↑ UP

MAGAZINE

HEALTH

FURAL

METALIT

DIPLING











UP! Fibre-free from above

»

Welcome to the world of Fural Metalit Dipling - a place where a lot is currently happening. With the second issue of our new magazine, we not only want to keep you up to date on the latest developments, but also share our enthusiasm for materials, architecture and quality with you.

In architecture, it is said that a roof makes a building a house. It is the same with rooms, because they only become complete through the ceiling. The „ceiling" creates extensive physical and psychological protection. It is about nothing less. Only ceilings shield us effectively.

For many years, our metal ceiling systems have been installed in hospitals, medical offices and healthcare facilities.

There, they successfully protect patients, doctors, employees, operators and, last but not least, the environment

Our metal ceiling systems are characterized firstly by hygiene, easy cleanability and good revisability. Secondly, by the integrability of a variety of technical functions such as heating, cooling, lighting and sprinkler system. Thirdly, by a proven improvement in acoustics. Fourthly, by the possibility of integrated fire protection. Fifthly, by its convertibility, deconstructibility and recyclability (at the end of its often decades-long service life). And sixth, through outstanding aesthetics and surfaces.

The goal of it all? Acoustic, thermal and visual well-being combined with protection and also social and environmental responsibility.

We look forward to discussing your hospital project with you as well and achieving an optimal result together!!

Let us inspire and excite you, discover materials in a whole new way, and get to know us better! We hope you enjoy the new **UP↑**,

Christian Demmelhuber
CEO Fural Group
Perfect metal ceilings

«

WHY METAL CEILINGS?

- The components already have a **finished surface** at the time of delivery.
- Delivery and assembly are **dust-free**.
- Both the ceilings and the substructures stand out due to their **durability**.
- Thanks to their continuous paint surface, metal ceilings are **especially hygienic**.
- The paint surfaces can be **easily cleaned, dry or wet**.
- For school rooms and sports venues, our ceilings can be designed to be **ball-proof**.
- Our metal ceiling systems can be easily **serviced**.
- There is a possibility of **simple dismantling**.
- Our products are winners owing to their **reusability**.
- All our components allow mono-material recycling.
- We have a **large portfolio** of possible perforations.
- The **integration** of technical elements can be done **easily and precisely**.
- Our metal ceiling systems offer **optimal conditions for the combination** with heating and cooling elements.
- We manufacture precise and **aesthetic** products.
- Modular pre-production **allows for a short construction time.**

Acoustics

Heating and cooling

Fire protection

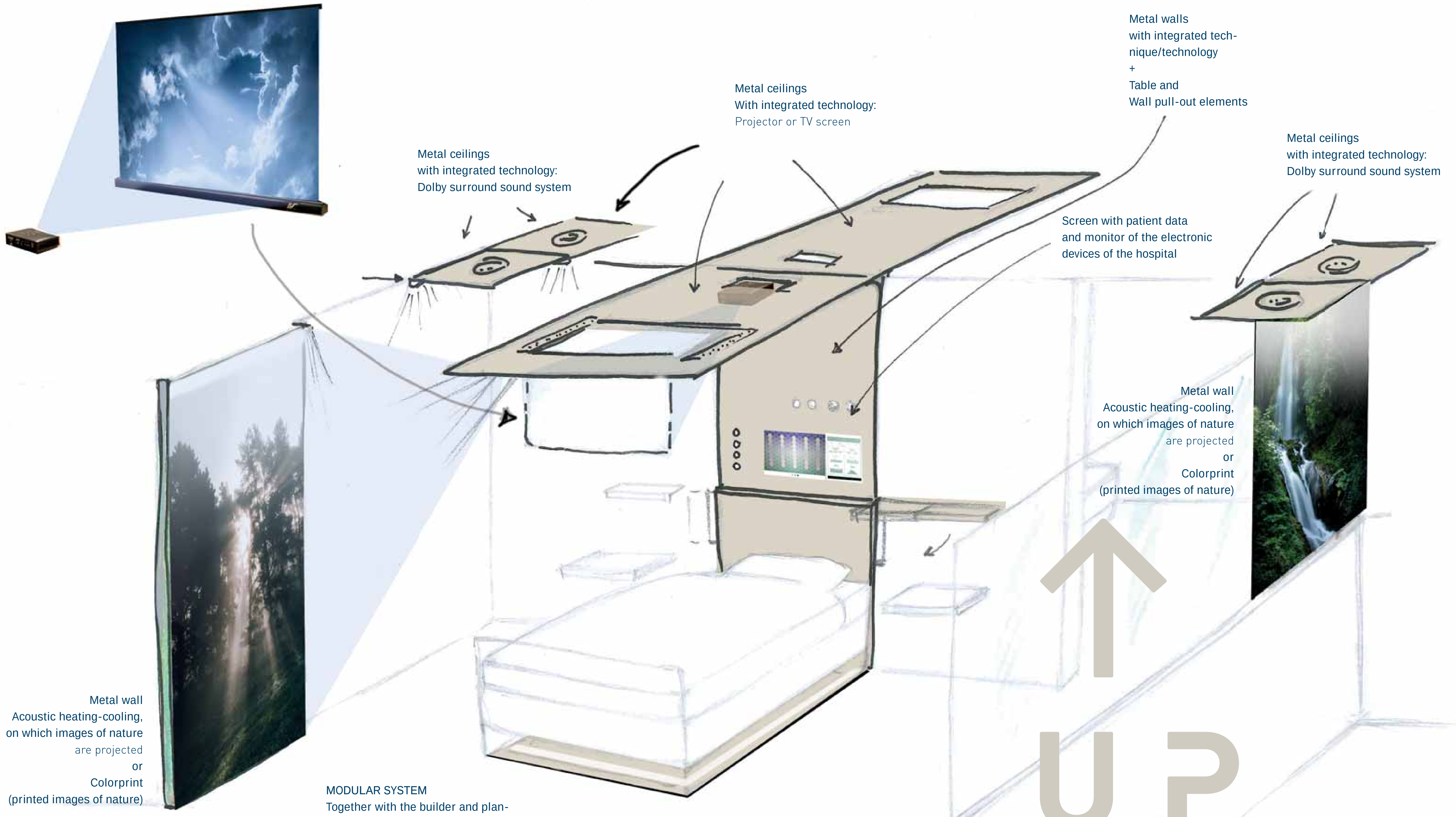
Hygiene

Design

Sustainability

Parzifal®

Baffle



MODULAR SYSTEM
Together with the builder and planner, the room goal can be adapted in the planning phase.
Samantha Mariuzzi / Head of Design of the Fural metal ceiling family sketches a patient room to feel good in.

UP

We think in terms of feeling good
and getting well quickly.

The patient room at AZ Sint-Maarten in Mechelen (BEL) as a comfort room

The patient room of the year from the Jansen Group

The Jansen Group is the proud winner of the award: the Patient Room of the Year. Jansen seeks its own way in the construction sector, focuses on innovation and thus makes every room a place to be for residents, employees, people of enjoyment and, last but not least, patients.
KAY comfort ceilings with a patented pipe system make every hospital stay as comfortable as possible. The patient enjoys a pleasant indoor climate thanks to cooling and heating by convection and radiation (without drafts and noiseless), healthy ventilation and perfect acoustics. All applications are combined in a beautiful and compact design that can even integrate lighting, music, fragrance, motion and daylight sensors.

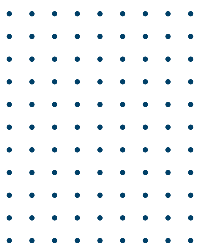
KAY is also fibre-free, dust-free and easy to clean. In this way, the Jansen Group is happy to contribute to the patient's well-being and rapid recovery.

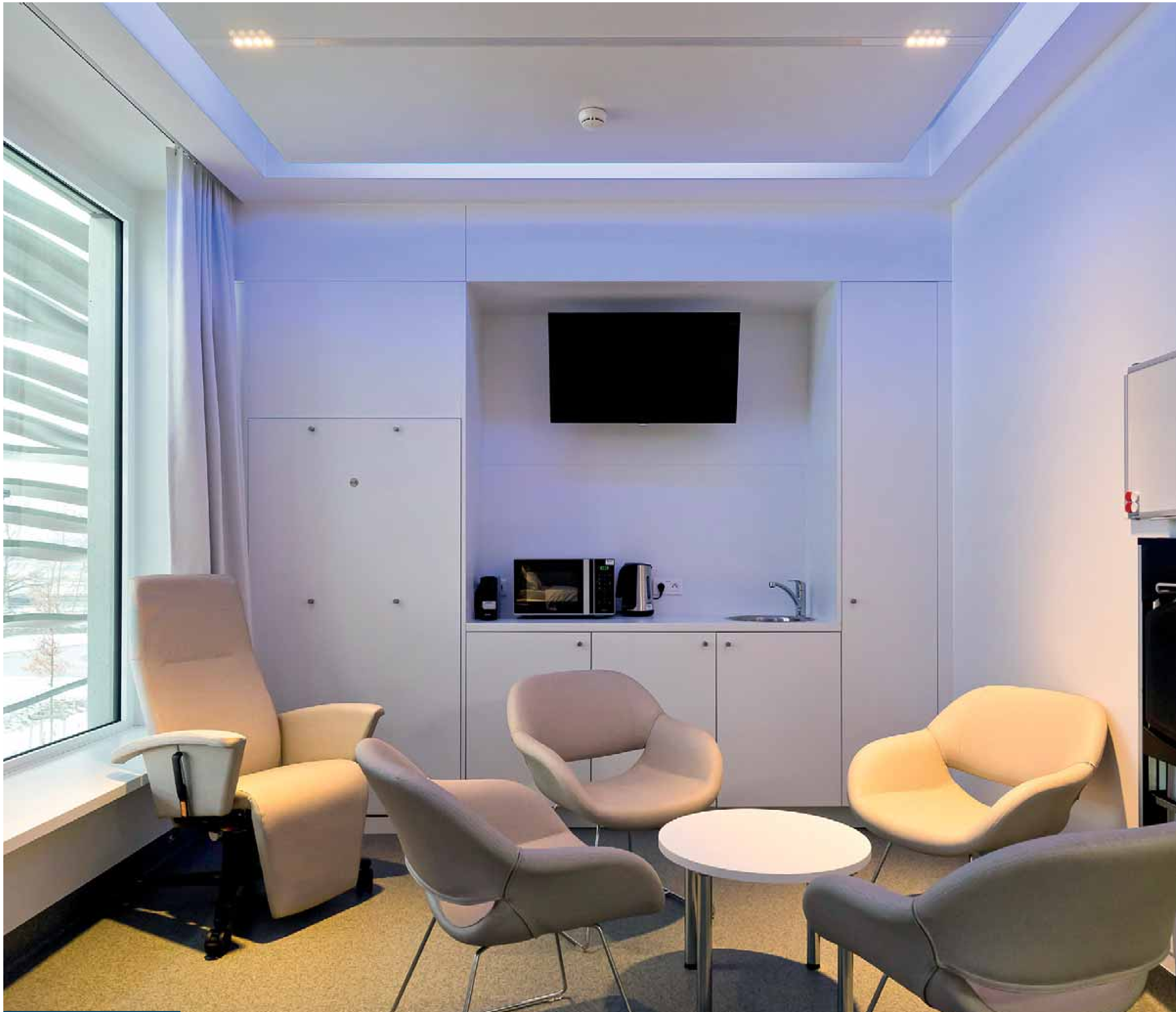
AZ Sint-Maarten in Mechelen

Architecture	VK Architects and engineers
Jansen Group	Interior construction, Cleanrooms, Surgery, Hospital pharmacy
Gross floor area	105.000 m²
Number of beds	643 inpatient beds, 96 in the day hospital
Ceiling system	Floating ceilings KLS 2500 x 860 45° edging
Fleece	Galvanized sheet steel
Surface	powder-coated: RAL 9016

Perforation

	Fural
Perforation Ø	Rg 0,7 - 4 %
Percentage of holes	0,7 mm
Perforation width max	4 %
Ref. according to DIN 24041	1.197 mm
Distance horizontal	Rg 0,70 - 3,00
Distance vertical	3,00 mm →
Distance diagonal	3,00 mm ↓
Perforation direction	4,24 mm ↘
	→





AZ Sint-Maarten in Mechelen (BEL)

We think from the perspective
of the patient.

We think in terms of comfort of patients and staff:

Climate and room air quality, acoustic, room-optical and hygienic comfort.

The well-being of the patient in the hospital environment, as well as his or her ability to recover, is influenced by a variety of factors.

In addition to medical and social factors, this also includes the comfort factors of room climate, room air quality, visual and acoustic comfort, accessibility, and the area of electro-magnetic fields.

When planning patient rooms, the needs of the patients should be taken into account first and only after that the technical and constructional desired requirements as well as possible problem areas of the hospital staff should be considered.

Room air quality

Room air quality is significantly influenced by the building products used.

Construction projects are monitored from a construction ecology perspective during the planning and construction phase in order to select the construction materials and construction chemicals used according to ecological criteria and to avoid the introduction of materials that are hazardous to health.

Particular attention is paid to solvents and allergenic building materials.

Building products as possible sources of pollutants are fibers, radon (granite), and VOCs (solvents in paints, glue, and varnishes, biocides in wood preservatives and carpets, PAHs in parquet adhesives, and formaldehyde-containing adhesives in wood-based materials).

Our metal ceilings and walls take the hygiene aspect into account. Our fire protection ceilings additionally ensure safety, because they achieve the required fire resistance - and without inserts made of artificial mineral fibers.

State Hospital Salzburg

Colors and room optical comfort

The fact that colors have an unconscious influence on people is no secret and part of psychological research. Each nuance has a different effect and can be calming or stimulating, invigorating or relaxing, concentration enhancing or distracting. Color accents in hospital construction also serve orientation and at the same time provide a feel-good atmosphere.

It is therefore perfect that metal ceilings from Fural can be manufactured in all RAL colors and thus adapt completely to the architectural ideas. In this way, a clinic becomes a place where people like to spend time - in rooms that are perfectly equipped in form and color for the respective purpose.

The visual comfort in the patient's room is also influenced by the choice of furniture in the room, type of windows, floor coverings, walls and ceilings.

The surfaces, objects, fixtures and attachments may be perceived as pleasant or even uncomfortable in terms of their color, format and arrangement.

Some of the most interesting research on the way hospitals are built looks at nature's role in promoting recovery. The more nature we have around us, the better we can recover from an illness.


Hotel Ameron Zürich Bellerive au Lac


Cardiac Center, Ludwigshafen


Eckenberg High School, Adelsheim

We are acoustic ceilings. We are acoustic walls.

Acoustic comfort

Hospitalization requires both mental concentration and communication from patients.

The recovery process can be significantly affected by acoustic annoyance.

These impairments can be: noise penetrating from outside and generated by work equipment, personal or telephone conversations of fellow patients, noise and sounds of any kind penetrating from the corridor, technical background noise, which is mainly generated by EDP and air-conditioning devices or room air-conditioning systems.

Sound triggers physiological and psychological reactions: some sounds are perceived as pleasant, others cause tension or feelings of annoyance.

From the ceiling to the wall

Acoustic walls from Fural not only control the room acoustics, they also optimize the design of the entire room. Thanks to their specific structure, the wall elements act as broadband absorbers and are thus ideally suited for regulating reverberation time and speech intelligibility. The wall cladding is suitable for both targeted and subsequent optimization of the room acoustics.

The benefits of metal ceilings as acoustic ceilings

Our systems combine outstanding acoustic properties and a high-quality appearance with functionality and durability. This combination creates a pleasant room atmosphere that impresses developers and users alike. Architects and installers hold us in high regard for our easily installed, perfected acoustic metal ceiling systems and our service-oriented project handling.

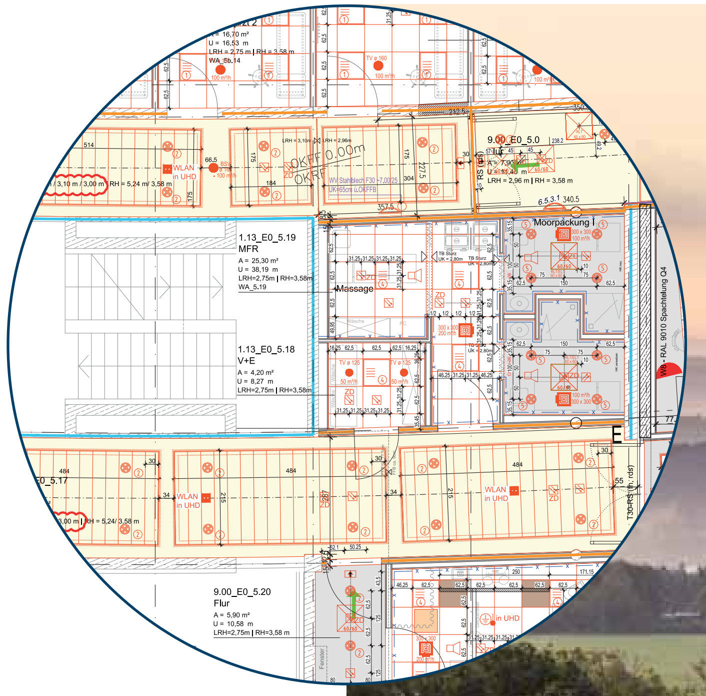
Our acoustic ceilings can also be fitted with additional functions, such as air conditioning (cooling, heating, ventilation) or lighting. Likewise, the product properties can be enhanced in terms of fire protection, hygiene (hospitals and laboratories) or resistance to ball impact (kindergartens, schools and sports halls). Ceiling components are manufactured on state-of-the-art production systems, which can produce everything from individual pieces to high volumes with maximum precision.
The metal ceilings are delivered with finished surfaces to the construction site, thereby ensuring quick and simple processing and short construction processes.

