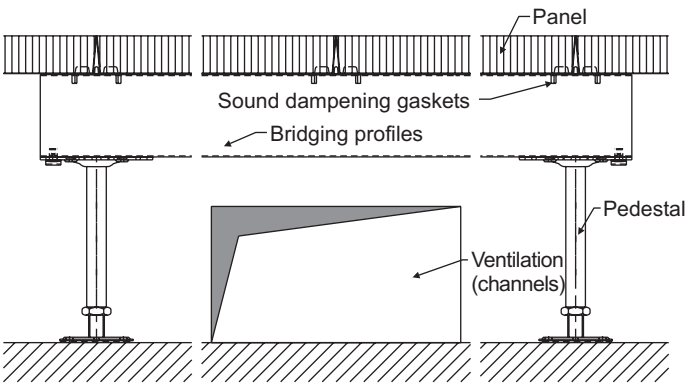


Electrical boxes

Since all the cables run under the raised floor, installing electrical boxes make it possible to select specific places for the electric connections.

Note:
Connections for different equipment can be installed in a distributing box.

Fig. 28

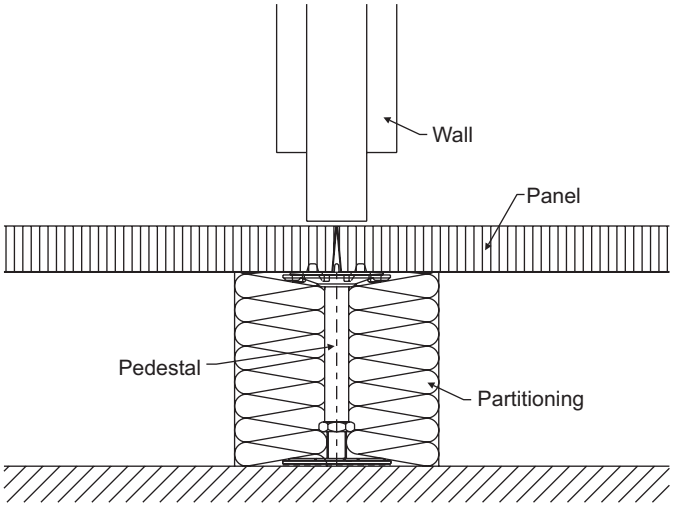


Bridging profiled section elements

Due to circumstances of the building, bridging profiled section elements are necessary in many areas of the raised floor for pedestals to be omitted.

Special bridging profiled section elements are provided for this, which enable simple installation and at the same time an improvement for instances of dynamic and static loading.

Fig. 29



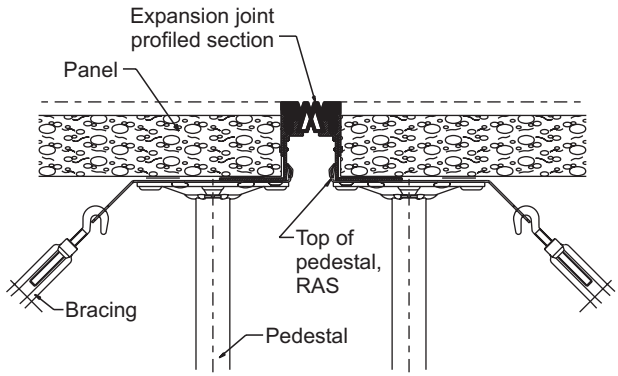
Partitioning

Three different types of partitioning are possible in the raised floor area to satisfy various requirements.

1. Ventilation system partitioning
2. Fireproofing partitioning
3. Soundproofing partitioning

These partitionings are made of single- or multiple-shell designs. Mineral wool, plasterboard and aerated concrete are available, depending on requirements.

Fig. 30

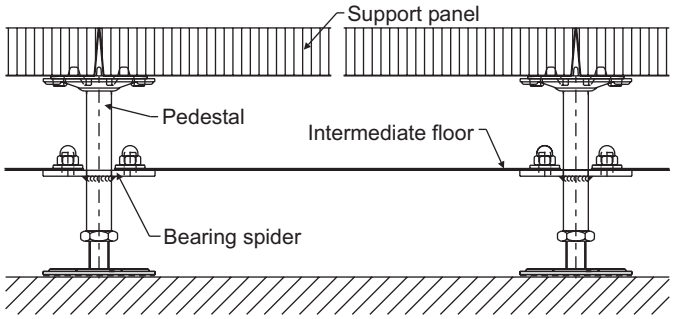


Expansion joints

Expansion joints are used to take up horizontal shifting and vertical settling at the building's expansion joints.

Two variations are available to do this:
- Fitted expansion joint, (see illustration)
- Attached expansion joint

Fig. 31

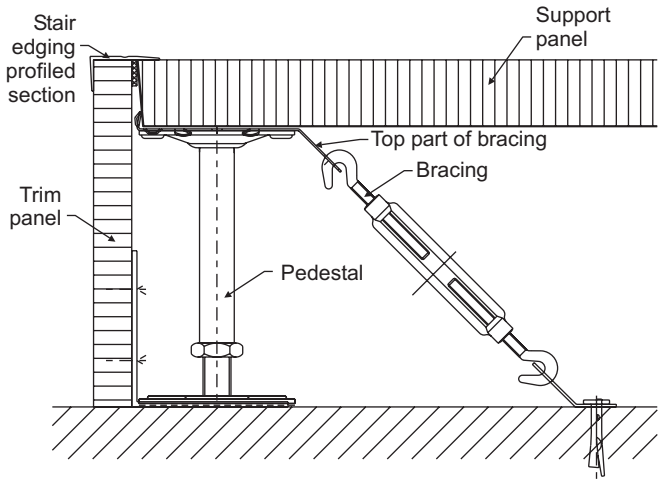


Intermediate floor for cabling

When there is a great density of installations, it is necessary to create additional surfaces for installations. Out intermediate floor for cabling makes this possible. It consists of a star-shaped carrier plate with threaded bolts welded onto the pedestals. Steel panels hook on these bolts and fasten with nuts. This also improves the horizontal stability of the systems.

Two version are available:
- A "walk-on" type, and
- A "non-walk-on" type (see illustration)

Fig. 32

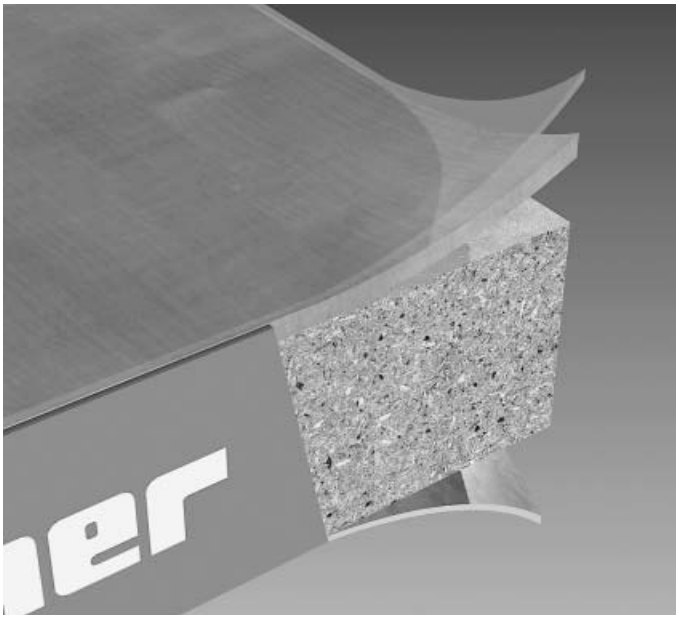


Fascia panel

On staircases, platforms, etc., it is necessary to use front cladding form closing the vertical opening.

When there are requirements, for open bordering, for example, the top edges of the trim panels are covered with stair edging profiled section. In addition to this, fastening with brackets at the bottom and bracing at the top of the trim panel assure stable construction.

Fig. 33



It is possible to apply parquet to Nortec and Ligna raised floor panels. To do so, a lamellar layer-type parquet is glued directly to the support panels. An edge trim with matching colour runs all the way to the top surface of the parquet so as to minimise the wood's sensitivity to humidity.

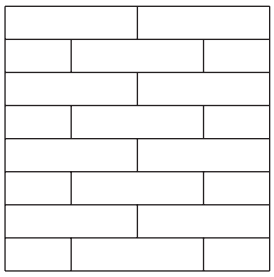
Types of parquet possible

- Oak
- Ash
- Merbau
- Walnut
- Maple
- Bamboo
- Bamboo, steamed
- Beech

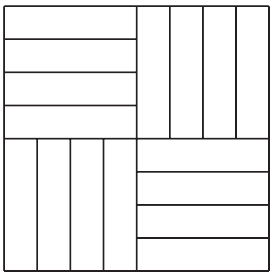
The types of wood listed are only a small selection from our product line. Other woods are available on request.

Patterns

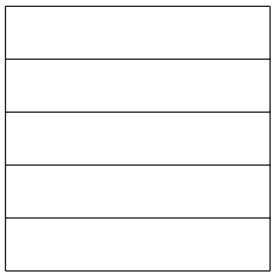
Fig. 34



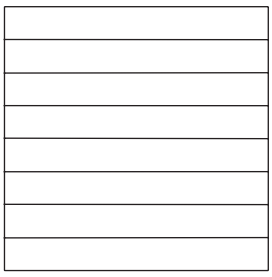
Strip flooring



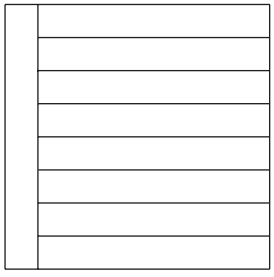
Cube, quadruple



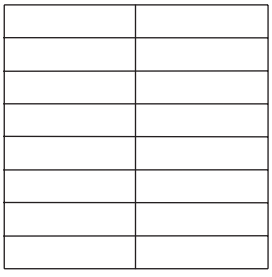
Large strip 1



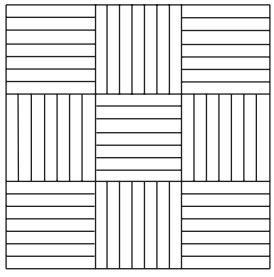
Large strip 2



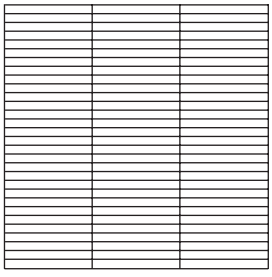
Strip, ladder



Strip, double-row



Mosaic



Industrial parquet

Special patterns are available on request.

Parquet surfaces

These are some of the remarkable advantages of varnished surfaces:
- Extreme hardness of the surface
- Uniform gloss rate
- A high degree or resistance to abrasion
- Hygienically safe
- Colourfast
- Easy to care for
- No yellowing
- No odour
- Adjustable gloss rate
- Resistant to bacteria and micro-organisms
- Varnish-textured
- No danger of slipping
- Soil-repellent

These are some of the remarkable advantages of oiled surfaces:
- Easy to care for
- Damage can be repaired
- Ecologically safe
- The natural texture of the surface is maintained
- No solvents
- Improves the wood's resistance to scratching

Floor Coverings

Applying textile or elastic floor coverings, stone, ceramics or HPL is no problem on Goldbach/Norit raised floors.

Textiles and elastic floor coverings
Textiles and elastic floor coverings are basically suited for application on raised floors. However, to guarantee consistent production quality, all floor coverings are subjected to intensive suitability testing. The following floor coverings can be sorted out right away just visually, because they do not produce the desired result when installed:

Floor coverings suited for raised floors

Fig. 35
Velour floor covering

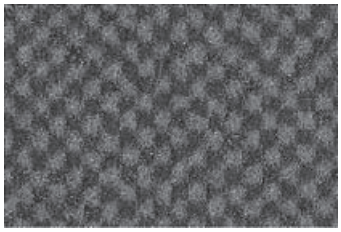
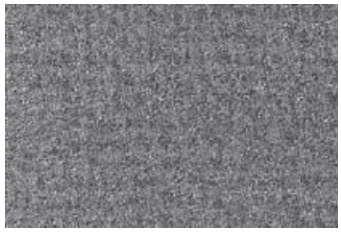


Fig. 36
Velour floor covering



Floor coverings non-suited for raised floors

Fig. 37
Loop pile carpeting

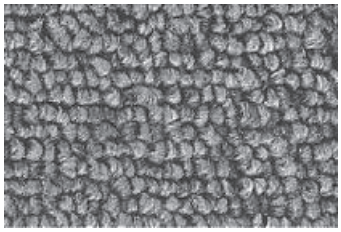
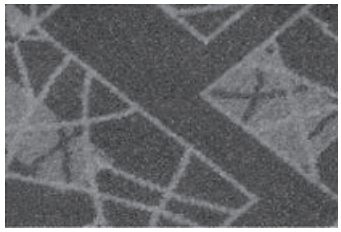
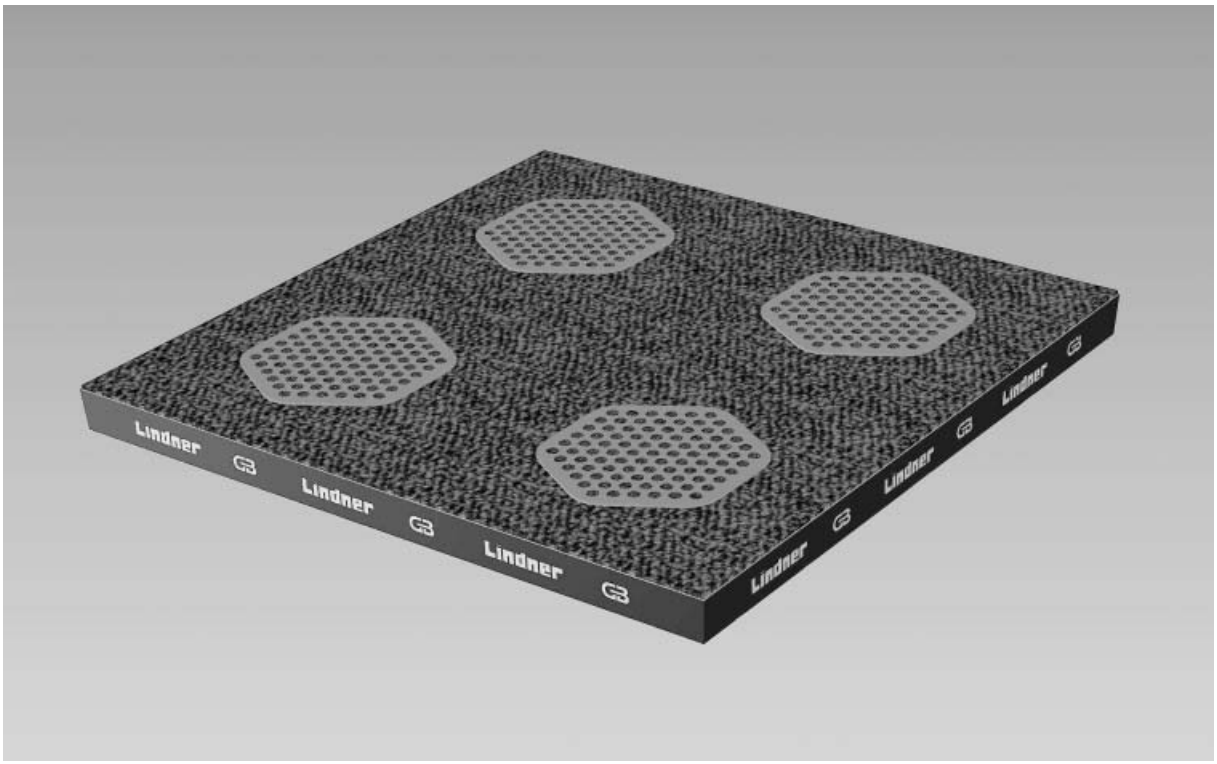


Fig. 38
Velour carpeting with a strong patterns



Cooling / Ventilating / Heating

Fig. 39



General information
In addition to easy accommodation for electric cables, Lindner's Goldbach/Norit floor systems also make it possible to use the cavity to ventilate, cool and heat the space used above them.

Using ventilation inserts makes it possible to cool, heat and ventilate without drafts. There is an open system and a closed system.

Different systems are offered for this:

- Open systems
In these, the ventilation is carried out directly through a cavity for installations, which is made by pressurising the floor, to the various ventilation inserts and/or hexagonal vents and thus into the room being ventilated.

The ventilation inserts can also be delivered with dust traps and volume control devices.

With open systems, the structural floor has to be provided with two-component sealing.

- Closed systems
In closed systems, the air is conducted via a network of piping or via compartments with fixed junctions to the "ventilation inserts".

