The Development of Reliability-Based Design Guidelines and Prototype Design of Super Long-Span Bridges

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Summary

To come up with the necessity of longer span for cable-supported bridges, a research program on the development of super long-span bridge technology was launched couple of years ago in Korea. The R&D program is planning to be continued to 2015. As a part of this program, the development of a reliability-based design technology is on-going with the consideration of lifetime-based design perspective. The use of high strength cable is one of the issues. The load and resistance factors as well as load combinations are determined considering the target reliability index and probability of failure. The return period of design loads are basically based on the lifetime of 200 year. Prototype designs are performed for the two potential sites of long-span bridges in Korea. One of them is planned as a suspension bridge with the main span length of 2,800m and the other as a cable-stayed bridge with the main span length of 1,200m. Both bridges were designed according to the conventional design guidelines to produce a baseline of current design practices. The applicability and economic efficiency of the proposed design guideline and the developed technologies are then estimated with comparing the products between the baseline and enhanced designs. An Intelligent Bridge Safety Pole is also invented and planning to be installed on the deck in order to enhance the safety of drivers by providing several informative data related to the bridge condition.

Keywords: super long-span, cable-supported, bridge, design guidelines, prototype design, reliability-based.

1. Introduction

As one of the leading constructional technologies in Korea, a R&D project in relation with the super long-span bridge has been launched since 2009. The project consists of research activities in core sectors such as design, material, construction, and maintenance. This paper, in particular, emphasis on the design technology which is driven by the Seoul National University (SNU) and leading design companies such as Yooshin Engineering Corp. and Seoyeong Eng. in Korea. The design sector is targeting to develop design method and corresponding technologies to realize the cable-supported bridges over 2km+ for suspension bridges and 1km+ for cable-stayed bridges. The key issues are relevance and cost effectiveness in the proposed design concept. The relevance of the design concept will be represented as the form of design guideline and the applicability and cost effectiveness of the proposed design technologies can be demonstrated as the form of prototype designs for the feasible construction sites in Korea.

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