AIRPORT CONSTRUCTION WITH REHAU
INTERNATIONAL SKILLS FOR SUSTAINABLE SOLUTIONS
1. AIRPORT CONSTRUCTION WITH REHAU
HOLISTIC SYSTEM SOLUTIONS FROM REHAU
AIRPORT BBI BERLIN-BRANDENBURG, GERMANY
By the end of 2011 the airport, Berlin Schönefeld, shall be developed into the new capital city airport, Berlin Brandenburg International (BBI). After this date, the high-tech airport will be able to offer business travellers, tourists and companies the best connections, international flights, its own motorway link and a train station directly beneath the terminal.

**Impressive figures**

Berlin Schönefeld Airport is currently being expanded by an area of 970 hectares and will comprise a total of 1,470 hectares, which works out as some 2,000 football pitches. In this huge area, the initial version of the six-storey terminal building will provide enough space for 22 to 25 million passengers. In comparison, that’s more people than there are living in Australia. But that’s not all, and not by a long-shot: In further development modules, a step-by-step increase to 40 million passengers is possible. In just one peak hour alone, the BBI will be able to cope with up to 6,500 people taking off and landing and offer a total of 85 aircraft parking positions.

**Sophisticated technology**

This huge area was divided into several different construction phases for the planning and construction tasks. During construction, the planners relied on REHAU expertise in the areas of energy efficiency, renewable energy, water management and infrastructure.

Thus, on the airport’s southern runway, a total of 72,000 metres of REHAU sub-duct protection pipes for underground installation, RAUDUCT EVMR, was put to use. 3,200 live-rail supports and 4.5 km of support cover ensure optimum function and safety. For the integration of the information and communication systems REHAU provided a further 440,000 metres of cable ducts, which roughly corresponds to the distance between Berlin and Nuremberg.
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BILBAO AIRPORT, SPAIN
The flying airport of Bilbao in Spain was developed with the help of REHAU’s most state-of-the-art system technology.

In the year 2000, the new terminal was brought on line. It is a Santiago Calatrava design and portrays a flying dove. The architect came up with an answer to the air-conditioning question for the new Bilbao Airport that was both aesthetically appealing and easy to implement. The combined underfloor heating/cooling of REHAU meant that having to make compromises in the look of this modern architecture was unnecessary.
Possible savings

Many practical examples show how important the issues of safety, comfort, design, technical building services, operating costs, legal specifications, water management, energy efficiency and renewable energy are when it comes to complex projects. The main drivers of energy consumption are space heating (50%) and lighting (15%). And it is here where the greatest potential for financial savings can be found, reducing operating costs and increasing competitiveness.

The proper planning and design of the building envelope don’t just help to reduce costly energy loss. They even go as far as making a reduction in the overall system size possible, meaning both investment and operating costs can be optimised. Buildings built with inefficient heating systems and poor insulation in Germany before 1977 consume four times as much energy compared to new buildings with modern systems and corresponding annual heating costs of 400 kwh per square metre. As such, this is not just an issue in relation to new constructions, but to building renovations most of all.

In a normal office or administrative building, savings of 6-12% are possible simply by efficiently distrib-
uting heating and even cooling through underfloor heating or concrete core tempering. This is possible due to the fact that much lower supply temperatures are needed compared to conventional heating systems. Often, it is possible that the number of energy inefficient air-conditioning systems can be reduced or even dispensed with altogether as the same systems currently in operation for both functions can be used to cool the building as well.

Example of heat generating with a heat pump:
The correct choice of energy source can be decisive when it comes to reducing operating costs. The sum of acquisition costs, operating maintenance expenses and fuel charges make up the sum here which brings about a total reduction of costs. With a comparable calculation of 15 years, the advantages of using heat pumps (brine/water) are clear to see. Comparisons show that the annual total costs of heat pumps are well below those of conventional heating systems.

Cost comparison

<table>
<thead>
<tr>
<th>Fuel costs</th>
<th>Acquisition costs</th>
<th>Operating maintenance costs</th>
<th>Liquid gas*</th>
<th>Heating oil*</th>
<th>Natural gas*</th>
<th>Pellets*</th>
<th>District heating</th>
<th>Heat pump</th>
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</thead>
<tbody>
<tr>
<td>100%</td>
<td>78%</td>
<td>77%</td>
<td>74%</td>
<td>72%</td>
<td>66%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) Condensing boiler/model data in the style of itemised bill

The best energy is the one not even needed.
Example: Stormwater seepage:
When it comes to choosing the right system, the large share of sealed surfaces and the fees which are charged for draining the surface water into the sewer system are often unexpected factors for potential savings to be made.

The runways of average international airports are 2800m long and 45m wide. Thus, there is a sealed area of 126,000m² for the runways alone.

Even with stormwater discharging fees of just €1 per m² of sealed surface, annual costs of some €126,000 will be incurred.

In order to return the fallen stormwater via the corresponding REHAU seepage systems on-site to the soil (‘seepable’ medium sand), a retention volume of approx. 4,500m³ is necessary. This kind of system including the corresponding seepage boxes and accessories costs on average approx. €1.4 million. With the current status of discharging fees, these investment costs would have amortised after 11 years. However, since these fees are constantly rising, a significant reduction in the return-on-investment already needs to be anticipated.

Details of precipitation fees

Amortisation of seepage system

In Anlehnung an:
Quelle: http://www.essen.de

Average rise in precipitation fees: 35%

Investment / Savings with current discharging fees (as of 2010)
Energy efficiency

Energy efficient construction solutions - sustainable, economic and CO$_2$-reducing. With REHAU, system solutions for all three pillars of energy efficiency, the „Trias Energetica“, come from a single source:

Efficient energy generation:
The application of future-oriented technology to use renewable energies like geothermal heating, solar energy and biomass

Efficient energy usage:
Optimisation of heat distribution through underfloor heating/cooling with low temperature systems

Reducing energy losses:
Highly efficient window and curtain walling systems for heat insulation

The use of REHAU systems can significantly undercut the primary energy needs and final energy demand of statutory minimum standards, e.g. EnEV (German energy saving regulations) 2009 (D), EnG (CH), Leed (USA) or SAP (UK). Investments in the future, which according to the current energy prices could pay off after just six years and considerably reduce CO$_2$ emissions as well. Thanks to its integrated system technology, REHAU is able to offer architects, planners, fitters and building owners a unique all-round systematic approach when it comes to new constructions and modernisation work. Alongside system solutions, this includes services with planning software, training courses at the REHAU ACADEMY and qualified project consulting.
Water management
Sustainable water management - Future-proof system solutions by REHAU
For a number of years now, REHAU has been pursuing an integral, holistic approach to modern water management and has established itself as a qualitative and innovative piping systems provider for the entire water economy. The polymer system solutions from REHAU cover the entire water cycle, from the source to the extraction point, including the subsequent return of waste water for targeted reprocessing.

Safe conveyance of water:
Supply from the source to the extraction point with ease, hygiene and safety

Efficient water treatment:
Aeration systems for water purification

Preserving resources:
Usage and efficient seepage of stormwater

Infrastructure
Solutions for telecommunications, airport and traffic route construction
With the increase in metropolitan areas and megacities as well as the demographic development, the requirements of supply and disposal, energy, communication and traffic route construction are increasing. The world of tomorrow requires greater mobility and considerable investment in infrastructure. With reliable, long-lasting and fully developed REHAU system solutions for airport and traffic route construction as well as for railway transport, planners and developers are perfectly prepared for the future.

Technical building services
Impressive systems for innovative building concepts
For decades, our customers have trusted the convincing quality and simple machining of REHAU’s professional building technology systems. Our company develops and produces integral and complete system solutions for everything to do with heating and cooling, water and gas installation, industrial piping and compressed air networks as well as electrical installation.

Heating and cooling:
All-round systems for energy-efficient heating and cooling

Water, gas and electrical installation:
Safety and quality

Industrial piping and pressurised air systems:
Systems for industry and the commercial sector
The most varying of aspects decide how competitive airports, airlines and their operators are.
- Air transportation is a growing global market
- The use of wide-bodied aircraft causes greater static and dynamic stress on the runways and the systems used on them
- The increase in low-cost operators together with the development of regional airports
- The restriction of operation costs via energy-saving measures
- Measures for environmental protection in accordance with guidelines and national legislation

In the meantime, REHAU now has over 50 international reference projects in 14 countries where REHAU systems were used during airport construction.

This includes, for example:
- Frankfurt Airport
- Cologne Bonn Airport
- Düsseldorf International
- Berlin Brandenburg International Airport
- Hamburg Airport
- Hannover Airport
- Beijing Capital International Airport
- Bilbao Airport
- Imam Khomeini Airport Teheran
- Moscow-Vnukovo Airport
- Tripoli International Airport
EXPERTISE
YOUR Project IN THE BEST OF HANDS
Skill
Modern airport-specific designs emerge on the one hand from the interaction between airplane and airport or the interaction between the airplane and the environment. On the other hand, the particular situation which emerges from the passenger and freight traffic and the corresponding service providers in the airport surroundings is a factor in airport planning. Included in airport planning in particular are, for example, the design of the entire airport system with the positioning of runways, taxiways and aprons as well as the structure of tower, passenger, luggage and freight handling systems. Many considerations in airport design result from the necessity of safety in aircraft movements, however economical and ecological factors are also starting to play an increasingly important role.

