



IN PROGRESS
GERMANY/NEUENTAL-BISCHHAUSEN/2017-19

EXTENDING OVER THE VALLEY



BAB 49 BW 103 Goldbachtal Bridge

Text: Uwe Fey

In June 2017, Hessen Mobil Strassen- und Verkehrsmanagement Kassel awarded PORR the construction contract for the new Goldbachtal Bridge.

Using a precise cost estimation which took PORR's complete value chain into account, we were able to offer the best price for the complete contract. In order to ensure optimal project execution, the construction aids were developed and built from scratch.

Background

In 2017, Hessen's Road and Transport ministry in Kassel (Hessen Mobil Strassen- und Verkehrsmanagement Kassel) appointed PORR as the main contractor for construction of the 285 m long Goldbachtal Bridge, which forms a component of the new section of the A49 national motorway. The contract covers setting up the construction site, earthworks and foundation work for the bridge columns, and the abutment embankments. It also incorporates manufacturing the superstructure as a composite cross-section with steel box girder and reinforced concrete slab carriageway, and constructing a concrete trough for drainage. Finally, the passive concrete and steel protection system for the parapets and the establishment of noise barriers around the abutments also form part of the contract. PORR was able to offer the best price for the complete contract by taking the company's complete value

Project data

Employer	Hessen Mobil Straßen- und Verkehrsmanagement Kassel
Contractor	PORR Deutschland GmbH
Architect	Leonhardt, Andrä und Partner, Dresden
Order type	Generalunternehmer
Project type	Civil Engineering/Infrastructure . Bridge construction
Project scope	Construction of a bridge 285 m long, using composite construction
Order volume	20.45 million euros
Construction start	07/2017
Construction end	10/2019

chain into account. PORR Deutschland GmbH's Steel Construction and Civil Engineering departments were involved in the special civil engineering cost estimations, along with PORR special civil engineering. The Steel Construction and Infrastructure departments at PORR Deutschland are also working closely together during project implementation.



SEVERAL CONSTRUCTION AIDS WERE PLANNED AND DEVELOPED DURING THE PROJECT.

Uwe Fey
Project Manager, PORR Deutschland



The columns have a height of just 30 m. Source: PORR

Extensive preparations

As soon as the contract had been awarded, planning work began on the electricity supply to the construction site, site facilities and access roads. The client had made available their verified structural analyses and object planning, including the material distribution plan for the steel superstructure, meaning that PORR was also able to make an immediate start on execution planning and designs for the steel construction, substructures and construction aids. The decision was made to design and build our own components for the incremental launch procedure. These include the launch rockers used on the abutments and columns, and in the prefabrication area. We also created a launching nose for launching the steel base, plus the launching system itself, which includes a lateral slide strand jack of our own design. These will eventually become part of the PORR inventory, enabling us to deepen our value chain for future similar construction schemes by using our own equipment.



Components including the launch rockers, a launching nose for shifting the individual sections and a launch system including a lateral slide strand jack of our own design were developed from scratch and can now be used for other projects. Source: PORR

The bridge takes shape

As soon as the preliminary work was complete, the Special Civil Engineering department began work manufacturing the bored piles along the lines where the columns would emerge. Although the drilling team had to battle through unusually hard rock, the special civil engineering works were completed on time in May 2018. Meanwhile, work on the columns had begun in parallel with the bored piles in March 2018. The columns were manufactured using a climbing formwork with climbing section lengths of 5 m, then reinforced and concreted. The exposed formwork was created using a board structure with a rough-sawn surface.

March 2018 also saw the start of work on the 160 m long and 30 m wide prefabrication area where the steel structure was assembled. At the same time, the embankment for the abutments was being constructed. The foundation for the abutment was integrated into the embankment. It is founded on the load-bearing colluvial deposit and made from unreinforced concrete. This foundation was built in during construction of the embankment as underfill for the abutment foundation. Around 3,000 m³ of concrete was built into each abutment for this purpose.



