

road arch bridge	
South Bohemia Region	
Písek district	
cad. territories Orlík nad Vltavou, Kostelec nad Vltavou	
buffer zone*	49°30'18.77"N 14°11'1.902"E



CTU

CZECH TECHNICAL
UNIVERSITY
IN PRAGUE*protection zone of the Orlík State Chateau (protected since 3 February 1977); no longer individually protected;
(protected as a cultural monument 3 May 1958 - 31 December 1987)

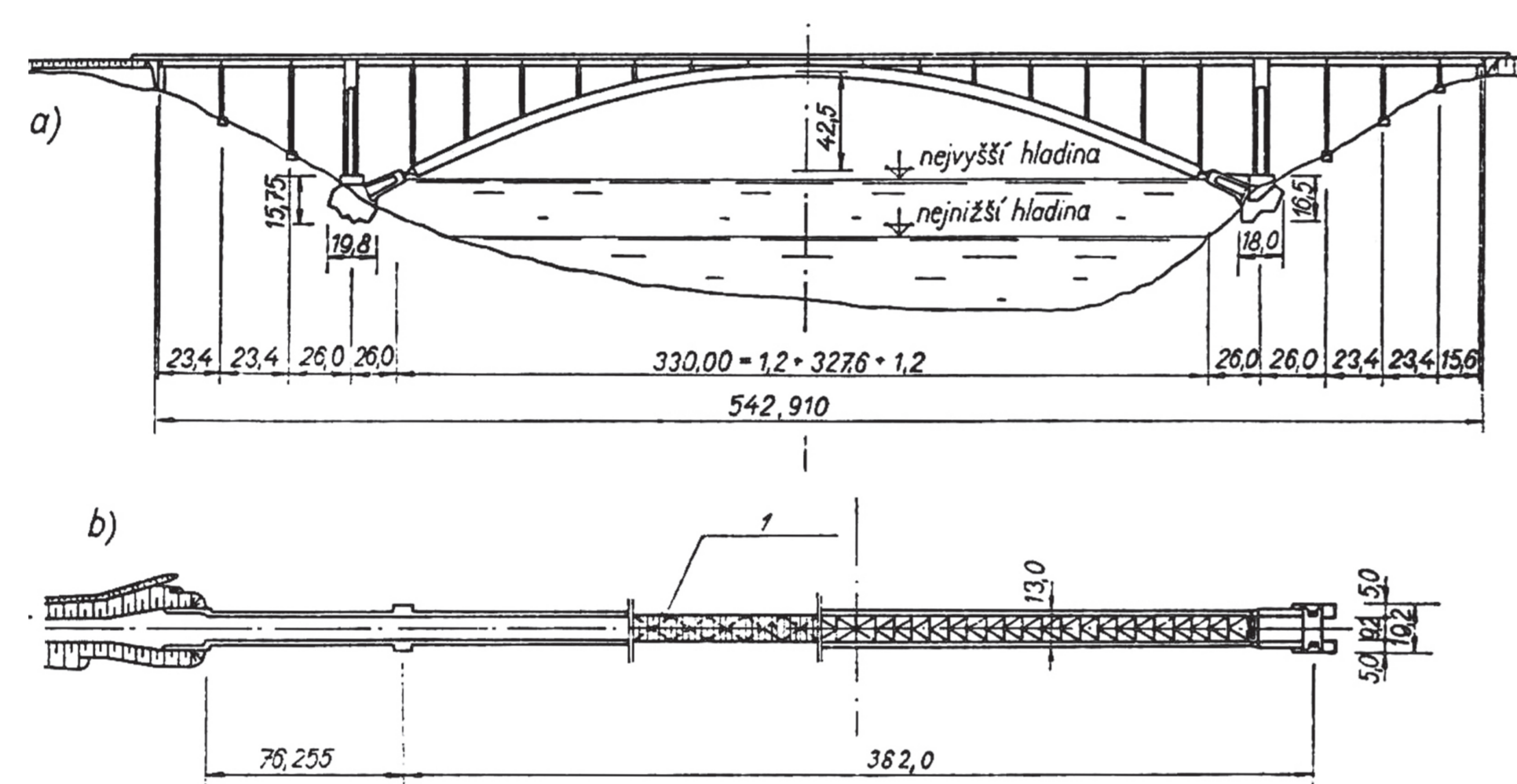
History

The bridge at Žďákov over the Orlík Reservoir carries the I/19 class road. It was built in 1957–1967 and at the time of its construction it was the largest bridge of its kind in the world (the largest steel simple full-wall double-arch bridge). In 2001, it was named Bridge of the Century in the category of steel road bridges. It is a technically and aesthetically perfectly designed and executed bridge work with a very interesting and rich construction history.

