

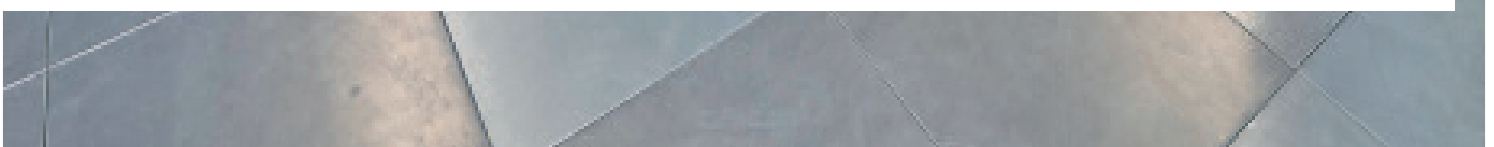


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## CHILLED CEILINGS

Technical manual

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This Technical Information concerning chilled ceilings is valid from May, 2020

This supersedes the previous Technical Information 860602 (Edition May 2012).

Our current Technical Information is available for downloading at [www.rehau.com](http://www.rehau.com).

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All dimensions and weights are intended as reference. We reserve the right to correct errors and make changes.



Due to a system conversion to SAP in 2012, our article numbers have changed to material numbers.

The previous article numbers have become material numbers with 2 extra digits:

old: 123456-789 (article number)

new: 11234561789 (material number)

To illustrate this in the catalogue, we have visually identified the additional digits: **1** = 1, e.g.:

**1**123456**1**789

Please note that in the system all quotations, order confirmations, dispatch notes and invoices will largely only be issued with the 11-digit number.

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# 1 INFORMATION AND SAFETY INSTRUCTIONS

## Notes on this Technical Information

### Validity

This Technical Information applies to COUNTRY.

### Applicable Technical Information

- Technical Information, Underfloor heating/cooling
- Technical Information, System principles, pipes and joints

### Navigation

At the beginning of this Technical Information you can find a detailed table of contents with hierarchical titles and corresponding page numbers.

### Pictograms and logos



Safety instructions



Legal information



Important information which has to be observed



Information on the Internet



The advantages for you



### Up-to-dateness of the Technical Information

For your own safety and for the correct application of our products please check at regular intervals whether a newer version of your Technical Information is available.

The issue date of your Technical Information is always printed on the bottom left-hand side of the cover page.

You can obtain the current Technical Information from your REHAU sales office, specialist distributor or you can download it from the Internet at: [www.rehau.com](http://www.rehau.com) or [www.rehau.com/downloads](http://www.rehau.com/downloads).

### Safety instructions and operating instructions

- For your own safety and the safety of other people, please read through all safety instructions and operating instructions carefully before commencing assembly.
- Keep the operating instructions safe and have them available.
- If you have not understood the safety instructions or the individual assembly instructions or find them unclear, please contact your REHAU sales office.
- **Failure to comply with the safety instructions can result in damage to property or personal injury.**

### Use in line with the specification

Chilled ceilings may only be planned, installed and operated as described in this Technical Information. Any other use is not in accordance with the specification and is therefore not permitted.



Observe all applicable national and international regulations relating to laying, assembly, safety and the prevention of accidents when installing pipe systems as well as the instructions in this Technical Information.

Areas of application not covered in this Technical Information (special applications) require consultation with our technical applications department. Please contact your REHAU sales office for a comprehensive consultation.



### Personnel requirements

- Our systems should only be installed by people who are authorised to do so and have received training in this.
- Work on electrical installations or pipeline components should only be carried out by qualified and authorised persons.

### General precautions

- Keep your workplace tidy and free of obstructions.
- Make sure there is always sufficient light in your workplace.
- Keep children, pets and unauthorised persons away from tools and the assembly area. This applies particularly to renovations in inhabited areas.
- Only use the components intended for that particular REHAU pipe system. The use of components from other systems or the use of tools that are not part of the relevant REHAU assembly system may result in accidents or other risks.
- Avoid open flames in the work area.

### Working clothes

- Wear protective goggles, suitable working clothes, safety shoes, a hard hat and a hairnet if you have long hair.
- Do not wear loosely fitting clothes or jewelry as they may get caught in moving parts.
- Wear a hard hat when carrying out assembly work at head height or above your head.

### During assembly

- Always read and follow the operating instructions for the REHAU assembly tool used.
- The REHAU pipe cutters have a sharp blade. Store and handle them in such a way that there is no risk of injury from the pipe cutters.
- When trimming the pipes, maintain a safe distance between the hand holding the pipe and the cutting tool.
- Never put your hand in the tool's cutting zone or on moving parts during the cutting process.
- Following the expansion process, the expanded pipe shrinks back to its original shape (memory effect). Do not insert any foreign objects into the expanded pipe during this stage.
- Never put your hand in the tool's compression zone or on moving parts during the compression process.
- Until the connection is established following the compression process, the fitting can fall out of the pipe. There is a risk of injury!
- During maintenance or retooling work and when changing the assembly area, always unplug the tool and prevent it from being switched on accidentally.

