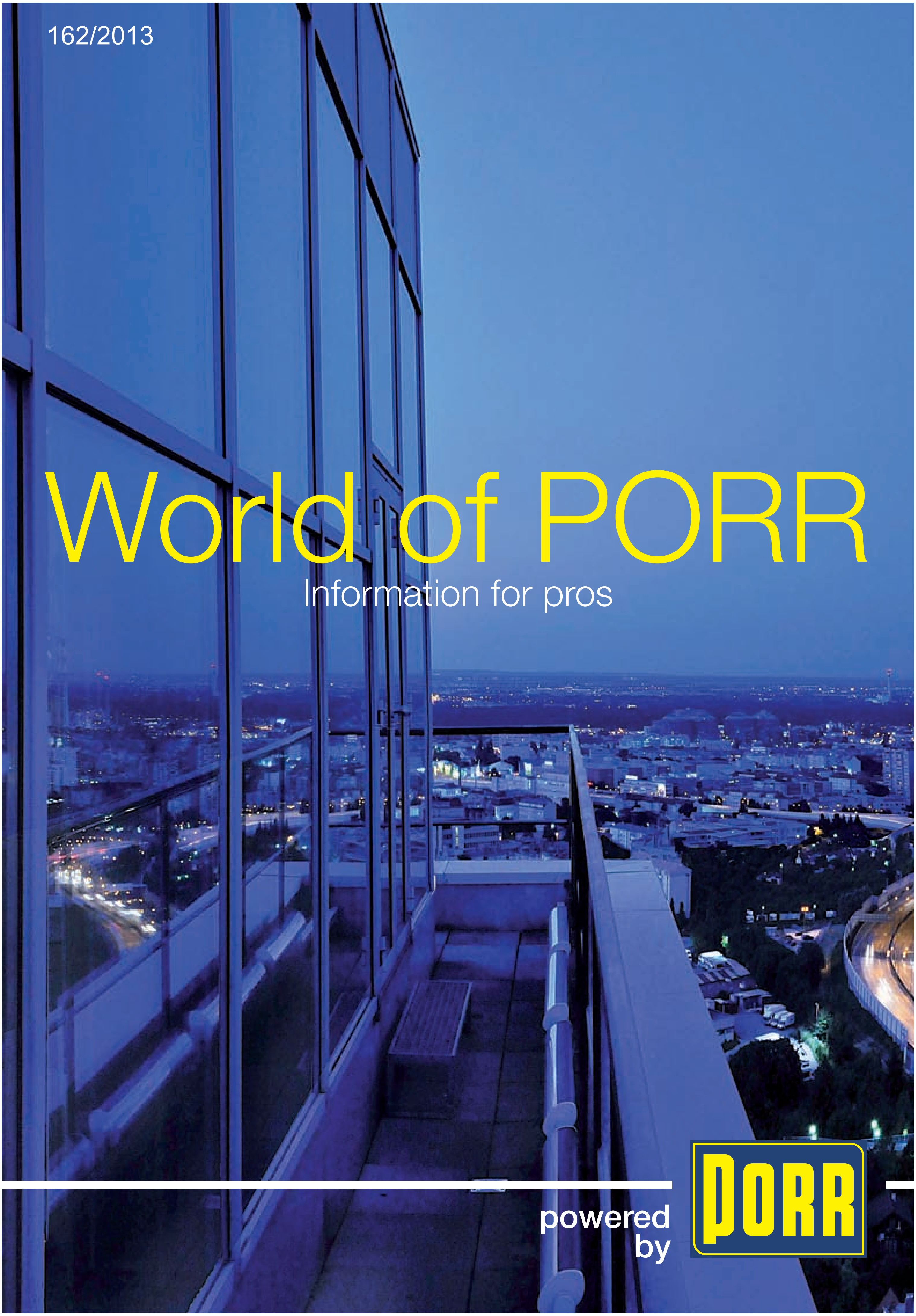
162/2013

World of PORR

Information for pros



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CEO Karl-Heinz Strauss

CEO Karl-Heinz Strauss
Image: PORR

Ladies and gentlemen,
Dear business partners,

It gives me great pleasure to welcome you to the latest edition of our specialist publication, “World of PORR”. Firstly, I would like to thank you, our readers, for your interest in PORR’s construction projects, sometimes over decades. Some of you have accompanied us for as long as 50 years now and we are always grateful for all your feedback and suggestions, but I would also like to welcome those of you who are reading “World of PORR” for the first time. In recent years, digitalisation of the publication has enabled us to gain many new readers with whom to share the technical challenges faced in our projects and the innovative problem-solving approaches of PORR’s engineers.

The current edition once again features a range of projects in all areas of construction, taking a closer look this time at the construction of hotels. The two projects Steigenberger Hotel am Kanzleramt in Berlin and Palais Hansen Kempinski Vienna exemplify the current cutting-edge technologies applied in constructing high-class accommodation facilities.

In recent years, hotel construction, particularly of four and five-star establishments in Austria and Germany, has become an important component of PORR’s activities. In order to respond even better to the needs of our clients, PORR offers on request a complete and comprehensive package which, in addition to construction services, can include development planning. In the last few years, numerous hotel projects carried out in cooperation with international hotel operators have not only set new standards in service and comfort but also produced new architectural landmarks.

The current edition also showcases some of PORR’s civil engineering projects, including an up-to-date report on the reconstruction of the Elbeu canal viaduct and the impressive “Gschnitztalbrücke” bridge project in Tyrol. In the area of infrastructure, there is a focus on the tunnelling projects East branch Biel bypass in Switzerland and Brenner Basis tunnel as well as the Reisseck II pumped-storage power plant in Carinthia. As usual, the edition is rounded off with a comprehensive update on projects currently in progress.

Lastly, I would like to comment briefly on the challenging weather conditions in the first few months of 2013. The long hard winter and high precipitation during spring presented a particular challenge to man and machine on nearly all construction sites. I would like to take this opportunity to personally thank our teams for their tireless commitment. They are the ones who, despite such adverse conditions, deliver outstanding results every day.

I wish you an interesting read and look forward to being able to greet you again in the next edition.

Karl-Heinz Strauss
CEO and Chairman of the Board

Campus Neu-Isenburg Project

Construction of new office complex for Lufthansa AirPlus

Gerald Schiefer

The Neu-Isenburg Campus (CNI) project comprises the construction of a new office complex for the AirPlus International company in Neu-Isenburg, Frankfurt, Germany. AirPlus is a leading international provider of daily business travel management solutions.

The project is characterised by a campus-style grouping of office buildings, a canteen building and various car parking areas adjoining a central, spacious green area.

The office complex is designed as a dual-chambered structure and each storey is divided into twelve units spread over three vertical fire zones. Floors one to five contain highly efficient office space and are topped by a recessed sixth floor.

The canteen building is located in a separate structure from the main building in the south-east part of the plot. The car park structure forms the southern limit of the campus.

In February 2012, ALU-SOMMER was commissioned with the planning, production and assembly of the metal façades. Three different types of façade were planned and ordered.

Visualisation: View of main entrance, Dornhofstraße
Image: Groß & Partner

Project data

Scope of delivery	approx. 10,000 m² of modular façade approx. 3,000 m² of aluminium sheet façade approx. 600 m² of post and beam façade
Construction period	12 months, beginning in June 2012
Developer	Groß & Partner Grundstücks-entwicklungsgesellschaft 60325 Frankfurt am Main
Client	W. Markgraf GmbH & Co KG Bauunternehmung D-95448 Bayreuth
Architect	Neumann Architekten GmbH D-60598 Frankfurt am Main
Lessee	Lufthansa AirPlus Servicekarten GmbH D-63263 Neu-Isenburg

Realising the CNI project was a challenge to ALU-SOMMER in many ways. Roughly 10,000 m² of modular façade (corresponding to 1,020 façade elements) had to be assembled in just three months in order to achieve a weather-proof building shell at speed. This presented an inordinate challenge to the whole project team, since for each element approx. 350 different components of various materials had to be supplied, adapted and assembled. The extremely short lead period required record-speed technical planning. Both the components and finished elements had to be integrated into the overall logistics process strictly according to the "just in time" principle. High priority was given to avoiding delays in production, and this was supported by special quality assurance measures.

Ultimately, a successful outcome was achieved due to the many years of experience, high degree of motivation and disciplined teamwork of all the employees involved.

Details of services provided by ALU-SOMMER

Modular façade

The modular façade consists of pre-fabricated, powder-coated aluminium structures with a standard size of 2,700 x 3,500 mm. Heat-saving and soundproof glazing was used to provide transparent panelling, which was partially equipped with alarm wires on the ground floor. Each element was supplied with a ventilation wing and fall-protected fixed glazing. The externally located venetian blinds providing sun protection were already incorporated into the elements during production. The guide rails were to be inserted into vertical recesses. The non-transparent surfaces were provided with canted powder-coated aluminium sheets inside and out. A total of 1,020 elements, consisting of 161 different models, were manufactured at the ALU-SOMMER plant in Stoob, Burgenland, and subsequently assembled on site.

Sample element 18.04.2013
Image: Alu-Sommer

Sheet metal façade
The shell construction surfaces that were still visible after assembly of the façade elements had taken place in the main areas, as well as all inner and outer corners of the building were provided with rear-ventilated curtain wall cladding. In order to comply with the architect's wish for a non-visible means of fixing the sheet metal cladding, ALU-SOMMER's engineers had to develop a special solution for the substructure. The undersides of any projecting roofs were also constructed using the vertical sheet metal construction principle.

Office component, modular and sheet metal façade
Image: Alu-Sommer

Post and beam façade, windows and doors
The office building areas at ground level and also the canteen building, extensively glazed, one and two storey post and beam façades were produced. Tilting windows and access doors were inserted and the main entrance was equipped with a fully automatic revolving doorway. As with the modular façade, external venetian blinds were mounted in front of the post and beam façade, the slats being guided by means of taut metal cables. All shade fittings were connected to an electronic control system installed on site.

Post and beam façade with revolving door
Image: Alu-Sommer

Modular façade with venetian blinds
Image: Alu-Sommer

Tests and certification
For the modular façades, the following performance tests had to be passed with certification:

- Wind and driving rain test at testing facility
- Sound proofing tests:
  - horizontal sound emissions measured at laboratory trial
  - horizontal sound emissions measured on site
  - vertical sound emissions measured on site
- Airtightness test performed on site ("blower door test")

An essential part of the contract consisted in unconditionally fulfilling all the façade-related criteria necessary for receiving the LEED (Leadership in Energy and Environmental Design) Gold Status building certification.

Logistics and assembly

A defining characteristic of the CNI project was the tight planning window and extremely short period between starting assembly and reaching the milestone of a weather-proof building. So as not to delay the overall building procedure, a three-month schedule had to be strictly observed. Another characteristic mentioned previously was the fact that there were many different types of elements in terms of size and fittings. For these two reasons, a serial production setup with two or several parallel lines and delivery buffer was not possible.

This made it all the more necessary to develop a sophisticated logistics plan which would consistently implement the "just in time" principle at all process levels. Following exactly this concept, components were produced, assembled, packed, delivered and ultimately installed.

The construction site received an average of 24 elements a day, which the assembly team had to install in one day. The task was made harder by the fact that the schedule required assembly of the post and beam façade to begin only two months after assembly of the modular façade had started.

A total of 92 lorry loads were sent from Stoob to Neu-Isenburg, Frankfurt, involving journeys of roughly 74,000 kilometres (not including return journeys).

The assembly supervisors sent on site by ALU-SOMMER also had a significant challenge on their hands, which they ultimately mastered with flying colours.

Construction progress on 28.06.2012
Image: Alu-Sommer

Construction progress on 25.09.2012
Image: Alu-Sommer

Completed building
Image: Alu-Sommer

The façade works were more or less complete by the end of April 2013, and were followed only by cleaning and adjustment work, leaving no obstacles to a successful handover to the client and developer in June 2013.

Prangl Zettling construction project

Construction of new Prangl branch on 41,300 m² plot

Matthias Auinger, Manfred Kohl

On May 25, 2012, PORR was commissioned by PRANGL Immobilien GmbH as the general contractor for the construction of Prangl's Zettling branch. The architects, Mascha & Seethaler ZT GmbH, were commissioned for its design.

Administration building with overhang
Image: PORR

Project description

The general contractor's order consisted in constructing a new plant for the Prangl company. The project consisted primarily in constructing an administration building (Building Component A), a workshop (BC B), a partially heated hall with canopy roof to house work platforms (BC C), a storage hall for crane parts and canopied storage areas for crane vehicles (BC D). It also involved building two fuelling stations, refuse sites, canopy roofs and developing extensive external grounds.

The project was set into motion in June 2012 and brought to completion on May 31, 2013. Owing to the directly adjacent motorway and a four-hectare construction site, the project attracted a great deal of attention already during the construction phase.

Administration building and workshop
Image: PORR

BC A – Administration building

The administration building consists of a basement level, comprising engineering rooms and an archive, a ground floor, comprising staff rooms, a lobby and conference area, a first floor with overnight accommodation for drivers and a second floor with offices and a spacious inner courtyard.

Shell construction of administration building
Image: PORR

Specific architectural requirements were placed on the administration building since it was located directly on the A9 Pyhrn motorway. The second floor juts out approx. 20 m and is supported by only six inclined columns. These columns, constructed out of fair-faced concrete, were produced in cooperation with Schwarzl (PORR) concrete engineering specialists.

Shell construction for supports
Image: PORR

The ceiling of the second floor was originally designed as a reinforced concrete ceiling. After close cooperation with the structural engineers, an optimised system was constructed using steel beams and a lightweight timber roof. This system enabled the office to be constructed without central supports, giving the client a higher degree of flexibility.

Access is provided by a lift and two stairways, one of which serves only as access to the drivers' rooms on the first floor.

Lightweight timber roof, 2nd floor
Image: PORR

The spacious open-plan offices are separated by glass partition walls. The inner courtyard features a 6 m high ginkgo tree which, owing to the open structural design and generous use of glass, is visible from every office.

The outer facade is characterised by the post-and-beam construction method and sun blinds. Developed specifically for this project, the blinds consist of 10 m long compressed aluminium profiles framed at the top and bottom by diagonal alucobond cladding.

Particular attention was also paid to the soundproofing requirements imposed on the facade due to the proximity of the motorway.

On the ground floor, a notable feature is the ample use of glass in the conference area and entrance hall, with high-quality materials being used for glass ceilings, wood panelling, glass walls and the glass-fibre concrete facade. The conference room is equipped with state-of-the-art technology, including mobile partition walls, ceiling beamers, screens and interior shades.

Reinforcement for supports
Image: PORR

BC B – Workshop building

Adjoining the administration building is the workshop. The 1,700 m^2 hall is constructed out of independent footings and pre-cast supports. The supporting frame is constructed out of laminated timber beams. Access to the first floor is via a stairway. The 410 m^2 area is designed to serve as storage space and for tyre fitting. In the last section there is a wash bay, which is separated from the workshop by a 11 m high reinforced concrete wall. The water supply to the wash bay is derived from a well drilled 16 m below the ground.

Natural lighting is provided by light strips in the roof and twelve glazed doorways.

Webcam: Workshop and accessories hall
Image: PORR

The technical facilities include two indoor cranes, three workshop pits measuring up to 30 m in length, and planned air extractors, welding waste suction removal systems and a pressurised air supply.

Assembly of workshop pits
Image: PORR

BC C – Work platform hall

The work platform hall is 130 m long and covers an area of 5,600 m^2. It is constructed out of independent footings and pre-cast supports. The main supporting frame is constructed out of reinforced concrete beams. In order to give a uniform appearance to all the buildings, the attic-style ceilings of hall components C and D are designed as 4 m high steel structures.

Supporting frame, hall C
Image: PORR

The roof and wall cladding consists of trapezoidal sheeting. The colours of the walls are in keeping with the Prangl colour scheme.

In the centre of the hall is a heated area for electric work platforms. The work platform hall and workshop are interconnected via a steel structure spanning more than 25 m.

Workshop and canopy roof
Image: PORR

BC D – Accessories storage and canopy roofs

The accessories hall is the largest building component, comprising a 20 m high central aisle and two canopy roofs. The central aisle provides storage for large cranes and the canopy roofs serve as storage space for mobile cranes. The central aisle is constructed out of reinforced concrete supports and a timber supporting frame. One side of the hall is open, enabling large parts to be loaded outdoors using the crane runway.

The supporting frame of the canopy roofs is constructed out of reinforced concrete beams and the central supports in the canopy area out of spun concrete beams.

The outer shell consists of a single trapezoidal sheet structure. In addition to the coloured wall surfaces there are large mounted transparent surfaces.

Shell construction for accessories hall
Image: PORR

Accessories hall
Image: PORR

Fuelling station

A fuelling station is constructed adjacent to the west facade of hall D. The two underground fuel tanks have a volume of 100,000 and 50,000 litres. The supporting frame of this part of the hall consists of a steel structure and a single roof structure. In order to lend a unified appearance to the halls, the attic-style structure of the canopy roofs was continued at the fuelling station. This provides a uniform overall picture of the hall structures.

External grounds

The excavation work and external grounds were managed in cooperation with TEERAG-ASDAG, Graz. The construction site covers an area of 41,300 m², 13,200 m² of which is developed.

A large part of the halls and all the external grounds were surfaced with a highly stable asphalt system. To ensure adequate runoff of rainwater from such a large area, extensive earth mounds and an underground drainage system were built.

External grounds
Image: PORR

The entire site is fenced in and can be entered via the 20 m high gate facilities.

Project data

Surface area of plot	41,293 m²
Surface area developed	13,152 m²
Gross floor area	14,448 m²
Excavated earth	44,500 m³
Reinforcement	511 t
Trapezoidal sheeting	22.000 m²
Steelwork	160 t

Steigenberger Hotel am Kanzleramt in Berlin

Construction of a hotel for the Steigenberger Group in the Berlin-Mitte district, adjacent to Berlin Central Station

Marko Lehmann

In December 2011, the Berlin branch of Porr Deutschland GmbH was commissioned with the turnkey construction of the Steigenberger Hotel. Porr Deutschland's Berlin branch was also awarded the contract for the total constructional planning (architecture, structural engineering, technical building installations, building physics, fire protection and foundation planning).

Project data

Client	Hotel am Kanzleramt GmbH & Co. KG, a subsidiary of STRAUSS & CO Development GmbH
Contractor	Porr Deutschland GmbH, Berlin branch
Start of construction	23 August 2012
Handover	31 March 2014
Hotel opening	1 May 2014
Gross floor area	26,500 m² (incl. basement)
Floors	basement, ground, Floors 1-7, building services
Stairways	4
Lifts	8
Concrete	10,000 m³
Reinforcement	2,000 t

Project description

The new Steigenberger Hotel am Kanzleramt, right next to Berlin Central Station, is a further addition to the Steinberger Hotel Group in Berlin. The hotel complex occupies four construction plots. Its construction and materials concept follows town planning guidelines established through an architectural competition as well as a comprehensive planning and approval process. On a total of eight floors, 339 hotel rooms, comprising 12 junior suites and 11 suites, are being constructed, along with a 700 m² restaurant area with exclusive private dining section, an 850 m² conference centre with select business area and a 400 m² ballroom / multi-functional hall. On the top floor, looking directly over the German Federal Chancellery and River Spree, a 600 m² upmarket spa and fitness area is being constructed and on the ground floor a further 480 m² of rentable space for shops and restaurants. The basement level houses the building services and storage rooms and 38 rented parking spaces, and a spacious inner courtyard completes the building. The street-side façades feature extensive glazing and natural stone pilasters extending from the ground floor up to the technical services floor in accordance with the Berlin building commission guidelines.

Graphic representation
Image: Ortner & Ortner

Foundations, dewatering and foundation pit

Unfavourable foundation pit conditions and the fact that the B96 main road tunnel runs under the building in the north east part of the site presented major challenges to the entire works preparation and constructional planning. Berlin's Senate Administration, which grants approval for development along the B96 tunnel, issued an extensive catalogue of requirements needed to fulfil standards and regulations. Continual certification procedures and tunnel controls were required. For the foundations, it was necessary to have part of the building suspended above the B96 tunnel. 20 large foundation piles measuring 1.20 m in diameter and 21 m in length had to be inserted to bear the loads.