REHAU operates in an innovative and technology-oriented environment and is thus the ideal partner for economic and safety-relevant solutions. Decades of experience, process expertise and material and tool skills make us your skilled partner in airport construction.

System technology
The performance and possible areas of applications of our products and systems are tightly bound to the requirements of their use. Using basic evaluations as our starting point, we create new, tailor-made all-round solutions which include planning support and a range of extensive services so that we can expand the existing product range and find new approaches for new applications.

Together towards success
The interdisciplinary exchange is becoming increasingly important in research and development. Suppliers, customers, but also institutes, research centres and universities participate in this process. Ongoing contact, maintenance and development of relations are a matter of course and have been successfully put to practice at REHAU for number of years. The findings and experiences gained from this find their way into new and optimised systems relevant to everything to do with airport construction and thus provide the opportunity of optimisation in regard to energy efficiency, water management, infrastructure and technical building services.
INTERNATIONALITY
GLOBAL PLAYER WITH LOCAL SERVICE
Since the company was founded in 1948 REHAU has grown on its own strength to become a globally active group. REHAU first established itself in Germany and the surrounding western countries. What followed was the successful further development in Europe and the foundation of branches in North America, Asia and Australia. For over ten years now, the company group has been heavily represented in Eastern Europe. Today, some 15,000 employees achieve growth and success all over the world for our company group. The company looks to work closely with the market and its customers at over 170 locations on five continents.
QUALITY
SAFE TECHNOLOGY IN ALL AREAS
The monitoring of airplanes between flights is subject to the highest standards. The same requirements apply to the infrastructure and constructions for air traffic. For this reason, you, as an airport operator should only work with partners who are also only satisfied with the highest quality standards.

REHAU stands for the highest levels of professionalism and reliability. This is because quality is a basic tenet of our philosophy. By meeting the quality standards and requirements of our customers, we make a considerable contribution to their satisfaction. We operate according to global quality policies and regulations across all of our REHAU locations. Our principles for quality don’t just apply to our employees, but to our suppliers as well: We meet the needs of our customers and make their quality requirements reality.

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ENERGY EFFICIENCY
SECURING COMPETITIVENESS FOR TOMORROW TODAY

Air traffic has a share of around two per cent in the annual global emissions of almost 50 billion tonnes of CO₂. For this reason, it is all the more important that airport buildings be at the top of energy optimisation. In this respect, operating and maintenance costs determine the market, not just in the air, but on the ground as well.

The specific fuel consumption of aircraft is some 3-4 litres per 100 kilometres and passenger, 7-8 litres for short-haul flights and some 4-5 litres per 100 kilometres and passenger for long-haul flights. The fuel consumption is therefore comparable with that of an economical car.

Fraport’s plan of action

By signing a charter, the airport operator, Fraport, commits itself to creating a plan of action to regularly report on the implementation of the measures determined within it and to update this plan. „Fraport’s plan of action contains numerous measures, among others, the energy-related optimisation of terminal systems and 60 office and service buildings. It is likely that this optimisation will bring about a reduction in energy consumption at the terminal systems of up to 30 per cent and in the office and service buildings by around 15 per cent“, emphasised the board member responsible for employee concerns at Fraport AG, Herbert Mai. In praise, Weinmeister continues „These measures will help the company reduce harmful greenhouse gases as well as save energy“. He points out that the company has already taken measures to reduce CO₂ emissions in the past, like for example, the introduction of free job tickets for employees or the importing of district heating from combined heat and power (cogeneration).
We provide the system solution. We comprehensively address the requirements of the issue of energy efficiency.
Generating energy ecologically, using it efficiently and cutting costs.

**Geothermal energy**  
Power generation from the deep

**Heat pump**  
Sustainable and trend-setting all-round solution

**Underfloor heating**  

**Solar**  
Effective use of solar energy

**GENEO window system**  
Perfect energy efficiency

**Air and geothermal heat exchangers**  
Monitored ventilation for the best indoor climate
1.1 GEOTHERMAL HEATING/COOLING

**REQUIREMENTS:**

Inexpensive and eco-friendly system solutions for specific applications in regard to energy usage for check-in areas, administrative buildings, maintenance and service facilities and buildings on the periphery of the airport.

- Reduction of heating and cooling costs
- Security of operation of clearways in winter
- Ease and comfort with a pleasant indoor temperature in the buildings
- Ecological, resource-preserving architecture and operation
- Improvement to the energy balance by reducing CO\(_2\) emissions
- Greater independence from energy costs
- Long-term operational safety

**SOLUTIONS:**

Use of geothermal heating with system solutions for new buildings and renovation.

**Geothermal probes:**

Adjusted to ground conditions and temperature zones for heating/cooling, like, for example, the helix probe: external depth restriction: 1 to 5 metres

**Energy piles:**

Collectors can be integrated into foundation piles without any additional space requirements or substantial added costs.

**Geothermal collectors:**

The inexpensive alternative to heating in frost-free periods and zones if there is enough space. Requires little depth: 1.5 m dual use, e.g. for keeping the manoeuvring areas free from ice and generating solar energy using hybrid collectors in the asphalt layer of these areas.
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

RAUGEØ Probe PE-Xa
- Maximum operational safety thanks to curved probe foot without welded connections
- Greatest robustness against notching and scratching when lowering into the drillhole
- Maximum operation security thanks to high-quality material PE-Xa
- Suitable for heat storage in the earth
- Ideal for building heating and cooling

RAUGEØ depth probe
- Long-term safety and ground water protection thanks to probe material which can withstand up to 120 bars of pressure by itself and handle temperatures of up to +95°C.
- High energy efficiency through the use of higher temperature levels at greater depths, thus improving the performance factor of the heat pump
- Space-saving installation

RAUGEØ coaxial probe
- Specially designed coaxial probe for space-saving radial boring
- Low boring costs
- Little ground work thanks to central boring point
- Use of depth restriction possible

RAUGEØ Helix® PE-Xa
- Ideal solution in areas with depth restrictions and little space
- Quick and easy installation with standard machine technology
- Simplified licensing procedure
- Long-lasting safety thanks to the PE-Xa material

RAUGEØ energy piles
- Ideal for covering the base load of building heating and cooling
- Low construction costs by using foundation piles, which are needed anyway, for energy use.
- No additional space requirements
- Long-term operational safety

RAUGEØ collect PE-Xa surface collector
- Inexpensive, sandbed-free installation and long-term operational safety
- Low operating costs and higher degree of efficiency thanks to improved heat conductivity of mixed earth instead of sand

RAUWAY stabil asphalt collector
- Specially developed hybrid collector for integration into the melted and rolled asphalt
- Use of solar absorbers and underground heating for keeping free from ice and snow
- Resistant to deformation thanks to integrated aluminium layer
1.2 AIR AND GEOTHERMAL HEAT EXCHANGERS
AIR AND GEOTHERMAL HEAT EXCHANGER SYSTEM AS HYGIENIC AND EFFICIENT ADDITION TO MONITORED VENTILATION

REQUIREMENTS:
Use of air treatment in airport buildings:

- Ease and comfort with a pleasant indoor temperature
- Reduction of operating costs compared to classic air-conditioning systems
- Ecological, hygienic and maintenance-free operation
- Improvement to the energy balance
- CO₂ minimisation

SOLUTIONS:
Air and geothermal heat exchanger system for eco-friendly and energy-efficient, controlled ventilation of airport buildings while taking hygienic aspects into consideration.

An air and geothermal heat exchanger system uses the energy storage capacity of the earth to increase the efficiency of controlled ventilation. Here, the fresh air intake in the underground piping system is heated (winter) or cooled (summer), which means that savings can be made on energy costs for the heat recovery device.
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

AWADUKT Thermo

In AWADUKT Thermo, REHAU has developed the first air and geothermal heat exchanger system with an anti-microbial inner pipe layer. In relation to heat recovery devices, this does not just save costs and energy but also considerably improves the air quality in buildings. Thanks to its specific properties, the AWADUKT Thermo air and geothermal heat exchanger system has won awards for innovation in France and Poland.

- Optimised heat transfer between the ground and the air sucked in through piping material with increased heat conductivity
- Anti-microbial inner pipe layer for hygienic, virtually germfree supply of fresh air
- Safe and air-tight piping system thanks to robust PP piping material and tried-and-tested safety-lock jointing technique
- Targeted condensate removal and de-watering
- Radon-proof system
- Individual solutions thanks to versatile fittings and manifolds range
- Optimisation by pre-filtering the fresh air intake

References, among others, in

- Industrial, commercial and administration buildings
- Schools and day-care centres
- Congress centres
- Kongresszentren
- Production sites
- Residential buildings

REHAU planning support

During all stages of your project, REHAU is there to help, be it in the form of intensive planning support, assistance with the technical specifications, production of special component parts, mediation of qualified installation experts or even instruction for product installation on the construction site. This does not just apply to the air and geothermal heat exchanger systems, but to the heating/cooling area with geothermal energy.
REQUIREMENTS:
- Reduction of running costs for hot water and/or heating
- Perfectly matching components in the complete system
- Easy, fast and flexible during assembly
- High performance and functional safety
- Easy integration into the existing heating system
- Innovative future-oriented image
- Attractive design
- Sustainable reduction in CO₂ emissions

SOLUTIONS:
Solar energy systems for energy-saving drinking water and heating support.

