

# Recognising Heritage Values of Bridge Structures – Path to Preserving Values



CTU

CZECH TECHNICAL UNIVERSITY IN PRAGUE

## Heritage value of structure

A key condition for ensuring the good practice in maintenance, repairs and reconstructions of heritage buildings is a detailed understanding of their heritage value. Adequate maintenance of the structure based on a detailed knowledge of its heritage value increases chances for its preservation. In contrast, insensitive structural interventions or poor maintenance leads to degradation and loss of authentic substance, and may lead to the extinction of the heritage value.



## Objectives

The specific task of the project is to assess the effects of survey and repair (or strengthening) methods on the heritage value of bridges. The application of these methods leads to a fundamental dilemma:

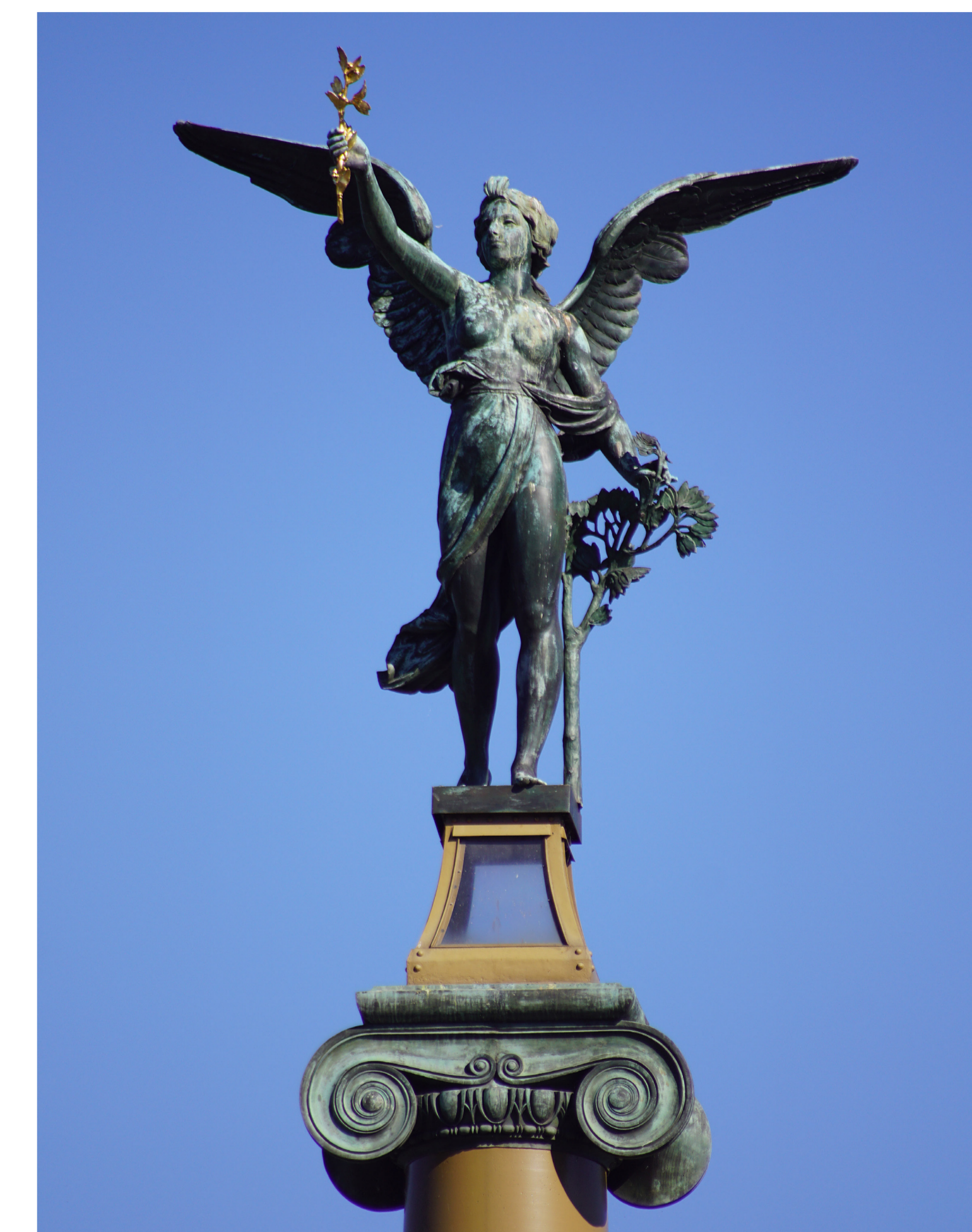
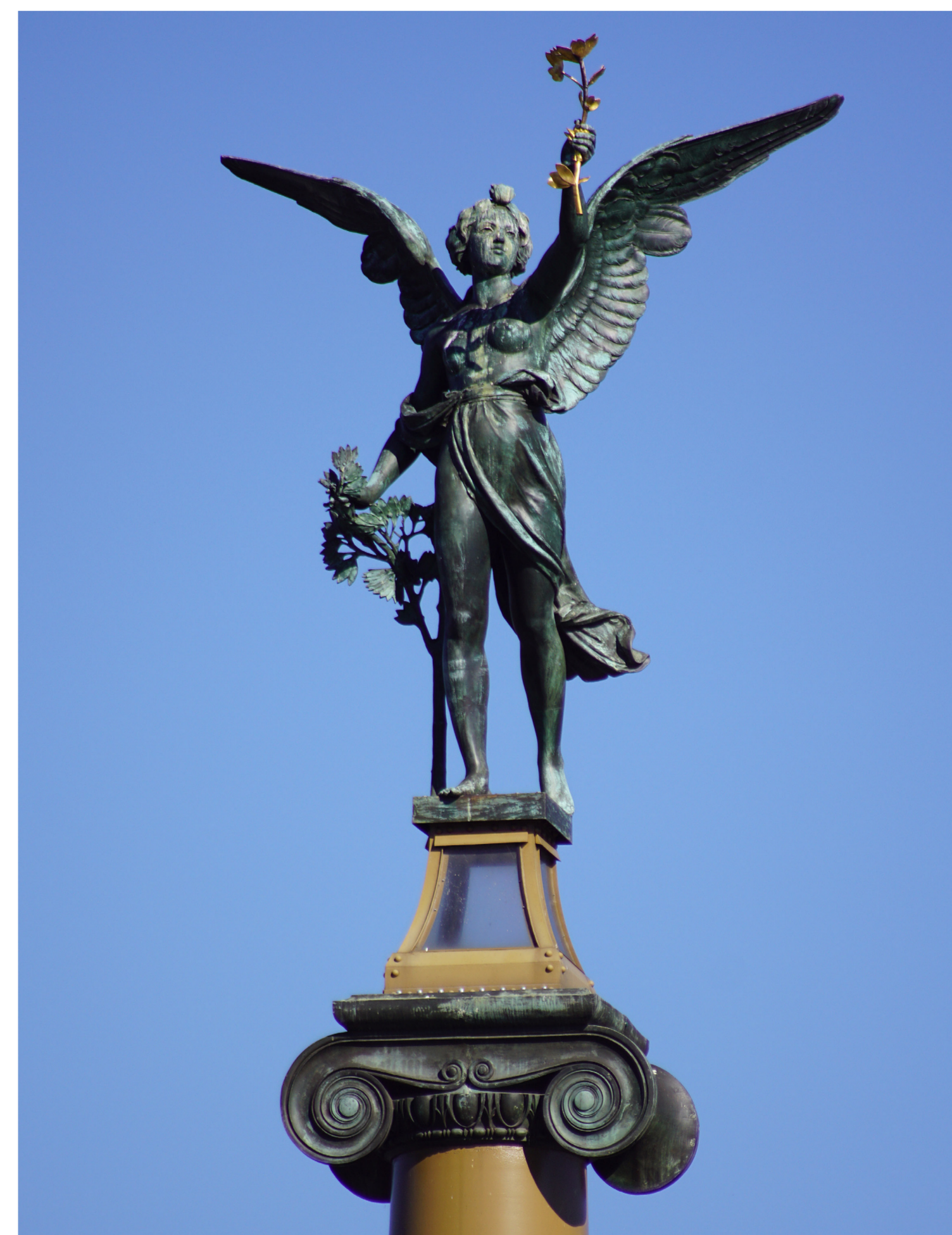
- Conservation-friendly structural surveys provide imperfect information about the physical and chemical properties of the material, thus forcing structural engineers to make conservative assumption and to design for higher strengthening. However, this may damage its heritage value.
- Similarly, a conservation-friendly strengthening may result in a reduced remaining service life of the structure.

