

Two New Bridges across Sava River in Zagreb

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Summary

The sustainable development of the Sava River banks area in Zagreb, as the most dominant natural and urban city motif, is planned to make the capital of Croatia a better place to live in. The improvement of this area, so far used only as a protection from floods, would be achieved by the complete river integration into the city and sufficient transport links between the city parts. Solving the problem of the inadequate capacity of the Sava River crossing in Zagreb, the public competitions have been organized for the preliminary bridge designs for the two new bridges located near the lakes, Jarun and Budek. In this paper the two winning solutions are shown. When they will be built, the Jarun Bridge, asymmetrical cable-stayed bridge with one inclined pylon, and the Budek Bridge, a continuous steel girder bridge comprising intersected arches forming frames, would be modern representatives of the worldwide-known Zagreb school of bridge engineering.

Keywords: sustainability, development, city bridge, river, public competitions, preliminary design

1. Introduction

The long-term solution of efficient and high-quality transport infrastructure and the Sava River integration into the city, balanced with the requirements to protect natural and man-made environment, are recognized as the major projects to make Zagreb modern and sustainable European metropolis.

Solving the problem of the inadequate capacity of the Sava River crossing in Zagreb, the City Council of Zagreb and the Croatian Society of Structural Engineers organized public competitions for the preliminary bridge designs for the two new bridges located near the lakes, Jarun and Budek, popular recreational and sports areas. Bridge design competition for both bridges posed strict requirements with respect to aesthetic value and blending with natural and urban environment. The new bridges should be city landmarks providing six traffic lanes, and light rail crossing. All present-day bridges across Sava River in Zagreb provide crossing of main transport arteries – road or railway. In order to liven up the riverbank and stimulate its use as recreational are, further pedestrian crossings would be most beneficial.

2. Jarun Bridge

The Jarun Bridge, situated in the proximity of the Jarun Lake, is a part of a major traffic network improvement. The main aim is to connect the western part of the City Zagreb with the main road towards the Adriatic Sea. This high capacity road will also connect two very attractive recreation and sports areas, northern and southern, now divided by the Sava River. The Jarun Bridge is designed as a city bridge and is inserted in the urban structure at the outside perimeter of the city.

For this city bridge asymmetrical layout with one inclined pylon was chosen. The main span is 150 m with the overall bridge length of 625 m. The main span is an asymmetrical cable-stayed bridge with twelve pairs of stays and three pairs of back stays. The superstructure is a continuous box type prestressed girder with constant depth of 280 cm over eleven spans $35 + 2 \times 50 + 2 \times 45 + 150 + 4 \times 48 + 34$ meters long (Fig. 1). The longitudinal layout of the cables is of modified fan type with partial suspension. Cable-stays in two parallel planes are spaced at 10 m longitudinally and 8.5 m in transversal direction.

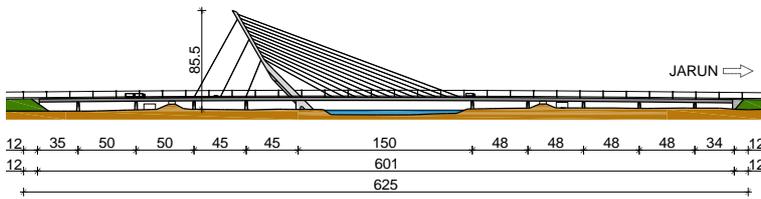


Fig. 1: Longitudinal view of the Jarun Bridge

The width of the six (6) lane carriageway and city railway is $11.5 + 12.0 + 11.5 = 35$ m and the overall width of the superstructure is 42 meters.

3. Bundek Bridge

The Bundek Bridge is situated along the central north-south axis of the Zagreb City. Therefore, the main expected characteristic of this bridge should be its incorporation into its urban surrounding. The six line carriageway comprises three lines for each direction, $0.5 + 3 \times 3.5 + 0.5 = 11.5$ m and 7 m wide city railway line. The Bundek Bridge is designed as a continuous steel girder bridge comprising intersected arches forming frames. Frames are shaped as longitudinal shells which are ellipse in the cross section (Fig. 2). There are three families of arches: arches above the roadway, arches below the roadway for the pedestrian crossing and arches for the composite roadway. Arches above the roadway change in height while the rest of the arches remain constant. The upper, lower and roadway arches connect in steel box girder on both sides, 2.2×1.8 m.

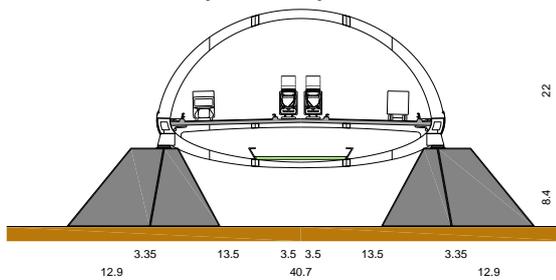


Fig. 2: Cross section of the Bundek Bridge

The bridge has four spans: $2 \times 93 + 2 \times 124 = 434$ m, and total length of 462 m (Fig. 3). This bridge foresees two decks, upper deck is for the road and city railway traffic, and the lower deck is a 12.5 m wide pedestrian causeway.

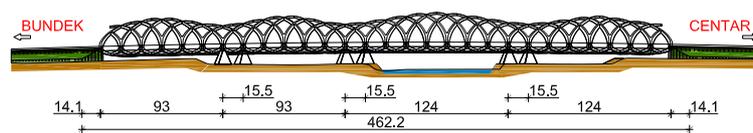
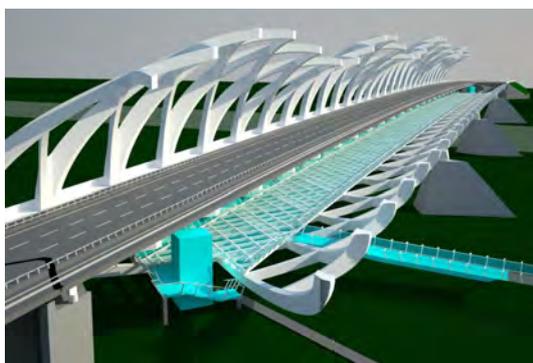


Fig. 3: Longitudinal view of the Bundek Bridge

This unusual structure will perfectly blend into its urban surroundings. The inspiration was in part drawn from biology which is best shown in the anatomy of the structure.

4. Conclusions



The sustainable development of the Sava River banks area in Zagreb, as the most dominant natural and urban city motif, is planned to make the capital of Croatia a better place to live in. The improvement of this area would be achieved by the complete river integration into the city and sufficient transport links between the city parts, divided by the river. First of this major project are the Bundek and Jarun Bridge, shown in the paper. When they will be built, would be modern representatives of the worldwide-known Zagreb school of bridge engineering.

Fig. 4: Vertical organization of the Bundek Bridge