Development of Bridge Design Codes in Russia

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Summary

This paper describes the concept and contents of the Russian codes and standards currently used in practice of bridge design and construction. The current design practice based on the limit states specified for the first and second groups are discussed. It also introduces the new system of specifications for design and construction sector. At this moment several activities have started for further development of the structural and engineering bridge design codes. One of the main objectives is to achieve international harmonisation regarding requirements on reliability of structures with Eurocodes and ISO standards.

Keywords: bridges; codes; design; reliability; limit states

1. Introduction

From 1962 the limit state principles were started to be adopted for design of bridges and culverts in the former USSR. At the beginning three groups of limit states were outlined in the bridge design standard – predecessor to the Bridge code currently in use. Later on in 1976 the concepts were refined and in the modern practice two limit states are specified by the State standard ГОСТ 27751-88. Codes are divided into three basic classes – those covering design, construction and workmanship levels, and materials.

2. Codes in Common Use

Main principles for design of bridges in Russia are specified in СНиП 2.05.03-84*. This standard is in one part covering design of bridges in steel, concrete and composite construction and is also used in the republics of CIS. The Bridge code covers design of new and rehabilitation of existing bridges and culverts for highways, railways, tramways, metro lines and also combined (highway-railway) bridges. The requirements specified are for the location of the structures in all climatic conditions in the former USSR, and for seismic regions of magnitude up to 9 (ground acceleration of 0.4g) on the scale of Institute of soil physics (former USSR Academy of science).

Construction and installation practices including the workmanship levels and requirements related to temporary structures are specified by the other code - СНиП 3.06.04-91.

Clearances of highway bridges are specified on the basis of highway classification. The minimum horizontal and vertical clearances are given by the Bridge code. The clearances of railroad bridges are based on the requirements of State standard 9238-83. Besides the highway and railroad clearances the bridges must also satisfy the navigational requirements.

The analysis of stream action on bridges is based on the design flood. The return period of the design flood is specified by the Bridge code and represents a fixed value dependant on the category of railway or highway on which a bridge is located. In the typical practice this range is from 100 year to 33 year flood.

In the existing Russian design practice the evolution of bridge design includes three major stages. These are feasibility study, preliminary design, final design. If the bridge project is simple or the bridge is of small or medium size the design is elaborated in one stage. Normally all stages are developed by a single design company. In the typical practice erection design forms a part of the complete design package. The main advantage of this system is that an interaction of structural solutions with the existing fabrication and erection techniques may be reached.

3. Codes Development and Renewal

A new system of specifications for design and construction in Russia have been introduced by СНиП 10-01-94. This new system was put in power in 1995 and established three levels of normative documents: Federal codes and standards; Regional codes; Standards of branches of industry.

In accordance with the basic principles of new system of normative documents for construction the design of bridges in Russia (besides Building norms and regulations) must also satisfy the requirements of Codes of practices and Regional normative documents. These standards are used to introduce new requirements and also to resolve inconsistencies found in the Bridge code.

In connection with the Moscow Ring Road widening project the "Additional requirements for design and construction of bridges on the Moscow Ring Road" had been worked out. These Additional requirements were approved in 1995. The bridge structures for this project had been designed taking into account the increased live loading specified by the Additional requirements.

The previously worked out Additional requirements formed a basis for the new standard ТСН 32. This new standard requires bridges on the specified routes to be designed for increased live loading and abnormal loading. Also it reflects the specifics of bridge design in Moscow and some other new requirements are established in order to improve the reliability and durability of the structures.

4. Conclusion Remarks

In order to interact the existing codes with the new system the preparatory works for revision the codes are currently under way. Some of the newly developed codes have already been issued and put into power. These are the codes which cover surveys for construction.