



TTC Timmler Technology

GraviVent®

Silent Cooling and Heating System

Reference Projects



Mitglied der
DGNB

Deutsche Gesellschaft für Nachhaltiges Bauen
German Sustainable Building Council



Member at Madaster,
the cataster for materials

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TTC BRANDS

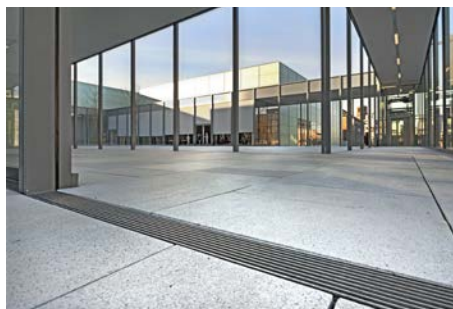
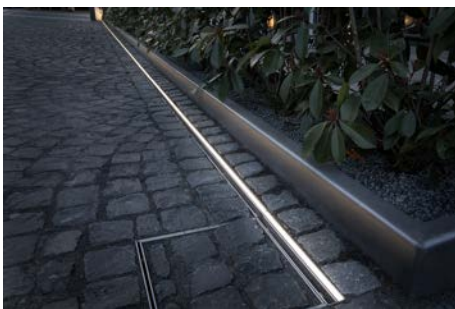
GraviVent® – Silent Gravity Cooling



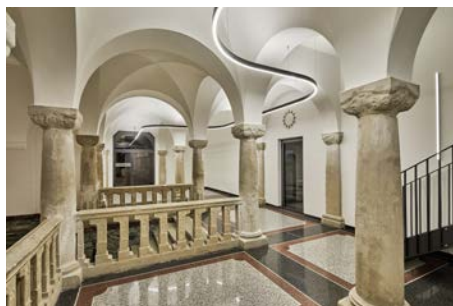
Design Oriented Gratings



Drainage Systems



ADO Lights





TTC Timmler Technology

ABOUT TTC

Designing innovative and sustainable solutions for new buildings and redevelopment together with architects and planners

Developing object specific solutions together with architects and specialist planners already during the planning phase is the strength of TTC Timmler Technology.

TTC provides smart building technology for contemporary living and working environments: LED light design, innovative air-conditioning systems, design-oriented façade elements and grating systems for interior and exterior areas.

With our extensive know-how we can balance modern design, energy efficiency, and economic efficiency. We design customized complete solutions in accordance with technical specifications, either made from standard components or made to your individual requirements.



Green and economical

People and environment are at the heart of all our endeavours. We develop natural airconditioning systems to go easy on resources and to save costs.

Multi-functionality Our know-how for your planning

Multi-functionality is a special strength of TTC building technology. Below a few examples:

- LED Light Design – TTC lighting elements can be combined with channels and gratings as well as maintenance platforms, using striking illuminations to show your architecture in the best light. TTC light design offers a variety of options: From façade illumination with SpaceLights, high brightness LEDs, LED light lines and light tiles to wall washers – with our large choice of materials and individual design we can provide a customized solution for your project.
- TTC GraviVent® and GraviWall can be used to provide a consistent climate within a building. Energy-efficient, making use of natural gravity.
- TTC Chilled Beams ensure comfortable, silent ventilation in a wide variety of working environments. In consultation with architects and planners they can be individually fitted into the ceiling design.
- TTC Floorunits with a variety of functions such as heating, cooling, ventilation combine design with functionality and energy efficiency without disturbing the look of, for example, room height glass façades.
- Homogeneous grating systems create seamless transitions from the interior to the exterior on glass façades. TTC Floorunits provide heating, cooling and ventilation for interior areas and complement the TTC façade draining systems for exterior areas.

Comfort and sustainability – two sides of one and the same coin

Climate change is one of the greatest challenges of today. Temperatures are rising, while natural meteorological events are increasing in frequency and becoming more extreme: Climatic changes are suddenly something we can all see and feel for ourselves. In order to avert imminent dangers to people and nature, or at least to reduce them, climate protection is imperative as a central global political task. However, the road to a society that declares sustainability to be one of its most important premises is long. And it's far from easy, since it often involves restrictions and sacrifices. Sustainability means that when we consume raw materials, we take future generations into account. We do not consume any more than can be regenerated.

Greenhouse gas emissions are rising worldwide. The Paris Agreement, to which the world's leading countries have committed, is intended to limit global warming to well below 2°C compared with pre-industrial levels. However, implementing the Paris Climate Agreement is proving difficult and poses huge challenges for global society.

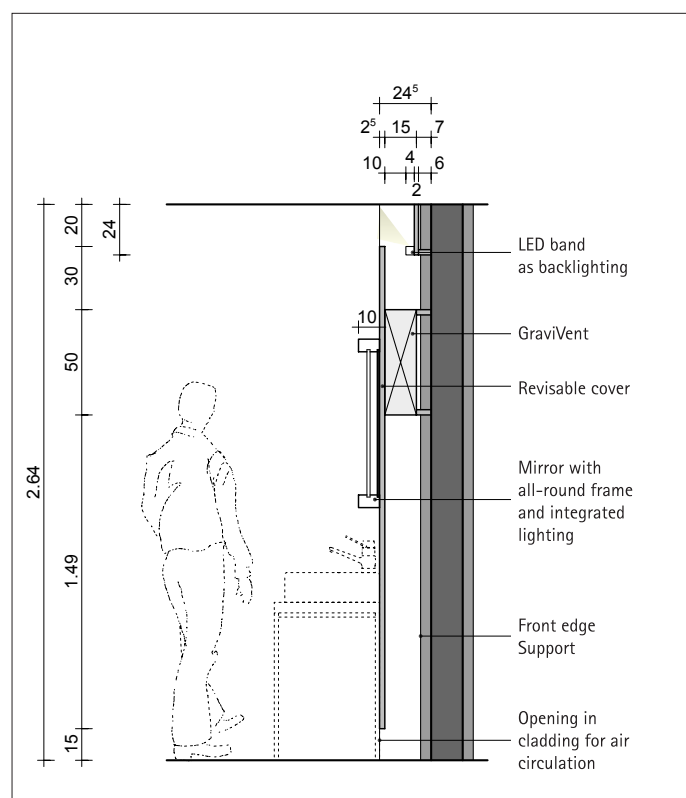
On average, a German citizen produces just over eleven tons of greenhouse gas emissions each year. Heating, traveling, living, eating – there are many areas where the desire for greater comfort unnecessarily increases the carbon footprint. The first step to change this is to raise awareness that every individual can make a less environmentally damaging choice in many of their decisions. Only if this message gets through to people will a reduction be

possible in the long term. The offers made by industry with regard to consumer goods are only helpful if they are then embraced. Cars can consume less energy (bicycles run without fuel altogether), and special shower heads can save water, albeit only if citizens themselves actively decide to use them. If the available offerings are not embraced, they are of no use.

Consumers are most likely to readily accept changes to their habits if – no surprise – the ecological features are combined with cost savings and gains in convenience. Such products exist, and some have been on the market for 40 years, even though there was no talk of global warming and climate crisis when they were launched. In the background, Siegfried Timmler was already thinking back then that using less material also has commercial advantages. The less material used, the easier a product is to transport, the more straightforward it is to assemble, and the less susceptible it is to failure during operation.

One such example is the GraviVent silent gravity cooling system, which Siegfried Timmler developed in the 1980s and which is still on the market today – gently optimized on an ongoing basis with new technologies. GraviVent, a product of TTC Timmler Technology, is a cooling and heating system for buildings, relies on a simple physical principle, is cost-effective, and improves the quality of time people spend in the room. GraviVent is likewise an effective building block for obtaining certificates from DGNB, the German Sustainable Building Council. For example, the Science Center Ex-

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6 Project Vilotel



Project Vilotel

THE IDEA

perimenta in Heilbronn was the very first building to be awarded DGNB "Diamond" certification – thanks in part to TTC silent gravity cooling technology.

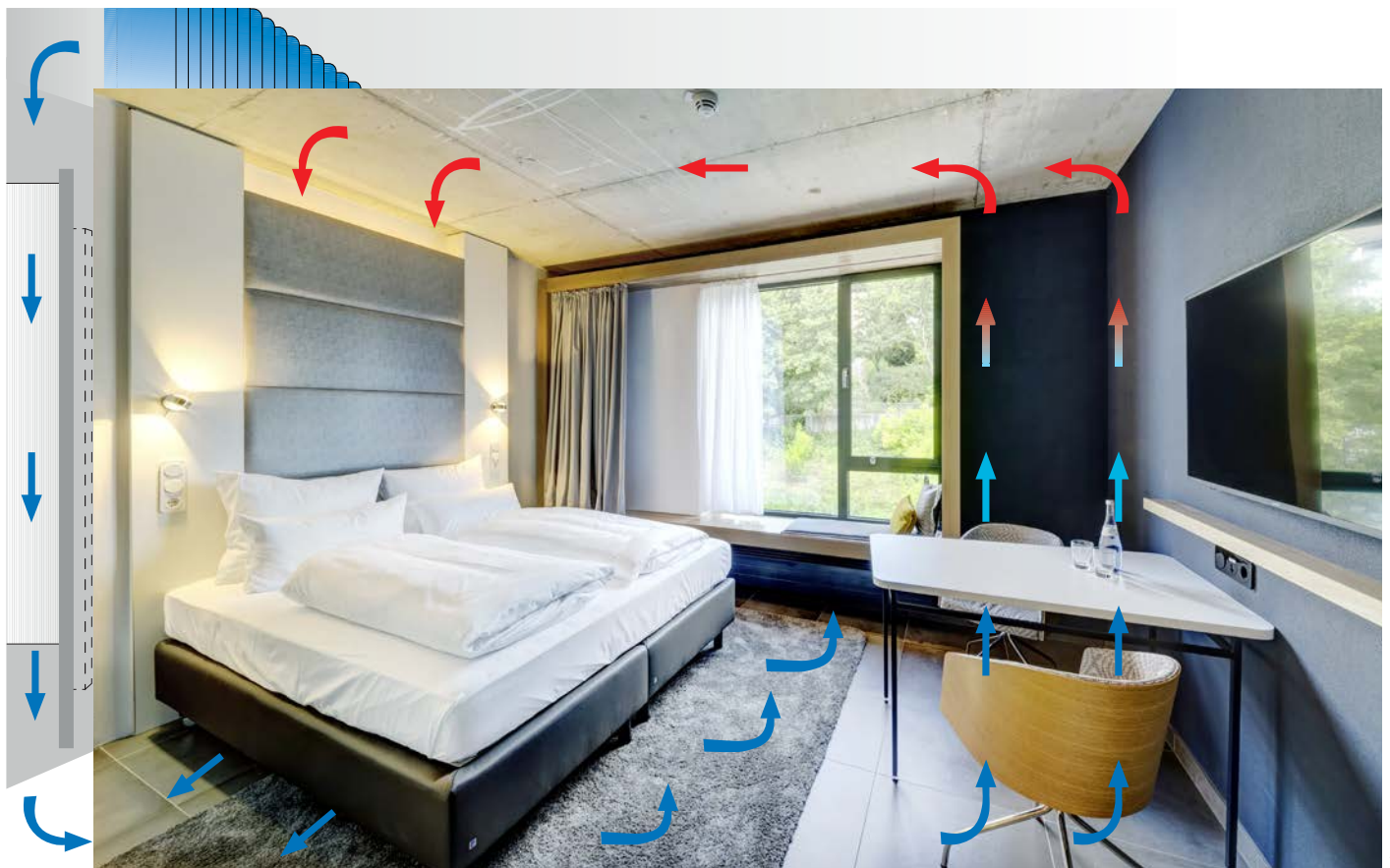
Silent gravity cooling has proven its worth over decades in large-scale projects. Its first origins, however, can be found in ancient times. Back then, palaces and mosques were cooled according to the same basic principle, which is rooted in a simple law of nature: Warm air rises to the top, where it is dissipated and cooled. The thereupon heavier air moves downwards through a shaft and re-enters the room at ground level through air outlets. This technology is an ideal method to cool rooms silently and using less energy; indeed, it ensures even temperature distribution in the room. It is as simple as it is ingenious – and it requires neither a fan nor an air filter of the kind we see in widely used room air conditioning systems (AC). The advantages are obvious: no noise, no unpleasant air movements, no sources of germs, low maintenance. Advantages that are appreciated in office buildings and even in the Berlin Chancellery, but TV studios and terminals at airports likewise benefit from TTC's silent gravity cooling device.

Silent gravity cooling avoids widely ramified ventilation ducts, which consume a lot of space and tie up resources unnecessarily. In addition, these conventional ventilation systems are often problematic for hygiene reasons. TTC's silent gravity cooling, on the other hand, has advantages in terms of energy efficiency as well – simply because it does not require any operational energy inputs. The cooling intensity

can be individually adjusted locally without the need to forego the advantages of a central ventilation system. In addition, outside air can be supplied in a controlled manner – but only when required; for example, when there are many people in a room.

It's often the simple things that make life easier. GraviVent consumes no energy in operation and offers people the opportunity to control the room temperature according to their personal well-being. Those who ask incisive questions are the ones who discern the ecological benefits. 'Our guests want to feel good while having a clear conscience,' says, for example, the director of the "Vilotel" in Oberkochen, a hotel that relies on silent gravity cooling. The ecological footprint, says Birgitt Mönch, will be given more and more attention in hotel bookings in the future. Those who have a convincing answer in this regard will have an advantage over the competition. The federal government's central travel management, which handles travel for government employees, agencies, and other state institutions, also wants in the future to give preference to sustainable hotels when it comes to overnight stays. Its directory is to be converted to certified sustainable hotels by the end of 2023.

Managing Director Patrick Timmler of TTC Technology GmbH puts it in a nutshell: 'People have always been at the center of our solutions, but this has never precluded a holistic approach. Conserving resources is important not only from an ecological point of view, but also from a business perspective. Less material consumption, lower costs, and less susceptibility to faults.'



PROJECTS + PRODUCTS

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	•	Altstadt Palais, München	116
•		AOK Gesundheitskasse, Kempten	
•		Atlanta Antriebstechnik, Bietigheim	
•		AXA Versicherung, Cologne	
	•	BAM Bundesamt für Materialforschung, Berlin	
•		BMZ Bundesministerium für wirt. Zusammenarbeit, Berlin	
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•		Électricité de France (F)	
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•		Kontorhaus Coworking Space, Berlin	
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•		Freaks 4U Gaming, Berlin	
•		HGJ Haus des gemeinnützigen Journalismus, Berlin	
•		Jura Kaffeemaschinen Deutschland, Nürnberg	
•		KiK Zentrale, Bönen	
•	•	Liebherr Baumaschinen, Hamburg	
•	•	Liebherr Russia HQ, Moskau	
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PROJECTS + PRODUCTS

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•		WDR Local Radio Station NRW	

Projects highlighted in blue can be found **IN THIS BOOKLET**

//////////////// VILOTEL
OBERKOCHEN////////////////



VILOTEL OBERKOCHEN

ARCHITECT | INTERIOR ARCHITECT | ENERGY CONCEPT

arch22 | Bogenrieder Crumbach Kugel, Stuttgart | GEPLAN DESIGN Planungsges. mbH, Stuttgart
Transsolar Energietechnik GmbH, Stuttgart

A hotel heads a new path

Air conditioning in hotel rooms brings with it its own set of issues. Sometimes guests cannot work out how to set it, and the noise and strong currents of air often spoil a stay. To say nothing of hygienic challenges: Blocked air filters in the fans are consistently underestimated breeding grounds for germs. Nonetheless, the hotel industry has to date mostly relied on popular air-conditioning systems with fan coils.

One hotel is now treading a totally new path and leading the way with ecological features that also make the guest's stay more pleasant. The new Vilotel in Oberkochen in the state of Baden-Württemberg is the first hotel in the world to use GraviVent® gravity cooling. What is ingenious about the sophisticated technology is that it can be integrated completely in the interior design and is only noticeable if you look closely. Above the bed's headboard there is a narrow opening through which warm air flows out and is cooled by a heat exchanger. The air, now cool and as such heavier, is directed to air outlets beneath the bed via a drop shaft and spreads slowly throughout the room.

The GraviVent system is not the only special technical feature in the 74-room hotel however. A geothermal system, for example, delivers heat from the earth, and warmed fresh air is supplied to the rooms via a passive ventilation element. Not least of all, the Transsolar energy concept features an electric charging station for hotel guests. Checking in by smartphone is no problem either. All this makes the Vilotel a hotel conceived with the future in mind.

With regard to its construction and running, the investor and operator paid particular attention to the sustainability of the hotel. The aim was to save resources and enable it to be run cheaply. This strategic concept was the basis for the fitting of the GraviVent® system, as it largely functions without maintenance and has numerous benefits from an ecological point of view as well. The increased comfort for guests is the main thing for the hotel manager. "Our guests should feel comfortable and have a clear conscience at the same time," she says, emphasizing that in future a hotel's ecological footprint is going to be of increasing importance when bookings are made.



GRAVIVENT® – SILENT GRAVITY COOLING

Cooling/Heating for hotel rooms | versions with bedhead

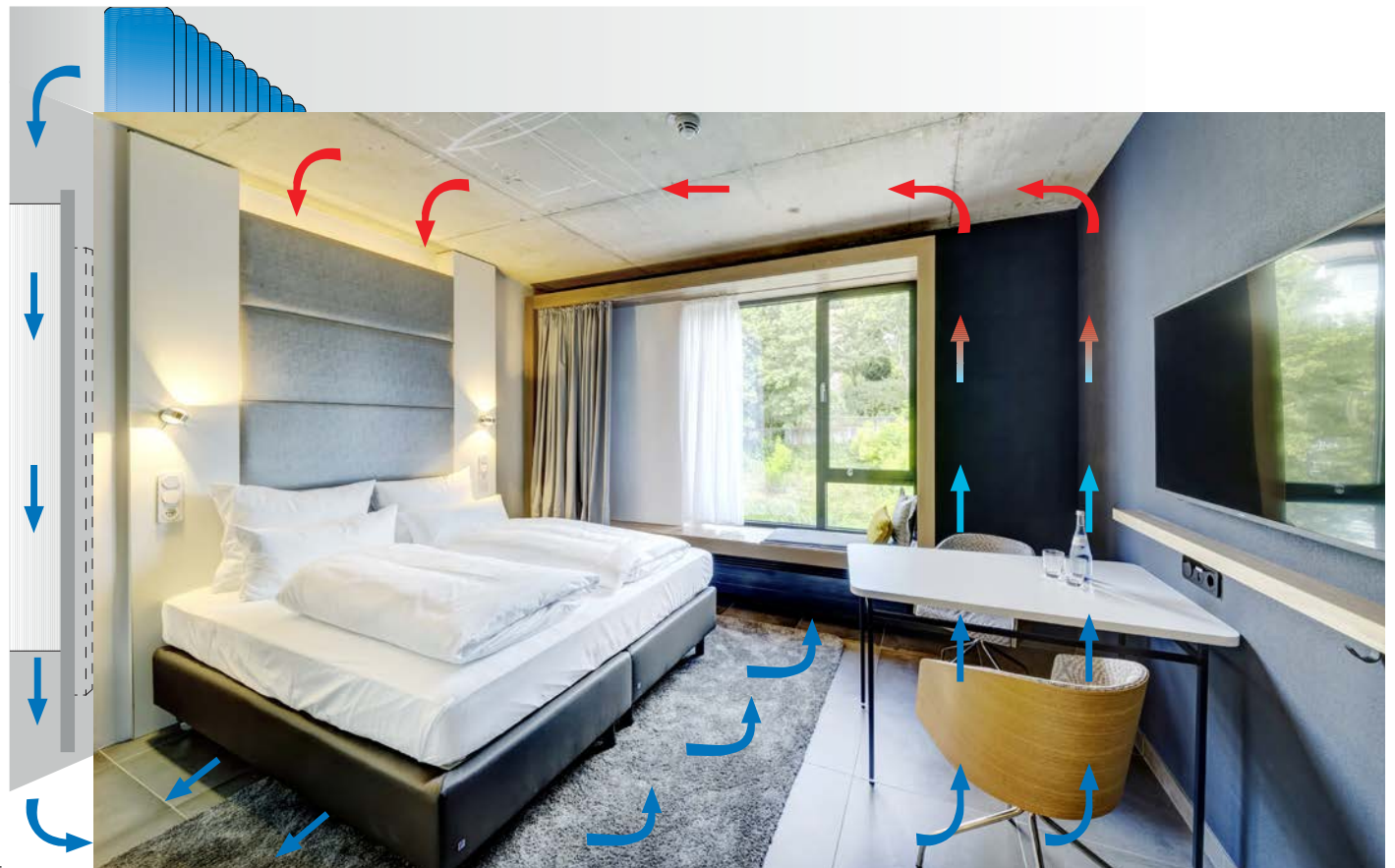
AIR CON SYSTEM DESIGN



The new Vilotel in Oberkochen is full of sophisticated technical features. The GraviVent® cooling system in use for the first time in a hotel anywhere in the world is a particular highlight. Furthermore, geothermal probes provide much of the energy used in the hotel; additional features include a charging station for electric cars and a mobile check-in terminal, which uses your smartphone as your room key.

The principle behind the TTC cooling and heating units is based on the law of nature stating that hot and cold air have different densities. The warm air near the ceiling flows into a narrow slit by the bedhead. With its temperature having been lowered by a cooler, the air is re-directed into the room through a drop shaft.

Guests can hardly see the GraviVent® system. The only thing pointing to the innovative cooling and heating technology is a slit above the headboard.



GRAVIVENT® – SILENT GRAVITY COOLING

Cooling/Heating for hotel rooms | versions with cover module

AIR CON SYSTEM DESIGN



Be it bedhead or cover module: The Vilotel also has an alternative solution for integrating the GraviVent® system's cooling shaft in the interior design.

Silent and energy-saving: GraviVent® heating and cooling units are a genuine alternative to traditional hotel-room air-conditioning systems and have advantages in terms of operation, hygiene, and noise.



TASK

GraviVent® – Silent gravity cooling

AIR CON SYSTEM DESIGN



Technical Specification

Cooling

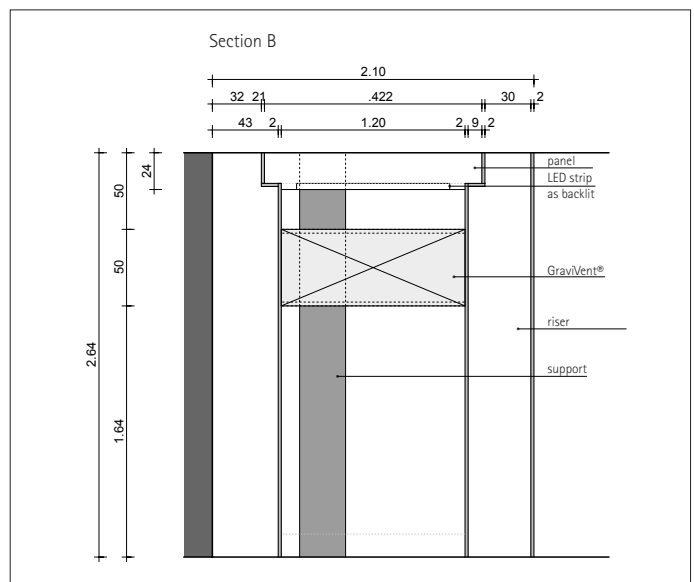
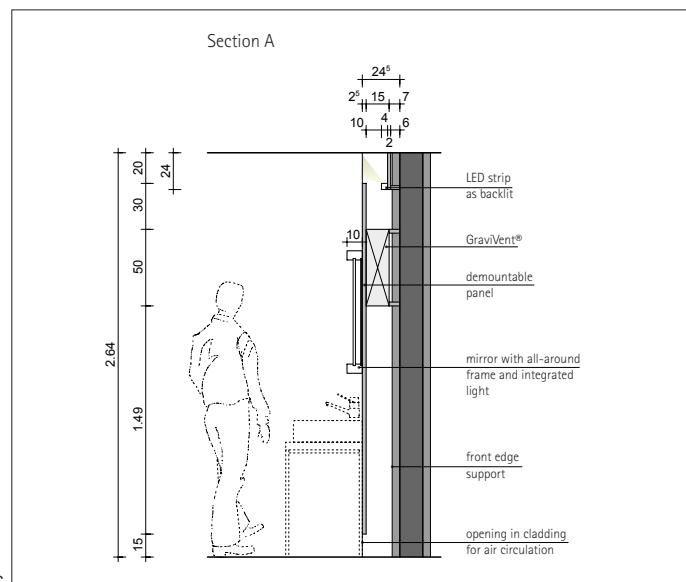
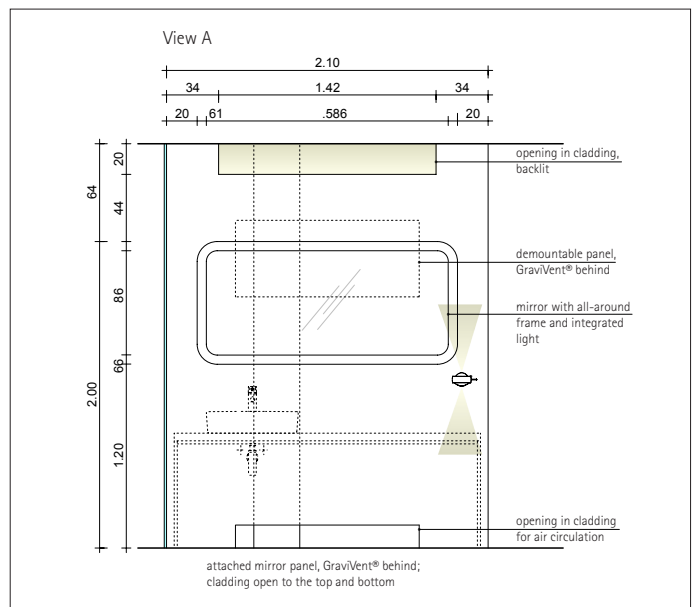
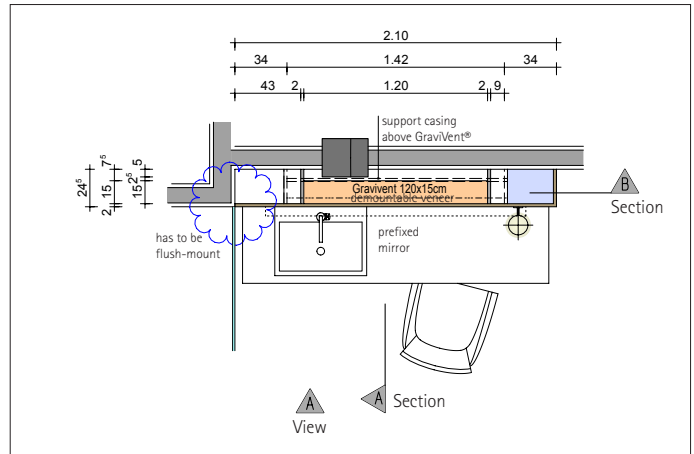
- Shaft height 1,500 mm
- Supply and return temperature 14/18 °C
- Room temperature 26 °C
- Cooling capacity ISHK 12.51 507 W

Heating

- Shaft height 300 mm
- Supply and return temperature 50/35 °C
- Room temperature 20 °C
- Heating capacity ISHK 12.51 615 W

GraviVent®

- 74 units type ISHK 12.51
- for concealed installation in drop shafts
- 1,200 x 500 x 145 mm [L x H x B]



//////////////////// **RTL**
LUXEMBURG //////////////////

CLIENT | ENGINEER

A+P Kieffer Omnitec | Jean Schmit Engineering, Luxembourg

For the highest demands

The RTL Group Europe's largest operator of advertising-financed private television, has had a new head office built. The complex is called "RTL City" and occupies a prominent position in Luxembourg: On the Kirchberg plateau in the direct vicinity of various banks and EU institutions, its three striking towers stand out from afar. The complex's atrium houses a building innovatively adorned with Corten steel – which in turn contains 18 radio studios.