Owing to the particular conditions prevailing in the foundation pit, a further 10 large foundation piles were introduced over the site to distribute the loads. In addition to the problems involved in building over the B96 tunnel, planning and execution also had to take into consideration the adjoining underground car park for the Central Station. Here, too, there were requirements from the Deutsche Bahn relating to spacing, load stress and vibration limitation. For the single-level basement garage it was necessary to build an enclosed pit using the classical "Berlin" lining technique, involving HEB dimensions of 400 to 450 and an axial spacing of 1.60 m to 1.80 m. The groundwater conditions on site made extensive drawdown necessary. For the volumes of water discharged in the nearby Humbolthain park, a 500 m long bridge structure had to be installed.

Excavation
Image: PORR

Excavation
Image: PORR

Excavation
Image: PORR

Particularities during shell construction

The high building density on site and simultaneous construction of other properties in the neighbourhood made it necessary for the construction team to develop a sophisticated crane and logistics concept. Owing to construction of the new S21 rail link shortly before construction was due to begin, Deutsche Bahn demanded that a continuous replacement bus service, running every 20 minutes, should operate around the perimeter of the site for a period of one and a half years. This meant that only a rotating tower crane could be installed for the basement.

With the agreement of neighbouring building sites, it was possible to use a further crane for certain periods. From the ground floor upwards, shell construction was accelerated by the use of a second rotating tower crane.

During works preparation and constructional planning, the site team decided to employ several pre-fabricated parts in response to the layout and structural design. Thus, in principle, all façade supports were designed and constructed as fully pre-fabricated parts.

50 % of the bulkheads, stairway walls and lift cores were constructed out of semi-finished parts. The high load transfer in the new building however made it necessary to build the remaining part as a monolithic structure until then.

From the second floor upwards, it was then possible to use a higher proportion of semi-finished parts. All hotel room bulkheads were constructed using semi-finished parts along the whole length of the rooms. Likewise, pre-fabricated modules were used for the ceilings. The top edge of the building is 35 m lower than the limit specified in the high rise directive guidelines. Despite the long, cold winter days from December 2012 to mid-March 2013, shell construction was completed by mid-June 2013.

Shell construction
Image: PORR

Shell construction
Image: PORR

Shell construction
Image: PORR

Window installation
Image: PORR

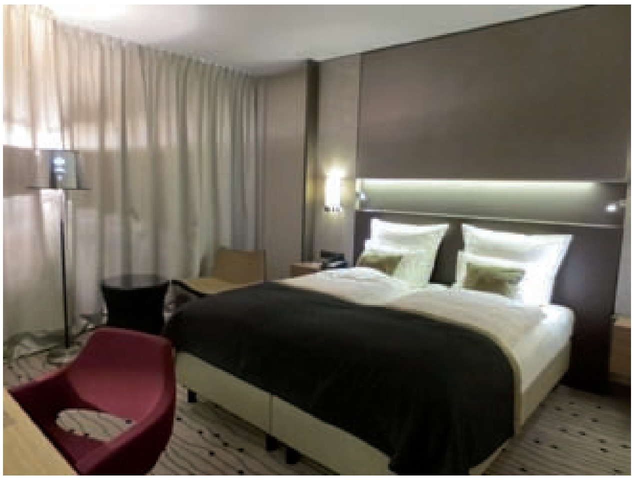
Shell construction
Image: PORR

Window installation
Image: PORR

Building envelope and fit-out

The four façades of the building, containing projections, recesses and inflexions on the eastern, southern and western sides, consist of extensive glazing. The remaining parts of façade, pilasters and ceilings are clad in natural stone lying flush with the large glazing elements. The façade's texture is derived by setting back the narrow window structures in different constellations, producing an attractive interplay of light and shadow. The imposing entrance is accentuated by a glass canopy. The windows in the lobby area are designed as modifications of the post and beam façade. All other glazing elements are designed as pure windows with custom aluminium frames and high-quality sound and sun protection glass. Due to the large size of the elements and productive preparation period, it was possible to build in all windows ready-glazed from the second floor upwards during shell construction, before installation of the filigree ceilings. Installation of the windows was performed by robot from the inside, saving a significant amount of time. This was only possible because the façade company was committed promptly and the planning and sampling process, involving samples of façade, also occurred promptly.

The complete fit-out is being planned by an interior design company. For the walls and ceilings, high-quality materials are being used, which were chosen in advance together with Steinberger as part of an overall interior design concept. Top-quality Axminster carpets, parquet flooring and 60 x 60 format tiles are being used to cover the floors. For the inner courtyard, a large light dome has been designed to illuminate the ground floor and upper floors. To allow viewing opportunities, a model hotel room was set up and provided with samples at the start of construction, in a hall which was specially rented for the purpose not far from the construction site.



Model room
Image: Hotel am Kanzleramt GmbH & Co. KG

In December 2013, after fine cleaning, individual storeys and general hotel areas (with finished walls, floors and ceilings) will be gradually handed over to the interior fittings company, which will subsequently begin with installing furniture and other fittings.

Model room
Image: Hotel am Kanzleramt GmbH & Co. KG

Technical building installations

The hotel rooms and suites are heated and cooled via a 4-step fan coil system, which can be controlled from the reception when guests arrive. All technical building equipment (for cooling, ventilation, emergency diesel power, etc.) is located in centres and free-standing stations on the roof, but these are not visible since the attic floor is trough-like in structure. The hotel has its own transformers installed in the basement to ensure operations in the event of a power failure.

320 hotel bathrooms will be supplied with pre-fabricated bathroom units, fitted floor by floor during shell construction in order to coincide with the window delivery and precede installation of the filigree ceilings. Supply lines leading from the engineering rooms to the bathroom units will be installed as pre-fabricated modules in parallel with assembly of the bathroom units.

Installation of pre-fabricated bathroom units
Image: PORR

Installation of pre-fabricated bathroom units
Image: PORR

Installation of pre-fabricated bathroom units
Image: PORR

Final comment

The hotel will be certified according to the German Sustainable Building Council (DGNB) silver standard. The pre-certificate in silver has already been awarded. With the hotel's completion and handover planned for 31 March 2014, sufficient time remains for FF&E interior fittings to be completed and for the hotel to be ready for opening on 1 May 2014.

Field report: Waste water disposal plant (ABA) Mautern on the Danube and sewage headers "F" and "G" in the voestalpine in Linz

Georg Steibl

A functioning waste water system is a basic requirement for maintaining our quality of life. Even if the current connection rate to municipal waste war treatment plants in Austria is currently well over 90%, it is indispensable to continually invest in the maintenance and optimization of the present systems because of the limited service life of the sewers.

The construction of a waste water disposal plant is a challenging engineering feat, similar, for example, to bridges or tunnels.

A functioning wastewater discharge and disposal can be guaranteed to be taken for granted only if high-quality planning is performed by experienced engineers with construction work at the highest level of quality.

The correct choice of pipe materials plays a crucial role in the construction of a wastewater system.

The following examples illustrate the successful use of concrete and ferro-concrete pipes on the basis of some project-specific particularities.

ABA Mautern on the Danube

Pipe dimensions: DN250 – DN1800
Total length: approx 8,300 m

Following decades during which hardly any investment was made in maintaining the wastewater system in Mautern on the Danube, the political decision was made a few years ago to rebuild nearly the entire sewer system, but also the drinking water network. This became necessary because of the hydraulic overloading of the old system.

In addition, many sections had surpassed their service life and a non-disruptive restoration no longer made technical and economic sense.

One particularity of this project was the circumstance that it involved a sewer-channel substitution, i.e. the provisional functional capability of the plant had to be guaranteed throughout the construction period.

Since space in the town centre of Mautern was very restricted, a major challenge was choosing the right machinery.

Flexible choice of lengths for the concrete and ferro-concrete pipes was very helpful for the transport to the site and installation.

Several previously unknown domestic waste water channels were found in the town centre of Mautern which could be immediately integrated into the new main system by using a core drilling machine for concrete and the appropriate seals.

This very flexible system made it possible to avoid disruptions in the construction sequence (e.g. due to long delivery times for molded components).

The pressure tubes needed in the area of the rain water outfall pipes into the Danube were armored accordingly and reinforced in the socket area with a steel ring.

Heavily reinforced pressure pipes, reinforced in the socket area with a steel ring
Image: PORR

Manhole base DN2000 with DN1600 main channel
Image: PORR

Very tight working space in the town centre of Mautern
Image: PORR

Trench with sheet pile wall and underwater concrete plug for pipe laying in ground water
Image: PORR

Sewage header "F" and 30 kV E-collector

Pipe dimensions: DN2200 – DN2600
Total length: approx 1,200 m

Construction of a new plant for discharging rain and industrial wastewater was necessary in the course of a massive expansion program of the voestalpine Stahl GmbH.

Since an additional power supply was also needed for the new production locations, and it was possible, with the appropriate planning, to route the pipeline alignments for the power supply and disposal plant (cable collector and sewage header) in parallel, significant synergies could be achieved by using ferro-concrete pipes for both structures.

One of the major challenges in this project was the optimization of the pipe statics in sections with respect to the extraordinary loads, e.g. due to the passage of special voestalpine Stahl GmbH vehicles with up to 200 tonnes total weight or due to the storage of slabs in the alignment area.

Cost-effectiveness and load capacity were maximized by intensive cooperation with the pipe supplier to adapt the reinforcement content, wall thickness and pipe support.

During construction a strict quality control plan ensured precise implementation of the assumptions made in the calculation.

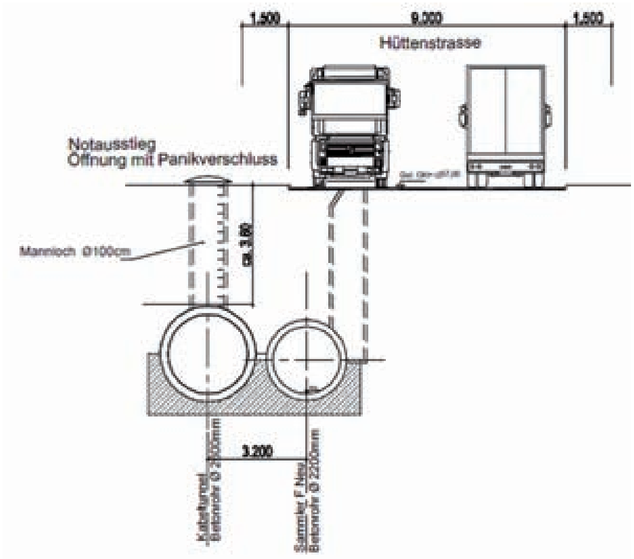
An additional challenge resulted from the fact that the numerous existing structures with the cable collector DN 2600 could not be crossed with culverts as for the waste water header DN 2200. Because of the need to be able to walk over the area, a solution was found whereby the collector was pivoted in three dimensions.

The complex implementation, from a survey-calculation point of view, was performed following exact detail planning with our suppliers.

Transition from a sheet pile wall to MEGA double slide rail shoring
Image: PORR

Inside the 30 kV E-collector DN2600
Image: PORR

Standard cross-section DN2600/DN2200 in MEGA double slide rail shoring
Image: PORR



Standard cross-section DN2600/DN2200
Image: PORR

Sewage header "G"

Pipe dimensions: DN1500 – DN2400
Total length: approx 1,400 m

It became necessary to discharge the incoming coolant water because of the expansions at the voestalpine Stahl GmbH site in the course of the expansion program “L6.”

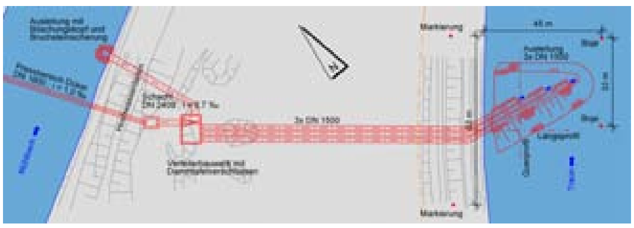
The chosen routing represented the optimal variant for the waste water header “G” on account of the plant location, terrain and grade conditions and the proximity to the river Traun.

The waste water header "G" has two discharge points. The pipe routing to the distributor structure runs from the discharge point into the river Traun through three pipe systems, each with a nominal diameter DN1500 in graded lengths.

The distributor structure as such is located at a tongue of land bordered on one side by the Traun and on the other wise by the Mühlbach. It serves to distribute the volumes into the river Traun or into the Mühlbach.

Proceeding from the discharge point in the Mühlbach, a pipe was constructed with a nominal diameter of DN 2400, which runs to the previously cited distributor structure.

In the area of the remaining alignment, the Mühlbach was culverted using an inverted siphon with a pipe pressing DM 1600 and a plant railway station was traversed by means of pipe jacking DN 2400.



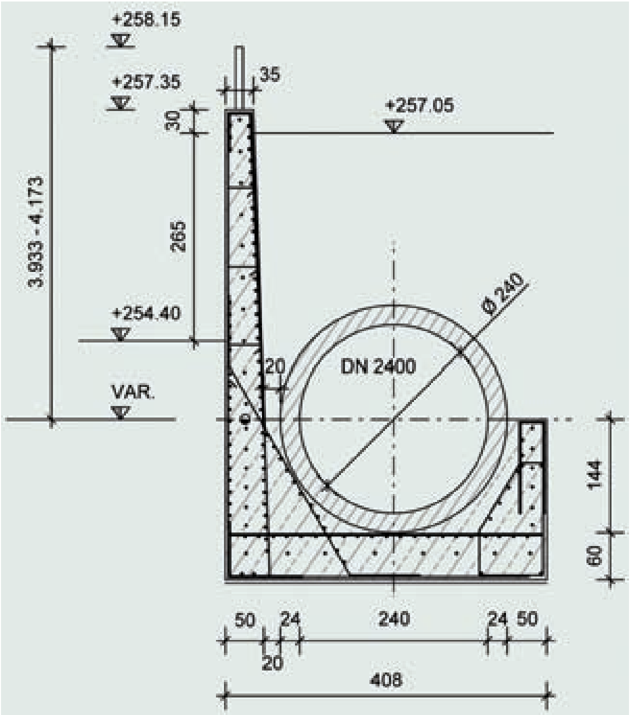
Site plan lead-out area Mühlbach/Traun
Image: PORR

Culvert and distributor structures
Image: PORR

On a section of some 300 m, a pipe bedding that was needed anyway could also be used as the foundation of a retaining wall.

Total project costs were significantly reduced by these synergies.

Standard cross-section DN2400 in MEGA double slide rail shoring
Image: PORR



Standard cross-section DN2400 with mounted retaining wall
Image: PORR

Construction of the mounted retaining wall
Image: PORR

Finished retaining wall
Image: PORR

A2 South Motorway – Traffic Control Centre Ilztal

René Jagerhofer

General

TEERAG-ASDAG, branch office Steiermark, will build a traffic control centre on order of the ASFINAG to accommodate the continuously growing traffic volume and the associated increasing number of lorries in road traffic. The order received in August 2012 will be carried out in cooperation with the construction areas Greinbach and Frauental.

The construction project is situated on the A2 South Motorway, in the direction of Graz at kilometre 147, between Ilz und Sinabelkirchen. It basically consists in the production of the control centre at the parking area 147 of the A2 together with a traffic outflow system on an area of about 12,000 $m^{2.}$

The new control centre encompasses the following areas: weight control, inspection hall with a brake test bench, inspection pit, height and width control, axel load scale, as well as its own ramp for loading and unloading lorries (customs clearance control). This represents a further important step toward identifying so-called rolling bombs, taking them off the road and thus enhancing traffic safety on Austria's roads.

The traffic control area will be used by the state of Steiermark (technical inspection), the motorway police Hartberg (police controls), the Federal Finance Ministry (customs) and Asfinag (toll stickers control).

Construction time

Commencement of construction was August 2012; completion of the entire project was May 2013.

Main works

- Soil stabilisation
- Infrastructure (water, waste water, electrical power)
- Widening of the embankment in the entrance area of the traffic control centre
- Traffic management system based on seven single crossbar bridges, seven side pillars with the associated equipment, adaptation of the road restraint systems and noise protection walls as well as connection to the CN.as line
- Operational buildings consisting of nine standard containers with roofing cover
- Flying roof including ramp for the Federal Finance Ministry (customs)
- Inspection hall with inspection pit with all needed facilities for technical inspection of vehicles
- Detention basin for the restricted discharge of surface water consisting of an intake shaft, sedimentation basin, transfer shaft, filter basin and discharge into the existing gutters
- Driving areas in concrete or asphalt construction (approx. 11,000 m^2)

Construction site
Image: PORR

Reservoir
Image: PORR

Soil stabilisation

An area of approx. 4,000 m² was cleared in order to achieve the needed building area for the traffic control centre of approx. 12,000 m². After that, a soil stabilisation of approx. 10,000 m³ had to be carried out in the northern section of the existing parking area. The reason for this necessary soil stabilisation was an existing storage area of rootstock in the embankment area. Under the supervision of a geologist usable and unusable material was distinguished and accordingly sorted and approx. 7,000 tonnes of contaminated material was removed. The embankment was rebuilt by means of lime stabilisation in a sandwich construction and supplemented with excavated material from the remaining construction area.

Accompanying the required inspections, a civil engineering office was commissioned for quality control of the earth works.

This described soil stabilisation was offered to the client as an alternative to the official design and was ultimately commissioned.

The logistical and technical challenge was primarily to stabilise the soil without additional off-site material.

A mobile tire washing plant was installed to avoid dirt on the motorway during the earth works.

Soil stabilisation
Image: PORR

Soil stabilisation
Image: PORR

Soil stabilisation
Image: PORR

Soil stabilisation
Image: PORR

Operational buildings

The operational buildings were constructed in the form of containers and consist of rooms for the motorway police, for monitoring the dynamic axel load scale and the height-width measuring facilities, customs, Asfinag, a technical room as well as toilet facilities for handicapped persons. The containers are arranged in three lines, each with three containers. A section of the container facility was constructed about 1 m over road level in order, on the one hand, to provide a good overview of the outflow route and, on the other hand, to reach the control area for checking the lorry drivers. The foundation was constructed as reinforced concrete strip foundations upon which the containers were placed. The roofing of the containers was implemented as a mono-pitched roof.


Concrete construction operational buildings
Image: PORR


Operational buildings
Image: PORR


Operational buildings with canopy roof
Image: PORR


Operational buildings
Image: PORR

Covered inspection areas – canopy roof

Sleeve foundations serve as footing for the steel construction of the flying roof. The total area covered is about 1,000 m^2 and the used steel about 105 tonnes.

Inspection hall

Technical inspection of the vehicles is performed in the inspection hall. All required technical facilities were installed for that purpose, such as an inspection pit with a brake-test bench, axel clearance tester, a vacuum unit and an inspection cabin with the necessary data-processing equipment. The foundation for the inspection hall consists of steel reinforced concrete pre-fabricated sleeve foundations into which the steel frame construction was mounted. Aluminium panels are used for the cladding. The inspection pit set into the foundation slab is a prefabricated steel unit with a length of about 30 m, which was grouted with flowing concrete following placement. The floor was constructed as a polished monolithic steel reinforced concrete slab.


Inspection hall
Image: PORR

Inspection hall
Image: PORR

Relocation of test pit
Image: PORR

Relocation of test pit
Image: PORR

Relocation of test pit
Image: PORR

Traffic management system

The traffic management system consists of seven steel-frame bridges (overhead signage) with up to 15 m clearance width, clearance height of > 5.50 m and accuracy of 0.1 mm.

It was possible to set up the overhead signage only by blocking the traffic lane in the direction of Graz during night work.

The overhead signage provides electronic-display information to vehicles 2.8 km ahead of the traffic control centre about reduced velocity, no-passing, traffic jam warnings and directions to the right traffic lane for vehicles that are to be inspected.

Road construction

In the interest of durability the parking spaces and the turning areas for lorries were constructed as a single-layer concrete slab (d= 20 cm) on a surface area of about 5,000 m² because of the tight radii. The asphalt surface with a dimension of about 5,500 m² was constructed as follows:

- 4 cm SMA 11 S3, GS
- 9.5 cm AC 32 binder RA 20
- 9.5 cm AC 32 binder RA 20

The binder course was produced in accordance with the requirement of the client with a 20% recycled asphalt content.

Loose upper base course with projecting roof
Image: PORR

Asphalting
Image: PORR

Asphalting works
Image: PORR

Completion of the full project and final remark

Completion of the full project, respectively the opening of the traffic control centre, was at the end of May 2013. Asfinag has thus taken a further step in the direction of traffic safety.