Our products are sustainable, because they consist of easily processed materials that can either be reused or straightforwardly recycled.

See from page 48 Special Acoustics.

MED CAMPUS Graz, Modul 2

Healing - Aesthetics
how patient rooms can help

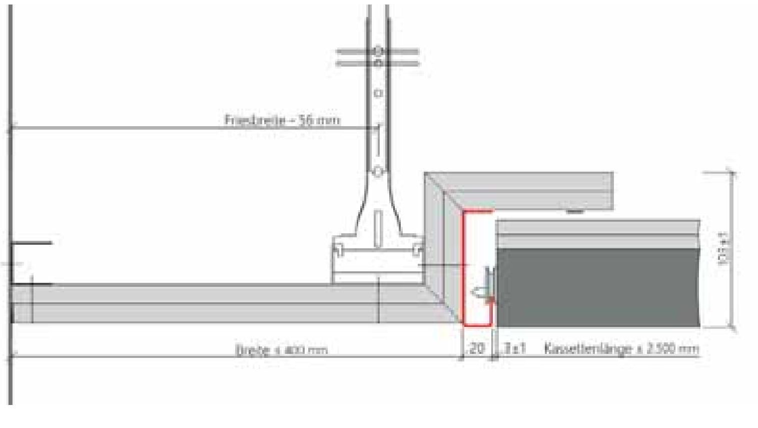


Hospitals are characterized by efficiency and pragmatism, because all processes must always run smoothly. The architectural firms HDR Germany and Matteo Thun & Partners succeeded in combining the character of an upscale hotel with the functionality of a clinic for the new building of the Waldkliniken Eisenberg. A bright and warm friendliness was implemented in the interiors. A lot of wood and off-white tones in soft and glare-free lighting harmonize perfectly.

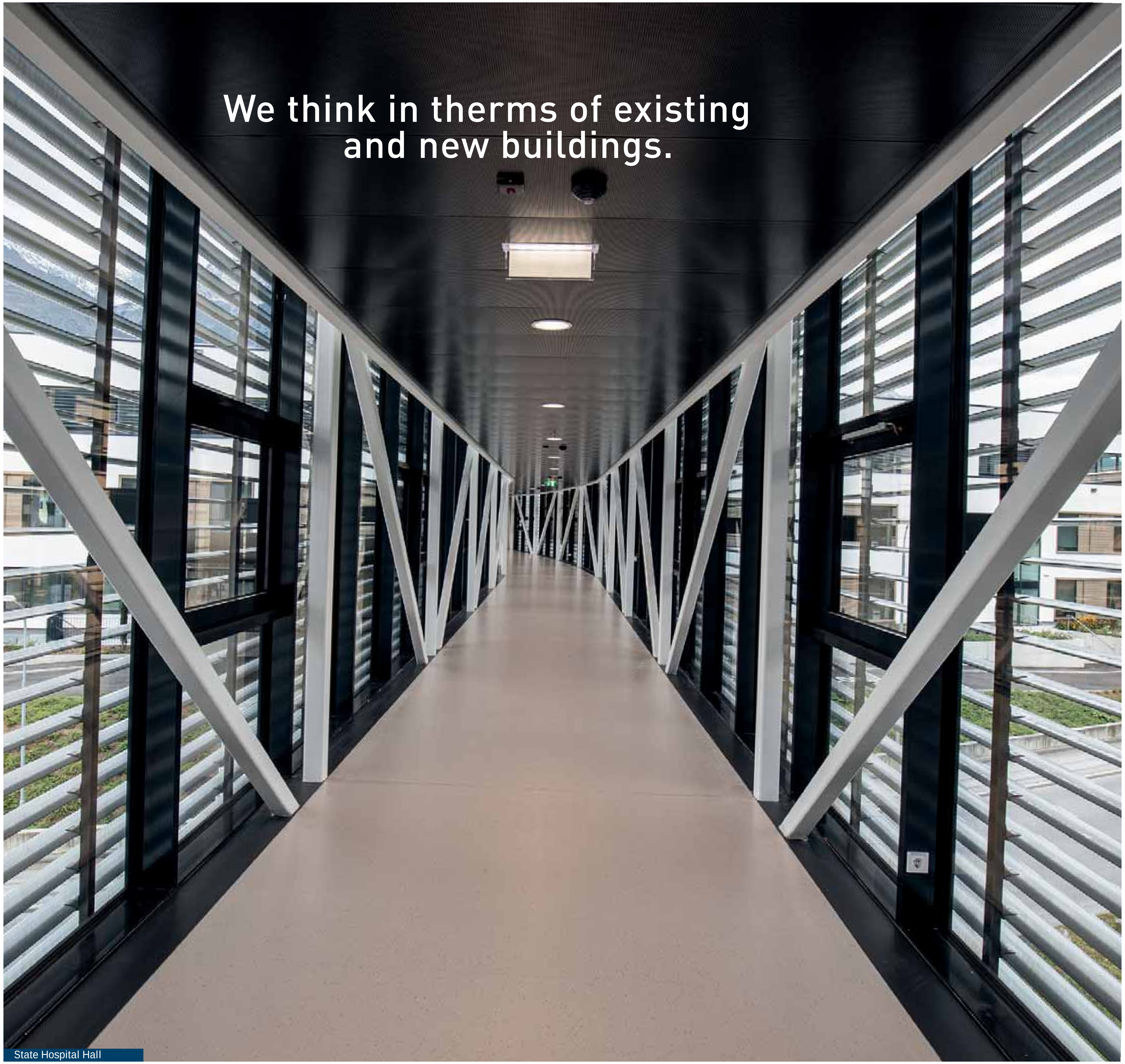
Even if it is not about l'art pour l'art, but about successful recovery and healing processes, it has been proven many times how a well-designed environment has a positive effect on this.

The processing and installation accuracy of our products, the beauty of the colors and the quality of the finishes make our metal ceiling systems an important player in achieving the overall aesthetic result.

Waldkliniken Eisenberg



A.FR.50
Frieze connection hallway lengthwise



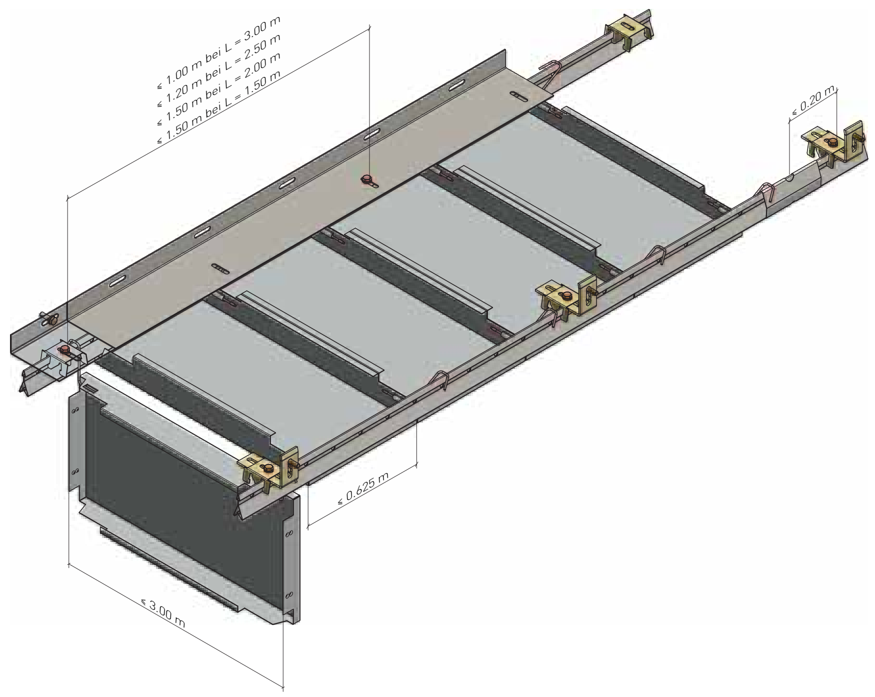
State Hospital Hall

Multifunctional metal ceilings

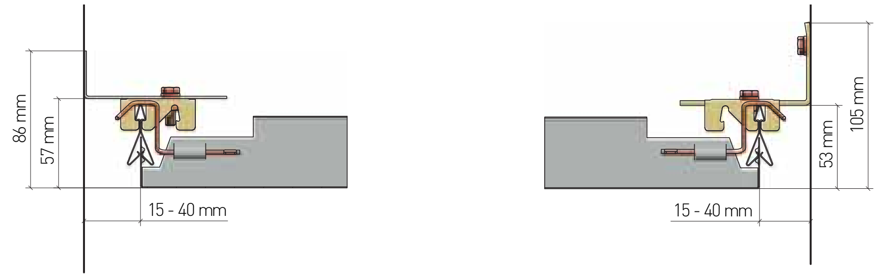
The Provincial Hospital Hall in Tyrol is the second largest hospital in Tyrol and offers a wide range of modern, medical, nursing and therapeutic care. The project was carefully planned by the architect Hinterwirth in Gmunden.

The Fural metal ceilings were installed in an area of over 6700 m² and, in addition to their aesthetic function, convince with excellent solutions for fire protection and hygiene. - Because especially in hygiene-sensitive buildings, such as hospitals, it is important to choose systems that meet all requirements.

The clip-in system has a special hospital wall connection, which is ideal for use in healthcare facilities. The ceiling system is also acoustically effective due to the perforation and offers uncomplicated access to the ceiling cavity in case of revision.



Detail ceiling structure incl. suspens
on



Wall connection variants

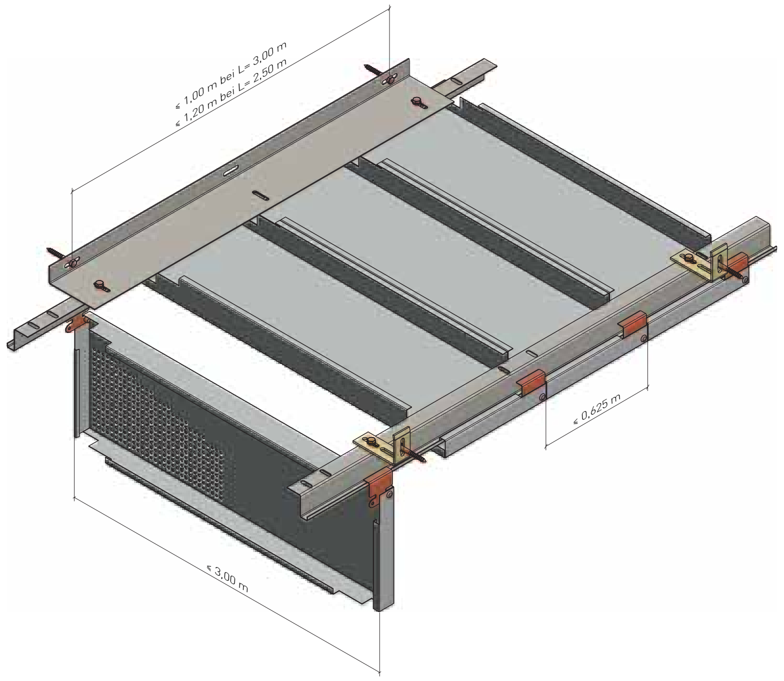
Hospital Maas/Kempen, Maaseik

Planning with experts

The Maas/Kempen Clinical Center in Maaseik, Belgium, planned by the Rotterdam-based architectural firm Gortemaker Algra Feenstra and completed in 2016, combines the previous Maas and Kempen locations into one building on an area of over 33,000 m². The new campus is divided into five individual buildings, each with clearly defined functions and a maximum height of 3 levels. This results in a pleasant atmosphere that perfectly complements the building structure and the surrounding landscape.

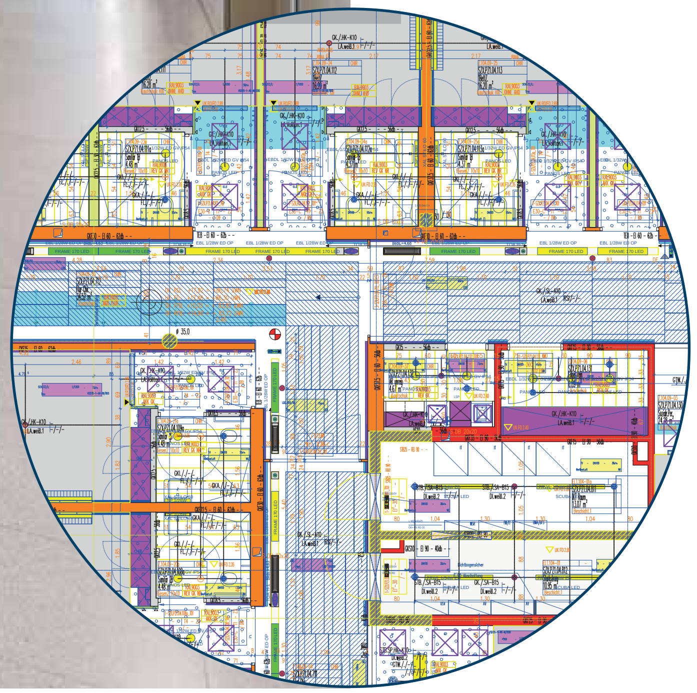
The architectural firm has founded a joint venture with EGM architects, Dordrecht, Netherlands, called „Dutch Health Architects.“

The planning of hospitals requires the use of specialists due to the extensive and specific requirements.



KLG 2.2.2.3 Long span tile - Hang-in system
Standard aisle ceiling

Kaiser-Franz-Josef-Spital, Wien



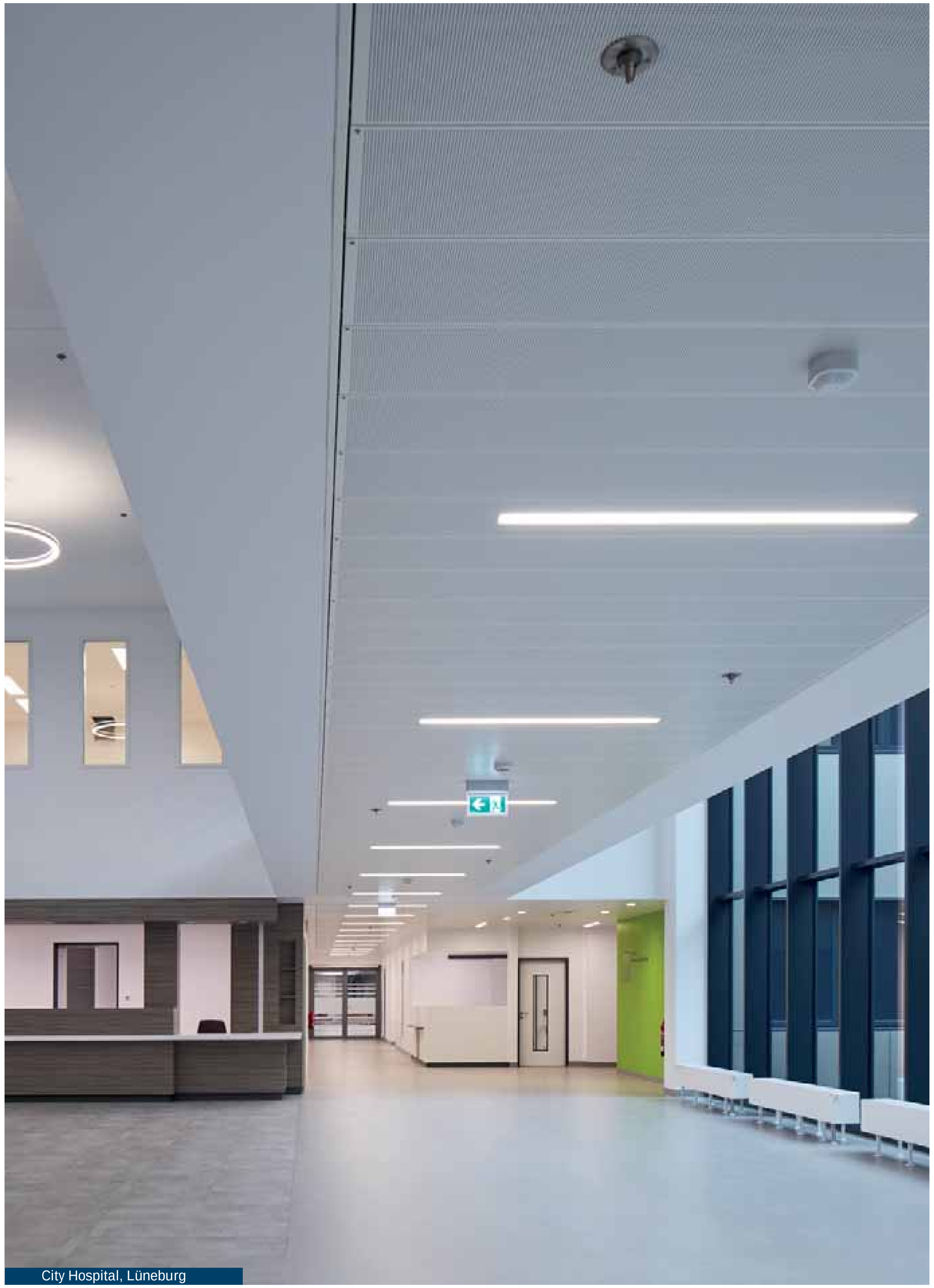
Hospital in the park

The expansion of the Kaiser-Franz-Josef-Spital in Vienna-Favoriten by the Munich-based firm Nickl Architekten Deutschland GmbH aimed to continue the historic idea of a clinic in a green setting. The social medical center houses nursing stations with over 250 beds as well as a mother-child area and a surgery center with 8 operating rooms.

