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# **Worldof PORR** Information for pros

JURR

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## Table of content

Foreword	
CEO Karl-Heinz Strauss	Page 4
PORR Projects	
AURON	
A modern, sustainable office building erected according to the principles of the Feng Shui doctrine	Page 5
Headquarters for ÖBB Infrastruktur AG	
Praterstern 3, 1020 Vienna	Page 11
Mobile flood protection for the town of Schärding	
on the River Inn, Upper Austria	Page 14
2nd building phase of the office complex in Warsaw is completed	Page 18
Raffelspergergasse 15	
Apartment building in 1190 Vienna	Page 20
Hollenburg private clinic	
Mental health facility for city of Krems	Page 24
Reconstruction of the Emscher culvert at Castrop-Rauxel	
floating 18,000 tonnes of reinforced concrete into position	Page 26
Flowenter cochool in Stuckenice	
A construction project of Porr (Česko) a.s.	Page 30
TEERAG-ASDAG AG	
Competence and efficiency also for alpine facilities	Page 32
Apartment building, Vienna, Wohlmutstrasse 19-21	
100th anniversary revitalisation	Page 34
Shopping Haidäcker Park	
The new shopping centre in Eisenstadt	Page 36
Flood protection Spitz	<b>D</b>
Flood protection project in the region of the town of Spitz on the Danube	Page 38

Roof refurbishment works on asbestos cement slabs for an apartment building	
in Vienna and other business lines of the BOMA Group	Page 41
IWP Liebhartstal II	
From the DB call for tender to the award including project concept	Page 44
Warszawa Centralna Station	
Renovation of the most important railway station in Warsaw	Page 47
Hotel Ramada Innsbruck Tivoli	_
Newly constructed hotel in the heart of the Alps	Page 51
Peek & Cloppenburg's Flagship Store	
in Kärntner Strasse, Vienna	Page 54
Sun gallery	
PORR builds a modern business centre	Page 58
Test Building Erste Campus	
"Mock-up-Room"	Page 60
•	
PORR Undates	
Topping out at the social service centre "Ganslwirt"	Page 63
Topping-out ceremony at Ashta hydropower plant	Page 64
PORR is building a section of the Maritsa motorway in Bulgaria	Page 65
Rock face stabilisation on Axen route	
Construction site with a spectacular view	Page 66
PORR receives contract to build Beskyd tunnel in the Ukraine	Page 67
Topping-out ceremony at the "Bike & Swim" apartment complex	Page 68
PORR opens Buchenberg tunnel at Waidhofen/Ybbs	
The 1,485-m-long Buchenberg tunnel was opened on November 6th 2011 after four years of	
construction work.	Page 69
opping-out celebration at the Austria Trend Hotel DOPPIO and DOPPIO Offices project	Page 70

Breakthrough celebration at Eierberge tunnel	Page 72
Ground-broaking coromony for contract soction 20 of the Emschar sower	
Works on contract section 20 of the Emscher sower were officially started with a ground breaking	
ceremony at Bottrop, North Rhine-Westphalia, on October 17th 2011.	Page 73
Major contract for a new section of the German high-speed rail network awarded to PORR	
Confirmation of expertise in infrastructure	Page 74
Germany: PORR wins biggest tunnelling contract ever	
PORR has been awarded two tunnelling projects to be built as part of the "Stuttgart 21" rail station	
about EUR 700 m.	Page 75
Opening celebration of the flood control dam Machland Nord, third contract section at	
Baumgartenberg	Page 76
Tenning out commony of the new HVDO NOE Headquarters in St. Dölten	
On October 20th 2011, the HYPO NOE Group celebrated the topping out of the Group's new headquarters in St. Pölten.	Page 77
Startup ceremony at Längholz tunnel, Berne tube	
Forward to the final struggle	Page 78
Limberg II: Start of operations at pumped storage power plant	
After five and a half years of construction work, the pumped storage hydropower plant Limberg II was	D
started up in an inauguration ceremony on October 5th 2011.	Page 79
PORR wins tender for major projects on the S 10 motorway	
ASEINAG has awarded the construction contracts for the Götschka tunnel and the southern bypass at	
Freistadt on the future S 10 expressway to PORR.	Page 80
Transport Minister of Schleswig-Holstein visits Störbrücke II site	
The Transport Minister of the German state of Schleswig-Holstein, Jost de Jager, visited the Störbrücke	Dago 81
	Fayeor
Topping-out ceremony at Science Park 3 building	Page 82
Twin-tube Tauern tunnel opened for traffic	
Great celebrity turnout at festive opening - speakers underline improvements to traffic flow and safety	Page 83
Imprint	Page 84

## **CEO Karl-Heinz Strauss**



CEO Karl-Heinz Strauss Image: PORR

## Dear Ladies and Gentlemen, dear Business Partners!

When I took up office as the new CEO, I said that the future belonged to fast and customer-oriented enterprises. For this purpose, we need a flat hierarchy level, fast decision-making processes and motivated employees. This process of finding and implementing albeit simple but decision-oriented management structures was one of our major targets for 2011. In the meantime, I can say that the reorganisation has been completed to a major extent and that the new structure must now be lived.

In this sense, we have also decided to relaunch the "PORR-Nachrichten". In the past years, this medium has developed more and more into an important platform by which we inform our customers about projects and building solutions. With this issue, we now also want to lead this medium itself into the digital future. Aside from the layout, the title has also changed. On the on hand, "World of PORR" should symbolise thereby that company was also focussed increasingly on international projects in the past years. And on the other hand, we would like to show that PORR is more than merely a constructor of buildings. We provide all facets of a full service provider, from project development through financing models up to accompaniment of the structure throughout its entire lifecycle.

You will find reports about current projects as usual and in the known quality. Structural engineering projects are

taken into particular account thereby in this issue. While doing so, we have selected a wide range of projects in order to demonstrate the company's performance capacity. We are pleased to inform you as usual, from office buildings (ÖBB Praterstern) through commercial buildings (Peek & Cloppenburg Weltstadthaus and Shopping Haidäcker Park) up to the special role of PORR in housing projects (apartment building Wohlmutstrasse and apartment building Raffelspergergasse). The tourism and health areas were also taken into account.

Civil engineering is focussed on the complex area of water this time. We present you the progress on the two flood protection structures Schärding and Spitz, on the one hand, and the Emscher sewage canal project in North Rhine-Westphalia, currently the largest sewer project in Europe, on the other hand.

On behalf of PORR, I would like to wish you interesting reading and hope that the new appearance meets your needs even better.

Karl-Heinz Strauss Chief Executive Officer

## AURON

A modern, sustainable office building erected according to the principles of the Feng Shui doctrine

#### Ingo Schuischel

The company Employrion GmbH & Co. KG is erecting a modern and sustainable office building according to the principles of the Feng Shui doctrine in Landsberger Strasse in the Laim district of Munich. The meander-shaped building complex is implemented in two construction stages, whereby the first section was completed already on September 30th 2010. The AURON consists of two basement storeys and seven storeys above ground. Both construction stages together have a gross storey surface of approx. 56,500 m<sup>2</sup> in total. In addition to the modern office workplaces, which are located in the upper storeys, conference areas as well as a casino with a connected kitchen and food counter were integrated in the building. An underground garage with more than 300 parking spaces and the computer centre of the main tenant of the first construction stage are located in the two basement storeys.



Rendering south view Image: Employrion GmbH & Co. KG

#### The project

The office building is located at the centre of the new urban axis currently being realised by the state capital Munich. This axis reaches from the main station up to the Pasing district. As a result of the privatisation of the German Federal Railways, surfaces formerly used for railway operations have become free along the shunting yard in the Munich-Laim district, which are now planned to be redesigned and revalorised in terms of urban development. The "AURON" is located directly beside the main urban railway line at the stop Laim and in the vicinity of Nymphenburg Palace gardens and Hirschgarten.

The building complex winds along Landsberger Strasse in a meandering manner and thus presents itself as an ensemble that is partially open and partially accompanying the road. The distinctive building structure is brightened up by the reciprocally oriented open courtyards. A continuous row of arcades on the ground floor forms the clearly detectable edge in the urban area.

In addition to the open architecture with large window fronts and the glass ground floor, the principles of Feng Shui and the requirements of the German Association for Sustainable Building (DGNB) are also integrated.

The building owner could already gain one of the most renowned opinion research institutes as the main tenant of the first construction stage before the start of construction, so that the requirements and wishes of the anchor tenant could be taken into account already at an early planning stage. This included, among other things, the integration of a casino with a central kitchen and food counter, a connected conference area, a central computer centre and a safety concept in the planning. The development axis grid was also adapted to the tenant's wishes.



AURON building geometry Image: PORR

The first construction stage is accessed via four cores with lift groups and staircases. The main entry is through a spacious foyer with reception desks and an adjacent single access door system. From here, one reaches the conference areas and the casino on the ground floor as well as the office areas of the upper storeys. An underground garage with 142 parking spaces is located in the two basement storeys, as well as various engineering rooms, storage and archiving rooms and the computer centre with redundant power and cooling supply.



AURON casino Image: PORR

#### Way to contract

In November 2008, PORR Deutschland GmbH, Branch Office Munich, was invited to participate in a prequalification for turnkey construction of the AURON project including the final design. PORR was able to present itself as competent and reliable construction partner through this process and made it onto the shortlist of bidders. During the subsequent short bidding phase from December 2008 until February 2009, PORR managed to convince the building owner based on an interesting cost offer in combination with a well-planned overall concept. The GMP GC contract for erection of the first construction stage was concluded with Employrion GmbH & Co. KG on March 27th 2009.

#### **Contract model**

A GC contract with a guaranteed maximum price was concluded between Employrion GmbH & Co. KG (a project company of Accumulata Immobilien Development GmbH and LBBW Immobilien Capital GmbH) and PORR Deutschland GmbH. The contract model is not a GC contract in the classical sense, but rather more a partnership contract with the objective of realising the joint project punctually, in high quality and at optimised costs. As a result, for example, subcontractor works are awarded according to the glass pockets principle. This means, among other things, that both the group of bidders is defined jointly as well as talks are held jointly and allocation decisions are made jointly. The contract includes a bonus regulation for both partners as an incentive for both contractual parties to make economic allocations and utilise technical potentials for optimisation.

#### **Building shell**

The supporting structure of the AURON is designed mainly as reinforced concrete skeleton with bracing central staircases in cast-in-situ construction method. The basement storeys are designed as waterproof concrete basements, as the building bonds in the groundwater with the second basement storey. Mainly flat slabs with a thickness of 30 cm and without beams are installed as storey ceilings.

The construction of the shell was started in April 2009. The

building pit and the sheeting with open water retention were commissioned to a joint venture by the building owner beforehand, so that the relevant preliminary works except for residual shaping of the base were completed in April 2009.

The inner courtyard areas were selected as crane locations in order to comply with the stipulations of the neighbouring Deutsche Bahn AG, on the one hand, and to achieve as effective exploitation of the carrying capacity and the outreach as possible, on the other hand.

The continuous monolithic floor slab has a thickness of 70 cm and of 100 cm in subsections. Expansion joints were also omitted in the walls and controlled crack joints arranged instead as instructed by the structural planner. These joints and the working joints were sealed using mineral-coated joint sheets that crystallise out under water inrush and thus seal the joint wherever water is in place.



Shell south view Image: PORR

As the structure is designed mainly without beams in the basement storeys, the use of ceiling tables was selected as formwork system. This concept was continued throughout up to the last ceiling in the 6th upper storey.

The interior walls were constructed as non-structural limestone walls in fair-faced masonry, unless they were required for design resistance.

After completion of the ceiling above the second basement storey, the working space was backfilled in sections. A sliding pressure beam connected between the sheeting and the basement ceiling enabled the necessary extension of the sheet pile flange and thus prevented excessive deformation of the sheet pile wall caused by the resulting load redistributions. With the completion of the basement storeys, the uplift safety of the structure was also achieved, so that the remaining working space could be backfilled, the sheet pile wall was drawn and the water retention dismantled.



Shell north view Image: PORR

During construction of the upper storey ceilings, special attention was paid to detailed coordination and timing of building engineering, formwork setters and steel fixers due to the planned near-surface concrete core activation. The design of the heating/cooling concept for the AURON provides that the pipelines are positioned on two different levels within the floor slab. Thus, the lines of the concrete core activation are positioned below the first reinforcement layer in the facade area and above the lower reinforcement layer in the interior area, which inevitably also resulted in multiple work steps. In order to make the processes economical and efficient in terms of time, it was decided to use tailored meshes.

The construction progress of the upper storeys was staggered in a three-week cycle, so that the entire shell could be almost completed earlier at the end of December.

#### Internal finish work

As the majority of the building is used by only one tenant, the interior work was uniform and followed the clearly structured colour and material concept of the architecture. All the more could attention be paid to relevant qualities and economic operation in the course of early sampling. This was convenient for both the tenant as well as the building owner.

The clearly structured sampling process was divided into the topics facade, lifts, office and conference areas, general and engineering areas, as well as outdoor facilities. As a result of the punctual sampling, it was ensured that the materials and products were defined in due time before the beginning of the interior work. To represent the main surfaces, a specimen area with office rooms, corridor area and toilet core was produced to a scale of 1:1. This also served for lighting and sound insulation tests, among other things. The tenant was able to improve his furnishing plans using the specimen area. Based on the advanced acoustic measurements, potential sources of error could be shown at an early stage already and thus prevented consistently during the later development phase.

The internal finish work was implemented within approx. 8

months. The interior work process was staggered timewise from west to east across the individual rental units and starting from the 6th upper storey downwards.

The start of the interior works in the individual storeys was staggered timewise by one to two weeks, so that efficient and continuous use of the subcontractor personnel was ensured.



Office view Image: PORR

The building is divided into multiple utilisation units with a single size of up to 400 m<sup>2</sup>. The dividing walls of the tenancy areas are designed in F90 quality or as fire walls with relevant connecting doors, so that no sprinkling and no necessary corridors had to be planned within the utilisation units on the part of preventive fire protection. This way, greatest possible flexibility can be granted to the user also in the future for planning the office distribution.

Hollow floors with false floor alignment are installed in all office areas in order to enable post-installations at a later stage.

An office partition system in the development grid with corridor walls of glass and wooden door elements also ensures greatest possible flexibility for reutilisation of the office rooms at a later stage, in addition to high surface quality.

The development of the basement storeys was implemented in parallel to the upper storeys. Here, the refrigeration areas of the central kitchen with the adjacent social area were also completed turnkey in addition to the development of the park areas, storage and engineering rooms. Special attention was paid to fully functional completion of the computer centre with redundant power and cooling supply already two months before the overall completion. As a result of the interior work being implemented in parallel on multiple floors, the acceptance inspections could be started already one and a half months before the date of completion.

#### Facade

The ground floor and the first upper storey of the north facade form a kind of building patten to the railway side

and are designed as punctuated facade. The remaining upper storeys are designed as strip-structured facade. The south side presents itself as metal facade with a partially interrupted strip window structure and a closed parapet area. The facade surface of the first construction stage with a total size of approx. 10,000 m<sup>2</sup> is characterised by the lower-lying strip windows with Venetian blinds in a dark colour shade and the silvery facade cladding from ventilated aluminium cassettes.

The strip windows are interrupted partially, shifted towards each other on the levels, and run around the building partially as glazed corners, as a result of which the volume of the building is playfully eluded.

A long roof terrace in the 6th upper storey structures the appearance additionally and provides the tenant with manifold options for use with a view over the city.

Based on the high degree of prefabrication of the facade elements and early planning safety, the mounting of the window elements could be started already in December 2009. Three months later, the facade was wind and rainproof and therefore nothing obstructed a punctual start of the internal finish works.

#### **Outdoor facilities**

The outdoor facilities of the AURON are divided essentially into two areas based on the location and the building structure. In the south, along Landsberger Strasse, the arcade area is flanked by the public walkway. This was produced as stipulated by the city and is provided with a friendly staging as a result of the plays of light from the special illumination running along the arcade ceiling.

In the north, along the railway route, the cycleway and footpath joins which is planned to connect Pasing with the main station in the future. A green strip of grass with columnar hornbeams escorting the path is located between the cycleway and footpath and the building facade.

Due to the meandering shape of the building, three courtyards result for the first construction stage, of which one is opened towards the roadside and two are opened towards the railway side.

The courtyard towards the road is characterised mainly in its function as delivery area with an asphalted siding. The inner area of the courtyard is planted with an unpretentious cherry laurel bosquet and three gingko trees.

The second inner courtyard opens up towards the railway side and is designed openly due to the necessary accessibility for the fire brigade. Due to the height conditions inside the building, two levels result in this courtyard. The lower level joins the casino as terrace area and rises up to the higher level by a stepping with planted sitting walls. Floodlit columnar hornbeams and shallow water basins with an illuminated foam fountain each stand face to face in the upper area.



Inner courtyard 2 Image: PORR

The third inner courtyard of the first construction stage was created as a kind of green labyrinth with a water feature located at its centre. The water feature consists of three stainless steel cubes with a light water film running down them, which is illuminated from the bottom by integrated light strips. In Feng Shui, the water features with a calm or slightly bubbling flow of water stand for the continuous flow of energy, which is meant to jump over onto the office users and employees.

The number of trees in the courtyards results from the doctrine of Feng Shui in dependence with the water features and is staged by tree spotlights at night.



Inner courtyard 3 Image: PORR

#### **Building engineering**

In order to realise an economic and energy efficient building under sustainable aspects in this day and age, an intelligent and future-oriented domestic engineering design and building engineering is required. This objective was implemented in the AURON office building by a series of measures, which is also reflected in the gold certification according to the DGNB.

The heating and cooling is implemented by means of a high-performance, near-surface thermo-active ceiling

(TAD). The problem definition in this context was that an individual room regulation had to be realised with greatest possible flexibility for room division at the same time. To achieve this goal, factory-made TAD elements in the development grid were inserted in the ceiling boarding at relevant distances (drilling zones) during the shell construction. To obtain a balance between the usually slowly reacting concrete core activation and the comfort of an individual room regulation with a quickly reacting heating-cooling system, the TAD coils were installed on the lower reinforcement layer, and in the near-facade area even below the lower reinforcement layer. Merely in exposed special areas, such as for example in corner offices, the design provides for flat ceiling elements with a heating-cooling function.



Concrete core activation Image: PORR

To ensure functionality of this heating-cooling concept, the preparation of a dynamic building simulation was placed on order. The results of this study confirm the planned concept.

The building draws its energy for the heating-cooling system mainly through utilisation of the groundwater. For this purpose, approx. 2.16 million litres of groundwater are raised daily, guided through heat exchangers and fed into the groundwater again. In order to be able to cover peak loads in winter, the building is provided with a district heating connection. In summer, a connection with a recooling plant exists.

