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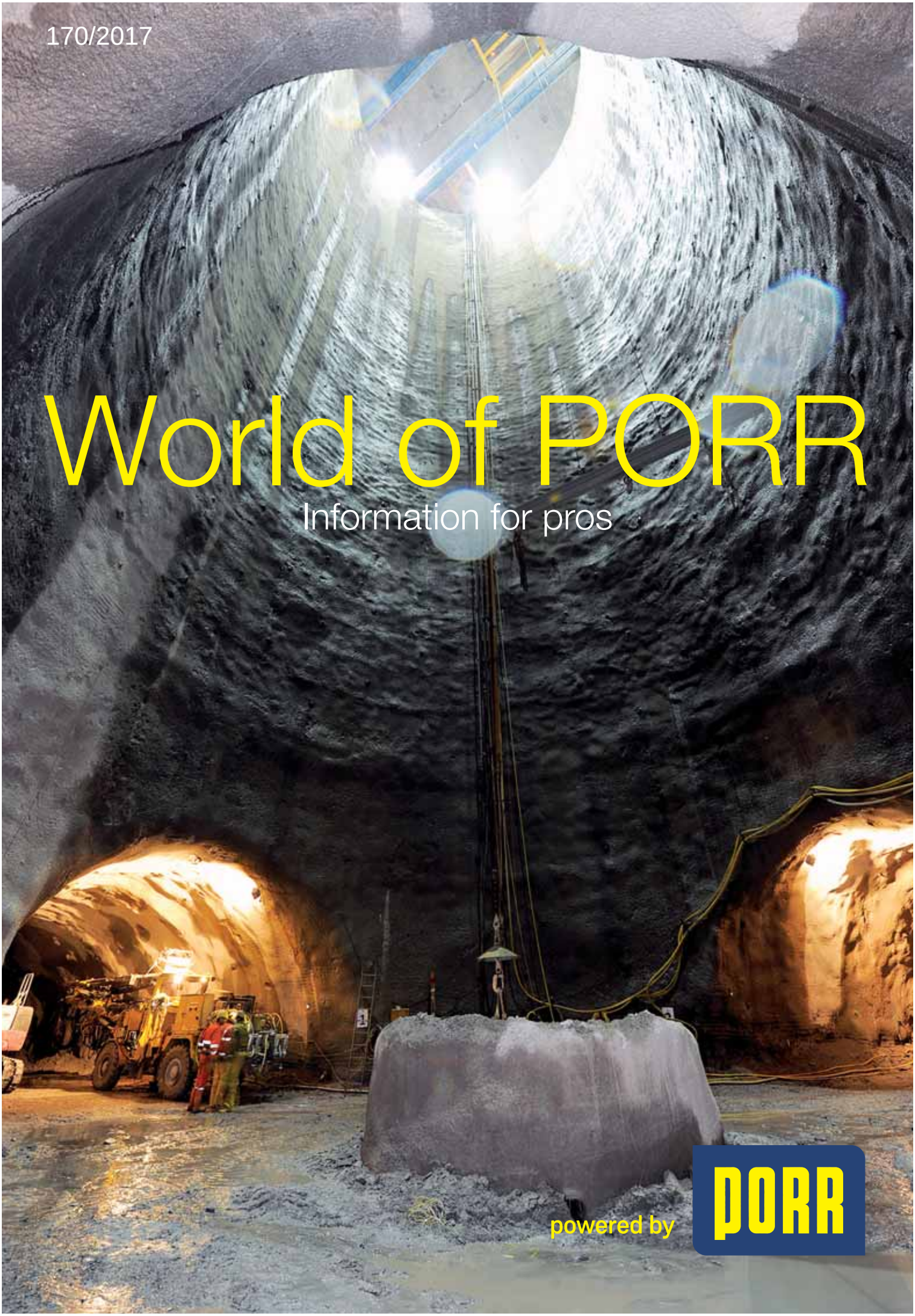

World of PORR

Information for pros

powered by PORR

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CEO Karl-Heinz Strauss

CEO Karl-Heinz Strauss
Image: PORR AG

Dear ladies and gentlemen,
dear business partners,

Once again it is time: The new edition of World of PORR is now available. We bring you the latest news from the world of PORR. Join our experts and gain exciting insights into our projects.

Read about the challenges of living on the river, and how PORR successfully mastered them with the new Prague district of Marina Island. Or how our team is getting Frankfurt and Berlin on track in Germany. Stadtwerk Winterthur in Switzerland is all about energy production: We merged two of their office locations while business operations were ongoing. The construction of the new pumped storage power station at Obervermunt on the Montafon is fascinating, a hidden masterpiece of energy production in the mountains. With the national road projects in Switzerland and Romania, we have brought important traffic connections in line with state-of-the-art technology. In a joint venture, PORR also built the Green Line in Doha as part of the "Qatar National Vision 2030".

In Vienna, PORR is implementing one of the largest individual investments in large scale cell culture for decades for the company Boehringer Ingelheim. And last but not least, the new U1 takes us right back to the centre of Vienna, which will provide a worthy stage for "Steffl", following a redesign of the Stephansplatz at the end of 2017.

But we were not only active in operational terms. We have also consistently pursued our strategy of intelligent growth. In Germany, we have significantly expanded our market position as a full-service provider by way of two acquisitions: the takeover of Oevermann GmbH, a specialist in road construction, and of Franki Grundbau GmbH & Co. KG, an expert in specialist civil engineering. In Poland, we also took an important step: Our two subsidiaries PORR Polska Infrastructure and PORR Polska Construction were merged. In the future, we will be operating on the Polish market as a strong player, PORR Polska S.A.

As you can see, a lot has happened at PORR in recent months. And, despite difficult conditions in 2016, we have once again concluded a successful business year. Year on year, our production output increased by 11.4% to EUR 3,925 million, our EBT by 12.3% to EUR 91.1 million, and the order backlog by 4.9% to EUR 4.804 million.

All that remains for me is to wish you an enjoyable read and a pleasant summer on behalf of the entire PORR team.

Kind regards,
Karl-Heinz Strauss
CEO

The most modern freight centre south of the Alps

Logistics centre DB Schenker sets new standards

Jörg Pirner

Project data

Client	GlaRi GmbH & Co KG
User	DB Schenker
Contractor	PORR Bau GmbH as total contractor
Project type	Office and industrial construction
Scope of performance	Construction of a logistics centre, development, lowering of motorway bridge
Order volume	EUR 30 million
Gross floor area (GFA)	32,000 m² of hall space, 2,800 m² of office space
Start of construction	February 2016
End of construction	December 2016
Country	Austria

General information

The construction of a new DB Schenker building at the existing Cargo Center Graz (CCG) in Werndorf by PORR Bau GmbH as total contractor on behalf of GlaRi GmbH & Co KG comprises a logistics centre with approximately 32,000 m² of hall space, 4,500 m² of outdoor storage space, as well as an office building of around 2,800 m². The project was not limited to the logistics centre. Also the complete development, the lowering of an existing motorway bridge, as well as the installation of a new sprinkler building were part of its scope.

The DB Schenker logistics centre in Graz
Image: PORR AG

Temperature-controlled area for sensitive pharmaceutical products

With an investment volume of EUR 30 million, the project "Hallenneubau DB Schenker" was the largest individual project to be implemented at the CCG site. The new site is the most modern freight transport centre south of the Alps. The expansion of the existing DB Schenker location in Graz creates 80 additional jobs. One of the special features of the project is the 9,000 m² temperature-controlled area, which offers an optimal storage space for sensitive pharmaceutical products.

Hall with floating floor

The hall building consists of three interconnected halls with around 8,000 m² of high-bay storage space, a connected handling area of approximately 4,000 m², as well as a technical centre and various hall offices. A continuous firewall separates the individual structures.

There are approximately 65 truck docking stations located around the hall, which can be loaded via a one-way system. The main office building with an area of 2,650 m² was placed off-centre on the site, to separate it slightly from the logistics area. The building equipment is state-of-the-art, and the structure is finished to the highest standards. The highlight: a "floating" floor.

Floating floor
Image: PORR AG

State-of-the-art construction to overcome high time pressure

The largest challenge in starting construction was represented by the 190,000 m³ of earthworks. Due to the short construction period of only nine and a half months, the deadline pressure was enormous, especially taking compliance with high quality and safety standards into account.

The very tight deadline situation was compounded by the production of the monolithic floor slab. Almost all fibre-reinforced and wing-smoothed concrete surfaces had to be produced under special precautions while exposed to the weather before the roof was finished.

The hall supports were constructed using the skeleton construction method, with prefabricated columns and beams made of reinforced concrete. Gluelam supports form the secondary bearing plane. The spans of the wooden beams range from 23 m to max. 41 m in length, this presented a logistical challenge for deliveries.

The building envelope in the roof area is designed as a trapezoidal sheet with hot roof construction and a polyurethane sandwich panel in the façade area. The fire walls and frost walls of the hall support structures were also optimised using prefabricated construction methods.

Overview picture of hall supports
Image: PORR AG

The office building was also built as a skeleton structure with prefabricated columns and prefabricated hollow sectional ceiling components.

In contrast to the panel surfaces, the building envelope of the office building was constructed as a thermal insulation composite system. The floating floor was elaborately suspended from the floor above by means of steel overlays.

Main dimensions of the construction project

Earthworks	190,000 m³
Total surface of façades	10,500 m² PU panels
Glass surfaces	2,500 m²
Monolithic plate	28,000 m²
Gates in the façade	65
Lift systems	1
Parking spots	170
Bicycle parking spots	10
Concrete	12,500 m³
Steel	1,300 t
Cables laid	250,000 km

Occupying the buildings during ongoing construction works

The increased or rather self-imposed work safety requirements and partial handover of the hall segments posed a particular challenge. Some areas had already been occupied while works on other parts of the shell construction and the finishing were still in full swing.

The tireless dedication of the entire construction team, especially with regard to work safety, was recognised by the PORR board with a "sweet" award in the form of a cake.

Cake award in recognition for special work safety efforts
Image: PORR AG

Summary

An important factor for the success in the handling of logistics projects with a short construction period is not only the high motivation of the team, but also the close cooperation with the authorities and competent bodies – from submitting an application to its final acceptance. We must also emphasise the trust vested in us by the client, which was not disappointed.

DB Schenker Hall
Image: PORR AG

Pooled energy

Site consolidation for the Stadtwerk Winterthur

Nicolas Senn, Reinhard Kuenzler, Paul Gilli

Conversion project Schöntal
Image: PORR AG

Project data

Client	Stadtwerk Winterthur
Contractor	PORR SUISSE AG
Project type	Office
Scope of performance	Sole contractors (restriction: execution of electrical and plumbing at responsibility of client) 2 basement floors; 4 upper floors
Gross floor area (GFA)	Approx. 17,000 m²
GFA (affected by conversion)	9,100 m²
Start of construction	October 2015
Construction period	19 months
Handover of main building	26 April 2017
Country	Switzerland

General information

The Stadtwerk Winterthur decided to merge two locations to make their workflow more efficient. The Werkhof Schöntal company building was to house all administrative departments of the municipal energy provider, and was converted into a service building with technical rooms and offices for this purpose. The construction works were carried out during ongoing operations at the site.

Clearly defined contracting and planning

PORR SUISSE AG succeeded in winning this contract on 27 April 2015. The contract provided for a sole contractor agreement. The client stipulated that the electrical and plumbing work was to be carried out by the in-house departments. PORR SUISSE AG was responsible for the construction management.

Comprehensive relaunch of a Swiss architectural jewel

In 1996, the year the building was completed, Zurich architect Theo Hotz won several awards for this project: the "Constructec Prize: European Prize for Industrial Architecture", the "Swiss Solar Prize" and the "European Solar Prize". Its distinguishing architectural feature is the façade: the first sustainable façade in Switzerland, which has drawn some prestigious awards. The façade was listed for this reason, and could not be altered during the renovation.

The renovated Stadtwerke Winterthur building was to house all administrative departments of the municipal energy provider. The company building was transformed into a service building with different uses. The architects BDE Architekten GmbH were responsible for the conversion phase.

The exterior envelope of the building was only slightly modified. A new main entrance, a staff entrance and emergency exit doors in the glass façade were implemented on the ground floor. On the north-western side of the second floor, the mullion façade made of sandwich panels was removed and replaced with glass.

The main conversion took place inside the building: A false ceiling in cast-in-situ concrete provides additional work spaces in the old factory building. Various components were reduced in height for this purpose.

Full-coverage metal acoustic ceilings and acoustic sails with microperforations were attached to the ceilings to improve the acoustics. The sails were installed between the exposed concrete ribs and fit optimally into the existing structure. The office space is designed as an open space with numerous meeting rooms and retreat rooms. The walls are partially faced with grooved acoustic panels, which are level with the plaster wall and separated by a 1 cm wide shadow gap. The planners chose a dark carpet as a floor covering, to contrast with the white acoustic sails.

Complex basic structure is a tough nut for structural engineers

Preliminary structural works were required for the creation of the false ceiling in the factory hall, known as the Dom. In the cellar, wing walls provide earthquake resistance and transfer the loads into the foundation plate. The formwork was executed in system formwork. The concrete was poured from above through several core holes.

On the ground floor, concrete walls act as a rigid core for horizontal reinforcement to ensure earthquake resistance. The primary load distribution takes place via composite supports. The head plate is provided with load feedthrough, which ensures a concentrated load introduction from an additional plane in the event of a further expansion. The sensitive glass façade was to be protected from any loads. The façade was connected to

the ceiling with gypsum boards.

Some of the composite supports are made with Geilinger mushrooms. U-shaped sections featuring threaded rods drilled through the columns serve to transfer the ceiling load into existing columns.

U-section with threaded rod through existing column
Image: PORR AG

A 2 cm deep heel was set into the existing walls at the top of the ceiling; the load was introduced by bolted U-shaped sections, which were fitted with welded head bolt anchors. Transferring the load into the existing walls takes place locally by means of bearing tappets.

In the areas surrounding a concentrated load introduction, punching shears, so-called dowel strips, ensure thrust resistance.

Since the new ceiling did not meet the minimum passage height throughout, two joists had to be shortened. The existing ceilings were supported with tree trunks up to the first basement floor. Subsequently, the PORR teams cut back the joist completely and created bearings for the new joist in the side walls. A steel HEB beam was inserted into the shortened joist and set in concrete again, to exposed concrete quality. The concreting was carried out by means of a lateral funnel. The filling wedge was cleaned neatly and given an exposed concrete finish.

Shortening of the hoist
Image: PORR AG

In the course of the general overhaul of the house technology, reinforcement measures for oversized floor openings were carried out in the form of adhesive reinforcements.

Conversion during ongoing operations

The greatest challenge was undertaking the conversion during ongoing office operations. Construction noise and dust formation were reduced to a minimum. Since the full transfer of operations to a temporary office proved impossible, the conversion works took place in two stages. Part of the client‘s staff moved into portacabins.

Temporary client office building
Image: PORR AG

Stage 1: Full speed ahead

In the first stage, the Dom, the technical centre, and the basement floors were converted. This was done under great time pressure. The existing goods lift had to be disassembled, and a tapered lift shaft was installed in its stead. The newly created room served as a riser shaft. The material for the monoblocks was transported through the elevator shaft. An intermediate podium was installed on the second floor to accelerate the construction process. This permitted a rapid expansion of the riser shaft. During completion of the installations on the first and second basement floor, the master builder was already in a position to start the construction of the new shaft. Subsequently, a concrete grate was built in a three-meter sequence. At the same time, the building technology team completed the works on the 3rd and 4th floors.

Various glazing works, walls and building technology systems were removed from the 1st basement floor, the ground floor, and the 3rd and 4th floors. The false ceiling was also installed during the first stage. Lightweight construction walls, sand-lime brick walls and concrete walls were used as partitioning components. On the 1st basement floor, high-standard cloakrooms and showers were installed. Concrete injections served to close the cracks in the existing foundation plate. A layer of bitumen formed the seal. The floor construction consists of a floating screed with epoxy resin flow coating. The ground floor houses meeting rooms, an auditorium, office rooms and the reception area. The showpiece of the auditorium is the multi-ton steel staircase, which is faced with maple acoustic panels. The staircase connects the ground floor with the 1st and 2nd floors. On the first floor, additional offices were set up.

The Dom from its original state to completion of the main entrance
Image: PORR AG

The critical part of the first stage was the construction of the lift and the expansion of the technical centre.

New lift shaft with a riser shaft behind it
Image: PORR AG

Due to the limited space on the 3rd and 4th floor, only a small portion of the material could be stored in advance. The completion of the technical centre and the vertical access (riser shaft in the old lift shaft) were the basic prerequisites for launching the second stage. The horizontal distribution of the house technology on the 2nd and 3rd floor was implemented here.

Spatial constraints in the technical centre
Image: PORR AG

The rubber granulate covering applied to more than 1,400 m² is worthy of a mention. In several steps over a period of four weeks, the covering was elaborately bonded, ground and then sealed. The steps included: granulate installation, coarse sanding, grout trowel, fine sanding, fine grouting, renewed fine sanding, and final sealing. The first stage was handed over to the client as scheduled on the 4 April 2016. The new offices have been in use since.

Installation of the steel staircase
Image: PORR AG

Final state of the steel staircase
Image: PORR AG

Stage 2: The old offices must go

The main works took place on the 2nd and 3rd floors. The first step was the demolition of the existing partition walls, which functioned as office spaces. On the 3rd floor, the entire composite floor was demolished. This was necessary to achieve a greater installation height for the double floor. Several hundred core drillings were carried out.

Demolition works on the third floor
Image: PORR AG

The basic planning concept for the new offices was open space. There are retreat and meeting rooms. The walls were built using lightweight construction methods with a glass front. Acoustic ceiling sails were installed between the exposed concrete ribs on the ceiling. Wooden acoustic panels were mounted on the walls. A double floor houses some of the building technology. This is implemented via a shroud channel, which features lacquered openable MDF panels. The other part is routed to the ceiling in a trunk.

Second floor, north-western side
Image: PORR AG

Second floor, north-western side after completion
Image: PORR AG

The 2nd and 3rd floor were completed without any major structural obstacles. The critical aspect was the horizontal distribution of the building technology.

Summary

Despite the challenges, the works were finished on time and to the highest quality standards in early April 2017. The client was satisfied. The ceremonial handover of the building took place on the 26 April 2017.

Baroque design meets architecture of the future

General renovation of the Palais of the Belgian Embassy

Bernhard Kazda

Project data

Client	Kingdom of Belgium
Contractor	PORR Bau GmbH
Project type	Revitalisation
Architect	Harald Mallner
Scope of performance	General contractor contract for general renovation, including conversion of the top floor and renewal of house technology and security systems
Start of construction	February 2016
End of construction	February 2017
Country	Austria

View of the Belgian Embassy at Schönburgstrasse
Image: PORR AG

General information

On the 8 January 2015, PORR Bau GmbH was appointed general contractor for the general renovation of the Belgian embassy and residence of the Belgian ambassador in Vienna.

The order comprised a two-storey top floor conversion, renovating and adapting the existing floors with the historical staterooms, renewing and expanding the house technology installations, modernising the security and monitoring technology, installing two lift systems, restoring the façade, and redesigning the outdoor facilities.

A Wilhelminian-era Palais with a princely history

The Palais, constructed in 1880 by the Austrian architects Viktor Rumpelmayr and Joseph Kubelka by order of the Princess Leopoldine Hohenlohe-Bartenstein, has been owned by the Embassy of the Kingdom of Belgium since 1922. Its Baroque elements and decor are reminiscent of the baroque architecture of Johann Lucas von Hildebrandt.

Mermaid at the courtyard fountain
Image: PORR AG

Daylight as the most important building material

The architectural concept for the general renovation and expansion of the residential and office areas was designed by architect Harald Mallner and features two glass atria on the second floor and the top floor. The ensemble-protected street-side appearance of the building is not affected. The daylight thus introduced creates a friendly and modern atmosphere in the offices and the gallery with its meeting rooms on the 2nd floor.

Converted second floor with access to the top floor
Image: Arch. DI Mallner

Generous green areas in the courtyards of the atria provide the offices with a garden view from all sides. By opening up the gable roofs to form flat roofs on the courtyard side, the usable areas on the upper storeys were increased. The additional roof areas are used to house technical installations.

The subtle design of the newly erected façade on the top floor creates a deliberate contrast to the historical legacy of the original parts of the building.

Invisible technology and historic pomp

The feudal flair of the staterooms and grand staircase in the residence and embassy areas has remained intact despite the installation of the house and security technology. The clever arrangement and cladding left the original luxurious appearance largely untouched.

Atrium and offices on the second floor
Image: Arch. DI Mallner

Steel construction in a velvet glove

To convert the top floor, the existing dowel beam ceiling was reinforced with composite screws and reinforced concrete for structural engineering reasons. The utmost caution and attention was required to protect the historical staterooms below. An additional steel structure bears the large weight of the aluminium and glass construction around the new atria on the second floor, and transfers the loads into the masonry.

After concreting, the ceiling throughout the entire top floor was temporarily sealed to ensure protection from the weather until the new roof was completed.

Demolition of the old roof truss and the ceilings
Image: PORR AG

The new top floor conversion was carried out in lightweight construction in steel and wood. The official architectural provisions specified that the original roof contour had to be replicated on the street side. Only the installation of flush windows was permitted.

While the works on the top floor were underway, steel frames and bracing walls were installed in the existing floors to strengthen the building structurally.

Construction of the steel structure
Image: PORR AG

Carpentered reinforcement of the steel structure, production of the new ceiling level on the top floor
Image: PORR AG

Newly constructed parking spaces meant that a partial demolition of the basement vaults and the installation of a reinforced concrete ceiling were necessary. The extension of the garage entrance required massive underpinnings of the exterior wall. The works on the courtyard side of the garage also entailed a redesign of the cobbled inner courtyard with its old trees.

A finish modelled on the historical design

A new wall was erected to replace the historic building enclosure of the court, which was in danger of collapsing. One of the old trees fell victim to this project. A replacement tree was planted in its stead.

The historical plaster of the richly structured façade was in good condition, despite its advanced age. The façade was renovated using crack-bridging, levelling silicate slurries. The colours were based on the original colour scheme.

House technology with a few extras

A disused lift shaft was used as a rise duct for the floor-to-floor connection of the house and electrical technology. The utility lines on each floor were mortised and sealed off under drywall claddings, respectivly.

A major portion of the services was the implementation of the security concept as defined by the Belgian Embassy, consisting of electronic access control, alarm and surveillance systems, as well as bulletproof barriers.

Summary

This technically demanding building project was handed over to the client as scheduled and to full satisfaction on the 6 March 2017, thanks to the commitment of all parties involved.

A monument on the fast lane

General renovation of the Jägermayrhof Linz successfully completed

Richard Weissenböck

Project data

Client	Arbeiterkammer OÖ
Contractor	PORR Bau GmbH in a joint venture
Project type	Revitalisation
Scope of performance	General renovation incl. demolition works, construction of an underground garage, planning from construction permission stage on
Gross floor area (GFA)	5,100 m²
Start of construction	February 2015
End of construction	July 2016
Fully operational	September 2016
Country	Austria

General information

The Arbeiterkammer Oberösterreich (Upper Austrian Chamber of Labour) issued an EU-wide call for tenders for the general renovation of the Jägermayrhof in Linz.

In February 2015, PORR Bau GmbH was commissioned in a joint venture with the reconstruction of the Bildungshaus and the construction of an underground car park. As the general contractor, PORR Bau GmbH was responsible for the technical management and construction management, as well as for all planning stages following granting of the construction permit and turnkey construction including all administrative procedures.