Therefore, survey methods and strengthening interventions should be optimised to achieve maximum effectiveness, while minimising damage to the heritage value of the structure.



## Analysis of heritage value of the Čechův bridge in Prague

<b>Age value</b>	The bridge was renewed several times during its existence, some elements were replaced by copies and replicas (light poles, festoons, vases), some elements were completely changed (surfaces of sidewalks, road and tram lanes, windows and doors openings in toll houses). Nevertheless, some elements have been preserved from the time of their creation (e.g. main arched load-bearing beams including abutments, most secondary load-bearing elements, pillars, craftsmen worked stones) - these elements have a significant value of age. Some other elements were replaced decades ago by copies (lighting poles) and their age value is beginning to take on. The most exposed and worn surfaces of roads and sidewalks are regularly renewed for rational reasons - they cannot reach the age value. The overall current state of the age value is average (3).
<b>Historical value</b>	The era of the construction of the bridge is related to an important period of economic and political growth of the city of Prague in the early 20th century. Between 1893 and 1908, a major urban reconstruction of Josefov quarter took place (until 1850, the Prague Jewish town or Judenstadt). The current Pařížská street was designed as the main street intersecting previous medieval buildings of Josefov according to the model of Haussmann's reconstruction of Paris (1852-1870). The Svatopluk Čech Bridge was designed as a continuation of this street and was to connect the medieval Old Town (South) with the newly planned city districts in the meander of the Vltava River (to the North). The bridge was named after a Czech writer and poet Svatopluk Čech, who died shortly before the bridge was opened. The state of historical value is above average (4).
<b>Use value</b>	The structure serves as an urban bridge, important due to the high density of city traffic. The current state of the use value is excellent (5).
<b>Creative value (artistic)</b>	he structure is decorated with original sculptures and reliefs of very good artistic quality; railings and light poles are complemented by above-standard original decoration and to a much greater extent than similar other bridges. The artistic decoration had a unified architectural concept (Jan Koula) and the works of art were commissioned by several excellent contemporary artists. The state of artistic creative value is excellent (5).
<b>Creative value (technical)</b>	Very good quality of engineer design, calculations were performed by the most respected Czech engineers of the time. Unusual is the use of a very low metal arch, which was criticized at the time of construction as being too daring. The only surviving metal arch bridge in Prague and at the time of construction quite unusual in Europe (a similar construction concept as Pont Alexandre III in Paris, which span of the arch is twice longer and which is few years older). Technologically advanced solution. The state of technical creative value is above average (4).
<b>Craftsmanship value</b>	Quality production, precisely aligned and assembled elements, excellent craftsmanship of cast and wrought elements. The state of the craftsmanship value is above average (4).
<b>Symbolical value</b>	The bridge was intended and it also became a symbol of the Czech national political and economic growth (this can be evidenced by the tender conditions, which were issued specifically for Czech authors and companies, the name of the bridge was named after Svatopluk Čech, a prominent Czech poet and writer of the national revival who died only few months before the opening of the bridge). From this point of view, the construction has an above-standard symbolical value. The current state of the symbolic value is above average (4).
<b>Scientific value</b>	The structure was never intended and was never used for scientific experiments. Just standard historical, heritage and technical research is carried out here. The current state of scientific value is below average (2).