# 2 CHILLED CEILINGS

## 2.1 System description



- High capacity output of up to 76 W/m<sup>2</sup>
- Suited for heating and cooling
- Four board sizes offer high configuration levels
- Stable sandwich construction offers outstanding handling
- Simple assembly thanks to predrilled fixing grid
- Preassembled ceiling element permits short installation times

### 2.1.1 System components

- Chilled ceiling
- Ceiling element 2,000 x 1,250 x 30 mm / 2.5 m<sup>2</sup>
- Ceiling element 1,500 x 1,250 x 30 mm / 1.88 m<sup>2</sup>
- Ceiling element 1,000 x 1,250 x 30 mm / 1.25 m<sup>2</sup>
- Ceiling element 500 x 1,250 x 30 mm / 0.63 m<sup>2</sup>
- Compression fitting 10
- Adaptor with union nut 10
- Straight coupling 10
- Compression sleeve 10
- Compression sleeve 17, 20, 25, 32
- Reduced coupling 17-10, 20-10, 25-10, 32-10
- Adaptor with male thread, 10-R 1/2
- T-piece 17-10-17 / 20-10-20 / 25-10-25 / 32-10-32
- Pipe support channel 16 / 17 / 20 / 25 / 32
- Rigips Climafit drywall screw TN Gold

### 2.1.2 Usable pipes

- RAUTHERM S 10.1 x 1.1 mm
- RAUTHERM S as distribution pipe:
  - 17 x 2,0 mm
  - 20 x 2,0 mm
  - 25 x 2,3 mm
  - 32 x 2,9 mm

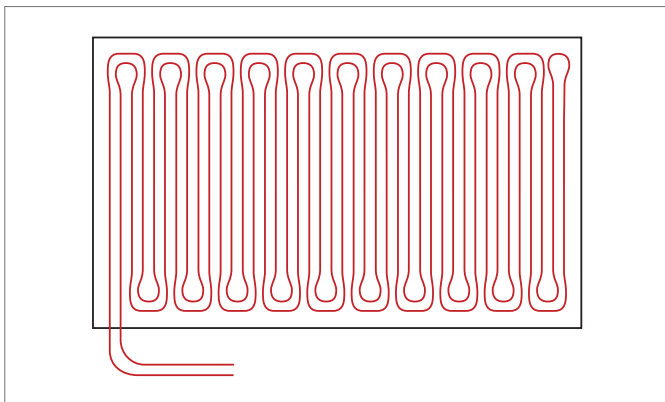


Fig. 2-1 Chilled ceiling for dry construction

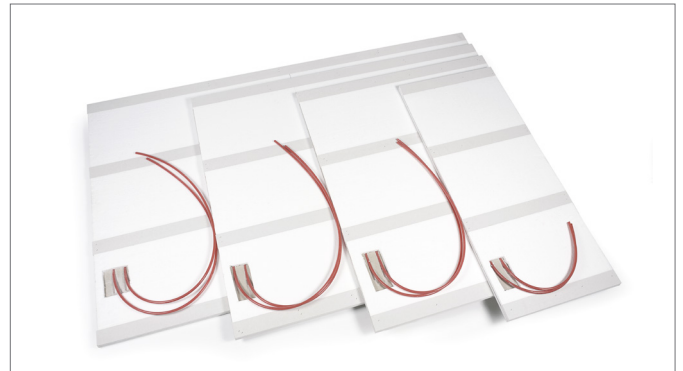


Fig. 2-2 Available board sizes

### 2.1.3 Description

Basically, chilled ceiling is made from line-production gypsum plasterboards in accordance with DIN 18180/DIN EN 520 respectively, and with or without integrated graphite. The chilled ceiling are gypsum plasterboards with grooves milled into them and RAUTHERM S 10.1 x 1.1 mm pipes with a 45 mm laying gap integrated in a loop pattern. A backing made of EPS 035 polystyrene insulation; together with gypsum reinforcement strips ensure easy installation. Ceiling elements in four different sizes ensure high coverage rates for active cooling areas, even in non-uniformly sized rooms. Inactive areas on the ceiling surface can be closed using commercially available 15 mm gypsum plasterboards in a double cladding design. The half-round, flattened edge (HRAK) on the sides parallel to the applied reinforcing strips allows the ceiling surface to be easily manufactured.

### 2.1.4 Application areas

Chilled ceilings are intended for the construction of suspended ceiling surfaces and for use inside buildings.



Chilled ceilings possess Class B s1, d0 fire behaviour characteristics in accordance with DIN EN 13501. They are **not** suitable for employment as fire protection ceilings or as other components with a fire resistance classification of F30 to F90 or higher! Requirements with respect to preventative and structural fire protection in escape or emergency routes must be complied with!

The ceiling elements can be employed in domestic and commercial areas such as office and administration buildings without moisture loading. With the exception of washrooms and toilet areas without showers, the system is not suited for employment in moist areas of any type, such as in commercial wet rooms, saunas and pools.

