CONSTRUCTION WORKS OF THE TISZA BRIDGE IN THE M 44 EXPRESSWAY SECTION BETWEEN LAKITELEK-TISZAKÜRT


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Work commenced in the first half of 2019 on the newest section of the M 44, connecting Nagykőrös to Békéscsaba, between Lakitelek and Tiszakürt. A new 556-metre-long Tisza bridge was built here by A-Híd Zrt., based on the plans of Uvaterv Co. (professional designer), with a maximum span of 152 metres. The project is implemented by National Infrastructure Development Ltd., the main contractor was Duna Aszfalt Ltd. The traffic started on the superstructure in December 2021 (Fig. 1).

KEY DATA OF THE TISZA BRIDGE:

Crossing angle:	90°
Span:	45.00+76.00+152.00+76.00+ 40.40+40.40+40.40+39.05 m
Riverbed span:	147.90 m
Superstructure length:	556.55 m
Deck slab width:	23.12 m
Superstructure surface:	12,867 m^2
Foundation:	bored pile foundation
Superstructure:	cable-stayed bridge with composite superstructure; reinforced steel girders and reinforced concrete slab

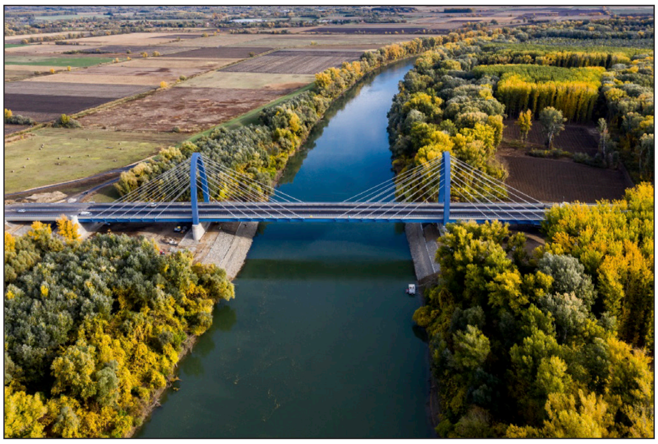


Fig. 1: Tisza bridge

RIVER BRIDGE – SUPERSTRUCTURE

The riverbed bridge is a three-span cable-stayed bridge with a maximum span of 152.00 m. Steel – concrete composite superstructure, with two steel box girder and a reinforced concrete slab with a parallel belt, is suspended on the outside by stay cables on half-elliptical reinforced concrete pylons.

The superstructure consists of a main girder, pylons, and stay cables. The steel main girder consists of two single-celled box girders with sloping webs, and function as a composite superstructure with an on-site concrete slab.

PYLONS

The cross-sectional area of the pylon is 3.00 x 2.50 m, with the highest point at 37.64 m above the track level and the highest point above 52 m above the ground level. The cables are symmetrically spaced, spaced evenly along the elliptical axis of the pylon at the top and located at 8 m intervals along the length of the superstructure at the bottom. The tension cables were leaded through the saddles in the pylon.

Custom-made Ø40 rebars were an essential part of the reinforcement. Due to the limited cross-section (there was no space for conventional couplers in most parts of the superstructure), special reinforcing steel couplers had to be used. *(Fig. 2).*

The pylon was built in thirteen concreting phases, with climbing formwork. In total, around 70 tonnes of formwork material were used to construct the arches. The height of the strokes varied between 3 and 4 metres, closely matching the phases of the reinforcement. For each phase, detailed formwork plans have been drawn up, taking particular care to manage the constant deformation due to the special shape of the pylon. Plenty of custom-made formwork panels and boxes were needed.

In order to work efficiently and safely, it was expected that in addition to the current working level, technological working

Fig. 2: Pylons

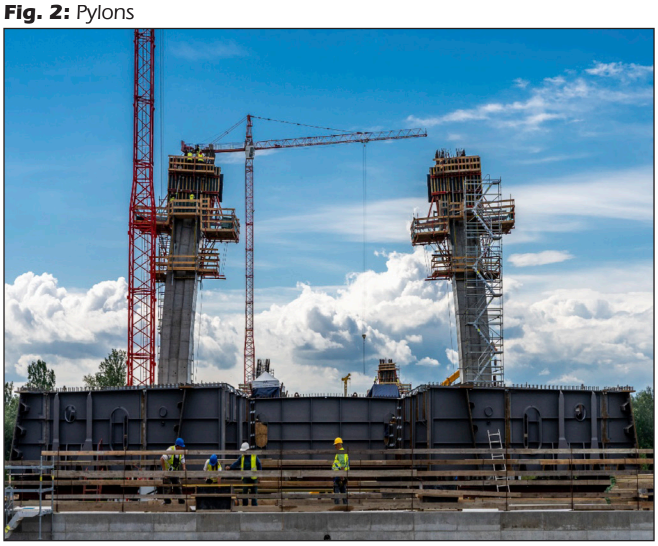


Fig. 3: Working platform

levels would be established at the upper and lower levels of the formwork.

With this system, phases I-X could be completed.