The need for a road connection between Plzeň and Tabor became evident in the first half of the 20th century. The final design of the bridge was the result of a public competition held in 1954. The project was conceived by "Hutní projekt Praha" under the direction of Ing. J. Zeman. The main structural engineer was Ing. A. Schindler. The project expert was Prof. F. Faltus. The steel structure was manufactured in Vítkovice and was assembled by Hutní montáže of Ostrava. The bridge was opened in 1967.

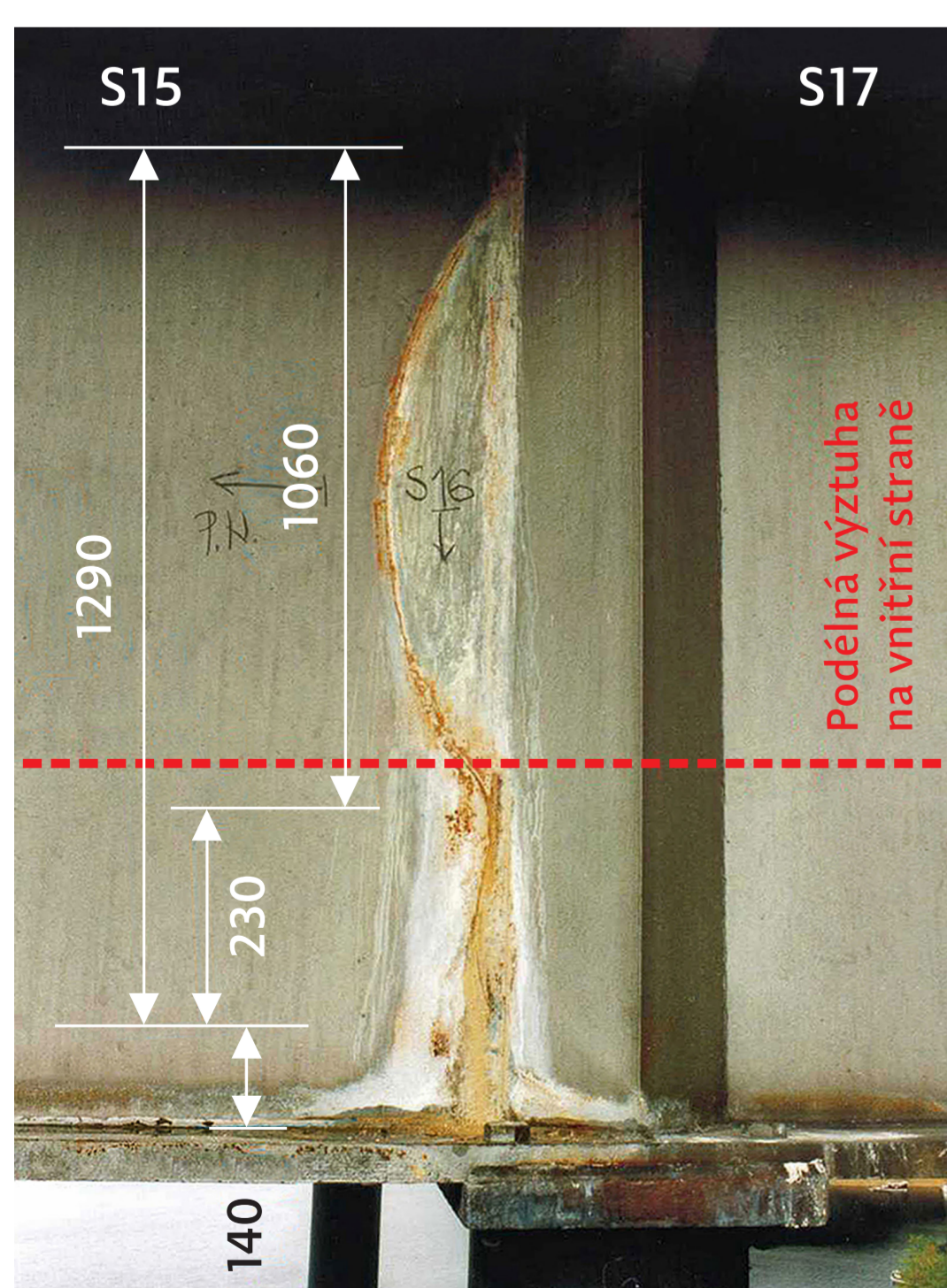


Žďákov Bridge, view on the arch

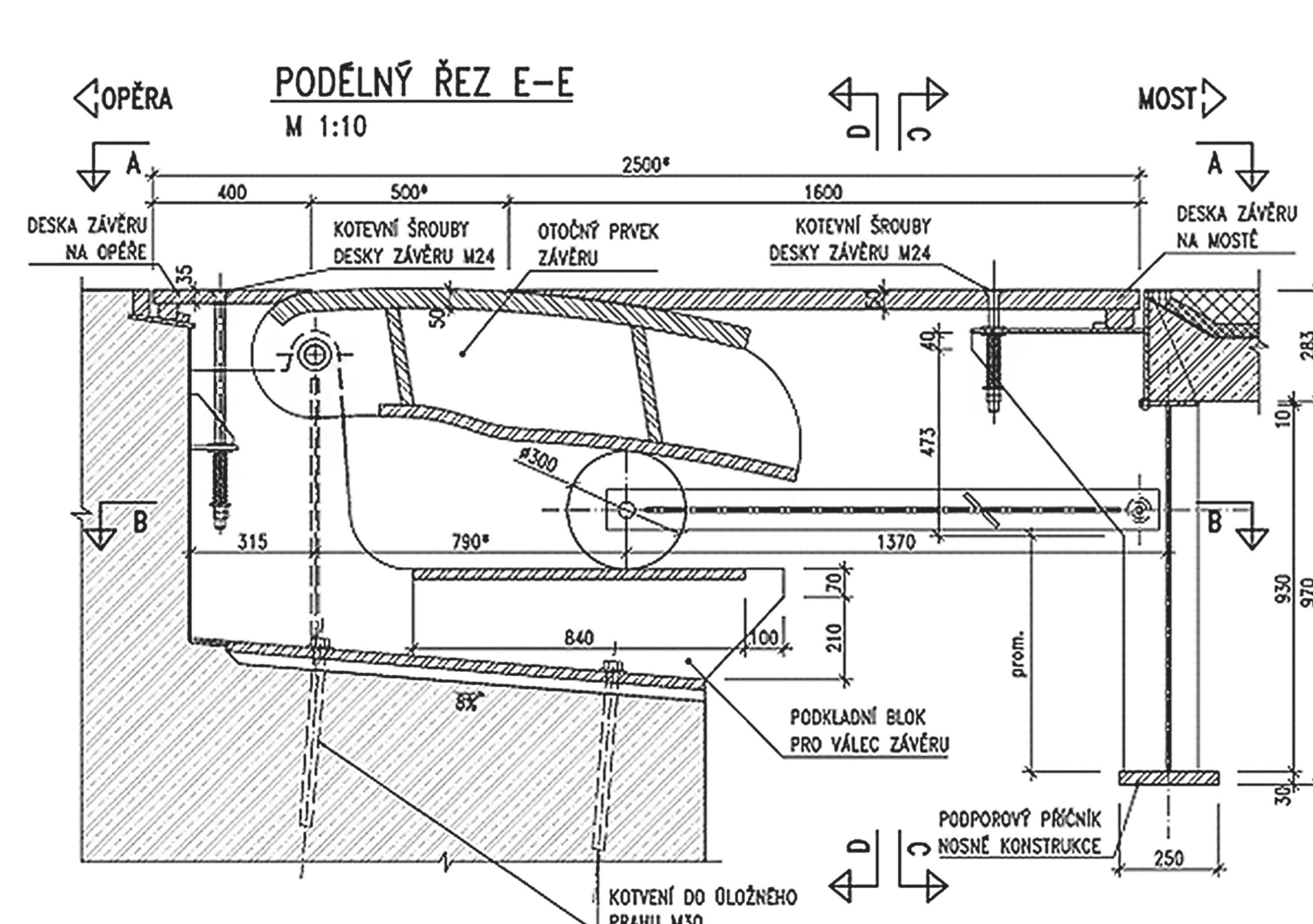


Žďákov Bridge over the Vltava River from 1967 – drawings

It is a steel arch bridge with an upper bridge deck with a total length of 542 m. The bridge deck is at a height of 50 m above the level of the Vltava River. The main load-bearing structure consists of steel arches, steel columns, reinforced concrete piers and the bridge deck beam. In the central span there are two steel full-wall double-arched arches with a span of 330 m and a rise of 42.5 m. Both arches lie in vertical planes at an axial distance of 13 m. The arch girders have a chamber section of 5 m in height, with an axial distance of 1 m between the walls, and are mutually braced at the upper and lower chords by longitudinal truss bracing. The two arches are supported by reinforced concrete cantilevers with 430 mm diameter pins. The reinforced concrete piers are 379 m apart and 47 m high. The beam of the bridge deck consists of two steel longitudinal beams, cross beams and a bridge deck slab. The fixed point is located in the middle of the span of the arch, and the beams are supported by single roller sliding bearings