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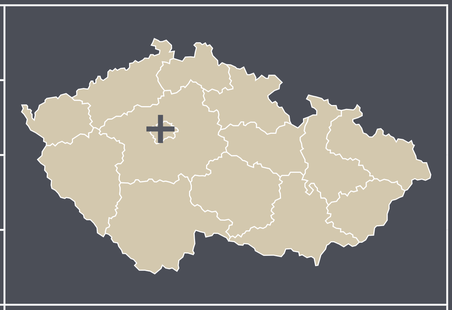
No. 48 – Prague – bridge of Svatopluk Čech

road and tram arch bridge	
Capital City of Prague	
Prague 1 district	
cad. territory Old Town	
cultural monument*	50°05'33.48"N 14°25'02.83"E

*urban conservation area of the city of Prague, Historic Centre of Prague (core zone C 616-001 of the WHL UNESCO)

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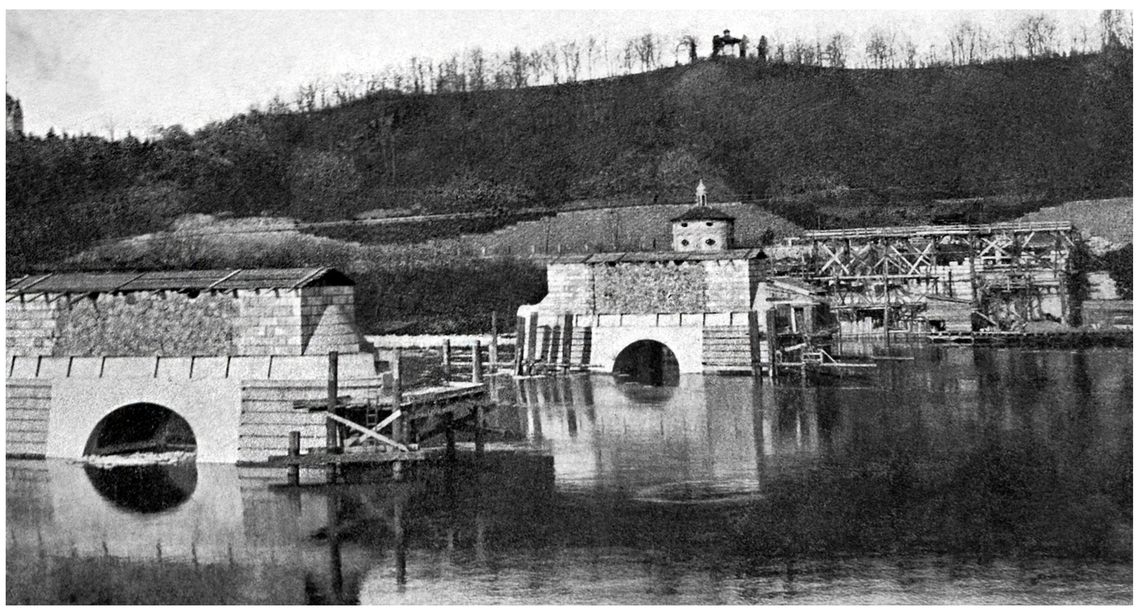
CZECH TECHNICAL UNIVERSITY IN PRAGUE

History

Built in Prague between 1906–1908, the Čechův Most Bridge is a testimony to the technical progress and the broader urban development concept of the city in the early 20th century. It follows Pařížská avenue, created during the earlier redevelopment of the historic quarter of Josefov. The designers of the bridge were the engineers Jiří Soukup and František Mencl, builders of many other Prague bridges. The architectural design was developed by arch. Jan Koula, who was also the author of the current design for the Letná cutting along the axis of the new bridge. The construction of the piers with rigid reinforcement made of profile irons, based on caissons, was carried out by the well-known Prague company Kapsa & Müller. The construction of the piers was ceremoniously completed with the laying of the last stone by Emperor Franz Joseph I on the 17th of April 1907. The iron structure was assembled by three Prague bridge factories, each of them building one arch – the right bank arch was assembled by the Prášil Brothers' engineering plant, the middle one by the Pražská akciová Engineering Plant and the left bank arch by the První českomoravská machine factory. The bridge was inaugurated on the 6th of June 1908.

