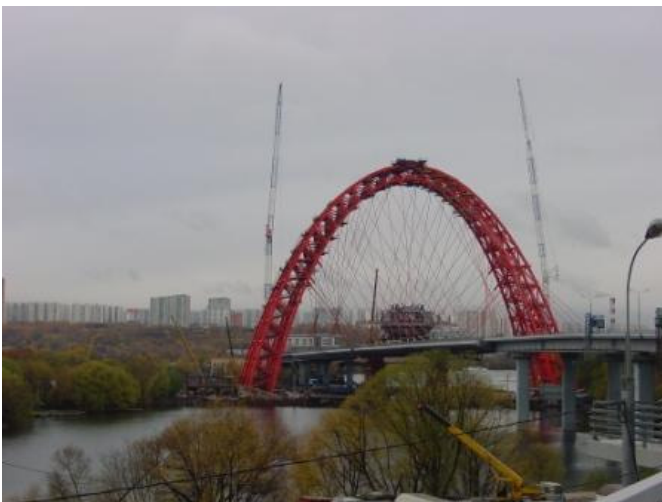


The road crossing project over the Moskva River with cable-stayed bridge (Zhivopisny Bridge) and damage occurring at a temporary support

The project

This bridge crossing of the Moskva River is part of the construction project Krasnopresnenski Avenue from MKAD to Marshal Zhukov Avenue in Moscow. It comprises a unique cable-stayed bridge of special design having no analogy in the world. In addition to the bridge, the avenue comprises two parallel tunnel barrels 3240 m long, surface road sections and a viaduct interchange at its crossing with Moscow Ring Road (MKAD).



The design

The bridge is unique in respect of the design of its pylon, made in the form of a huge arch structure spanned between the river banks. The roadway superstructure is held suspended by cables attached to the arch. It is for the first time in the world that a cable-stayed bridge is partly stretched along the riverbed. Contrary to traditional straight-line cable-stayed bridges, the new bridge superstructure is curvilinear (S-formed) in plan, the alignment consisting of two opposite curves (i.e. one left curve and one right curve). The bridge is 44 m wide providing 4 traffic lanes each direction.

The span suspended with cables is 410 m long. The pylon made in the form of a lattice arch structure is as high as 85 m. Total bridge length is 1038 m and consists of sections of $2 \times 105 + 410 + 2 \times 105 + 84 + 82 + 42$ m. Together with the approach fly-over the total construction is

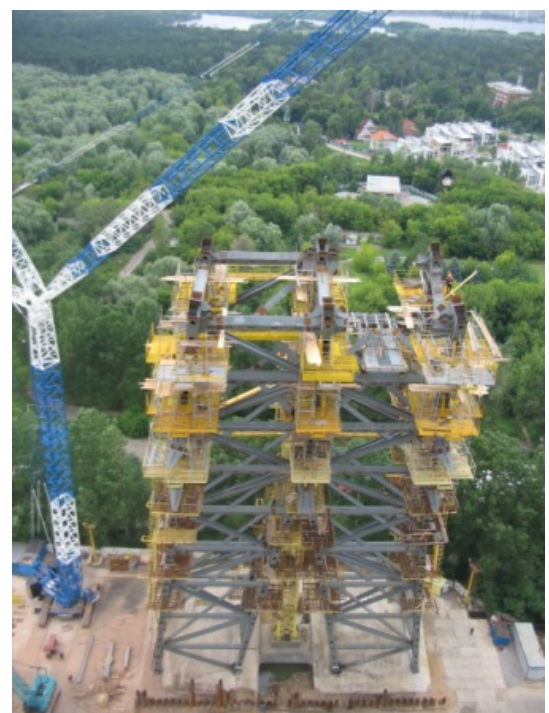
1625 m long. The bridge bank abutments are of cast-in-situ reinforced concrete and founded on piles.

The superstructure of the bridge is composed of box steel girders covered with concrete. The superstructure was assembled by means of launching section by section using barge-placed temporary steel supports for riverbed superstructure spans.

Various stages of construction are shown in the following pictures:



The arch pylon structure was assembled by the semi-cantilever method. As soon as the pylon is built and the superstructure is launched, the cable system consisting of 72 ropes to hold the superstructure to the pylon was installed.