TV and radio studios in particular have high requirements. The basic noise level must not exceed a certain value, for instance, otherwise the sound of the technical equipment or air-conditioning units can be heard in sound recordings. This translated into NR20 standard acoustic requirements. An additional installation was to effectively support the envisaged cooling ceiling system, for in the studios themselves a maximum room temperature of 26 degrees was defined, and in the control room, for example, 24 degrees. A further requirement was that as little of the wall surface as possible should be covered, because it is used for sound absorption.

All stipulations are met by the silent cooling of TTC Timmler Technology. The state-of-the-art TTC product GraviVent® boasts several advantages: All mechanical components are located outside the studios. The gravity cooling only switches on when the cooling ceiling system no longer ensures the desired room temperature. With gravity cooling integrated into wall shafts, their exterior surfaces can be used for sound absorption.

This solution enables the reliable regulation of the room climate – with no noise emissions and yet still in a resource-sparing manner. Even large amounts of heat are discharged without ventilation. As such, the TTC system meets the high demands applicable to the entire RTL complex.

CEO Thomas Rabe said at the inauguration: "The new building is efficient, cutting edge, and has the state-of-the-art technology." And precisely these qualities also apply on the cooling system.



TASK

Air grids + GraviVent® – Silent gravity cooling

HOMOGENEOUS GRID DESIGN AND AIR CLIMATE DESIGN SYSTEM



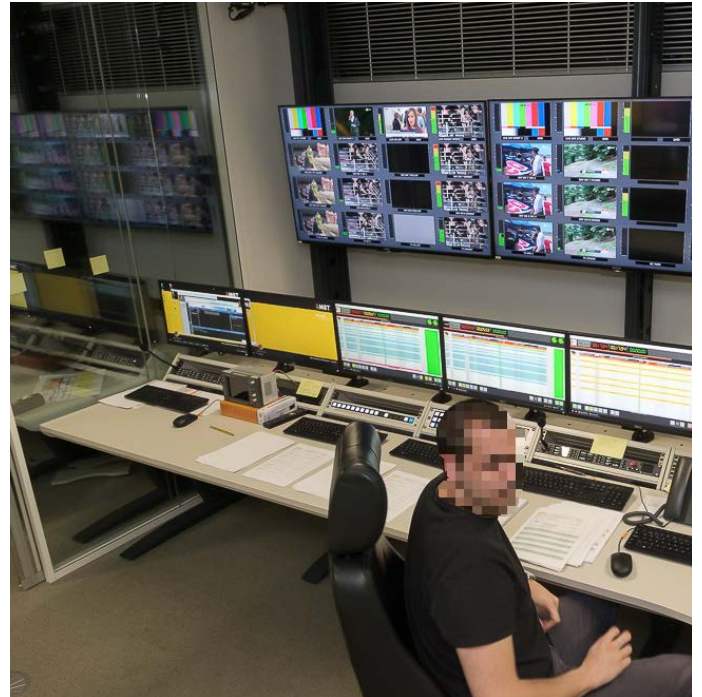
Technical Specification

Air Grids

- Air grid LST 18, bar distance 17 mm, natural anodised
- Frame 29/25/6 mm, natural anodised, with clips
- Total 108.52 m x 576 mm + 108.52 m x 250 mm

GraviVent®

- 148 metres type AISI x-51-2-R/L-2
- 103 units with length divisions from 800 mm every 200 mm upwards to 2200 mm
- Supply and return temperature 15°/18° | room temp. 24 °C
 H_{eff} (effective duct height) 1.83 m = 335 W/m
- Supply and return temperature 15°/18° | room temp. 24 °C
 H_{eff} (effective duct height) 2.26 m = 350 W/m
- Supply and return temperature 15°/18° | room temp. 26 °C
 H_{eff} (effective duct height) 1.90 m = 540 W/m



//////// SRF STUDIO ZURICH //////////



ARCHITECT | PLANNER

Penzel Valier, Zurich | Gruner Gruneko AG, Basel

Quiet please

The new broadcasting building of Schweizer Fernsehen in Zurich-Leutschenbach houses editorial and administrative offices, catering, computer centre etc. as well as broadcasting studios for news and sports.

These studios are equipped with the latest technology and fully digitalised. The cameras are mounted on columns which can be moved wirelessly by joystick via a rail system. The recorded data are simultaneously transmitted to the respective editorial offices and processed.

A new energy concept was to be implemented to dissipate the resulting high heat loads. Thus GraviVent® is used for cooling in the studios.

Using a special process, silent gravity cooling was integrated into two transparent panes (glass + Makrolon), which are provided with a micro-perforation for the acoustics in a special process. This produces glass drop shafts which prevent unwanted draughts. In addition to silence, which is another important requirement when cooling broadcast studios.



GRAVIVENT® – SILENT GRAVITY COOLING

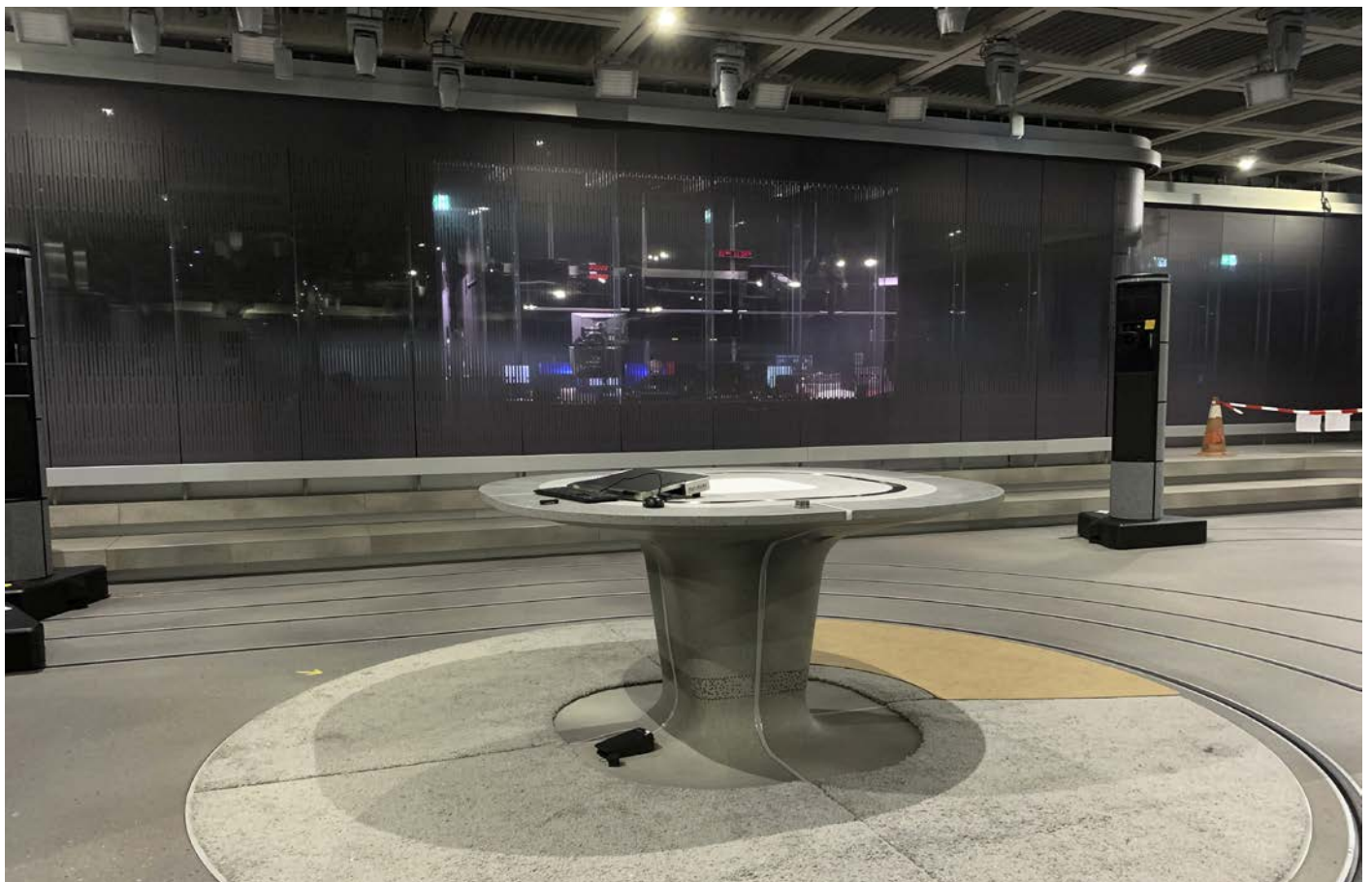
Cooling for a completely digitalised studio

AIR CON SYSTEM DESIGN



GraviVent® – innovative + sustainable

- Silent gravity cooling integrated in two glass panes with a special makrolon-window treatment with micro-perforation for acoustics
- "Green" product: low energy costs, low maintenance requirements, 100 % recyclable after entire building cycle
- Important component for DGNB/LEED certification
- Optional with heating function



GRAVIVENT® – SILENT GRAVITY COOLING

Cooling for a completely digitalised studio

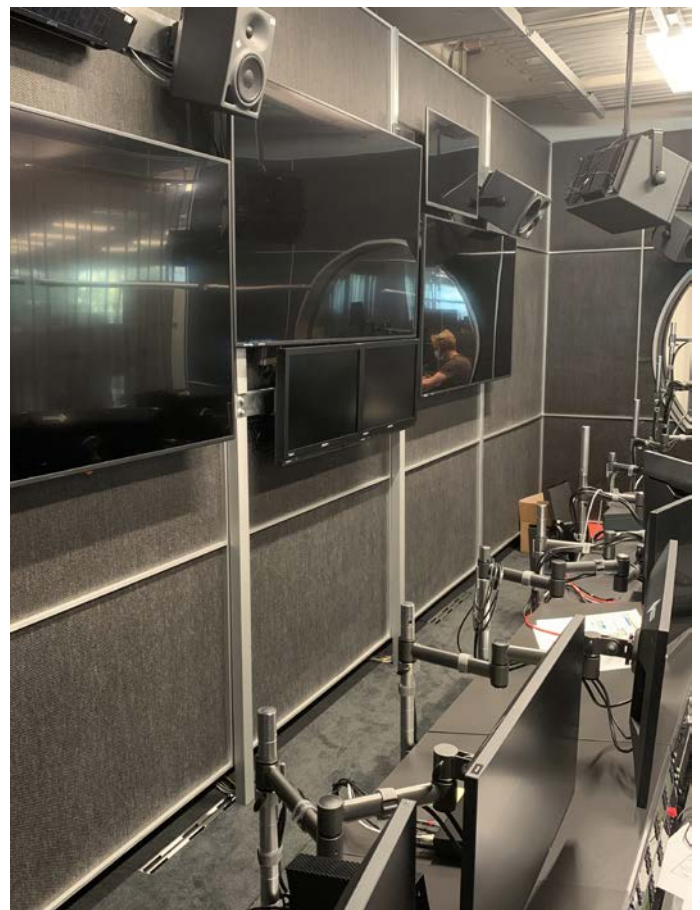
AIR CON SYSTEM DESIGN



GraviVent®

Silent gravity cooling type ISHK for Cooling

- High performance cooling unit for power capacity 2 for dissipation of sensible cooling loads by a guided free construction
- For installation within a fall shaft
- Condensate drip tray over full cooling unit length
- Condensate drainage nozzle toward fall shaft



TECHNICAL SPECIFICATIONS + DRAWINGS

GraviVent® – silent gravity cooling

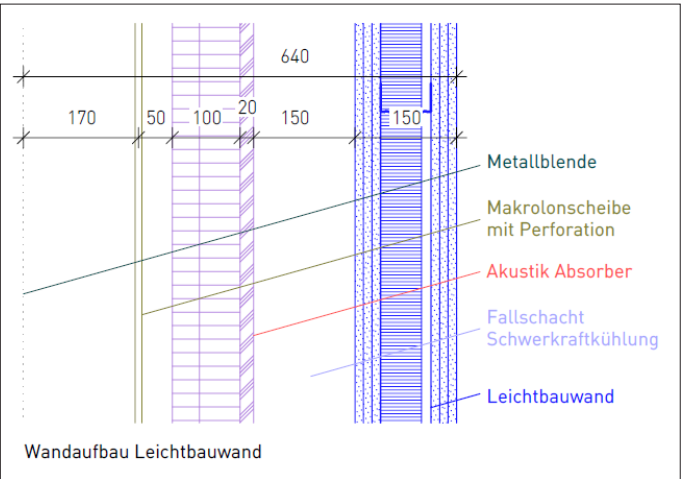
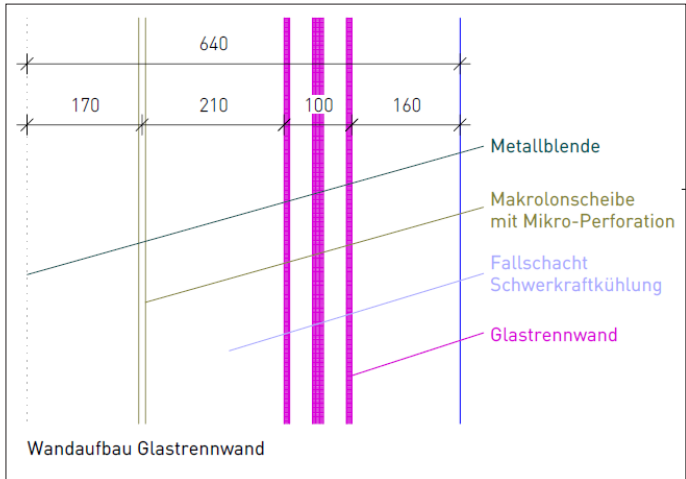
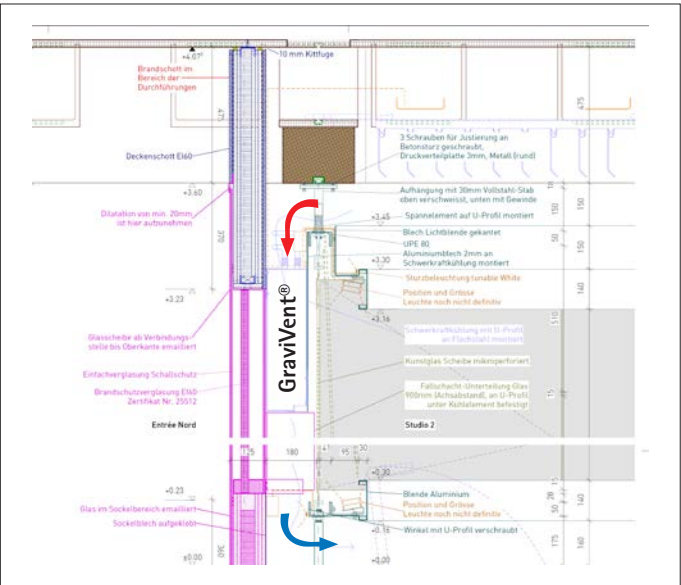
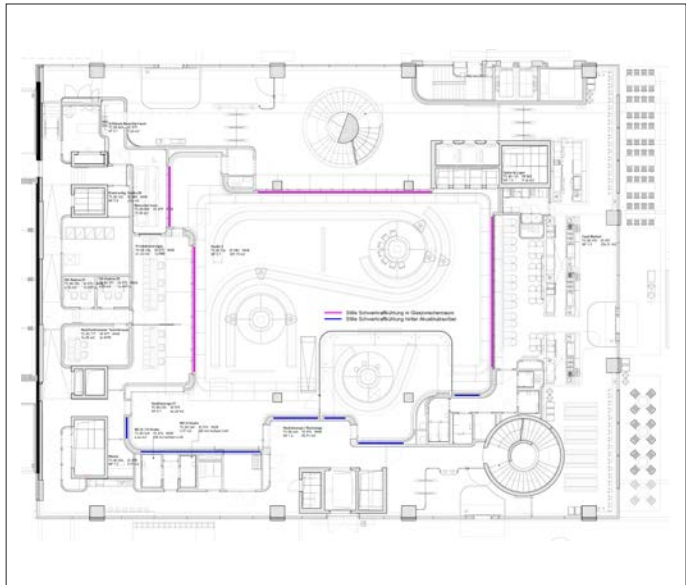
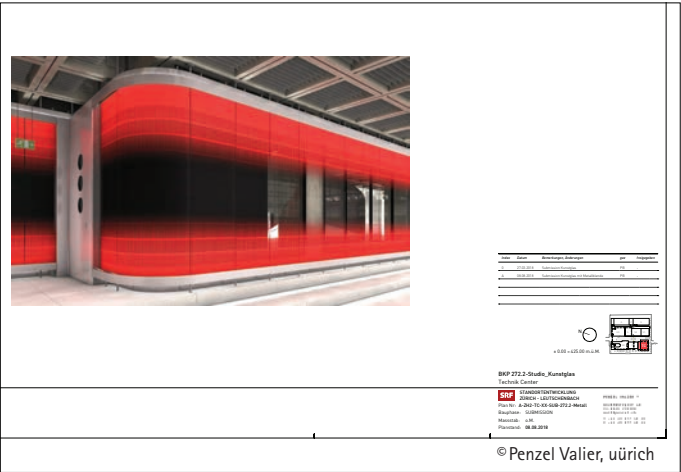
AIR CLIMATE DESIGN



Technical Specification

Cooling

- 105 metres type ISHKx.51-2R/L2
[H x W] 500 x 150 mm in different lengths
- Room temperature 26 °C
Supply temperature 18 °C
Return temperature 21 °C
Temperature difference Δt_m 6.5 K
Active duct height (H_{active}) 2.8 m
Cooling efficiency ribbed unit length 380 W/m



////////// **PASSPORT**
CONTROL //////////
////////// **COUNTERS**
AIRPORT //////////
////////// **HANOVER**



////////// PASSPORT
CONTROL //////////
////////// COUNTERS
AIRPORT //////////
////////// HANOVER

PASSPORT CONTROL COUNTERS

Hannover Airport

ARCHITECT | INTERIOR DESIGN

Obermeyer Planen + Beraten, Munich | Hannibal Innenarchitektur, Hannover

Keep a cool head at passport control

The modernisation of Hannover-Langenhagen Airport was undertaken primarily with security in mind, but flexibility and smooth processes also play an increasingly important role as the number of passenger increases.

In cooperation with the airport company and the Federal Police, Hannibal Interior Design developed new passport control counters. Safety-relevant and technical requirements have to be met in a very small area, but thermal and air-hygienic comfort are also essential so that employees remain concentrated and efficient.

For this, the experts relied in GraviVent – the silent gravity cooling system from TTC Technology. The extremely high loads require a powerful cooling system, which, for architectural reasons, also had to be largely invisible. Silent operation without ventilation and without draughts ensures a pleasant climate for working through natural convection – even in such a confined space.

The coolers are controlled according to the wet-bulb temperature and are operated in a sliding mode. The flow temperature of the cooling water is 12 °C; the water is recirculated at 14 °C.



PASSPORT CONTROL COUNTERS

Hannover Airport

GRAVIVENT® – SILENT GRAVITY COOLING

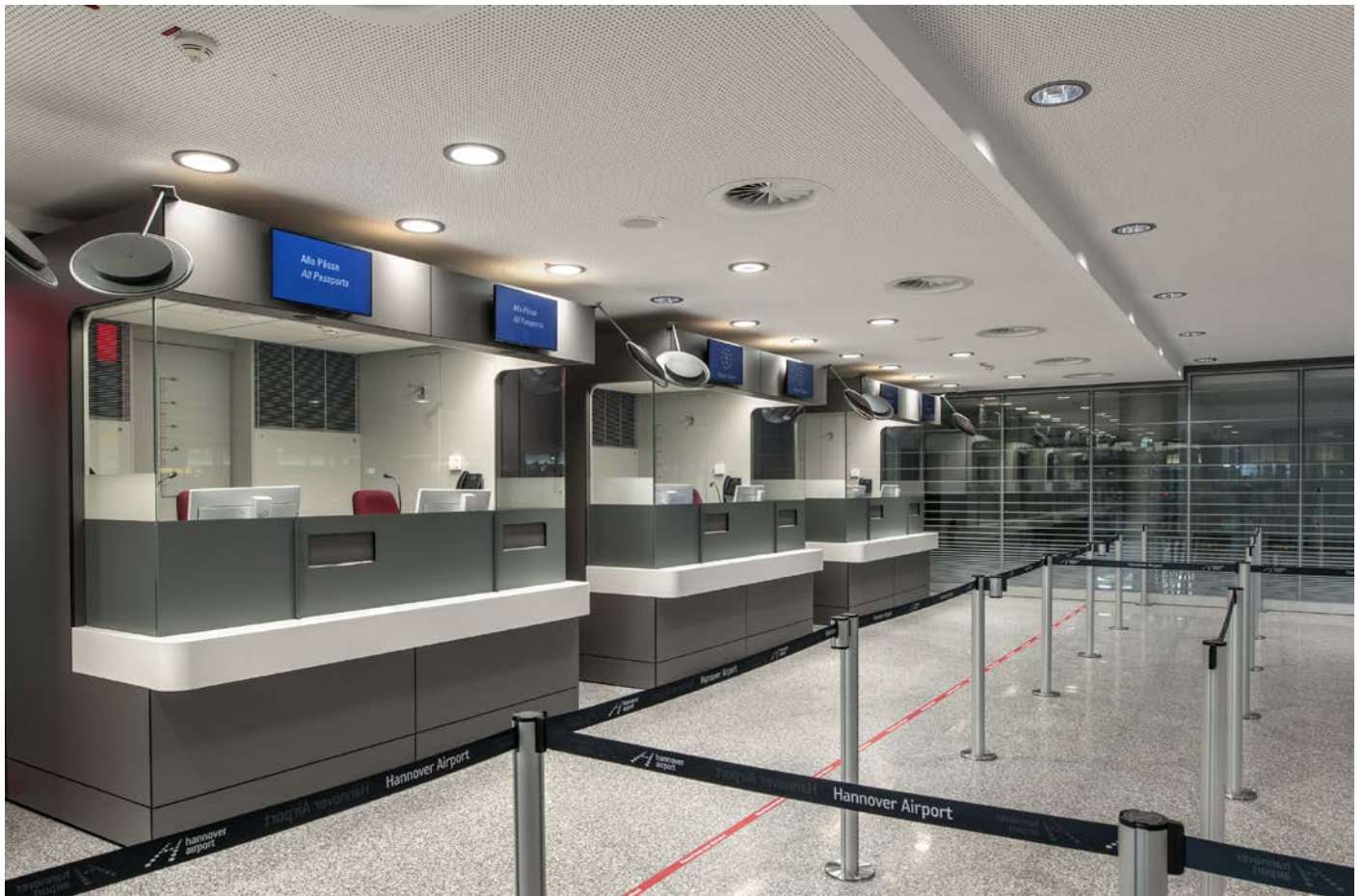
Cooling with linear gratings covering

AIR CLIMATE DESIGN



GraviVent®

- 34 units cooling convectors type AISI-W 08.51.2x2, suitable for performance class 2, for condensate accumulation, 800 x 525 x 153 mm [L x H x D], incl. mounting system for installation in drop shafts
- Horizontal outlet of cooled circulating air from the bottom of the drop shaft, which is then distributed in the room
- The simplest possible design for use in on-site drop shafts
- Condensate drain connection towards the drop shaft



PASSPORT CONTROL COUNTERS

Hannover Airport

TECHNICAL SPECIFICATION + DRAWINGS

GraviVent® – silent gravity cooling

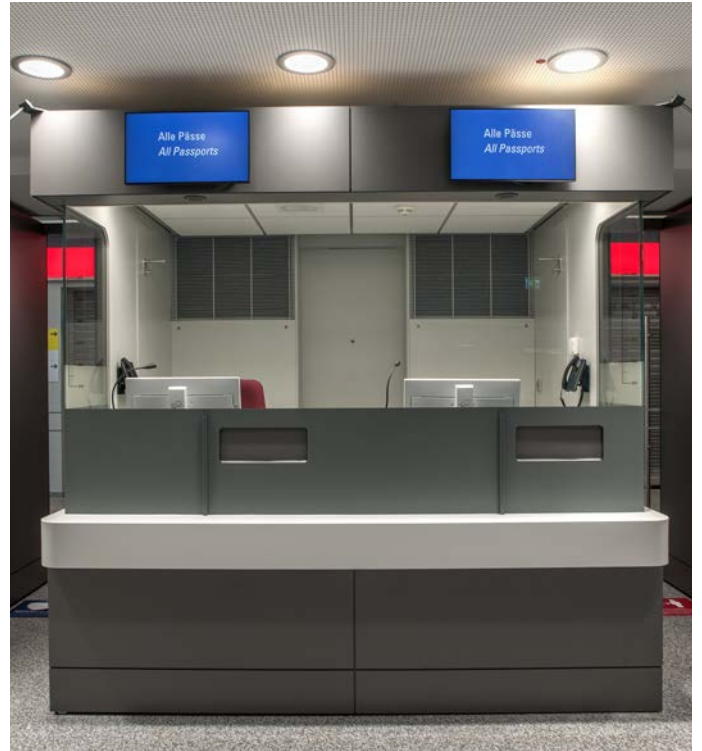
AIR CLIMATE DESIGN HOMOGENEOUS GRIDS



Homogeneous grids

Air outlets with filigree linear gratings

- Aluminium linear gratings type LSF 18/3.10 with 10 mm bar spacing = 70 % air passage, aluminium angle frames 20 x 20 x 2 mm with 4 mounting brackets per grating, air inlet 34 units 893 x 624 mm [L x W], air outlet 34 units 893 x 224 mm [L x W]
- Surface white powdered



