

Concept of reconstruction of Libeň bridge in Prague

P. Tej*, J. Kolísko and P. Kněž

Czech Technical University in Prague, Klokner Institute
Šolínova 7, 160 00, Prague, Czech Republic
e-mail: petr.tej@cvut.cz, web page: <http://www.klok.cvut.cz/en>

ABSTRACT

The Libeň bridge in Prague is a cultural and technical heritage of concrete construction of the beginning of the twentieth century. The bridge was designed by architect Pavel Janák, the founder of cubism in architecture. According to experts, the Libeň bridge is the only example of the application of cubist morphology to the bridge structure. Evaluation of Libeň bridge structural condition is an up-to-date topic leading to decision whether this bridge should be repaired or replaced by a new bridge. The paper deals with the static and dynamic loading tests supplemented with additional FEA models for condition assessment of the bridge. The main part of the contribution is the design of reconstruction of vault part across Vltava river using UHPFRC. The concept of the enhance of the bridge condition is based on adding new thin layer on the upper vault surfaces made of R-UHPFRC (reinforced, ultra-high performance concrete). The UHPFRC layer is supplemented with a standard reinforcement located in the main stress direction to provide a reliable response to tensile stress. Reinforced concrete bridge structures are exposed to extreme effects of aggressive environmental influences, especially chlorides, which will damage most exposed components in most bridges for a long time before their planned life. UHPFRC material is suitable for repairs of these structures and especially due to its impermeability and high resistance. By using it appropriately, it is possible to increase the service life and load capacity of the structure. Reinforcement of bridges using this material has already been realized on several projects in Switzerland (Prof. Eugen Brühwiler), Japan and the United States (Floyd River Bridge in Iowa, Bridge at Sapporo, Bramois Bridge, Chillon Viaduct). The existing decking is roughened is made by milling, which ensures removal of non-bearing layers and is subsequently cleaned with pressurized water. Reinforcements, most often in the form of nets, are added to the surface prepared in this way. The application of the UHPFRC itself is then performed by a special finisher in the required thickness. The bonding of the existing concrete with the new layer is ensured only by the adhesion of the UHPFRC material without the need to apply coupling elements, ie without drilling and gluing the reinforcement to the existing structure. After thorough treatment of the concreted layer, a layer of asphalt concrete can be applied directly to the R-UHPFRC layer without additional insulation.

REFERENCES

- [1] E. Brühwiler, "Enhancement of RC using Structural UHPFRC: UHPFRC Short Course". *EPFL*. France: IABSE, 2018
- [2] SIA 2052. Ultra-High Performance Fibre Reinforced Cement-based composites (UHPFRC): Construction material, dimensioning and application. Lausanne, Switzerland: EPFL-Swiss Federal Institute of Technology, 2016.
- [3] NF P 18-470. Concrete - Ultra-high performance fibre-reinforced concrete: Specifications, performance, production and conformity. 2016-07-P. France: AFNOR, 2016.
- [4] NF P 18-710. National addition to Eurocode 2 - Design of concrete structures: specific rules for Ultra-High Performance Fibre-Reinforced Concrete (UHPFRC). 2016-04-P. France: AFNOR, 2016.