169/2016

World of PORR

Information for pros

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CEO Karl-Heinz Strauss

CEO Karl-Heinz Strauss
Image: PORR AG

Dear ladies and gentlemen,
dear business partners,

when I recapitulate PORR's development in recent months, two words immediately come to my mind: eventful and successful. And when you leaf through the current edition of World of PORR, you are sure to understand what I mean. An exciting journey through the operational world of PORR awaits you. As usual, our experts will provide you with knowledgeable insights and explain the technical details of our projects to you in the following pages.

We start this time with eastern Austria: read, for example, about the strict safety regulations for the general renovation of the 11/29 runway system at Vienna International Airport. We continue into Burgenland, where we built a drinking water transport pipeline. In western Austria too, PORR is not passed by: we report from Tirol on the construction of the Niklasgalerie. In Vorarlberg, we were commissioned with the construction and pipe-laying works for a pumped-storage power plant. Of course, there has been plenty going on outside Austria too: our new PORR headquarters in Munich, Twin Yards, scores with its DGNB platinum certification, among other things. Likewise in Germany, we are currently working on the realisation of four projects worth a total of more than 1.6 billion Euros as part of the Stuttgart 21 large-scale construction project and Deutsche Bahn's (DB) newly built Wendlingen–Ulm route.

These are just a few examples from the "PORR Projects" section. In "Updates", we then invite you to celebrate with us: a multitude of ground breaking ceremonies, foundation stone laying ceremonies and topping-out ceremonies tell of construction starts and progress. In addition, we take a look at Slovakia, where we have gained projects this year which are very important to us: The Bratislava bypass, also known as D4/R7 will be implemented via a public private partnership model. Other infrastructure jobs such as the recent D3 project, confirm our commitment to this market. There is also infrastructure news from Norway besides. There, we have been given the contract for the construction of a 5.5 km long section of the motorway 17 in the Nordland province, which will run through two tunnels.

You can see: our strategy of intelligent growth with a focus on the creditworthy home markets is proving itself. Away from the operational activities, this is also proven by our available key performance indicators for the third quarter: in the first nine months of 2016, our production output rose by 9.8% and – at 2,788 million Euros – was significantly higher than the comparative figure from last year. The earnings before tax rose by 25.0% and reached 40.8 million Euros, and the earnings for the period, at 30.7 million Euros, rose by 27.9% in comparison with the figures for the previous year. Despite a difficult environment characterised by consolidations, we managed in time to implement performance and profit-enhancing measures.

I wish you relaxing holidays with your loved ones, a happy New Year, much happiness, joy, humour and health for 2017. I am looking forward to a varied and trendsetting 2017 with you and our PORR group.

Kind regards,
Karl-Heinz Strauss
CEO

General rehabilitation of runway system 11/29

Vienna International Airport

Peter Hanak

Project data

Company	TEERAG-ASDAG AG, Lower Austria branch (today: PORR Bau GmbH, Tiefbau)
Client	Flughafen Wien AG, 1300 Vienna airport
Type of project	Rehabilitation of the wearing and base courses as well as shoulder improvement
Country/town	Austria/Vienna-Schwechat
Start of construction work	06/04/2016
End of construction	15/06/2016
Execution period	35 nights and 6 weekends
Milled asphalt material	95,000t
Asphalt	95,000t
Surface marking	17,000m²
Line marking	12km
Cable conduits	15km
Cable	270km
Runway floodlights	850 pcs.

Massive time pressure and high safety requirements marked the framework conditions for the rehabilitation of runway 11/29 of Vienna's airport (Vienna International Airport). Precise planning and a professional team were essential during the nightly work on the runway.

Introduction

Air traffic at Vienna's airport is coordinated via two runways, runway 11/29 and runway 16/34. Runway 11/29's first section had been built in the late 1940s, extended eastwards in the 1960s and extended to today's full length in the late 90s. In 1972 and 1993, runway 11/29 had been comprehensively overhauled.

Now, the asphalt, base and wearing courses as well as shoulders, all together measuring 210,000m² needed to be completely renewed along the entire length of the starting and landing runway 11/29. The forces a runway course needs to be able to withstand are truly colossal: A landing aircraft pushes down on the runway course with a force of several hundred tonnes. Neglecting these rehabilitation measures would have meant grave safety risks for starting and landing aircraft.

Contract and contract volume

In mid-February 2016, a consortium under the commercial leadership of TEERAG-ASDAG AG's Lower Austria branch (today: PORR Bau GmbH, Tiefbau) was commissioned with the services on implementing construction work in the course of the general rehabilitation of starting and landing runway 11/29´, which had been tendered in the framework of a multi-stage negotiation procedure by Flughafen Wien AG. The contract was worth a net total of approx. EUR 20m.

The construction measures were scheduled to be implemented between early April 2016 to late May 2016. The project comprised the following steps:

- Renovate surface and base layers of runway 11/29
- Increase the load bearing capacity of runway 11/29's shoulders.
- Renovate wearing and base courses of subsequent taxiways
- New construction of displaced threshold 29
- Enlargement of anti-blast areas 11 and 29

Qualitative specifications demanded to construct the runway surface without joints.

Runway 11/29

Runway 11/29 is 3,500m long and 45m wide. The runway shoulders are 7.5m wide on each side. The runway has a sloping shape which means the area of the southern runway edge represents the highest point of the runway in transverse direction. From the margin line, the surface descends in a northerly direction with a gradient of 1.5%. Additionally, 1-cm-deep and approx. 5-mm-wide grooves have been milled into the entire length of the runway in transverse direction. This improves the runway's grip as well as the deflection of rain water between tires and runway surface.

Construction progress

The construction scheme was implemented in stages. For this purpose, the runway was closed during the night and on the weekends. It was open for regular air traffic in between. In 35 nights and on six weekends, from 6 April to 15 June 2016, 275,000m², 210,000m² of which were runway surface and 65,000m² taxiway surface, were completely renewed. A total of some 95,000t of asphalt were removed and newly installed. In total, 16cm of asphalt needed to be milled off and newly laid, at the eastern runway head this figure even rose to 40cm. Some 200 workers and up to 150 pieces of construction machinery were used every night. On the weekends, up to 350 workers worked on runway 11/29 using 200 pieces of equipment and lorries. The hot asphalt mix was delivered to the site by up to six mixing plants simultaneously.

16cm of the existing, 45-m-wide runway surface were milled off in stages measuring approx. 150m at night and up to 780m on the weekends. Following high-pressure cleaning and the application of the bitumen emulsion, two layers of the 6-cm-thick binding course (base course) were applied in the same night.

Milling work at night
Image: Peter Köhler, Flughafen Wien AG

Milling work during the day
Image: Peter Köhler, Flughafen Wien AG

Daily procedures

Decisions on closing the runway and executing construction work were made daily, depending on the actual wind and weather conditions. Thus, representatives from the consortium and Flughafen Wien AG checked the weather situation every day at 3:00 p.m. Until 4:00 p.m., the client then decided whether the construction site could start working at 9:00 p.m. under the predicted weather conditions.

Furthermore, the work stages were meticulously documented and planned in these meetings. Deployment plans were required to be able to act correctly, even in emergency situations.

Once the airport had given its go-ahead, a massive machinery started moving. In case it would cancel the operations, they could do so until 9:00 p.m. This, however, would have incurred massive costs.

The go-ahead was followed by a precisely planned procedure: At 7:00 p.m., the airport's safety staff started securing the construction site access to allow the construction machinery to enter. A vehicle convoy up to 4km in length needed to be lined up in an organised manner, after all. At exactly 9:00 p.m., large sections were closed down to make sure the runway could be opened for the construction vehicles shortly afterwards. It took some 30 minutes every day just until the countless construction vehicles had entered the runway. From then onwards, a veritable sea of orange-coloured flashing lights dominated the scene on Vienna airport's runway 11/29. After the end of every shift, the runway was cleaned and checked so it could be re-opened for air traffic.

Entering of construction vehicles
Image: Robert Deopito

Binding course installation
Image: Peter Köhler, Flughafen Wien AG

Binding course installation
Image: Peter Köhler, Flughafen Wien AG

Cleaning of the runway
Image: Robert Deopito

Despite long nights of work, once work had been completed, a meeting was held every day in which the participants discussed in a constructive manner about possible improvements for the next deployment.

In addition to the night shifts, work also took place on the weekends, between Friday 9:00 p.m. and Sunday 4:00 p.m. In order to assure high levels of quality, the wearing course was installed in daylight.

On the first weekends, the runway's binding course was newly applied along a length of up to 780m as well as on selected taxiways. Every Saturday on the last two weekends, the runway's and adjacent runway shoulders' wearing course was applied in a jointless manner along a width of 60m and a length of 1,750m using 14 teams of finishers.

Runway wearing course installation
Image: Peter Köhler, Flughafen Wien AG

Runway wearing course installation
Image: Peter Köhler, Flughafen Wien AG

Runway wearing course installation
Image: Peter Köhler, Flughafen Wien AG

Once the wearing course had cooled down, the required final runway markings were applied and the runway lights were installed.

Finished runway, displaced threshold 11 prior to approval
Image: Peter Köhler, Flughafen Wien AG

To reduce stress on residential areas and residents alike, the materials were delivered and removed via the superordinate road network such as motorways and express roads.

Quality control

In order to achieve the specified quality, the corporate laboratories conducted ongoing quality control during

asphalt mix installation, on top of the stipulated acceptance tests.

Overall completion

Due to unfavourable weather, the project schedule needed to be extended. Following 35 nights and six weekends of strenuous work, the project was completed on 15 June 2016.

The client’s target and requirements

The construction scheme’s target was to adapt the runway system to the current state of technology.

Furthermore, maximum safety, runway availability, an economical solution, a short construction period and highest possible levels of quality as well as lowest possible additional stress on neighbouring communities were the top priorities.

The challenge

The toughest challenge the executing consortium and all other project participants faced was the immense time pressure as a result of the fact that the runway needed to be re-opened every day at 7:00 a.m.

Another demanding task was to precisely assign and coordinate the construction equipment every day.

The project’s size, tasks being performed simultaneously as well as the material quantities likewise represented a major challenge.

Final remark

Thanks to excellent collaboration between all project participants, from the client to the local building authority to the executing companies, sub-contractors and suppliers, all construction work could be implemented to the full satisfaction of the client.

"Aqua Burgenland Sopron" drinking water transport pipeline

Neudörfl to Rohrbach section

Philipp Freiler, Igor Smrtnik

Project data

Client	Wasserleitungsverband Nördliches Burgenland, Rusterstraße 74, 7000 Eisenstadt
Contractor	A consortium under the leadership of PORR
Project location	7201 Neudörfl to 7222 Rohrbach bei Mattersburg
Contract award	13/10/2014
Order volume	EUR 13.18m (gross)
Construction time	Start of construction work: 06/11/2014 Scheduled end of construction: 31/07/2017

DN800 cast pipes	130m
DN600 cast pipes	13,790m
DN500 cast pipes	4,940m
DN200/250/400 cast pipes	4,500m
Steel pipe jacking DN600 to DN1000	9 pcs.
Micro-tunnelling DN1000 – radius: 200m	104m
DN150 to DN600 gate valves installed underground	30 pcs.
Disinfection	23,360m

The project's background

The Vienna-Györ-Bratislava-Sopron-Eisenstadt area is developing rapidly, both in a societal and economic as well as touristic sense. Project Aqua Burgenland Sopron was created to safeguard the future drinking water supply for this region which is home to some 300,000 people. The cross-border EU project is based on a joint feasibility survey (phase 1 was completed in 2007).

Construction of the first project section from Neudörfl to Rohrbach

The "AQUA BGLD SOPRON" consortium had been commissioned with excavation, master builder and pipe laying work in the framework of the first project section from "Well Field Neudörfl" to "High-Level Tank Rohrbach" on 13 October 2014. After the ground-breaking ceremony at Neudörfl's well field, pipeline construction in the area of Neudörfl began in November 2014.

The transport pipeline has a length of approx. 18,900 running metres. Adding to this were approx. 4,500m of connection pipes linking it to the Mattersburg and Rohrbach water storage systems, many ventilation and air extraction shafts as well as drainage shafts. The transport pipeline was executed as a cast line in the dimensions DN 500, DN 600 and DN 800. The connection pipelines were likewise executed as cast lines in the dimensions DN 250 to DN 400.

Ground-breaking ceremony at Neudörfl's well field
Image: PORR AG

Cast line construction DN600 Neudörfl
Image: PORR AG

Archaeological excavations and searching for bombs

Prior to proper construction work on the pipeline, however, the development site had to be released by archaeologists due to suspected archaeological sites. Thereby, it was necessary to carefully and layer by layer remove the topsoil in large areas of the scheduled route in a time-delayed manner prior to pipeline construction to allow for archaeological surveys. As expected, the survey actually produced finds in certain areas. Thanks to

investigations undertaken beforehand, however, negative effects on construction progress could be avoided.

Due to the fact that the planned route area of the water transport pipeline was also suspected to contain remnants of war, the respective suspected areas needed to be inspected for explosive ordnance by a specialist company.

Pipeline construction

The water transport pipeline was constructed using an open construction method. Due to the necessity to maintain distinct high and low points, the stipulated longitudinal section needed to be maintained minutely. The laying depth thereby ranged from 2.20m to some 6m. In terms of laying, the pipeline route zone thereby varied from paved superordinate road sections, municipal roads, farm road areas to gravel road sections and fields. Depending on the route section in question, the team thereby had to take into account various aggravating aspects such as keeping traffic flowing, spatially restricted development site conditions, difficult soil and ground water situations or various installation safeguarding systems.

Railway track and road crossings

In the course of the water transport pipeline, several special construction measures for various railway and road crossings needed to be implemented. Thereby, it was required to cross two ÖBB railway tracks, three motorways and three country roads without digging by means of DN800 to DN1000 steel pipe jacking and to install a medium PE pipe in the dimensions DA630 and DA710, respectively.

Micro-tunnelling

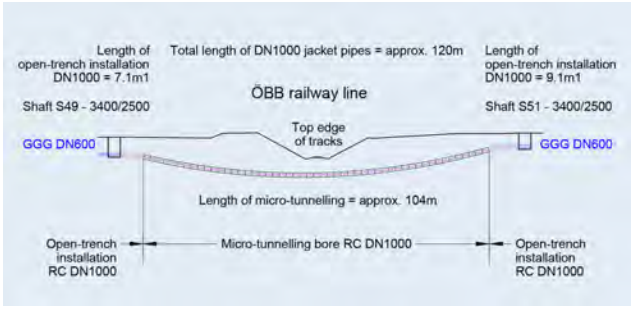
To build the DN600 water transport pipeline, the team needed to cross the ÖBB railway line Wr. Neustadt – Schattendorf in the Neudörfl area. Due to the fact that – compared to the surrounding terrain – the railway route runs in a deep depression in the area of the crossing, the construction of exceedingly deep launch and target shafts (depth of approx. 12m) would have been required if one had wanted to use a conventional boring method involving DN1000 steel pipe jacking. This would have meant immense efforts and would have been highly unfavourable for the water pipeline's routing. This is why a "micro-tunnelling" method was chosen for this crossing since it allows for boring in a radius. Using a 200-m radius, the launch and target shafts' depth could be restricted to a maximum of 6m. After boring was complete, the actual medium pipe of the water pipeline, a DA710 PN16 RC PE pipe was pressed into the DN1000 reinforced concrete jacking pipes. In the area of the launch and target shafts, the connection between the PE pipe and the DN 600 cast pipe was executed by means of a control / drainage shaft.

- Micro-tunnelling construction time: approx. 4 months (incl. preparatory and finishing work)
- Length of bore hole: approx. 104m
- Track covering: 4m

Bore head
Image: PORR AG

Micro-tunnelling launch shaft including hydraulic press frame
Image: PORR AG

PE DA710 PN16 RC pipe insertion
Image: PORR AG



Longitudinal section micro-tunnelling
Image: PORR AG

Control shafts

The contract volume also included all drainage, air extraction and gate valve shafts that needed to be built along the route. A total of 10 ventilation shafts and 28 various drainage and gate valve shafts were built. They were all executed as rectangular concrete shafts and were made from pre-manufactured parts to speed up construction progress. Thereby, the shaft installation unit was delivered to the construction site in an almost completely assembled state which meant it could be placed in the concrete shaft as an entire unit by means of a truck-mounted crane. Using multi-part shafts and pre-manufactured installation units, we were able to implement a high-quality, time and cost saving solution in the framework of the required assembly work.

Pipeline route after humus removal in the Sigless area
Image: PORR AG

Branch shaft with fittings DN600 / 500 – assembly condition
Image: PORR AG

Completion of Neudörfl – Mattersburg construction stage

The first construction stage from Well Field Neudörfl to High-Level Tank Mattersburg with an approximate length of 12,544m could be completed in February 2016. Following the required pressure tests and pipeline disinfection work, this pipeline section was – a month and a half ahead of schedule – taken into service by Wasserleitungsverband Nördliches Burgenland in early April 2016.

Overall completion

The 2nd construction stage from High-Level Tank Mattersburg to High-Level Tank Rohrbach could be completed by mid-November 2016. Once the pressure tests, pipeline disinfection work and various reconnection work have been completed, nothing stands in the way of commissioning and thus, the successful completion of the project in the spring of 2017.

Rellswerk power station – Vorarlberger Illwerke AG

One step toward Vorarlberg's energy autonomy

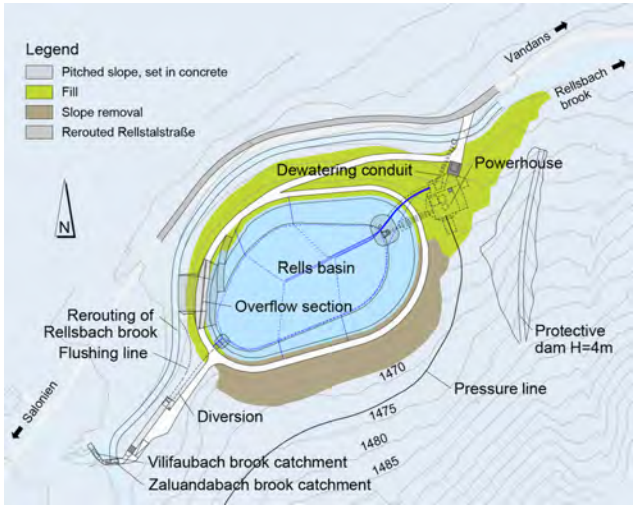
Thomas Steinwender

General information

Vorarlberger Illwerke AG produces electricity exclusively from hydro-power and other renewable sources. In the framework of the Rellswerk Project, another pump storage power station was erected to optimise the group of ten existing Illwerke power stations in the Montafon region. This project aims at damming the Vilifaubach and Zaluandabach brooks in the Rells Valley in the Vandans region some 1,450m above sea level and use the water at Lake Lüner power station. The water from these two brooks is temporarily stored in a balancing reservoir and – during pump operation – delivered to the existing group of power stations' intake waterway by means of a pressure line. Additionally, the Rellswerk power station can be run in turbine operation and thus produce an annual 20GWh of primary energy. It can also be used for purposes of recirculation pump storage. Thus, the power station contributes to producing high-quality peak and control energy.

Order

Following the positive outcome of the environmental compatibility study and the call for tenders, PORR's subsidiary Nägele Hoch- und Tiefbau GmbH from Röthis – as part of a consortium – was commissioned with master builder and pipeline work. The contract is worth approx. EUR 10m. The entire project encompasses an investment of some EUR 38m.



General layout
Image: Execution documents Vorarlberger Illwerke AG

Construction measures

Apart from the construction of a 2,300-m pressure line with a diameter of 1,000mm, the task the consortium had been commissioned with included the installation of two brook catchment structures including sedimentation basin, a 44,000-m³ storage reservoir and a powerhouse entirely located underground. Furthermore, the team needed to relocate a brook and a road, erect an energy transmission system and a barrier as well as build a bridge to access the powerhouse.