In order to be able to offer the office user as well as the subsequent operator the maximum comfort possible, the complete individual room regulation from sun protection through illumination to temperature control were combined into a comprehensive building management system in the AURON. With the system used, the vertical integration of the field, automation and management level is combined with the horizontal integration of various systems. The integral advantages resulting from this are reflected in the reduced energy demand, among other things.

Modern office buildings like the AURON demand modifiable room divisions and flexibility. For this reason, a building management system was used that also permits rapid retrospective reutilisation at a later stage by adaptations of the room allocations, jalousie groups and lighting assemblies at little cost. The use of a batteryless and wireless radio sensor forms an integral part of this concept, among other things. The wireless radio sensors and room thermostats can be positioned differently at any time and additional switches reinstalled easily without requiring any costly retrofitting of cables for this purpose.



Radio switches Image: PORR

#### Sustainable building

It was of particular importance to the building owner that a sustainable building be erected that was to be certified accordingly by the German Association for Sustainable Building (DGNB). For the sustainable erection of a building, not only the selection of the building materials is decisive, but rather more the entire planning and construction process must comply with the relevant requirements, starting with the selected location of the object up to the operation of the building.

The goals were set high and were pursued and implemented by the entire project team during the entire planning and construction phase. A total of 61 so-called fact files exist which list the assessment criteria with regard to the ecology as well as the economy and the social aspects of an object.

Thus, for example, the relevant requirements in the tenders for subcontractors were also implemented by standardising specific working procedures and materials to be used. During the construction phase, the local site management focussed on low-noise and low-dust working practices, among other things, and inspected the materials used continuously.

The integrated management system practiced by PORR, which formed an ideal basis and therefore already fulfilled some requirements of the DGNB, was useful at this point. Thus, for example, the operating procedures and work instructions on health and safety, on environmental issues and on hazardous materials could be used for the DGNB documentation papers.

As a result, the building owner was able to receive the gold certification for the AURON as the highest award.



North view Image: Employrion GmbH & Co. KG

#### Feng Shui

Feng Shui is a part of the Taoist philosophy rooted in China. The objective of this doctrine is the harmonisation of humans with their environment, which is meant to be achieved by a special layout of the living places. In Asia, this harmonisation is considered as the basic requirement for professional and with that financial success, which is meanwhile also accepted more and more in the western world.

The purpose of the AURON office building was to follow this trend right from the start, so that a renowned Feng Shui consultant was commissioned already by the building owner before the plot was acquired.

An essential element for implementation of the Feng Shui guidelines is a suitable piece of land as well as the position and the geometry of the building. For this purpose, a geobiological survey is prepared, in which the plot is investigated for naturally occurring disturbance areas, such as water veins, earth faults, Benker or Curry lines. The findings made from this can result in further actions, such as necessary land healings, or have an impact on the design of the building. In the AURON project, for example, the position of the access cores was selected in such a way on the basis of the investigation results that these are located on the more unfavourable plot areas and the constant workplaces are arranged in the favourable area. Furthermore, the staircases were planned so that the steps lead upwards clockwise.

Of course, Feng Shui is also reflected in the facade design for the AURON office building, as well as in the interior building organisation and the room division, the design of the outdoor facilities with water features, but also in the materials used. Thus, shielded electric cables and data cables were used, among other things, to prevent alternating electric and magnetic fields. To minimise the radio burden, the radio signals etc. at the workplace, the window elements were manufactured from aluminium profiles and a thermal insulation glazing was used, which at the same has a metallic coating with the main element being silver. This coating is applied in the factory by means of a high-performance sputtering system. The facade cladding consists of powder-coated aluminium cassettes.

In collaboration with the Feng Shui consultant, the planning and implementation team managed to create an effective and harmonic symbiosis between the demanded functionality of a modern office building and the implementation of the Feng Shui guidelines in the design and layout of the interior areas. The harmony between humans and work area and with that health, well-being and success are ensured in the AURON office building by an aligned colour and orientation concept, the prevention of sharp-edged corner designs up to the definition of a suitable light colour for the interior lighting.

#### **Final remark**

Based on the remarkable commitment and professionalism of all parties involved in the construction including the entire planning team and the close collaboration with the principal, PORR Deutschland GmbH could hand over the first construction stage to the building owner as planned on September 30th 2010.



Image: PORR

#### Project data stage 1

Principal	Employrion Gmbh & Co.KG, Weil
Contractor	PORR Deutschland GmbH, Munich Branch Office
Project planning	KSP Jürgen Engel Architekten GmbH, Munich
Construction period	April 2009 – September 2010
Gross storey surface (all storeys)	27,160m <sup>2</sup>
Plot size (CS1 + CS2)	12,600m <sup>2</sup>
Concrete	17,400m³
Reinforcing steel	2,300 t
Facade	10,000m²

## Headquarters for ÖBB Infrastruktur AG

Praterstern 3, 1020 Vienna

Stefan Wusits, Andreas Eckhart

#### Location / construction time

The modern office building of the ÖBB Infrastruktur AG headquarters was erected on the site of the previous Imperial North Station at Praterstern, close to the Vienna Ferris Wheel, by order of ÖBB-Immobilienmanagement GmbH. After a construction period of about 2 years, the building – which is located right beside the tracks of the Praterstern railway station and the underground railway – was completed in the 2nd quarter of 2011 and handed over to the users.



View of Praterstern 1919 Image: ÖBB-Immobilienmanagement GmbH



Upon completion Image: LBS RedI

#### **Project description**

Covering an area of about 5,000 m<sup>2</sup>, the new 8-floor office building consists of two almost parallel structures with a central atrium. The main entrance faces the railway station and is accessible via an outside flight of steps and a lift. Part of the ground floor is open to the public and is divided by a pedestrian passage. The ground floor boasts a conference centre for training purposes and meetings, a staff restaurant with some 200 seats, a fitness centre, and an ÖBB (Austrian Federal Railways) shop. In addition to the offices, the 1st floor contains the heart of the building – a covered atrium that serves as a communication area for guests and employees and can also be used for events. Also located in the atrium is the porter's lodge with a reception desk and lounge, which is staffed around the clock. Starting from the 2nd floor upwards one finds the standard office floors that are accessible via four core shafts. Offices with a gross floor space of 32,000 m<sup>2</sup> have been provided for about 800 employees.



Staff restaurant Image: Projekt-Agentur Peter Stangl



Image: Projekt-Agentur Peter Stangl

#### **Building shell**

The construction work for the building shell has already been described in detail in issue 158 of the "PORR-Nachrichten" (from page 78).

#### Interior work

Interior work was started together with the floor-by-floor completion of the outer facade in April 2010. Because of the flexibility demanded by the principal, namely a basic grid for single and group offices, the interior walls were built as drywalls that are mounted on the false floor with its ventilation facilities. Moreover, the specifications made it necessary to mount the fin connections of the office separating walls on the continuous interior aluminium window sills. All functional areas such as sanitary installations, tea kitchens, rooms for LAN, archives, printers, etc. are arranged along the access corridors. All technical services for the offices are routed behind the suspended aluminium panel ceilings in the corridors, and via the false floors. Access to the individual office units and meeting rooms is through all-glass doors. An offline system is used for access control – the same system has already proved to be successful in two other buildings at Nordbahnstraße 50 and Praterstern 4 respectively.



Kitchen and corridor Image: Projekt-Agentur Peter Stangl

#### Facade

In order to comply with the architect's specifications for the facade, and those for a low-energy building, eight different facade types were used. Because of the expected noise level and also for energy-saving reasons, the facades above and below the window strips consist of a dual-shell glass construction. Gathered blinds are fitted for outdoor shading, and awnings are used for indoor shading. Rear-ventilated facades with 16-cm-thick insulation are used on the concrete surfaces. The rear-ventilated outdoor facades are made of pre-weathered, slate grey shiplap panels, and Cetris panels are used in the atrium. All facade components are made of non-flammable materials.



Image: Projekt-Agentur Peter Stangl

#### **Foil cushion roof**

Another highlight of the office building is the foil cushion roof, which "floats" above the top floor. With a span of 26 m, the construction covers an area of about 1,000 m<sup>2</sup> and is supported on 13 steel trusses. Thanks to the foil cushion roof, the supporting structure is considerably lighter than would be necessary for a glass roof. What's more, the ETFE foil exhibits a certain self-cleaning effect due to the chemical surface properties, and the air filling also provides thermal insulation. Two compressors on the roof supply the necessary pressure for the foil cushions.

#### **Outdoor facilities**

The comprehensive work for the outdoor facilities was carried out partially with 80 cm x 60 cm x 18 cm concrete slabs in accordance with Vienna City regulations, and with in-situ concrete surfaces with a broom-brushed surface.

#### **Project data**

Effective floor space	20,250 m²
Total floor space	31,240 m²
Concrete	17,000 m³
Reinforcing steel	1,700 t
Coolant pipes	90,000 m

#### Technical building services

Building heating is provided by two Fernwärme Wien (Vienna district heating) heat exchangers. Primary radiators are installed in the offices, whereby the offices with room-high façade glazing are fitted with dual-circuit floor convectors. If necessary, the floor convectors can also be supplied with coolant via a central switchover unit.

Cooling is provided by two ammonia chillers and two heat exchangers mounted on the roof. The sprinkler tank, with a volume of 320 m<sup>3</sup>, is used as a cold sink. Cooling in the office units is effected via floor-level concrete core activation, plus individual floor convectors where necessary. Fan-coils provide the cooling in the technical equipment rooms.

Two roof-mounted air conditioning units ensure an air exchange rate of 1.5 in the entire office area. The supply air enters the rooms via floor outlets. Separate air conditioning units are provided for the rented areas on the ground floor (conference room, restaurant, kitchen, and Kieser training room), and for the technical equipment rooms in the basement.

In order to ensure smoke-free escape routes in case of a fire, the staircase wells are force ventilated. Excess air escapes via smoke & heat extraction façade louvres in the covered atrium. In case of excessive smoke density in the atrium, 60 m<sup>2</sup> of the foil cushion roof melts away.

With the exception of the transformer station, the entire electrical installations for indoor and outdoor lighting, building services, emergency lighting, fire alarm system, safety equipment, sunshade & blind control, and the access control system were provided.

Moreover, the IT network was installed in cooperation with ÖBB-ICT. All safety-related systems and installations are powered via an emergency diesel generator, and the IT system has an uninterruptible power supply.

#### Final remarks

In spite of unexpected events during project implementation, the building was handed over to the principal on schedule in May 2011 after 522 working days. This was possible thanks to the successful partnership during execution in accordance with the ÖN B 2118 standard, and the good cooperation of all parties involved – from the developer's representatives to the accompanying project monitors, ÖBA, architects, structural engineers, and the sub-contractors commissioned by the general contractor.



Facade by night Image: Projekt-Agentur Peter Stangl



View from rooftop Image: Projekt-Agentur Peter Stangl

# Mobile flood protection for the town of Schärding

on the River Inn, Upper Austria

Joachim Donko

#### The project

Scarcely any natural event makes such a lasting impression on people as a flood. This was last demonstrated by the flood disaster of 2002. Nevertheless, people have lived along the banks of rivers from time immemorial. The implication is that they are thus also living, more or less consciously and voluntarily with the possibility of flood. River channel renaturing has lately been used increasingly in an effort to provide more space for flood waters to escape. But space of this kind may be lacking in densely built-up areas. The only remaining solution in such cases where relocation of residents is not a real option is the employment of technical means designed to be used only in case of floods.

#### The initial situation of the town of Schärding

Schärding, situated on the banks of the River Inn, has regularly been inundated by the floods for centuries. The water level of the river reached a historic high of over 11 m above normal in 1598. By comparison, the water level of the once-in-a-century flood of 2002 (see Figure 3) was almost 9 m. This was sufficient for the flood to inundate the old town along the Inn Promenade and also far into the hinterland where the water reached a depth of about 3 m.

The rising number of flood events in recent years and the damage caused by them have clearly shown that it is necessary to provide for some technical flood protection for the heritage-protected town centre along the River Inn.

A mobile flood protection system consisting of light-weight aluminium system components has been selected in order to answer the requirements of landscape protection and the quality of living involved. In October 2010, Alusommer GmbH was awarded a contract for supplying and erecting a mobile flood protection system. This is intended to protect the town in emergencies over a length of about 220 m and, depending on the terrain to a possible flood height of 4 m. This height corresponds to a so-called 30-year event and it should avert damage in the event of a flood occurring – a statistical probability – once every 30 years.

The integration of the flood protection structures posed a particular challenge, because of the location of this historic town on the River Inn and the fact that a substantial portion of the existing buildings are under conservation orders.

The idea was that all elements visible at normal times should be reduced to a minimum and answer the specific optical requirements of the location.

Financial considerations – federal and provincial government subsidies account for 95 % of the total cost of

the flood protection project – have led to the subdivision of the project into two phases. The first of these was completed in June 2011, the second phase will be commenced in the Spring of 2012 at the latest and is scheduled for completion by Autumn of 2012.



Fig. 1. Flood of 2002 Image: PORR



Fig. 2. Flood of 2002 Image: PORR



Fig. 3. Wassertor gate of Schärding Image: PORR

#### The mobile flood protection system

A suitable foundation or base wall of sufficient dimensions is needed to permit the erection of mobile flood protection elements as necessary. This construction work was implemented by the Linz Branch Office of PORR. At first so-called anchor plates (see Figure 4) were installed on a base prepared in advance, on which the central aluminium mounting brackets for the mobile wall elements are screwed when needed. As soon as the first mounting brackets are placed, the bulkheads, also of aluminium, can be stacked in between to a partial height and then to full design height (see Figure 5).

As each flood has its own intensity and character, particular emphasis was placed on the possibility of providing for partial flood protection stages. The final stage will consist of three phases.

The bulkheads gradually fill with water as the water level rises during a flood, which enhances both the stability and the water tightness of the system.



Fig. 4. Placing anchor plates Image: PORR



Fig. 5. Installation of a complete mobile wall Image: PORR

#### How the mobile flood protection system works

The technical merits and the functional principle of the aluminium system elements may be difficult to perceive at first sight. But the experience gathered in hundreds of projects during the 15-year market presence of the system have contributed to its continuous development, which has aimed at the enhancement of the static stability of the system – despite its low material weight –, so as to make it satisfy steadily increasing requirements, such as flow and impact loads in case of a flood.

This is why it has been possible to use the latest development stage of the mobile system for the Schärding flood protection project. Particularly noteworthy are its interlocking bulkheads as well as the aluminium brackets that are easy to mass produce in a modular construction system.

#### How the bulkheads work

The bulkheads, the main elements of a mobile flood protection system, are produced in an extrusion process. They are fitted with a distinct, patented S-shaped toothing ("tongue and groove principle"), which increases the surface of the bulkhead and thus permits smaller wall thicknesses (see Figure 6). This enhances the stability, while saving weight. It has also been possible to minimise the assembly time and the number of staff needed – the bulkheads are always installed manually – in case of emergency.

The mobile flood protection system must clearly exhibit a high measure of water tightness. The toothing permits the introduction of the gasket in a corresponding groove. The gasket is compressed to the optimal load in case of flood, while affording protection from further compressive load. This substantially reduces the risk of potential damage and the magnitude of maintenance input required.



Fig. 6. Bulkheads Image: PORR

#### How the brackets work

The central brackets cater for the stability of the wall and transfer the compressive and tensile forces to the foundation.

Here, too, the challenge is to reach a high stability level along with a low system weight so as to permit erection in the case of alarm without needing a crane. In order to reach this goal in the best possible way, the central aluminium brackets are screwed to threaded rods over the whole length (see Figure 7). In this way, no bracket footing is needed. Where the brackets are higher, aluminium reinforcements are welded on. This helps to save material and working time for the assembly of the brackets.

Both the aluminium brackets and the reinforcements are manufactured using the extrusion process. No additional elements are needed to produce all the protection variants – heights of up to 5 m are possible. The central brackets can in most cases be designed as free standing elements. Where greater protection heights are needed, so-called "back supports" can be provided depending on the static requirements.



Fig. 7. Assembling a central bracket Image: PORR



Fig. 8. Central brackets put in place Image: PORR



Fig. 9. Placing the bulkheads Image: PORR

#### The mobile flood protection system in use

When the mobile flood protection system was handed over to the town of Schärding a test assembly demonstrated that this can be done by about six people within one hour only per assembly phase. The straightforward and rapid assembly process with a very low tool input was very well received by the clients.

It should be mentioned for the sake of completeness that the net assembly time for the mobile flood protection system is only one aspect in an overall process. The real challenge is alerting the emergency services and assembly team (fire department and/or local authority workers) in time and transporting the mobile elements from storage to the site, using a safe route. A full emergency drill will be carried out at least once a year, ensuring that this time-intensive and complex logistic process is optimised and functions to perfection.

Alusommer GmbH will carry out the maintenance of the system and provide routine training for the emergency personnel over the next five years in order to ensure the best possible availability of the mobile flood protection system.

The town of Schärding now possesses an effective mobile flood protection system, which has reduced the threat posed by future floods and the fear they cause in the community.



Fig. 10. Continued assembly of the mobile flood protection system  $\ensuremath{\mathsf{Image: PORR}}$ 



Fig. 11. Complete assembly of a partial stage on a base wall Image: PORR



Fig. 12. Mobile flood protection system Image: PORR

## Office building EQUATOR II

## 2nd building phase of the office complex in Warsaw is completed

#### Thomasz Pachecki

#### The Project

After a construction period of 21 months, the second of four office buildings planned along Jerozolimskie Alley was handed over by PORR (POLSKA) S.A. at the end of September 2011.

The first building, Equator I, was also erected by PORR (POLSKA) S.A. in 2008.

Equator II counts as a special case on the Central European market, as this office project was realised without security by preliminary rental agreements despite of the worldwide financial crises, which also impaired Warsaw's real estate market.



Office building EQUATOR II Image: PORR



Office building EQUATOR I Image: PORR

#### **Project description**

During the construction works, the high groundwater level reaching up to 7 m above the bottom of excavation had to

be lowered using five wells and by local dewatering using vacuum lances.

To optimise the earthworks and structural works, PORR (POLSKA) S.A. worked out an alternative for the project of the diaphragm wall:

- wall thicknesses 60 and 80 cm
- a stiffening horizon
- stiffening of the walls in mixing system steel frames and ground anchors
- preliminary underpinning of the stiffening slab by steel supports founded on piles.

The costs of the pit stabilisation could be reduced as a result of this design.

Concrete of the quality B30 W8 was used for construction of the foundation slab and 660 t of steel with diameters between 20 and 32 mm were used up. The foundation slab was divided into nine sections, of which the central one was concreted in three work steps. Its thickness varied up to 4.4 m. The foundation base was 14 m below terrain level at the lowest point.

The shell of the basement storeys incl. ground floor slab was completed in August 2010. The entire shell was completed at the end of February 2011.