Fig. 40

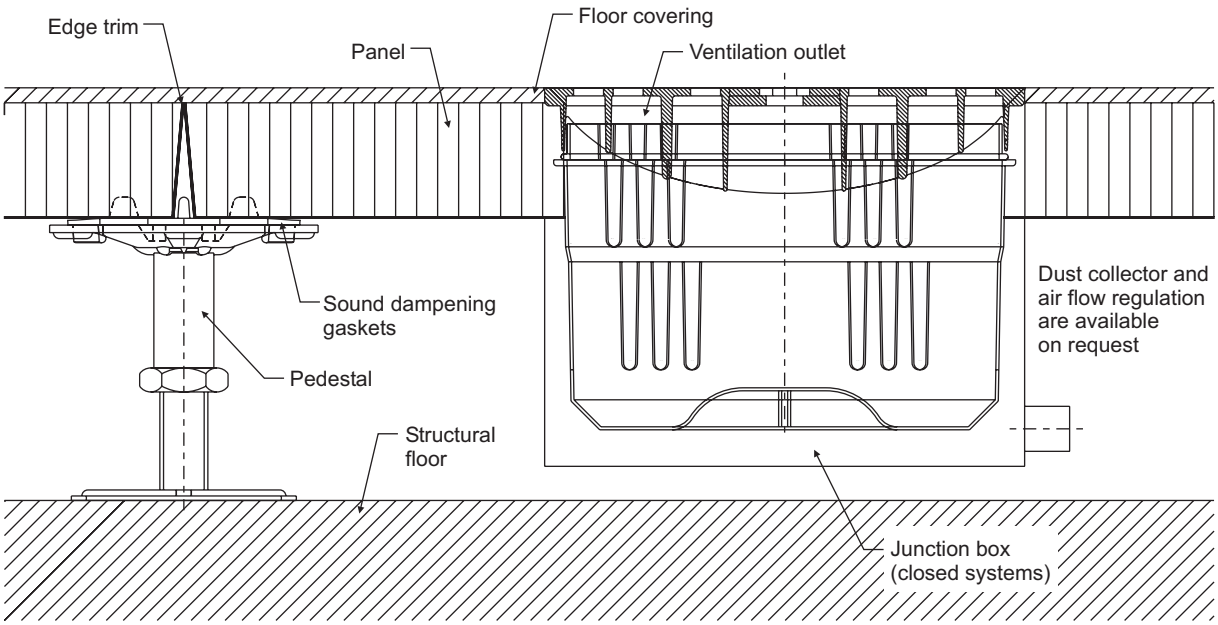


Fig. 41 Raised flooring tile with four hexagonal ventilation inserts

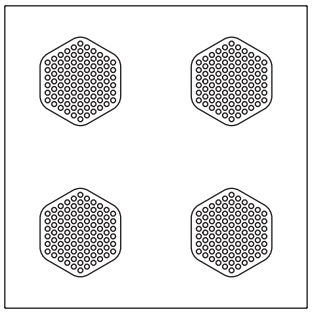


Fig. 42 Raised flooring tile with two hexagonal ventilation inserts

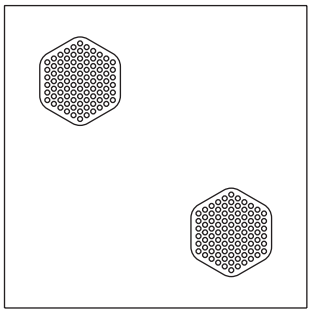
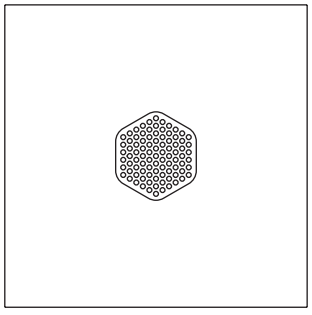


Fig. 43 Raised flooring tile with one hexagonal ventilation insert



Statics

Allow for the minimum edge spacing and interim spacing
→ Reinforcement measures if necessary

Variation 1

Fig. 44 Hexagonal ventilation outlet

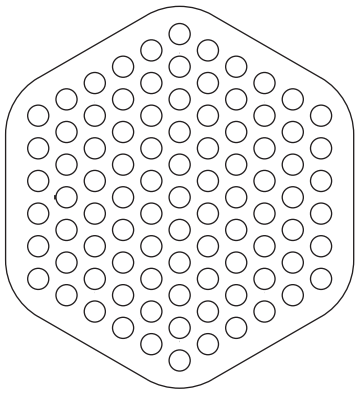
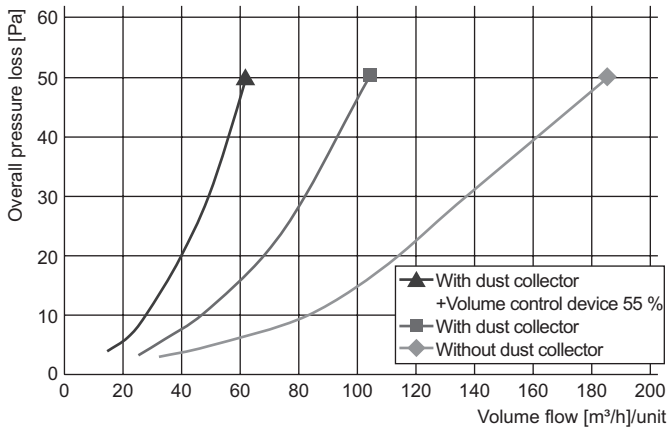


Fig. 45



Variation 2

Fig. 46 Plastic diffuser, Ø of 150 mm

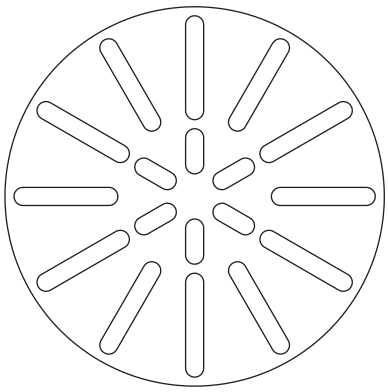
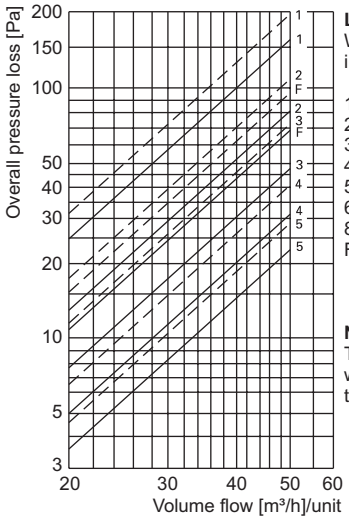


Fig. 47



Legend:
Width of opening of the individual slots in the baffling device

1 = 1 mm
2 = 2 mm
3 = 3 mm
4 = 4 mm
5 = 5 mm (open all the way)
6 = 6 mm
8 = 8 mm (open all the way)
F = Swirl diffusor and filter insert (unsoiled)

Note:
The figures in the diagram for opening widths of 5 also apply to dust traps for the short model.

Variation 3

Fig. 48 Plastic carpet ring, Ø of 200 mm

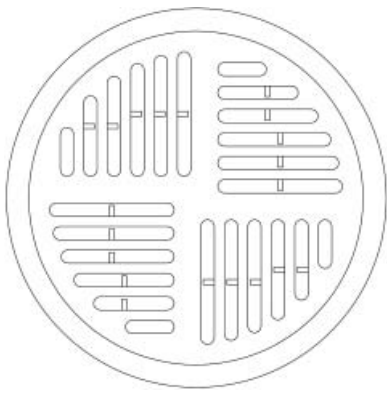
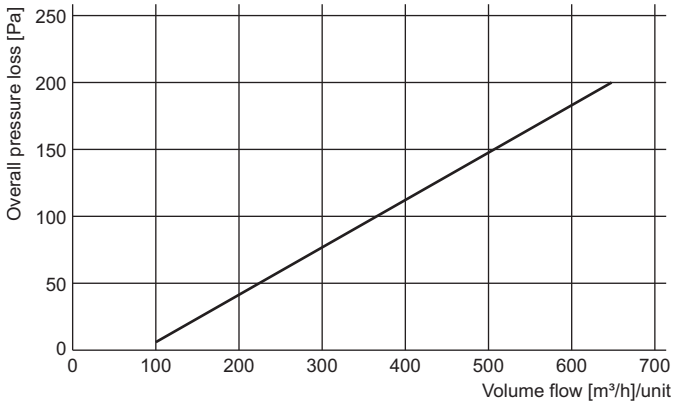


Fig. 49



Raised Flooring
Tightness of Joints

When air is conducted openly under raised floors, it has to be guaranteed that the construction is tight.

The figures specified below have been confirmed by the *Institut für Fenstertechnik e.V.*["Institute of Window Engineering", a registered association] in Rosenheim with Test Report 26101076/2:

Influencing factors

V_L = volume of air flow per unit of length
a = joint tightness coefficient
Δ_p = test pressure difference

Test results

- Wall junctions designed with an edge trim

  Test of wall junction a_{wi}

  → Joint tightness coefficient
  a_w = 0.27 m³/hm

- Wall junctions designed with an edge trim and stringers set in;

  Test of wall junction a_{wi}

  Joint length 6.0 m

  → Joint tightness coefficient
  a_w = 0.27 m³/hm

- Wall junctions designed with airtight sealant; testing of the joints between the raised floor panels a_D

  Joint length 4.2 m

  → Joint tightness coefficient
  a_D = 0.04 m³/hm

Use loosely laid floor coverings for ideal trimming with regard to the joint tightness coefficient of raised flooring systems.

Raised flooring pedestals

These are pedestals protected under patent law, the supporting heads of which can be used in multifunctional ways.

M-pedestals:
Standard design

The M-pedestal line was developed for standard load cases. Constructions heights can be realised from 35 mm – 1200 mm. The surface of the pedestal is yellow-chromatised to prevent corrosion.

Fig. 50 M-pedestal

H-pedestals:
Reinforced design

The H-pedestal line was developed for heavy load applications. Constructions heights can be realised from 35 mm – 1200 mm. The surface of the pedestal is yellow-chromatised to prevent corrosion. The H-line is suited for applying RO, RM, CL and CM stringers (see "Stringers").

Fig. 51 H-pedestal

Heights going beyond this will be manufactured tailored made.

Raised Flooring
Stringers

Stringers can be used to reinforce the static properties of raised flooring.

There is a clipping type, a bolted type and clamping stringers to select from.

Fig. 52

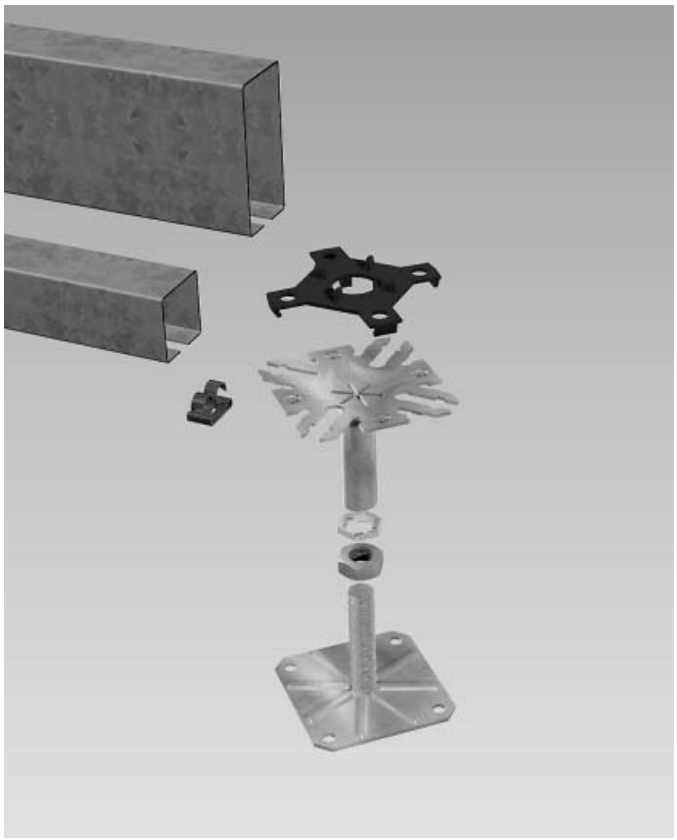
RO, RL (light) and RM (medium) stringers are made of cold-bent, galvanised steel sheet. The cross-sectional form of the RO-type is similar to that of a curved spring clamp. This allows the stringer to be put in by pressing vertically from the top. As with the RL- and RM-types, the cross-sectional form of which is U-shaped, there are springs located on stays on the sides to prevent metallic rattling. Slots in the top side of the stringers are ideal for bolting with drilling screws.

How these are used:
The RO stringer is only for reinforcing systems horizontally.

The RL-type stringer is both for reinforcing systems horizontally and vertically. The load-bearing capacity is improved by approx. 500 N.

The RM-type stringer is both for reinforcing systems horizontally and vertically. The load-bearing capacity is improved by approx. 2,000 N.

Fig. 53

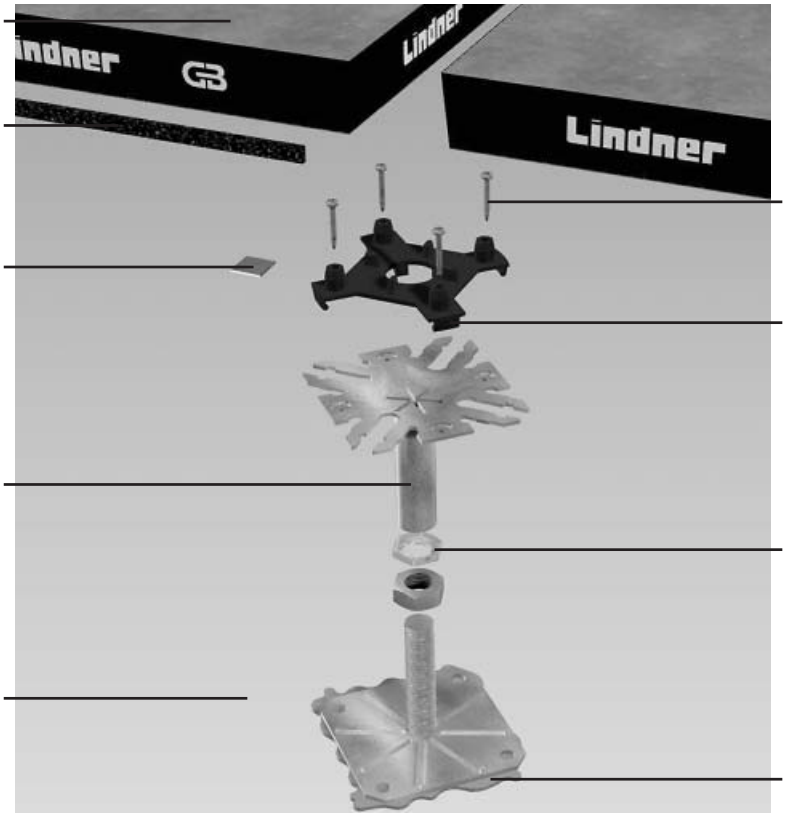


CL (h = 41 mm) and CM (h = 84 mm) stringers are made of cold-bent, galvanised steel sheet. The grid for the pedestals is 600 mm x 600 mm. The stringers are fastened from below by supporting heads using a spring-clip, doing so in the longitudinal direction all the way through, and crosswise at lengths of 558 mm.

With the CM stringer it is possible to install pedestals with a grid of 600 mm x 1200 mm. This variation is useful when the density of installations is high.

With different dimensions for the stringers, loading of up to 2,000 N (2 kN) can be achieved. The exact load figure depends on the type of overall design.

Fig. 54



On item 2): Wall foam tape
A wall junction strip allows expansion by the surfaces of raised floors caused by climatic conditions. A soft strip of foamed material, it produces evenly pre-stressed surfaces of raised floors with optimal fitting of the joints.

On item 3): Self-cutting screws
Self-cutting screws firmly connect sound dampening gaskets (“corner lock” type) to the pedestal heads.

On item 4): Aluminium paces
Equalising plates of various thicknesses made of aluminium are available to equalise tolerances allowed.

On item 5): Sound dampening gasket
There are gaskets available geared precisely to our raised flooring pedestals, with the knobby forms necessary for the various panel types.
These gaskets are made of a highly conductive, PVC-free PE (polyethylene) and/or PA (polyamide) – with a slip-resistant surface on the tops of the plates.
Our gaskets are labelled appropriately with regard to their environmentally friendly disposal.
A variation of sound dampening gaskets are gaskets with plastic sleeves, which lock into place in drilled holes on the reverse side of the raised floor panels. This system, which is called the **“Corner Lock”** system, clips onto the pedestal, or each nub permanently fastened by means of self-cutting screws. This makes horizontal bracing possible without having to use stringers.

On item 7): Mechanical lock
The mechanical lock prevents the height getting out of adjustment as the result of vibration caused by the floor system being used. Later readjustments are possible at any time.

On item 8): Anti-dust-sealing
The primary objective of sealing the structural floor is to bind dust from the surface of the unfinished concrete, and thus enable permanent adhesion of the pedestals. Visual standards, such as spots caused by varying degrees of absorption by the unfinished concrete, are of secondary importance. Coverings of paint can be applied on request.

