

道路橋の設計状況設定法に関する研究

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概要

2002 年の道路橋示方書の改定後、許容応力度法にかわる設計法として部分係数設計法の導入について調査が進められている。橋全体系としての性能規定化を行うためには、供用中に橋が置かれる状況を設計状況 (Design situation) として網羅的に考慮し、橋の状態を評価する必要がある。

本資料は、国内外における設計状況の設定に関する理論的背景を調べた上で、参照期間 (Reference Period) 中に時々刻々と変化する組合せ作用の確率過程を考慮するための荷重同時載荷シミュレーションの方法を提案し、様々な橋梁・断面に対してモンテカルロシミュレーションを行い荷重組合せ・荷重係数のおおよその範囲を推定したものである。

キーワード：道路橋、部分係数、設計状況、荷重係数、モンテカルロシミュレーション

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Stochastic simulation of load combinations for design of highway bridges

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Synopsis

This report has studied a stochastic simulation method to estimate load and load combination factors and define the design situations for highway bridges. The proposed method employs the Monte Carlo simulation and considers the stochastic simultaneous loading process of variable loads, such as live loads, thermal effects, wind loads, and seismic loads, incorporating probabilistic characteristics of scale and frequency of those variable loads. The proposed method is capable of evaluating the extreme distributions of load combination effects, namely cross-sectional forces, at different cross-sections in a bridge, such that each extreme cross-sectional force can be translated to the load and load combination factor values.

The simultaneous loading is applied to more than 60 bridges and the extreme distributions of load combinations are evaluated for zillion cross-sections for a reference period of 100 years.

Then another new method has been proposed to narrow down the load combinations with accompanying load and load combination factors at an expected probabilistic level out of the zillion load combination samples of the 100-year extreme cross-sectional force distributions, where the idea of the new method is derived from the well-known Turkstra rule. Finally, this report has proposed that the expected ranges of load and load combination factors for highway bridge design in Japan.

Key Words : highway bridges, partial factor, design situation, load factor, Monte Carlo simulation

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