With thermal solar power systems, savings can be made on a large portion of the energy consumption for hot water and heating. This lets you make a valuable contribution to reducing CO₂ emissions.

- Optimum usage of solar energy using perfectly coordinated components
- Different collectors and reservoirs for various uses
- Low-maintenance and reliable system for high solar yields
- Easy combination with the most different of heat generators
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

REHAU SOLECT complete solar thermal energy system
- Usage in practically all roofing and building types
- High performance thanks to perfectly matching components
- Long life with consistently high yields
- Assembly systems tested against wind and snow loads
- Flexible building block system for the highest demands of technology, architecture, hygiene and convenience
- Certified according to the European quality mark for sun collectors, Solar Keymark

REHAU SOLECT collectors
- Certified quality, for high performance and long service life
- Good ratio between gross area and absorbing area
- Hail-proof transparent solar security glass
- Simple installation
- Coordinated assembly options for various roof construction types (e.g. roof-mounting, roof integrated or stand-alone support)
- Appealing optics thanks to transparent glass and profiled absorbing area

Different versions for every use
- Wall-mounted, flat, frame-based and cross collectors

REHAU SOLECT reservoir
- Reservoirs in three versions (drinking water reservoir/compact reservoir, combi-reservoir, buffer reservoir) with minimum maintenance requirements
- Large-area solar heat exchangers enable a high level of hot water convenience
- Easy-to-assemble connection design
- High-quality corrosion protection
- Option of supplementary heating through integrated electric heating element

Fresh water station
In combination with a buffer reservoir, drinking water is heated according to the flow principle as needed.
- Greater hot water convenience up to 40l/min
- Very good hot water temperature constancy
- Comprehensive range of controller functions, like initial operation support, temperature-setting to the exact degree, circulation operation (demand-actuated or on a timer)
- High system efficiency in combination with REHAU SOLECT buffer reservoir

REHAU SOLECT controller
Solar controller 100, 300, 800
- Simple initial operation thanks to start-up assistant
- Compact construction
- Individual design with large illuminated graphical display
- Plain text menu navigation (multilingual)
- Made in Germany
1.4 BIOMASS, LOCAL AND DISTRICT HEATING
CENTRAL AND LOCAL ENERGY GENERATION AND DISTRIBUTION

REQUIREMENTS:
In connection with airport buildings, maximum flexibility of heat distribution needs to be guaranteed by the district and local heating networks.
- Flexible networking of the ductwork
- Good system insulation properties
- Realisation of special solutions
- Connection to local thermal power stations
- Creation of local, central units for additional upgrading
- Highest static and dynamic load capacity
- Long-term functionality and operational security
- Fast and easy installation with just a few connection elements

SOLUTIONS:
Highly insulated compact composite pipe system
- Complete piping and fittings range
- Least heat loss by using high-quality foams
- Longevity and high static load capacity
- Long-lasting pressure and temperature resistance up to 85°C
- Fast route installation thanks to large collar lengths

Flexible hybrid pipe system
- Complete piping and fittings range
- Low energy loss thanks to threefold insulation
- Low bending radii
- Greatest robustness due to solid-walled outer sheath
- Easy building installation

Socket principle
- Quick-install socket principle with high insulating properties
- Safe, inseparable jointing technique
- Permanent water-tightness
- Pressure-resistant complete system
- Equal heat insulation properties of piping and socket system
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

RAUTHERMEX – composite pipe system
- Long life > 50 years thanks to PE-Xa medium pipe
- Minimum heat loss on long heat routes by using polyurethane foam
- Flexibility of the complete system makes it possible to situate the thermal power plant outside of the direct flight safety area
- Longitudinal stability of the pipe prevents shrinking/expansion of the carrier pipe due to heat
- Robust outer layer protects internal piping from damage during and after installation
- Permanently low pressure loss for the entire service life due to the innovative jointing technique without cross-section constriction
- Reduced assembly and time outlay thanks to large coil lengths of up to 560 m

RAUVITHERM - hybrid pipe system
- High flexibility with low bending radii due to PEX soft insulation
- Pre-insulated hybrid piping technology of up to 125mm
- Optimum heat transfer with low heat loss due to additional insulation layers
- Extremely profiled outer layer enables use in complex and closely branched heating networks and the easy circumvention of safety-relevant systems beneath the manoeuvring areas
- No incrustation from PE-Xa material, ensuring long-term functional safety
- Longitudinally waterproof piping system in connection with the closed-cell PEX foam brings about the permanent insulating effect of the pipe network
- High robustness and suitability to construction site due to solid-walled PE outer layer

REHAU socket technique
- Stable socket system suitable for construction site
- Flexible adjustment for pipe diameter DN25-DN125
- Fast and easy installation using innovative building block system
- Highest heat insulating properties by using polyurethane foam
1.5 HEATING AND COOLING SUPPLY
CHECK-IN AREAS - SERVICE AREAS - ADMINISTRATIVE BUILDING

REQUIREMENTS:
Low temperature systems with the highest design and technical requirements of heating and cooling distribution while taking into account the optimisation of operating costs.
- High architectural and technical creative freedom
- High heating comfort
- A system for heating and cooling
- Solutions for modernisation projects and new buildings
- Energy costs savings
- Installation systems for wall, ceiling and floor
- Realisation of special solutions
- Complete solution incl. control technology
- Combination with heat pump applications/use of geothermal heat

- Prevention of the accumulation of condensate water and ground undercooling in summer operation

Concrete core tempering (CCT)
- Quick assembly thanks to pre-configured CCT module
- Flexible adjustment to heating cycles when in use and during changes to use

Underfloor heating/cooling
- System solutions in wetwall construction method with DIN CERTCO certification
- System solutions in drywall construction method with DIN CERTCO certification
- Certification reports according to DIN EN 14240

Individual solutions for the most varying of installation situations
- Underfloor heating/cooling
- Wall heating/cooling
- Ceiling heating/cooling
- Acoustic ceilings for heating and cooling

SOLUTIONS:
Control technology for heating/cooling
- Controller set with fully automatic, need-oriented switching between heating and cooling
- Single room feed temperature control dependent on atmospheric conditions when heating

- Concrete core tempering (CCT)
- Quick assembly thanks to pre-configured CCT module
- Flexible adjustment to heating cycles when in use and during changes to use

Underfloor heating/cooling
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Individual solutions for the most varying of installation situations
- Underfloor heating/cooling
- Wall heating/cooling
- Ceiling heating/cooling
- Acoustic ceilings for heating and cooling
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

RAUTHERM S heating pipes
- Highest safety and flexibility thanks to PE-Xa oxygen-tight according to DIN 4726
- Extensive quality checks
- Fast, safe and easy jointing technique for optimum installation
- Excellent bending properties

REHAU concrete core tempering (BKT)
- Variable module dimensions and special geometries for flexible use
- Individual length of the connection pipes
- BKT module for processing in precast concrete components
- Adaptation to complex building geometry through on-site installation of REHAU BKT
- Reduction in assembly time

REHAU underfloor heating/cooling
- Studded panel Varionova with or without impact noise insulation, for various requirements of construction height, heat insulation and moving loads
- Stapler system with integrated impact noise insulation
- Dry systems with low construction heights for modernisation projects and new building

REHAU radiant heating and cooling ceiling
- Gypsum plasterboard with integrated piping system
- High level of safety thanks to high-quality, air-tight RAUTHERM pipes made from PE-Xa, both inside the ceiling elements and for the connection pipes.

Various board sizes for high level of use

REHAU acoustic heating/cooling ceiling
- The best acoustics at optimum indoor temperatures
- Perforated gypsum plasterboards attached to each other with integrated pipe and reverse-side laminated acoustic filter
- Reduction of noise level by absorbing the sound
- Various different board sizes for modifying the ceiling to different room geometries
- Various hole pattern types for flexible design options

REHAU wall heating/cooling
- Systems for dry and wet construction
- Dry system with gypsum plasterboard and integrated pipe system for quick installation
- Various board sizes for high level of use of the wall space
- Low construction height of the gypsum plasterboards at 15mm
- During wet construction, safe pipe fixing with clamping rail for fast and flexible installation
- Suitable to modernisation work and for new construction sites

REHAU heating/cooling controlling technology
- Anticipatory activation of cooling mode
- Individual adjustment to the building’s characteristics

All systems can be combined with REHAU geothermal products (see Page 22/23)

Effectiveness of the cooling system
Comfortable surface temperatures when cooling thanks to temperature sensor

Various board sizes for high level of use
INDUSTRIAL/OUTDOOR FACILITY HEATING
HANGARS - MAINTENANCE YARDS - AREAWAYS - FOOTPATHS AND ROADWAYS

REQUIREMENTS:
The heating of a modern airplane hangar or maintenance yard using underfloor heating demands the highest technical and economical requirements of design and execution.