Two sealing variations are used:
a) 1-K dispersion sealant for binding dust
b) 2-K epoxide resin sealant for binding dust and further requirements, such as open conduction of air

On item 9): Pedestal adhesive
The standard pedestal adhesive used is a single-package PU adhesive system.
- The setting time until the first loading: 20 hours
- The setting time until the final hardness 1-2 weeks, depending on the marginal conditions

Fast-setting adhesives with short liquid pot lives are available for special applications.

General Description

Fig. 55

Frequently just a line in planning documents, in conventional buildings the floors are hardly given attention to the floor is to a large extent functionless, serving to accommodate aesthetic floor coverings.

For the building of office and administration buildings, this attitude has changed. With the advent of cavity-type flooring and raised flooring systems, walk-on space is created that can be used to install a great many supply and disposal lines. The floor obtains a function that gives buildings much improved characteristics. With the flexibility thus obtained the future of the investment is assured.

The highest degree of flexibility is obtained from raised floors. But such a high degree of flexibility is not estimated everywhere. And continuous joints also interfere.

This is why a new generation of flooring was developed that uses the advantages of well-known installations flooring but in doing so avoids well-known disadvantages:

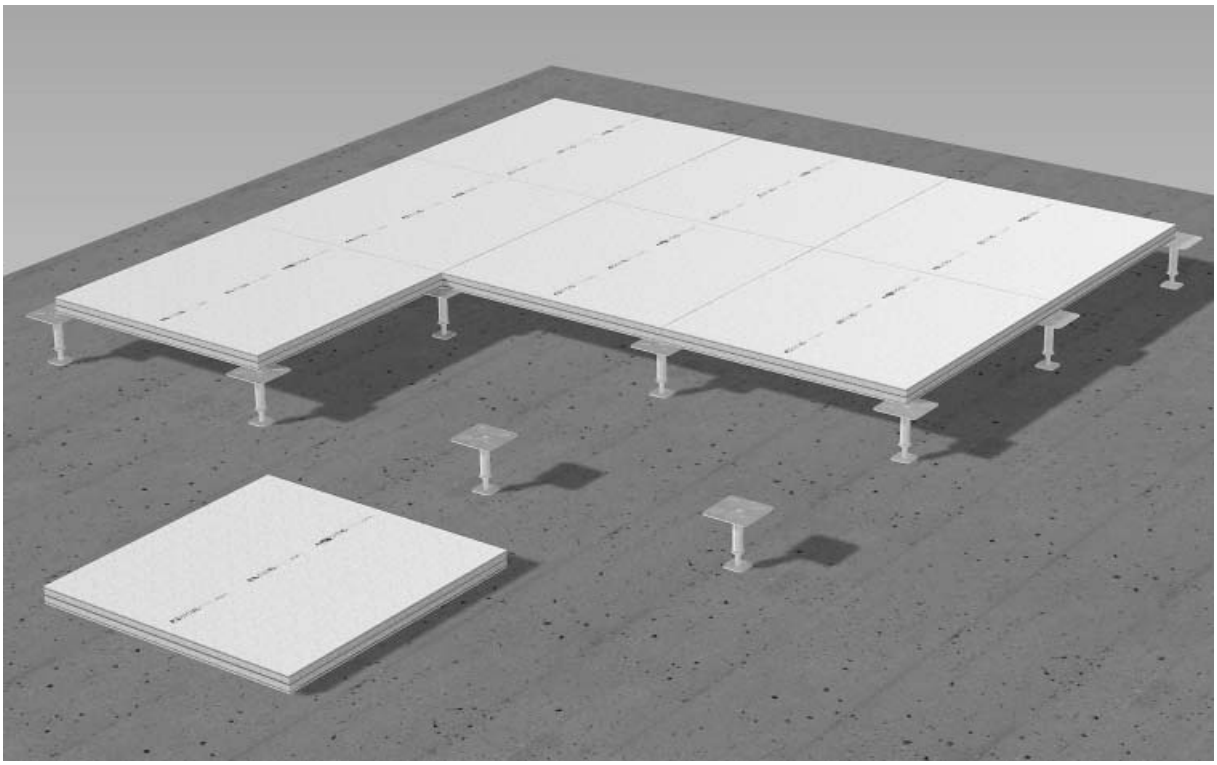
***Floor and more,* a dry flooring system**

High-strength mineral flooring panels are joined with one another by means of a special toothed milling of the edges, thus forming a surface that appears to be jointless. To equalise constructional tolerances, the system rests on steel pedestals.

Due to the innovative geometry of the edges, a combination of closed and removable flooring areas is created geared to individual use. The meshing of the panels produces a construction the stability of which is maintained even during alterations.

FLOOR and more

Fig. 56



The *Floor and more* flooring system consists of calcium sulphate panels with a thickness of 24/30/36 mm.

Suitable panels are available depending on the requirements (such as loading or construction height).

The special shaping of the panel edges enables installation creating a closed, homogenous surface.

This special profiling meshwork is glued exactly at site using a special adhesive.

The panel dimensions are 600 mm x 600 mm.

To obtain the best possible footfall sound reduction, the galvanised cavity-type floor pedestals are glued both to the floor panel and to the structural floor.

The surface of the flooring can be loaded after just a few hours.

A self-adhesive foam tape prevents direct sound transmission to adjacent components.

For air-conducting installation floors, we recommend coating the structural floor with a two-component sealant.

Range of use
- Projects with short construction times (no time for drying)
- Refurbishment areas
- Training and research rooms
- Industrial and factory rooms
- Office and designing areas

Special features
- Excellent fireproofing properties
- Low weight per unit area
- No drying time
- Can be walked on immediately
- Substructure adjustable in height
- Combination with other flooring systems, such as cavity-type flooring or raised flooring

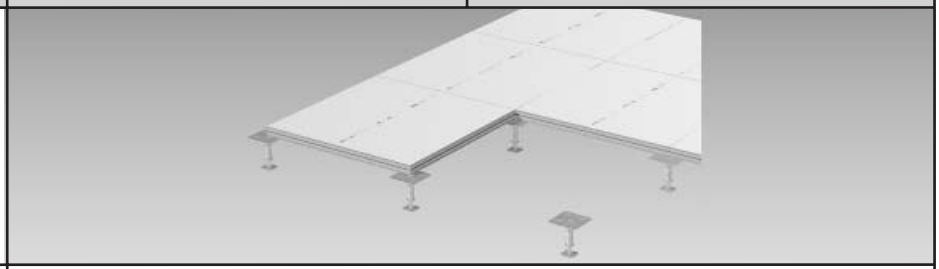
Coverings
- In rolls and as tiles
- Linoleum, PVC, rubber
- Tufting, woven textile, needled felt
- Parquet, timber pavement, unfinished parquet applied by the factory
- Ceramics, natural stone, artificial stone

TESTED & RECOMMENDED BY THE

GEPRÜFT UND EMPFOHLEN VOM
IBR
INSTITUT FÜR BAUBIOLOGIE ROSENHEIM GmbH

Health and ecological aspects were also considered for recommendations of the product.An examination was carried out for: lindane, pentachlorphenol, formaldehyde, heavy metals, and more

Floor and more
System Specifications

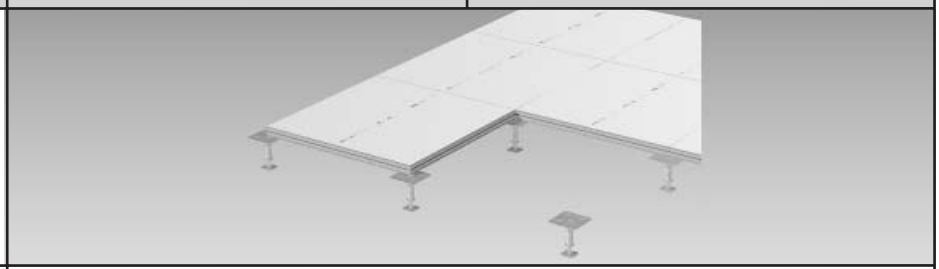
System designation	Floor and more	Floor and more
Type	N 24 x L / A	N 24 x L / B
Illustration		
Panel / Material	Calcium sulphate panel with profiled edges	
Dimensions	600 x 600 mm	
Thickness	24 mm	
Weight [1]	38 kg/m²	
Substructure Recommendation for construction height > 500 mm	Steel pedestals RO stringers	
Construction heights [2]	62 - 800 mm	
Loading capacity rating	See “STATICS” supplement	
Fireproofing Building-materials rating ot the panel	A (non-combustible)	
Soundproofing [3]	Without floor covering	With floor covering (improvement = 25 dB)
Degree of longitudinal sound reduction	– (50 dB) [4]	45 dB
Airborne Sound Reduction index	62 dB	–
Footfall sound level index assessed	– (60 dB) [4]	55 dB (47 dB) [4]
Degree of improvement of footfall sound	–	23 dB (27 dB) [5]
Suitability of covering	Textile coverings, Elastic coverings, Loosely laid tiles, Parquet/Unfinished parquet applied by the factory	

1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) VDI 3762 must be complied with; values tested with the 30-mm panel
4) With isolation joint and mineral fibre bulkhead
5) With footfall sound insulating plates

FLOOR and more

Subject to change without notice.

Floor and more
System Specifications

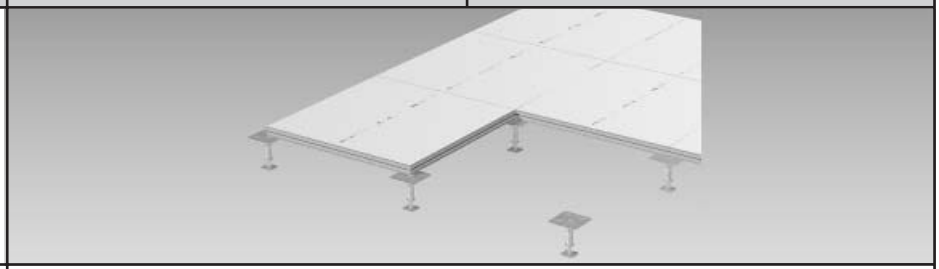
System designation	Floor and more	Floor and more
Type	N 30 x L / A	N 30 x L / B
Illustration		
Panel / Material	Calcium sulphate panel with profiled edges	
Dimensions	600 x 600 mm	
Thickness	30 mm	
Weight [1]	47 kg/m²	
Substructure Recommendation for construction height > 500 mm	Steel pedestals RO stringers	
Construction heights [2]	68 - 800 mm	
Loading capacity rating	See “STATICS” supplement	
Fireproofing Building-materials rating of the panel Fire-resistant rating [3]	 A (non-combustible) F30	
Soundproofing [4]	Without floor covering	With floor covering (improvement = 25 dB)
Degree of longitudinal sound reduction	– (50 dB) [5]	45 dB
Airborne Sound Reduction index	62 dB	–
Footfall sound level index assessed	– (60 dB) [5]	55 dB (47 dB) [5]
Degree of improvement of footfall sound	–	23 dB (27 dB) [6]
Suitability of covering	Textile coverings, Elastic coverings, Loosely laid tiles, Parquet/Unfinished parquet applied by the factory, Stone [7]	

1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance period for the support panel
4) VDI 3762 must be complied with
5) With isolation joint and mineral fibre bulkhead
6) With footfall sound insulating plates
7) Available on request

FLOOR and more

Subject to change without notice.

Floor and more
System Specifications

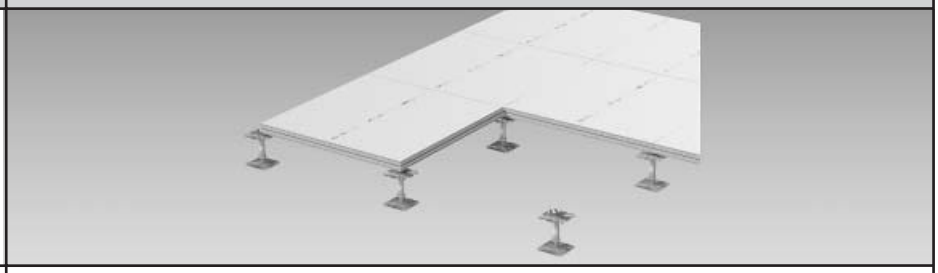
System designation	Floor and more	Floor and more
Type	N 36 x L / A	N 36 x L / B
Illustration		
Panel / Material	Calcium sulphate panel with profiled edges	
Dimensions	600 x 600 mm	
Thickness	36 mm	
Weight [1]	56 kg/m²	
Substructure Recommendation for construction height > 500 mm	Steel pedestals RO stringers	
Construction heights [2]	74 - 800 mm	
Loading capacity rating	See “STATICS” supplement	
Fireproofing Building-materials rating of the panel Fire-resistant rating [3]	 A (non-combustible) F30	
Soundproofing [4]	Without floor covering	With floor covering (improvement = 25 dB)
Degree of longitudinal sound reduction	–	46 dB
Airborne Sound Reduction index	62 dB	–
Footfall sound level index assessed	–	55 dB
Degree of improvement of footfall sound	–	23 dB (29 dB) [5]
Suitability of covering	Textile coverings, Elastic coverings, Loosely laid tiles, Parquet/Unfinished parquet applied by the factory, Stone	

1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance period for the support panel
4) VDI 3762 must be complied with
5) With footfall sound insulating plates

FLOOR and more

Subject to change without notice.

Floor and more
System Specifications

System designation	Floor and more
Type	N 40 x H / A
Illustration	
Panel / Material	Calcium sulphate panel with profiled edges
Dimensions	600 x 600 mm
Thickness	40 mm
Weight [1]	62 kg/m²
Substructure Recommendation for construction height > 500 mm	Steel pedestals RO stringers
Construction heights [2]	72 - 800 mm
Loading capacity rating	See “STATICS” supplement
Fireproofing Building-materials rating of the panel Fire-resistant rating [3]	 A (non-combustible) F30
Soundproofing [4]	Without floor covering / With floor covering (improvement = 25 dB)
Degree of longitudinal sound reduction	– / 46 dB
Airborne Sound Reduction index	62 dB / –
Footfall sound level index assessed	– / 55 dB
Degree of improvement of footfall sound	– / 23 dB (29 dB) [5]
Suitability of covering	Textile coverings, Elastic coverings, Loosely laid tiles, Parquet/Unfinished parquet applied by the factory, Stone

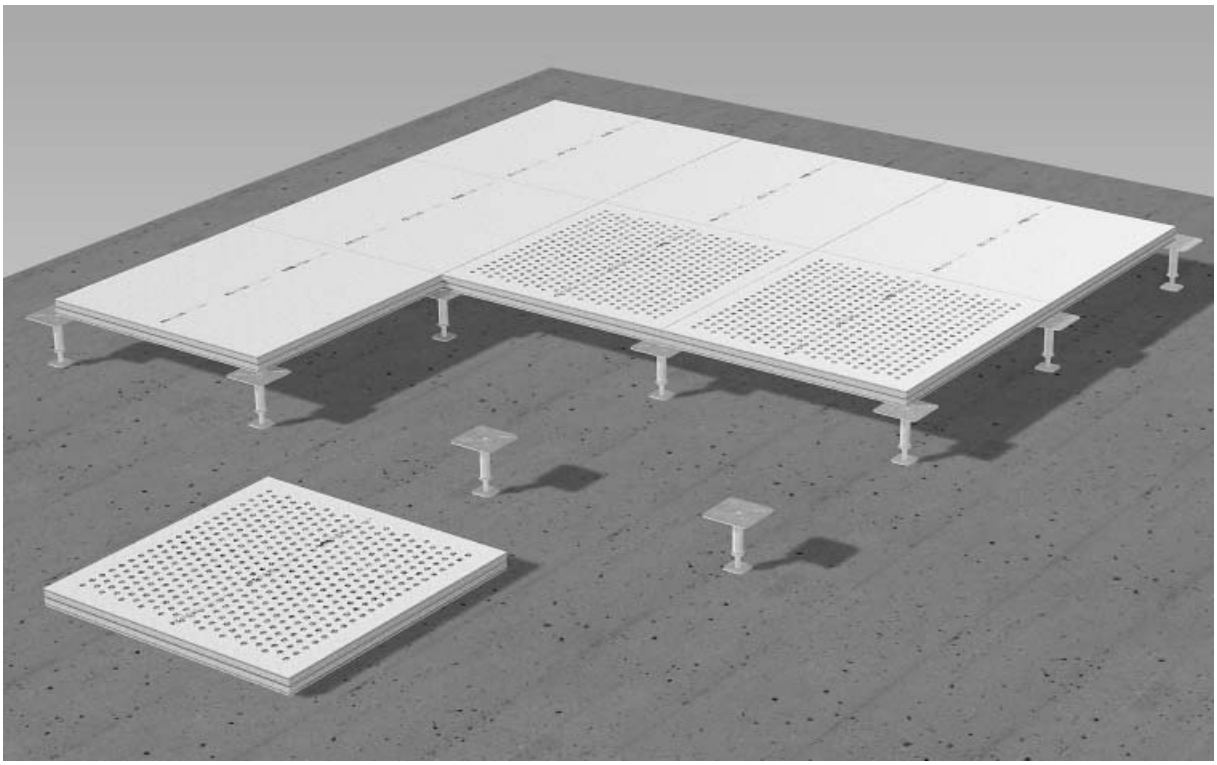
1) With 150-mm finished floor height, without floor covering
2) Special heights available on request
3) Fire-resistance period for the support panel
4) VDI 3762 must be complied with; values tested with the 36-mm panel
5) With footfall sound insulating plates

FLOOR and more

Subject to change without notice.

