

Highway bridge passage over Dnieper River in Zaporozhe

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Objektyp: **Article**

Zeitschrift: **IABSE structures = Constructions AIPC = IVBH Bauwerke**

Band (Jahr): **2 (1978)**

Heft C-4: **Structures in the USSR**

PDF erstellt am: **26.09.2024**

Persistenter Link: <https://doi.org/10.5169/seals-15100>

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7. Highway Bridge Passage over Dnieper River in Zaporozhe

Owner: Town Executive Committee of Zaporozhe

Designer: Inst. "Ukrprojectstalconstructsia" and Paton's
Inst. for electrowelding

Contractor: Dnieprostroy Trust

Main datas:

Total length of the bridge passage: 1488 m

Width of the bridges: for four lanes of traffic

Spans: up to 64 m

Consumption of steel per m² of bridge surface: 338 kg

The highway bridge passage is built along and over the buildings of the hydroengineering complex of the famous power station Dnieprogress. The passage includes a chain of four curved steel bridges with orthotrope deck:

- bridge over the outer chamber of the water basin of the power station with the multispans continuous trapezoidal box girder;
- bridge along the power station's dam with the multispans continuous plate girder;
- bridge connecting the passage on the dam with an approach fill of the left bank with the multispans continuous framed structure with the trapezoidal box girder;
- bridge over the ship-lock of the left bank with the same type of framed construction.

Steel constructions of all four bridges are all welded and have welded factory and field joints.

Cross section of the bridges over ship-lock and near the dam are shown in Fig. 1. For these bridges a new system was worked out, which utilises the curvature of the structure as a beneficial factor. The peculiarity of the new system is the fastening of the ends of the curved framed structure to the abutments with the hinges. These new links form with the curved in plane structure the double hinged arch, which can easily carry all the horizontal forces. The unloaded intermediate columns of this new spatial working structure are very thin and flexible.

Cross-section of the bridge along the dam is represented in the Fig. 3. This bridge along the dam is erected instead of an old one with the composite plate girders for two lanes of traffic. It was decided to utilise the old construction for the longitudinal part of the new bridge. For this purpose under old superstructure were placed the powerful steel cross-bars. Bridge over the outer chamber of the water basin is built also instead of the old bridge inadmissible for modern traffic, because of its tight curvature and small width. To make it possible to utilize one of the old piers, situated at the part of the water chamber with the depth about 30 m, was worked out a new system of superstructure with eccentric supporting of the continuous box girder.

The construction of all superstructures of all bridges and its joints allowed nearly full automatic welding. The new elaborated technology allowed the welding of field joints of main girders even by cantilever erection.