With the realization of this project, TEERAG-ASDAG Greinbach and TEERAG-ASDAG Frauental have fulfilled the high requirements to the satisfaction of all parties, and by bundling forces and resources, they have together proven themselves capable of mastering all of the technical and commercial challenges.

Reconstruction of the Elbeu canal viaduct

Strengthening inland waterway transport over and against road freight traffic

Nico Eick

Introduction

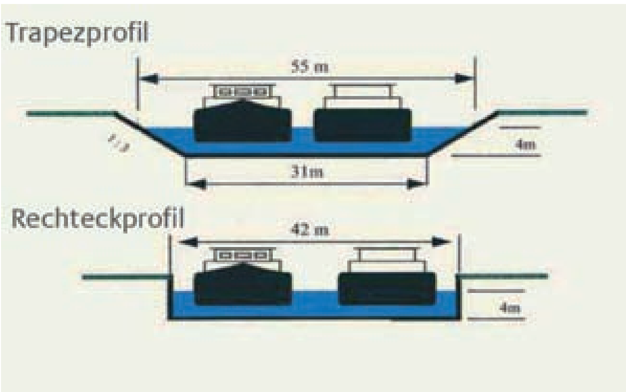
The Mittellandkanal was built from 1906 to 1916 as the link between the north German rivers Rhine / Ems and Weser for tow-shipping, and in 1938 it was extended to the Elbe.

Following the Second World War, shipping changed from the slow tow-ships to freight ships with their own propulsion (motor-freight ships with propellers), but these were limited in size by the profile of the Mittellandkanal.

German transportation policy today aims to shift freight transportation, at least as concerns growth, from the roads to inland waterways.

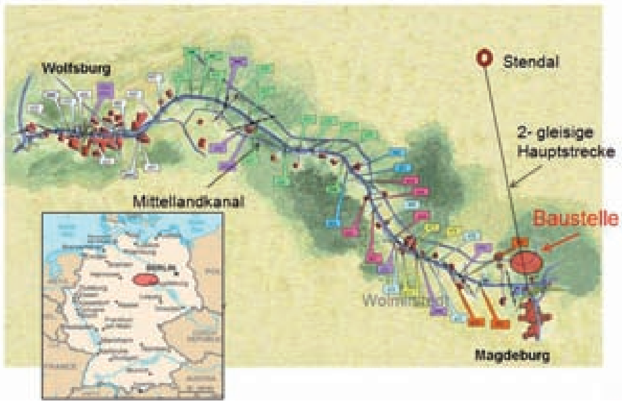
In view of this, the reconstruction of the Elbeu canal viaduct is part of the transportation project *Deutsche Einheit* (German Unity) Nr. 17 aimed at opening up the Baltic Sea inland harbours and the North Sea inland harbours for larger container ships with a draught of 2.80 m, a maximum length of 185 m and a tonnage of up to 3,500 t, as well as to link the metropolitan areas of Wolfsburg, Magdeburg and Berlin.

The cross-section of the Mittellandkanal will therefore be rebuilt from a single-ship channel trough to a two-ship rectangular cross-section and in the course of this work the draught will be extended by 1 m.



Construction cross-section of the Mittellandkanal
Image: WNA

The main Magdeburg to Stendal railway line crosses underneath the Mittellandkanal, which at 16 m above the surrounding terrain is on an "elevated embankment", north of Magdeburg.



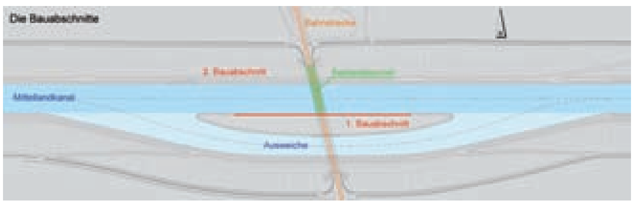
Overview map of the Mittellandkanal
Image: coda

The old canal viaduct, approximately 100 m long, was built over the existing railway line in 1928 during the construction of the Mittellandkanal. It was shaped as a masonry circular arch on gravity walls of tamped concrete in horseshoe form. The tamped concrete abutments were cladded with clinker brickwork on the interior and with granite blocks at the portals.

Existing tunnel and rail line, March 2010
Image: J. Bunte

Structural design

The structural design aimed to minimize as far as possible traffic disruptions for inland waterway and railway traffic. The project was therefore divided into two construction stages.



Overview drawing
Image: grbv

In the first construction stage the existing railway tunnel was extended and the "turnout" for the canal viaduct built.

Once the turnout was operational, in the second construction stage the "old route" of the Mittellandkanal was blocked. The existing tunnel was then demolished and, analogous to the tunnel structure built in the first construction stage, the reconstruction of the canal viaduct went ahead.

After that, the Mittellandkanal was restored.

The turnout needed for shipping during construction will not be removed following completion of the "old route," but will remain as is.

Execution of construction

In February 2010 Porr Deutschland GmbH, Branch Berlin, as part of a consortium, won the civil engineering works contract for the reconstruction of the Elbeu canal viaduct.

After searching for and rerouting the railway control cables, some of which dated back to 1928, the actual project could get underway.

Construction stage 1

At the beginning of the first stage of construction, working levels were built up on both sides of the railway line as a cofferdam construction to create the secant bore pile wall and the reinforced concrete bank wall.

Working level with production of the bore pile wall, September 2010
Image: PORR

The working levels were dismantled once construction of the bank walls was completed. The foundation bore piles for the new construction of the frame structure were then installed and the pier head beams were concreted.

The frame struts for the tunnel structure were erected in the railway possession periods.

The two-layer main reinforcement (ø 28 /10) had to be butted with twist-on reinforcement connectors in order to maintain the required clearance distance between the massive reinforcement in the frame ceiling and the railway line's overhead contact wire, which was still in operation.

The frame ceiling was constructed on falsework to keep rail operations from being disrupted. The foundation for the falsework was on a skidway on the already completed framework struts.

Frame strut 1. Construction section with skidway, March 2011
Image: PORR

The frame ceiling was concreted in 30 m sections on the skidway in night work in the weekend possession periods. The lagging and the ceiling concreting were done in the same way.

Tunnel 1. Construction stage before flooding, November 2011
Image: J. Bunte

At the conclusion of the first construction stage, the soil stabilisation piles were installed to reduce foundation soil settling and the structure was backfilled.

Construction stage 2

The railway was completely shut down for two weeks at the beginning of the second construction stage to pump out the canal trough, remove the "Alten Fahrt" and demolish the arch roof of the existing tunnel structure. Here, in addition to demolishing the existing overhead line, the railway tracks had to be taken into account and rebuilt.

Stripping away the soil to demolish the existing tunnel, March 2012
Image: J. Bunte

Demolition of existing tunnel, March 2012
Image: J. Bunte

Construction pit and frame structure of the second construction stage, March 2013
Image: PORR

The asphalt sealing of the existing tunnel was also removed and disposed of in a professional manner while the railway was shut down.

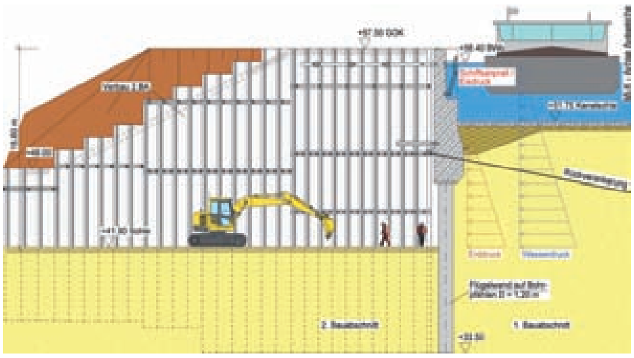
Following the removal of the arch roof, the frame struts were constructed, analogous to the first construction stage, while a single rail line was closed, and the roof was built up in night work during weekend possession periods.

The overhead contact wire had to be shifted depending on the status of the construction work at a given time.

At the end, the construction pit of the second construction stage was backfilled and the sheet-pile shoring was extracted.

Special challenges

The reinforced concrete bank wall built in the first construction stage and resting on the secant bore pile wall between the two construction sections presented a particular challenge for planning and execution because it forms the direct partition of the canal bed from the turnout and the 16 m-deep construction pit.

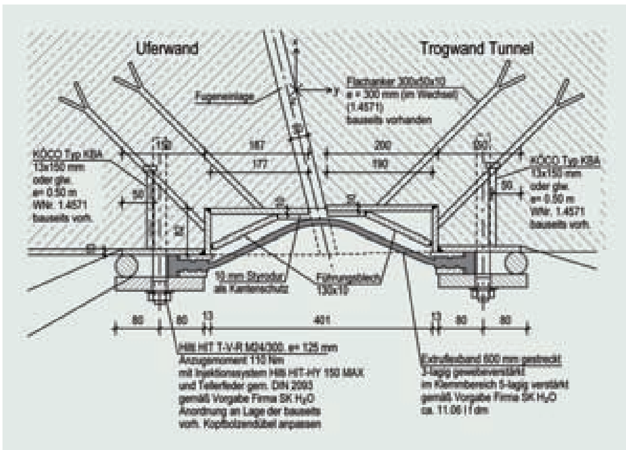


Construction pit and frame structure of the second construction stage
Image: grbv

The safety concept for the bank wall was enhanced in the context of technical design work. This was achieved by aligning the high-pressure injection (HDI) grouting curtains, additional grouted anchors and decoupling the construction pits of the first and second construction stages.

Additionally, the bank walls and the tunnel of the first construction stage were separated from each other because of the different settlement behaviour by applying a non-standard expansion joint construction.

The planning, usability tests and execution of this expansion joint construction in compliance with the Wasserbauvorschrift (hydraulic engineering specification) ZTV - W and taking into account the planning for the possession periods represented a major challenge for all involved in the project.



Grouting between canal bank wall and tunnel, 1st building section
Image: PORR

Final remark

After the railway possession period is before the railway possession period. The constraints on railway operation established in the course of the client's design planning were fixed as possession periods by the DB AG and so scheduled.

This meant that railway operations prior to and especially between the possession periods had to be strictly organised and implemented such that the next construction level was reached before initiation of the coming possession period.

Here we would like to express our particular gratitude to everyone involved in the construction project. Despite the requirements that derived from sometimes very considerable extra work, all interim levels were reached and possession periods adhered to. No possession periods were exceeded and the construction project was implemented without accident.

Technical key data

Contract volume	EUR 11.9 m (ARGE)
Start of construction	April 2010
End of Construction	2013

Scope of works

	Technical design processing of the canal viaduct
Foundation	950 m bore pile ø 1.80 m
	test load 7.5 MN
	secant bore pile wall ø 1.20 m
	5,200 linear meters soil stabilisation piles ø 0.50 m
	3,800 m² sheet-pile-construction pit shoring partly back-anchored up to 16 m depth
Earth works	90,000 m³ soil removal and soil application
Demolition	900 m³ masonry demolition with asphalt paper board
	5,100 m² tamped concrete abutment demolition
Reinforced concrete	9,000 m³ waterproof concrete
Reinforcement	1,800 t with reinforcement screw connectors
Track construction	track tamping by machine
Control and safety systems	underground cabling and rerouting of cable lines

A13 Brenner Motorway – Refurbishment of the corrosion protection on the Gschnitztal bridge

Refurbishment superstructure underside and drainage

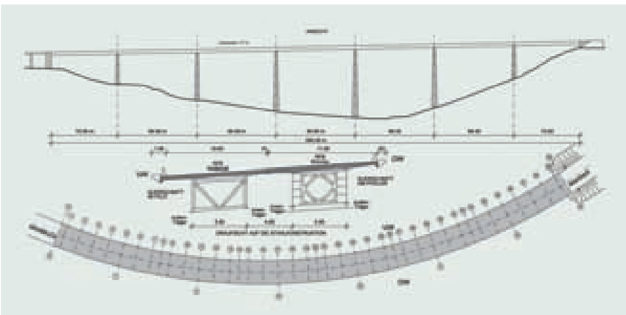
Günter Haid

General

The Brenner motorway is the most important and, from a geological point of view, the most difficult to construct section of the European motorway from Munich to Modena.It runs over the Brenner Pass (the real "Brenner") which, with its altitude above sea-level of 1,350 m, is the lowest pass, frequently used even by the Romans to get over the main Alpine ridge. Today it forms the border between the Austrian Federal State of Tirol and the Italian province of South Tirol, whose course mostly follows the ridges of the high-altitude mountains of Tirol.

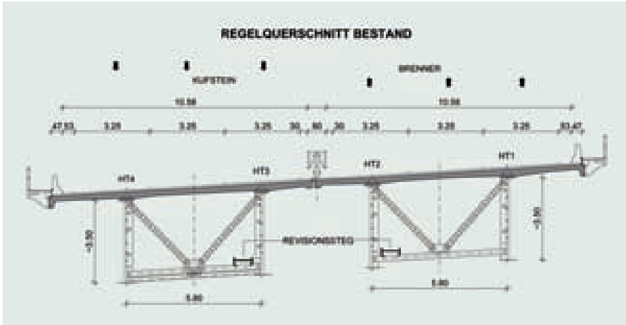
There are many bridge structures on the A13 Brenner motorway, built between 1959 and 1971. A number of bridges are in a condition requiring a general refurbishment because of the topological location of this road and the high and continuously increasing proportion of trucks in the through-traffic from and to Italy. In some cases, severe deficiencies have been found during the regular bridge inspections of the support structures, now between 30 and 40 years old. The cause was primarily the intensive salt-spreading during winter operation on concrete bridges and the extreme freight traffic with continuously increasing numbers of trucks and ever larger individual weights or axel loads.

This also applies to the 674 m long Gschnitztal bridge (including the foreshore bridges) that spans the valley entrance of the Gschnitz valley at the town of Steinach at the Brenner at a height of up to 80 m. This steel composite bridge (km 22.788 – km 23.340) has an independent support structure for each traffic carriageway, separated by a centre strip. The composite bridge consists of seven spans in the lengths 70 m + 5 x 84 m + 70 m = 560 m and is strongly curved in horizontal projection (R = 600 m).



Front and plan view of the Gschnitztal Bridge
Image: PORR

Two steel main girders with a height of 3.5 m and distance from each other of 5.8 m were constructed per carriageway. The haunched carriageway deck was concreted on the underside of these girders. The bridge was constructed between 1965 and 1968 with a total width of 10.4 m (travel direction Innsbruck) und 10.9 m (travel direction Brenner). The carriageway width at that time was 9 m.



Bridge cross-section over both carriageways
Image: PORR

The bridge was widened in 1986, so that 1.65 m additional width per carriageway and three lanes each way have been available since that time. The main bridge piers were not separated at the centre strip, i.e., both support structures rest on one common pier plate. Pier heights are between approx. 20 m up to about max. 70 m. Pier head width is 17.8 m and the pier head thickness is between 2 m and 2.7 m. The existing steel structure was kept unchanged except for minor reinforcement measures.

There were material failures in the transverse braces (lying torsion brace) of the steel structure due to the continuously increasing truck freight traffic. The hollow diagonals with slotted-in gusset plates, which are problematic from the standpoint of material fatigue, were replaced with new diagonal braces in 2008 – 2009. The new parts were given only a primer coating in the course of the reinforcement measures and a temporary corrosion protection was applied in the mounting areas.

All of the parts of this reinforcement were first provided a final corrosion protection in the course of this refurbishment.

Contract

In March 2011 ASFINAG Baumanagement GmbH awarded TEERAG-ASDAG AG, Branch Tirol the contract for the Gschnitztal Bridge on the A13 Brenner motorway. The refurbishment of the steel structure's corrosion protection, refurbishment of the underside of the support structure and the renewal of the bridge drainage. In addition, refurbishment of edge protection and renewal of the measuring equipment at the bridge bearings was commissioned. All work was carried out while keeping two travel lanes open in each direction.

Scaffolding work began on 18 April 2011.Refurbishment work on the first bridge span started on 9 May 2011. In the period from 16 December 2011 to 2 April 2012 work was interrupted because of the weather. The full project was completed on 12 October 2012.

Contractual conditions

Parallel to the refurbishment work on the corrosion protection for the steel structure, another contractor performed a general refurbishment of all piers on the Gschnitztal Bridge. The two refurbishment processes had to be timed so that the work-areas did not overlap for extended periods of time. The ASFINAG contract required an absolutely dust-tight scaffold. This requirement was to assure that the residents who lived, in part, immediately under the bridge, would not be disturbed.

Overview of the bridge with the residential area below
Image: PORR

Another aggravating circumstance was the Bergeralm crossing cable-car route in the area of span 6. No scaffolding work was allowed during the operational times of the cable-car. So special times for scaffold work were fixed – on the one hand, cable-car maintenance periods were used, or the work was carried out after 5 PM.

Scaffolding work

The refurbishment scaffold hangs on the bottom boom of the main girder of the Gschnitztal Bridge. The entire scaffold was covered with pool liner to achieve the required dust-tightness. As for tents, the access areas were provided with zip fasteners and could be closed for dust-tightness as best as possible during the sand-blasting work. For the best possible cost-efficiency of the work, one entire bridge span covering both carriageways was scaffolded.

Scaffold bridge span 7 with access area
Image: PORR

Scaffolding work began at the Brenner abutment. The scaffolding work could not be performed, as planned, on two adjacent spans because of problems with the structural stability of the bridge spans. Because of the dead weight of the hanging scaffold, the live load of the sand blasting work and the bridge's structural limits values, it was necessary to always leave two spans between the scaffolding fields free. This meant increased transportation time/effort for all of the scaffold parts. The scaffold parts had to be lowered as elements by rope, transported to their new location by flat-bed truck and there pulled up again with a winch and secured. The areas between the scaffold parts were closed with planks. It took about three weeks to set up the scaffolding on one span, dismantling following completion of refurbishment work took about two weeks.

Scaffold work bridge span 4
Image: PORR

Concrete repair work and renewal of the bridge drainage

In some places at both ends of the structures, considerable refurbishing work on the structural concrete was required in the area of the centre strip. The damaged material was removed in a professional manner, the corroded reinforcing bar sand blasted to SA 2 and surface treated. The construction was then restored by applying shotcrete.

Concrete refurbishment of the centre strip
Image: PORR

The concrete refurbishment work had to be completed ahead of the corrosion protection work in order to avoid qualitative impairment of the corrosion protection work. Following completion of the concrete refurbishment work, the centre strip was provided with a stainless steel trough that was directly connected to the also renewed bridge drainage. The concrete on the outer edges of the bridge had to be refurbished as well, but not to the same extent as at the centre strip.

Corrosion protection work

Where required, heaters were used to dry the air in order to achieve conformity with the norms for climate factors in the enclosure during the corrosion protection work. For reasons of space and weight, this equipment was placed on the deck of the bridge and not on the floor of the scaffold.

The bottom 70 cm of the main girder were treated as follows (Coating System 2 according to RVS 08.09.02):

Surface preparation:

- Hot water blasting
- Secondary cleaning of the molybdenum disulfide coated nuts with solvent
- Sweep-blasting of the new bolt connections
- Blast derusting preparation standard Sa 2.5 full-face

Primer coat	nominal layer thickness 70 µm
Intermediate coating	nominal layer thickness 80 µm
Edge protection cover	nominal layer thickness 80 µm
1. Cover coat	nominal layer thickness 80 µm
Sealing of joints and cavities	
2. Cover coat	nominal layer thickness 80 µm

System 2 (lower 70 cm) and system 3 (above that)
Image: PORR

Remaining surfaces were refurbished in accordance with RVS-Coating System 3:
Surface preparation:

- Hot water blasting and rub-down with sandpaper

Edge protection cover	nominal layer thickness 80 µm
1. Cover coat	nominal layer thickness 80 µm
2. Cover coat	nominal layer thickness 80 µm

Damaged areas were patched:
Surface preparation:

- partial blast derusting preparation standard PSa 2 1/2 about. 5 % of the total surface preparation

Primer coating	nominal layer thickness 80 µm
Intermediate coating	nominal layer thickness 80 µm

Coating system 3
Image: PORR

The deck coating was applied by spraying. This resulted in an optimum appearance and very uniform layer thicknesses.

