

# New Bridges across the Danube and Sava River in Serbia

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**Abstract** The short presentation of bridges across the Danube and Sava River, recently completed or under construction or in design stage, are given in the paper.

The new railway/roadway bridge across the Danube in Novi Sad (two steel arches with 219m & 177m main spans), constructed in 2018. It was open for railway traffic in 2022.

The new highway bridge across Sava River in Belgrade at Ostružnica (downstream new steel box beam structure, with 198m main span) in the scope of Belgrade Bypass was finalized 2020.

The twin old upstream steel box beam structure was retrofitted in period 2022-2023. The highway bridge across Sava River at Obrenovac (two parallel continuous girders of prestressed concrete, 175m main span) was finalized in 2020.

The highway bridge across Sava River at Šabac (two parallel continuous girders of prestressed concrete, integral in 155m main span) was finalized in 2023.

The highway bridge across Sava River at Sremska Rača (2 parallel steel box beam structures, with 150m main span) was constructed. The final works are in the course.

Under construction: the roadway bridge across the Danube in Novi Sad on fast route (extradosed prestressed concrete continuous girder frame structure, 235m main span, 2 pylons).

Under construction: the roadway bridge across the Danube in Novi Sad (extradosed prestressed concrete continuous girder frame structure 2x240m main spans, 3 pylons).

The construction of new roadway-tramway bridge across Sava River in Belgrade (steel arches tied by steel deck of 166m main span) will start in 2025, after removal of the existing old bridge.

The roadway bridge across the Danube in Belgrade at Ada Huja (in the scope of the EMT speed road) is planned to be built in near future (preliminary design). The roadway-railway Bridge across the Danube at Vinča (in the scope of the Belgrade Bypass) is planned to be built in near future (preliminary design).

## 1 Introduction

In the period after the 10<sup>th</sup> Danube Bridges Conference in 2019, five bridges across the Danube or Sava River were completed / open for traffic (Railway-Roadway Bridge across the Danube in Novi Sad, and across Sava River: Highway Bridge at Obrenovac, Highway Bridge at Ostružnica, Highway Bridge at Šabac and Highway Bridge at Sremska Rača); two bridges across the Danube are now under construction (Roadway Bridge in Novi Sad on state road and Roadway Bridge in Novi Sad on fast route), and four bridges are planned to be built in the near future (3 bridges across the Danube: Roadway Bridge at Bačka Palanka, Roadway Bridge in Belgrade at Ada Huja and Railway-Roadway Bridge at Vinča and one bridge across Sava River: Roadway-Tramway Bridge in Belgrade).

## 2 New Bridges across the Danube

### 2.1 Railway-Roadway Bridge across the Danube in Novi Sad (completed in 2018)

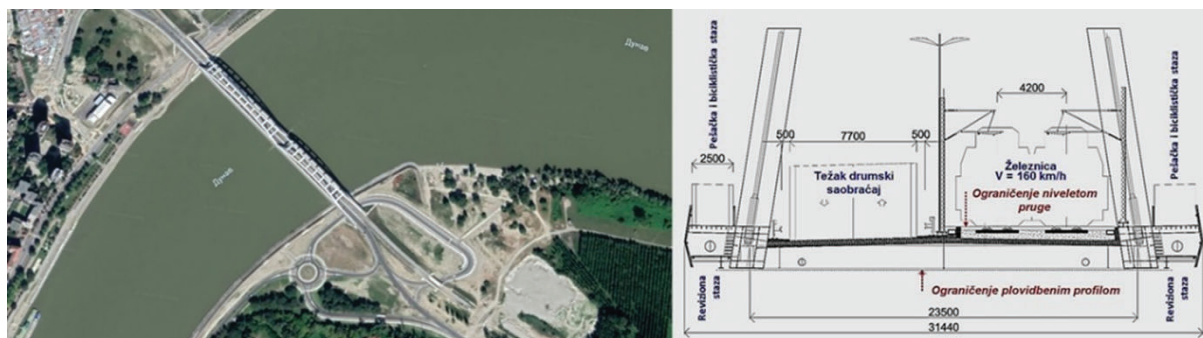
The Railway-Roadway Arch Bridge across the Danube in Novi Sad (Fig. 1), was completed in 2018 on the foundations of former arch concrete bridge destroyed in 1999. It is in the scope of new modernized railway line Belgrade-Budapest. The bridge was open for railway traffic in 2020. It was constructed for two railway tracks (160 km/h), two roadway lanes and two-sided foot & cycle ways. Bridge total length is 474m and bridge width is 31,5m. The Main bridge structure consists of inclined steel tied arches, with network hangers ( $l/h=219/42m$  &  $l/h=177/34m$ ), having composite deck. The 219m span is the longest one in the category of tied arch bridges (network hangers) with two rail tracks. Contractor: JV AZVI S.A., Taddei S.p.A. & Horta Coslada S.L. Design: DEL ING D.O.O & ENCODE D.O.O Belgrade [1], Investor: Serbian Railways A.D. Belgrade.