on both abutments and on the concrete piers. The beam girder is welded I section, 1.8 m high. The span of the crossbeams is 12 m, they are welded I section, placed at an axial distance of 2.6 m. Their height is 0,8 to 1 m. The bridge deck slab is reinforced concrete with a height of 0,18 m. The carriageway is 10,5 m wide and both sidewalks are 1,25 m wide. The total weight of the steel structures is 4 465 t.



View of the web with a crack



Original expansion joints supported by cylinders

In 1998, vertical cracks were found in the longitudinal beam supports (due to leakage into the closed cavities and repeated freezing of water) and the bridge was closed to all traffic for a short period of time as a precautionary measure until emergency repairs were carried out. In the following year, three new movable inspection footbridges were installed under the bridge deck and on the arches to allow for regular inspection, and the load-bearing capacity of the bridge was also re-assessed.



Žďákov Bridge over the Vltava River from 1967



Demolished upper part of the abutment



End crossbeam before reconstruction

Preparation of the bridge reconstruction

The results of the regular inspections indicated serious damage and non-functionality of the expansion joints, degradation of the concrete of the upper parts of the abutments, corrosion of the end girders, and non-functional drainage. The diagnostic survey carried out in 2008 included a description of the defects, recommendations for repair, and the expansion joints were required to be replaced. In 2010, vehicles over 13 tonnes were restricted to cross the bridge due to defects in the bridge abutments. The 2011 supplementary diagnostic survey