Exterior view of the Jägermayrhof after general renovation
Image: PORR AG

Schubert's praise of the Jägermayrhof inn

The "Jägermayrhäusl" was first documented in 1741, when it was sold to the Wilhering Abbey. The 16th century forester‘s lodge was later converted into an inn, and in the 18th and 19th century became a popular destination just outside the city gates of Linz. Even Franz Schubert is said to have praised the inn‘s good beer.

Current listed hotel building
Image: PORR AG

The Jägermayrhof has been an education and training centre for the Arbeiterkammer Oberösterreich since 1959.

Historical conservation is just the beginning ...

The oldest part of the ensemble is a turn of the century building with later additions from the 1970s. The listed historical building belonged to Anton Dreher, the owner of a brewery.

The building‘s external appearance goes back to a 1957 conversion and was subject to the highest degree of protection.
The listed status – PORR Bau GmbH prepared all necessary documents for the client‘s funding applications – was only one of many challenges involved in this construction site.

The building fabric, which is more than 100 years old, was in urgent need of a general renovation. Various areas of use such as the hotel, the dining room, the kitchen, the offices and the seminar area as well as the building technology were no longer up to today‘s standards. In addition to renovating the façade, the aim of works was to reorganise and standardise the entire complex. The hotel and three other building segments were to be pitted, structurally rebuilt, and converted according to the architect‘s plans.

Works on the underground car park began at the beginning of February 2015. During the general renovation from 2015 to 2016, the building was cleared completely, and the business was moved to a temporary building.

Hotel building after underpinning works and excavation of the underground garage
Image: PORR AG

Back to the beginning – and double speed ahead

Shortly after the start of demolition works in the historic part of the hotel in February 2015, the construction managers stated that the quality of the building fabric had fallen short of expectations.

Upgrading the existing roof structure as originally planned was no longer realistic for structural engineering and economic reasons. The exposed steel concrete ceilings were also in much worse condition than previously assumed. Neither the concrete cover nor the current state of the reinforcements permitted renovation works.

The original plans featured only pitting and newly expanding the hotel; but in the end, only the supporting outer walls remained after the necessary additional demolition works had been completed.

The exposed roof structure
Image: PORR AG

Demolition of the ceilings
Image: PORR AG

The new, entirely different situation meant that a new structural engineering concept was required. The construction management and structural engineers had to comply with the contractually agreed completion date, despite the additional planning effort. The client had planned on moving the business back in at this point in time. PORR Bau GmbH succeeded in adapting the construction schedule and completing all necessary works in the agreed construction period under an additional contract.

Aerial view of the construction project
Image: PORR AG

Main dimensions of the construction project

Excavation works	9,200 m³
Constructive concrete	2,500 m³
Reinforced steel	300 t
Formwork	6,000 m²
Prefabricated ceilings	900 m²
Underground car park	47 Parking spots

Jägermayrhof reloaded – making seminars a fun experience

The historical façade, which is a protected historical monument, was given a new lease of life in its new interpretation. The Austrian Federal Monuments Office

required the installation of wooden windows on the ground floor. The glazed and recessed entrance area reveals the historical building fabric. The roof was renovated and part of the seminar area was demolished. In its place, a large seminar and event room opens onto the inner courtyard via glazed sliding doors.

A new leisure area with gym and sauna in the basement offers a quiet area that is not visible from the street. The seminar and dining area, as well as two of the hotel rooms, are accessible to people with disabilities.

Training room
Image: PORR AG

Energy from sustainable sources

The energy supply at the new Jägermayrhof is entirely generated by ecologically sustainable sources. A photovoltaic system on the roof provides most of the electricity required for the building and an e-mobility station. Eco-electricity is purchased to cover any additional needs.

A pellet heating system, solar thermal system and heat pump ensure the supply of heating and hot water. The thermal renovation reduced the heating requirements by more than half. The confined spaces inside the listed Jägermayrhof posed a great challenge for the building technicians.

Planning services at a glance:

- Execution and detailed planning on the basis of the guideline execution plans
- Structural calculations
- Formwork and reinforcement planning
- Structural engineering proof of constructive fire protection
- Energy certificate
- Planning of thermal building physics, sound insulation and room acoustics
- Creating a safety and health plan plan
- Fire protection and escape route planning
- Fire safety handovers, etc.

Office wing
Image: PORR AG

One of the courtyards
Image: PORR AG

All services performed at the new Jägermayrhof summarised

The exterior works on the historical hotel building include the restoration of the clock tower and revitalisation of the façade. The final rendering for the façade was chosen in close consultation with the Federal Monuments Office, and applied in a professional manner. The historical tiled stove in the the Linzerstüberl was removed and rebuilt after the renovation works were completed.

The new Linzerstüberl with the historical tiled stove
Image: PORR AG

Now that the works are finished, the new Jägermayrhof has a total of 30 rooms with 44 beds, two of which are accessible to people with disabilities. Three 45 to 200 m² meeting rooms and five seminar rooms are available for meetings; if required, two of the seminar rooms can also be subdivided. System partition walls provide flexibility in the office wing.

The kitchen, which can be used to serve up to 120 people in the dining room, is equipped with state of the art technology. The lift system was modernised and extended to include a freight lift. The existing passenger lift was removed, the lift shaft was extended, and a new lift was installed.

The drainage pipes and basic utility lines were renewed. All covered building components were newly sealed and equipped with perimeter insulation. The underground car park comes with 47 parking spaces, and there is also an outdoor car park for 23 vehicles.

Art at the construction site
Image: PORR AG

Summary

The ambitious construction schedule, which became even tighter due to additional works, was completed within the agreed deadline. This was made possible by the good cooperation between the entire construction team and all trades involved. The building has been in full operation since September 2016.

Living on the Vltava – Marina Island in Prague

Successful completion of the first expansion phase

Miroslav Havelka and Jana Beranová

Project data

Client	Marina Island s.r.o.
Contractor	PORR a.s. (100 %)
Project type	Residential construction
Architect	Moshe Tzur Architects
Scope of performance	Construction of five residential buildings with nine to twelve floors each 347 Apartments 457 Parking spots
Gross floor area (GFA)	36,450 m²
Start of construction	November 2014
Building completion (first stage)	April 2017
Country	Czech Republic

General information

One of the largest residential construction projects in the Czech Republic, Marina Island, is currently underway in Prague. The project is the outcome of a collaboration between the Israeli developer Lighthouse Group and the Daramis Group. Both have been operating on the Czech market since 2000.

The lighthouse project on the Vltava is being developed under the leadership of the renowned Moshe Tzur Architects, in cooperation with a Prague-based general planner. The order for the construction was issued to PORR a.s. The first phase of the exclusive city district was successfully completed in April 2017. Completion of the second stage is scheduled for the end of the year.

The port in Holešovice – a historic location

For more than a hundred years, the port has been a dominant feature of the Prague district of Holešovice. Situated on an artificially deepened arm of the Vltava, it originally served as a winter and shelter port. Today, it is home to the district's shopping area. Even though the area has evolved steadily and gradually assumed the character of a modern residential district, the old harbour buildings remained intact.

Two worlds meet at this location: on the one side, the harbour with its proximity to the river and the beautiful natural space and on the other side, Prague city centre with its countless offices, shops, cafes and rich cultural life.

A new district for Prague

Marina Island consists of five apartment buildings with a total of 347 apartments, arranged in chessboard pattern. The gross floor area (GFA) of the residential building complex, which is currently being built in two stages, is around 36,500 m². The two twelve-storey building sections A and B, each 39.55 m high, are located at the centre of the complex. The three nine-storey buildings C, D and E, with a height of 32.85 m, are located on the banks of the Vltava. Sections E, D and B are already finished; A and C are set to follow at the end of the year.

The residential buildings all share a pedestal foundation with two basement floors. The underground garage with 457 parking spaces, 19 of which are accessible to people with disabilities, and the house technology for the entire building complex are located here. The entrance halls, utility rooms and apartments with direct access to the ground floor are situated on the ground floor. The upper floor contains solely apartments. A total of 16 lifts provide rapid access to all parts of the building.

Marina Island: In the foreground, buildings C – E, and behind them, buildings A + B
Image: Václav Jedlička

Airy living spaces with a view of the river

The one to six room apartments meet the highest standards of living. The ceilings are a comfortable 2.8 m to 5.5 m high. The designer bathrooms are tiled in high-quality ceramics. The open-plan kitchens are built as an integral part of the spacious living areas. Each apartment comes with a private outdoor space such as a balcony or terrace.

Highest standards for facilities in the apartments
Image: Václav Jedlička

Just like living in a villa

In addition to the apartments, Marina Island also offers townhouses that feel just like living in a villa, thanks to the direct access to their own front gardens on the ground floor, as well as to the private garages in the basements. Penthouses are situated on the top floor, with breathtaking views over the city. The townhouses and penthouses are designed to be retrofitted with their own swimming pools at any time.

Penthouses on the top floors
Image: Václav Jedlička

Relax in your own park

In addition to the private green spaces and outdoor areas such as terraces and garden roofs, the complex also comes with a range of areas for shared use. The future residents can relax in a private park with a spa or work out in the gym. Representative event rooms are available for festivities.

Construction ecology for comfort

The building‘s reinforced concrete envelope is designed as a ventilated façade. The surface cover, made from large panels of high pressure laminate (HPL), is attached to the outer wall with aluminium system profiles. The façade panels meet the fire protection requirements of resistance class A2. The mineral wool thermal insulation layer is 20 cm thick.

The windows and balconies are triple-glazed with insulating glass panes and frames made of wood profiles (UW = max. 0.9 W / m²K).

All roof structures above the residential areas have a U value of max. 0.20 W / m². The ceilings on the first basement floor are equipped with a 10 cm thick thermal insulation layer below the buildings, which is inserted into the formwork.

Sustainable works at the construction site

Ecological considerations already played an important role during the construction of the new Prague district. For instance, the Vltava was used as transport route. High-capacity ships moored at the site served to transport the approximately 50,000 tonnes of excavated material. The excavated material was loaded on to the ships directly from the excavation pit via a mobile ramp.

Intelligent flood protection as a special challenge

The immediate proximity of the Vltava, while being the project‘s particular appeal, also constituted its largest technical and legal challenge.

The housing complex is located in the floodplains of the river. It was therefore necessary to ensure that this area is protected in the event of flooding. The building construction must be able to withstand these conditions of extreme stress. Neither the residents nor their assets may be at risk in any way.

The primary flood protection is provided by the design of the building complex. The substructure is made of water-proof concrete, as a so-called "white tub". This protects the building with a reserve for a thousand-year flood. The foundation is made of large-diameter piles with a high tensile strength.

Underground parking
Image: Václav Jedlička

Controlled flooding in the basement

The planned, controlled flooding of the second floor is designed to mitigate the buoyancy uplift caused by the river water level in the event of flooding. In the event of a hundred-year flood, the water is filtered from the

foundation area and automatically absorbed by flood wells and pipelines.

If the second basement floor is flooded, shut-off fittings on the pipelines prevent this from flooding the first basement floor, which houses the technical installations, such as the transformer system, the heat exchanger and the machinery room for the ventilation system.

The buildings‘ structure is connected to the mobile flood protection system of the city of Prague, which protects the access roads.

Scheduled, controlled flooding of the 2nd basement floor by flooding wells and pipes. Shut-off valves on the pipelines prevent flooding of the first basement floor with the technical installations
Image: Václav Jedlička

Shut-off component on the overflow pipe of the flooding pipeline on the second floor
Image: Václav Jedlička

The future is down by the riverside

Further developments are planned in the immediate vicinity on the same peninsula. The procedures for determining and allocating the location for the next stage of development are currently underway. PORR a.s. is already involved in intensive negotiations on continuing their tried and tested collaboration in this forward-looking Prague city development project.

Residing at the Mauerpark – diversity in Berlin-Mitte

A clever mix creates a lively city district for young and old

Ralf Mühlebach

Aerial view
Image: Groth Gruppe

General overview
Image: AMP utilization plan

General information

The construction project "Wohnen am Mauerpark" (Residing at the Mauerpark) is currently in progress at the edge of the much-loved Berlin Mauerpark, on an approximately 3.5 ha large property located between the Brunnen district and Prenzlauer Berg. The Groth Group has developed an urban conceptual framework for this area in cooperation with Prof. Carsten Lorenzen as lead architect. Under their management, five renowned architect offices drafted a detailed and modern urban concept, for a new, very liveable and mixed district that is designed for young and old, couples, singles and students. The result is an exciting residential mix consisting of freehold and lettable accommodations, as well as student apartments subdivided into the five quarters of building parts A to E.

In the fall of 2015, PORR Deutschland GmbH Berlin . branch was awarded the first of a total of five general contractor assignments for the erection of 502 residences and 193 student apartments. Despite different quality standards regarding the amenities of these accommodations, all of the buildings dispose of an underground garage and bicycle parking. Furthermore, the roof surfaces will be provided with extensive roof greenery. Horticultural outdoor facilities and inner courtyards with playground areas, will harmonically connect the newly built residential accommodations with the neighbouring park.

During construction, the traffic infrastructure provided a special challenge for construction site logistics. Until the start of June 2017, the construction project could only be reached via a construction site road and the landmarked Gleim tunnel. After the start of the excavation works on the 4 January 2016, construction of the individual building parts commenced with a 3-month delay. For the development of this new city district, and alongside the construction of the buildings, additional traffic connections to the Gleimstraße are being built. This includes are public streets to the south and west, as well as private roads in the northern and eastern areas.

Construction sector E – urban framework of the new district

Project data

Ordering party	Project company of the Groth Group
Contractors	PORR Deutschland GmbH . Berlin branch
Project type	Residential construction
Architect	Cramer Neumann Architects
Scope of services	Erection of a three residential buildings, with six and up to seven floors 122 apartments 54 passenger car parking spaces
Gross floor space (GFS)	14,300 m²
Start of construction	January 2016
End of construction	September 2017
Country	Germany

Aerial view
Image: Groth Gruppe

Out of an ensemble of five individual accommodations, blocks A to E, PORR was initially commissioned with the construction of block E by the Groth Group. The concept by architect's office Cramer Neumann Architects comprises three buildings with a total of 122 apartments and eight building entrances. The property, with an area of 5,229 m², will include an aboveground gross floor space (GFS) of 10,825 m² per storey, and an underground GFS of 3,454 m² that includes an underground garage with 54 parking spaces for passenger cars.

First-time use of BiM

With the objective of optimizing the construction plans and execution, PORR used building information modelling (BiM) for the first time, a method for modelling building data. This records relevant construction data digitally, such as wall thicknesses, concrete classes, exposure classes, as well as finishing information. This method provides substantial support in determining the data for a bill of quantities. Errors are voided thanks to data consistency and by means of the extensive visualization and filtration features of the program, which provides visible data controls.

Subsidized housing with private outdoor spaces

This construction segment is comprises subsidised rent apartments. Building 1 is a six- to seven-storey residential building, which forms the end of the western and northern, L-shaped housing ensemble. A total of six stairwells, with either two or three spans, all equipped with an elevator and access to the underground garage. Each of the apartments disposes of a balcony or a terrace. The basement contains rooms for the connection of the building to mains and piping, tenant cellars and storage rooms for a variety of uses. Buildings 2 and 3 will be constructed with five storeys. The stairwells are located in the centre and, like building 1, will contain an elevator. Building 2 is planned as a two-span, while building 3 is planned as a three- and four-span construction. Here, too, all apartments will be furnished with balconies or terraces.

Facilities of the apartments

The facilities conform to the standards of subsidised housing. This includes plastic windows, drywall partitioning, wooden doors, vinyl and tile flooring, gypsum and lime cement plaster. All apartments will be furnished with floating screed, while the walls and ceilings are finished with an emulsion coating on painter's fleece. Tile flooring made of in fine stoneware will be installed in the water closets and bathrooms.

Construction process and building details

The excavation works started on the 4 January 2016. The shell of the building was completed as early as September 2016. It consists of brick and concrete walls, which also contain prefabricated and semi-finished components. Waterproof concrete is used for the walls and foundations that have contact with the ground. The outer shell, which contains a composite system for thermal insulation, is covered with a finishing plaster and a coat of paint according to the colour concept and the urban design. An all-round massive upstand of the walls encloses the roofing, which contains an installation that corresponds to the physical requirements of the construction and bituminous waterproofing. Parts of the surface will have roof greenery.

The completion of block E is scheduled for September 2017.

Block D – student studios and apartments suitable for seniors

Project data

Ordering party	Project company of the Groth Group
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Residential construction with business areas
Architect	Feddersen Architekten and architect Stephan Thiele
Scope of services	Erection of four residential buildings, with four and up to six storeys 42 residential accommodations, 193 student apartments 44 passenger car parking spaces
Gross floor space (GFS)	14,211 m²
Start of construction	March 2016
End of construction	October 2017
Country	Germany

Visualization
Image: EVE Images

View into a studio – visualization
Image: bloom images (Berlin)

This block consists of four residential buildings for the elderly and students, including a total of five stairwells. The design and execution planning for buildings 1, 2 and 4 was prepared by Büro Feddersen Architekten. The architect Stephan Thiele is responsible for the design of building 3 – PORR constructed the shell of this building. The generous inner courtyard area with greenery and playing surfaces is the connective element and meeting place. Cellars and technical rooms, as well as parking places for bicycles and passenger cars, are located in the common basement. An underground garage, which can be reached via a single lane ramp, will be built between buildings 1 and 4.

Modern studios for students

Building 1 is designed as a residence for students, providing a total of 193 furnished 1-room apartments, 28 of which have been built without partitions. This elongated building complex, which consists of one ground floor and six upper floors, can be accessed through two stairwells and one elevator. This house fulfils the requirements of "Effizienzhaus 55" (Efficiency House 55), a subsidy program of the Austrian Reconstruction Loan Corporation (KfW). The KfW Efficiency House 55 is a technical standard, prepared by the subsidy programme of a bank for energy-efficient building. The lower the figure, the higher the energy efficiency.

View into a studio – visualization
Image: bloom images (Berlin)

View from the dining area of the shared terrace – visualization
Image: bloom images (Berlin)

Lounge – visualization
Image: bloom images (Berlin)

Tailor-made solutions for senior-friendly living

Buildings 2 and 4 are corner blocks, which consist of a ground floor and four upper floors. Overall, PORR is building 42 senior-friendly residential units.

Construction details

The entire building is erected by a massive construction method. The underground garage, cellar walls and the ceilings of storeys will be made of reinforced concrete. The walls of the upper floors are primarily made of sand-lime brick. The façades will include a composite system for thermal insulation with a plaster structure, whereby the

ground floor of buildings 2 and 4 is decorated with facing clinkers. For the windows, the architectural concept partially provides for an implementation in plastic, with a two-colour finish. The Northern façade will have customised casement windows, which extend beyond the façade and are made of aluminium. The roofs will be flat and covered in greenery.

Block C – individual living, as a result of carefully considered planning

Project data

Ordering party	Construction management by the Groth Group
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Residential construction
Architect	Architect's office Fuchshuber
Scope of services	Erection of three residential buildings, with four and up to six storeys 122 apartments, commercial areas 63 passenger car parking spaces
Gross floor space (GFS)	16,872 m²
Start of construction	June 2016
End of construction	March 2018
Country	Germany

Building view
Image: EVE Images

Aerial photo
Image: PORR AG

The ensemble consists of three residential units with eight stairwells. The design by architect's office Fuchshuber, for a total of 122 freely financed rental units, is characterized by well thought-through planning and a high measure of individuality. Lightweight partitions permit flexible division of the space. Some of the residential units are designed barrier-free. The gardening design of the courtyard area offers sufficient space and possibilities for playing.

Building 1 is a corner house that contains six stairwells, including one ground floor and up to seven upper floors. Houses 2 and 3 consists of only one building part, with one ground floor and four upper floors. The maximum height amounts to 22 m. All three houses have one ground floor and a joint underground garage. The basement contains cellars and utility rooms, as well as bicycle and passenger car parking slots. Access to the underground garage takes place via a single-lane entry and exit ramp, which is controlled by a traffic light.

Construction details

All of the buildings were erected by a massive construction method. The underground garage and the storey ceilings are made of reinforced concrete. The cellar walls are carried out as exposed painted brickwork. The walls in the upper floors are primarily made of sand-lime brick. The façades are equipped with a combination system for thermal insulation. The plinth of each floor is covered with clinkers, while the support walls in the outer area are partially covered with natural stone. The windows are carried out in two-coloured plastic. The roofs are planned as flat roofs covered with bituminous sealant and extensive greenery.

The buildings meet the requirements of the Efficiency House 70 standard of the KfW subsidy program. The facilities of the apartments include, amongst others, wooden doors, floor heating and vinyl floor covering. The bathrooms will be tiled with large format files, and they are partially provided with floor-level showers.

Block B – ecology and living comfort on the one roof

Project data

Ordering party	Project company of the Groth Group
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Residential construction
Architect	Nöfer Architekten
Scope of services	Erection of four residential houses 111 apartments, commercial unit 69 passenger car parking spaces
Gross floor space (GFS)	14,605 m²
Start of construction	January 2017
End of construction	October 2018
Country	Germany

Building view – visualization
Image: EVE Images

Four buildings, which are accessible via seven stairwells, are containing 111 freehold flats. In conformity with the overall concept of the facility, the horticultural design of the courtyard areas provides a generous space for recuperation and outdoor playing. A communal underground garage is located under the greenery of the inner courtyard and includes the apartment storage and utility rooms, as well as bicycle and passenger car parking spaces. Access to the underground garage is provided via a single-lane entry and exit ramp, which is controlled by a traffic light.

Construction details

The thermal insulation fulfils the requirements of the Energy Savings Ordinance EnEV 2016 published by the German Ministry for Environment, Natural Conservation, Construction and Reactor Safety. As of the 1 January 2016, this ordinance defines the energy requirements for new buildings.

The window, terrace and recessed balcony elements consist of plastic windows, which have been fitted with thermal insulation glazing, in conformity with EnEV thermal insulation certification. Sun protection glazing ensures protection against summer heat. The window frames are coated in conformity with the colour concept of the architect. The windows and the window doors in the ground floor, at the level of the garden, are provided with electrically operated roller shutters, including an anti-lifting device. Excluded from this is a second escape route, which is required by construction legislation. This shutter is mechanically operated. In the upper storeys, electrically operated external sun protection equipment (screens) is provided as a cable or rail-guided version. Their operation is carried out from the entrance door to the room.

Public and private open spaces

An inner courtyard with greenery is planned above the underground garage ceiling with a total depth of approximately 0.70 m. Publicly accessible courtyard areas and the ramp to the garage are paved. Other access paths are protected against water penetration. A private area is assigned to the ground floor apartments. Parts of the roof surfaces will be covered with extensive greenery. The technical facilities, such as gratings covering elevator shafts, ventilation and smoke exhaust facilities, are located here.

Extensive roof greenery – visualization
Image: EVE Images

Block A – barrier-free, with an elevator in the park

Project data

Ordering party	Project company of the Groth Group
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Residential construction
Architect	Lorenzen Mayer Architekten GmbH
Scope of services	Erection of three residential buildings 105 apartments, 1 commercial unit 54 passenger car parking spaces
Gross floor space (GFS)	11,222 m²
Start of construction	May 2017
End of construction	Spring 2019
Country	Germany

Building view – visualization
Image: EVE Images

Block A consists of three buildings, including a total of seven stairwells. 105 rental apartments and one commercial unit are located here. Apartment storage and technical rooms, as well as bicycle storage spaces and a joint underground garage, are located in the basement. Access to the underground garage is provided via a single-lane, traffic light controlled entry and exit ramp.

Construction details

The basement and the underground garage ceiling are constructed in waterproof reinforced concrete. The upper storeys are composed of a masonry construction with filigree ceilings. The high-quality building shell consists of two-coloured plastic windows, a combination system for thermal insulation of the façade that is partially decorated with facing clinkers as a protruding ornament, and a flat roof.