FLOOR and more

Fig. 57



A further development of the *Floor and more* floor system, with ventilation holes, adds some further advantages in using it in addition to the well-known properties of the standard floor system. The number of holes with a diameter of 13 mm is variable, and so open cross-sectional areas can be realised of 10%, 13% or 16%.

Applying top floor coverings suited for seepage ventilation produces “invisible room air-conditioning”.

A big advantage is also the floor system’s sound absorption. Using textile carpeting suitable for seepage ventilation, the perforated dry floor can be classified in Sound Absorption Class D. In modern office construction with smooth surfaces, the reverberation time is reduced positively when Floor-and-more elements with perforation for ventilation are used. An additional combination with absorbent ceilings enables cousiderable advantages in the room acoustics.

Range of use
- Projects with short construction times
- Refurbishment projects
- Training and conference rooms
- Office areas
- Areas with high sound-absorption requirements

Special features
- Low weight per unit area
- No drying time
- Can be walked on immediately
- Substructure adjustable in height
- Combination with other flooring systems, such as cavity-type flooring or raised flooring
- Suited for room heating and cooling
- Suitable for absorbing sound

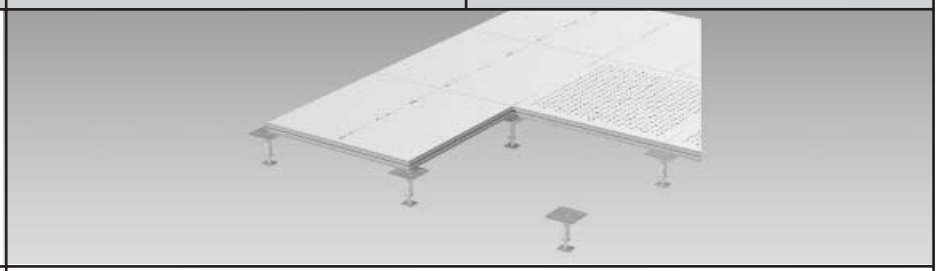
Coverings
Textile floor coverings and loosely laid tiles suited for seepage ventilation

TESTED & RECOMMENDED BY THE

GEPRÜFT UND EMPFOHLEN VOM INSTITUT FÜR BAUBIOLOGIE ROSENHEIM GmbH
IBR

Health and ecological aspects were also considered for recommendations of the product.An examination was carried out for: lindane, pentachlorphenol, formaldehyde, heavy metals, and more

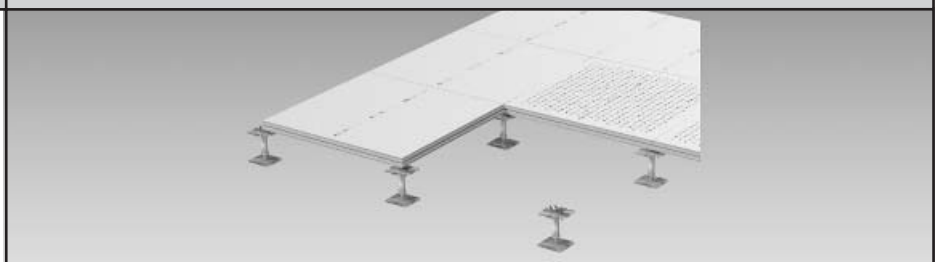
Floor and more
System Specifications

System designation	Floor and more	Floor and more
Type	N 36 R 10 x L / A N 36 R 13 x L / A N 36 R 16 x L / A	N 36 R 10 x L / B N 36 R 13 x L / B N 36 R 16 x L / B
Illustration		
Panel / Material	Calcium sulphate panel with profiled edges and perforations for ventilation 13 mm in ø [1)]	
Dimensions	600 x 600 mm	
Thickness	36 mm	
Weight [2)]	51 kg/m²	
Substructure Recommendation for construction height > 500 mm	Steel pedestals RO stringers	
Construction heights [3)]	74 - 800 mm	
Loading capacity rating	See “STATICS” supplement	
Fireproofing Building-materials rating of the panel	A (non-combustible)	
Perforation type R 10 R 13 R 16	Free air percentage 10 % 13 % 16 %	
Suitability of covering	Textile coverings and loosely laid tiles suitable for seepage ventilation	
Sound absorption [4)] R 16 with needle-punched nonwoven R 16 with velours R 16 with needle-punched nonwoven and cavity insulation	Degree of absorption 0.50 0.40 0.55	Absorption rating D D D

1) Different hole diameters are possible as an option
2) With 150-mm finished floor height, without floor covering
3) Special heights available on request
4) Top floor covering suited for seepage ventilation

FLOOR and more

Floor and more
System Specifications

System designation	Floor and more
Type	N 40 R 10 x H / A N 40 R 13 x H / A N 40 R 16 x H / A
Illustration	
Panel / Material	Calcium sulphate panel with profiled edges and perforations for ventilation 13 mm in ø [1]
Dimensions	600 x 600 mm
Thickness	40 mm
Weight [2]	54 kg/m²
Substructure Recommendation for construction height > 500 mm	Steel pedestals RO stringers
Construction heights [3]	72 - 800 mm
Loading capacity rating	See “STATICS” supplement
Fireproofing Building-materials rating of the panel	A (non-combustible)
Perforation type R 10 R 13 R 16	Free air percentage 10 % 13 % 16 %
Suitability of covering	Textile coverings and loosely laid tiles suitable for seepage ventilation
Sound absorption [4]	Degree of absorption / Absorption rating
R 16 with needle-punched nonwoven	0.50 / D
R 16 with velours	0.40 / D
R 16 with needle-punched nonwoven and cavity insulation	0.55 / D

1) Different hole diameters are possible as an option
2) With 150-mm finished floor height, without floor covering
3) Special heights available on request
4) Top floor covering suited for seepage ventilation

FLOOR and more

Subject to change without notice.

Fig. 58 Ventilation diagram: Floor and more N 36 *with* floor covering

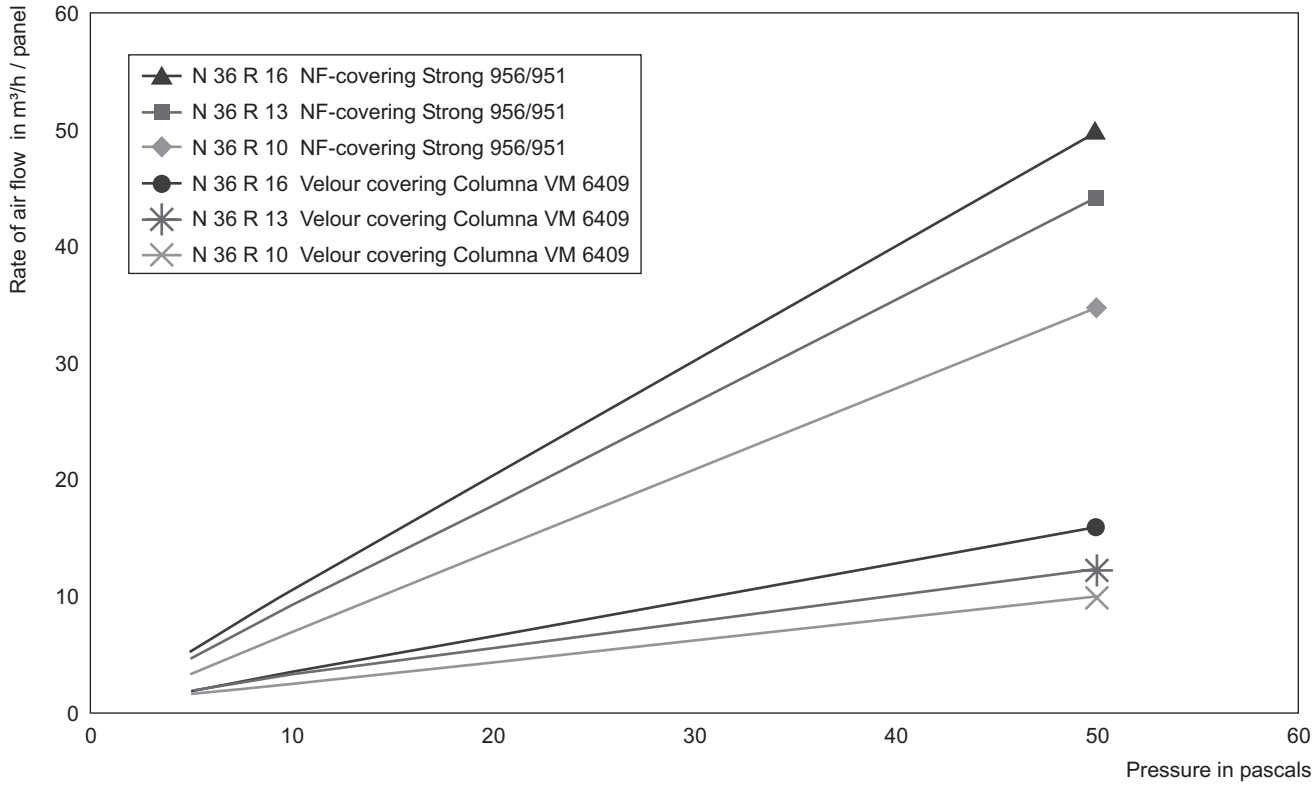


Fig. 59 Ventilation diagram: Floor and more N 40 *with* floor covering

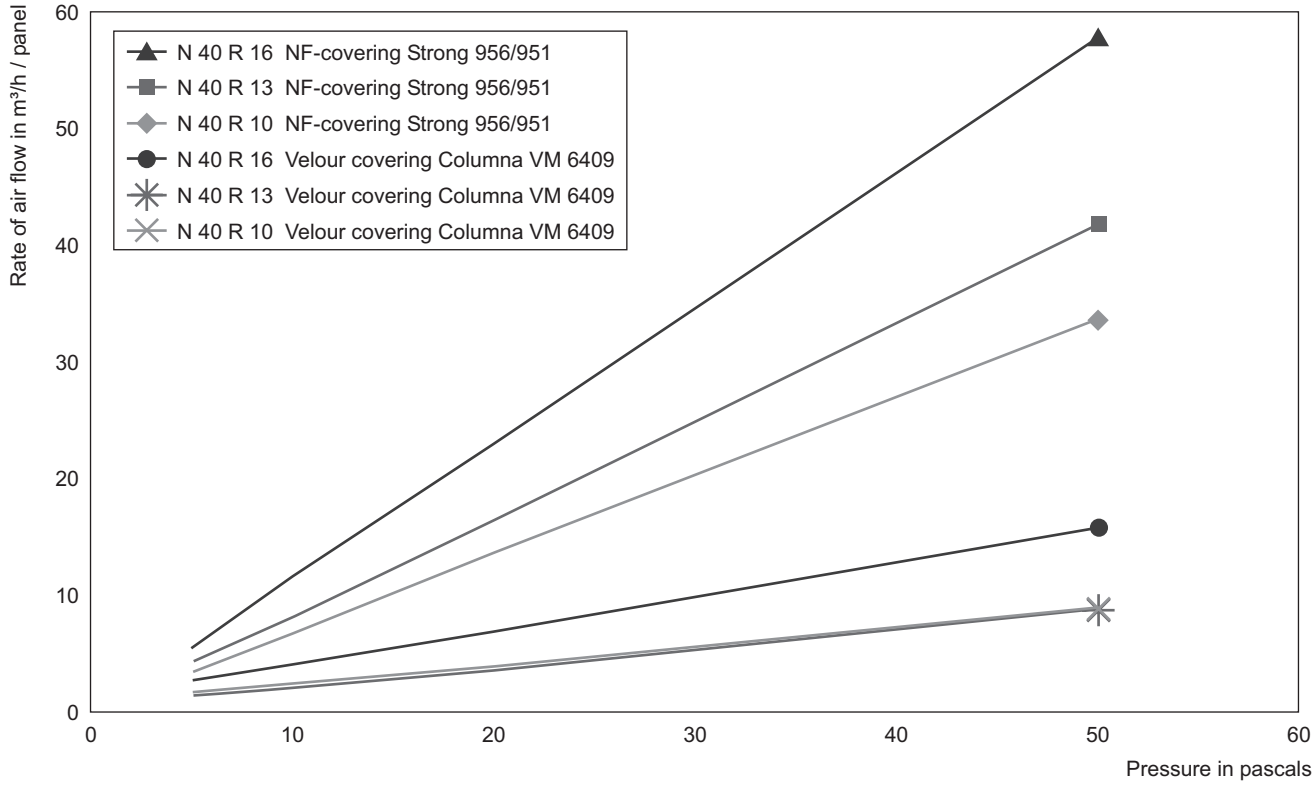


Fig. 60 Floor and more N 36 R 16 x L with velour carpet (type: DLW, Premier Queen)
Rated degree of sound absorption
α_w = 0.40 (LH)

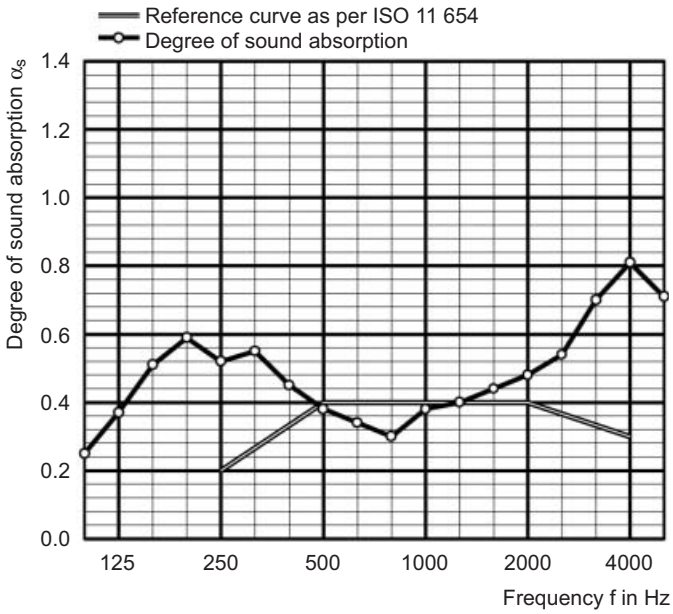


Fig. 61 Floor and more N 36 R 16 x L with needle-felt floor covering (type: Forbo, Titan)
Rated degree of sound absorption
α_w = 0.50 (LH)

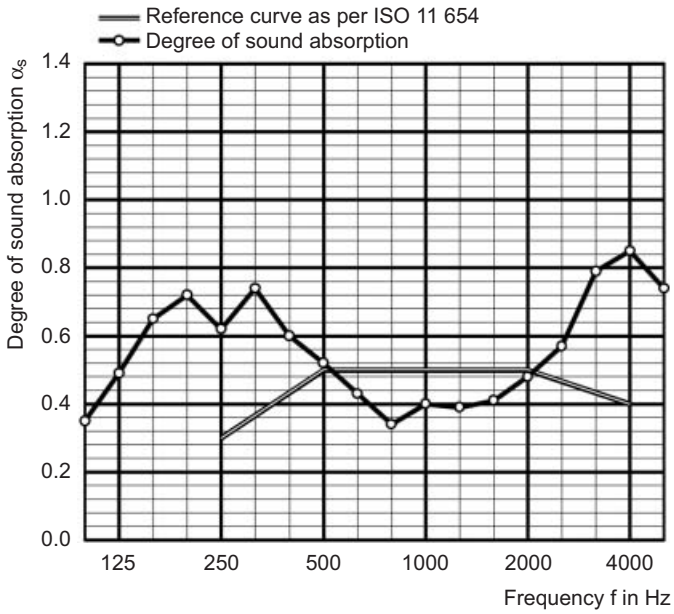
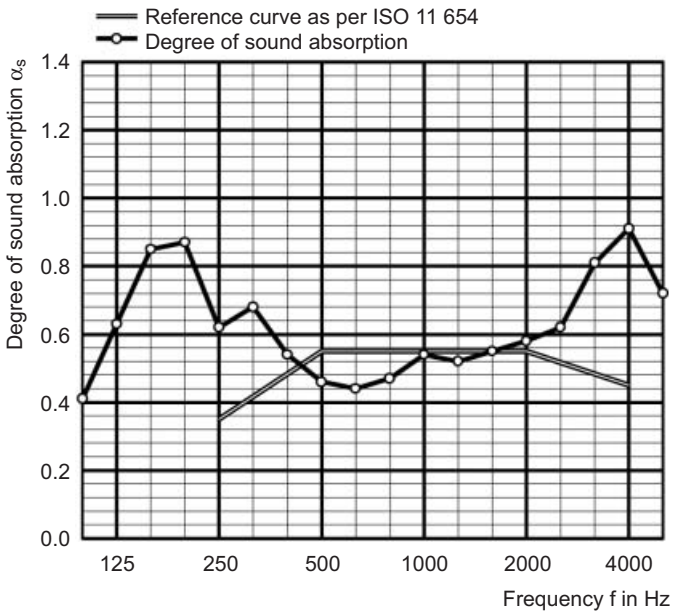
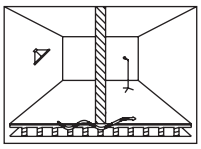


Fig. 62 Floor and more N 36 R 16 x L with needle-felt floor covering (type: Forbo, Titan) and cavity insulation
Rated degree of sound absorption
α_w = 0.55 (LH)



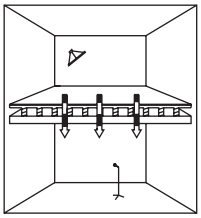
The most important parameters for Lindner floor systems are described in the following overview.

