THE ERECTION OF DUNAÚJVÁROS DANUBE-BRIDGE

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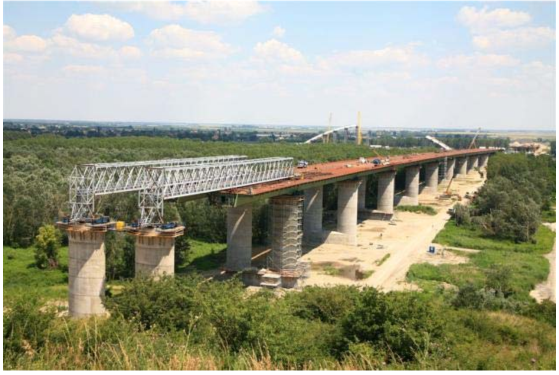
As a part of an extensive highway development program in Hungary a new Danube bridge is under construction in Dunaújváros, about 70 km south of Budapest. The 1676,9 m bridge will be completed in the summer of 2007. The main part of the bridge is a basket handle type tied arch bridge with a span of 307,9 m. The geometrical size, structural solutions and erection method of the bridge required preliminary research and advanced design methodology. Not only the size of the Dunaújváros Danube bridge is remarkable but the applied technologies are unique.

The piers of the arch bridge should had been built in the bed of the river. The contractor wanted to apply the technology used by them at a former bridge in Budapest 15 years ago. We had to modify it because of the much larger dimensions of the pier. According to the original conception prefabricated reinforced concrete elements were placed to the bottom of river bed and there were steel walls elevated above those. After that they pumped out the water from the surrounded site. The dimensions of the piers of Dunaújváros Danube bridge (plum core shaped horizontal section with 42*14m) are so large that the possibility of lifting was doubt. Because of the limit of crane capacity the concrete elements are formwork of the concrete pier and not only protecting elements of the underwater site. So we didn't use steel elements but only concrete ones. The concrete shell elements were prefabricated on the left bank, poured on each other for both piers. We achieved very well fitting joints with this solution. During the prefabrication process the bottom of the bed were swept and steel pipes were vibrated down along the contour of the pier. The head of the piles were cut on a level with the bottom of river bed and covered with plates. The first concrete shell element was placed onto the top of the piles. The piles of the piers were bored from ships directed by rings welded to the stiffening truss elements of the shell. After placing the concrete in the piles the following concrete shell elements were lifted on the former one. Reaching above the water level they punped out the water from the surrounded area, assembled the reinforcement and placed the concrete.

The superstructure on the right bank was erected on the top of 20-25 m high pylons. Our sub-designer proposed and finally designed a subsidiary bridge structure, what moved on the top of the superstructure spanning the following span and supporting the end of the superstructure while it was pushed ahead. The 17m long elements (assemblies) were assembled on the assembling site of Csepel Island, shipped on the Danube to Dunaújváros and lifted onto the tubular scaffolding between 13 and 14 supports. They were welded to the former assembly and the superstructure was pushed ahead by synchronized hydraulic presses. The contractor could achieve a speed of 17m/5 hours. During this process they controlled the forces on the subsidiary bridge structure. The sensors to control the process governed a coupling device. They filed all the results of the sensors.



The most exciting, complicated and difficult task will be the shipping of the arch bridge. The contractor assembles the structure on the left bank of the river. After the completion of the arch structure they let down the scaffolding, thread and stress the cables lifting with that the superstructure from its supports. After that they build temporary stiffening between the arch and the deck, lift the bridge structure on its' temporary end supports and take it on the barks. The total shipping mass is approximately 10500 tons. We calculated the stresses of the arch bridge, the scaffolding what supports it on the deck of the bark and the barks during the shipping phase for un-awaited effects as well. The designer and contractor worked out a complete shooting script of the whole process including all the steps of the technologies, the communication routes, responsibilities, risk elements and the necessary dispositions. There was a trial loading of the bark in August - after the submission of the article – to verify the calculation of its'stresses.