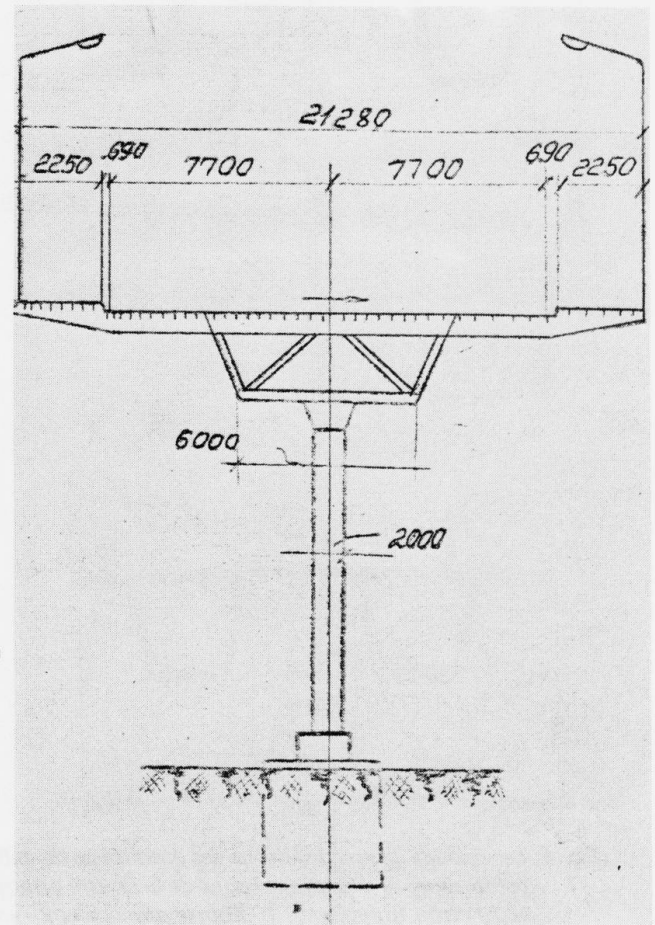


Fig. 1 Cross section of the bridges over ship-lock and near the dam

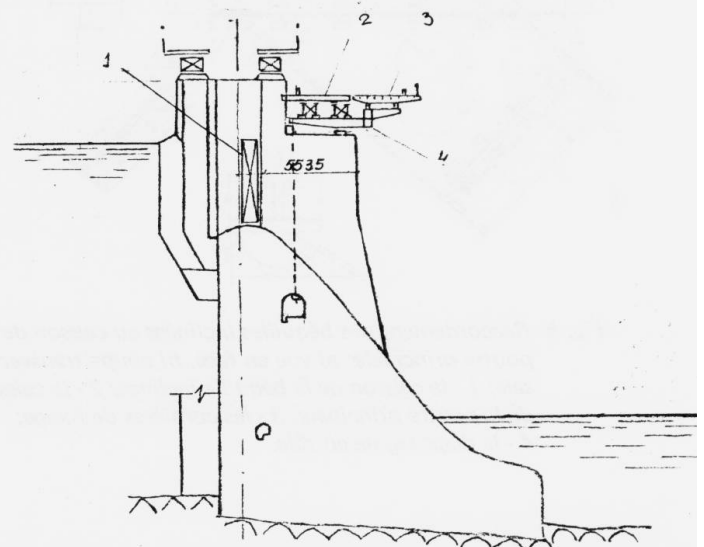
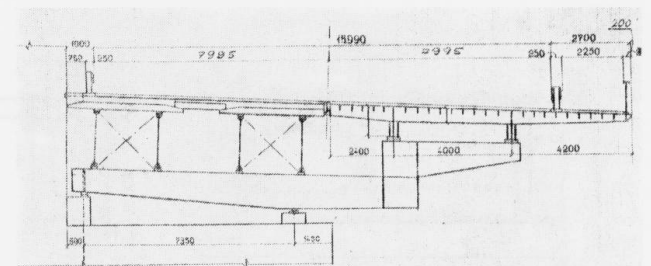


Fig. 2 Cross-section of the dam with the bridge: a) general view; b) detail of the cross-section; 1 - gates of the dam; 2 - existing structure of the old bridge; 3 - new steel structure; 4 - steel cross-bars.

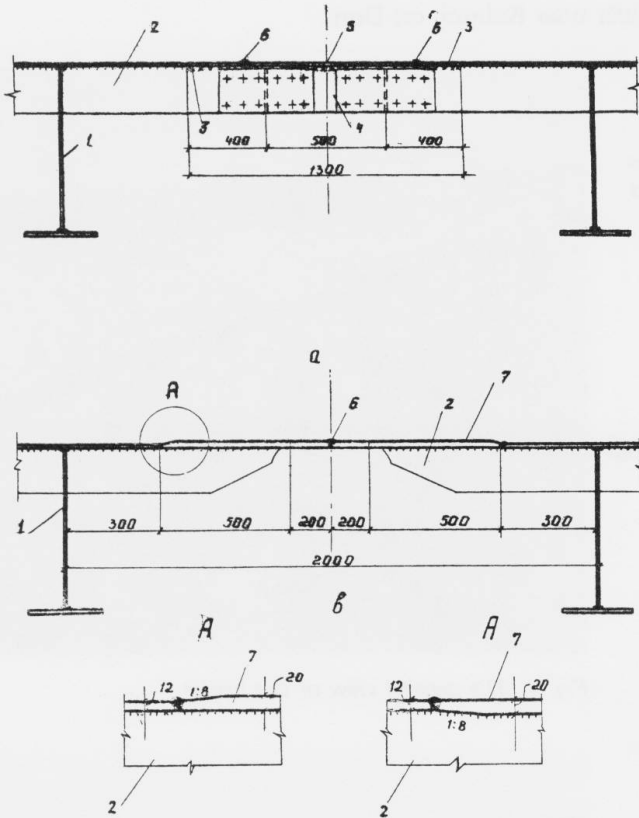


Fig. 3 Field joints of the orthotrope deck: a) generally accepted solution; b) construction of the Inst. "Ukrprojektstalconstructsia"; 1 - transverse girder; 2 - longitudinal rib; 3 - field weldings; 4 - field inserts of the ribs; 5 - field inserts of the floor; 6 - field joints of the floor; 7 - thickening of the flooring.

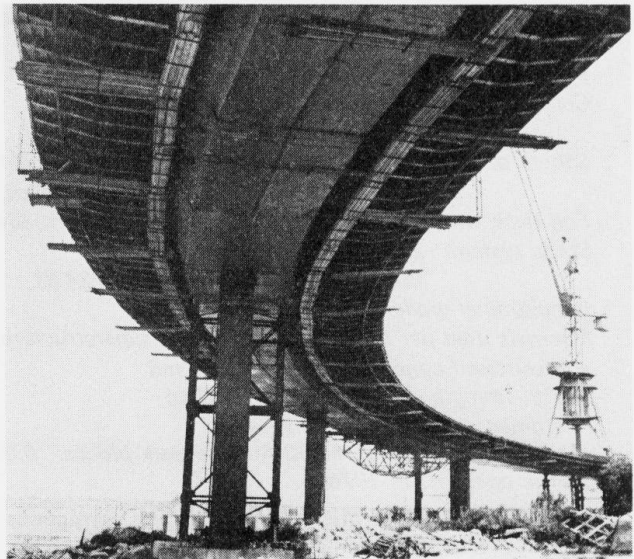


Fig. 4 General view of the bridge over ship-lock during the erection.

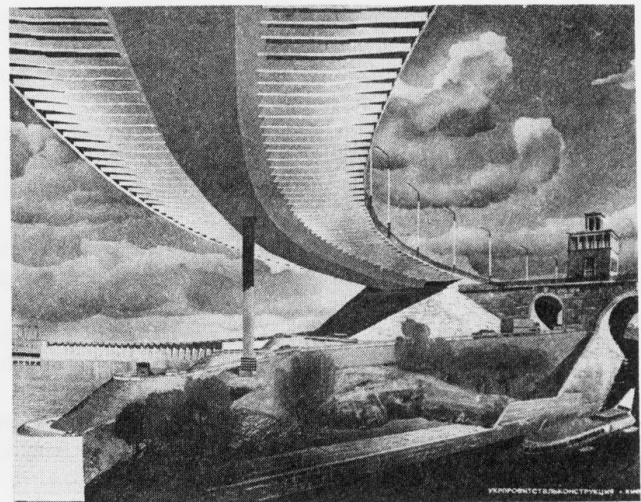


Fig. 5 General view of the bridge over the ship-lock after completion.