Remarks:



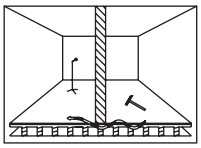
Rated degree of longitudinal sound reduction as per DIN 52210 $R_{L,w,P}$ and/or $D_{n,f,w,P}$ as per ISO 140-12

The measurement is made in a horizontal direction in conjunction with a high-performance sound-insulating partition wall placed on the system floor. This determines an index figure for the floor, using which the sound insulation index can be calculated from room to room, incorporating the other flanks and the isolating wall in the building. Higher figures are better due to the higher insulating value.



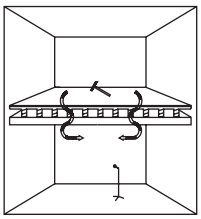
Sound insulation index $R_{w,P}$ as per DIN 52 210 and/or ISO 140-3

The measurement is made in a vertical direction, i.e. from storey to storey of the building, with a standardised structural ceiling. This allows different systems to be compared. A conversion has to be made to the construction conditions, however, if the actual structural ceiling differs in its structure. Higher figures are better (because of the higher insulating value).



Rated footfall sound level $L_{n,w,P}$ as per DIN 52 210 and/or $L_{n,f,w,P}$ as per ISO 140-12

The measurement is made in a horizontal direction in conjunction with a high-performance sound-insulating partition wall placed on the system floor. Higher figures are better, (as they are louder).



Degree of improvement in footfall sound $\Delta L_{w,P}$ as per DIN 52210 and/or ISO 140-8

The measurement is made in a vertical direction, i.e. from storey to storey of the building, with a standardised structural ceiling. This allows different systems to be compared. However, a conversion has to be made to the construction conditions in this case, too, if the actual structural ceiling differs in its structure. Higher figures are better (because of greater improvement).

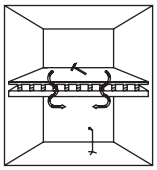
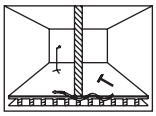
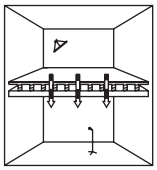
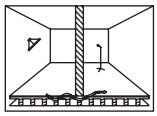
The floor covering is not relevant for Airborne Sound Reduction of the cavity. The results for footfall sound reduction depend on the degree to which the floor covering provides an improvement. Openings for ventilation, which might lower the degree of soundproofing, have not been taken into account.

To calculate values for a building, the corrective degrees should be allowed for in accordance with VDI 3762.

Combinations of raised floors and hollow floors or hollow ceilings should be assessed in each individual case. The corrective degrees should be determined by a planner.

For information relevant to soundproofing for the various systems, refer to the system specification sheets and/or the following table.

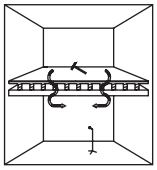
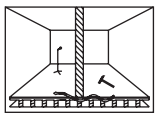
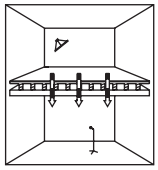
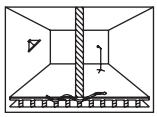
Overview of Floor Systems
Airborne Sound Reduction and Footfall sound reduction

Airborne Sound Reduction and Footfall Sound Reduction			 Degree of improvement of footfall sound in db $\Delta L_{w,P}$	 Rated footfall sound level in dB $L_{n,w,P}$ or $L_{n,f,w,P}$	 Rated sound insulation in dB $R_{w,P}$	 Rated degree of longitudinal sound reduction in dB $R_{L,w,P}$ or $D_{n,f,w,P}$
Raised Floor	**Type Lintec AK**	Without floor covering or with hard floor covering	17 L132-P108/86[2)]	67 L338.95-P171[2)]	–	57 L339.95-P171[2)]
		With carpet, improvement = 25 dB, as loose-lay tiling	25 0126.98-P199[2)]	45 L133-P108/86[2)]	–	–
		With carpet, improvement = 28 dB, as loose-lay tiling	–	–	62 L132-P108/86[2)]	–
		Without floor covering or with hard floor covering with enhanced footfall sound reduction	22 0127.98-P199[2)]	–	–	–
	Type Lintec AS	With carpet, improvement = 28 dB, as loose-lay tiling	25 L337.95-P171[2)]	43 L331.95-P171[2)]	62 L132-P108/86[2)]	55 L335.95-P171[2)]
	Type Nortec 30	Without floor covering or with hard floor covering	–	–	–	48 AC99-057/2[1)]
		With carpet, improvement = 25 dB, as loose-lay tiling	22 dB	47 AC99-057/2[1)]	–	–
		With carpet, improvement = 28 dB, as loose-lay tiling	–	–	62 L132-P108/86[2)]	–
	Type Nortec 36	Without floor covering or with hard floor covering	14 AC99-136/4[1)]	70 AC99-136/16[1)]	–	49 AC99-136/15[1)]
		With carpet, improvement = 25 dB, as loose-lay tiling	24 AC99-136/3[1)]	51 AC99-136/14[1)]	–	–
		With carpet, improvement = 28 dB, as loose-lay tiling	–	–	62 L132-P108/86[2)]	–
		Without floor covering or with hard floor covering with enhanced footfall sound reduction	26 AC99-136/2[1)]	–	–	–
		With carpet, improvement = 25 dB enhanced footfall sound reduction	32 AC99-136/1[1)]	–	–	–
	Type Nortec 36 ST	Without floor covering or with hard floor covering	14 AC99-136/5[1)]	70 AC99-136/18[1)]	–	49 AC99-136/17[1)]
		With carpet, improvement = 28 dB, as loose-lay tiling	–	–	62 L132-P108/86[2)]	–
	Type Ligna 38 AL	Without floor covering or with hard floor covering	16 L132-P108/86[2)]	63 L340.95-P171[2)]	62 L132-P108/86[2)]	49 L344.95-P171[2)]
		With carpet, improvement = 28 dB and MF-partition (w = 500 mm)	–	–	–	60 L342.95-P171[2)]
	Type Ligna 38 ST	Without floor covering or with hard floor covering	16 L132-P108/86[2)]	64 L343.95-P171[2)]	62 L132-P108/86[2)]	49 L344.95-P171[2)]
		With carpet, improvement = 25 dB, as loose-lay tiling	–	52 L132-P108/86[2)]	–	–
		With carpet, improvement = 28 dB, as loose-lay tiling	–	–	–	52 L345.95-P171[2)]

1) Testing in accordance with NF EN ISO 140, Parts 1 to 12 2) Testing in accordance with DIN 52 210

Subject to change without notice.

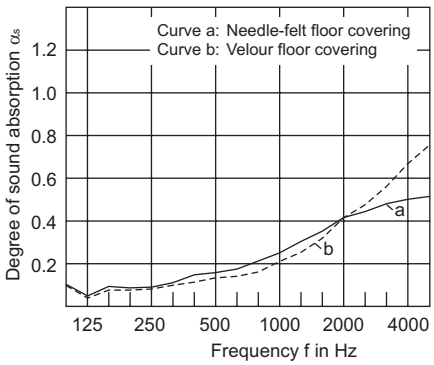
Overview of Floor Systems
Airborne Sound Reduction and Footfall sound reduction

Airborne Sound Reduction and Footfall Sound Reduction			 Degree of improvement of footfall sound in db $\Delta L_{w,P}$	 Rated footfall sound level in dB $L_{n,w,P}$ or $L_{n,f,w,P}$	 Rated sound insulation in dB $R_{w,P}$	 Rated degree of longitudinal sound reduction in dB $R_{L,w,P}$ or $D_{n,f,w,P}$
Floor and more	**Type N 24**	Without floor covering or with hard floor covering	–	–	62 AC01-091/14[1)]	–
		With carpet, improvement = 25 dB, as loose-lay tiling	23 AC01-091/11[1)]	55 AC01-091/6[1)]	–	45 AC01-091/2[1)]
		With carpet, improvement = 25 dB, enhanced footfall sound reduction	27 AC01-091/13[1)]	–	–	–
		Without floor covering or with hard floor covering with isolation joint and MF-partition (w = 600 mm)	–	60 AC01-091/8[1)]	–	50 AC01-091/4[1)]
		With carpet, improvement = 25 dB, but with isolation joint and MF-partition (w = 600 mm)	–	47 AC01-091/9[1)]	–	–
	Type N 30	Without floor covering or with hard floor covering	–	–	62 AC01-091/14[1)]	–
		With carpet, improvement = 25 dB, as loose-lay tiling	23 AC01-091/11[1)]	55 AC01-091/6[1)]	–	45 AC01-091/2[1)]
		With carpet, improvement = 25 dB, enhanced footfall sound reduction	27 AC01-091/13[1)]	–	–	–
		Without floor covering or with hard floor covering, with isolation joint and MF-partition (w = 600 mm)	–	60 AC01-091/8[1)]	–	50 AC01-091/4[1)]
		With carpet, improvement = 25 dB, but with isolation joint and MF-partition (w = 600 mm)	–	47 AC01-091/9[1)]	–	–
	Type N 36	Without floor covering or with hard floor covering	–	–	62 AC01-091/14[1)]	–
		With carpet, improvement = 25 dB, as loose-lay tiling	23 AC01-091/20[1)]	55 AC01-091/16[1)]	–	46 AC01-091/18[1)]
		With carpet, improvement = 25 dB, as loose-lay tiling, enhanced footfall sound reduction	29 AC01-091/22[1)]	–	–	–

1) Testing in accordance with NF EN ISO 140, Parts 1 to 12

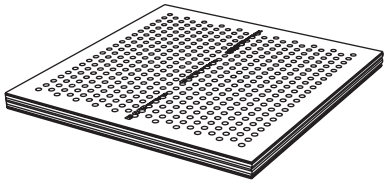
Overview of Floor Systems
Sound Absorption

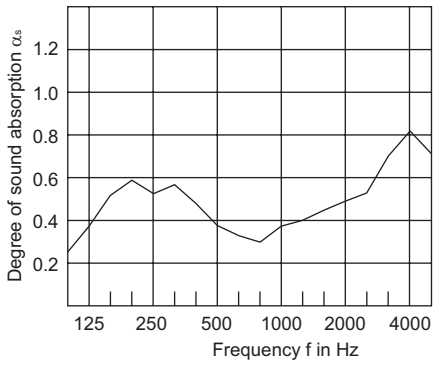
System floor without sound-absorbing measures,
with needle-felt floor covering and/or velour floor covering,
215-mm cavity; see Test Report 46 178/10 for details



f in hertz	125	250	500	1000	2000	4000	$\alpha_{s,m}$ [2]	α_w [3]	NRC [5]
a: α_s [4]	0.10	0.10	0.15	0.25	0.40	0.50	0.22	0.25	0.23
b: α_s [4]	0.10	0.10	0.15	0.20	0.40	0.65	0.19	0.20	0.21

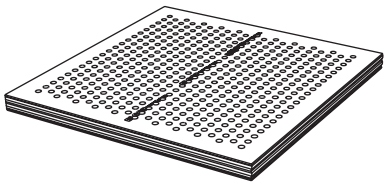
Floor and more N36 R 16 x L
With velour floor covering (type: DLW, Premier Queen),
215-mm cavity; see Test Report 46 178/10 for details

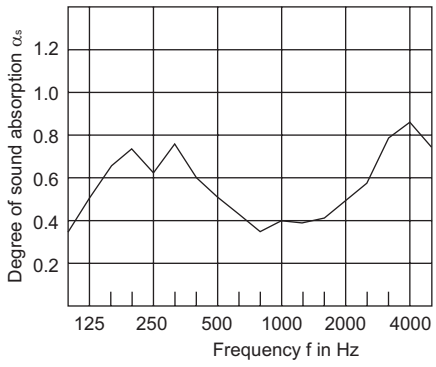




f in hertz	125	250	500	1000	2000	4000	$\alpha_{s,m}$ [2]	α_w [3]	NRC [5]
a: α_s [4]	0.40	0.55	0.40	0.35	0.50	0.75	0.42	0.40 (LH)	0.44

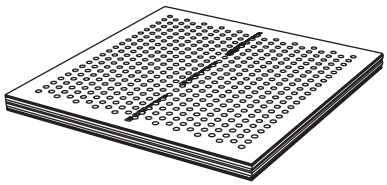
Floor and more N36 R 16 x L
With needle-felt floor covering (type: Forbo, Titan Queen),
215-mm cavity; see Test Report 46 178/10 for details

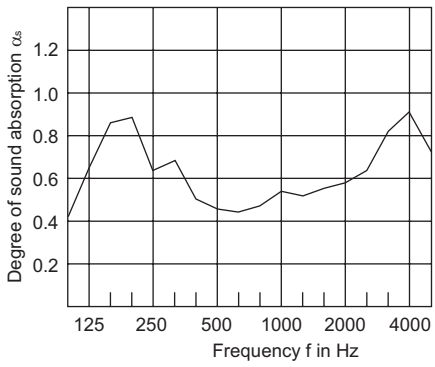




f in hertz	125	250	500	1000	2000	4000	$\alpha_{s,m}$ [2]	α_w [3]	NRC [5]
α_s [4]	0.50	0.70	0.50	0.40	0.50	0.80	0.49	0.50 (LH)	0.51

Floor and more N36 R 16 x L
With needle-felt floor covering (type: Forbo, Titan Queen)
and cavity insulation, 215-mm cavity;
see Test Report 46 178/10 for details





f in hertz	125	250	500	1000	2000	4000	$\alpha_{s,m}$ [2]	α_w [3]	NRC [5]
α_s [4]	0.65	0.70	0.50	0.50	0.60	0.80	0.54	0.55(LH)	0.55

2) For definition, see I17/I18/I22 3) The information in brackets corresponds to form indicators 4) In accordance with DIN EN 20354 5) In accordance with ASTM C 423

Raised flooring and cavity-type flooring offer the possibility of simply putting all the mechanical services systems, such as cabling, supply and disposal lines, ventilation, heating, air-conditioning, etc. wherever they are needed.

Such facilities also have to satisfy certain requirements in case of a fire. The following criteria have to be allowed for:

- Protection of adjacent emergency rescue routes
- Protection of other neighbouring units used
- Maintaining the stability of partition walls put on the floor
- Fire-resistance period of the design
- Combustibility and building-materials rating
- Protection against a fire in the floor cavity
- Protection against a fire in the room

The details are regulated in the December 1998 version of the “Sample Guideline for Fireproofing-related Requirements on Cavity-type Flooring and Raised Flooring” (or: “MDBR”).

Even in the countries in which this guideline has not (yet) been introduced in terms of building supervisory regulations, property developers can make use of it, because in developing and adopting the Sample Guideline, the representatives of the states’ building supervisory authorities identified with its content.

When operating cable and duct systems, fires cannot be ruled out from developing as the result of overheating. In such case, the construction has to resist this fire strain. In actual practice it must also be taken into account that with small cavities (< than 20 cm), due to lack of oxygen this causes, no blazing fire can develop. This has been accordingly put into practice in the MDBR. In fire tests in accordance with DIN 4102, ETK-stressing and loading at 1.5 kN/m² is required in Germany. For more details on this, refer to Specifications Sheet 11 of the BVS (*Bundesverband Systemböden*, [National System Floors Association]).

When studying the MDBR, it is advisable to pay attention primarily to the text, because most of the illustrated explanations refer to special cases and just looking at these might produce some uncertainty. In addition to this, one must take into consideration the problems of fires spreading and of partitioning into fire compartments.