In addition to the integration of a variety of technical functions in our metal ceilings, the aesthetic and varied design also contributes significantly to the well-being in the hospital.

We think in terms of maintenance and service, as well as easy recess opening.

↑ UP




Detail F30 tile

Fire protection and hygiene

In hygiene-sensitive buildings in particular, hospitals for example, cleanliness and sterility take top priority. The fire protection ceilings from Fural offer the necessary conditions for it.

Thanks to their special design, metal ceilings from Fural Metalit Dipling not only prevent the accumulation of dust particles but also ensure easy cleaning of the surfaces. The plaster board of our fire protection tiles behind the ceiling remains completely closed, so dust has no possibility to accumulate. The metal ceiling also enables ideal disinfection.

Fural metal fire protection ceilings combine practicality and safety with today's building requirements and boast of numerous advantages:

In addition to being 100% free of dust, ceilings from Fural Metalit Dipling are easy to clean and fibre-free. The panels do not contain any rock wool; as false ceilings, they guarantee fire protection for up to 90 minutes.

Thanks to the minimum height, light or emergency and warning lights can be easily integrated into the ceiling panels.

In addition to the fire protection function, a cooling system can be integrated as well.

"Fire Protection Ceiling" Manual in AT/CH/DE according to the corresponding country standard
EI 30 a ←→ b
EI 60 a → b + EI 30 a ← b
EI 90 a → b + EI 30 a ← b
F30 from above and from below
F90 from above and F30 from below

- Intro
- Swinging down system and lay-in system
  - Design of the fire protection tiles
  - Direct wall connections
  - Centre suspensions
  - Hall crossings
  - Niche connections
  - Frieze connections
  - Centre friezes
- Installation guide
- User guide

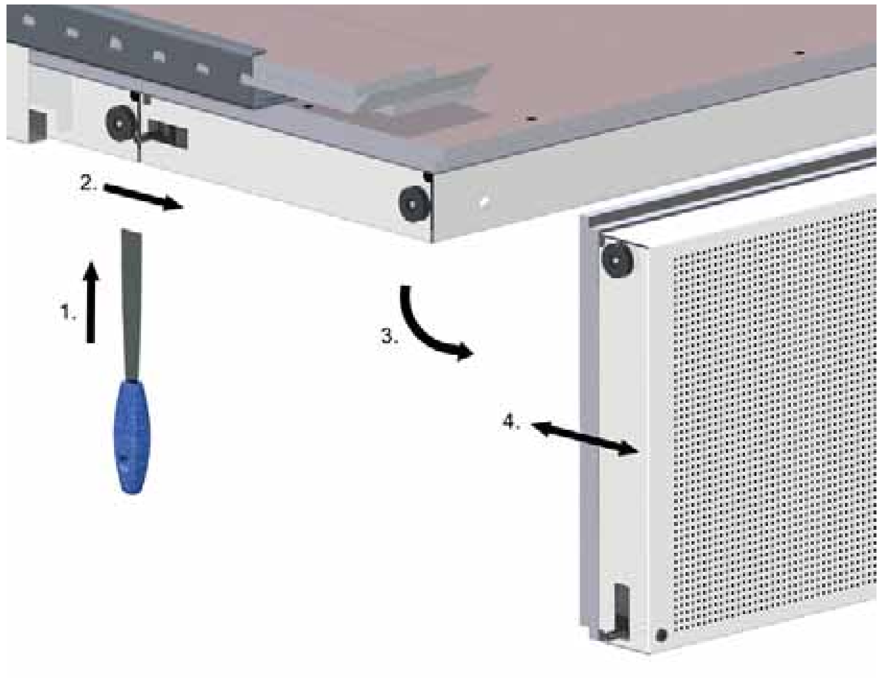
For more information, see our "Fire Protection Ceilings" Manuals, available for Germany, Austria and Switzerland, as well as on our website at: www.fural.com/en/metal_ceilings/fire_protection/11

Open and close

Hinge-down process of the Fural-Fire protection wall

- The ceiling is easy and to open without special tools.
- With a spatula or Allen key the F30/EI 30, EI 60 and F90/EI 90 or F90/EI 90 ceilings can be easily opened.
- The twist lock is galvanized and prevents signs of wear due to the opening.
- The swivel castors guarantee through their perfect shape an au-to-centering of the tiles between

1 Insert ceiling opener or Allen key
2 Open twist lock
3 Fold down tile
4 Move tile



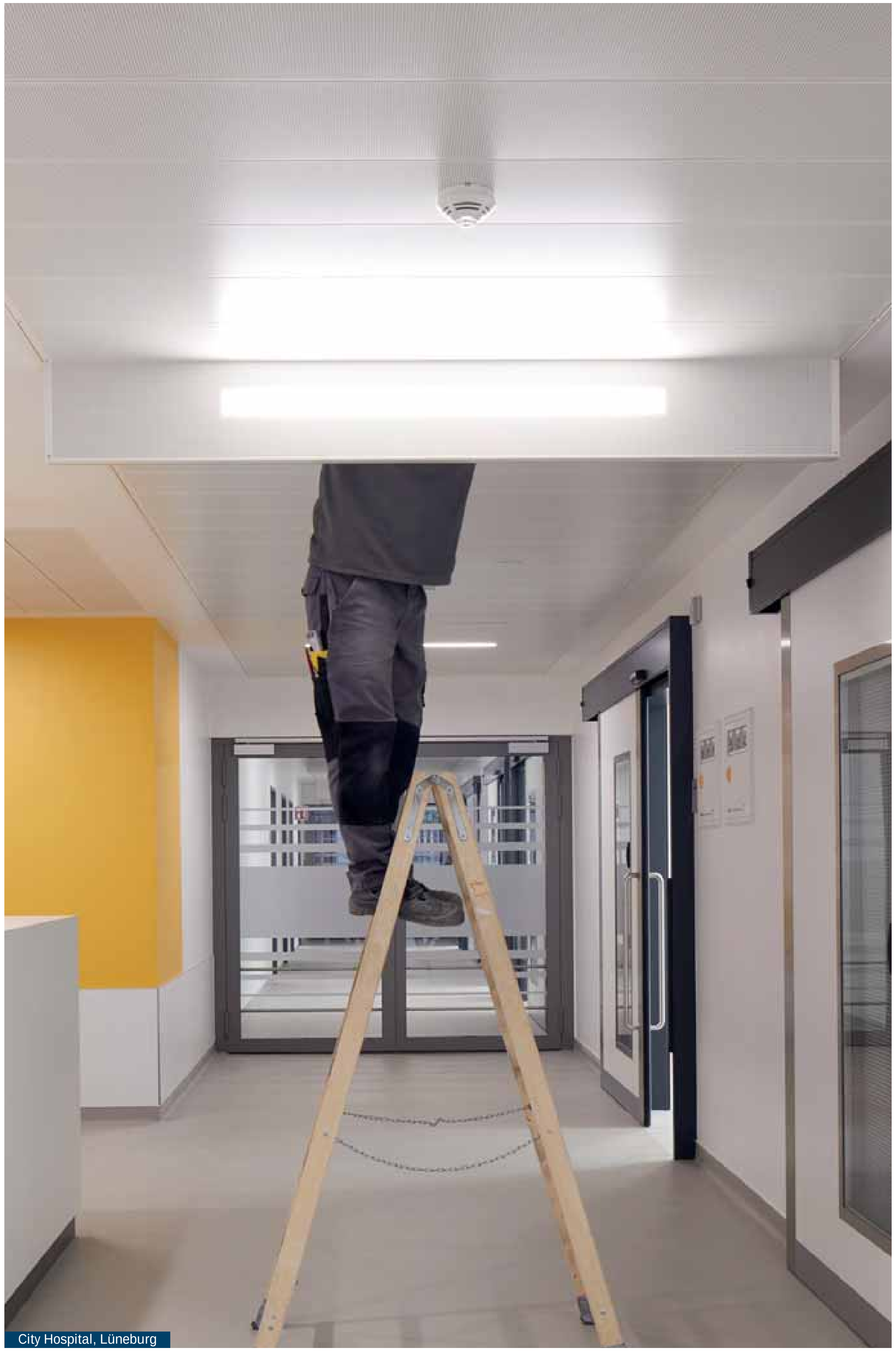
Technical fixtures

Generally tested are the installation or connection of:

- Lights, e.g. LED-light 410 and more types, LED Luminaire series 481
- Speaker
- Escape route pictograms
- Poppet valves
- Fire protection damper/Swirl diffu sers

Various fixtures can be supplied integrated as system parts ex works. These include a selection of LED lights, escape route pictograms and speakers.

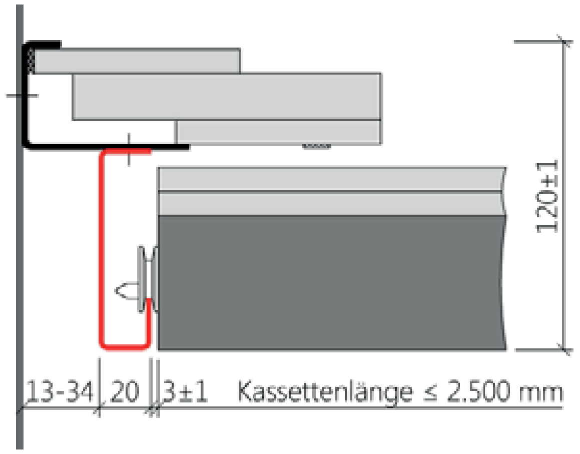
Further information on this as well as photometric data can be found on our website www.fural.com or on request. For fixtures, corresponding cutouts are produced ex works.


City Hospital, Lüneburg

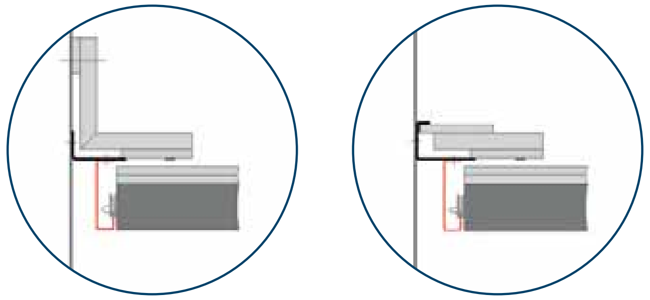
Security

At the Mainkofen district hospital planned by Eggert Architekten, the particularly safety-relevant circulation areas were equipped with fire protection ceilings from Fural.

The used metal ceiling systems have an easy-to-clean, smooth surface and can be easily hinged-down for revision of the ceiling void. This means that patients and caretakers can sleep peacefully.

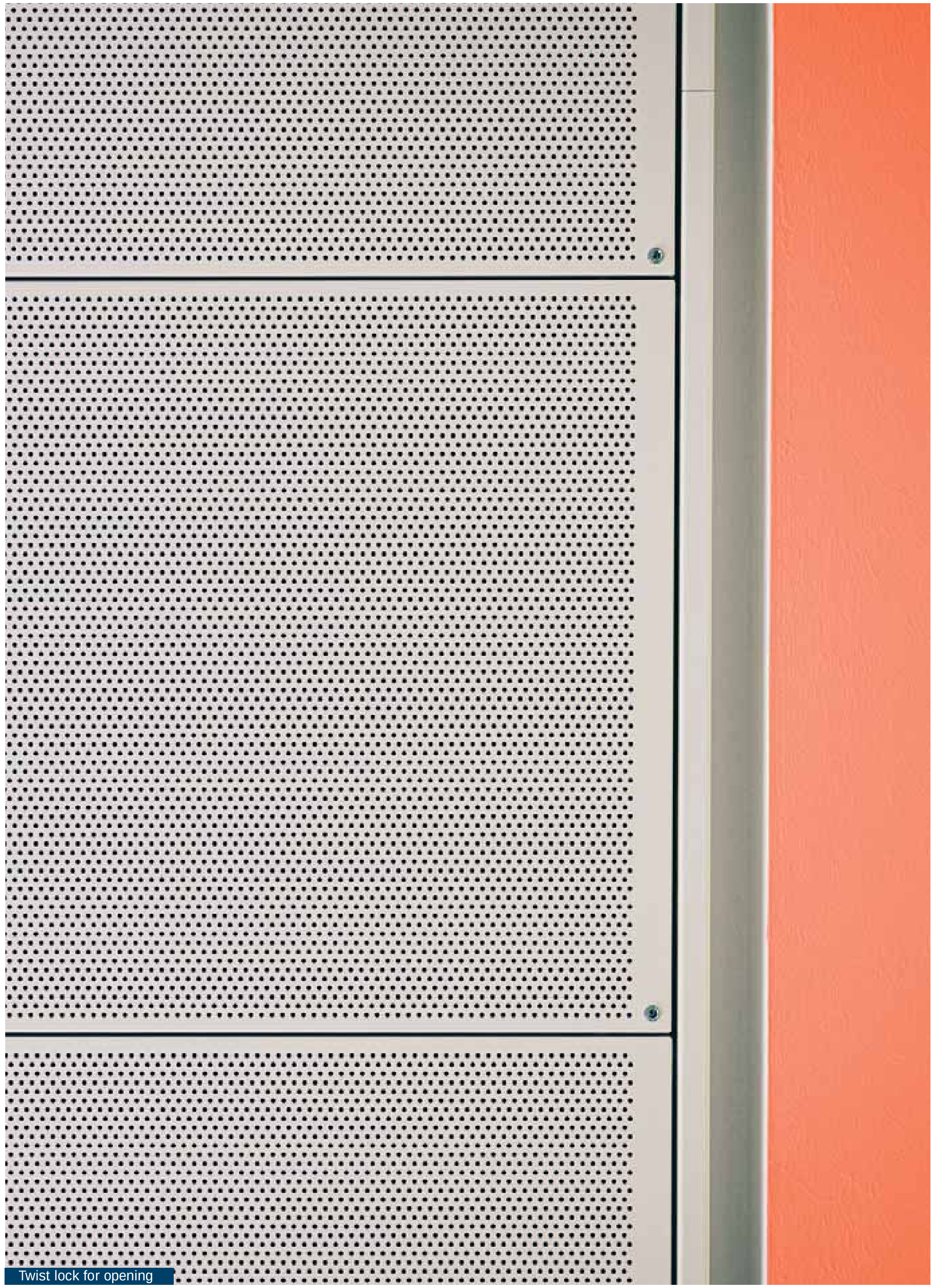


A.W.50
Longitudinal corridor connection



Connection old → Connection new

District Hospital Mainkofen



Twist lock for opening

Multifunctionality

Metal ceilings from Fural can be equipped with functions in many ways. Our products combine the following features:

- Fire protection
- Acoustics
- Heating, cooling and ventilation
- Integration possibility of fixtures
- Each tile can be hinged-down
- Simple maintenance
- easy replacement of ceiling components
- easy revision of the ceiling void
- 100 % separable by type
- Recyclability


SKL Hospital Lüneburg

Infodisplay


Linear luminaire

Integration of technology

It is important to control not only the technical aspects of the building, but also the comfort of patients and staff. For example, the control of temperature and humidity, thermal regulation and lighting appropriate to health conditions, and combine all this with the intended use of the structure (clinical paths and relative coherence of the rooms, flexibility of the parameters of each room).


Downlight


Speaker


BG Accident Hospital Berlin: New building rehabilitation clinic

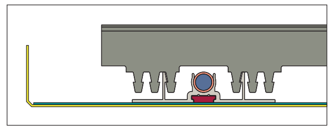
Copper/aluminium register with magnetic fixing for heating and cooling, Zent-Frenger + Fural

Heating and cooling

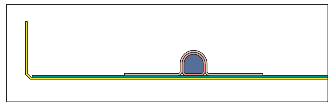
Climate elements

In Austria, the following climate elements are manufactured by long-term and well-experienced partner companies and integrated into our products.

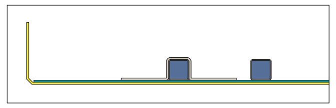
– Copper/aluminium systems with magnetic fixation



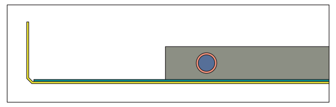
– Copper/aluminium systems with adhesive fixation



– Plastic/aluminium systems with magnetic fixation



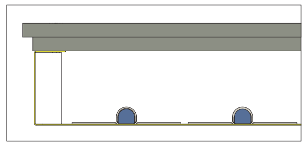
– Copper/graphite systems with adhesive fixation



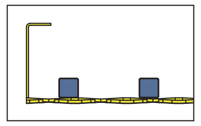
For more information please refer to our website at: www.fural.com/en/metal_ceilings/cooling_and_heating/12

Fire protection ceiling and cooling

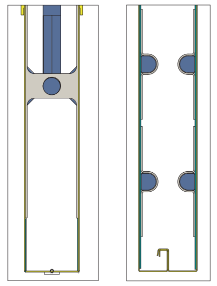
*Cooling ceiling systems in the case of fire protection ceilings always require an expert opinion.



Expanded metal ceiling and cooling

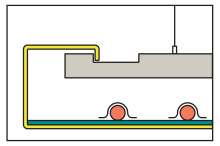


Baffle ceiling and cooling

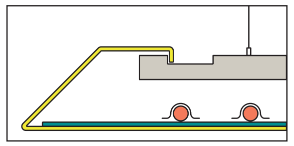


Floating ceiling and cooling

90° angle



45° angle



(60° angle also available)

We are a cool company!

Above all, it's the metal ceilings we produce that are cool. Because they make it possible to heat and cool rooms in a very simple way. Climate functions can be added and integrated into our metal ceilings according to the modular principle and be combined with other ceiling variants, e.g. acoustic ceilings.

Why use metal for a cooling ceiling?