Public and private open spaces

An inner courtyard with greenery and a children's playground will be built above the underground garage. The courtyards are paved at the generally accessible areas and the ramps. The access paths are protected against water penetration. Apartments on the ground floor come with private parking spaces.

The elevator facility for public use, which is located at the southern side of the property, connects the entrance of the residential buildings with the parking level at the Mauerpark and is accessible without passing any barriers.

Summary

With the 'Residing at the Mauerpark' project, PORR Deutschland GmbH . Berlin branch is building a modern and centrally located city district in Berlin. Energy efficiency and an urban mix of uses were successfully implemented by the renowned architectural offices participating in the project. The entire ensemble will be completed in the spring of 2019.

Building a bridge to the future

New Sylvenstein bridge over the Isar open to traffic

René Spörr

Project data

Client	Staatliches Bauamt Weilheim (Weilheim Building Authority)
Contractor	PORR Bau GmbH
Project type	Bridge building
Project scope	Partial renovation of the bridge structure
Construction start	March 2016
Construction end	March 2017
Country	Germany

General information

The Sylvenstein Bridge over the Isar was in a poor state of repair. It had been constructed in 1956 as part of the B13 national route and could no longer meet modern needs. Renovation was urgently required.

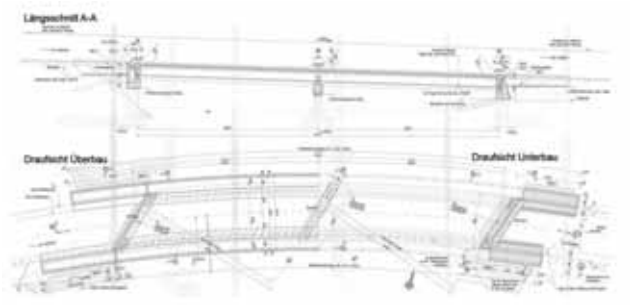
In January 2016, Weilheim Building Authority contracted PORR Bau GmbH to carry out partial renovation of the bridge. The existing substructures were to be overhauled and a new bridge substructure to be constructed. Execution planning began immediately the contract was awarded in January, and work was able to start as early as 14 March 2016.

A bridge with regional importance

The bridge is the only crossing point for the River Isar between Lenggries and Sylvenstein. It forms an important transport link for the adjacent communities and nearby tourist regions; significant heavy goods traffic for the region also travels along this route. Suspending traffic flow for the duration of the work would have meant over an hour's detour for the local residents. In order to avoid this, creation of a bypass route over a temporary bridge had to form a preliminary stage of the new construction.

Using the existing structure as a temporary traffic route

The solution was to use the existing bridge as a temporary transport link during the construction period. It was shunted onto specially constructed temporary substructures near to its original location, and the new bridge construction was developed on the reinforced existing substructure. After completion, traffic was redirected onto the original route and the temporary bridge completely dismantled. The project was completed by recultivating the construction area.



Longitudinal section and plan view
Image: PORR AG

Site plan
Image: Google

Structural comparison of the bridge support structures.

The existing bridge

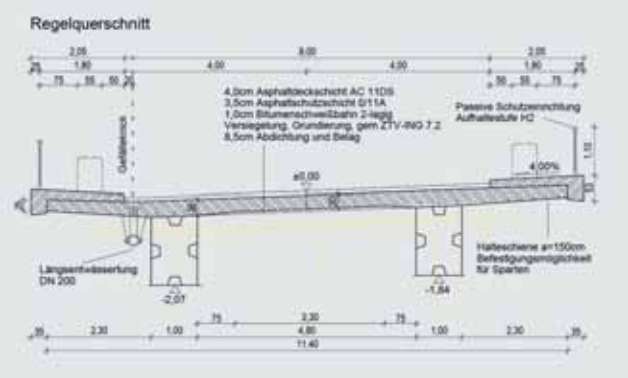
The existing structure from 1956 was a triple T-section girder bridge. It consisted of two structurally independent simple span bridge sections, each one supported at each end.

The existing bridge
Image: PORR AG

New bridge structure

The new bridge has been constructed as a two-section steel composite bridge with a continuous superstructure

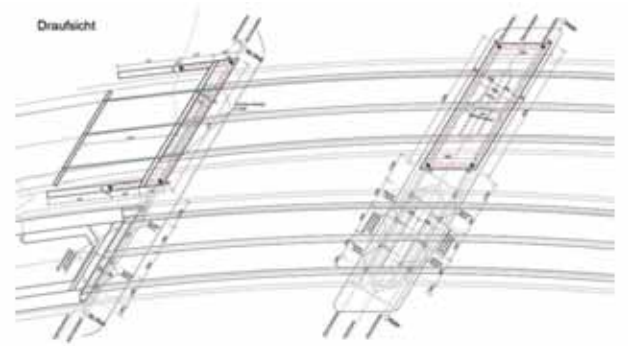
cross-section. It takes the form of a double T-section made of airtight welded steel box girders, structurally connected to an overlaid carriageway slab made of reinforced concrete.



Standard cross-section of the bridge to be erected, by comparison with the existing bridge
Image: PORR AG

Building the bypass road with temporary bridge

The provisional auxiliary abutments and columns were constructed on a working platform. Sheet-pile walls were then rammed, braced and backfilled. Top plates were then concreted onto these auxiliary constructions, which would serve as a bearing plate for the shunt track that was to be built – used both to shunt the existing bridge and as bearing points for the temporary bridge.

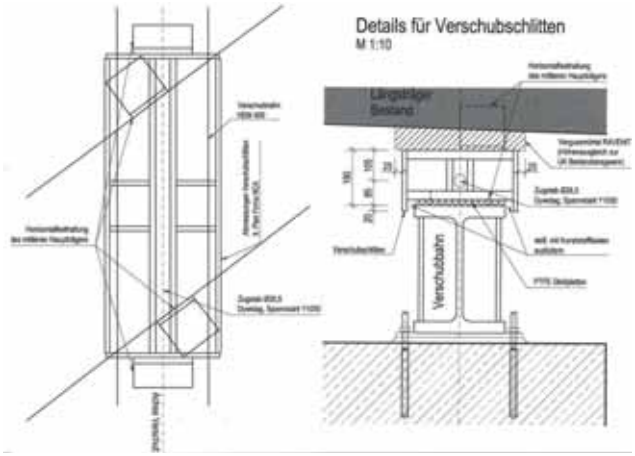


Location of the temporary bridge, provisional abutments and auxiliary columns
Image: PORR AG

The shunt structure was the heart of the construction

After the preparatory work, construction of the shunt structure and “shunt sledges” began. These consisted of stainless-steel sheets mounted on Teflon slabs, which were fastened to the existing bridge girders with steel sections. They were mortared to ensure good traction for the future power transmission. The sledges rested on shunt beams spanned between the old and new substructures. Steel slabs were welded onto the beams, which were then anchored with the new columns and abutments. To shunt the existing bridge, tension rods were drawn through the shunt structure and secured using anchor plates and domed anchor nuts.

Shunt structure including shunt sledges, consisting of a layer of stainless-steel sheets mounted on Teflon slabs
Image: PORR AG



Detail of the shunt sledge
Image: PORR AG

Preparing for shunting

To carry out the shunt operation, incisions were made into the chamber walls of both abutments and these were removed. In addition, parts of the longitudinal beams on the existing bridge were also separated and removed.

The preparatory works were then completed – the shunt track was ready.

Preparatory work for the shunt operation
Image: PORR AG

One side was closed to traffic in order to carry out the remainder of the work on the bridge superstructure. The asphalt surface and the superstructure were separated along the expansion joints at both abutments, with an incision depth of c. 60 cm. After the incisions had been made, the bridge was dismantled and removed.

Work on the bridge superstructure
Image: PORR AG

Once one side had been completely removed, the national road over the Isar was closed for seven days. Demolition of the bridge began. Two 20-tonne excavators worked in parallel around the clock.

Removing the bridge
Image: PORR AG

The bridge was closed for seven days
Image: PORR AG

Twelve jacks needed for the shunt

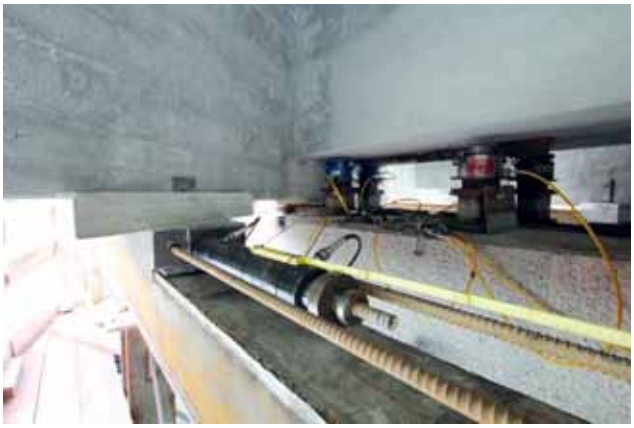
After demolition was complete, work began on the jacks for raising the old bridge. Altogether, twelve jacks were used – each with 200 metric tonnes of lifting power at a pressure of 630 bar. Three additional units ensured that the bridge was raised and lowered evenly. After the bridge had been raised, the existing bearings were removed and the old substructure lowered onto the shunt track.

Jacks for raising the old bridge
Image: PORR AG

It was now possible to begin the shunt – moving the bridge to its new location so that the bypass route could be constructed. Twelve sledges were used altogether, with four hollow piston jacks. The tension rods were installed at this stage.

As the hollow piston cylinders were extended, the pressure from the jacks would cause the sledges to move in the direction of the shunt. The cylinders were then retracted, the nut and anchor plate repositioned – and the next cycle could begin.

The Teflon slabs – freed by the forward movement of the sledges – were re-laid in the direction of the shunt. Following this system, the existing support structure was shunted sideways for the total distance of 14.65 m.



Hollow piston cylinders
Image: PORR AG

Preparations for the sideways shunt
Image: PORR AG

When the final position was reached, the bearing could be constructed for the temporary bridge. This was achieved by welding cleats onto the shunt structure and the sledges.

The final step was connecting up the bypass road. The expansion joints were capped flush to the carriageway surface with elevated timber beams. The bypass route, including the temporary bridge, was then opened to traffic after only four days of closure.

The way is clear for the new bridge

Next, partial renovation of the abutments and the existing columns began. The substructure was maintained as far as possible and carefully dismantled. The connecting areas were roughened by sand blasting. The new bearing plates were structurally connected to the existing substructure by drilling holes and anchoring in reinforcing bars with adhesive. Finally, the new abutments and columns were constructed on these substructures – which had been refurbished beforehand.

In parallel with this work, the two airtight hollow steel welded cross-sections for the new bridge were constructed, with two sections per girder. The two steel girder parts had already been fitted with shear studs and corrosion protection in the factory. On-site, there were only the construction site joints to weld, treat and coat.

The superstructure in detail

The span widths are 28.55 m per section and the clearance widths between the abutments are 47.80 m. The construction height is 1.85 m throughout; the steel box girders account for 1.50 m of this. The bottom and top plates, as well as the column supporting points and cross girders at the end, are strengthened with transverse bulkheads. Welded shear studs create a connection between the steel construction and the track slab made of in-situ concrete.

Careful installation

The substructure was laid on the abutments and columns, and secured against tipping. The superstructure was laid on two elastomer bearings on each abutment and column. The longitudinal retainer was shunted from its previous location on the middle column onto the eastern abutment. There are lateral retainers on both abutments.

In the final stage, reinforced concrete cross beams are to be fitted on the abutments and over the columns. In order to connect the two box girders during the construction period – particularly during concreting – and brace them, steel cross girders were initially installed. These were subsequently coated with in-situ concrete, except for the undersides.

Construction of the carriageway slab took place via scaffolding on the main girders. As per local custom, the exposed concrete surfaces were constructed with rough-sawn tongue-and-groove formwork.

For future bearing replacement, locations have been specified where jacks can be based in order to raise the superstructure.

Construction of the roadway (from bottom to top)

- Sealing, primer (thermosetting resin, 1000g/m²)
- 1.0 cm sealing layer formed of two coats of bitumen sealing membrane
- 3.5 cm bitumen protective layer AC 11 DS
- 4.0 cm bitumen surface layer AC 11 DS

Completionwork of the bridge
Image: PORR AG

Completionwork of the bridge
Image: PORR AG

Completionwork of the bridge
Image: PORR AG

Substructure of the bridge
Image: PORR AG

Completion of the bridge
Image: PORR AG

Finishing off

Before the concrete supporting structure could be demolished, the bitumen and bituminous sealing had to be milled off. Railings on the old bridge also had to be disposed of. The temporary bridge was removed once the new Isar bridge had been approved in January 2017.

For this purpose, a special working platform was built, so that the Isar – in accordance with environmental requirements – was unaffected by the disassembly. Next, the temporary abutments and columns were dismantled. The shunt structure and reinforced concrete bearing plate were removed and the sheet-pile walls detached and taken away.

Finally, the construction area was completely dismantled, steps were built on the embankment and the area was recultivated.

Dismantling the construction area
Image: PORR AG

Dismantling the construction area
Image: PORR AG

Main dimensions of the construction scheme

Construction section lengths	150 m
Bridge lengths	57.10 m
Bridge width	12.10 m
Bridge deck area	690 m²
Spans	2 x 28.55 m
Steel bridge construction	110 metric tonnes
Cubic metres of concrete	720 m³
Reinforced steel	130 metric tonnes
Sheet piles	1,125 m²
Bituminous mix	726 metric tonnes

Summary
The major challenges for PORR Bau GmbH lay partly in the technically demanding construction and assembly of the bridge as well as the short planning and construction period. Particularly challenging was maintaining circulation on the B13 to the greatest extent possible.

Setting of the course for Favoriten

Construction task U1/13 – south-bound U1 extension almost complete

Christoph Brenner

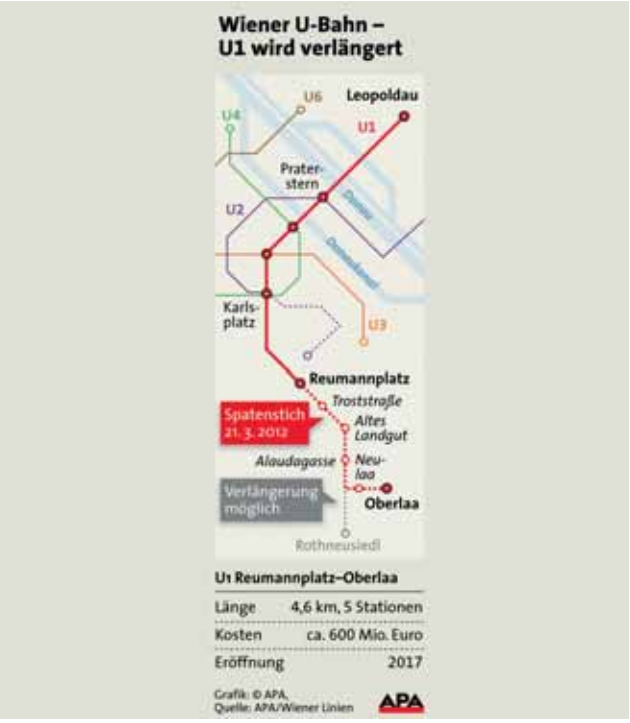
Project data

Client	Wiener Linien GmbH & Co KG
Contractor	PORR Bau GmbH
Project type	Structural engineering, Specialist civil engineering
Scope of performance	Construction of the route including track construction, building signal boxes, point systems [check] and preparatory works for a further extension to the underground (U-Bahn).
Order volume	EUR 20.5 million net
Start of construction	January 2014
End of construction	August 2017
Opening	2nd September 2017
Country	Austria

General information

In the summer of 2013, Wiener Linien GmbH & Co KG called for tenders for the last three construction segments of the extension of the U1 underground (U-Bahn) line to the south of Vienna – from Favoritenstraße to Therme Oberlaa.

A comprehensive study of alternative line layout designs had been made beforehand. The city of Vienna's decision was to extend the U1 line to Oberlaa in the short term, and establish the necessary conditions to later branch the line towards the Rothneusiedl urban development area.



Vienna U-Bahn network with U1 extension to Oberlaa and future Rothneusiedl branch
Image: APA Grafik

At the end of 2013, PORR Bau GmbH was awarded the contract for all three tendered construction segments. The individual segments were: U1/13 – Favoritenstraße points system, U1/14 – Neulaa and U1/15 – Oberlaa. The contract value for the U1/13 construction scheme totalled around EUR 20.5 million, with the cost for all construction tasks amounting to some EUR 68.3 million.

Besides the route and track construction works, the contract also included a signal box, corresponding points system and preparatory work in the course of the U1/13 – Favoritenstraße points system construction segment.

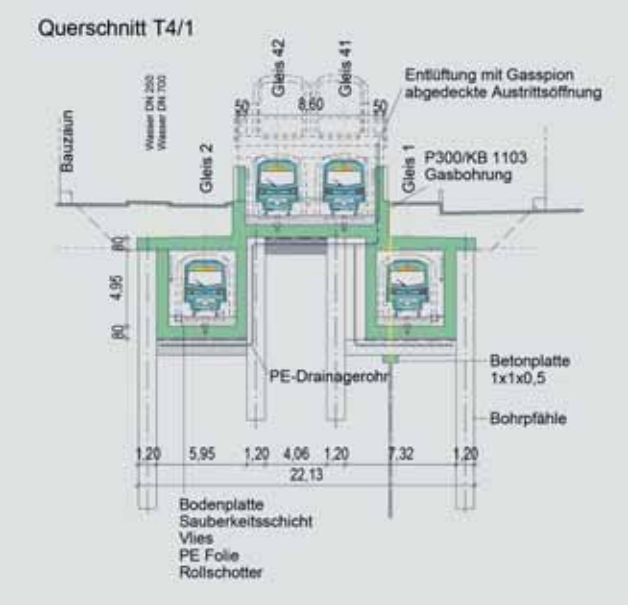
The work began on schedule at the beginning of 2014 and will be completed in summer 2017.

Favoritenstraße: the backbone of the development

Site plan for the U1/13 construction segment
Image: FCP

The U1/13 construction segment is located along Favoritenstraße in Vienna's tenth district and covers a length of about 612 m. The route consists of both elevated and below-grade structures as well as underground sections, both open cuts and covered sections.

The signal box, along with the points system and two sidings, is situated halfway along the route. For the Rothneusiedl branch, a raised support structure has been planned at this location in order to take the U1 from the lower level to the upper level in the direction of the future urban expansion area.



Points system with sidings and future upper level in the direction of Rothneusiedl
Image: FCP

The way to the water is through the water

The first month of construction work was occupied with site clearance tasks such as probing for unexploded ordnances, relocating utilities and traffic redirection. Fifteen drilled wells and two water gauges served to release the pressure on the water table. In regions with ground aquifers, vacuum units were fitted to the wells and operated. This closed dewatering system ensured the stability of the excavation pit base and protected the installed components until buoyancy safety could be achieved.

Once the deep wells had been completed, work began with the bored piles. A total of 865 non-contiguous large bored piles, 120 cm in diameter and with a total length of around 14,000 m, were installed. In combination with vaulted jetcrete superimposed between the individual piles, they initially served to secure the construction pit. The bored piles form an exterior layer and are structurally relevant parts of the entire construction. In combination with the pile caps, they create the foundations for the planned Rothneusiedl branch.

Bored pile construction works for U1/13 between Favoritenstraße and Per-Albin-Hansson-Siedlung
Image: PORR AG

Excavation between bored piles with jetcrete and concrete structures subsequently added
Image: PORR AG

Part of the specialist civil engineering work in the covered sections was to construct the U-Bahn ceiling from in-situ concrete. It rested on a deep foundation of piles on both sides.

In the open-cut sections, pile caps were installed with starter bars after the preliminary excavation, in order to later be able to tether the ceiling. After the first structural reinforced concrete work had been completed, the final excavations followed, down to the base of the pit. An open dewatering system ensured the collection and removal of residual water in the construction pit.

Construction pit excavation in the transition from open cutting to a covered section
Image: PORR AG

Waterproof concrete: when concrete starts to sweat

In order to maintain a watertight U-Bahn construction, the majority of the concrete structures were implemented as waterproof concrete. As well as entailing the relevant calculations by the planner, this meant that it was necessary to pay particular attention to the formation of expansion joints and construction joints at the construction site. Further important factors included: the concrete installation temperature (nitrogen cooling was required on hot summer days), the curing process for the concrete and the stripping times. In order to make the inner layer strength as constant as possible despite the non-contiguous bored pile walls, the spandrels between the piles were concreted into lost shuttering after the blinding layer had been created. This procedure resulted in a good, friction-locked connection. Plastic sheeting on the lost shuttering acts as an anti-friction layer between the exterior layer, consisting of the bored piles and jetcrete, and the inner layer, consisting of structurally reinforced concrete – in accordance with the guidelines for implementing a waterproof concrete structure.

Open cutting with lost shuttering for concreting the spandrels between bored piles
Image: PORR AG

Cross-sectional geometry: building on the foundations

After the gaps had been concreted, the base plate was reinforced and concreted. The inner layer concreting and hardening took place in regions with different cross-sectional geometries, predominantly from above – through special openings either in the pile caps or in the ceiling. A 4.80 m high girder formwork served as shuttering, used both in the open-cut sections and covered sections.

Shuttering and reinforcement works on the inner layers below the roof
Image: PORR AG

In regions with constant cross-sectional geometry, a formwork carriage was used for the construction preparations. This had advantages for working speed and the homogeneity of the concreting, since wall-to-ceiling joints could be omitted.

Inner layer reinforcement in the region of track 2, with formwork carriage
Image: PORR AG

Concreted right-angle cross-section with formwork carriage
Image: PERI

The signal box: multi-purpose design on two levels

The signal box had two floors with various areas for operation, ventilation and power supply. The walls were constructed with conventional panel shuttering. For the ceiling shuttering above U-Bahn level, the table-form shuttering from the open cut was used. Around the T-beam slabs, additional prefabricated parts were installed in the form of floor slabs. A tower crane supplied the construction site with materials in this stationary construction area.

Construction site overview with the signal box in the foreground
Image: PORR AG

Once the structural work had been completed, the next stage of construction and the interior fitting could begin. PORR Bau GmbH constructed the tracks throughout all the construction segments. This was a major advantage for coordinating across construction sections during the execution – benefiting all project participants.

The track construction works were completed on time at the end of February 2017. This meant that Wiener Linien was able to carry out the subsequent trials for measurement and set-up runs. Nothing more stands in the way of the opening of the U1 extension on the 2 September 2017.

Installation of sound insulation mats and ballasted track underground
Image: PORR AG

Track construction works around the open track
Image: PORR AG

Main dimensions of the construction scheme (U1/13 construction section)

Track length	612 m
Excavation / earth moved	90,000 m³
Line lengths	2,800 m
Bored piles DM120 mm	865; 14,000 m
Jetcrete	1,700 t
Scaffolding	17,000 m³
Formwork	21,000 m²
In-situ concrete	27,000 m³
Reinforcement	3,600 t
Bituminous sealing	7,000 m²
Ballast track	4,000 m³
Sound insulation mats	9,000 m²
Tracks	2,000 m

Summary
The construction scheme “U1/13 – Favoritenstraße points system” represented a technically demanding civil engineering infrastructure project, which was realised by PORR as a partial general contractor, including the track construction and parts of the finishes. The project was distinguished by its extremely detailed planning. Both the active and technically experienced client and the realistic deadlines facilitated an intensive preparation procedure for the work. The construction scheme was carried out by qualified individuals as well as specialists within the company. A key feature of the project was the cooperative development in collaboration with all participants.

The tracks to the future have been laid, the switches set.