Fig. 63 Protection against the transmission of fires

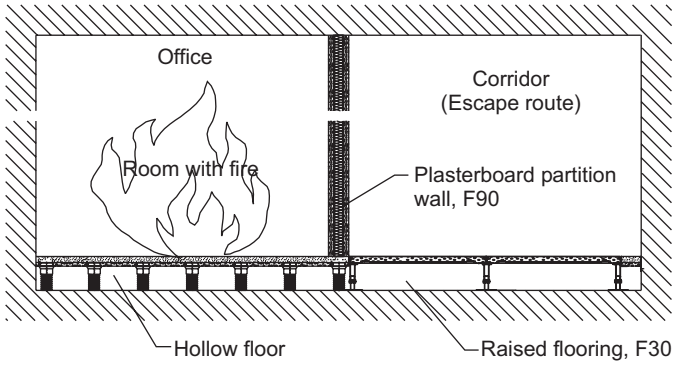
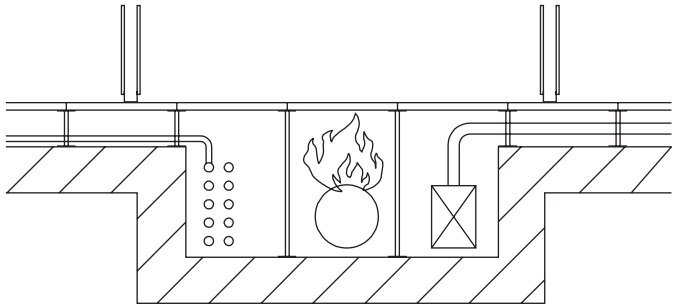
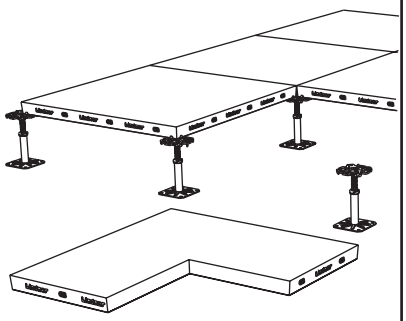
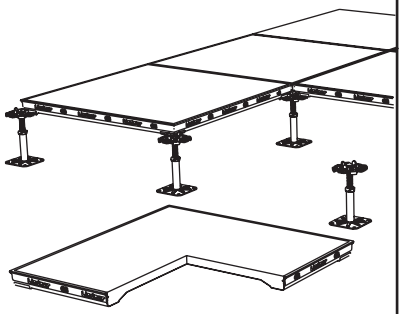
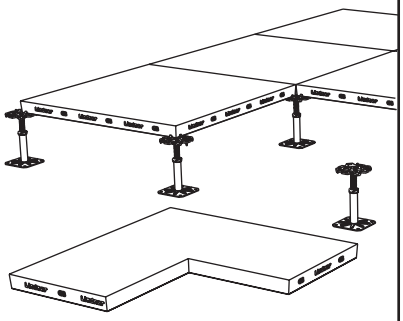


Fig. 64 Protection against fire in the cavity



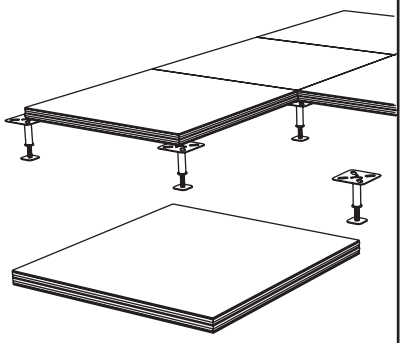
For information relevant to fireproofing for the various systems, refer to the system specification sheets and/or the following table.

Overview of Floor Systems
Fire Rating

Cate-gory	Raised floor		
Fire-proofing	F30	F30	F30/F60
Illustrations, product abbreviations	**Ligna** 	**Lintec AK** 	**Nortec** 
Product description	High-density chipboard with edge band at the perimeter, tubular beam column Construction heights to a finished floor height of 820 mm With steel sheet or aluminium lining on the reverse side	A mineral-filled steel panel on tubular beam columns Construction heights to a finished floor height of 600 mm	A calcium sulphate panel with optional edge band at the perimeter, on pedestals With or without steel sheet lining on the reverse side Panel thicknesses from 24-40 mm Construction heights to a finished floor height of 800 mm (to 1500 mm with control-room profiled section elements)
Inspection Certificate No.	P-OGI-I 17.1.3 III.1-81162 35-81456 SLPO 016-01A [2)]	P-3318/2089-MPA BS 3605/3270 3471/8063	P-MPA-E-99-199 231016694 P-MPA-E-99-198 230589095 P-OGI-I 17.1.2 35-81315 To 1,500 mm with control-room profiled section elements P-3423/3139-MPA BS 3047/9737 LP-763.2/99 [2)] NP-763/A/99 [2)]
Classification	Classification [1)] F30-AB with flame contact from below F 0,5 h [2)]	Classification [1)] F30-AB with flame contact from below	Classification [1) 2)] F60-AB with flame contact from below With control-room profiles F30-AB with flame contact from below

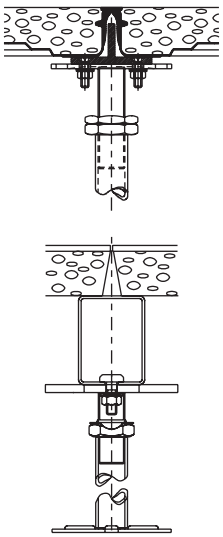
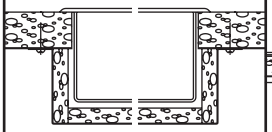
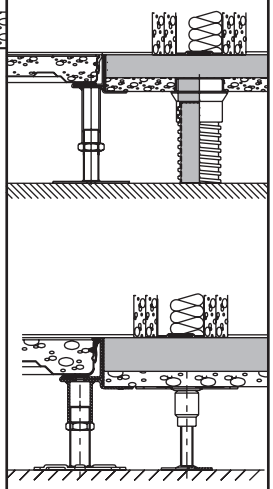
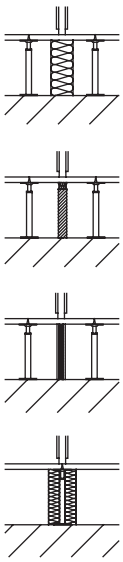
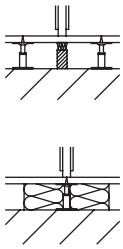
1) As per DIN 4102 2) According to Polish standard

Overview of Floor Systems
Fire Rating

Category	**Floor and more**
Fire-proofing	**F30**
Illustrations, product abbreviations	**Floor and more** 
Product description	A calcium sulphate panel with profiled edges, panels glued to one another, pedestals to calcium sulphate panels and structural floor Panel thicknesses from 24-40 mm Construction heights to a finished floor height of 800 mm Bridgings and inspection openings tested with raised floor panel
Inspection Certificate No.	P-3151/4242-MPA BS
Classification	Classification [1)] F30-AB with flame contact from below

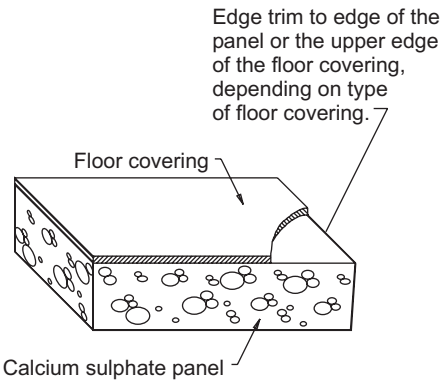
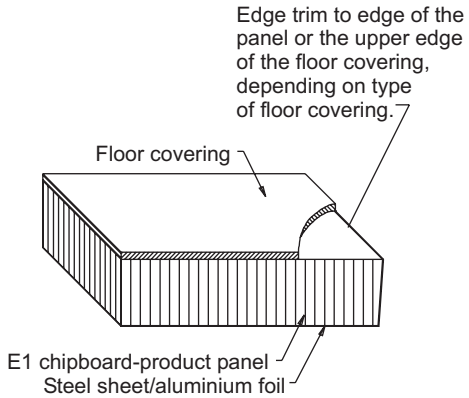
1) As per DIN 4102

Overview of Floor Systems
Fire Rating

Category	Special Structural Designs				
Fire-proofing	F30	F30	F30	F30	F90
Product	Access Flooring Bridging profile	Access Flooring Fittings	Transition access flooring/cavity-type flooring	Partitioning Examples	Partitioning Examples
Illustrations					
Product description	A great density of installations might make it necessary to eliminate individual pedestals. In such cases, the bridging elements have to be made in such a way that the fire resistance is preserved.	Incorporation of electrical and ventilation fittings	Structural design of the bridging element from the hollow floor to the raised floor, for inspection channels in corridors, for example.	Raised flooring made of chipboard panels, cement fibreboards, calcium sulphate panels or from steel panels filled with anhydrite. Partition walls with fire-resistance class (F30) can be installed. Fire above or beneath the flooring The construction height is in accordance with the system inspection certificate.	Raised flooring made of chipboard panels, cement fibreboards, calcium sulphate panels or from steel panels filled with anhydrite. Partition walls with necessary fire-resistance class (F30/F90). Fire above or beneath the flooring Construction height up to finished floor height = 200 mm + construction
Inspection Certificate No.	P-3312/6019-MPA BS 3818/5290	917/3296	P-3331/2219-MPA BS 3963/4855 3451/3871 3964/4865	185/No/Rm vom 19.05.99	186/No/Rm vom 19.05.99
Classification	Classification [1] F30-classification with flame contact from below	Rating [1] F90-classification of the plasterboard partition wall is preserved		Rating [1] F30	Rating [1] F90

1) As per DIN 4102 2) According to French standard 3) According to Polish standard 4) According to Hungarian standard 5) According to Belgian standard 6) According to English standard

Overview of Floor Systems
Building Material Classification

Product	Nortec	Ligna
Illustrations, product abbreviations		
Product description	Support panel non-combustible - Support material: calcium sulphate panels (12 - 40 mm thick) - Rating without floor covering - With or without steel sheet lining on the bottom side	Raised flooring panel flame-resistant - Support material: chipboard-product panels - Rating without floor covering
Approval	P-3779/3159-MPA BS N RA98-250 B 2)	P-LGA-M-0140181
Classification	A2 1) MO 2)	B1 1)

1) As per DIN 4102 2) According to French standard 3) According to Polish standard 4) According to Hungarian standard 5) According to Belgian standard 6) According to English standard

Loading Capacity

Determining the permissible loading capacity is carried out by means of testing and calculations with official authorities being included. The results produced from this are substantiated by certificates of conformity complying with the application guideline for standards DIN EN 12825 and DIN EN 13213.

The following items are decisive and differ:

a) Size of load
b) Supporting surface of the load forcer
c) Arrangement of the load on the test indentor
d) Safety factor

Both for raised floors and for cavity-type floors, the concentrated load is the critical load. The flooring systems are assigned to a loading-capacity and displacement rating on the basis of a static loading to be expected. Linear loads and distributed loads are not generally taken into account, because the loading capacity of the cavity-type and raised flooring constructions is usually greater than the loading capacity of the structural floor.

Concentrated loading
To determine the concentrated load, a static load (such as a table leg) is simulated. On the basis of the permissible load determined by doing so, classification is made for the appropriate loading and displacement rating. In accordance with standardised practice, the load is applied with a 25-mm x 25-mm test indentor.

Dynamic loading
To determine the permissible dynamic load (such as a forklift), the following has to be taken into account:
- The unloaded weight of the vehicle
- The total weight of the vehicle
- The max. wheel load
- The contact surface of the tires or rollers
- Distance between the axles
- Max. travelling and pulling speeds
- Quantity, diameter, width and material of wheels or rollers
- Max. acceleration and deceleration of the lifting motion
- Safety factor

On the basis of the above-mentioned facts given, an appropriate load factor is determined for the static load ascertained (permissible overall weight of a vehicle) and multiplied by the max. permissible static load. When selecting a floor covering, one must be sure that the floor covering and adhesive are suited for these special requirements.

Fig. 65 Concentrated load

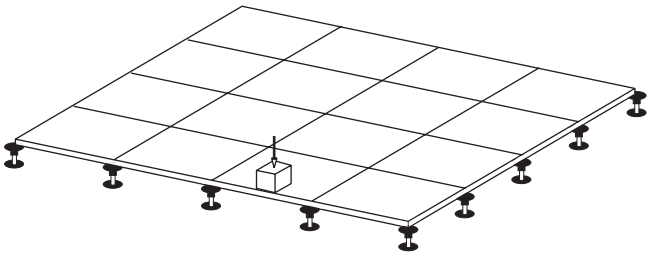


Fig. 66 Loading instances

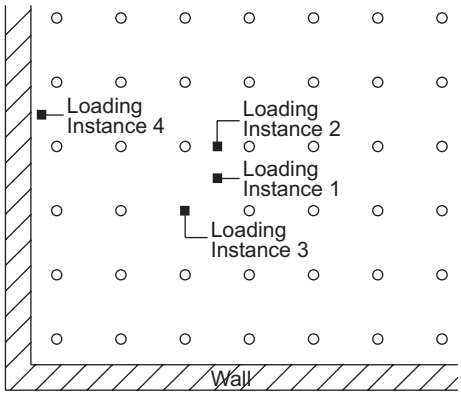
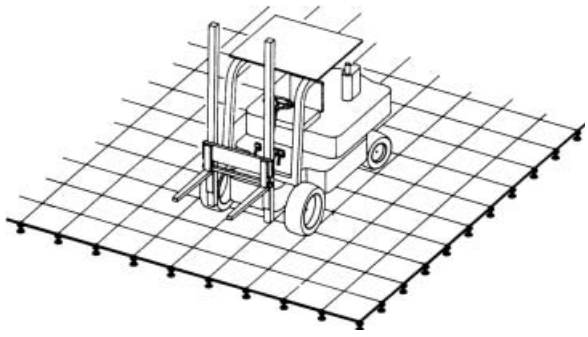


Fig. 67 Dynamic loading



Electrostatics / Static Electricity

Preliminary Remarks:

Static electricity as a natural phenomenon is generally known by the layman from discharge flashes on door handles after having sauntered over a department store carpet.

This electrical discharge is generally of no danger to people. There is, however, a possibility of startling and the incorrect actions triggered by such.

In addition to this, however, there is also a great number of consequences of static electricity, some of which it is absolutely necessary to prevent. These range from the destruction of electronic components to the explosion of entire factory facilities.

A) Brief Description

I. Creation of static electricity = Electric charge

Static electricity is always created when there is motion of fixed insulators or liquid substances, or to be exact, when they are separated. An extreme example is dusty air grazing a wall.

The voltage of a charge depends on the humidity. With dry air, higher charges come about than with humid air.

Electronic components are extremely sensitive to this. Discharges of as little as just 30 V can destroy them and/or trigger faulty switching.

This would create vast risks and thus incalculable costs. Taking the edge off the problem, one must consider that electronic components are nearly always shielded.

II. Static Electricity and Conductance

At best one can reduce, but never prevent, the creation of static electricity by selecting favourable materials, to the extent that this is at all possible. What one can prevent is charging to too great a degree of people and objects by seeing to it that the charges created do not accumulate, but rather are conducted away again immediately and evenly. When static electricity can be continuously conducted away via an earth connection as soon as it is created, the charge cannot become large enough for a discharge flash (electric shock) to develop.

III. Static and Dynamic Electricity

By dynamic electricity, the electric current is meant which – continuously fed in by power stations – flows into lines and contacts as voltage. Static electricity, on the other hand, is not fed by a voltage source, but rather is so to speak a one-off event, which after its discharge, is not immediately available again but rather which first has to be built up again.

B) Method of testing for electrostatic properties

I. Resistance measurements; quantity measured: Ω (Ohm)

Most tests are carried out in a prescribed test atmosphere, which, however, is not uniform for the various standards.

a) Contact resistance (R_1-Procedure A – DIN EN 1081)
The electric resistance, measured on a sample between the tripod-type electrode on the surface of the floor covering and an electrode on the bottom side directly on the other side.

b) Resistance to earth (R_2-Procedure B – DIN EN 1081)
The electric resistance, measured on an installed floor covering between the tripod-type electrode pressed on the top side and earth.

c) Surface resistance (R_3-Procedure C – DIN EN 1081)
The electric resistance, measured on an installed floor covering between two tripod-type electrodes set up at a distance of 100 mm from one another.

d) Contact resistance of location (R_{ST} DIN 57100 / VDE 0100 T-10)
What is measured in this case is the resistance between the surface of the floor covering installed to the earth potential.

II. Measurements of charging; quantity measured: KV (kilovolts)

a) Walk test (DIN 54345, T2)
This measures the voltage of charging of a test person who walks on the floor covering installed shuffling their feet.

b) Instrumental testing (DIN 54345, T3)
Here the walk test cited above is simulated with a piece of equipment. This testing can only be carried out in a laboratory.

c) Terminology

1. Antistatic:

Elastic floor coverings are also antistatic if they are conductive in accordance with Section c) 2.

Floor coverings are antistatic if in general they do not allow annoying electrostatic charges to develop. This is the case if when subjected to the walk test, the charging is ≤ 2.0 kV.