Metal is ideally suited as a conductive medium for heat and cold.
Optimal temperature control is achieved on the basis of the radiation principle.
Since our cooling ceilings work completely without air circulation, dust swirling is prevented and draft is avoided. During the pollen season, it is particularly important to ensure an agreeable cooling of the room – without being exposed to pollen.
This is particularly relevant to school buildings, since more and more children suffer from allergies due to pollen in the air.
Cooling and heating ceilings with copper/aluminium or plastic systems can be implemented in various designs.
Sustainability is also taken into account: Energy is saved, and costs are reduced.

We test cooling ceilings

The efficiency of our cooling ceilings and walls is no accident. We test your individual projects in our own test laboratory and guarantee custom-tailored solutions for your projects in topmost quality.

Detailed solutions for hospitals

Our hospital projects show the wide range of detailed solutions associated with fire protection and acoustic ceilings.

1. 100× opening and closing, fold in the plaster, no mineral fibre, light fittings in a tray
2. Strip lights
3. Strip lights + pictogram escape route
4. Fire protection and cooling ceiling
5. Speaker
6. System installations, lighting series 481
7. LED-Light Gypsum
8. Column in the fire protection ceiling
9. KQK light fittings
10. Sprinkler and lighting
11. System installations lighting series 481, ventilation outlets
12. KLK light fittings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4


5


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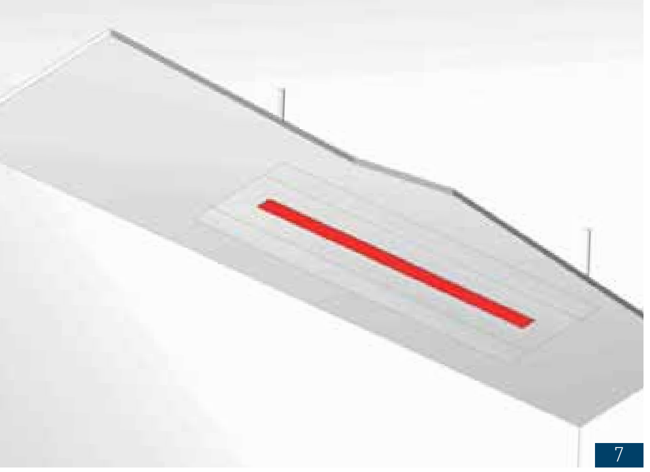
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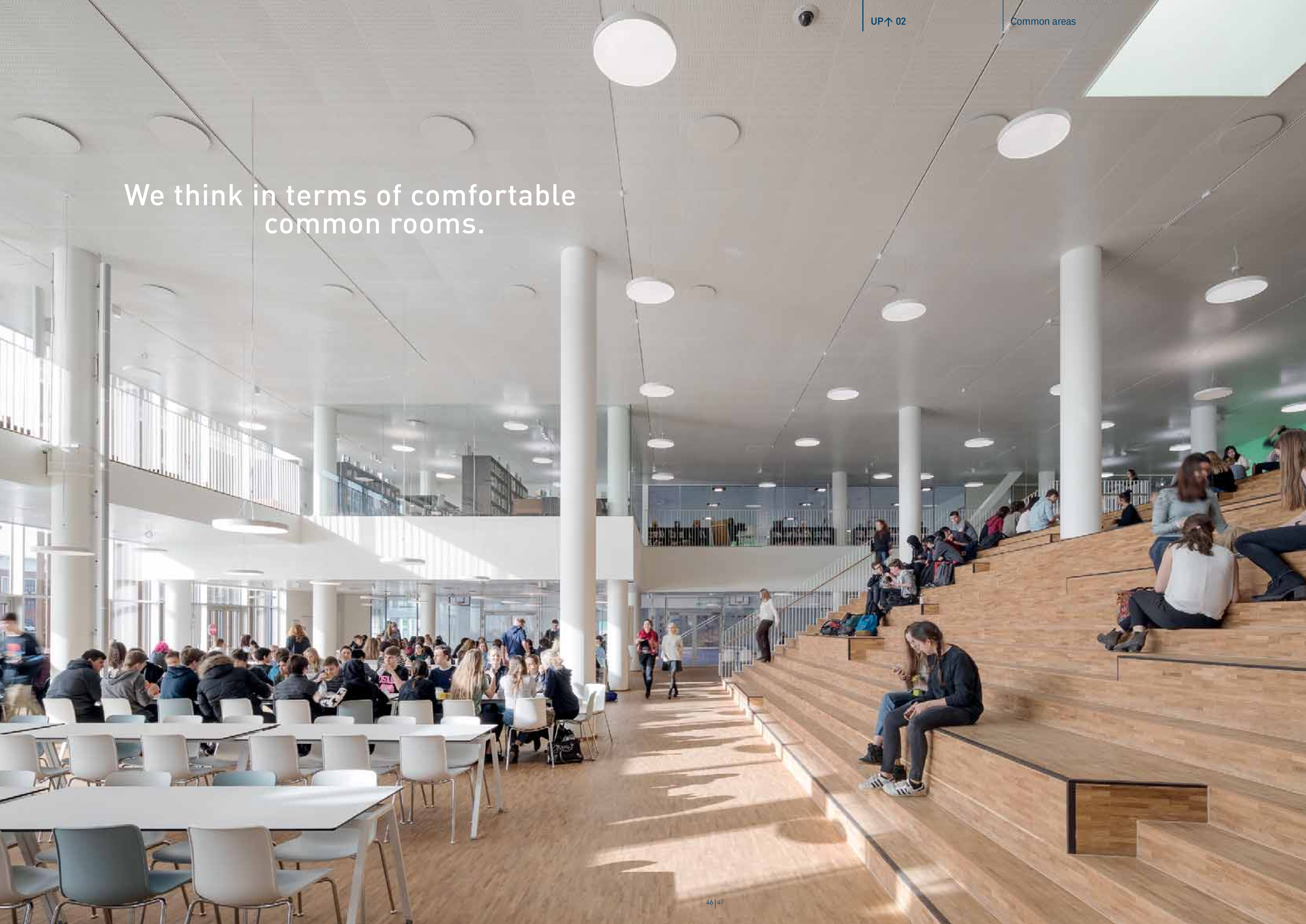


We think in terms of comfortable common rooms.


E-Campus Graz

Stay in a feel-good atmosphere

In addition to excellent, all-inclusive care, the environment and atmosphere in hospitals is an important factor in feeling comfortable.

The metal ceilings from Fural Metalit Dipling create an area with one hundred percent feel-good character in the lounge, eating and drinking areas. Whether for eating, drinking, chatting or relaxing and switching off - for patients and all employees.


Airport, Wien


asr Headquarters, Utrecht

↑ UP

Silence

„Action takes place in a certain amount of noise.
Work takes place in silence.“
(Peter Bamm, 1897-1975)

Acoustics terminology

Sound and sound level

The term "sound" refers to localised vibration and the propagating waves. These can occur in air (**airborne sound**) or in solid materials (**structure-borne sound**). If floors, ceilings and stairs are stimulated to vibrate by footfall, this is referred to as **impact sound**.

The sound intensity is designated with sound level L and specified in the decibel (dB) unit.

Acoustic quality

The term "acoustic quality" describes the interaction of the acoustic factors of a room for such sound events as music or speech with reference to the individual location of the person listening.

Rather than any physical properties of the room, the acoustic quality describes audio-physiological and audio-psychological effects on the listeners.

Acoustic quality is therefore not a clearly ascertainable quantity. It also depends on individual and subjective factors, for example on hearing capacity and listening experience.

However, the aim of a good acoustic plan should also be to include people with poorer hearing and therefore to achieve generally good average audibility.

Sound absorption area

The so-called **equivalent sound absorption area**, A, of a component is calculated by multiplying its area with the sound absorption coefficient, α.

All boundary surfaces, S_i, of a room have individual sound absorption coefficients, α_i, which allows the equivalent sound absorption area, A_i, to be determined for each partial area:

$$A_i = \alpha_i \times S_i (m^2)$$

The total equivalent sound absorption area, A, is calculated by adding up the individual amounts:

$$A_{total} = \alpha_1 \times S_1(m^2) + \alpha_2 \times S_2(m^2) + \ldots$$

Reverberation time

The reverberation time, T_{60}, is a measure of the time required for the sound pressure to reduce to 1/1000 of its initial value after the sound source becomes silent.

This value is usually determined for a centre frequency (500 Hz or 1000 Hz) and specified accordingly.

The reverberation time increases in proportion to the volume of the room and in inverse proportion to the equivalent sound absorption area, A.

Sabine formula

In the field of technical acoustics, reverberation time T is calculated with the "Sabine formula":

$$T = V \div A \times 0.163$$

"V" describes the room volume and "A" the equivalent sound absorption area in m^2.

What do abbreviations α_s, α_p, α_w and NRC A stand for?

α_s (alpha$_s$) describes the so-called **one-third-octave** value. In a close spacing of thirds, 18 different sound absorption values are measured between 100 and 5000 Hz (100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1000 Hz, 1250 Hz, 1600 Hz, 2000 Hz, 2500 Hz, 3150 Hz, 4000 Hz and 5000 Hz). A value of 1.0 means complete absorption, while a value of 0.0 means complete reflection.

α_p (alpha$_p$) describes the so-called **practical sound absorption coefficient**. Three on-third-octave values α_s are used to calculate an **octave value** α_p. In addition 6 frequencies are represented (125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz).

α_w (alpha$_w$) describes the so-called **weighted sound absorption coefficient**. This is frequency-dependent and specified as a single-number value rounded to the nearest 0.05. The α_w value can be supplemented with so-called "shape indicators". These state that the measured values in the low (L), mid (M) or high (H) frequency range are better than those identified by the α_w value (see index word "shape indicators").

NRC A specifies the average of the sound absorption at octave values 250 Hz, 500 Hz, 1000 Hz and 2000 Hz, rounded to the nearest 0.05. A noise reduction coefficient of 0.80 stands for an average sound absorption of 80%.

Shape indicators (L/M/H)

The weighted sound absorption coefficient, α_w, can be supplemented with so-called "shape indicators", expressed by the letters L, M and H (low, mid, high), in which frequency ranges the sound absorption level is particularly high.

- L Particularly good absorption up to 250 Hz
- M Particularly good absorption at 500 Hz to 1000 Hz
- H Particularly good absorption at 2000 Hz to 4000 Hz

Absorber classes

According to DIN EN 11654, acoustic elements are assigned to absorber class A, B, C, D or E based on their sound absorption coefficient.

- A Extremely absorbent α_w 0.90–1.00
- B Highly absorbent α_w 0.80-0.85
- C Very absorbent α_w 0.60-0.75
- D Absorbent α_w 0.30-0.55
- E Slightly absorbent α_w 0.15-0.25

Longitudinal sound insulation $D_{n,f,w}$

In buildings with a skeleton construction – typically nearly all new office buildings today – the individual rooms are separated by lightweight partition walls. The ceilings are suspended.

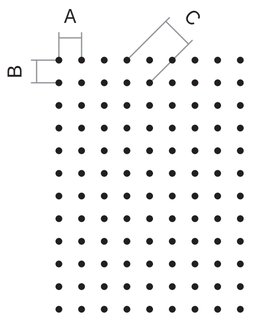
The cavity that this creates between raw ceiling and suspended ceiling acts as a sound transmission path which must be compensated for with longitudinal sound insulation.

The longitudinal sound insulation can be implemented with vertical or horizontal compartmentalisation.

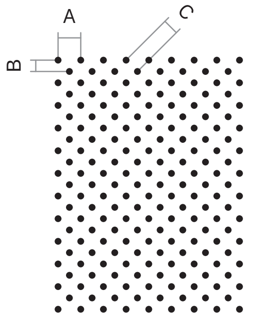
The longitudinal sound insulation is determined according to EN ISO 717-1 and specified as a weighted normalised flanking sound level difference $D_{n,f,w}$ in **dB** units.

Here "$D_{n,f}$" describes the normalised flanking level difference for flanking components (e.g. suspended ceilings). "$_w$" means that the measured values have been weighted in accordance with normative specifications. The specified numerical value is the value read from the reference curve at 500 Hz.

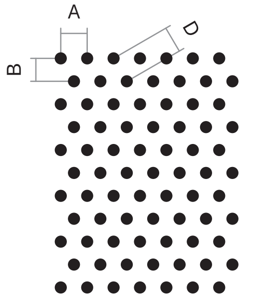
The reference curve is not shown in the test report diagrams.



Rg



Rd



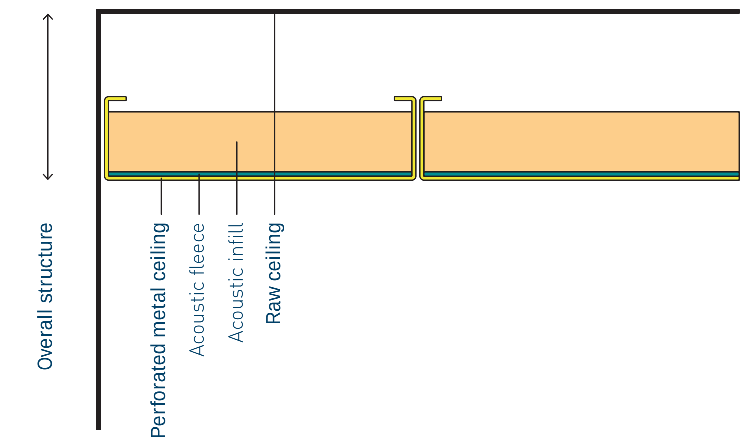
Rv

Perforation sizing

- A Horizontal spacing
- B Vertical spacing
- C Diagonal spacing 45°
- D Offset spacing 60°

Effect of acoustic infills


SKA-Rehabilitation Center, St. Radegund

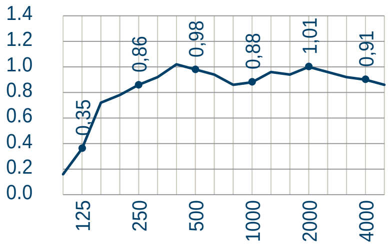


Different acoustic infills (absorber types)

The sound absorption coefficient is greatly affected by the acoustic infills used, which can consist of mineral wool, mineral wool sealed in PE film, foam or polyester wool.

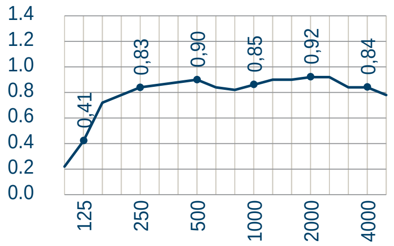
These acoustic infills are also available in different volumetric weights (kg/m³).

	Fural
	Rg 2.5 - 16 %
Perforation Ø	2.5 mm
Hole content	16 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rg 2.50 - 5.50
Horizontal spacing	5.50 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→
Sound absorption	Sound absorption coefficient α_s at one-third centre frequency f (Hz)



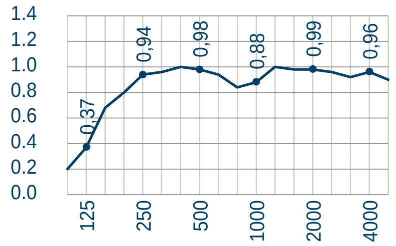
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 14
NRC	0.95
α_w	0.95
Absorber class	A (DIN EN 11654)
Acoustic infill	**30 mm mineral wool 45 kg/m³**

	Fural
	Rg 2.5 - 16 %
Perforation Ø	2.5 mm
Hole content	16 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rg 2.5 - 5.50
Horizontal spacing	5.50 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→
Sound absorption	Sound absorption coefficient α_s at one-third centre frequency f (Hz)



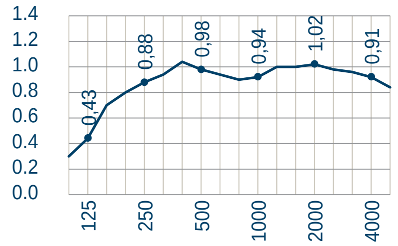
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 17
NRC	0.85
α_w	0.90
Absorber class	A (DIN EN 11654)
Acoustic infill	**30 mm mineral wool 45 kg/m³ in PE film**

	Fural
	Rg 2.5 - 16 %
Perforation Ø	2.5 mm
Hole content	16 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rg 2.50 - 5.50
Horizontal spacing	5.50 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→
Sound absorption	Sound absorption coefficient α_s at one-third centre frequency f (Hz)



Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 18
NRC	0.95
α_w	0.95
Absorber class	A (DIN EN 11654)
Acoustic infill	**30 mm foam 9 kg/m³**

	Fural
	Rg 2.5 – 16 %
Perforation Ø	2.5 mm
Hole content	16 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rg 2.50 – 5.50
Horizontal spacing	5.50 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→
Sound absorption	Sound absorption coefficient α_s at one-third centre frequency f (Hz)

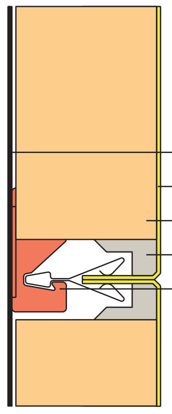


Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 19
NRC	0.95
α_w	0.95
Absorber class	A (DIN EN 11654)
Acoustic infill	**30 mm polyester wool 48 g/m³**

