



## Some proposals for the Highway Bridge Design System improvement, aimed at increasing of maintenance and rehabilitation efficiency

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### Abstract

This article revises the existing Highway Bridge Design System. The traditional and improved approaches dealing with bridge life cycle are considered. Shown, that success depends primarily on decisions taken at the design stage. Some results of bridge inspections in Russia are presented. The examples of technical and organizational solutions improving are given. The paper spotlights that retrofitting of the existing Design System must be based on feedback from the operation process. Systematization of data from operation of similar facilities, risk analysis, development of routine and heavy maintenance plans, inspection plans and health monitoring systems should start from very beginning of design process. Example of contradiction between design and operation is presented. It's suggested to create the Data Base, containing the information concerning structures, ineffective in terms of safety and long service life of highway bridges.

**Keywords:** Design System; highway bridges; inspections; life cycle; maintenance; monitoring.

### 1 Introduction

Currently, Russian bridge engineers are working hard to improve the National Design Codes. The main targets of this work are:

- Improving of safety, reliability and efficiency of design solutions;
- Adaptation of the Bridge Design System to the best International Standards;
- The bridge stock life cycle costs reduction.

More recently Bridge Design Codes in many countries have been directed primarily to achieve mainly the desired strength, stability, endurance and deformability from operational loads impact. However, in many modern Codes, for example, in [1], [2] the positions concerning SLS, robustness and similar criteria, are already embodied

contributing to extend service life and reducing risks of sudden failure.

The Russian Standards [3] since the 80s of the last century contain analogues of limit states SLS such as permitted deflections for girders, limits of cracks width and so on. This type of limit state when exceeding the limit parameter violates the conditions of normal operation is called the "Second Limit State".

The European Union also issued a very useful document EN 1504-2005 [4], which regulates proper application and control products and systems for the protection and repair of concrete structures. The similar document [5] was developed and put into operation in Russia. However, the data of existing bridges inspections showed that the actual average service life, for example, for precast simple reinforced concrete beams with spans of 6,00 – 22,16 m was defined