Similar challenges are evident in the area of outdoor facility heating in regard to helicopter landing pads, access routes, parking areas for cars and planes and areaways for pedestrians.

- Operating cost efficiency through energy efficiency
- High point load resistance
- Safety aspects
- No interruptions to operations when removing snow and ice
- Long-term, complete or partial use of renewable energy sources to cover the heating and cooling needs
- Low maintenance or maintenance-free systems

SOLUTIONS:
Industrial underfloor heating radiates warmth, thus bringing about homogenous heat distribution. Without compromises in regard to usage or construction.

- Low temperature level of the heating system for eco-friendly use of the corresponding energy source. Depending on circumstances, process waste heat can be used to heat the yard
- Optimum heat distribution within the yard, no unnecessary warm air buffer beneath the yard ceiling
- System stability and long life
- Low air flow with less dust swirling up

Outdoor facility heating guarantees that sensitive, heavily used outdoor areas remain free of snow and ice without any interruption to operations due to road-clearing or de-icing services.

- No interruption to operations due to snowfall or freezing wet conditions for clearance
- No use of material-damaging de-icing salt
- The use of renewable energies and the implementation of local systems ensure that costs can be controlled when investing and during operation
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
A system is only ever as good as its weakest link: For this reason, all of the component parts of REHAU industrial underfloor heating, that is, the joints, piping and distributors, are perfectly matched to each other. REHAU industrial underfloor heating has been optimised for use in the most difficult of conditions.

- PE-Xa pipe quality with high safety margin
- High building site suitability of PE-Xa pipes
- Robust pipe and safe jointing technique for easy and fast installation
- Permanently sealed jointing technique
- Integration of the heating system into the floor construction

As the leading provider of pitch heating, REHAU provides comprehensive expertise in outdoor facility heating for a number of surfaces, e.g. concrete, block paving, grass areas, etc.

- Parallel installation on mats or prestressing reinforcements installed by the client
- Parallel installation beneath the paving on clamping rails
- High building site suitability of PE-Xa pipes

REHAU heating/cooling controlling technology
- Anticipatory activation of cooling mode
- Individual adaptation to the building’s characteristics and highest possible efficiency of the cooling system
- Comfortable surface temperatures when cooling thanks to temperature sensor

All systems can be combined with REHAU geothermal products (see Page 22/23)
1.7

WINDOWS
MORE THAN JUST A CLEAR VIEW OUTSIDE

REQUIREMENTS:
Alongside the unique design, the technical properties of the window in regard to sound insulation are also significant factors when choosing which system to use.

- Storey-high window elements
- Large glass surfaces
- Freedom of design in shape and colour
- Heat protection
- Noise protection
- Tamper-proof
- Highest surface quality
- Low maintenance requirements

SOLUTIONS:
An architect’s or developer’s requirements of windows are as varying as the buildings into which they are fitted. Those who wish to be in the reckoning as competent, reliable partners cannot afford to come up short anywhere.

Required are different systems ranging from standard windows to certified passive house windows with the corresponding noise insulation classes.

This applies not just to applications which are directly related to the building activity of the airport, but increasingly so to the area of the airport’s surrounding environment.
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

**REHAU window technology**
The benefits of a window system can be seen in the flexibility with which it can adapt itself to the requirements of the building envelope.

**Trend-setting heat insulation**
The excellent insulating properties of the REHAU window profile systems mean that operating costs are kept to a minimum.

The highlight is the REHAU GENEO system which achieves the highest stability thanks to its fibre-coated high-tech material RAU-FIPRO without thermal bridges and caters for $U_w$ values of up to 0.66 W/m²K.

**Creative freedom for individual tastes**
REHAU window profile systems offer creative freedom when it comes to size, shape, colour, decoration, style and opening method.

**Noise protection to meet your requirements**
REHAU window profile systems are suited to all installation types and achieve noise insulation values of up to SSK 5 when combined with the corresponding glass types.

**Effective tamper resistance as needed**
The high-quality and resistant PVC surface also reduces the overall effort expended. The HDF surface (high definition finishing) of the window frames is high in quality, extremely smooth and robust. This makes it less susceptible to dirt and especially easy to clean.

**REHAU GENEO**
The new dimension in window construction for the highest level of energy efficiency from the high-tech material RAU-FIPRO

**REHAU EURO design 86 plus**
The economical system with a construction depth of 86mm

**REHAU Brillant design**
The design-oriented system with a construction depth of 70mm

Individual design. Show your colours.
- Aluminium shell
- Foil lamination
- Finishing

Long-lasting and environmentally friendly: Windows and curtain walling in the REHAU profile systems feature an outstanding ecological balance and are known for their decade-long use with a minimum outlay of time for maintenance and care.
The resource of water is precious and preserving it is a must if we are to safeguard its supply for future generations. Because without water there is neither life, growth nor progress. People can live for a long time without electricity, but just a few days without water.

The ecological and economical handling of water in regard to costs is currently relevant for competition especially when it comes to large gatherings of people, as is normal in airports.

The polymer system solutions from REHAU cover the entire water cycle, from the source to the extraction point, including the subsequent return of waste water for targeted reprocessing. This approach is complemented by the most modern stormwater management systems for pre-purification and usage and ecologically sensible seepage.
We provide the system solution. We comprehensively address the requirements of the issue of water management.
2.1 DOMESTIC INSTALLATION/WATER SUPPLY
SYSTEMATIC HYGIENE

REQUIREMENTS:
A guaranteed water supply is of utmost importance to the routines and operations of an airport. Hygiene, reliability, safety and flexibility are to be guaranteed at all times in this respect. It needs to be possible to carry out maintenance work, upgrades and additions during running operations.

- Safe, long-lasting, maintenance-free, perfectly matching system components
- Modern and cost-saving installation
- Incrustation-free

SOLUTIONS:
Secure system for installation into the ground and technical building management.

- Guaranteeing the drinking water quality by adhering to national and international specifications
- (e.g. KTW recommendations, DVGW quality mark)
- Extremely robust and safe system components with high, mechanical load capacity
- Safe jointing technique suitable for the building site
- High safety margin
- Extensive range of jointing elements and accessories

Drinking water piping systems for ground installation
- Pipe systems for installation with and without sandbed
- Classic or trenchless laying
- Maximum flexibility of pipe dimensions

Domestic installation system
- All-round solutions for drinking water, heating, gas and industrial applications
- Universally utilisable jointing technique
- Flexible and flexurally resistant piping systems
- Multiple different solutions thanks to extensive system accessories
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

Ground installation
PE-Xa drinking water piping
- Notch insensitivity
- Resistant to point loads
- Stress cracking resistance
- High friction resistance
- High flexibility and notched impact strength at low temperatures
- Can be used up to 95°C continuous temperature
- High resilience (memory effect)

RAUPROTECT made from PE 100-RC drinking water with traceability barcode
- Excellently suited to modern and inexpensive installation methods like horizontal directional drilling, cutting in, ploughing in, impact mole technique, controlled auger boring, long-section relining, burst lining and installation in open piping trench without sandbed or pipe support
- No development of cracks under point loads
- Suitable to all soil classes
- Can be installed without expensive soil exchange
- REHAU Quality System (RQS) including permanent barcode identification
- Complete traceability of every metre of piping installed
- Automated welding documentation without any potential for errors, like with manual logging

Domestic installation
RAUTITAN universal system for drinking water and heating
RAUTITAN drastically reduces sound propagation in the piping compared with metal piping systems.

In order to protect users of buildings in the case of fire, REHAU offers certified and approved fire protection solutions in its RAUTITAN domestic installation system which dependably prevents the distribution of fire and smoke.
- A fittings range for flexible PE-Xa pipes and flexurally resistant combined metal plastic pipes
- Compression sleeve jointing technique without O-ring
- Low loss of pressure thanks to expansion technology
- Connections immediately resistant to compression stress
- Planning and execution safety thanks to mutually compatible system components
2.2 DOMESTIC DRAINAGE

REQUIREMENTS:
High material resilience against contaminated waste waters/fats/oils
- High temperature resistance
- High pressure flushability
- No incrustation
- Strong noise protection properties
- Easy installation

SOLUTIONS:
- Universal domestic waste system approved by the German Institute for Structural Engineering (Deutsches Institut für Bautechnik/DIBT) in Berlin
- Satisfaction of noise protection requirement according to VDI guideline 4100
- General technically approved fireproofing collars and system components
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
RAUPIANO PLUS
Satisfaction of noise protection requirements of DIN 4109 (30 dB(A)) as well as the much more stringent requirements of the VDI guideline 4100 (20 dB(A)) by:
- Reducing airborne noise through the use of innovative functional layers and special material reduction of the impact sound through patented mounting technique (sound-proof support bracket)
- Same dimensions as the conventional HT
- Simple design like HT, since identical hydraulic discharge capacity
- Tried-and-tested push-fit socket principle, no additional tools necessary
- Excellent low-temperature impact strength for raw construction site operation - qualified with ice crystal test according to DIN EN 1451/1411 (break resistance as low as -10 °C)
- High pipe stiffness (ring stiffness > 4 kN/m² according to DIN EN ISO 9969)
- Optimised weight for quick and easy processing
- Hot-water resistant, chemically resistant and corrosion-proof
- Economical and innovative fire protection solutions
- Long-term stress resistant up to J24

- Proven high-pressure flushability up to 120 bars
- Can be combined with the AWADUKT piping system without adaptors
- General technically approved by the German Institute for Structural Engineering (Deutsches Institut für Bautechnik) in Berlin

Fireproofing collar
- Fire resistance duration of at least 90 min. (F90)
- Quick assembly thanks to self-fixing and snap fit
- Variable installation depth
- Integrated noise protection
- For flush-mounting and surface mounting

Pipe fitting
- Patented system for increasing noise protection
- Non-slip fixing of the pipe thanks to special rubber profiles
- REHAU pipe fasteners for optimum noise buffer thanks to double pipe strap
2.3 DRAINAGE

REQUIREMENTS:
- Resistance to chemically contaminated industrial waste water/fats/oils/lubricants/detergents
- High temperature resistance
- High pressure flushability
- Cleaning in place
- Ease of system inspection
- Low tendency to incrustation
- Installation under high static and dynamic ground and moving loads (underground installation)

SOLUTIONS:
Continuous sewer system highly resistant to chemicals which runs all the way from the discharge point to the purification system.