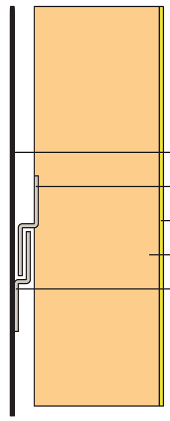
Acoustic walls

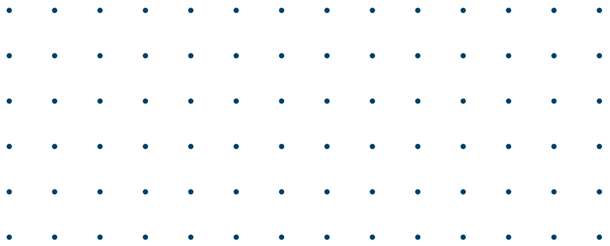

High School Eckenberg

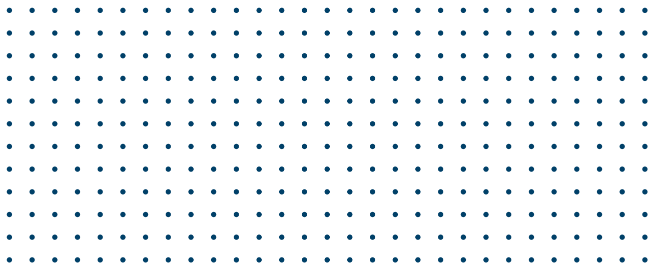
Clip-in system

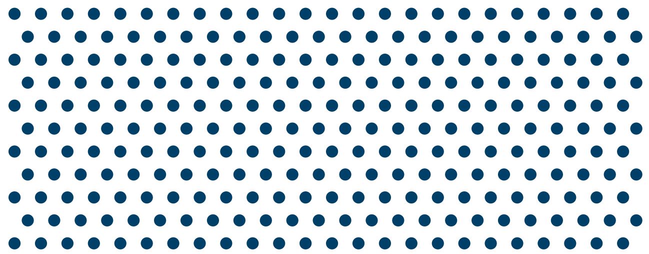


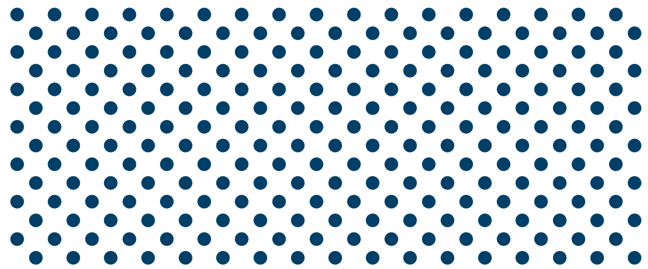
Hang-in system









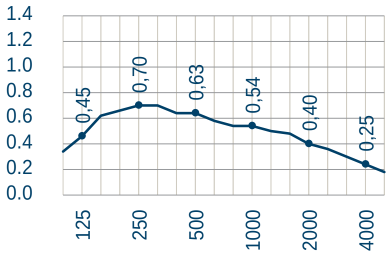


Fural Rg 0.7 - 1 %

Perforation Ø	0.7 mm
Hole content	1 %
Max. perforation width	1,140 mm
Des. acc. to DIN 24041	Rg 0.70 - 6.00
Horizontal spacing	6.00 mm →
Vertical spacing	6.00 mm ↓
Diagonal spacing	8.48 mm ↘
Perforation direction	→

Sound absorption

Sound absorption coefficient α_s at one-third centre frequency f (Hz)



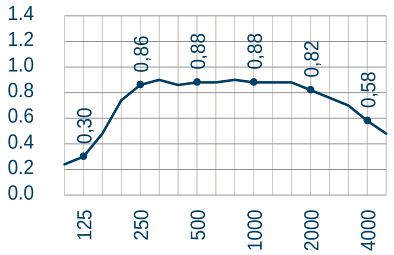
Overall structure	50 mm
Fleece	Bonded acoustic fleece
Test certificate	07.12.2010 M 61840/27
NRC	0.55
α_w	0.40 (L)
Absorber class	D (DIN EN 11654)
Acoustic infill	50 mm mineral wool 100 kg/m³ in PE film

Fural Rg 0.7 - 4 %

Perforation Ø	0.7 mm
Hole content	4 %
Max. perforation width	1,140 mm
Des. acc. to DIN 24041	Rg 0.70 - 3.00
Horizontal spacing	3.00 mm →
Vertical spacing	3.00 mm ↓
Diagonal spacing	4.24 mm ↘
Perforation direction	→

Sound absorption

Sound absorption coefficient α_s at one-third centre frequency f (Hz)



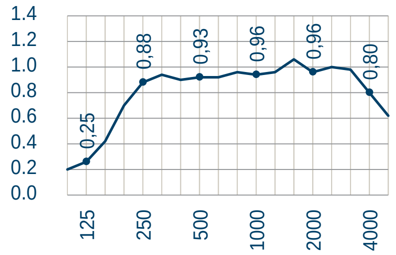
Overall structure	50 mm
Fleece	Bonded acoustic fleece
Test certificate	07.12.2010 M 61840/26
NRC	0.85
α_w	0.80 (L)
Absorber class	B (DIN EN 11654)
Acoustic infill	50 mm mineral wool 100 kg/m³ in PE film

Fural Rv 1.6 - 20 %

Perforation Ø	1.6 mm
Hole content	20 %
Max. perforation width	1,450 mm
Des. acc. to DIN 24041	Rv 1.60 - 3.50
Horizontal spacing	3.50 mm →
Vertical spacing	3.03 mm ↓
Offset spacing 60°	3.50 mm ↘
Perforation direction	→

Sound absorption

Sound absorption coefficient α_s at one-third centre frequency f (Hz)



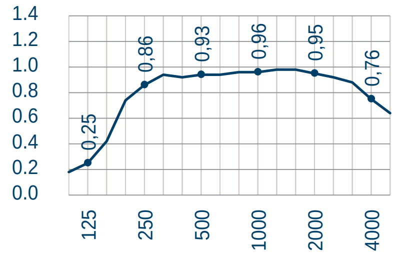
Overall structure	50 mm
Fleece	Bonded acoustic fleece
Test certificate	07.12.2010 M 61840/22
NRC	0.95
α_w	0.95
Absorber class	A (DIN EN 11654)
Acoustic infill	50 mm mineral wool 100 kg/m³ in PE film

Fural Rd 1.8 - 21 %

Perforation Ø	1.8 mm
Hole content	21 %
Max. perforation width	1,400 mm
Des. acc. to DIN 24041	Rd 1.80 - 3.50
Horizontal spacing	4.96 mm →
Vertical spacing	2.48 mm ↓
Diagonal spacing	3.50 mm ↘
Perforation direction	→

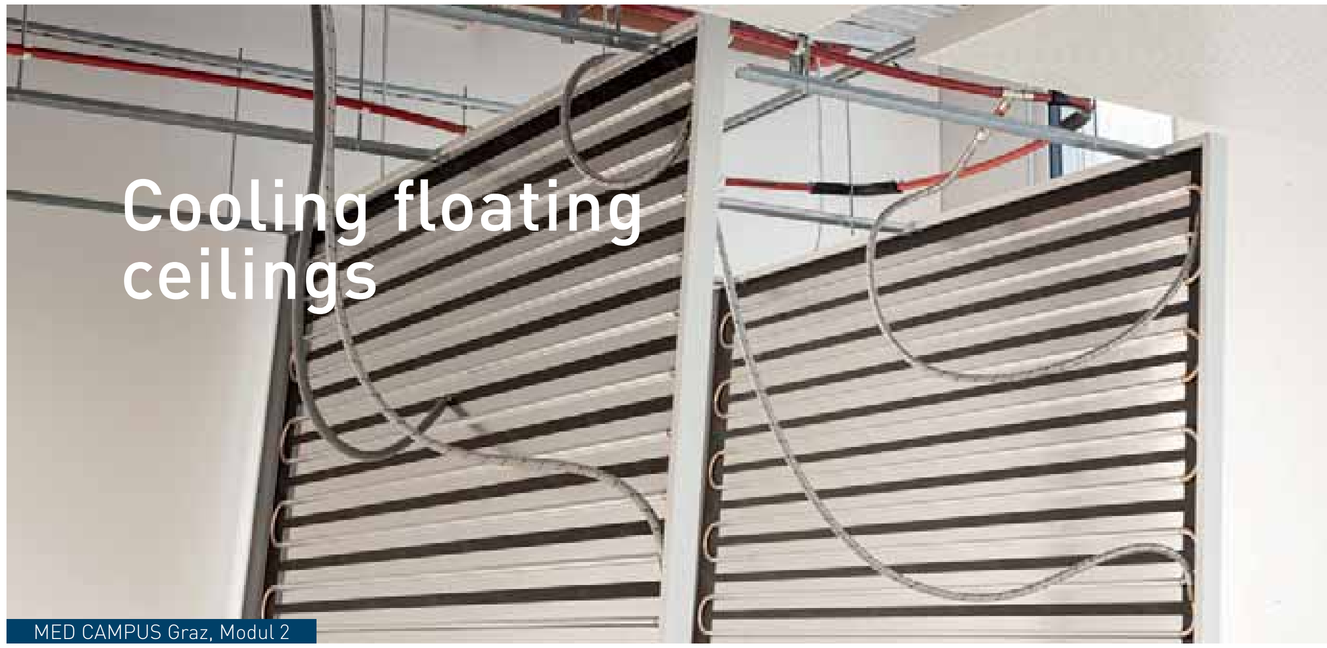
Sound absorption

Sound absorption coefficient α_s at one-third centre frequency f (Hz)

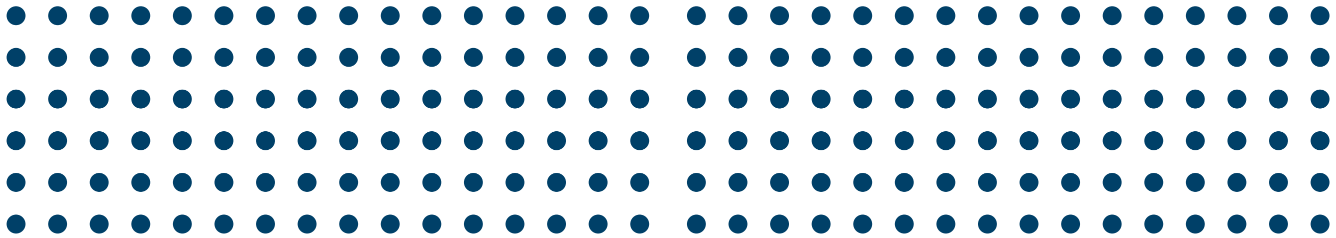


Overall structure	50 mm
Fleece	Bonded acoustic fleece
Test certificate	07.12.2010 M 61840/25
NRC	0.95
α_w	0.95
Absorber class	A (DIN EN 11654)
Acoustic infill	50 mm mineral wool 100 kg/m³ in PE film

Cooling floating ceilings



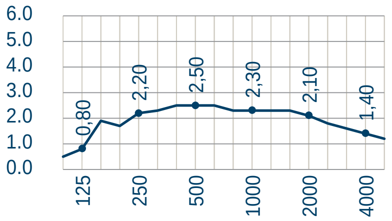
MED CAMPUS Graz, Modul 2



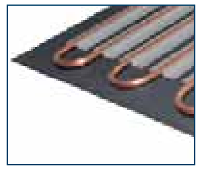
	Fural
	Rg 2.5 - 16 %
Perforation Ø	2.5 mm
Hole content	16 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rg 2.50 - 5.50
Horizontal spacing	5.50 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→

Sound absorption

Absorption area A_{Obj}/m² at one-third centre frequency f (Hz)



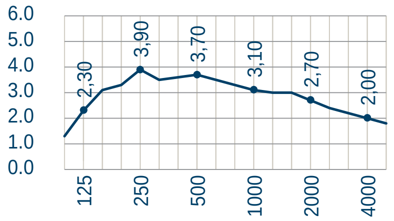
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	28.06.2019 M 105629/37
Equiv. sound absorp.	(500 Hz) 2.50 m²
Visible surface area	3.45 m²
Acoustic infill	**Cooling system**
Acoustic occ. level	73 % (cooling system with 12 heat conducting profiles)



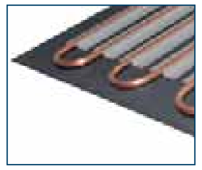
	Fural
	Rg 2.5 - 16 %
Perforation Ø	2.5 mm
Hole content	16 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rg 2.50 - 5.50
Horizontal spacing	5.50 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→

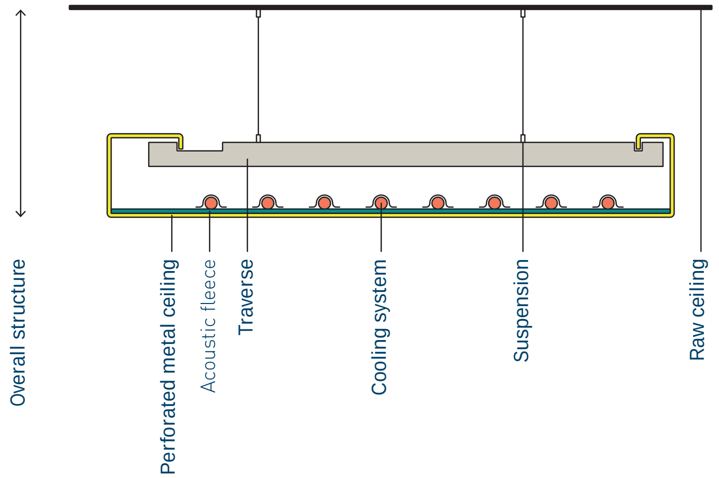
Sound absorption

Absorption area A_{Obj}/m² at one-third centre frequency f (Hz)



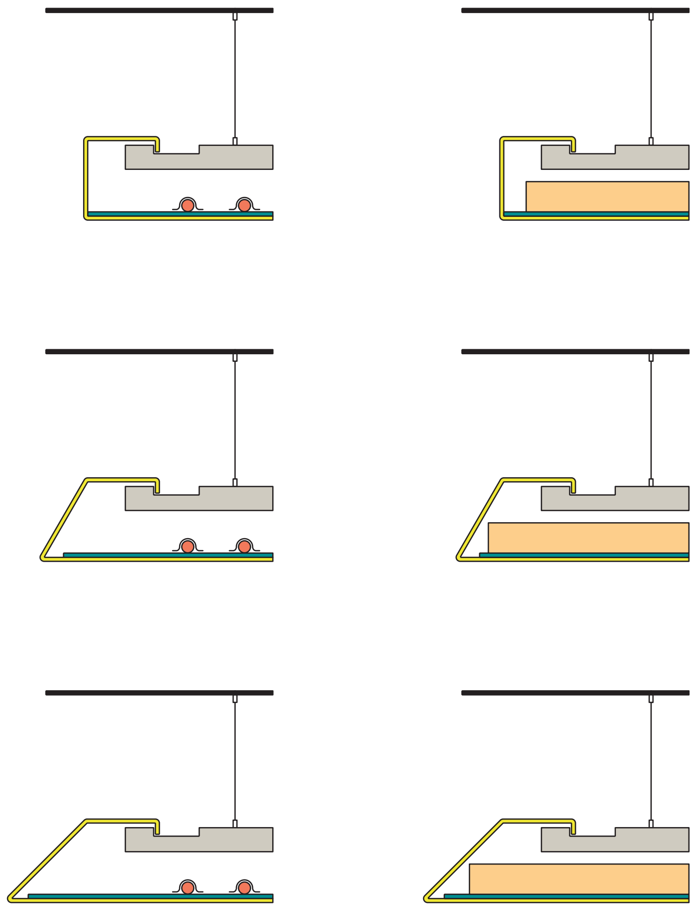
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	28.06.2019 M 105629/38
Equiv. sound absorp.	(500 Hz) 3.70 m²
Visible surface area	3.45 m²
Acoustic infill	**50 mm mineral wool 100 kg/m³ in PE film + cooling system**
Acoustic occ. level	73 % (cooling system with 12 heat conducting profiles)





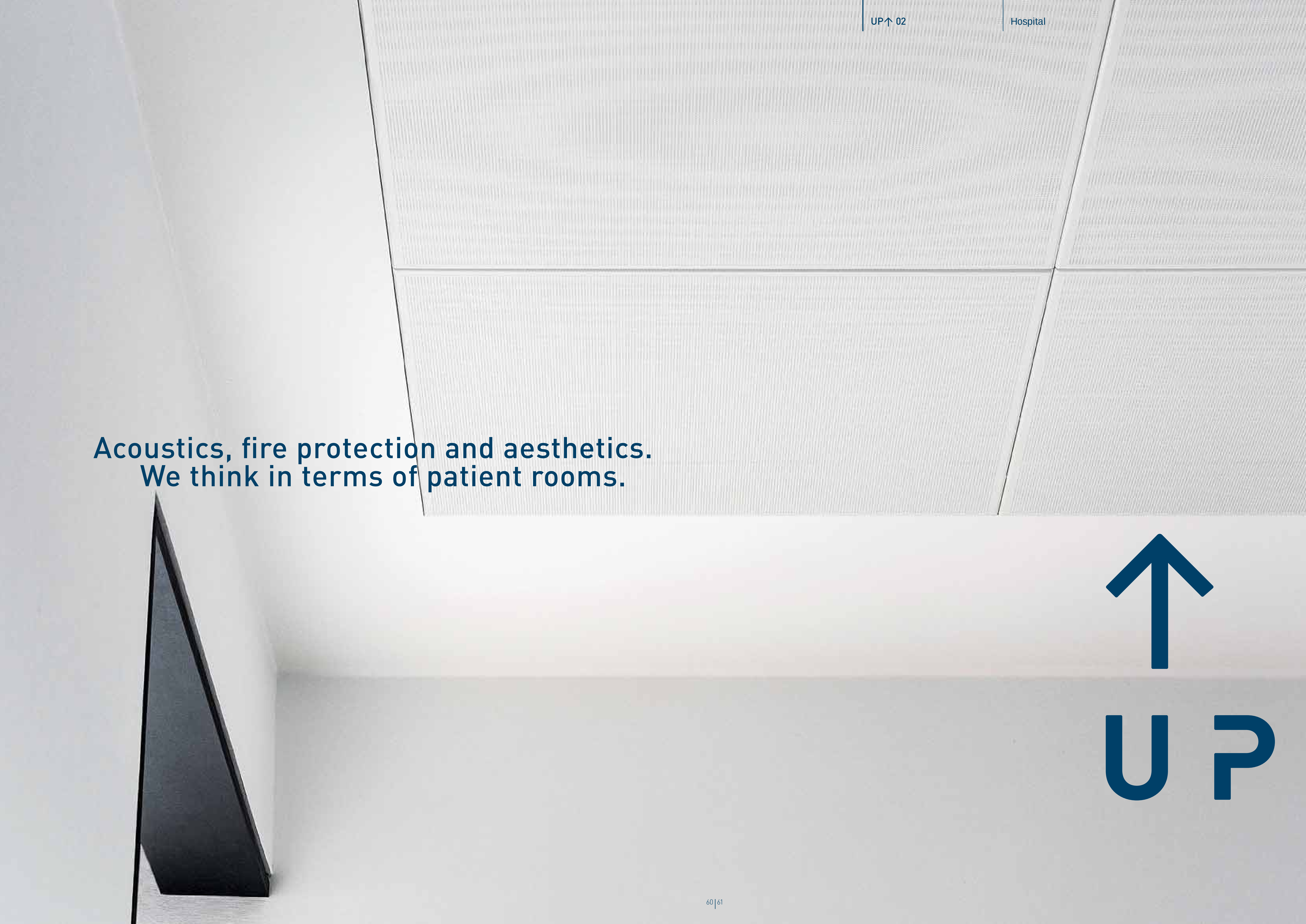
Room temperature control by floating ceiling

Floating ceilings are particularly suitable for combination with water-bearing heat exchangers for room temperature control. Fitting with cooling systems changes the acoustic properties of the floating ceilings, because the previously continuous holes of profiles are covered. Therefore the "acoustic occupancy level" is specified in the tables. This means the proportion of the area covered by the heat conducting profile.