Around 25,000 m³ of earth had to be excavated for the

prefabrication area, and stored to one side for later replacement.
Source: PORR

Complex steel work with our own construction aids

In the middle of April 2018, the time came to set in place the eleven prefabricated steel components for launch cycle 1 of the first section of the eastern superstructure. Delivery of the steel components, weighing up to 85 t and measuring 35 m in length, represented an enormous logistic challenge for this process.

PORR began work on manufacturing the abutments in May 2018. Before this, however, the embankment had to be raised to the lower edge of the abutment, a cubage of around 20,000 m³. Once this was done, the abutment was shuttered to a height of a bit more than 10 m, then reinforced and concreted, so that it could be completed “just in time” for the first launch. Work on the first eastern section was carried out from the middle of April until July: it was welded and checked on the construction site, then shifted out of the prefabrication area – this made room for the second section of the eastern superstructure, which followed immediately. The first launch section was preceded by six weeks of metalwork and welding, sonic and x-ray weld seam checking, and corrosion protection work.

The new construction aids – launch rockers, launching nose and launch system using strand jacks – were used for the first time during this preliminary work.



Six weeks of metalwork and welding preceded the successful launch. Source: PORR

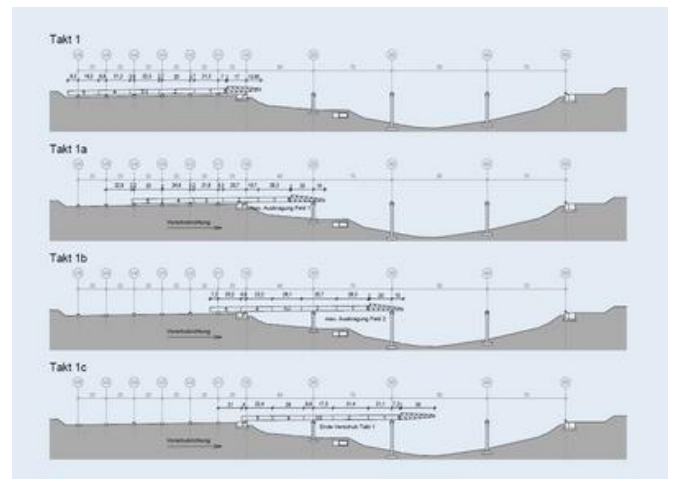


Unloading the 85 t steel components for the Goldbachtal bridge. Source: PORR

Complex steel work with our own construction aids

In the middle of April 2018, the time came to set in place the eleven prefabricated steel components for launch cycle 1 of the first section of the eastern superstructure. Delivery of the steel components, weighing up to 85 t and measuring 35 m in length, represented an enormous logistic challenge for this process.

The steel components for the second section of the superstructure were unloaded in the middle of July, following the successful first launch section; these were then assembled and launching continued until September. Due to the height of the launch rockers, the eastern superstructure was launched into a position elevated by around 30 cm. Once the launch was complete, the structure was lowered to its final position, and the prefabrication area was converted ready for work to begin on the western superstructure.



Extract from a launch cycle plan. Source: Leonhardt, Andrä und Partner

Technical data



80,000 m³ approx.

Excavation volume

19.100m³

Concrete incorporated

Construction pit depths	Up to 12m
Bridge lengths	2x 285m
Tarmac	1260t poured asphalt MA
Drill piles	D 1500mm, L up to 18.50m
Steel incorporated	2.700t
Reinforced concrete	2.200t

Looking ahead

The abutments and columns have now been completed. The steel components for the western superstructure have been shifted already or are on-site ready for assembly. The formwork carriage for creating the carriageway slabs has been assembled; production of the slabs began in December 2018 using a back-and-forth process where the carriageway slab in the centre of the bridge area is concreted first of all, followed by the slabs above the columns.

Manufacture of the parapets will start in spring 2019, using PORR's own parapet formwork carriage, specially designed in 2018 for the Rothof Valley and Goldbachtal bridges. Corrosion protection work on the inside and outside of the steel box girder will likewise take place. In summer 2019, the cladding work will be carried out and the superstructure kitted out.



Six weeks of metalwork and welding preceded the successful launch. Source: PORR



Completion of the Goldbachtal bridge is scheduled for autumn 2019. Source: PORR