**Figure 1a:** Railway-Roadway Bridge across the Danube in Novi Sad – Downstream View [1]

### 2.2 Roadway Bridge across the Danube in Novi Sad (completion in 2026)

The Roadway Bridge across the Danube in Novi Sad (Fig. 2), is currently under construction [2]. The bridge is situated on the State Road No 111 [2]. The total length of the Main bridge over the Danube with approach structures on south side amounts 2267m. The Main bridge is extradosed prestressed



**Figure 1b:** Railway-Roadway Bridge across the Danube in Novi Sad – Location View & Cross Section [1]

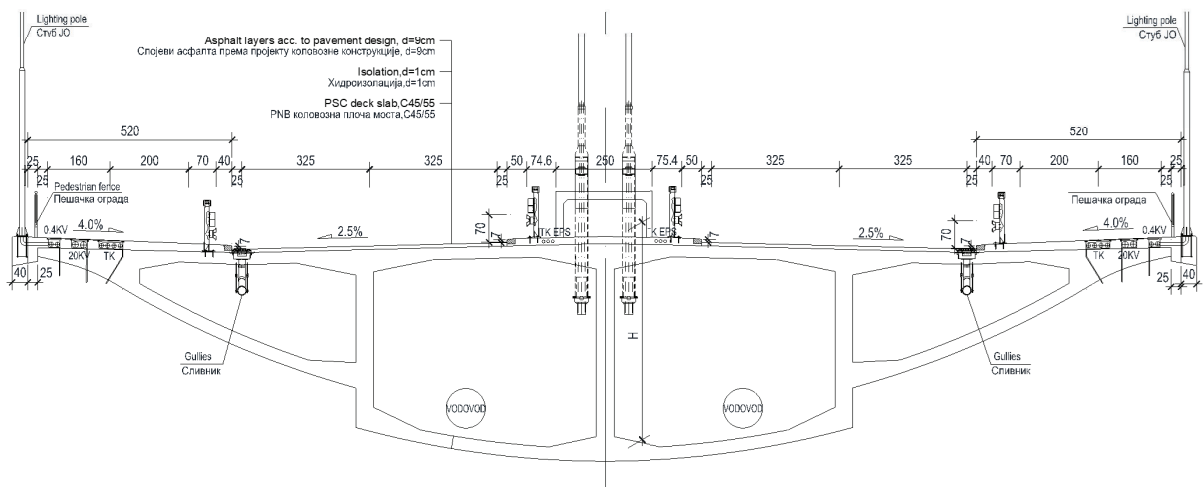
concrete continuous girder frame structure, with spans:  $50+150+2\times 240+150+50$ m, having 3 single pylons (30m height). The deck is a unique box 4-cell cross section (29,4m width), transforming into a 5-cell box girder in the end parts of the bridge. The Main bridge structure is carried out by free cantilever construction, additionally supported by stay cables and approach structures (span by span method). It is planned to complete the bridge in 2026. Contractor: China Communications Construction Company Ltd. Belgrade Branch (CCCC), Investor: Public Enterprise Roads of Serbia Belgrade (PERS).

### 2.3 Roadway Bridge across the Danube in Novi Sad on fast route (completion in 2025)

The Roadway Bridge across the Danube in Novi Sad (Fig. 3) is currently under construction.. The bridge is situated on the State Road No 111, section Novi Sad - Ruma [3]. The total length of the bridge (1663m) includes the Main bridge over Danube river and approach structures on north and south side. The Main bridge is extradosed prestressed concrete continuous girder frame structure, with spans:  $134+235+134$ m, having 2x2 pylons (25m height). The deck is a unique box of 4-cell cross section (28m width except 32m width at the pylons). The Main bridge structure is carried out by free cantilever construction, additionally supported by stay cables. It is planned to complete the bridge in 2025. Contractor: China Communications Construction Company Ltd. Belgrade Branch (CCCC), Investor: Public Enterprise Roads of Serbia Belgrade (PERS).