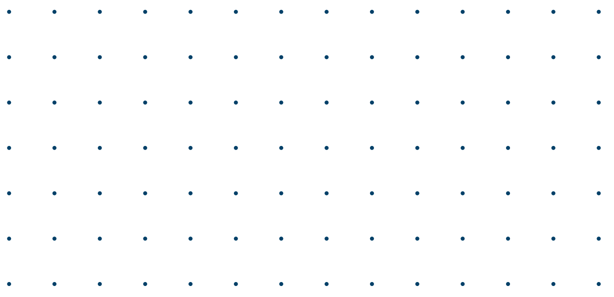
Edge formation of floating ceilings

The edge formation of floating ceilings can be implemented with internal angles of 90°, 60° or 45°. While internal angles of 90° create a voluminous impression, the versions with internal angles of 60° and 45° have a more two-dimensional effect.

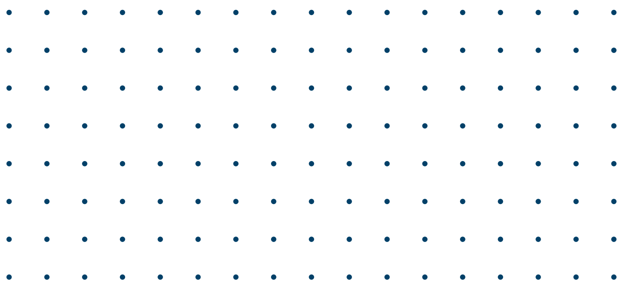


Acoustics, fire protection and aesthetics. We think in terms of patient rooms.

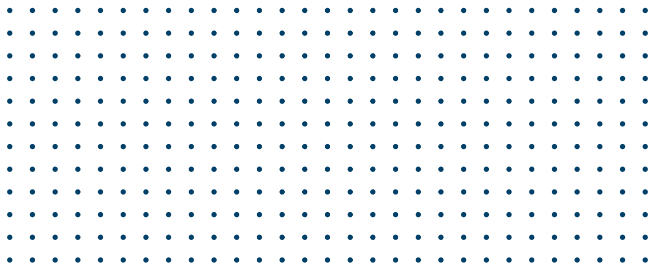
Tested perforations 1



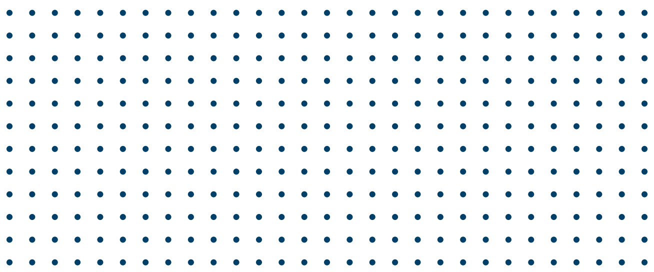
	Fural
	Rg 0.7 - 1 %
Perforation Ø	0.7 mm
Hole content	1 %
Max. perforation width	1,197 mm
Des. acc. to DIN 24041	Rg 0.70 - 6.00
Horizontal spacing	6.00 mm →
Vertical spacing	6.00 mm ↓
Diagonal spacing	8.48 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	31/08/2007 P-BA 231/2007
NRC	0.65
α_w	0.50 (LM)
Absorber class	D (DIN EN 11654)
Acoustic infill	w/o



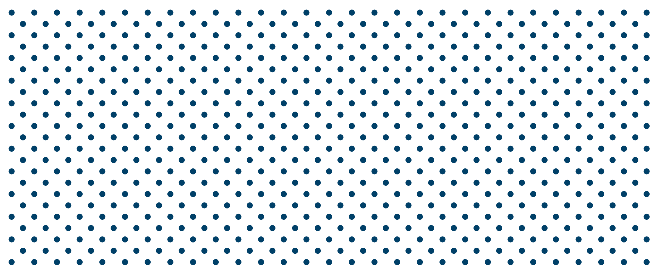
	Fural
	Rg 0.7 - 1.5 %
Perforation Ø	0.7 mm
Hole content	1.5 %
Max. perforation width	1,400 mm
Des. acc. to DIN 24041	Rg 0.70 - 5.00
Horizontal spacing	5.00 mm →
Vertical spacing	5.00 mm ↓
Diagonal spacing	7.07 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	04/12/2019 M 105629
NRC	0.60
α_w	0.50 (L)
Absorber class	D (DIN EN 11654)
Acoustic infill	w/o



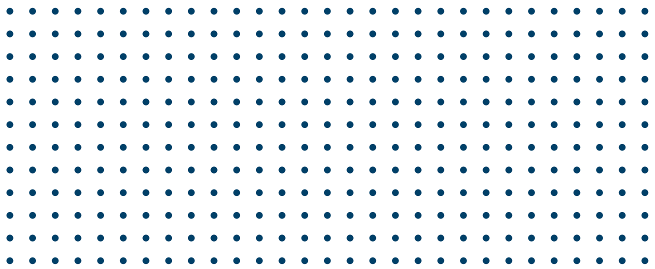
	Fural
	Rg 0.7 - 4 %
Perforation Ø	0.7 mm
Hole content	4 %
Max. perforation width	1,197 mm
Des. acc. to DIN 24041	Rg 0.70 - 3.00
Horizontal spacing	3.00 mm →
Vertical spacing	3.00 mm ↓
Diagonal spacing	4.24 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	31/08/2007 P-BA 219/2007
NRC	0.80
α_w	0.75 (LM)
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



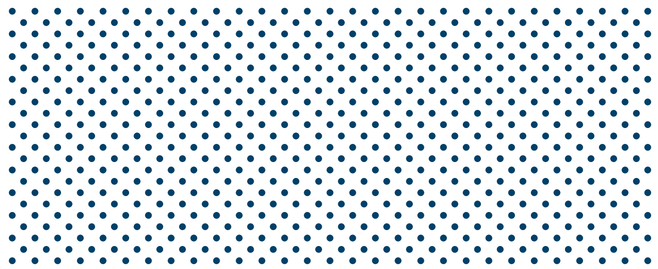
	Fural
	Rg 0.8 - 6 %
Perforation Ø	0.8 mm
Hole content	6 %
Max. perforation width	1,400 mm
Des. acc. to DIN 24041	Rg 0.80 - 3.00
Horizontal spacing	3.00 mm →
Vertical spacing	3.00 mm ↓
Diagonal spacing	4.24 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	09/06/2017 M 105629/17
NRC	0.75
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



	Fural
	Rd 0.8 - 11 %
Perforation Ø	0.8 mm
Hole content	11 %
Max. perforation width	1,400 mm
Des. acc. to DIN 24041	Rd 0.80 - 2.12
Horizontal spacing	3.00 mm →
Vertical spacing	1.50 mm ↓
Diagonal spacing	2.12 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	09/06/2017 M 105629/18
NRC	0.75
α_w	0.70
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

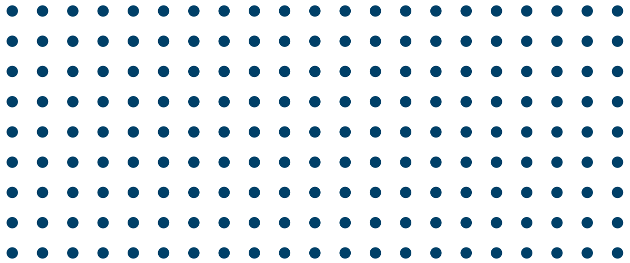


	Fural
	Rg 0.9 - 7 %
Perforation Ø	0.9 mm
Hole content	7 %
Max. perforation width	1,022 mm
Des. acc. to DIN 24041	Rg 0.90 - 3.00
Horizontal spacing	3.00 mm →
Vertical spacing	3.00 mm ↓
Diagonal spacing	4.24 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	30/09/2019 M 105629/44
NRC	0.75
α_w	0.70
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

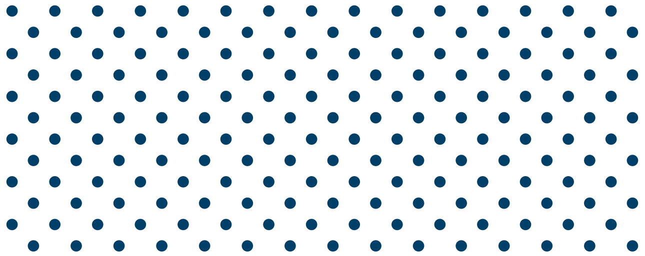


	Fural
	Rd 0.9 - 14 %
Perforation Ø	0.9 mm
Hole content	14 %
Max. perforation width	1,022 mm
Des. acc. to DIN 24041	Rd 0.90 - 2.12
Horizontal spacing	3.00 mm →
Vertical spacing	1.50 mm ↓
Diagonal spacing	2.12 mm ↘
Perforation direction	→
Overall structure	400 mm
Fleece	Bonded acoustic fleece
Test certificate	17/11/2012 7178-12-2
NRC	0.55
α_w	0.55 (LH)
Absorber class	D (DIN EN 11654)
Acoustic infill	w/o

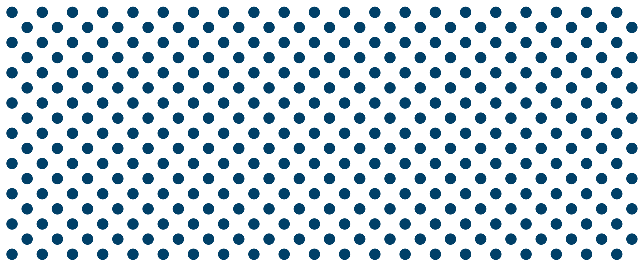
Tested perforations 2



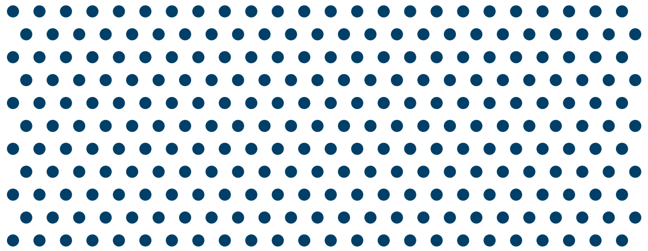
	Fural
	Rg 1.5 - 11 %
Perforation Ø	1.5 mm
Hole content	11 %
Max. perforation width	1,488 mm
Des. acc. to DIN 24041	Rg 1.50 - 4.00
Horizontal spacing	4.00 mm →
Vertical spacing	4.00 mm ↓
Diagonal spacing	5.65 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	07/12/2010 M 61840/6
NRC	0.80
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



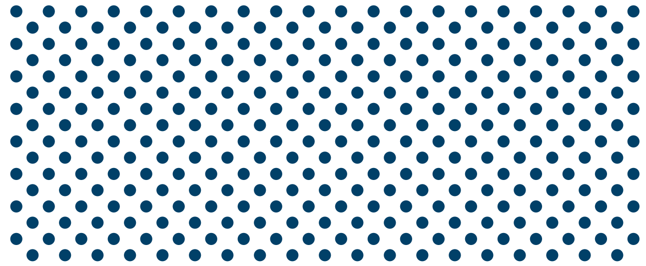
	Fural
	Rd 1.5 - 11 %
Perforation Ø	1.5 mm
Hole content	11 %
Max. perforation width	1,470 mm
Des. acc. to DIN 24041	Rd 1.50 - 4.00
Horizontal spacing	5.66 mm →
Vertical spacing	2.83 mm ↓
Diagonal spacing	4.00 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	07/12/2010 M 61 840/6
NRC	0.80
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



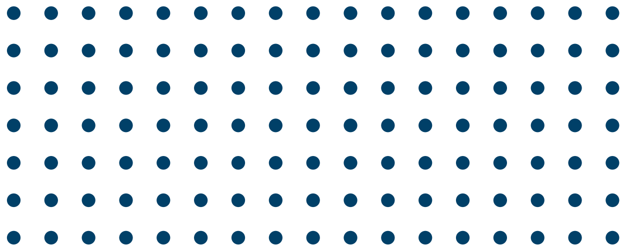
	Fural
	Rd 1.5 - 22 %
Perforation Ø	1.5 mm
Hole content	22 %
Max. perforation width	1,488 mm
Des. acc. to DIN 24041	Rd 1.50 - 2.83
Horizontal spacing	4.00 mm →
Vertical spacing	2.00 mm ↓
Diagonal spacing	2.83 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	07/12/2010 M 61840/5
NRC	0.70
α_w	0.70
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



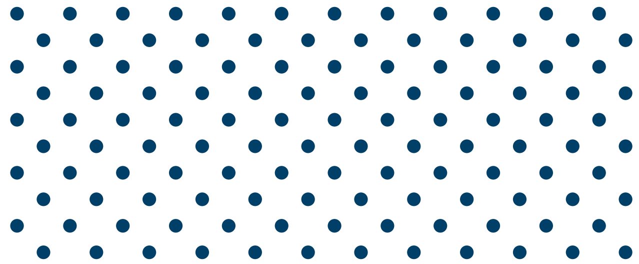
	Fural
	Rv 1.6 - 20 %
Perforation Ø	1.6 mm
Hole content	20 %
Max. perforation width	1,450 mm
Des. acc. to DIN 24041	Rv 1.60 - 3.50
Horizontal spacing	3.50 mm →
Vertical spacing	3.03 mm ↓
Offset spacing 60°	3.50 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	14/12/2006 P-BA 279/2006
NRC	0.74
α_w	0.80
Absorber class	B (DIN EN 11654)
Acoustic infill	w/o



	Fural
	Rd 1.6 - 22 %
Perforation Ø	1.6 mm
Hole content	22 %
Max. perforation width	636.4 mm
Des. acc. to DIN 24041	Rd 1.60 - 3.00
Horizontal spacing	4.30 mm →
Vertical spacing	2.15 mm ↓
Diagonal spacing	3.00 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	09/06/2017 M 105629/19
NRC	0.70
α_w	0.70
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

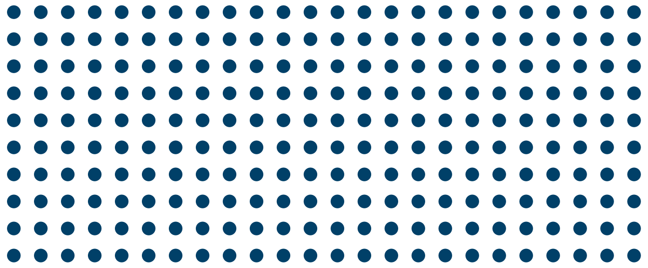


	Fural
	Rg 1.8 - 10 %
Perforation Ø	1.8 mm
Hole content	10 %
Max. perforation width	1,400 mm
Des. acc. to DIN 24041	Rg 1.80 - 4.95
Horizontal spacing	4.95 mm →
Vertical spacing	4.95 mm ↓
Diagonal spacing	7.00 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	07/12/2010 M 61840/4
NRC	0.80
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

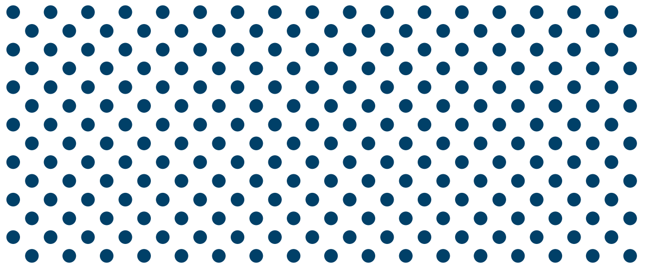


	Fural
	Rd 1.8 - 10 %
Perforation Ø	1.8 mm
Hole content	10 %
Max. perforation width	1.460 mm
Des. acc. to DIN 24041	Rd 1.80 - 4.95
Horizontal spacing	7.00 mm →
Vertical spacing	3.50 mm ↓
Diagonal spacing	4.95 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	07/12/2010 M 61840/4
NRC	0.80
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