The objective of the projecting team APA Wojciechowski was to maintain a uniform character of the planned new constructions at the northern road front of Jerozolimskie Alley and at the same time find innovative solutions for the individual buildings.

The ideal location of this building complex at the edge of the city centre of Warsaw is given, on the one hand, by the construction of the north-east underground railway line as well as the vicinity to Warszawa Ochota station and, on the other hand, by additional traffic infrastructure improvements in the near vicinity.





## Raffelspergergasse 15

Apartment building in 1190 Vienna

#### Dietmar Prater

#### **The Project**

A luxury apartment building was erected on the "Raffelspergergasse 15, 1190 Vienna" plot, measuring around 1,300 m<sup>2</sup>. The complex involves a building with six privately financed apartments ranging in size from 140 m<sup>2</sup> to 190 m<sup>2</sup>. All of the apartments boast generous outdoor areas such as loggias, balconies, terraces or gardens. The roof terrace of the highest roof-top apartment measures around 220 m<sup>2</sup> and offers breathtaking views of Vienna.



Views over Vienna from roof-top terrace Image: PORR



Views over Vienna from roof-top terrace Image: PORR

The underground car park has 12 parking spaces – each apartment has two parking spaces assigned. Users also have the option of washing their cars in the car park as all of the garage floor drains are connected to the main sewer via an oil separator.

#### Construction progress Building shell

Excavation work began on February 28th 2010. Owing to the tight space restrictions from the neighbouring houses directly bordering and the established trees, the construction pit was stabilised using shotcrete and GRP (glass fibre reinforced plastic) anchors.



Stabilising construction pit Image: PORR

The foundations were laid using floor slabs approx. 35-cm thick from waterproof concrete. The outside walls of the basement were also built using the waterproof concrete method with reinforced concrete walls up to 30-cm thick. The basement ceilings were mostly built with in-situ concrete, while the ceilings of the upper storeys were made with prefabricated slabs.

All of the cellar walls were sealed with a 2-layer bitumen coating. The developer also requested that the building be drained. The construction work on the shell – the walls were built using hollow brick blocks – took just 4 months to complete.



Completed shell Image: PORR

#### World of PORR 159/2011

#### **Building facade**

Full thermal protection from expanded polystyrene was used for the facade insulation (12 cm EPS-F-PLUS). A cornice (substructure made of wood) was fitted between the first floor and the roof storey and clad in metal. A thermally insulated, back-ventilated Eternit facade (AURIA-C) was placed above the cornice (roof storey).

#### Natural stone facade - retaining wall

The reinforced concrete retaining wall facing the road was clad with quartz sandstone (BAVARIA GOLD).



North-east view from street Image: PORR

#### Alu-glass facade

Facing the courtyard every apartment has an area resembling a conservatory. The aluminium-glass constructions have large sliding doors (width up to 1.20 m; height up to 2.70 m) with revolving windows and fixed components.



View of garden Image: PORR

#### Windows

The windows used in the apartments are PVC with Alu-Clip (heights mostly between 2.50 and 2.70 m). The architect paid great attention to the design of the corner sections as all-glass corners. Anti-fall guards had to be made for the French windows on the upper storeys. These were realised with laminated glass, whereby the mounts were incorporated into the facade and hidden from view. All of the balcony doors are tilt and slide doors.



North-west view from street Image: PORR

#### **Blinds and shutters**

The client requested that the sun blinds should disappear into the facade. This was made possible with a flush-mounted sun-blind box as a prefabricated lintel (built in during the shell construction).

Burglar-proof shutters were installed on the ground floor and venetian blinds were used on the upper storeys. All shutters and blinds are controlled electronically.

#### Heating

The gas heating is realised as an underfloor heating system and is operated by a freestanding boiler situated in the bathroom (combined appliance: self-contained gas central heating including a 160-I hot water boiler).

#### **Entrance foyer**

The entrance foyer is accessible from street level. There is a flower bed in the foyer; the wall space above is once again clad in quartz sandstone (BAVARIA GOLD). Some parts of the walls are embellished with pilaster strips of red natural stone (ROSSO ASSIAGO).



Entrance foyer Image: PORR

Natural stone (OLYMPO PERLATO) was used throughout for the flooring. During the fitting, painstaking attention had to be paid to the laying pattern (frieze, diagonal areas etc.). The entire stairwell has indirect lighting and ceiling spotlights.

The banisters on the main landing employ an all-glass construction.



Stairwell – main landing Image: PORR



Stairwell – main landing Image: PORR

#### Interior

Each apartment has at least three generously sized bedrooms and two large bathrooms (including two showers with disabled access, two WCs and one bath tub).

The living room is approx. 80 m<sup>2</sup> and is divided from the kitchen by an all-glass sliding door approx. 2.50-m high and from the entrance hall by a double-leaf, all-glass revolving door with all-glass fixed components on the side.



Glass doors in living room Image: PORR

All of the interior doors have an opening of 2.20 m and are hung in a wooden frame. Furthermore, each apartment has been fitted with a safe. The floors are solid parquet (American walnut).



Living room Image: PORR

IPE decking is used for the balcony flooring. This wood is less affected by water, leading to longer life spans.

#### **Outdoor facilities**

Establishing the outdoor facilities presented challenges as the land displayed great variation in height. It proved necessary to build a retaining wall in the courtyard to achieve a flat, even surface.

#### **Quality management**

One of the most important points on this project was quality management. In order to guarantee the high quality demanded by the principal and to keep checks on more than 70 companies and suppliers as well as up to 80 workers in the later phases, every single sub company and every product was approved by the principal.

#### **Final remarks**

The apartment building was completed in a mere 12

months. The keys were handed over to the developer and the tenants on February 28th 2011.

#### **Project data**

Principal	el Appartementbau GmbH
Construction start	February 2010
Completion	February 2011
Built-up area	approx. 430 m <sup>2</sup>
Total floor space	approx. 2,430 m <sup>2</sup>
Living space	approx. 1,078 m <sup>2</sup>
Plot size	approx. 1,300 m <sup>2</sup>
Apartments	6
Parking spaces	12

## Hollenburg private clinic

### Mental health facility for city of Krems

Harald Fries

#### The Project

Nestled in the vineyards of Hollenburg, a district in the south of Krems, a special facility for psychiatric rehabilitation and treating depression and burnout is being built. With a construction start in November 2010, Porr Bau GmbH, Lower Austria Branch Office and Styria Branch Office, are realising the building as design-build contractor and the clinic will start being used at the end of 2011.



Rendering main building Image: Sanlas Holding GmbH



Rendering main entrance Image: Sanlas Holding GmbH

#### Location & building design

The property is being built on a 73,000 m<sup>2</sup> plot in a sunny location with views onto the Danube and the city of Krems. The main facility has two U-shaped buildings which intersect and have multiple storeys.



Site map Image: PORR

The clinic is connected by the foyer in the centre of the building and boasts space for 100 single and 10 twin rooms which are spread across the wards and therapy areas. The space allocation plan also includes areas for a day clinic and out-patient facilities. In the east wing a gym room and adjoining relaxation room have been planned.

An on-site kitchen with restaurant and cafe on the ground floor has been integrated into the space allocation plan. In-patient rooms are found on the first and second floors. On the third floor there will be a health hotel with 17 suites and an adjoining roof terrace.

A 'green' underground car park with 75 spaces ensures sufficient parking facilities along with an additional 90 parking spaces and a bus parking spot outside. In the basement one finds the heating system with building services and side rooms as well as the underground car park.



Construction site Image: PORR

One particular challenge is constructing a pond for harvesting rainwater which will also be used as a reservoir for extinguishing fires (volume of water for fire extinguishing: min. 500 m<sup>3</sup>). The water which is stored here will be used both for initial dousing (600 litres/min for half an hour), as well as for longer fire-fighting measures.

#### About the principal

The principal is the Sanlas Group, a company with its headquarters in Graz which was founded in 1992 by Dr. Günter Nebel, a Chief Physician. The Sanlas Group currently operates 10 centres of this type in Austria.

According to the Main Association of Austrian Social Security Organisations, a total of almost 2.5 million sick days were caused by mental health problems in 2009. This figure has tripled in the last 20 years.

During their six-week stay, patients are offered a therapy programme with the goal of facilitating their re-entry into a regular job.



Construction site Image: PORR

#### Final remarks

An analysis was conducted which showed that a further 225 beds would be needed in the "East" healthcare catchment area by the year 2015.

The location chosen for the Hollenburg private clinic from multiple options was the breathtaking setting at the foot of the Wachau surrounded by vineyards.

One particular challenge is the timely realisation of this building with a total floor space of  $13,300 \text{ m}^2$  in a construction period of just 13 months.

#### **Project data**

Project name	Hollenburg private clinic
Principal	Sanlas Holding GmbH
Architect	Architekt Maurer
Construction start	November 2010

Completion	December 2011
Total floor space	13,300 m <sup>2</sup> inc. underground parking
Plot size	73,000 m²
Number of storeys	5



Completed building Image: PORR

# Reconstruction of the Emscher culvert at Castrop-Rauxel

floating 18,000 tonnes of reinforced concrete into position

#### Olaf Schrader

#### The Project

The Western German canals link the Ruhr Region with the seaports and the River Rhine, while also serving as an efficient transport link with the industrial regions in Central and Eastern Germany. An important part of this system is the Rhine-Herne Canal (RHK), which starts from the River Rhine at Duisburg Ruhrort, Europe's largest inland port, and connects this with the greater canal system up to the ports on the North Sea and the waterways of Berlin.

The River Emscher is a right-hand tributary of the Rhine in the northern Ruhr Region and has a length of 83 km. Along with the industrialisation of the Ruhr Region, this river developed into an open sewer, when mining and the resulting settlements prevented the provision of an underground sewerage system over a long period of time.

The RHK passes over the River Emscher at Castrop-Rauxel. A crossing structure was built in the form of a sag pipe in 1927 and reconstructed as a culvert in 1968. This old culvert structure consists of three reinforced-concrete pipes with an internal diameter of 5.34 m each. The end walls, which also form the retaining walls of the RHK, leave a navigation channel of only 30 m between them.

Since 1965 the Western German canal system has gradually been widened and deepened as well as developed by the construction of new locks and bridges to permit the navigation of vessels up to 110 m in length, 11.40 m width and 2.80 m draught as well as pushed barge trains with a length of up to 185 m. The last bottleneck on the RHK is the old culvert structure, which is furthermore in a poor state of repair. This is why a joint venture under the commercial direction of the PORR Group, Berlin Branch Office, was awarded a contract, in 2008, for the reconstruction of the Emscher culvert. Within the joint venture, PORR is responsible for the construction of the new culvert structure proper and for floating it into position. The owner of this more than 30 million euro project is the Datteln Wasserstraßen-Neubauamt (waterway reconstruction office) as a representative of the Wasser- und Schifffahrtsdirektion West (water and navigation administration West), a sub-department of the German Federal Ministry of Transport, Building and Urban Development.



The old culvert and construction of dry dock Image: PORR

#### The structure

The new culvert structure of 126 m total length has a central unit consisting of two rectangular chambers of 11.90 m width each and 3.90 m height. Following completion, the RHK will cross the Emscher at a depth of some 5 m beneath the canal floor. The design flow for the water of the Emscher is 180 m<sup>3</sup>/s.



Cross-section through the new structure Image: PORR

Interruptions to navigation must be kept to a minimum during the construction period in view of the great importance of the RHK within the German canal system. This requirement prompted the decision to build the central unit of the new structure first in a temporary dry dock provided by the side of the canal, 200 m further north, before installing it in its final position.

Preparatory work was commenced immediately after the award of contract. This included drillings for the potential hazard of unexploded wartime bombs buried in the ground, relocation of the Torfheider stream and dewatering of the "Alte Fahrt", a disused section of the RHK. Then the sheetpiling was sunk for the dry-dock excavation, for the cofferdam as a separation between the dry dock and the canal and for the floating-in port, which is situated on the opposite bank of the canal. The sheet piling connects to the marl horizon beneath and, aided by excavation dewatering, serves as a waterproof element against the ground water. The specific ground conditions of the site required soil-replacement drillings as a preparatory measure for the provision of the sheet piles, which are up to 22 m long. Excavation of the pit of 12 m depth and, simultaneously, the installation of the anchors formed the next step.

The completion of the excavation floor and the special substructure needed for getting the central unit afloat later marked the beginning of the work of the Berlin engineers. The entire bottom of the element to be floated in, with a length of 85 m and a width of 26 m, had to be produced in a single section to answer the special requirements imposed on waterways. To this end, 3,200 m<sup>3</sup> of concrete was placed within 37 hours, following installation of 550 tonnes of reinforcement steel. Then the walls and cover were constructed in several concrete-placing sections, and a total of eight massive steel elements were installed as points of load transfer for the subsequent lowering of the units with the help of strand jacks.



Placing 3,200  $\mbox{m}^{\rm a}$  of concrete for the floor of the central unit Image: PORR

Hydraulic structures such as locks and culverts must meet particularly high production and quality standards to meet the requirements for their uses. Such standards are defined in the Additional Contract Terms for Hydraulic Engineering (ZTV-W). These impose very stringent conditions on concrete elements regarding aggregates and concrete placement. In order to meet these requirements, a liquid-nitrogen cooling plant was installed at the construction site and used whenever necessitated by the ambient temperature.



Construction of the walls for the central unit Image: PORR

#### Floating the unit into position

After completion of the central unit with a calculated weight of 18,000 tonnes, the next job was to make it floatable. Massive steel bulkheads, 12 m high and 26 m wide, were installed to close the unit at its front sides. In addition, temporary walls of 2.70 m height were placed on the cover to increase buoyancy. The flooding of the dry dock was awaited by all concerned with considerable tension. The big open question was would the unit behave as planned and exhibit the required floating stability?

The surveying performed after the successful floatation demonstrated the high quality of the concrete builders. The unit showed a heeling of only a few tens of millimetres despite its enormous dimensions, which rendered any corrective ballasting unnecessary. In addition, no water penetrated into the interior of the unit during the entire test floating time, a further proof of the excellent workmanship.



Construction dock after flooding Image: PORR

## Below are the key points of the further preparatory works, for a better overview

- Underwater excavation for the floating-in channel of 12 m depth within the canal
- Lowering the four auxiliary foundations, weighing about 50 tonnes, onto the floor of the floating-in

channel by means of a floating crane

- Demolishing the separating dams between the construction dock as well as the floating-in port and the canal
- Erecting the beams for carrying the strand jacks on the prepared sheetpiling foundations
- Erecting the hydraulic presses and the pumps inside the unit
- Erecting the winches for floating the unit into position



Floating the central unit into the canal Image: PORR



Structure in its final position Image: PORR

#### The floating-in process proper had to be implemented within a period of 54 hours, during which the RHK was closed to navigation. Below is the procedure in detail, also in key points

- Pulling the unit into its final position in the canal, using four rope winches
- Attaching the structure to the strand jacks
- Flooding within the temporary walls, followed by demolition of the walls by divers
- Lowering the unit onto the auxiliary supports using strand jacks
- Transfer of the load from the strand jacks to the computer-controlled hydraulic presses installed in the floor of the structure
- Exact height adjustment of the structure using the hydraulic presses

- Fixing the unit in its final position
- Connecting the structure to the sheet piling of the canal by means of concrete plugs
- Mortar grouting of the space beneath the floated-in unit through grouting sockets in the floor, so as to ensure that the structure is firmly embedded in the ground over its whole area
- Backfilling of the lateral space between the unit and the excavated channel with underwater concrete

It is due to the extremely precise preparation of the work that the entire floating-in and lowering process could be implemented exactly as planned. The structure was brought into the correct position with an impressive accuracy of some 10 mm both in position and height.



Attaching the unit to the strand jacks Image: PORR



Transfer of the load to the presses Image: PORR

#### **Further work**

As soon as the central unit of the culvert was in its final position, the new canal bed for the RHK was constructed above the structure. It was now possible to bail the building dock and the floating-in port. Then began the construction of the inlet and outlet structures adjacent to the central unit. The massive concrete wing walls with a height of more than 12 m were poured onto the floors, each in a single process. Works remaining to be carried out were the construction of the channels within the structure as well as the baffles. In parallel to this, the dry dock and the floating-in port must be demolished to allow the construction of the new Emscher profile including berms and ramps. The work is scheduled for completion in 2012 following the diversion of the Emscher into the new structure and underwater demolition of the old culvert.

Floating a structure of such huge dimensions into position is a feat that is rarely accomplished in this form and is undertaken by very few contractors. Exact and extremely detailed planning and design plus preparatory work as well as the high motivation of the PORR Group staff involved were the essential prerequisites for the successful implementation of the project. Similarly the good and always target-oriented cooperation of everyone engaged in the project contributed much to its successful completion. These included the representatives of the owner and the site management as well as designers, inspectors and experts.



Construction of the culvert structure Image: PORR

#### **Project data**

Concrete	20,000 m <sup>3</sup>
Reinforcement	2,700 t
Grouting mortar	1,500 m³
Sheetpiling	27,000 m²
Number of anchors	600
Volume of earth moved	550,000 m³
Floating-in weight of central unit	18,000 t
Overall length	126 m

Width	26.40 m
Height	6.40 m / 12.40 m
Discharge capacity of new structure	180 m³/s
Construction period	2008 – 2012

## Elementary school in Strakonice

A construction project of Porr (Česko) a.s.

Martin Benda

#### **Project description**

The newly constructed school complex is planned to provide space for 540 pupils in altogether 18 classes. The originally single-storey provisional wooden building is planned to be reconstructed in two stages and include a sports facility, also for public use, along with a canteen. Garden areas, public surfaces and access roads are also to be redesigned.



Building shell Image: PORR

Both a spatial separation of the primary and secondary school classes as well as the areas used for school and non-school purposes was demanded. Based on these demands, a multi-winged, three-storey building with an H shape was developed. The sports hall was planned as multi-winged basilica building with a cambered single-storey gymnastics area, on which the accessible roof areas can be used as break terraces.

The catering area is arranged in a separate underground building part, of which the roof serves as outdoor sports ground.

#### The construction works

The vertical load-bearing structure was constructed as monolithic reinforced concrete skeleton, whereby a gap for laying the heating lines was atypically taken into account in the reinforced concrete supports. The curved walls were constructed from self-compacting fair-faced concrete. The curved walls were joined with the connecting walls by composite reinforcement dowels with polystyrene waterproofing, by which the formation of thermal bridges is prevented.

The supporting external walls of the sports hall were constructed from reinforced concrete or from fair-faced

concrete on the entire basement storey level. The uppers storeys were planned in combination from reinforced concrete gable walls with sidewalls and glazed frames from glued wood girders.