PASSPORT CONTROL COUNTERS

Hannover Airport



TECHNICAL SPECIFICATION + DRAWINGS

GraviVent® – silent gravity cooling

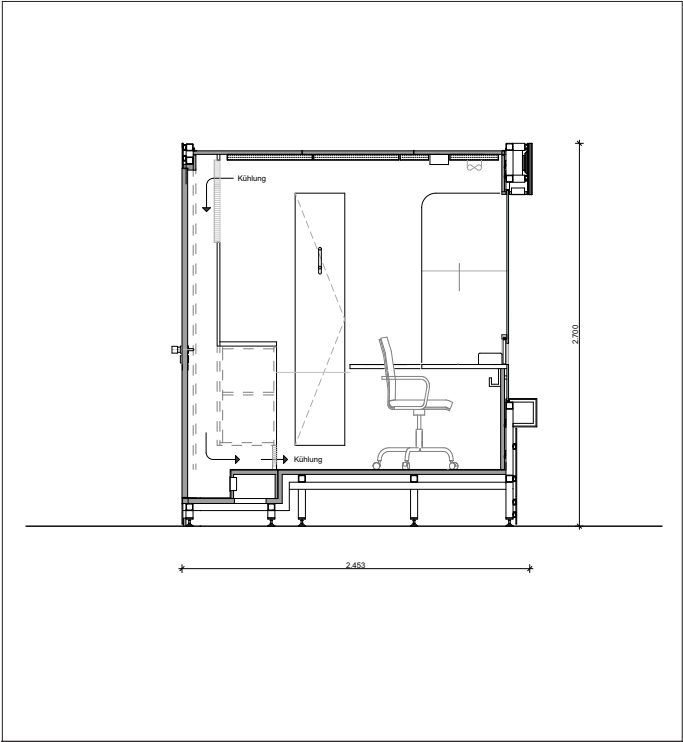
AIR CLIMATE DESIGN



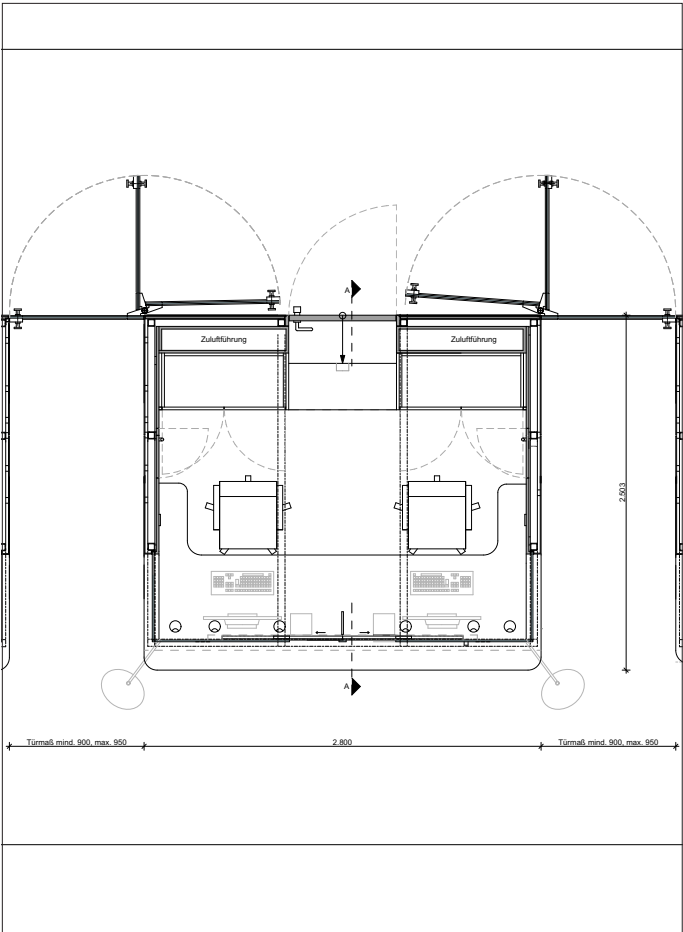
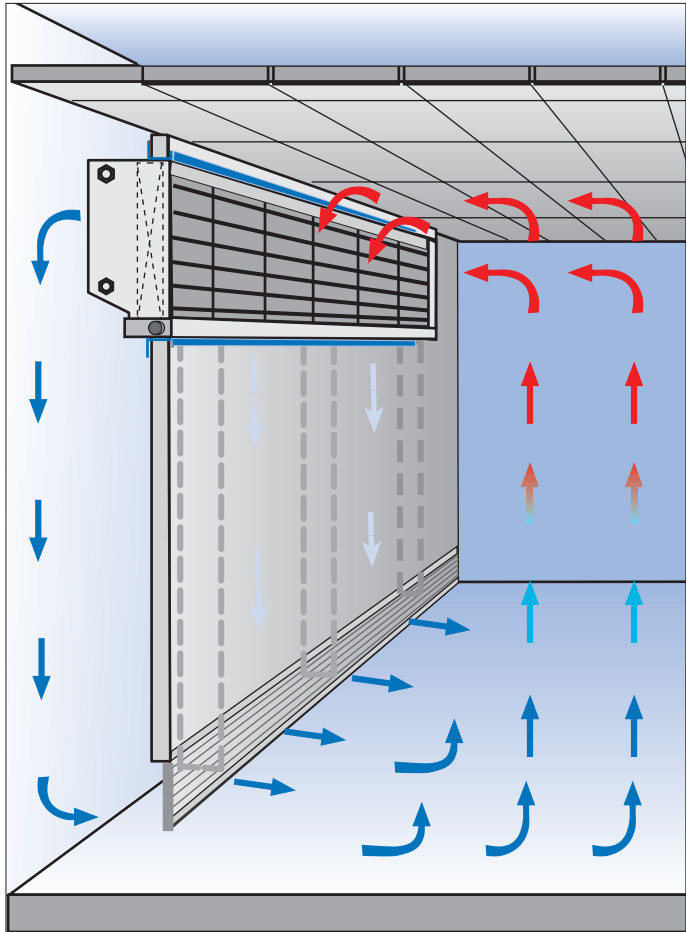
Technical Specification

Cooling

- Room temperature 26 °C
- Supply temperature 12 °C
- Return temperature 14 °C
- Temperature difference Δt_m 13 K
- Efficient duct height (H_{active}) 1.8 m
- Cooling capacity finned unit length 550 W/m



©Hannibal Innenarchitektur



© Drawings: TTC Timmler Technology (below left), Hannibal Innenarchitektur (right)

**////// KAP EUROPA
FRANKFURT //
////////// AM MAIN**



////// KAP EUROPA FRANKFURT /////////////// //////////////////// AM MAIN

CLIENT | ARCHITECT

ECE Projektmanagement GmbH, Hamburg | Eike Becker_Architekten, Berlin



Platinum for Kap Europa

Made for the future. "Kap Europa" is the world's first congress centre that has been awarded the Platinum Certificate of the German Sustainable Building Council (DGNB). Located adjacent to the Messe Frankfurt (Frankfurt Trade Fair), its facilities and intelligent partitioning effectively complement the large spaces of the congress centre.

"Kap Europa" is made for the future because planning, construction and operation are consistently aimed at conserving resources. ECE Projektmanagement GmbH and Eike Becker_Architects systematically implemented this ambitious overall concept by using environmentally sustainable materials and resources, energetically optimized windows and facades, power from renewable sources, LED lighting. In addition, 1000 square metres of green roofing improve the carbon footprint. The high number of measures also includes the conscious use of natural and physical phenomena: glass fronts create brightness inside the building. Better and cheaper than artificial light. The comfortable temperatures in the two large halls of the congress centre are based on using GraviVent® – a well-engineered

product for gravity cooling from TTC Timmler Technology GmbH. Originally designed for use in sound and television studios, this technical solution provides the benefit of ensuring a good climate and pleasant temperatures without producing any noise at all. The energy demand of the water-fed system is 50 to 70 percent lower than with traditional systems. And it has a higher performance than chilled ceilings.

This is an important aspect because the divisible "Meridian" congress hall on level 2 covers 660 square metres and the "Horizont" hall on level 4 can accommodate around 1000 people. That many persons in one place heat a space within a very short period of time. Usually. But thanks to the GraviVent® cooling units installed in the walls, hidden from the visitor's eye, nobody works up a sweat. The rising heated air is cooled down to 16 degrees by the water-fed system and sinks to the bottom through the duct below. It then exits again as a fresh breeze through horizontal outlets at the foot of the wall. Almost unnoticeably, because the low-impulse displacement ventilation efficiently keeps the room at a moderate temperature.



GRAVIVENT® – SILENT GRAVITY COOLING

"Meridian" hall + terrasse

AIR CON SYSTEM DESIGN



The generous room heights are another reason why GraviVent® works so well: The longer the duct behind the wall panelling, the stronger the cooling effect. To achieve the desired temperature and 30 kW of cooling power, 15 AISI cooling units were installed in the "Meridian" hall (ceiling height 7.30 metres). For the even larger "Horizont" hall (ceiling height 8.40 metres) 34 kW of cooling power had been specified and 21 cooling units now provide a pleasant airiness.

Naturalness and high tech, coolness and comfort: in the "Kap Europa" these terms merge in an exemplary fashion – this innovative congress centre provides an ideal environment to focus on your work, in perfect surroundings, with a perfect climate.



GRAVIVENT® – SILENT GRAVITY COOLING
"Horizont" hall

AIR CON SYSTEM DESIGN



TASK

GraviVent® – Silent gravity cooling

AIR CON SYSTEM DESIGN



GraviVent® | Technical Specification

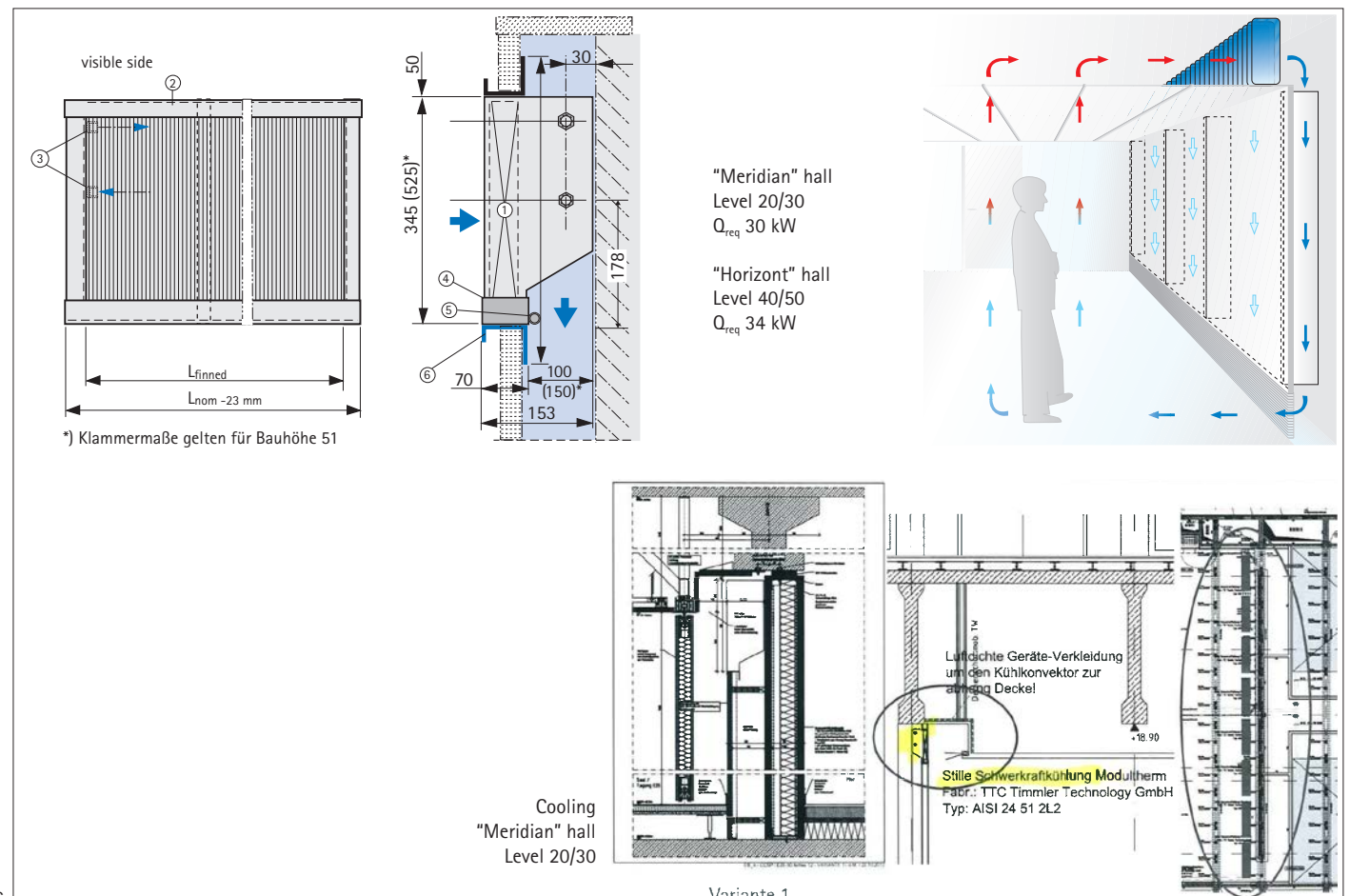
Dimensioning Silent Cooling

"Meridian" Hall

- Room height 7,500 mm | required cooling efficiency 30 kW
- 16°/19°–26 °C | H_{eff} (effective duct height) >7.0 m
- 15 units type AISI 24.51 = 36 m
Effective length 34.8 m x 884 W/m = 30.76 kW

"Horizont" Hall

- Room height 8,400 mm | required cooling efficiency 34 kW
- 16°/19°–26 °C | H_{eff} (effective duct height) >7.0 m
- 14 units type AISI 24.51 = 33.6 m
Effective length 31.78 m x 884 W/m = 28.04 kW
- 3 units type AISI 22.51 = 6.6 m
Effective length 6.36 m x 884 W/m = 3.27 kW
- 4 units type AISI 18.51 = 7.2 m
Effective length 6.88 m x 884 W/m = 4.02 kW
- Total hall 35.83 kW



//////////////// DLR RMC
OBER- //////////////////
/// PFAFFENHOFEN

A photograph of a modern building with large glass windows and a metal grate floor. The text is overlaid on the image.

/ DLR ROBOTICS +
MECHATRONICS //
//////////////////// CENTRE
OBER- //////////////////////
/// PFAFFENHOFEN

DLR ROBOTICS AND MECHATRONICS CENTRE Oberpfaffenhofen

ARCHITECT

Birk Heilmeyer und Frenzel Architekten, Stuttgart

Miracle of technology

The experts of the DLR Robotics and Mechatronics Centre are always one step ahead of the present: They develop intelligent robot systems for production lines, for example, in the automotive industry, cutting-edge applications for surgeons – even a joystick for astronauts. This is to be used by the crew of the International Space Station (ISS) to control a robot on earth. 300 employees and 80 students work in the newly built centre of excellence in Oberpfaffenhofen.

The building was designed by Birk Heilmeyer and Frenzel Architects in Stuttgart. Furnishings and design were oriented towards the needs of the people researching future-oriented technologies in these surroundings every day. This includes stable conditions, particularly in the labs and the workshops, hence, steady temperatures, no noise emissions. Any deviations or other disruptive factors would have a negative impact on their work and measurements.

Innovative solutions from TTC Timmler Technology were chosen for the air-conditioning technology, i.e. silent cooling and gravity cooling, by using the resource-saving, efficient TTC GraviVent product, because the company's high performance convectors and gravity cooling systems meet the client's specifications: A constant room climate with a maximum deviation of ± 1 °C, especially in the measurement labs as well as noiseless operation without ventilation. This does not just mean a high level of comfort but also precise results.

The filigree linear gratings serving as covers for the Floorunits also come from TTC Timmler Technology. Gratings and frames are made from stainless steel. The lengths of the individual components were adapted to the axial dimensions of the façade. This was a request of the architect and is a matter of course for TTC. It is this attention to detail that corresponds with the aesthetic demands of TTC as a specialist company.



SILENT COOLING + GRAVIVENT® – SILENT GRAVITY COOLING
Office and laboratory areas, workshops

AIR CON SYSTEM DESIGN



FILIGREE LINEAR GRATINGS

Made of stainless steel for floor units

HOMOGENEOUS GRID DESIGN



TECHNICAL SPECIFICATION

Silent cooling | GraviVent® – silent gravity cooling | Linear gratings

AIR CON SYSTEM DESIGN
HOMOGENEOUS GRID DESIGN



Silent cooling + GraviVent®

Office/laboratory areas and workshops

- High-performance cooling convectors type AECBK
- GraviVent® type AISI 510/300 mm
- Installed in sight on the ceiling;
By request of the customer there is no noise emission and an as much as possible constant temperature $\pm 1^\circ\text{C}$ especially in the measurement laboratories
- 312 metres in lengths of 3,000 mm



Filigree linear gratings

for floor units

- Stainless steel gratings type KSM-V3.4
- 10 mm bar spacing with angle frame made of stainless steel
- By demand of the architects lengths are adapted to the axial dimension of the façade
- 455 metres



**//// CONCERT HALL
COPENHAGEN /////**

//// CONCERT HALL COPENHAGEN ////



CONCERT HALL

Copenhagen (DK)

ARCHITECT | CLIENT

Jean Nouvel, Paris | Danish Radio

Being quiet

There it is, like a shining blue cube. The new Copenhagen Concert Hall is spectacular, even from the outside.

However, the real surprise is hidden on the inside, behind its glass fibre skin: The concert hall hangs in a steel construction, a bit like a meteorite. This is the brainchild of the French architect Jean Nouvel. This concert hall is a global synthesis of the arts. The idea to control the sound quality through a sail above the heads of the audience comes from Japan. Other details were designed and manufactured in Germany by TTC. A real eye-catcher are the revolving doors in the entrance area. They revolve above gratings that look like a huge LP made from metal. A stylised sound carrier as an entrée! Both Danmarks Radio, the client, and the architect were very enthusiastic about this subtle detail.

The interior ventilation gratings and the exterior drainage gratings are also aesthetically pleasing – they are of identical design and have a sleek appearance. Less visible but nonetheless important:

The air-conditioning gratings have cantilever arms, anchored in the concrete and the floor, and thus provide a special, reversible subconstruction to prevent acoustic noise being passed into the concert hall.

In collaboration with the architect Jean Nouvel and Danmarks Radio, the client, TTC Timmler Technology designed reversible and sound acoustically:

- _ The substructure for the floor unit ducts with brushed stainless steel linear gratings for the interior areas
- _ The substructure for the drainage system with brushed stainless steel linear gratings for the exterior areas
- _ For the interior/exterior intersections of the revolving doors, the swing doors and the double-winged sliding doors a combination of curved and straight linear gratings made of brushed stainless steel with a 5 mm bar spacing; can be walked on with stiletto-heeled shoes; have a load carrying capacity of 4 kN on 100x100 mm
- _ The energy efficient silent gravity cooling GraviVent® for the studio control rooms

On the following page you will only find information about GraviVent®, the complete reference sheet can be found at www.ttc-technology.de



CONCERT HALL

Copenhagen (DK)

GRAVIVENT® – SILENT GRAVITY COOLING

Cooling with linear gratings covering

AIR CON SYSTEM DESIGN HOMOGENEOUS GRATINGS



GraviVent®

- Energy efficient silent gravity cooling in the studio controll rooms
- 53 metres of chilled beams incl. fixing system for installation in the drop shafts
- Grating cover with aluminium gratings, powder-coated black according to RAL9005 matt or colour-coordinated with the platform for the source ventilation



///////////////// **LIBRARY**
MED CAMPUS /////
///////////////// **UNI LINZ**

LIBRARY MED CAMPUS UNI LINZ



ARCHITECT | ENGINEER

Lorenzateliers ZT GmbH, Wien/Innsbruck | Sautter ZT, Graz

Airy learning space

The new medical faculty in Linz is quite different from what was originally intended. Fortunately, because the result is a piazza around which the four buildings are clustered. As different as they are in terms of volume, colour and materials, they all refer to each other, and each one stands for a function: lecture halls, laboratories, administration and the library.

The Faculty of Medicine library is mainly run as an e-library and has a high quality of stay thanks to its bright, open rooms. However, so much open space also requires thermal and air-hygienic comfort so that the students remain concentrated and efficient.

Ideal conditions for GraviVent – the silent gravity cooling system from TTC Technology. Silent operation without ventilation and without draughts ensures a pleasant climate for reading and studying through natural convection – in summer and winter.

The façade, consisting mainly of a lot of glass and larch wood slats for shading, prevented the drop shafts from being attached to the walls, so another solution was needed. This was found in that the drop shafts simultaneously function as walls of the sanitary cores, which are arranged as cubes in the room and covered with textile fabric.



GRAVIVENT® – SILENT GRAVITY COOLING

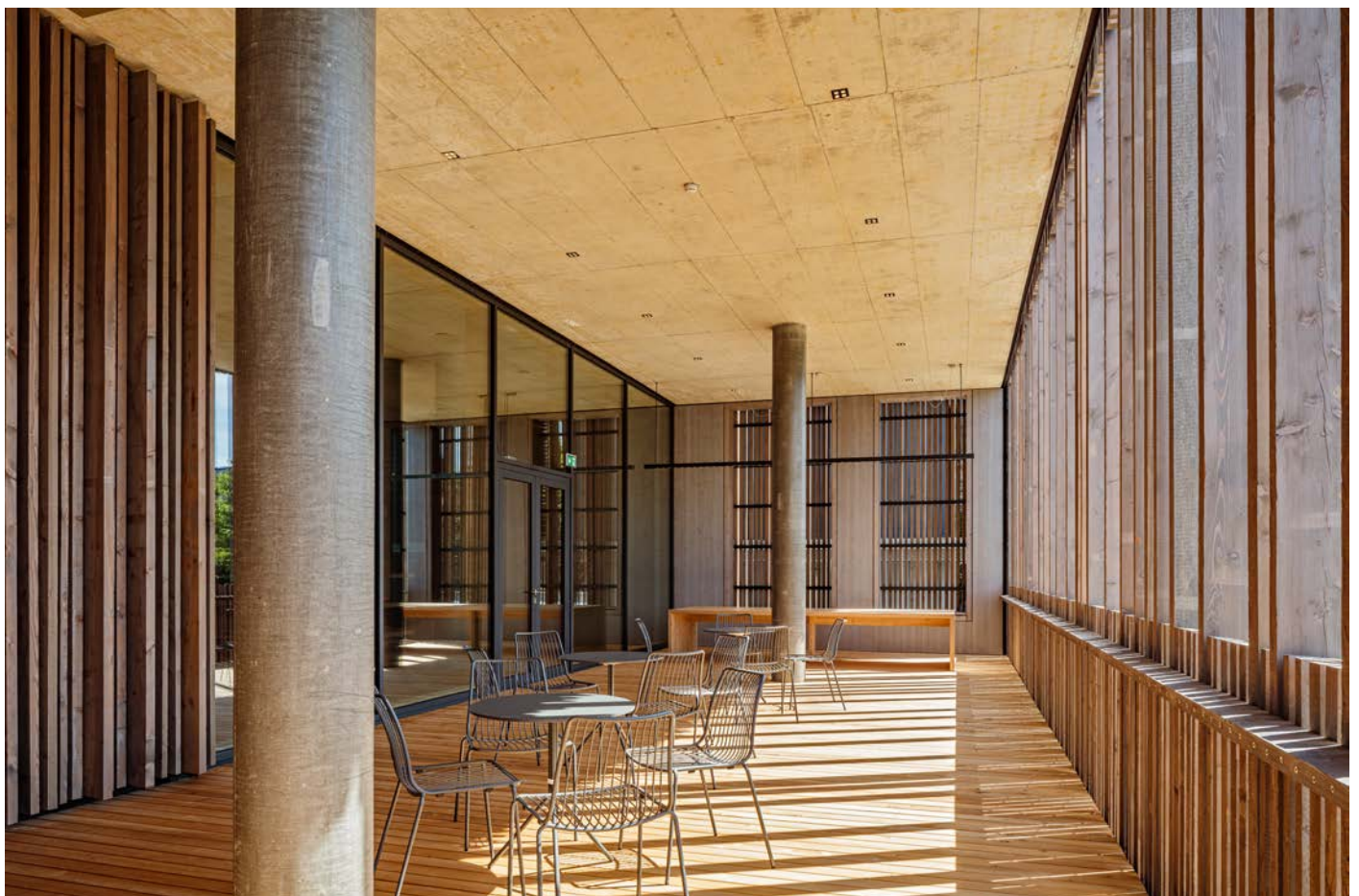
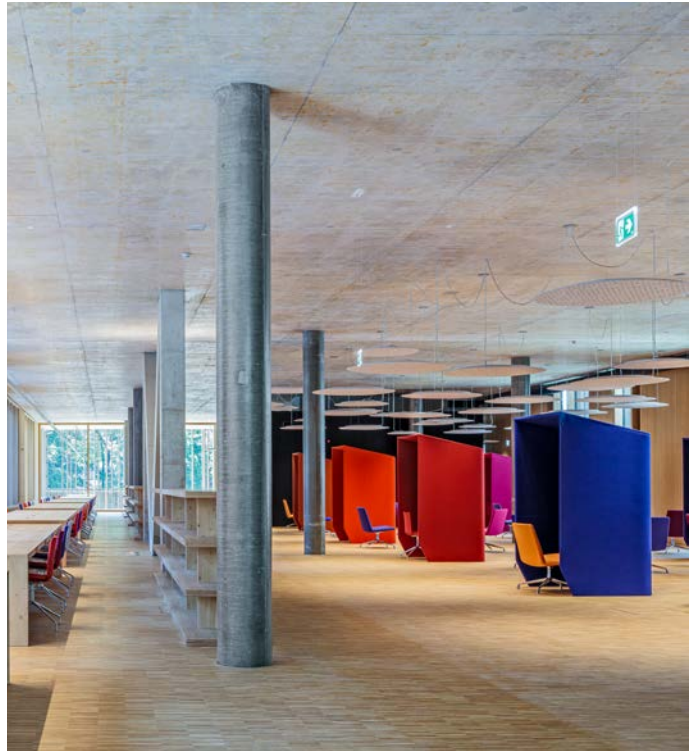
Cooling with linear gratings covering

AIR CLIMATE DESIGN



GraviVent®

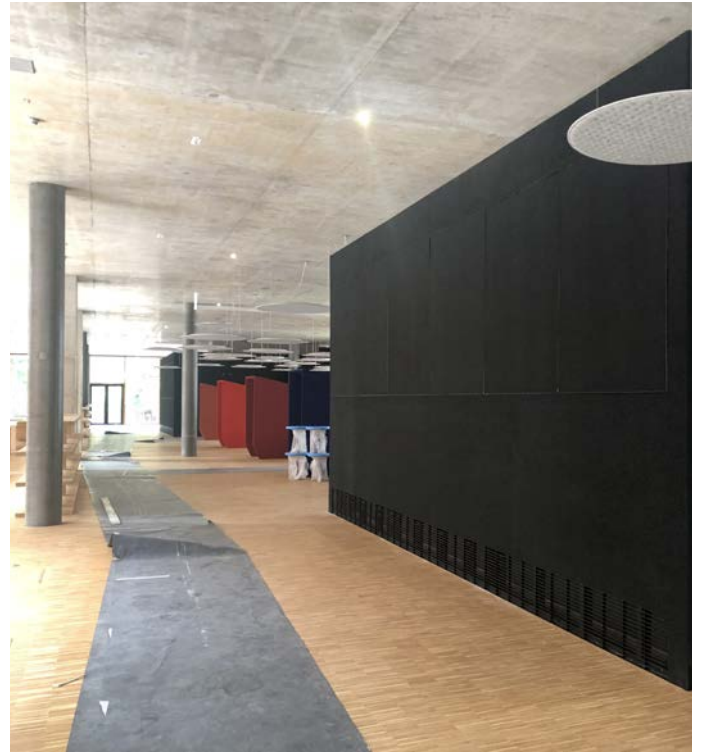
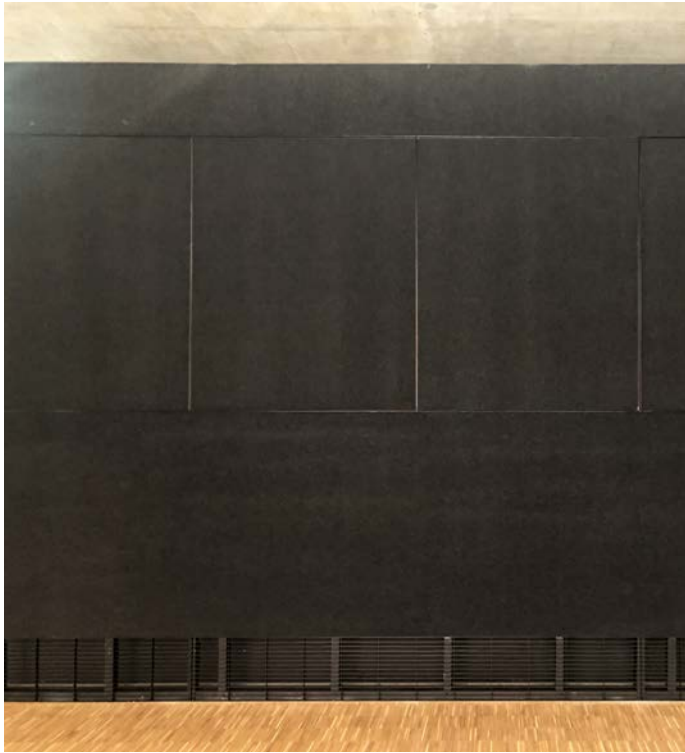
- 30 units cooling convectors type ISHK-W 25, in three lengths with connections on the left or right, 550 x 250 x 800/1,000/1,200 mm [H x W x L], incl. mounting system for installation in drop shafts
- High-performance cooling unit for dissipating sensitive cooling via guided, free convection
- Suitable for mounting inside a drop shaft
- Condensate tray made of aluminium over the entire cooling unit length
- Condensate drain connection towards the drop shaft
- For use with cooling medium of drinking water quality according to VDI 2035



