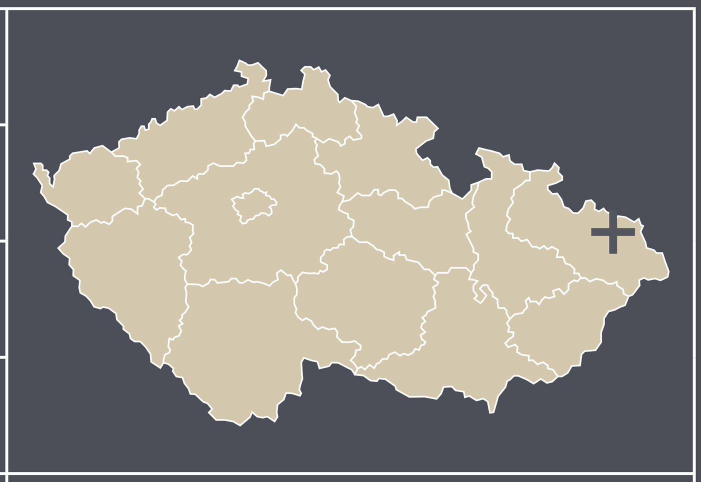
14

No. 57 – Ostrava – bridge of Miloš Sýkora

road arch bridge	
Moravian-Silesian Region	
Ostrava-City district	
c.t. Moravská and Slezská Ostrava	
cultural monument	49°50'15.02"N 18°17'46.72"E



CTU
CZECH TECHNICAL UNIVERSITY IN PRAGUE

History

The current Miloš Sýkora Road Bridge, formerly known as the Imperial Bridge, is built on the site of several of its predecessors. The bridge is located on the River Ostravice, part of an important medieval and then regional trade route. Later, in the times of the construction and maintenance of the imperial roads, the road connecting Opava with the Těšín region ran here along this line. The first historically documented bridge located on the site of the present bridge stood as early as 1450. This bridge and its successors built in front of the city gate of the original Ostrava were always from timber, at least until the mid-19th century. The load-bearing capacity of the last timber bridge built on the site of the current bridge became insufficient, until it was replaced by a new bridge – a suspension bridge, chained, made of wrought steel, with members of stone masonry pylons and steel bridge deck suspended on chains clamped to a pair of portal pylons. The design of this structure was developed by Ing. Josef Seifert, after which the bridge was manufactured between 1847 and 1851 in Klein's Ironworks in Sobotín. However, the expanding city did not enjoy it for long. During a ceremonial military parade on the morning of the 15th of September 1886, it collapsed beneath the weight of a combined march of infantrymen and cavalrymen from the 13th Hulán Regiment. During the unfortunate event, four people died and several dozens were injured.

On the remains of the pylons, a simple arch truss structure was anchored with a length of 59 m and a bridge deck width of 5.5 m. Damage repair, the design of the new structure, its manufacture and installation were carried out in a surprisingly short time. The riveted steel bridge spanning the River Ostravice was completed within four months and came into service on the 8th of January 1887. It was designed and built by the bridge factory of Vítkovice Ironworks.

At the beginning of the 20th century, the steel riveted bridge was no longer sufficient for the increasing amount of traffic, and its load-bearing capacity no longer met the requirements of contemporary transport. For these and other reasons, work began in 1912 on the design of a new "Reich Bridge". The bridge was designed by Ing. G. Hermann from the design office of Friedrich Bleich. Vítkovice was again commissioned to build the bridge and it came into service in 1914. The bridge is a massive atypical steel riveted truss structure made of mild steel. The span of the truss arch is 60.7 m and the width of the bridge deck, including sidewalks, is 16 m. The total length of the steel bridge structures is 92 m. At the time of construction, the bridge was also equipped with one 760 mm narrow-gauge track to serve the local intercity railway.

The massive bridge received its present name several decades later – on 30 April 1945, when tanks of the 1st Czechoslovak Independent Tank Brigade entered Ostrava, intending to continue over the bridge to Silesian Ostrava. The German army, however, mined the bridge to prevent the Red Army from crossing the river. The attempt to cut the wires between the charges of the mined bridge was made by twenty-four-year-old Miloš Sýkora, a young turner. Sýkora volunteered to carry out the task, and though he managed to save the bridge, he himself was killed by the gunfire of the retreating German army.

Original suspension chain bridge

Collapse of the previous bridge in 1886

The Miloš Sýkora Bridge is still an important transport link today. It has undergone several reconstructions, the largest of which took place in 1974, when the narrow-gauge railway was removed from the bridge deck due to the cancellation of the narrow-gauge intercity railway line between Ostrava and Bohumín (1973). The bridge underwent another significant reconstruction in 2002.