View of arched walls Image: PORR

The individual ceiling structures consist of reinforced concrete slabs with a thickness of 250 mm. The ceiling system is supported on reinforced concrete pillars. The subbases for the floor structures at terrain level were designed as self-supporting reinforced structures. The ceiling of the last storey was constructed as reinforced concrete supporting gable with a level underside. The ceilings above the classrooms were prepared for the installation of a facing from flat large-surface cassettes, which regulate the room acoustics.

A single-pitch roof with air insulation sloping towards the corridor wing was mounted in the area of the class wings. The sports hall was covered using a cylindrical solid wood roof with a large radius of camber. The actual roof shell was then laid on top of this structure (sandwich construction). The roof of the changing rooms and the storage for the gymnastics apparatuses is accessible and partially planted.



Facade cladding Image: PORR

#### Project data

Address	Povážská Street 263, Přední Ptákovice
Building owner	City of Strakonice
General contractor	JV Porr (Česko) a.s., Jihospol, Prima, Protom
Planning firm	Atelier AR 18 Němec Žilka
Award of contract	September 17th 2010
Construction start	January 2011
Completion	June 2012
Plot size	7,300 m²
Built-up area	4,600 m <sup>2</sup>
Effective floor space	6,600 m²
Cubage	36,400 m <sup>3</sup>

## TEERAG-ASDAG AG

### Competence and efficiency also for alpine facilities

#### Stefan Plankensteiner

TEERAG-ASDAG AG (T-A) has been deeply rooted in construction activities in Austria since 1914 and has been an important part of the PORR Group since 2000. Over the past twenty years it has established itself as a leading partner of lift and cable car companies and has become a specialist in the construction of Alpine sports facilities.

TEERAG-ASDAG AG is one of the most important road construction companies in Austria, implementing projects throughout the entire range of civil engineering works. The company focus is on the construction of roads, asphalting projects, outdoor facilities, sewers and water pipelines, gas and district-heating lines, bridges, power plants and noise-protection walls as well as concrete and engineering construction.

The construction of water storage reservoirs and snow-making systems has recently become another increasingly important area of expertise.

TEERAG-ASDAG AG has implemented numerous challenging high mountain projects of various scales in Alpine terrain together with its branch offices in Styria, Salzburg and Tyrol. These have been completed to the greatest satisfaction of cable car company clients operating in the Austrian and South German Alps.

## TEERAG-ASDAG AG's range of services in the "Alpine field" include

#### Lift and cable car construction

building construction for the stations, pylon foundations, cable work and drainage work,...

#### Ski slope and snow-making facilities

earthworks, ski slope correction, short water pipelines, pipe-placing work,...

#### **Reservoir construction**

all works for the complete construction of water-storage ponds, building construction for the pumping stations, earthworks for the construction of the pond, (geotextiles and HD-PE sheet), various minor structures,...

#### Slope stabilisation systems

reinforced earth slope stabilisation structures and prestressed steel-net reinforced anchor walls for slope stabilisation for ski slopes, slopes along roads,...

## Selected projects of TEERAG-ASDAG AG implemented in the past few years

## Optimal snow security for the Lachtal skiing area – Tanzstatt water-storage pond

A water-storage pond has been constructed between a

wind farm and hiking trails within the Wölzer Tauern mountains in Styria, which blends harmoniously with the surrounding landscape. The Styrian Branch Office of TEERAG-ASDAG AG performed the earthworks for this project in cooperation with the Scheifling and Mürzzuschlag sub-branches. The pond, about two hectares in area and situated above the small old Tanzstatt chapel on a wide mountain ridge, is essential for the Lachtal skiing region. Holding about 107,000 m<sup>3</sup> of water and 9.30 m deep, it is among the largest and highest-level snow making reservoirs in the Styrian skiing region.



Air photo showing Tanzstatt storage pond Image: Lachtal-Lifte u. Seilbahnen GmbH & Co KG



Storage pond viewed from above Image: Lachtal-Lifte u. Seilbahnen GmbH & Co KG

The construction of the pond involved a workforce of 25 people with 13 large-scale earthworks machines. The work was completed ahead of plan within a record time of three months and as an additional plus point before the onset of winter. The snow-making system was extended by a further 4.5 km, while the pumping station and a pump line between the spring and the pond were completed. The compact snow produced by this system brings security to the Lachtal area, which can now offer a full skiing provision for winter guests within only three days even when

snowfall has been scarce. This region is now one of the most reliable in terms of snow security anywhere in Austria.

## Project data of the new snow-making system in the Lachtal area

- Snow water reservoir with a capacity of 107,000 m<sup>3</sup> (107 million litres) and a water surface area of almost 2 hectares
- Earthworks 70,000 m<sup>3</sup>; rock excavation 24,000 m<sup>3</sup>; filter gravel 12,000 m<sup>3</sup>
- Reservoir waterproofing: Geotextile 40,000 m<sup>2</sup>; HD-PE sheet – 20,000 m<sup>2</sup>
- Pumps with a connected load pf 450 kW and a capacity of 300 litres per second
- Almost 5 km of pressure piping and 15 km of cable were placed.

The Tyrol Branch Office of TEERAG-ASDAG AG has successfully developed expertise in Nordic skiing sports facility construction over the past few years.

## Reconstruction of the Olympia ski jump at Garmisch-Partenkirchen in Bavaria

The contract for the construction of the new ski jump (with the exception of structural steel work) was successfully implemented according to schedule in 2007. It included all earthworks, the foundation works and special civil engineering works, reinforced-concrete work for the starting tower, landing bridge and hill, jump-off platform building and referees' building as well as placement of the infrastructure lines, such as water supply, sewerage, power etc.

## Seefeld ski jump – Nordic Intensive Training Centre in Tyrol

The sports infrastructure of the community of Seefeld was substantially enhanced by the construction of two ski jumps in 2010. The First Olympic Youth Winter Games iare to be held in Innsbruck/Seefeld in 2012. This very ambitious construction project was implemented by TEERAG-ASDAG AG as general contractor. Following demolition of the existing Toni Seelos Ski Jump, a HS109 ski jump was constructed at the same site and, further east, a slightly smaller HS75 jump, both in open steel truss construction. The contract included all demolition, earth and drainage works, the foundation and concrete works for the two ski jumps and also construction on a ready for occupation basis of the building for housing the ski jump referees.



New Olympia ski jump at Garmisch-Partenkirchen Image: PORR



Seefeld ski jump – Nordic Intensive Training Centre Image: PORR

## Taking on and dealing successfully with major challenges

The many years of experience behind us in the implementation of an immense range of projects has earned T-A an excellent reputation within this sector. The T-A is well-known and admired for competence, efficiency and flexibility, not least when the tightest schedules in the most difficult conditions call for services of an altogether special standard. These merits explain how T-A can respond with extraordinary capability and success to the most challenging of special requirements, including changes to the detailed design at short notice or under difficult and varying weather conditions.

## Apartment building, Vienna, Wohlmutstrasse 19-21

100th anniversary revitalisation

Gerfried Tamerler

#### History

100 years ago the apartment building, built in 1911 in Vienna's Stuwerviertel quarter, had a richly textured, historic facade facing the street which had disappeared over the years for reasons related to the cost of construction measures.



Facade before revitalisation Image: Architekturfotografie Irene Schanda



Facade after revitalisation Image: Architekturfotografie Irene Schanda

#### The order

In April 2009 PORR, Revitalisation Division, received the general contractor order for the revitalisation of the entire building including a roof extension, building a new elevator and thermal insulation of the facade, starting with the shell before completing the extension but without building services.

The developer called for the construction of seven high-end, roof-top apartments with generous roof terraces to be realised to the highest quality standards by PORR with the design of the Office of Architects Harald Mallner. Other main focal points from the developer were to return the historic facade to its original glory, build balconies onto the inner courtyard and improve the building's energy efficiency through thermal insulation.

#### The construction

#### **Roof-storey extension**

The roof-storey extension consists of a floor area of around 690 m<sup>2</sup> across two storeys including around 200 m<sup>2</sup> of roof-top terraces.

In order to be able to remove the existing roof truss in its entirety, a reinforced lightweight concrete slab was erected to relieve the load on the existing ceiling above the fourth floor including provisional horizontal sealing with grout. After securing the firewalls and the chimneys, a prefab steel construction with head plate joints was screwed into the framework using the skeleton construction method.

The back-ventilated, pitched roof facing the street was given powder-coated aluminium rhombus panels, while the flat roof areas towards the courtyard were given membrane roofing. The flat-roof terraces were designed and realised as a warm roof.

#### Renovation

In addition to adapting and renovating seven unoccupied apartments, all of the apartments on the two wings facing the courtyard were given generous balconies consisting of two freestanding steel towers with wooden decking made of larch. The inner courtyard itself was landscaped, the area for waste containers was newly concreted and a glass porch roof was put up by the elevator entrance. The basement was completely overhauled and the necessary technical rooms were established, along with new cellars and a storage space for bicycles and pushchairs.



Lift shaft construction Image: PORR

World of PORR 159/2011



Courtyard facade with lift construction Image: Architekturfotografie Irene Schanda



Balconies onto courtyard Image: Architekturfotografie Irene Schanda

#### Street-facing facade

In addition to the thermal insulation of the street-facing facade with 8-cm-thick EPS F facade insulation boards attached to the base surface, the facade texture was recreated in the image of the original. This was achieved by layering and grading the width of the boards on site in combination with prefabricated decorative elements. The fire protection bolts required as a result of the increased insulation thickness caused by the texturing were built in during the course of the facade manufacture as agreed with the authorities (MA 39, Vienna).

The building's energy efficiency has been significantly increased through thermal insulation on the courtyard facades, the small courtyard and the fire walls, achieved by the application of full thermal protection and replacing the windows.

#### The result

The new design of the facade with its colour palette and the interplay with the new roof storey allows the building to integrate harmoniously into the building ensemble of Wohlmutstrasse, both in terms of style and urban construction. The newly erected balconies and service rooms will not only improve the quality of life for the tenants of the roof-storey apartments, but also for everyone residing in the building.



Wohlmutstrasse Image: Architekturfotografie Irene Schanda



Gallery in living room Image: Architekturfotografie Irene Schanda

#### **Project data**

Principal	EKO Immobilien GmbH
Contractor	Porr Projekt und Hochbau AG, Revitalisation
Construction period	June 2009 – August 2010
Planner	Harald Mallner
Statics	Albert Röder
Site supervision	Office of Harald Mallner
## Shopping Haidäcker Park

### The new shopping centre in Eisenstadt

#### Markus Huber

#### The project

Haidäcker Projektentwicklung GmbH, a PORR Solutions subsidiary, built a new shopping centre in the south of Eisenstadt, state capital of Burgenland.

The project is situated on the S 31 expressway on the "Eisenstadt Mitte" junction, directly next to the exit for the city centre; a high quality location with excellent connections.

The shopping centre is made up of three construction lots and can accommodate one supermarket and 14 retail outlets. Outdoor car parking facilities are provided for 480 vehicles.



Site map Image: Köstinger Projekt Management GmbH

#### **Project participants**

PORR GmbH, Lower Austria Branch Office, was hired for the general contractor works. Construction began on November 17th 2010. The design for the supermarket store was carried out by the architects Consult ZT GmbH. On-site construction supervision as well as the design of the shopping centre, lots 2 and 3, was conducted by Köstinger Projekt Management GmbH. Woschitz Engineering ZT GmbH was responsible for the statics.



Overview Image: PORR

#### Foundation

The plot for the shopping centre is located in an area that was once marshland. The supporting soil was at a depth of 5-8 m; therefore all of the foundations were laid using ductile piling.

The soil's bearing capacity was increased through soil stabilisation with lime. Here a layer of lime 10-20 cm thick was formed and then inserted into the existing soil at a depth of around 40 cm.



Soil stabilisation with lime Image: PORR

#### Groundwater

The groundwater situation presented serious problems. In the preceding two years the groundwater level had risen by around 1 m, thereby encroaching into the foundation area by 30-60 cm. It was possible to solve this problem by using an additional drainage pipe along the edge of the plot, as well as up to 13 pumps and around 3,000 m of drainage lines. Because of weather conditions, slabs of groundwater ice with thicknesses of up to 10 cm had to be removed.

#### Execution

The construction of the shopping centre used prefabricated parts including sleeve foundations, ice walls, pillars, glulam timber girders and lightweight wooden roof elements with roofing membranes.

The outdoor shell was built with a glass facade on the front (entrance) side, while the other facade surfaces were clad with a 10-cm-thick metal panel facade. The requisite vents for heat and smoke and lighting are found on the roof. Monolithic floor slabs with a thickness of 16 cm were used – with the exception of the supermarket sales floor. Here 25-cm-thick, steel-reinforced, monolithic floor slabs were used to accommodate the weight of the shelving.



Awning construction Image: PORR

Reinforcing steel	150 t
Prefab sleeves	180
Prefab ice walls	2,000 m <sup>2</sup>
Precast columns	180
Cavity walls	1,500 m²
Prefab reinforcements	150 t
Glass facade	1,500 m²
Metal panel facade	3,200 m²



Monolithic flooring Image: PORR

#### Final remarks

To sum up, despite problems with the groundwater and the bad weather typical for this time of year, good cooperation and the great dedication of everyone involved made it possible to adhere to the tight construction schedule.



Completed shopping centre Image: Christian Jobst

#### Project data

Construction period	November 2010 – August 2011
Total floor space	13,600 m²
Ductile piles	approx. 900
Pile length	average 8 m
Soil stabilisation with lime	40,000 m <sup>2</sup>
Earth excavation	approx. 15,000 m <sup>3</sup>
Concrete	4,000 m³

## Flood protection Spitz

Flood protection project in the region of the town of Spitz on the Danube

#### Karl Reiter

#### The project

Settlements along the Danube have been confronted repeatedly with devastating floods for many centuries. In order to provide better flood protection for the affected towns and villages, the Lower Austrian Provincial Government decided to improve the flood protection measures for the town of Spitz in 2009. Spitz is located in the heart of the Wachau region on the left bank of the River Danube between the towns of Melk and Krems. In some parts, the town is only separated from the river by the B 3 (Donaustrasse) and the towpath. The Danube is joined by the Spitzerbach, Teichbach and Mieslingbach streams within the area covered by the project.

The construction contract was awarded to a joint venture consisting of TEERAG-ASDAG (Krems Branch Office), Porr GmbH (St. Pölten), and Porr Technobau und Umwelt AG on January 27, 2010.

Following a short preparatory period, work began on March 1, 2010. The contract provided for the completion of the project after a construction period of 24 months, and the functional operability of the flood protection measure was targeted for December 1, 2011.

#### Areas threatened by flooding

The areas subject to potential flooding were determined by the civil engineering company Retter & Partner using a one-dimensional discharge model.

A 100-year flood would affect an area of about 225,000 m<sup>2</sup> and 193 buildings with a total area of some 38,000 m<sup>2</sup>. Particularly noteworthy are the very high floodwater levels involved.

The fact that a 100-year flood would inundate the front rows of buildings in the town to a depth of 3.50 m precluded any solution involving a permanent barrier between the town and the Danube for reasons of landscape conservation.



Flood in June 2010 Image: PORR

The only solution remaining was thus a barrier of the same height that would only be erected in the event of a flood. This consisted of a wall plus a combination of fixed elements and mobile walls, with reinforced-concrete connections with a total length of about 120 m being provided at the eastern and western ends of the polder.



Wall, October 2010 Image: PORR

In addition, reinforced concrete foundations with a total length of some 2,100 m for erecting the mobile elements were required. Of these foundation walls, about 400 m needed to be flush with the ground.

Ground waterproofing was required for a length of about 2,000 m.

Bore piling with depths of up to 10 m below ground level was sunk to ensure the static load transfer of the flood barrier wall.



Bored pile, April 2010 Image: PORR

Jet grouting between the bored piles completed the impervious element.

#### Waterproofing and controlled water table variations

Jet grouting was also used for underground waterproofing in the connections to existing outlets (crossings, connections to the pressure-proof covers of the Teichbach channel, sewers etc.) as well as in the areas next to existing structures.

Complete imperviousness between the polder and the ground, however, was not be provided, since this would have cut off the communication with the receiving water course. The negative effect of this is that floodwater from the Danube can permeate the ground, with a groundwater flow rising behind the flood protection structures.

The rising water table is controlled by means of a pressure relief system which collects the groundwater along the flood barrier in a drainage line and body, from where it is pumped off.



Drainage, August 2010 Image: PORR

#### Pump stations including auxiliary equipment

A total of four pump stations (PW1 to PW4) with a maximum pump delivery rate of 3,650 litres per second and a total capacity of about 750 kW was required for the project area. The pump stations were designed to discharge storm water, combined wastewater and drainage water by gravity flow during non-flood periods.

In the event of a flood, both storm water and combined wastewater flows, together with drainage water, are routed to all four pump stations and pumped into the Danube. In order to prevent mixing of the two types of water, involving the risk of backwatering in the drainage pipe and resulting leakage of sewage water into the subsoil, the pump stations were equipped with two pump chambers (one for sewage water from the existing combined wastewater sewer system and one for drainage water).

The pump stations are designed as underground shafts with free-standing switchgear cabinets. The selected pumps are of the dry-run proof immersion type in stationary wet installation. The pumps have electric drive motors, with a second unit being provided in each pump shaft as a back-up.

The pumps and the auxiliary equipment were installed with the help of a mobile crane. The installation hatches have trafficable covers, and access for maintenance is provided via a separate hatch in each pump chamber. All hatch covers comply with Class D (400 kN, trafficable by trucks). Pressure sensors are used for pump start-up and shut-down as well as for starting up additional pumps as necessary. The switching and control unit as well as the power supply cables for each pump station are installed in a free-standing switchgear cabinet close to the station. Moreover, a warning beacon has been provided in the vicinity of every switchgear cabinet for alarm signalling in case of fault.

During the non-flood periods, the pump stations are usually not in operation, and the pump sumps are empty. The respective drainage systems bypass the station inlets and feed into the discharge pipes, which are designed as pressure pipes.

When a flood is approaching, the gravity drains are closed by means of slide valves, and the inlets to the pump sumps are opened. As soon as the pump shafts are flooded, the pumps are put into operation.

All the slide valves up to DN 400 needed to shut off individual pipelines in the flood barriers are operated manually, while larger valves are fitted with drive motors. In principle, subsequent conversion to completely automatic operation is possible.

Apart from the local fault signalling system, the entire drainage system is fitted with a cumulative fault signalling device. Power sockets are provided in the switchgear cabinets of each pump station, so that emergency generators can be connected quickly to resume pump operation in case of power failure.

Each pump chamber is equipped with two or three service pumps and a standby pump. This distribution of capacity together with the dry-run proof motors permitted the selection of relatively small pump chambers only, a constraint imposed by the limited space available. The individual pumps are switched on and off depending on the water level. Power supply to the standby pumps is not locked, so that additional safety is ensured in the case of an extreme flood event.