It could thereby only use the snow-free months between May and November to implement these measures. What made matters more difficult was the fact that construction machinery needed to access the construction site via an approx. 7-km-long mountain road which only had one lane and could only be negotiated with appropriate vehicles. Thus, for instance, all reinforcing steel and pipeline supplies and all other transports needed to be adapted to the conditions on location and the transport machinery.

Construction year 2014: Powerhouse, construction pit, water catchment system and sedimentation basin

Apart from said framework conditions relating to the construction site's location between 1,450 and 1,600 metres above sea level as well as the access and weather conditions, the construction of the powerhouse was possibly the toughest challenge of this construction scheme.

The powerhouse has four basement floors and two upper floors. It encompasses a built-up ground area of some 700m² and cubic contents of approx. 8,000m³. Based on the environmental compatibility procedures and the idyllic scene of the side valley in the Montafon region, the entire building, in its finished state, is located underground or covered.

To build the powerhouse, we first needed to prepare the development site. To this end, a bridge crossing Rellsbach brook was built. The single-span bridge was executed as a frame structure and served as the access route for the construction period and will continue to do so for the future power station operators. However, to be able to start construction prior to the bridge's completion, we also built a temporary bridge.

As a first step in the powerhouse's construction, a 13-m-deep sidehill cut was made using shotcrete and injection bore anchors to secure it. Starting at the bottom of the advance excavation, some 1,600m of tubed bore piles with a diameter of 120cm were installed by means of a cable excavator. The bored pile wall arranged in a circle, on the one hand, served to enclose the construction pit and, on the other hand, was incorporated into the statical concept of the powerhouse's foundation. The construction pit enclosure was executed as a secant bored pile wall by PORR's own Foundation Engineering Department. Thereby, they first bored and concreted non-reinforced primary piles down to the final depth at intervals

determined by a boring template. In a second step, the reinforced bored piles were then placed between the primary piles in an overlapping manner. To establish a sufficiently dense and dry construction pit, the bored piles needed to be sunk by up to 15m and incorporated into the ground moraine due to surrounding groundwater. This incorporation into the ground moraine which had been compacted by the weight of the primordial glacier turned out to be a tough challenge. The great depth and the associated friction of the piping in combination with the dense soil conditions significantly impaired the boring machinery's performance. Despite all these challenges, the construction pit enclosure could be finished just in time before the start of the winter of 2014.

Bored pile work in the powerhouse area
Image: PORR AG

Simultaneously, the team erected two weir systems to catch the water of the Vilifaubach and Zaluandabach brooks as well as a sedimentation basin. The two weir systems were constructed in the form of a "Tyrolean Weir". The water had to be diverted for the entire duration of these plant parts' construction since it represented the confluence of the two brooks towards Rellsbach brook. For this purpose, the team first built a weir system while the water was diverted through a diversion channel. After that, the brooks needed to be joined a little above the catchment structures and diverted through the existing catchment structure. Subsequently, the second brook catchment structure as well as the 40-m sedimentation basin could be built. Until the final installation of the screen and the fittings, the brook catchment structures needed to be sealed temporarily.

One of the two "Tyrolean Weirs" incl. sedimentation basin
Image: PORR AG

Due to the fact that the caught water contains sulphites, C_3A-free binding agents needed to be used during construction. Otherwise, the sulphate in the water would have reacted with the tricalcium aluminate (C_3A) in the cement. This would have caused concrete expansion effects. Therefore, the concrete recipes had to be adapted.

Construction year 2015: Powerhouse and pressure line

Following the first winter break of 2014/2015, the construction of the approx. 15-m-deep bored pile enclosure for the powerhouse with a diameter of some 17m could begin.

Snow clearing by the client on the access road
Image: Vorarlberger Illwerke AG, Construction Manager Simon Mark

Excavation work for the powerhouse's construction pit
Image: PORR AG

Excavation work for the powerhouse's construction pit
Image: PORR AG

The powerhouse's four basement floors were then built in the dry construction pit. These basement floors now house the turbine, the generator and the power station's other plant parts. Due to the associated high loads and vibration, the structural slabs are up to 150cm thick and appropriately reinforced. Single-sided formwork walls with supports were used for the exterior walls to which the bored piles were concreted. Thus, the basement floors including the interior walls could be built in cycles of three weeks. At the same time, the pressure line / connection line to the reservoir was incorporated into the powerhouse. The approx. 10-m tall crane hall and the operating rooms were then built atop the four basement floors.

Area photo of development site 2015
Image: PORR AG

Single-sided wall construction – concreting to bored pile wall
Image: PORR AG

Construction of the upper floors incl. crane hall
Image: PORR AG

2015 furthermore saw the laying of some 2.3km of pressure line between the powerhouse and the power station association's existing headrace pipeline. The steel pipeline was laid in a sloping trench at depths between 1.50 and 3.50m. The team used 12-m (spiral-welded and coated) pipes. At a storage site in the valley, the pipes were bent in accordance with an optimised bending plan and then hauled to the installation site. There, they were installed and welded together. The pipes' coating which had suffered from the welding process was repaired after successful welding seam inspection.

Welding of the individual pipe sections
Image: PORR AG

Delivery and laying of the pressure line
Image: PORR AG

Construction year 2016

In spring of 2016, master builder work on the powerhouse was completed. The precisely manufactured and positioned crane brackets are integrated into the crane hall's exterior walls. These support the gantry crane which has a lifting weight of 55t. The gantry crane had to be lifted into the hall and assembled before constructing the ceiling. Due to the fact that the crane's sensitive parts needed to be protected from the site's alpine weather conditions, ten prefabricated girders span the crane hall's ceiling which was executed as a prefabricated ceiling with in-situ concrete covering. Thus, the hall's roof could be completed in a minimal amount of time. Due to the access situation, however, the prefabricated girders were manufactured and lifted into the hall on site. In the powerhouse alone, the team installed some 3,500m³ of structural concrete and 380t of reinforcements. In its final state, the powerhouse structure's only visible parts will be the access portal and a ventilation tower. All other structural parts are located entirely underground or in the reservoir dam.

Covered powerhouse shortly before completion in 2016
Image: PORR AG

The storage reservoir with its usable capacity of approx. 44,000m³ was built at the same time as work advanced in the powerhouse. For this purpose, 75,000m³ of soil were removed and 43,000m³ of material were used to construct the dam body. Due to special requirements regarding the embankment construction's settlement, the processed material needed to be stabilised using lime. The storage reservoir was sealed using PE-HD sealing sheets and lined with armourstones to permanently secure the sealing.

Area photo of powerhouse and reservoir shortly before completion
Image: PORR AG

Final remark

The processing of this project in alpine terrain which was challenging and extensive in terms of logistics and construction demanded full commitment and high levels of flexibility from all participants. Only this allowed us to construct the interlinking plant parts in a way adjusted in terms of schedule, construction operation and technical implementation and to the full satisfaction of the client.

Once more, the PORR Group managed to show that it is a competent and strong partner in wide areas of construction engineering.

Project data

Client	Vorarlberger Illwerke AG
Contractor	Nägele Hoch- und Tiefbau GmbH as part of a consortium
Contract value	EUR 10m
Start of construction work	May 2014
Test operation	from December 2016
Annual output	20GWh
Max. power draw in pump operation	15MW
Max. bottleneck capacity in turbine operation	12MW
Max. throughput	1.5m³/s
Size of storage reservoir	44,000m³
DN 1000 pressure line	2.3km
Filling material	50,000m³
Concrete incl. bored piles	7,300m³
Reinforced concrete incl. bored piles	700t
DN120 bored piles	1,600m
Shotcrete protection	2,500m²

Twin Yards

New PORR headquarters in Munich

Josef Stadler

Exterior view of the building
Image: PORR AG

Location

Right on the main access road into Munich from the north, the A9 motorway, Twin Yards closes the last gap in the office area of Parkstadt Schwabing. The location right on Mittlerer Ring, the main transport artery for Munich, and ideal public transport connections with the city centre and to Munich airport distinguish the first-class location of the site.

Alongside big name corporations such as Microsoft and Amazon, many start-up companies have their headquarters in Parkstadt Schwabing, shaping the district into one of the most in-demand business locations in Munich, with international character.

An adjacent, typical park is used by the employees on the office and commercial spaces as a communication space and common area. A shopping centre and numerous small restaurants round out the daily requirements.

External view of the building
Image: PORR AG

The “Twin Yards” brand

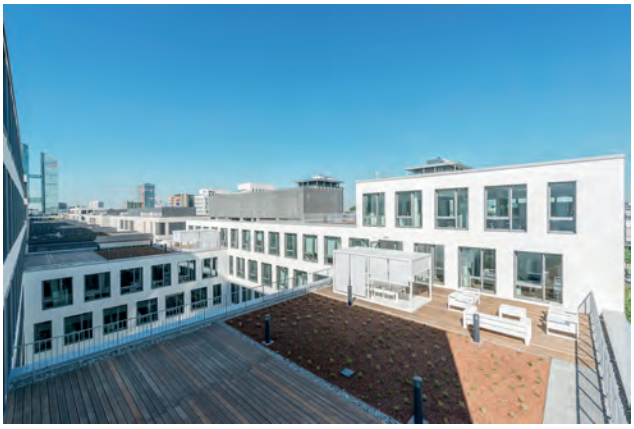
The “Twin Yards” brand developed from the outward appearance of the building. Uniquely in this office location, the building offers two inner courtyards. The first inner courtyard, bordering the neighbouring properties to the south, was designed as a typical access road.

Inner courtyard "yard 1" from above
Image: PORR AG

The centrally located, second inner courtyard consists of a relaxation space, flooded with light and endowed with plenty of plants, for the tenants. Multiple rooftop gardens are further eponymous attributes.

Yard 2 in the evening
Image: PORR AG

The staggering of the building allows for the creation of a total of seven roof terraces consisting of a mixture of larch timber decking and intensive planting with grasses. The use of the terraces would soon be permitted thanks to the tenant's individual terrace furnishings.



Roof landscape
Image: PORR AG

Construction phase

Construction began on 4 December 2013 with the decontamination of the plot. To this end, the construction field was divided into nine fields by the soil surveyor and systematically analysed. By the beginning of 2014, the initial excavation was largely completed so that work could begin on the actual excavation, with shoring and water retention.

Since a special solution was required for water retention in the tertiary sands present, PORR Deutschland opted for a design with 63 vacuum small filter wells. This design had a clear benefit in comparison with conventional gravity wells, which only have limited scope.

Remaining excavation
Image: PORR AG

At the same time, it was possible to tackle the excavation so that from March 2014 the site equipment could be set up using three tower cranes. In the carcass phase, work proceeded with a very high proportion of precast columns for the exterior walls and cavity wall elements on the party walls. A total of approx. 13,500m³ of concrete and 1,900t of structural steel were processed.

Start of the carcass
Image: PORR AG

Multiple changes of plan by the clients and tenants led to delays time and again. In December 2015, the building was handed over by Top Office Munich GmbH (a joint venture between Münchner Grundbesitz Verwaltungs GmbH MGV and Strauss & Partner Development GmbH) to the investor, Wealth Cap GmbH, a subsidiary of UniCredit. The tenant fit-out has been completed for the entire building since September 2016. For occupancy was already achieved by the beginning of 2016.

PORR Logo on exterior facade
Image: PORR AG

The building

Twin Yards offers a gross above-ground floor space of approx. 13,500m² and an underground gross floor space of approx. 6,000m².

Seven floors with a standard floor space of 2,660m² gross floor space each were designed on the first three floors. Three staircases and three lifts ensure the free movement of personnel.

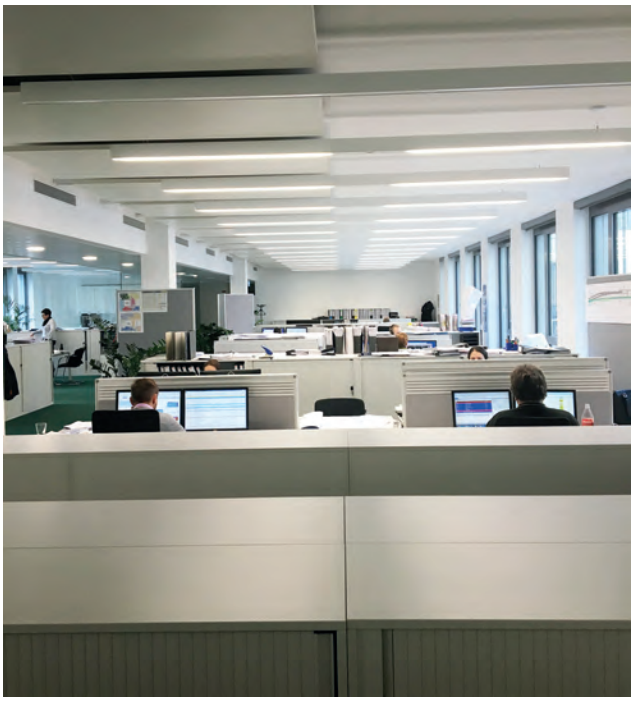
The clear room height is 3.50m on the ground floor, with a minimum of 3.05m of room height on offer on the standard floors. The office depths are between 4.95m and 6.13m. The two underground car park floors offer space for a total of 168 vehicles. In the outdoor area, five covered visitor parking spaces are offered.

The building has a mechanical air intake and ventilation system with heat recovery. In the office areas there is a 2-times air exchange rate, and the busy conference areas have a 6-times air exchange rate. Ventilation and central cooling are distributed across two roof spaces and are hidden behind a high quality architectural facade made from expanded metal.

Roof technology centre
Image: PORR AG

For year-round thermal comfort (heating and cooling) in the office and conference space, near-surface component activation was integrated into the steel-reinforced concrete ceilings. Above this, acoustically effective heating and cooling sails were used in the conference area and team offices.

The workspaces were lit using LED linear pendant luminaires. Direct lighting with symmetrical light distribution was chosen. The lights are controlled depending on presence and daylight.



LED linear pendant luminaires above workspaces
Image: PORR AG

All windows open individually and are triple glazed. Highly effective exterior sun protection from aluminium slats, with daylight reflection in the upper third of the hangings, and a manually operated interior blind are further comfort features.

The spacious and inviting foyer is thermally regulated using underfloor heating. A heating/cooling ceiling ensures additional comfort.

PORR and the “new working world“

PORR Deutschland, as the main tenant, has also established its head office in the roughly 13,500m² total floor area of Twin Yards. The move to the new building took place in November 2015.

"new working world"
Image: PORR AG

The PORR Deutschland offices were one of the first locations to see the implementation of the “new working world”. Openness and transparency shape the character of the new office. Rigid walls were reduced to the technical necessities. The necessary separation of the work areas was realised using elegant glass partition walls. An in-house conference area with high quality video technology allows for optimal communication with other branches.

“Building construction” conference room
Image: PORR AG

Certification

During the course of Expo Real 2016 in Munich, the “Twin Yards” project was awarded the DGNB Platinum certificate, the highest possible distinction for a building project with regard to sustainability.

B180 Reschen Straße – New construction of Niklasgalerie

Avalanche gallery in high alpine terrain

Stefan Plankensteiner, Thomas Steinwender

Introduction

The B180 Reschen Straße is a country road in Tyrol that runs from the end of the motorway feeder road in Fließ through the Upper Inn Valley to the border with Italy shortly before Reschen Pass, which also gives it its name. Built in 46 after Christ, the Roman Road named Via Claudia Augusta was the first navigable road crossing Reschen Pass. All through the Middle Ages and all the way up to early modern times, it ranked among the most important historic alpine crossings. Between 1850 and 1856, a new road, starting at Kajetans bridge in Pfunds was built in extremely steep rocky terrain. The road ascends some 400 metres to Nauders via Hochfinstermünz and the Finstermünz Pass. Located in Hochfinstermünz, Nauders Castle is an outer fort erected in 1840 and today houses a military museum. Reschen Straße ranks among the most important north-south connections in the Alps. Therefore, some 2,600m of protective structures were built along this high-alpine route section in the past 30 years to protect the population, tourism and through-traffic from natural hazards. Avalanches and rockfall are common occurrences in the area of Hochfinstermünz. This is why the Province of Tyrol, in its role as client, has decided to build a more than 275m long avalanche and rockfall gallery in this last undeveloped and rockfall-endangered section of the B180. Thus, drivers using this road which is frequented by up to 4,500 vehicles per day can get to Nauders or further on to the Southern Vinschgau region (South Tyrol) in even more safety.

Existing structure – natural tunnel at milestone 60
Image: PORR AG

Hochfinstermünz – Nauders Castle / at the beginning of the contract section
Image: PORR AG

Order

In May 2014, the Office of the Tyrolean Government's Traffic and Road Section, Bridge and Tunnel Construction, commissioned TEERAG-ASDAG's Tyrol branch (now: PORR Bau GmbH, Tiefbau), with the construction of the 320-m gallery incl. expansion of the natural tunnel. The contract's item was the new construction of the structure known as Niklasgalerie on the B 180 Reschen Straße from km 30.22 to km 30.66 in the municipal area of Nauders. Apart from the construction of the avalanche and rockfall gallery and the associated road construction work, an approx. 45-m-long natural tunnel was to be expanded, the Stillerbach bridge at the contract section's beginning was to be widened and to receive a new superstructure and several retaining walls were to be installed. Furthermore, a catch basin and seepage channels were to be built, the Stillerbach bridge's existing foundations were to be underpinned and the dam on the left shore of the Labaunerbach brook was to be extended downstream in an arched shape to the estuary of the Stillerbach brook. To secure the gallery's foundations on the valley side, the slope on the left shore as well as the Stillerbach brook's bed were to be equipped with riprap and the like.

Project

From portal to portal, Niklasgalerie is some 320m long and was built in 18 sections with standard lengths of 15m each. The gallery was built with a flat ceiling. The superstructure's thickness varies and amounts to at least 90cm. An existing natural tunnel some 45m in length in the road axis divides the gallery into a northern part 226.5m in length and a southern part 48.5m in length. The structure's rear wall was executed as a reinforced concrete angled wall and monolithically connected to the gallery's ceiling. The gallery's supports on the valley side were founded on

strip foundations, as were the walls on the mountain side. The foundations on the valley side were equipped with a cover and the accruing loads were transferred into the ground by means of micro piles.

Located at the beginning of the contract section, the Stillerbach bridge's superstructure through the gallery structure was executed as a truss structure some 30m in length on the upstream side. Connecting to the natural tunnel on both sides are gallery blocks angular in terms of their ground plan. At 0.9m x 0.55m, the supports' dimensions are equal along the entire length of the gallery. The supports' height thereby varies depending on terrain and foundation type. The supports of blocks 1 and 2 rest on an edge girder next to the Stillerbach bridge's superstructure. The supports of blocks 3 to 5 rest on a retaining wall to be built in this area. All other blocks' gallery supports are founded on regular foundations which means block foundations with micro piles. Niklasgalerie serves to compensate rockfall loads and was therefore built with a massive covering (1.20m – 3.8m). The superstructure features dual-layer bituminous sealing which was equipped with sealing protection.

Preparatory work began in July 2014. A 400-m dual-track construction site bypass with a temporary bridge crossing the Stillerbach brook and a corrugated passage at the Labaunerbach brook had to be built to allow this construction scheme to be implemented. In the course of this procedure, three historic tanks from WWII as well as several cannons which had been on exhibit in the area of the future bypass road had to be loaded onto flatbed lorries and transported to Pontlatz Barracks in Landeck in spectacular fashion.

Loading of historic tanks
Image: PORR AG

Main construction work (gallery and road construction) including opening to traffic was complete in 2015. Remaining tasks were to be completed and recultivation work was to be implemented by June 2016.