PICTURES + FUNCTIONAL PRINCIPLE

GraviVent® – silent gravity cooling

AIR CLIMATE DESIGN



TECHNICAL SPECIFICATIONS + DRAWINGS

GraviVent® – silent gravity cooling

AIR CLIMATE DESIGN



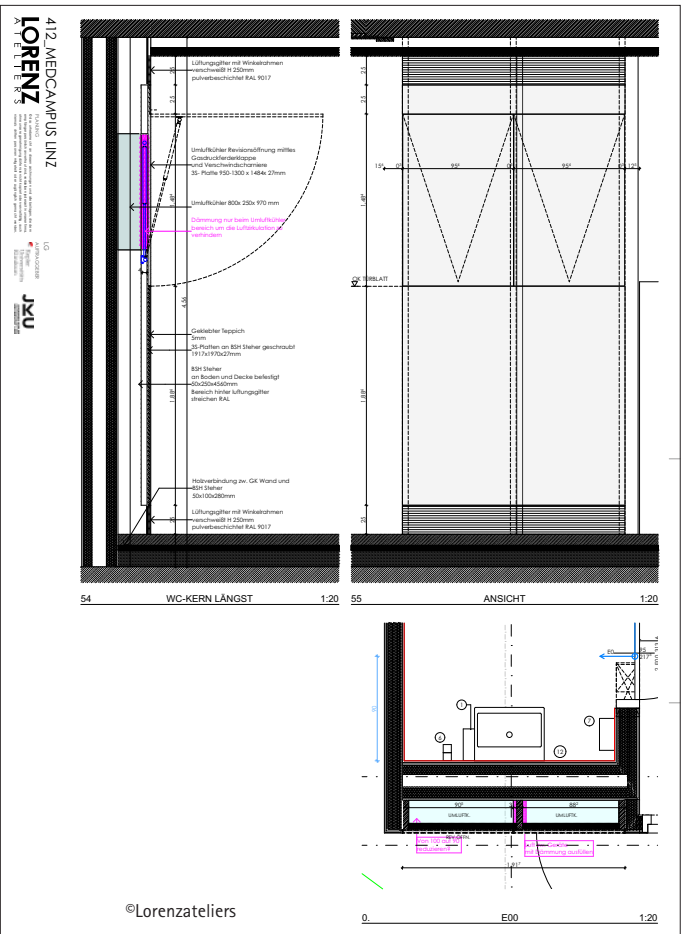
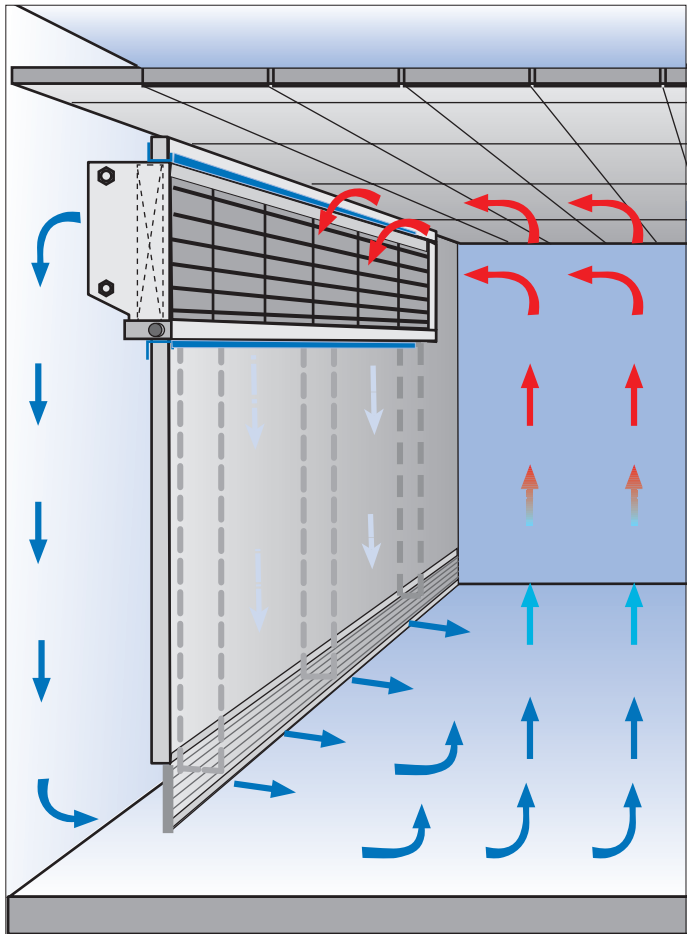
Technical Specification

Cooling ground floor + upper floor

- Room temperature 26 °C
Supply temperature 8 °C
Reply temperature 12 °C
Temperatur difference Δt_{um} 13 K
- **Ground floor**
Effective duct height (H_{active}) 3.0 m
Cooling capacity finned unit length 1.6 KW/m
- **Upper floor**
Effective duct height (H_{active}) 2.3 m
Cooling capacity finned unit length 1.2 KW/m

Heating ground floor + upper floor

- Room temperature 20 °C
Supply temperature 70 °C
Reply temperature 55 °C
Temperature difference Δt_{um} 42.5 K
Effective duct height (H_{active}) 0.15 m
Cooling capacity finned unit length 0.7 KW/m



//// THEATERHAUS
HALL 7 //////////////////////////////////////
//////////////////////////////////// **LEIPZIG**

**//// THEATERHAUS
HALL 7 ///////////////
////////// LEIPZIG**

THEATERHAUS HALL 7

Leipzig

ARCHITECT | PLANNER

W+V Architekten, Leipzig | ZBP Zimmermann + Becker, Leipzig

(No) Spinning Yarn

A former cotton spinning mill in Leipzig – until the beginning of the twentieth century the largest in continental Europe and still in operation after the fall of the Berlin Wall – has been transformed within a few years into an internationally known centre of art and culture. Under the motto »from cotton to culture« mainly artists, musicians, designers, architects, galleries, but also craftsmen and companies have taken up residence in the old factory halls. In the meantime, large parts of the approximately 10 hectare area have been renovated and revitalised..

Hall 7, which was not built in brick in 1907, but as one of the first steel skeleton structures in Leipzig in Hennebique construction, has been the new location of the theatre house since 2019 and unites the Leipzig dance theatre LTT, LOFFT – the Theatre and the Theatre of the young world (TdJW) under one roof.

On 4,000 square metres, there are administration, storage and technical rooms on several floors, as well as rehearsal rooms and two black box stage rooms on the two upper floors, one of which is a large hall with four playable sides. This was exactly the special requirement: the walls for the GraviVent shafts must be suitable for active dance and theatre play such as jumping on.

For this, the experts relied in GraviVent the silent gravity cooling system from TTC Technology. The extremely high loads require a powerful cooling system, which, for architectural reasons, also had to be largely invisible. The coolers are controlled according to the wet-bulb temperature and are operated in a sliding mode. The flow temperature of the cooling water is 16 °C, the water is returned at 18 °C, or 60 °C in the flow and 40 °C in the return in the case of heating.



GRAVIVENT® – SILENT GRAVITY COOLING

Heating/Cooling with linear gratings covering

AIR CLIMATE DESIGN HOMOGENEOUS GRIDS



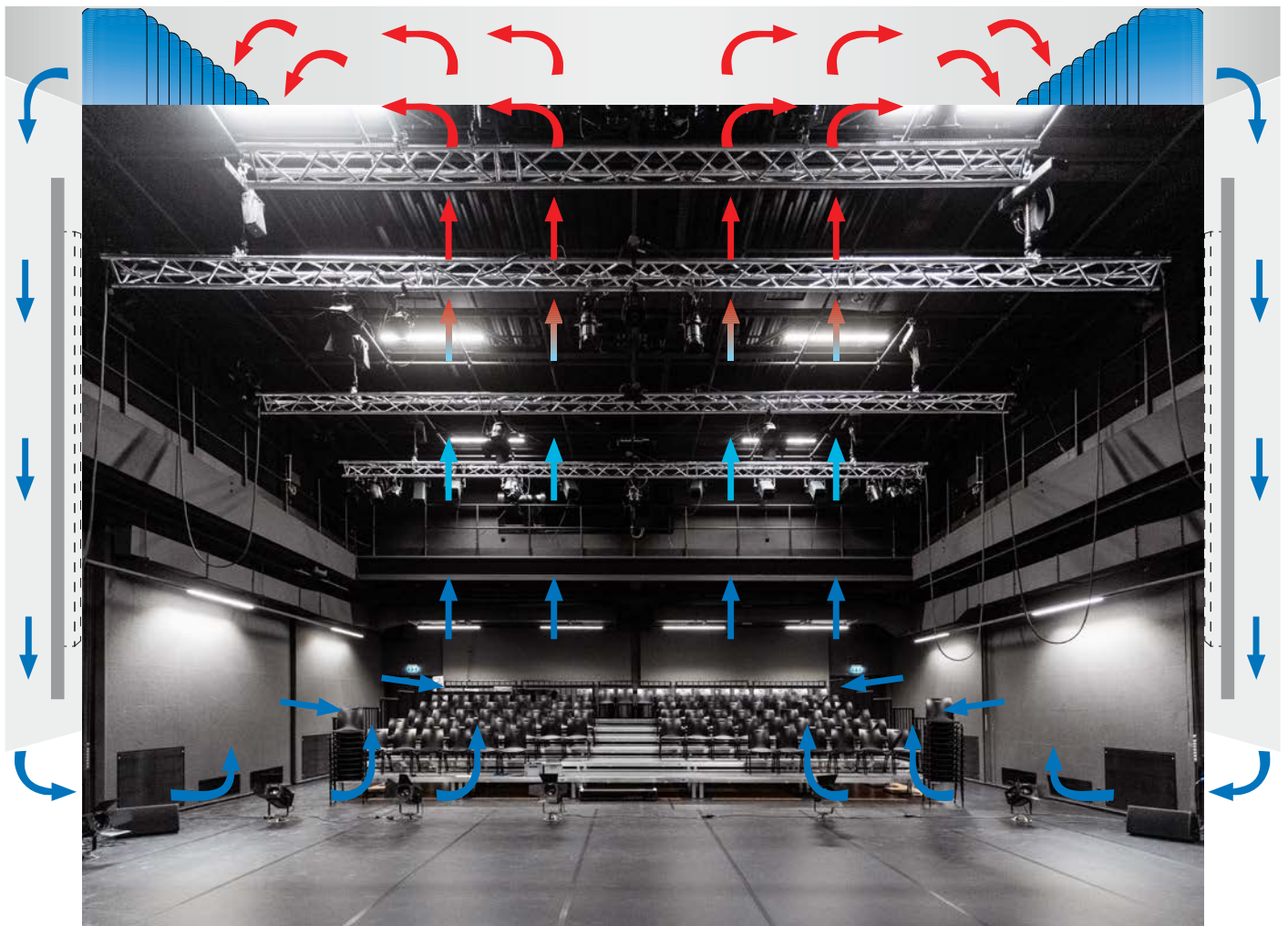
GraviVent®

- 45 units heating/cooling convectors type ISHK 10.51
1,000 x 500 x 150 mm [L x H x D]
incl. mounting system for installation in drop shafts
- Horizontal outlet of cooled circulating air from the bottom of the drop shaft, which is then distributed in the room
- The simplest possible design for use in simple on-site drop shafts
- Condensate drain connection towards the drop shaft

Homogeneous grids

Air outlets with filigree linear gratings

- Stainless steel linear gratings type LSF, 1,450 x 240 mm [L x W],
with 10 mm bar spacing = 70 % air passage + fixing plates
with aluminium angle frame 25 x 25 x 3 mm
- 2 units per GraviVent shaft (1 x top, 1 x bottom)



THEATERHAUS HALL 7

Leipzig

TECHNICAL SPECIFICATIONS + DRAWINGS

GraviVent® – silent gravity cooling

AIR CLIMATE DESIGN



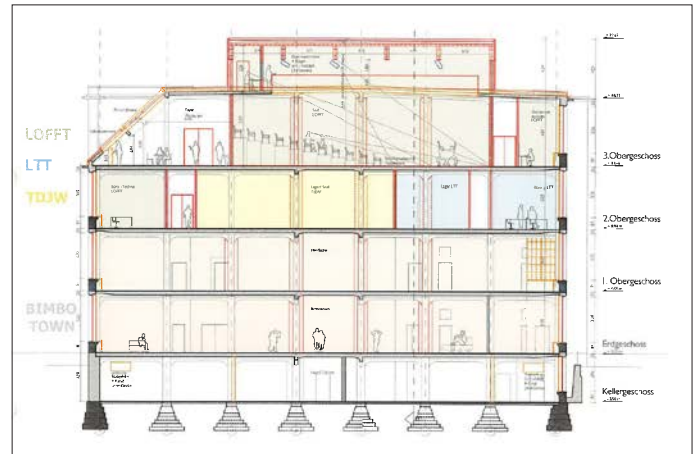
Technical Specification

Cooling

- Effective duct height 3,050 mm
- Supply/Return temperature 16/18 °C
- Room temperature 24 °C
- Cooling efficiency min. 504W per unit

Heating

- Duct height 250 mm
- Supply/Return temperature 60/40 °C
- Room temperature 21 °C
- Heating efficiency min. 600W per unit



© W+V, Leipzig



**FRAPORT
FRANKFURT
AM MAIN**

AIRPORT FRANKFURT

TERMINAL 1 EXTENSION

Frankfurt am Main

CLIENT | ARCHITECT

gmp · Architekten von Gerkan, Marg und Partner, Hamburg

Reaching for the sky

Transparent and flooded with light, that is how Gate A-Plus at Frankfurt Airport presents itself. This extension was designed by the Hamburg firm of architects gmp (von Gerkan, Marg and partner): The planners focussed on a virtually full glass façade towards the south and the runway and spanned the rotunda in the business area with a glass dome. Even the areas where escalators connect the various floor levels give a taste of the sky. They too have transparent, slightly domed glass roofs.

Intelligent heating and air-conditioning technology is needed to give these sections of the building a pleasant indoor climate for travellers from all over the world. Having a glass roof means solar radiation in summer and thus increased temperatures. In winter, however, the entry to the escalator area can cool down considerably. Considering the additional capacity of six million passengers per year this presents a major challenge for the air-conditioning technology. TTC Timmler Technology, as a specialist for state-of-the-art energy efficient systems, has contributed an innovative solution that matches the concept of the high-quality interior design: 28 heating and cooling ducts

are positioned behind the wall panelling, invisible to the eye of the observer.

The gravity cooling in particular is very energy-efficient because warm air that rises upwards is sucked in through discreet openings and then cooled with water. It then re-enters the room as a refreshing breeze through gratings at the foot of the wall. This process has numerous advantages: The water cooled GraviVent system entails significantly lower costs than traditional applications. It operates in silence and the low-impulse displacement ventilation is very unobtrusive. Convector heaters guarantee a comfortable room climate during the winter months. The air-conditioning operates gently and evenly – both cool and warm airflows disperse imperceptibly.

The covers at the upper end of the wall panelling and in the floor also come from TTC Timmler Technology. The substructure for the gratings was produced in close cooperation with the drywall constructor and the specialist firm for ceiling and wall systems and the length of the comb gratings was adapted to the panel dimensions. Hence, joint matches joint, resulting in homogenous surfaces.



AIRPORT FRANKFURT TERMINAL 1 EXTENSION Frankfurt am Main

TASK

GraviVent® – Silent gravity cooling

AIR CON SYSTEM DESIGN



GraviVent® | Technical Specification

GraviVent cooling units type ASIS 51.21.2

- Performance: high power capacity category 2
with condensation tray and drain pipe
Front side powder-coated black
- 30 units 1,800 mm
- 5 units 2,400 mm

Heating convectors type HK 2.075.200

- made of copper pipes with aluminium fins
- 22 units 1,800 mm
- 5 units 2,400 mm

Air inlet at the top

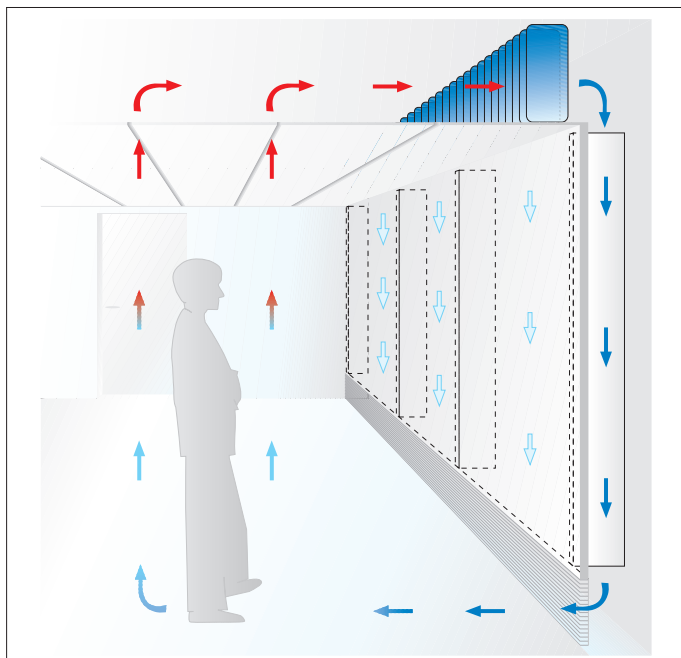
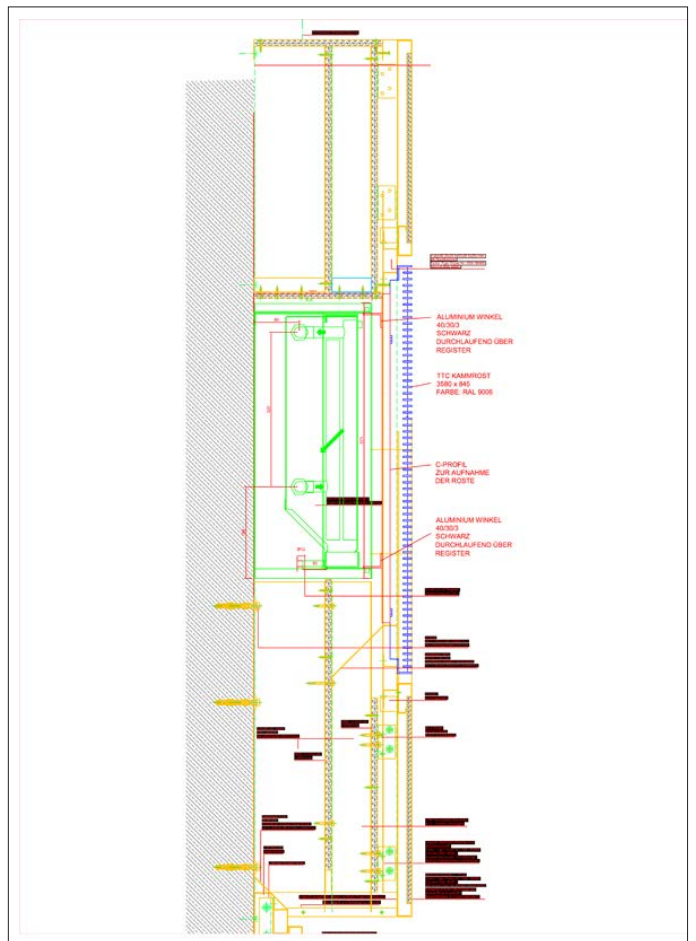
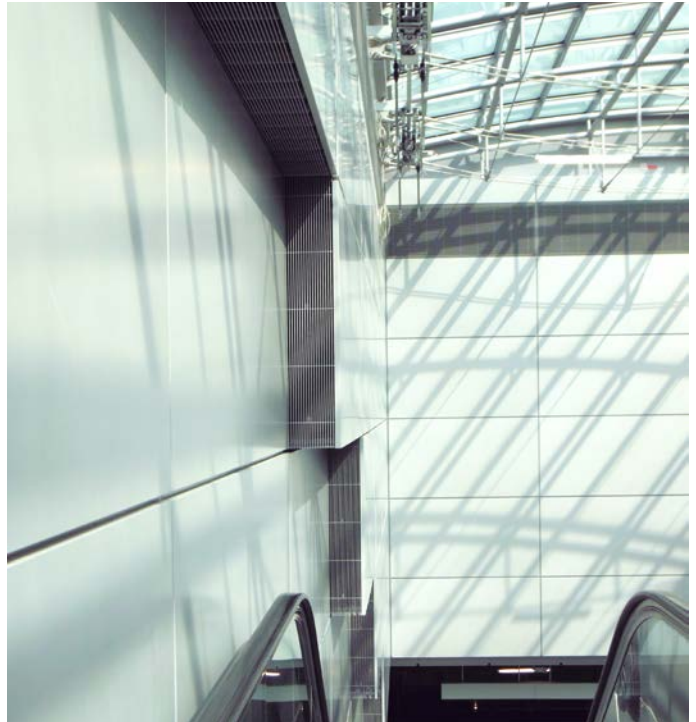
Linear gratings type KST 18.03.77 AP

- made of aluminium, bar distance 10 mm, total height 45 mm,
powder-coated according to RAL9006
- 22 units 3,600 x 845 mm [L x W]
- 4 units custom-made fitting pieces
- 6 units 2,700 x 845 mm [L x W]

Air outlet at the top

Linear gratings type KST 18.03.77 AP

- made of aluminium, bar distance 10 mm, total height 45 mm,
powder-coated according to RAL9006
- 22 units 3,600 x 270 mm [L x W]
- 4 units custom-made fitting pieces
- 6 units 2,700 x 270 mm [L x W]



///// EXPERIMENTA HEILBRONN ///////////////

//// EXPERIMENTA HEILBRONN //////////////



BUILDER | ARCHITECT | PROJECT MANAGEMENT/DGNB AUDITORS

Dieter Schwarz Stiftung, Neckarsulm | Sauerbruch Hutton, Berlin | Drees + Sommer, Stuttgart



Lighthouse project with certification

Experimenta in Heilbronn is the first museum building to receive platinum and diamond certification from DGNB, the German Sustainable Building Council. DGNB has used the above certification to reward a real showpiece for the Dieter Schwarz Foundation. The Science Center is a good example of the perfect symbiosis of outstanding architecture and innovative technology.

At the heart of the Science Center is a silent gravity cooling system by TTC Timmler Technology. For the architects, the innovative air conditioning technology was an important component of this sustainable showcase project, because when in operation it uses almost no energy and at the end of its product lifecycle it can be completely dismantled. Moreover, it integrates into the building's architecture so completely that it becomes as good as invisible.

Experimenta is a world of experiences and learning which has now had a spectacular new building added to it. Here, each day up to 2,500 visitors can discover and learn in a way that is refreshing and by no means pedantic. It is often the case that the body temperatures of large groups of people present air conditioning technology with a major challenge. Particularly if the contractor has, from the outset, defined a clear objective, the building concept should

not only be technically well-thought-out, but also and especially an ecologically exemplary one. And this not only with the desired DGNB certification in mind. It was, amongst other things, the intention of Schwarz Real Estate to put in place exemplary building management, thus making for the kind of property that would highlight new approaches, at as a beacon project and serve as a shining example, one that would be taken notice of far beyond the confines of the region. With Drees & Sommer, a leading European consultancy, planning and project management company became involved in the project.

For their undertaking, the experts opted for the Gravivent silent gravity cooling system by TTC Technology. The extremely high indoor cooling requirement of the exhibits and media technology called for a powerful cooling system, one that also needed to be as invisible as possible for architectural reasons. Over the four stories there was total wall length of only 179 meters available on which the type AASI.51 high-performance units could be installed. The cooler is controlled in accordance with the wet-bulb temperature and is self-adjusting. Here the flow temperature of the cooling water is 15 °C, when it reaches 17 °C the water is reintroduced into the cooling system.



GRAVIVENT® – SILENT GRAVITY COOLING

Air conditioning of the exhibition spaces

AIR CON SYSTEM DESIGN HOMOGENEOUS GRIDS

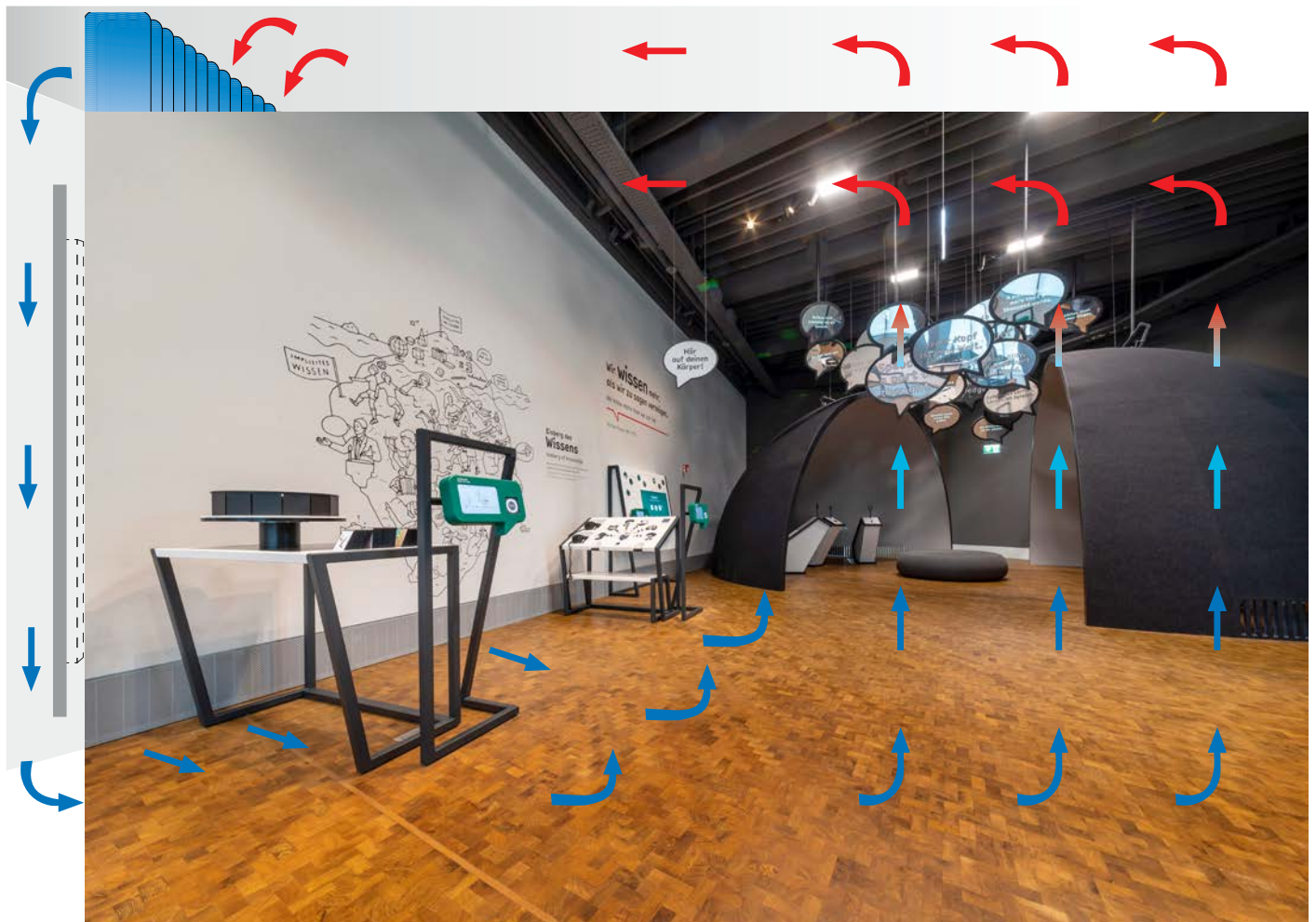


The delta is sufficient to keep the ambient temperature to a maximum of 26 °C at all times. 'This system is extremely energy-efficient, quiet and low-maintenance and is ideal for experimenta's high walls and the chosen ventilation concept,' explains project manager Jürgen Behringer of Drees & Sommer confidently.

Many different factors contribute to making experimenta what it is, namely an exemplary building in all respects. Its glass façade means that the incident light is natural; this saves on energy for lighting. In order to keep the thermal and cooling loads as low as possible the engineering experts at Drees & Sommer optimized the façade's thermal behavior and its performance with regard to daylight. A high degree of comfort in the building is achieved through component cooling in the ceiling and a gravity cooling system which works with heat exchangers and physical effects. By using groundwater in combination with a heat pump, 75 percent of the heat used in heating can be derived from groundwater. When the system is in cooling mode the groundwater absorbs the heat. Thus, thanks to the well and the cooling load reduction, each year the system cuts emissions by 200 metric tons of CO₂. By using these technologies, this energy concept adapted to usage manages to get

significantly below the statutory requirements. 'An ideal package, one that combines the advantages of different systems,' explains Jürgen Behringer of Drees & Sommer.

