Seismic Design Guidelines for Super-Long-Span Cable-Supported Bridges in Korea

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Summary

Bridges with usual span lengths have been designed according to the Korea Bridge Code which allows large inelastic displacements. This code is, however, not applicable to cable-supported bridges. Recently new seismic design guidelines are being developed as one of the core tasks to develop super long-span cable-supported bridge technologies. New design earthquakes and seismic performance criteria are defined. The detailed performance requirements are assigned to each component of bridge. General cable-supported bridges have been designed seismically against an earthquake with a return period of 2400 years, but new guidelines adopt an earthquake with a return period of 4900 years as a design earthquake. The performance of a cable-stayed bridge designed in a conventional way has been investigated for the new design earthquake.

Keywords: seismic design; cable-supported bridge; long-span bridge; performance criteria; seismic behaviour.

1. Introduction

Korea peninsula locates on the Eurasia tectonic plate where seismic actions are much more inactive than other countries located near boundary of active tectonic plates, such as Japan and U.S.A. We have not experienced great earthquakes during the last decades. For this reason, the KBC (Korea Bridge Code[1]) just adopted the seismic design concept of AASHTO[2] in U.S.A in 1992. According to this code, ordinary bridges with span lengths not exceed 200m are designed against a design earthquake with a return period of 1000 years. The KBC is, however, not applicable to special types of bridges such as cable-supported ones because it allows piers to experience a large inelastic displacement. Due to increasing importance of cable-supported bridges, it is recommended that they should be designed for an earthquake with a return period of 2400 years, allowing small inelastic displacements. However, this recommendation is not still appropriate for super long-span cable-supported bridges. Recently a research program for the development of super long-span cable-supported bridge technology was launched in Korea. Development of seismic design guidelines is also one of core tasks. In this paper, developing seismic design guidelines are introduced in brief and the results of seismic performance of a proto-type bridge designed by the current guidelines are presented.

2. Seismic Design Guidelines

2.1 Design principles

The main concept of seismic design is that bridges should be designed to satisfy required seismic performances against different levels of design earthquakes. Bridge ought to be serviceable without any repair after minor earthquakes frequently occurring in lifetime of bridges. To meet this

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