Completed points system with sidings before the start of test operations
Image: PORR AG

Everything on track in Vršovická

Low-noise tram route upgrades neighbourhood

David Pospíšil and Kateřina Baxová

Project data

Client	Prague transport companies
Contractor	Consortium Společnost pro RTT Vršovická under the leadership of PORR a.s. (55 %)
Project type	Rail and road construction
Scope of performance	New construction of the tram line including modernisation and repair of the associated technical transport infrastructure
Start of construction	October 2015
End of construction	April 2016
Country	Czech Republic

General information

The transport companies of the capital Prague have been modernising the entire tram network for several years. The route along Vršovická Street has been one of the city‘s most important traffic routes since the beginning of the 20th century. It links the south-eastern parts of Prague with the centre. This infrastructure element was in urgent need of an all-round renewal.

Under the project title "Renovation of the Vršovická tram line", the transport companies issued a tender for the new construction of the tram line, including modernisation of the associated technical transport infrastructure. The repair of adjacent areas was also part of the project.

The order for implementation went to the consortium "Společnost pro RTT Vršovická" under the leadership of PORR a.s.

Visualisation of the finished tram route
Image: Tomáš Malý

Vršovická – a road beautifies the district

Vršovice is an inner city district of Prague. The Vršovická crosses a densely populated and heavily frequented neighbourhood. The renovation measures had to be carried out during ongoing traffic. This placed high demands on logistics, as well as the speed and accuracy of the workflow. The coordination of the numerous involved trades posed a particular challenge.

Visualisation of the finished tram route
Image: Tomáš Malý

The reconstruction works involved a 2,640 m section of the tramway. The width of the existing, elevated track body imposed a lateral limitation on the construction site. An expansion only took place in the areas of the new stops and the change in routing.

The road construction along the route was entirely renovated or replaced. 49E flat-bottomed rails on reinforced reinforced concrete sleepers in the ballast bed form the heart of the renewed tramway route. Grass covers the track body along most of the route. The junction areas were asphalted, the railroad crossings were executed as open gravel beds, and the rail crossings were paved with large granite stones. The joint tram and bus stations were fitted with a concrete surface.

Alongside the reconstruction of the track bodies and the stations, including the associated electrical systems, many other modernisation measures were carried out. These included the construction of a new catenary system, a switch controller, and the installation of a traffic signal system. In addition, the new combined lighting masts carry the catenary, and replace the original lighting. The existing infrastructure, such as railway cables and pipelines, was reinstalled.

Finishing work on the overhead line and distribution of the topsoil for the future grass cover of the tram section between the stops Nádraží Vršovice (city-bound) – Otakarova.
Image: PORR AG

More living space for a whole neighbourhood

Since Vršovická road is slowly losing its importance as a main arterial road for motorised individual transport, the Prague transport companies were pursuing further objectives with this project, beyond the complete reconstruction of the tram route: the reconstruction and revitalisation of the entire road space, and the improvement of user-friendliness for pedestrians and cyclists.

Since the conversion, only one lane per direction has been available for motor vehicles - until recently, the Vršovická was still a four-lane road. Today, these lanes have been replaced by bike lanes and parking spaces.

Greenery has been planted along most of the tracks of the tram line at the centre of the road. On the one hand, this is to contribute to the aesthetic improvement of the whole road, and to the low-noise movement of the trams on the other. New stops, accessible to people with disabilities, and a guidance system for the blind improve passenger comfort.

Visualisation of the finished tram route
Image: Tomáš Malý

One hundred days of construction – Three construction phases – No suspension of traffic

The construction project was realised in three stages and without suspension of traffic so as to keep the obstruction of tram traffic on Vršovická to a minimum. For three and a half months, an average of 110, at times even 130 staff worked on the construction site.

1st stage, section Otakarova - Minská

A 1,200 m section was brought up to date from the 3 October 2015 to the 18 November 2015. In just 46 days, four stops along the line were renewed alongside track reconstruction works and the production of the covering layers.

2nd stage, section Minská – Moskevská

The high point of the construction works between the 19 November 2015 and the 7 December 2015 was the production of the covering layer of the crossing area along a 20 m section. The works on the 145 m section were finished in just 12 days.

3rd stage, section Koh-i-noor - Kubánské náměstí

Over a construction period of just 44 days, a total of 1,234 m of the tram line was renovated and modernised between the 27 February 2016 and 11 April 2016.

The measures conducted during this stage were highly complex and time-critical. In addition to the renewal of a further three stops, the workers established a complete crossing area in just ten days; the reconstruction of the tram route alone took four days.

The works included the milling of the asphalt and concrete covering layers, the excavation to the planned depth, and the concreting of the cement-stabilised base course and base plate. This was followed by the laying, undergrouting and concreting of the precast slabs, as well as the connection to the road with mastic asphalt.

Reconstruction section of the base course around the future Bohemians tram stop (city-bound). In the middle of the track body construction, drainage pipe DN 150 is laid in a sand bed, with the separation geotextile and ballast fill, grain size 16/32.
Image: PORR AG

During the remaining two days, the construction teams moved the tracks into the junction - at night, during a short suspension of traffic. Thereafter, only half of the junction was blocked to secure the tracks with polyurethane potting compound during ongoing traffic.

Thanks to the construction site management and the untiring efforts of the workers, the contractually agreed execution period of 45 days was met. The final official handover took place three days before the agreed date.

Main dimensions of the construction project

Rails

Rail profile on concrete slabs	4,058 m
Rail profile with W-tram fastening to concrete base plate	725 m
Rail profile with W-tram fastening	2,392 m
Asphalt cover layer 4 cm	5,294 m²
Concrete top layer	2,481 m²

Section of the tram line at the future stop Bohemians (coming from the city centre), view facing Minská junction with the future solid road surface with a cement concrete covering layer. Installation of L-profiles throughout, vibration-dampening mats and securing of the tracks before installation of the concrete C30/37 XF4.
Image: PORR AG

Laying the city-bound concrete sleepers and rails at section Kubánské náměstí – Slavia.
Image: PORR AG

Section of the future tram stop Slavia (coming from the city centre) – Kubánské náměstí. Completion of the rail assembly before tamping and laying of the ballast bed, grain size 32/63 between the sleepers.
Image: PORR AG

Tram catenary

Copper wire CuRi, AC 120 mm²	5,045 m
Current masts	91

A job for specialists - and for specialist machinery

The reconstruction of the Vršovická tram line entailed classical earthwork methods. A drilling rig was used for the earth excavation for the catenary mast foundations. Special mobile platforms were used to install the electrical systems and catenaries.

The concrete was produced on site in concrete mixers. Autocranes, rail excavators, tractor excavators, crawler excavators, bobcats, loaders and suction excavators were in continuous use. Vibrating rollers assured the compacting of the ground and the lower layers of the tramway structure during the renovation of the foundation layer.
The track-laying machine was used both for tamping and switch construction. An automatic welding system provided the necessary high geometric accuracy for track welding.

Finishing works on the crossing, consisting of prefabricated reinforced concrete slabs at the junction Vršovická - Bělocerkevská. Completion of the ballast bedding layer – grain size 32/63 – for laying of the sleepers.
Image: PORR AG

Summary

Despite the high demands placed on the construction management, the process was conducted smoothly. All services were delivered on time and to the required quality standards. The project is a milestone in Prague's transport infrastructure. The modernised tram route was opened and put into operation by the Mayor of Prague during a festive ceremony that attracted keen media attention on the 11 April 2016. At present, the line is in operation and fully utilised.

Kubánské náměstí stop (city-bound). Completion of the concrete bedding layer C 20/25. Preparation for mounting of the railings and canopy before installation of the mastic asphalt, separating and top layers (MA8).
Image: PORR AG

Section of the tram line from Slavia stop (coming from the city centre) – Kubánské náměstí. Tamping complete, preparation for the introduction of the topsoil for the future grass surface on the tram tracks.
Image: PORR AG

A different way to be neighbourly

Zwentendorf WWTP as a focus for regional cooperation

Georg Steibl

Project data

Client	Municipality of Zwentendorf an der Donau
Contractor	PORR Bau GmbH
Project type	Pipeline construction
Scope of performance	Construction of the Zwentendorf main pumping station, including a dual high-pressure pipeline and sewer overflow
Order volume	EUR 5 million
Start of construction	October 2016
End of construction	February 2018
Country	Austria

Main dimensions of the construction project

Route length	18.000 m
Excavation trench	110,000 m³ sloped
HDPE pipe length	33.000 m

General information

The Zwentendorf sewage treatment plant could no longer be considered state-of-the-art. A study showed that Zwentendorf's waste water should be pumped into the larger Traismauer system in the future, as this would be more economical in the long term than building a new separate sewage treatment plant. The municipality also stands to gain advantages in terms of flexibility, which is essential in the light of future business development and the anticipated quantity of waste water. After a public call for tenders, PORR Bau GmbH was awarded the contract on 5 October 2016. The contract included earthworks, construction work and pipe installation for the Zwentendorf WWTP, extending to the connection to the Traismauer sewage treatment plant.

Cross-border cooperation between three municipalities

During the planning stage, the municipality of Atzenbrugg joined the project, as it had the same problem to solve. This neighbouring community will deliver its waste water through its own high-pressure pipelines to the Zwentendorf main pumping station, which will transport the loads jointly to the Traismauer sewage treatment plant.

A clean solution with no chemical additives

Over long stretches – the route from Zwentendorf main pumping station to the Traismauer sewage treatment plant is c. 13 km long – waste water can often start to decompose, causing massive corrosion of the system components. The solution to this problem was found in a bivalent high-pressure drainage system. This was created by constructing two parallel 315 mm (DA315) high-pressure pipelines between the Zwentendorf main pumping station and the Traismauer sewage treatment plant. During dry weather, the waste water will be pumped to Traismauer through one of the pipelines (alternating), by means of a pneumatic system with a pressure of 8 bar. In the event of heavy rainfall, both pipelines will transport the waste water using progressive cavity pumps. No chemicals are added, which balances out the higher energy requirements for the pneumatic system.

Green light for an ambitious project

After the turf-cutting ceremony on 19 October 2016, work began on laying the 13 km of dual pipelines from the Zwentendorf main pumping station to the Traismauer sewage treatment plant. At the same time, work on the sheet-pile walls marked the start of construction at Zwentendorf main pumping station.

Turf-cutting ceremony with Deputy State Governor of Lower Austria (4th from right) Dr. Stephan Pernkopf
Image: PORR AG

Working together to combat unexploded ordnance and crop damage

Before work could begin on laying the high-pressure pipeline, mine clearance specialists from the Federal Ministry for National Defence inspected the entire route for unexploded ordnance. The probe of the construction area covered c. 100,000 m² and 1,400 foreign bodies were identified. A mini excavator excavated these, monitored by a munitions expert. Grenades and munitions which were still live were deactivated.

The temporary use of agricultural areas necessitated compensation for crop damage. PORR Bau GmbH's construction management team – working closely with the Tulln Chamber of Agriculture – engaged in dialogues with the farmers affected. Informational events were held,

where they were able to form an agreement with all 260 landowners.

Pipe construction of the future – fast and accurate

The dual high-pressure pipelines were constructed using an open cutting method. It was only necessary to make use of flush drilling and pipe ramming methods to cross a stream and to cross a rural road. For hydraulic engineering reasons, the pipes had to be laid with a high degree of accuracy. In order to achieve the required daily output in the light of this requirement, the trench was excavated using a 45-tonne hydraulic excavator (HEX) with a 3D steering system. This excavator was equipped with a special trapezoidal bucket tailored to the standard cross-section.

The equipment was specially tailored to the construction scheme, which made the construction site an ideal destination for several educational field trips. Students from Krems School of Technology and official representatives of the state of Lower Austria came to get an overview of the work on site.

Krems School of Technology field trip with the advance excavator with its trapezoidal bucket and 3D steering
Image: PORR AG

The trapezoidal bucket
Image: PORR AG

Once the trench had been created, mobile and track excavators laid the high-density polyethylene (HDPE) pipelines – which had been assembled previously with electrofusion sleeves.

Laying the pre-welded HDPE pipelines
Image: PORR AG

A mobile excavator with a specially adapted sorting grapple handled the 33 km-long HDPE pipelines.

Handling the pipeline (section length 16 m) with an adapted sorting grapple on a mobile excavator
Image: PORR AG

The main pumping station, a deep matter

PORR Bau GmbH was the main contractor for Zwentendorf main pumping station. The two underground levels of the construction required a 9-metre deep construction pit. The deepest excavation bed lay 5 m below the water table. Sheet-pile walls and two reinforcements ensured that the construction pit was watertight.

Watertight construction pit with sheet-pile walls and two reinforcements
Image: PORR AG

Dual-function sewer overflow

Two sewer overflows made of glass-fibre reinforced unsaturated polyester resin pipes (GFUP) – with a maximum diameter of 2,550 mm – act as a buffer before the sewage treatment plant in Traismauer and the main pumping station, in case of malfunction. They serve as a pressure release for the waste water quantities arriving at high speed from the high-pressure pipelines.

Laying the sewer overflow pipes near the Traismauer sewage treatment plant
Image: PORR AG

Summary

PORR Bau GmbH is on schedule with the Zwentendorf WWTP – despite the project scope having expanded during the planning stage. There are no further obstacles to completion of the work on time at the end of 2018. Smooth cooperation with all participants in the construction plans – authorities, landowners, etc. – has significantly contributed to this seamless progress.

Completion
Image: PORR AG

Think BIG – Large Scale Cell Culture

Specialist civil engineering creates base for new manufacturing plant

Bernhard Widmoser, Christian Marchsteiner, Norbert Markl

Project data

Client	Boehringer Ingelheim RCV GmbH & Co.KG
Contractor	PORR Bau GmbH
Project type	Specialist civil engineering
Scope of performance	Production of a sealed construction pit enclosure, construction of deep foundation elements, all dewatering measures, earthworks, as well as the construction of the construction pit as a cover construction, including floor slab
Order volume	EUR 20 million
Start of construction	March 2017
End of construction	October 2017
Fully operational	2021
Country	Austria

General information

The company Boehringer Ingelheim RCV GmbH & Co.KG is expanding its site in the twelfth district of Vienna to create a 2.2 hectare biopharmaceutical production facility. A cell culture plant and the necessary operating buildings will be built in several construction stages. The construction project Large Scale Cell Culture (LSCC) is the first expansion project on the existing site. The investment volume of all the measures for the new biotech production facility is around EUR 700 million. This is the largest single investment in Vienna since the construction of the General Motors plant in Aspern in 1979. PORR Bau GmbH was commissioned to carry out the civil engineering construction measures for building complex A with a volume of around EUR 20 million.

Overview of company site and expansion
Image: Google

A secure foundation for future investment

The measures essentially comprise:

- The construction of a sealed construction pit enclosure with slotted walls and cut bored pile walls at a depth of up to 40 m
- The implementation of deep foundation elements at a depth of up to 45 m
- All dewatering measures
- The earthworks
- The construction of the excavation pit as a cover construction including production of the floor slab

2021 as a milestone in company history

The plant for the production of pharmaceutical products with the aid of cell cultures will go into full operation as early as 2021. The timely completion of the works is an important milestone for the client. The extremely tight timetable for implementing the civil engineering measures can only be met with the corresponding staff and equipment. This concentration of specialist civil engineering equipment is unparalleled in Austria. The deployment, equipment and coordination of six rotary drilling rigs – BG28 to BG40 - and five rope dredgers, as well as the delivery and removal logistics all represent a major challenge for everyone participating in the project.

An unparalleled concentration of large specialist civil engineering machinery in Austria
Image: PORR AG/Harry Schiffer

Traversing building across the Lainzer tunnel

A special feature of the project is the underground crossing of an ÖBB railway line with three tunnel tubes, running from east to west under the construction site. The tunnel structures of the Lainzer tunnel have to be traversed with almost no load, since the future production plant will be located above the tunnels.

The traversing structure was dimensioned accordingly. It must be ensured that the maximum additional loads on the tunnels as specified in a post-utilisation study are not exceeded. The construction will consist of pre-stressed steel concrete hollow boxes, which are set up on an overlapping bored pile wall of the sealed construction pit

enclosure, as well as on a discontinuous bored pile wall with a depth of about 40 m and a diameter of 90 to 120 cm, to the north of the Lainzer tunnel.

Construction of the bored pile walls enclosing the construction pit
Image: PORR AG/Harry Schiffer

Enclosing the construction pit using two different construction methods

The ground surveys conducted in advance have shown that very hard conglomerate layers are to be expected in some sections. Since drilling these layers while excavating the trench is expected to result in strong vibrations, which are not permitted by the ÖBB, the sealed construction pit enclosure is to be created using two different construction methods.

In the vicinity of the tunnel, the temporary construction pit system will be implemented by means of a 40 m deep, overlapping bored pile wall with a diameter of 120 cm. The higher time expenditure will be compensated by using several boring pile devices. The more distant areas of the construction pit will be secured with a slit wall up to 35 m deep and 80 cm thick.

Construction of a cut-out bored pile wall near the tunnel
Image: PORR AG/Harry Schiffer

Innovative proprietary development to secure construction pit

In addition to the slit and bored pile walls enclosing the construction pit, more than 500 deep foundation elements – bored piles and diaphragm wall components – will be installed at a depth of up to 45 m.

Since the temporary construction pit system cannot be anchored by conventional means due to the Lainzer tunnel, the excavation of the construction pit will be carried out as a cover construction. Steel auxiliary supports will be installed to temporarily support the cover sections during the excavation works. The main difficulty consists in installing the steel auxiliary supports, with a welded head and foot structure and a weight of up to 1.6 t per piece, at the same time as the deep foundation elements are established, in such a manner as to avoid the necessity of any subsequent works when producing the cover.

For this purpose, PORR Bau GmbH has developed a proprietary process that permits the rapid installation of the steel supports with sufficient positional and height accuracy. This optimised method allows the heavy column across the interception structure, which is supported on the drill pipe, to be aligned with the planned height.

Installation of an auxiliary support
Image: PORR AG

Installation of an auxiliary support
Image: PORR AG

Installation of an auxiliary support
Image: PORR AG

Specialist civil engineering machine for constructing slit walls
Image: PORR AG/Harry Schiffer

Specialis civil engineering secures large-scale investment
Image: PORR AG/Harry Schiffer

Special dewatering measures

In addition to creating a sealed enclosure, the groundwater-bearing layers must also be dewatered in order to create the construction pit. The exploratory boreholes indicate that the first groundwater horizon is located at a depth of approximately 6-7 m below the upper ground level of the site. Underneath, there is a relatively thick layer of clayey silt or Viennese Tegel, which acts as a groundwater lock, and is enclosed in the water-bearing layers of fine sand. In these layers, at a depth of approximately 26-27 m below the upper ground level, confined groundwater is to be expected and must be removed to secure the construction pit. Additional confined groundwater horizons are present further down, but these are not relevant for an excavation depth of approximately 10 m.

The ground dewatering system with continuous monitoring of the water levels inside and outside the construction pit comprises around 20 extraction and drainage wells, as well as control levels that are operated and maintained 24 hours a day, seven days a week, to ensure a smooth construction process.

Summary

Thanks to its broad portfolio and excellent cooperation with other divisions of the PORR Group, PORR Bau GmbH was in a position to offer a solution to this extremely complex task from a single source within a short time.

Metro in Doha – a Green Line, as part of a national vision

A tunnel construction project near the sea has been successfully completed

Lars Bayer

Project data

Ordering party	Qatar Railways Company
Contractor	Joint Venture Green Line Underground under the management of PORR Bau GmbH
Project type	Tunneling
Scope of services	Construction of two main tunnels in a parallel location, including crosscuts and shafts
Start of construction	June 2014
End of construction	December 2016
Country	Qatar

General information

As a part of the "Qatar National Vision 2030“, the government of Qatar formulated the objective of expanding their capital at Doha into a modern centre for economy and trade. A part of this vision is a comprehensive metro system. The Red Line South, Red Line North, Golden Line and the Green Line will be built in a first phase.

Qatar – country on the Persian Gulf
Image: Google Earth

As part of a joint venture, PORR Bau GmbH assumed primary responsibility for the realisation of the 33.5 km underground track section of the Green Line, which runs between the station Trough in the west and the station Mushaireb in the eastern part of the city.

This exceptionally demanding project was successfully completed in December 2016.

Route taken by the Green Line
Image: PORR AG auf Basis Google Earth

Green light for a race in two directions

The driving of the tunnel was carried out in three route segments, using six earth pressure balancing machines. Four of these started in a starting shaft in Al Messila. The other two tunnel boring machines started from Trough, from the direction of Education City.

Starting shaft Al Messila
Image: PORR AG

Tunnel boring machines with tubbing were used to bore two main tunnels. Tubbing consists of pre-manufactured concrete segments, which are used to realise the single concrete and waterproof lining in the tunnel.

Primary volumes of the construction project

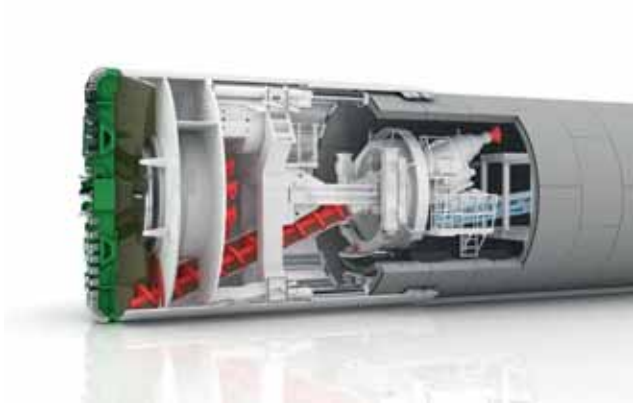
Tunnel boring machine (TBM), total	33,402 m
Stations of driving routes	3,216 m
Excavated volumes (solid)	approx. 1,330,000 m³
Tubbing rings	20.876
New Austrian Tunnelling Method (NATM) road crossings	2
Top concrete layer of tunnel	approx. 100,000 m³
Employees	1,550
Worked hours	approx. 7.100.000

Special geological conditions next to the sea

The tunnels are almost entirely located in limestone in various layers and degrees of weathering. Ground and rainwater have partially led to crevices and hollow spaces, which may form large caverns. Depending on the depth at which they are located, they are filled with groundwater, and, they are directly linked to the sea close to the coast. Due to the predefined incline, the tunnels progress alternately through all the layers. The groundwater contains a very high portion of salt and sulphates, which means it is chemically very aggressive.

Proprietary design for a highly complex tunnel driving operation

The tunnel sections were driven using earth pressure balancing machines. In this method, an active support pressure is created just behind the cutting wheel, by means of plastic earth slurry. It compensates for the impacting forces of the earth and the groundwater. The pressure is regulated by a screw conveyor, which re-moves the excavated material.



Model of earth pressure balancing machine
Image: Herrenknecht AG

TBM acceptance procedure at the manufacturer's site
Image: PORR AG

Machine data for tunnel driving machine (TBM)

Type	Earth pressure balancing (EPB)
Nominal diameter	7.01 m
TBM length	approx. 120 m
Total weight	approx. 850 t

Tunnel driving with lots of extras

The daily average driving distance amounted to 13.60 m and 22.67 m. The maxi-mum daily distance of a machine was close to 56 m. During a single month, all tun-nel boring machines achieved a total of up to 3,520 m. This also includes ancillary items, such as the passage through the stations, planned downtimes, cutting wheel/tool replacement, extensions of the conveyor belts and drawbacks in logistics suppliers etc. Marked downturns of up to 20% were noted during the "summer work-ing hours". During this period, work exclusively took place at night.

Due to competent planning and ongoing optimisation, all boring sections were com-pleted one month in advance of schedule. The schedules had to be contractually ad-justed with the neighbouring lots.