The costs of the total bridge construction cost were US\$ 250 million.

The construction period took 3.5 years (from June 2004 to December 2007).

The Insurance

During the whole construction period, the risks were insured by a policy that was effected in stages in conformity with the commencement of the main construction work packages. On the whole, six construction/erection insurance agreements were signed, all of them remaining in force up to the project completion date. The first insurance agreement was signed for the right road approach construction and erection work. Later, insurance agreements were signed for construction and erection work for the following packages:

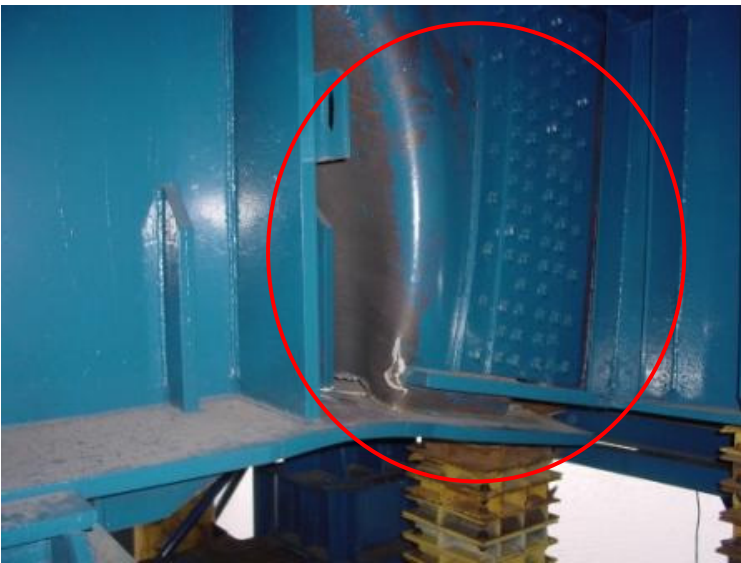
- site preparation; Moskva river bed dredging and bank protection; temporary facilities (temporary supports, approach roads, etc.);
- arch pylon support foundations and bank abutments;
- superstructure (coarsen assemblage and erection);
- pylon structure;
- cable system and roadway superstructure.

The standard insurance cover package excluded design-related faults.

The occurrence of the damage

On 29th September 2006 the 11th superstructure launching stage was underway at the project. The superstructure was being launched on temporary supports using a special roll-on structure comprising roll-on beams to serve as guides while launching.

Soon after beginning the next launch cycle of the superstructure section 2-4, bending of the transverse beam occurred when P41 superstructure block passed the right temporary support B04 (marked in red).



The launching process was stopped. Owing to the transverse beam's bending the following defects took place:

- subsidence of the superstructure at the right temporary support B04;
- local deformation of the superstructure right box girder lower slab by a 120 mm deflection of the slab inward the box girder;
- deformation of sway beam located under the box wall nearest to the bridge axis: the girder got screw-shaped;
- longitudinal sway beam walls of the rolling facility got deflected from its vertical position with the result that the lower slab under the superstructure box girders lost its surface support against the rolling ways;
- failure of the ball bearing under the rolling facility of the cross beam owing to the fact that the upper sway beam rotated in excess of allowable values.



The main cause of the accident is excessive friction while moving the superstructure over the rolling facility in the course of launching, the friction having grown owing to pollution of the rolling ways with abrasive materials used while cleaning the superstructure and the pylon steel surfaces. And this was due to the personnel's negligence in removing the cleaning waste material from the rolling tracks. Besides the BO4 right temporary support also other temporary supports suffered damage.

Fortunately the bridge superstructure section proper, that was being assembled, had not lost its bearing capacity and operational characteristics.

Owing to the accident, the rolling facility at BO4 of the right temporary support and the ball bearing under this facility could not be used any more. The rolling facilities at BO4 (left), BO5 and BO6 temporary supports as well as the deformed lower slab of the P41 superstructure right box girder could be repaired.

The overall loss amounted to about US\$280,000.00.

The indemnity paid amounted to US\$275,000.00.