Ceiling type	Unit	Chilled ceiling			
Standard cooling capacity in accordance with DIN EN 14240 (8K) <sup>1)</sup>	W/m <sup>2</sup>	51,7			
Standard cooling capacity in accordance with DIN EN 14240 (10 K) <sup>1)</sup>	W/m <sup>2</sup>	66,0			
Standard heating capacity based on DIN EN 14037 (10 K) <sup>1)</sup>	W/m <sup>2</sup>	53,3			
Standard heating capacity based on DIN EN 14037 (15 K) <sup>1)</sup>	W/m <sup>2</sup>	82,6			
Fire reaction classification in accordance with DIN EN 13501	–	B-s1, d0			
Element surface area	m <sup>2</sup>	2,50	1,88	1,25	0,63
Thermally active element surface	m <sup>2</sup>	2,10	1,60	1,00	0,50
Length <sup>2)</sup>	mm	2000	1500	1000	500
Width <sup>2)</sup>	mm	1250	1250	1250	1250
Thickness <sup>1)</sup>	mm	30	30	30	30
Element weight	kg	42,5	32,0	21,0	10,7
Pipe length	m	48	37	23	11
Element pressure loss $\dot{m} = 25 \text{ kg/m}^2\cdot\text{h}$	Pa (mbar)	17.800 (178)	8.500 (85)	2.700 (27)	415 (4)
Element cooling output (8 K) <sup>3)</sup>	W	108	83	52	26
Element cooling output (10 K) <sup>3)</sup>	W	138	105	66	33
Element heating output (10 K) <sup>3)</sup>	W	112	85	53	27
Element heating output (15 K) <sup>3)</sup>	W	173	132	82	41

<sup>1)</sup> In accordance with the heating/cooling capacity standard, all values are based on 1 m<sup>2</sup> of active surface area.

<sup>2)</sup> The specified dimensions and tolerances are compliant with the requirements of DIN EN 520.

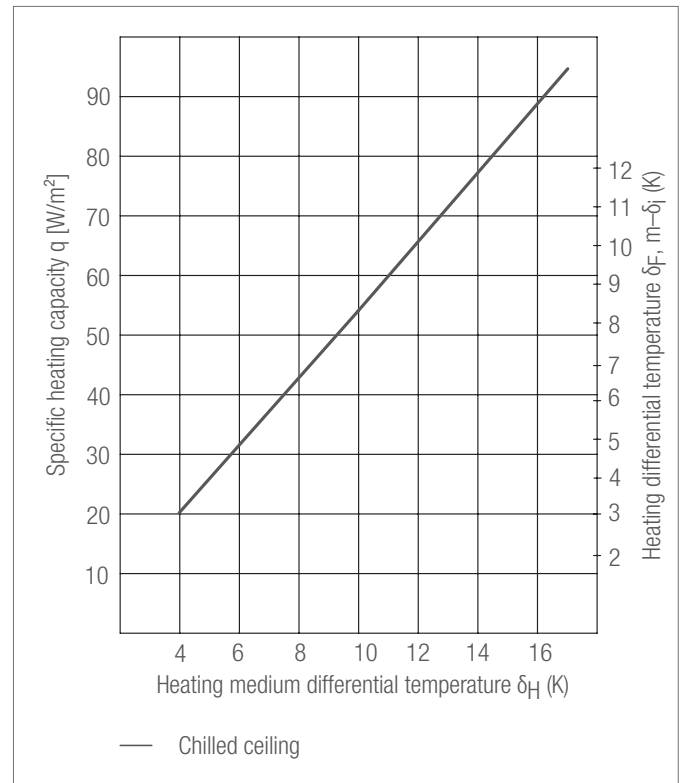
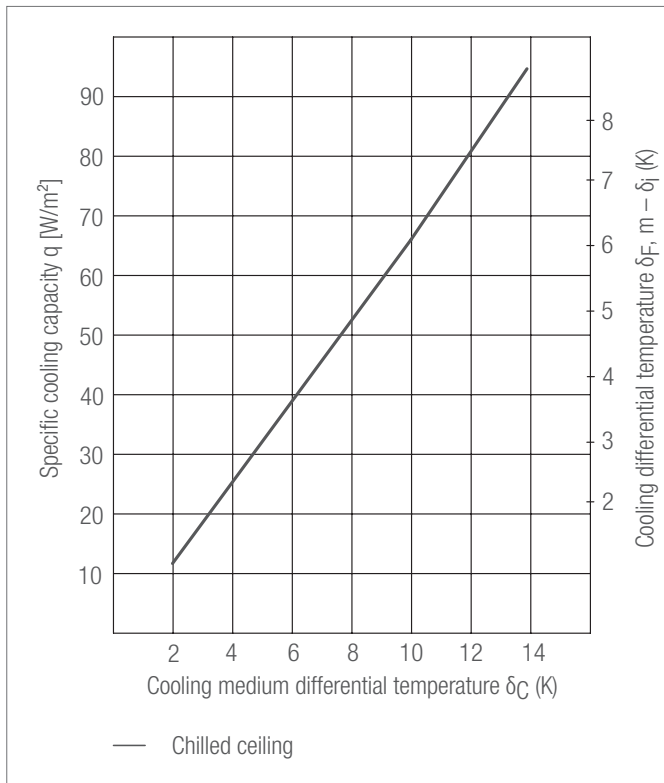
<sup>3)</sup> Heating/cooling capacity of the total element surface area

#### Cooling capacity in accordance with DIN EN 14240

The cooling capacity is based on a 1 m<sup>2</sup> active cooling area.

#### Heating capacity based on DIN EN 14037

The heating capacity is based on a 1 m<sup>2</sup> active heating area.



## 2.2 Mounting

### 2.2.1 Ambient site conditions

Many years of experience have shown that the ideal installation conditions for working with gypsum plasterboards are a relative humidity of between 40 % and 70 % and room temperatures above +10 °C.



