



Evaluation of Riveted Railway Bridge Using Experimental-Numerical Analyses

Richard Hlinka, Jaroslav Odrobiňák, Jozef Prokop, Josef Vičan

University of Žilina, Faculty of Civil Engineering, Žilina, Slovakia

Ondrej Kridla, Branislav Vavák

Railways of the Slovak Republic, Bratislava - R&D Institute of Railways, Žilina, Slovakia

Contact: jaroslav.odrobinak@uniza.sk

Abstract

Railway bridges represent crucial points within railways, because of its strategy meanings in transportation infrastructure. During the decades of exploitation, degradation processes and external influences attack the bridge structures. Typical 70-years old riveted railway bridge with main plate girders and the upper member deck is analysed in the paper. Load-carrying capacity, possible reserves and analysis of critical details are presented. Provisions of the new guideline for determination of load-carrying capacities of railway bridges were applied. Data needed for numerical analysis and subsequent calculation were supported by enhanced diagnostics and measurements. Actual behaviour of the whole structure and chosen members, respectively, were verified by the static and the dynamic load tests. Both the researches academics from the university and the R&D institute staff of the state railway administrator were involved in this pilot project.

Keywords: Bridge evaluation; existing bridge; railway bridge; experimental measurement; load-carrying capacity.

1 Introduction

Within transportation infrastructure represent bridges crucial points not only because of its strategy meaning, but because of their importance in terms of maintenance and repairs. There are approximately 2300 bridges in service within state railway lines in Slovakia. Most of them were built in the first half of last century, lot of them even before WWII. Their durability and reliability is decreasing in time, while traffic load remains almost the same or even higher than in the past. Thus hundreds of them are above or almost at their planned lifetime, moreover some of them are not in good conditions.

The process of planned modernizations of railway lines is protracted and the financial resources allocated for reconstructions are also limited. Thus, some bridges have to be urgently subjected to detailed analysis and evaluation whether there is a possibility to continue their operation, or whether their exploitation can be prolonged by partial repairs of the elements/parts of the bridge. The mutual combination of experimental and numerical analyses based on data obtained by deepen diagnostic research seems to be the right tool for correct evaluation of the condition of existing bridge structures, [1,2].