Overall boring performance of the TBMs
Image: PORR AG

Final breakthrough in Al Qadeem
Image: PORR AG

Proprietary production plant for tubbing

Tubbing production took place in a plant that was especially erected for the project. An appropriate leadtime had to be planned in this regard. The concrete plant was a part of the facility. Due to the extreme climatic conditions, it became necessary to cool the aggregates. This was the only possible way of producing concrete to the required quality standard. Due to the aggressive groundwater, an additional challenge for the concrete technology was in sulphate-resistance.

Tubbing transport with Multi-Service-Vehicles
Image: PORR AG

A total of 30 formworks were deployed for the tubbing. Concrete was poured at least twice each day into each of these moulds. The construction site workers erected two off-premise warehouses with a storage capacity of 3,000 tubbing rings to ensure suf-ficient advance production.

Ring design

Number of tubbing rings	20,900
Ring distribution	5+1
Tubbing thickness	30 cm
Tubbing length	1.60 m
External ring diameter	6.77 m
Inside ring diameter	6.17 m
Total weight of ring	approx. 25 t
Concrete	C50/60, with 40 kg steel fibre content and 1.8 kg PP fibres
Screw connection	Ring groove and lengthwise groove
Ring groove design	Force transfer concrete / concrete
Seal type	Anchored

Cross passages, as a horizontal connection between the tunnels

A special challenge was posed by the parallel construction of the tunnel tubes and 56 cross passages. These link the two main tunnel tubes at intervals of 250 m. The cross passages were built behind the tunnel boring machines in the completed tub-bing of the tunnel. The PORR teams implemented these works in conformity with mining practice using excavators and spray concrete as an initial solution, which is used to establish an inner shell from locally poured concrete for the final structure. Each cross passage was subjected to an individual risk analysis, whereby additional safety measures were taken against groundwater leakage in the excavation diameter. Only then was it possible to open the tubbing in the cross passage section.

Challenging logistics for material delivery

The delivery of material to the six machines was carried out via two initial shafts at Al Messila and Trough. Several rotating tower cranes and a large number of mobile cranes were deployed for this. The numerous excavation points needed for building the tunnels, cross passages and stations required precise planning and organisation. The delivery of the tubbing segments, as well as the operating material for the tunnel boring machines, as well as supplies for the cross passage construction sites, was carried out by 22 so-called multi-service vehicles (MSVs).

Proprietary power plants for the construction site

Diesel generators ensured the supply of electrical power. Total consumption of diesel fuel was at approximately 20,000 l per day. A power output of 18 MW was required solely for the six tunnel boring machines, while 5 MW was used by the conveyor belt facilities and 1 MW for cooling facilities. The total water requirement stood at 5,000 m³ for all six TBMs per day. For this purpose, we required our own cooling towers and water desalination facilities. Three mortar mixers provided the daily requirement of the six TBMs, for covering approximately 500 m³.

Diesel generators, starting shaft at Al Messila
Image: PORR AG

A conveyor belt system, with a total length of 75 km

The greatest logistical expenditure was caused by the transport of the excavation material. The conveyor belt system, with a total length of 75 km, transported approximately 1.3 million m^3 of excavated material. The material was stored on a large interim waste tip and disposed of properly thereafter. This was made possible by a finetuned logistical concept.

Conveyor belts facilitate at the starting shaft in Al Messila
Image: PORR AG

Transfer procedures in the stations

Due to the high number of cross passages and the special geometry of the Green Line metro project, a special logistics concept for the six tunnel boring machines was required. Overall, the TBMs were transferred through eight shafts or stations. After the breakthrough of the TBM in a station, and after the earth pressure balancing shield had been pushed out towards the "next tunnel section", the machines were dragged through the station.

Transfer in the switchbox
Image: PORR AG

Disassembly of the tunnel boring machines

At the end of the construction project, the PORR teams had to retrieve the machines and transport them away, sometimes under the most difficult conditions.

In the Station Education City, four TBMs were assembled in a single target shaft, and then recovered in parts by a 300 tonne crawler crane. The cutting wheel and the screw conveyor had been previously separated from the shields in the shaft.

The situation was substantially more difficult in the target shaft at Musheireb, since it was impossible to directly recover the machines with the crane. The TBM was there-fore transported in parts over guide rails to the edge of the construction pit, where it was recovered.

Summary: Successful cooperation of an international team

For the Doha Green Line metro, the tunnel construction works were a highly complex undertaking with many different aspects, which required the highest level of competency, experience and professionalism.

In the summer, Qatar is subject to frequent climatic changes, including extreme air humidity, as well as hot and dry desert air. Sandstorms are an additional burden for both workers and machines.

The team was characterised by its many different nationalities, and a wide variety of cultures and different ways of working. Especially in the construction of tunnels, communications problems were the main factor causing errors and risks. More than 200 safety staff were deployed for monitoring work safety and preventing accidents during the project. The high expenditure on occupational safety paid for itself.

At the end of 2016, PORR Bau GmbH was able to implement and conclude an important project characterised by a national vision and carried out by an international team.

Tunnel with a layer of concrete
Image: PORR AG

Renovation and modernisation of ÖBB railway tunnel – Bosruck

The central section of the Pyhrn railway is fit for the future

Franz Hofmarcher, Sebastian Guganeder

Project data

Site	Bosruck mountains / Pyhrn railway
Section	ÖBB railway tunnel – Bosruck
Contracting authority	ÖBB Infrastruktur AG, new development and renewal area Project management Upper Austria 2
Contractor	Consortium ÖBB Tunnel Bosruck under management of PORR Bau GmbH . construction
Project type	Tunneling
ÖBA/ Project engineer	IGT Geotechnik und Tunnelbau ZT Company
Execution period	June 2016 – April 2017
Country	Austria

General information

The single-track 4,766 metre long Bosruck tunnel is the most important section of the Pyhrn railway between Upper Austria and the Steiermark. It connects Spital am Pyhrn Station to Ardning Station. Countless faults and partly grave damage patterns of the tunnel base as well as a technologically outdated building structure mean that a fundamental redevelopment of this significant section is absolutely essential.

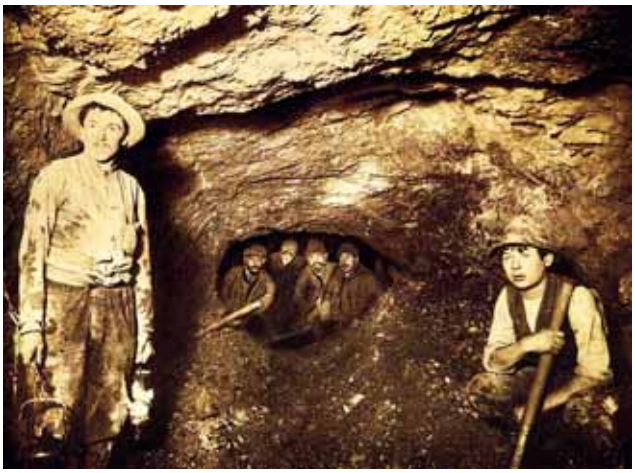
In March 2016, under management of the railway department of PORR Bau GmbH, the Consortium ÖBB Bosruck Tunnel was commissioned by the ÖBB Infrastruktur AG with the restructuring of the existing Bosruck railway tunnel. After just one year of construction time, the work carried out was concluded successfully in April 2017.

Site plan
Image: PORR AG

Building history and chronology

The Bosruck railway tunnel was constructed between 1901 and 1906 as part of the big “New Alps Railways” state investment project for the imperial and royal state railways.

Construction crew 1904
Image: PORR AG



Bosruck breakdown
Image: PORR AG

Building agreement and planned construction process

Mechanical advancement on the northern side, hand drilling on the southern side (average performance 2.80 metres and 1.40 metres, respectively, completion: 7 months)

- 1 March 1905: Breakthrough
- 1 October 1905: Completion of the building work
- Total building time: Four years and three months

Actual construction process

Due to many difficulties and severe incidents, the programme for construction acceleration was been changed several times. Therefore, soon after construction commencement, mechanical drilling began on the southern side as well. Nonetheless it proved impossible to

keep within the completion date.

- 1 July 1901: Beginning of preliminary work, northern side
- 22 July 1901: Beginning of preliminary work, southern side
- Completion of preliminary work by E. da Giau and L. Zateranda companies
- 14 August 1902: First big water penetration, soon afterwards: Allocation of entire order by the National Railway administration to the Italian company E. Falletti, Zateranda & Comp
- 23 November 1902: Construction contract (already 1,288 metres tailgated bottom drift)
- July 1904: Drying up of “Screaming Stream” water flow near Spital am Pyhrn, adjustment from machine operations to manual mode; work undertaken with restricted ventilation
- November 1904: Start-up operations using additional steam machine
- End of April 1905: Additional costs due to water penetration, leading to parliamentary criticism causing withdrawal by railway construction director, Karl Wurmb, and railway minister Heinrich von Wittek, the operators of the New Alps railways project
- May 1905: Expected tunnel breakthrough
- 17 May 1905: Another big water penetration on the Südstollen
- 22 May 1905: Methane gas explosion, 16 worker deaths
- 22 November 1905: Tunnel breakthrough despite the need to fully change the building process
- End of June 1906: Completion of the brickwork
- 31 July 1906: Closure of work on the tunnel
- 22 August 1906: Traffic handover (overrun in the construction time: 11 months)

First refurbishment work

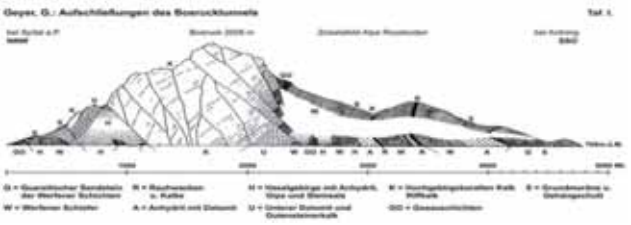
- 29 September 1963: Tunnel shut to traffic for several months due to refurbishment work following damage from water penetration, high ground pressure and steam engine gases, simultaneous electrification of Selzthal to Spital on the Pyhrn section to avoid further smoke damage
- 29 May 1965: Reopening

Existing construction

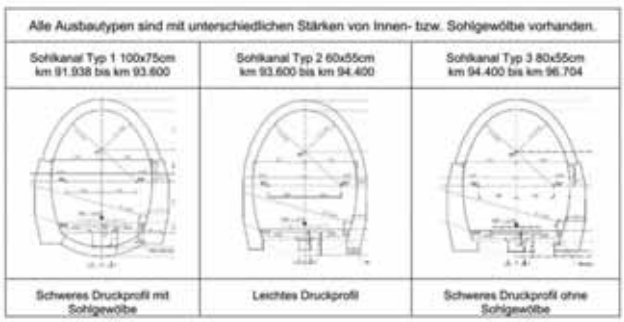
The tunnel construction shows a continuous vaulted masonry work with ring area (ring length 8 metres each)

- Northern section with two 125 and one 37 rings
- Southern section with two 125 and one 59 rings

A range of different building types were used to address the highly varied mountain conditions, which were in use at the time.



Section of Bosruck mountains
Image: PORR AG



Sections of vaulted stand
Image: PORR AG

Scope of renovation measures

The focal point of the work lay with the strengthening of the tunnel lining in the geotechnically difficult sections of the tunnel. The renovation work of the sole flue in the middle of the tunnel cross-section was equally urgent. Previous investigation work had shown an increased requirement for renovation.

Because of the short track barrier given by the ÖBB works (beginning of total barrier on 20 June, ending on 11 December 2016), the renovation areas needed to be restricted to the absolutely urgent activities.

During several years of preparation work, the ÖBB authorities in charge and the IGT Geotechnik und Tunnelbau ZT GmbH project manager defined the renovation sections and secured the renovation work possible within these timeframes.

Renovation phases and measures in detail

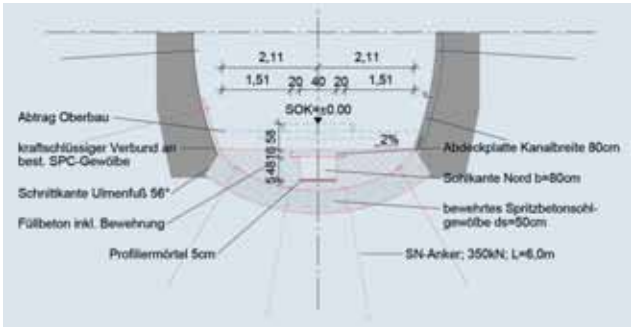
a) Prior to complete block-off, the section parts of the brick tunnel vault needed to be cleaned with a high pressure water jet during night and weekend work. This was done on the one hand to clean the tunnel and on the other hand to recognise the possible areas of damage that could be repaired during the course of the building work.

b) Existing cover plates of the sole flue along the length of the tunnel were removed and disposed of.

c) Depending on the damage patterns and the degree of damage to the base, different renovation measures were implemented:

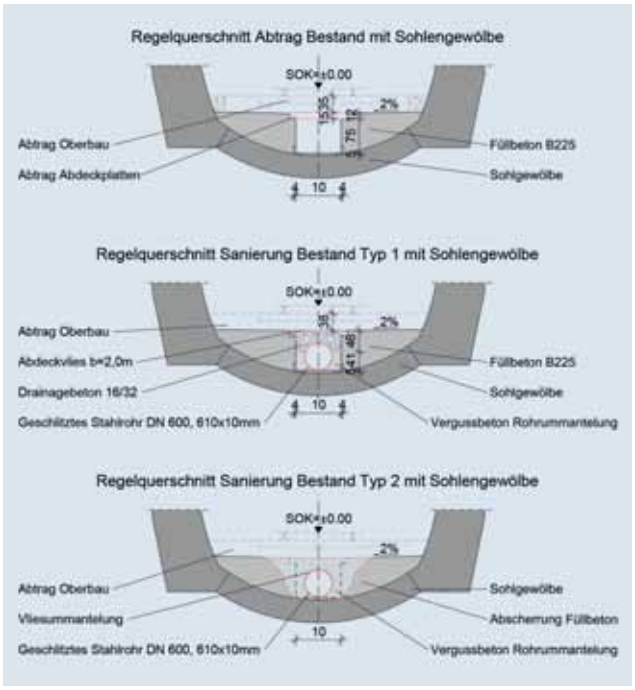
In areas where the base was not broken and the filling concrete had only minor flaws, steel drainage pipes were laid in the sole flue and sheathed with drainage concrete.

Pipe work of the sole flue
Image: PORR AG



Regulation cross-section of the piping work
Image: PORR AG

Base section prior to SpC
Image: PORR AG



Regulation cross-section base renovation
Image: PORR AG

In sections with serious damage, the existing sole build-up was removed and a reinforced base vault was built in with sole anchoring in parts. The anchors had been manufactured before the break of the base, even before beginning the reinforcement work was released and lengthened with special socketing.

The construction contract stipulated a maximum opening length of the base of 3 metres and a minimum strength of the shotcrete base of 0.50 m.
Immediately before the demolition work, both elms (tunnel side walls) were cut to a depth of 72 cm by a wall saw.

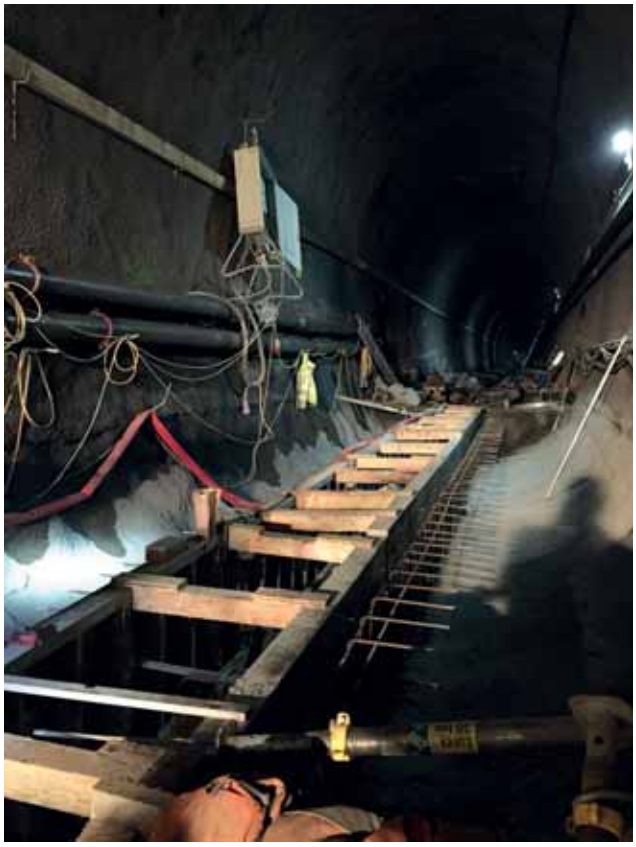
The break out of this tunnel base happened after bringing in 14 tonne diggers, as the tunnel profile did not allow for a bigger eruption device.

The statically specified reinforcement was achieved through the introduction of two layers of pre-bent drawing pads. Shotcrete manipulators were brought in to use shotcrete.

To create the new base, the incoming water had to be collected by pumps and the relevant renovation area needed to be pumped over twice with DN 250 pressure pipelines. Due to this high water pressure, the pumps were provided with their own failsafe power supply (cable lines).

After completion of the new base vault, the filling concrete was added with a dehulled base flue in a section length of approximately 24 meters. The supports for moving the

covers were built alongside.



Dehulling of middle flue
Image: PORR AG

The sole flue covers were removed in certain sections and newly laid during the course of the construction work.

Cutting supports
Image: PORR AG

Moving of the cover
Image: PORR AG

Completed tunnel base
Image: PORR AG

d) During the course of the total block, in agreement with the federal memorial department, the two listed portal building works were repaired and renovated.

Renovation work of the northern tunnel portal
Image: PORR AG

e) In the final two weeks of the total block, the substructure in the front portal regions–300 m in the north and 100 m in the south–were completely renewed and brought up-to-date technologically. This stage included stabilising the underground by milling in a lime-cement mixture.

Particular Challenges

a) Building time

Three building phases:

- Preparation phase: 1 June 2016 until 20 July 2016 (1.5 months) track-bound tunnel washing during night and weekend blocks as well as superstructure removal by the ÖBB.
- Core construction time: 20 July 2016 until 9 November 2016 (3.5 months) Main work in tunnel renovation in the 3-shift operation, neither buffer times nor training periods, during loss of building time: Accelerating measures
- Post-preparation phase: 9 November 2016 to 21 December 2016 (1.5 months) After hand-over of new tunnel base: Creation of the overbuilding and tunnel equipment measures such as laying of cable, overhead lines, etc. by the ÖBB

b) Logistics, construction process

Coordination of different work steps with a view to limited building times, renovation work going on simultaneously on both sides of the tunnel (northern and southern sections), therefore passing through the tunnel is not possibleSeveral activities for each section of renovation directly dependent on one another: Measuring (before, during and after work), sections, water containment, removal, mucking out (the mining of the outbreak with dumper vehicles), reinforcement, bringing in shotcrete sand, form-work of the sole flue, bringing in filling concrete, sheeting, creation of the sole guttering, relocation of covers, etc.

c) Special geological boundary conditions, innovative cement recipes

Due to the geological boundary conditions (Haselgebirge rock, anhydrite, gypsum as well as the high sulphur-content mountain water), an aggressive concrete was used as well as gradual transition of the concrete into thaumasite. Above all, the process of thaumasite formation has not been fully researched scientifically and therefore has not yet been added to the valid standard use.

In recent years, there has been comprehensive research on the Bosruck tunnel and recipes developed for special cements, which have shown a higher resistance against thaumasite formation. These recipes were successfully tested in preliminary tests.

Starting materials of concrete recipes in areas with sulphate / thaumasite attack

Bonding agent:

- C3A-free cement
- AHWZ only ground granulated furnace blast slag GS-HS (no pulverised limestone or fly ash)
- Micro silica (only Slurry is permissible) 15 kg/ m^3

Aggregates:

- The small particles in the sand under 2 mm may not contain lime, or dolomite rock (granite sand from Loja quarry in the Wachau was used)

Additives:

- Additives only permitted according to the following Austria standards (ÖNORM B4710/ÖNORM EN934-2).

The following concrete types were used:

- C25/30(56)/XC4/GK22/C3A-free for filling concrete and pouring concrete
- SpC/30/37(56)/III/J2/XC4/XAT/GK8/C3A-free for bottom shotcrete

Primary dimensions of the construction project

New underpinning	720 m
Shotcrete	2,500 m³
Filling concrete	2,500 m³
Reinforcement	120 t
Concrete sections	1,800 m²
Washing of tunnel	11,200 m²
Cover	2,700 m
Bottom break-out	5,000 m³
SN-Mortar anchor	1,970 m
Steel drainage pipe	1,400 m
Pumped water volume	1,500,000 m³
Working hours	28,000 h

Summary

In order to succeed with a building plan of this type, there is need for diligence on the one hand and the unshakeable employment of building site personnel on the other. Above all, however, the construction contractor’s constructive support is needed, including the whole planning teams and the local construction supervisors.

Pump-storage power station Obervermunt II increases total capacity

Construction site in high mountains poses technical and logistic challenges

Roland Schorn

Project data

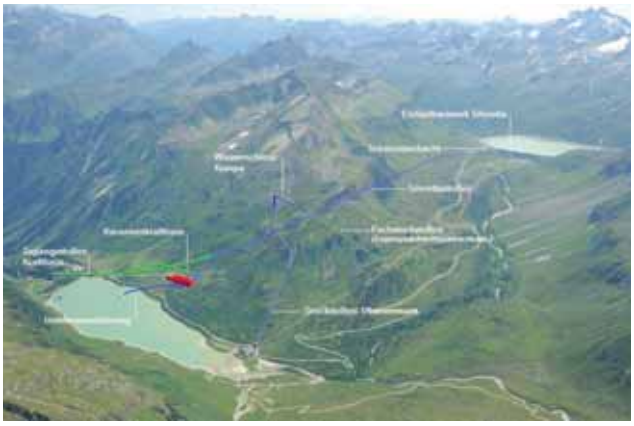
Location	Montafon, between the Silvretta and Vermunt reservoirs
Ordering party	Vorarlberger Illwerke AG
Contractor	PORR Bau GmbH in a consortium
Bau	Obervermuntwerk II
Project type	Power plant construction
Scope of services	Construction of a pump-fed power plant, including the works water channels and other ancillary structures
Contract sum	EUR 120 million
Start of construction	May 2014
End of construction	August 2018
Country	Austria

General information

In Montafon, between the existing reservoirs Silvretta and Vermunt, the Vorarlberger Illwerke AG (VIW AG) is building the pumpfed power plant Obervermunt II (OVW II). Located in the municipal area of Gaschurn, the construction site covers approximately 10 km by 1,100 m, rising up to 2,100 m above sea level. The Tunnel Construction Department of PORR Bau GmbH was asked to take part in the primary construction works in February 2014.

The new power plant uses the hydraulic gradient between the reservoirs for supplying the circulation pumps, thereby making a decisive contribution to increasing efficiency in the use of water power. OVW II is built as a sister plant to Obervermunt I, which will be provided with a new works water channel. The old aboveground pressure pipeline will be dismantled in due course.

The construction of all facilities will be carried out below ground, with the greatest possible consideration for nature and an ecological balance. The order amounts to approximately EUR 120 million. The time required for construction is estimated at four years. Commissioning has been planned for 2018.



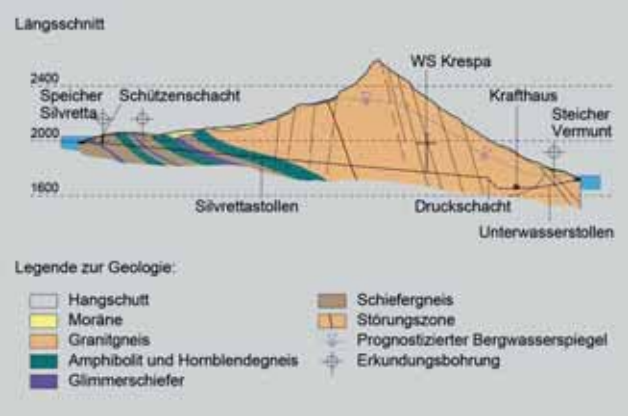
Overview of the Obervermuntwerk II facility
Image: VIW

Geological conditions: Tunnels cut through numerous types of rock

Obervermunt II is located in the Eastern Alps and entirely within the central part of the upper Silvretta plain, which is characterised by a wide variety of crystalline and mixed rock formations.