The connecting fittings in the pylon (saddles, flight direction lights, etc.) made our task even more difficult.

A new solution was needed for the formwork of the pylons in phases XI-XIII, as the previously used formwork system was no longer usable due to the high inclination. *(Fig. 3,4)* A-Híd Zrt. Technical Department and the colleagues working on the site have designed and developed a working platform consisting of modular elements created by the pylon legs being supported together. This platform provided both safe working conditions and adequate support. The scaffolding and formwork system for the upper phases were completed from this working level.

The pylon construction works were served by 1 Wolff WK 91 SL type tower crane, respectively.

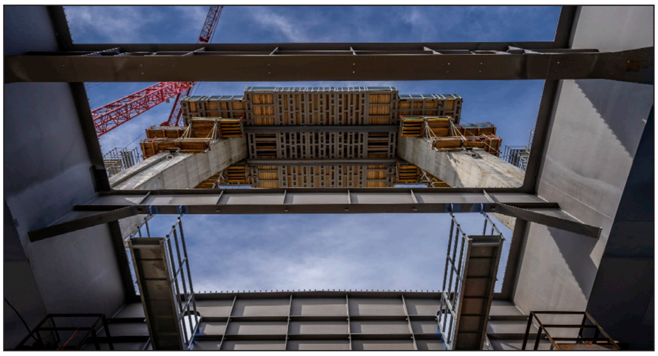
During the break between the two phases of the tensioning works, the painting of the pylon in "pigeon blue" colour was also started, partly using the alpine technique.

MAIN BRIDGE

The steel superstructure of the riverbed bridge under the slab, connected by cross girders, was erected and pushed from both flood plains towards the middle of the bridge. After the steel superstructure was completed and adjusted, the cables were installed and tensioned simultaneously with the on-site concrete slab in several phases. The factory and on-site joints were made by welding. *(Fig. 5)*

In order to serve the formwork of the slab, it was necessary to build a temporary moving working level between the box girders. The formwork wagons were in operation all day, as the formwork of the slab, the concreting and the reinforcing works were continuously. The concreting was carried out in five steps according to the phasing diagrams provided by the designer - in co-ordination with the tensioning of the stay

Fig. 4: Working platform



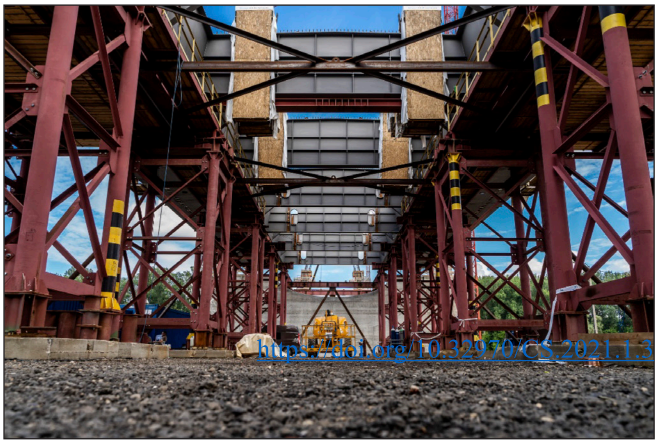


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Fig. 5: Erecting area

cables. The concreting of Phase I (one field on the right and one on the left bank) was a spectacular operation, as it was carried out in synch with 4 concrete pumps. With the next concreting phase (also two segments), followed by the placement of the joints, the riverbed bridge slab was connected to the floodplain bridges on both the right and left banks. Concreting works of the riverbed bridge slab continued after the 2nd tensioning step (last two cable groups).

APPROACH BRIDGES

The pillars are made with a 7.70 m wide 1.50 m high pile head beam and 1.80 m diameter columns.
Superstructure of the approached bridges were made with using prefabricated prestressed reinforced concrete beams.

The approach bridge superstructure is an on-site concrete slab with composite precast prestressed reinforced concrete bridge girders. A total of 127 bridge beams were built for the two floodplain bridges. Due to the limited working space, the lifting of the beams had to be carried out with 2 cranes in several cases. *(Fig. 6)*

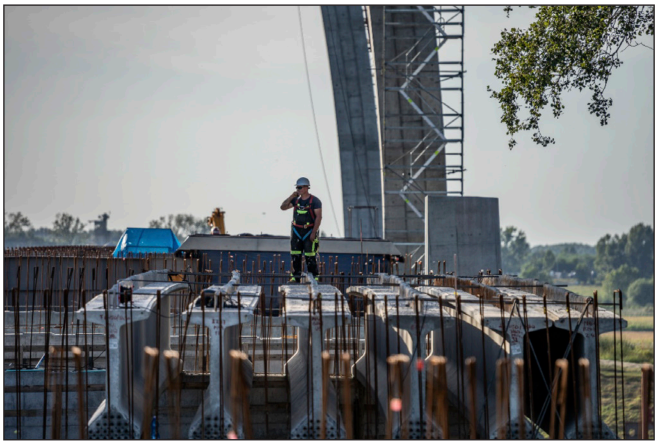

Fig. 6: bridge beams

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