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Pedestrian bridge over Türr-channel Baja, Hungary: a unique arch bridge design

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Abstract

The Danube has a side branch in Baja, the Sugovica, from where the Türr-Channel opens. An innovative pedestrian bridge over the Türr-Channel in Baja, Hungary was opened for traffic in 2015. Bridging over the navigable channel faced serious difficulties due to the high flood level and significant ship traffic. The preliminary studies investigated movable and high positioned deck variations. The completed structure has 62 m span. The upper deck arch bridge is made of steel tube arches filled with concrete and rc. slab for the deck. Minimal structural height was necessary in the midspan to ensure the shipping clearance so the arch has the same plane as the deck in the midpoint. According to the high flood level and low clearance, the safety of the structure is ensured by filling concrete in the main girder tubes. The fabrication segments were assembled at site to 3 crane segments and were lifted to the temporary supports in the river. The concrete abutments became the part of the flood protection system. The unique shell-like cross girders and the slender arch gave a delightful bridge, which became the new symbol of the city. The bridge was built on sand with horizontally bended piles so the calculation had to examine the soil-structure iteration. The dynamic parameters were tested by dynamic load tests with the help of large group of people and with dropped truck.

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1. Introduction

It was an old dream of the city Baja in Hungary to connect the two islands in the middle of the city, the Petőfi and the Pandur-Islands. The first plans and studies were made in the sixties, but for the funds the city had to wait until 2012-2014, when a tender financed the project's realization.

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The construction deadline was 2014.11.20, there was short time for making the detailed design and getting the approval, the building had to start immediately. In a situation like this, getting the approval from the authorities is realized in more steps, the planning follows the steps of the technology, the design work consorts the building method until the completion. As the result of this process, the structure could have been finished before the deadline, the unique bridge could be opened for public after long years of designing preparation.

2. Detailed design

2.1. Location

The obstacle to cross was The Türr-Cut or Türr-Channel, which is an artificial waterway between the Petőfi-Island and the Pandúr-Island. The channel is also used by the Local Danube Directorate as a operational port and winter port, it has huge parking and crossing ship transport. The icebreaker fleet, which is responsible for the de-icing of the whole southern Danube also stations here. As the most important units of the flood protection, they must be able to be deployed under any circumstances.

The flood can fill the whole bed of the channel until the top edge, and even higher, so at the major floods of the recent years the Petőfi-Island was protected with temporary dams. According to ship transport, in time of high flood, ship clearance with significant height had to be taken into consideration. The main problem was that the icebreaker fleet must be able to leave the port even at the highest water level, so a 20 m wide and 9,5 m high clearance is needed at the highest water level ever measured, so the fleet can sail out to prevent a possible disaster.

The Municipals wanted to implement the structure near the northern estuary of the Türr-Channel, as the lengthening of an existing passenger walkway. This was the first location for the bridge at the 0+060 section of the Türr-Channel. In this location, the ship transport of the port should have crossed under the bridge, and the passenger track should have been highly above the water level, above the ship clearance, or a movable bridge would have been needed with a deck possible to open at the time of ship transport. The idea of a new location turned up during pre-planning below the port, so the ship transport would not cross under the bridge daily.

Considering all the possibilities, the cost, implementational and operation difficulties the Customer, the Local Danube Directorate and the designer collectively took the view, that the new bridge must be implemented at the 0+400 section of the Türr-Channel, below the port. This way the icebreaker fleet can operate undisturbed.



Fig. 1. The location

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