- Heavy duty sewer pipe system - safe and reliable under the highest stress
- Sewer shaft as an inspection shaft in the traffic route and domestic connection areas
- Systems for subsequent connection of new sewer pipes to existing pipe networks possibly made from different materials
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
- High chemical resistance against aggressive and hot industrial waste water as well
- Can be used temporarily at up to 90°C
- Service life of at least 100 years according to the LGA Nuremberg report
- Permanently air-tight sewer network solution using special seal system
- High safety margin thanks to solid full wall construction
- Smooth inside surfaces prevent incrustation and simplify cleaning

AWADUKT PP SN10/HPP heavy duty sewer pipe system
- EN standard 1852 - approved for Europe-wide use
- Flushable under high pressure of up to 340 bars

AWASCHACHT (System DN 315-1000)
- Stress-resistant up to SLW 60 - acc. to LGA Nuremberg
- Easy to inspect thanks to bright colour and safe thanks to corrosion-resistant steps

AWADOCK sewer pipe connection system
Permanently air-tight solutions for subsequent integration of domestic connection and sub-duct networks:
- AWADOCK NEW GENERATION combines functionality with new and unique safety technology. The way this works is similar to an airbag.
- REHAU has succeeded in transferring this important technology to its pipe connection systems and in AWADOCK NEW GENERATION developed a new era of connection systems.
- AWADOCK CP for a pressure-sealed and secure connection of lateral inflow pipes
- AWADOCK POLYMER CONNECT combines PVC and PP smooth-walled plastic pipes
2.4 STORMWATER MANAGEMENT

REQUIREMENTS:
On the airport grounds, the majority of the area is sealed. It is required that the stormwater be quickly drained from the area, to have it seep and thus return it to or store it in the ground water and have it gradually released to the drainage system. Contamination in the stormwater is to be removed as much as possible before being fed to the ground water or to the receiving channel.

SOLUTIONS:

**Stormwater purification system**
- Stormwater filter system with certified purification performance
- Multi-level filter principle which also guarantees the binding of unfixed contaminants
- Installation also possible in heavy duty traffic zones
- Sedimentation for the removal of contaminants bound to particles
- Underground installation, thus no space requirements on the surface

**Reservoir modules**
- Reservoir modules with the highest possible reservoir volume
- Integrated distribution/control/flushing channels for long-lasting, safe function
- Optimum adaptation to spatial conditions and space available
- Quick and easy installation
- Heavy-duty version for applications with high standards in regard to installation depth and static safety

**Seepage pipes**
- Greatest possible flexibility when it comes to system selection
- Pipe and trough-pipe infiltration trenches depending on the area of application
- Throttled disposal and adherence to a maximum allowable waste outflow
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

RAUSIKKO Box
- High storage coefficient of 95%
- Inspectability and flushability of the system
- Long-term function of the seepage system
- High load capacity also permits installation in extreme conditions
- Long-lasting unrestricted system functionality
- RAUSIKKO Box Heavy-duty with an extremely high load capacity in vertical and horizontal directions
- Extensive complete system with all of the necessary components for box and trough-box infiltration trenches
- Free, user-friendly software for easy dimensioning of the system

RAUSIKKO seepage pipes
- Special slot pattern for optimum function of the seepage pipes
- With pipe invert for distribution of the stormwater in the infiltration trench
- Defined water exit point for long-term functionality of the infiltration trench
- Extensive complete system with all necessary components for pipe and trough-pipe infiltration trenches

RAUSIKKO HydroClean
- Technical approval from the German Institute for Structural Engineering (DIBT): Z-84.2-5
- Highest operating safety thanks to a series of tests and LGA/TÜV Rheinland inspection
- Efficient filter elements which guarantee both the bonding of unfixed contaminants and their chemical precipitation and the therewith defined retention
- Satisfaction of the strict limit values of the German ground protection ordinance „BBodSchV (Bundesbodenschutzverordnung)“, e.g. for copper and zinc
- Delivery as complete system in the AWASCHACHT DN 1000

RAUSIKKO sedimentation
- Easy installation beneath the used surfaces
- Simple modification of the system to the size of the connected surface
- High retention volume for light liquids, e.g. in the event of an accident
- Proof of treatment in accordance with the DWA-M data sheet 153
- Simple inspection and cleaning of the systems
2.5 WATER PURIFICATION

REQUIREMENTS:
Local disposal of waste water of airports and associated facilities.
- Reduction of operating costs of sewage treatment systems
- Reduction of waste water charges
- Chemical resistance of the system components
- Low maintenance operation
- Quick and easy installation

SOLUTIONS:
Biological sewage treatment system with aeration system.
Operating your own treatment system which is adapted to meet the requirements and size of an airport makes possible optimisation from both a technical and commercial point of view. This makes it possible to clean the waste water on-site instead of expensive sewer disposal.
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
RAUBIOXON pipe aerator

RAUBIOXON aeration system
- Low energy consumption
- Membrane based on silicone rubber free of plasticiser
- Excellent chemical resistance of the materials used
- Well suited to oily or fatty waste water
- Tailor-made problem solutions
- Delivery and installation of complete aeration systems
- RAUBIOXON system for very good oxygen absorption (TU Darmstadt report)

References in the following areas:
- Dairy processing
- Leather processing
- Starch production
- Paper industry
- Mineral oil processing
- Drinks industry
- Chemical cleaning
REHAU offers you future-oriented, holistic solutions for infrastructural projects in and around the airport for the most varying of needs. Here, REHAU stands for safety, energy-efficiency, ecology, cost-effectiveness and a long service life combined with cooperative service concepts and thus contributes to the optimisation of your operating costs. The REHAU team builds on tried-and-tested innovative products from the areas of window and curtain walling systems, building technology as well as underground construction which can be put together to make complete systems which are perfectly compatible with each other.
We provide the system solution. We comprehensively address the requirements of the issue of infrastructure.

Hybrid collectors
More than just generating energy

Drainage
Secure and economical usage of transport routes

Reinforcement
For long-lasting and inexpensive renovations

Cable protection
Protects cables for generations

Drainage
The safe solution for buildings

Pipe renewal
The low-cost alternative to open installation
3.1 ASPHALT REINFORCEMENT

REQUIREMENTS:
Due to the increasing air traffic, the static loads and associated static requirements of the runways and the apron are also increasing.

- Products for long-lasting and inexpensive renovations to traffic zones
- Long-term, sustainable stabilisation of the road constructions
- Minimising crack formation in the surfaces and the associated impairment of flight safety
- Faster installation without the risk of long downtime

SOLUTIONS:
Asphalt reinforcement
- For the partial or full renovation of asphalted traffic zones in the airport area in order to reinforce the new asphalt surface
- For superstructing cracked concrete roads with asphalt wearing courses in order to fully reinforce the new surface
- For widening the asphalted traffic zones in order to reinforce the connection area
- For the subsequent construction of pipe and cable trenches in asphalted traffic zones in order to reinforce the surfaces of the trench boundaries
- An optimum layer composite and effective force absorption by the reinforcement
- High degree of installation safety and ease
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

**ARMAPAL asphalt reinforcement**

- Absorbs the tensile stress which occurs in the bituminous road surface and dissipates them across a larger surface area.
- Improves the dynamic load stress and fatigue behaviour of bituminous layers.
- Delays the occurrence of reflective cracking.
- Delays crack formation from connecting joints when widening the road and constructing utility trenches.
- Increases the intervals between renovations by three to four times compared to non-reinforced asphalt. As a result, the installation of ARMAPAL significantly reduces renovation costs in the long term.
- It has an extremely low ultimate strain of approx. 2% and as a result is in a position to absorb tensile stress even at the low strain levels permitted for asphalt layers.
- It is highly temperature-resistant up to 840°C and thus suitable for use in melted asphalt.
- The glass roving of ARMAPAL GL makes sure there is good adhesion with the lower layer during installation and prevents the bond coats from pushing through.
- With ARMAPAL reinforced surfaces can be easily cut off later on. ARMAPAL makes it possible to re-use the removed milling material if needed.
3.2 DRAINAGE

REQUIREMENTS:
- Systems for long-lasting, fast intake and targeted drainage of stormwater from sealed surfaces or roof areas and from the ground (depth de-watering) in order to secure both the stability of base layers and the safety of all structures.
- Retention and delayed, throttled drainage or targeted seepage of stormwater in order to avoid overflows in the sewer networks and to make savings when constructing stormwater sewers.