Removal, excavation and rock stabilisation work

In terms of technology and construction logistics, the construction scheme presented a tough challenge for the people in the employ of TEERAG-ASDAG and PORR's Foundation Engineering Department. In a first step, the rock faces on both sides of the valley needed to be cleared and permanent rockfall protection fences in portal areas and temporary rock fall protection fences in the remaining area of the contract section had to be installed to guarantee the workers' safety. Furthermore, comprehensive rock removal and slope stabilisation measures (shotcrete soil nail wall) needed to be carried out in the run-up to allow for the project's implementation.

Natural tunnel expansion

The existing, some 45-m-long natural tunnel needed to be expanded to achieve the new gauge. Both blasting driving and mechanical methods were used to expand the tunnel, always guaranteeing a minimum of strata degradation. To secure the "rock column" on the valley side, it was supported by means of untensioned anchors. Cracking support for the tunnel was provided by a 15-cm-thick shotcrete shell with a reinforcement layer on the mountain side and steel grating arches as well as system anchoring using SN anchors. This work was likewise completed in November 2014.

Natural tunnel – expanded and secured
Image: PORR AG

Stillerbach bridge

Built in the time of the Austrian-Hungarian Empire, the Stillerbach bridge consisted of a 5-web tee-beam. In the course of route regulation in 1954, this old superstructure was reconstructed and widened by means of superstructure elements triangular in shape. Measured obliquely, the span amounts to some 21 metres. The two edge girders are 1.75m tall. The new bridge superstructure was executed as an angled reinforced concrete slab with edge girders along the bridge's free edges and reinforced girders in the bearing axes. The crossing angle with the brook axis is 45°. The bridge's vertical span is 7.6m. Due to the bridge's gradient, the span of the edge girders is 22.2m and the length of the edge girders 25.7m each. To support the wider bridge superstructure, the existing abutment walls upstream needed to be extended by some 6.10m (right) and 7.2m (left). The uppermost parts of the existing abutment walls were removed down to a depth of some 2.2m below the road surface to make room for the

new abutment structures. The abutments were founded on approx. 20-m-long micro piles with a diameter of 63.5mm and a yield stress of 1,742kN. Due to the reinforcement girders in the bearing axes located underneath the superstructure slab and the edge girders along the free edges, the extremely slanting superstructure slab (thickness: 0.45m) was enclosed at all four edges. The slab borders the edge girders which are 1.28m tall in total. The reinforcement girders in the bearing axes reach some 1m into the superstructure's bottom edge. A slanted superstructure length of 26.2m in total and the superstructure's width of 12.9m results in a bridge deck area of some 338m². The superstructure was covered and the open land road surface was executed in full thickness. An additional girder entirely disconnected from the bridge superstructure was installed for the gallery supports located upstream. A truss needed to be built to accommodate the enormous vertical loads of the gallery roof. The additional girder next to the bridge formed the truss construction's lower wing. The gallery roof's superstructure slab serves as the truss's upper wing. Four columns as well as the diagonal struts placed between the first and second as well as between the third and fourth column yield a massive truss construction. On the bridge, the gallery structure could only be built by supporting it using the bridge superstructure which was itself still supported.

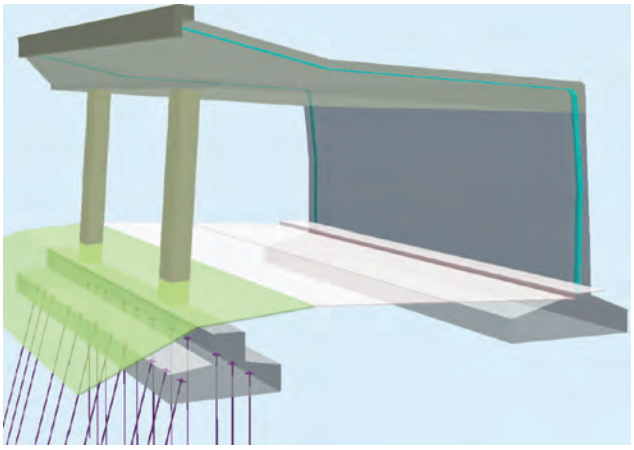
Concrete construction for the gallery's structural frame

After the scheduled winter break 2014/2015, main construction began in March 2015. The gallery structure was executed as a structural frame construction with supports on the valley side. In the first construction stage, the northern gallery section (blocks 1 – 15) with a length of 226.5m was constructed adjacent to the overbuilt Stillerbach bridge. While the foundations on the mountain side were installed (width: 4.5m), the team began building the foundations for the valley side supports (width: 3m). The foundations on the mountain and valley sides were executed as strip foundations. The foundations on the valley side were built using S 555/700 GEWI micro piles with a diameter of 63.5mm and ribbed threads as well as dual corrosion protection. In the rock, the bond length was 8m, in the loose material some 20m. This was followed by the installation of the 80-cm-thick, slightly haunched wall slab more than 5m in height on the mountain side. On the valley side, the supports with a cross section of 55 x 90cm were built simultaneously. In June 2015, the team on site began assembling the gallery form work carriage. Following the form work carriage's assembly, the first of 18 superstructure blocks with a regular length of 15m was concreted in early July.

Construction of blocks 1 and 2 / Stillerbach bridge superstructure
Image: PORR AG

Gallery construction, northern section 2015
Image: PORR AG

Gallery formwork carriage
Image: PORR AG



3D view of block 10
Image: PORR AG

Aerial shot: gallery construction 2015
Image: PORR AG

Furthermore, building the transition blocks 15 and 16 connecting to the natural tunnel in an arched shape presented the team with a tough technical challenge. Comprehensive adjustment work regarding formwork needed to be implemented in this context. With the southern gallery section (blocks 16 – 18) at a length of 48.5m, main construction work was completed in November 2015.

A natural tunnel divides the two gallery sections.
Image: PORR AG

Gallery construction, southern section 2015
Image: PORR AG

While the gallery structure was constructed, the plaster recesses on the mountain side and the drainage lines for the drainage of water coming down the slope were installed. The gallery's sealing was also drawn in. A 47-m retaining wall on the mountain side was installed after the gallery structure in the direction of Nauders had been completed.

Completion of natural tunnel

The 45-m-long natural tunnel was lined at the same time as the gallery's construction advanced in November 2015. After a sealing carrier and a drainage mat had been applied, the tunnel was equipped with a plastic sealing sheet (umbrella sealing). Due to the tunnel's moderate length, the inner lining was executed as a 20-cm-thick dual-layer shotcrete inner lining. A protective layer was applied to the plastic sealing due to the reinforcement. The inner lining's reinforcement mats were attached to grid arches and anchors executed as waterproof penetrations of the plastic sealing.

Inner lining – shotcrete shell natural tunnel
Image: PORR AG

Back filling / road construction

Following the completion of concrete and sealing work, back filling the gallery started in October 2015. For this purpose, a temporary ramp allowing access to the gallery

roof had to be built close to the natural tunnel. The dual layer sealing was supported by means of a drainage mat after which a 50-cm-thick protective layer with a maximum grain size of 80mm was applied to the superstructure slab. Due to the immediately adjacent rock in most areas, back filling was performed using filter gravel in certain places. In areas that allowed compacting, back filling was installed and compacted layer by layer. After the completion of drainage and road construction work in December 2015, the new gallery could be opened to traffic for the first time just in time before the winter season of 2015/2016.

After the winter break, remaining tasks were completed in the spring of 2016. These included, among others, the completion of the edge girder at the gallery roof, the installation of the gabions which, with their alpine appearance, harmoniously blend in with the landscape and allow for ample compensation of rockfall loads through an up to 3.8-m-thick backfill on the gallery roof. The temporary access road was subsequently removed, hydraulic engineering work on the Stillerbach brook completed and the entire contract section recultivated. Finally and without restrictions, the construction scheme was opened to traffic in June 2016.

Incorporation of Stillerbach bridge into Niklasgalerie
Image: PORR AG

Nauders gallery portal
Image: PORR AG

Hochfinstermünz gallery portal
Image: PORR AG

Road – driving space in gallery structure
Image: PORR AG

Connection of gallery structure with natural tunnel
Image: PORR AG

Final remark

Thanks to excellent collaborations between all project participants – from the client to local building supervision and authorities – work proceeded to the great satisfaction of all those involved and the section could be completed and opened to traffic in June 2016. The biggest challenges TEERAG-ASDAG AG and all those involved in the project had to face were keeping traffic moving in the construction site area on the one hand, unsteady weather conditions in summer and winter, local framework conditions (spatial restrictions) and the construction site's topographically difficult location in Alpine terrain on the other. With this

project, PORR, in cooperation with several corporate companies, once again proved its experience and expertise in the areas of infra-structure and road construction, just as it had done in the course of the other large Tyrolean gallery projects it had processed in recent years.

Project data

Client	The Office of the Tyrolean Government, Bridge and Tunnel Construction
Contractor	TEERAG-ASDAG AG / Tyrol branch (today: PORR Bau GmbH, Tiefbau)
Contract volume	EUR 6.9m
Start of construction	July 2014
Final completion	June 2016
Project length	440m
Road surface	4,300m²
Excavated material, earth moved	17,000m³
Frost layer	3,000m²
Ready-mix	2,000t
Tunnel/gallery structures	320m
Concrete volume	9,300m³
Reinforcing steel	1,400t
Shotcrete surface	720m²
IBO anchors	750m
Micro piles	7,300m

Ruhrquartier housing complex

Representative architecture in extraordinary location

Till Tengelmann

General information

Mülheim an die Ruhr! (German for “Let’s bring Mülheim to the Ruhr River!”) is the slogan of the decentralised urban development project called Ruhrbania. The core of this urban development project is the Ruhr River promenade. It encompasses several development sites directly on the Ruhr River, one of which is Ruhrquartier. The inner city there takes one step closer to the river along a length of 500m.

Started in January 2014 and completed in late 2015, Ruhrquartier links representative architecture with an extraordinary location, thus creating a new kind of living. Thanks to the individual building bodies’ arrangement on the more than 7000m² site between Rathausmarkt square, the Ruhr River promenade and the new harbour basin, an open building ensemble with a strong connection to the water has been created.

Top location: directly on the Ruhr River, surrounded by the new Ruhr River promenade towards the water, close to the harbour basin with its jetty, framed by the future Ruhr Valley bicycle way on one side and the nicely renovated Town Hall on the other.
Image: MWB

Visualization
Image: MWB

Obstacles prior to the start of construction

Before the Ruhrquartier new building project could start in earnest, the client Mülheimer Wohnungsbau eG (MWB) needed to deal with a couple of delays: The original general contractor and co-partner had become insolvent. That's why a new general contractor needed to be found and the financing needed to be reorganised. Tenders, plans and calculations were reviewed once more, not just at MWB itself but also in close coordination with the City. In PORR Deutschland GmbH, they found a reliable construction company whom they commissioned to be the general contractor. Many obstacles needed to be overcome but the originally scheduled completion date could be kept nonetheless.

Thus, premium freehold flats, comfortable rental flats, restaurants and service areas as well as an underground car park with 141 parking spaces were created at Ruhrquartier. All freehold flats have already been sold and almost all rental flats have been rented out. Some long-established physicians from Mülheim jumped to the opportunity to move into modern practices in a breathtaking location. In total, they are renting 825m² in the building section located on Rathausmarkt square and Bahnstraße and benefit from the structure’s central location. Three practices – two specialists and one family doctor – have opened their doors at Ruhrquartier as early as spring 2016. This was followed by a cardiologist and a pharmacy in the summer of 2016.

The building

Three clearly separated building structures with a total gross floor area of 26,262m² merge to a single appealing unit with a green courtyard in the form of a loose design.

Each one of the three buildings comprises a basement floor, ground floor, three or four upper floors and a stacked floor. The joint underground car park links the basement floors of all the buildings.

Complex foundation conditions

A third of the ground plan of the construction area is located on a former harbour basin which was filled up with rubble and demolition debris in an non-compacted fashion in the years following WWII. It therefore didn't directly support foundations. Additionally, an outcropping coal bed whose original mining borders could no longer be determined presented the foundation concept with a special challenge. For economical and ecological reasons, the complete excavation and re-filling of the harbour basin to achieve a consistent foundation level was out of the question. Therefore, pile foundations were chosen for the western part of the construction pit located close to the river and only slightly above the ground water table. This allowed the team to penetrate this difficult terrain formation and rest the building on the Ruhr River gravel.

The construction pit with Berlin type pit lining
Image: PORR AG

Following an audit of the neighbouring buildings, especially the historic Town Hall, the construction pit was enclosed using single layer back-anchored Berlin type pit lining. To allow for excavation all the way down to the piling level, the ground water table was lowered due to the high permeability of the Ruhr River gravel.

Subsequently, the foundations were installed by means of pre-manufactured driven piles down to the contact plane at a depth of 8m. Driving work was accompanied by vibration measurements to make sure adjacent buildings were not damaged. The frequencies and amplitudes produced didn't even come close to the maximum levels stipulated to prevent damage. The worries about excessive noise and negative effects on the residents resulting from pile driving, thankfully, proved groundless, too. This rarely used method also attracted the interest of many neighbours and citizens who watched this construction phase closely.

Driven pile foundations: The pile heads are still to be cut.
Image: PORR AG

The eastern part of the building's foundations was executed using conventional flat foundations. The two up-to-1-m-thick bottom slabs were connected by means of a real expansion joint which is capable of compensating different levels of settlement between the two foundation types and at the same time guaranteeing water-tightness. A ground water drainage system, in the form of a gravity well in certain areas and in the form of a vacuum system in others, was used for the entire duration of the bottom slab's construction.

Individual foundations within the flat foundations
Image: PORR AG

Flat foundation work
Image: PORR AG

Carcass

Located close by, the Ruhr River's bank produced varying ground water levels in the spring. To prevent possible effects of the ground water on the basic building fabric and to guarantee the operational safety of the underground car park and the basement rooms, the entire basement floor was built as a white tub.

The rising building sections were constructed as conventional reinforced concrete / masonry buildings with a low amount of premanufactured parts. On top, all buildings are equipped with a flat ceiling with an overlying warm roof construction.

Carcass construction on all three buildings is progressing swiftly.
Image: PORR AG

House 2: The top floor has been reached.
Image: PORR AG

View over the carcass of building 3 onto building 1
Image: PORR AG

Facade design

The appealing beam-and-post aluminium facade on the ground floor is upgraded by a high-quality, sanded natural stone cladding made from Krensheim shell limestone. This creates a visual connection to the historic Town Hall in the direct vicinity in terms of materials. On the upper floors, the façade is equipped with 18-cm-thick light-coloured heat insulation plaster. The flat windows' soffits feature decorative grills that add a subtle design element to the facade.

Facade view in the direction of the historic Town Hall
Image: Andreas Köhring

Roof greening

To underline the overall project's guiding ecological principle, all roofs have been greened to significantly slow down the drainage of rain water and make an important contribution to the improvement of the inner city's microclimate.

Wide range of flats with high-quality interiors

The buildings oriented towards the Ruhr River feature 52 freehold flats in sizes from 65m² to 242m². From open spaces with the ambience of a penthouse, studios with the charms of a loft or barrier-free comfort flats, the buildings cover the most varied requirements.

The building located on Bahnstraße features a representative stacked floor. On the floors 1 to 3, 48 light-flooded, low-barrier comfortable rental flats from 47m² to 75m² to 152m² provide singles and couples with extraordinary living space.

The flats' premium equipment wows their inhabitants with many amenities: Every flat, for instance, includes a balcony or terrace, triple heat insulation glazing, solid wood parquet flooring, stylish tiles, floor heating, electrically operated blinds and an intercom system with video function as well as bathrooms of exquisite quality.

Location on the River

Not least, Ruhrquartier wows with its location: Traffic is reduced on three sides of Ruhrquartier and the River, the Ruhr River promenade, the new jetty as well as the Ruhr River bicycle way are located directly in front of the door, so to speak. Following the River's course, one reaches the city centre. With its broad green spaces and forests, Mülheim an der Ruhr, the "City on the River", is known as an appealing place to live between Düsseldorf and Essen. The new Ruhrquartier residential area will contribute to making this region even more attractive for "urban nature-lovers".

View of the courtyard
Image: Andreas Köhring

Project data

General contractor	PORR Deutschland GmbH
branch	Düsseldorf
Developer	Mülheimer Wohnungsbau eG (MWB), Mülheim an der Ruhr
Construction time	January 2014 to December 2015

"Pradl Ost" housing complex, Innsbruck

Johannes Gietl

General information

Südtiroler-Siedlungen (German for “South Tyroleans’ estates") in Innsbruck

In the summer of 1939, representatives of the national-socialist German Reich and the fascist Italian state agreed on the option of the resettlement of the South Tyrolean population. As a result, some 75,000 people left their home south of the main chain of the Alps in the course of the following four years. Before this resettlement began in earnest, flats all across Austria were planned for the expected “resettlers” (as they were called in the NS jargon) and the largest residential housing project of the war years was started in Tyrol and Vorarlberg. The goal was to erect 10,000 new flats.

Südtiroler-Siedlung, Thüringstraße before demolition
Image: PORR AG

Project preparation and contract

To be able to start with the project, the Südtiroler-Siedlungen that had been occupied up to this point, needed to be demolished. Some residents needed to move to existing flats belonging to Neue Heimat Tirol for the time being. After construction was completed, the residents could move back into their flats.

In July 2015, PORR Bau GmbH’s Tyrol branch was commissioned with the extended master builder work for the Pradl housing complex by Neue Heimat Tirol. The job included the construction pit, outside facilities, ETICS work as well as the redesign of the access road.

Project description

The housing complex was built on the site of the Südtiroler-Siedlung in passive house standard.

The building consists of 1 to 2 basement floors and 4 to 5 upper floors. It features two courtyards, whereby courtyard 1 was executed as a high terrace (toddler playground). The large second courtyard does not have a basement underneath.

The three-storey car park (ground floor, basement floors 1 & 2) is located directly underneath courtyard 1 and is accessed via offset mezzanines. The auxiliary and cellar rooms are located in the boundary areas. The majority of the car park is located on the ground floor and is ventilated and lit naturally. The 1st and 2nd basement floors were equipped with a mechanical flue gas and heat extraction system. The buildings forming courtyard 2 in the north, east and south have one basement floor and are exclusively ventilated mechanically and artificially lit.

The underground car park access and exit ramps are located on Gumppstraße in the southern part of the property. Bicycle parking areas are situated on top and assigned to the individual building segments. Additionally, bicycle and pushchair parking areas and dry rooms are planned to be installed on the first basement floor. The central garbage room is located on the ground floor in the north of the property. The individual building segments are accessed via twelve staircases with integrated barrier-free facilities.

Exterior view of the new housing complexy, Thüringstraße
Image: PORR AG

Project data

Start of construction	July 2015
Handover	November 2016
Gross floor space	21,000m²
Flats	145
Parking spaces in underground car park	198
Excavated earth	30,000m³
Shotcrete	1,100m²
Concrete	11,700m³
Reinforcements	890t
Facade area	11,800m²

Laying of the foundation stone, from left to right: Patrizia Zoller-Frischauf (Provincial Councillor for Economy), Mag. Gerhard Fritz (City Councillor for Innsbruck), Mag.a Christine Oppitz-Plörer (Mayor of Innsbruck), Hannes Gschwentner and Prof. Dr. Klaus Lugger (Managing Directors of Neue Heimat Tirol)
Image: NHT

Building process

Overview of building segments
Image: PORR AG

In the area of the two-storey underground car park, the construction pit was secured using shotcrete. This turned out to be more difficult than expected since numerous built-in elements were discovered which had not been documented exactly or not at all. Furthermore, the existing bus stop needed to be preserved and secured. The rest of the building segments could be installed in the open method.

