

Towards the introduction of the partial factor design method to road bridge design standards

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1. Introduction

The Technical Standards for Bridges and Highway Bridges (below called, “Specifications for Highway Bridges”), which are design standards for road bridges, consist of a system based on the allowable stress design method, which designs member sections so that the stress produced in each member by the action of loads does not exceed the allowable stress of the member. Under technical standards for infrastructures on the other hand, performance-based specifications are implemented to flexibly design various types of structures, and at the same time, the partial factor design method, which permits the consideration of bridge-building environmental conditions or the degree of reliability of the safety allowance of materials in order to clarify the required performance, is being introduced with rising frequency.

NILIM studies an overall system of technical standards, settings of the basic required performances for bridges, analyses of the safety allowances for the existing standards, and settings of load factors based on analysis from the perspective of reliability.

2. Setting load factors

Introducing the partial factor design method, it is necessary to set partial factors considering the safety allowances which should be ensured for each type of factor. In order to clarify the load coefficients, NILIM studies the analyses of the safety allowances to secure reliability based on evidence of load regulations for the conventional standards with regard to dead load, live load, wind load, temperature, earthquakes, snow load, earth pressure and other load factors after collecting the latest available data. Moreover, in order to study effects of partial factorization, we extracted road bridges with the proven structure’s types and scales in Japan and conducted numerical simulations considering the characteristics of loads obtained by an analysis of their design service lifetime (100 years) to analyze the bridge performances from a variety of perspectives such as the safety allowances which has been ensured by the existing standards.

3. Future research policies

An introduction of the partial factor design

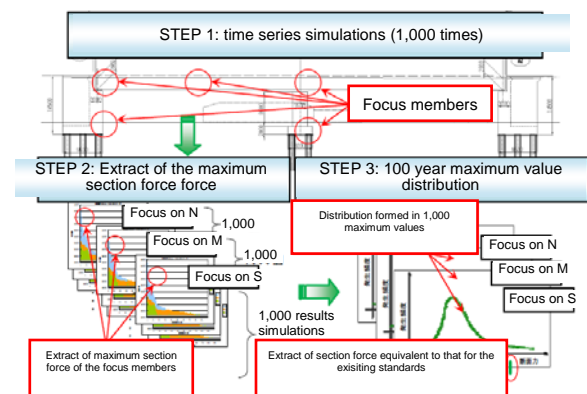


Figure 1. Numerical Simulations

method to the Specifications for Highway Bridges will make it possible to reflect designs based on appropriate evaluations, and to conduct designs rationally and economically.

Until now, we have conducted the setting of the load factors by analyzing against representative structural forms or focused members. In the future, we will continue to increase trial calculation cases and widely conduct a survey to verify the appropriateness of the factors at the practical design level, and at the same time, we will study applicability to repair and reinforcement design. We will perform various kinds of studies in cooperation with various related institutions to achieve an early introduction of the partial factor design method to the road bridge design specifications.

[Reference]

Bridge and Structures Division web site (contains related paper)

<http://www.nilim.go.jp/lab/gcg/index.htm>