### 2.4 Roadway Bridge across the Danube in Belgrade at Ada Huja (design stage)

The Roadway Bridge across the Danube & over Ada Huja Island (3.500m total length) is planned to be constructed in the scope of EMT speed road. Currently the preliminary design is completed in variant 2 (Fig. 4). The Main bridge part (1.070 m length) has two twin continuous pre-stressed concrete box beam type structures (integral in main spans), with main spans:  $4\times 180$ m. Bridge width:  $2\times 16,15$ m (+0,20m). Start of construction: 2025/26. Design: Consortium DB Engineering, Ponting & Gradis [4]. Investor: City of Belgrade. Contractor: to be chosen.



**Figure 2:** Roadway Bridge across the Danube in Novi Sad – Photo Visualization and Cross Section [2]

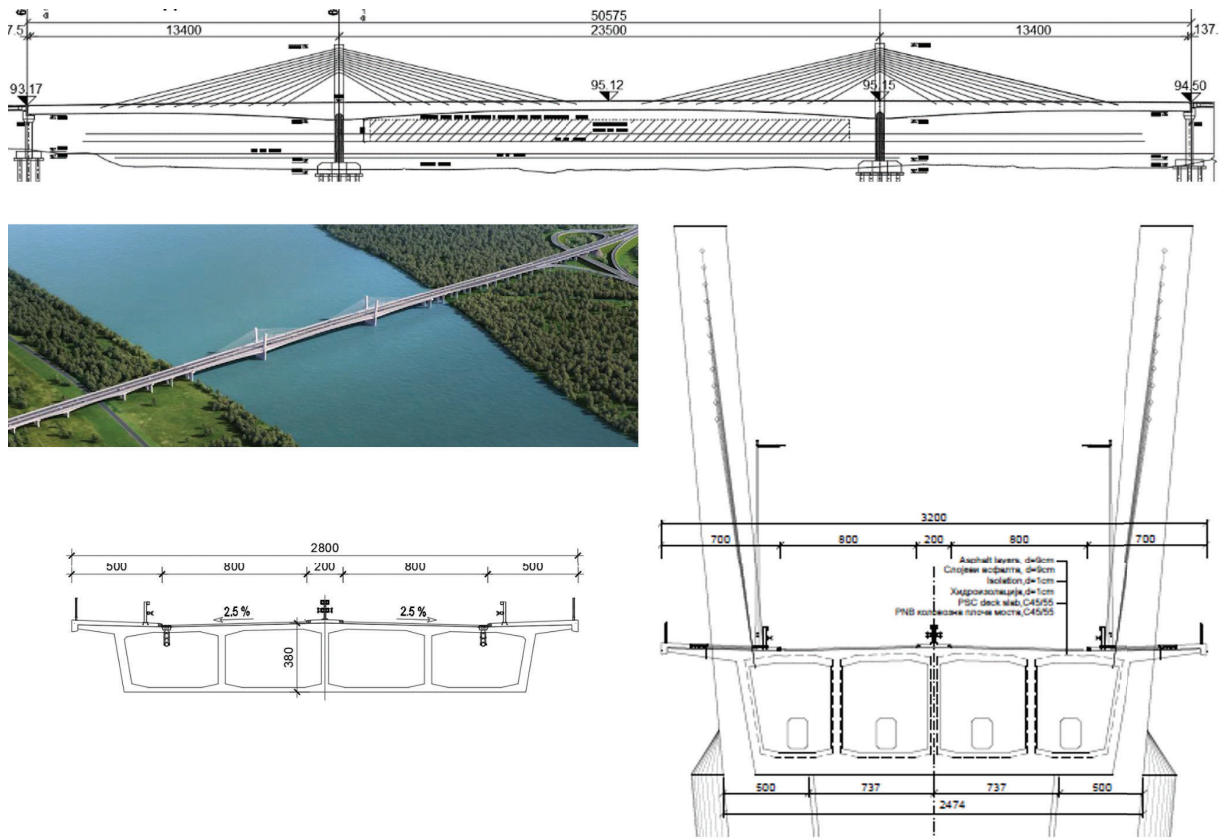
## 2.5 Railway-Roadway Bridge across the Danube at Vinča (design stage)

In the scope of the Belgrade Bypass, it is planned to build the Railway-Roadway Bridge across the Danube at Vinča (Fig. 5). Preliminary design is completed [5]. The Railway-Roadway Bridge across the Danube at Vinča (total length: 1,258m left carriageway, 1,308m right carriageway & 1,355m railway) has Main bridge parts (over the Danube) designed as three double steel arches tied by steel deck, with spans: 156m, 240m, 156m. Bridge width: 38,3m. Design: CIP Traffic Institute Belgrade. Investor: PERS & Railways Serbia. Contractor: to be chosen.

