

Sedlec-Prčice bridge

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Factbox

Client: Středočeský kraj

Contractor: PORR, a.s.

Architect: PONTEX s.r.o.

Contract Type: Generalunternehmer

Project Type: Civil engineering/infrastructure . Bridge construction

Scope: Renovation of a historic stone bridge in a municipal area

Contract Volume: 28 million Czech Koruna (1.1 million euros)

Construction Start: 04/2017

Construction End: 05/2018

Location: Sedlec und Prčice

Renovation of a historic bridge

PORR renovated an almost 300-year-old bridge between the municipalities of Sedlec and Prčice under the strict supervision of the Czech Monument Care Department.

As the bridge needed to remain open to pedestrians for the duration of the works, PORR also erected an additional aluminium structure. In the course of this project, PORR demonstrated its expertise in the renovation of heritage-protected structures.



The bridge with the statues by the famous Czech sculptor Ignaz Platzer jr. source: PORR

Background

In 2016, the Středočeský kraj, the region of Central Bohemia, invited tenders for the rehabilitation of the historic bridge between the municipalities of Sedlec and Prčice. The structure, built between 1815 and 1822, consists of three natural stone arches in the Empire style with two sandstone sculptures by the famous Czech sculptor Ignaz Platzer Jr. With a bid of CZK 28 million, PORR was able to win the tender based on the lowest bidder principle. The contract was also a prestigious success for PORR, as it is an important reference project for the rehabilitation of listed buildings. The aim of the comprehensive rehabilitation was to extend the bridge's service life and increase its load-bearing capacity.

Difficult conditions

Since the last comprehensive rehabilitation in the 1950s, maintenance of the bridge had been severely neglected. Its technical condition was correspondingly poor. The client's structural investigations revealed significant damage to the carriageway, decayed reinforced concrete railings and heavy water ingress into the bridge's load-bearing structure. In addition, it was found that regional natural stone of poor quality had been used in its construction. The defects identified had a negative impact on both the service life and the load-bearing capacity. PORR managed to extend the service life by replacing the bridge equipment. The carriageway surface and, above all, the historic reinforced concrete railings were replaced and a functional bridge drainage system was installed. New bridge caps and bituminous seals were installed as well as new composite slabs and the natural stone masonry was partially renewed. All work was carried out under the supervision of the monument protection authority and with the condition that the bridge had to remain open to pedestrian traffic during the entire renovation phase. For this purpose, a lightweight aluminium bridge structure was built to allow pedestrians to cross the construction site and the Sedlecký potok stream.



The bridge deck was replaced, as were the historic concrete railings. Source: PORR



Inspections revealed damage to the carriageway, crumbling reinforced concrete railings and heavy water ingress in the bridge structure.

Alexandr Herzán
Project Manager, PORR a.s.

Elaborate surface treatment

In the first construction phase, the surface was removed. The carriageway was milled off, pavements and kerbs were dismantled. This was followed by the rehabilitation of the concreted backs of the vaults with new surface drainage between the lining and parapet walls. A reinforced concrete distribution slab in concrete quality C30/37 XF3 was laid over the lining walls and between the retaining walls. To prevent wear and tear, an elastic EPS polystyrene layer was laid on the surface of the right-hand wall, which was levelled with mortar or concrete. On the left-hand side of the wall, the slab finish was underlaid with brackets, as the existing masonry could not be demolished according to the specifications of the monument protection authority. PORR fulfilled this technical requirement with arch scaffolding along the entire length of the bridge.

The bridge composite slab was produced with a roof-shaped transverse slope of 2.5% and a varying thickness of 341 mm in the bridge axis, 250 mm in the gutter area and 200 mm in the end areas. A 15 cm thick sub-concrete layer was applied to the compacted frost-proof backfill under the composite bridge deck. The bitumen membrane damp-proofing was laid on a sealing layer on the composite bridge deck. The composite bridge deck is drained via a longitudinal drainage system and a pipe system that flows into the collective drainage system of the kerb drainage. The edges of the reinforced concrete composite slab were fitted with reinforced concrete caps, which are anchored directly in the bridge deck slab. The bridge deck slab and the caps were fitted with expansion joints and elastic shrink joints every 15 metres.



Even the kerb drainage had to comply with the specifications of the monument protection authority. Source: PORR

The strict eyes of the monument protection authority

Following the installation of the waterproofing system, the kerb drainage was installed at 10 metre intervals, which, like the granite gargoyles, had to be approved by the monument protection authority. The same applied to the new reinforced concrete railings mounted on reinforced concrete caps. A prototype of the steel rod infill was also submitted to the heritage authority. PORR constructed a three-layer asphalt carriageway between the kerbs. The pavement structure was designed as natural stone paving in a sand bed with a cross slope of 2.5%.

After the release

Once the work on the carriageway surface had been completed and the bridge put into operation, the arch scaffolding was dismantled and the arch structures as well as the retaining wall were treated using the high-pressure nozzle water jetting method. The pressure of 1,200 bar was tested in advance on reference surfaces. During this work and the additional necessary investigations of the structure, caverns were discovered in the area of the back of the vault, which were filled using the mortar injection method. The natural stone masonry was grouted to a depth of 80 mm. This grouting was carried out - again in consultation with the conservationists - using a lime mortar with a maximum of 5% white cement additive for soft and porous stone types and a maximum of 10% for igneous stone. The visible joint surface was neither mechanically smoothed nor treated in any other way. Instead, the mortar was discoloured with sand in the natural colour of the historical mortar. Missing or weathered natural stone masonry was supplemented with the exposed quarry stone, taking into account the joint distribution.



The visible joint surfaces were neither smoothed nor treated in any other way. Missing natural stone masonry was supplemented with quarry stone. Source: PORR



The bridge's foundations are made of natural stone. Source: PORR

New paving

The most recent renovation work consisted of renewing the paving in the area of the flood flow bed and the paving under the bridge. In addition, the base was deepened in order to prevent abrasion of the brick-lined arches and bridge abutments at the usual water flow rate. The paving was 3 metres in the inflow area as well as 3 metres in the outflow and entire riverbed area under the bridges. The flood flow bed was also completely rehabilitated. The riverbed was paved with concrete sleepers.

2042.25 m²

Area of the load-bearing structure

Technical data

Total bridge length	194,50 m
Bridge height	4,20 m
Bridge width	10,90 m
Volume of new concrete structures	1.200 m ³