In the themed areas where media technology, light and the exhibits themselves generate heat the gravity cooling system keeps temperatures perfect and gets the air moving. As well as being cheap to operate, the system's silent cooling is one of the important advantages to the product, particularly in the learning environments where concentration is called for. In this context, the design approach favored by the architects Sauerbruch Hutton called for air vents that were frameless like a wall, could still be inspected, and simultaneously guaranteed the necessary airflow for the Gravivent system. In consultation with the architects, the idea was to purpose-develop a KSM-V grids with spacing between the bars of 2.5 mm as this met all the requirements. Whereas the high-performance units are almost invisible despite being installed on-wall, the refined KSM-V type air vents meet DGNB requirements. These were also designed and manufactured by TTC Technology and guarantee a harmonious visual appearance.



GRAVIVENT® – SILENT GRAVITY COOLING

Air conditioning of the exhibition spaces

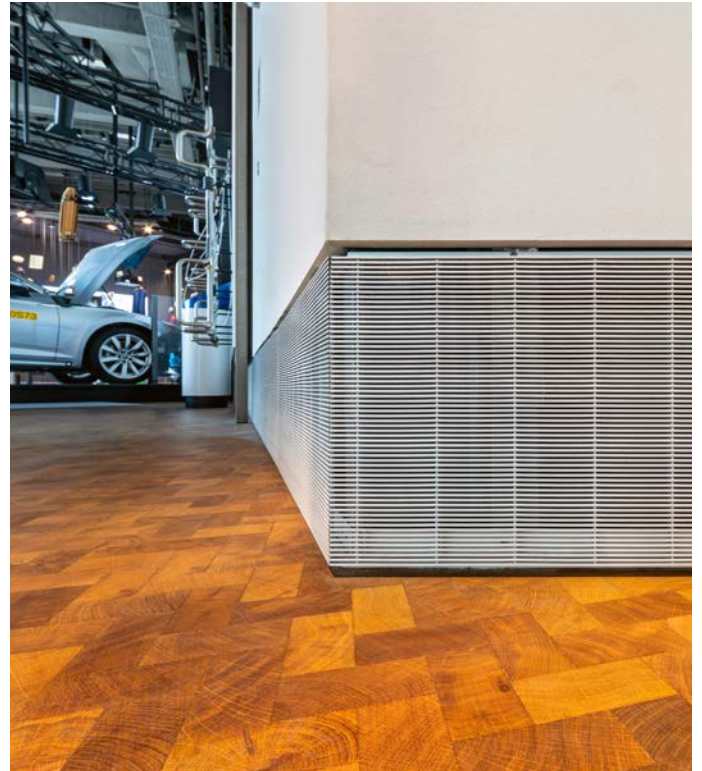
AIR CON SYSTEM DESIGN
HOMOGENEOUS GRIDS



GraviVent®

Silent gravity cooling

- High performance units type AASL51, in total approx. 179 meters, in unit lengths of 1,000 to 2,400 mm
- Performance categorie 2; coated in special colours after specifying for the purpose of certification
- Water flow/Return temperature 15/17 °C
Room temperature 26 °C
Performance per meter 950 Watt



GRAVIVENT® – SILENT GRAVITY COOLING

Air conditioning of the exhibition spaces

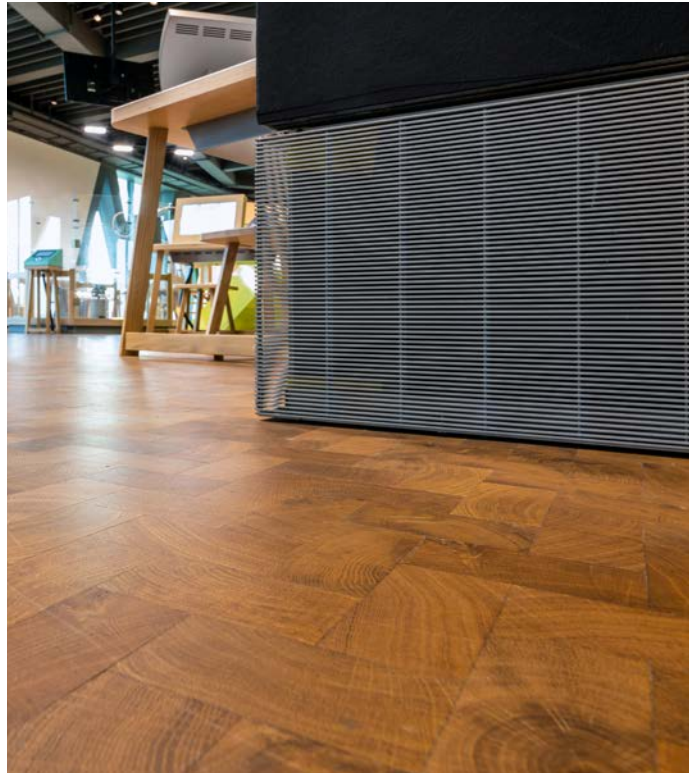
AIR CON SYSTEM DESIGN HOMOGENEOUS GRIDS



Homogeneous grids

Air outlets with filigree linear grids

- Stainless steel linear grids type KSM-V | width 300 mm, total length 360 meters straight grids + 25 meters curved grids in the entrance area
- 2 mm thickness, bar spacing 2.5 mm, likewise 2.5 mm to supporting angle used as skirting base; hidden mounting by selective brackets for the attachment in metal support section; Recesses for single/double power sockets; removable through fold mechanism of the grids; general impression of a continuous grid as skirting board
- Symmetrical divided cross-connections, as well across grid divisions; built-in flaps as access to ELT installations such as power sockets



GRAVIVENT® – SILENT GRAVITY COOLING

Air conditioning of the exhibition spaces

AIR CON SYSTEM DESIGN
HOMOGENEOUS GRIDS



GRAVIVENT® – SILENT GRAVITY COOLING
Air conditioning of the exhibition spaces

AIR CON SYSTEM DESIGN
HOMOGENEOUS GRIDS



TECHNICAL SPECIFICATION

Linear gratings | Drainage channels

AIR CON SYSTEM DESIGN

HOMOGENEOUS GRIDS + DRAINAGE CHANNELS



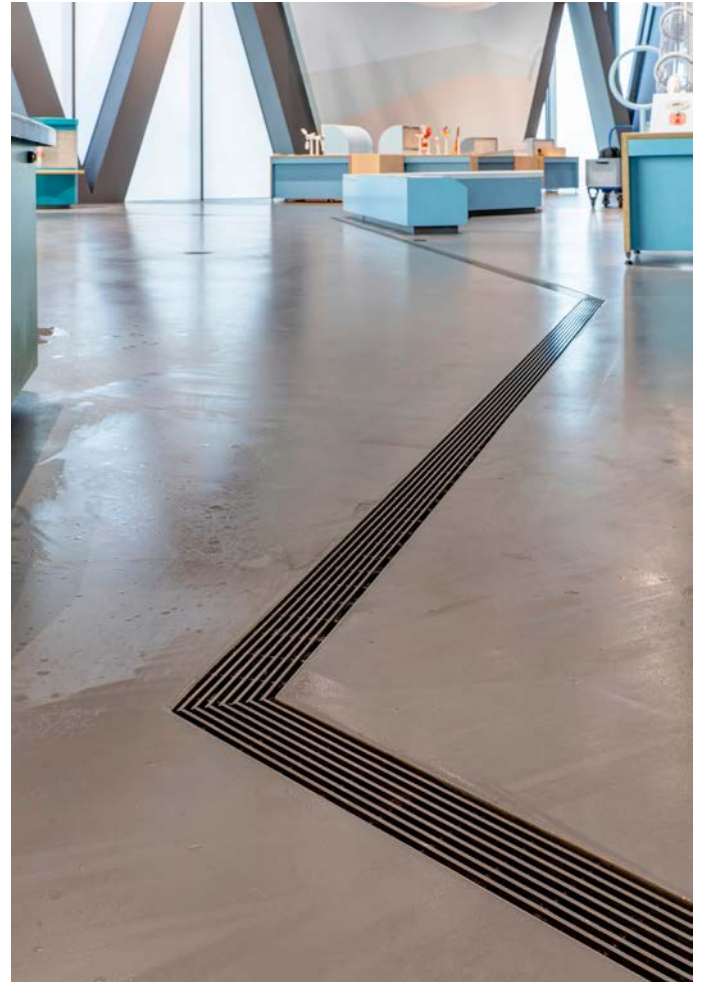
Grids + channels

Linear grids for smoke outlets in the staircase

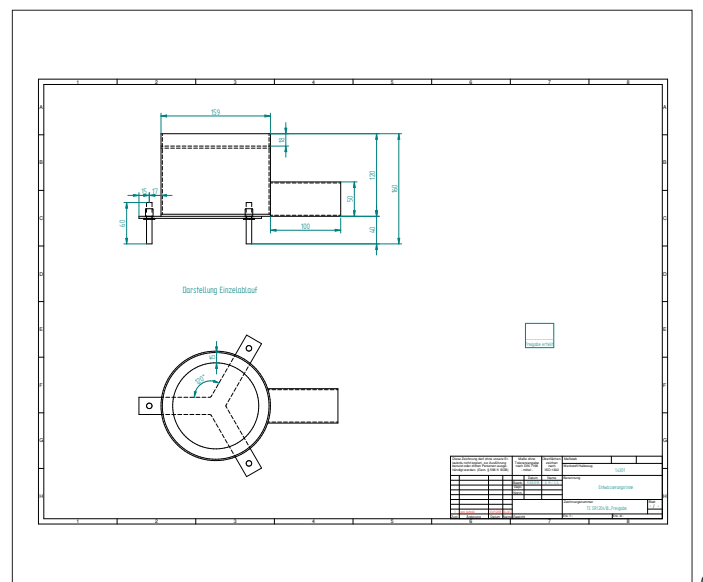
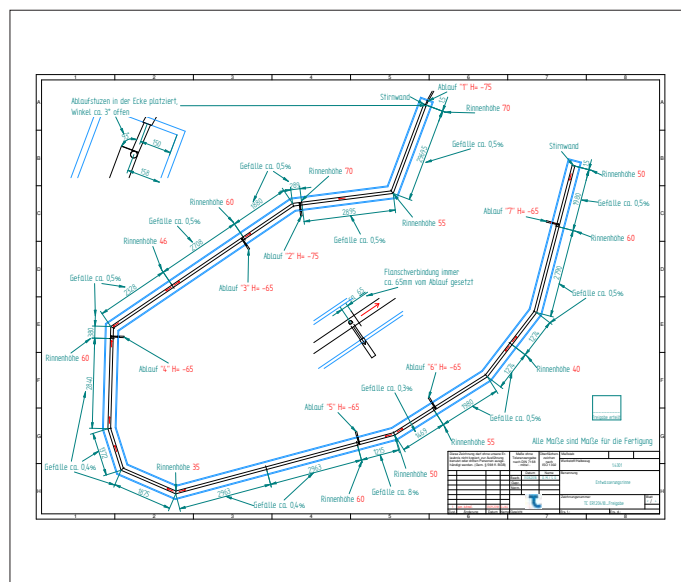
- Linear grids type KSF made of powder-coated steel; bars 18/3, total height 50 mm, bar spacing 10 mm; 77 % air outlet with angle profile 40/30/3 mm
- Width 730 mm | 8 lengths each 1,500 mm
- Frameless appearance through identical bar spacing between the profiles

Water games

- Stainless steel drainage channels with slope; height from 35 to 97 mm, parts flanged; welded drain $\varnothing$ 32 mm, length 200 mm
- Stainless steel linear grids type KSM-V | width 86 mm, total length 38 meters; profile width 3.4 mm, bar spacing 7 mm, slip resistance R10 linear 9 miter corners



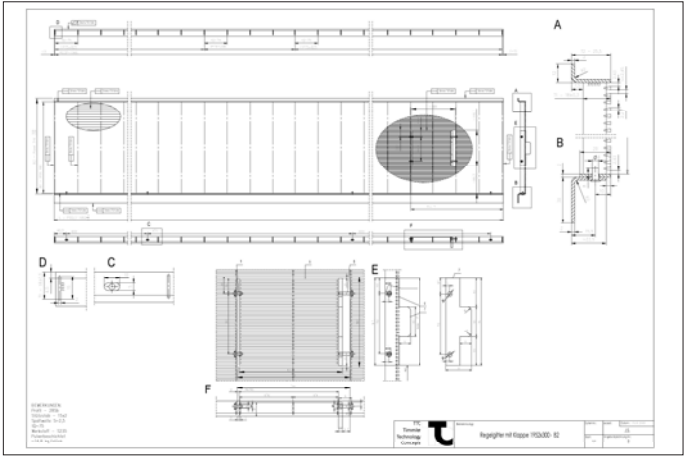
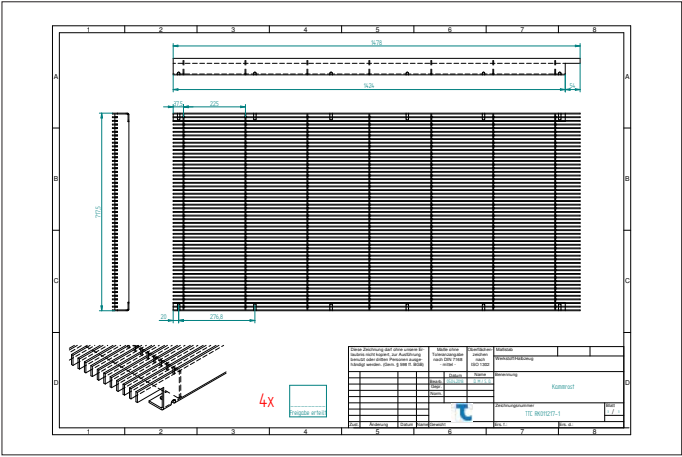
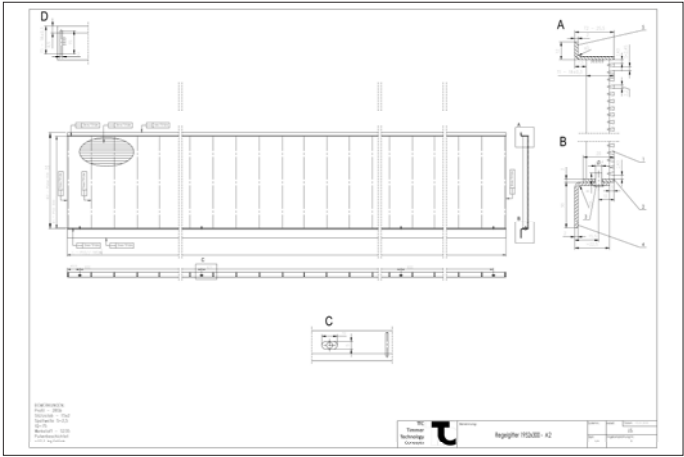
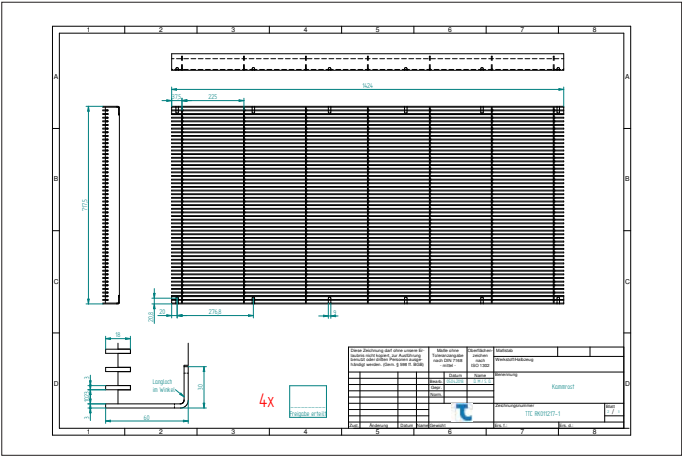
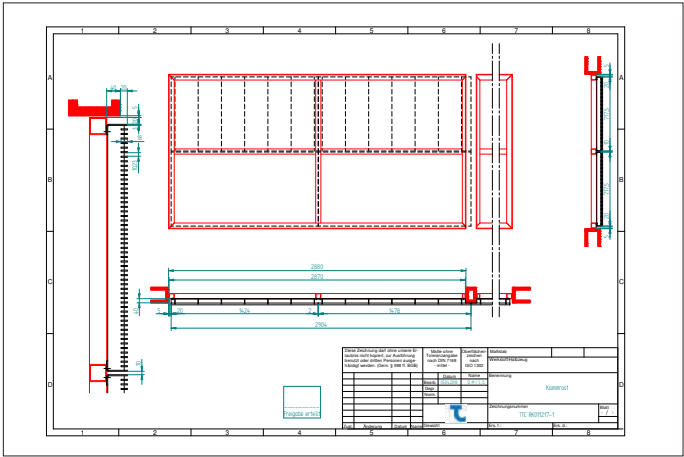
© Drawings: TTC Timmler Technology; Photo: Arnulf Hettrich





TECHNICAL DRAWINGS
Linear grids | Comb grids

HOMOGENEOUS GRID DESIGN



////////////////// **SMU-X**
+ SPORTS HALL //
////////////////// **SINGAPORE**

SMU CONNEXION (SMU-X)

Singapore Management University

Singapore



ARCHITECT | ENGINEER | TTC PARTNER

MKPL, Singapore | Meinhardt Consultant, Singapore | Barcol-Air, Singapore



Good climate for learning

The Singapore Management University (SMU) was only founded in 2000, but is already one of the world's best universities in the field of business studies.

SMU's urban campus is nestled between the National Museum and the historic Fort Canning Park. The new SMU Connexion Building, SMU-X for short, connects two existing faculty buildings across a main throughfare, but also makes it easier for passers-by to access to the popular green space.

The five-storey building in solid wood construction with a floor space of around 8500 sqm is designed as an experimental learning space. There are extensive informal learning zones and open floor plans for teamwork as well as classic seminar rooms, learning 24/7 including sleeping accommodations, use of new technologies, creative furniture systems – everything is possible..

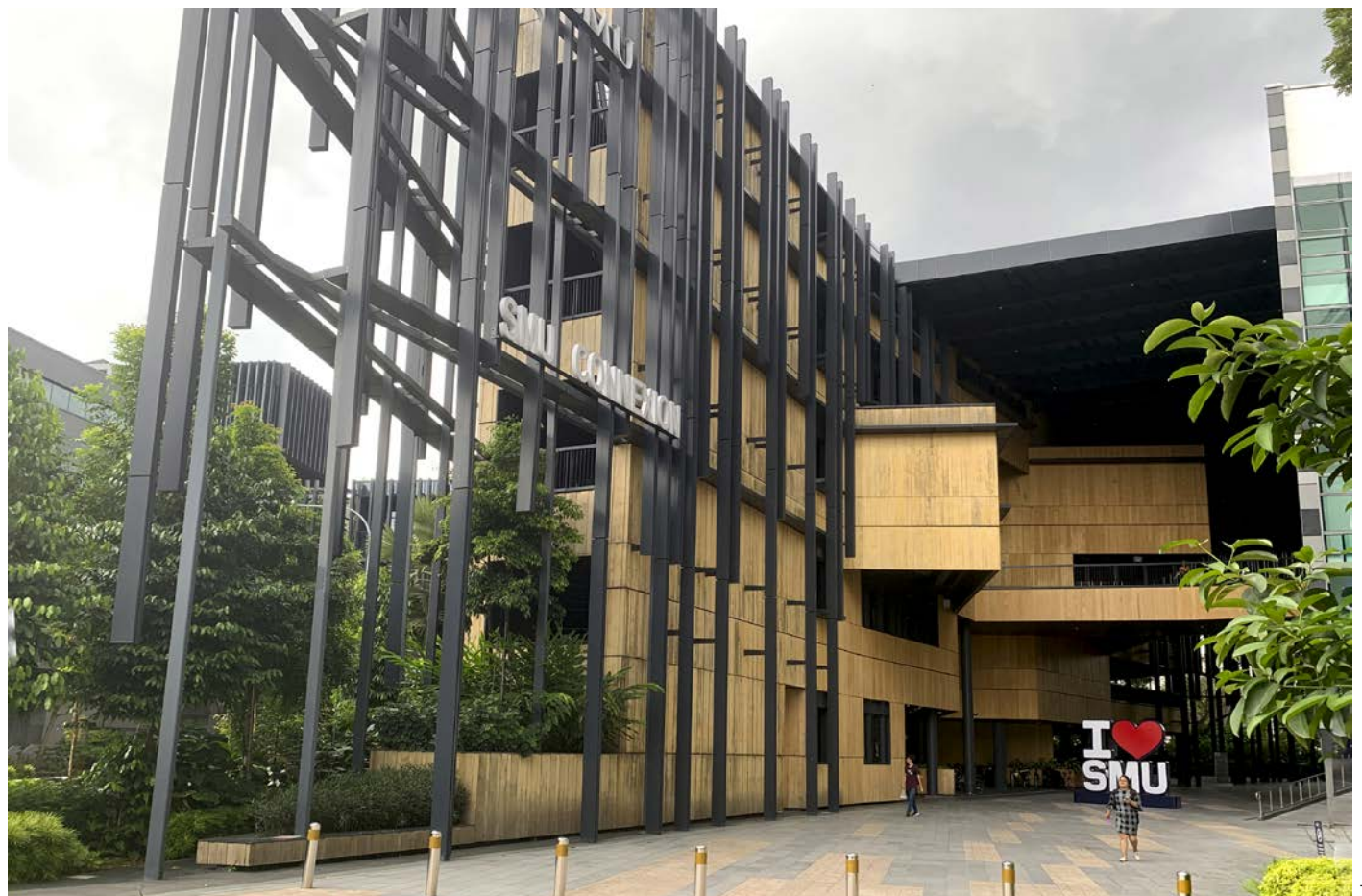
But above all, the SMU-X for Singapore is a pilot project in passive displacement cooling in an institutional building. **GraviVent®** –

the silent gravity cooling – contributes to the optimal climate in the building. To dissipate sensitive and latent cooling loads via guided free convection, 661 high-performance cooling units were installed in the false ceilings.

GraviVent® is a cooling system of short distances and without long pipes. Developed in the 1980s by Siegfried Timmler, the system is based on the simple law of nature that warm air rises. When it is discharged and cooled, it falls down the shaft and re-enters the room through air outlets – energy-neutral and sustainable. Up to 60 % of the energy otherwise used can be saved compared to split air-conditioning units.

Thanks to the additional use of solar energy, the SMU-X is a net-zero energy building, awarded GreenMark Platinum certification and the WELL Building Standard®.

A true smart building where everything is designed for the health and well-being of learners, teachers and the environment.



GRAVIVENT® – SILENT GRAVITY COOLING

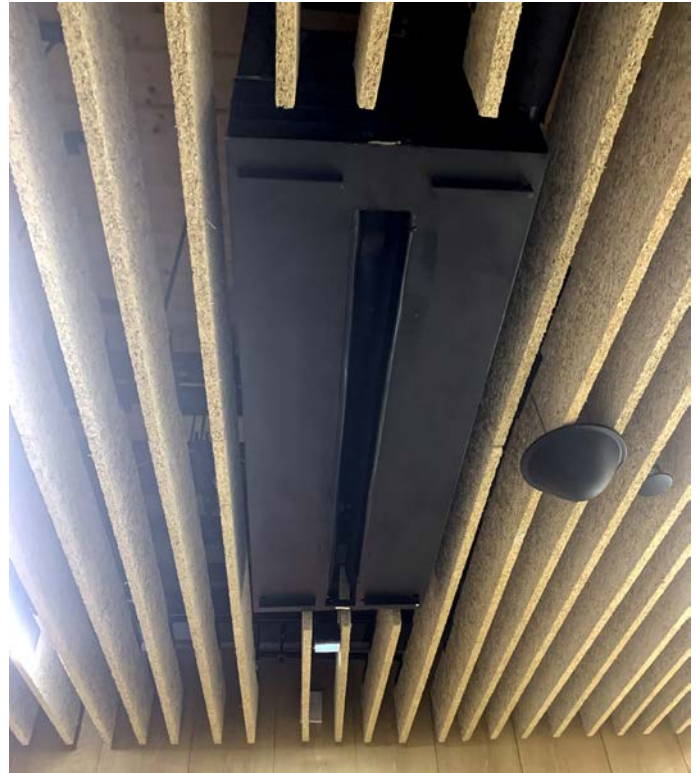
Cooling with linear grate cover

AIR CON SYSTEM DESIGN



SMU Connexion Building

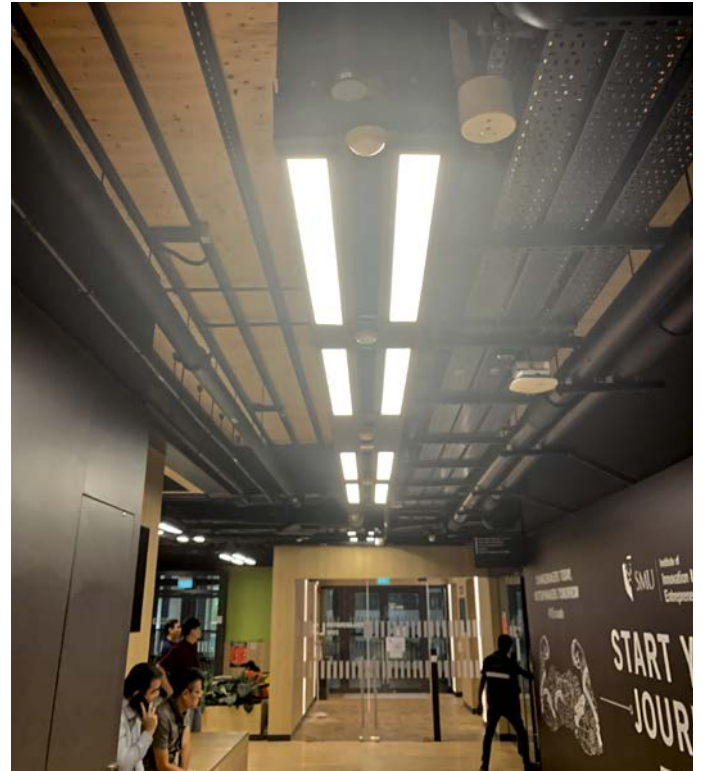
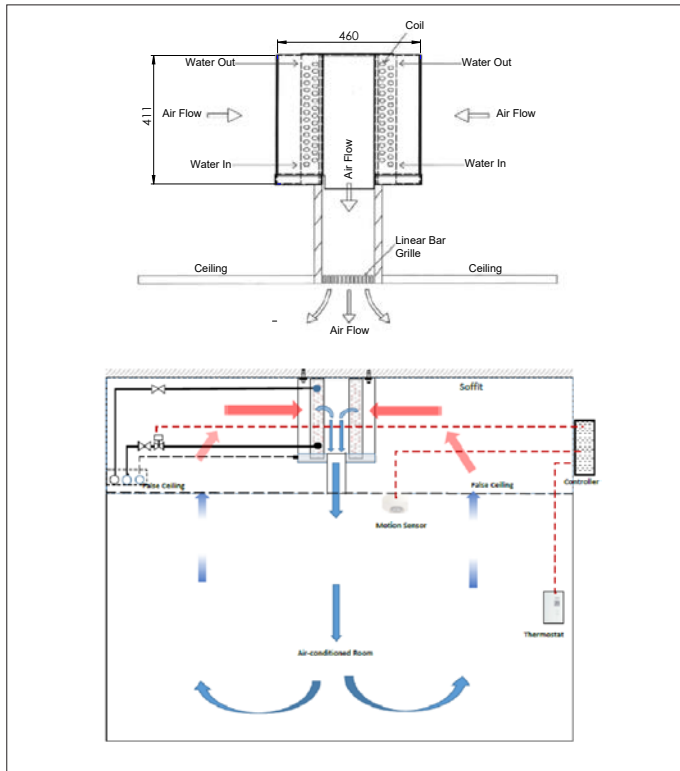
- 661 high-performance units type AASS-W 12.410 Dual, black coated, 1200 x 411 x 460 mm [L x H x D]
- Suitable for installation in false ceiling; filled 33 kg
- For use with cooling medium in drinking water quality according to VDI 2035; copper pipes with aluminium fins, mechanically expanded, pipe collector made of copper pipe; U-shaped tray made of aluminium, condensate drain 1/2", water flow and return 3/4"
- Room temperature 23 °C (60 % RH)
Water flow temperature 7 °C
Water return temperature 12 °C
Temperature difference 13.5 K
Effective drop shaft height 290 mm
Cooling capacity (sen. + lat.) 950 W/m
Pressure drop < 1 kPa



GRAVIVENT® – SILENT GRAVITY COOLING

Pictures + technical drawings

AIR CON SYSTEM DESIGN



SPORTS HALL, L3, ADMIN BLDG

Singapore Management University

Singapore

ARCHITECT | ENGINEER | TTC-PARTNER

Cullinan StudioL, London/KNTA Architects, Singapore | Maunsell Consultants, Singapore | Barcol-Air, Singapore



Sport without draughts

SMU (Singapore Management University) has a sports hall on the 3rd level of the administration building.