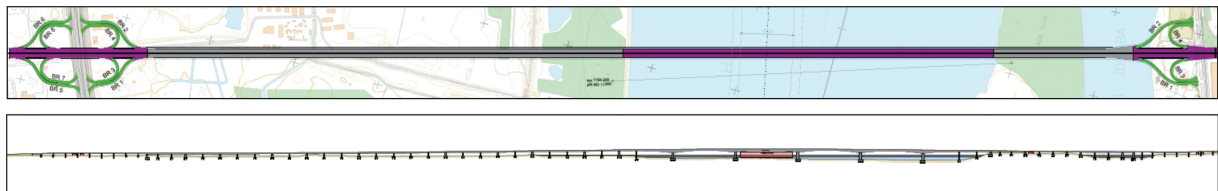
## 3 New Bridges across Sava River

### 3.1 Highway Bridge across Sava River at Sremska Rača (completion in 2024)

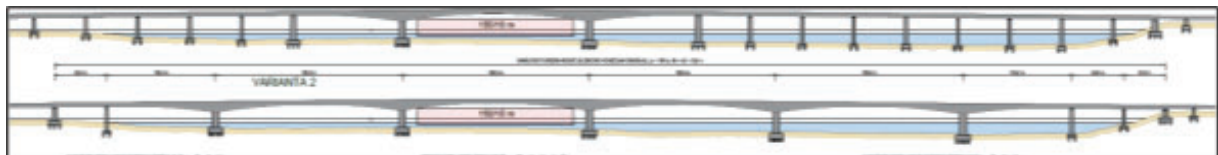
The bridge over Sava River on the highway Kuzmin - Sremska Rača consists of two neighbor steel bridge structures; each has  $\sim 15m$  wide deck with 2 traffic lanes (Fig. 6). The main bridge across



**Figure 3:** Roadway Bridge across the Danube in Novi Sad on Fast Route – Side View, Photo-visualization & Cross Sections [3]



**Figure 4a:** Roadway Bridge across the Danube in Belgrade at Ada Huja in (3.500m total length) – Plan View & Side View [4]



**Figure 4b:** Main Bridge over the Danube at Ada Huja – Variant 2 selected (main spans 4x180m, total length 1070m) [4]

Sava River, 330m length, having spans 90+150+90m, consists of 2 steel box beams with 5m constant depth. The trapezoidal single-cell box section, with both sided cantilevers, has an upper flange consisting of orthotropic plate. The bridge length, with approach concrete structures, amounts to 1321m. The piers are common for both bridge structures. The main steel bridge structure [6] was

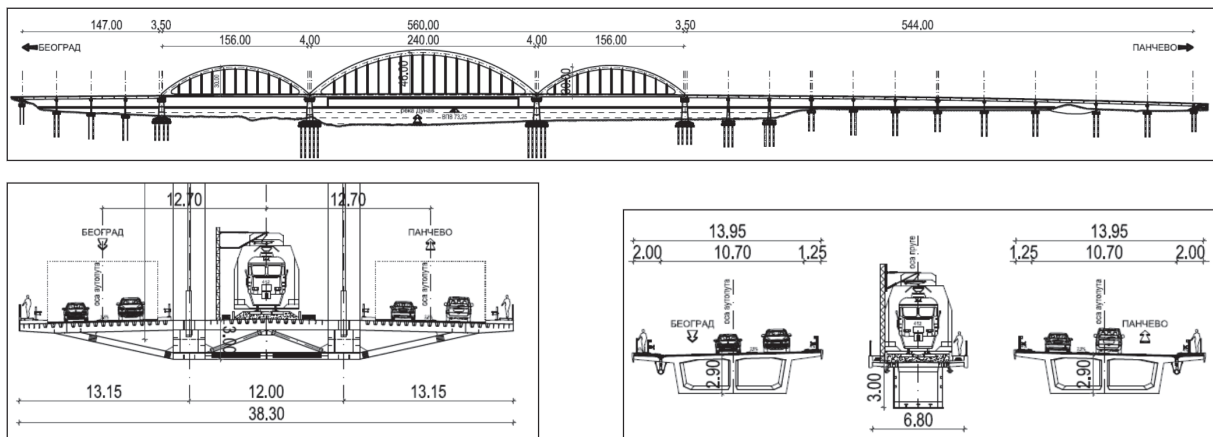


Figure 5: Railway-Roadway Bridge across the Danube at Vinča – Side View and Cross Sections [5]

fabricated in Turkiye, transported, assembled and erected (incremental launching) in 13 months. The bridge structure was completed. The final work is in the course. The Design: CIP Traffic Institute Belgrade. Contractor: Tasyapi - Turkiye. Investor: Public Enterprise Roads of Serbia.