Coating system 3 after the last deck-layer
Image: PORR

Completion corrosion protection work – inside steel structure with inspection gangway
Image: PORR

Final remark

The great challenges for TEERAG-ASDAG AG, Branch Tirol as well as all others involved in the planing and execution, engineering consulting offices, companies and the local construction supervisors, were, on the one hand, to keep the disruptions for the neighboring residents as low as possible (dust and noise emissions) and, on the other hand, despite the difficult contractual conditions and the tight construction schedule, to deliver high quality work.

TEERAG-ASDAG AG, a key component of the PORR-Group, once again demonstrated its versatile competence on this infrastructure project when it comes to construction projects that are challenging from a technical and scheduling point of view.

Project data

Client / Owner	ASFINAG Baumanagement GmbH Wien
Contractor	TEERAG-ASDAG AG, Branch Tirol
Bridge length	560 m
Bridge width	approx. 24 m
Spans	70 m + 5 x 84 m + 70 m
Bridge height	approx. 20 to 72 m
Length of bridge drainage	2 x 560 m
Corrosion protection system 2	6,200 m²
Corrosion protection system 3	19,950 m²
Refurbished small areas System 3	1,765 pcs.
Start of construction	18 April 2011
Winter break	16 December 2011 – 2 April 2012
Full project completion	12 October 2012

Brenner Basis Tunnel – A milestone in the European rail transport

Construction sections Ahrental, Sillschlucht and Ampass

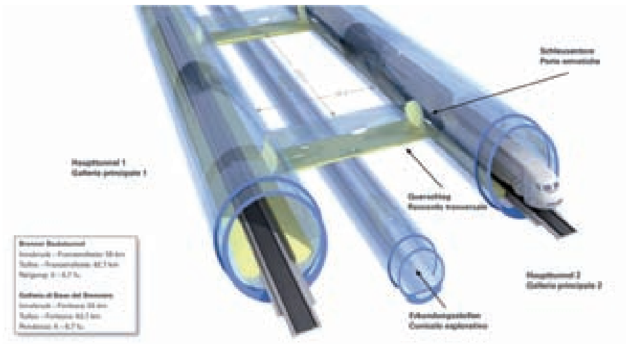
Anton Ertl

Introduction

The Brenner Basis Tunnel (BBT) forms the centrepiece of the 2,200 km long Berlin−Palermo North-South-Corridor, also known as the TEN-1-Axis. The European Union supports the expansion of this cross-country railway section and categorises it as preferential.

The Brenner Basis Tunnel is a level railway tunnel connecting Austria and Italy. It runs from Innsbruck to Franzensfeste (55 km). Taking into account the already existing Innsbruck railway diversion, into which the BBT debouches, the alpine breakthrough is 64 km long. This makes it the longest underground railway connection in the world.

Schematic illustration, Brenner Basis Tunnel
Image: BBT-SE



Standard cross-section, Brenner Basis Tunnel
Image: BBT-SE

Major project: Brenner Basis Tunnel
Image: APA/BBT-SE

Layout drawing, exploration and access galleries Innsbruck Ahrental
Image: BBT-SE

Ahrental access tunnel

Tunnelling	2,404 m
Cross-section	95 – 120 m²
Longitudinal gradient	max. 11.6 %
Shotcrete	25,907 m³
Explosives	313,030 kg
Asphalt road surface	24,000 m²

The portal of the Ahrental access tunnel is located directly below the A13 Brenner motorway. The site installation area, representing part of the “Ahrental” infrastructure for construction logistics, is located in the immediate vicinity of the portal area. On account of the limited accessibility of these areas prior to construction measures, a new temporary interchange will be built, starting from the high quality public road network, to access the construction site area. This provisional interchange is a non-public entrance and exit for the site installation area as well as to the Ahrental portal and consists of two ramps as well as a site road connecting these two ramps with the site installation area. The construction of these access ramps was carried out in compliance with the requirement for uninhibited traffic on the A13.

The profile type of the Ahrental access tunnel is a two-lane tunnel with an excavation cross-section of up to 120 m². The tunnelling began on 16 July 2010. The excavation was carried out according to the principles of the New Austrian Tunnelling Method and is divided into calotte, side wall and invert broken out by blasting.

Because of the proximity of the Ahrental access tunnel to the Wipptalstörung (Wipptal dislocation) the bedrock in this tunnel is thoroughly and clearly sectioned. The Wipptal dislocation separates the rock of the Ötztaler und Stubaier Alps from the large quartz phyllite mass.

Accordingly, depending on the encountered rock type and rock behaviour, either a deep invert arch or a flat invert was installed.

Ice-age gravel deposits were found up to tunnel metre 30 in the upper part of the tunnel cross-section. Both the occurrence of this loose rock as well as the undercrossing of the A13 Brenner motorway under the specification of the motorway operator, ASFINAG, to keep the subsidence cavity on the carriageway low, required using several sections of pipe-shielding to obtain a stiff and strong structure.

In particular, the extreme gradient of up to 11.6 % made the greatest demands on personnel and equipment. To counter the 200 m difference in elevation (20 bar water pressure), greatest attention had to be given to operating a redundant water-retention system for the predicted volumes of water of up to 30 l/sec. In addition, parallel to tunnelling work, the planed backfill of the invert with drainage as well as bituminous carriageway was installed. The desired positive effect with respect to work efficiency and work safety took hold.

The breakthrough to the Innsbruck-Ahrental exploratory gallery was on 11 October 2012.

Anchor works
Image: PORR

Intersection area Ahrental access tunnel and exploratory gallery
Image: PORR

Blasting a heading face
Image: PORR

Innsbruck–Ahrental exploratory gallery

Tunnelling	5,469 m
Cross-section	25 – 75 m²
Longitudinal gradient	0.4 – 0.6 %
Shotcrete	45,250 m³
Explosives	414,491 kg
Flowing concrete	10,500 m³

The construction-logistical infrastructure is located on the grounds of the Sillschlucht site installation along with the container units for the client's representatives, local building supervision, construction and control surveying, geologists, geotechnical engineers as well as the project and site management. In addition to access bridges built in preliminary lots, various slope and rock consolidation work was necessary, as well as the laying of an asphalt-paved construction road, before tunnelling work began.

Tunnelling work in the Sillschlucht of the Innsbruck–Ahrental exploratory gallery began following the ground breaking ceremony in December 2009.

The tunnel will be built by blasting, again according to the principles of the New Austrian Tunnelling Method, but, due to the tight cross-section conditions, divided only into calotte and invert. A median drive performance of approx. 6.5 m per working day was achievable with the four to six blastings daily. The very tight space conditions of this single-lane exploratory gallery, in particular, made it necessary to construct double-lane 20 m long lay-bys regularly at a distance of 250 m.

Especially the supply of the drive with lining material and concrete, bringing out the rubble, fresh-air supply and all other logistical details of a line construction site, make this drive special.

The tunnelling work for the Innsbruck exploratory gallery in the direction of Brenner was ended once the junction was reached with the Ahrental access tunnel after 3,658 m.

In the context of this construction contract, the client additionally ordered the production of a 657 m long “North drive”, which will in the future discharge the mountain water directly into the adjoining Sill River. In the course of this section of the tunnel, an existing scour sluice gallery (distance 20 m) as well as an access tunnel (distance 1 m) of an adjacent power plant had to be passed under. The threshold values determined by expertise report by the power plant operator were 5 mm/sec and, by changing the used detonation system (dual-shock detonator), this value was adhered to for each detonation.

About 30 m in front of the planned breakthrough point, the mining method drive was stopped. The breakthrough was carried out by large-hole boring with a diameter of 800 mm. This work was completed at the end of 2012.

The production of the 3,660 m long dewatering channel with a flowing-concrete mixer over the entire drive-length was carried out directly upon ending the drive works in this section. In advance the invert profile was milled to its target level using a mining milling machine. Following that work, the concrete invert channel was produced in a total of five concreting steps. Daily performance rate of up to 200 linear metres of flowing concrete were achieved. The alternative invert channel production worked out by means of value engineering was convincing on account of the outstanding quality of the finished product.

Work began on the 1,150 m extension of the exploratory gallery in the southern direction with the breakthrough of the Ahrental entrance gallery to the Innsbruck-Ahrental exploratory gallery in October 2012.

At the end of this drive, from tunnel metre 4,750, a 50 metre-long cavern with an excavated cross-section of 240 m² will be built. This will be needed as an assembly hall for tunnel boring machines for future construction lots of the Brenner Basis Tunnel.

Sillschlucht site installation area
Image: PORR

Intersection area, Innsbruck-Ahrental exploratory gallery with the northern extension
Image: PORR

Invert gutter production after four of five working steps
Image: PORR

Cutter head of the 800 mm large-hole drilling
Image: PORR

Ahrental South storage site

All of the excavated material from the drives described before is stored on a permanent basis at the Ahrental South earth excavation storage area in accord with the 2008 Waste Disposal Ordinance. To keep the area not covered with humus and not planted as small as possible during the operational phase, the packing of the stored material was carried out in four steps.

The material is deposited in layers of 60 cm maximum in compacted condition. The testing of the compaction is performed with surface-covering dynamic compaction control (FDVK). In addition, to verify proper compaction, the Proctor density was measured and several seepage tests and large shear tests were carried out.

In the current phase of construction the storage site holds a dumping volume of nearly 450,000 m³.

Excavated earth storage at Ahrental South in April 2012
Image: PORR

Ampass entrance gallery

Tunnelling	1,370 m
Cross-section	approx. 35 m²
Gradient	1.3 %
Shotcrete	10,000 m³
Explosives	49,000 kg

The portal of the Ampass entrance gallery is located at the eastern outskirts of Innsbruck. The start of construction in September 2011 was simultaneously the first main construction measure of the Brenner Basis Tunnel and thus a milestone for the realization of this European railway project.

In the course of this construction measure, two temporary junctions were built at the A12 Inntal motorway in Ampass and Tulfes for construction-logistical supply of the Ampass entrance gallery as well as for future BBT construction lots.

The material excavated from the entrance gallery is deposited on a permanent basis at the site at Ampass. The successive elevation of the terrain of the storage area in the course of its production meant that the existing natural gas high-pressure line DN400 PN70 had to be rerouted over a length of 625 m in running gas-supply operation outside the heat periods (May to October) in two steps of tapping and plugging.

The portal of the Ampass entrance gallery lies immediately in the area of the L283 state road, which means that the road had to be diverted to a previously constructed 13.5 m long cut and cover tunnel. It was therefore necessary in advance to bore and concrete two separated bore pile rows with 18 bore piles each and a length of 8 metres as the later left and right tunnel walls. A tunnel arch was concreted onto these bore piles and on this the new state road was built. Once the traffic flow had been rerouted, the production and stabilisation of the portal front area as well as excavation work beneath the roof could begin.

Upon completion of the site installation area, the tunnelling work began at the Ampass entrance gallery in May 2012.

On account of the single-lane drivable cross-section in the Ampass tunnel, two lay-bys and a turning bay are planned at 330 m distance from each other. The rescue gallery will be built in the direction of Tulfes and Bergisel at the end of the access tunnel parallel to the existing Innsbruck railway diversion.

Over the first 300 m the Ampass entrance gallery crosses primarily glacial deposits, mostly built up of moraine sediments. In this section of the tunnel the loosening method was to use an excavator with the aid of a partial cutting machine for a non-aggressive removal of the rock. The cutting area was stabilised by the regular use of horizontal spits.

After that, from a depth of about 300 m, stone from the Innsbruck quartz phyllite zone was excavated. These manifest an intensive cleavage with flat to medium-steep incident angles. Locally there are tectonically delimited incursions of lime and dolomite marble as well as metamorphic green stone. These types of rock can only be loosened by blasting.

A 550 m long conveyor is used to transport the excavated material along the northern side of the state road L283 from the portal to the storage area at Ampass South. Projected transport performance is 100 t per hour. The extremely tight curve radii of only 180 m for the conveyor posed a major challenge to the systems engineering. With a number of individual and detailed solutions, the operation represents a critical situation, but it functions to everyone's satisfaction.

Ampass portal with rerouted state road and workshop building
Image: PORR

Cut-and-cover method and bore piles at the Ampass portal
Image: PORR

TBM ITC 312 in operation
Image: PORR

Tunnel drive work
Image: PORR

Conveyor construction
Image: PORR

Project data

Client	Brenner Basistunnel BBT SE
Type and Scope of Contract	Tunnel structure and carriageway construction; construction of infrastructure for construction logistics
Location of the project	Innsbruck / Tyrol
Project in consortium	Strabag – PORR (commercial lead management)
Date of contract award	Innsbruck-Ahrental exploratory section: Nov. 2009 Ampass entrance gallery: Aug. 2011
Construction time	Innsbruck-Ahrental exploratory section: 50 months Ampass entrance gallery: approx. 25 months
Project completion	End 2013

Pump storage hydro power plant (PSKW) Reißeck II

A challenge in high-altitude mountains

Roland Schorn

Short description

The new pump storage power plant (PSKW) Reißeck II represents an expansion of the already existing group of power plants, Malta and Reißeck/Kreuzeck in Carinthia. The new plant will link the hydraulic systems of this power plant group and better exploit the available resources. The existing annual storage reservoir Großer Mühldorfer See will be used as the upper reservoir, and the existing reservoirs Gößkar and Galgenbichl as lower reservoirs.

All of the plants will be built underground with the greatest possible consideration for nature and ecological balance. No additional reservoirs or stream collecting works are required. The entire construction area runs a length of approx. 7 km in the Mühldorfer Graben area; headings are located between 600 and 2,400 m above sea-level. The length of the new headrace is approx. 5 km on the whole and consists in detail of a 3.3 km long headrace gallery as well as 0.8 km pressure shaft with a 42° gradient which flows into the new hydropower cavern over the 0.6 km lower horizontal section and the upstream distribution pipeline.

There the two machinery units will be installed underground with an output of 215 MW each. The headrace is connected to the existing gallery system for the Malta power plant group through the downstream distribution pipeline and a 0.3 km underwater gallery. The power plant will have a power output in turbine and pumping operation of 430 MW. Commissioning is planned for 2014.

In the following report we will describe the full project and discuss the particular technical and logistical challenges of this high-altitude mountain construction site.

Illustration 1: Schematic overview of the pump storage power plant Reißeck II
Image: PORR

Technical data for pump storage power plant Reißeck II (chart 1)

Turbine type	reversible Francis pump turbine, vertically installed
Median gross head	595 m
Number of machinery units	2
Max. turbine output	2 x 215 MW
Max. pumping power	2 x 215 MW
Max. metered flow per turbine unit	40 m³/s

Contract

The consortium PSKW Reißeck II, consisting of the companies G. Hinteregger & Söhne, Östu-Stettin, Porr Bau GmbH and Swietelsky Tunnelbau, were awarded the contract in spring 2010 by the Verbund Hydro Power to carry out the primary works. The contract at hand encompasses all of the primary works for the new power plant. Total construction time is projected at 4.5 years. A half year for the ground opening, two years for excavation and structural work, and two additional years for the complete expansion. At the time of contract conclusion in May 2010 the contract volume was approx. 100 m euros.

Geology

The project area of PSKW Reißeck II lies in the area of the overthrust of the Glockner nappe (upper schist shell) over the Storz nappe and the upper Central Gneiss Core (crystalline basement). The Glockner nappe system is a macro-tectonic unit of the Pennine nappes of the Tauern window.

The project lies for the most part in the area of the Central Gneiss Core. Mostly granite and augen gneisses are encountered, while band gneisses played a subordinate role in excavation. In the course of the tunnel drive operations high-strength rock was observed but also high quartz and mica content, and thus very high abrasiveness of the rock.

Site installation area, organisation

The construction site in Mühldorfer Graben stretches over 7 km and an elevation difference of 1,800 m. The main site installation is located in Mühldorfer Graben at 1,500 m over sea-level (Illustration 2). In addition to the construction office for the client and contractor, the living cabins for approx. 300 men, a central workshop, a concrete mixing plant, a storage area for materials handling and a site canteen are also located there.

A somewhat smaller site installation was set up at Schoberboden at 2,200 m over sea level for the high-pressure side of the headrace. There is an additional repair shop in this area.

Illustration 2: Main site installation in Mühldorfer Graben, Schoberboden access road
Image: PORR

Site accessibility, access roads

The 12 km long Burgstall access road runs from the valley to the site installation in Mühldorfer Graben. The existing road had already exceeded its useful life and was rebuilt over the entire length while maintaining traffic operations. The Schoberboden access road with a length of 6 km is connected to the Burgstallstraße at Mühldorfer Graben and runs to the Schoberboden construction area at an elevation of 2,200 m. This road was realigned and built anew.

In the following we describe the individual construction areas, in particular the penstock from the intake structure at Großer Mühldorfer See via the cavern up to the connection to the existing gallery system of the Malta power plant.

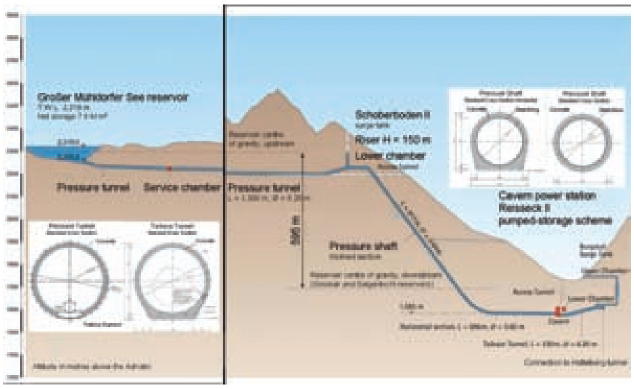


Illustration 3: Overview of longitudinal section through the high and lower pressure headrace
Image: PORR

High-pressure side of the headrace

Intake structure

The new intake and outlet structure is located at the western flank of the existing Großer Mühldorfer See reservoir. An extra road into the reservoir will be built to construct the structure. The road construction, excavation and shoring work for the structure together with the remaining tunnel drive to the already excavated headrace gallery will be done when the reservoir is empty in the summer of 2013.

Pressure gallery

The pressure gallery runs from the intake structure in the existing Großer Mühldorfer See to the Schoberboden surge chamber lower tank. The main part of the approx. 3.3 km long headrace gallery was excavated with an open hard stone tunnel boring machine (TBM) with a cutter diameter of 7 m. The TBM was built up underground over days in an assembly chamber built especially for that purpose with connecting start-tubes. The excavated material was transported initially by rail over the gallery system up to the rotational tipper bridge at the surface. The excavated material was collected there, transported by truck to the Schoberboden storage area and filled in there.

The headrace gallery is lined with a 40 cm thick inner lining of in situ concrete connecting to a 2.05 m wide tubbing segment in the invert area.

Illustration 4: Pressure gallery with machine tunnelling, chisel marks on the heading face
Image: PORR

Illustration 5: Pressure gallery with machine tunnelling, feed cylinders (yellow) and gripper
Image: PORR

Schoberboden surge chamber
The Schoberboden surge chamber is located at the high pressure side of the headrace and forms the transition between the pressure gallery and the penstock. In detail, this surge chamber consists of a ventilation structure, riser duct with restriction, ramp gallery with lower chamber as well as the transition to the penstock (Illustration 6). Excavation was done in conventional blast drive. Tunnel lining, adapted to the encountered rock, was done with three-cord arch lattice girders, 25 cm shotcrete, two-layers reinforced, and a norm anchoring of 6 m long mortar or injection drill anchors. The lining of the lower chamber is a circular, strongly reinforced in situ concrete shell with 7.1 m inner diameter.

The portal cut for the ventilation structure is at an altitude of 2,400 m above sea level in a 35-40° steep high-alpine terrain. The construction ground is blocky colluvium and permafrost soil (Illustration 7).

The 150 m high plumb shaft was excavated in a shaft-sinking process from the top downwards. The excavated diameter is 6.55 m. Stabilisation was implemented with three-cord arch lattice girders, 25 cm reinforced shotcrete as well as norm anchoring of 4 m long injection drill anchors. A 35 cm thick and reinforced in situ concrete shell is planned for the inner lining. The foundation for the ventilation structure will be the shaft inner-shell.