#### **Teichbach and Spitzerbach channels**

Provision had also to be made in the flood protection area to ensure that the outlets of the Teichbach and Spitzerbach channels are not flooded by backwater from the Danube, with resulting leakage to the ground.

The portion of the existing Teichbach concrete box channels which lies above the HQ100 high-water line had to be removed, because it was to be doubted that the existing covers were completely watertight. Instead, pressure-proof pipework with a length of some 250 m was provided.

Also, all the municipal and provincial roads affected by the construction work were resurfaced as an accompanying measure.



Asphalting work, December 2010 Image: PORR

A similar approach was also needed for the pressure-proof cover of the Spitzerbach channel. In addition, two existing bridges across the Spitzerbach had to be demolished, and suitable adaptations and new bridge structures had to be provided in this area.



Spitzerbach stream Image: PORR

The adjoining retaining walls of the Spitzerbach were completely renewed. The outlet area inland of the B 3 Donaustrasse were poldered in accordance with the system of the B 3 flood protection wall, which therefore provides an unobstructed view in certain sections.

In the light of the short construction period and the difficult construction site with the limited space available, I wish to express my particular thanks to everyone involved in the project for the excellent cooperation.

# Roof refurbishment works on asbestos cement slabs for an apartment building

in Vienna and other business lines of the BOMA Group

Friedrich Reidinger

#### The project

The cooperative Gemeinnützige

Siedlungs-Genossenschaft Altmannsdorf und Hetzendorf reg.Gen.m.b.H. contracted the company Eisenschutz, a company of the PORR Group, for the refurbishment works on the apartment building Edelsinnstraße 46-48 in 1120 Vienna on September 14, 2010.

#### **Project description**

The refurbishment works of the two apartment blocks 1 and 2 were started in April 2011 and completed within four weeks. In this case, 1,350 m<sup>2</sup> of asbestos cement slabs (corrugated eternit) had to be refurbished. At the beginning, the complete roof surfaces were inspected on foot to identify any possible damage and to check all fastening screws. The screws were checked for stability and rust, tightened and missing screws added. Furthermore, sealing tapes were laid in the area of the slab joints, in order to prevent a possible entry of water onto the underlying insulation for the subsequent cleaning works. In addition, all chimney faces, marginal sheets, roof exit windows etc. located on the roof were derusted and coated twice in the course of the coating works.



Cleaning works under safety protection Image: PORR



Before / afterwards Image: PORR

The cleaning works on asbestos cement were performed in a specially developed method with a specially designed roof carriage using a high-pressure water jet. The difficulty on this apartment building was not only the cleaning, but above all the discharge of the contaminated wastewater with algae and asbestos fibres. Unfortunately, it was not possible to direct the complete wastewater through the discharge pipes into our filter system in the case of this building, as the discharge pipes were internal. As a result, we were required to suck off the complete wastewater through the gutters. A special pump that continuously sucks off water and air, pumps away the complete sludge at a height of 15 m, and directs it into the filter system was necessary for this purpose. From there, everything was passed on once again into a special pump and ultimately filtered to 1 µm. No impact on the environment and the groundwater resulted. Residues of the asbestos fibres and other contamination were collected in separate containers and then disposed of by PORR Environmental Engineering.

The incipient cracks on the slabs were repaired on a cleaned base. All cracks were grouted using a permanently elastic jointing compound on acrylic basis. Larger cracks were glued over additionally using glass fabric bandages or damaged slabs exchanged and replaced by new asbestos-free slabs.



Application of coating Image: PORR

The coating was implemented in two work steps according to the Isonit roof coating system. Isonit is a weatherproof roof coating on 100 % pure acrylate basis. The material is characterised by high covering capacity as well as rapid desiccation and extreme elasticity. Isonit is UV resistant and weatherproof, capable of diffusing, water- and dirt-repellant due to the extremely smooth surface, and 197 % permanently elastic. The entire roof surface was coated in tone light grey. Historical values for durability of the coating are at approx. 15 years; afterwards another coating can be implemented without the costly cleaning works. All asbestos fibres are bonded and do not represent a risk to the environment anymore.

Following this contract, our company was able to acquire and implement additional objects successfully on the part of the building owner specified above, as well as perform other contracts from private clients in Vienna, Lower Austria and Burgenland.

The advantages of the professional roof coating are numerous, no matter whether on asbestos cement or concrete roof tiles:

- no structural measures required
- no disposal costs
- no release of asbestos fibres
- · no environmental impact



Refurbished roof Image: PORR

With the new coating system based on nanotechnology, the service life of the roof is extended by many years. The extremely smooth surface not just brings about a better flow-off of water (pearl effect), but also prevents moss and algal bloom. After completion of the works, there is no contamination on the building or the property whatsoever. The roof coating is possible in various colours. Approx. three days are needed for the coating of a single-family house.

## The BOMA Group – specialist for marking and painting works within the PORR Group

Approx. 120 staff are employed by the BOMA Group at two sites. The companies Ing. Otto Richter & Co. GesmbH as well as Tancsos und Binder GmbH are located at the Traiskirchen site. Road markings are the focus here.

The companies Eisenschutzgesellschaft m.b.H. and Panitzky GesmbH are located at the Vienna site with the focus on painting.

In addition to that, the group of companies has been implementing all coating works successfully for decades under the motto "from the floor to the roof – everything from a single source".

Exclusively skilled personnel is employed, which is qualified at best for the necessary fields of work, trained continuously and has all necessary certificates. Special attention is also paid to the training of apprentices.

The BOMA Group is known for best quality and longstanding reliability and intent on constant further development of environmentally friendly products in collaboration with the material manufacturers.

The group of companies is based on five lines of business, which comprise the following spectrum of services:

#### Marking

Production of markings through our plotter system on foils at the Vienna branch office, as well as all manual markings onsite.

- Sign production
- Template production
- Foil markings
- Wall markings
- Floor markings



Sign marking Image: PORR

### Road marking

Execution of all road marking works as well as traffic routings on the high-level road network and performance of various public and private contracts in the federal provinces Vienna, Lower Austria, Burgenland, Upper Austria, Styria and Carinthia.

- Floor markings
- Demarcations
- Airfield markings
- Foil laying
- Garage markings
- Central separation systems
- Traffic routings



Coloured central strip marking Image: PORR

#### Roof coating

See previous project description.

- Roof coatings on asbestos cement slabs
- Roof coatings on concrete and clay tiles
- Roof coatings on sheet metal roofs
- Roof repairs
- Chimney refurbishments

#### Painting

In this area, our company is engaged mainly with maintenance works of any kind that comprise apartment buildings, hospitals, schools, kindergardens, offices, industrial buildings and private clients in the area of Vienna, Lower Austria and Burgenland.

- Paintworks
- Paint stripping
- Mould control
- Repair of water damage
- Lacquer technology and glaze technology
- Wood sealing
- Facade coatings
- Floor coatings



Interior paintworks Image: PORR

#### **Corrosion protection**

Execution of all sand-blasting works at the Simmering Branch Office as well as jet-blasting works onsite, water jet removals and concrete repairs.

- Concrete repairs
- Fireproofing coats
- · Jet-blasting rust removals



Renovation of the facade (corrugated metal) Image: PORR

## **IWP** Liebhartstal II

### From the DB call for tender to the award including project concept

Peter Doleschal, ATP

At the end of 2010 PORR managed to emerge as the winning bidder in the "IWP Liebhartstal II" award procedure, acquiring the order for the design-build contractor services for the new construction and renovation of an existing residential and care home.

#### The task

In Vienna's 16th district, Ottakringer Straße 264, the existing retirement home "Liebhartstal II" is to undergo extensive renovation along with the construction of a new extension to meet current requirements, under contract to the Curatorship Vienna Senior Residences (Kuratorium Wiener Pensionisten-Wohnhäuser - KWP) in the course of the "Innovative Wohn- und Pflegehäuser" - IWP ("Innovative Residential and Care Homes" - IRCH") project. The services should be realised by a design-build contractor, with planning and construction handled by the same source. The principal chose a two-stage award procedure, the first stage of which involved a selection procedure (prequalification), with the second stage seeing the posting of the call for tender and an award procedure with the qualified bidders resembling a competition. The award procedure was conducted as a negotiated procedure with prior publication in line with the 2006 Austrian Federal Contracts Act (Bundesvergabegesetz).



Construction measures Image: ATP/renderwerk

#### First stage - prequalification

In February 2010 PORR applied to take part in the award procedure. KWP hired the lawyers Heid Schiefer to handle the award procedure. Even during the first stage there were high quality requirements for potential bidders. PORR took on this task together with partner ATP ARCHITEKTEN UND INGENIEURE and submitted the requisite documents to the awarding body in March 2010. In June 2010 Heid Schiefer announced that PORR was one of five applicants to be invited to submit a design-build contractor bid.

#### Second stage - tender, negotiations and award

In June 2010 the awarding body invited PORR to submit a bid for the design-build contractor services for the renovation and new construction of "IWP Liebhartstal II". The bid documents basically involved comprehensive "Functional Specifications", a detailed "Space and Function Programme" and "Building Regulations" for the plot of the extension to be newly constructed. The design of the project as well as the overall architectural concept of the plot was left up to the respective bidder in the course of providing the complete design services. It was announced that every offer, including design submissions, would be presented to a commission. This commission had to examine and evaluate the documents - in line with the criteria of the call for tender - both in terms of design and function as well as for financial considerations, before determining the best bidder as a first step by awarding points. After a general negotiating round and the possibility to revise the prices in the offers, exclusive negotiations were announced with the bidder who had emerged as the best bidder.

PORR was able to edge ahead of its competitors in this evaluation – not least because of the exceptional design and functional concept from ATP – and was invited by Heid Schiefer and KWP for exclusive negotiations.

These negotiations involved an extremely full programme over three weeks (two negotiation meetings per week). In the final meeting on December 17th 2010 it was possible to confirm both parties' agreement to work together. The final contract award decision was conveyed to PORR in January 2011 after the legally prescribed standstill period.

#### **Project concept**

#### **Design aspects – architecture and urban setting** In Vienna's 16th district the "Liebhartstal II" retirement home is set to be modernised and extended with a new building. The building complex is situated on the slopes of Wilhelminenberg, where the densely built-up city area meets the more sparsely populated suburbs.

From the site itself there are views onto the hilly landscape in the north west of Vienna and onto the city's foothills in the south. The geometry of the plot circles the Grünspan Restaurant and borders the well-tended park grounds in the north west.

Because of its intended use, the building is presented as a Z-shaped facility with a functional head in the entrance area which also borders the existing building. The new construction should be seen as a continuation of the existing building and displays a clear building structure. The subtlety of its form also helps it to define itself in this way beside the existing building.



Rendering aerial view Image: ATP/renderwerk

The location of the main entrance will be maintained and its new image will be designed to reflect the planned functions of the entrance area. The generously sized, covered forecourt serves as a vestibule for the entire site. After entering the vestibule one sees the split-level "market place" flooded with light. This area and its facilities (hairdresser, grocer, doctors, multi-purpose function room, reception etc.) serve as an interface between the complex's residents, visitors and neighbours from the surrounding area.



Entrance area – "Market place" Image: ATP/renderwerk

With the facades, great attention was paid to displaying the individuality of the residents to the outside world, as every apartment is presented to the exterior via a panoramic window. The openings are punched windows in the facade, most of which has full thermal insulation. As the parapet is only 45 cm, it facilitates views of nature from a sitting position or from a care bed. Wooden cladding in the window area gives the form an additional structure and the building a homey character which also corresponds to the surrounding park.

In order to bring the existing building and the new construction together as one unit, the openings on the head buildings were realised as continuous strips. The existing building will retain its clinker facade, although the apartment balconies will be added and glazed. The roof of the existing building will be removed and replaced with a thermally insulated flat roof.

Three courtyards bring the green outdoors into the building, resulting in protected oases of calm. The courtyard facades also create the vision of the main facades in the interior. When designing the building attention was paid to ensuring that the living rooms and bedrooms face onto peaceful green areas.



Facade design, various views Image: ATP/renderwerk

The materials listed in the tender were used in the interior. In order to simplify orientation for the building's residents, four different themes have been used to define groups on every floor. The themes are drawn from the elements of nature and can be seen in the building's interior as water, breeze, light and forest.

The outdoor facilities have been designed in line with the "Garden of the Senses" concept. The form of these sensory gardens should make lifetime events tangible again.



View of Hofzinsergasse with Image: ATP/renderwerk

#### Interior and exterior development

The facility can be accessed via a forecourt which offers a covered exit/entrance area. This where ambulance and taxi access is provided, along with a taxi bay. The main entrance leads into the building's reception area. Past the reception one finds the central core of the building which is the intersection for accessing all parts of the building. The main passageway from here provides a short route to the residential areas and functional spaces, while also maintaining a distance from the noise of the guest garden.

The space used by all groups is found in the head of the building. The kitchen is linked to the function room and has a direct, vertical connection to the wardrobe, storage and delivery areas as well as an access tunnel to the "Liebhartstal I" building.



Example level 1 Image: ATP/renderwerk

The intersection is designed as a brightly lit corridor with recreational areas which form the entrance points to the groups of apartments. The groups of apartments have been conceived as parts of the building which function independently. In line with IRCH specifications, 14 apartments are arranged around a central area for cooking, dining and relaxing. The living rooms are open plan and easy to access. Every residential area has an outdoor spot in the form of a terrace or loggia. The choice of materials and furnishings is tailored to the residents' phase of life. Natural materials and colours have deliberately been selected to promote a feeling of wellbeing.



Communal lounge Image: ATP/renderwerk

#### Project data

Design start	January 2011
Construction start	Autumn 2011
Completion	Summer 2013
Occupancy and fully operational	December 2013
Total floor space	approx. 26,660 m <sup>2</sup>
Gross volume	approx. 85,400 m <sup>3</sup>
No. of rooms	252 apartments
Parking spaces	36
Outdoor facilities	approx. 9,500 m <sup>2</sup>

## Warszawa Centralna Station

Renovation of the most important railway station in Warsaw

Małgorzata Wojtowicz

#### From the history

The first concepts of land development for the station emerged in 1946. The ideas of the main planner Arseniusz Romanowicz developed over the next 25 years, in order to finally take shape together with Piotr Szymaniak in 1972. The construction took only three years and was one of the most successful and most modern station buildings of the seventies in Europe.

The building was equipped with the most modern ventilation and air-conditioning systems as well as smoke extraction and heating systems of the time. The building materials were imported from nearly all over the world: the escalators from Paris and Brussels, ceilings, automatic doors and facades from Switzerland, electronic clocks from Italy, granite from Poland (Koźmin, Strzegom) and Spain (Emerald), and the marble from Italy.



View of the eastern facade Image: PORR

#### **Project description**

The station building is located directly at the centre of Warsaw and comprises four storeys, of which two are located below ground level.

Level (-2) – railway platforms with a surface of  $32,000 \text{ m}^2$  – is composed of four platforms of 400 m each. It is connected with the neighbouring Sródmiescie station [city centre] that serves local railway connections by a pedestrian tunnel system.

Level (-1) – shopping malls with a surface of 13,500 m<sup>2</sup> – consists of two galleries that run in parallel to the tracks and are connected with three additional galleries (east, central and west), from where the exits lead down to the railway platforms. In conjunction with the pedestrian tunnel system of Warsaw, this level enables barrier-free pedestrian traffic in the vicinity of the station.

The main hall with a surface of  $4,800 \text{ m}^2$  is located on level (0). Level (+1) provides space for the "food court" area on the east side, while the waiting room and offices are located on the west side. The total surface of this level is  $3,500 \text{ m}^2$ .

The usable area of the entire station is approx. 54,000 m<sup>2</sup>.

#### The renovation works

The planning works of the renovation were assigned to Warsaw's renowned architects Jerzy Porębski and Grzegorz Niwiński. Taking the building owner's limited budget into account, they drew up a project that was based on the best maintained architectural elements of the station. These include: granite floors, marble coverings, metal ceilings and wooden benches. In order to obtain a modern and spacious interior, special attention was paid to the illumination of the ceilings.

The removal of the sales booths that had developed inside over the course of time, standard adjustments in the shopping malls, and the use of aluminium-glass system show cases contributed to an improved spatial harmony.

The architectural details used were a major factor for the merger of the station's monumental architecture with the modern surrounding of the centre of Warsaw.

The elements designed from rust-resistant steel (railings), aluminium and glass (ice cube, pavilions in the shopping malls and on the platforms, lift covers in the main hall) provide an interesting contrast to the traditional materials used for original construction of the station.



Demolition works Image: PORR



Mounting of ceiling elements Image: PORR

#### **Realisation of the renovation** On July 5th 2010, PORR (POLSKA) S.A. signed the

contract for renovation of the station.

The interior works were complicated significantly by a large number of water ingresses that only became visible after the old ceilings and linings had been stripped.

The biggest challenge during the refurbishment was to ensure the functionality and operation of the after all largest station of Poland's capital by exact planning of the individual construction stages, and to maintain accessibility of the pedestrian tunnels below one of the main arterial roads, namely Jerozolimskie Street, during the construction works.



Platform 4 Image: PORR

#### Safety and comfort for the passenger

"The passenger is most important for us", says Jolanta Fabiszewska, project manager of PKP. "The main requirement was to implement the renovation in a safekeeping way. Thanks to a harmonious collaboration with PORR (POLSKA) S.A., it was possible to time the works in such a way that the impact on the passengers' travelling quality was limited to a minimum."

"Above all, the experience and the commitment of all employees of all companies involved in this enterprise contributed to the fulfilment of the tight deadlines for the individual renovation phases, which also includes the expert skills of the engineers of PORR (POLSKA) S.A. who headed the works and with whom I have the pleasure of managing this renovation", adds Lech Moroz, the project manager of PORR (POLSKA) S.A.

#### Platforms

The renovation of the platforms, which hadn't been renovated since they were created, was particularly laborious. It was necessary, among other things, to mount more than 1.6 km of safety fencing for the separation of these areas.

Every single noise insulating element was dismounted, sand-blasted, repainted, the insulating wool replaced, and then remounted.

**PORR** Projects

"Part of the works on the sewer installation and other works to be performed in the areas between the tracks could only be implemented in the night hours", reminds Jolanta Kempińskadie, coordinator of the installation works of PORR (POLSKA) S.A., "as two additional tracks had to be taken out of operation for that purpose".

The renovation of the platforms included not only cleaning, replacements and painting. The long-penetrating water that had entered through leaky expansions caused heavy corrosion of the reinforced concrete load-bearing structure. A detailed examination of the structural elements made the preparation of an expertise necessary for assessment of the concrete condition and the repair method.



Shopping mall before renovation Image: PORR



Shopping mall after renovation Image: PORR

#### **Shopping malls**

The old show cases, dividing walls and ceilings were torn down. Small snack stalls with fast food and many kiosks were removed. New stone coverings were installed on the walls and ceilings.