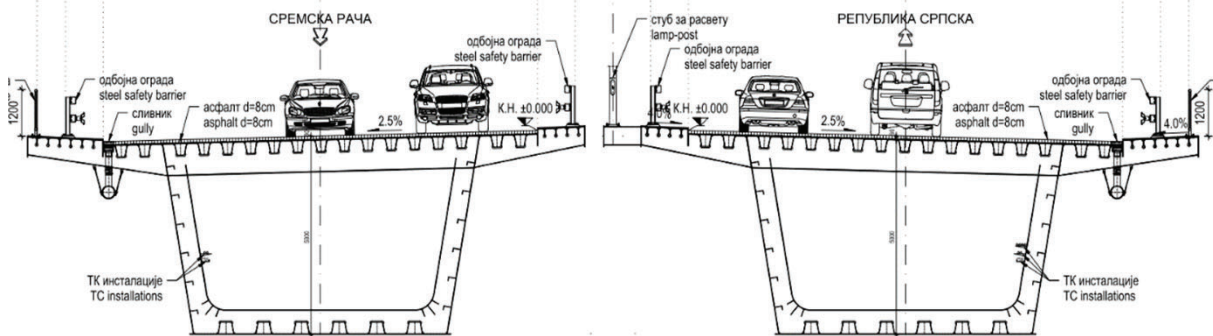


Figure 6a: Highway Bridge across the Sava River – Cross Section [6]

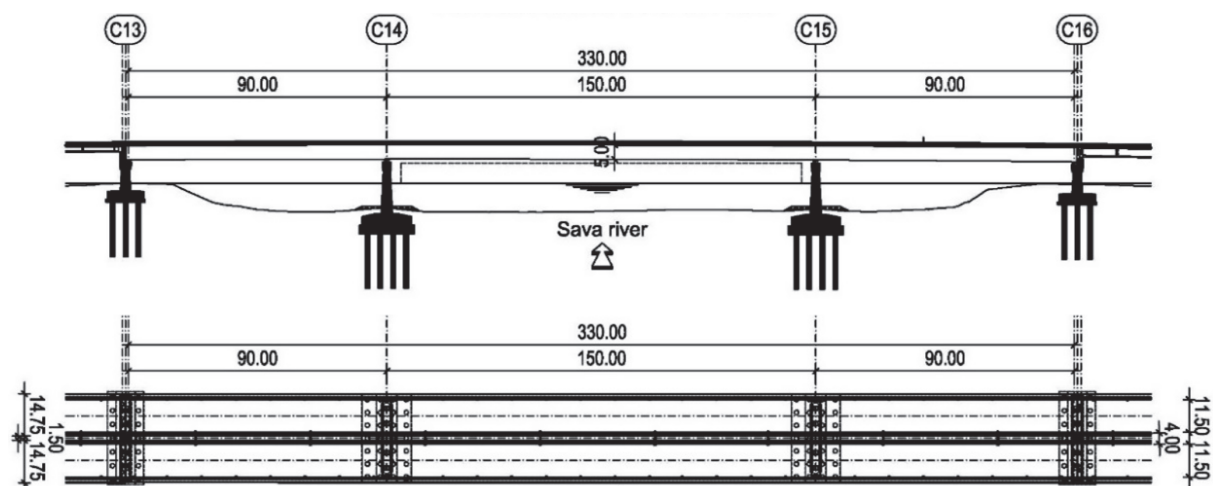
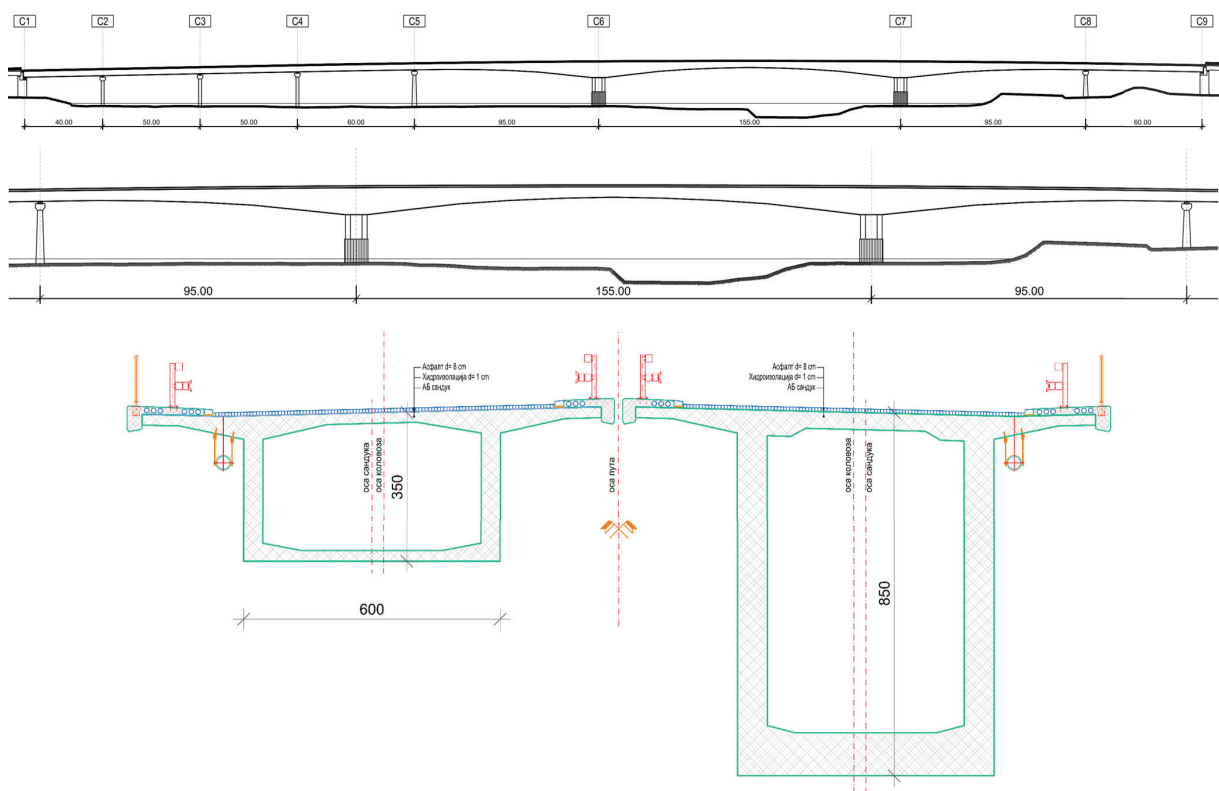