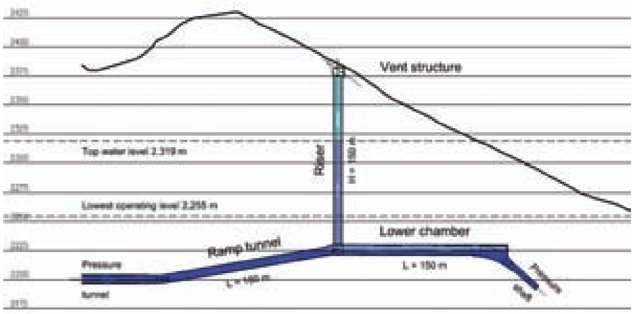


Illustration 6: Overview Schoberboden surge chamber
Image: PORR

Illustration 7: Preliminary cut shaft head of Schoberboden surge chamber
Image: PORR

Illustration 8: Plumb shaft of Schoberboden surge chamber, shaft sinking
Image: PORR

Illustration 9: Excavation of penstock, shaft-sinking, 42° gradient
Image: PORR

Illustration 10: Penstock construction, inner lining with armoured steel
Image: PORR

Penstock
The 817 m long penstock reaches from the Schoberboden surge chamber lower tank to the shaft bottom in the lower horizontal section. The excavation of the 42° gradient penstock was carried out by conventional shaft-sinking methods from the top downwards. The rock was loosened by drilling and blasting. The loosened debris was loaded in hoppers and taken out of the shaft head with a winch (Illustration 9). Via an intermediate heading it was possible to perform the excavation over two headings. The excavated diameter is 4.3 m.

The penstock is lined with armoured steel and has a 3.6 m inner diameter. The annular gap between the excavation soffit and the steel tube is grouted with highly flowable concrete. Concreting sections are as a rule 14 m long. A self-compacting highly flowable concrete was used. For that purpose, a trapezoidal sheet-steel chute was installed over which the concrete flowed. The composition of the concrete was previously submitted to large scale tests and optimized with respect to its installation characteristics.

Lower horizontal section
The high-pressure side of the headrace is connected to the power cavern via the penstock over the approx. 600 m long lower horizontal section and the upstream distribution pipeline. This section was also provided with an inner armoured steel lining.

Power and transformer caverns with power transmission
Two power caverns 58 m long, 25 m wide and 43 m high were excavated out of the inside of the mountain for the two machinery units, each with 215 KW power output (Illustration 11). For construction and safety technical reasons, the two machine transformers were installed in separate chambers, in the so-called transformer cavern. This is 59 m long, 15 m wide and 15 m high. For the two caverns a total of approx. 65,000 m³ of rock was excavated (Tab. 2). The caverns were constructed with conventional drill and blast methods. Tunnel lining was done with three-cord arch lattice girders, 30 cm shotcrete, two-layers reinforced, and a norm anchoring of 6 m long mortar anchors and 15 m long permanent single-rod anchors.

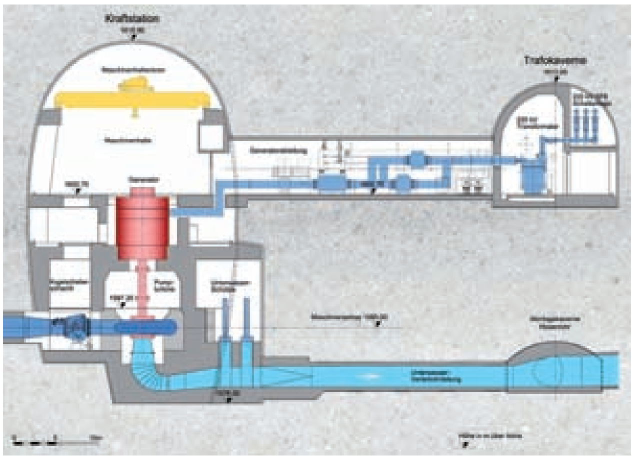


Illustration 11: Cut through the power and transformer caverns
Image: PORR

Illustration 13: Interior work, power cavern
Image: PORR

Comparison of the two cavern excavations (chart 2)

Power cavern	
Rock excavation (solid)	51,000 m³
Length	58 m
Width	25 m
Max. height	43 m

Transformer cavern	
Rock excavation (solid)	14,000 m³
Length	59 m
Width	15 m
Max. height	15 m

Power is transmitted from the transformer cavern to the relay station in three steps. At the beginning, the energy transmission runs 820 m underground over the Burgstall access gallery and the energy transmission gallery. From the portal of the energy transmission gallery up to the existing machinery chamber of the Hattelberg penstock, the energy transmission is run along the Burgstall access road into an 830 m long accessible cableway. Then comes a 1,750 m long cable duct parallel to the existing Hattelberg pressure pipeline down into the valley, to the existing outdoor switchgear bay of the 220 kV Malta main stage relay station (Illustration 14). The special challenges in constructing the cableway are the steep terrain, supplying the site via the aerial railway as well as the short construction time.

Illustration 14: Power transmission along the existing pressure pipeline, supply via the aerial railway
Image: PORR

Headrace, low-pressure side

Underwater galleries

The underground gallery with a length of 230 m links into the existing Hattelberg gallery of the Malta power plant at a right angle. Excavation was done by blasting. As with the headrace gallery, the interior was provided with an in situ concrete shell with inner diameter of 6.2 m, which connects in the invert area to a tubbing segment.

The connection to the existing Hattelberg gallery will be made only following completion of the underwater area in the summer of 2013. For that purpose, the existing steel armouring in the connection area will be cut open and linked to the underway gallery.

Burgstall surge chamber

The Burgstall surge chamber is located on the low pressure side in front of the connection of the underwater gallery to the existing Hattelberg gallery. It is constructed as a double-chamber differential surge chamber with nozzle restrictor and rising shaft widening. In detail, this surge chamber consists of an upper chamber with a ventilation structure, riser duct with restriction and widening as well as a lower chamber with the connecting shaft to the underwater galleries (Illustration 15).

Excavation was done in blast drive. The excavation diameter in the 120 m high rising shaft is 6.55 m and in the area of the widening 14.1 m ("backpack", height 35 m). A mucking shaft with 1.8 m diameter was constructed first with raise boring. The shaft was then widened from the top downward.

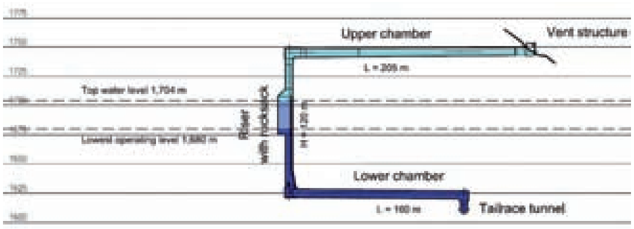


Illustration 15: Overview of Burgstall surge chamber
Image: PORR

Headrace injections

Following concrete work on the headrace, systematic injections will be carried out. We differentiate:

- Injections in concrete-lined parts as well as
- Injections in steel armoured parts of the headrace

In addition to the mandatory first-contact injection, an additional high-pressure injection into the mountain will be carried out in the concrete-lined parts of the headrace. On the one hand, the purpose of this injection is to assure contact between the mountain and the lining, on the other hand to reduce the porosity of the mountain rock as well as to increase rock stability, and furthermore to achieve a marginal pre-stressing of the mountain rock and lining. The injection is carried out with bore holes, the number and length adapted to the excavated rock. In addition to a pure concrete suspension, a cement-bentonite suspension is also used as injection material. Injection pressures are up to 20 bar.

Where the injections are carried out in steel armoured parts of the headrace, an additional annular gap "steel armour concrete" is injected in addition to the already described injections. These injections are made via nipples in the steel armour. The injection pressure is matched to the respective sheet metal gauge and lies between 6 and 10 bar.

Special challenges in the project implementation

The main challenge in the excavation phase was the production of the 42° gradient and approx. 820 m long sloped shaft with conventional shaft-sinking.

The extraordinarily comprehensive and tight construction programme as well as the large number of headings represent special challenges to the site management and logistics. On account of the location in the high-alpine area, in addition to the daily construction operation challenges, diverse difficulties in supplying the construction areas and hazards of the high-altitude mountain area also have to be mastered. A special avalanche warning system is also in operation for the construction site in the winter months.

The existing power plants are a tourist attraction and there are many visitors in the summer months. These traffic flows through the construction site area also have to be organised.

Final remark

Excavation work was completed for the most part in the autumn of 2012. Concreting work at the headrace and in the caverns will be completed by the end of 2013. After that, construction will only be auxiliary and finishing works. If no delays occur in the following works, nothing stands in the way of commissioning the two machines in 2014.

Hydro-energy is among the most important renewable energy resources. The Reißeck II pump storage power plant was designed as a balancing and backup power plant and thus contributes to a sustainable energy production.

Project data (chart 3)

Total investment of which construction work at the signing of the contract	EUR 385 m EUR 100 m
Start of construction	June 2010
End of construction	September 2014
Cumulative length of tunnelling operations	9 km
Total excavation	510,000 m³
Shotcrete	40,000 m³
Anchors	40,000 pcs.
Structural concrete	120,000 m³
Reinforcement	4,000 t

Biel East Branch motorway bypass

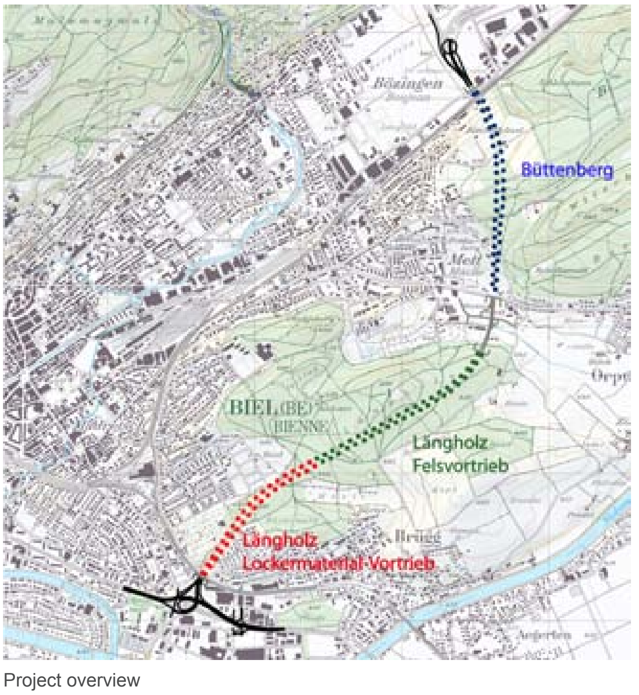
Büttenberg Tunnel and Längholz Tunnel

Armin Strauss

Project overview

After 30 years of planning, construction work started on the eastern branch of the Biel motorway bypass, which will close one of the last gaps in the Swiss national road network. The bypass will link the major Neuenburg-Solothurn and A16 Trans-Jura routes to the T6 to Bern.The construction project was assigned to the Biel East Branch Tunnels Bypass Consortium (ATUBO), comprising the companies Porr Bau GmbH, (2007 – Porr Technobau und Umwelt AG, Porr Suisse AG), Walo Bertschinger AG and Specogna Bau AG, in October 2007. The scheme was commissioned by the public works authority of the Canton of Bern.

The project essentially involves the construction of four tunnels. These were excavated using a tunnel boring machine (TBM) under the technical supervision of Porr Bau GmbH, who provided the option of the use of an earth pressure balance machine (EPB Shield) with a diameter of 12.56 m.



Project overview
Image: PORR

The tunnel interiors are still undergoing construction and are made out of a double shell consisting of lining segments and an in-situ concrete inner lining with rain seal. Construction work has also involved demanding underpinning measures and the construction of a cut-and-cover tunnel and tunnel control stations at the tunnel portals.

Construction programme

After the initial foundation pit had been excavated and some demanding underpinning measures had been undertaken, such as the “Tischbrücke” (table bridge) construction, excavation of the first tube of the Büttenberg tunnel (west tube) started at the beginning of June 2009. Breakthrough was achieved in November 2009 and the whole TBM was transported 630 m to the portal of the first tube of the Längholz tunnel. Excavation was completed here by the end of September 2010. For construction of the parallel tubes (east tubes), the TBM was disassembled and transported back partially via the excavated tunnels and partially by road to Bözingenfeld to be reassembled. Breakthrough of the fourth and final tube took place in February 2012.

Transfer of TBM, west tube
Image: PORR

Breakthrough of Längholz tunnel tube, west
Image: PORR

Transfer of TBM, east tube
Image: PORR

Breakthrough of Längholz tunnel tube, east
Image: PORR

Construction work on the inner lining (base/dome/intermediate ceiling/floor/verge and road) and on the cut-and cover tunnel is currently underway and began when excavation of the east tubes started at the beginning of 2011. The work will be finished in autumn 2014 and opening to traffic is planned for 2016.

Geology

The geology of the land excavated along the Biel East Branch bypass is extremely rich. Various types of sediment deposited by the former Molasse Sea were interrupted and covered by ice-age advancements of the Rhone glacier.

The sections containing the Büttenberg tunnel, each 1,230 m in length, consist essentially of alternating beds of marl, sandstone and underlying silt from the Lower Molasse Lake. Far more unstable loose gravel strata, which can give rise to very challenging conditions locally, are found only at the north portal.

The sections containing the Längholz tunnel (each 2,330 m) can be geologically divided into two more or less equal parts. In the north, the region of the former Upper Molasse Sea consists mainly of sandstone and small quantities of silt and marl, and in the south there is a loose gravel area, consisting of post-glacial, glacial and inter-glacial sediments, with an extremely heterogeneous, highly varied structure and very complex hydrogeological conditions.

Construction support measures

Having to cross a double-track main line of the Swiss Federal Railways and a very busy regional main road presented a huge challenge even in the approach area of the Büttenberg tunnel. In order to cut through the extremely unstable subsoil with the TBM while maintaining rail and road traffic, the so-called “Tischbrücke” option, a variant of the contractor’s, was applied.

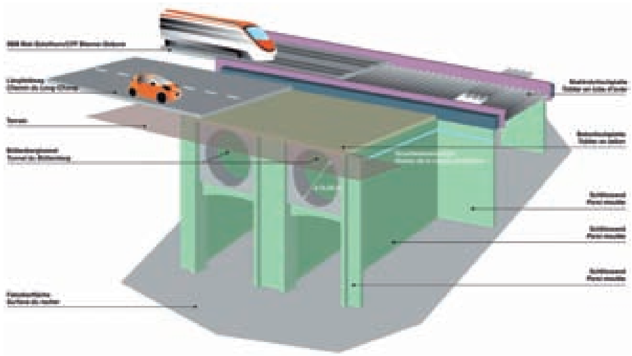


Table bridge
Image: PORR

Since closure of the railway line for erecting possible auxiliary structures was not possible, the railway embankment was underpinned using steel tubes driven horizontally into the ground. The steel tubes, measuring 1.40 m in diameter, were additionally reinforced, filled with concrete and pre-stressed. In order to dissipate the traffic load into the load-bearing layers of the subsoil, the previously incorporated slurry wall sections and the horizontally lying steel tubes were linked using cross beams. This process was easier in the area of the main road, since closure of alternate sides of the road allowed the constructed slurry walls to be covered with a reinforced concrete plate.

TBM tunnelling

After analysing the predicted conditions and establishing a risk assessment, and based on experience gathered from former projects, ATUBO decided to offer the EPB option to blast the loose gravel section. The original tender had specified the use of a hydro-shield machine for this geologically complex section. After thorough consultation with the client, this option was chosen.

The TBM employed had a total weight of 2,500 t and diameter of 12.56 m, with an installed capacity of approx. 6,600 kW. Only the use of different operational modes allowed successful penetration of the varied and challenging geological conditions. In the solid rock, the “hard rock” and “pressurised air” modes were used, in the loose gravel, “earth pressure” mode and in the open areas, “transfer mode”. Based on the geological assessment, several tunnelling mode changes were to be expected. In order to be able to change from mode to mode as quickly as possible over the tunnelling sections and without costly reconstruction work in between, a spiral conveyor was employed for removal of spoil in all areas.

Hard rock mode (open mode)

The basic plan was to bore through the solid rock using the hard rock mode. As with a hard rock TBM, the air is kept at atmospheric pressure in the removal chamber. This excavation mode requires essentially stable geological conditions. The great advantages of this operational mode are mainly the high rate of advance that can be achieved and the efficient change of equipment.

Pressurised air mode (semi-closed mode)

With a “pressurised air” excavation system, the removal chamber is supplied with the precise amount of compressed air needed to increase the rate of advance by the desired or necessary degree. This mode was subsequently adapted and employed in the solid rock sections because of serious control problems, adverse deformation of the tunnel lining and resultant lining damage. The main advantages were improved controllability, increased tension in the tunnel lining in the area of operation and water removal from the tunnel lining grouting. Disadvantages were higher excavation costs, the need for a sealed lining and increased abrasion to the cutter head caused by the necessarily partially filled removal chamber.

Earth pressure mode (closed mode)

The loose gravel zones and sections comprising an unstable work face were bored using the conventional earth pressure balance mode, whereby the excavated earth is used as a support medium and, if necessary, is modified by adding surfactants and/or polymers. In order to maintain the necessary support pressure in the removal chamber, the excavated material is removed under control using a spiral conveyor. Compared to the open mode, the EPB method is very costly owing to the addition of surfactants and/or polymers, reduced rate of advance, aspects of the disposal of the excavated material and substantial use of resources. Moreover, cutter head controls and equipment changes can only be carried out with considerable effort.

Assembly of TBM cutter head
Image: PORR

TBM cutter head
Image: PORR

Transfer mode

Between the Büttenberg and Längholz portals, a highly innovative approach was employed: specially constructed pre-fabricated concrete parts, hydraulic cylinders, components using pre-stressing technology and steel structures were optimally combined, and by employing alternating lifting and dragging procedures, the entire TBM, complete with backup system, was advanced along the 630 m section without any problems. To be able to set down the cutting shield, a shield balancing construction was first welded to the underside of the shield. The shield shifting track consisted of a special steel construction provided with Teflon plate sliding surfaces. Using four vertically arranged hydraulically controlled jacks, the weight of the 1,500 t shield was transferred onto the laterally situated shifting track. For the actual dragging procedure, the first transfer employed the VSL braid system, whereby the TBM with horizontally arranged jacks was dragged forwards along pre-stressed steel braids. For the second transfer, the braid system was replaced with horizontally arranged jacks.

For the shifting track for the backup system, geometrically matched ribbed concrete elements were used. These were adapted to fit the tunnel radius and on a rotational principle were taken up at the end of the last backup train, transported by means of a track-mounted self-propelled wagon to the area where the tunnel lining crane was at work and re-deposited by the crane in front of the first backup train.

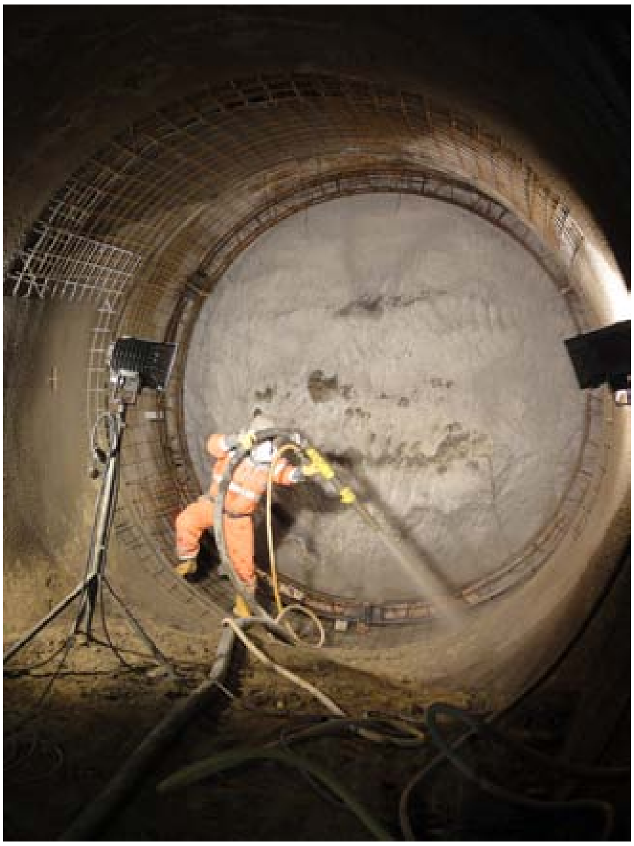
Through the use of such an integrated system, it was possible to advance the TBM along an incline of 2.5 % and a decline of 4 % at an average cut-through speed of six metres per hour during the first transfer and ten metres per hour during the second. Compared with disassembling and reassembling the TBM, this saved considerable time.