The malls were arranged in accordance with the old project ideas of Arseniusz Romanowicz on the newly gained surface. Boutiques of recognised brands settled down and contributed with that to a new standard of the malls.

In the description of the next work phase, the site manager of PORR, Piotr Łapiński remembers, "The works during the dismantling reminded a little of archaeological diggings. In addition to the accumulations of waste from thirty years, such historical "pearls" as e.g. bulletins of the Warsaw Central Committee of the Polish United Workers' Party (PZPR) from the early eighties could be found. Thank goodness that they are only a paper witness of that past period of time".



Current view of the hall Image: PORR

#### Main hall

The renovation of the ceiling inside and outside of the station's main hall turned into the greatest challenge. Special scaffolds with a height of 20 m were necessary for implementation of the elevated works in the outside area, namely cleaning, painting and completion of the faceplates, as an anchorage at the roof edges of the building was impossible.



Works on the facade Image: PORR

At least three main entrances as well as the stairs leading from the main hall to the platforms had to be kept free and the functionality of at least half the cash desks ensured during the works.

#### Safety and modern technologies

The renovation of the station includes not only the repair of the building elements, but also the introduction of modern technologies that ensure the safety of its users. Particular attention was paid to the CCTV system with its 160 digital cameras and 24 special cameras with a high resolution. The cameras permit car registrations to be read from a distance of up to 200 m.

The monitoring centre is equipped with eight modern 42-inch screens and is with that one of the most modern

installations of this kind in Europe. Many solutions were introduced according to the example of Brussels station.

The fire protection alarm system works through 1,000 sensors of various types, networked and operated by three centres.

The technical infrastructure in relation to the entire electrical works had to be renewed completely, which represented a major challenge during an ongoing operation.

#### **Toilet facilities**

The toilet facilities are certainly the "Achilles' heel" of most stations in Europe, but not so at Warszawa Centralna station. The concept of toilet installations with touch-free switchgear established by the Dutch company meets the requirements for a high standard in its entirety.

#### Suitable design for handicapped persons

Another important issue was to design the station interior suitable for handicapped persons.

Induction loops that support the sound pick-up in hearing aids were mounted at two selected cash desks serving persons with impaired hearing on the level of the main hall and the mall.

Three lifts were installed in the main hall, by which persons with limited mobility can reach the level of the waiting room and the gastronomy area.

The projected wayfinding system for blind and visually handicapped persons was patented by the locksmith company working for PORR (Polska) S.A..

The readable, permanent, foot-perceptible and elegant solution was also used in Warsaw's underground railway, among other things.

The guide track consists of four lines with a width of 20 mm and a height of 4 mm.

The warning strip is formed by a system of convex "buttons" shaped like a blunted cone with a diameter of 30 mm.



Entrance to platform with warning strip for blinds Image: PORR

The installation of a visual information and advertising system was an additional novelty. In accordance with the general Polish guidelines of PKP, modern graphics with clear pictograms were created, ensuring efficient information of the passengers.



Neon "WARSZAWA CENTRALNA" before renovation Image: PORR



Neon "WARSZAWA CENTRALNA" after renovation Image: PORR

Under consideration of our quality of work and the good previous collaboration with the principal, we hope that a decision is reached with regard to continuation of the renovation works on other station areas once new financial resources have been released and that PORR (POLSKA) S.A. is used once again.

#### **Project data**

Principal	PKP (Polskie Koleje Państwowe SA, Oddział Dworce Kolejowe
Contractual engineer	Mace Polska Sp. z o.o.
General contractor	PORR (POLSKA) S.A.
Project development	Towarzystwo Projektowe G. Niwiński, J. Porębski
Realisation period	July 2010 – December 2011
Realisation period Location	July 2010 – December 2011 Warschau

## Hotel Ramada Innsbruck Tivoli

Newly constructed hotel in the heart of the Alps

#### Christof Hilber

#### The Project

In May 2010 PORR received the design-build order from Triton Raiffeisen-Immobilien-Leasing GmbH for the turn-key and operational realisation of the Hotel Ramada Innsbruck Tivoli project. FF&E services (furniture, fixtures & equipment) were the only area which the developer directly put out to tender.



Rendering hotel Ramada Innsbruck Tivoli Image: PORR Solutions

#### General project description

The 3-star hotel Ramada Innsbruck Tivoli is located directly opposite the Olympic ice stadium with excellent links to the centre, station, airport and motorway.

It is one of Innsbruck's tallest buildings, with a basement, ground floor and 12 upper storeys. In the basement there is an underground car park with 58 parking spaces, building-services rooms for heating, ventilation and air-conditioning as well as emergency power, electric and battery rooms. The basement storey also houses the service area for hotel staff as well the staff changing rooms and bathrooms. On the south side of the ground floor there is a split-level entrance lobby with a bar area, pantry and reception; on the north side one finds the delivery entrance with storage space and waste facilities as well as office space for staff and sanitary units.

Running through the middle of the building from floors 1 to 10, where the guest rooms are situated, is a central corridor. To the south and the north of this corridor are the guest rooms, suites and apartments with breathtaking views onto the Patscherkofel, the Serles, the Kalkkögel and the Inntalkette.

The modern air-conditioned rooms all offer a flat-screen TV, wireless LAN, minibar, safe and telephone. The storeys can be accessed via the two safety stairwells and their adjoining landings as well as the two staff elevators

and the fire-fighting lift.

On the 11th floor there is a generous breakfast room which opens onto a roof terrace, as well as the kitchen and 4 seminar rooms which can be split using mobile dividing walls. The 12th floor is subdivided into a wellness area with sauna and steam room, a fitness area with bathroom facilities and changing rooms. On this floor there are also the building service rooms for ventilation and heating.

With the exception of the underground car park, the whole building is fitted with a sprinkler system. The two stairways with their connecting landings have a stairwell pressurisation system along with other safety features.



Aerial view construction progress Image: Dipl.-Ing. Peter Fiby



Aerial view construction progress Image: Dipl.-Ing. Peter Fiby



Aerial view construction progress Image: Dipl.-Ing. Peter Fiby



Aerial view construction progress Image: Dipl.-Ing. Peter Fiby

#### **Construction work**

In the middle of May 2010 construction work began on the Hotel Tivoli project. Because of the slanting structure it was necessary to secure the construction pit in the west section with the help of tension piles. Furthermore, floor slabs with a thickness of up to one metre were needed. Excavated material from the construction pit had to be secured with shotcrete on the side facing the road. The majority of the building shell was built using in-situ concrete; only the flights of stairs were prefabricated and delivered to the site.



Climbing formwork and Staxo shoring Image: PORR

One particular challenge was the formwork for the east facade which has a slant of up to 57°. This was implemented in collaboration with Doka Kletterschalung (climbing formwork) and Traggerüst Staxo (shoring). Time pressure meant that formwork and concreting had to continue over the Christmas holidays. The shell was finally completed in March 2011. In February 2011 a sample room was made in order to facilitate better interior design.



Sample room Image: PORR



Sample bathroom Image: PORR

All of the internal partitions were built as dry walls, with the

exception of the load-bearing construction parts, the facades, corridor walls, stairwell core and elevator shafts. By using prefab installation shafts ("Instablock"), which were moved in the course of the shell construction, it was possible to cut the time needed for finishing by several weeks.

The facade design was carried out in accordance with the project surety agreement with the city of Innsbruck and in line with the permit application handled by Henke und Schreieck Architekten. Execution planning was realised by PORR Solutions. The facade's appearance stands out through the sculptural form and the juxtaposed French doors of equal size.

Glass panes, which are flush against the aluminium facade on the north and south facades, serve as anti-fall guards. The thermally insulated, back-ventilated aluminium curtain facade was built with Alucobond-A2 panels, meeting the fire regulations for high-rise buildings.

A central cooling system was installed for all air-conditioned areas; the necessary cooling is generated using groundwater. The building's heating and warm water generation is achieved with a ground source heat pump and a gas furnace. The interior design was carried out in cooperation with the Bachhuber–Geissinger planning office.

#### **Final remarks**

It was possible to hand over the first four storeys for FF&E services to begin as early as mid August 2011. The remaining storeys then followed in stages by the beginning of September 2011. The final inspection of the building was carried out at the end of October 2011. Following a pre-opening phase, the hotel can open on schedule at the beginning of December. A special mention must go to the exceptionally good teamwork of everyone involved in the project.

#### **Project data**

Principal	Triton Raiffeisen-Immobilien-Leasing GmbH
Operator	RIMC Austria Hotelmanagement & Consulting GmbH
Design-build contractor	Porr Bau GmbH, Tyrol Branch Office, large-scale projects
Permit application	Henke & Schreieck Architekten
Execution planning	PORR Solutions Immobilien- und Infrastrukturprojekte GmbH
Formwork planning	ZSZ Ingenieure GmbH
Construction period	May 2010 – November 2011
Storeys	14
Hotel rooms	159 rooms, suites and apartments
Seminar facilities	4 dividable seminar rooms for a total 80 people

## Peek & Cloppenburg's Flagship Store

in Kärntner Strasse, Vienna

#### Helmut Artinger

"Not a single complaint about this project landed on my desk", said the Mayor of Vienna, Michael Häupl, with surprise during the ceremonial key handover to the building's owner Peek & Cloppenburg (P&C) on July 12th 2011. He continued: "That is highly unusual for a project of this size and in such a prominent location".



View of flagship store Image: PORR

#### **Order assignment**

In 2009, Porr Projekt und Hochbau AG was commissioned by Naxos Grundverwaltungs GmbH – a subsidiary of the P&C Group Düsseldorf – as the design-build contractor for the demolition of the previous building in Kärntner Straße No. 29 - 33 and the construction of the new building. The P&C Group Düsseldorf is a chain of fashion department stores with outlets in many European countries. PORR Solutions accompanied P&C even during the project planning phase. By commissioning PORR for project implementation, P&C took advantage of the PORR Group's "one-stop" full service that ensures successful project execution.

#### Location and "Weltstadthaus"

Located directly on Kärntner Straße in Vienna's first district, the site with the building that was to be demolished – a post-war building that had previously been used by the Ministry of Finance – is flanked by two side streets, Himmelpfortgasse and Johannesgasse.

With a height of 35 m, the new Flagship Store ("Weltstadthaus") has seven floors, six of which are used as salesrooms. The top floor is reserved for administration, and an atrium in the centre of the salesrooms connects the floors.

#### Key data and implementation

The building's gross floor space is roughly 19,590 m<sup>2</sup>, of which almost 12,000 m<sup>2</sup> is used as a retail area. During construction, about 10,200 m<sup>3</sup> of in-situ concrete, 1,100 tonnes of reinforcing steel, and 160 tonnes of steel girders were used. The rubble from the demolished building had a volume of around 20,000 m<sup>3</sup>.

Construction work began in July 2009, and 24 months later, in July 2011, the building was handed over to P&C – a fully satisfied customer. Demolition work in the restricted surroundings of the city centre was very difficult and took 6 months after which the building shell was completed in 9 months. In order to optimise construction work and time, work on the outer facade began immediately after completion of the first four floors of the building shell. Early in September 2011, the "Weltstadthaus" was officially opened by P&C – an event that drew great media interest.

#### **Difficult building conditions**

One of the greatest challenges for the project's logistics was the fact that Kärntner Straße is a pedestrian area. This meant that material delivery was only possible via the two side streets, whereby one of them is a 300 m cul-de-sac that had to be traversed in reverse gear, and the other street is only suitable for trucks with max. 4 axles. Access traffic had to be coordinated with the relevant city authorities and with an adjoining construction site. The neighbouring property owners were kept informed continuously about construction progress.



Lorry reversing with banksman Image: PORR

#### Demolition

Because of the proximity to neighbouring buildings, two different methods were used for the demolition of the existing building. Brickwork was demolished from the outside in. Hereby the lower floors were filled with rubble via specially prepared openings in the ceilings. Dust generation was kept to a minimum by means of continuous sprinkling. In the upper floors, controlled demolition of the reinforced concrete structure, which stood close to a narrow, free-standing adjoining building, was carried out with small machinery. For this, every part was first secured, then cut, and finally removed.



Demolishing brickwork Image: PORR



Removing reinforced concrete Image: PORR

#### Foundations and supporting structure

Deep founding was done with bored piles with a total length of 1,710 m. Jet grouting was used for underpinning the existing walls, which were also used in combination with anchors for securing the basement excavation work. All of this work was executed by PORR's foundation engineering department.

The building's supporting structure is characterised by the use of only a few slim supports with large spans. This made it necessary to employ full-section steel supports in the atrium area, which are clad with precast hollow concrete elements in architect quality. In order to comply with P&C's demand for the utmost flexibility regarding the building's future use, the full-section steel supports were built in two sections.



Driving bored piles Image: PORR



Aerial view of construction Image: PORR



Atrium hall construction Image: PORR

#### Atrium

For prototyping purposes, a full-size atrium support, complete with binding girder, ceiling panels, and floor covering was built in a hall in Vienna Schwechat. The visual impression of the atrium stands out because of the high quality demands for the visible concrete, and the specified narrow joints with very tight tolerances. For this, the six hollow concrete elements surrounding the escalator shaft and the architrave (U-shaped precast cladding parts for the binding girders) were manufactured in the factory using architect-quality concrete (precast parts with Danube limestone additives). Moreover, the horizontal and vertical joints between the precast elements with lengths up to 12 m are only 10 mm wide, as specified.

The interior of the atrium's glass roof has ornamental cladding, intended as a reference to Vienna's Art Nouveau period. The ornaments are die-cast aluminium elements, specially designed and manufactured for this building.

Escalators and ceilings of the atrium galleries are fitted with white-coated aluminium panels to provide a pleasant ambience. All installations such as lighting and sprinklers are mounted flush against the ceiling. The joints were arranged to fit in with the other elements.

#### Facade

The building's outer facade consists of precast curtain elements made of architect-quality concrete, onto which 12-cm-thick, finely pointed Danube limestone slabs are attached. All the natural stonework and the precast parts are flush mounted, without parting lines. In order to comply with the high quality demands placed on the material, the boundary samples for the natural stone were determined on site in Bulgaria, together with P&C and the designers. Drainage of the wall plates in the upper floors is taken to the window portals to prevent undesirable stain marks below the window sills. For this, it was necessary to provide a drainage channel in front of the portal, and to install the drain pipe between the curtain facade and the concrete supporting wall.

A particular feature of the facade is that - contrary to

standard specifications – it was not necessary to provide continuous elastic, vertical expansion joints. By dispensing with elastic vertical joints, it was possible to maintain the impression of a continuous masoned stone facade. This was achieved by means of an ingenious arrangement of reinforcing steel and fixing elements. Consequently, the facade is an absolute novelty. In addition the outer facade, a sample surface with an area of 90 m<sup>2</sup>, was manufactured beforehand in Simmering, Vienna.



Facade construction Image: PORR



Jamb on facade Image: PORR

#### **Technical building facilities**

Heating energy is provided from a district heating supply

that enters the building in the central heating station in the basement. The air conditioning system is installed on the roof. The three ventilation units that supply 100,000 m<sup>3</sup>/h each to the salesrooms are also used for smoke extraction in case of a fire. Additional smaller ventilation units are provided e.g. for auxiliary rooms and the entrance air curtain. Two refrigerator units in the refrigeration station on the 5th floor, and two heat exchangers in the atrium of the 5th floor provide the necessary cooling energy for the building.

Two interconnected reservoir tanks supply the sprinkler system for the building's fire protection system. The central sprinkler station is located in the basement.

A medium-voltage switchgear station with three 1,000 kVA transformers is located on the 5th floor together with the main low-voltage power distribution station. For this, a 10 kV high-voltage cable runs from the basement up to the 5th floor. Also located on the 5th floor is an 800 kVA emergency generator. Every floor has its own electric power distribution room, and the rooms are accessible via both staircases.

Ten escalators in the atrium and one lift in the salesroom facilitate customer transport. Two additional lifts are provided for transporting staff and goods.

#### **Final remarks**

With the construction of the "Weltstadthaus", design-build contractor PORR was faced with an extremely complex task both in terms of building technology and logistics. Thanks to the company's strengths – know-how and experience in the implementation of technically demanding projects, as well as comprehensive project management matched precisely to the requirements – the PORR Group was able to guarantee the successful conclusion of this project. The final result was a highly satisfied customer and a pleasantly surprised Mayor.

## Sun gallery PORR builds a modern business centre

#### Adam Stawski

#### The project

The Sun Gallery in Radom built by PORR (POLSKA) S.A. is part of a multifunctional project and belongs to the new urban concept of Radom, which plans to offer its inhabitants a new quality of daily life.



Rendering Image: PORR

The Sun Gallery is located in the centre of Radom at the junction of Chrobrego Street and Struga Street, in the direct vicinity of the technical university and the theatre.



Location of the sun gallery Image: PORR

Radom is the second largest city of the Masovian voivodeship and only 100 km away from Warsaw. It is an important railway junction at which the lines from Warsaw, Krakow and Lodz meet and well-developed in terms of traffic infrastructure based on a modernised road network.

Radom has approx. 250,000 inhabitants and boasts several universities attended by more than 30,000 students.



Pedestrian bridge Image: PORR

#### The PORR know-how as building success!

The investor of the shopping and business gallery Slonecna is the company AIG Lincoln Polska, with which PORR collaborated already for construction of the Grzybowska Park office building in Warsaw.

The know-how of PORR and the business activity in Poland that lasts for more than two decades already, as well as the good collaboration with the investor enabled the construction of such a complex modern business centre in a relatively short time.



View from Struga Street Image: PORR

#### Modern business centre

The Sun Gallery forms a major part of the total complex, on the premises of which also an aqua park with two sports swimming pools and a wellness and fitness area were constructed, as well as a seasonal ice-skating area, a children's playground, an open amphitheatre, a multiplex cinema, and an exclusive apartment building.

The building is characterised by a unique architecture and especially by a functionality, which permits a combination between leisure-time activities, shopping and recreation. The Sun Gallery project was developed by the architect's office APA Wojciechowski in cooperation with the architect's office Altoon & Portet. The building complex conveys the impression of an "urban road front". The barrier-free connection of the gallery's upper storey with Jagielloński Square through a footbridge over Struga Street also connects the building with the urban pedestrian precinct. The square in front of the main entrance connects with the historic centre of the old city. Based on the number and position of the building entrances, the gallery is "open" and therefore easily accessible. The roofed malls appear as a continuation of the city's streets.

The gross floor space of this two-storey centre is 110,000 m<sup>2</sup>. On a rentable space of 42,000 m<sup>2</sup> there are 170 shops with leading clothing trademarks and cosmetic goods of known brands, salons with interior decoration articles and sports shops. The offer is rounded off by numerous restaurants and cafés.

The Sun Gallery has 1,220 car parking spaces with direct access to both shopping levels.

