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Combined Frame-Strut Earthquake Resistant Bridge

Pont mixte triangulé résistant aux séismes

Erdbebensichere Rahmen-Sprengwerk-Brücke

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I. INTRODUCTION

One of the most complicated problems of the transport construction is erection of viaducts across deep mountain canyons and workings.
The considered design-technological solution under the conditions of hard accessibility regions was directed toward reduction of terms required for erection of the above transport structures, and ensures their high reliability in the cours of operation.
The bridge superstructure features:
- a through system of cross-bar and bearing struts allowing passage of railway and motor transport at various levels, excluding in this case erection of high piers;
- engagement of the automatic passage orthothropic plate in a combined operation with elements of main girders;
- method of "downward" strut erection with closing the cross-bar in the middle of the central span.

2. BRIDGE ACROSS THE RAZDAN RIVER (ARMENIA)

Built in 1981, the bridge incorporates a frame-strut steel superstructure and reinforced concrete scaffold parts.
The crossed 250 m wide and 110 m deep canyon featuring steep vertical slopes.
The area seismisity is of 9 number force.
The welded superstructure (Fig.1) uses high strength bolts for erection joints.
The structure material - steels 10XCHD, 12 ХГТФД of grade C-40, 15 XCHD (C-35), 16D (C-23). The total mass of metal is 3276 t.
The factory made metal structures were manufactured with the use of standard equipment and attachments for standard railway superstructures.
The developed erection method is universal for any climatic conditions.

The bridge rational parameters, the cross-bar strut lattice superstructure, application of plastic material, stability against brittle destruction, despite existing considerable overloads and oscillations made it possible to reliably ensure intactness and stability of the structure.
The design-technological solutions were applied in designing and erection of a number of objects in the USSR and abroad, on the combined bridge across the Red river in Hanoi (Vietnam).

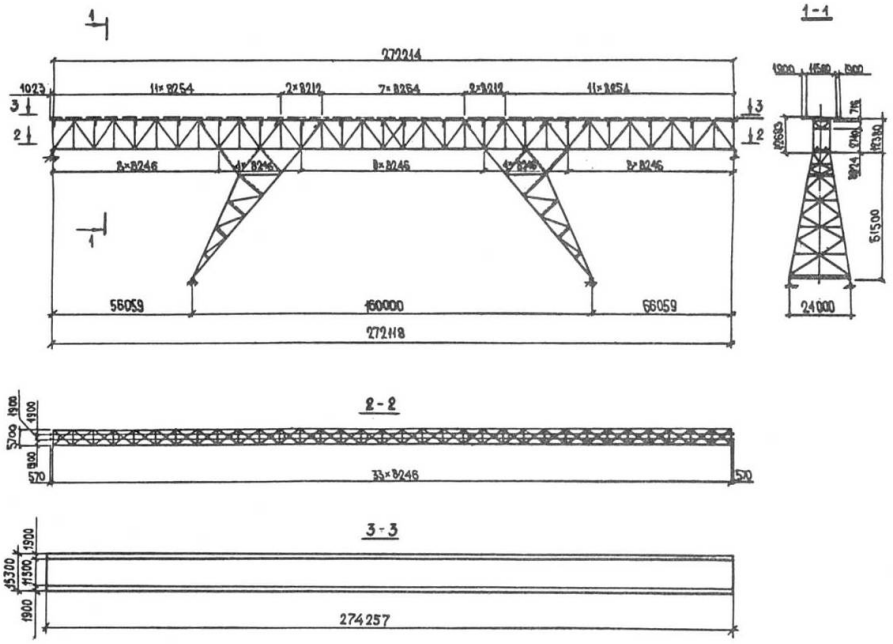

Fig. 1 Diagram of superstructure

The bends, measured in the course of tests, made 80% relative to the design ratings, and the axial stresses in the main girder elements - 70-85%.
The bridge was normally operated within 10 years, and during the disastrous earthquake of 1988 the superstructure (Fig.2) suffered no damage.

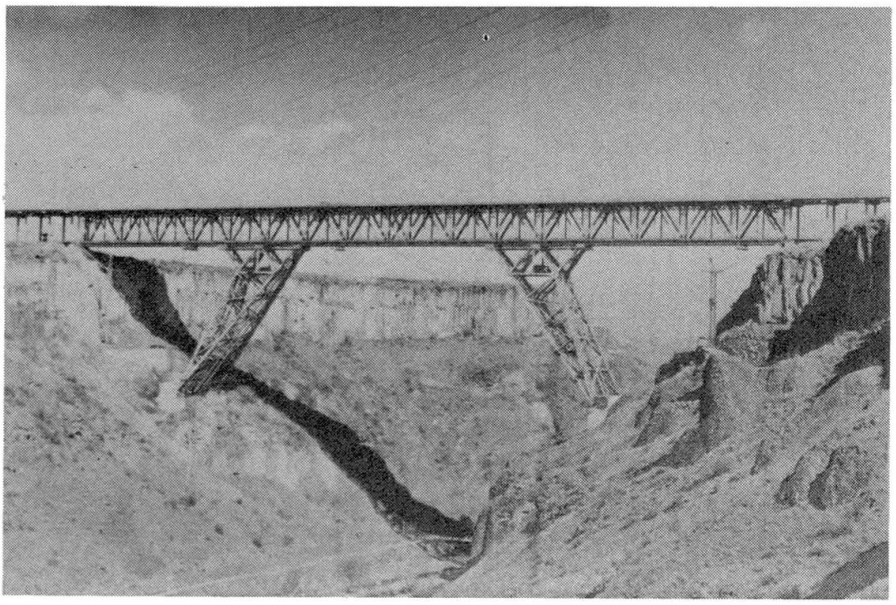

Fig. 2 General view of bridge