SOLUTIONS:
Civil engineering drainage systems
- Depth de-watering with heavy-duty civil engineering drainage system in accordance with DIN 4262-1 and DIN 1852.
- Safe intake of seepage water through grille with corresponding water inlet areas.
- Fast and long-term safe drainage of water thanks to smooth inside areas with good hydraulic characteristics.
- Protection against stubborn deposits and grit.

Stormwater sewer pipes
- High volume sewer pipe system with corresponding ring stiffness.
- Safe and quick drainage of water from underground and surface de-watering.
- Suitability for retention or as accumulation sewer.
- Quick and easy installation thanks to long construction lengths.
- Secure jointing technique.
- Fittings range for simple adaptation to local circumstances.

Road gulleys
- Surface de-watering of sealed areas and safe feeding to the de-watering sewers.
- Intake of stormwater and safe drainage and thus avoidance of damage to or settling on the surface.
- Modular system for adjusting to the different installation depths and requirements, with and without sludge collectors.
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

REHAU civil engineering drainage system
RAUDRIL Rail PP
- Made from high-quality polypropylene without filler
- High chemical resistance (pH value 2-12)
- Usable under high static and dynamic load stress
- Very high resistance to point loads
- Flushable under high pressure of up to 340 bars
- Statically calculable according to ATV-DVWK A 127
- Extensive fittings range
- Manufacturer-related product qualifications (HPQ) of German rail operator „Deutsche Bahn”
- Railway approval for installation under UIC traffic load

REHAU stormwater sewer pipes RAUVIA
- Large pipe system up to DN 1200
- Made from high-quality polyolefin material PP or PE
- High chemical resistance (pH value 2-12)
- Load stress up to SLW 60 even with low depth of coverage
- Statically calculable
- High discharge capacity thanks to smooth inside wall
- Easy storage and transportation
- Quick installation thanks to low weight and simple connections
- Grille model with 3-level slot pattern for optimum function of the seepage pipes

REHAU RainSpot road gulleys
- Impact-proof, break-proof and long-lasting thanks to material PP
- Resistant to de-icing salt, corrosion and frost
- Load transfer to the surrounding ground without straining the gulleys
- Long-lasting air-tight system thanks to sealing profile
- Quick, easy and safe installation thanks to low weight
- Flexible installation thanks to modular system
3.3 TELECOMMUNICATIONS

REQUIREMENTS:
- Resistance to high static and dynamic stress from the moving loads of the airplanes
- Protection of data and signal cables
- Easy, tried-and-tested installation
- Required/Matching fittings range
- Flame-retardant PVC
- Optimum use of the pipe diameter of already installed PVC cable ducts

SOLUTIONS
Cable ducts
- In accordance with DIN 8061/8062 and DIN 16873
- Statically calculable according to ATV A 127
- Complies with the requirements of EBA and DTAG
- Flame-retardant materials (material class B1) according to DIN 4102, Section 1

Multiple subducting pipes
- Material in accordance with DIN 8074/8075
- Material in accordance with material class B2 according to DIN 4102
- Jointless, water-tight and gas-proof casing of the individual pipes
- With corresponding grooving in order to achieve maximum injection lengths
- Direct ground installation
- Optimum use of the pipe diameter in cable duct trenches

Micro-cable pipe systems
- Subsequent use of the ductwork routes
- Provisioning for individual circumstances
- Need-based adjustment of the network structure for data and signal transmission
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
RAUDUCT and RAUDUCT EVMR are complete systems which cover all use-cases in the area of multiple subduct cable protection pipes for underground installation. An extensive range of fittings and accessories complement the system. The pipes can be safely and reliably connected with interlocking, tight-connecting and pneumatically sealed socket fittings. RAUDUCT is attached to the beginning and end of the shaft using sealing plugs. They meet the following requirements of PVC cable ducts:
- In accordance with DIN 8061/8062 and DIN 16873
- Extreme quality surveillance by the SKZ in accordance with HR 3.31
- Statically calculable according to ATV A 127
- Complies with the requirements of EBA and DTAG
- Flame-retardant material (material class B1) according to DIN 4102, Section 1

RAUDUCT/RAUDUCT EVMR multiple subducting pipes by REHAU
- Material in accordance with DIN 8074/8075
- Material in accordance with material class B2 according to DIN 4102

RAUDUCT systems made from PE-HD are robust, yet flexible. Even at low temperatures (as low as -15°C) the pipes can be installed straight out of the drum from shaft to shaft without joints. The RAUDUCT system offers an extensive range of different cross-sections for integration into existing cable trunking as well as directly into the ground.

Both during insertion into the protective piping and during direct ground installation, the piping coil remains stable, even when the direction is changed. Thanks to the combined covering which follows the contour, there is no twisting of the composite piping. This minimises the risk of building site downtime. Construction costs which are incurred as a result of subsequent network extensions are spared thanks to the installation of RAUDUCT subducting pipes for underground installation as additional cables can be fed in without incurring any additional installation costs.

With the special REHAU trapezoidal grooving, frictional resistance is minimised. The result is optimum injection lengths and the easy option of cable removal should insertion of new cable technology become necessary.
3.4 RAIL POWER SUPPLY

REQUIREMENTS:
With increasing traffic volume in cities and metropolitan areas, modern regional public transport is becoming increasingly important. In the area of rail power supply through a third rail, the materials and systems used need to be easily integrated even in the most difficult climatic conditions: regardless if required for the tunnel or for the „S-Bahn“ (rapid-transit railway) area.

SOLUTIONS:
Supporting elements in the operating current supply
- High static and dynamic stability
- Less breakable than ceramic and cast resin insulators
- Impact-resistant materials
- Long air and creepage distance as supports and insulators are united in one component part
- Significantly better electrical properties than steel support
- Self-extinguishing
- Halogen-free in accordance with DIN EN 50267-2-2 / VDE 0482 Section 267-2-2
- UV stabilisation; suitable for outdoor areas without any additional finishing
- Resistant to chemicals in underground and rapid-transit railway (U-Bahn and S-Bahn) operation
- No corrosion, even when close to the sea and with high air humidity levels

Cover systems for safe transmission of operating current
- High mechanical load capacity all the way to walkability
- High break strength
- Materials adjusted for impact-resistance
- Reliable and insulating
- High creep resistance
- Self-extinguishing or flame-retardant
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
Alongside the development of complete building block systems, the capacity for development and system versatility of REHAU also facilitates customer-specific solutions. Covers and system components are made for railway power supply using a number of different production techniques, materials and profiles ─ everything from a single source and system-relevant. In this regard, the component parts satisfy the following properties when in use or being assembled:

**Live-rail supports**
- Balance of threshold tolerances or different installation conditions thanks to vertical and horizontal adjustability
- Easy to assemble and low-maintenance
- Customer specific attachment/hole pattern possible
- Optimum live-rail sliding due to the supports thanks to integrated sliding components
- The most varying of heights and foot lengths can be implemented

- Tested by REHAU’s own testing devices under realistic conditions

**Cover systems**
- Existing building block system suitable for lots of installation situations
- Simple installation
- Maintenance-free system components
- Delivery of all necessary additional system items

Complete REHAU systems have already been developed for the largest metropolises of the world, for example, the underground and overground railway systems in Berlin, Cairo, Munich, Vienna, Hamburg, Helsinki, Warsaw and Istanbul.

Strict quality controls according to DIN EN ISO 9001 from the arrival of goods to their issuing safeguard the continuously high quality of products and adherence to the agreed material and component part properties. If needed, 3D models and FEM calculations can be created and project-specific options implemented.

- Halogen-free materials in accordance with DIN EN 50267-2-2 / VDE 0482 Section 267-2-2 (Duroplast) or DIN VDE 0472 Section 815 (Thermoplast)
- UV stabilisation for outside use
- Resistant to many chemicals
REHAU develops and produces integral and complete system solutions for building services whose criteria of ecology and economy, design and functionality and safety and comfort do not contradict each other.

Standardised systems are implemented in a similar way to services specifically for target audiences. The core skills are to be found in the areas of heating and cooling, gas and water installation, industrial piping and compressed air networks as well as in electrical installation. Thanks to our many years of experience and our international setup, we can provide our partners with sophisticated systems for planning, tendering, implementation and execution on almost all markets. Engineers, architects and planners rely on strong partnerships. We satisfy these high demands by consistently improving the functionality and robustness of our products for rough construction work. In Europe, REHAU is one of the leading providers of systems for technical building services.
We provide the system solution. We comprehensively address the requirements of the issue of technical building services.