The power plant cavern and its side tunnels, the downstream tunnels, the lower part of the Silvretta tunnel and the Krespa waterlock, will all be located within a layered granite/gneiss slope. The upper part of the Silvretta tunnel and the supply tunnel will cut through the underlying amphibolite and paragneis layers. The corresponding tunnel sections are dominated mainly by amphibolite, hornblende gneiss and slate gneiss.

The morphology of the project area is characterised by glaciations of the Quaternary era. Gigantic glaciers scraped the valleys into broad trough-like forms and left behind some huge moraines in the project area, especially in the area of the Bielerhöhe and Großvermunt. No major slope movements occurred after the supporting effect of the glaciers was lost, but sliding movements did occur in the area of the Kresper plate.



Geological cross section of the entire facility
Image: VIW

Facility description – detailed overview

Obervermunt II consists primarily of the following three facility sections:

Upstream works water channels

- Inlet structure at the Silvretta reservoir, with inlet tunnel
- Shuttle tunnel, with locking equipment and ventilation facilities
- Head race tunnel (Silvretta tunnel) and Silvretta pressure shaft
- Obervermunt head race tunnel with slide chamber, including locking equipment and pressure pipe (pipe tunnel)
- Krespa waterlock with a vertical shaft, lower and upper chamber
- Fuchsloch tunnel (access tunnel to Krespa waterlock) and portal construction
- Distribution pipe, each with two pump riser pipes and turbine inlet pipes
- Access tunnel to the pressure tunnel
- Access tunnel to the distribution piping

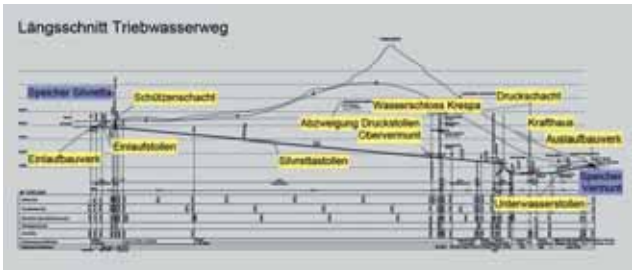
Powerhouse cavern and accompanying facility components

- Access to the powerhouse and portal building
- Machine cavern, with two horizontal machine sets
- Two turbines and ball valve pumps
- Two pump inlet and turbine outlet gates
- Transformer cavern, including machine transformers, network-linked transformer and a gas-insulated switching facility (SF6 switching facility)
- Cable and escape tunnels, with water tanks for cooling and firefighting, and a portal building
- Spoil tunnel
- Utility tunnel with supply shaft

Downstream works water channel

- Downstream access tunnel
- Two pump inlet and turbine outlet tunnels each
- Downstream tunnel
- Outlet structure in the Vermunt reservoir

The entire excavation of all tunnels, shafts and caverns was carried out at 33 different locations. Up to four tunnels had to be bored simultaneously.



Longitudinal cross section through a works water channel
Image: VIW

Description of the facilities – construction details

Upstream works water channels: More complicated working conditions

The upstream pressure tunnel of the OVW II (Silvretta tunnel), which is about 3 km long, departs from the Silvretta inlet structure, falling with an incline of approximately 9 % down to the start of the armoured pressure shaft. The works water is led to the two machine sets of the OVW II through the distribution piping on to the Silvretta pressure tunnel. Approximately 500 m in front of the pressure shaft, which has an incline of 48°, the Obervermunt pressure tunnel branches off from the joint works water channel, at the point where it connects to the existing Obervermunt plant.

The excavation of the Silvretta tunnel, which has a cross-section of approximately 50 m², was carried out using cyclical blasting over the entire length. Rock bolts, construction steel grating and sprayed concrete were used for securing and supporting the cavity created by the boring.

From the middle of May 2015 until the end of August 2015, a strong influx of mountain water, which reached a peak value of approximately 120 l/s, made the boring works more demanding. A geological prognosis had indicated short-term and strong influx of water, however only up to 30 l/s. Since the influx lasted longer than assumed, and since it reached four times the forecast water volume, the project was seriously put to the test. For the miners, this meant working under highly extreme conditions. Normal rainwear was no longer sufficient. Only the use of neoprene dry suits as an added personal protective measure and the upfront drilling of drainage holes improved in the working conditions.

Normal construction operations in the tunnel were carried out primarily in an excavation bed tubbing and in an inner shell without reinforcement, which had been poured above the tubbing on-site. In those sections, where the mountain cannot support the maximum water pressure, the Silvretta tunnel is shielded with tension-resistant and waterproof steel armour.

Silvretta tunnel, interior construction, advance excavation bed tubbing, trailing formwork carriage for the vault
Image: ARGE Bau OVWII

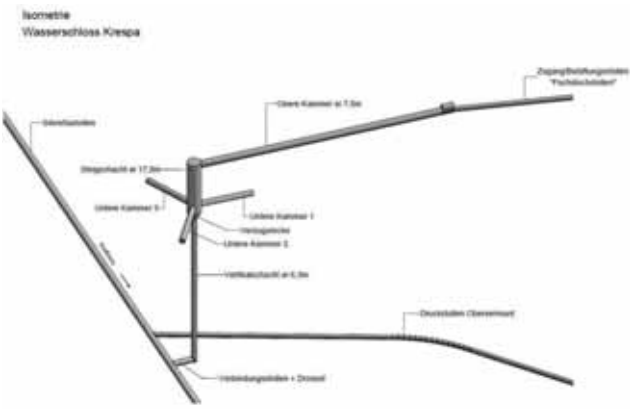
Silvretta tunnel, unreinforced concrete inner shell, cross section 6.80 m, longitudinal incline 9 %, rear-mounted vault formwork carriage
Image: ARGE Bau OVWII

Pressure shaft, upper vertical elbow, installation of steel armouring, inside cross section 4.5 m
Image: ARGE Bau OVWII

Krespa waterlock: Complex pressure regulation, at the inside of the mountain

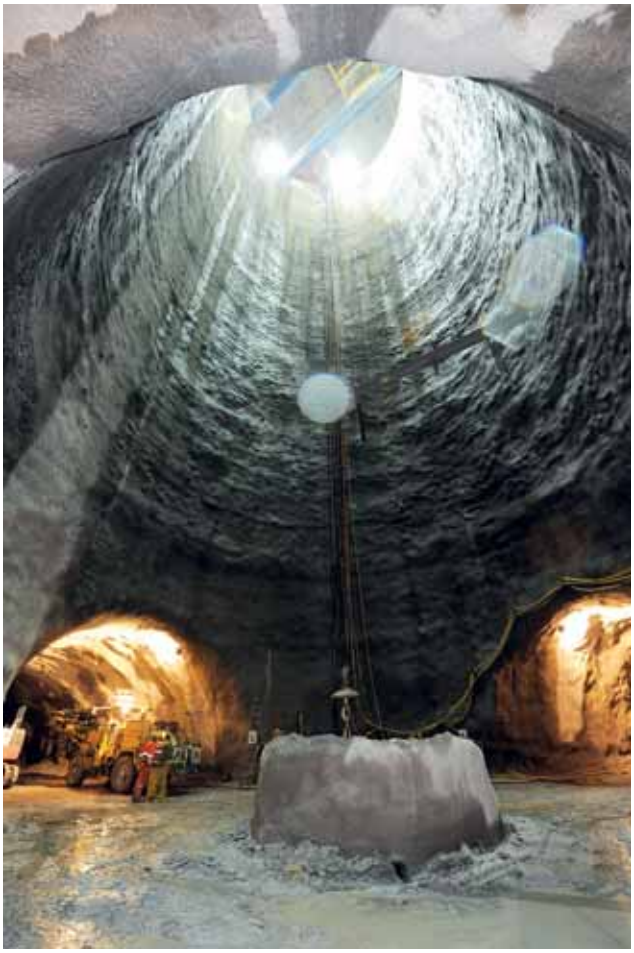
In power plants technology, a waterlock serves to limit pressure fluctuations by means of load alternation paths to the machine sets. These come into play, for instance when starting up or slowing down the machines. The dimensioning of the Krespa waterlock is designed for the high demands of extremely short transitions in operation either from pumping to turbine operations, or the other way round. The core is formed by a 292 m high vertical shaft, which has been excavated in many different cross sections, ranging from 7.30 m to 18.40 m, and several 70 m long downstream chambers that are arranged in a star-shaped pattern, which have been excavated in changeable, so-called conical shapes.

For the shaft excavation, a spoil hole was created in advance by means of the "raise drilling" method, with subsequent widening from top to bottom by blasting. A portal crane with a 20 t service load was used for the transport of equipment and material. The transport of workers was realized via a personnel transport system. The installation of the inner shell of the shaft was carried out in the slip-form method.



Krespa waterlock, schematic presentation, total shaft height 292 m
Image: VIW

Krespa waterlock, riser duct, inner shell completed by slip-form method, inner cross-section 17 m, three branching and lower chambers, equipped warping section
Image: ARGE Bau OVWII



Krespa waterlock, excavated riser duct, tunnel crown excavation, lower chambers in progress
Image: VIW

Power plant cavern: Larger than the St Stephen's Cathedral in Vienna

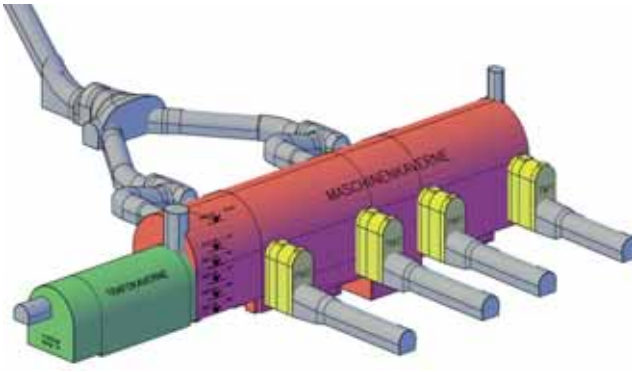
During turbine and pump operations, the power plant will have an output of 360 MW. Two machine sets will be used, which dispose over separate turbines and pumps that are highly flexible and can be quickly and comprehensively adjusted.

The power plant, which lies underground, consists of a transformer and machine cavern, with a total length of 170 m, a width of up to 25 m and a height of a maximum of 39 m. Besides the machine sets and the related regulation and control facilities, ancillary facilities are also installed there. Each of the machine sets consists of a pump, coupling, motor generator, an overriding clutch and a turbine. Each of the turbines comes with a separate downstream channel, while each pump has its own pump water channel. The downstream channel empties into the Vermunt reservoir via the outlet structure.

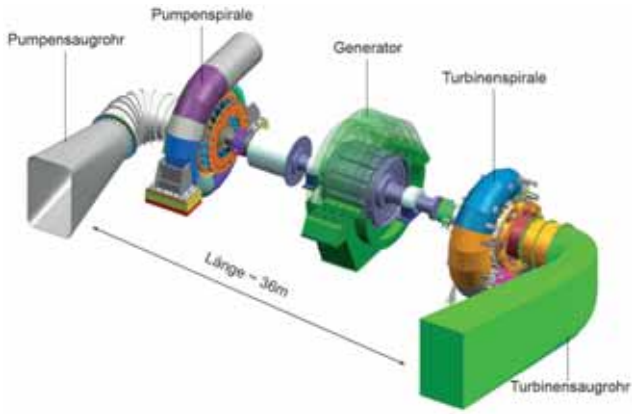
The shape of the machine cavern is primarily determined by the horizontally installed machine sets and the geological conditions. In contrast with this, the altitude at which the machine cavern has been built is primarily determined by the necessary installation depth of the pumps. For achieving the required inflow pressure to the pumps, these must be installed sufficiently below the target water level at the Vermunt reservoir. Besides the hydraulic factors, their position is largely determined by the characteristics of the mountain and geo-mechanical necessities.

The cavern excavation was carried out in eight levels from the top to the bottom. The cavity was stabilised by multiple layers of sprayed concrete with armouring and with 20 m long rod anchors, which have a cross-section of 57 mm and a breaking load of 200 t. In total, 115,000 m³ of rock had to be excavated for the power plant.

Installation of the interior facilities was successfully completed between March 2016 and April 2017. Major challenges were presented by the coordination of the works and the other interior installations, as well as by the cramped space available underground.



Power plant, schematic presentation of the transformer and machine cavern
Image: ARGE Bau OVWII



Presentation of a single machine set, length 36 m
Image: VIW

Machine cavern, interior installations, height of up to 21.5 m of the crane track pillars
Image: ARGE Bau OVWII

Transformer cavern, with aligned pump and turbine spirals
Image: ARGE Bau OVWII

Transformer cavern, location for pre-assembly of pump and turbine spirals
Image: ARGE Bau OVWII

Material processing and concrete mixing facility

Due to the location in a high mountain region, which also required a five month winter shutdown of the access roads, and for environmental reasons required by the client, the concrete had to be prepared on-site and from the excavated material. This enabled savings of 35,000 freight lorry trips in the Montafon region. For approximately 250,000 m³ of concrete, this required the installation of a winter-proof material processing facility and two concrete mixer facilities. A cable railway with a loading capacity of 20 t was erected especially for ensuring the mixing facilities with binding agent during the winter. This required a major deployment of equipment and personnel, including the corresponding logistic challenges.

Facilities for employees, at 2,000 m above sea level

For the accommodation of employees existing barracks in the Silvretta area were used, and additional accommodations were established at a height of 2,000 m above sea level. A proprietary construction-site canteen was responsible for meals.

The "Silvretta village" at 2,000 m above sea level; avalanche-proof quarters with a constructionsite canteen
Image: ARGE Bau OVWII

Tourism as an additional challenge

The high alpine road at Silvretta and the existing power plant facilities are a popular tourist attraction throughout the year. The resulting traffic streams must be guided through the construction site in an ordered way.

Installation of the main construction site, at the foot of Vermunt reservoir dam: Material processing, gravel works, two concrete mixers, a concrete laboratory, workshops, storage facilities
Image: ARGE Bau OVWII

Technical data for the Obervermunt II pump-fed power station

Number of machine sets	2
Bottleneck capacity during turbine operations	360 MW
Max. power consumption during pump operations	360 MW
Turbine type	Francis turbine, installed horizontally, rotating speed 430 rpm/minute
Output per turbine	180 MW
Output per reservoir pump	180 MW
Max. flow-through during turbine operations	150 m³/ s
Max. flow-through during pump operations	135 m³/ s
Falling height	291 m

Primary volumes of the construction project

Length of the mining operations, total	9 km
Height of the shaft constructions, total	510 m
Total of excavated volumes (solid)	775,000 m³
Spray and construction concrete	250,000 m³
Armouring	5,000 t

Summary and Outlook

The boring operations ended in April 2017, and the concrete works on the works water channel will be completed at the end of 2017. If the installation works inside the mountain and the subsequent finishing works are completed on schedule, commissioning is expected in 2018.

Dispose of building rubble

PKM-Muldenzentrale, an important partner of the construction industry

Harald Baburek

PKM drivers of PKM Muldenzentrale GmbH
Image: PORR AG

General information

Whether it comes to the construction of residential accommodations, the construction of power plants, or the renovation of bridges - all building and civil engineering projects produce rubble that must be professionally disposed of to prevent ecological harm.

In the past, this primarily entailed the separation of waste by type and its proper disposal in waste tips to prevent hazardous substances from entering the environment. However, today the responsibilities have become much more extensive. Now, new know-how and technologies require thinking and acting in cycles. Demolition and construction waste are now understood as valuable materials for future construction projects, and are therefore re-integrated into the construction process and assigned to new uses.

PKM-Muldenzentrale, which is part of PORR Umwelttechnik, has built up comprehensive competence in this highly complex area of the construction industry, thereby making it an important partner for every construction project.

A success story in environmental technology

The Muldenzentrale: How everything began...

Because a lot of rubble was generated by the tunnelling works for tramline 2 on the Wiener Lastenstraße in the middle 70s, a number of companies cooperated in founding the "Muldenzentrale". This company was primarily concerned with the disposal of construction site waste from inner-city areas by filling tip lorries and containers. This permitted the swift collection of rubble and construction residues using containers. Industrial companies subsequently also started to dispose of their waste in this clean and quick manner.

The construction industry as a quickly growing market

Since the 80s, there is an increasing amount of construction and industrial materials for separation and sorting. In 1984, a plot of land was rented in Wien Simmering, which initially served for manual sorting. In 1985, the company management decided on the construction of a mechanical sorting line, which was taken into operation in 1986. In 1992, this facility was modified and extended to its current size.

At the end of 1988, PORR AG founded "ARGE – MULDEN" in cooperation with another company with the objective of jointly benefitting from their experience in collecting waste materials. By 1989, four tip lorries were already disposing of approximately 35,000 tonnes of construction waste. The positive development of orders led to the joint foundation of the company "PK-Mulden Service Ges.m.b.H.".

Diversification and new operations site

A modern vehicle fleet with a wide range of tip lorries for the most varied disposal purposes, IT-supported logistics, disposition of the fleet via mobile telephones and efficient partners from the disposal sector have all contributed to the success of the company. All types of construction waste, such as rubble, material excavated for subterraneous curtain walls and also commercial and residual waste, is collected and disposed of. The principal operating site was located in the 21st district in Vienna on the "Langes Feld" landfill.

In 2004, the merger of "Muldenzentrale Sortier & Recycling GmbH" with the company "PK-Mulden Service Ges.m.b.H." led to today's "PKM-Muldenzentrale GmbH".

The focus of the activities was on the disposal of construction site waste. This merger of two renowned disposal companies including their professional know-how in waste management, resulted in a solid and competent organisation. Since June of 2005, the company is a certified professional waste management facility. The service portfolio has expanded substantially in the meantime and is being optimised in an ongoing manner.

In 2016, PORR Umwelttechnik acquired a majority stake in the company.

Service spectrum of PKM-Muldenzentrale

The portfolio includes the removal of construction site and related waste materials in tip lorries and containers, as well

as waste from earthworks and demolitions, clearances, the transport of hazardous goods, craneable tip lorries, special leakproof tip lorries and other special vehicles, which are used in civil engineering and for the transport of such materials as sand and gravel.

The equipment of PKM-Muldenzentrale consists of 3,500 tip lorries and containers in various sizes, including special types such as leakproof tip lorries, for instance for the transport of material excavated for subterraneous curtain walls.

With its own special vehicles, and with the fleet of its partner companies, up to 45 freight lorries and 10 trailers are available for use, including multi-bucket vehicles and roll-off tippers. This means that about 50,000 tip lorry and container trips are made each year.

The transfer and processing of the waste materials, such as residual construction waste, wood and commercial waste, takes place at three proprietary sorting and processing facilities, which are located on the 40,000 m² operating premises.

The incoming construction site waste is separated into various types, including recyclable materials that are recycled or disposed of in conformity with applicable legislation. Sorting residues and residual waste are transferred for thermal processing.

Larger construction works include a variety of waste-intensive processes, such as structural works, expansion and occupancy. In these different phases, a large variety of different waste and recyclable materials accumulate due to the number of different construction materials and the cooperation of professionals and subcontractors. As a service, PKM-Muldenzentrale offers the establishment of a "collection point". Containers are made available in the volumes that are required for all types of waste. Waste registration, the logistics for transport from the collection point, and invoicing to the individual companies, are carried out directly by PKM-Muldenzentrale.

PKM-Muldenzentrale-9213
Image: PORR AG

Two new projects of PKM-Muldenzentrale

Online shop

In July 2016, the company established an online shop for private customers, offering disposal containers for the most common types of waste. The type of waste and the required container – mobile and lockable waste containers in sizes of 120 l, 240 l and 1100 l, and Type 8 and Type 10 containers – can be directly selected in the online shop. Order confirmation and all other information is provided via e-mail.

Intelligence of fleet control

In March 2013, PKM-Muldenzentrale in Vienna realised the most modern fleet control system in Austria. The objective of this project was paperless handling of all orders, as well as a fully automatic control of the new vehicle scale.

A large number of innovations were connected with this, such as:

- Bidirectional order communications
- GPS-supported satellite positioning
- Container management with GPS positioning
- Digital signature of documents
- Dispatch of delivery vouchers by e-mail – as of October 2015
- A fully automated scale, with gating function and photo documentation
- Driver time registration
- Integrated calculation of the contribution margin

Efficient order handling – how it works...

All drivers have been issued with a tablet computer, which also offers features such as navigation, weather reports and traffic information. For precise GPS positioning, the sensor technology is provided in a blackbox by the company rona, which is permanently installed in each vehicle.

The dispatchers book orders directly to the vehicles as usual. The tasks assigned to a driver are displayed on a tablet in the cockpit. The order is activated with a tap. The trip is subsequently displayed in real time in the scheduling system. The driver enters the quantities at the customer site, displays a digital copy of the delivery voucher, and has it signed directly on the tablet. The centralised server software then immediately sends the delivery voucher to the customer by e-mail. Even without a signature, the delivery voucher shows the geographic coordinates and timestamp, which documents the pickup. Back at the company, the driver proceeds to the automated scale and presses the button "Carry out weighing". The weight of the order is recorded, a photo of the received delivery is made and archived, and the gate is opened. The driver can then unload. After unloading, the driver activates the weighing process once again, which closes the circle; the order has been completed and an automated invoice is now created. Due to this increase in efficiency, customers can now be served still more quickly and precisely.

Summary and outlook

The processing of residual construction waste covers an enormous area in the construction industry. A comprehensive understanding is required of the complexity of the individual task areas and their interaction, as well as a capacity for thinking in terms of processes and cycles.

PKM-Muldenzentrale, a part of PORR Umwelttechnik, disposes over decades of expertise in all areas of the waste disposal and management sector, and, by meeting all requirements of the construction industry, it is rightly viewed as an expert and highly competent partner by it.

Employees of the company
Image: PORR AG

Railway overpass in Magdeburg restructures city traffic

The goal is to create a more attractive city centre

The underpass area for pedestrians, cyclists and trams
Image: PORR AG

The Berlin branch of PORR Deutschland GmbH was commissioned with the renewal of five railway overpasses in close proximity to Magdeburg's main railway station in January 2015. The project is executed along the redesigned Ernst-Reuter-Allee.

A new tunnel below the present road level will separate the motorised private traffic from the remaining traffic flows, such as trams, pedestrians and cyclists. Magdeburg will thereby give its inner city an entirely new flair.

Tunnel restructures city traffic in Magdeburg
Image: PORR AG

Intermittent stops are a special challenge

The project sequence is mainly determined by the three railway closures during 2016, 2017 and 2018. Some of the railway overpasses are more than one hundred years old, and must be replaced in sections. Any shifts in the closure periods will impact on the project schedule.

Accelerated construction sequence – reaching goals by way of teamwork

For this reason, the construction team has formulated an accelerated construction process in collaboration with the contracting authorities, which is to permit compensation of any delays by special measures.

The time-critical steps were carried out over a total period of four months in a shift system with a seven-day week. These measures have succeeded in meeting the agreed deadline for handover to railway construction on 19 October 2016, and thus to comply with the timetable.

The company is currently working intensively on meeting the next agreed handover deadlines.