As in the Connexion Building, the sports hall is also equipped with a »green«, environmentally friendly air conditioning system, because SMU is committed to creating a sustainable campus – a model project in the greater Singapore area..

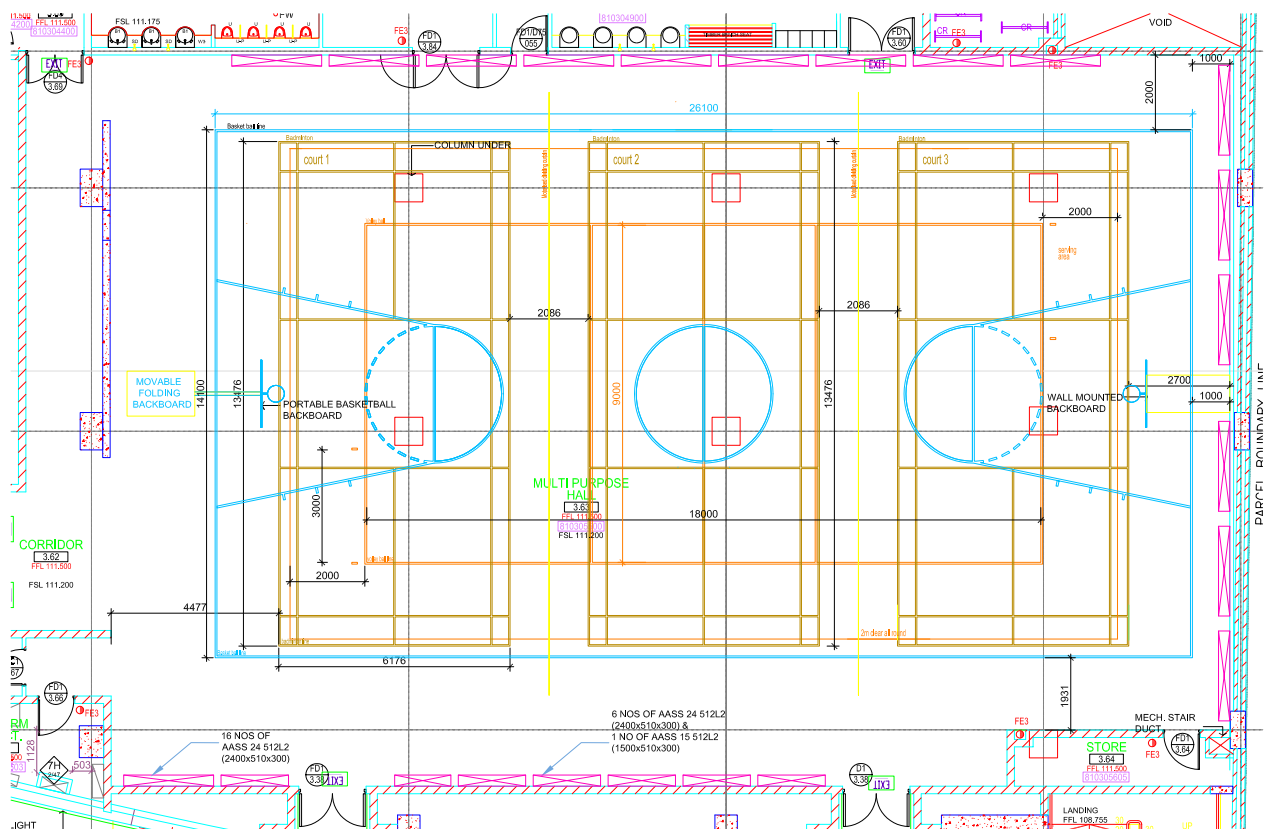
One of the most popular indoor sports in Asia is badminton, and draughts are not particularly conducive to this sport. Here, **draught-free air conditioning with GraviVent® cooling units** was the obvious solution. How well this works is also shown by the numerous students sitting with their laptops on the edge of the courts under the air outlets. Why? They appreciate the feel-good atmosphere and working with a cool head without a cold draught.



AIR CON SYSTEM DESIGN



- 22 high-performance units type AASS-W 24.51.2L2, black coated, 2400 x 510 x 300 mm [L x H x D]
- 22 high-performance units type AASS-W 12.51.2L2, black coated, 1200 x 510 x 300 mm [L x H x D]
- Drain at the bottom, for mounting the units on the working side, connection either left or right
- Room temperature 24 °C
Water flow temperature 9 °C
Water return temperature 14 °C
Effective drop shaft height 6000 mm
Cooling capacity finned unit length 1.98 kW/m
Total cooling capacity for the sports hall 156.81 kW



//////// TREEHOUSE
BANYAN TREE //
//////// MANDAI
SINGAPORE //

TREEHOUSE

Banyan Tree Mandai

Singapore

ARCHITECT | ENGINEER | TTC-PARTNER

WOW Architects, Singapore | Arup, Singapore | Barcol-Air, Singapore

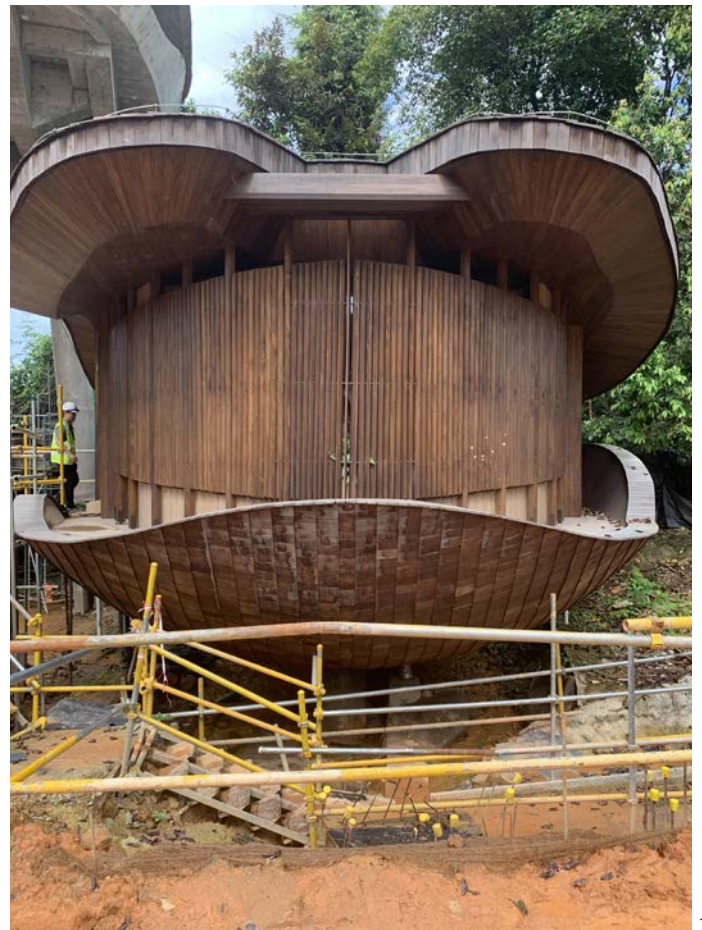
Under construction: Airy experience

Mandai, a district in the north of Singapore, is known for its zoo a large-scale nature and wildlife reserve. Biodiversity and sustainability play an important role here. Directly adjacent to the wildlife parks is a 4.6-hectare eco-resort. The resort, designed by WOW Architects and operated by Banyan Tree Hotels, will open in 2023 and is designed to be as sustainable as possible.

Nestled in the vegetation are 30 seed pod-shaped tree houses where guests are truly in the midst of nature, looking over or directly into the nature reserve.

To create a **natural indoor climate**, the **silent gravity cooling system GraviVent®** is installed here. The silent mode of operation does not disturb the experience of nature with all its sounds, there is no draught and, above all, GraviVent® works in a resource-saving an environmentally friendly way.

A total of 80 gravity cooling units are installed; all with black-coated fronts and connections that can be mounted either in the left or right. Almost invisibly, GraviVent® integrates flexibly and adaptably into this great project.



GRAVIVENT® – SILENT GRAVITY COOLING

Cooling with linear grate cover

AIR CON SYSTEM DESIGN



GraviVent®

- 80 High-performance units type AASI-W 12.51.2L/2R, black coated, 1200 x 510 x 300 mm [L x H x D]
- Drain at the bottom, for mounting the units on the working side, connection optionally left or right
- Installation shaft for water-side flow/return and condensate drain pipe (CDP) in the partition wall of bathroom and bedroom
- Room temperature 24 °C
Water flow temperature 8 °C
Water return temperature 15 °C
Cooling capacity per unit 1,15 kw
Active shaft height 2000 mm

On the right: GraviVent® in the bedroom

Bottom right: GraviVent® in the bathroom

Bottom left: Installation shaft in the partition wall



TREEHOUSE

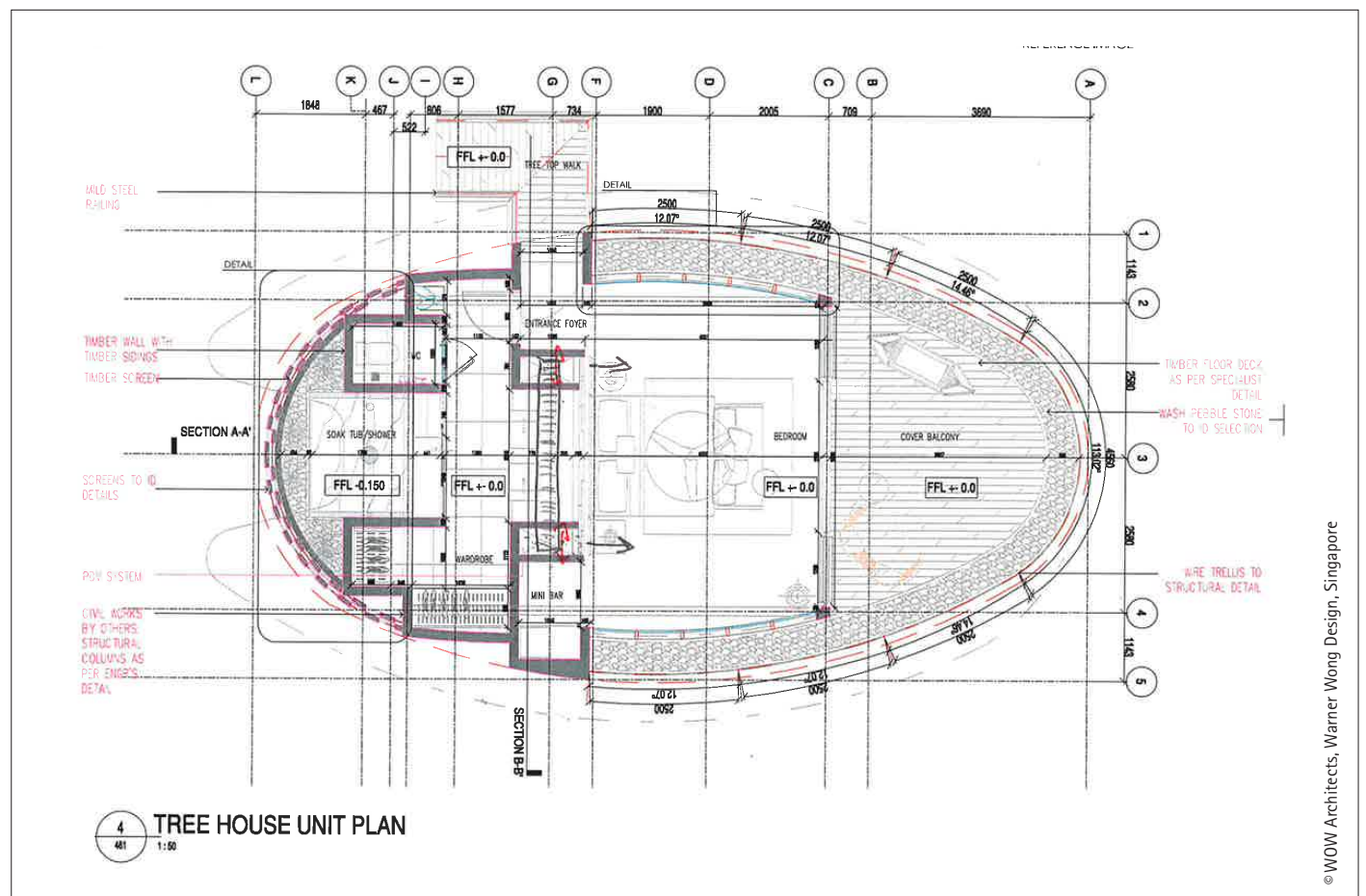
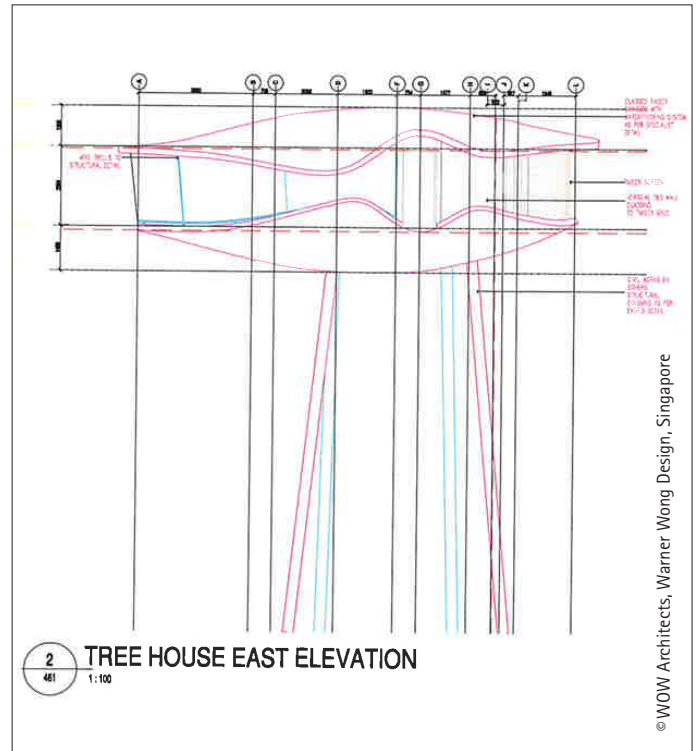
Banyan Tree Mandai

Singapore

GRAVIVENT® – SILENT GRAVITY COOLING

Technical drawings

AIR CON SYSTEM DESIGN



**//////// KUNSTHAUS
GRAZ //////////////////////////////////**

ARCHITECT | ENGINEER

Spacelab Cook/Fournier, Graz/London | HL Technik Prof. Klaus Daniels, München/TB Pickl & Partner, Graz

Friendly Alien

In 2003, Graz was the European Capital of Culture and landed the Kunsthaus, which the architects described as a friendly alien, on the banks of the Mur. The biomorphic building with its BIX media façade was by no means undisputed – but it was innovative.

The cooling system used here was also innovative: GraviVent® is a cooling system of short distances and fast reaction times. Developed in the 1980s by Siegfried Timmler, the system is based on the simple law of nature that warm air rises. When it is discharged and cooled, it falls down the shaft and re-enters the room through air outlets – energy-neutral and sustainable. Up to 60 % of the energy otherwise used can be saved compared to split devices.

Since the thermoformed façade not only resembles a blob on the outside, but also consists mainly of curves and dome-like structures in the exhibition area, the climate concept for the Kunsthaus is a hybrid system consisting of a cooling/heating floor, the GraviVent® silent gravity cooling system and a ventilation system. Installed behind the facing shell and beautifully concealed by the curtain wire mesh, the system is still doing its job reliably after twenty years. The cooling and heating system requires very little maintenance, as the technical manager told us enthusiastically in conversation.

In the meantime, the people of Graz are also enthusiastic about the Kunsthaus – it is just friendly, the alien, and an architectural landmark.



GRAVIVENT® – SILENT GRAVITY COOLING

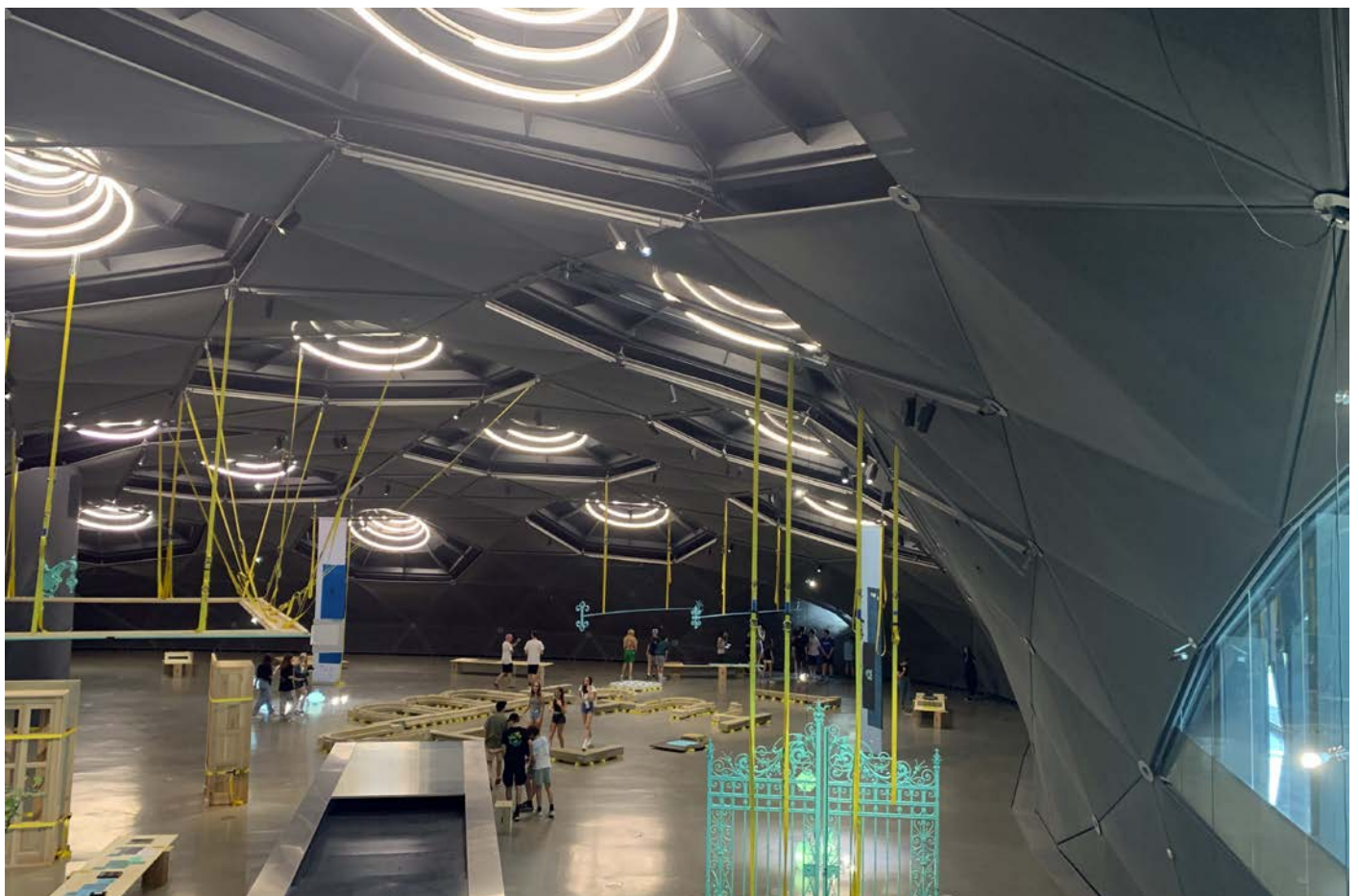
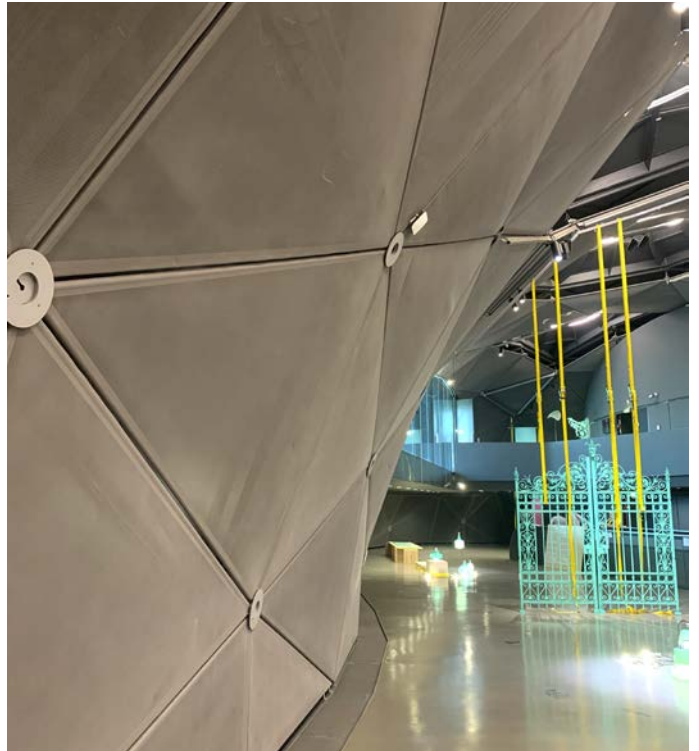
Hybrid climate system with cooling/heating floor, GraviVent® and ventilation

AIR CON SYSTEM DESIGN



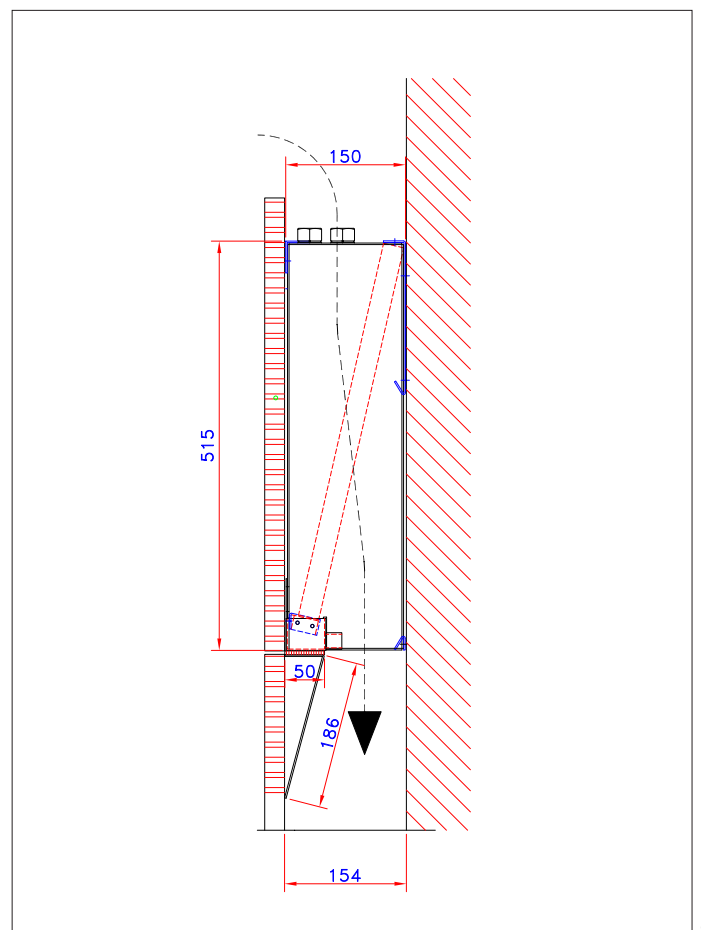
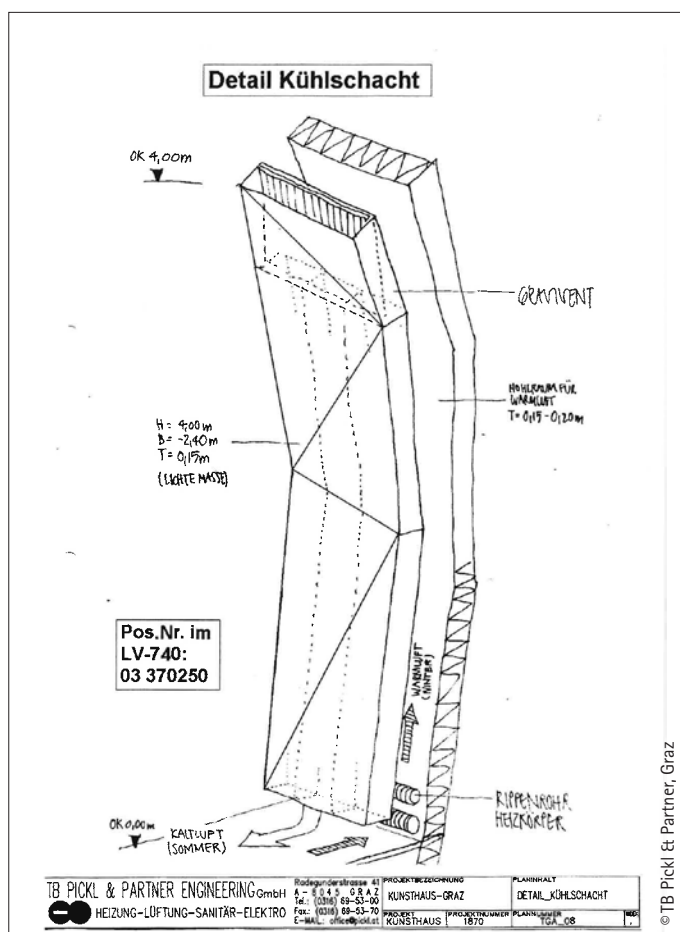
GraviVent®

- 31 units cooling convectors type ISHK-W 24.51, 150 x 510 x 2400 mm [H x W x L], performance class 2
- High-performance cooling units for dissipating sensitive cooling via guided, free convection
- Condensate tray made of aluminium over the entire cooling unit length
- Condensate drain connection towards the drop shaft
- For use with cooling medium of drinking water quality according to VDI 2035
- Maximum air humidity 50 %
Supply temperature 15 °C
Reply temperature 18 °C
Room temperature 22–23 °C
Cooling capacity ripped unit length 1,38 kW/Stück
Total cooling capacity for the Kunsthaus 42,78 kW



GraviVent® – silent gravity cooling

AIR CON SYSTEM DESIGN



/// URBAN GARDEN

MYHIVE **//////////**

////////// VIENNA

URBAN GARDEN

myhive am Wienerberg

Vienna (A)

ENGINEER

Ingenieurbüro Lakata GmbH, Wien

Green office

Myhive is the international and innovative office brand of the Vienna Immofinanz Group. The concept includes the letting of office locations, from individual desks in coworking to several floors for small and large companies.

With the myhive am Wienerberg | Urban Garden location, a green project has now been established for the first time in which sustainability is the very top priority. All Austrian locations already have BREEAM certifications, but Urban Garden is aiming the BREEAM excellent certification.

Part of the office concept are, among other things, focus rooms that form quiet individual honeycombs in the beehive-like throng of open-plan offices. Here you can concentrate on work or have conversations and telephone calls that are not meant for everyone's ears.

GraviVent® ensures a pleasant room climate. Silent gravity cooling is an excellent choice when the focus is on sustainable air conditioning. The silent operation without ventilation and without draughts ensures thermal and air-hygienic comfort through natural convection.