Crossways and SOS bays

The safety concept of the Biel East Branch bypass includes a crosslink between the two more or less parallel running main tunnel tubes at 300 m intervals. In addition, every 150 m along the edge of the right lane there is an SOS/hydrant bay. The crosslinks can be used as escape and rescue routes in an emergency and for maintenance work under normal circumstances. In order for fire engines and ambulances to change from one tube to the other, a cross passage large enough to drive through was provided for each tunnel group. A total of eleven cross passages with an average length of approx. 26 m and 46 bays with a depth of 3.5 – 4.5 m were excavated in cycles using shotcrete protection as in the New Austrian Tunnelling Method (NATM).

Owing to the complex geological and hydrogeological conditions in the second half of the Längholz tunnel, the client opted for the freezing process to support construction of the cross passages and bays in this section. Based on the geological information and TBM analyses from the main excavation work, additional analyses were performed in the main tubes and from the surface. With the newly gained knowledge, it was possible to substantially reduce the number of freezing measures originally planned. Instead of two connecting passages accessible to vehicles and 12 bays, only one passage and seven bays had to undergo freezing.

Excavation of cross heading 3
Image: PORR



Shotcrete strengthening – cross heading under icing
Image: PORR

Tunnel interiors

The tunnel interiors consist of a 30 cm thick cast-in-situ concrete lining which is largely without reinforcement. Reinforcement is only required in the areas of the portals and connecting passages accessible to vehicles. Drainage and sealing are catered for by a drainage system in the tunnel base and a rain seal in the ceiling/side walls area. The tunnel base is produced first with the aid of base formwork carriages and the supply line channel, with separate formwork for the cast-in-situ concrete construction.

Arched formwork carriage
Image: PORR

Tunnel tube with segmental lining
Image: PORR

Arched formwork carriage
Image: PORR

Afterwards, the lining formwork carriages in 12.5 m long blocks are put into use. After the sealing system is attached to the tunnel lining, tested for leaks and passed, tunnel concreting takes place. The leading train of the two lining formwork carriages is set apart. Five texture curing machines ensure optimal climatic conditions at the concrete surface and enable a daily stripping of the formwork.

In contrast to the Büttenberg tunnel, the Längholz tunnels have a suspended ceiling. The slightly protruding 20 cm thick reinforced ceiling serves to extract any smoke fumes that might arise during use. Suspension of the ceiling also allows [installation of] the fabricated reinforced panels in the inner lining [to take place] during concreting.

Concreting of the inner lining is followed by construction of the road and verges and associated installations.

Project data

General Project Data	
Client	Tiefbauamt des Kantons Bern
ATUBO contractor	Walo Bertschinger AG Porr Bau GmbH Specogna Bau AG
Contract sum upon award (net)	SFr 363 m
Primary tunneling	
Büttenbergtunnel (BBT) 2-tubes	2 x 1,230 m
Längholztunnel (LHT) 2-tubes	2 x 2,330 m
Volume excavated material (solid)	approx. 900,000 m³
Cut and cover tunnel	
Bözingen	30 m
Orpund	470 m
Brüggmoos	250 m
TBM machine data	
Type	EPB - shield
TBM diameter	12.56 m
Length including trailing gear	approx. 110 m
Total weight	approx. 2,500 t
Primary drive	electrical
Total drive power	4,200 kW
Screw conveyor diameter	1.40 m
Drive power	1,200 kW

Regeneration and conversion of Palais Hansen, Schottenring, Vienna

Mario Jurenitsch, Julius Gegendorfer, Robert Tröber

Introduction and history

Designed by the famous architect, Theophil Hansen, and constructed as his private investment, Palais Hansen, located at Schottenring 20 – 26 between the Stock Exchange and Ringturm, is the largest private building along Vienna's Ringstraße development. Theophil Hansen (1813 to 1891) is regarded as one of the key architects of the Vienna Ringstraße era. His ability to capture the forms of the prestigious historicism style played a crucial role in shaping the architecture of the period. As a young architect in 1837, he started studying classical antiquity in Greece, worked there and from 1850 onwards was able to apply his knowledge to new designs in Vienna. The most outstanding of his numerous buildings include the Austrian parliament building, the Musikverein concert hall, the stock exchange, the Academy of Fine Arts, the Military History Museum, Schloss Hernstein and the city palaces of Epstein, Ephrussi, Todesco and Hansen.

Construction of Palais Hansen took place from 1869 to 1870 under the title of a city palace. However, from the outset it was intended to be a private apartment building in which eight flats sharing a common facade and roof formed a clearly recognisable unity. In 1873, the property was converted into a hotel for the World Exhibition in Vienna. It was subsequently transformed into an office building for the monarchy and later for the City of Vienna.

In 2007, the City of Vienna announced it was selling the property. A consortium made up of STRAUSS & PARTNER Development GmbH, Warimpex Finanz- und Beteiligungs AG, Wiener Städtische Versicherung AG Vienna Insurance Group and Wien Holding acquired the listed building and after a bidding process gained the highly renowned Kempinski hotel chain as a tenant for a luxury hotel concept. On the attic floors, 17 flats were constructed, which the hotel offers as serviced apartments.

STRAUSS & PARTNER Development GmbH took on the role of project developer and manager. UBM Bohémia supervised the technical interior design. The regeneration department of Porr Bau GmbH constructed the shell and core and together with the large project department undertook the general contractor assignment for the finishing works, technical building installations and FF&E services. PORREAL was awarded the contract for FM services.

In accordance with the basic project development concept, public areas were housed on the ground floor and entresol levels and the hotel rooms on the 1st to 3rd floors. The 17 luxury flats are situated on the converted 4th floor and attic floor, while the building shell of the original Palais had to be preserved according to historical monument protection regulations and zoning requirements. This gave rise to some challenging planning questions as to how to realise a sufficiently flexible design solution.

After lengthy discussions with the heritage office and planning authorities to clarify procedures, it was possible to start construction in the late summer of 2010. On 28 February 2013, the project was handed over to the hotel operator, who conducted the grand opening on 20 March 2013. The flats were realised for the most part in parallel, with structural work relating to demands of the purchaser being due for completion in the summer of 2013.

Project data

Address	Schottenring 20-26, 1010 Vienna, Austria
Area of plot	4,858 m²
Gross floor area	33,204 m²
Usable floor space	25,655 m²
Floors above ground level	7
Floors below ground level	2
Start of construction	Autumn 2010
Completion	28 February 2013

Investor / Proprietor	Palais Hansen Immobilienentwicklung GmbH consisting of:
	STRAUSS & PARTNER Development GmbH
	WIENER STÄDTISCHE Versicherung AG Vienna Insurance Group
	Warimpex Finanz- und Beteiligungs AG
	Wien Holding GmbH

Hotel management	Kempinski Hotel Vienna Management GmbH, Schottenring 24, Vienna

Architecture	Boris Podrecca & Dieter Hayde consortium
Interior design	Studio Desseins / Paris in cooperation with UBM Bohémia / Prague
Spa design	Rizzato / Tettnang
Kitchen planning	Stria / Vienna
TGA planning (building services)	ZFG Eipeldauer
Lighting planning	LDA Regvart / Eichgraben

Apartments	4th and 5th floors
Usable floor space	4,346 m²
Number	17 flats between 130 m² and 340 m²
Parking spaces	25 car parking spaces exclusively for the use of owners of the flats (hotel parking spaces in the neighbouring Wipark garage in Zelinkagasse)

Services	Services relating to the serviced apartments are offered directly by Kempinski. They include use of the hotel wellness, fitness and spa area.

Shell and core construction and regeneration of a protected building

The defining structural characteristic of the project is that the building is under protection. The original wish of investors to have the building gutted and completely redesigned while retaining just the facade was not supported by the heritage office (BDA). On the basis of studies and discussions conducted between the architects Podrecca und Hayde and the BDA, agreement was reached on a concept which accounted for both the building elements that were to be preserved and the building elements that were to be demolished for complete reconstruction. This led to the scenario, with consequences for both design and construction, where different stages of demolition were underway simultaneously, and where floor by floor structural stabilisation of one building section was a prerequisite before demolition of the next building section could take place.

Demolition work on 1st floor – future hotel room section
Image: Irene Schanda

Demolition work in courtyard
Image: Irene Schanda

Building demolition in courtyard
Image: Irene Schanda

Stairway demolition
Image: Irene Schanda

Thus, a new structure consisting of a reinforced concrete skeleton was incorporated into the old building, floor by floor, beginning with the soilcrete foundation elements covered by reinforced concrete grids on the basement levels, and finishing with the apartment storeys built into the former attic, in many individual interrelated building phases.

Reinforced concrete work inside building
Image: Irene Schanda

Reinforced concrete work for new building in courtyard
Image: Irene Schanda

Reinforced concrete supporting frame for new building in courtyard
Image: Irene Schanda

Steel construction for courtyard roofing, incl. lift tower
Image: Irene Schanda

As a consequence, the original construction period, estimated at 16 months, had to be extended to at least 24 months. The shell construction period was contractually fixed at 16 months, meaning the finishing works had to be carried out in the following eight months leading up to overall project completion. This tight schedule presented a huge challenge for all project participants.

Several challenging situations added to the extreme complexity of the project, for example when it was discovered during foundation work that, despite extensive preliminary analyses of the building, the foundations of certain structurally important walls were inadequate, or the discussions on how to proceed with repair of the façade, including the problem of finding a cleaning product which would comply with the heritage office's regulations.

More extensive additional building stabilisation measures during the construction phase caused changes to the original structural specifications. This resulted in the need to delay certain building sections. Despite postponing overall project completion by six months, pressure was by no means taken off the regeneration team. In answer to the increased workload, working hours were increased to the maximum possible.

Securing the building in the construction state
Image: Irene Schanda

Securing the building in the construction state
Image: Irene Schanda


Securing the building in the construction state
Image: Irene Schanda


Excavation work at thoroughfare of underground car park
Image: Irene Schanda

Countless interventions finally led to all the components of the reinforced concrete puzzle being united in one impressive finished piece.

With regard to the façade, it was clear from the beginning that the planned restoration work should be modelled on the look of the former Ringstraße era. This was made more challenging when chemical analysis of the façade revealed that up to five coats of paint had been applied to the façade and windows since Hansen's time, with totally different colour schemes than the latest being revealed after the latter had been stripped. The Riesel plasterwork at the base of the building was of particular interest to the heritage office. The original materials and structures were to be preserved as far as possible in careful restoration. Most of the existing plasterwork and Riesel elements, despite being more than 150 years old, were still essentially functional and more time-consuming improvements to the plaster's structure were necessary only in some places.

Palais Hansen – historical photo
Image: Irene Schanda

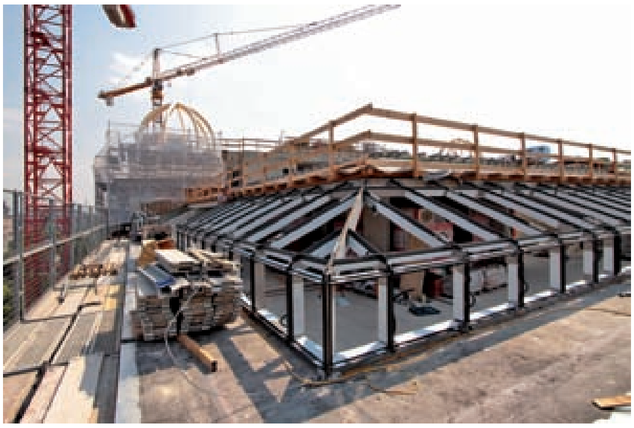
View of building after opening
Image: Irene Schanda

Re-profiling of the facade's structural elements was considerably more complex. Since removal of the coats of paint was unavoidable, the layers were removed using a dry spraying process selected together with the heritage office. Owing to the necessary change in the facade's structure, the structural refinements of each individual element were reproduced by carrying out time-consuming re-profiling work or by creating re-casts of the original elements.

View of main façade, balcony incl. figures
Image: Irene Schanda

View of façade in courtyard, incl. lift tower
Image: Irene Schanda

Examination of the state of the wooden framed windows, wooden doorways and four fibre-cement-tile roof domes revealed that it was not feasible to restore these without an excessive amount of effort. Therefore, replicas of the windows and domes were produced using fibre-cement tiles and fittings typical of the period. For the street-side doorways, it was decided that a consciously contrasting design using aluminium structures should be used to match the new building.



French windows on residential floor
Image: Irene Schanda

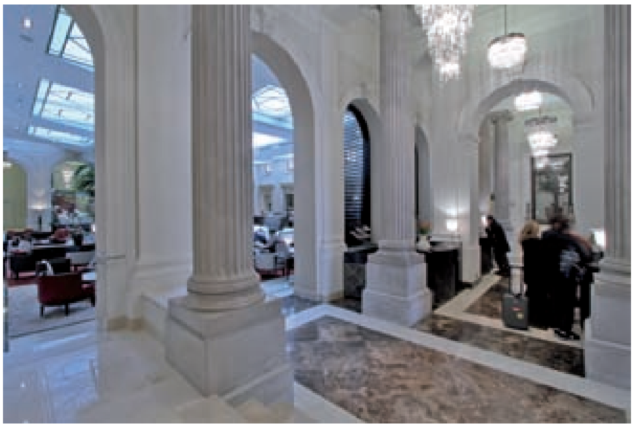
View of main façade, incl. French windows of flats
Image: Irene Schanda

View of Palais Hansen, incl. roofscape before completion
Image: Irene Schanda

Historical staircase – with restored banisters, glass panels and underpinning of original wedge steps
Image: Irene Schanda

Entrance hall – historical columned hall – public area
Image: Irene Schanda

In the interior of the building, the heritage office made a distinction between zones to be preserved and new construction zones. In the zones to be preserved, all discussions relating to materials and design were based around using style elements typical of the period. This mainly affected the old stairways with their natural stone steps, involving restoration of the banisters and at least some of the terrazzo. In addition, the four entrance halls, complete with stone columns and capitals, were painstakingly restored, as well as a limited number of wooden doors on the upper floors.



Historical columned hall – reception area – access to historical staircases A and B
Image: Irene Schanda

Special attention was paid to the walls and decorative features of the former inner courtyards, which underwent interior designing to become closed-in function rooms for the lobby, ballroom and all-day dining room. In all areas, productive meetings resulted in satisfactory preservative solutions that could be integrated into the hotel's overall interior design concept. As a result, hotel guests and visitors can take delight in discovering the perspectives within a new design which blends perfectly with the restored creation of Theophil Hansen.

Lobby, ground floor, with guest lift
Image: Irene Schanda

Lobby, ground floor, with guest lift
Image: Irene Schanda

Lobby, ground floor – view of entresol
Image: Irene Schanda

Ballroom
Image: Irene Schanda

Shell and core technical data

Foundation elements – jet grouting columns, d=120 cm, l=10 m	approx. 400 pieces (378 pieces)
Quantity of concrete used in construction	16,310 m³
Quantity of reinforcement steel used in construction	1,910 t
Demolished brickwork	6,920 m³
Demolished ceiling – wood beam ceiling	9,260 m²
Demolished vaulted ceiling	650 m³
Area of façade repaired, incl. courtyards	approx. 11,000 m²

Finishing works, technical building installations and interior design

The finishing works for the hotel comprised the following areas: the three floors containing a total of 152 guest rooms, including a presidential suite; the lobby and reception; two restaurants with show kitchen and chefs' table; two bars; a large and a small ballroom; five meeting rooms; a cigar lounge; the administration, staff and storage areas and a multi-unit kitchen zone with a total of three supply feeds. On the floors with guest rooms, the geometry of the building combined with the need for four room categories to satisfy user requirements resulted in a total of 26 room types, meaning that on average there are just six geometrically identical rooms per room type. Each plan and change thus had to be implemented 26 times in the plans. In the public areas, the ever-present interplay between zones to be preserved and zones to be renewed together with the abundance of varying materials and qualities brought together a myriad of specific problems and solutions which all had to be agreed upon, adapted and varied between users, the heritage office, architects, interior designers, structural engineers, technical building installers and building physics expects.

Night bar – Henri Lou
Image: Irene Schanda

Lobby, ground floor – side section of glass roof
Image: Irene Schanda

Fine dining – Edvard
Image: Irene Schanda

Lobby bar
Image: Irene Schanda

Since it was agreed with the heritage office that only partial demolition would take place, the construction procedure was unusually accompanied by neighbouring shell construction work, contractor services and the start of finishing works. While ceilings were still being concreted in building sections that were lagging behind, and in places even demolition work was being carried out, dry construction and technical installation works were being conducted in the leading core sections so that on the same floor there were totally different stages of construction in progress. In addition, the flat conversions and all the associated special wishes and additions, naturally unrelated to the other construction work, led to the need for special scheduling in the vertical building process. Consequently, at peak times there were roughly 400 workers in neighbouring work areas carrying out totally different activities at the same time, creating a huge challenge for site management.

The finishing works comprised a conventional part according to Kempinski specifications and more luxurious finishes from interior design. The conventional part applied to the brickwork and plasterboarding, plastering and paintwork, steel construction and fitting, glass façades, doorways, inner courtyard roofing, sheet steel doors, wooden door panels and fire doors as well as the garages and storerooms.

The more luxurious finishes by interior design mainly applied to the floor, wall and ceiling surfaces and cladding, doors, paintwork and the whole area of furnishing. Subsequently, extensive sampling of curtains, fabrics, fittings and accessories took place and the following finishes were eventually decided upon:

- Stone surfaces in the public areas in Crema Marfil, Emperador Brown and Green Viana marble, and Blue Pearl and Emerald Pearl granite;
- Stone surfaces in the bathrooms of the hotel guest rooms in Emperador Brown marble;
- Wood surfaces in American Walnut and Wenge;
- Carpeting in various Wilton und Axminster patterns;
- Ceramic flooring in Floor Gres und Ragno Galassia;
- Stone plating as in the show kitchen in basalt;
- Wall surfaces in the public areas with Muraspec wallpaper, Walnut wood cladding, various stucco applications, fabric coverings, flat decorative plaster features, Bottocino und Metro wall tiles, Bisazza mosaic surfaces and coloured glass panels;
- Wall surfaces in the guest rooms and bathrooms with Muraspec wallpaper, Bottocino wall tiles and wash basin units in Thassos marble;
- Suspended ceilings with multiple offsets, with and without acoustic perforations;
- Curtains in Rubelli Marmorin patterns

For special areas, such as the presidential suite and spa, an entirely exclusive collection of materials was chosen.

Both the all-day dining area and the presidential suite received the special feature of a "green" wall, for which real plants were used with irrigation and lighting.

All-day dining with “green wall”
Image: Irene Schanda

With regard to FF&E, the general contractor was not commissioned with delivery and assembly but with tendering and processing.

In the processing order, particular emphasis was placed on providing samples. Three separate sampling sessions accompanied by specifications, permits and documentation were held for the heritage office, the hotel user Kempinski and supervisors of the flat conversions. For Kempinski, two showrooms were installed, complete with bathrooms, in a nearby property, and for one and a half years were the subject of visits and changes. For the flat conversions, a showroom was installed in another nearby rented property, where interested parties were presented with samples of intended surfaces, materials and fittings.

View of bed head in twin room
Image: Irene Schanda

Suite living area
Image: Irene Schanda

The technical building installations, including heating, ventilation, cooling, plumbing and electrical facilities, are mainly predefined by the standards specified in the Kempinski guidelines. Fit-out for the flats was specified by project management and flat design consultants. Equipping the hotel with a sprinkler system is not officially required but was stipulated by Kempinski for insurance reasons. Instead of the usual sprinkler system, a high-pressure system with spray mist, which requires less space and smaller tanks, was chosen, creating yet more storage area for Kempinski. Other technical building installations such as a pressurised ventilation system, fire alarm, fire brigade communication system, smoke extractors and a CO detection system for the garage were installed according to authority regulations. A final addition consisted of a call bell system. There are 13 lifts designated for guests, staff and flat owners.

In addition to the traditional heating supply used in Vienna via the Fernwärme Wien network, a newly installed district cooling network provides cooling, making compressors unnecessary and creating space for three more hotel rooms.

The electricity supply is provided via rented transformers from Wien Energie, backed up by a 630 kVA diesel generator set and battery operated emergency lighting system.