Project data

Client	Contracting entity at DB Netz AG, City of Magdeburg, Magdeburger Verkehrsbetriebe, municipal supply and disposal companies
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Structual engineering
Scope of performance	Renewal of five railways overpasses Tunnel construction
Start of construction	Spring 2015
End of construction	December 2019
Country	Germany

Hohenthurm railway overpass completed

Milestone of traffic project Deutsche Einheit 8 achieved

Hohenthurm railway overpass
Image: PORR AG

In July 2014, the Berlin branch of PORR Deutschland GmbH was instructed to build the Hohenthurm railway overpass over Landesstraße 168, which is to be constructed simultaneously.

The project was part of the modernisation of the Halle (Saale) transport hub. The conversion has created the conditions for rail-bound high-speed traffic at the railway node. The measures were part of the transport project Deutsche Einheit 8.

High speed requires special actions

The modernisation of the line also involves an increase in the permissible speeds. All railway level crossings along the route must be replaced by overpasses or underpasses.

Execution of extensive civil engineering works

The services provided by PORR included the construction of the railway overpass around the traffic hub, as well as the construction of road 168 in a trough structure. The pedestrian ramps also had to be connected to an existing pedestrian underpass at the station. Extensive civil engineering and specialist works were required. The execution took place as part of a working group.

Planned overall completion

After completion of the contractually agreed traffic release for the new road and partial acceptance of the completed services by 17 November 2016, the overall completion of the project was also achieved on schedule.

Project data

Client	DB Netz AG Frankfurt
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Structual engineering
Scope of performance	Construction of the railway overpass in the area of Halle (Saale) traffic hub Construction of road 168 Connection of pedestrian ramps to existing pedestrian underpass
Start of construction	October 2014
End of construction	February 2017
Country	Germany

The festive release of the Hohenthurm railway crossing
Image: PORR AG

State-of-the-art transport infrastructure for Frankfurt's Europaviertel

Construction of partial section of urban railway line U5

PORR Deutschland GmbH is constructing the 1,160 m subterranean section from Platz der Republik to its surfacing point in front of the Emser Brücke and the shell of Güterplatz station.
Image: Stadtwerke Verkehrsgesellschaft Frankfurt am Main mbH

Project data

Client	SBEV – Stadtbahn Europaviertel Projektbaugesellschaft mbH
Contractor	PORR Deutschland GmbH in a consortium
Project type	Structual engineering, Specialist civil engineering and Tunneling
Scope of performance	Construction of the subterranean section of the U5 urban railway line extension and the Güterplatz station in Frankfurt
Start of construction	February 2017
End of construction	July 2022
Country	Germany

In mid-January 2017, a contract was signed between SBEV - Stadtbahn Europaviertel Projektbaugesellschaft mbH and PORR Deutschland GmbH in Frankfurt. The subject of the contract was the construction of the subterranean section of the U5 urban railway line from Platz der Republik to Europaviertel.

A new district for Frankfurt

The Europaviertel in Frankfurt is a newly created inner city quarter that will be the home and workplace to 30,000 people. Its high quality of life results from generous urban development, modern infrastructure and optimal traffic connections.

For this purpose, the U5 urban railway line is to be extended by approximately 2.7 km with four new stations. This additional section consists of several construction sections. The order to PORR Deutschland with a consortium entails the 1,160 m subterranean section from Platz der Repbulik to the surfacing point of the line ahead of Emser Brücke.

Rapid tunnel construction

The project also includes the shell construction of the underground station Güterplatz. The projects commenced in February 2017. The drilling of the two tunnel tubes by earth pressure process is set to take around 16 months, with various accompanying measures. The project mainly consists of specialist civil engineering and structural engineering projects. The projects are set to be completed in July 2022.

U5 station Berliner Rathaus set for complete overhaul

Following successful shell construction, the finishing is also commissioned

Visualisation
Image: Collignon Architektur und Design GmbH

Project data

Client	Berliner Verkehrsbetriebe (BVG)
Contractor	PORR Deutschland GmbH . Berlin branch . Infrastructure
Project type	Traffic and transport construction
Scope of performance	Expansion of the public passenger areas and the non-public areas such as operating rooms, as well as a range of structural infrastructure
Start of construction	February 2017
End of construction	August 2018
Country	Germany

In December 2016, the PORR Deutschland GmbH . Berlin branch was commissioned with the expansion of the Berliner Rathaus underground station. The PORR had previously built the shell, which is connected to the existing tunnel at the staging facility Alexanderplatz further east.

The Berliner Rathaus underground station has three storeys. It was constructed as a reinforced concrete frame structure with cover method in two levels: the upper level with the platform and railway tracks, and the lower level with a four-track staging facility.

Overall, the contract covers the expansion of the public passenger areas, levels -1 to -2, as well as the expansion of the non-public areas and the operational areas from levels -1 to level -3.

Facelift through exceptional architecture

The architectural design by the Collignon architecture office was a particular point of focus. The striking mushroom column heads and the wall cladding in white and anthracite colour, which follows the shell walls in concave and convex-elliptical design, characterise the appearance of the subway station.

Railways open to all – Tulln soon to be barrier-free

Celebratory ground-breaking ceremony for the conversion of the main station

The projects were kicked off in the presence of representatives of the Austrian Federal Railways, the federal government, the Lower Austrian provincial government and the municipal municipality of Tulln. Left to right: Kommerzialrat Harald Schinnerl, Landesrat Karl Wilfing, Mayor Peter Eisenschenk, ÖBB board member Franz Bauer
Image: PORR AG

The ground-breaking ceremony for the conversion of Tulln main station took place in icy temperatures on the 23 January 2017.

The conversion projects of Tulln railway station entail connection of the basement and ground floor area to the pedestrian passage, as well as conversion of the associated north portal. Two new island platforms will provide barrier-free access to platforms 1 to 4 in the future.

The scope of services also includes the dismantling of a part of the historic platform roof, and realisation of new roof foundations.

New forecourt for bike & ride facility

In addition, a new forecourt for a bike and ride facility and noise barriers will be built. The PORR rail construction department will carry out the order as part of a consortium by 2018. The completion and transfer is planned for August 2018.

Project data

Client	ÖBB – Austrian Federal Railways
Contractor	PORR Bau GmbH in a consortium
Project type	Rail construction
Scope of performance	Conversion of the main station incl. new island platforms and establishment of barrier-free access
Start of construction	January 2017
End of construction	August 2018
Country	Austria

Setting the course for the future – modernisation of important main lines

Two further railway construction contracts in Poland

Switch assembly on the main railway line LK 4 in Biała Rawska
Image: PORR AG

PORR Polska Construction succeeded in winning two interesting orders at the end of 2016. This is particularly noteworthy given the fact that the investment expenditure of the Polish railways (PKP PLK) reached a mere 50% of the previous year.

Modernisation of main railway line LK4

On 21 December 2016, the construction order for the modernisation of another railway switch signal box on main railway line LK4 was signed at PKP PLK in Warsaw. The line links Warsaw to the cities of Katowice and Krakow. Similar to the LK 4 Biała Rawska construction measure, which was successfully implemented by PORR in 2015, a switch connection and the electronic switch signal box at Pilichowice station have now been modernised. Special transport trolleys from Austria were used to deliver the four required EW-1200 switches. All earthworks and overhead line assembly works were carried out in the course of a six-day complete closure of the LK4.

Project data

Client	PKP PLK (Polish Railways)
Contractor	PORR Polska Construction
Project type	Rail construction
Scope of performance	Modernization of a switch and electronic switch signal box at Pilichowice
Start of construction	December 2016
End of construction	October 2017
Country	Poland

Modernisation of the E30 between Katowice and Krakow

On 29 December 2016, the PKP PLK awarded the contract to modernise a 15 km section of line E30, which links Katowice to Krakow. The measures are to be implemented by a consortium under participation of PORR.

In Jaworzno railway station and on the route between Jaworzno and Trzebinia, a total of 38 km of tracks and 40 switches, including base courses and the overhead line, will be completely renewed. The overhaul of 33 civil engineering structures, the new construction of six platforms, and the erection of 4 km of noise barriers are also scheduled as part of the order. The modernisation of control and safety systems, as well as the power supply and telecommunication systems complete the range of services. The consortium has 28 months to carry out all of the projects.

Project data

Client	PKP PLK (Polish Railways)
Contractor	Consortium with participation of PORR Polska Construction
Project type	Rail construction
Scope of performance	Modernization of a 15.000 m section of line E30 between Katowice and Krakow, including the overhaul of 33 civil engineering structures and equipment, with a wide range of associated infrastructure facilities
Start of construction	December 2016
End of construction	December 2018
Country	Poland

Regulation and plugging of switches on the main railway line LK 4 in Biała Rawska
Image: PORR AG

New Rothof bridge to be built without traffic downtime

Spectacular construction site on the Bavarian highway

The existing building
Image: PORR AG

On 10 January 2017, the Federal Republic of Germany, represented by Autobahndirektion Nordbayern, awarded the order for the replacement of the Rothof bridge to PORR Deutschland GmbH . Berlin branch.

The construction contract entails the complete renewal of a viaduct near the Lower Franconian villages of Rottendorf and Rothof in the north of Bavaria. The existing structure in the form of a one-piece steel composite cross-section no longer meets the requirements of today's traffic loads. In the course of the six-lane extension of federal motorway BAB A7, the bridge is to be replaced by a new structure. The contractual construction period is scheduled for April 2017 to May 2021.

Tactful construction

The designers conceived the new Rothof viaduct as a two-piece cross-section. Both directional lanes are each provided with a separate superstructure as a hollow box of prestressed concrete.

The superstructures are established by an incremental launch process, with 13 stages with a maximum single element length of approximately 30 m. The process makes use of a launching nose with a length of approximately 36 m. The superstructures have a total length of 410 m each, and are distributed over two counterfort and seven pillar abutments. The largest span widths are 60 m. The superstructures are placed on solid, full-bodied piers with a bone-shaped outline. The piers are inclined obliquely upwards on all four sides, and terminate in Y-shaped pierheads.

The piers are between 12.50 m and 25.50 m high. The foundation of the new building is on massive bored piles with a diameter of 1.50 m and a length of up to 22 m.

Direction Fulda – interim bridge

As a result of the continuity of road traffic on the A7 motorway and the one-piece design of the existing structure, the directional lane towards Fulda had to be temporarily installed on auxiliary piers and abutments next to the existing structure.

The superstructure for the directional lane towards Fulda is incorporated into the incremental launch method via the previously established temporary foundation piers. Once completed including railings and flooring, the entire traffic of the A7 motorway will be carried on this temporary route. The existing structure is then dismantled entirely. The demolition of the transversely and longitudinally prestressed roadway plate will take place sequentially. The steel structure will be equipped with auxiliary supports for the transfer of loads during dismantling.

Direction Würzburg – bridge on wheels

After demolition of the existing structure, the final substructures for both directional lanes will be built. Finally, the second superstructure for the directional lane towards Würzburg will also be built by means of the incremental launch process, and brought into its final position.

After construction of the Würzburg route is finished, the A7 motorway traffic will be rerouted again. This permits the superstructure for travel direction Fulda, which is currently in the replacement position, to be inserted transversely into its final position. The transverse stroke bearings are based on special plain bearings for all bearing axles. The necessary displacement forces are introduced via the abutment axes.

Project data

Client	Federal Republic of Germany represented by Autobahndirektion Nordbayern
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Bridge building
Start of construction	April 2017
End of construction	May 2021
Country	Germany

The Bridge from the bird's-eye view
Image: Google Maps

Construction data

Pier heights	12.50 m to 22.50 m
Spans	35 m to 60 m
Superstructure weight Lateral shift	17,760 t
Concrete bored piles	7,200 m³
Concrete substructures	10,400 m³
Concrete superstructures	13,305 m³
Reinforcing steel	4,175 t
Clamping steel, internal	450 t
Clamping steel, external	165 t

Start of construction of the Varodd bridge in Kristiansand

Norway chooses comprehensive expertise

Visualisation of the Varodd bridge
Image: Statens vegvesen

The contract was signed in mid-February 2017; construction works started right after in March: PORR is building the new Varodd bridge in Kristiansand. The project is executed for Statens vegvesen Region Sued, and is set to be completed in the spring of 2020.

Conversion and integration of existing bridge structures

The 654 m bridge over the Topdalsfjord is erected between two existing bridge structures. A suspension bridge from the year 1956 will be demolished in the course of construction works, and the second bridge from 1993 is to be converted and integrated into the new structure. A total of six lanes will be created, which will carry some 50,000 vehicles across the fjord in the future. A footpath and cycle path are also planned. Due to the location on the main road to Kristiansand and the approach to the airport, building logistics must meet the highest demands.

PORR as an experienced partner in Norway

The decision to award the project to PORR was not based on price, but above all the positive experience in working with other ongoing projects, such as the Farris bridge in Larvik. At the end of 2015, PORR realised one of the most spectacular bridge projects in the region, the Tresfjord bridge. The cornerstone was the cooperation with local partners, which will continue in the future.

Preparation of the first underwater blasting
Image: PORR AG

Construction of a bridge foundation at the drydock
Image: PORR AG

Project data

Client	Statens vegvesen Region Sued
Contractor	PORR Bau GmbH . PCN Norge
Project type	Bridge building
Scope of performance	Construction of a 654 metre bridge with six lanes, including a footpath and bike path
Start of construction	March 2017
End of construction	Spring 2020
Country	Norway

Hietzing Hospital – a facelift for the former revolutionary

Conversion and extension of Pavilion 1 commissioned

Exterior view of Pavilion 1
Image: Architektenbüro Baumschlager Eberle

The hospital association Wiener Krankenanstaltenverbund (KAV) has granted PORR Bau GmbH the partial general contractor agreement for the conversion of Pavilion 1 and the erection of a new extension to Hietzing hospital.

The award was won after a multi-stage selection procedure. The project is executed by PORR Bau GmbH as part of a consortium.

An imperial-era pavilion is upgraded for the 21st century

Hietzing hospital, originally built as Kaiser-Jubiläums-Spital under Mayor Lueger in the years 1908 to 1913, is distinguished by the then-revolutionary system of pavilions.

Pavilion 1 is now set to become the new site for the psychiatry department with appropriate additions and conversions. The building is upgraded to the state of the art in medical care by coring, underpinning, soil improvement, wall reinforcement, static reinforcement and draining, as well as installation of all necessary technical and medical equipment.

The extremely short construction period of approximately 15 months presents a major challenge for the project, which PORR Bau GmbH will address using comprehensive preparation and proven management systems.

Exterior view of Pavilion 1
Image: PORR AG

Project data

Client	Wiener Krankenanstaltenverbund – KAV
Contractor	PORR Bau GmbH . Revitalisation in a consortium
Procejt type	Revitalisation
Architects	Baumschlager Eberle Architekten
Scope of performance	Hietzing Hospital, additions and conversions to Pavilion 1 incl. installation of all necessary technical and medical equipment
Start of construction	November 2016
End of construction	Early 2018
Country	Austria

La Tête – An extraordinary media company brings movement to the city

Topping-out celebration for editorial buildings with its own journalism school

Topping-out ceremony at the La Tête. Left to right: Oliver Knörr (Technical Branch Manager Building Construction, PORR Deutschland GmbH . Dusseldorf branch), Stephan Hebgen (Managing Director, PORR Deutschland GmbH . Dusseldorf branch), Dr. Joachim Wieland (CEO, Aurelis Real Estate), Thomas Geisel (Mayor of Dusseldorf), Frank Jainz (Managing Director, PORR Deutschland GmbH . Dusseldorf branch), Caspar Schmitz-Morkramer (Managing Director, msm meyer schmitz-morkramer rhein GmbH), Gabor Steingart (chairman of the management, Verlagsgruppe Handelsblatt)
Image: krischerfotografie

Around 280 guests gathered for the topping-out celebration of the La Tête project in Düsseldorf on the 3 February 2017. Aurelis Real Estate GmbH & Co. KG commissioned PORR Deutschland GmbH . Düsseldorf branch as general contractor with the turnkey erection of the complex. After a construction period of just one and a half years, the handover is set to take place at the end of October 2017.

Modern office architecture reflects corporate philosophy

More than half of the total lettable space of 23,800 m² will be occupied by Verlagsgruppe Handelsblatt. The office architecture with open conference and communication zones, as well as the attractive location in the young and creative city district, reflect the company's leitmotif: A media company on the move.

In the modern, seven-storey building, the editorial offices of Handelsblatt, WirtschaftsWoche, as well as all other publishing departments and subsidiaries with around 700 employees will be united under one roof. The Georg von Holtzbrinck School for Economic Journalists will also occupy a few study rooms in the new building.

Exciting insights and views through Media Wall and Skygarden

The architecture office msm meyer schmitz-morkramer has designed the office building La Tête. La Tête comes from French, and means head or tip. The name refers to its prominent position: The building, which is around 30 meters high, forms the northern end, and thus the head of the development on Toulous Avenue. A skygarden with a view over Düsseldorf, as well as the exciting rhythmic facade, following a barcode, underline the uniqueness of the building.

A media wall of around 80 m² is to be installed on the facade of Toulous Allee, one of the main approach roads to Düsseldorf city centre, which will show current economic news from Handelsblatt and Wirtschaftswoche.

Project data

Client	Aurelis Real Estate GmbH & Co. KG
Contractor	PORR Deutschland GmbH . Dusseldorf branch
Architects	Architekturbüro msm meyer schmitz-morkramer
Project type	Office
Scope of performance	Turnkey construction as general contractor, Approx. 23,800 m² of total lettable area
Start of construction	Spring 2016
End of construction	October 2017
Country	Germany

'La Tête' is located in the Quartier Central district on the site of the former Derendorfer freight depot.
Image: Aurelis

Carlsquartier creates a transition between old town and banking district

Elegant city house near Königsallee in Düsseldorf

Visualisation of Kasernenstraße
Image: Hines / SOP Architekten

An old office building was demolished in the centre of Düsseldorf. Now the Düsseldorf branch of PORR Deutschland GmbH is set to erect the so-called Carlsquartier in its place. The client is a joint venture of Hines Immobilien GmbH and a utility company.

Royal neighbourhood

The building site is in a prominent location in the immediate vicinity of Königsallee, one of Europe's leading luxury shopping streets. The city district is characterised by office buildings, as well as by a high concentration of retail shops.

After completion, the building will house a mixture of office, gastronomy and retail premises. The distinctive and elegant corner construction creates a transition between the small-scale, old town facades and the more monumental banking district.

The major Swiss bank UBS will be the anchor tenant. The bank will occupy the upper three storeys of the new building from mid 2018.

Client is drawing on PORR expertise in value engineering

In addition to the order for the turnkey construction of the Carlsquartier, PORR was also commissioned with planning support for the client’s adjoining project. The PORR value engineering expertise is applied for cost optimisation and reduction in the construction project.

Project data

Client	Joint-Venture of Hines Immobilien GmbH
Contractor	PORR Deutschland GmbH . Dusseldorf branch
Project type	Office and Shopping centres
Gross floor area	6,900m²
Gross volume	24,500m³
Floors	2 underground, 6 above ground
Start of construction	March 2017
End of construction	June 2018
Country	Germany

Metroffice Bucharest awarded Green Building Certificate in Gold

First construction stage of the Romanian office complex completed

Metroffice Bucharest, office building A
Image: PORR AG

PORR Construct S.R.L has completed works on the new office building A, Metroffice Bucharest, Romania. The project is located in the north of the city opposite the major Pipera metro station. The final Metroffice will consist of four buildings, offices A, B and C, as well as a hotel.

The goals are maximum flexibility and sustainability

The goal of the project was the construction of a sustainable building with office space, which offers potential tenants a maximum of flexibility. The design also provided an environmentally friendly and energy-efficient building. As a result of the efforts in this respect, Metroffice will soon receive the Gold award of the Green Building Certification Institute.

Public space and new company headquarters

On the ground floor, two z-shaped areas form a public courtyard with cafes and shops. The entrances to the offices above are also located there. The new PORR Construct S.R.L company headquarters are located on the third floor.

Project data

Client	Real Habitation SRL, part of IMMOFINANZ Group
Contractor	PORR Construct S.R.L as general contractor
Project type	Office
Total area	21,800 m² (upper floor) 12,000 m² (underground floors)
Start of construction	September 2014
End of construction	November 2016
Country	Romania

Metrooffice Bukarest
Image: PORR AG

Metrooffice Bukarest, office space
Image: PORR AG

Metrooffice Bukarest, meeting room
Image: PORR AG

Metrooffice Bukarest, meeting room
Image: PORR AG

Stylish town house on Maybachufer

Living with a view of the water

PORR Deutschland GmbH . Berlin branch, to execute the turnkey construction of the residential and commercial project at Maybachufer 36-38.
Image: PSS Generalplanung GmbH & Patzschke Schwebel Architekten

PORR Deutschland GmbH . Berlin branch will execute a residential and commercial project for Cross Jeanswear GmbH in the Berlin-Neukölln district in the immediate vicinity of Tempelhoferfeld. Located directly on the Landwehrkanal, the building will have a total of 69 residential and two commercial units, as well as 33 car parking spaces. Construction work began in April 2017, and is set to be completed in July 2018.

Design by Berlin celebrity architects

The U-shaped building was designed by the Berlin-based twin architects Jürgen and Rüdiger Patzschke; the stylish exterior facade in Gründerzeit style truly makes it stand out. The project consists of a total of four building elements. Two sections will be built as freehold apartments with a magnificent view of the Landwehrkanal. Rental housing is planned for the other two building parts. The ground floor will house commercial units.

The building corner on the Landwehrkanal side is accentuated by a round corner tower, which forms the upper end, and thus the centre of the entire complex.

New client impressed with high quality and timely delivery

This building project was another opportunity for the Berlin building construction department to apply their expertise and knowledge in the field of residential construction. The new client worked with the PORR Deutschland GmbH . Berlin branch for the first time in this project.

Project data

Client	Cross Jeanswear GmbH
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Residential and Commercial construction
Architects	Jürgen and Rüdiger Patzschke
Scope of performance	Construction of four building elements 69 Residential units and two commercial units 33 Parking spaces
Start of construction	April 2017
End of construction	July 2018
Country	Germany

Zurich Gleistribüne – living with a view of the railway tracks

New landmark at the heart of the city

View from Zollstraße
Image: SBB Immobilien

In addition to the major project for site development at Europaallee with the three building sites B, D and F, PORR SUISSE AG has received another order – this time on the opposite side of the railway tracks. The building project comprises three buildings with six to eight storeys, which will house 139 rental apartments.

The Zollstraße site was conceptually developed by SBB Immobilien Development, one of the most important real estate developers in Switzerland, as part of the Europaallee master plan. Construction work began in March 2017. The turnkey transfer is scheduled for August 2019.

Special urban development situation

Zurich Gleistribüne, with a land area of 6,360 m², is located at the heart of the city around 250 m from the main station. The project is located on the edge of Kreis 5, the industrial quarter of Zurich, and borders the railway tracks. In formulating the Gleistribüne architectural concept, the architects Philipp Esch and Stephan Sintzel were inspired by the location on the edge of the railways. The design emerged as the winner of a two-stage architectural competition. The project was also selected for its robust urban architecture, which is well anchored in Kreis 5.

Sustainability as a guiding principle

The construction project with its three buildings is executed by PORR SUISSE AG as total contractor. The DGNB (SGNI) label in gold as well as the MINERGIE-P-Eco standard (without certificate) are integral components of the order.

The complex will house rental apartments, sales areas with gastronomy establishments, and car parking spaces. The retail areas and the entrances to the apartments are located on the ground floor of the three houses on the Zollstraße side.

The side facing the tracks contains courtyards with access to the bicycle garage, as well as commercial areas and track-side access to the retail areas. The apartments are located between the first and the top floor.

The residential buildings open to the south and west to the open space on the railway side, a uniquely urban view of the expanse of the tracks. The ground plans of the three buildings are identical from the second floor upwards.

