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Swietokrzyski Bridge, Warsaw

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Abstract

A bridge competition was organised 1997 to find technically the most innovative and progressive bridge solution over the river Wisla in Warsaw. A single pylon cable-stayed bridge proposed by Finnish and Polish designers was the winner of the competition. Many modern technical solutions were proposed in this bridge. The cable anchorage structures as well as the cross section of the superstructure have been designed in most economic and effective way. The aesthetics of the bridge was investigated very thoroughly.

The bridge is located in the heart of the city of Warsaw. The new bridge will be built just beside the existing bridge named Syreny bridge. The bridge will give a new outlook for the city and river banks. The building of the new bridge is a part of the bigger building project to improve the traffic conditions in Warsaw.

The bridge is a cable stayed bridge of composite construction. The cable spans are 180 and 140 metres in length. The total length of the bridge is 448 metres. The total effective width of the bridge deck is 29.8 metres, consisting of four traffic lanes and bicycle and pedestrian lanes on both sides of the bridge deck.

The bridge will be constructed in extremely short time, during 1998-2000.

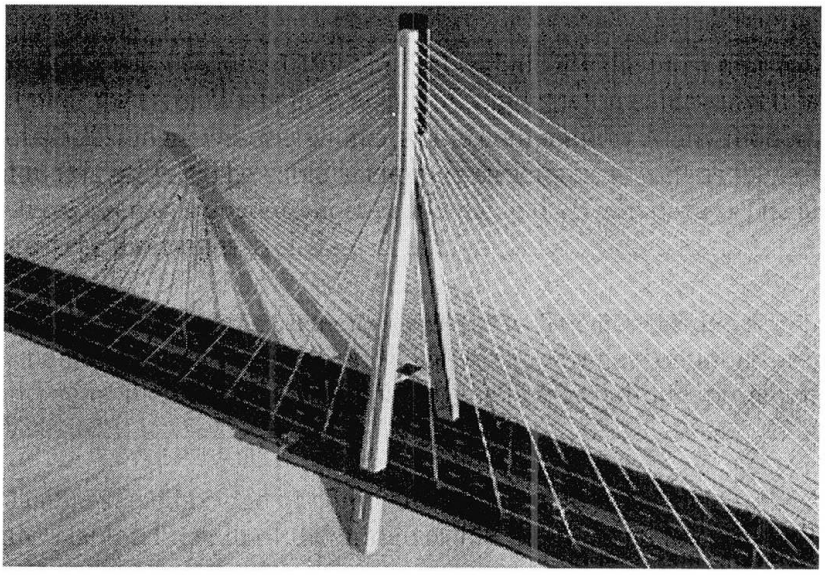

Fig 1. The Pylon

The superstructure of the main bridge is a composite steel - concrete girder. In cable spans the cross section has two main longitudinal steel beams. The deck slab is a reinforced cast in situ concrete slab. The aerodynamic behaviour of the bridge was analysed in the conceptual design phase. The ratio between height and width of the cross section is only 0.08.

In order to get more stiffness to the cross section outside the cable-stayed part two additional beams have been placed to the cross section. The total amount of structural steel in cross section is only 180 kg/ m2. The superstructure is fixed to the ballast abutment. The uplift force at the abutment is balanced by a foundation slab and earth filling. There is only one expansion joint in the main bridge.

The steel superstructure will be installed by launching. Launching will be carried out by using temporary supports at the main spans. The concrete deck slab will be cast in 20 metres long sections.

The A-pylon is a 87.5 metres high concrete tower. The cross section of tower legs is hollow with a hole of ϕ 1.25 metres for maintenance purposes. In order to get smaller inclination in legs they are forced to penetrate the deck slab at the pylon.

The cable forces are anchored directly to the webs of the main steel girders. The anchorage structure is simple and consists of stiffened steel web and guide pipe. The locations of cable anchorages don't affect the spacing of cross beams. The stressing of cables will be carried out at the pylon top, therefore the space needed for cable anchors is minimised on the deck level. Forces due to eccentricities of guide pipes are eliminated by using short external centring pipes, which are installed after the stressing of cables.

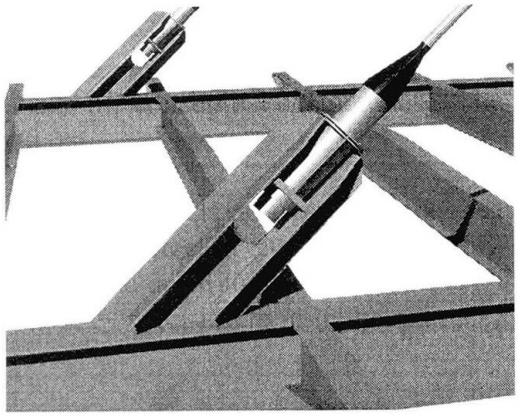

Fig 2 Cable anchorage to the girders

The cable anchorages at the pylon top will be fixed to the concrete structure. The cables are anchored to the concrete tower by penetrating cable guide pipes through the tower.

The stay cables consist of high quality parallel wires, which are protected against corrosion with hot-dip galvanising, grease and HDPE pipes. The cables will be stressed at the pylon top.

All supports are founded on cast in situ bored piles. The piles act partly as end-bearing and partly as cohesion piles. The diameter of piles is 1.5 metres, except at ballast abutment where the diameter is 1.2 metres. Raked piles are used for ballast forces, collision loadings and for launching forces during construction. Vertical piles are used only at pylon and abutment S1.

Because of the soil conditions, a lot of attention has been given to the settlements of the pile foundations. FEM-analyses have been made to determine total settlements and deformations during the construction period. Full scale test loading of piles will be implemented during the piling work