The Sun Gallery in Radom is one of the many projects of PORR in Poland that could be completed with success.

#### **Project data**

Principal	Poland Business Park XI Sp. z o.o.; Grzybowska Str. 5a; 00-132 Warszawa
General contractor	PORR (POLSKA) S.A.
Planning	APA Wojciechowski Sp. z o.o.
Construction period	July 2009 – March 2011
Location	Radom

# Test Building Erste Campus

"Mock-up-Room"

#### Othmar Laister

#### The project

In early November 2010, PORR was contracted for the erection of a test building on the Arsenal grounds in 1030 Vienna for the group headquarter of Erste Bank, the "Erste Campus", planned for early 2012. The test building serves the principal for conducting tests in terms of building physics with regard to noise and thermal protection during the period from mid 2011 until the end of 2012, in order to be able to let their results be integrated in the tender already or prior to implementation of the "Erste Campus" main building. In addition, the "Mock-up Room" also serves as a specimen building in terms of architectural and design engineering.



Southeast view Image: PORR



East view Image: PORR

#### **Project participants**

Due to the very short construction period for turnkey completion of the 2-storey test building, a good collaboration of all project participants was particularly important. The architect's office "Werkstatt Wien" was responsible for submission/foreman planning as well as the local site supervision (ÖBA). The architect's office "Henke und Schreieck Architekten" was contracted by the principal for the architectural supervision; the static calculations were made by the office "Gmeiner Haferl ZT GmbH". The calculations and details in terms of building physics were provided by the office "Dr. Pfeiler GmbH" from Graz and the service engineering office "Altherm Engineering GmbH" was responsible for the service engineering lead design. Since a double facade was also implemented in this project, a separate planning office, namely "MDE Metal Design Engineering GmbH", was appointed with the lead design for this special item.

The test building must be understood as a 1:1 model of the future headquarter of the Erste Group, the so-called "Erste Campus", which will develop on the grounds of the former Vienna South Station. Accordingly, special attention was also paid to the execution of all works by the ÖBA.



Image: PORR



North-west view Image: PORR

#### Turnkey construction in just 74 workdays

The carcass works were started in early December 2010. The test building was erected on a circulating foundation frame and constructed as floor-column-floor system. Two open plan offices were produced on the two erected office levels. However, these can be converted into multiple single offices by putting in dividing walls. A false floor was implemented as floor structure, respectively a hollow floor in peripheral areas. The corridor/foyer area was simulated at the centre of the open plan office. Here, a suspended punched gypsum board ceiling was implemented with MDF panels suspended in the peripheral area as inspection strips.

Despite the unfortunate time of year in which the building was erected, the building carcass could be completed after barely 20 workdays.



Office area Image: PORR



Office area Image: PORR

#### Office shell and interior design

The entire building was constructed with a double facade. Merely in those areas where a neighbouring office was simulated by the external wall was the wall structure implemented by means of a 5-fold planked gypsum board double beam wall, which was clad on the outside using sandwich panels.

The double facade consists of the external and the internal facade. The external one consists of an advanced aluminium-glass structure; the internal one was constructed as transom element facade in wood and aluminium.



**PORR** Projects



Double facade clearance Image: PORR

The architect paid her special attention to the design of the facade.

Two different timbers (spruce, larch) were used for the wooden transom elements and the surface coating was also implemented in four different variants. In the facade clearance, also two different variants of sun protection were mounted, on the one hand raffstores and on the other hand a design using "light directing jalousies", which direct the incident light to the ceiling and thus provide for more indirect lighting in the office.

The double/hollow floor was covered with altogether 11 different carpet designs. The office workplaces are supplied through floor sockets installed in the double floor. The illumination of the planned office premises was accomplished purely by floor standard lamps, which illuminate the workplace very efficiently by indirect non-blinding lighting.



Detail of double facade Image: PORR

#### **Technical building equipment**

Also for the service engineering equipment of the building, all possible variants were implemented. The heat supply is performed through underfloor convectors located in front of the complete transom facade, as well as through a wall heating inserted in the gypsum board walls. The offices are also ventilated through the underfloor convectors and the "air conducting" double floor located in front. The cooling of the building was ensured by means of cooling tubes inserted in the unfinished concrete floor, a so-called "building component activation". All service engineering systems as well as the sun protection were interconnected by means of a BUS system and are controlled through a single control unit. The necessary centre for the service engineering was located on the roof of the ground floor (ventilation centre), on the one hand, and in a site container serving especially for this purpose, on the other hand.



Cooling tubes - component activation Image: PORR

#### **Final remarks**

Despite the fact that shop drawings had to be prepared by the relevant subcontractors for all works (HVAC, electrics, facade, double floor) and released by the principal, and beyond that lead times of 6-9 weeks were necessary, the test building could be handed over to the principal after just 74 workdays.

This could only be accomplished on the basis of the close and good collaboration of all project participants.

#### Project data

Principal	Immorent-Rialto GrundverwertungsgesmbH
Contractor	Porr Bau GmbH (formerly Porr Projekt und Hochbau AG)
Construction start	November 29th 2010
Handover	April 5th 2011
Pure construction period	74 workdays

## Topping out at the social service centre "Ganslwirt"

Vienna's City Councillor for Health and Social Affairs, Sonja Wehsely, joined PORR in celebrating another major milestone in the construction of the "Ganslwirt" social service centre on Gumpendorfer Strasse.

The topping-out ceremony for the construction project at Gumpendorfer Strasse 157, which was awarded to PORR as main contractor, was celebrated at the site on Wednesday, October 13th in the presence of the Vienna City Councillor for Health and Social Affairs, Sonja Wehsely, and the Deputy Chairwoman of the 6th district, Vlasta Osterauer-Novak. Counselling, social and medical services will be offered at the centre by Vienna's community service providers in the fields of mental health and social support work. The building with a floor space of more than 7,000 m<sup>2</sup> is scheduled for completion in early autumn of 2012. Total project cost runs to some EUR 19 m, with EUR 4 m being contributed from funds set aside by the City of Vienna as subsidies for residential construction.

City Councillor Wehsely emphasised the importance of the project in her celebratory address, pointing out that "Vienna is committed to active policies in the health and social services field. Expanding and improving health and social services is an important part of these policies. This construction project makes a significant contribution to social sustainability in Vienna. Those in need of services can find them here quickly; access is easy; and the services, while providing top quality for everyone, are tailored to individual clients' needs."

## Topping-out ceremony at Ashta hydropower plant

PORR is currently building two hydropower plants in Albania for ENERGJI ASHTA Shpk, a joint venture of the two Austrian electricity utilities Verbund and EVN.

The topping-out ceremony for Ashta 1 was held on July 5th 2011 after a record construction period of less than 18 months. Among the many guests of honour participating in the festive event were the CEOs of Verbund, EVN and Andritz and the Prime Minister of Albania, Sali Berisha, who stressed the importance of the project for his country. The event also received much attention from the media and the general public.



Honored guests Image: PORR

A strong Austrian delegation at the ceremony, including Austria's ambassador to Albania, Florian Raunig, as well as government ministers and other political representatives, testified to the close economic ties between the two countries. PORR CEO Karl-Heinz Strauss took the opportunity to meet with the on-site team and inspect the construction works.

Work on the Ashta project, which comprises two run-of-river power plants with a 5-km connecting canal, started in January 2010. Once completed, the hydropower complex's 90 turbine-generator units (HYDROMATRIX® technology) will generate an output of 50 MW of electricity. Up until the end of 2012, PORR will move more than 3 million m<sup>3</sup> of earth and build structures that will require nearly 100 000 m<sup>3</sup> of concrete. Total contract volume is more than EUR 60 m.

Picture from left: Mr. Stelzer, managing director of Energji Ashta; Mr. Rabensteiner, CEO of Verbund International; PORR CEO Mr. Strauss; Mr. Berisha, prime minister of Albania; Ms. Topalli, speaker of the Albanian parliament



Ashta 1 in April 2011 Image: PORR

# PORR is building a section of the Maritsa motorway in Bulgaria

The ground-breaking ceremony for contract section 2 of the Maritsa motorway in Bulgaria was celebrated on 26th July 2011. With a total value of EUR 62.5 m, the contract covers the motorway section connecting the cities of Dimotrovgrad and Harmanli, which includes three major interchanges on a total length of 34 km. The project, for which a construction period of 25 months has been scheduled, is being carried out by a consortium in which PORR Bau GmbH is partnered with the Bulgarian company Road Construction Equipment JSC.



Image: PORR

Bulgarian Prime Minister Boyko Borisov and the Minister for Regional Development, Rosen Plevneliev, participated in the ceremony, along with many local government representatives. The guests of honour also included Gerhard Reiweger, Austria's ambassador to Bulgaria, and the head of the Bulgarian Road Infrastructure Agency, Mr. Sergei Mikhalev. Heino Wörner, Rainer Leu and Thorsten Härtel represented Porr Bau GmbH at the event.

## Rock face stabilisation on Axen route

### Construction site with a spectacular view

To protect rail track and road, PORR Suisse AG is working to stabilise the steep rock face above the Ölberg tunnel at Morschach, Switzerland. The works have been commissioned by the Schweizerische Bundesbahnen (Swiss Federal Rail System).



Image: PORR

Work on the heavily fractured, partly perpendicular, about 100-m-high rock face started in autumn 2010 after very detailed planning and has been making good progress: about 700 m<sup>2</sup> of loose rock have been covered with nets, 500 rock bolts have been driven into the face, and six concrete underpinnings installed. Because the road does not go all the way up to the base of the scaffolding, material had to be delivered to the site by helicopter.

The construction site is a one-of-its-kind experience for the work crews: working on 15-storey scaffolding, they get a spectacular view of the Vierwaldstättersee lake and the lower ranges of the Alps.



Image: PORR

# PORR receives contract to build Beskyd tunnel in the Ukraine

This new, twin-track tunnel is being built as part of the 5th Pan-European Transport Corridor. It will be an important milestone in the improvement of rail connections between Eastern and Western Europe.



The old Beskyd tunnel was built in 1886 Image: PORR

On July 15th 2011, an international consortium consisting of PORR and the Ukrainian company Interbudmontazh signed the contract for construction of the Beskyd tunnel which is designed for fast passenger trains. The project was commissioned by the state-owned Ukrzaliznytsia (Lviv Railway).

The new two-track rail tunnel will be about 1,822 m long and will be built alongside the old one-track tunnel from 1886, which it will replace. All engineering works will be carried out under the supervision of PORR's experts, and the New Austrian Tunnelling Method will be applied throughout.

The contract covers all excavation and tunnelling works, laying of the tracks, and all the electrical and mechanical works for the tunnel and the tunnel portal over a length of about 500 m at both ends.

The old Beskyd tunnel will continue in operation during the whole construction period and will remain in place for emergencies after the commissioning of the new tunnel. For this purpose, three cross-passages will be built between the old and new tunnels.

# Topping-out ceremony at the "Bike & Swim" apartment complex

Porr Bau GmbH is currently building a project called "Bike & Swim", an apartment complex in Vienna's 2nd district, for Gesiba, a real estate development and management company owned by the City of Vienna. The complex is intended primarily for people who opt not to own a car, but favour public transport and/or cycling instead. Its layout is U-shaped, with 8 stairwells, 231 apartments, seven upper floors, two additional penthouse floors, a ground floor, and a basement with 104 car parking spaces and rooms for communal facilities. On the Vorgartenstrasse front, part of the building will be used as office space; entry to the garage is on the Haussteinstrasse front. The ground-level inner courtyard will be landscaped.



Completed building Image: PORR

After project owner Gesiba had handed over the site to Porr Bau GmbH in September 2010, construction of the composite steel and concrete shell progressed apace and was duly completed after ten months. On June 9th 2011, the topping out of the structurally complete project was celebrated by all those involved in the construction works, as well as a strong showing of Gesiba representatives.

In his welcome to the guests, deputy director Schilling of Porr Bau GmbH expressed his appreciation for the committed work of the site teams and thanked Gesiba for the good collaboration. Responding in kind, Mr. Steurer from the management of Gesiba thanked everyone who had contributed to the project. The official part of the celebration ended with the recitation of the traditional topping-out toast, and thanks were expressed to the project owner for the topping-out payment. Project manager Mr. Samer then opened the buffet, and the evening came to a pleasant end with plenty of food and cool drinks.

## PORR opens Buchenberg tunnel at Waidhofen/Ybbs

The 1,485-m-long Buchenberg tunnel was opened on November 6th 2011 after four years of construction work.

Many visitors, including a strong showing of celebrities from politics and business, turned out for the celebration that marked the opening of the Buchenberg tunnel at Waidhofen. With a total length of 1 485 m, it is the longest tunnel in the province of Lower Austria's road network. Even more remarkably, it was completed three months ahead of schedule. Lower Austria's Governor Erwin Pröll performed the ceremonial opening.



Image: PORR

CEO Karl-Heinz Strauss, who together with other company officials represented the PORR Group at the celebration, paid his respects to the site team, saying that "the completion of the project in record time is yet another instance in which the PORR Group and its employees have demonstrated their ability to do the job, and to do it well."

The tunnel will significantly improve the traffic situation at Waidhofen/Ybbs, bringing much-needed relief to the local inhabitants whose limits of endurance have been tested by traffic frequencies of around 12,500 vehicles daily. The environment also stands to gain from the new tunnel, whose high-tech facilities will dramatically reduce pollutant emissions.

PORR was represented by Wolfgang Stipek, Managing Director Porr Tunnelbau GmbH, CEO Karl-Heinz Strauss and Aldred Sebl, Managing Director Porr Bau GmbH (from left).

## Topping-out celebration at the Austria Trend Hotel DOPPIO and DOPPIO Offices project

- New 4-star, 155-room hotel in the Neu Marx development cluster
- 7,514 m<sup>2</sup> of lettable office space
- Completion in April 2012
- Hotel opening in May 2012

Vienna, July 12th 2011. Nine months after the project launch in late September 2010, the project partners celebrated the topping out of the DOPPIO hotel and office complex in Vienna's Neu Marx neighbourhood together with guests from politics and business. The project is being developed as the final building complex of the T-Center, an award-winning urban development project. The 4-star, 155-room hotel and the office building with 7,514 m<sup>2</sup> of lettable floor space will close the final gap in the urban development zone of Neu Marx.

The DOPPIO project was developed by PORR Solutions Immobilien- und Infrastrukturprojekte GmbH, with Porr Bau GmbH as general contractor. The Austria Trend Hotel DOPPIO will be run by Verkehrsbüro Hotellerie GmbH, a wholly-owned subsidiary of the Verkehrsbüro Group.

Celebratory addresses were given by Rudolf Zabrana, Deputy District Chairman of Vienna's third district; Michael Wurzinger, spokesman for the management of PORR Solutions and Harald Nograsek, Director General of the Verkehrsbüro Group. All three speakers applauded the good progress that has been made and said they are looking forward to the completion of the project in April 2012 and the opening of the hotel one month later.



Michael Wurzinger, Managing Director Image: APA-Fotoservice/Strasser

#### Another milestone for Neu Marx

The premises of the former St. Marx slaughterhouse in Vienna's third district are being redeveloped in an ambitious project called Neu Marx, a high-tech and media cluster that is to serve as a technology, research and creative industries hub for all of Europe.

Many companies and research institutions have already relocated to the area, and the film industry is set to get a new homebase here, complete with TV studios and training institutions. From 2016 onwards, 15,000 or more people will be living and working in Neu Marx. "This is where the future is happening," says Rudolf Zabrana. "It is not only our slogan, we are putting it into practice too. The Austria Trend Hotel and the new office space will help to further liven things up at Neu Marx, and this will have a knock-on effect for the whole third district."



Apprentice Dominik Zaunik Image: APA-Fotoservice/Strasser

#### Perfect location

The location of the hotel and office complex offers the advantage of excellent accessibility – there is a direct motorway link to the airport, as well as public transport (underground rail, tram and bus) connections to the city centre. Neu Marx is one of Vienna's most important centrally located business areas. Companies and other institutions there, which include the Austrian headquarters of telecom operator T-Mobile at the T-Center, the Campus Vienna Biocenter and the Media Quarter Marx 1, will all benefit from the new Austria Trend Hotel.

#### An excellent PORR project

"The Austria Trend Hotel DOPPIO and DOPPIO Offices project is a major milestone in the development of the entire Neu Marx neighbourhood," said PORR Solutions management spokesman Michael Wurzinger in his address. "It is yet another example of the broad range of products and services which PORR AG is able to provide, covering the whole life cycle of complex real estate and infrastructure development projects. We are a one-stop shop, offering everything from the first idea to project development, design, construction and management of the completed building, and we do so cost-effectively and to the full satisfaction of our partners and clients." Talks with potential tenants, which are already in full swing, have shown that the location of the office building, its proximity to the new hotel and its on-site facilities are all regarded as highly attractive by future users. "In addition to first-rate office space with free choice of floor plans, raised access flooring and air conditioning, future tenants also find ample car parking and storage space. Moreover, this site is ideally located for access by private car or public transport," explained Mr. Wurzinger, clearly taking pride in all that has been achieved.

#### Award-winning design

The architectural design of the Austria Trend Hotel DOPPIO and DOPPIO Offices fits in harmoniously with the existing T-Mobile office complex, which was planned by Architektur Consult ZT GmbH. The hotel will be housed in the building that stands at a right angle to Rennweg, and the building parallel to Marianne-Hainisch-Gasse will be used as office space. Ample outdoor parking will be available for the hotel guests, and office tenants can use the building's own underground parking decks.

#### Smooth progress of construction work

Any topping out is an occasion to celebrate the work crews, and this one was no different. Appreciation was expressed for the workers' outstanding performance, especially during the winter months, which made it possible to erect the building shell in only nine months. Thanks to the smooth progress of construction work, completion of the project is expected in April 2012, and the hotel is scheduled for opening in May 2012.
#### Breakthrough celebration at Eierberge tunnel

After nearly a year of tunnelling, breakthrough was achieved at the Eierberge tunnel on August 29th 2011 – as in other projects led by PORR, this was again significantly before the contractual deadline. As in the precursor project, the Osterberg tunnel on the new Erfurt–Halle–Leipzig rail line, PORR has again delivered excellent performance, timeliness and high-quality work.

The breakthrough was celebrated with the work crews and subcontractors of the consortium, representatives of Deutsche Bahn AG and experts and planners involved in the project, as well as a good showing of guests from the fields of politics and public administration. PORR AG was represented at the celebration by CEO Karl-Heinz Strauss and Director Alfred Sebl. In addition to 400 guests who had been personally invited by Deutsche Bahn, more than 2,000 visitors joined in the subsequent tour of the tunnel.