At the junction of Hafnerstraße – Zollstraße, a new quarter, the Louis-Favre-Platz, is being built. The ground floor of building F houses a restaurant with adjoining café, which is oriented towards Louis-Favre-Platz, and a square that is level with the railway tracks.

Living with a clear view of the railway tracks
Image: SBB Immobilien

Project data

Client	Schweizerische Bundesbahnen SBB spezialgesetzliche Aktiengesellschaft, with headquarters in Bern, represented by SBB Immobilien Development
Contractor	PORR SUISSE AG as subsidiaries
Project type	Residential and Commercial construction
Architects	Esch Sintzel Architekten GmbH
Scope of performance	Construction of three buildings with six to eight floors 139 rental apartments Business and gastronomy areas 41 Parking spaces Outdoor facilities
Gross floor area	20,874 m² (without outdoor facilities)
Start of construction	March 2017
End of construction	August 2019
Country	Switzerland

Individual living, from studio to penthouse

Start of construction Das Lichtenhain in Berlin

Visualisation of overall complex Das Lichtenhain
Image: BUWOG Group

Visualisation if interior finishing Das Lichtenhain
Image: BUWOG Group

BUWOG Group has appointed PORR Bau GmbH as general contractor for the construction of more than 200 residential units at Lückstraße in Berlin Lichtenberg. The project is carried out jointly with the Frankfurt branch of PORR Deutschland GmbH.

A range of residential formats is on offer

A total of 207 residential units are being built on the 19,000 m² site. The options range from single apartments in the gatehouse, one-room apartments, penthouses, duplex apartments down to terraced houses with five rooms and a total living space of 141 m², with sun terrace and direct access to the underground garage. The streetside buildings are connected by the underground car park with direct access to the apartment. The grounds are host to some playgrounds in a park-like environment. In the past summer, interested parties were issued with information on the many advantages of the new complex in the scope of an event. The new neighbours will already be moving in next year.

The excavation work started in June 2016, and completion is scheduled for the end of September 2018.

Project data

Client	BUWOG Group
Contractor	PORR Bau GmbH
Project type	Residential construction
Scope of performance	Construction of 207 residential units from one-room apartments to penthouses Play streets with a park-like design
Start of construction	June 2016
End of construction	September 2018
Country	Germany

Visualisation play street at Das Lichtenhain
Image: BUWOG Group

MySky as the landmark building

The topping-out ceremony has taken place

MySky topping-out party - visit to the sample apartment, left to right: Florian Rode (HNP architects ZT GmbH), Michael Gehbauer (WBV-GPA GmbH), Josef Kaindl (Deputy Leader for the 10th District), Claus Stadler (UBM Development AG), Alfred Vandrovec (PORR), Martin Schilling (PORR), Andreas Samer (Construction Manager)
Image: Frederick Nilsson / www.goodlifecrew.at

On the 9 March 2017, topping-out ceremony for the residential building MySky took place. PORR Bau GmbH is the managing construction company for this project. STRAUSS & PARTNER Development GmbH is in charge of project development in cooperation with the Wohnbauvereinigung für Privatangestellte (WBV-GPA).

External visualisation of MySky
Image: SITION

As part of the scope of the topping out, an exclusive visit to the sample apartment and an inspection of the shell took place.

A highlight of the district development

Construction work on the 66 m high residential tower, which is set to be completed by autumn 2017, started one and a half years ago. The MySky complex is a residential high-rise building with a total of 20 floors in the new urban development area of Monte Laa in the 10th district of Vienna. The project comprises 128 privately financed freehold apartments of STRAUSS & PARTNER Development GmbH. The building also houses 100 subsidised rental apartments and the WBV-GPA "Heim-Vorteil" residence.

The complex consists of two high-rise buildings connected by a low-rise building with roof terrace. Autumn 2017 is the target timeline for the first residents to move in as well as for the new Troststraße underground station opening.

The shell
Image: STRAUSS & PARTNER

Project data

Client	STRAUSS & PARTNER Development GmbH in cooperation with WBV-GPA
Contractor	PORR Bau GmbH
Architects	HNP architects ZT GmbH
Project type	Residential construction
Scope of performance	128 privately financed freehold apartments 100 subsidised rental apartments Residence "Heim-Vorteil"
Start of construction	Autumn 2015
End of construction	Autumn 2017
Country	Austria

Good prospects for residential building Panorama 3

Ground-breaking ceremony of the first wohngut project

The special guests at the ground-breaking ceremony. Left to right: Ariel Muzicant (Int. Colliers Group), Rudolf Zabrana (Deputy District Leader), Martin Kohlbauer (Architects), Alfred Vandrovec (PORR Bau GmbH), Barbara Modliba and Lukas Sykora (Managing Directors of wohngut-Immobiliengruppe GmbH).
Image: wohngut Bauträger GmbH

Panorama 3 forms the gateway to the future Franzosengraben district, and is located at the heart of the future Viennese urban development area Erdberger Mais.

PORR celebrated the ground-breaking ceremony of the first wohngut project on the 9 November 2016 in the presence of some distinguished guests. The project is executed by PORR Bau GmbH on behalf of the client wohngut Bauträger GmbH.

A generous range of communal areas and private spaces

The complex will comprise 177 privately financed two to four room apartments on eleven floors with a living area of 10,464 m². The high-rise building with a total height of about 35 m comes with a bicycle garage, common kitchen, sauna and common terrace. All apartments are equipped with generous outdoor areas such as a private garden, loggia, balcony or terrace. More than half of the apartments have already been marketed at the time of the ground-breaking ceremony.

Project data

Client	wohngut Bauträger GmbH
Contractor	PORR Bau GmbH
Project type	Residential construction
Scope of performance	Erection of 177 privately financed residential units
Start of construction	November 2016
End of construction	September 2018
Country	Austria

The Infineon semiconductor factory set to be ready for Industry 4.0 at the end of 2017

The Regensburg site will cover the entire value chain

Topping-out ceremony in Regensburg. Left to right: Christian Heilmeier (Managing Director PORR Industriebau Germany), Pandelis Haidas (CEO of the worldwide Infineon production), Mayors Jürgen Huber and Gertrud Maltz-Schwarzfischer, and Production Manager Lutz Labs.
Image: Fleischmann

In mid-March, the festive topping-out ceremony of the new hall at the Infineon semiconductor factory in Regensburg took place. PORR Industriebau GmbH was granted the construction task of the extension building as general contractor in mid-2016. In addition to construction of the new Hall 17 in the west of the city, the complete range of clean rooms also forms part of the range of services.

Sophisticated production conditions

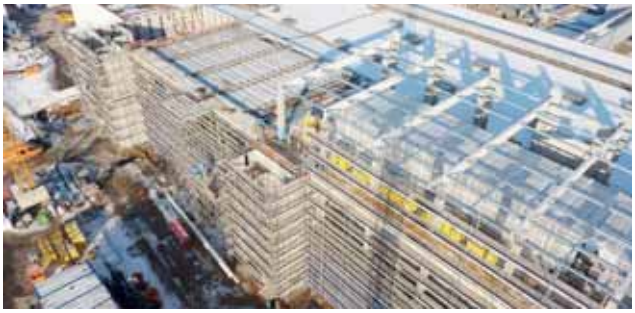
Hall 17 is 108 m long, 21 m wide and 25 m high. The building will be equipped with clean rooms on two 1,400 m² floors. The temperature and humidity conditions are constantly held at 22 °C (+/- 1 °C) and 40% (+/- 5%) humidity throughout the year by means of advanced climatic engineering.

The distinguishing feature of the Infineon factory in Regensburg: The entire value chain is covered at this site. All elements from the silicon wafer to the intelligent end product are entirely manufactured here.

The commissioning, which is scheduled for the end of 2017, will ensure production for further, sophisticated Infineon products. The new Hall 17 comes with all prerequisites for Industry 4.0 by providing for networking of people and machines.

Intelligent climate control

The complex is also built to the highest standards in the field of energy saving measures. The building will be equipped with sun protection glazing to significantly reduce the energy required for cooling. Furthermore, heat recovery systems based on compressed air generation, exhaust air and cooling water will be installed. These have a recovery rate of more than 40%.



The shell
Image: Infineon

Project data

Client	Infineon Technologies AG
Contractor	PORR Industriebau GmbH
Project type	Industrial construction
Scope of performance	Construction of hall 17 (semiconductor factory) Clean room finishing, clean rooms on two 1,400 m² floors
Start of construction	Mid-2016
End of construction	End of 2017
Country	Germany

Wastewater project Emscher to ensure clear conditions

Building works as part of a comprehensive master plan

Existing construction pit for the pumping station Oberhausen
Image: PORR AG

On the 17 February 2017, the Berlin branch of PORR Deutschland GmbH was commissioned to build the BA 60 Emscher sewage system. The project includes the realisation of the Oberhausen pumping station, the neighbouring Oberhausen-Handbach pumping station, along with associated infrastructure. The client is the Emschergenossenschaft of Essen. The construction work is part of the comprehensive reconstruction of Emscher from an open sewer system to a natural water body.

A giant is built 45 m below ground

The new Oberhausen pumping station will conduct the sewage from the low-lying channel to the WWTP sewage plant via an overhead gravity canal. The Oberhausen-Handbach pumping station pumps the sewage from Handbach wastewater channel to the new Oberhausen pumping station. The construction pits for the two pumping stations have already been built as part of a separate construction stage in slotted and bored pile construction.

The Oberhausen pumping station consists of a cylindrical underground section with an internal diameter of approximately 40 m and a foundation depth of approximately 45 m below the upper edge of the site. Pumping station Oberhausen-Handbach has a diameter of 8 m and a depth of 11 m.

Refined interplay of a widely branched system

In addition to the pumping stations, there will also a 220-meter-long driven tube (DN 1200), as well as facility buildings, expansion shafts, oxidation plant and a viewing tower for the construction project.

The PORR Deutschland GmbH . Berlin branch is already working on the realisation of the Emscher sewage system in the framework of the BA 40 project. The tunnel boring machine will be moved into the construction pits before the start of construction at Oberhausen pumping station.

The Berlin branch PORR Deutschland GmbH thus continues the successful cooperation with the Emschergenossenschaft, which started in 2011 with the BA 20 contract award.

Project data

Client	Emschergenossenschaft, Essen
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Structural engineering
Scope of performance	Construction of Oberhausen pumping station and Oberhausen-Handbach pumping station, along with the associated infrastructure, facility buildings, viewing tower
Start of construction	July 2017
End of construction	July 2020
Country	Germany

Complete overview without terrain and external facilities
Image: EGLV

Berlin Waßmannsdorf – keeping things clean

Project to construct the second-largest sewage treatment plant in Berlin

Waßmannsdorf sewage treatment plant
Image: Berliner Wasserbetriebe

On the 15 March 2017, the Berlin branch of PORR Deutschland was commissioned with part of the two-stage extension of the Berlin-Waßmannsdorf sewage treatment plant. The company has been involved in this large-scale project from the outset.

Waßmannsdorf sewage treatment plant is the second largest serving Berlin and the Brandenburg region. 180,000 m³ of wastewater are cleaned here every day. Berliner Wasserbetriebe are now starting to modernise and expand the sewage treatment plant.

Two-stage extension of the sewage treatment plant

The extension will take place in two stages. The first stage comprises the expansion of the capacity of the sewage treatment plant. For this purpose, a mixed-water storage tank and two additional cleaning lines will be built. In addition, a process water and a sludge treatment plant are also being installed. In the second stage, the sewage plant will be equipped with a fourth purification stage and a plant for the removal of phosphorus, a so-called flocculation filtration.

Mixed-water storage with 50,000 m³ capacity

The mixed water storage facility is a concrete basin with 50,000 m³ storage volume. Once the capacity of the sewage treatment plant has been reached in rainy weather, mixed water is collected here and then returned to the sewage treatment plant.

Mixed-water draining into Teltow Canal will be significantly reduced in the future, resulting in improved water quality in the Spree and the Havel. The basin has dimensions of approximately 80 x 65 m and a depth of up to 15 m. The reinforced concrete construction will contain numerous separating and guiding walls. All interior walls will be clad with polyethylene (PE) panels for corrosion protection. The entire basin will be closed off with a glass-fibre reinforced plastic (GRP) cover.

A range of plant components with a single goal: Clean water

The building contract also includes a tee-off building, a machine-building in reinforced concrete, and a steel-structure exhaust air treatment hall.

The machine house will be built on a pit with a watertight sheet pile wall on a re-anchored underwater concrete floor. The tee-off building will be connected directly to the existing sand trap, and is designed to regulate the inflow of waste water in rainy weather.

Further works planned in Berlin

With this order, the PORR Deutschland GmbH . Berlin branch has won a new client and established a basis for further participation in the construction works of Berlin water companies. In addition to the recently won order for Oberhausen pumping station of the Emschergenossenschaft, this is another step in building the market segment of sewage plant construction in Germany.

Project data

Client	Berliner Wasserbetriebe
Contractor	PORR Deutschland GmbH . Berlin branch
Project type	Structural engineering
Scope of performance	Construction of a mixed-water tank, and a process water and a sludge treatment plants
Start of construction	April 2017
End of construction	July 2018
Country	Germany

Construction of the MONACO gas pipeline is progressing rapidly

New transport line to expand network capacity

Lowering of the pipe rod
Image: bayernets

On the 19 December 2016, the Berlin branch of PORR Deutschland GmbH was awarded a contract for construction of the MONACO high-pressure gas pipeline by bayernets GmbH, construction stage 1 from Burghausen to Aschau am Inn. The gas transport service is to expand the network capacity, specifically to connect gas storage facilities in Haiming and Haidach in Austria. PORR Deutschland will implement the project as part of an integrated consortium.

Open construction with numerous intersections along the route

The laying of the gas line with a diameter of 1.2 m is mainly carried out in an open trench. However, the route runs below about 25 roads and railway lines with a capped product pipe pressing process. In addition, the pipeline is to cross numerous water bodies, including the Alz, in culverts. The Alzkanal is crossed twice by a DN 2000 microtunnel at the site.

Pipe trench excavation
Image: bayernets

Materials used and testing during installation

The materials used are polyethylene (PE) and steel-sheathed steel pipes with a wall thickness between 22.2 and 24.4 mm. The pipes will mostly be welded with automatic welding machines outside of the pipe trench, and then lowered into the pipe trench in sections of more than 1 km. Every weld seam is tested with a non-destructive process. After refilling the pipe trench, a partial pressure test is carried out with water from the river Inn. The pipeline is designed for an operating pressure of up to 100 bar.

Construction progress and accompanying infrastructure

The average construction progress is around 500 m per day. The total scheduled construction time from clearing of the route to handover for gassing is 12 months. In addition to the pipeline, three section shut-off stations and a new pigging station will also be erected. Planned completion of the overall project is in March 2018.

Project data

Client	bayernets GmbH Munich
Contractor	PORR Deutschland GmbH . Berlin branch in a consortium
Project type	Pipeline construction
Scope of performance	Construction of the MONOO high-pressure gas pipeline, section 1 Three section shut-off stations One pigging station
Start of construction	April 2017
End of construction	March 2018
Country	Germany

Il Campo di Vienna

Ground-breaking ceremony for the redesign of Stephanplatz

The ground-breaking celebration. Left to right: Cathedral Prelate Toni Faber, Berhard Engleder, Head of MA 28, Vice-Mayor Maria Vassilakou, employee of PORR Bau GmbH, Markus Figl, District Chairman of the 1st District, and Gerhard Fida, Managing Director of Wiener Netze GmbH
Image: PORR AG

Vienna's central square to be renovated and re-paved. The goal: More space for pedestrians. On the 13 March 2017, the symbolic ground-breaking ceremony for the redesign of Stephanplatz took place. The project comprises a general overhaul and new paving. The construction project is carried out as part of an ARGE. Completion is planned for mid-November.

A worthy performance for the "Steffl"

After completion, the service will have a plate pattern in different granites similar to the Graben and Kärntnerstraße, but with additional crosses. The outline of the Magdalenenkapelle and Virgilkapelle are redrawn with smoke crystals. Numerous seating elements in Hartberg granite complete the new look.

Visualisation of the future square
Image: Kirsch ZT GmbH

Project data

Client	Road administration and road construction (MA 28)
Contractor	PORR Bau GmbH as part of the consortium STEPHANSPLATZ 2017
Project type	Public square design
Area	10,700 m²
Materials	Hartberg granite, Schrems granite, Gebharst Syenite from Austria, Gylsboda granite from Sweden
Start of construction	13 March 2017
End of construction	November 2017
Country	Austria

Route 76 – National road completed in Romania

20 km section between Brad and Ionesti upgraded

The section of national road 76 completed by PORR.
Image: PORR AG

The road DN 76 (E79) in the west of Romania connects Deva (Diemrich) to Oradea over a distance of 185 km. Extensive reconstruction and modernisation work was required. The national road was therefore divided into several lots, and PORR Bau GmbH won one of them.

Contract reward under an international call for tenders

Following an international call for tenders, the national body for motorways and national roads in Romania commissioned PORR Bau GmbH with the reconstruction and renewal of a 20 km section of the road in Hunedoara region. The modernised section is located between the towns of Brad and Ionesti.

Modernisation and improved traffic safety

The project mainly comprised widening the roadway from 8 m to 10 m and reconstructing the existing road structure. As part of the modernisation of the road, the drainage system was improved, six bridges were overhauled, 45 passages were replaced or renewed, and all traffic safety facilities were renewed.

The work was completed on schedule in December 2016.

Project data

Client	National body for motorways and national roads in Romania
Contractor	PORR Bau GmbH
Project type	Road construction
Scope of performance	Modernisation of a 20 km section of national road 76
Start of construction	October 2013
End of construction	December 2016
Country	Romania

Swiss National oad leads the way in construction methods

First-time use of ultra-high-performance fibre concrete

PORR has the necessary expertise for concrete ceiling installation.
Image: PORR AG

The 35-year-old section of the Swiss National Road between Zürich and Altdorf required urgent repairs. At the end of last year, the Swiss Federal Roads Authority ASTRA commissioned PORR SUISSE AG with reconstruction of the road. The project comprises five bridges and two tunnels, and is executed as part of a consortium. Construction work began in February 2017, and is scheduled for completion in October 2019.

High-tech planning and construction methods

PORR SUISSE AG and PORR Design & Engineering GmbH are cooperating closely for this project. During the planning phase, the teams created an early digital visualisation of the project using Building Information Modelling (BiM). The execution focusses on cooperation with local partners and maximum quality of execution.

This is the first use of ultra-high-performance fibre concrete in Central Switzerland. PORR holds the necessary expertise in concrete ceiling construction thanks to its own subsidiary, Österreichische Betondecken Ausbau GmbH, abbreviated as ÖBA, a specialist in this field. Their expertise is brought in when needed for challenging projects throughout the Group.

Comprehensive reconstruction with traffic restrictions

The two lanes are offset in height and position. This restricts the traffic and poses an additional challenge for construction work.

The bridges Boli, Mettlen and Linden, which are 160 m to 540 m in length, are in very bad structural condition and require full reconstruction. The bridges Harmettlen and Rigiaa, 60 m and 115 m respectively, only need minor concrete restoration works. The new roadway is executed as a noise-reducing cover layer.

Engiberg and Schönegg tunnels, 200 m and 290 m in length, have issues in the portal areas, and thus require extensive reconstruction work. In addition, the existing control panels of both tunnels must be expanded.

The reconstruction work is to be carried out in several construction stages, and is scheduled for completion within three years.

Project data

Client	Swiss Federal Roads ASTRA
Contractor	PORR SUISSE AG in a consortium
Project type	Road construction and Concrete slab construction
Scope of performance	Overhaul of the Schweizer Nationalstraße between Zürich and Altdorf, including bridge and tunnel reconstruction work
Start of construction	February 2017
End of construction	October 2019
Country	Switzerland

Emergency works on the steep slope have resolved state of emergency

Deployment under time pressure and difficult terrain conditions

A landslide has blocked off the only connection between Bristen and Amsteg
Image: Urner Wochenblatt

On the 5 March 2017, a 10-meter-long section of road broke loose and covered the underlying road section in the Swiss mountain village of Bristen. Due to the blockage of the sole link between Bristen and Amsteg, this state of emergency lasted for several weeks. The inhabitants were cut off from the outside world. The old cable car was put into operation to provide an emergency connection to the valley. Baudirektion Uri entrusted PORR SUISSE AG with the difficult emergency work.

Barely any space for construction machines

Above all, the conditions at the construction site posed a major challenge for all parties involved: The terrain is extremely steep and narrow. A large portion of the work had to be performed manually.

First, the PORR team secured the slope by way of jetcrete and metal anchors. Next, the construction workers erected a foundation slab. This was used as a basis for the erection of walls to support the street.

Exceptional construction site, difficult working conditions

The space restrictions and the execution of work on a steep slope required a high degree of awareness to avoid accidents. Occupational safety is the top priority at PORR. This was particularly important at this construction site, and demanded tremendous skill from the construction workers. This way was the only way to ensure rapid progress of the construction work.

Completion in just six weeks

The construction work was carried out at high pace to bring the road back into operation as quickly as possible. The construction progress was also strongly dependent on the weather situation. The construction workers worked in two shifts to ensure rapid restoration of the link between Bristen and Amsteg. Thanks to their untiring efforts, around 180 vehicles were guided past the site of the landslide in mid-March. The construction work was completed by Easter and the entire connecting road was opened to the traffic.

Project data

Client	Baudirektion Uri, Switzerland
Contractor	PORR SUISSE AG
Project type	Road construction
Scope of performance	Securing and restoring part of the connecting road between Bristen and Amsteg
Start of construction	March 2017
End of construction	April 2017
Country	Switzerland

Distinguished awards of the construction industry in Poland won

Projects and employees awarded in several categories

The Tadeusz-Mazowiecki Bridge in Rzeszów
Image: PORR AG

The end of the year is the time for retrospection, and at the same time the moment for decision-making in the major construction competitions. Their projects once again landed PORR S.A. on the podium for the most important awards of the Polish construction sector.

Maksymilian Wolf Bridge Competition 2016

PORR Polska received the first prize in two of four categories. In the category "Construction of a road or railway bridge with a span of more than 70 m", it won the main prize for the Tadeusz-Mazowiecki bridge in Rzeszów. The first place in the category "Repair of existing civil engineering" was awarded to PORR S.A. for repair works to the Łazienkowski bridge.

Silesian Construction Sector Award 2016

The Silesian Chamber of Construction in Katowice announced the results of the sixth "Śląskie Budowanie" competition, in English "Silesian construction trade".

The presentation was coincided with completion of the last stage of one of the most important routes in southern Poland, the main road in Gliwice. PORR Polska executed the last construction stage, G2, in cooperation with the consortium leader. PORR was awarded the first place for this project.

The title "Autorytet Budownictwa i Gospodarki Sląskiej", which means "Outstanding personality of the construction sector and the Silesian economy", went to Piotr Kledzik, Chairman of PORR S.A.

Masonry award in gold for bridge in Rzeszów

PORR S.A. was also successful in winning the award "Golden Trowel – Construction of the Year 2015" of the Lublin Department of the Polish Association of Civil Engineers and Construction Technicians. It received the first place in the "Civil Engineering" category as the general contractor of the Mazowiecki Bridge in Rzeszów.

The Tadeusz-Mazowiecki Bridge in Rzeszów
Image: PORR AG

Contact

Distributor and publisher
PORR AG
Absberggasse 47
1100 Vienna

Managing editor
Sandra C. Bauer
T +43 50 626-3338
comms@porr-group.com

Editor-in-chief
Bernadette M. Hoeritzauer

www.porr-group.com | wop@porr-group.com

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Pump-storage power station Obervermunt II . Krespa waterlock . © VIW

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PORR AG
Absberggasse 47, 1100 Vienna
T +43 50 626-0
office@porr-group.com
porr-group.com