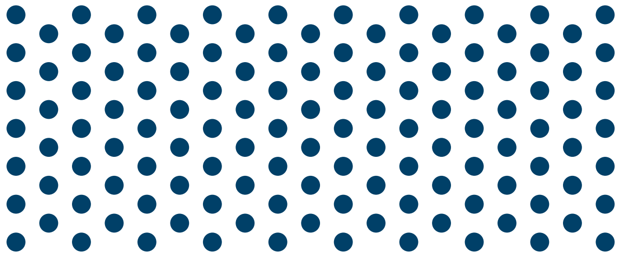
Tested perforations 3



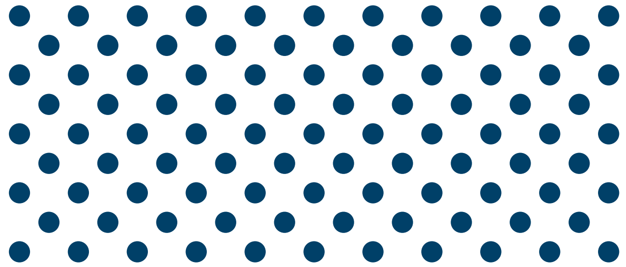
	Fural
	Rg 1.8 - 20 %
Perforation Ø	1.8 mm
Hole content	20 %
Max. perforation width	1.460 mm
Des. acc. to DIN 24041	Rg 1.80 - 3.50
Horizontal spacing	3.50 mm →
Vertical spacing	3.50 mm ↓
Diagonal spacing	4.95 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 220/2007 Figure 2
NRC	0.75
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



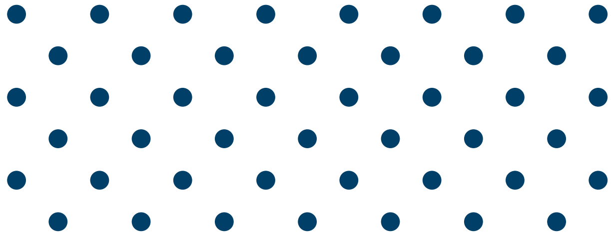
	Fural
	Rd 1.8 - 21 %
Perforation Ø	1.8 mm
Hole content	21 %
Max. perforation width	1,400 mm
Des. acc. to DIN 24041	Rd 1.80 - 3.50
Horizontal spacing	4.96 mm →
Vertical spacing	2.48 mm ↓
Diagonal spacing	3.50 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	31/08/2007 P-BA 220/2007 Figure 2
NRC	0.75
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



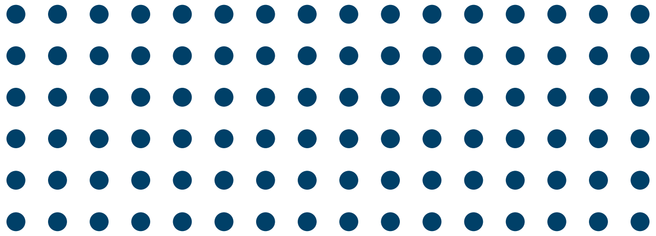
	Fural
	Rv 2.5 - 23 %
Perforation Ø	2.5 mm
Hole content	23 %
Max. perforation width	1,467 mm
Des. acc. to DIN 24041	Rv 2.50 - 5.00
Horizontal spacing	8.66 mm →
Vertical spacing	2.50 mm ↓
Offset spacing 60°	5.00 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	07/12/2010 M 61 840/7
NRC	0.75
α_w	0.75 (L)
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



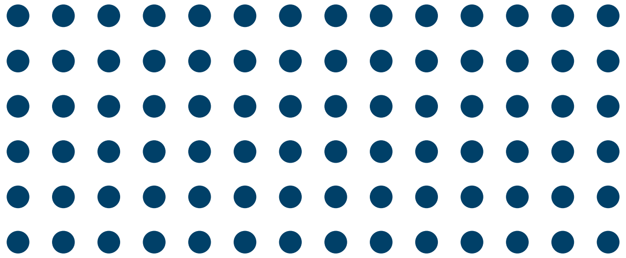
	Fural
	Rd 2.8 - 20 %
Perforation Ø	2.8 mm
Hole content	20 %
Max. perforation width	627.9 mm
Des. acc. to DIN 24041	Rd 2.80 - 5.50
Horizontal spacing	7.80 mm →
Vertical spacing	3.90 mm ↓
Diagonal spacing	5.50 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	09/06/2017 M 105629/20
NRC	0.75
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



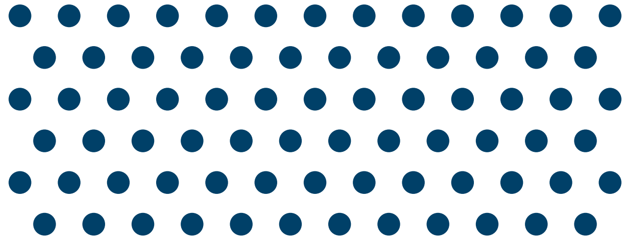
	Fural
	Rd 2.5 - 8 %
Perforation Ø	2.5 mm
Hole content	8 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rd 2.50 - 7.80
Horizontal spacing	11.0 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	14/12/2006 P-BA 279/2006 Figure 5
NRC	0.80
α_w	0.75
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



	Fural
	Rg 2.5 - 16 %
Perforation Ø	2.5 mm
Hole content	16 %
Max. perforation width	1,460 mm
Des. acc. to DIN 24041	Rg 2.50 - 5.50
Horizontal spacing	5.50 mm →
Vertical spacing	5.50 mm ↓
Diagonal spacing	7.78 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	14/12/2006 P-BA 279/2006 Figure 1
NRC	0.80
α_w	0.80
Absorber class	B (DIN EN 11654)
Acoustic infill	w/o

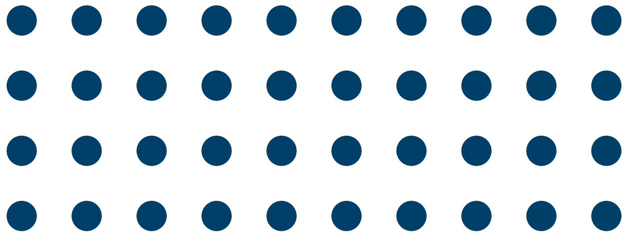


	Fural
	Rg 3.0 - 20 %
Perforation Ø	3.0 mm
Hole content	20 %
Max. perforation width	1,434 mm
Des. acc. to DIN 24041	Rg 3.00 - 6.00
Horizontal spacing	6.0 mm →
Vertical spacing	6.0 mm ↓
Diagonal spacing	8.48 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 221/2007 Figure 2
NRC	0.80
α_w	0.75 (L)
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

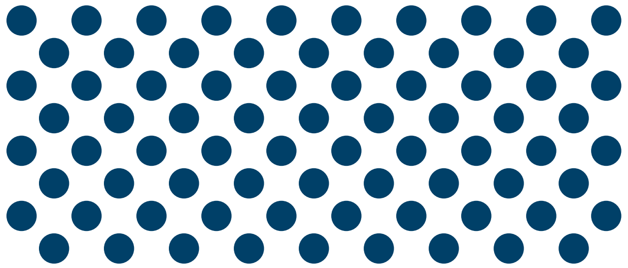


	Fural
	Rv 3.0 - 20 %
Perforation Ø	3.0 mm
Hole content	20 %
Max. perforation width	1,402 mm
Des. acc. to DIN 24041	Rv 3.00 – 6.35
Horizontal spacing	6.50 mm →
Vertical spacing	5.50 mm ↓
Offset spacing 60°	6.39 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 221/2007 Figure 2
NRC	0.80
α_w	0.75 (L)
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

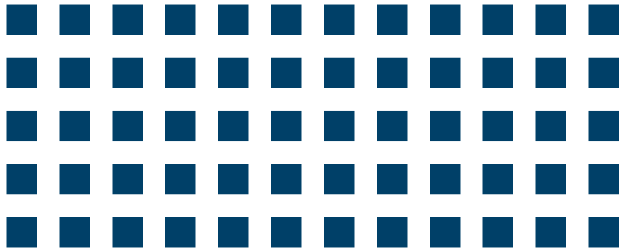
Tested perforations 4



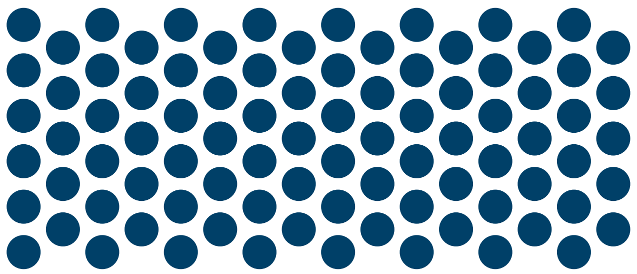
	Fural
	Rg 4.0 - 17 %
Perforation Ø	4.0 mm
Hole content	17 %
Max. perforation width	1,453 mm
Des. acc. to DIN 24041	Rg 4.00 - 8.60
Horizontal spacing	8.60 mm →
Vertical spacing	8.60 mm ↓
Diagonal spacing	12.1 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 7
NRC	0.80
α_w	0.80
Absorber class	B (DIN EN 11654)
Acoustic infill	w/o



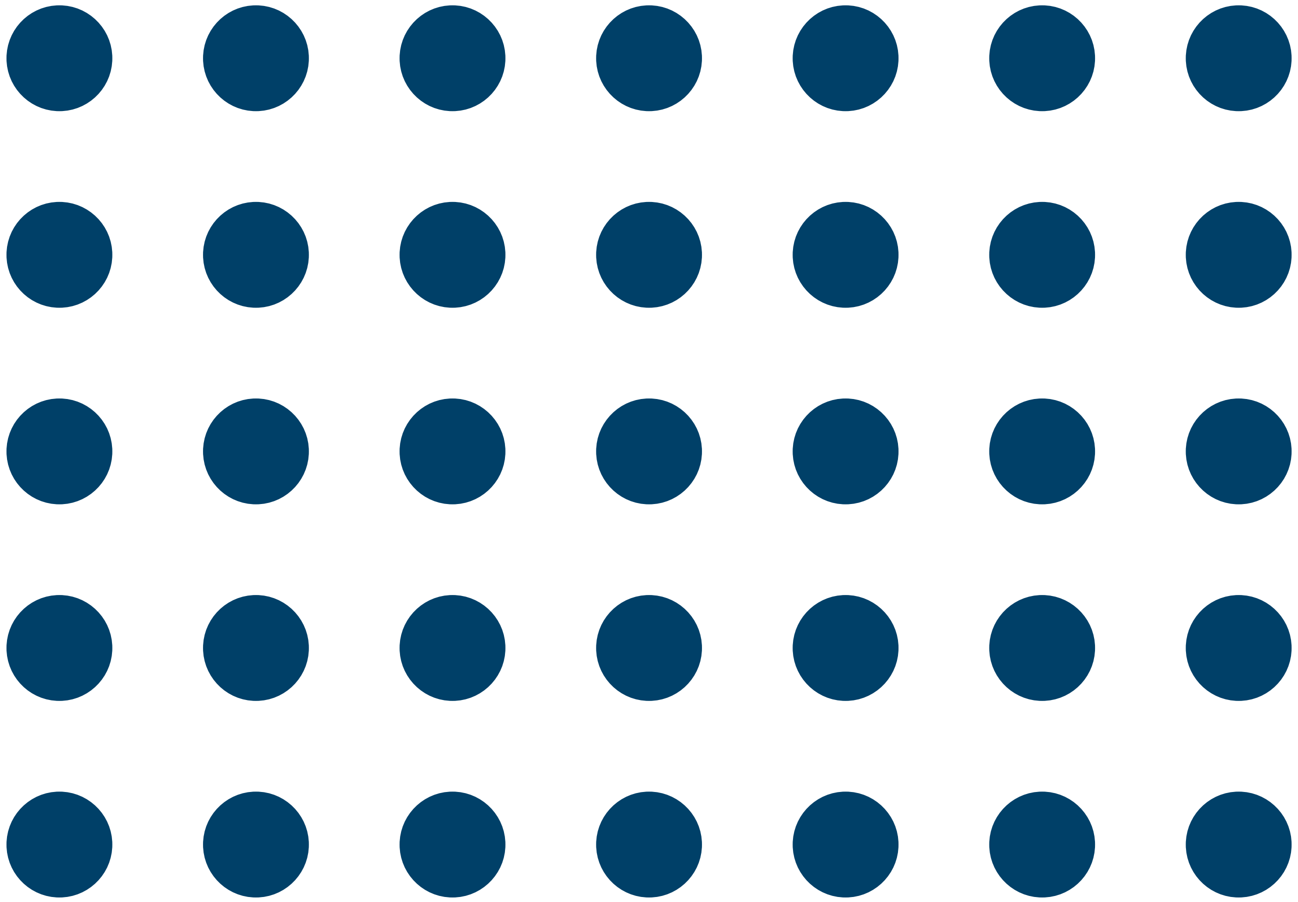
	Fural
	Rd 4.0 - 33 %
Perforation Ø	4.0 mm
Hole content	33 %
Max. perforation width	1,450 mm
Des. acc. to DIN 24041	Rd 4.00 - 6.10
Horizontal spacing	8.60 mm →
Vertical spacing	4.30 mm ↓
Diagonal spacing	6.10 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 3
NRC	0.80
α_w	0.80
Absorber class	B (DIN EN 11654)
Acoustic infill	w/o



	Fural
	Qg 4.0 - 33 %
Perforation	4.0 mm
Hole content	33 %
Max. perforation width	630 mm
Des. acc. to DIN 24041	Qg 4.00 - 7.00
Horizontal spacing	7.00 mm →
Vertical spacing	7.00 mm ↓
Diagonal spacing	9.89 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 4
NRC	0.80
α_w	0.80
Absorber class	B (DIN EN 11654)
Acoustic infill	w/o



	Fural
	Rv 4.5 - 51 %
Perforation Ø	4.5 mm
Hole content	51 %
Max. perforation width	627 mm
Des. acc. to DIN 24041	Rv 4.50 - 6.00
Horizontal spacing	10.4 mm →
Vertical spacing	3.00 mm ↓
Offset spacing 60°	6.00 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	09/06/2017 M 105629/21
NRC	0.65
α_w	0.65 (L)
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o



	Fural
	Rg 14.0 - 23 %
Perforation Ø	14.0 mm
Hole content	23 %
Max. perforation width	598 mm
Des. acc. to DIN 24041	Rg 14.00 - 26.00
Horizontal spacing	26.00 mm →
Vertical spacing	26.00 mm ↓
Diagonal spacing	36.76 mm ↘
Perforation direction	→
Overall structure	200 mm
Fleece	Bonded acoustic fleece
Test certificate	P-BA 279/2006 Figure 8
NRC	0.75
α_w	0.75 (L)
Absorber class	C (DIN EN 11654)
Acoustic infill	w/o

Dust-free
Dust is a so-called “dry” carrier of infections, in which viruses and bacteria spread. Dust can also be deposited in mucous membranes and the respiratory tract. This is why it is vital to avoid dust.

Fibre-free
Fibres are also “dry” carriers of infection. Since fibres can enter the body through the respiratory tract and skin, it is essential to avoid fibres – and not only those of a risky type.

Mould-free
Mould fungi evolve in a humid and warm environment. They secrete substances that can be harmful to humans, either indirectly through the air or by direct contact. Mould must be avoided.

Disinfection
In sensitive environments such as hospitals, doctor’s offices, schools and public institutions, hazardous environments can be created through use and operation. It must be possible to disinfect surfaces in such buildings.

No moisture absorption
Components that can absorb moisture often turn into a breeding ground for microorganisms when heated. Subsequently, the surfaces are hard to disinfect and dry. Metal ceilings by contrast are especially easy to clean and do not absorb moisture.

Hygienic heating and cooling
Thanks to the high level of thermal conductivity of metal, our ceilings are excellently suited for heating and cooling. Since our systems work via radiation instead of air transport, they are also especially hygienic.

Serviceability
Our ceilings can be quickly and easily opened nearly everywhere. This guarantees easy and thorough servicing not only of the ceiling itself but of the ceiling cavity and the built-in components in it as well.

Wet cleaning
With water as a solvent and surfactants, dirt can be removed far easier than by dry cleaning. Important here is that the surfaces can be rinsed with clean water – metal ceiling systems allow for this, too.

Interior air quality
Our metal ceiling systems do not release any relevant quantities of VOCs, even taking into account the paints and adhesives (LCI values, evaluation according to AgBB evaluation scheme). Independent testing institutes have certified this.

WE ARE HYGIENE

ARCHITEKTUR ZEITUNG
DEUTSCHLAND ÖSTERREICH SCHWEIZ

Metalldecken: Rohstoff für den generationenübergreifenden Wiedereinsatz

ROM / 23. NOVEMBER 2021

FACHARTIKEL

Der Elisenhof München wurde nach Plänen des Münchner Architekten Herbert Kochta erbaut. Für die Deckengestaltung wurde eine Metalldecke gewählt. Bildquelle: Taim

Der Begriff der Nachhaltigkeit ist in der Baubranche sehr präsent. Experten aus Bauindustrie, Handwerk und Planung übersetzen „Nachhaltigkeit" als Zusammenfassung der Eigenschaften dauerhaft, umweltverträglich und langlebig. Für die Umsetzung nachhaltiger, energieeffizienter und ressourcenschonender Gebäude ist die Materialauswahl für den Innenausbau von größter Bedeutung.

