European Guideline for Assessment of Existing Railway Bridges

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Summary

This paper gives a general overview of the "Guideline for Load and Resistance Assessment of Existing European Railway Bridges - advices on the use of advanced methods" that is providing guidance and recommendations for applying the state-of-the-art knowledge for assessing existing railway bridges. The Guideline has been recently developed within the European Project Sustainable Bridges. The paper highlights the most advanced solutions proposed in the Guideline, which are novel compared to the current practice. Moreover, it tries to gives some guidance to other recommendations recently developed in Europe regarding inspection, condition assessment and monitoring of existing railway bridges.

Keywords: Railway bridges; safety assessment; load capacity evaluation; safety requirements; assessment procedures, masonry bridges, metal bridges, concrete bridges, bridge loads.

1. Introduction

In most of the European countries the railway infrastructure has been created at the end of nineteenth and the beginning of twentieth century. Then, the major part of it has been built or rebuilt after world wars destructions. Consequently, nearly 75% of the existing railway bridges are more than 50 years old and about 35% of all these bridges are older than 100 years.

In last decades, the traffic loads and speeds on European railway network have drastically increased. As a consequence, many of existing railway bridges are now subjected to loads and speeds far higher than those for which they have been designed. In order to provide effective, reliable and safe railway transportation, it is of vital importance to upgrade the existing railway bridges and ensure that they will behave properly under increased loads and higher speeds.

Recently developed "Guideline for Load and Resistance Assessment of Existing European Railway Bridges - advices on the use of advanced methods" [1] is providing guidance and recommendations for applying the state-of-the-art knowledge for assessing existing railway bridges. This includes systematized step-level assessment methodology, advanced safety formats (e.g. probabilistic or simplified probabilistic), refined structural analysis (e.g. non-linear or plastic, dynamic considering train-bridge interaction), better models of loads and resistance parameters (e.g. probabilistic and/or based on the results of measurements) and methods for incorporation of the results from monitoring and on-site testing (e.g. Bayesian updating). Furthermore, it tries to cover most of the problems commonly encountered in the existing railway bridges, which have been determined due to survey performed among railway administrations of European countries.

This paper gives a general overview of the Guideline. It highlights the most advanced solutions proposed. Moreover, it tries to gives some guidance to other recommendations developed in Europe regarding inspection, condition assessment and monitoring of existing railway bridges.

2. Objectives, scope and outline of the developed Guideline

The main objective of the "Guideline for Load and Resistance Assessment of Existing European Railway Bridges - advices on the use of advanced methods" [1] is to provide bridge evaluators with the most advanced knowledge regarding methods, models and tools that can be used in the assessment of existing railway bridges in order to get a realistic evaluation of their load carrying capacity and also more accurate evaluation of their remaining service life. This Guideline is organized in 10 chapters and contains 12 related Annexes.

3. Developed Guideline in a wider perspective

Performance assessment of existing bridges, which is main topic of the SB-LRA Guideline [1], is not totally independent activity. It is a part of the operation management of the railway bridges along theirs entire service life. In this perspective it can be seen that any assessment guideline has to be coherent with other recommendations regarding such activities as inspections, condition assessment, testing, monitoring, strengthening planning, etc. Therefore, the SB-LRA Guideline [1] has been prepared in close collaboration with other working groups of the Sustainable Bridges European project developing "Guideline for Inspection and Condition Assessment of Railway Bridges" [2], "Monitoring Guidelines for Railway Bridges" [3], "Repair and Strengthening of Railway Bridges - Guideline" [4].

4. Conclusions

As it can be seen from the description presented in this paper, the "Guideline for Load and Resistance Assessment of Existing European Railway Bridges - advices on the use of advanced methods" provides a lot of data, models and tools specific for the assessment of existing concrete, metal and masonry railway bridges than can not be find in any of existing design and assessment codes. It also gives guidance on the comprehensive methods of the analysis and assessment that are normally not used in the every day design or assessment practice and therefore are not very well known by the bridge engineering community. All these methods, models and tools might help in saving many existing railway bridges from unnecessary repair, strengthening or replacement. Furthermore, the SB-LRA Guideline [1], together with the other Guidelines [2-4] developed within Sustainable Bridges project, found the basis for the rational operation management of existing ageing European railway infrastructure.

5. Acknowledgements

6. References

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