2. Conductive

The resistance to earth of conductive floor coverings is in an **R_2-Procedure B -** ≤ 10^9 Ω. Even lower resistance levels are frequently demanded however.

3. Insulation

As defined by DIN 57 100 / VDE 0100T410, Section 6.3.3, floor insulate (provide security against contact voltage from mains current), if the contact resistance of the location R_{ST} does not fall short of the following value:
50 kΩ = 5 x 10^4 W for installations with rated voltages below 500 V
100 kW = 1 x 10^5 Ω for installations with higher rated voltages

Note:
Due to the differing test conditions, the contact resistance of a location can only be approximately calculated from the contact resistance (R_1-Process A- DIN EN 1081). From experience, however, it is known that conductive floors with R_1 < 10^6 Ω do not meet the VDE-requirements.

With all types of covering, moisture in flooring systems can also cause a lowering in the contact resistance of a location.

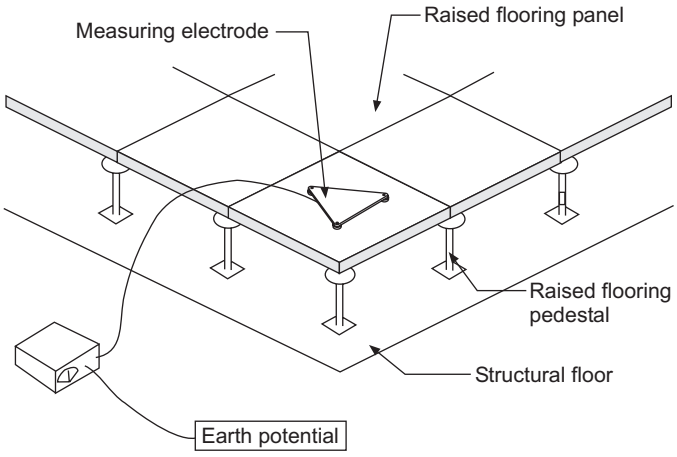
Resistance to Earth

Resistance to earth R2—Procedure B – DIN EN 1081; measurement of the resistance to earth R_2 on the floor covering installed.

The electricity resistance of a floor covering installed is measured between an electrode on the surface and earth. The tripod-type electrode is set on the dry floor covering (48 hrs after installation) and connected to the resistance measuring instrument. The connection to earth is also linked to the resistance measuring instrument. Before the voltage is switched on, the tripod-type electrode has to be load with at least 300 N (test person).

Note:
With values of 10^{10} Ω, the charging of individuals can decay in approx. one second. Below 10^8 Ω a covering is sufficiently conductive to prevent any risks of ignition for inflammable dusts or gases by electrostatic charges when being walked on. Below 10^6 Ω, a covering is suited even for storage and production rooms of explosives. The respective requirements by the trade associations (e.g. ZH 1-200), electronics manufacturers and users must all be complied with.

Fig. 68



Tripod-type electrode:	Aluminium plate with rubber feet
Weight:	≥ 300 N (test person)
Measuring voltage:	R ≤ 10^6 = 100 V; R > 10^6 = 500 V
Performance:	At least three measurements

Measurements of Charging

Measurements of charging for walk test, DIN 54 345 / Part 2
- Measurements of the inclination toward electrostatic charging during walk tests -

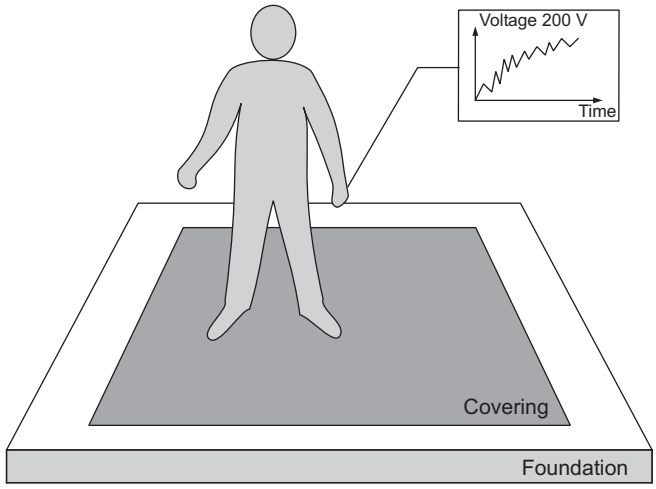
Duration of the walk test:
The voltage of charging is measured when the test person touches the floor covering with both feet.

A floor covering is considered as antistatic if the voltage of charging does not rise above 2000 V (definition according to Memorandum EDV 1, issued 7/84 by the TFI of Aachen for Carpets)

1 minute (shuffling one's feet) at 23° C and at 25% relative humidity.

For the material of the soles, a special rubber material from the *Bundesanstalt für Materialprüfung (BAM)* [German Federal Materials Testing Institute]. This material is slightly conductive, offering a resistance of approximately 10^9 Ω between the test person and a conductive floor.

Fig. 69



Contact resistance of location

Contact resistance of location R_{ST}, DIN VDE 0100 – measurement of the contact resistance of a location between the surface of the floor covering installed to the earth potential –

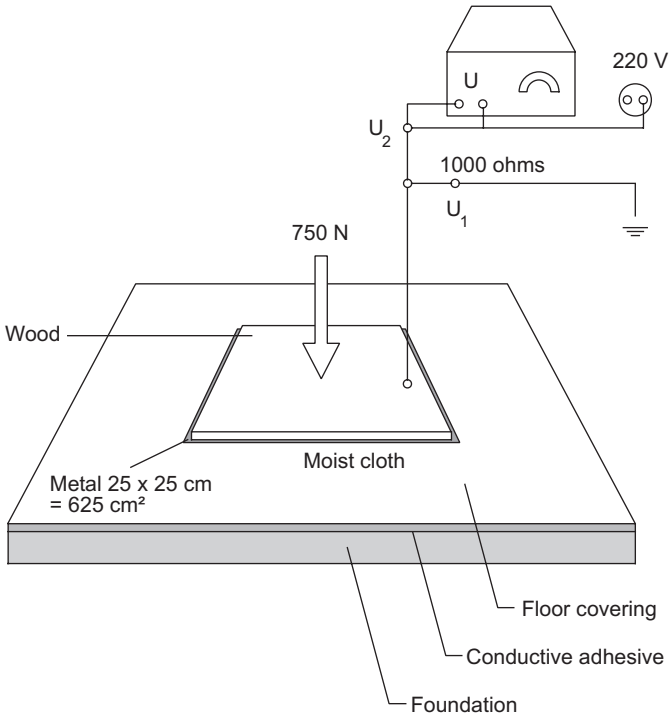
At workplaces where electrostatically endangered components are processed and at which work is regularly carried out with open voltages, such as in testing shops, an electrically conductive floor covering also must at the same time insulate as defined by VDE 0100. A measurement of the resistance of a location R_{ST} is used to assess the electric insulating power.

Note:
A lower limit to the contact resistance of a location R_{ST} for the workplaces cited above is prescribed in VDE 0100 / Part 410.

At workplaces at which the rated voltage does not exceed 500 volts AC, the resistance of a location R_{ST} has to amount to at least 5 x 10^4 Ω. If there are rated voltages of between 500 and 1,000 volts AC, then the contact resistance of a location has to be at least 1 x 50^5 Ω.

Electrode surface: 625 m²

Fig. 70



Examples of Use

Examples of use and requirements for the raised flooring field

On the preceding pages we explained what the word electrostatic means and showed the various measurements. What else then does one have to bear in mind in the raised flooring field, and what requirements are useful?

The electric resistance of the various areas add up, which in actual practice means:

The resistance to earth R_2 must never be lower than the highest resistance of the individual element in the series: floor covering / adhesive / raised flooring panels / sound dampening gasket / raised flooring pedestals.

The floor systems have to meet the following requirements:

1. Offices with terminals, sales and display rooms, etc.

   In these areas, floor covering is sufficient that is antistatic in accordance with DIN 54 345 with ≤ 2 kV as its voltage of charging.

2. Rooms with electronic equipment, such as computer centres, offices with special equipping, resistance to earth $R_2 \leq 1 \times 10^9$ ohms or voltage of charging U maximum of 2 kV.

3. Unprotected electronic components or components with requirements for protecting people, such testing shops in the electronics manufacturing field, resistance to earth $R_2 < 1 \times 10^8$ ohm, contact resistance of the location in accordance with VDE 0100, $R_{ST} > 5 \times 10^4$ ohm or $R_{ST} > 1 \times 10^5$ ohm (the amount of rated voltage is decisive).

4. Unprotected electronic components or components, such as manufacturing or laboratory rooms for making, repairing or testing electronic equipment, subassemblies or components, resistance to earth $R_2 < 1 \times 10^8$ ohm.

5. Explosive atmospheres in general, such in potentially explosive laboratories, gas pressure control facilities, storage battery rooms, resistance to earth $R_2 < 10^8$ ohm.

6. In medically used rooms, newly installed, $R_2 < 10^7$ ohm, in four years $R_2 < 10^8$ ohm; HF-surgery $R_2 > 5 \times 10^4$ ohm

7. Potentially explosive substances, such as in manufacturing and storage rooms of explosives, munitions or pyrotechnical articles, resistance to earth $R_2 < 10^6$ ohm.

Summary:

For most areas of application of raised flooring systems, a floor covering is usually sufficient which does not exceed the 2-kV limits to charging. Requirements on the resistance to earth in the overall construction are not a good idea; according to the listing above, requirements on the resistance to earth are only necessary in some areas, such as central computer rooms.

Due to the varied tests and requirements, seen as a whole the field of electrostatics is a difficult subject to understand. This is perhaps the reason why in the past, requirements completely over the top were made on resistance to earth.

Manufacturers of raised flooring can only fulfil resistance to conductance as low as $< 10^8$ ohms by using highly conductive coverings, panel materials and adhesives. Bearing the building costs in mind, exaggerated requirements which are not necessary should therefore be avoided. In addition to this, with regard to this subject, it should be mentioned that appropriate clothing by the user (conductive shoes) is very crucial. Even a technically perfect floor construction will be ineffective with insulating shoes. ESD-damage is inevitable in such case.

List of sources:

Safety Guideline for Raised Flooring, AGI Worksheet, manufacturer's recommendations, Carpet Research Institute.

Quality Assurance
ISO 9000:2000

One of our stated corporate objectives is high-quality performance at competitive prices.

To do so, we operate an integrated management system based on the recommendations of the international standard ISO 9000:2000, also taking safety and environmental aspects into account, which is guaranteed by the operational procedures in our domestic and international companies.

To provide flawless performance, our employees control and examine the work, products and services to be provided during all their phases of preparation, documenting this in specified documents.

This self-monitoring is based on EN 12 825 for raised flooring, EN 13 213 for hollow floors along with the pertinent application guidelines as well as further country-specific requirements, such as MBO PSA, for deliveries and installation both domestically and internationally. Doing so assures that for each order, inspection is carried out for the characteristics defined according to internal specifications regarding frequency, scope and strictness, using a suitable means of inspection.

This action guarantees constantly high quality of our products and services, on which customers all over the world can rely.

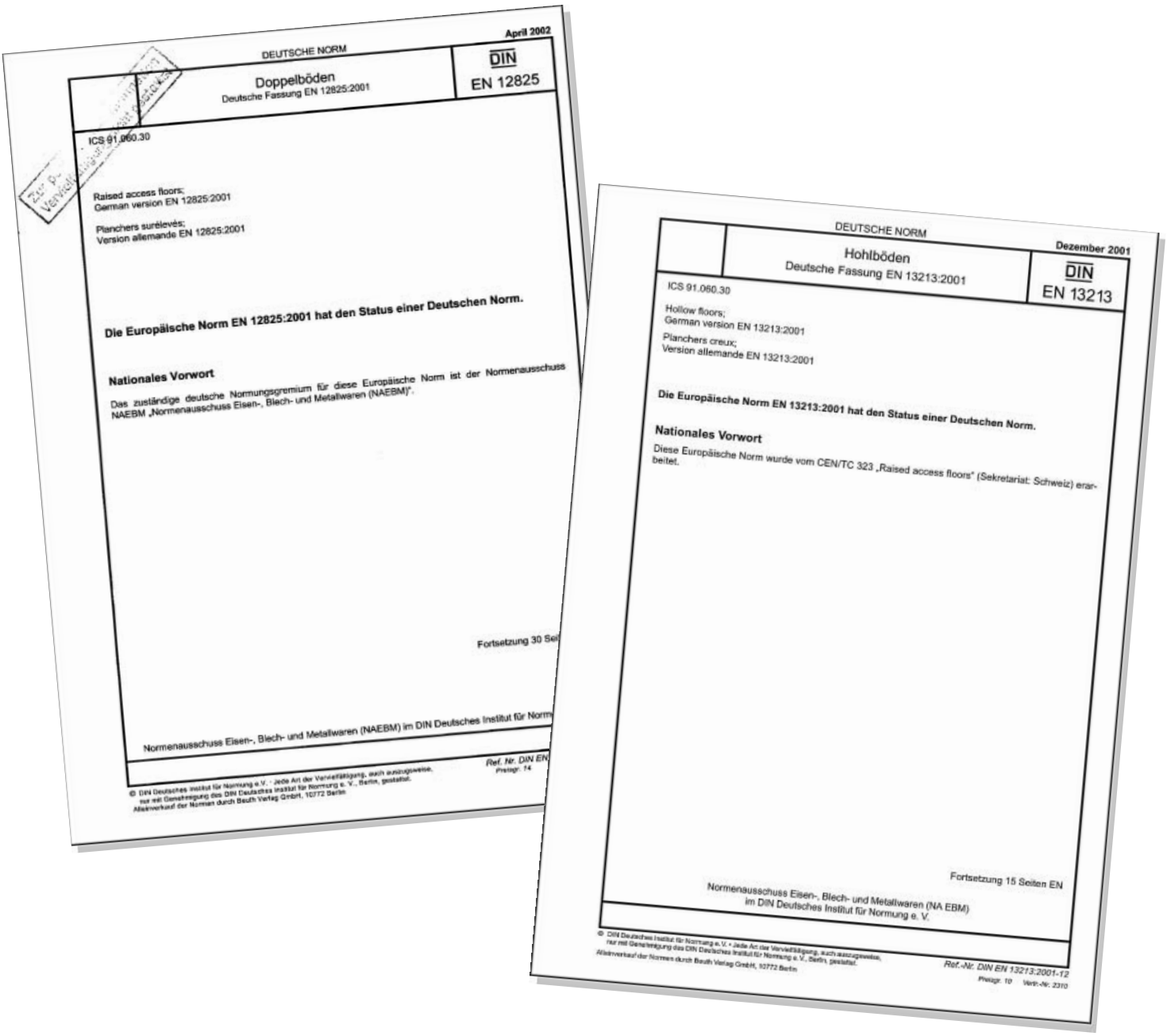
DIN EN 12 825 Raised Floors
DIN EN 13 213 Hollow Floors

It's hard to imagine modern administrative and office buildings any more without system floors, especially raised and hollow floors, and thus are an everyday issue for planners and architects.

System floors also do a number of jobs concerning safety. Planners are required to go into a great number of technical regulations and building ordinances and regulations.

On the basis of building product guidelines, DIN EN 12 825 and DIN EN 13 213 are introducing methods of testing and performance ratings for system floors uniformly Europe-wide. The pertinent application guidelines implement the European standards allowing for German Building Regulations Law and the generally accepted rules relating to this technology in requirements and regulations that may be applied nationally. At the same time they regulate the methods for the certification of conformity with standards.

The complete DIN standards are available from:
Beuth Verlag GmbH, Burggrafenstrasse 6, 10787 Berlin, tel. (030) 2601-2260- http://www2.beuth.de



DEUTSCHE NORM April 2002
Doppelböden
Deutsche Fassung EN 12825:2001
DIN EN 12825
ICS 91.060.30
Raised access floors;
German version EN 12825:2001
Planchers surélevés;
Version allemande EN 12825:2001
Die Europäische Norm EN 12825:2001 hat den Status einer Deutschen Norm.
Nationales Vorwort
Das zuständige deutsche Normungsgremium für diese Europäische Norm ist der Normenausschuss NAEBM „Normenausschuss Eisen-, Blech- und Metallwaren (NAEBM)".
Fortsetzung 30 Sei
Normenausschuss Eisen-, Blech- und Metallwaren (NAEBM) im DIN Deutsches Institut für Norm

DEUTSCHE NORM Dezember 2001
Hohlböden
Deutsche Fassung EN 13213:2001
DIN EN 13213
ICS 91.060.30
Hollow floors;
German version EN 13213:2001
Planchers creux;
Version allemande EN 13213:2001
Die Europäische Norm EN 13213:2001 hat den Status einer Deutschen Norm.
Nationales Vorwort
Diese Europäische Norm wurde vom CEN/TC 323 „Raised access floors" (Sekretariat: Schweiz) erarbeitet.
Fortsetzung 15 Seiten EN
Normenausschuss Eisen-, Blech- und Metallwaren (NA EBM)
im DIN Deutsches Institut für Normung e. V.
Ref.-Nr. DIN EN 13213:2001-12

Application guideline for DIN EN 12 825
Raised Floors
Application guideline for DIN EN 13 213
Hollow Floors

Important requirements and characteristics are prescribed in the application guidelines as implementation of DIN EN 12 825 and DIN EN 13 213 for fitness for use and traffic for the purposes of safety standards in construction engineering.