To be able to keep to the schedule, building segments A,B,C,D,L,K with two basement floors were built at the same time as the others with just one basement floor. All building segments were founded on strip foundations. In the area of the staircases, a bottom slab with insulation underneath needed to be installed since this is part of the building's warm cladding and complies with passive house standards. The other areas were equipped with reinforced paving as a sub base since it only plays a minor role in terms of statics. A floor construction or asphalt was applied to the paving. Formwork was applied to the sloping underground car park ceilings and they were concreted. The structure is a dual-layer bridge insulation system. For the courtyard of the first upper floor, the team chose to implement a white tub.

Carcass work on all twelve building segments was completed in March 2016.

Aerial shot, February 2016
Image: NHT

Outdoor facilities

The outside facilities are divided into four sections which were executed as follows:

- **Ground floor courtyard**
  This is where the large playground with green area and playing mound as well as the entrances to the nine buildings and the "artificial tunnel" are located. The latter is a "Kunst am Bau" (German for "Art on the Construction Site") project. The floor surface was designed using premanufactured concrete parts while the walls were clad with black perforated sheets. The main traffic areas have been built using asphalt. The building entrances have been constructed in "creative concrete" (coloured concrete).

Artificial tunnel
Image: PORR AG

- **First floor courtyard**
  This courtyard serves as an auxiliary entrance hub for the five houses. They are accessed via a prefabricated staircase which originates on the ground floor courtyard. It furthermore houses the toddler playground and various plant beds.

- **Am Roßsprung play street**
  Located to the north of the housing complex is a play street which also serves as a fire department access road for the neighbouring structures and for our own construction scheme. The road is closed to all other traffic to allow for its use as a play street.

- **Gumppstraße / Thüringstraße crossing**
  In the course of construction, this street has been completely redesigned and the existing infrastructure has been renewed, relocated and extended.

"Am Roßsprung" play street
Image: PORR AG

Exterior view Gumppstraße
Image: PORR AG

Facade

The facade consists of a thermal insulation system which complies to the stipulations to achieve passive house standards. The final coating was applied in two layers whereby the team achieved the desired white concrete texture.

First floor courtyard
Image: PORR AG

Large courtyard including a playground
Image: PORR AG

Large courtyard including a playground
Image: PORR AG

5th floor flat
Image: PORR AG

Only thanks to excellent cooperation between all trades, the team on site was able to stick to the tight schedule and hand the project over to a satisfied client.

Large-scale project Stuttgart–Ulm

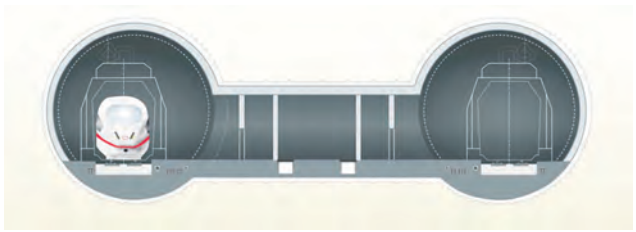
Construction section Albaufstieg: Boßler and Steinbühl Tunnels

Kurt Joham

Four projects worth a total of more than EUR 1.6 billion are currently being implemented under the leadership of PORR in the framework of the large-scale project Stuttgart 21 and Deutsche Bahn's (DB) newly built Wendlingen–Ulm route.

The Albaufstieg construction section is the central part of the new, 59.6-km-long DB railway section from Wendlingen to Ulm. The route running from the north-west to the south-east crosses the entire Schwäbische Alm mountain range between its starting point of Wendlingen near Stuttgart and its destination in Ulm. The centre pieces of this construction section are the twin-tube Boßler Tunnel the twin-tube Steinbühl Tunnel.

New route Wendlingenï Ulm with Boßler Tunnel, Fils Valley Bridge and Steinbühl Tunnel
Image: Deutsche Bahn



Tunnel system with one driving tube each and cross-ways every 500m
Image: Deutsche Bahn

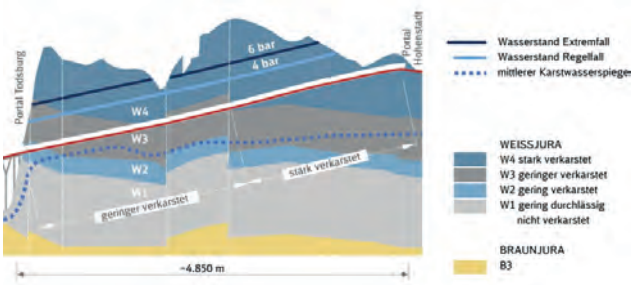
Background

In February 2012, DB Netze AG had initiated the tender proceedings for the construction scheme new route Wendlingen-Ulm, project approval section 2.2 Albaufstieg Tunnel. The project, divided into three contract sections, includes the Boßler Tunnel's dual-tube tunnel structure with a total length of 8,806m (contract sections 1 and 2) and Steinbühl Tunnel's dual-tube structure with a total length of 4,847m (contract section 3).

The offer submitted in May 2012 by the Austrian Albaufstieg Tunnel Consortium (ATA) under the leadership of PORR included all 3 contract sections. In the course of the following negotiation procedure which lasted until October 2012, ATA was commissioned with a special proposal – the joint commissioning of all three contract sections including the use of a TBM at contract section 1 within the driving stations stipulated by the client.

Steinbühl Tunnel

Steinbühl Tunnel exclusively penetrates the White Jura strata starting at Fils Valley with Oxfordian 2, followed by Kimmeridgian 1, Kimmeridgian 2 and the lower compacted limestone. One had to expect strong karst formations in the area of the compacted limestone.



Geological longitudinal section Steinbühl Tunnel
Image: Deutsche Bahn

Work on Steinbühl Tunnel started according to schedule in spring 2013 with excavation work on the construction pit Pfaffenäcker near Hohenstadt. The ceremonious tunnel inset on 19 July 2013 marked the starting signal for underground work on the two advancing tunnels leading north and the two short advancing branches leading south at the Pfaffenäcker construction pit. Heading – excavation and support system – based on the principles of the "Neue Österreichische Tunnelbaumethode NÖT" ("New Austrian Tunnel Construction Method") – was carried out entirely by means of the conventional, cyclic blasting and excavator method in case of Steinbühl Tunnel. The assumption in the call for tenders with regard to the likely presence of karst formations could only be confirmed to a lower extent which meant that driving proceeded without any problems worth mentioning.

The tunnel structure's most important key data include a bore section of some 93m² and a maximum longitudinal tunnel incline of 25‰.

Conventional driving: NÖT at Steinbühl Tunnel
Image: ATA

Driving on Steinbühl Tunnel was carried out using the conventional cross-section division into calotte, side wall and base. Without negative effects on the local infrastructure, excavated material was removed directly from the driving area to a side deposit site by means of a conveyor belt and installed. Additionally, a significant portion of excavated rock could be reused on location through a material processing system.

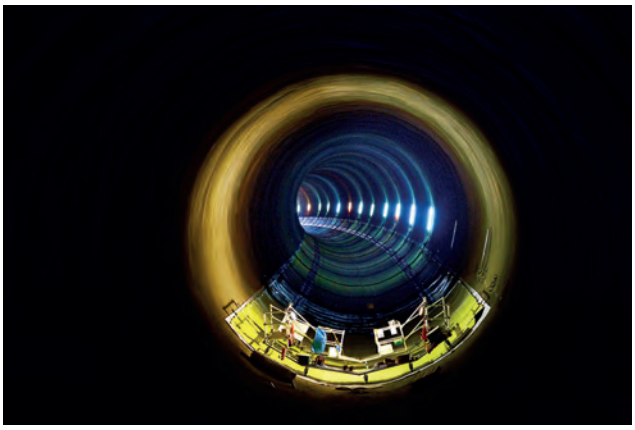
Material conveyance and processing at Hohenstadt portal
Image: Arnim Kilgus

In addition to the tunnel tubes, a total of nine cross-ways were to be built. Through adapting the cross-ways to the logistics parameters of driving procedures, excavation work could be implemented with first class performance.

Railway tunnel with cross-way at Steinbühl Tunnel
Image: ATA

September 2015, more than six months ahead of the contractually agreed breakthrough date, the breakthrough of both tunnel tubes to Fils Valley could be celebrated.

Conventionally headed using a shotcrete method, Steinbühl Tunnel, after driving has been completed and a plastic foil sealing has been installed, will be equipped with a reinforced inner lining executed in sections of 12.5m using in-situ concrete, divided into a base section and the concrete ring section. Two inner lining application systems, consisting of sealing, reinforcements, concrete and finishing work are used to build the inner lining.



Tunnel sealing by IAT/PORR
Image: ATA

The installation of the western tube's inner lining could be completed as early as December 2016. The completion of the eastern tube's inner lining is scheduled for mid-2017. Following subsequent finishing work of the cross-ways and walkways and the installation of 425km of cable conduits, the overall completion of construction on Steinbühl Tunnel in mid-2018 and thus, compliance with the contractually agreed completion date of February 2019, can already be guaranteed.

Reinforced concrete ring: d=45cm and block length=12.5m
Image: ATA

4.8km of completed inner lining prior to road surfacing
Image: ATA

Boßler Tunnel – the other “galaxy of the project"

Two attack points had been planned for the driving of the Boßler Tunnel, one at the northern Aichelberg portal for the driving of contract section 1 in southerly direction and a second one – executed as a 950-m access tunnel – in the Umpfen Valley for the driving of contract section 2, both as a reverse drive northwards and southwards to the southern Buch portal. The client had specified that blasting driving in shotcrete construction had to be used as a driving system.

Only for 2,900 metres of tunnel at contract section 1 from Aichelberg portal, the client had permitted the use of a special suggestion, mechanical driving (TBM driving). The use of a TBM, however, was restricted up to construction-km 42 and 100 (equals 2,900m).

PORR’s significant leadership: Success through technical know-how and innovative strength

The offer submitted in May 2012 by the Austrian Albaufstieg Tunnel Consortium (ATA) under the leadership of PORR included all three contract sections. In the course of the following negotiation procedure which lasted until October 2012, ATA was commissioned with a special suggestion – the joint commissioning of all three contract sections including the use of a TBM at contract section 1 within the driving stations stipulated by the client.

PORR had been convinced from the very beginning that, using the latest mechanical technology, TBM driving should be possible and feasible for a far greater section of Boßler Tunnel and that the existing TBM and infrastructure facilities could be used in an optimal way.

Therefore, ATA, after order placement in 2012 and under PORR’s leadership, submitted to the client an optimisation offer for extended TBM driving in the contract sections 1 and 2 for the entire Boßler Tunnel.

This laid the corner stone for a technically innovative and – in its joint gradual implementation highly difficult and elaborate – path whose special challenge had been the joint search for and definition of the required steps to secure the implementation of this contractor suggestion which should keep all project participants busy for the following four years.

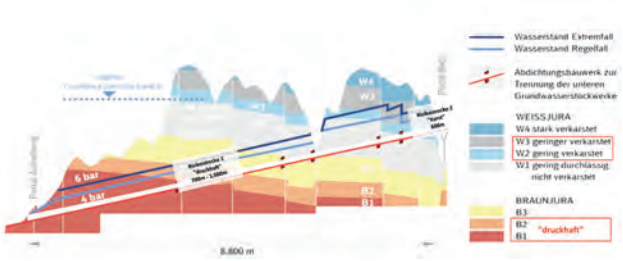
For the first time in the history of tunnel construction, a large-scale project whose development had taken no less than ten years was adapted to an entirely new technical and contractual project basis in the course of construction execution.

17,500m of shotcrete tube ...
Image: ATA

... become 17.500m of segment ring tube
Image: ATA

Project optimisation concept

In summer 2013, the preliminary goal of the optimisation measures was to extend TBM driving in the eastern tube by 900m in front of the squeezing zone and subsequently pull the TBM some 1.5km through the eastern tube which had been executed in shotcrete and drive the rest of the tunnel through the White Jura strata. If needed, driving through the squeezing rock section in the Brown Jura strata at a length of 880m was to be performed via a cross-passage using shotcrete. According to the construction schedule foreseeable by the middle of 2013, the Umpfen Valley access tunnel would reach the Brown Jura layers roughly by the end of 2013. These layers – according to forecasts for shotcrete construction in the Umpfen Valley access tunnel – were also expected to present squeezing conditions. From the crossing of the access tunnel and the eastern tube, the team planned driving the tunnel’s eastern tube downwards in shotcrete construction through the highly squeezing area of the Bajocian and Aalenian layers of the Brown Jura strata.



High-risk zones during TBM boring
Image: ATA

The advance implementation of the access tunnel and a part of the eastern tube using shotcrete construction allows for the development of a concept aimed at gaining new information and subsequent readjustment of the geomechanical properties prior to the start of TBM driving / before the TBM was predicted to reach the squeezing area.

The TBM's conceptualisation and ordering needed to take place at project start with hindsight on subsequent optimisation at ATA's risk.

Increasing bore head diameter to install segments; d=45 cm and d=65cm
Image: ATA

Aichelberg portal ramp with segment manufacture and project management
Image: DB-PSU Stuttgart

TBM at Aichelberg portal
Image: ATA

TBM – Bore head
Image: ATA

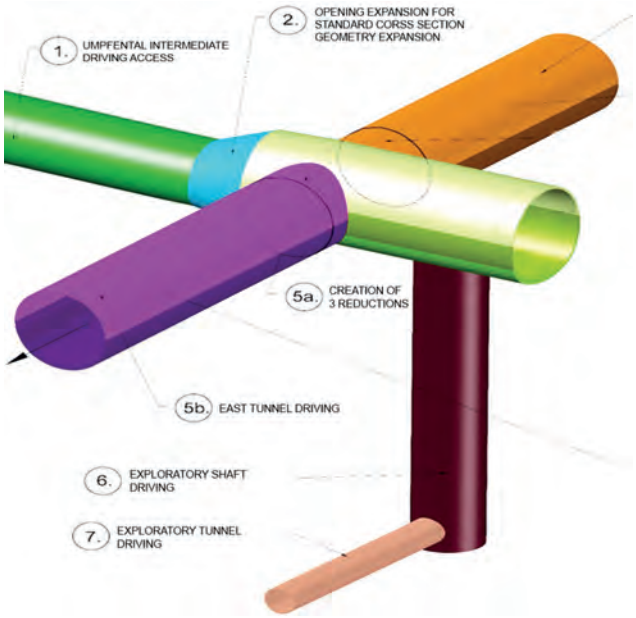
TBM specifications

TBM	Herrenknecht
Diameter	11.39m
Type	Earth pressure shield (90mm)
Open & close mode	possible
Installed power	7,200kW
Advance performance	127,000kN
Max. required in eastern tube	70,000kN
Auger conveying performance	1,200kW – 120cm
System control	100% digital
System documentation	100% digital
Infrastructure	Railway operation
Rolling stock	2x traction 4% gradient
Conveyor belt	100cm woven belt
Conveyor belt length	9,300m
Ring gap filling	Bicomponent filament
Pumping performance	48 bar transfer pumps
Ventilation performance	400kW
Segmental Removal	
Segment manufacture	PORR/MABA
Segment manufacture	12 formwork sets d=45/65cm
Segment system	6+1
Segment storage	1,200 rings
Total no. of rings	8,750/61,250 rocks

Proof of concept

In the following four project years, comprehensive design performance, sometimes several designs and elaborate test programmes needed to be implemented to prove the concept's feasibility.

The following is a list of key measures:



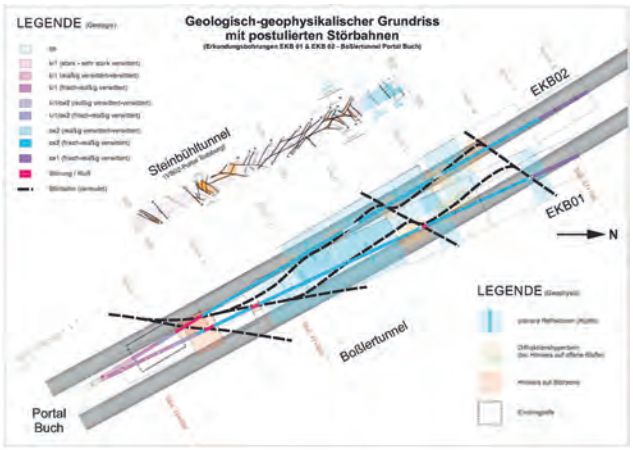
System sketch of exploratory shaft and gallery in the Boßler Tunnel for purposes of advance exploration of forecast squeezing rock areas.
Image: ATA

Exploratory shaft: Depth: 55m, diameter: 8m
Image: ATA

Exploratory gallery: Diameter: 3.6m. For the purpose of advance exploration of tunnel sections forecast to show squeezing rock
Image: ATA

Comprehensive monitoring of all construction stages. In the picture: Measuring systems in the segment to determine utilisation ratio.
Image: ATA

TBM driving through the exploratory section which had previously been executed conventionally in the Umpfen Valley intermediate attack.
Image: ATA



Two horizontal bores each 360m in length with adjacent geo-radar crosshole measurements for purposes of karst exploration in the Buch portal area.
Image: ATA

The long way to the optimised project's implementation in accordance with the construction contract

Apart from the technical challenge of extended driving operations in the Boßler Tunnel, the team also needed to establish the contractual basis and agreements to do so. After all, the contract had originally been largely based on tunnel driving using shotcrete construction. Despite the fact that both client and contractor strived to make preparations for "best case" TBM driving and "worst case" driving scenarios, long negotiations were needed which was a result of the mentioned continuous development of the probably feasible TBM sections and the resulting effects on the construction contract. In the course of four years, more than 15 possible project scenarios had to be dealt with in terms of the construction contract. Despite many technical and contractual setbacks, the feasible TBM sections could be steadily expanded until the TBM had finally reached the Boßler Tunnel's southern portal in 2016.

A total of three contractual agreements on the general implementation of extended TBM driving were created between 2012 and 2016 and could only be finalised with the TBM breakthrough at Buch portal in November 2016. During this time, ATA assumed high technical, contractual and economic risks and had – despite the client's active and pronounced willingness – always been exposed to the risk of the less than secure outstanding verification of its concept.

November 2016 milestone

6 November 2016, following 18 months of problem-free shield machine driving, saw the breakthrough at Boßler Tunnel's southern portal.

Breakthrough of eastern tube on 6 November 2016
Image: ATA

Building on a courageous decision in 2012 and the breakthrough of the eastern tube following 8,760m of TBM driving, the optimised TBM operations in the course of Boßler Tunnel's construction can already be regarded as a great success for all participants.

With its tunnel breakthrough optimisation at Boßler Tunnel, PORR could once again prove the technical know-how and innovative strength of its employees. In this context, we, the project team, would like to thank our motivated and fit team players from the construction execution squad as well as PORR's entire corporate management who, by trusting in its employees and their personal dedication have led this unique, tough and risk-heavy task to successful completion.

Tunnel finishing

Following excavation and inner lining, the tunnels are equipped with lateral emergency walkways containing all the required cable routes with some 425,000 running metres of required cable conduits, lines for fire extinguishing water with a length of some 27,000 running metres and a further 70,000m³ of concrete by 2019. The project furthermore encompasses cross-ways at a maximum distance of 500m from one another. Thus, Boßler Tunnel will be equipped with 17 connections and Steinbühl Tunnel with nine. Just like the main tunnel, the emergency exits' inner shell will be executed in a water-tight concrete construction holding back groundwater, and an outer layer of flexible membrane liners. The emergency exits are equipped with fire-resistant and smoke-tight airlocks. Every second cross-way will additionally feature operation rooms providing the possibility to house railway-related operation equipment as well as extinguishing water tanks needed in the event of an accident.

Structure hand-over – commissioning

The completion of structural work and hand-over of Albaufstieg Tunnels to the client is scheduled for the first quarter of 2019. Commissioning of the entire Stuttgart-Ulm railway project is scheduled for 2021.

