



Re-Evaluation of Aerodynamic Stability of Suspension Bridges in Seto-Ohashi Bridges

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Abstract

The Shimotsui-Seto Bridge, Kita Bisan-Seto Bridge and Minami Bisan-Seto Bridge are highway-railway combined suspension bridges in the Seto-Ohashi Bridges, which connect Honshu Island and Shikoku Island in Japan. Cross sections of stiffening truss girders of the bridges are identical and have two levels for transportation. Upper level and lower level are for highway and railway, respectively. In order to satisfy the aerodynamic stability, open gratings are installed at the center divider and both sides of road deck. However, since small objects may drop through them and endanger railway operation, it is disadvantageous to use them in terms of maintenance.

In order to minimize range that requires open gratings, aerodynamic stability of the bridges was re-evaluated by three-dimensional flutter analysis. This analysis method was developed after the completion of the Seto-Ohashi Bridges. From the analysis, it was found to be possible to minimize the range that requires center gratings. Also, it was found to be possible to close all center gratings by installing center barrier.

Keywords: Suspension Bridge, Open Grating, Flutter

1 Introduction

The Honshu-Shikoku Bridges have 17 long span bridges, which connect Honshu Island and Shikoku Island in Japan by 3 routes. The center route is the Seto-Ohashi Bridges, which consist of three suspension bridges, two cable stayed bridges and one truss bridge and have total length of 9.4 km.

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In the design stage of the Seto-Ohashi Bridges, aerodynamic stability was verified mainly by two dimensional wind tunnel test. In this verification, cross section of the truss girder was assumed to be uniform along the bridge axis. On the other hand, in the design stage of the Akashi Kaikyo Bridge, three-dimensional flutter analysis that can