Figure 6b: Highway Bridge across the Sava River – Side View and Plan View [6]

### 3.2 Roadway Bridge across Sava River at Šabac on fast route (completed in 2023)

The Roadway Bridge across Sava River at Šabac on fast route (Fig. 7) has a layout mostly influenced by the bridge location and dimensions of navigation clearance 120x9m. The spans 40,0+50,0+50,0+60,0+95,0+155,0+95,0+60,0m form the total structure length of 605,0m. The main girder of the structure over the river is a prestressed concrete box girder, with parabolically changeable depth (from 3,60 to 8,50m) and vertical ribs at a constant distance of 6.0 m. The cantilever construction method was applied. The river piers are short, and the bridge structure is integral in the main span (155m). Two identical twin concrete bridge structures are constructed. The bridge was completed in 2023 [7]. Design: Mostprojekt Belgrade. Contractor: AZVIRT – Belgrade Branch. Investor: PERS Belgrade.



**Figure 7a:** Highway Bridge across Sava River at Šabac – Side View and Cross Sections [7]

### 3.3 Highway Bridge across Sava River at Obrenovac (completed in 2020)

The Highway Bridge (in the scope of a new motorway “Miloš Veliki” from Belgrade to the south) was constructed in 2020 (Fig. 8). The total length of the bridge (with approach bridge structures) amounts to 1.581 m. The main bridge part (370 m length) has two twin continuous prestressed concrete box beam type structures (integral in main span), with parabolically variable depth: 4,0–10,5 m, having spans: 96,0+175,0+96,0 m over Sava River. Bridge width: 2x14,6 m (+0,20 m). The cantilever construction method was carried out. Design: CIP Traffic Institute Belgrade [8]. Contractor: CCC China. Investor: PERS Belgrade.