Crossing Fils Valley after 8.8km of tunnel
Image: ATA

Exiting from Alb Tunnels in Hohenstadt in the direction of Ulm after a further 5km
Image: ATA

More impressions of Albaufstiegtunnel

Tübbingausbau Boßler tunnel east tunnel 2016
Image: ATA

Access tunnels intersection structure Umpfental to the Boßler tunnel
Image: ATA

Boßler tunnel portal at Aichelberg material conveying
Image: ATA

Boßler tunnel portal at Aichelberg segment production and storage
Image: ATA

Steinbühl tunnel material conveying via the intermediate access
Image: ATA

Emscher wastewater channel, Construction section 40

Bernd Schockemöhle

Project data

Client	Emschergenossenschaft
Contractor	ARGE Emscher BA 40 – PORR Bau GmbH / PORR Deutschland GmbH
Region	Germany/Ruhr district
Construction time	December 2013 – April 2018
Contract value	EUR 144m (net)
Tunnel use	Wastewater channel
Contract components	Mechanised tunnelling, civil engineering, pipe jacking, special civil engineering

Project description

The Emscher is a tributary of the Rhine, some 85km long, which was converted into an open wastewater canal due to the historical development of the Ruhr district. Despite degradation of the ground surface caused by mining, this drainage system was able to ensure an effective and proper discharge of wastewater. As part of the renaturalisation of the Emscher, a 51km channel system was built, which in the future will convey the wastewater underground. The Emscher and its tributaries will thereby be converted into natural waters. The future Emscher wastewater channel (AKE) runs from Dortmund to Dinslaken and carries the incidental wastewater to the treatment plants at Bottrop and Emschermündung (Emscher mouth). A wastewater channel will be constructed as a double pipe system, over a length of about 10km, in the construction section 40 (BA 40) between the pumping station Oberhausen and the mouth of the Berne in the Emscher, west of Bottrop. In addition, nine primary and five secondary shaft structures will be built, as well as four side inlets by pipe jacking.

Shaft SD.033 direct on the Emscher
Image: PORR AG

Tunnelling and pipe jacking

The inner diameter of both the main tunnels is 2.60m, and the distance between the centres 6.20m. The tunnel tubes are produced using tubing methods and full-face machines with earth pressure support. Due to the small cross section, the tunnelling work will carried out in three sections to simplify logistics. The launch shaft of both tunnelling operations forms the intersection of the construction section 20 (BA 20), which was also executed by PORR. The excavation work will take place throughout in the marl ("Emscher marl") and ground water levels. The maximum ground coverage is about 30m. Tunnelling will cross under the A42 and A3 motorways, and various supply lines many times. These areas are particularly sensitive to settlement and require a tunnelling method with minimal settlement.

Two of the side inlets will be produced by compressed air tunnelling with DN1600. The total length is approximately 760m. The other two side inlets with a total length of about 100m will be driven using micro tunnelling with DN600.

View out of the pioneer drift in the direction of the tunnel segment
Image: PORR AG

View out of the pioneer drift in the direction of the launch shaft SD.033
Image: PORR AG

Supply train with segments in the tunnel
Image: PORR AG

Special civil engineering

Before the start of the civil engineering works, it must be ensured that each shaft is free of unexploded bombs or shells. The shafts are produced as slurry wall excavation pits. The excavation depths are between 12m and 40m, and the diameters between 8m and 20m. Due to the high water pressure and fissured marl, relief drilling is carried out to avoid the sole breaking out during excavation. The excavated earth masses will amount to approximately 58,000m³.

Diaphragm wall grabber
Image: PORR AG

Construction engineering

The internal construction of the shafts is performed in reinforced concrete. This requires construction with about 2,200t of reinforcing steel and 22,000m³ concrete. In addition, due to the high demands on corrosion protection, the main shafts will be lined with HDPE plates. Also included in the civil engineering works are the construction of the sole, head beam and ceiling, all partition walls required for the operating state. Clinkering of the drainage channels and locksmith works are also part of the construction engineering works.

PEHD cladding in the shaft
Image: PORR AG

Special features

Due to the elaborate fire and rescue concept, caused by the small cross-section, the nine main shafts must be made immediately accessible as soon as the tunnel boring machines have passed through, creating a particular challenge for the entire construction site logistics and the coordination of work schedules.

Status of the works

Tunnelling work is approx. 75% completed. Both machines have opened up more than 7,700m of tunnel. It is expected that both machines will reach the target shaft at the Oberhausen pumping station in May 2017. The special civil engineering is largely completed. The subsidiary tunnels have also been opened and will be equipped with the necessary media pipes. Meanwhile, construction engineering works have begun on several shafts. The lining, including PEHD panels, has been installed in three shafts. The complex internal shaft walls are now gradually being concreted and are likewise being equipped with corrosion protection in the form of PEHD panels. Since the interior construction is very laborious, it will only be completed one year after the tunnelling works.

Tunnelling machine breakthrough in shaft SD.017 on 28/09/2016
Image: PORR AG

“Glaubtenstrasse” residential complex, Zurich-Affoltern

Maja Rikic / Ralf Miczuga

The project contract

On 26 November 2014, PORR SUISSE AG received the sole contractor contract from HALTER AG for the Glaubtenstrasse building project in Zurich-Affoltern. Included in the contract were the turn-key-ready construction of a total of 20 rental flats, eight condominiums, the associated underground car park and the design of the entire outside facilities. A prerequisite for the construction of the three buildings was the demolition of three existing blocks of flats including the associated remediation of contaminated sites. Work started on 01 April 2015. Turnkey delivery of the entire complex to the clients occurred on 30 September 2016.

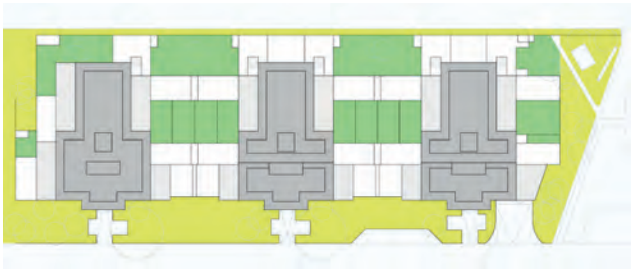
View from a north-westerly direction
Image: PORR AG

Design and design concept

Both the preliminary design and the complete implementation planning for the replacement construction were drawn up by BDE Architekten GmbH. Under consideration of the statutory stipulations, this resulted in a complex of three apartment buildings which harmoniously blend into the existing slope of the neighbouring family gardens. The basic idea of the architectural concept was the maximum use of the living space. The underground car park was therefore situated on the ground floor behind the buildings in the south-easterly slope.

The plots form the transition from the Käferberg landscape with the existing family gardens, meadows and forest. A continuous ground floor base grips the edge of the Käferberg incline and links the facades of the buildings into Glaubtenstrasse. The slight slope allows for a general focus on the countryside as well as directly accessible, private terraces and gardens for many of the flats.

The newly created residential development consists of three separate properties with eight condominiums in building A as well as 20 rental flats in buildings B and C. The rental flat offering includes 2.5 to 4.5 room flats with individual layouts.



Floor plan: Glaubtenstrasse residential complex environment
Image: PORR AG

Construction pit and carcass

Once the remediation of contaminated sites, which accrued additional costs owing to materials which had not been investigated, was completed, the demolition work progressed relatively quickly. Since the ground floor also forms the basement in the slope and the underground car park in the south-east, the excavation support was designed as a nail wall. Thanks to the local conditions, dewatering was not required.

In a period of just four months, from September 2015 to the beginning of December 2015, the structural work was realised using the reinforced concrete method with high-strength precast columns, bracing walls in the stairwells/lift shafts and ceilings. All domestic cables were laid in the 25 cm thick steel-reinforced concrete ceiling, as is standard in Switzerland.

Construction pit
Image: PORR AG

Ceiling inlays above the ground
Image: PORR AG

Cross section of building B
Image: PORR AG

Ground floor, carcass
Image: PORR AG

Building envelope

The three building volumes, which are divided by windows and balustrades, rise from the monolithic concrete foundation.

On the two rental buildings, the split level results in interlacing of the lines of windows and balustrades made from fibre cement. Thus, the lines of windows on the south side become lines of balustrades in the north.

The project meets the requirements of the 2012 Minergie standard. The specifications of this label are fulfilled with regard to the facade with triple insulated wood and aluminium windows and 20 cm of mineral wool insulation. The flat roofs were sealed with bituminous sheeting and extensively planted.

The circumferential lines of balustrades and windows made from Stahlton elements and a special mineral plaster were a particular challenge on the facades. The latter was realised as so-called “Worms plaster”. Through the spraying method, the grain remains visible as such on the surfaces. This results in a rough surface with an even texture.

View of the building B facade / garden side
Image: PORR AG

Interior finishes

The condominiums were furnished according to the buyers' wishes. Support for the future property owners was also undertaken by PORR SUISSE for this project. The rental flats were designed according to the architect's colour and material concept.

The flats are organised around a central core with bathroom, kitchen and coat rack. This is all designed to be non-load-bearing in all flats and is erected like furniture in the space. The core has a monochrome, smooth surface and is offset from the ceiling with a shadow joint. The kitchen, coat rack and doors are coated with synthetic resin, the plasterboard walls are smoothed, sanded and painted.

There are fine colour accents in the incised niches in the kitchen and coat rack. The solid frame doors to the bathrooms are installed flush, with flush closing. All of the rooms surrounding the core received parquet flooring.

On the walls, the ribbon facade theme was also carried through into the interior. While the balustrades, the lower section of the pillars and the ceiling are kept in a neutral white, the windows come together with the curtain board and windowsill, as well as the upper section of the pillars, in a ribbon of warm grey and frame the view of the verdant surroundings.

Condominium bathroom
Image: PORR AG

Rental flat bathroom
Image: PORR AG

Attic flat
Image: PORR AG

Technical building equipment

The energy generation for all three buildings occurs using geothermal probes. The underfloor heating, which is supplied from the geothermal probes, is not only used for heating during the winter period but can also be regulated as comfort cooling in the summer. The controlled domestic ventilation fulfils the Minergie standard requirements. The ventilation in building A can be manually controlled by the owners. The condominiums are equipped with “digitalstrom”, which allows the users to individually control all electronic installations.

Geothermal probes in the floor panel
Image: PORR AG

Summary

A particular challenge of this small but excellent project, alongside the limited space available and the difficult slope stabilisation, was the implementation of the finely ordered facade in a thermal insulation system with Stahlton elements. This connects the three building volumes in question, with their strong circumferential fibre cement ribbons, together into a unit. The design of the terrace-like outside facilities cut into the slope, which allow direct access to their terraces and private gardens for many of the flats, was also very challenging.

The planned Minergie standard with controlled domestic ventilation and heating and cooling supplied by means of geothermal probes, as well as the personal buyer support with the consistent implementation of individual special requests in interior finishes rounded off the requirements profile for the PORR SUISSE AG construction and project management team.

Project data

Gross floor area	12,300m²
Flats	28 flats in 3 buildings / 20 rental flats, 8 condominiums
Outdoor facilities	4,600m²
Underground car park	24 car / 2 motorcycle parking spaces, 750m²
Special features	Turnkey implementation incl. buyer support
Start of construction work	April 2015
Construction time (calculated from carcass completion)	18 months
Carcass construction time	4 months
Completion	October 2016

New Apostolic Church in Zofingen

A modern sacred building in a central location

Andreas Bart

The project

In January 2014, PORR SUISSE AG was commissioned by the Swiss New Apostolic Church to build a new church and a residential building in Zofingen. The commission was preceded by a project competition which the architectural firm Schneider & Schneider from Aarau won. PORR SUISSE AG acted as the sole contractor and took over the planners from the project phase in the implementation phase.

In the new, larger church building, which replaced the roughly eighty-year old existing property, several parishes will be brought together. The new building replaces the approximately eighty-year old building. After the completion of work on the new church, the existing building would be demolished and replaced by a residential building with 24 rental flats. For the realisation of the construction volume, the Swiss New Apostolic Church was able to acquire the unused plot neighbouring the existing church. Church activities needed to be maintained throughout the entire construction time.

Entrance side of the church "lantern"
Image: PORR AG

The construction phase – “From old to new in several steps”

Work started on 22 March 2014. The whole project was handed over on 30 November 2016 (without the outdoor facilities of the residential building). The completion and handover of the surrounding will occur by 30 April 2017 at the latest.

Preliminary work 1 (2014)
Partial demolition of the rearward section of the existing church (approx. 10% on the old building volume) and establishment of a protective and strengthening construction against the existing building.

Stage 1 (2014/2015)
Construction of the new church with associated initial parking garage section and the surroundings of the church.

Preliminary work 2 (2015)
Demolition of the existing church taking the proper disposal on hazardous building materials such as asbestos, for example, into account.

Stage 2 (2015/2016)
Construction of the residential building with associated, second parking garage section and the full surroundings.

A sign of belief cast in concrete

The architectural firm Schneider & Schneider is known for its exposed concrete buildings. The New Apostolic Church in Zofingen was therefore created in bush-hammered exposed concrete, with a monolithic design and without dilation joints. The building fits in with its surroundings and follows the specified limits of its location. The distinguishing feature of the building is its large sacred space which stands out with its narrow, high windows and can thus be seen from afar, like a lantern lit from within. The church appears like a fortress which keeps watch immovably over the junction between Funkenstrasse and Untere Grabenstrasse. It thus creates a modern contrast to the historical centre of Zofingen which it faces and its strong fortifications are easily noticeable among the old buildings.

On the street side, a large window facade invites the faithful and visitors to enter the church and find peace away from the hustle and bustle. The spacious, two-storey foyer welcomes the people and leaves room for encounters. Attached to this is the generous cloakroom, lit from above.

From the foyer, you move directly into the lofty sacred space with a view of the altar. The organ, which does not compete with the altar despite its power, fills the room to far above the windows which begin one storey higher. Behind the sacred space, visitors have the opportunity to make use of the stairs up to the gallery, and thus to observe the church service from an elevated perspective. Behind the sacred space, with soundproof separation but with a clear view of the altar through a window facade, there is a special room for parents with small children who aren’t able to maintain the required level of calm for a whole service but should nonetheless be able to participate.

The sacred space
Image: PORR AG

Back in the foyer, you can get down to the garden level by lift or down the stairs, where there is a large seminar room and two teaching rooms alongside technology and side rooms. These rooms are equipped with broad window facades, the glass doors in which lead into an inner courtyard surfaced with natural stone and bounded by a bush-hammered concrete retaining wall. The rooms also include a spacious coffee kitchen and a flower room in which the floral arrangements and bouquets for church services, weddings and funeral services are prepared. The priests, bishops and apostles prepare for their masses in the sacristy. From the garden level, a staircase and a lift lead down to the parking garage which is available to selected members of the church.

The residential building stands out with its architecture, which avoids competition with the church without appearing inferior to it as a result. The facade is defended against the street and the neighbouring fire brigade base in plastered external insulation with aperture windows, while the rear and garden sides are clad with suspended timer formwork, and expansive window facades look out on the continuous loggias. The building too fits into the surroundings and the existing limits in shape and alignment, whereby a right to build closer to the boundary on the rearward side favours optimal utilisation.

Housing complex
Image: PORR AG

In the interior, two staircases open up the basement, the ground floor and the three upper floors. Using the staircase on the street side, you can reach a reduced space attic floor with two spacious flats.

The total of 24 flats with between one and a half to four and a half rooms are arranged in three wings around the staircases on the standard floors. On the ground floor of the staircase on the street side, there is also a workshop as well as several workrooms and side rooms. The utility rooms, laundry rooms and cellar spaces are located in the basement. From the basement, you can reach the parking garage which is located at the side along the residential property and which connects to the church parking garage.

From plan to reality

Concrete

The church was realised as a double-skinned concrete structure. Originally, the intention was to build the outer shell before the inner in order to be able to form the more important structural element on both sides. During the course of implementation planning and preparation for the construction work, however, this was switched over and the inner shell, including the overlying ceilings, was built first. The quality of the white cement concrete shows that the subsequent single-sided raising of the outer exposed concrete shell was not detrimental. However, it turned out during sample production on the facade mock-up that the original finishing of the concrete with different grades of sandblasting envisaged by the architects did not provide sufficient differentiation and was dropped in favour of a uniform block.

It was not possible to use an in-situ concrete construction in the area of the sacred space lantern described at the beginning. Instead, steel supports were placed on the inner concrete shell and fixed, supporting a roof of steel supports and corrugated sheet without any additional strain. The steel supports were veneered on the outside with prefabricated concrete supports and the edge of the roof was completed with pre-produced concrete elements placed on the concrete supports. The elements were combined into a monolithic roof corona with 60cm wide sections of in-situ concrete.

The monolithic concrete construction specified by the architects and the long lifespan for the building required by the clients presented PORR SUISSE AG and the structural engineering firm Wilhelm & Wahlen from Aarau with a wide variety of challenges. In the corner area, the thickness of the thermal insulation had to be reduced by 2cm in order to be able to take the differing expansion of the inner and outer concrete shells into account without transferring the pressure to the other shell. Likewise, the dilation-free construction resulted in heavy reinforcement in places, in particular for the connecting pieces made from in-situ concrete which join the elements together to form a whole.

The building layout, which was adjusted on the outside to fit the boundaries of the plot, resulted in many

non-rectangular rooms in both the church and the residential building, which brought sometimes laborious formwork stages with them.

In-situ concrete and concrete elements are combined to form a complete work.
Image: PORR AG

Glass mosaic
Originally, the windows for the sacred space were meant to have been overlaid with glass mosaics in the specialists' workshop and before installation in the building. Ultimately, the construction process did not allow for this, the mosaic therefore had to be applied to the fully fitted windows on site. Since the finishing required a high level of cleanliness and very little room for manoeuvre in terms of temperature fluctuations, the scaffold had to be fully clad and heated using three oil-fired furnaces. This required approximately 900 litres of oil per furnace per week over a total period of approx. six weeks.

Window facades
The extensive window facades with little sectioning, frameless external construction and similarly designed door installations required laborious planning before it was possible to present a satisfactory and simple design. The appearance desired by the architects with the narrowest possible joins required very precise structural calculations for the long concrete lintels even during carcass planning in order to keep the sagging under control.

The window facades allow the inside and outside to blend together.
Image: PORR AG

Timber
Doors, fittings and some floors are made from elm. In order to achieve a uniform result, the architects worked together with the joiners commissioned by PORR SUISSE AG to search the veneer traders for two trees to be used for the veneer on all of the wooden doors and furniture. The result is a beautifully consistent overall appearance between all of the woodwork in the church.

The consistent use and well thought out lines of the veneers meet the clients' and architects' high standards.
Image: PORR AG

Natural stone
An Italian silver quartzite was used for the floorings. The polygonal method of laying required an exact and careful approach from the subcontractor. The dilation joints which were unavoidable here had to follow the polygonal stone joints, which is why decoupling mats had to be used over the straight joints in the floating screed.

Marmorino stucco (lime plaster)
In the sacred space, a very light Marmorino stucco was applied to all walls, columns and ceiling ribs. It gives the surfaces a subtle shine. In the column base area, however, it was not possible to manage without joints since slight movements between the solid concrete base and the steel columns clad with plaster half shells must be taken into account. Here, PORR SUISSE is the dividing line between the technically feasible and the artistic requirements of architecture which today pays little attention to the properties of materials and structures.

Residential building
In contrast to the church, the selection of materials for the residential building was kept simpler, although there was still strict and high quality implementation for the design as in the church. Pristine oak parquet flooring, elegant tiles, smooth gypsum plaster on the ceilings and fine rubbing on the walls define the rooms. Clear lines dominate both inside and out.

But in contrast to the church, the facade is characterised not only by material but also by colours and variety. In the interior, the tenants are left with enough leeway to create their own individual oases in the flats.