Many artists participated in the decoration of the bridge. The author of the figures of the four Victorias on the cast-iron columns of the toll houses is Antonín Popp; the figures of the bronze light-bearers were made by Ludvík Wurzel and Karel Opatrný; the candelabras are decorated with the works of Gustav Zoula; the relief fillings of part of the spans of the iron structure were made according to the designs of Karel Klusáček. While the architectural design of the bridge is Art Nouveau, some of its decorative elements follow the Neo-Renaissance tradition. An integral part of the decoration of the bridge was its lighting, which was provided by 200 light bulbs and gas flambons in the torches of light-bearers.



The bridge substructure construction

Technical features of the structure

Built in 1906–1908, the Čechův Most Bridge is the largest Art Nouveau bridge in the Czech Republic. The bridge has 3 spans and 2 pillars. The first span is 47.6 m on the Old Town side, the middle span 2 is 52.9 m, and span 3 is 59.0 m on the Letná side. The total length of the bridge being 176 m. The main structure of the bridge is a steel truss double-jointed arch with an upper bridge deck. There are 8 truss arches placed side by side in each field.

View of the bridge from the west in 2020

The axial distance of the arches in the transverse direction is 2.0 m; only the two central arches are placed at a distance of 3.2 m due to the arch over the opening in the pillar. In the transverse direction, there are vertical stiffeners between the arches. The bridge deck trusses are at the level of the upper chords . The crossbeams were originally 125 mm high gutter irons (Zorés) and the roadway was made of timber blocks. The cross-sections of the upper and lower chords of the main girders are single-wall riveted T-shapes. There are longitudinal truss stiffeners at the level of the lower chords. The steel structure was designed from mild steel according to the regulations in force at that time for state bridges of the first class. The main girders are placed on the abutments and on the piers by means of cast-iron/ steel joints.

Bridge repairs during its lifetime

During the 114 years of the bridge's life, a number of building modifications have been made. During the bridge modifications in 1953–1956, the bridgehead on the Letná side was widened. The underground space of the planned café in the bridge abutment was removed, the gloriets on the front side of the bridgehead were also removed, and the toll houses with Victoria columns were relocated in their place. In 1971–1975 the bridge was extensively reconstructed, during which the original timber pavement was removed and replaced with asphalt pavement.

Some members of horizontal and transverse bracing were removed and replaced with new members of the same dimensions. The repair of the main beams consisted mainly in replacing a large number of rivets. In 1997, the left bank underpass of the bridge was rehabilitated. The steel structure of the bridge was reconstructed in 2000–2001. The subject of the reconstruction was the repair of the crossbeams and vertical bracing. In addition, new bracing was welded to the existing bridge deck plates, and the railing, expansion joints and public lighting were also repaired. In 2014, restoration work was carried out on the historic toll houses.

View of the bridge deck during reconstruction in 2000–2001

Cracks in bridge deck welds, leakage and leaching of dirt

Deterioration and corrosion weakening

The extensive survey of the bridge was carried out in 2020. The bridge deck nad supporting members of the railing are the most damaged parts of the steel structure. The most characteristic defects are cracks in the bridge deck welds at the point of contact between the longitudinal stiffeners of the bridge deck slabs and the crossbeams. The cause of the weld defects is likely the dynamic effects from car and tram crossings, and inadequate fatigue details. For this reason, the welds are spalling off and subsequent deflections of the bridge are causing damage to the insulation. At the point of defect, clay impurities are flooded and washed away, and water causes surface and crevice corrosion. Crevice corrosion develops in the joint between the longitudinal bracing and the crossbeams. The crossbeams are formed by a pair of rolled U-sections with the webs oriented towards each other. The joint between the webs is subject to flaking, and defect of the corrosion protection leads to corrosion weakening of the U-sections. This defect is apparent in the crossbeams, where leakage occurs through the transverse joint between the deck plates. The existing supporting members of the railing structure are also severely corroded. In particular, the angles connecting the balustrade posts to the brackets are severely degraded, with severely corroded flakes spalling off the steel members. The railings and the cornice are in a state of disrepair. However, reconstruction of the railing and cornice members is currently underway, and an overall renovation is being planned.