System floors are subject to continuing technical and scientific further development. This makes it necessary to regularly adjust this application guideline's performance requirements to the latest developments in the technology.

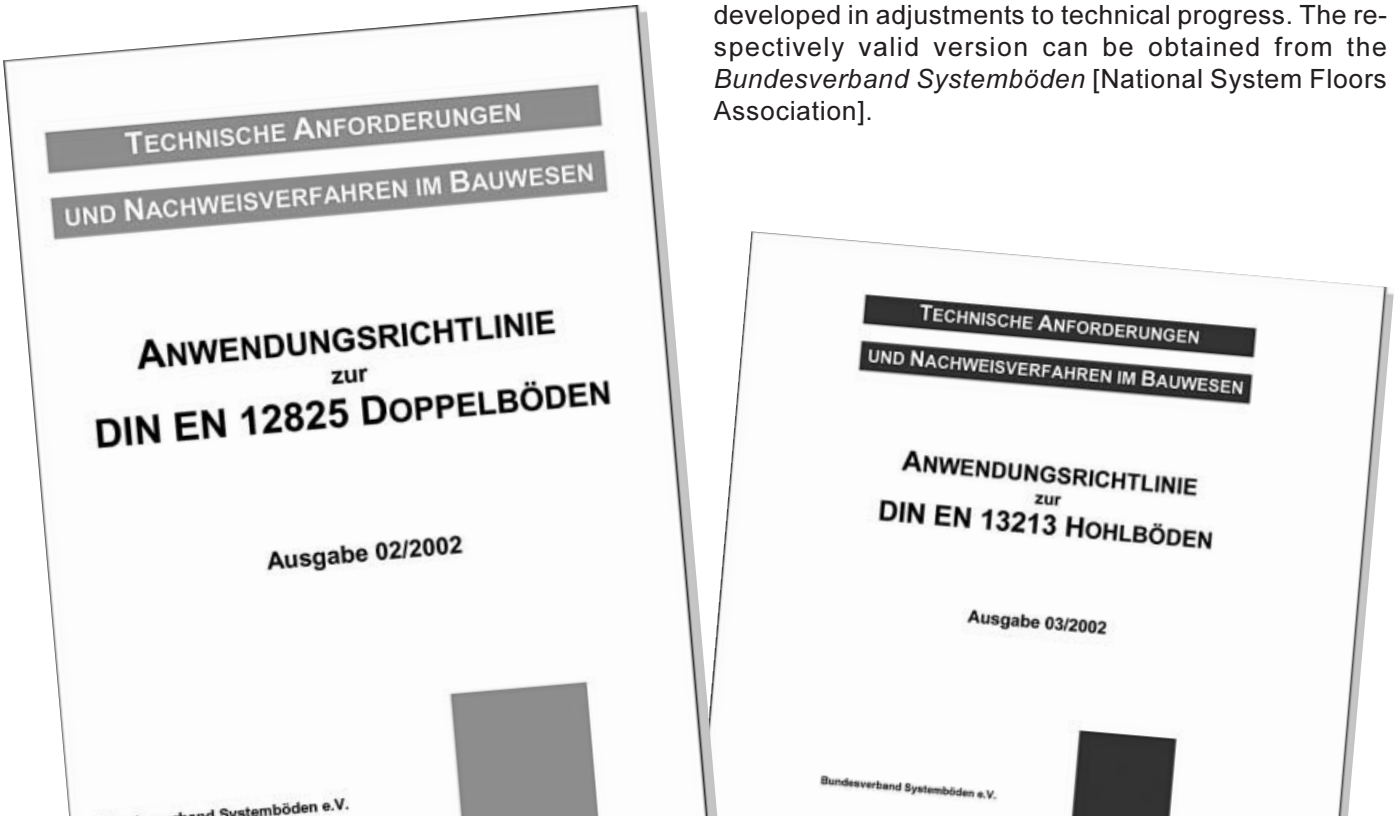
The Certificate of Conformity for Raised Floors and Hollow Floors is only awarded to system floors that go beyond manufacture conforming to standards to meet safety requirements for the application guideline on construction, stability, materials and workmanship and thus also durability.

This safety standard is monitored by internal company monitoring at the production firm and by regular external monitory by neutral inspection institutes and experts in accordance with this application guideline.

The monitoring of the safety standard guarantees compliance with necessary criteria of fitness for use and traffic and thus is a reliable guide to selecting the floor systems.

Installing a certified raised floor or hollow floor guarantees users and property developers that they have complied with the latest developments in the technology with regard to safety, liability law and industrial safety law.

The application guideline is supplemented and further developed in adjustments to technical progress. The respectively valid version can be obtained from the *Bundesverband Systemböden* [National System Floors Association].



As the basis for execution and settlement of accounts

DIN 18 350 Dry Construction
DIN 18 202 Tolerances in Structural Engineering
DIN 18 560 Screed in the buildingtrade/Classifying the various classes of screed
DIN 18 365 Floor covering work
DIN 18 352 Tile and panel work

In addition to this, we also access relevant manufacturers' guidelines and/or product specifications if no independent DIN-standard is responsible for the respective product.

RAL-Guideline RAL-GZ 941 for quality assurance of raised floors

As the basis for a high quality standard, the RAL-GZ 941 quality control was designed by *Gütegemeinschaft Doppelboden e.V* [or "Raised Floor Quality Association", a registered association].

This guideline on quality control was published in October of 1989. The authors of the RAL have set themselves the goal of creating uniform, comparable inspection criteria.

Only raised floor systems that go beyond manufacture conforming to standards to meet high quality and safety requirements by the Quality Association for the construction, stability, materials and workmanship and thus also durability were supposed to be awarded the RAL Mark of Quality for Raised Floors.

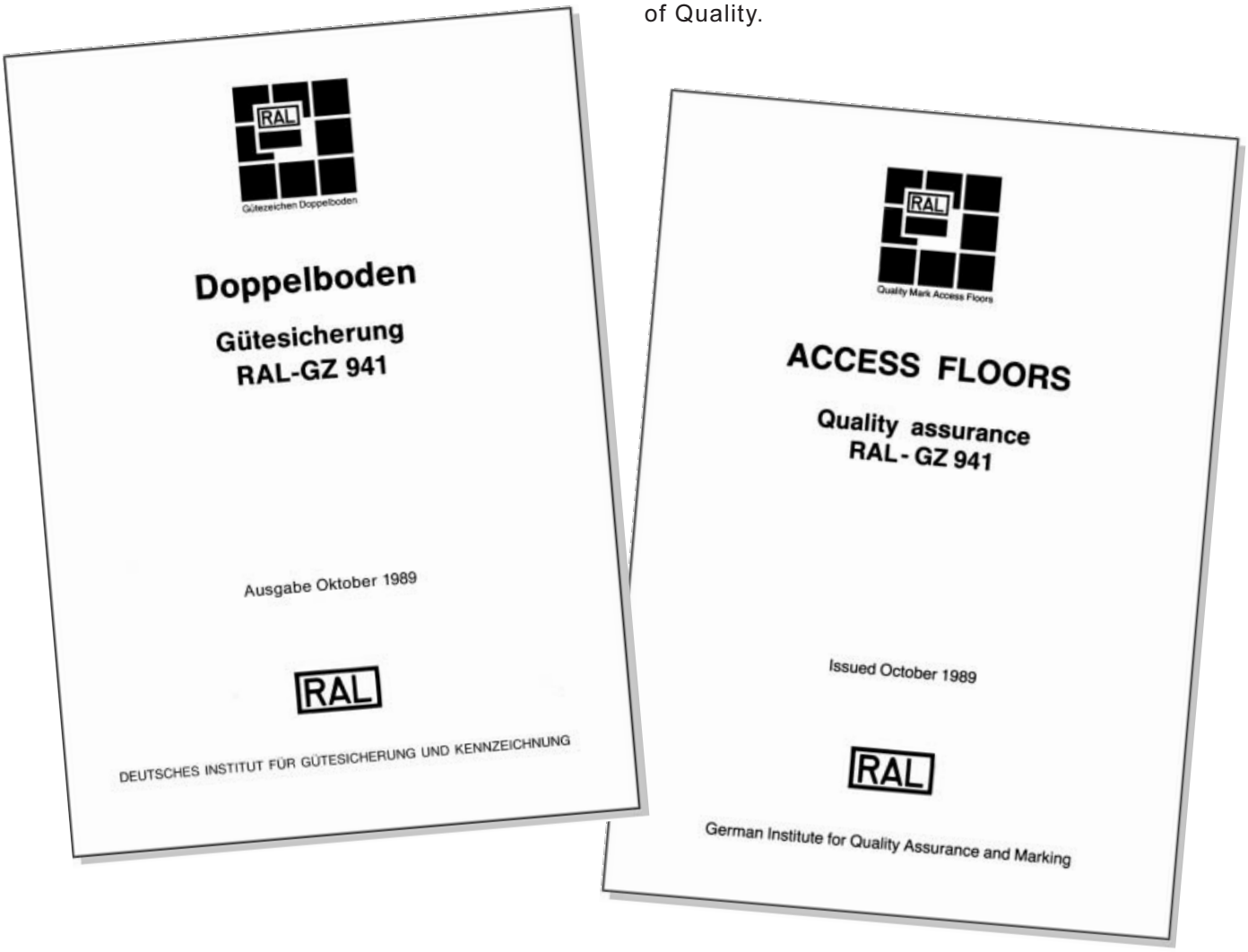
This quality control is carried out by internal monitoring at the production firm and by external monitoring at neutral inspection institutes contracted by the Quality Association.

The basis for this are the quality and inspection regulations accepted by RAL as well as the implementation regulations.

Note:
Raised floors with the RAL Mark of Quality are high-q products that are above average quality standards. The quality standard desired should be agreed separately for each individual piece of property.

Gütezeichen Doppelboden
Raised Flooring Mark of Quality

Only raised floors with this mark of quality satisfy the high quality standard of the RAL-GZ 941 Mark of Quality.



Ceilings & Interior Systems Construction Association (CISCA)

CISCA is publishing an industry access flooring testing standards in order of access flooring might have a relevant guide for comparing industry products. The testing standards were developed after solicitation of comments from U.S. and foreign manufacturers.

The publication of Recommended Test Procedures for Access Floors by the Ceilings & Interior Systems Construction Association (CISCA) represents a significant milestone in establishing a common basis of accepted test methods.

That document is intended to benefit contractors, specifiers, users, and manufacturers. By providing an accepted frame of reference for access floor testing, product characteristics can be judged in a fair context of industry-approved uniform test methods.

CISCA's intent is to provide a method for evaluating access floor characteristics, not criteria requirements. Because differing circumstances demand a range of performance levels, both manufacturers and users benefit from a variety of types of access floors in the marketplace.

It is essential, however, that product comparisons be based upon commonly used tests for valid results. These procedures have now been established in an industry-wide spirit of cooperation to achieve our common goal.

Property Services Agency (PSA)

The Method of Building (MOB) performance specification for Platform (Raised Access) Floors first introduced in 1982 by The Property Services Agency (PSA) and is now generally accepted as the UK standard reference for Raised Access Flooring.

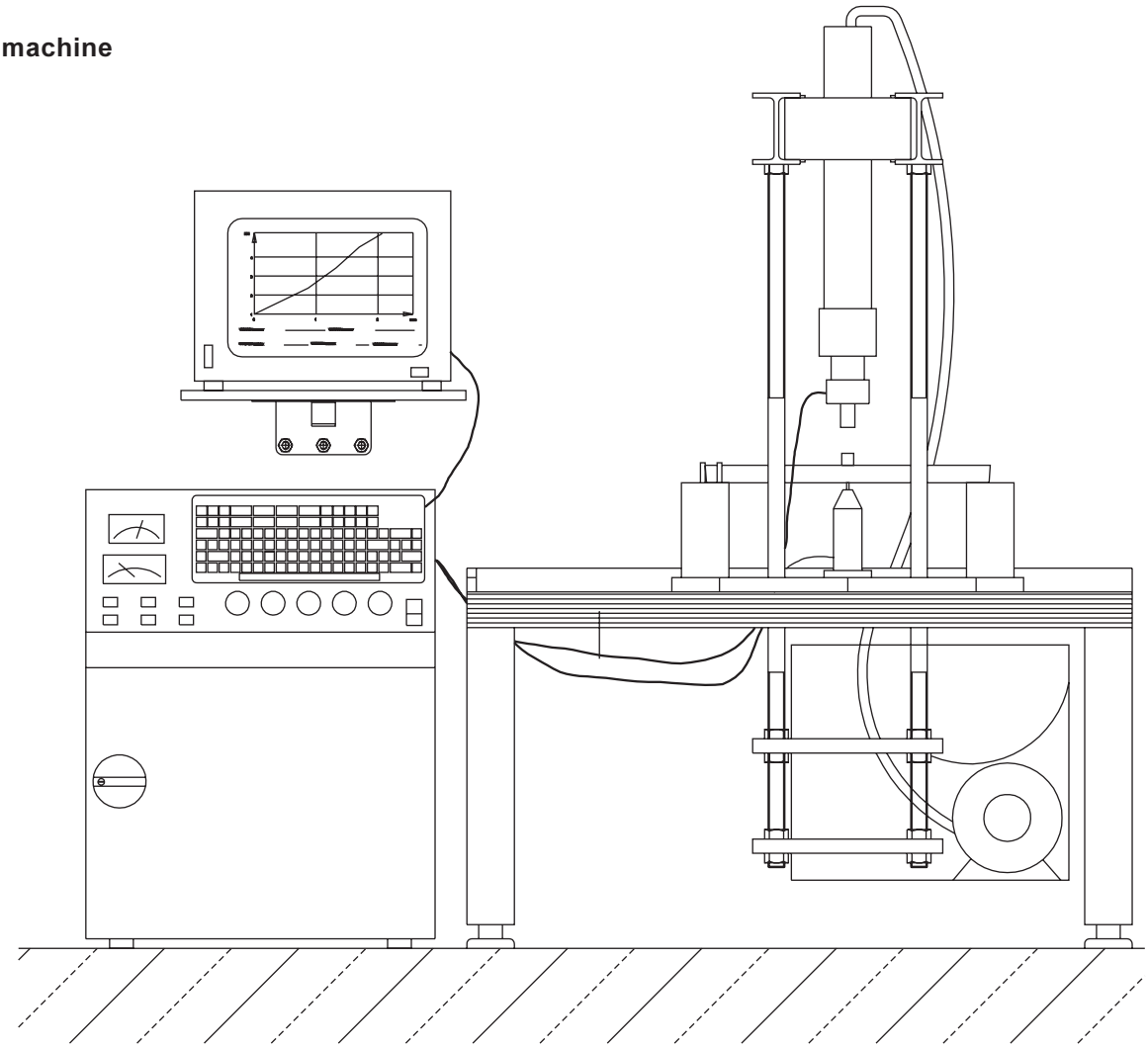
Our systems are checked by the market leader for testing and expert knowledge B.I.T.S., GB.

Factory Inspection Certificates

Similar to other sets of rules, in the factory standard (Factory Inspection Certificates), testing criteria suitable for actual practice are set up which assure flawless functional performance of raised flooring facilities in accordance with a requirement profile.

The type and scope of the tests to be carried out was prescribed and carried out by the official material testing authority (the LGA in Nuremberg).

Testing machine



National Association

The growing together of the countries of Europe, the single market which has now become a reality and the creation of standards and laws for regulating this free market are facts forcing medium-sized companies to merge into interest groups so as to wield the greatest possible weight at all public institutions as well as for standardisation intentions in the face of competing European companies.

This contributed to the *Bundesverband für Systemböden* being founded on 1 January 1995, which represents the interests of the previous associations, such as the *Fachgemeinschaft Doppelboden* [Technical Association on Raised Flooring] or the *Fachverband Hohlraumboden* [Technical Association for Cavity-type Flooring].

In addition to the synergy effect associated with this, the nation-wide association will also continue to participate in the CEN/standardisation work for raised flooring and to accompany anew the European standardisation for raised flooring in CEN. With this standardisation, high-quality technical offers are to be prescribed for raised flooring products and cavity-type flooring products.

With regard to further current information, especially BVS-specification sheets for system floors, the listing providing an overview of system floors certified as conforming with standards and the German System Floor ABP Central Index, refer to the internet homepage www.systemboden.de of the *Bundesverband Systemböden e.V.* [National System Floors Association]). The general technical terms of contract for system floors (BVS Systemboden ATV) are also available on the homepage as a download.

Lindner AG is a member of *Bundesverband Systemböden e.V.*