Building technology – Minergie standard as a requirement

Both buildings draw heat from a ground water heat pump, the pipes of which stretch down into the depths under the church's inner courtyard. This is used to heat the hot water tank, operate the underfloor heating and pre-heat the ventilation for the church. In the summer, the system can be used for cooling. The heating system is located in the church's garden level. The residential building is connected by means of district heating pipes.

The church has LED lighting which conforms to the cutting edge of technology. Intelligent lighting controls make it possible to establish appropriate lighting moods for a variety of ceremonies. In the darkness, the windows of the sacred space are lit from the inside with LED spotlights, allowing for an energy-saving lantern effect at night.

The New Apostolic Church also makes use of the latest communication options. In the sacred space there are induction loops in the floor, making the transmission of sound for those with hearing difficulties possible. Images and sound are also recorded for the church services, and they are broadcast live on occasion. All members of the church therefore also have the option of attending the church services from home. Transmission to the sacristy also makes for a precisely timed ceremony.

In the residential building, all of the flats have their own individual ventilation unit. This technology allows for a pleasant indoor climate over long periods in the flats, even with large gatherings of people.

Telephone, internet and TV are available centrally in the electronic sectioning in each flat. From there, each tenant can transmit the signals, according to their requirements and the options for their subscriptions, to the multimedia sockets in all rooms. Provisions were made for later retrofitting of fibre optic cables.

Construction progress

Following the partial demolition of the existing church and the securing of the remaining structure, the excavation for the new church was dug step by step and, at the same time, the excavation support was established in the form of a nail wall. The first stage of the parking garage was installed just in front of the nail wall and provided with the connection reinforcement for the later addition of the second stage.

The interior concrete load-bearing walls were built over the parking garage floor by floor and completed with the ceilings between floors. Since the architecture called for absolutely invisible routing of all ventilation ducts, electrical, heating and sanitary systems, precise collaboration between the master builder and the building services companies was essential. In particular, attention needed to be paid to good compaction for the solid reinforcement and the countless inlays in order to achieve the required exposed concrete quality.

Ceiling inlays for the building services installations
Image: PORR AG

Floor by floor, the thermal insulation, made from extruded polystyrene, was applied to this and the external concrete skin was raised by means of single-sided skinning. After an idle period of approx. three weeks, the concrete was sufficiently cured for bush-hammering. This lengthy and very demanding work had to be scheduled in stages, as early as possible in all cases.

Erection of the steel structure of the lantern began from the roof above the main entrance. To this end, a multi-storey surface scaffold was set up in the sacred space as a working platform. The individual pillars were superimposed on the wall coping of the inner concrete skin and were screwed onto a fixed structure with previously inlaid threaded rods. From the uppermost platform of the surface scaffold, the steel supports for the roof structure could then be installed and covered with the corrugated sheet.

Lantern / sacred space load-bearing steel structure
Image: PORR AG

In order to meet the short construction time, the flat roof was temporarily sealed immediately, and the tall, narrow windows were installed without mosaic. As a result, it was possible to start the finishing works in the sacred space early, while at the same time the concrete elements, prefabricated and bush-hammered on the construction site in a horizontal position, were installed on the steel supporting structure in the external area.

The edge of the roof, only provisionally sealed, with ongoing concrete work and the ongoing drywall works beneath it led to extensive expansion and alteration of the scaffold in spring in order to prevent the ingress of rainwater.

Enclosure of the facade as preparation for application of the window mosaic
Image: PORR AG

Further scaffold extensions and cladding were required for the application of the mosaic to the window pane since this work was more suited to handicraft in the workshop than to working on a carcass in February and March.

Window facades with mosaic pieces affixed on site
Image: PORR AG

The installation of the large window facades should be mentioned as the final difficult aspect. Following a long planning period and several months of production time, it was only possible to install them one month before completion of the church. As a result, all finishing works in these areas, including parquet flooring, had to remain one metre behind the facade and be completed at the last moment. This shows how early the complex window and facade sections had to be fully planned, approved by the client and ordered. The other finishing works were completed without significant complications. In August 2015, the inaugural church service took place in the new church and the first stage was then completed.

Finishing works in the sacred space
Image: PORR AG

At the beginning of the second stage, the existing church was demolished from August 2015 and the excavation for the residential building was dug. The nail wall to the already completed section of the parking garage was opened and the parking garage was extended. The carcass work for the residential building proceeded slowly because it was necessary to carry out the concrete work in four stages in order to create the oblique-angled floor plan. This resulted in the necessity of temporarily sealing the carcass above the second floor in order to begin the finishing underneath this point while two further floors were being built above it. With these measures and good coordination of the works on the part of the construction management team on site, it was ultimately possible to ensure the completion of the works at the end of November 2016.

Project data

Gross floor area of the church	1,216m²
Gross floor area of residential buildings	3,146m²
Gross floor area parking garage	1,329m²
Residential buildings	24 flats, one workshop and 3 hobby rooms
Plot size	3,201m²
Underground car park	47 car parking spaces
Special features	2 stages, while ensuring continuous church activities
Start of construction work	22 March 2014 (ground breaking)
Construction time	32 months incl. preparation work for both stages
Carcass construction time	Church approx. 8 months, residential building approx. 8 months incl. parking garage per stage
Completion	30 November 2016

Construction of “NOVE” office building in Munich

Achim Mantel

On the last vacant lot in Munich's Arnulfpark, the project company Horus Development GmbH, consisting of Art-Invest Real Estate in joint venture with SALVIS Consulting will erect the NOVE office building.

Contract drafting and planning

PORR Deutschland, Building Construction branch Munich, has managed to be awarded the contract as a general contractor in form of an alternative contract type with GMP on 11 February 2015.

Both the branch's expertise proven in previous projects involving GMP contract types as well as the presentation of almost 40 special proposals, of which 37 were incorporated into the contract, led to their success.

The list of interfaces and clarifications appended to the contract comprises no fewer than 300 individually agreed contractual services.

For this project, PORR Deutschland performed all general contractor services, including planning of the service phase five (implementation planning) for architecture, statics and building technology.

A first, particular challenge for the in-house planning coordination could be found in the integration of the plans specified by the builder into the actual contract with the clients and, at the same time, synchronising the planning status actually in existence with the proposal we submitted - and with commissioning.

Furthermore, we had to integrate the design architect into our work from the beginning.

PORR Design & Engineering in Vienna took care of most of the calculation, tender and planning services when it came to technical building equipment.

In addition, our Munich PORR construction team was supported by experienced building services construction managers from Vienna.

The facade was the only part outsourced to a third tenderer.

PORR leads overall construction with involvement of the on-site facade partner in the form of a roof-consortium.

Vizualitation
Image: PORR AG

Architecture

The new building is supposed to assume a unique position in Munich's office real estate market. In order to meet this demand, the architecture office Antonio Citterio Patricia Viel & Partners from Milan was commissioned with project planning, the planning of the interior as well as lighting planning after winning a competition between seven invited participants.

Citterio, known for its design creations for Hermès Maison, Vitra, Flexform, Arclinea or B&B Italia, allowed for realisation of top class working areas with NOVE.

In terms of city development, NOVE is modelled after an Italian Palazzo. In the centre, two inner courtyards invite tenants and their guests to take a break in a sheltered open-air area. Four equivalent entrances allow for "house inside a house" solutions. Thus, the new construction caters to both major tenants requiring several 1,000m² of office space as well as to smaller users. In total, the ensemble provides space for more than 1,300 jobs.

The facade of the building is the characteristic feature: gold bronze aluminium frames adorn the windows and lend the building a distinctive, three-dimensional structure with an appearance which is elegant at the same time.

From the spacious roof terraces on the sixth floor, you have the opportunity to enjoy distant views towards the foothills of the Alps. Just like the lounge bridges which appear to float in the atrium high above the foyer, they invite you to interact with colleagues and to take breaks.

The one thing which unites previous Citterio projects – such as the five star Bulgari Hotel & Resort buildings in Milan, London or Bali – is the combination of design and efficiency. The interior design and furnishing of NOVE also follow this principle – both were likewise designed by Citterio.

The project was able to obtain the internationally award-winning Swiss landscape architect, who will fill the inner courtyard with water basins and selected plants, for the design of the two verdant inner courtyards and the outdoor facilities.

Construction project

Some 27,500m² of overground and some 18,500m² of underground floor area will be built on the 7,300m² building grounds at Luise-Ullrich-Straße and Lilli-Palmer-Straße. This is distributed across six standard floors which were initially proposed in the contract as a so-called phantom design.

Key highlights of the building are a 23m high atrium which welcomes the company's guests much like a very spacious hotel lobby, a skyscraper wing with nine floors on Luise-Ullrich-Straße and a three-storey underground car park with around 430 parking spaces.

The atrium
Image: PORR AG

The building thus embeds more than 12m into the Munich gravel bed, thus naturally requiring the careful design of a "white tank".

The excavation at the beginning of construction
Image: PORR AG

The total height of the skyscraper from the ground floor up to the eighth floor is approx. 34.60m; the low-rise building from the ground floor to the fifth floor has a total height of approx. 23m and a height of approx. 27m with the superimposed staggered floors. The grid axis for the office buildings is 1.35m.

Four tower cranes, the load capacity of which was sufficient to assist the ARGE partner with erection of the facade, were used for accomplishment of the erection of the carcass on the construction site.

The major construction site at the turn of the year 2015/2016
Image: PORR AG

Owing to the very constricted inner city location, it was necessary to establish a complex delivery management system. Both for the carcass and in particular for finishing, PORR logistics specialists ensured almost problem-free just-in-time delivery of the necessary building materials.

At peak times, there were almost 200 people working on the carcass. The completion of the carcass was held precisely to 8 December 2015.

The roofing ceremony in 2015
Image: PORR AG

External view in spring 2016
Image: PORR AG

The construction site is currently in the final phase of basic finishing, with completion of the functional building on 31 January 2017 with the exception of the rental units.

At the beginning of December 2016, 48 finishing companies with up to 400 employees and 26 members of the construction management team were working on the project.

The first rental unit will be handed over on 15/02/2017. A total of almost 10,000m² of rental space will subsequently be completed up to 1 April 2017.

The ground floor's public area consists of the previously mentioned spacious atrium, a restaurant and two inner courtyards which are available to both tenants and visitors.

One of the inner courtyards, December 2016
Image: PORR AG

The majority of the building is comprised of office space meeting very high construction standards in terms of both technical equipment and surface quality.

So, for example, all interior doors are flush-mounted with an exposed joint of just a few millimetres, attached to the interior walls. The interior walls themselves are partially clad with natural stone or even wood-panelled.

A precisely specified joint ensures that the flows and lines of the natural stone exterior facade can be found again, flush and without misalignment, in the interior facade. Ultimately, the entire laying of the natural stone facades is thus oriented towards neuralgic constraint points such as the lift portals or the four entrances.

Almost all of the materials installed are of similar quality to those in a five-star hotel and thus also reflect the builders' expectations that PORR would build an office building which has no equal.

Heating and cooling ceilings ensure a constant work climate in the office units and, designed as suspended ceilings, guarantee the greatest possible degree of flexibility with a clear room height of approx. 2.90 m. The technical facilities and storage areas are located in the basements next to the parking spaces.

NOVE has been designed as a "Green Building". LEED Platinum certification is intended. This required sustainable state-of-the-art building methods. Naturally, the new construction also meets the requirements towards energy-efficient building operation.

The building is located in close proximity of the Donnersberger-Brücke high-speed railway station in Arnulfpark. The main station is within walking distance and an access to Mittlerer Ring ring road is located at the next junction. The airport is roughly 130 minutes away by car.

At total of 247,000m² of gross floor area has sprung up on 185,000m² of gross development area in Arnulfpark in recent years. Of this, 172,000m² is commercial space, 68,000m² is residential space and 5,000m² is for cultural facilities.
With the realisation of the “NOVE” project, PORR marks the highlight and conclusion of the development of this district.

NOVE is scheduled to commence operations with the handover of the first rental unit in the middle of February 2017. The rest of the rental finishing will also be perfomed by PORR around the end of the 3rd quarter.

Project data

Client	Projektgesellschaft Horus Development GmbH
Start of construction work	April 2015
Handover	February 2017
Gross floor area	46,000m²
Gross building volume	185,000m³
Number of floors	3 basement floors, 8 upper floors
Parking spaces	430

U4 modernisation, west track section

Sub project renovation of the superstructure and substructure 2016

Lorenz Schluder, Georg Pleva

Project data

Start of construction work	04/04/2016
End of construction	Primary construction time: 04/09/2016 Secondary construction time: 23/12/2016
Client	WIENER LINIEN GmbH & Co KG
Contractor	ARGE U4 West
Order volume	approx. EUR 29m
Excavation	37,000m³
Double track section	3,800m
Cable conduits	8,000m
Cable trough	7,500m
Stations renovated	4
Platforms rebuilt	7
New operations buildings	2

New points system
Image: PORR AG

The modernisation of the approx. 4 km track section of the U4 from Hütteldorf to Schönbrunn was completed with an operational shut-down of just four months (May 2016 to August 2016). Just 3.5 months were available for the construction works.

General information

In Vienna, the U4 has connected the west to the centre and the north of the city for many decades and has run on the former line of the Wiener Stadtbahn (Vienna Metropolitan Railway) without any significant interruptions since then. Owing to a lack of points, which would have allowed for two-way track operation on this stretch between Hütteldorf and Schönbrunn, significant delays have resulted, until now, when faults occurred on the U4.

The rationale behind the renovation was the installation of additional points, as well as renovation of the entire substructure. This included the installation of a reliable drainage level and new central and side drainage.

The time frame for the renovation, at just four months, presented the project team with a challenge in terms of logistics and technical construction process.
PORR-Bahnbau took this challenge on together with a qualified partner in the consortium (ARGE U4 West).

Installation of the bituminous base layer for drainage
Image: PORR AG

Project description

The contract section was divided into three sections: arch renovation, construction section 1 from Ober St. Veit station to Braunschweiggasse station, and construction section 2 from Braunschweiggasse station to Hietzing station.

The underground track on the U4 line is located in the Wiener Westeinfahrt (Vienna West Gateway) area between Hietzinger Kai (Hietzinger Quay) (main road with 3-4 lanes) and the "Wienfluss" (Vienna river). The client's plan was to process the delivery of materials through Hietzinger Kai and organise both the removal or excavation materials and the provision of the substructure and superstructure materials through vertical delivery points. The strain on the surrounding road network, in particular Hietzinger Kai, as a result of the site traffic and lifting works, into and out of the underground trench would have been significant. In addition, massive disruptions to traffic would have needed to be taken into account as a result of the additional bus route U4Z in operation during the building works. We therefore entirely rethought the operation plan proposed by Wiener Linien and were able to offer the customer a construction process which was significantly more efficient in terms of logistics: we wanted to also use the riverbed of the Vienna river as an additional access road.

Arch renovation
The arch renovation was an approx. 120m long section in which the U4 is routed in an elevated position and which is flanked on one side by the "Vienna river" and on the other side by Hackinger Quay. In this construction section, the challenge lay in delivering the excavated floor material and floor replacement material vertically and therefore avoiding interrupting the flow of traffic on the biggest entry road from west Vienna.

Vertical delivery in the arches
Image: PORR AG

Construction section 1
At 2.5km, construction section 1 was the largest track section. The underground line was routed underground here, in a trench between the Vienna river and Hietzinger Quay. This section was worked on as a line construction side with three spearheads. In order to keep traffic disruptions as a result of the lorry traffic on Hietzinger Quay to a minimum and ensure a speedy construction process, the project team decided to establish an entrance at the beginning of the construction section as well as an exit ramp at the end and to direct lorry traffic through the trench. The trench was divided up lengthwise, with one side service as the work side and the other service as a traffic lane. High quality logistics were required in order to coordinate all of the incoming and outgoing deliveries, whether of excavation material, bulk material, concrete for the platforms, formwork transportation, prefabricated parts, cable troughs, cable conduits or other materials deliveries.

Working area on the left, road on the right
Image: PORR AG

Site traffic in the trench
Image: PORR AG

Construction section 2
In construction section 2, the same services as in construction section 1 were required, but over a shorter track section of approx. 1.3km. In this project section, it was not possible to install a line construction site since there was no possibility of setting up another ramp with an exit option on Hietzinger Quay. Here, the existing ramp was adapted and converted into an entry and exit ramp. In addition, two vertical delivery points were established in order to supply the construction site. The delivery and removal of materials was achieved using these vertical delivery points and an adapted ramp.

Vertical delivery point in construction section 2
Image: PORR AG

Building works carried out

Substructure renovation

The 3.5km long substructure renovation was divided into the track section, station sections and the section with the turnaround before Hietzing. In these sections, the entire superstructure and approx. 80cm of the substructure was replaced and a drainage level of bituminous roadbase and wearing course was put in. Approx. 7,500m of cable conduit was laid in the substructure for signalling technology and the electrical connection.

Superstructure renovation

During renovation of the superstructure, the rails and sleepers were removed and prepared for re-installation in a rented storage area. In addition, all of the track ballast was removed and largely reused in the substructure renovation. An approx. 5,000m long cable trough was created for the cables and as an emergency escape route.

Civil engineering works

The civil engineering works included the renovation of four stations. In the process, a majority of the platform structures were broken up and rebuilt. Two new operations buildings were built at the Braunschweiggasse and Ober St. Veit stations.

Traffic in the station area
Image: PORR AG

Arch renovation

The front of the arches was secured using an anchor and the water permeable brick arches were sealed to the height of the apex of the vaulting using concrete panels.

Particularities of the building project

One of the objectives of the building project was to recycle the greatest possible amount of the excavation and demolition materials and reuse them after processing. The aim was to save on resources and avoid placing unnecessary strain on the surrounding road network with our massive lorry traffic. The use of recycled material was beneficial from both an ecological and an economic standpoint.

The difficulty of renovating an underground line lies in particular in the fact that it is not possible to compensate for the closure of a section of underground using other public transport since underground systems are far and away the most efficient for of inner city transport. The closure, and as a result also the construction time, was therefore extremely limited.

Due to the fact of the extremely short construction time, we decided to boost our team with two construction schedulers who monitored the progress of construction hourly and thus made meticulous time control possible for us. The smallest deviations could therefore be remedied quickly and subsequently be documented in great detail. Weekly reports on the current situation for each construction section were provided to the client.

From the beginning of the construction measures, the client, the planners and we ourselves needed to recognise that the building structure which we encountered had a continuous concrete panel in the arch section where there should have been no external protective material. Underneath the platforms, we were in places still digging out the old concreted platform edges which weren't meant to exist any more.

Our construction process plan therefore had to be completely reworked of construction measures.

As previously mentioned, Wiener Linien's plan included delivery via Hietzinger Quay. This proposed solution – using the riverbed for the delivery of materials – was approved by the authorities subject to numerous constraints. So, for example, it had to be possible to clear the riverbed completely within 60 minutes since the water level could rise quickly within just a few minutes in bad weather, in particular in the event of storms in the western drainage basin.

In order to minimise idle periods as a result of a traffic overload in the area around the construction site and to avoid peak periods, we also used the underground trench as an access road. Just after Aufhof, the site traffic diverted into the trench via a ramp, and it left the trench again via a ramp near the Hietzing district court after Braunschweiggasse station.

In order to be able to comply with the required construction time, three construction teams needed to be served by entry and exit ramps in the underground trench at the same time. Simultaneously, all of the works in the station areas had to be carried out. In the trench, it was not possible for work units to pass owing to the confined conditions. This held an enormous risk since it was clear to us that if we did not get to grips with simultaneous delivery to the three construction teams and the stations then additional pushing of the work would not be possible. This meant that there was no plan B.

Summary
Despite an extremely short construction time and several surprise in the state of the old underground line, PORR and its partner ARGE were able to meet all of the deadlines and hand the renovated stretch back over to the client on time. This was the cornerstone for the U4 being able to resume normal operations for the start of school on 5 September 2016.