proposed demolition of the upper part of the abutments, a method of rehabilitation for the pylons and arch footings was provided, and complete removal of the bridge deck slab along the main girders in a width of 2.0 m was proposed. The additional diagnostic survey included tests of material properties, testing of the concrete surface resistance against water and de-icing salts diffusion, and determination of carbonation progress.

The documentation for the bridge reconstruction included:

- Repair and rehabilitation of the substructure (demolition and new abutment sections, full concreting of pylon shafts, rehabilitation of chambers of the pylon heads, etc.).
- Repair of the bridge superstructure and bridge deck (removal of the bridge deck, demolition of part of the bridge deck slab, modification of the transition area behind the abutments, new pavement layers, new expansion joints, rehabilitation of the corrosion protection, etc.).
- Renovation of corrosion protection of arches and props.
- Bridge equipment.

Reconstruction 2015–2017

In 2011, a general reconstruction of the bridge was commissioned with a budget of CZK 160 million. The reconstruction of the bridge was carried out between June 2015 and October 2017, the contractor was Colas CZ, a. s. The reconstruction was supervised by the Faculty of Civil Engineering of the Czech Technical University in Prague.

The main objective of the reconstruction was the replacement of the expansion joints, new upper parts of abutments, renewal of the waterproof insulation of the bridge deck slab, replacement of the cornice beams and railings, renewal of the corrosion protection of steel structure and rehabilitation of the concrete parts of the bridge.