INSTALLATION IN FOCUS ROOMS

GraviVent® – silent gravity cooling

AIR CON SYSTEM DESIGN



GraviVent®

- 33 High-performance cooling units type ISHK-W 08.15, 510 x 150 x 800 mm [H x W x L], incl. mounting system for installation in drop shafts
- High-performance cooling units for dissipating sensitive cooling via guided, free convection, performance capacity 2
- Isolated condensate tray made of aluminium over the entire unit length, condensate tray connection towards drop shaft
- For use with cooling medium of drinking water quality according to VDI 2035
- Room temperature 26 °C
Supply temperature 16 °C
Reply temperature 19 °C
Effective drop shaft height (H_{active}) 1,9 m
Cooling capacity finned unit length 350 W/m



On the right: GraviVent® in focus room with built-in glass wall

Bottom: GraviVent® in focus rooms before installation of the glass walls



URBAN GARDEN

myhive am Wienerberg

Vienna (A)

PROJECT VIEWS

Green façades + section interiors

AIR CON SYSTEM DESIGN



**//////// ATTORNEY'S
OFFICE ///////////
/// SCHREYVOGEL-
GASSE ///////////
//////// VIENNA**

ATTORNEY'S OFFICE

Schreyvogelgasse 2

Vienna (A)

PROJECT DEVELOPER | ENGINEER

Immofinanz, Wien | Ing.büro Stefan Sommerauer, Oberalm (A)

Old splendor with modern inner workings

Just around the corner from Vienna's Burgtheater is the beautiful old building from the turn of the century – richly ornamented in the outside, and freshly refurbished in the inside. A jewel in which, among others, an attorney's office has moved into its new quarters.

GraviVent® was chosen to ensure that the air conditioning in the rooms remains as constant as possible. Architecturally completely

inconspicuous except for the filigree linear grids, the silent gravity cooling provides thermal and air-hygienic comfort, essential for long periods of concentrated work.

The silent operation without ventilation and without draughts creates a pleasant room climate through natural convection. In addition, the system is energy-efficient and requires little maintenance.



GRAVIVENT® – SILENT GRAVITY COOLING

Cooling with linear gratings covering

AIR CLIMATE DESIGN
HOMOGENEOUS GRIDS



GraviVent®

- 22 units cooling convectors type AISI-W xx.15, in different lengths, 528 x 153 x xx mm [H x W x L], incl. mounting system for installation in drop shafts
- Approx. 41 metres linear grids LSF made of aluminium, powder-coated according to RAL 9016, 10 mm bar spacing, 580 mm, arranged in a line
- High-performance cooling units for dissipating sensitive cooling via guided, free convection
- Front black coated, connections on the left behind the heat exchanger, aligned to the slat field
- Isolated condensate tray made of aluminium over the entire unit length, condensate tray connection towards drop shaft
- For use with cooling medium of drinking water quality according to VDI 2035
- Room temperature 26 °C
Supply temperature 16 °C
Reply temperature 20 °C
Effective drop shaft height (H_{active}) 3 m
Cooling capacity finned unit length 620 W/m



[illegible]

//////////////// RUFFINI
HOUSES //////////////////
//////////////// MUNICH

RUFFINI HOUSES

Munich

CLIENT | PLANNER | ENGINEER

City of Munich | BPA Braun Architekten, Munich | RS Ingenieure, Munich

Baroque outside, modern technology inside

The Ruffini Houses in the heart of Munich look like a historical ensemble of buildings from different baroque eras. In reality, however, the large and diverse buildings were built in the neo-baroque style to plans by architect Gabriel von Seidl between 1903 and 1905.

The buildings have been extensively revitalised in recent years. The traditional shops – which have since been relocated – have turned to the ground floor, while the top floors houses offices for the Munich municipal administration.

To keep the air conditioning in the attic rooms as constant as possible, the choice fell on chilled beams in the perforated suspend ceiling

on the one hand, and the silent gravity cooling system GraviVent® on the other. The system is operated with energy-efficient, cost-effective district cooling, which saves more than half of the primary energy consumption while reducing CO₂ emissions.

Architecturally completely inconspicuous apart from the filigree linear grilles, the silent gravity cooling ensures thermal and air-hygienic comfort, essential for concentrated work.

The silent operation without ventilation and without draughts creates a pleasant room climate through natural convection. In addition, the system is energy-efficient and requires little maintenance.



GRAVIVENT® – SILENT GRAVITY COOLING

Cooling with linear gratings covering

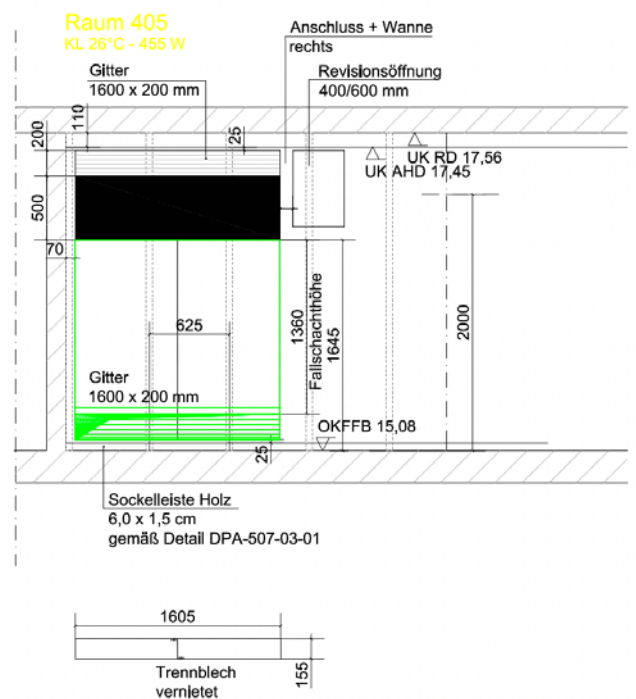
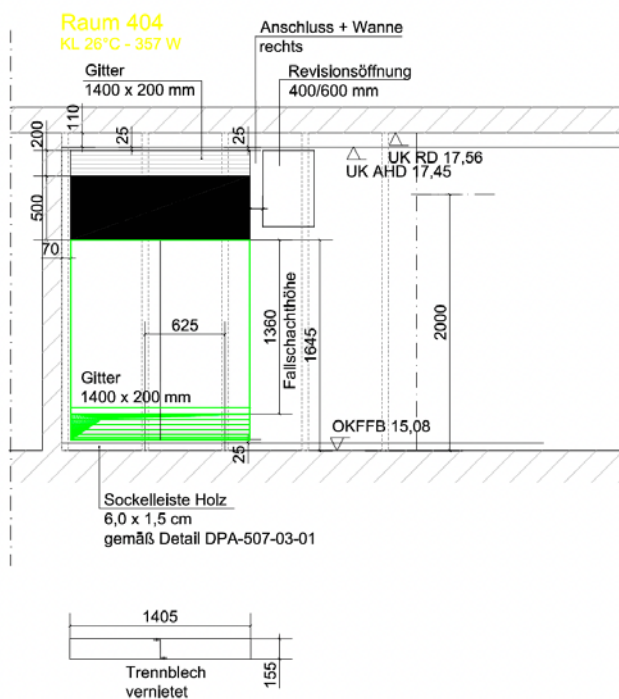
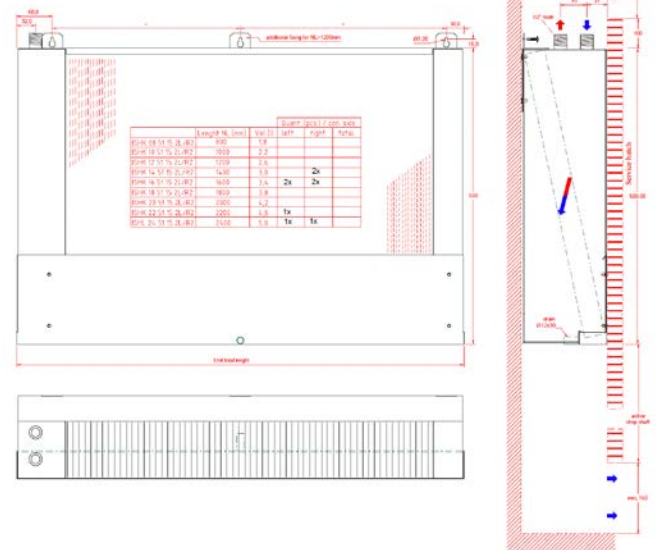
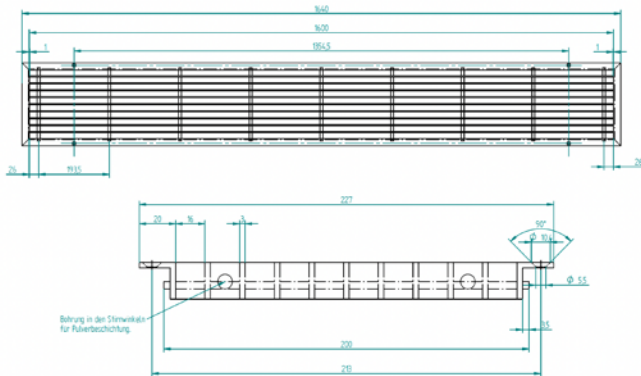
AIR CLIMATE DESIGN
HOMOGENEOUS GRIDS



GraviVent®

- 9 high-performance cooling units type ISHK xx.15, in different lengths from 1400 to 2400 mm, 510 x 150 x xx mm [H x W x L], incl. mounting system for installation in drop shafts
- Approx. 32 metres linear grids LSF made of aluminium, powder-coated to RAL 9006, 15 mm bar space= ~ 88 % air passage
- High-performance cooling units for dissipating sensitive cooling via guided, free convection
- Front black coated, connections on the left behind the heat exchanger, aligned to the slat field
- Isolated condensate tray made of aluminium over the entire unit length, condensate tray connection towards drop shaft
- For use with cooling medium of drinking water quality according to VDI 2035
- Room temperature 26 °C
Supply temperature 16 °C
Reply temperature 19 °C
Effective drop shaft height (H_{active}) 1.58 m
Cooling capacity finned unit length 300 W/m





CHILLED BEAMS

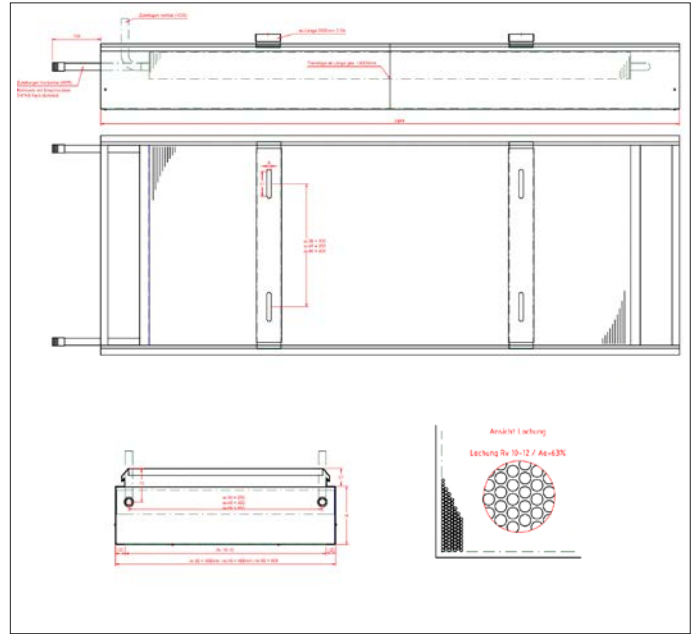
Chilled beams in the suspended ceiling

AIR CLIMATE DESIGN



TTC Chilled beams

- 8 high-performance cooling units C-line type AECBU, in different lengths from 1500 to 3000 mm, 150 x 605 x xx mm [H x W x L]
- 8 high-performance cooling units C-line type AECBU, in different lengths from 1500 to 3000 mm, 220 x 605 x xx mm [H x W x L]
- High-performance cooling units for dissipating sensitive cooling via guided, free convection
- Suitable for mounting in a perforated suspended ceiling
- For use with cooling medium of drinking water quality according to VDI 2035
- Room temperature 26 °C
Supply temperature 16 °C
Reply temperature 19 °C
Temperature difference 8,5 °C
Cooling capacity finned unit length 280 W/m



//////// MICROSCOPY
FACULTY //////////
//////////////////// ISTA
KLOSTER- //////////
//////////////////// NEUBURG

////// MICROSCOPY
FACULTY ///////////////////////////////////
////////////////////// ISTA
KLOSTER-//////////////////////
////////////////////// NEUBURG

MIKROSKOPY-FACULTY

ISTA Life Sciences Lab Building

Klosterneuburg near Vienna

ENGINEER

Altherm Engineering, Baden (A) | ZFG Projekt, Baden (A)

Silent cooling for cutting-edge research

The Institute of Science and Technology Austria, ISTA for short, is dedicated to interdisciplinary cutting-edge research in the natural sciences of biology, computer science, mathematics, neuroscience and physics. The campus in Maria Gugging, a district of Klosterneuburg near Vienna, was opened in 2009 and extends over 20 hectares including a technology park.

A successful mix of classical and modern buildings characterises the grounds. The high-quality new buildings are as cutting-edge as the research facilities. Great importance is attached to sustainability. One of the newest buildings is the Moonston Building for experimental and theoretical research groups. The GraviVent® silent

gravity cooling system was installed in the microscopy rooms in the basement of the laboratory building.

Several criteria predestine the silent gravity cooling system for research laboratories: the almost silent and draught-free operation of this cooling system is ideal for working in the laboratory. In addition, the high cooling capacity allows the system to react extremely quickly even at low room temperatures. The high energy efficiency and minimal maintenance requirements are additional plus points. For example, GraviVent® is already used at the Max-Planck-Institut in Mülheim an der Ruhr, the Fraunhofer Institute in Aachen and the DLR's Robotics Mechatronics Centre in Oberpfaffenhofen.



MIKROSKOPY-FACULTY

ISTA Life Sciences Lab Building

Klosterneuburg near Vienna

INSTALLATION IN THE LABORATORY

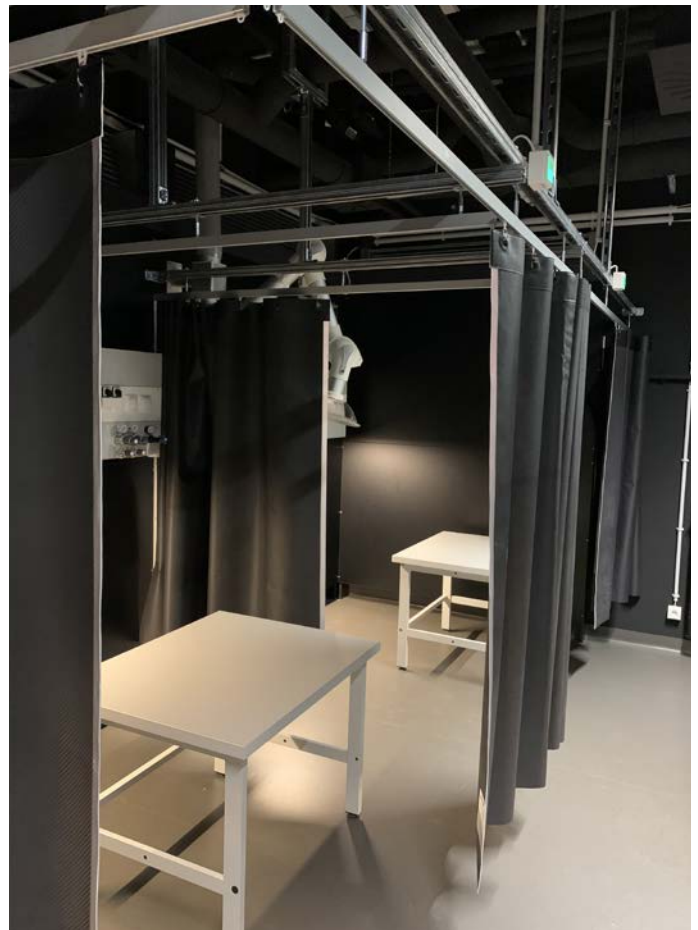
GraviVent® – silent gravity cooling

AIR CLIMATE DESIGN



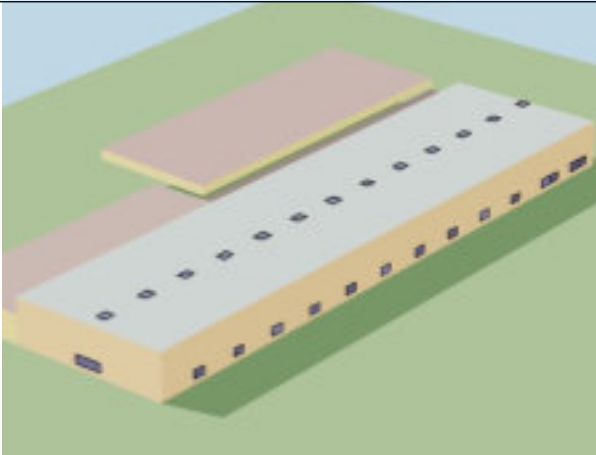
GraviVent®

- 32 high-performance cooling units type ISHK-W xx.15, in two widths and three lengths, 525 x 150/250 x 1800/2000/2200 mm [H x W x L], incl. mounting system for installation in drop shafts
- High-performance cooling unit for dissipating sensitive cooling via guided, free convection
- Front black coated, connections on the left behind the heat exchanger, aligned to the slat field
- Isolated condensate tray made of aluminium over the entire unit length, condensate tray connection towards drop shaft
- For use with cooling medium of drinking water quality according to VDI 2035
- Room temperature 21 °C
Supply temperature 6 °C
Reply temperature 12 °C
Temperature difference Δt_m 12 K
Effective drop shaft height (H_{active}) 2,5–3 m
At 150 mm: Cooling capacity finned unit length 900–1100 W/m
At 250 mm: Cooling capacity finned unit length 1200–1360 W/m



////////////////// **FURTHER**
PROJECTS //////////////////

Deckel MAHO Pfronten



TAS building simulation modell



Assembly hall, interior view

Project information

BUILDING OWNER	Deckel MAHO GmbH, Mechanical engineering, Pfronten
ARCHITECT	Dorothea Babel-Rampp, Pfronten
ENGINEER	Engineering office Kurt Güttinger, Kempton Dynamic building simulation and CFD: Institute IFES, Frechen
REALISATION	Gassner GmbH, Kempton
INSTALLED	62 ADO gTHERM units VS 200 / 510 K 24

System requirements

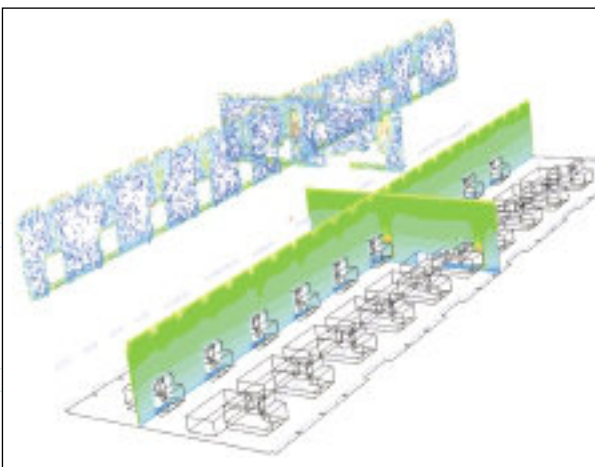
In order to secure top quality, the requirements regarding the temperature distribution in the proposed assembly hall for high precision machines are very high.

The customer has to be guaranteed a constant temperature, within a tolerance of $\pm 1\text{K}$, over a height of 4 m during the entire manufacture, assembly and quality controll phases of production.

An existing water well system should be integrated into the complete system to supply the required cooling capacity.



Arrangement of the ADO gTHERM system at the hall's walls provide a flexible utilisation of the hall area



Result of the 3D-simulation, temperature distribution and, air flow pattern, © all pictures IFES, Frechen

System solution and design

The basic heating and cooling capacity is supplied by an indolent thermal active floorplate.

To fulfil the high expectations regarding the heating and cooling performance throughout the whole year, the ADO gTHERM system has been installed to compensate dynamic load fluctuations throughout the day. The applied wall-system with cooling units type VS 200/510 connected to high false wall shafts – approx. 6 m in this case – provide the removal of high cooling loads combined with a quick performance adaptation.

By means of a dynamic building simulation and CFD, worked out by IFES, Frechen, it was possible to prove that the given requirements regarding to temperature distribution and air flow pattern were optimally reached with the installed system. The arrangement along the hall's walls provided thereby a high rate of flexibility in utilising the single sections of the hall. The displacement ventilation and distribution of cooled air generated by ADO gTHERM makes it possible to comply with temperature limits simultaneous to low air velocities.

The break-down of the system into 21 control zones provides a flexible regulation of the single sections regarding to their actual load. Primary energy consumption and operating costs are reduced by cooling performance supplied from a water well system.

Thereby the gravity driven cooling system in the final assembly and technical inspection hall at Deckel MAHO is a extraordinary example for applying a ADO gTHERM system in industrial areas in order to keep up with complex requirements regarding to temperature distribution and air flow pattern.

University for Film and Television Potsdam



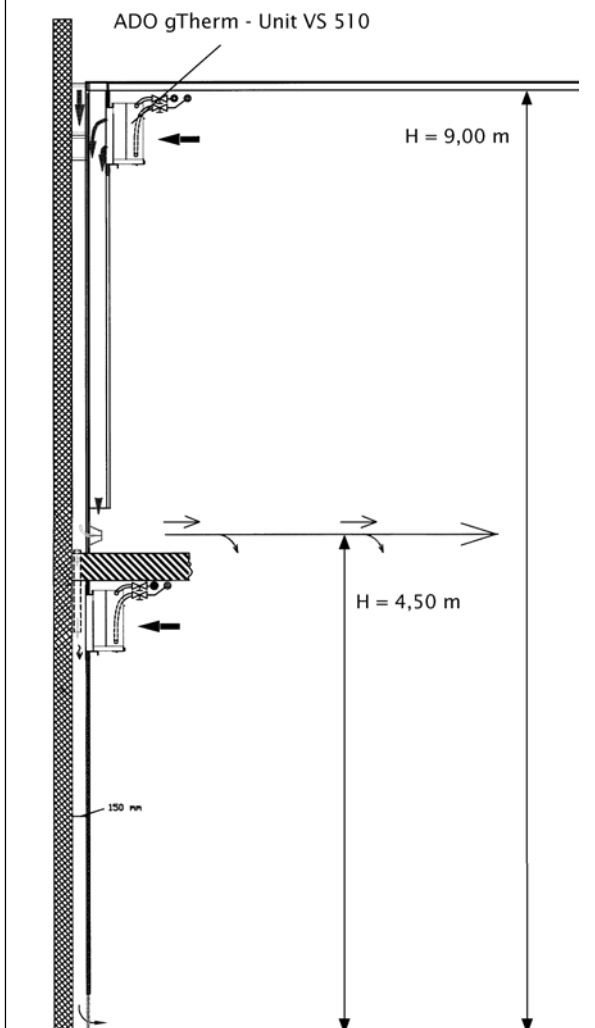
UFT main entrance, picture: © Klaus Frahm/artur

Project information

CLIENT	Landesbauamt Potsdam
ARCHITECTS	medium Architekten, Hamburg Jentz-Popp-Roloff-Wiesner
TGA-PLANERS	Ridder Meyn u. Partner mbH, Norderstedt
CONSTRUCTION	Selck GmbH
SYSTEM	172,0 Lin.M. ADO gTHERM
INSTALLED	VS 200/510 Cooling Power approx. 140 KW

Requirements

Under a closed glass envelope with internal sun protection there are five individual buildings surrounded by green spaces. Air from the outside is fed into the glass envelope via a storage tank in the ground where it will be pre-cooled or pre-heated – depending on the time of year. The film studios and their associated adjoining rooms required high flexibility due to being part of a teaching establishment. The loads in the 10 m high studio areas, which varied depending on how the studios were used, needed to be removed safely and in compliance with flow technical and acoustic conditions.



Sectional view of a wall in the studio area with cooling duct

System solution

- The ADO gTHERM system has been installed in the upper third of a 10 m high studio area.
- The ducting fronts were formed of sound absorbing material.
- Cool air is fed in at a height of ca. 6 m so that all wall areas below that height can be freely used.
- A wide projection nozzle, positioned below the air outlet, carries the cooled air to the centre of the room where it is distributed over the whole of the studio space.
- In the adjoining rooms the units have been integrated in wall facing panels.

System technology

The low temperature difference between cold water and room air which is characteristic for this gravity-driven cooling system allows an economical and ecologically sound integration into the energy supply system of the building.

With the ADO gTHERM system the static and dynamic pressure losses which occur while flowing through the cooling units and the subsequent air guiding components (upstream area, inlet grating, diverting units, down duct and outlet grating, etc.) are solely compensated for by the hydrostatic pressure difference which is a result of the temperature difference between the warm air in the room and the cooled air in the down duct.

The solution used in this project is another example which shows that the ADO gTHERM system is the ultimate solution for the complex thermic and acoustic requirements found in studio environments.

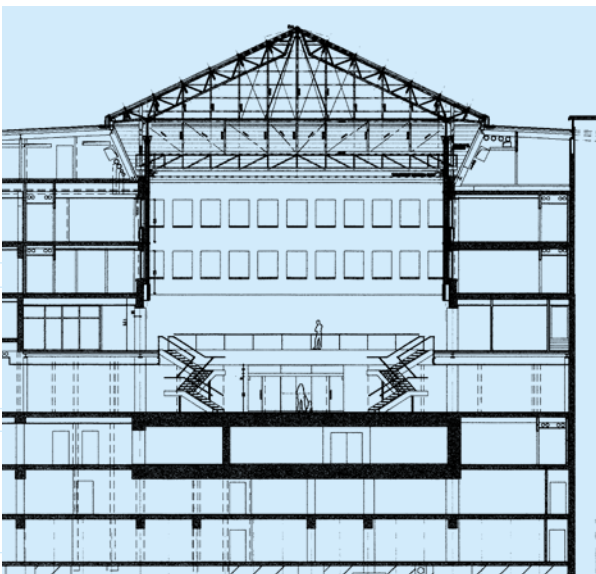


UFT interior view with ADO gTHERM, picture: © Klaus Frahm/artur

Stadtparkasse Dortmund



A view of the daylight flooded customer service area



Customer service area section view

Project information

CLIENT	Stadtparkasse Dortmund City Savings Bank
ARCHITECTS	Architekturbüro A. Saatkamp, Dortmund
PLANNING	HL Technik AG Consultant Engineers, Frankfurt
CONSTRUCTION	Louis Opländer GmbH
SYSTEM	430 LIN.M. ADO gTHERM
INSTALLED	AS 300/330 And Isi 155/345 Total cooling power approx. 190 KW

Requirements

The Project entailed the renovation of the original flat-roof building as well as the development of an extension to the head office. What had originally been an inner courtyard is now used as a covered customer service area flooded with daylight. The ADO gTHERM room cooling system has been installed in the first to fourth floor offices, which have windows that can be opened and have appropriate sun protection. The deciding factors for the client's decision were the savings both with the initial investment and the operating costs and the fact that a particularly pleasant and performance enhancing room climate could be guaranteed for each and every work place.



Cupboard in open-plan office

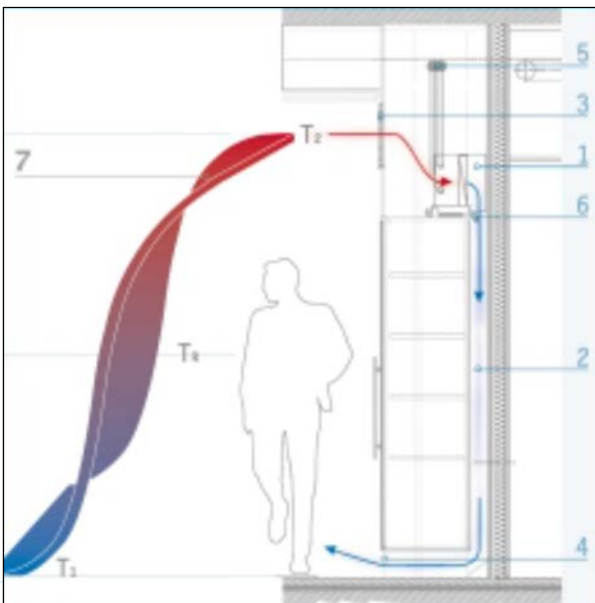
System solution

ADO gTHERM units have been integrated inside cupboards along corridors or behind wall facing panels where there are cross beams. The cupboard has the advantage that it can be used directly as the system carrier. The down duct is located at the rear and is not visible to the user. The air inlet and outlet openings have been covered with air-permeable components that match the ADO gTHERM system for a visually pleasing design.

