Tests on Steel Railway Bridges over the River Tisza

Essais des ponts ferroviaires métalliques sur la Tisza

Experimentelle Untersuchungen der Eisenbahn-Stahlbrücken über die Tisza

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INTRODUCTION

The crossing of the River Tisza by two continuous 3+4 span heavy-duty, high-speed railway bridges (Fig. 1.) offered an excellent chance to carry out delicate investigations relating to the special erection technology and the general behaviour of these type of structures. Some details worth of interest are presented in the poster-contribution of the authors.

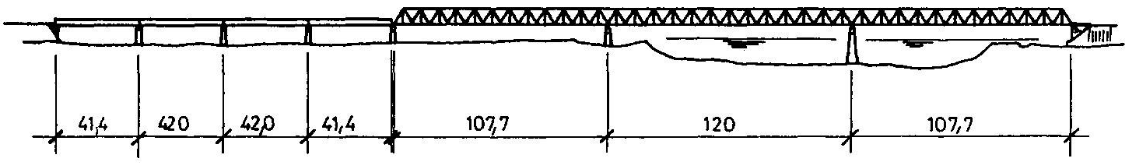

Fig. 1.

The design and arrangement of the steel superstructure were governed by the effort to make the erection operations as simple as possible. The roughly 18 m long plant made welded structural steel units were connected on the site by HSFG bolts.

Both continuous superstructures were pre-assembled on the banks of the river, in the line of the bridge axis. The completely assembled units were then gradually pushed to their place. Temporary trestles were needed only for the truss bridge. Chrom-nickel plated stools were placed atop the supports to distribute the reaction forces during the pushing process and PTFE coated plates were inserted continuously along the slide-track.

THREE-SPAN CONTINUOUS TRUSS BRIDGE

Over the river, the first superstructure is a three span continuous truss bridge with constant heigth of 9000 mm.

Actual measurements reveal the nature of semi-rigid connections of the complex structural system. The obtained normal stresses are confronted to easy to handle calculations of the floor system.

Components of normal stresses near the intersections of diagonals chords of the main are analysed for further refinement of fatigue design. (Fig.2)

Measured deflections show the effect of the rigid connections of bars in the main and the contribution of floor system as well. Special problems, such as effect of lack of fitness are analysed to focus attention to crucial details of bracing system.

Horizontal and vertical natural frequencies, maximum lateral displacements and dynamic coefficients had also been determined and are presented.

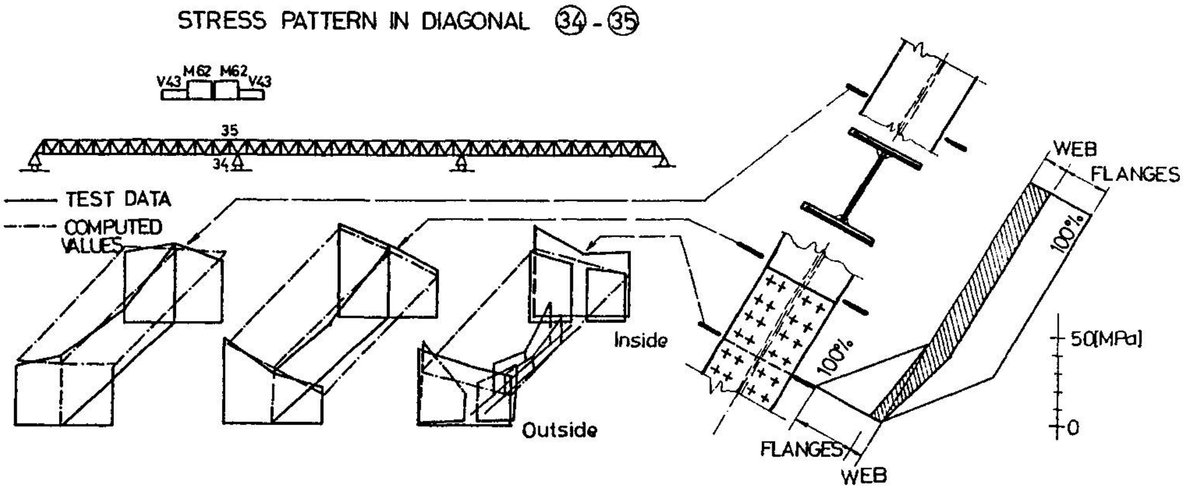

Fig. 2.

FOUR-SPAN CONTINUOUS PLATE GIRDER

The second structure of this bridge system is a four-span continuous plate girder with stringers, cross beams and bracing system similar to the trussed one.

Static measurements showed, that because of the elastic connections among the stringers and main girders, stringers behave as parts of the main girder, but not always with full intensity depending on the position of the loading along the bridge.

The horizontal stiffeners of the web can be taken into consideration totally while during calculation of cross sectional properties of main girders, stringers partially (0,6- 0,8) which are subjected to biaxial bending and warping.

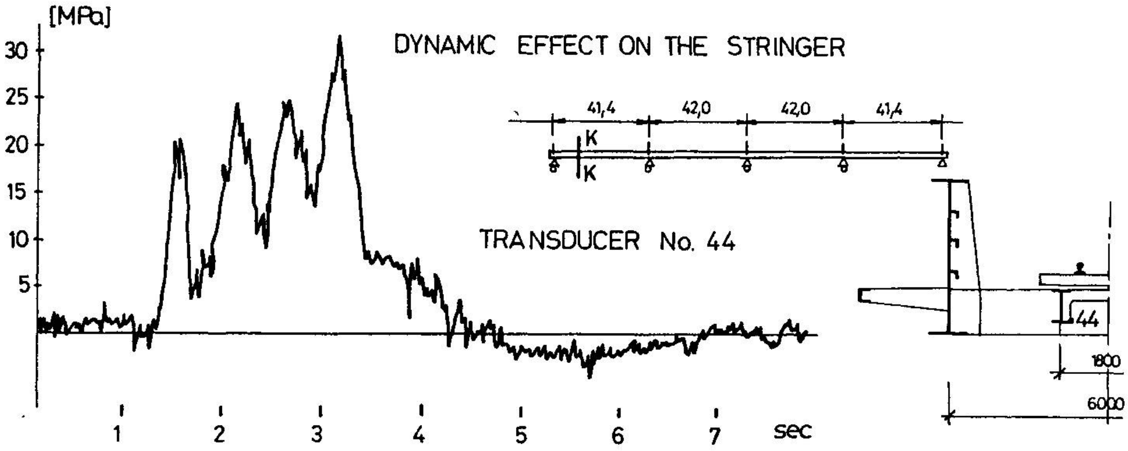

Fig. 3.

Dynamic measurements are illustrated by Fig. 3. Analysis of measured strains on stringers at a train velocity of 60 km/h resulted appr. 15% stress increase because of dynamic effect.

CONCLUSION

Test data prove, that special attention has to be paid to the interaction of different structural components so as to achieve a good agreement at the reality and the results of numerical approaches.