The Evolving Metropolis
2019 IABSE Congress
New York City

IABSE 90 YEARS

Calibration of Load and Resistance Factors for the Design of Cable Members in Cable-supported Bridges Using Optimization of Strength

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1 Abstract

This proceeding presents the calibration process of load and resistance factors for the design of cable members under a gravitational loads-governed limit state adopting optimization scheme. In reliability-based bridge design code, although the cable members show various behavior depending on the structural types of bridges, a proper reliability level should be satisfied by the load and resistance factors. A cable is a nonlinear component, thus tension of it also shows nonlinear characteristics. In this study, the limit state function is linearized, and the tension of each load component is normalized by total nominal tension. With the purpose of performing code calibration independent of structural types of bridges, the normalized tensions are parameterized by three load ratios. The target reliability indices of cable members are determined considering results of reliability analyses of existing cable-supported bridges in South Korea, and a target strength, which satisfies the target reliability indices exactly, is evaluated. Optimization problem to minimize an error between the target strength and nominal strength, which is calculated by the load and resistance factors, is defined, and optimal values of the factors are calibrated. Reliability analyses for the strength calculated from the optimal factors are performed and it is verified that the factors can lead to the design with a uniform reliability level.

Keywords: load-resistance factor design; reliability-based design; code calibration; cable-supported bridge; optimization.

2 Introduction

Since, in reliability-based Load-Resistance Factor Design(LRFD) code, the safety of a bridge is secured by load and resistance factors(L-R factors), it is important to calibrate proper L-R factors. Thus many studies to calibrate proper L-R factors are performed, however, for most of the bridge design codes which are adopting reliability-based LRFD, ordinary short- to mid-span bridges are set as target structures.

In South Korea, Lee et al. [1] perform code calibration of cables to develop a reliability-based LRFD bridge design code for designs of domestic cable-supported bridges, which is Korean Highway Bridge Design Code(limit state design)-Cable-

https://doi.org/10.2749/newyork.2019.1365
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