Celebratory addresses were given by Susanne Ramsauer (tunnel patroness and wife of the Federal Minister of Transport), Klaus-Dieter Josel (Director of Deutsche Bahn AG in the Free State of Bavaria), Rüdiger Grube (Chairman of the Board of Deutsche Bahn AG), Petra Platzgummer-Martin (Deputy President of the Government of Oberfranken) and Kurt Joham (Technical Director of the consortium), in which the speakers expressed their appreciation for the efforts of all those who contributed to this achievement.



Image: PORR

Drawing particular attention to the spirit of partnership that prevailed in the collaboration with Deutsche Bahn AG as the project was implemented, the managing director of the consortium, Kurt Joham (PORR), said:

"With respect to project implementation and cooperation between contract awarder and contractor, as of today there are neither outstanding claims for compensation nor unresolved points of dispute concerning the construction contract – a very unusual situation for a project with a volume of EUR 145 m. This is the result of genuine partnership and good collaboration in the daily work on the project."

Key figures from the 18-month construction period to date: 560,000 m<sup>3</sup> tunnel excavation volume 800,000 m<sup>3</sup> total earth moving work 240,000 kg explosive used 4,000 tonnes steel used

Up to 250 workers work continuously on a 24/7 shift system. Work on the tunnel lining, the emergency exits and shafts was started in July 2011 and will be completed by year-end 2012.

In addition to the 3,756-m tunnel, five bridges and major earthmoving works with a total volume of 1.3 million m<sup>3</sup> will be carried out as part of the overall 7,700-m long project, which is scheduled for completion by mid-2013.

In the picture from left: Foreman Gotthard Pajenk, CEO Karl-Heinz Strauss, Rüdiger Grube, Chairman of the Board of Deutsche Bahn AG, tunnel patroness Susanne Ramsauer, project manager Andreas Karlbauer (PORR)

### Ground-breaking ceremony for contract section 20 of the Emscher sewer

Works on contract section 20 of the Emscher sewer were officially started with a ground-breaking ceremony at Bottrop, North Rhine-Westphalia, on October 17th 2011.

This is the first section of what is currently Europe's biggest sewer construction project. The water management organisation Emschergenossenschaft has commissioned a new underground sewer system to be installed between the cities of Dortmund and Dinslaken. Once in operation, it will replace the open sewers which are still in use there, and all sewage will disappear underground. The open sewers have remained in operation up to now because of the subsidence problems in this former coal mining district, a well-known part of the Ruhr region.



Image: PORR

In June 2011 PORR started work on the construction of the first section of the new underground sewer with a length of about 3.2 km. In all, 11 shafts with diameters of up to 23 m and depths of up to 32 m will be sunk and connected to each other by sewage pipes with an inside diameter of 2.80 m. More than 1,000 reinforced steel pipe segments weighing up to 35 tonnes apiece will be lowered underground and put in place by hydraulic ramming.

Underground excavation will be done by a tunnel boring machine run by the PORR experts.

The chairman of the board of Emschergenossenschaft and the mayor of Bottrop conducted the ground-breaking ceremony. On behalf of PORR, Hans Köhler of our tunnelling division, Johannes Haslhofer, managing director of PORR Germany and Olaf Schrader, head of our Berlin Branch Office, participated in the event.

In the picture you see the Mayor of Bottrop and the management of PORR Germany.

# Major contract for a new section of the German high-speed rail network awarded to PORR

Confirmation of expertise in infrastructure

PORR AG has received a major contract for a new section to be built as part of the high-speed rail route that links the German cities of Erfurt and Leipzig/Halle (VDE 8.2). The contract covers a two-track, 90-km section between Erfurt and Gröbers and includes numerous tunnel and bridge structures, where PORR intends to use the "Feste Fahrbahn" slab-track system which it has developed in cooperation with the Austrian Federal Railways (ÖBB).



Lehrter railway station, Berlin Image: PORR

The contract was awarded by DB Netz AG, a subsidiary of Deutsche Bahn AG, and has a total value of about EUR 200 m. In addition to building the tracks, PORR will also install 22 km of wind and noise abatement walls, which will significantly reduce noise pollution along the route. The project is scheduled for completion by the end of 2013.

Used as a standard solution in Austria since 1995, the ÖBB-PORR slab-track system has also increasingly been applied in Germany since 2001. It is particularly well suited for high-speed routes and can remain in place without repair or maintenance for impressively long periods. PORR has installed slab tracks in Germany before, including at the Berlin central rail station project (Lehrter rail station).

The Chairman of the Board of PORR AG, Karl-Heinz Strauss, was pleased with the prospect of this major undertaking, saying that the project "once more confirms our expertise in the area of complex infrastructure projects. We have positioned ourselves very successfully, both in Austria and in our other home markets Germany, Switzerland and Poland, and expect to receive other contracts of this magnitude in future. The slab-track system, which we developed in collaboration with ÖBB, offers especially great potential in this respect."

### Germany: PORR wins biggest tunnelling contract ever

PORR has been awarded two tunnelling projects to be built as part of the "Stuttgart 21" rail station development project – taken together, the total contracting volume of the two contract sections runs to about EUR 700 m.

Within a single week, PORR has been awarded two major contracts in Germany: an EUR 200 m contract for 90 km of twin-track high-speed rail line on the Erfurt–Halle route, which will be built as a slab track system; and two tunnel construction contracts which Deutsche Bahn has awarded to a consortium led by PORR by as part of the "Stuttgart 21" rail station development.

Both tunnels are located on the 175-km Stuttgart–UIm–Augsburg rail route which is being upgraded and in part newly built in the context of the European Rail Infrastructure Masterplan of the International Union of Railways (UIC).

The contract section 1a "Fildertunnel" comprises the 9.5-km Filder tunnel and the tunnel branches leading to Obertürkheim and Untertürkheim, as well as the connection to the southern end of the new central rail station. In addition to PORR, the companies Oestu-Stettin Leoben, Hinteregger Salzburg and Swietelsky Tunnelbau are partners in the consortium that will carry out the works. The same consortium has been awarded contract section 1b "Tunnel Ober- /Untertürkheim", a 6-km tunnel running from the central rail station in Stuttgart towards the towns of Obertürkheim and Untertürkheim. A special challenge here is that the tunnel has to undercross the river Neckar.

Commenting on the projects, PORR CEO Karl-Heinz Strauss said: "These two contracts, which Deutsche Bahn has awarded us within a few days of each other, are an impressive testament to the high level of international regard for our competence in rail construction and tunnelling. This is a continuation of our success story which started with projects such as the Berlin central rail station and the Eierberge and Finnetunnel rail tunnels. Our clear focus on top quality has been reaffirmed, and we are proud indeed to have won this contract for a major European infrastructure project – an impressive confirmation of PORR Group's strategy."

### Opening celebration of the flood control dam Machland Nord, third contract section at Baumgartenberg

Twenty years after the first decisions were taken to protect Baumgartenberg against flooding by means of a dam, the structure was inaugurated on October 9th 2011.

Historically, the Machland region has been hit by repeated large-scale flooding affecting agricultural areas and, more importantly, towns and free-standing homes.

As a consequence of the catastrophic flooding of 2002, the plans first made in 1991 took on concrete shape.

Extending over a distance of 36.4 km, the flood control works in the northern part of the Machland region protect seven communities against flooding. While the flood defences at Mauthausen and Grein on the Danube are mainly walls with mobile elements on top, the central Machland communities, including Baumgartenberg, are protected by dams.

At contract section 3, Baumgartenberg, PORR built 12.3 km of flood control dams, 14 pumping stations, numerous mobile elements and a bridge at Wagra.

At the inauguration that was celebrated on October 9th, Mayor Erwin Kastner said that "flood control not only provides safety; it also helps to strengthen Baumgartenberg as a business location and promotes residential building." Mr. Kastner thanked the representatives of the neighbouring community of Strengberg, Lower Austria, who were present at the celebration, for understanding the necessity of the project. Gerhard Mysliwietz, managing director of Machlanddamm GmbH, thanked PORR as the lead partner, as well as all other companies that collaborated in the project, for having completed the works within the planned schedule despite a number of imponderables.

### Topping-out ceremony at the new HYPO NOE Headquarters in St. Pölten

On October 20th 2011, the HYPO NOE Group celebrated the topping out of the Group's new headquarters in St. Pölten.

The CEO of the HYPO NOE banking group, Peter Harold, Lower Austria's Deputy Governor Wolfgang Sobotka, Mayor Matthias Stadler, architects Johannes Zieser and Ernst Maurer and the head of the local PORR office, Johann Aigner, participated along with 250 other guests in the topping-out ceremony for the new headquarters of the HYPO NOE Group.



Representatives of PORR and HYPO NOE Image: PORR

The construction of the six-floor office building with three underground parking decks required 35,000 m<sup>2</sup> of formwork, 12,000 m<sup>3</sup> of concrete and 1,200 tonnes of reinforcing steel. The works were carried out by a consortium led by PORR, with PORR Grundbau contributing a specifically engineered solution for the excavation of the pit in groundwater.

The bank's new headquarters are located adjacent to the river Traisen, opposite the government offices of the province of Lower Austria, and provide office space for 400 employees, who will be able to go about their daily work in a building that is a showpiece of energy efficiency in building construction.

### Startup ceremony at Längholz tunnel, Berne tube

#### Forward to the final struggle

Slightly less than two months after the hole-through of the third tube on the Biel eastern road bypass project, excavation work was set to begin on the Berne tube of the Längholz tunnel. Prior to the drivage startup celebration, the tunnel boring machine, complete with trailing gear, was transported to the portal of the Längholz tunnel.

The shield was lifted and drawn by VSL System, and the trailing gear was slid along on specially made precast concrete components. The TBM had to be transported over a distance of some 660 m, with a road bridge to be passed under along the way. The road was closed off for a weekend, the bridge lifted, the TBM pulled through, and the bridge put back into place again.

The cutterhead of the TBM was prepped for the upcoming stresses and strains of the remaining 2.3 km tunnelling section for the last tube, and the necessary back-up systems, such as conveyor belt, track and supply pipes were put in place.



Image: PORR

The big day finally came on July 25th 2011. In a modest startup ceremony, the TBM was blessed by Andreas Bitzi, the priest of the local parish of St. Maria in Biel. The service was held in German and Portuguese to enable the workers of the lining team to join in the celebration. Speaking on behalf of the client, Bernhard Linder of the construction supervision consortium UBOT commended the tunnelling teams on their achievements and wished them accident-free continuation of their work. Site manager Michael Huser gave a brief retrospective and outlook on all that remains to be done up to the completion of the project.

We now have to drive the tube through 1,261 m of hard rock and 1,060 m of loose rock. In the first drivage section, compressed air will be used to support the face, giving the TBM sufficient grip to allow precise steering. In the last remaining section, we will switch to suspension support of the face to prevent groundwater ingress. With the help of St. Barbara, we hope to be able to complete the tunnelling works by March 2012.

Follow-up work has already started in the tubes that have so far been excavated. Our Austrian workers were able to display their high level of skill in producing the necessary cross-cuts and niches. Work has also started on the lining; given the regulatory ban on weekend work in Switzerland, this is scheduled for completion in 2014.

### Limberg II: Start of operations at pumped storage power plant

After five and a half years of construction work, the pumped storage hydropower plant Limberg II was started up in an inauguration ceremony on October 5th 2011.

The inauguration opened with a musical performance by the local brass band Musikkapelle Kaprun, followed by celebratory addresses by Verbund CEO Wolfgang Anzengruber, Governor of Salzburg Gabi Burgstaller and Austrian Vice Chancellor Michael Spindelegger. After blessings had been pronounced by suffragan bishop Andreas Laun and protestant dean Luise Müller, the pumped storage hydropower plant (PSP) Limberg II was officially put into operation. The guests at the ceremony witnessed the startup via a live link that impressively demonstrated how fast the PSP can feed power into the grid. With 144 m<sup>3</sup> of water per second driving the two turbines, output jumped from zero to 480 MW within just three minutes.



Turbine house of the underground power plant Image: PORR

The PSP is able to generate or store energy, as required. Its power storage capability helps to even out the fluctuations in power generation by wind and solar energy plants. Thanks to this load balancing effect, Limberg II supports the increased utilisation of these renewable energy sources.

The addition of the PSP Limberg II brings the total turbine capacity of the Kaprun hydropower cluster up to 988 MW and increases its pumping capacity approximately fivefold to 610 MW; overall, Kaprun will deliver about 10 % of Austria's peak-period power demand in future.

The PSP is a fully underground structure whose completion required total investments of EUR 405 m. Optimised project management and outstanding progress in the excavation phase enabled the project to be completed and started up six months ahead of schedule.

The next project for the Kaprun hydropower cluster is already under preparation. This will be the PSP Limberg

III, for which the environmental impact assessment is currently under way. On the technical side, the only precondition still to be met will be closing the gap in the 380-kV connection in Salzburg.

## PORR wins tender for major projects on the S 10 motorway

ASFINAG has awarded the construction contracts for the Götschka tunnel and the southern bypass at Freistadt on the future S 10 expressway to PORR.

ASFINAG, the Austrian motorway construction and management company, awarded the contracts with a combined value of some EUR 210 m to PORR as best bidder. The contract sections are scheduled for opening in 2015, when the whole southern part of the S 10 expressway (Unterweitersdorf – Freistadt Nord) will become available for traffic – except for the bypass, which will already be finished in 2014.

Construction of the Götschka tunnel is the biggest single construction contract ever awarded by ASFINAG. The tunnel will be situated northeast of Linz, between the communities of Unterweitersdorf and Matzelsdorf, and will be a twin-tube tunnel, as required for traffic safety. Because of the gradient, the eastern tube running towards Prague will have three lanes (two driving lanes plus one crawler lane), while the western tube running towards Linz will have two lanes. State-of-the-art safety technology will be installed along the full 8.8 km length of the two tunnel tubes.

### Transport Minister of Schleswig-Holstein visits Störbrücke II site

The Transport Minister of the German state of Schleswig-Holstein, Jost de Jager, visited the Störbrücke II construction site on November 10th 2011.

This is the central project in the last section that will complete the A 23 motorway between Hamburg and Husum. The German state of Schleswig-Holstein has commissioned a new bridge that will carry southbound traffic towards Hamburg across the river Stör near Itzehoe. The construction contract for this project was awarded to a consortium consisting of the PORR Group's local civil engineering Porr PTU Berlin Branch Office, Eiffel Deutschland Stahltechnologie GmbH and Sächsische Bau GmbH, with Porr PTU Berlin as the technical lead partner.



Image: PORR

Minister de Jager visited the site before demolition work started on the old bridge across the Stör. The bridge, which is approximately 1.3 km long, will be demolished by conventional methods over the coming six months. In this process some 18,500 m<sup>3</sup> of concrete will be pulled down by excavators and removed for disposal.

The old bridge will be replaced by a new composite steel bridge of the same length supported by 18 piers, which will take three years to build.

Photo (from left): Olaf Schrader, local director of Porr PTU Berlin; Jost de Jager, Transport Minister of Schleswig-Holstein; Kai-Uwe Schacht, local director of the regional road transport authority LBV-SH; Joachim von Laufenberg, contract manager, Porr PTU Berlin

### Topping-out ceremony at Science Park 3 building

The local branch office of Porr GmbH in Upper Austria is the technical lead partner in a consortium that is currently working on the construction of the Science Park 3 building, which will be part of the campus of Johannes Kepler University, Linz. The project has been commissioned by Bundesimmobiliengesellschaft m.b.H. (BIG), the real estate development and management company of the Austrian federal government.

The completion of the building shell was celebrated after only twelve months of construction works on June 9th 2011, in a topping-out ceremony that was attended by many guests of honour.



Image: PORR

The building, which was designed by Caramel Architekten ZT GmbH, Vienna, has a gross floor space of 18,570 m<sup>2</sup>; it consists of a basement (to be used for underground car parking) and eight floors, including the ground floor and mezzanine. As much of the building's concrete surfaces will remain exposed and receive no further surface treatment, much care and attention had to be given to concrete quality.



Image: PORR

In his celebratory address, BIG project manager Gerald Mannel emphasised the high quality of the works and the good cooperation on the site.

Director Sommer of Porr GmbH Upper Austria thanked the site crews for a great job and in particular for the fact that the works had progressed without accident. After thanking the project owner for the words of praise and the topping-out payment for the workers, he concluded by expressing the hope that this project would serve to recommend Porr for others yet to come.

After the official part of the ceremony had ended with the traditional topping-out toast, refreshments were served for all present.

In the picutre from left: Master builder Josef Mayrhofer, Alpine; Wolfgang Hinterhölzl, site manager, PORR; project manager Gerald Mannel, BIG; Wilhelm Sommer, director of Porr GmbH Upper Austria

#### Twin-tube Tauern tunnel opened for traffic

Great celebrity turnout at festive opening – speakers underline improvements to traffic flow and safety

A milestone in international road transport development was marked by the ribbon-cutting ceremony held in Salzburg on June 30th 2011: with the opening for traffic of both tubes of the Tauern tunnel between Flachau (Pongau region) and Zederhaus (Lungau region), the A 10 (Tauernautobahn) motorway, one of Europe's major north-south transit arteries, has finally shed its last bottleneck. Previously, congestion in front of the tunnel portal was a frequent occurrence, with record back-ups of up to 40 km at the peak of the summer holiday season.



Image: PORR

The event was attended by many celebrities, including Austrian transport minister Doris Bures, the governors of Salzburg and Carinthia, Gabi Burgstaller and Gerhard Dörfler, and the top management of ASFINAG, the Austrian motorway construction and management company. PORR CEO Karl-Heinz Strauss also participated in the opening, a great moment for PORR too. All speakers at the event stressed that the second tube will not only help traffic move faster, but will also improve safety. The elimination of oncoming traffic in itself makes the tunnel safer, and additionally, help can arrive more quickly in case of accident because the two tubes have been connected by 26 cross-passages. "In all, we are investing nearly five billion euros up to 2014 to make Austria's tunnels safer," said transport minister Bures.

The cost of building the new tube and renovating the existing one totalled EUR 197 m, which was EUR 31 m less than originally budgeted. Parallel to the tunnel project, the toll station at St. Michael (Lungau region) was enlarged; with the addition of five more lanes, it will now be able to handle up to 2,200 vehicles per hour.

#### First and second tube

Construction of the first tunnel tube began at the north portal in November 1970. 56 months later, on June 21st 1975, the tunnel (Tauern mountain route) was opened for traffic. The construction cost at the time was 1.5 million Austrian schillings, equivalent to about EUR 109 m today.

Work on the second tube started after the contract had been awarded to Porr Tunnelbau GmbH on June 14th 2006 and was duly completed after 44 months. The pre-existing structures of the first tube were an advantage that helped the quick progress of the works. The newly built tube was opened on April 30th 2010 for bi-directional operation, to take up all traffic while the first tube was being renovated, until both tubes were finally officially opened on June 30th 2011. **PORR Updates** 

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