- **Drinking water and heating installation**
  Systematic hygiene

- **Sprinkler installation**
  High-quality installation system

- **Heating/Cooling**

- **Electrical installation/Telecommunications**
  The best way to be quicker

- **Gas installation**

- **Industrial pipes**
  Can be installed for practically all applications
Since the fire in Düsseldorf Airport at the latest, it has become clear that it is not just preventative fire protection, but safe fire-fighting which are matters of utmost importance. Sprinkler systems need to fulfil the following requirements:

- Low-cost installation
- Safe operation
- Mutually compatible complete systems
- Incrustation-free
- Reliable fire protection
- Dependable protection of life and limb
- Reduction of consequential damage risk

Solutions:

- High-quality installation systems for sprinkler installation with corresponding permissions.
- System solutions for different installation situations
- Robust and easy to create jointing technique
- High mechanical and chemical resistance
- High safety margin with all components
- Usage of corrosion-proof and incrustation-free materials for safe, maintenance-free operation
- Flameless jointing technique for reducing the risk of fire during assembly
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
RAUTITAN universal piping system for use in sprinkler, drinking water and heating installation

Installation system RAUTITAN sprinkler
- VdS tested and certified
- Clear identification of the fittings and compression sleeves for the sprinkler area of application
- Complete solutions suitable for the building site in sizes ranging from 32 to 63mm
- Use of the compression sleeve jointing technique, which has been proven a million times over, and the tried-and-tested RAUTITAN universal pipes
- Flexible PE-Xa piping RAUTITAN flex for great ease of installation
- Flexurally resistant combined metal-plastic pipe, RAUTITAN stabil, with self-supporting inliner and high safety margin

- Reusable sprinkler mounting system for safe and easy fixing of the sprinkler jet and installation onto the wooden lagging during the raw construction phase
- Professional assembly tools RAUTOOL
- Powerful fire protection system for installation into concrete ceilings
4.2 GAS INSTALLATION
SAFE GAS SUPPLY

REQUIREMENTS:
- Safe and long-lasting
- Fire-resistant and explosion-proof
- Suitable to modern, inexpensive installation techniques
- Economical in operation
- Coordinated complete system
- Subsequent upgrading and reconstruction possible
- Colour-coding for clear identification

SOLUTIONS:
Gas pipe systems for ground installation
- Pipes for installation in the sandbed
- Pipes for sandbed-free installation
- Pipes for sandbed-free and trenchless installation
- Range of sizes 32 to 160 mm
- As cut lengths and as coil
- Maximum flexibility of the pipe system and the accessories range (couplers, branches, tapping clamps, etc.)

Gas installation system for use in buildings
- Combined metal-plastic pipe system resistant to deformation in dimensions ranging from 20 to 40mm
- Special fittings range with coloured marking and W/G 100 identification
- Extensive system accessories for every area of operation
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

General
- Extremely robust and high-quality system components
- High mechanical and chemical load capacity
- Safe jointing technique suitable for the building site
- High safety margin, unbreakable connections
- Safe, fast and easy processing
- With DVGW quality mark

Ground installation
RAU-PE-Xa for sandbed-free and trenchless installation
- Cost savings thanks to sandbed-free and trenchless installation methods (ploughing, cutting in, directional drilling)
- Tapping clamps allow upgrades and the squeezable pipes allow upgrades and repairs during running operations
- Europe-wide approval

Domestic installation
Gas installation system RAUTITAN gas
- High quality of all components
- Compression sleeve jointing technique without O-ring proven a million times over
- Execution of the compression sleeve jointing technique can be optically monitored
- Planning and execution safety due to mutually compatible and tested system components
- Low loss of fitting pressure thanks to large inside cross-section, thus advantageous dimensioning
- Very fast and easy system dimensioning
4.3 ELECTRICAL INSTALLATION

REQUIREMENTS:

**Individual office connections**
- Future-proof installation which can be variably customised to changing room usage and new infrastructures
- Power, data and communication connections are freely positionable and accessible at all times
- High-quality materials and components in discreet design

**Safe building in the event of fire**
- Adherence to cabling system guidelines
- Fully satisfy fire-retarding sealing principle
- Floor-by-floor fire-retardant cabling system impenetrable to smoke

SOLUTIONS:

**Dado trunking**
- Building block system with uniform inner workings, covers and parapet wall cover
- Simple and easy assembly
- Different model versions in form and design

**Fire protection trunking**
- Certified system components and materials: Trunking, attachment and partition
- Standard-compliant and perfectly fitting finished components for installation requirements which are important in practice; the ready-to-install assembly of the components does not involve any follow-up work
- Complete range for the most differing of assembly types
- Maintaining electrical functions for safety systems in the event of fire
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

SIGNO dado trunking
- CUBICO pre-wired trunking socket: The assembly technique by hand is playfully easy and very fast. In addition, there is a compact form in a simple, perfect design
- Click-to-fit quick coupler1: The exemplary jointing technique for trunking bases. Especially easy assembly with a playfully easy hand grip
- Attractive cap mouldings: Neat corner cladding, which perfectly complements the fit, the impressive look and quick-assembly use
- Impressive console technology: The ingeniously simple principle with resounding effect. Reliable pre-assembly and the easiest unassisted handling
- Impressive brand quality: Harmony from fascinating technology and perfect design in tested professional quality without having to make compromises. License from EP 0721243 B1

RAUTHERMO fire protection trunking
- The fire protection trunking system RAUTHERMO is a building component certified according to DIN 4102: Functional Integrity + smoke protection + prevention of hazards
- The RAUTHERMO system is the responsible solution to structural fire protection at the highest level of safety.
- Together with the approved mounting system, RAUTHERMO safeguards the installation of a cabling system with functional integrity and without the need for any special cables
- RAUTHERMO fire protection trunking with its internally-installed cabling system may be used in emergency escape routes
- Construction site speed: Lowest weight of its class (outside sheet steel coat - inside lining made from inflammable fire-proof panels of building material class A1)
- Reliable and perfect-size fittings
- „Third hand assembly aid“ thanks to tongue-and-groove joint with unique 5cm offset
- In case of emergency, RAUTHERMO works in two directions: Over a specific period of time, outside flames will not penetrate the inside trunking either through fire or heat. Important electrical cabling does not fail in the event of fire = Functional integrity E30 to E90. Alternatively, in the case of fire attacking the cabling, the spread of smoke and flames from the trunking to the emergency exits and escape routes is suppressed for at least 90 minutes = I 90.
**INDUSTRIAL PIPES**

**QUALITY CONNECTS**

**REQUIREMENTS:**
- Reduction in operating and maintenance costs
- High mechanical and thermal load capacity
- Easy, fast and flexible
- Colour-coded
- Universal system with extensive fittings range
- Permanently leak-proof
- Corrosion resistant
- Upgrading and modification possible during ongoing production

**SOLUTIONS:**

**Universal industrial pipe systems**
- For all industrial areas of application
- For the most varying of application areas like compressed air, cooling water and other media
- Quick installation in coils
- Reduction in operating and maintenance costs
- Optimisation of assembly times
- Medium identifiable thanks to colour-coding
- Chemicals and corrosion resistant piping system
- Long-term air-tightness, no leakage, no energy loss, low operating costs
- Extensive fittings range for use in new constructions, upgrading and renovation projects
- Temperature-resistant
- Immediately pressure and temperature-resilient after making the connection
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

**RAUPEX industrial pipe system**
- DIN 2403 recommends colour-coding pipes in order to avoid mix-ups. RAUPEX pipes are already colour-coded, thus dispensing with any subsequent and expensive colour identification.
- Flexible installation. Should unexpected problems arise during installation, these can often be immediately resolved by the flexibility of the piping. Of course, this can also be resolved by the extensive fittings range.
- Temperature-resistant up to 95°C
- Safe jointing technology which can be optically monitored and is proven a million times over
- Immediately pressure and temperature-resilient after making the connection
- Permanent with long-term air-tightness, no leakages, no energy loss, low operating costs
- Quick to install, thus shortening the building period
- Without O-rings
- Low cross-section constriction in the area of connections, thus less pressure loss
- Extensive fittings range

**REHAU tapping clamp**
With the REHAU tapping clamp, the subsequent creation of a branch can be done in the space of a few minutes. Even with piping which is under pressure and without interrupting ongoing production.

**Installation in cable tray system**
Due to their low weight, RAUPEX pipes can often be attached to existing cable trunking using the REHAU pipe clamp.

**RAUPEX pressurised air accessories**
- REHAU safety coupling prevents „whiplash effect“-active safety in the workplace
- REHAU blow gun - ergonomic form, exact metering of the air jet, very easy
- RAUFILAM E pressurised air hose - cadmium-free, textile-reinforced and type-tested by the TÜV Product Service - the ideal pressurised air hose
- REHAU pressurised air connector three-fold
- Optically appealing, ergonomic and functional
- User-friendly coupling and decoupling
- No buckling of the hose on the steel male coupling, meaning longer service life
- Direct connection to the RAUPEX industrial piping using REHAU compression sleeve
- Easy assembly by REHAU mount for pressure connector
- Versions with compression sleeve connection 32 x 2.9 and threaded connection Rp 1“
REHAU has established itself as the leading manufacturer and supplier of polymer-based solutions for the most varying of application areas in the furniture industry and as a reliable partner for trading and interior fitting. With the motto „Design for furniture“, REHAU is developing, producing and selling functional and appealing surface tops as well as matching system solutions for modern living and working environments.