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Cladding using products based on gypsum plasterboards should not be performed when the ambient humidity in the structure exceeds 80 % for extended periods.

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After installation, the ceiling elements must be protected against the long-term effects of humidity. Therefore, the structure must be adequately ventilated once assembly has been completed. Directly blowing on the ceiling surface with either hot or cold air is to be avoided. If hot asphalt is intended to provide the screed, spackling may only be carried out once the screed has cooled. Rapid, sudden heat increases in the winter are to be avoided, as these could result in changes in length, tension fractures or bulging on the ceiling surface.



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Particularly plastering and screed work results in drastic increases in relative humidity. Thorough ventilation must be provided for these situations, particularly in conjunction with dry construction work.

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## 2.2.2 Storage

Chilled ceiling boards and accessories must be protected against the effects of humidity. Basically, all gypsum products must be stored in dry areas. To avoid deformations and breakage, the ceiling elements should be stored flat, e.g., on pallets or support blocks, spaced approx. 35 cm apart. Improper storage of chilled ceiling elements, such as, for example, in an upright position, will result in deformation which will impede proper assembly.



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When storing boards indoors, note the structure's ceiling load bearing capacity. Twenty ceiling elements measuring 2,000 x 1,250 mm have a weight in total of approx. 850 kg.

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### 2.2.3 Installation process

1. Mounting of the distribution network on the ceiling slab
2. Preparation of the substructure
3. Mounting of the active ceiling elements on the substructure
4. Connection of the ceiling elements to the distribution pipes
5. Rinsing and performing the pressure test
6. If required, complete insulation of the distribution and connecting pipes
7. Mounting of the inactive ceiling areas
8. Spackling the ceiling surface
9. Treating the ceiling surface

#### Substructure

In accordance with DIN 18181, chilled ceiling boards are designed for assembly on metal substructures. Two versions of substructures based on metal profiles can be employed:

- Directly attached metal substructure (refer to Fig. 3-3)
- Suspended metal substructure (refer to Fig. 3-4)



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Substructures in the form of metal substructures must be capable of bearing the approx. 17 kg/m<sup>2</sup> weight of the chilled ceiling boards.

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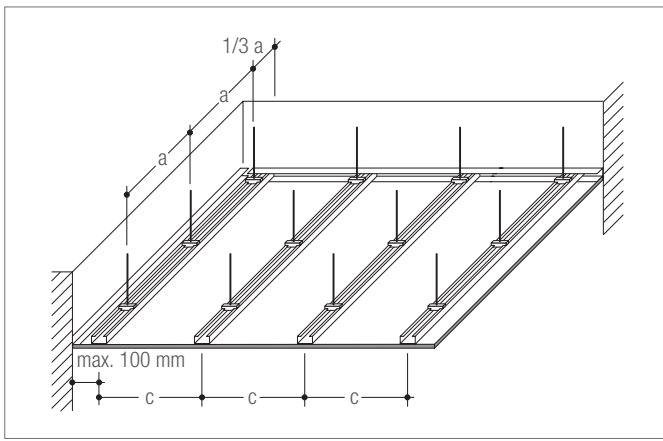


Fig. 2-3 Directly attached metal substructure in accordance with DIN 18181  
Wall connection, refer to Fig. 3-9

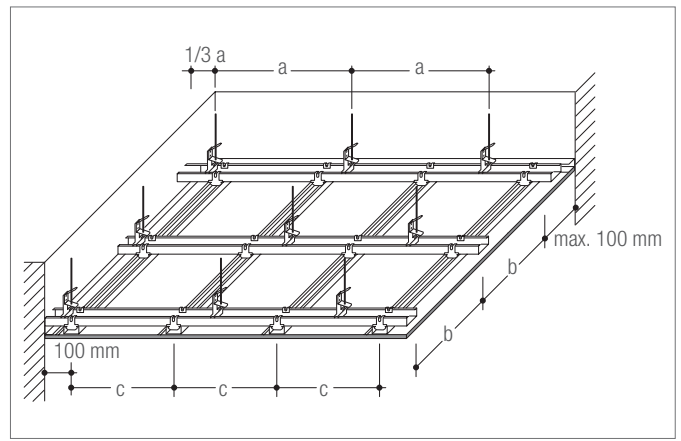


Fig. 2-4 Suspended metal substructure in accordance with DIN 18181  
Wall connection, refer to Fig. 3-9

Substructure versions		Directly attached metal substructure (refer to Fig. 3-3)	Suspended metal substructure (refer to Fig. 3-4)
Hanger	a	1000 mm	750 mm
Basic profile	b	entfällt	1000 mm
Support profile	c	417 mm parallel to the longitudinal edge of the board	417 mm parallel to the longitudinal edge of the board

Tab. 2-1 Support spans for metal substructures for horizontal surfaces and 10 – 50° roof slopes

CD profiles 60 x 27 x 0.6 mm are recommended for building the metal substructure.

Conventional suspension elements in accordance with DIN 18181, such as Nonius hangers, perforated or slotted strip steel, wire hangers or direct hangers can be employed to attach the boards to suspended metal substructures. Anchor and attachment hardware approved for the specific applications and loads involved are employed to secure these substructures to solid ceilings.

Connections between metal base and support battens must be made using appropriate accessory components from the CD profile manufacturer. Details concerning their design can be found in the individual construction technology documentation prepared by the CD profile manufacturer.