**Figure 7b:** Highway Bridge across Sava River at Šabac –Downstream Photo [7]

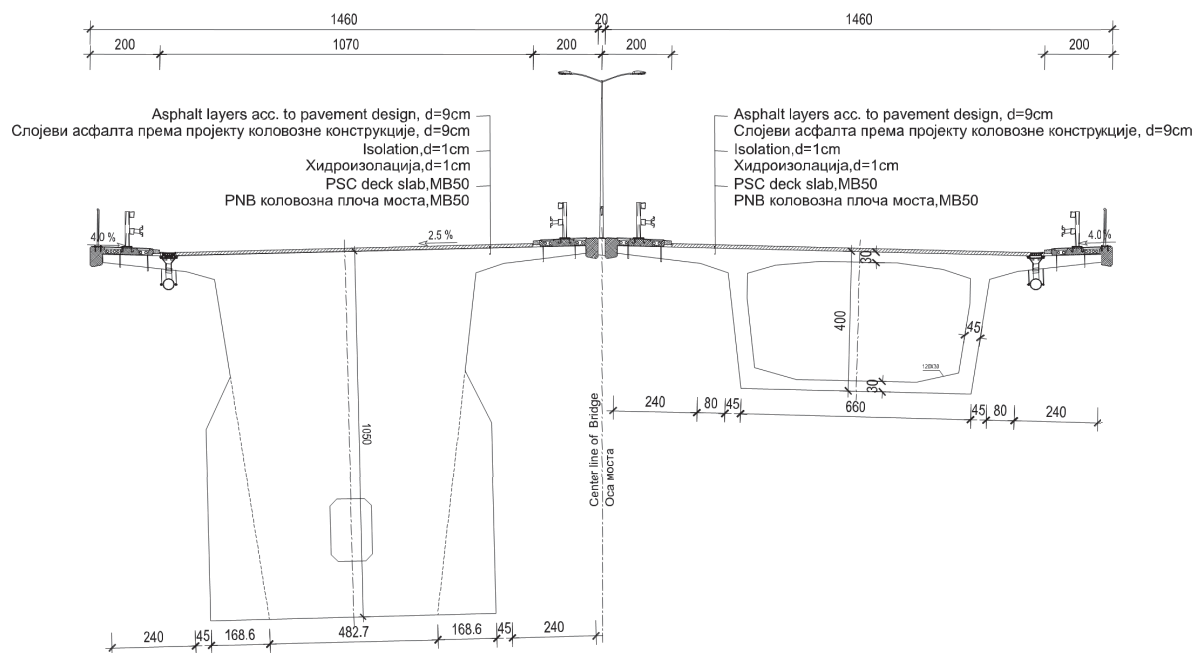
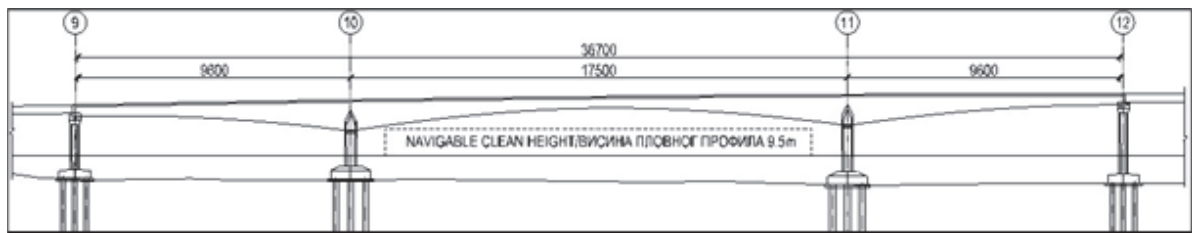
### **3.4 Highway Bridge across Sava River at Ostružnica (completed in 2020)**

In the scope of the south-western bypass around Belgrade, it was completed the new (left deck) half of the Highway Bridge at Ostružnica, with total length of 1.963 m, containing the main bridge part as steel continuous beam over Sava River (Fig. 9), with spans: 99,0+198,0+99,0+99,0+88,0 m. The highway bridge half width is 14,3m. Two years after completion of the new bridge half (left deck) in 2020, the old right deck bridge structure was retrofitted in 2022. Design: Mostprojekt Belgrade. Investor: Public Enterprise Roads Serbia (PERS). Contractor: Strabag Serbia [9].