With its patented sound-absorbing tambour door system RAUVOLET acoustic-line, REHAU underlines its claim to be the driving force behind innovations in the furniture area, where it manufactures products with added value. The multi-award-winning system makes a significant contribution to improving room acoustics, especially in open-plan offices.

REHAU emphasises its core skills when it comes to materials, technology and design with its trend-setting developments, like the high-tech material RAU-WOOD (one of its own WPC formulations), which gives REHAU’s RELAZZO terrace system its unique product characteristics.

For appealing design solutions in interior fitting, in RAUVISIO, REHAU offers a modern surfaces range which leaves no stone unturned when it comes to design wishes. Countertop elements, tables, shelving units - RAUVISIO provides solutions for numerous application fields.
REHAU provides system solutions for room design both indoors and out.

**RELAZZO**
Long-lasting terrace system

**RAUVOLET acoustic-line**
Sound-absorbing tambour door systems

**RAUVISIO**
Innovative surfaces range

**RAUCORD**
High-quality weaving material
5.1 RELAZZO
THE HIGHLIGHT OF THE OUTDOOR AREA

REQUIREMENTS:
In modern airports, the peripheral areas are becoming increasingly important. The RELAZZO WPC terrace system impresses with its appealing design and has been proving its worth in day-to-day use with these properties. A terrace is constantly subjected to varying weather conditions. Rain and moisture afflict the wooden component parts, while sunlight affects colour stability. For this reason, conventional terrace planks can be considerably affected after just a few months. This can be apparent in contorted or even broken planks on the one hand or fading original colours on the other.

SOLUTIONS:
WPC revisited
REHAU has reinterpreted the material WPC (wood polymer composites) and developed its own ecologically high-tech material composition RAU-WOOD. This gives the terrace system excellent resilience and a long service life. From a technical point of view, the high-tech material RAU-WOOD is distinguished by its optimum ratio of wood and polymer components, homogenous distribution of finely structured wood particles and a special plastics matrix. These features make sure that RELAZZO absorbs a minimum of water and that the colour of the planks remain highly constant. RELAZZO does not need to be painted, oiled or ground.
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
- High surface hardness
- Low maintenance requirements
- Outstanding UV stability
- Weather-resistance
- Longevity
- Low water absorption
- Appealing look
- Colourfulness
- High-quality accessories
- Easy installation
- Subsequent disassembly and reassembly of individual planks possible
- Easy terrace planning at www.rehau.com/relazzo

Appealing design - Creative freedom for your ideas
RELAZZO offers a wide range of options when it comes to designing terraces for publicly utilised areas. Six appealing colours, two different surface variations - grooved or ridged, depending on which plank side is chosen - and high-quality accessories all put the terrace into the right light. The system is available in all six standard colours and in plank lengths of four, five and six metres from stock.

Optimum handling
RELAZZO also offers a number of advantages when it comes to installing - from straight-lined design to playful shaped panels, all creative wishes can be easily implemented. The sophisticated construction makes child’s play of any subsequent disassembly or reassembly of individual planks, for example, in case you wish to install lights. Accessory parts like the flexible end trim, a specially developed protective profile for installing stairs or connecting plates, leave no questions unanswered.
REQUIREMENTS:
Thousands of people enter and exit international airports daily. The expectations of air passengers range between professional use (business trips) to relaxed comfort (holidays). For this reason, the challenge is using surfaces which both feature functional properties and do justice to aesthetic demands. Simultaneously, the maintenance of the surfaces, e.g. cleaning, needs to be possible for the user with efficiency and without any great effort.

SOLUTIONS:
RAUVISIO mineral
The solid, thru-coloured solid-surface material RAUVISIO mineral combines a stone-like look with warm, pleasant feel. The modern acrylic material is extremely versatile thanks to practically unrestricted formability and is best suited to sophisticated and true to size design solutions. Examples of use:
- Decorative elements
- Counters (e.g. check-in)
- Seats
- Wall cladding
- Catering
- Bathroom areas (e.g. wash-bowl)
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:

RAUVISIO mineral
- Translucent decoration for rear-lit applications
- UV-resistant
- Abrasion-proof, resistant to normal household acids and alkalines
- Regenerative surface: scratches can be polished off, larger damaged spots can be repaired practically invisibly
- The non-porous surface and jointless processing are particularly hygienic and easy to clean
- Suitable for lightweight construction solutions
- Fire protection class B1 on request

RAUVISIO quartz
- Capillary-free and non-porous and thus especially hygienic to use
- Long-lasting
- Resistant to chemicals
- Fire protection class B1; special decorative designs A2

RAUVISIO glass
- Especially hygienic thanks to non-porous surface
- Heat-resistant
- Especially resistant to chemicals
- Fire protection class A

RAUVISIO quartz
The quartz material RAUVISIO quartz is optically uniform and has a similar feel to natural stone. The industrially finished stone impresses with its durable, abrasion-proof and impact resistant surface, which is also capillary-free and non-porous and thus especially hygienic and easy to clean. Examples of use:
- Wall cladding
- Catering areas
- Bathroom areas (e.g. wash-bowl)

RAUVISIO glass
The translucency of the innovative glass ceramic surface of RAUVISIO glass opens up versatile creative perspectives. This combination with light makes interesting effects and impressive room design possible. The optical and technical options of usage in the premium segment are quite numerous for glass ceramics. Examples of use:
decorative, e.g. rear-lit wall cladding and separating walls

RAUVISIO quartz
The quartz material RAUVISIO quartz is optically uniform and has a similar feel to natural stone. The industrially finished stone impresses with its durable, abrasion-proof and impact resistant surface, which is also capillary-free and non-porous and thus especially hygienic and easy to clean. Examples of use:
- Wall cladding
- Catering areas
- Bathroom areas (e.g. wash-bowl)
5.3  
FURNITURE / OFFICE ENVIRONMENTS  
RAUVOLET ACOUSTIC-LINE

REQUIREMENTS:
Current trends in architecture like glass or exposed concrete are dominating the aesthetic of modern open-plan offices. The sound-reflecting materials and a reduction in the walls result in problems with the room acoustics, which decreases employees’ efficiency levels.

In order to be able to concentrate when working, employees need peace and quiet and a pleasant atmosphere. For this reason, the room acoustics need to be balanced again.

SOLUTIONS:
RAUVOLET acoustic-line
REHAU’s sound-absorbing profile RAUVOLET acoustic-line makes a significant contribution to improving room acoustics.

Its special profile geometry with consistent perforation in combination with a special acoustic filter absorbs the sound and contributes to the creation of an acoustically pleasant atmosphere in the employees’ surrounding environment.

The profile can be used in cabinets, sideboards and highboards, movable walls or as decorative murals. With individual printing of decorative designs and the use of differently coloured filters, the most varying of surfaces can be realised - useful furniture can be turned into an element of architectural and creative relevance.
ADVANTAGES OF REHAU SYSTEM TECHNOLOGY:
- Linear broadband absorber
- Acoustic effectiveness and high-quality design combined with storage space
- Noise shielding and absorption in the employees’ surrounding environment
- Flexible usage
- Furniture’s functional surface dispensed with
- Individual design options
- Assessed degree of noise absorption $\alpha_w = 0.8$
- When used in cabinets, the profile absorbs an average of up to 80% of the impacting noise.

Please also note the combination with an acoustic heating/cooling ceiling (see Page 31)
In relation to both new constructions and existing buildings, various regulations and laws need to be taken into consideration on the one hand, while the benefits of funding subsidies from the federal government, the state and communities need to be used wisely on the other.

These investments are designed in such a way that incentives are given to reduce CO$_2$ emissions and/or increase energy efficiency. Here, REHAU is your competent contact partner, and much more.
1. Full service provider in support planning for your projects

Specialists in window and curtain walling technology, building technology and in the area of underground construction/infrastructure are at the ready to provide you with advice and assistance in all of the phases of your building project, from comprehensive planning support all the way to technical support, e.g. during the installation of our systems for the first time. Here, REHAU can provide you with fully developed software tools which ensure you get that extra benefit when working on your property.

Three of the „Tools for your success“ are

1. REHAU energy savings calculator
2. REHAU building technology planning box
3. REHAU „Systems for stormwater management“ calculation programme

A key tool is the REHAU building configurer. This supports architects, planners and fabricators when it comes to optimising the new construction of detached homes and apartment buildings. You can use the building configurer on the REHAU customer website:

www.rehau.de/gebaeudekonfigurator
www.rehau.co.uk/buildingconfigurator

Contact us and discover a whole new world of REHAU services. More information is available online at:

www.rehau.de/service

Send us an email:
energieinfo@rehau.com
We’ll contact you immediately.

2. Direct contact for everything to do with resource-preservation and energy-efficient building

If you are interested in REHAU system solutions for energy-efficient construction and wish to find out more or to have a REHAU expert come visit you after making an appointment.
# AIRPORT CONSTRUCTION WITH REHAU

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INNOVATIVE SYSTEMS FOR CONSTRUCTION

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