Topping out ceremony at the Bałtyk building

A new office building in the very centre of Poznań

One of the architectural highlights is the irregular building shape with cascade-like patios.
Image: PORR AG

The slanted walls make the building look different on each side.
Image: PORR AG

By this time, the building has already reached its target height of 66m.
Image: PORR AG

On Friday, 17th June, the topping out ceremony at the Bałtyk Building – a new office building in the very centre of Poznań – took place.

At this time the inhabitants of Poznań have been able to observe the progressive construction stages of the new office building for several months. Having reached the target height of 66m, a topping out ceremony was organized which marked the end of a key stage in performing the project. The meeting provided an opportunity for expressing thanks to the employees at the building site for their commitment and intensive work.

About 200 employees from the Bałtyk construction site took part in the topping out ceremony, representatives of the investor – Sophia sp. z o.o. – and representatives of the general contractor and partner companies involved in the execution of the object.

The Baltic Building consists of 16 above ground floors intended for office and commercial use, and three underground floors including garages and technical rooms. The object will occupy a total area of 30.650m².The irregular building shape fits into the marked building setback and the cascade-like observation decks on the southern side and slanted walls in other places make the building look different on each side. The main building entrance has been exposed by undercutting the body of the building.

The architectural design of the Baltic Building was developed by one of the best architect studios in the world – the Dutch company MVRDV – in cooperation with the Polish architects Natkaniec Olechnicki Architekci and the structural engineers AKON. The company in charge of the lease of office and retail space is Garvest Real Estate.

Information on the timeline

- Site takeover: 31st October 2014
- Beginning of works: November 2014
- Planned completion date: 1st quarter of 2017

Quartier Belvedere Central

Laying of the Foundation Stone at QBC 3 and QBC 4

Image: Zoom VP.AT

Karl-Heinz Strauss (CEO of PORR AG), Ernst Vejdovszky (Chairman of the Board of S IMMO AG), Peter Bartos (Managing Director and partner of BDO Austria GmbH), Claus Stadler (COO of UBM Development AG) and Josef Kaindl (Deputy District Leader for the 10th district) at the symbolic laying of the foundation stone
Image: Philipp Lipiarski

Image: PORR AG

Roughly one year after the laying of the foundation stone for the first part of Vienna's "Quartier Belvedere Central" (in short: QBC) project, the ceremonious laying of the foundation stone for the next projects, the two office buildings QBC 3 and QBC 4, was held on 24 June 2016, once again in bright sunshine. Even before construction started, QBC 4 had been sold to the renowned tax counselling and auditing firm BDO and the first rental contracts for QBC 3 had been signed.

DI Claus Stadler (COO of UBM Development AG) and the Chairman of the Board of S IMMO AG, Mag. Ernst Vejdovszky greeted the more than 100 guests, among which clients, architects, investors, project partners and representatives of the executing companies. Managing Director and partner of BDO Austria GmbH, Peter Bartos, highlighted that the perfect infrastructure in central location with quick connections to both the city centre and the airport as well as its immediate proximity to the main station were the decisive factors that spoke for BDO Austria's new location.

The deputy district leader for Vienna's 10th District, Josef Kaindl, thanked all participants who have helped to develop and turn the formerly dreary area around Südbahnhof station into a new city quarter worth living in.

PORR's CEO Karl-Heinz Strauss, who stressed the excellent atmosphere between the project partners as well as the good collaboration with the City of Vienna, was in charge of the concluding remarks preceding the joint laying of the foundation stone. He is confident that construction will start soon on QBC 6 (a residential building).

Projects QBC 3 and QBC 4
By autumn 2017, some 9,000m² of gross floor space used for office and commercial space will be created at QBC 3. Plans include a restaurant and shops on the ground floor as well as offices on the eight upper floors. QBC 4 has a gross floor space of some 20,000m² and is scheduled to be completed in late 2017. The two buildings share an underground car park which will feature 700 car parking spaces for the entire project. A special highlight of these two eight-storey buildings are their roof terraces which can be used by all tenants and which provide views of Vienna's skyline.

The two construction projects received a platinum pre-certification by DGNB / ÖGNI as early as October 2015 for their ecological, energy-related and social real estate development.

Execution
PORR Bau GmbH was commissioned as a general contractor and implements the project – just like QBC 5 – in the framework of an internal joint venture formed by the Departments of Large-Scale Building Construction Projects and the Vienna Building Construction branch / New Construction 1.

PEMA-Tower no. II

PORR Bau GmbH, Tyrolian branch office, receives largest building construction order in the branch's history

Visualisation
Image: renderwerk.at

Following lengthy negotiations the contract for "PEMA II", the largest building construction project in PORR Tyrol's history, was signed on 20 June 2016.

The project includes the construction of a complex housing the city library and 173 student flats as well as a public culture platform for the city of Innsbruck. PORR processes this general contractor order as part of a consortium including the companies Elin and Ortner. Just the façade will be directly contracted by the client.

The starting signal for the building construction project was given on 28 June 2016 by the client and PEMA's boss Mag. Markus Schafferer and Mayor Christine Oppitz-Plörer.

Even though an order of this magnitude in the middle of Innsbruck represents a great challenge, all participants are already looking forward to it. Rumour has it, after all, that, apart from the towers PEMA I and PEMA II, discussions about a PEMA III project in the close vicinity of the bus terminal are already happening.

Starting signal for Austrian Makita headquarters with logistics centre

Ground-breaking ceremony in Fischamend

From left to right: Stefan Meszar (PORR Bau GmbH, Group Manager for Lower Austria), Werner Lasek (Makita Operations Manager), Mag. Thomas Ram (Mayor of Fischamend), Nobuo Katamine (General Manager of Makita Austria), Dr. Günther Ofner (CEO of Flughafen Wien AG), Master Builder Ing. Johann Aigner (PORR Bau GmbH, Head of Lower Austria Building Construction Department), Ing. Dieter Haderer (PORR Bau GmbH, Branch Manager for Wiener Neustadt)
Image: Makita

24 June 2016 saw the starting signal for the construction of the new headquarters of Makita Austria in the town of Fischamend. Symbolically, the ground-breaking ceremony was conducted in the presence of Nobuo Katamine, General Manager of Makita Austria, Mag. Thomas Ram, Mayor of Fischamend, Dr. Günther Ofner, CEO of Flughafen Wien AG, Werner Lasek, Makita Operations Manager, as well as the representatives of PORR Bau GmbH Johann Aigner, Dieter Haderer and Stefan Meszar.

PORR Bau GmbH's Wiener Neustadt branch builds an office building and a 16-m-tall storage hall measuring 12,000m² in size on a 23,000m² lot. The contract includes the erection of a carcass, the facades and the roof structure.

The construction time for the storage hall is five months, the office building including facade will be erected in eight months. Starting in June 2017, the new Makita Austria headquarters will house the sale of the brand's wide range of power tools and garden products all over Austria and Eastern Europe.

The town of Fischamend's industrial estate is located in the immediate proximity of Vienna International Airport. Makita Austria thus boosts the growth of business in this region.

The hall provides space for the storage of some 18,000 pallets. Furthermore, 2,000 floor positions, a zone for commissioning processes and packaging, dispatch and receipt, an accessories storage, a workshop for equipment repairs and an administration wing for some 60 employees are created at the site.

Apart from goods receipt and dispatch via the loading yard, there is supposed to be a structural connection between the interim storage area and Cargo Partner's adjacent premises to the west. The customer area consists of a show room some 500m² in size, a similarly sized demonstration room used for training purposes and demonstrations as well as the repairs receipt and retail area.

The Makita logistics centre is being planned by the architectural office of ATP Vienna.

Ground-breaking ceremony at Brünner Straße residential complex

From left to right: Thomas Herbst (PORR), Michael Zeiler (DWK), Roland Pichler (DWK), Georg Papai (District Leader), Josef Knötzl (architect) and Martin Schilling (PORR)
Image: PORR AG

The ground-breaking ceremony for the erection of the residential complex at Brünner Straße 124 in 1210 Vienna was held on 5 July 2016.

For its client “DWK – die Wohnkompanie”, PORR Bau GmbH’s Vienna Building Construction branch builds 124 flats with a total floor space of 8,700m², a separable commercial area some 1,100m² in size as well as an underground car park with 58 parking spaces for cars and three for motorcycles.

The project is located at the corner of Brünner Straße and Siemensstraße in the heart of the Jedlersdorf area, not far from the new Krankenhaus Nord hospital and Siemens City, in an established residential area with excellent infrastructure.

The residential complex is scheduled to be completed in November 2017.

The ground-breaking ceremony was carried out by Thomas Herbst (PORR), Michael Zeiler (DWK), Roland Pichler (DWK), Georg Papai (District Leader), Josef Knötzl (architect) and Martin Schilling (PORR).

The official ground-breaking ceremony was followed by snacks and refreshments as well as entertaining talks at hot summer temperatures.

PORR wins first tunnel tender in Norway

Order volume: around EUR 36m

The Liafjellet, through which the longer of the two tunnels will run, has a height of 925m.
Image: PORR AG

Vienna, 29 August 2016 – PORR Nordic Construction Norge (PNC Norge) has been awarded a tender by Nordland Fylkeskommune/Statens vegvesen to build a 5.5km-long stretch of County Road 17 in the county of Nordland. The road is set to run through two tunnels. The order is worth around NOK 340m (= EUR 36.3m).

“We faced fierce competition on this project; in the end the client chose us because of our internationally renowned expertise and extensive experience in tunnelling and road construction”, Karl-Heinz Strauss, CEO of PORR AG, on the first tunnel tender acquired in Norway. “The tunnel through the Liafjellet requires particularly extensive technical and local knowhow: this is why we are drawing on the bundled expertise of the PNC Norge team, the specialists in the PORR Group and on established local partners”, continued Strauss.

County Road 17 runs between Liafjellet and Olvikvatnet. The current route is at risk of avalanches. This is why the route of the new section will comprise a 1.9km-long tunnel through the Liafjellet Mountain, as well as an additional tunnel with a length of 360m to Lake Olvikvatnet. The road will have a width of between 6.5m and 8.5m. Work will begin in the coming weeks and completion is set for summer 2019.

Project data

Project type	Tunnelling and road construction
Scope of services	Building a 5.5km-long stretch of road and the two tunnels through which the road will run
Order volume	NOK 340m (= EUR 36.3m)
Client	Nordland Fylkeskommune/Statens vegvesen
Contractor	PORR Nordic Construction Norge (PNC Norge)
Construction start	Autumn 2016
Completion	Summer 2019

Laendyard – Construction work begins on 270 more apartments by the Vienna Donaukanal

F.l.t.r.: Karl-Heinz Strauss (CEO PORR AG), Marion Weinberger-Fritz (Executive Board Raiffeisen Vorsorge Wohnung GmbH), Elisabeth Binder (Executive Board Raiffeisen Vorsorge Wohnung GmbH), Erich Hohenberger (District Director Vienna Landstraße), Daniel Jelitzka (JP Immobilien), Florian Nowotny (Management Board Member CA Immo)
Image: CA Immo/APA-Fotoservice/Schedl

The concept of Laendyard effectively combines an urban location with elegant architectural design, individual scope and open spaces for relaxation.
Image: CA Immo

Joint venture partners JP Immobilien and CA Immo have officially commenced the building of 270 owner-occupied and investment apartments on Erdberger Lände by symbolically breaking the earth. Together with the Wohnbau Süd residential complex, which has been under construction on the same site since the spring of 2016, around 500 rental and owner-occupied apartments will be created in the Laendyard district by 2018 – a prime, centrally located quarter close to the Lände and Wiener Prater recreation areas.

Daniel Jelitzka, Managing Director of JP Immobilien, Florian Nowotny, Management Board member at CA Immo, Erich Hohenberger, district director for Vienna Landstraße and Karl-Heinz Strauss, the CEO of PORR, symbolically broke the ground for the project on 9 September 2016. The residential complex will comprise some 270 owner-occupied and investment apartments designed by architects MALEK HERBST in six separate buildings forming an L-shaped structure, in the centre of which will stand a re-imagined traditional village square. The range of residential options is wide, encompassing everything from small flats and spacious loft apartments to split-level townhouses with private gardens. Approximately 1,000m² of retail outlets and restaurants completes the picture.

The Laendyard district: around 500 apartments constructed by 2018
The Wohnbau Süd residential complex, comprising 220 rental apartments and 142 parking spaces on Haidingergasse, has been under construction since the start of May 2016. Now the entire Laendyard quarter is under development with the start of construction for the second residential complex right by the Donaukanal.

By the spring of 2018, some 500 apartments spanning 40-150m² will be built according to an architectural concept devised by BEHF and MALEK HERBST. All apartments will come with private balcony, terrace or garden. The Wohnbau Süd project will be developed by CA Immo on behalf of ESTRELLA Immobilieninvest AG, a property company belonging to the Karl Wlaschek private foundation. JP Immobilien will be exclusively responsible for marketing the whole of the Laendyard district.

Location and transport connections
With an unobstructable location on the Donaukanal, the city and the airport are just minutes away; it is a five-minute walk to the U3 underground line and Vienna University of Economics and Business. The location is also ideal for cyclists thanks to the nearby intersection of two national cycle paths. The Wiener Prater is a stone's throw away thanks to a pedestrian and cycle bridge crossing the Lände in front of the building.

Facts and figures: the Laendyard residential district

- Approximately 500 apartments
- 30,000m² of usable space for residential purposes
- 1,400m² of retail space
- 300 parking spaces
- 1,500m² of undeveloped space
- Ownership and rental models
- Apartments spanning 40-150m²
- Start of construction: Late summer 2016
- Completion: Start of 2018

PORR Industriebau is building a semiconductor factory for Infineon

View of the new factory with its ultra-clean rooms
Image: Advanced Engeneering (Asia)

First August PORR Industriebau GmbH signed a general contractor agreement with Infineon Technologies AG on the construction of an extension building H17 at its Regensburg location where it produces semiconductors.

The basis for this was, among others, PORR Industriebau GmbH's extensive experience in the construction of semiconductor factories in Germany. The contract includes the turn-key-ready construction of a production building with four levels, including design in a period of just 11 months. Interior fit-out includes the construction of some 2,000m² of ultra-clean rooms.

Clean and ultra-clean rooms are particularly required for special production methods, above all in semiconductor production, where particles in normal ambient air would disrupt the structure of integrated circuits at a scale of fractions of micrometres.

Other fields of clean room application or clean room technology include optics and laser technology, the aerospace industry, life sciences as well as medical research and treatment, research and sterile food and drug production as well as nanotechnology.

A comparison: particles in the air and particles in a clean room

- 1m³ of air in the vicinity of a smoker contains up to 100,000,000 particles > 0.5 µm
- 1m³ of city air (zone 30) contains up to 500,000 particles > 0.5 µm
- 1m³ of air at the North Pole contains up to 10,000 particles > 0.5 µm
- 1m³ of air in a class 100/ISO 5 clean room contains a maximum of 3,520 particles > 0.5 µm
- 1m³ of air in a class 1/ISO 3 clean room contains a maximum of 35 particles > 0.5 µm

Particularly worth mentioning when it comes to the construction is the construction concept's implementation which was based on the foundation plate with waffle tables and shear forces for stabilisation purposes to exclude any dynamic building vibration.

To make sure the tight schedule could be met, 85% of all concrete elements were executed using pre-manufactured parts.

“Rotes Rathaus” in Berlin

Topping-out ceremony for new U5 underground station

From left to right: Mr. Maik Kopsch (Sub-Project Manager BRH Projektrealisierungs GmbH U5), Dr. Hischam Fouad (Managing Director of PORR Germany); Ute Bonde (Managing Director of Finanzen Projektrealisierungs GmbH U5), Jörg Seegers (Managing Director of Technik Projektrealisierungs GmbH U5), Heinz Peyer (Site Supervisor with PORR Germany)
Image: PORR AG

The Gap Closure U5 project extends the previous underground line 5 from Alexanderplatz to Brandenburg Gate right through the centre of Berlin and there, connects it with the U 55 line. One of three new underground stations is built right in front of “Rotes Rathaus” (“Red City Hall”) and will in the future bear its name.

In the course of the completion of the “Rotes Rathaus” underground station, BVG/Projektrealisierungsgesellschaft GmbH U5 invited 300 guests to a roofing ceremony on 7 September 2016.

Guests in attendance included Michael Müller, Mayor of Berlin, the head of board of Berliner Verkehrsbetriebe, Dr. Sigrid Evelyn Nikutta, the management of PORR Deutschland GmbH, Dr. Hischam Fouad and many representatives from politics and the economy.

The 30m-deep and waterproof construction pit and the carcass of the two-storey underground station including the connection to the existing tunnel could be completed on schedule.

In their speeches, Mayor Müller and the head of the board of BVG, Ms. Nikutta, highlighted PORR’s high quality of execution, in particular the “mushroom cap” columns, and thanked the participants for the project’s on-schedule completion.

In PORR Site Supervisor Heinz Peyer’s ceremonious roofing speech, he thanked the client and all builders involved, expressed the wish that the underground station "Rotes Rathaus" may stand forever and inaugurated the latter in the manner of his profession.

Ground-breaking ceremony for Warngau junction, Southern Bavaria

At the ground-breaking ceremony, from the left: Vice President of the Provincial Government Maria Els, Mayor Klaus Thurnhuber, Deputy County Commissioner Ingrid Pongartz, Federal Minister of Transport Alexander Dobrindt, Bavaria's Minister of Economy Ilse Aigner, Member of the Bundestag Alexander Radwan, Wolfram Wurdinger (PORR Bau GmbH, NL Tirol)
Image: PORR AG

Important guests at the ground-breaking ceremony on 12 September for the extension of the Warngau junction on the B 318 in Southern Bavaria close to Lake Tegern.

Marking the most important connection between Munich and Lake Tegern, the B 318 is being lowered along a length of 900m by a bidding consortium under PORR Bau GmbH´s, NL Tirol (formerly TEERAG-ASDAG AG) technical leadership. It will in the future run below a green bridge on which the county road MB 19 (Bahnhofstraße and Taubenbergstraße) including a bike- and walkway will run. This project marks an extension that does without crossroads. The two roads will be connected by means of horseshoe bends. First preparatory work is already underway, among others on the temporary carriageway west of the B 318.

Federal Minister of Transport Alexander Dobrint as well as Bavaria's Minister of Economy Ilse Aigner underlined the importance of the B 318 extension in Warngau as well as further projects in the surrounding area such as the Holzkirchen, Waakirchen and Gmund bypass as well as the four-lane extension of the B 318 in accordance with the BVWP (the German Federal Transport Infrastructure Plan).

This project once again shows that PORR, with its area construction manager Ing. Wolfram Wurdinger and his team, has established itself well in the Southern Bavarian region and thus, this construction scheme worth some EUR 4.8m will also be executed to the full satisfaction of the client until summer 2017.

Quartier Belvedere Central

Topping-out ceremony QBC 5

Concentrated PORR power and a great atmosphere among the project team's members on location
Image: PORR AG

From left to right: Claus Stadler (UBM), Yannick Wagner (Vice President Development AccorHotels Central Europe) und Karl-Heinz Strauss (PORR CEO)
Image: PORR AG

The Gleichenbaum ("topping-ou tree") at sunset
Image: PORR AG

The carcass stands: After 14 months of construction, UBM's Board of Directors expressed its thanks to the project partners and some 120 attending workers in the framework of the topping-out ceremony which was held in the future restaurant area of the Novotel hotel Wednesday, on 14 September 2016. The first construction stage of Quartier Belvedere Central is bang on schedule and budget. The keys to the 63-metre-tall building are supposed to be handed over in May 2017.

144,000 hours of work, 29,000m³ of concrete, 3,800t of steel, 3.5km of threaded rods and 19 finished storeys: The topping-out ceremony in the carcass of the two new buildings belonging to AccorHotel Group (ibis and Novotel) next to Vienna Main Station was a great opportunity to thank the project participants and workers for their dedication, commitment and work.