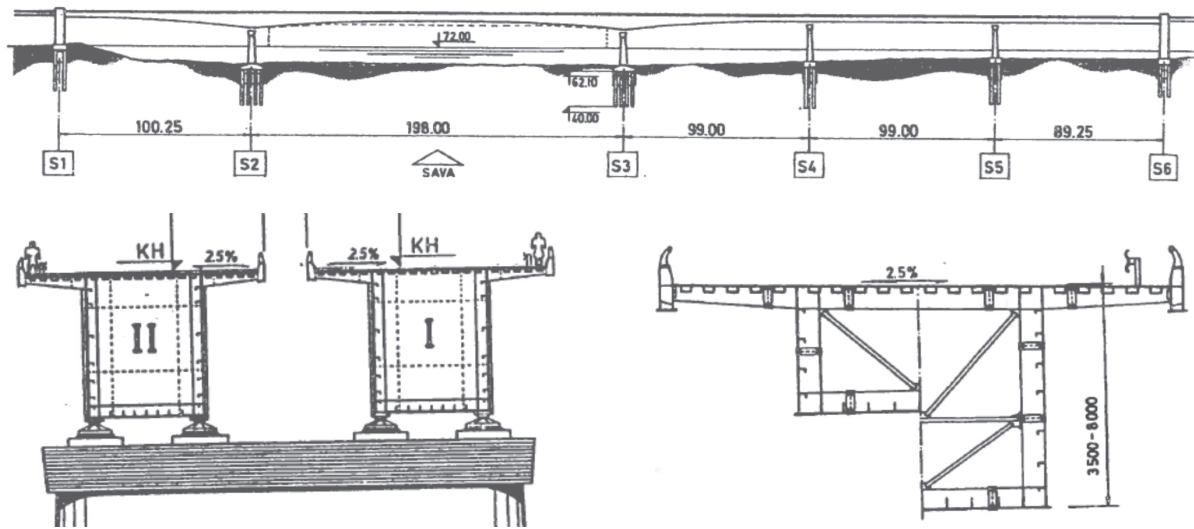
### **3.5 Roadway-Tramway Bridge across Sava River in Belgrade (completion in 2027)**

The Roadway-Tramway Bridge across Sava River in Belgrade city (Fig. 10), after preliminary design and building permit design, it is currently in the final design stage [10]. Total bridge width: 37,2 m, containing the width of carriageway and both-sided cycle tracks / footpaths. Bridge length amounts 420m, with spans: 54,0+73,0+166,0+73,0+54,0m. The bridge structure type (main span over Sava River) may be classified as the double steel arch tied by steel deck. Preparatory works for removal of the existing steel arch bridge (built in 1943 on the same location) started in 2024, and consequently the construction of new bridge is planned to begin by the middle of 2025. Preliminary design: CIP traffic Institute Belgrade. Investor: City of Belgrade. Contractor: POWERCHINA.





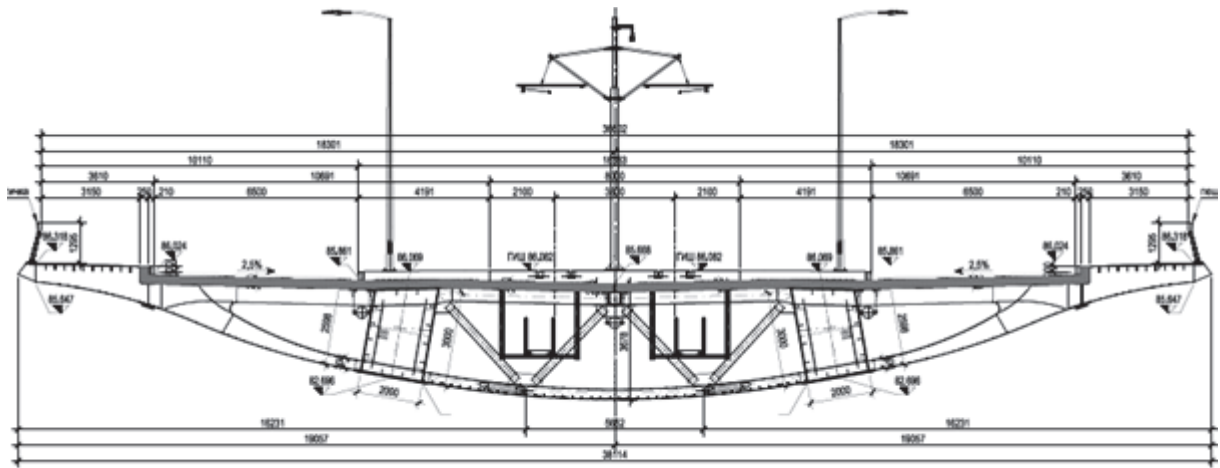
**Figure 8:** Highway Bridge across Sava River at Obrenovac – Side View, Cross Sections and Downstream Photo [8]



**Figure 9:** Highway Bridge across Sava River at Ostružnica – Side View, Cross Sections and Upstream Photo [9]



**Figure 10a:** Roadway-Tramway Bridge across Sava River in Belgrade – Side View [10]



**Figure 10b:** Roadway-Tramway Bridge across Sava River in Belgrade – Cross Section and Photo-Visualization [10]

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