For access control in various hotel areas, two different systems were used: an electronic online control system for the hotel rooms, an electronic offline system for the basement floors and a mechanical locking system for administration and ancillary areas. The entresol level houses the spa which, in addition to the usual fitness area also contains several massage rooms, saunas, a pool and quiet areas. The entresol also houses the conference rooms, all equipped with the latest audio-visual technology. Most of the technical building installations are located on the first basement level, with the two ventilation stations on the second basement level, each spanning two floors.

Spa – pool area
Image: Irene Schanda

Specifically for Kempinski, various IT and telephone equipment was installed in its own area of operation.

Interior design planning and processing
The hotel's interior designing turned into yet another challenge as the project developed, with cooperation occurring in three languages between the building architects in Vienna, a design architect in Paris, the technical interior planners in Prague, the user in St. Moritz and the construction and project management team in Vienna.

As always with such large projects, the project was executed and completed to the satisfaction of the user thanks to close cooperation between all parties and the improvisational skills of the constructional engineers.

As a result, the regeneration and conversion of the largest private property of the Ringstraße era was presented and handed over to the heritage office and authorities, user and owners, and constitutes a significant career milestone for everyone involved.

Completion of the new Vienna – St. Pölten railway line

Herbert Beran

General

The railway infrastructure in the metropolitan area of Vienna has been distinguished since the Austro-Hungarian monarchy by the existing terminal stations in the imperial capital and residential city, from which the main railway lines accessed the former Austro-Hungarian empire .

With the opening of the approx. 12 km long Lainzer Tunnel, this conception has now given way to the requirements of modern rail traffic. Together with the Vienna main railway station, still under construction, the Lainzer Tunnel connects the Western, Southern and Eastern lines of the railway.

The connection to the newly constructed line of the Western Railway through the Tullnerfeld region is established by the Wienerwald Tunnel. With a total length of more than 13 km, this tunnel is immediately connected to the Lainzer Tunnel and consists of a two-track single-tube section and a section with two single-track tubes. For freight and long-distance traffic, it replaces the existing line through the Wienerwald Tunnel characterized by tight arc radii.

The first partial commissioning of the Lainzer Tunnel in the Western construction area, the so-called point switch hall, took place in 2008. Now the tunnel is fully operational together with the entire new Vienna-St.Pölten railway line.

Line map new Vienna - St. Pölten railway line
Image: Irene Weichselbaumer

Opening

The high-performance line Vienna Meidling – St. Pölten went into operation on 9 December 2012. The completion of the new Tunnerfeld railway station was celebrated on 23 November 2011 on the 175th anniversary of the railway and the line was symbolically opened. This immensely shortens travel time for guests from and to the Western Railway station. Freight trains have been rolling through the Lainzer Tunnel since 9 December 2012, and two years later the first long-distance passenger trains will also pass through and stop at the main station.

Symbolic opening on 23 November 2012
Image: ÖBB / Krischanz

The symbolic opening presided over by: ÖBB Executive Chairman Georg-Michael Vavrovsky, "First Lady" Margit Fischer, Member of the Cabinet of the EU Vice-President and Commissar for Transport Siim Kallas, Désirée Oen, Head of the Vienna Provincial Government Michael Häupl, Minister of Transport Doris Bures, Head of the Provincial Government of Lower Austria Erwin Pröll and the Chairman of the Executive Board of ÖBB-Holding Christian Kern

Opening trip at over 200 km/h
Image: PORR

The new high-performance line is a crucial component of the expansion to a four-track Western line between Vienna and Wels. It offers significantly more capacity for environmentally friendly mobility for passengers and freight, faster connections between the population centres and is part of the trans-European network.

Lainzer Tunnel transfer point
Image: PORR

More than half of the Vienna Meidling – St. Pölten line runs in a total of eight tunnels (including the Lainzer Tunnel).

Innovation trips
Image: PORR

Both long-distance and short-distance passenger traffic, along with freight traffic, benefit from the expansion. The fastest trains will cover the 300 km-long line between Salzburg and the Vienna West railway station at up to 230 km/h top speed in only two hours and 22 minutes. Travel time from Vienna to St. Pölten is shortened by up to 15 minutes, and to Salzburg actually by up to 23 minutes. To be prepared for the future, the new high-speed line is designed for passenger traffic speeds of up to 250 km/h. The future average speed of the fastest trains from Vienna to Salzburg is 132 km/h (currently still 114 km/h) and thus more than the highest speed on the motorway. From Vienna to Linz the future speed will even reach 151 km/h (currently 120 km/h).

Wienerwald Tunnel West Portal
Image: PORR

Measurement run Portal / open track transition area slab track to ballasted track
Image: PORR

Porr Bau GmbH was lead agency on important projects in the construction of the new Western line.

- Modification of Meidling railway station
- Partial sections of the structural work in the Lainzer Tunnel
- Structural work in Wienerwald Tunnel
- Numerous bridge and tunnel structures along the new Vienna – St. Pölten railway line
- Modification of St. Pölten railway station

New line, civil engineering structures
Image: PORR

Track and technical works

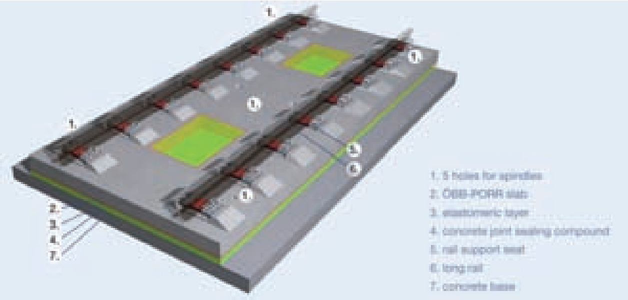
The railway construction department as lead agency carried out the track and technical works on the Vienna - St. Pölten line through to commissioning beginning in September 2009, a total contract volume of 270 m euros. Approximately two-thirds of the contract volume is directly or indirectly related to work on the elastically bedded slab track system from ÖBB-PORR. Of this volume, PORR / railway construction accounted for more than 150 m euros.

Measurement run, open track, ballasted track
Image: PORR

The track works were carried out in four construction sections:

- Lainzer Tunnel
- Wienerwald Tunnel
- Tullnerfeld
- Perschlingtal

System ÖBB-PORR elastically supported slab
The entire chain of tunnels was outfitted with the ballastless elastically supported slab “ÖBB-Porr”.



Elastically supported slab: System ÖBB-PORR
Image: PORR

The principal element of this system is the elastically supported slab. The slab is an untensioned reinforced precast slab with integrated rail support seats. The bottom of the slab, as well as the tapered openings, are attached with an elastomeric layer. The result is double-layered elasticity, reduction in the vibrations or structural-borne noise, and decoupling from its structural supports. A joint width of 40 mm separates two slabs and compensate any deformations caused by creeping, shrinking or temperature changes. The joints serve also as surface water drainage or spaces for cable-crossing.

The slabs are supported and fixed on a thin base layer of self-compacting concrete (SCC). This allows homogeneous setting, and without the need to vibrate the concrete reduces disturbances of final track alignment to a minimum. Upon concrete hardening the tapered joints work as anchors to vertically and horizontally keep the slab in place.

Installation of track support slabs
Image: PORR

Spring-mass systems contribute to protection for residents over large sections of the Lainzer, but also in the eastern section of the Wienerwald Tunnel as well as in some sections of the Perschlingtal construction lot.

The inner-city location of the Lainzer Tunnel was mainly what made planning and execution challenging.

The slab-track in the Wienerwald Tunnel and in the construction section tunnels for Tullnerfeld and Perschlingtal was additionally outfitted for vehicles with rubber tyres as well as road vehicles.

The main masses for the track work on all construction sections together:

Concrete	195,000 m³
Steel reinforcement	13,600 t
Slab track	15,000 pcs.
Switches	39 pcs.
Slab track system ÖBB-PORR	75.272 km

Lainzer Tunnel
Image: PORR

The technical outfitting work ordered and carried out together with the track work encompassed:

- Fire water piping
  In the course of the track work, all of the tunnels were completely equipped with fire-water piping. This work was performed for the most part by the group company RAB/Kraft und Wärme.
- Ventilation
  The ventilation units in the Lainzer Tunnel were installed in the numerous emergency escape areas.
- Backfitting of building fire protection
  Backfitting of the oldest part of the Lainzer Tunnel in the Auhof section with an inner-tunnel shell of fire-protection shotcrete to comply with regulations for the new tunnel construction.
- Fire-protection doors
  Outfitting of the emergency escape areas of the Lainzer Tunnel and Tullnerfeld with up to 180 minutes fire-resistant escape and airlock doors also formed part of the contract
- Measures for assuring accessibility for emergency vehicles
- Metalwork
  More than 2 km railing was installed just in the emergency escape areas of the Lainzer Tunnel.
- Emergency escape areas
  Most of the emergency escape areas were already constructed with the structural work lot, but some could only be built in the course of the track work.
- Noise protection
  On the one hand, the track support slabs in all of the tunnels, except the main section of the Lainzer Tunnel, were outfitted with so-called sound absorbers, and on the other hand, noise-protection walls and embankments were built in the course of the track work in the areas of the Wienerwald Tunnel, Tullnerfeld and Perschlingtal. Aluminium panels were installed in the tunnel portal area for acoustic insulation.

Porr Bau GmbH's capacities and competence in railway construction were impressively demonstrated over the course of this project.

Andersia Business Center

Andersa Square in Poznań establishes itself as city's premium office location

Jarosław Golimowski

Overview

In October 2012, handover of the Andersia Business Centre by general contractors PORR Polska took place on schedule and to the complete satisfaction of the investor.

Following the wishes of the investor, a partnership between the Von der Heyden Group and the City of Poznań, the property, which lies in the heart of the city, was constructed in two phases:

The first stage involved constructing the underground section of the building – a two-storey garage.

The second stage entailed building the four office floors and the ground floor allocated for shops and restaurants.

The Andersia Business Centre is already the third building in the Andersa Square vicinity to have been commissioned by this investor. With Andersia Tower (AT) and Poznań Financial Centre (PFC) already in place, Andersa Square has become a magnet for renowned companies such as Bank Zachodni WBK, polkomtel, Ernst & Young, IKB Leasing and many others. After completing the marketing of the ABC building, the investor has plans for two more office complexes, which will complete the spatial concept in Andersa Square.

The design of the Andersia Business Centre is based on this concept of the emerging business area. The clever harmonisation of the three building forms stems from architects Ewa und Stanisław Sipiński, who have already participated in numerous significant projects in Poland.

Completed building
Image: Paweł Młodkowski

Completed building
Image: Paweł Młodkowski

Technical challenges

Foundation work was made difficult by the extremely unstable Poznań clay soil, which in unfavourable storm conditions could pose an enormous engineering risk. If it becomes damp this leads to plastification and loss of any geotechnical parameters, which can render the ground unsuitable for a foundation.

Water seepage from the permeable soil layers was abated by the construction of diaphragm walls on the Królowa-Jadwiga Street side.

Protection against rainwater was continuously ensured by covering the foundation base immediately with lean concrete. The optimally planned workflow on site together with the excellent organisation ensured against plastification of the clay subsoil, which would have caused considerable additional costs. In autumn 2010, installation of the steel cover over the first basement level brought the first investment phase to a close.

Underground garage
Image: Paweł Młodkowski

Shell construction

Work began on the next phase, shell construction, in the summer of 2011. This phase had to be completed within four months, before the first frosts of winter.

Thanks to the total commitment of employees on site and the excellent cooperation with the subcontractors, it was possible to complete shell construction on schedule and to create the conditions necessary for installing the aluminium-glass façade.

Shell construction
Image: Paweł Młodkowski

Shell construction
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Shell construction
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Aluminium-glass façade

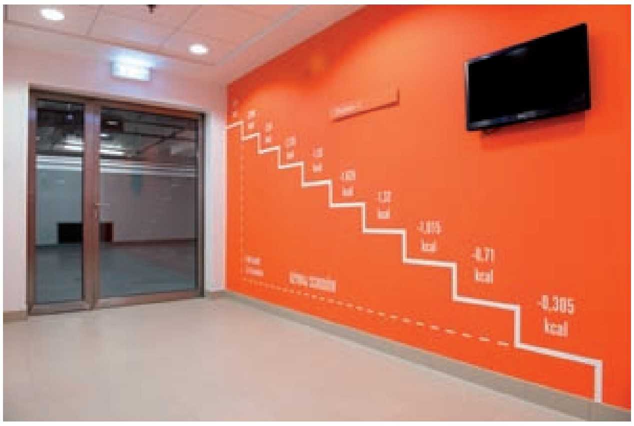
The building's aluminium-glass façade was modelled on a semi post and beam design, with some pieces being designed and executed as a double-skin façade. The complete aluminium-glass façade spans an area of 7,000 m² and despite advancing winter conditions was installed in just six months.

Aluminium-glass façade
Image: Paweł Młodkowski

Specific project features

The client attached great importance to the quality and design of the finishing works. To meet the high demands, lifts for example were imported from Spain. The resulting increase in time and effort invested (including a visit by the Spanish producer) was however rewarded by the desired visual effect being achieved to the client's full satisfaction.

Despite numerous changes to the original plans by the investor, it was possible to complete the building ahead of schedule. Also worthy of mention is the fact that the Andersia Business Centre obtained a certification for the Gold LEED Standard.



Exceptional design
Image: Paweł Młodkowski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Exceptional design
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Exceptional design
Image: Paweł Młodkowski

Final remark

During the entire construction period, cooperation between investors Von der Heyden Group, architects Sipiński and the PORR (POLSKA) S.A. team proceeded smoothly. PORR Polska was once again able to confirm its reputation as a reliable and professional contractor and can look forward to undertaking further interesting projects in the city of Poznań.

TEERAG-ASDAG, Lower Austria branch, wins major contract on the A2, Leobersdorf – Wiener Neustadt section

TEERAG-ASDAG wins again with road building expertise
Image: PORR

ASFINAG has awarded the largest contract in Lower Austria yet in 2013 to TEERAG-ASDAG, Lower Austria branch. The contract is for the maintenance of the existing, high-ranking road network. The commissioned work is for bridge and road surface repair work between Leobersdorf and Wiener Neustadt from kilometre 29 to kilometre 46. The contract is worth nearly 16.5 million euros net. The commissioned works include renovation of several large bridges, 25,000 m² concrete repair work and 270,000 m² asphalt pavement refurbishment. The contract is to be carried out by 2015.

PORR wins contract at Urban Lakeside Aspern in Vienna

Contract commitment for two building sites

Image: schreinerkastler.at | wien 3420

New construction department 3 has won the contract for two construction sites in the Urban Lakeside Aspern. Construction will begin soon on the first lots of the total project with its almost 2,500 apartments. The two PORR construction projects, beginning in the second quarter of 2013, entail construction of a total of 329 apartments, a number of business premises and numerous parking spaces. The apartment construction is part of the city of Vienna's residential building initiative known as CALL.

Construction Lot J8 consists in 174 homes and three business premises with a total of 12,775 m² living/usage space. There are additionally parking spaces for 290 cars. 155 homes, two business premises as well as 194 parking spaces will be built on Construction Lot J9.

Start of construction of Gdynia Waterfront

SwedeCenter, a project development company of the Inter IKEA-Group, began with the realization of the project Gdynia Waterfront. The company PORR Polska was selected to be general contractor for the first stage of the investment. Planned completion of the construction work is mid-2015.

Gdynia Waterfront is a multifunctional project which will provide commercial space, apartments as well as space for cultural and recreation purposes. The total area of the complex located in the vicinity of the Skwer Kościuszki will amount to approximately 90,000 m².

First the area between the Gemini Centre and the high-rise Sea Towers, near the Presidential Basin, will be built up. An office building as well as the Hotel Marriott Courtyard will be constructed there.

The planned 11 storey office building will provide 11,500 m² of state-of-the-art equipped office space. Restaurants and cafés are planned for the ground floor along the pedestrian zone connecting the Jana-Pawła II Avenue with the high-rise Sea Towers. The property was designed in accordance with the LEED certification principles of sustainable construction.

The Hotel Marriott Courtyard, whose operator will be Scandinavian Hospitality Management AS, will ensure its demanding business clients a premium level of comfort. The hotel will have 201 rooms and a 650 m² conference centre. The ground floor of the 9 storey building will have a restaurant with a magnificent view of the Presidential Basin.

Roger Andersson, Managing Director of the SwedeCenter Sp. z o.o.: “The investment was prepared over several years and we were happy to obtain the construction permit certificate for the construction of the first phase. The complex will undoubtedly be erected at the best known and most prestigious point in Gdynia.”

The architectural concept and the submission planning for the first stage of the project were prepared by the project consulting office FORT from Gdansk, which had already won the competition for the design of the office and hotel building at the President's Pier in Gdynia.

The owner and developer of the investment is SwedeCenter. The company has been active on the Polish market for over 29 years and, among other projects, had already appeared as the developer for the Mera Hotel & Spa in Sopot as well as the office complex Brama Portowa (Harbour Gate) in Szczecin. The company is also currently building three large business parks, the so-called “Business Gardens” in Warsaw, Poznań and Wrocław.

These projects are being built in accordance with the principles of sustainable construction as well.

PORR Polska was selected as general contractor for the first stage of the investment.

Peter Hartmann, Board Member of PORR (POLSKA) S.A.: “With great pleasure and expectations for our joint success, PORR (POLSKA) S.A. signed the contract for the implementation of the first stage of investment in “Waterfront Gdynia” after several months of negotiation with SwedeCenter. We are convinced that the return to the President's Pier of Gdynia, where we were already commissioned with the expansion of the movie theatres in the Gemini centre for culture and recreation in 2000, and where we built the building shell for SEA TOWERS in 2008, will be a great success for us as the contractor. The completed building will become yet another reference project on the Polish coast for PORR Polska."

PORR wins contract for housing project DC Living

Residential housing complex with 299 apartments to be built in Donau-City, Vienna

The building construction Branch of Porr Bau GmbH in Vienna won the contract for the project “DC Living” in Vienna’s Donau-City on the last working day before the holidays, 21 December 2012, from PRO Wohnbau AG, a subsidiary of BAI (Bauträger Austria Immobilien GmbH).

The project consists in the new construction, as prime contractor, of a residential housing complex with 299 apartments, three restaurants and 304 parking spaces. The project is split into two parts. Part 1 has seven upper storeys, and Part 2 has 16 upper storeys. The open-plan underground parking garage on three levels has sufficient space for the residents' cars.

With heights of 23.62 m (Part 1) and 52.88 m (Part 2) these high-rise residential buildings will give Vienna’s Donau-City skyline an additional special attraction. Construction commenced on 25 March 2013. Completion is planned for 31 March 2015.

Image: Copyright©comm.ag

New expansion stage on the Emscher Canal

Startup ceremony at Section 20 in Bottrop with many guests of honour

The startup ceremony for a 3.5 km long wastewater pipe, to be built with tunnel boring methods, was held in Bottrop on 14 January. The section is part of a 4.5 billion euro wastewater canal project. This is currently Europe's largest canal construction project. The Emscher Genossenschaft is building a new underground canal system between the cities of Dortmund and Dinslaken. This will banish the wastewater currently running in open channels underground. Earlier mining operations and the associated settlement in the renowned Ruhr coal-mining area made it impossible to manage the wastewater engineering in open channels in any other way.

Mayor Budke has Arthur Göbl (PORR) explain the complicated machinery
Image: PORR

Executive Manager of Porr Bau GmbH Alfred Sebl-Litzlbauer and Mayor and tunnel patron Monika Budke with Jochen Stemplewski from the Emscher Genossenschaft
Image: PORR

The new 3.5 km long and 2.8 m high tunnel section, constructed under the lead management of PORR, will have shaft structures every 600 m which will be used under later operation as access points for maintenance, inspection and repair of the canal system. These shafts, up to 40 m wide and deep, will be used during the construction period as the start and end points for the underground tunnelling. 1,050 pipe elements are to be installed by summer 2015.

Breakthrough was achieved for the first tunnel section of the BA 20 by the end of February.

Tunnel construction in the Ruhr Area – breakthrough right on target No. 2

Emscher project progressing well thanks to the strong commitment of the team

Already 2 months after the first breakthrough at Construction Section 20 of the Emscher, on 21 April 2013 the miners with their tunnel boring machine again saw the light at the target shaft.

Several railway lines, one federal motorway and the River Emscher were driven under in this very challenging drive. An immense high-voltage pylon in the so-called power highway, about 80 meters high, was also directly over the tunnel.