System technology

The low temperature difference between cold water and room air which is characteristic for this gravity-driven cooling system allows an economical and ecologically sound integration into the energy supply system of the building.

With the ADO gTHERM system the static and dynamic pressure losses which occur while flowing through the cooling units and the subsequent air guiding components (upstream area, inlet grating, diverting units, down duct and outlet grating, etc.) are solely compensated for by the hydrostatic pressure difference which is a result of the temperature difference between the warm air in the room and the cooled air in the down duct.



ADO gTHERM functional principle

- | | |
|-------------------------|---|
| 1 ADO gTHERM Unit | 7 Behaviour of the room temperature |
| 2 Down duct | |
| 3 Air inlet grating | |
| 4 Air outlet | T ₁ Outlet air temperature |
| 5 Water flow and return | T _R Average room temperature |
| 6 Condensate pipe | T ₂ Inlet air temperature |

Presse- und Informationsamt der Bundesregierung, Berlin



Haupteingang Foto: Stefan Klonk, Berlin



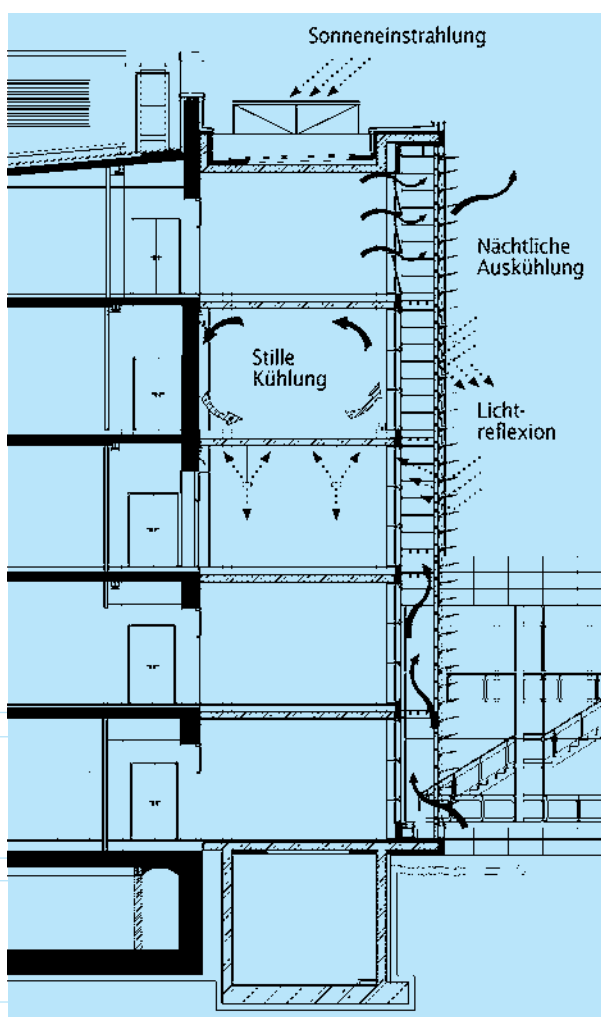
Atriumbereich Foto: Frank Springer, Bielefeld

Projektinformation

BAUHERR	Bundesrepublik vertreten durch: Bundesministerium für Verkehr Bau- und Wohnungswesen vertreten durch das Bundesamt für Bauwesen und Raumordnung
PROJEKT- STEUERUNG	HPP, Düsseldorf Bau- und Projektmanagement GmbH
ARCHITEKT UND GENERALPLANER	KSP Engel und Architekten, Berlin
FACHPLANER	IGH Ing. Gesellschaft
AUSFÜHRUNG	KRANTZ TKT FLZ Lauterbach GmbH
INSTALLIERTES SYSTEM	ca. 150 lfdm. ISI 155/52 ca. 306 lfdm. ADO gTHERM gitter Gesamte Kühlleistung ca. 95 KW



Außenansicht Klimafassade Foto: Stefan Klonk, Berlin



Klimakzept an der Schnittstelle Neu-Altbau
Grafik: KSP Engel und Zimmermann

Anforderungsprofil

Das heterogene architektonische Konglomerat von insgesamt 43.000 m², das seit Mitte des 16. Jahrhunderts an dieser Stelle emporgewachsen war, sollte instandgesetzt, restauriert, neu strukturiert und erweitert werden. Hierbei wurde besonders Wert darauf gelegt, daß die vorhandene historische Bausubstanz mit den heutigen modernen Gebäudeanforderungen kombiniert wird. Weiterhin sollten Teilbereiche des Gebäudes als „Nullenergiehaus“ ausgeführt werden, so daß das ADO gTHERM System aus energietechnischer Hinsicht genau in das Gebäudekonzept passte.

Systemlösung

Die ADO gTHERM Kühlunits sind an den flurseitigen Wänden in den Büros in einer doppelten Wandvorsatzschale integriert. Diese vorgesetzte Wand dient im Bereich des Altbaus gleichzeitig als Ausgleich der Oberfläche der alten Wandflächen.

Die Luftanströmöffnung und die Quelluftaustrittsöffnung sind mit einem filigranen Lineargitter, abgestimmt auf das ADO gTHERM System, optisch verkleidet.

Systemtechnik

Der für das Schwerkraftkühlsystem charakterisierende geringe Temperaturabstand zwischen Kaltwasser und Raumluft ermöglicht eine ökonomische und ökologische Einbindung in das Energieversorgungssystem des Gebäudes.

Beim ADO gTHERM System werden die statischen und dynamischen Druckverluste, die bei der Durchströmung der Kühlunits und den anschließenden Luftführungskomponenten (Anströmbereich, Durchlaßgitter, Umlenkungen, Fallschacht und Austrittsgitter etc.) auftreten, alleine durch die hydrostatische Druckdifferenz kompensiert, die sich aufgrund der Temperaturdifferenz zwischen der warmen Luft im Raum und der gekühlten Luft im Fallschacht einstellt.

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RTL Hauptstadtstudio Berlin



RTL Aussenansicht



RTL Innenansicht

Projektinformation

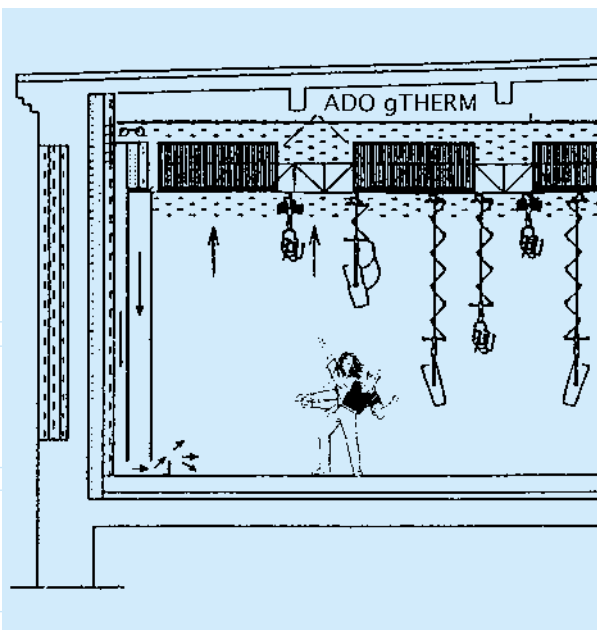
BAUHERR	Schiffbauerdamm Betreiber- gesellschaft mbH, Eschborn
ARCHITEKT	Architekturbüro Jürgen Klemm, Berlin
FACHPLANER	THB Ing. Gesellschaft mbH, Eschborn
AUSFÜHRUNG	KRANTZ TKT, NL Berlin
INSTALLIERTES SYSTEM	92,6 lfdm. ADO gTHERM VS 200/330 und VS 200/510 Gesamte Kühlleistung 125 KW

Anforderungsprofil

- Hierbei handelte es sich um die Sanierung bzw. Umnutzung einer Industriehalle zu einem Fernsehsendezentrum mit Büros, Studios, Regie- und entsprechenden Peripherieräumen.
- Bedingt durch den hohen Glasflächenanteil des Studio-bereichs mussten für die Abfuhr von hohen thermischen Lasten flexible Lösungen gefunden werden.
- Da bei der Sanierung das optische Erscheinungsbild, geprägt durch die Verwendung eines sichtbaren Mauerwerks aus Backstein, erhalten werden sollte bzw. musste, bot sich der Einsatz eines wandintegrierten Systems an.



Fallschacht im Studio



Funktionsprinzip ADO gTHERM

Systemlösung

Es ist ein Wandsystem mit Kühlunits vom Typ VS 200/510 in dem Studio und VS 200/330 in den Nebenräumen installiert.

Durch die hohen Fallschächte im Studio, sowie die Integration von zwei übereinanderliegenden ADO gTHERM Units mit einem Doppelschacht können die großen Wärmelasten abgeführt werden.

Die Fallschächte in den Nebenräumen sind als Gipskarton-Wandvorsatzschale ausgeführt. Bei der Integration wurden sowohl vorhandene Unterzüge als auch unterschiedliche Deckenhöhen berücksichtigt, so dass in den jeweiligen Bereichen die höchstmöglichen Schächte installiert und damit entsprechend hohe Kühlleistungen erzielt werden konnten.

Die Wandsysteme bieten insbesondere folgende Vorteile: Die Wandflächen bleiben frei nutzbar und die Materialien der Wandvorsatzschalen (WVS) sind frei wählbar. Der Flächenbedarf ist relativ gering.

Systemtechnik

Der für das Schwerkraftkühlsystem charakterisierende geringe Temperaturabstand zwischen Kaltwasser und Raumluft ermöglicht eine ökonomische und ökologische Einbindung in das Energieversorgungssystem des Gebäudes.

Beim ADO gTHERM System werden die statischen und dynamischen Druckverluste, die bei der Durchströmung der Kühlunits und den anschließenden Luftführungskomponenten (Anströmbereich, Durchlaßgitter, Umlenkungen, Fallschacht und Austrittsgitter etc.) auftreten, alleine durch die hydrostatische Druckdifferenz kompensiert, die sich aufgrund der Temperaturdifferenz zwischen der warmen Luft im Raum und der gekühlten Luft im Fallschacht einstellt.

Der Einsatz von ADO gTHERM ist beispielhaft für die Überlegenheit des Systems im Studiobereich.

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Allianz München



Innenhof Allianz

Projektinformation

BAUHERR	Allianz Versicherungs AG, München
ARCHITEKT	Lanz ■ Architekten + Ingenieure, München
FACHPLANER	Krebs Ingenieure GmbH, Ditzingen
AUSFÜHRUNG	Caliqua Wärmegesellschaft GmbH & Co.KG
	Paul Feederle GmbH
INSTALLIERTES SYSTEM	328,6 lfdm. ADO gTHERM
	AS 300/330
	ca 490,0 lfdm. ADO gTHERM Roste
	Gesamte Kühlleistung ca. 151 KW

Anforderungsprofil

- Das Projekt ist gekennzeichnet durch die Sanierung eines bestehenden Gebäudebereichs mit einer Aufstockung zusätzlicher Etagen als auch fingerförmiger Aufbauten im Innenhofbereich.
- Durch die Anforderung des Bauherren, auf eine Klimaanlage weitestgehend zu verzichten und individuell über Fenster belüften zu können, war entsprechend der Betrieb bei geöffneten Fenstern und freischwingender Feuchtesituation sicherzustellen. Bei der Installation mußte die Limitierung der Geschosshöhen im bestehenden Gebäudebereich berücksichtigt werden.



Schranksystem mit ADO gTHERM in der Praxis

- Hohe optische Anforderungen an die Inneneinrichtung.
- Für den Sanierungsbereich sollte die Erschließung für die Kühlung der Gebäude über den Flurbereich erfolgen, da in den Büros keine abgehängten Decken vorgesehen sind.

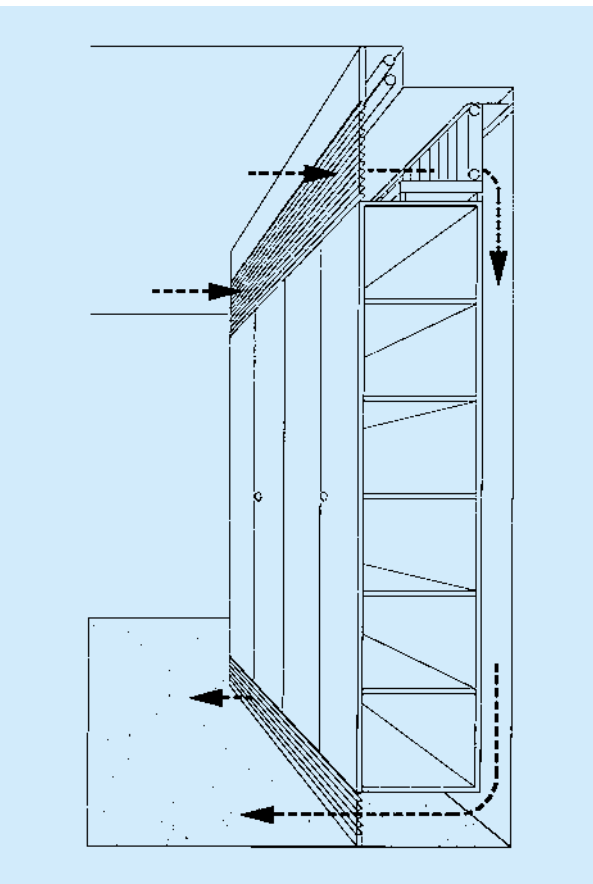
Systemlösung

Die ADO gTHERM Units sind in die flurseitigen Schrankwände integriert. Das hat den Vorteil, daß der Schrank direkt als Systemträger genutzt werden kann. Im hinteren Bereich befindet sich, für den Nutzer nicht sichtbar, der Fallschacht. Die Luftanströmöffnung und die Quellluftaustrittsöffnung sind mit einem filigranen Lineargitter, abgestimmt auf das ADO gTHERM System, optisch verkleidet.

Systemtechnik

Der für das Schwerkraftkühlsystem charakterisierende geringe Temperaturabstand zwischen Kaltwasser und Raumluft ermöglicht eine ökonomische und ökologische Einbindung in das Energieversorgungssystem des Gebäudes.

Beim ADO gTHERM System werden die statischen und dynamischen Druckverluste, die bei der Durchströmung der Kühlunits und den anschließenden Luftführungskomponenten (Anströmbereich, Durchlaßgitter, Umlenkungen, Fallschacht und Austrittsgitter etc.) auftreten, alleine durch die hydrostatische Druckdifferenz kompensiert, die sich aufgrund der Temperaturdifferenz zwischen der warmen Luft im Raum und der gekühlten Luft im Fallschacht einstellt.



Funktionsprinzip Schranksystem

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Wolfgang Schmid

Feng Shui consultants advises

Active Chilled Beams control room climate in Altstadt-Palais, Munich

Nowadays technical and economical considerations are no longer the only aspects when choosing an air conditioning system, other aspects also play an important part. Criteria such as space flexibility, comfort, cost effectiveness, and even principles of the Asian doctrine of Feng Shui had to be taken into account when deciding on how to control the room climate in the Altstadt-Palais, which is located on the Karl-Scharnagl-Ring in Munich, with its around 9,800 square metres of office space. The decision was made in favour of in-ceiling Chilled Beams with a primary air supply.

Cooling ceilings with dispersed air ventilation are in many places regarded as the office air conditioning system with the highest level of comfort. By contrast, concrete core temperature control using water and window ventilation marks the basic requirements for a contemporary temperature control inside buildings.

For Udo Keller, branch manager of the Munich office of Zibell Willner & Partner (ZWP), Ingenieurgesellschaft für Technische Gebäudeausrüstung mbH, in Cologne,

there was no doubt that due to the local traffic situation and the high expectations of the prospective tenants, an air conditioning system with ventilation would be the only viable option for the Altstadt-Palais. As he recalls, "We were faced with a somewhat complex situation when choosing the air conditioning concept." "On the one hand it was obvious that a building in such a triple A location, in view of the Staatskanzlei and Maximilianstraße, would attract nothing but top-class tenants." The Munich based companies Accumulata Immobilien Development GmbH and LBBW Immobilien Capital GmbH saw a chance to make a difference to the mass market with this new

The Altstadt-Palais is one of the new prime locations in the centre of Munich.



A total of 434 active in-ceiling Chilled Beams were installed in the Altstadt-Palais.



development. They aimed for stylish offices with very high space flexibility in a building that was to be designed with ecological and Feng Shui principles in mind. Hence, around 400 kilograms of energized and manually polarised rock crystals were buried in a 35 centimetre grid, in the soil of the so-called improved subgrade underneath the 1,742 square metres of concrete that form the base plate, to block negative impacts from, for example, underground watercourses and earth faults.

The latter requirements – the harmonisation of man in his environment in accordance with Feng Shui principles – were also instrumental in the decision on which type of air conditioning to implement. According to the traditional beliefs of daoistic philosophy, Feng Shui, which tries to harmonise the flow of life-energy through the house, can help, amongst other things, “to favourably dispose the spirits of air and water”. Naturally, air and water-bearing heating, ventilation and air conditioning systems are intrinsic parts of this theme.

Dress codes also have a say

What is considered a comfortable work environment can differ greatly from one occupational group to the next and from one industry to the next. Hence, the planners at ZWP first of all tried to envisage who the potential tenants might be and what sort of dress code they would favour. As the premises in the vicinity of the Altstadt-Palais are predominantly occupied by law firms and tax accountants and due to the exclusivity of the location it seemed safe to assume a similar type of clientele for the new building, so the planners based their selection on a very formal dress code. They assumed that the offices would be used by professionals who would wear suits all year round. "This type of apparel has a high insulating factor," explains Udo Keller their train of thought. "A cooling ceiling with its mild radiation does not really come into effect when 'people are wrapped so well'. Thus we decided on active in-ceiling Chilled Beams which while having a similar thermal effect presented a 50% cost saving." Another important factor in the decision for the Chilled Beams was that they made it easier to guarantee space flexibility. "For each spatial axis one Chilled Beam element was installed which is supplied with cold water and supply air from a false ceiling in the corridor. This helped

us to achieve a maximum of space flexibility," confirms Keller. A total of 434 Chilled Beams were installed.

For the return air the planners at ZWP again chose a solution that satisfies the requirement for high space flexibility. The used air flows via a ceiling joint and a noise-reduced overflow element to the return air duct in the corridor and from there to the air conditioning unit containing a heat recovery unit.

Constant air volume flow

All office spaces are designed for an air change of 1.8 to 2.0, whereby the system operates with a constant air volume and the air is blown out, virtually isothermal, through the Chilled Beams. To avoid condensation and to maintain the cooling power on days with high humidity the supply air is dehumidified in summer. Capturing the central enthalpy data provides an additional safety feature and if necessary the cold water flow temperature

Used air is transported to the return air duct in the false ceiling of the corridor through a noise-reduced overflow element.



ture (design temperature 16/19 °C) is increased. The cooling load is between 40 and 50 W/m²; the nominal temperature is 24 °C in summer. A separate system of radiators is used for heating.

Convincing fine-tuning

When choosing the product the client decided on active Chilled Beams from TTC Timmler Technology GmbH. Apart from the flexibility in the choice of Chilled Beam covers and the "fine-tuning" of the system the surprisingly high shell construction tolerances could also be compensated for. Being a modular system the ceiling design with built in Chilled Beams to match the high quality interior design allows customised solutions which accommodate the design requirements of the architects Auer-Weber, and those of the client, as well as the functional requirements of the system manufacturer.

For Markus Ullrich of Imtech in Munich the air conditioning system chosen for the Altstadt-Palais with its active Chilled Beams is more than just an economic alternative to a cooling ceiling with dispersed air ventilation: "The chosen Chilled Beams constitute an in-ceiling solution that closely matches the form and design ideas of our architects". The primary air supply is also ideal, in particular in view of the fact that due to the type of air outlet via jet panels secondary air from the room is taken in which results in strong induction. "The cooled air does not simply drop down, as it does with purely passive Chilled Beams, instead it already mixes with the room air in the higher regions. Our smoke tests have confirmed this on several occasions." While in actual operation the chosen solution again shows advantages, confirms Markus Ullrich: „This type of construction allows inspection of the Chilled Beams from below. Having to remove just four bolts allows for easy removal of the cover, for example, for hygiene inspections." ■

www.auer-weber.de
www.zwp.de
www.ttc-technology.eu
www.imtech.de



A tenant's reception area

Photos: TTC Technology/MDS

////////// **RESIDENCE**
WITH ///////////
////////// **DISTINCTION**

St. Louis County Residence

Project Highlights and Results

- Designed system eliminates reliance on natural gas for space heating and prepares the site for potential carbon neutral or net-zero operations.
- Geothermal field serves entire heating and cooling needs as well as DHW preheating.
- Working with Peter Rose + Partners, and Transsolar KlimaEngineering, and manufacturing partner, TTC Timmler Technology, designed gravity wall units -- a relatively new technology to the U.S. -- to meet sound and aesthetic requirements within limited ceiling space for implementation.
- Energy and custom, parametric TRNSYS model used to determine field performance for appropriate geothermal field sizing.
- System eliminates reliance on natural gas for space heating and prepares site for potential future carbon neutral or net zero operations.

Project Background

Location:	St. Louis County, MO
Team/Team Lead:	Don McLaughlan, Brian Malone, Bhupendra Tailor
Design Team:	Peter Rose + Partners, Transsolar KlimaEngineering
Elara Role:	MEP Design Engineer
Type:	New Construction

Project Overview

Building Type:	Single-Family Residential
Building Attributes:	3 Floors (plus basement); 14,790 SF w/ Heated Outdoor Pool and Pool House
Initial Construction:	2020
MEP Systems:	Geothermal Water Source Heat Pumps w/ Vertical Well-Field, Makeup Air Unit w/ Heat Recovery, VRF, Humidification, Gravity Wall Units, In-Floor Radiant, High-Efficiency Lighting, Back-Up Generator, Integrated Digital Controls

Innovation

- Due to zoning restrictions that limited building height and subsequently ceiling space to distribute sufficiently sized ductwork, 63 gravity wall units were utilized for space conditioning and to achieve desired aesthetics.
- Detailed modeling of the gravity wall units, including operational mockups, resulted in manufacturer design modifications to meet project requirements.
- The geothermal field, with 22 wells at 300 feet in depth, serves the entire heating and cooling needs of the building, as well as pre-heating of the domestic hot water. Energy is recovered from the exhaust via an enthalpy wheel in the geothermal source makeup air unit.
- Quiet operation and significant reduction in energy associated with heating and cooling for the project derived from gravity wall units and radiant floors that minimize the need for fan operation associated with the heating and cooling of spaces.
- Geothermal source VRF system used for remote standalone pool house and lounge.

FIRST PLACE

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FIRST PLACE

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//////////////// MAISON
DE LA RADIO //
//////////////// PARIS

La maison de la radio et la géothermie

25/02/2014 par Guillaume Tixier dans A la une, Energie géothermique



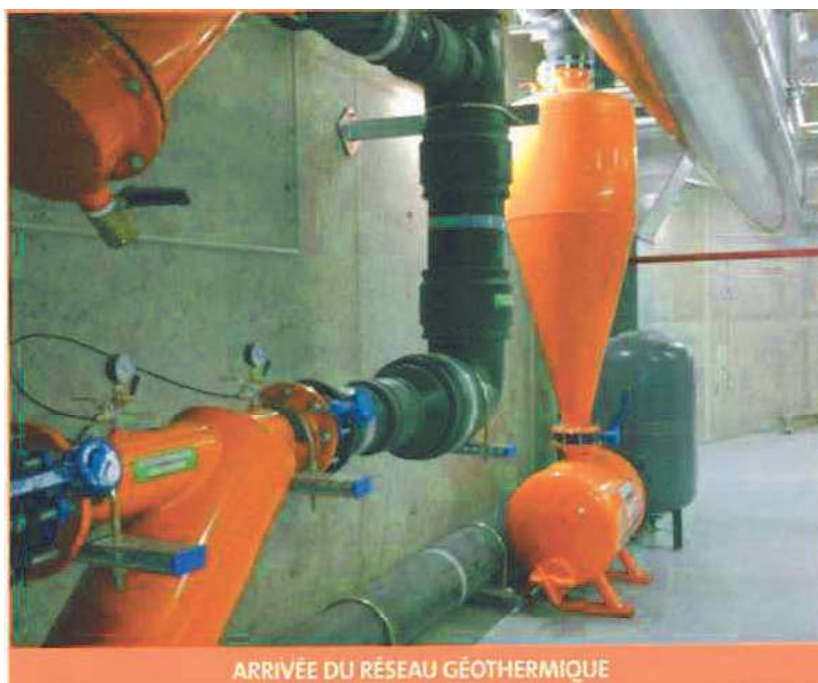
Ce bâtiment circulaire qui fête son demi-siècle est le premier en France à s'être chauffé grâce à la géothermie. Inauguré en 1963, la Maison de la radio puisait ses calories à 600 mètres de profondeur dans la nappe phréatique du bassin de l'Albien, une eau souterraine à 27°C.

« La rénovation de la Maison de la Radio nous a donné l'occasion de repenser et d'améliorer ce système » explique Michel Loiseau, en charge du suivi de ces travaux géothermiques pour Radio France. «L'ancien forage n'était plus conforme à la réglementation, il fallait trouver une alternative. On a envisagé plusieurs solutions, et finalement nous avons opté pour la création de trois nouveaux forages, à 40 mètres de profondeur seulement, sous l'avenue du Président Kennedy, dans une nappe d'accompagnement de la Seine avec une eau à 16°C».



RÉALISATION DES FORAGES DE PRÉLEVEMENTS, JUIN 2010

Cette eau plus fraîche suffit, grâce à des pompes à chaleur, à chauffer le bâtiment en hiver, et surtout permet de le rafraîchir en été. Quand il fait froid, l'eau puisée à 16°C est restituée à la Seine à 7°C délestée de ses calories, et à la belle saison, chargée de la chaleur excédentaire, à 28°C. « Nous avons pu supprimer les tours aéro-réfrigérantes et ainsi libérer deux étages au sommet de la tour où nous avons désormais une magnifique salle de conférence » se réjouit Michel Loiseau. « Et produisons, pour un investissement de 2,8 millions d'euros amortis en cinq ans, l'équivalent annuel de la consommation électrique d'une ville de 20 000 habitants ».



Chauffage et climatisation sont assurés, grâce aux échangeurs thermiques, par un double réseau, un circuit d'eau froide à 5-6 °C et un circuit d'eau chaude à 38-40°C qui irriguent la quasi-totalité des installations techniques de la Maison de la Radio. Des serpentins dans les plafonds diffusent les calories des fluides qu'il suffit de mitiger pour avoir la température souhaitée. Un système de chauffage écologique et réversible. Depuis la rénovation le système a gagné en finesse et la régulation se fait désormais au plus près de l'utilisateur, pratiquement bureau par bureau.

« Nous sommes très attentifs à l'absence totale de bruit. Dans nos studios nous utilisons des systèmes GRAVivent®, des radiateurs statiques qui sont en fait des cheminées de refroidissement par gravitation, sans le moindre ventilateur » précise le spécialiste.



L'ancien forage est aujourd'hui rebouché. Et les trois nouveaux permettent la climatisation de 28% de surface supplémentaire pour une consommation énergétique identique. Pionnière de la géothermie il y a cinquante ans, la Maison de la Radio reste à la pointe de l'innovation. Sa rénovation en fait une référence en matière de géothermie à basse température et un exemple de ce que peut être la transition énergétique.

Pour en savoir plus : une [présentation détaillée](#)

Crédits photos : ©[Maison de la Radio](#)

<http://www.faiteslepleindavenir.com/2014/02/25/maison-de-la-radio-geothermie/>

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