For requirements with respect to the different versions of substructures, table 3-3 offers information concerning the dimensions of base and support battens, together with the permissible support spacing.



The support profiles of the substructure must always lie parallel with the installed ceiling elements reinforcing strips. The support profiles may only be installed to the gypsum strip laminated on the upper surface of the chilled ceiling elements.



Fig. 2-5 Installed ceiling element

### Transport

Ceiling elements are delivered on pallets. On site they must be carried upright or moved using suitable methods of transport.



Carrying chilled ceiling elements with the polystyrene insulation facing "down" is to be avoided.



## Mounting the chilled ceiling elements

We recommend the employment of a mechanical board lifter when installing the ceiling elements. In this way, the chilled ceiling elements can be installed by a single individual.



Only standard drywall screws may be employed to secure the **chilled ceiling boards**. These must exhibit the following characteristics on the visible side:

- Screw length: 55 mm
- Nominal diameter: 3,9 mm
- Thread type: Coarse thread



Use approx. 20 screws per m<sup>2</sup>.

We recommend the employment of a drywall screwdriver with a depth stop.

Screw holes outside the indicated fastening points can damage the fabricated 10.1 x 1.1 mm RAUTHERM S pipes. Ceiling elements are installed with the continuous visible board side face inwards into the room. Ceiling elements may only be secured with drywall screws in the area of the laminated gypsum strip backing. Installing screws in the area of the laminated polystyrene insulation on the back can result in board breakage.



No cross joints may be made when installing the chilled ceiling elements. A side-offset of at least 400 mm must be maintained.

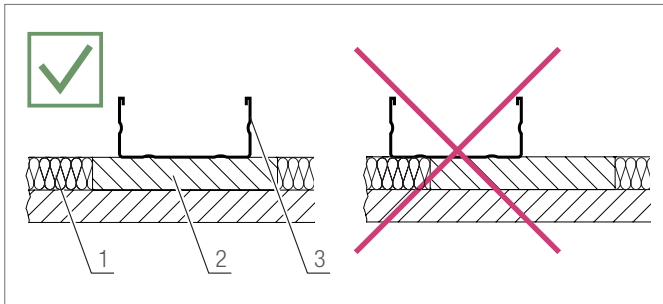


Fig. 2-6 Proper ceiling elements assembly

- 1 Insulation
- 2 Gypsum strips
- 3 CD profile

## Inactive ceiling areas

Inactive ceiling areas can be finished off using commercially available s = 15 mm gypsum plasterboards, designed as double cladding. The substructure in these areas must be able to support the associated weight



Assembly elements such as, for example, integrated lighting, air vents or sprinklers, may only be installed in thermally inactive areas of the ceiling. This must be taken into account in a timely manner while the ceiling surface is being planned.



When planning the inclusion of built-in elements, it may be necessary to create safety zones to the chilled ceiling elements. Please note the requirements provided by the assembly element manufacturers.

## Spackling

In general, the half-round, flattened edges of the chilled ceiling elements, together with the screw heads, must be spackled. The transverse board edges must be bevelled and, prior to spackling, must be cleaned with a moist brush or sponge. Basically, all board joints should be free of dust. To prevent cracking, the joints of the ceiling elements must always be designed to include paper reinforcement strips. Prior to spackling, these must be moistened in order to prevent bubbling.

The gypsum plasterboard "LaPlura" made by LaFarge forms the basis for the REHAU chilled ceiling.

The materials to be used per work step are listed in the table below.

Work step	Chilled ceiling
1. First spackle application	LaFillfresh B45/B90
2. Apply reinforcement strips	Paper reinforcement strips <sup>1)</sup>
3. Second spackle application	LaFillfresh B45/B90
4. As required Finish	LaFinish

<sup>1)</sup> To avoid blisters, the paper reinforcement strips must be moistened before applying

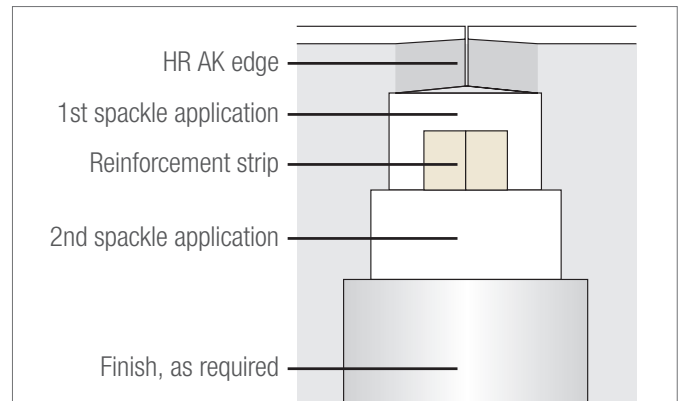


Fig. 2-7 Spackling with reinforcement strips

## Flushing, filling and de-aerating

Flushing must occur immediately after the installation of the active chilled ceiling elements. At the conclusion of filling, hydraulic compensation of the individual pipe sections (if the Tichelmann system was employed) or the separate heating circuits (if connected directly to a manifold) must be carried out.



Venting the air bubbles from the system requires that a minimum volume flow rate must be established. This flow rate is 0.8 l/min, corresponding to a speed of 0.2 m/sec.