In their speeches, UBM CEO Claus Stadler, Vice President Development AccorHotels Central Europe Yannick Wagner and PORR's CEO Karl-Heinz Strauss particularly highlighted the workers' excellent performance and the exemplary collaboration between all project participants.

With its three-star ibis hotel and the four-star Novotel hotel, AccorHotel Group wants to create a comprehensive range of accommodation offers for families, city and business travellers. 576 state-of-the-art rooms and an approx. 1,800m² event area with ballroom and conference rooms are created on a gross floor space of 27,300m². The two hotels' opening which is scheduled for next year raises the number of AccorHotels in Vienna to more than 20.

Before Site Supervisor Franz Sömenek received the Gleichengeld (a traditional gift of money as part of the topping-out ceremony) on behalf of the workers, the party's official part ended with the topping-out verses spoken by an apprentice who then took a hearty gulp of wine and – according to ancient tradition – threw the glass on the ground which is said to bring luck. After that, the party's some 250 guests let the evening come to an end with food and drink.

Europaallee Zurich – Development site F

A rather special laying of the foundation stone

Laying of the foundation stone
Image: PORR AG

Hubert Seifert, Managing Director of PORR SUISSE AG
Image: PORR AG

The time capsule is marvelled at, well attached and subsequently lowered into the construction pit while Alpine horns are player in the backround.
Image: PORR AG

Image: PORR AG

On 14 September 2016, one of the last hot late summer days, we celebrated the laying of the foundation stone for development site F of Europaallee in Zurich together with guests invited by the client, the Swiss National Railways (SBB).

Following a welcome speech by Jürg Stöckli, Head of SBB Immobilien, architect Roger Boltshauser presented interesting details. The last was Hubert Seifert, Managing Director of PORR SUISSE AG who asked all participants to implement this challenging construction scheme accident-free, safely and on time.

A rather special laying of the foundation stone
Perhaps because this is not any project but the last step in the completion of a new district called Europaallee in the centre of Zurich, the obvious approach was to stage something special, something lasting for all participants and onlookers.

For this reason, SBB had worked out something truly special. Why not collect and store the impressions of people today, in the year 2016? This is just what “sozial-artistisches Stadtlabor” has done. Thus, everything that seemed worth storing was collected for the duration of an entire day. The initiator assured us that the smorgasbord even includes a piece of pizza to make sure future generations can see what lunch at Europaallee in the year 2016 looked like.

Meticulously and using high levels of skill, the capsule was attached to a crane and ceremoniously lowered into the construction pit by Messrs Stöckli, Boltshausen and Seifert. And since such moments call for a proper musical backdrop, an original Swiss Alpine horn duet put us in the right mood.

A successful laying of the foundation stone, a moving start and one of the last hot late summer days that, unfortunately, couldn't be preserved in the time capsule, but will remain in our memories.

We would like to thank all participants for the extraordinary occasion.

Europaallee – all important facts at a glance:
Already, Europaallee, in the heart of the city, represents a central node for many Zurich residents as well as many thousands of through-travellers and tourists alike. Located directly at the city’s main station and featuring many cafés and restaurants, shops, flats and, of course, banks, it offers a platform that merges tradition and innovation. A district that, once all eight stages are complete (four of which are currently occupied already), will make Zurich look even more modern.

Development site F will become a part of the whole in the spring of 2019: Google will move into 9,000m² of office space, a day-care centre will be installed, 170 flats will become available and shops as well as restaurants will be created on the ground floor.

EURO PLAZA 6 topping-out ceremony

Structural work is complete

The entire EURO PLAZA 6 team including client, architect, statistician and construction supervision
Image: PORR AG

Tapping the keg, from left to right: Client Karl Kapsch, PORR's CEO Karl-Heinz Strauss and Foreman Harald Loschy
Image: PORR AG

From left to right: Structural Workmamager Philipp Krikler, CEO Karl-Heinz Strauss and Foreman Harald Loschy
Image: PORR AG

The finished carcass, decorated with the 4-m-high topping-out tree
Image: PORR AG

15 years ago, the construction of the buildings A, B and C marked the starting point of Vienna's largest office park – EURO PLAZA. Now, in a mere six months, the structural work on the sixth and (for the moment) last construction phase was successfully completed.

The client took this opportunity to thank the project partners as well as some 100 attending workers in the framework of the topping-out ceremony which was held on the first floor of the future office premises on 26 September 2016. Construction phase 6 is bang on schedule and within budget and is supposed to be handed over in May 2017. It is processed by a joint venture between the Department of Large-Scale Building Construction Projects and Vienna's New Construction Department 1.

Approximately 100 workers installed 15,000m³ of concrete and 1,550t of steel on two basement floors and six upper storeys in the course of 40,000 work hours. A single worker would have taken some 20 years to complete the job. The sixth construction phase creates an additional 12,500m² of rental space on a gross floor space of 14,600m² as well as 128 parking spaces on the basement floors and a roof terrace which will be available to all tenants.

In their speeches, Kari Kapsch (COO Kapsch Group), Gerald Bejdl (Area Manager for New Construction 1) as well as PORR's CEO Karl-Heinz Strauss used the topping-out ceremony which – matching the season – was held in the form of an Oktoberfest to thank all workers and project participants for their hard work and dedication. Apart from the workers, the performance of the team headed by Project Manager Thomas Hofbauer and Structural Work Manager Philipp Krikler, Foreman Harald Loschy and Construction Commercial Clerk Markus Hirner was particularly emphasised.

According to tradition, the event's official part was concluded in style by an apprentice's recital of the topping-out verse. Subsequently, Elisabeth Kapsch handed over the traditional gift of money to Foreman Harald Loschy who accepted it on behalf of the workers.

To ensure the event's success, the guests – approximately 300 had come – were served knuckle of pork and veal sausage and enjoyed traditional music into the wee hours.

Construction start for Zalando headquarters in Berlin

Groundbreaking for the Zalando headquarters in Berlin with (from left) Marko Lehmann (PORR), Gunter Henn (architect), David Schneider (Zalando), Michael Müller (Mayor), Christian Berger (Münchner Grund), Andreas Geisel (Senator)
Image: Linus Lintner

Ground was broken for the new headquarters of the online fashion retailer Zalando on 6 September 2016. This thereby marked the official start of construction for the joint venture consisting of PORR Deutschland GmbH, Berlin branch office and large-scale projects Germany. The two buildings with around 28,700m² and 13,300m² of office space will provide space for around 2,700 employees. Completion is set for September 2018.

Mayor of Berlin Michael Müller (SPD), Senator for Urban Development Andreas Geisel (SPD), Zalando Board Member David Schneider, architect Gunter Henn, Christian Berger, Managing Director of Münchner Grund and Marko Lehmann, Branch Office Manager of PORR Deutschland GmbH all came together in Berlin for the symbolic groundbreaking.

Münchner Grund Immobilien Bauträger GmbH has charged PORR with the general planning through to the turnkey construction of the complex in the Berlin district of Friedrichshain-Kreuzberg. The main tenant of the building is Zalando.

The atrium in section A will form the centrepiece of the new structure, stretching across the entire height of the building. The site also includes an open-office concept, a 400m² roof terrace, a basketball court on the roof with sports facilities and showers, as well as a food court and kindergarten. Zalando will also be celebrating its ten-year anniversary in the year of completion of the new headquarters.

PORR Construct SRL: Construction work of Ciheiului overpass completed

Opened for traffic on 21 October 2016

The Ciheiului overpass spanning the Oradea ring road.
Image: PORR AG

Construction start	May 2015
Completion	October 2016

PORR Construct completed the work on the 517m long Ciheiului overpass in Oradea, Bihor County, Romania.

“It is an example of our professionalism. I hope this will be a model for upcoming projects in Romania”, declared Transport Minister, Sorin Buse with reference to the construction work of the overpass.

The project consisted of the construction of the overpass, the access ramps and the connections to the ring road of Oradea.

Additionally, other works included water drainage systems, relocation of powerlines, by-pass and protection of utilities networks and lighting systems.

The construction of the bridge was executed by placing prefabricated 33m long T-shaped beams with a height of 1.8m.

The particular challenge of this project was the diversion and protection of two 20kV underground power lines by installing a new 900m long underground cable and the replacement of four electrical poles corresponding to a 120kV power line.

The EUR 4.3m project was finalized two months ahead of schedule.

Project data

Contractor	PORR Construct SRL
Project type	Road and bridge construction
Scope of services	Building a 517m long overpass and associated works
Order volume	EUR 4.3m
Client	Romanian National Company of Motorways and National Roads

Bautech Labor GmbH

Comprehensive competency confirmed

Image: PORR AG

The repeat assessment by Akkreditierung Austria (the national Austrian accreditation body of the Federal Ministry of Science, Research and Economy), held once every five years, has once again confirmed the high-level qualifications, expertise and equipment of Bautech Labor GmbH’s testing and inspection centre.

An inspection of our sites in Premstätten, Villach and Mils was also carried out. Here the auditors were equally convinced by the testing expertise of all employees, along with the testing methods applied and the laboratory equipment used.

Bautech Labor GmbH is thereby the second Austrian testing centre to hold site accreditation in addition to the earlier Austria-wide accreditation. This underlines the high quality standards of our inspection centre on behalf of and as a service provider to our Group, as well as for third parties.

Alongside the national authorisation in line with the so-called "Lex Exner" of the "Central Lab" in 1975 and gaining accreditation as Austria’s first test laboratory in August 1994, this represents a further milestone in our longstanding corporate history.

In this way, we are capable of providing complete coverage across Austria with testing services at the highest level at our sites in Vienna Simmering, Graz, Premstätten, Villach, Mils and Linz.

PORR Tunneling scores points with outstanding innovative strength

PORR wins 1st, 2nd and 3rd place at the Innovation Awards 2016

Innovation Awards 2016 – Certificate for 1st place
Image: ÖGG/Chris Hofer

From left to right: Univ.-Prof. Dipl.-Ing. Dr.mont Robert Galler (President of ITA Austria), Provincial Councillor Hans Mayr, DI Arthur Göbl (PORR Bau GmbH), DI Manfred Bauer (G. Hinteregger & Söhne), DI Wolfgang Stipek (President of ITA Austria)
Image: ÖGG/Chris Hofer

Every two years, the International Tunneling Association (ITA) offers an innovation award. The international applications also included seven contributions from PORR or with PORR's participation.

1st place went to DI Arthur Göbl (PORR Bau GmbH) and Per Cato Standal, ReforceTech AS/Norway. The expert jury was particularly impressed by their innovation of a tunnel liner consisting of non-corroding basalt fibre reinforcement.

In mechanical tunnel construction, tunnels are advanced by means of tunnel boring machines and usually lined with segment rings or pressure pipes. Such lining consists of concrete with steel reinforcements. Said innovation replaces the steel reinforcements in the lining system with mineral reinforcement fibres made from basalt.

These non-metallic fibres' distinguishing feature is the fact that, due to their material properties, they are not prone to corrosion. This makes them particularly interesting for structures that need to meet increased durability demands. They are especially beneficial in applications with chemically aggressive structural conditions such as ground water with a high salt content or when coming into contact with corrosive waste water or gases in the tunnel interior.

2nd place went to Ing. Kurt Joham, Ing. Reinhard Zenz from PORR and DI Armin Strauss from PORR and DI Jürgen Voringer from G. Hinteregger & Söhne for the implementation of a bi-component ring gap material in a traffic tunnel.

The use of this application primarily prevents damaging segment uplift, which occurs very often when using conventional ring gap grout in connection with high tunnelling performance and dense rock conditions. The system, which so far had only been used outside of the German-speaking world – not least because of a lack of basics in the rulebooks – needed to be implemented by the consortium by means of technically challenging verification processes.

3rd place went to DI Rocco Tittel (PORR Bau GmbH) and Di Christoph Sturm and DI Arnold Pichler (G. Hinteregger & Söhne) for their stationary dust extraction system on the concrete repair wagon.

This innovation essentially yields a significant improvement of the concrete rehabilitation staff's work conditions. The newly designed system consists of one stationary dust extraction device with a permanently installed pipe distribution system on each side of the scaffold wagon. This means that one only needs to move the suction hose. In accordance with the minimisation imperative, one can thus significantly reduce the dust concentration at the work place.

The award ceremony was held in the framework of the "Tunneltag" & "Geomechanisches Kolloqium" event on 12 October 2016 in Salzburg which, with some 1,000 visitors from 25 countries, was very well attended indeed.

Arthur Göbl said after the award ceremony: "I am proud of our tunneling team which for many years has managed to patent other innovations in its long-standing experience in mechanical tunnel construction. We need to preserve and promote this creative spirit since it yields many economic advantages for us. I see innovation as a key factor to maintain our position as a top player in mechanical tunnel construction."

Highest ratings of sustainability for Arena Boulevard: DGNB Gold & LEED Platinum certificate

Visualisation of the project Arena Boulevard Berlin: Not far from PORR´s branch in Berlin and PDE Deutschland is the online commerce company Zalando located.
Image: JSK Architekten

LEED Platinum certificate
Image: PORR AG

Arena Boulavard "live": Not only is the building visually appealing, it also scores points with excellent infrastructure links.
Image: PORR AG

After receiving a very solid “DGNB Gold” as DGNB certificate for the project Arena Boulevard in March 2016, the U.S. Green Building Council (USGBC) recently confirmed the attainment of the highest rating “LEED Platinum”. These labels honour energy-efficient, resource-preserving construction schemes, which furthermore have a high user comfort.

On order from Münchner Grund, Immobilien Bauträger GmbH – a subcompany of UBM Development AG – the building construction department of PORR Deutschland GmbH's central Berlin branch, in its function as general contractor, had erected the new office and business building called Arena Boulevard in a central location in Berlin's Friedrichshain neighbourhood opposite the Spree River, the East Side Gallery and the Mercedes-Benz-Arena. Several companies and departments of PORR were involved in the entire design and execution process of the project, which meant that all the internal know-how of PORR could be utilised.

The basis for the excellent rating formed a well thought-out energy concept in combination with consciously chosen solutions according to construction physics, thermal comfort, sustainable location factors such as good supply of daylight as well as interior quality, resource-preserving use of construction materials and the considerate use of drinking water during operation through water-saving fittings.

The new construction of Arena Boulevard, Berlin branch's new location, is the first PORR project in Germany in which the company's “new workingworld” was implemented. In the course of the “new workingworld”, PORR relies on open structures and transparency to facilitate communication and teamwork when it comes to the design of offices and branches.

Besides the efforts as general engineering contractor of PORR Design & Engineering from Germany as well as Austria, the construction project was audited by the Sustainability Group. The PDE / Sustainabiltiy Department sees itself as a solution-oriented provider in the field of green & blue building services and has firmly established itself as one of the largest service providers in this sector.

This award is a high-profile expression of the exceptional construction and process standards of PORR, which becomes apparent especially to investors, tenants, building users as well as the public.

The certification underlies the efforts in resource-preservation and environmental protection ad is an additional proof of PORR's reliability and trustworthiness.

D4/R7 Bratislava Highways: Laying of the foundation stone

Good atmosphere at the ceremony
Image: Ferrovial

At the end of October 2016, the Bratislava D4R7 highways contract held its laying of the foundation stone ceremony to mark the beginning of the project. Held in Slovakia's Samorin Village, the event was well attended by government officials, mayors from the municipalities involved and senior figures from the JV companies.

The official ceremony to mark the beginning of construction on the project was performed after a number of speeches including those delivered by Mr. Ersek, Minister of Transport, Construction and Regional development in the Slovak Republic, Mr. Bugár, Deputy Chairman of the National Council of the Slovak Republic, Jaime Lamela, CEO Zero Bypass Ltd, the Cintra consortium. Funding for the project was secured in May 2016 and since then there has been close collaboration between the engineers, designers, archaeologists and the ministry to ensure the best solutions are reached and value engineering is fully achieved.

The design and build of the 27km highway (D4) and the 32km radial highway was awarded to the consortium between Ferrovial Agroman and PORR in June 2016. The D4 will involve construction of 27km of new dual carriageway between Jarovce and Raca, creating a beltway to the east of the city. The R7 is a new 32km radial highway with 2-3 lanes each way, running in a south-easterly direction from the city centre. The entire scheme also involves the construction of nine interchanges and almost 100 bridges and bridge structures, including a new bridge crossing of the River Danube.

Laying of the foundation stone ceremony of Józef Piłsudski Museum in Sulejówek

We build a Museum to last for centuries

Karl-Heinz Strauss (CEO PORR) together with the guests of honor at the ceremony, among others: Andrzej Duda, President of the Republic of Poland (fifth from left)
Image: Muzeum Jozefa Pilsudskiego w Sulejowku, fot. Mariusz Bodnar

The official laying of the foundation stone ceremony for the construction of the cutting edge museum and educational complex of the Józef Piłsudski Museum in Sulejówek in Poland was held on 9 November 2016. The signing of the groundbreaking act and the ceremony itself took place in the presence of honorary guests, including the President of the Republic of Poland, Andrzej Duda, as well as state and self-governmental authorities. PORR Poland being the General Contractor of the Museum was represented by Karl-Heinz Strauss, CEO of the PORR Group.

The Józef Piłsudski Museum is one of the key cultural investments to be delivered in Poland. Its opening to the visitors is scheduled for 2018, at the 100th anniversary of regaining independence by Poland. The message behind the “Museum for centuries” addresses the actions planned by the Museum that are related to the celebrations of the 100th anniversaries of key events in the history of Poland to be commemorated in 2018 – 2021. It also reflects the paramount idea behind the Museum – deriving from history to build the future of Poland for the upcoming centuries.

The contract between the Józef Piłsudski Museum and PORR Polska Construction S.A. was closed on 23 May 2016. It consists in continuing the design works and performance of construction works of the museum and its educational complex.

Constructing the cutting edge museum and the educational complex of the Józef Piłsudski Museum in Sulejówek is the core of the investment. It will consist of the historical part and a new building with a narrative exhibition playing the role of a museum as well as educational and animation purposes. The investment covers both the construction of the new museum and the educational facility as well as the revitalization of the historical buildings and the rehabilitation of green areas.

Consortium involving PORR to build section of D3 motorway in Slovakia

Order volume: EUR 239m

Rendering of the motorway section
Image: NDS a.s.

Client	State motorway company NDS a.s. (Národná diaľničná spoločnosť)
Scheduled completion	48 months

Vienna / Bratislava, 23 November 2016 – A construction consortium involving PORR has been chosen to build a 5.6 km section of the D3 motorway in northern Slovakia. The contract is being realised on behalf of the state motorway company NDS a.s. and is scheduled to be completed after 48 months of construction. The order is worth EUR 239m, PORR holds a stake of 34%.

“Technical know-how is needed during the construction of this motorway section. With our strong joint venture partners, we are optimally positioned to deliver. Once more, we can prove our experience in the construction of large transport infrastructure projects. That fits in perfectly with our skills profile. At the same time, the tender confirms our confidence in the Slovak market,” said Karl-Heinz Strauss, CEO of PORR.

The project comprises the construction of the roadway, 19 bridges, several retaining walls and more than 11km of noise barriers. This section of motorway forms part of the Pan-European Transport Corridor and will improve the transport connection to the country’s northern neighbour of Poland. The geological conditions of the land mean that drainage measures are being taken and retaining walls erected ahead of construction. The section traverses several deep valleys, which will be connected by appropriate bridge structures. The geological conditions will require the carriageways in one area to be constructed at different elevations with a maximum horizontal separation of 4m.

Project data

Project type	Road construction
Scope of services	Building a 5.6km-long stretch of road incl. the roadway, 19 bridges, several retaining walls and more than 11km of noise barriers
Order Volume	EUR 239m (PORR stake: 34%)

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