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Die Forderung nach der Nachhaltigkeit eines Baumaterials ist eine Herausforderung für zukünftige Generationen. Alle in einem nachhaltigen Wirtschaftskreislauf beteiligten Systeme können ein bestimmtes Maß an Ressourcennutzung dauerhaft aushalten, ohne Schaden zu nehmen. Baumaterialien und zuverlässige Bausysteme sind dazu ein wichtiger Produktionsfaktor im Bauprozess. Die Baubranche braucht langfristig wirkende Konzepte für einen verantwortlichen Umgang mit unseren endlichen Ressourcen. Dazu kommt die Erkenntnis: Ökologisch sinnvoll – und von der Fachwelt propagiert – ist ausschließlich die Bilanzierung eines Gebäudes über den gesamten Lebenszyklus.

Ein Sportartikelhersteller in Herzogenaurach entschied sich mit den Metallbaffeln für eine ganz besondere Deckenkonstruktion. Bildquelle: Rasmus Hjortshøj – COAST

Unsere Bausysteme sind der Rohstoff von Morgen

In der deutschen Baubranche herrscht derzeit ein eklatanter Materialmangel. Stahl, Aluminium und weitere Baumaterialien fehlen auf dem Bau. Der Baustoffmangel gefährdet sowohl Neubauprojekte als auch Sanierungsarbeiten, daher gilt es für die Zukunft vorzusorgen. Wir müssen folglich unseren gebauten Bestand als Rohstoffquelle für morgen verstehen. In Gebäuden eingesetzte Stahloder Aluminiumprodukte zum Beispiel werden grundsätzlich nie zu Abfall, denn baulich verwendete Metalle wie Stahl und Aluminium werden nicht „verbraucht", sondern immer wieder neu genutzt. Bauexperten bescheinigen den Baustoffen Stahl und Aluminium daher eine hohe Recyclingfähigkeit.

Man kann die Prognose wagen, dass Abbrucharbeiten in Zukunft nicht mehr Kosten verursachen, sondern als „Abbau von Rohstoffen" für Gewinne sorgen. Beim so genannten „Urban Mining" werden rückgebaute Systeme aus Metall für die Rohstoffversorgung und im Sinne der Ressourcenschonung in Zukunft essentiell sein.

Upcycling von Stahl ist ein Zukunftstrend

Stahl lässt sich verlustfrei recyceln. Wird der Baustoff nach seiner Verwendungszeit in einem Bauwerk zu einem neuen Produkt gleicher oder besserer Qualität aufgewertet, findet ein so genanntes Upcycling statt. Ein bemerkenswertes Beispiel für das Upcycling ist der Bau des höchsten Gebäudes der Welt: Das Hochhaus Burj Khalifa in Dubai besteht in den oberen Stockwerken überwiegend aus Stahl, der ursprünglich aus dem ehemaligen „Palast der Republik" in Berlin stammt.

Stahl ist folglich ein langlebiger und zeitloser sowie einer der weltweit am meisten recycelten Rohstoffe. Jedes Jahr werden weltweit rund 570 Mio. Tonnen recycelt. Weil während des Recyclingprozesses keine Qualitätsverluste auftreten, gilt Stahl als einer der nachhaltigsten Werkund Baustoffe. Dabei ist der Baustoff Stahl noch nicht ausgereizt, weitere Potenziale des Baumaterials liegen beispielsweise in der ingenieurtechnischen Materialoptimierung für den jeweiligen Einsatz.

Mit Heiz- und Kühldecken kann die Raumtemperatur zuverlässig geregelt werden. Bildquelle: Taim

Das Leichtgewicht Aluminium hat eine gute Umweltbilanz

Aluminium ist ein – weit über die Baubranche hinaus – weltweit eingesetztes Metall. Aluminium hat das Potential für einen Rohstoff mit guter Ökobilanz. Im Gegensatz zu anderen Werkstoffen kann reines Aluminium ohne Qualitätseinbuße immer wieder aufs Neue für hochwertige Produkte eingeschmolzen werden. Ein qualitativer Unterschied zum Primärmetall, das aus dem Erz Bauxit gewonnen wird, besteht nicht.
Aluminiumrecycling ist besonders energieeffizient: beim Umschmelzaluminium wird nur 5 % der Energie benötigt, die man sonst beim Primäraluminium brauchen würde.

Die Baubranche setzt Aluminium auch als Metalldecken ein. In dieser Form ist das Baumaterial leicht rückbaubar und kann ohne Qualitätsverlust wieder in den Rohstoffkreislauf eingeführt werden. In Deutschland wird mehr recyceltes Aluminium produziert, als neues Aluminium hergestellt. Die Recyclingraten für den Metallwerkstoff sind hierzulande sehr hoch. Im Baubereich oder im Verkehrsbau werden etwa 95 Prozent des Aluminiums wiederverwendet.

Metalldecken im Einkaufszentrum Herti, Schweiz. Bildquelle: Plafondnova

3R-Baustoffe stehen für die Zukunft des Bauens

Der Begriff „3R“ (Reduce, Reuse, Recycling) steht für die drei Themen Reduzieren, Reaktivieren und Recyceln. Damit sind die Grundvoraussetzungen für ein von Fachleuten anerkanntes, ressourcenschonendes, nachhaltiges Bauen vorgegeben.

Reduzieren: Baumaterialien sind Wertstoffe und folglich möglichst effektiv einzusetzen.
Reaktivieren: Unsere bebaute Umwelt ist das Rohstofflager der Zukunft. Moderne Baustoffe müssen in einer Art und Weise verbaut werden, die dafür Sorge trägt, dass diese wieder leicht lösbar und trennbar sind.
Recycling: Bereits verwendeter Stahl oder Aluminium ist kein Bauschutt. Metall ist ein dauerhaft wertvolles Baumaterial – jetzt und in Zukunft.

Auch wenn wir hier ausschließlich die Baustoffe Stahl und Aluminium in Bezug auf Metalldecken erwähnen, gelten die vorbeschriebenen Grundsätze natürlich auch für andere am Bau verwendeten Metalle. Von der Stahl- oder Aluminiumfassade über die Metalldecke bis zum Stahlträger oder Aluminiumrohr, können nach der Nutzungsdauer von i.d.R. einigen Jahrzehnten recycelt werden und stehen dem industriellen Kreislauf weitgehend uneingeschränkt wieder zur Verfügung. Dieser Recyclingprozess besteht seinerseits schon seit Jahrzehnten und hat sich bewährt. Nachdem das Material als Rohstoff für das Recycling dient, erfolgt bei der Rückgabe seit jeher eine monetäre Vergütung

Stahl und Aluminium in der Anwendung als Metalldecken

Als Baustoff für hochwertige Raumgestaltung haben sich Metalldeckensysteme seit Jahrzehnten bewährt. Die hochpräzise herstellbaren Metalldecken lassen sich in allen Größen werkseitig vorfertigen und für die bauseitige Montage vorbereiten.

Praktisch jede planerisch darstellbare kreative Idee lässt sich mit Metalldecken verwirklichen. Zudem können technische Einbauten, also Leuchten, Brandmelder, Lautsprecher, bereits systembedingt leicht integriert werden. Akustische oder gestalterische Anforderungen sind mit Metalldecken sicher und zuverlässig machbar.

Vorteile von Metalldecken

Gemäß der Nutzungsdauer von Bauteilen nach dem Bewertungssystem Nachhaltiges Bauen /BBSR Tabelle 2017/ liegt diese bei über 50 Jahren. Danach ist eine Metalldecke nicht etwa wertlos, sondern kann als hochwertiger Rohstoff zurück in den Produktionskreislauf der Metallherstellung gegeben werden. Innerhalb der zu erwartenden Einsatzdauer von einigen Jahrzehnten wird es in privaten wie auch in gewerblich genutzten Bauten immer wieder gebäudetechnische Ergänzungen oder Reparaturen geben.

Ein großer Vorteil von Metalldeckensystemen ist, dass diese ohne Beschädigung abgenommen und wiederverwendet werden können. Bei Sanierungsund Wartungsarbeiten ist dies von großem Vorteil. Generell bieten Metalldecken aufgrund ihrer Robustheit eine dauerhafte und leichte Zugänglichkeit zum Deckenhohlraum.

Metalldecken als Heiz- und Kühldecken

Bild links: Das Hochhaus Burj Khalifa in Dubai wurde mit Stahlschrott gebaut, der ursprünglich aus dem ehemaligen „Palast der Republik" in Berlin stammt. Bildquelle: Taim

Zuverlässiges Heizen und Kühlen sind für die Nutzer eines Gebäudes elementare Komfortmerkmale. Metalldecken tragen als Heizund Kühldecken zu einem angenehmen Raumklima bei. Von unschätzbarem Vorteil ist dabei die Tatsache, dass ein Deckensystem sowohl zum Beheizen, wie auch zum Kühlen eines Raumes verwendet werden kann.

Akustische Anforderungen an Deckensysteme werden dabei erfüllt. Für das Empfinden einer subjektiv gefühlten Behaglichkeit sind drei Faktoren entscheidend. Neben der Luftfeuchte spielen auch die Luftund Oberflächentemperaturen eine Rolle.

In Bürogebäuden kommt dem Raumklima eine große Bedeutung zu, denn es verhilft zu einer als angenehm empfundenen Aufenthaltsqualität und steigert somit die Konzentrationsund Leistungsfähigkeit der Nutzer. Heiz- und Kühldecken – im Allgemeinen werden sie auch als Flächentemperierungen bezeichnet – haben eine positive Kostenbilanz. Mit nur einem hydraulischen Kreislauf können Gebäude zuverlässig und aufgrund der wirtschaftlich erzeugbaren Vorlauftemperaturen mit geringen Betriebskosten auf der gewünschten Temperatur gehalten werden. Die Heizund Kühldecke bleibt zudem im Wartungsfall zuverlässig leicht erreichbar.

Fazit

Metalldecken erfüllen alle Anforderungen an moderne, nachhaltige Baustoffe. Sie sind langlebig und zählen auch nach über fünfzigjähriger Einsatzdauer noch nicht zum „Alteisen", stattdessen sind sie Rohstoff für den generationenübergreifenden Wiedereinsatz.

taim.info

The built environment is an essential factor in the fight against Climate Change.

Sustainable building with sustainable metal ceilings

Sustainability - a topic that is increasingly becoming the focus of social discussions – and justifiably so!

In the fight against climate change, the conscientious use of resources and measures to promote the ecosystem are urgently needed to protect the environment. The idea of sustainability should also find its way into the construction industry: Thus, at Fural Metalit Dipling we focus on this and process our steel and aluminum sheets directly in the factory and to measure, which avoids unnecessary work on the construction site. In addition, metal ceilings allow repairs and revisions at any time without much effort and can be reused. Last, but not least, our metal ceiling systems are long-lasting and easy to recycle, thus gentle on the environment.

Building materials

The use of building materials and constructions with substances that cause environmental damage has long been avoided or greatly reduced in sustainable construction.

In addition, we always keep an eye on the reusability of individual components in the event of modernization or reconstruction. Since around 79% of mineral waste in Germany comes from the building industry and a total of around 53% of the entire waste volume can be attributed to the building industry, possible deconstruction or conversion is increasingly being taken into account as early as the planning phase.

In addition, building components and products that require less energy to manufacture are now preferred - assessing the energy flows involved in manufacturing, transporting, and processing building materials involves calculating their primary share of non-renewable energy, their share of global warming, and their share of acidification.

Metal ceilings for more comfort in the room

Metal ceilings are ideal for cooling and heating rooms, because the temperature control is based on the radiation principle: The heat or cold radiates gently through the metal ceiling directly into the room. In addition, cooling ceilings work completely without air circulation and thus cause neither dust turbulence nor drafts.

»Nothing fits the building life cycle like a Fural metal ceiling." (Dirk Freytag, CTO)

Hospital Projects

1 **Asklepios Klinik Hamburg Heidberg (Mitteltrakt Haus 7/8), DE**
749 m² Fire protection
2 **Bezirksklinikum Mainkofen, DE**
810 m² Fire protection, Lights
3 **BG Klinikum Unfallkrankenhaus Berlin (Reha-Klinik), DE**
1.782 m² acoustic ceilings/F0, Fire protection
4 **Bildungszentrum am Klinikum Itzehoe, DE**
889 m² fire protection
5 **Bürgerspital Solothurn, CH**
18.983 m² Cooling ceiling (only tiles)
6 **Caritas Krankenhaus St. Josef, Regensburg, DE**
163 m² fire protection, Lights
7 **Centrum für Integrierte Onkologie (CIO), Universitätsklinikum Köln, DE**
4.143 m² Cooling ceiling (only tiles)
8 **Elblandklinikum Radebeul (Haus 2), DE**
863 m² Fire protection
9 **Erweiterung Städtisches Klinikum Lüneburg, DE**
2.752 m² Fire protection
10 **Evangelisches Krankenhaus Wien, AT**
732 m² Acoustic ceiling/F0
11 **Felix-Platter-Spital Basel, CH**
18.629 m² Acoustic ceiling/F0, Fire protection
12 **Universitätsklinikum Frankfurt (Haus 35), DE**
1.6285 m² Acoustic ceiling/F0
13 **Gastroenterologie, Stadtspital Triemli Zürich, CH**
154 m² Acoustic ceiling/F0
14 **Heinrich-Braun-Klinikum Zwickau, DE**
492 m² Fire protection
15 **Helios Klinikum Bad Saarow, DE**
565 m² Fire protection
16 **HNO/Augenklinik Universitätsklinikum Essen, DE**
1.102 m² Acoustic ceiling/F0, Fire protection, Lights
17 **Kantonsspital Baselland, Liestal (Frauenklinik), CH**
105 m² Fire protection
18 **Kantonsspital Graubünden (Kinderklinik M), CH**
358 m² Acoustic ceiling/F0, Fire protection
19 **Katholisches Klinikum Koblenz • Montabaur (Marienhof), DE**
177 m² Fire protection, Lights
20 **Kinderklinik im Klinikum Wolfsburg, DE**
564 m² Acoustic ceiling/F0
21 **Kinderklinik im Klinikum Worms, DE**
995 m² Fire protection
22 **Klinik Bad Bergzabern (Klinikum Landau), DE**
551 m² Acoustic ceiling/F0
23 **Klinik Hohe Warte Bayreuth (Therapiegebäude), DE**
613 m² Acoustic ceiling/F0, Fire protection
24 **Klinik Kitzinger Land, DE**
1.293 m² Acoustic ceiling/F0, Fire protection, Lights
25 **Klinik Lausanne, CH**
125 m² Acoustic ceiling/F0
26 **Kliniken am Goldenen Steig, Krankenhaus Freyung, DE**
1.097 m² Fire protection
27 **Klinikum Frankfurt Höchst, DE**
8.900 m² Acoustic ceiling/F0, Fire protection, Lights

Hospital Projects

28 **Klinikum Heidenheim, DE**
1.809 m² Acoustic ceiling/F0, Fire protection
29 **Klinikum Landkreis Tuttlingen, DE**
931 m² Acoustic ceiling/F0, Fire protection
30 **Krankenhaus der Barmherzige Brüder Graz, AT**
681 m² Cooling ceiling complete
31 **Krankenhaus der Barmherzige Brüder St. Veit an der Glan, AT**
76 m² Fire protection
32 **Landeskrankenhaus Hall in Tirol, AT**
4.301 m² Acoustic ceiling/F0
33 **Landesklinikum Salzburg – Uniklinikum der PMU**
5.000 m² Acoustic ceiling/F0
34 **Lindenhofspital Bern (Schulgebäude Arztpraxen) CH**
229 m² Expanded metal
35 **LKH-Univ.-Klinikum Chirurgie Graz BE2, AT**
4.619 m² Acoustic ceiling/F0
36 **LVR-Klinik Bedburg-Hau, DE**
584 m² Fire protection
37 **Pius-Hospital Oldenburg (Umstrukturierung OP, Ersatz F-Flügel), DE**
449 m² Acoustic ceiling/F0, Fire protection
38 **Radiotherapie & Radio-Onkologie und Universitätsklinik für Nuklearmedizin & Endokrinologie (RANUK Salzburg), AT**
623 m² Acoustic ceiling/F0
39 **Rechbergklinik Bretten, DE**
2.235 m² Fire protection
40 **Rehaklinik Heidelberg-Königstuhl, DE**
2.150 m² Acoustic ceiling/F0
41 **Salzkammergut Klinikum Vöcklabruck, AT**
1.568 m² Acoustic ceiling/F0, Fire protection
42 **Sana Kliniken Cham, CH**
792 m² Acoustic ceilings/F0, Lights
43 **Spital Grabs, CH**
301 m² Fire protection, Lights
44 **St. Claraspital (NPK) Basel, CH**
2.927 m² Acoustic ceiling/F0, Fire protection
45 **St. Marienhospital Vechta (Aufstockung Kinderklinik), DE**
288 m² Fire protection
46 **St. Vincentius-Kliniken, DE**
639 m² Lights
47 **St. Johannes-Hospital Dortmund, DE**
316 m² Acoustic ceiling/F0, Fire protection
48 **Tirol Kliniken – MZA, AT**
653 m² Acoustic ceiling/F0
49 **Universitätsklinikum des Saarlandes, DE**
3.092 m² Fire protection
50 **Vivantes Klinikum Neukölln (Bettenhaus Psychiatrie, Onkologie), DE**
596 m² Acoustic ceilings/F0
51 **Waldkliniken Eisenberg (Neubau, Umbau Bestand), DE**
1.840 m² Fire protection, Lights
52 **Zentrum für Synthetische Lebenswissenschaften (ZSL) des Universitätsklinikums Düsseldorf, DE**
576 m² Fire protection
53 **ZithaKlinik, LUX**
1.320 m² Acoustic ceiling/F0, Fire protection

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