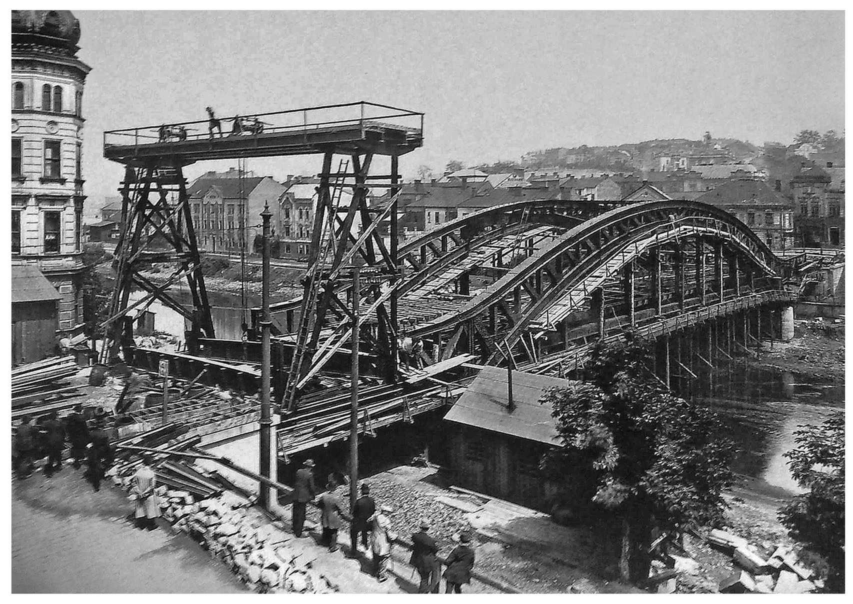
Deterioration and corrosion weakening

Although the condition of the structure can be assessed positively, especially in regard to its age, some structural defects were found in the course of the inspection. In general, it can be noted that the corrosion protection coating (CPC) is deteriorating. Degradation and spalling of the CPC layers were observed on both the bottom and top chords of the truss arch.

However, the most significant problem appears to be in the details of the embedded hinges fitted to the overhanging portion of the arch. Uniform corrosion was observed in this detail and there was evidence of leakage from the bridge deck through the asphalt grout sealing the passage of the truss members through the bridge deck structure. Relative displacement between the beams in this detail is causing deformation of the grout and the creation of an opening through which rainwater can flow into the structure. However, in its current state, the structure does not show any significant corrosion weakening in these details. Another cause for concern is the crevice corrosion found in some of the narrow gaps of the riveted members. There is also local deformation of the members and additional tensile stress acting on the rivet heads due to the progress of corrosion in the inaccessible gap. During the last restoration of the CPC, some of the corrosion in the details of the arch top chord was sealed and contained, a process that helped to decelerate the corrosion progress. However, the detected uniform corrosion is superficial with no noticeable weakening.

View of the bridge from the southeast in 2021

The construction of the new bridge



The new bridge before completion

Technical features of the structure

The manufacture of the structure dates to 1914, which suggests the use of mild steel. During the renovations, parts of the structure were reinforced by welded plates, which demonstrates the weldability of the material used. The design of the Miloš Sýkora Bridge is remarkable for the unusual choice of the static arrangement of the structure, whereby hinges are embedded in the main structure in the zero moment areas of the approach spans to eliminate the transmission of bending moments. Thus, the structure essentially functions as a Gerber beam with a load-bearing inner span consisting of a truss arch and two approach spans.

The reinforcement of the supporting crossbeam in the area of the arches is also quite interesting. Here, the internal space of the composite riveted members was filled with concrete, which, in addition to increasing the load-bearing capacity of the member, also prevented the ingress of water or the accumulation of dirt, with a consequent reduction in the progress of corrosion.

Assessment of the bridge condition

The structure is regularly inspected in accordance with normal requirements. The last major reconstruction with the renewal of the CPC took place in 2002. The condition of the CPC is already showing significant deterioration in some details of the structure (Ri 4), and will require renewal in approximately 5 to 10 years. The condition of the superstructure is good, despite the identified damage. The defects in the current state do not affect the load-bearing capacity and serviceability. However, during the inspections, special attention should be paid to checking the areas of the embedded hinges in the approach spans, which are the weakest points of the structure due to deterioration. Also, crevice corrosion, if neglected, has the potential to significantly deteriorate the condition of the bridge, and may even reduce the load-bearing capacity.

Diagonal deformation due to crevice corrosion

Corrosion of members in the detail of the embedded hinge, excessive def