## Pressure test

The pressure test must be performed once the air has been ventilated from the system. It must be carried out and documented in accordance with the pressure test report for REHAU underfloor heating/cooling. Where a freezing risk exists, appropriate steps should be taken to prevent the system from being damaged by freezing. These can include, for example, structure heating or the employment of an antifreeze agent.



Pressure test reports can be downloaded at [www.rehau.com/downloads](http://www.rehau.com/downloads).



The de-aerating of the system and subsequent pressure testing are vital to commissioning the chilled ceiling.

## 2.3 Surface treatment

### 2.3.1 Subsurface

The subsurface, that is, the side of the ceiling elements facing the room and including the joints, must comply with the requirements for surface levelness as set forth in DIN 18202. Beyond this, it must also be dry, load bearing and free of dust and dirt.



The employment of special wallpaper, shiny coatings, indirect lighting or strip lighting, makes particular demands on the subsurface levelness. In these instances, the entire ceiling surface must be spackled.

The design information related to quality stages Q3 and Q4, respectively, must be strictly adhered to.

### 2.3.2 Primer

Prior to any additional application of colour or of wallpaper, the ceiling elements and spackled joints must be primed. Primer helps balance out the absorption differences between gypsum plasterboard and joint spackle. If interior dispersion paint is applied directly to gypsum plasterboards, absorption differences can result in colour variations and shadowing. Attempts to correct such differences by repainting can result in paint cracks.

### 2.3.3 Wallpaper and plasters

Before applying wallpaper, we recommend applying a wallpaper primer. This will ease the removal of old wallpaper during subsequent renovations.



Only methyl cellulose adhesives may be employed for wallpapering.

### 2.3.4 Paints and lacquers

Chilled ceiling boards can be coated using plastic-bonded roller and brush plasters. Primers or adhesive coatings based on the manufacturer's recommendations should be employed for this.



Performance degradations resulting from the application of roller and brush plasters must be taken into account.

Most commercially available emulsion paints can be used. Paint may only be applied with a suitable roller or brush or, after priming, with a paint spray gun.



Mineral-based paints such as, for example, lime, mineral and silicate paints are not suitable.

Any fibres which are not secured by priming must be removed prior to paint application. When coating with lacquer, we recommend the application of two coats. Information regarding special spackling requirements for quality stage Q4 must be strictly complied with.

### 2.3.5 Locating pipes transporting media

Using thermal sheeting, pipes carrying media can be located during a warm-up process. For this, the thermal sheeting is placed on the area being examined, after which the ceiling elements are commissioned. Thermal sheeting can be reused several times.

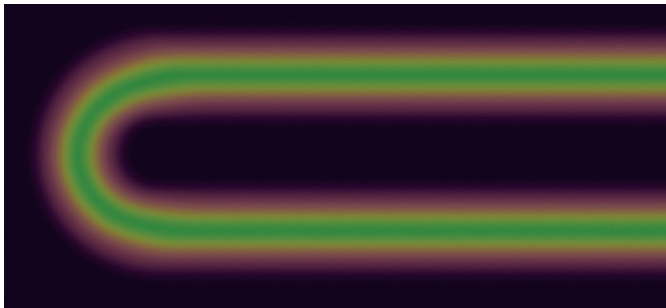


Fig. 2-8 Using thermal sheeting to locate pipes transporting media

## 2.4 Joints and connections

Joints and connections must already be taken into account during the planning phase. Joint planning principles can be found in Section 4.7 on pg. 31. The following structural and planning principles must be considered:

- The employment of expansion or movement joints on the ceiling surface must provide the same degree of movement as the structure's moving joints.
- DIN 18181 requires that ceiling surfaces be interrupted in both the longitudinal as well as the transverse directions every 10 m by expansion or movement joints.
- Suspended ceiling cladding must be structurally separated from integrated supports and assembly components such as, for example, lamps.
- Wherever the cross-section changes to a marked degree, for example, due to hallway widening or jutting walls, the ceiling surface must be equipped with joints..

When chilled ceiling elements are installed, the following joint or connection types may arise.

### 2.4.1 Floating wall connection

A floating wall connection must be provided between the ceiling elements and the room wall. The temperature-related horizontal expansion of the ceiling elements can be compensated for by these connections. In the area around the floating joint, the ceiling connection profile is visible. The front face of the chilled ceiling can be covered by an edge profile.



The support battens may be spaced up to a maximum distance of 10 cm from the adjacent wall surface.

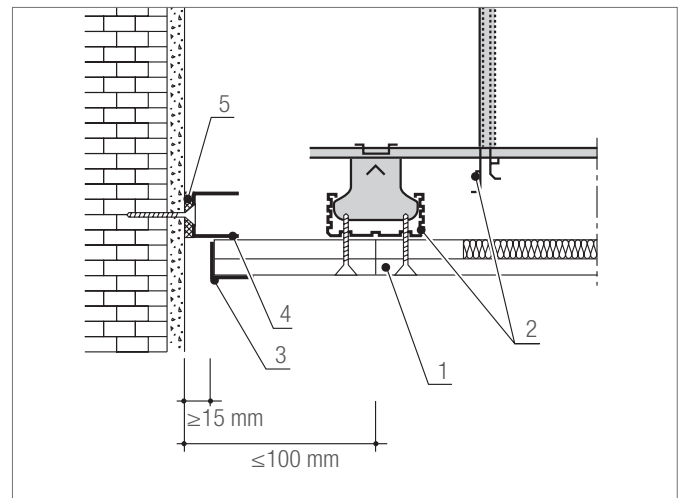


Fig. 2-9 Floating wall connection

- 1 Chilled ceiling
- 2 Metal substructure
- 3 Edge profile
- 4 Connection profile
- 5 Connection seal

## 2.4.2 Movement joint

The entire ceiling structure must be separated in the area surrounding a movement joint. It is employed to bridge structural joints in the building's corpus, or if the ceiling length necessitates a subdivision into sections. This is required at least every 10 m for the chilled ceiling.