The shield machine had to be driven forward with extra caution and very little settlement in order not to endanger these sensitive structures. The teams succeeded in doing this, and only the most minimal effects were measurable on the surface.

About one third of the boring distance of the 3.2 km long tunnel has already been completed thanks to the tireless efforts of the PORR employees, who even worked through the Easter holidays.

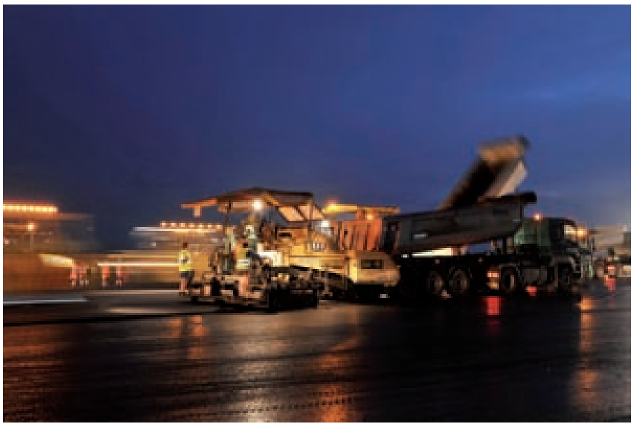
This brings the Emscher wastewater canal, at more than 70 km total length currently Germany's largest environmental protection project, another step closer to completion.

TEERAG-ASDAG, Lower Austria branch, wins large contract for Vienna Airport

At the beginning of January, a contract worth approximately 20 million euros was awarded to a consortium with significant participation of TEERAG-ASDAG, Lower Austria branch, in the context of a multi-level negotiation process for work offered for tender by “Vienna International Airports” for runway restoration 16/34.

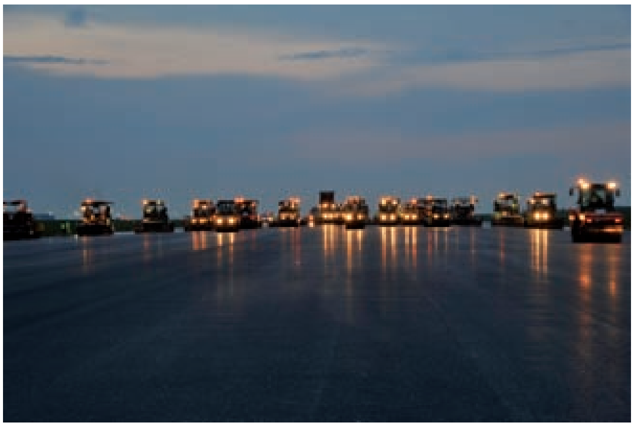
The aim of the construction project was to adapt the runway system to the current technical standards. This makes takeoffs and landings of larger aircraft such as the A380 possible in regular operation. The work was carried out in the months of April – May almost exclusively at night and on weekends to keep the disruption of flight operations and neighbouring communities as low as possible. Within this short period, the load-bearing capacity of the runway shoulders was enhanced, work on the lighting and marking was carried out and some 80,000 tonnes of asphalt were processed and paved.

It was possible to complete the work on 24 May, a few days earlier than planned, and to the full satisfaction of the client.



Runway restoration Vienna Airport
Image: PORR

Runway restoration Vienna Airport
Image: PORR



Runway restoration Vienna Airport
Image: PORR

Topping-out ceremony for Sonnwendviertel, lot C.03.01

Following a construction period of 12 months, the achievement of the building shell height was celebrated on 14 February 2013 with good attendance of representatives of the clients GESIBA and GSG and all others involved in the project.

Vice-director DI Martin Schilling (Porr Bau GmbH, Department Head New Construction 2) welcomed the guests. He praised the efforts of the entire crew and expressed thanks for the collaborative and smooth cooperation with representatives of the clients.

Promoter General Director Ing. Ewald Kirschner and the Deputy Regional Director Mr. Josef Kaindl also expressed their satisfaction with the progress of the project. They also wished every success to all those involved in the project for the expansion phase which will be concluded at the end of January 2014.

At the conclusion of the official part of the ceremony, the topping-out oath was read, the client was thanked for the topping-out payment and a short film on the construction of the building shell was shown.

The evening ended with a sumptuous buffet and cool drinks.

PORR successful in foundation work for high-rise buildings

PORR's impressive history of success in foundation engineering

Concentrated machinery deployment for the production of the slotted wall barrette of the Donau-City Tower 1 with up to 40 m depths
Image: PORR

PORR can look back on a remarkable series of successfully executed high-rise foundations over the past 5 years. In addition to heavy infrastructure projects, this work is one of the special challenges in foundation engineering and is always a focal point of public attention for that reason.

Beginning in the year 2008 with the highest building in Burgenland, the **Pannonia Tower** in Parndorf and the **Blumau Tower** in Linz (75 m), there later came spectacular projects especially in Vienna, such as the high-rise building **TownTown CB03** (98 m) and the **Donau-City Tower 1** (220 m). Then a deep-seated foundation was successfully executed in the autumn of last year for the new **ÖBB Group company headquarters** (88 m) at the main railway station, together with a deep construction pit shoring.

The common denominator of all these projects is that, together with the usually very complicated inner-city environment, the executed foundation solutions were always special proposals developed by PORR. True to the tradition of the planning master-builder, these alternative proposals are developed in-house at the foundation engineering department and prepared for execution as part of the total contract.

Lastly, PORR was commissioned in January of this year by Stumpf AG with the planning and execution of the pile foundation for the high-rise Vienna City Gate Tower C1 (110 m) at the Wagramerstrasse. On the basis of the convincing total concept, PORR will now also carry out the foundation work for the 20 m lower sister-tower VCG Tower C2 (92 m).

PORR builds a hotel in Wrocław, Poland

The contract for the project was awarded to a consortium consisting of PORR (POLSKA) S.A. and "AKME" Zdzisław Wiśniewski as early as November.

The hotel is being built in the centre of Wrocław near the main railway station based on the layout of a polygon that runs orthogonal to the axis Zaolziańska Street – Powstańców-Śląskich-Straße. The main entrance is located at the intersection of the two streets. Gastronomic facilities as well as a sanitary complex are planned for the ground floor in addition to the lobby.

Barrier-free access is provided throughout the building complex, including the cellar levels. A conference area with its own gastronomy is located in the first floor, and above that there are 128 hotel rooms on six floors. A generous garage level is located in the basement.

Visualisation: View from Zaolziańska Street
Image: PORR

Innovative anchor system at the Construction Project Monte Laa, Construction Site 6

The MA 28 has very strict requirements for the production and removal of temporary anchors for inner-city construction pit support systems.

Only removable strand or rod anchors (tie rods) or GRP anchors left in the ground are allowed in order not to impede subsequent construction projects.

The anchor systems available on the market up to now all have their problems, some more, some less, when they are removed (e.g. requiring blasting or removal with pulleys, including disposal of lubricated litz wires) or they are not capable of transferring the necessary high loads, or only non-prestressed anchors (GRP rods) are available.

In addition to the cited problems, the fact that up to 100 euros per running metre of unremoved anchoring (tie rod) remaining in the ground has to be paid as a "penalty" entails a major risk and loss potential.

Since the removal of the anchors represents a significant time and cost factor, it became an urgent matter to find or create a suitable system.

The department for foundation engineering is working on the development of a pre-stressed GRP anchor with working loads of up to 800 kN. An anchor was used for the first time at the project at hand which consists of three GRP elements (rupture load >1000 kN, working load = 400 kN). The working loads required for structural stability were achieved with no problems.

Additional pulling tests with similar GRP elements and proprietary special anchor heads and previously unachievable working loads with GRP elements of up to 800 kN have been and are now being performed. At the moment, suitable and, in particular, economical suppliers are being sought.

GRP anchor on the bearing plate, head blocks and free lengths
Image: PORR

Installation of the anchor in the finished borehole
Image: PORR

Tensioning of the anchor is performed with a standard tensioning press and short tie rods which can be easily removed on dismantling of the anchor head.
Image: PORR

Warsaw: Opening of the Office Building “Le Palais”

Renovation of the historic town-houses in the Prózna-Street 7 and 9

The official opening of two refurbished 19th century town-houses took place on 19 February 2013 with representatives of the municipality and media in attendance. Among the invited guests were the mayor of the Warsaw’s city centre district, Wojciech Bartelski, co-founder and Managing Director of the Warimpex Finanz- und Beteiligungs AG Franz Jurkowitsch, Managing Director of the Polish branch of Warimpex Jerzy Krogulec, co-founder of the consulting office OP ARCHITEKTEN ZT Sp. z o.o. Wojciech Popławski as well as PORR (general contractor) representatives Franz Scheibenecker and Peter Hartmann. The ceremony was held in the first floor of the refurbished building. The mayor, the architect and representatives of the client summarised the history of the listed buildings and their reconstruction. The investor expressed his gratitude to the company PORR for the proper completion on schedule. The guests then took the opportunity to admire the beautiful interior rooms in the context of a guided tour. At the end, the guests were entertained in festive surroundings.

The rental houses in the Prózna-Straße were built at the end of the 19th century in neo-Renaissance style by the architect Franciszek Brauman. The buildings had been uninhabited since the end of the 1990s and gradually began to deteriorate.

In the course of the expansion and reconstruction, it was possible to develop a state-of-the-art office building out of two connected old buildings in 18 months. It is now used by consulting, financial and law firms. The house façades were also carefully reconstructed and regained their former glamour.

The investor's aim was to maintain parts of the original painting and stucco. Every detail of the façade and in the interior furnishing of the most valuable rooms was thus carefully restored. Every original that could be saved returned, to its original place following the restoration work, be it a piece of railing, a lattice or a door knob.

One of the attractions of "Le Palais" is a wooden terrace with a planted ceiling. From here the visitor enjoys an extraordinary view of the newly designed Grzybowski Square.

With the refurbishment of the two buildings, PORR (POLSKA) S.A. now has an additional interesting reference project to show in the heart of Warsaw.

Investor	Warimpex Finanz- und Beteiligungs AG
General contractor	PORR (POLSKA) S.A.

Project interior decoration	OP ARCHITEKTEN
Gross floor space	9,845 m².
Rental space	6,700 m²
Parking spaces	33

Carefully reconstructed façade
Image: PORR

Porr Bau GmbH Managing Director Franz Scheibenecker and Michał Wójcicki, Project Manager at Le Palais, PORR (POLSKA) S.A.
Image: PORR

IAT supplies tanks to Rosenbauer International AG

Challenging special tanks produced for worldwide fire-fighting specialist

Rosenbauer is the leading manufacturer of fire-fighting vehicles worldwide. As a full-range supplier for the fire-fighting sector, Rosenbauer offers a wide array of municipal fire-fighting vehicles and aerial rescue equipment according to European as well as U.S. norms, a comprehensive series of airport and industrial vehicles, the most modern extinguisher systems and fire-fighting equipment. Rosenbauer is present with a worldwide sales and customer-service network in more than 100 countries and supplies all of the target groups, such as professional and volunteer fire departments, industrial plant fire-fighting and airport fire-fighting groups.

The special extinguisher vehicles called the Watertanker are produced at the Leonding headquarters. The core of this unit is a 15,000 litre tank made 100% of plastic (polypropylene = PP). The tanks were developed for use under a wide range of temperatures and are also food-safe. The finished tanks are polished and coated with a high-quality paint in the colour of the vehicle.

The Watertankers are delivered primarily to Saudi Arabia where they are also used to transport drinking water. The tank is impressive on account of its elaborate internal features which assure that it can withstand any structural and thermal loads.

IAT GmbH, a subsidiary of TEERAG-ASDAG AG, will deliver 100 of these tanks to Rosenbauer by the end of 2013. The high quality of the tanks produced means IAT can look forward to follow-up contracts.

Modern fire-fighting vehicles “powered by PORR”
Image: Rosenbauer International AG

PORR wins another construction lot at S10-Mühlviertel highway

ASFINAG, following the Götschka Tunnel, again demonstrates its confidence in PORR's infrastructural competence.

ASFINAG has awarded the last open Lot 3 for the infrastructure project S10-Mühlviertel highway to a consortium of PORR, Alpine and Haider. PORR's competence was already confirmed earlier with the award of the Götschka Tunnel and Lot 4.1 (Freistadt Süd). The Kefermarkt construction section comprises 5 km and the project consists in underground lines and additional engineering structures. Execution includes earth works, civil engineering and road construction work.

With the last lot, the entire S10 line has been awarded. Work had already begun on 15 January 2013 in order to make a joint opening of the full project possible. The total contract volume for Lot 3 is approximately 60 million euros net.

Chairman of the Board of PORR AG, Ing. Karl-Heinz Strauss is pleased at the confidence the ASFINAG has shown: “We see the contract for Lot 3 as confirmation of the good work we are performing at the Götschka Tunnel and the Freistadt bypass. We will demonstrate our competence and strict adherence to schedules together with our consortium partners in Kefermarkt as well.”

Noise-protection tunnel at Lot 4.1 (Freistadt Süd)
Image: PORR

Belgrade’s Sava Bridge awarded the Deutscher Stahlbau Engineering Prize

bauforumstahl e.V. presents PORR with the prestigious prize.

Image: PORR

The Sava Bridge in Belgrade, a major project built under PORR's lead management, was awarded the Deutscher Stahlbau Engineering Prize on 15 January. The new landmark of the Serbian capital, with its 969 m length and 200 m high central pylon, is a symbol for the country's path in the direction of Europe which can be seen from far away. The laudation emphasized the pioneering technical work. On Europe's largest single pylon cable-stayed bridge, the back-span as the counterweight to the main span is not supported on piles, but hangs solely in perfect balance with the main span in the cables. Large lifting loads on the rear piles are thus avoided.

Chairman of the Executive Board of PORR AG, Ing. Karl-Heinz Strauss, is pleased about the prize and stresses the high level of technical competence of everyone involved in the project: “PORR has been known at home and abroad for its pioneering work for decades, especially in infrastructure projects such as tunnels, motorways and railway lines. With the Sava Bridge in Belgrade, modern Serbia's new landmark, PORR has now also been able to make an impressive demonstration of its known-how on a large bridge project. With the Deutscher Stahlbau Engineering Prize, the project has now also won international appreciation.”

Deutsche Bahn again relies on PORR “Slab Track Austria” technology on the high-speed railway network

The third large contract for Austrian PORR patent in the past months

DB Netz AG, a subsidiary of Deutsche Bahn AG, has once more awarded PORR with a major contract worth approximately 60 million euros. This means the company is further strengthening its market position in railway construction. With “Slab Track Austria”, PORR builds on Austrian technology that has proven itself over many years and confirms the innovative capabilities of domestic companies.

The market-leading railway track system “Slab Track Austria” will be implemented on an approximately 22 km long, two-track section of the new Ebensfeld-Erfurt line. Formerly known under the name ÖBB/PORR, the patented system has now won contracts for the third time in the past two years for track construction on Germany's high-speed link VDE 8 between Berlin and Munich. Slab tracks, overhead contact lines and noise-protection walls will be built from mid-2013 to the end of 2014 on a total of eight bridges, in six tunnels and on 10 km of open track.

“Slab Track Austria” was developed by PORR in 1989 in cooperation with ÖBB on the basis of an elastically bedded slab track and since 1995 it has become the standard throughout Austria for newly constructed and expanded rail lines. In addition to the unique technology, the system is impressive on account of its service life and the quality of the exposed concrete. The system has proven its competence since 2001 in Germany, Slovenia and the Czech Republic as well.

Chairman of the Board of PORR AG, Ing. Karl-Heinz Strauss sees great potential in this system: “With ‘Slab Track Austria’ PORR has a technology in railway construction which is now establishing itself in ever more countries. In view of our clients’ excellent experience and the positive reception in our markets, I am hopeful that we will win more large international contracts.”

PORR builds Styria Tower in Graz

One of the largest high-rise projects in Styria becomes reality.

The Styria Tower – currently one of the largest high-rise projects in Styria – will become the new headquarters for Styria Media Group AG in Graz.

PORR, in a team consisting of the Styrian branch and the major projects department, was awarded the contract, including execution planning, as general contractor for construction of the prestigious project.

“In addition to the market-based price, the contract award was based primarily on the cooperation in partnership, performance capabilities and confidence in PORR. This is not commonplace in our business and makes us all the happier about it,” says Styrian Branch Manager Peter Schaller.

In addition to the office space, an ultra-modern newsroom, the studio for Antenne Steiermark, a bank and a company kindergarten are housed in the 60 m high tower and the 14 upper floors. The target date for completion is 2014.

Impressive architecture for the Styrian state capital
Image: ArchitekturConsult ZT GmbH

"Powered by PORR" now also in Turkey

PORR wins contract for canalisation in Diyarbakir.

Following a year of presence and highly motivated efforts on the Turkish market, Porr Bau GmbH has won acceptance for its first contract in Turkey, "New construction and renovation of the Diyarbakir canalisation system".

The general contractor contract, financed by the EU and awarded by Turkey's Ministry for Environment and Urbanisation, was signed on 27.12.2012.

The project consists in the new construction and renovation of the wastewater collection and rainwater discharge system of Diyarbakir.

With more than a million residents, Diyarbakir is the second largest city in southeast Anatolia (Turkey's second smallest geographic region).

The project encompasses construction of approximately 112 km wastewater collection, about 70 km rainwater drainage and a pumping station. Construction began officially on 23 January 2013, and completion is planned for the end of 2015.

An "international" market for PORR: Turkey
Image: PORR

PORR wins contract in Hard Turm Park in Zurich

Contract award for Construction Lot A2

PORR Suisse AG, in cooperation with the major projects department, has won a contract from Halter Entwicklungen AG, one of the largest Swiss project developers.

PORR, as sole contractor, will build Construction Lot 2 as part of the Hard Turm Park construction project.

Execution planning of the 6-storey structure with mixed usage and inner courtyard had already begun. Start of construction was 1 April 2013, with completion of the building including outdoor facilities planned for early summer 2015.

The project consists in 98 apartments (about 11,225 m² living space), 5,825 m² service space, 118 car parking spaces (on 6,300 m² underground garage space) and about 5,620 m² of outdoor facilities area.

PORR puts the Voitsberg power plant to good use

The dismantling and demolition of the block-unit power stations is a major challenge for the know-how of PORR's environmental technology.

PORR has purchased the Voitsberg coal power plant, located on an area of almost 245,000 m², from A-TEC Beteiligungsgesellschaft mbH. The area is to be prepared by PORR and partner companies for subsequent use by carrying out an orderly dismantling and demolition of the power plant blocks 1, 2 and 3 and then the sale of the properties. The removed material, in particular non-ferrous metal, scrap, various aggregate material and parts of the plants will be recycled.

The official green light for the industrial dismantling of the power plant took place at an event on 25 April with the participating companies PORR and Scholz Rohstoffhandel, as well as representatives of the city of Voitsberg and neighbouring communities. The preliminary works begun in February were well advanced; now the main demolition work began on blocks 1 and 2.

The professionally proper demolition is a special challenge for PORR's environmental technology which is carrying out the work. In all, four buildings, each with heights of more than 100 m, must be demolished, among them a 180 meter flue. In the process, 200,000 tonnes of reinforced concrete will be demolished; more than 90 % of the material will be recycled. According to the plan, the main work on blocks 1 and 2 are to be completed at the end of 2013; at the moment the insides of these power plant blocks are already being dismantled.

The 100 m high cooling tower of the coal-fired power station was demolished according to schedule in mid-May. The reinforced concrete sections are now being broken up on site with special equipment and gigantic cutters.

Ing. Karl-Heinz Strauss, Chairman of the Executive Board of PORR AG, is impressed in view of the complexity of the challenge: "The Voitsberg power plant is currently the largest demolition project in Austria and it is a formidable demonstration of the capabilities of PORR's environmental technology, the market leader in this field. We were also able to gain a very experienced partner in the company Scholz Rohstoffhandel."

Dismantling the boiler, Boiler House Block 1+2
Image: PORR


Boiler dismantling with dust suppression
Image: PORR


Dismantling the cooling tower with 2 demolition excavators
Image: PORR

Dismantling the cooling tower with 2 demolition excavators
Image: PORR

Dismantling the cooling tower with 2 demolition excavators
Image: PORR

Overview webcam
Image: PORR

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The enclosed brochure is an automatically generated print version of the original electronic publication: worldofporr.porr-group.com

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