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## **Arched Reinforced Concrete Pylon Composite Bridge in Hungary**

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### **ABSTRACT**

In this paper the design and the construction of a unique bridge are presented, and the history of the basic idea is described as well. The bridge spanning over the second largest river is innovative in many ways in Hungary, such as the first bridge with non-prestressed reinforced concrete pylons (allowing tension), the first cable-stayed bridge applying saddles, the first cable bridge with composite stiffening girder, etc. These facts and the immaturity of the antecedent designs repeatedly raised problems to which unique answers had to be found in the detailed design phase.

To bring them into their exact final position, the erection control of the pylon and the composite stiffening girder had to be designed and carried out, which required extremely precise calculation and construction. The building of the half ellipse pylon, which also proved a serious challenge to the contractors is also discussed.

**Keywords:** arched pylon, concrete pylon, cable-stay, composite, stiffening girder

### **1 INTRODUCTION**

In 2005 the city of Esztergom announced an invitation-only design competition at a study level with the title "New bridge over the Danube between Esztergom and Šturovó". One of the versions presented by UVATERV C.C. Ltd. gained the 2nd prize. The span of the riverbed bridge was 200 m, while the required width was 34.5 m.

The point of the idea was to "bridge over" the wide cross-section transversally with an arch like structure and then to suspend the superstructure on it by cables. The structure thus became a cable-stayed bridge with two arched pylons. We checked how it looks when viewed from different points with a simple 3D model. After it was acceptable, we prepared a study and visual plan.

Not when figuring out the form, but only later did we review the international examples of bridges made with similar pylons. We found two, one of them was the Miho Museum Footbridge (1997, Japan), the other was the Lingotto Footbridge (2005, Italy). Since then, more than a dozen similar pylon bridges have been built around the world, but we could not find any information about the design history of them.

We did not let the successful project to get forgotten by continuous showing it in several study plans as a possible version according to our possibilities. Finally, we prepared the Study Plan for a bridge over the river Tisza belonging to the M44 expressway in several versions in 2015 [3]. With a composite stiffening girder, the cable-stayed bridge with an arched pylon proved to be economically competitive and it was also supported by the Client.

The bridge, with its unusual pylon shape and the twisting cable surface, was not a definite success, the design jury was also divided. We thought that although it reminds us of many different