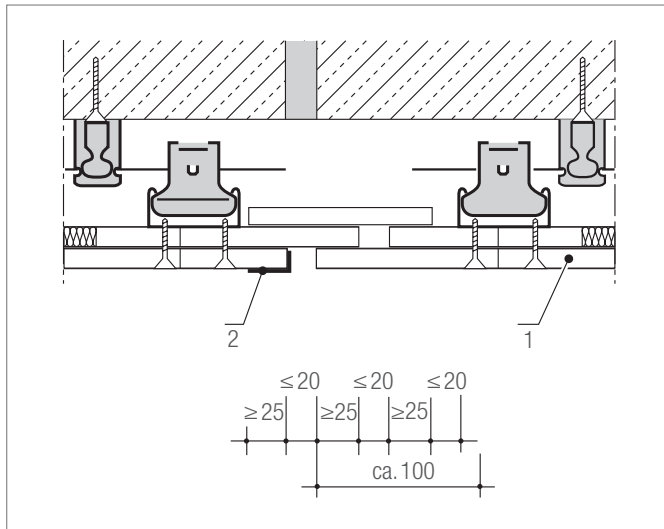


Fig. 2-10 Movement joint (measurements shown in mm)

- 1 Chilled ceiling
- 2 Edge profile

# 3 PLANNING

## 3.1 Planning principles

In order to ensure the proper execution of the chilled ceiling elements, ceiling planning must be carried out on the basis of a ceiling plan agreed upon by architects and specialized planners. Ceiling installations such as, for example, lighting, vents or sprinklers must be considered during planning so that the necessary active ceiling areas can be defined for chilled ceiling. A timely coordination across trades is essential. Heating and cooling output calculations must be available.

The positions of the chilled ceiling elements must be considered already in the planning to ensure fast, easy and professional installation without problems later on the building site. Therefore the following planning principles must be observed:



Preferably large ceiling elements are to be used because this reduces the number of joints and the associated spackling effort.



The arrangement of the chilled ceiling elements and the positioning of the distribution pipe network within the active ceiling field must be considered already in the planning in the interests of interface coordination of the drywall installation and building technology units.

## 3.2 Heating/Cooling capacity

The heating/cooling capacity of the chilled ceiling or chilled ceiling elements are based on DIN EN 14037 for heating and, for cooling, are in accordance with DIN EN 14240. They have been determined by an independent certified testing institute.



Capacity diagrams are available for downloading from the Internet under [www.rehau.com/downloads](http://www.rehau.com/downloads).



For heating, the maximum permissible continuous operating temperature for the chilled ceiling must be limited to +45 °C. Higher temperatures will result in ceiling element destruction.

## 3.3 Connection

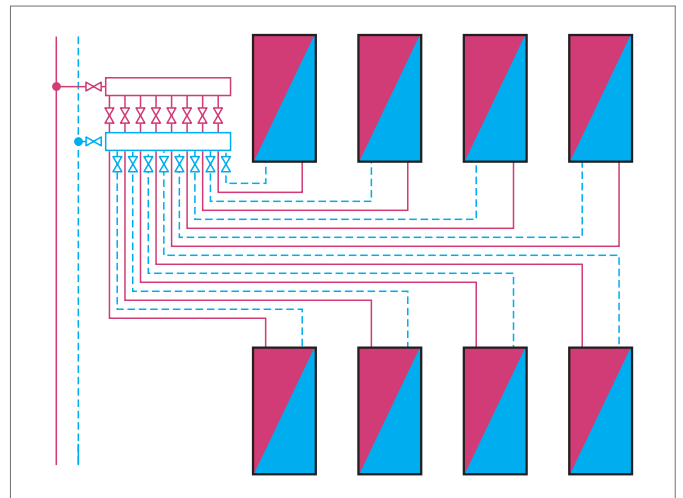


Fig. 3-1 Schematic diagram of a separate connection

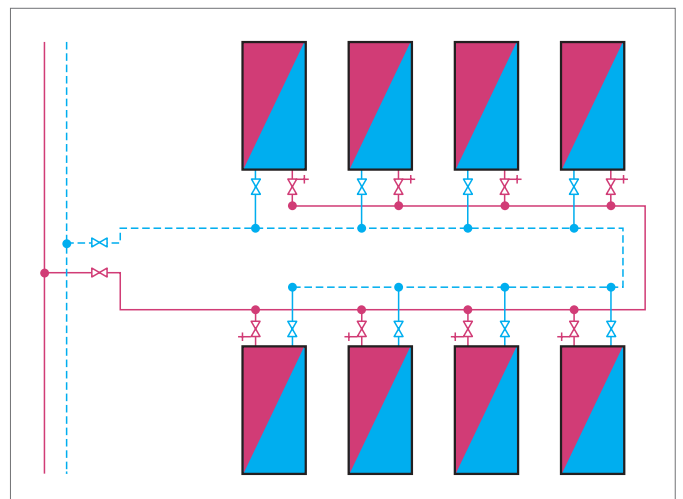


Fig. 3-2 Schematic diagram of the Tichelmann system

The Tichelmann system is the most sensible means of establishing the hydraulic connection between the individual ceiling elements for the chilled ceiling.