## E-P (Evaluation by Parts) Method

A special E-P method was proposed for the assessment of the effects of surveys and repairs on the heritage value of historic bridges, being a specific type of industrial heritage. The E-P method relies on the fact that the heritage value is a complex notion which can be easier analysed by parts. Each of these parts is specifically sensitive to surveys, repairs or to strengthening methods. The analysis by the E-P method is demonstrated by the case study of the Čechův most in Prague.



<b>Social value</b>	The end of the 19th century brought a strong social pressure from two groups of citizens (Bubeneč and Letná on the one side and Malá Strana on the other side) to build a bridge from the Old Town towards Letná, resp. to Malá Strana. The Bridge of Svatopluk Čech built in 1908 won in time, compared to the later Mánes Bridge to Malá Strana (1914). In the 1950s, a gigantic Stalin monument was built on the axis of the bridge on the Letná Hill. In 1989, during the Velvet Revolution, the hill above the bridge was a meeting place of young people and students, and in 1991 a statue of the Metronome by Vratislav Novák was placed here. The state of social value (including the Letná Hill, accessible by stairs), is above average (4).
<b>Spiritual value</b>	The structure has no spiritual value. (On the contrary, the spiritual value of the Charles bridge is very high considering the conditions of its founding and statues of saints) (0).
<b>Urbanistic value</b>	The bridge was intended as an important part of the urban development of Prague. Pařížská street (formerly Mikulášská) leads to the bridge from the Old Town, and its further extension by a street or a tunnel connecting the Old Town and Letná was planned. However, this plan was not implemented. The current state of urban value is therefore average (3).
<b>Landscape value</b>	The bridge is an important part of the picturesque city landscape along the Vltava river. The current state of the landscape value is above average (4).
<b>Uniqueness value</b>	The bridge is a part of a complex of Prague bridges, however it is structurally and artistically different; it is unique in the Central European context. The current state of the value of uniqueness is between above average and excellent (4-5).
<b>Typicality value</b>	The construction is typologically common (bridge); however, this bridge is unique in terms of both load-bearing structure and decoration. The design was never intended for series production. The state of the typicality value is weak (1).
<b>Integrity value</b>	The structure was partially damaged in traffic accidents and also due to insufficient protection against corrosion. Some elements were replaced, some fundamental material changes took place (road surfaces and sidewalks). Due to large compositional changes (relocation of toll houses) in the 1950s, it can no longer meet the original integrity from the time the structure was erected, yet it is possible to consider the newly set integrity from the late 1950s. Since 1995, the bridge has been protected as a part of the Historic Center of Prague listed on the UNESCO World Heritage List, so its integrity is closely monitored. The current state of the integrity value is average (3).
<b>Authenticity value (material)</b>	The bridge has been protected since 1958 as a part of the heritage conservation area of Prague and since 1975 it has been individually registered as a cultural monument. During its existence, its close surroundings were significantly changed during the 1950s (relocation of the chapel of St. Mary Magdalene, relocation of toll houses), later it was repaired several times, since the early 1970s already under the supervision of the heritage preservation authority. Some original elements were replaced before the cultural protection (e.g. the original Zorés steel sheets were replaced by rolled beams in combination with the sheets), some already under (the original paved road surfaces were replaced by bituminous ones). Many elements have been replaced by copies or replicas. The current state of the material authenticity value is average (3).
<b>Authenticity value (non-tangible)</b>	Due to the compositional changes in the 1950s it is no longer possible to achieve the original intangible authenticity from the time the structure was created. The reduction of intangible authenticity is also caused by the change of the original surfaces to completely different ones (e.g. road surfaces). At present, intangible authenticity is respected by the effort to use materials and craftsmanship procedures similar to historical ones, but only to an economically and operationally sustainable level. The current state of the value of intangible authenticity is below average (2).
<b>Transformation value</b>	The structure can only be used as a bridge. In the case of insufficient resistance, the road and tram traffic can be reduced, extremely down to a pedestrian traffic only. However, there is no other reasonable way to transform/convert this structure. The state of the transformability value is below average (2).