Separate connection of individual chilled ceiling elements to the heating circuit distributor is generally only employed for very small active cooling areas.



Connection employing the Tichelmann system requires that only equally sized chilled ceiling elements or fields of equal pipe length are employed.

### 3.4 Joint planning principles

Joints and connections must already be considered during the planning phase. The following structural and planning principles must be considered:

- The employment of expansion or movement joints on the ceiling surface must provide the same degree of movement as the structure's movement joints.
- DIN 18181 requires that ceiling surfaces be interrupted in both the longitudinal as well as the transverse directions every 10 m by expansion or movement joints.
- Suspended ceiling cladding must be structurally separated from integrated supports and assembly components such as, for example, lamps.
- Wherever the cross-section changes to a marked degree, for example, due to hallway widening or jutting walls, the ceiling surface must be equipped with joints.

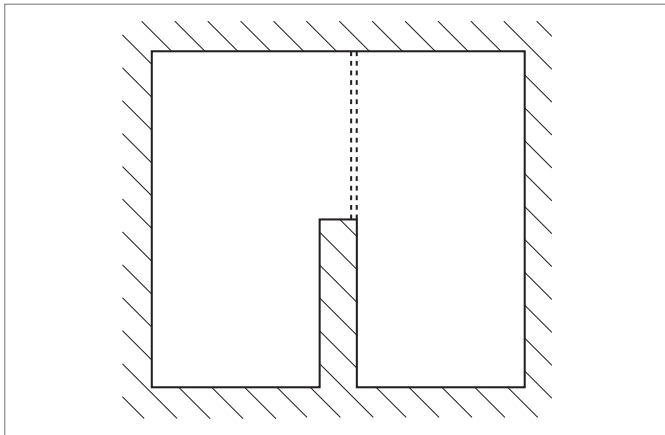


Fig. 3-3 Jutting wall section

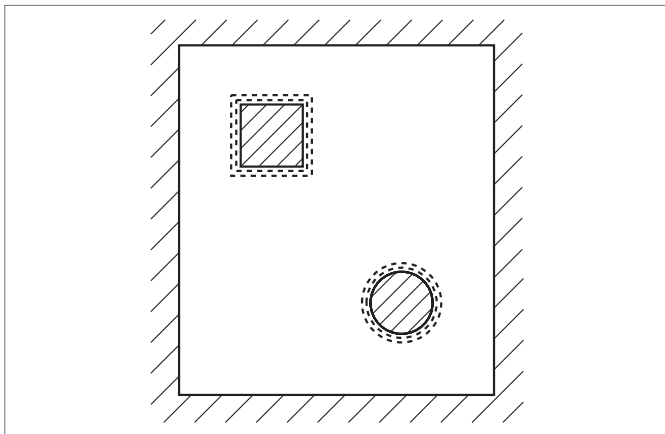


Fig. 3-4 Suspended ceiling with supports

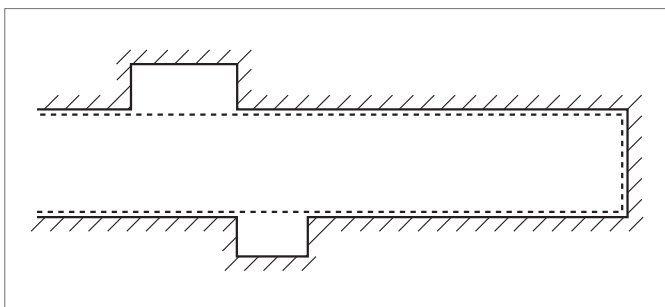


Fig. 3-5 Hallway ceiling with niches

### 3.5 Control technology

Individual room control technology must be employed if chilled ceilings are to be used. In order to avoid water condensation resulting from cooling to form on the ceiling side facing the room interior, it is vital that the ambient room condensation temperature be monitored. Where cooling occurs, the flow temperature of chilled ceilings, must lie + 2 K above the dew point temperature:

$$T_{\text{flow}} = T_{\text{dew point}} + 2 \text{ K}$$

Condensation formation on the surface of chilled ceilings can result in an unevenness of the board surfaces. Frequent moisture buildup on the ceiling surface can result in the destruction of the chilled ceiling elements.

### 3.6 Comfort

In order to ensure a comfortable indoor climate when chilled ceilings are employed for heating, the element surface temperatures must be taken into account during design.

In rooms with a clearance of  $\leq 2.6$  m, the surface temperature of the chilled ceiling must be restricted to +29 °C for heating.

### 3.7 Degassing

The use of degassing devices is recommended to remove air residue from the pipe network.



# NOTES

A series of 20 horizontal grey bars, stacked vertically, intended for taking notes. The bars are evenly spaced and cover most of the page's width.



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Hill Court, Walford  
Ross-on-Wye  
Herefordshire, HR9 5QN  
[www.rehau.uk](http://www.rehau.uk)

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