

Variations in seismic retrofit design of cable-stayed bridges of different sizes

Takao Kaneda, Kazunori Yamaguchi

Honshu-Shikoku Bridge Expressway Co. Ltd, (HSBE), Kobe, Japan

Contact: takao-kaneda@jb-honshi.co.jp

Abstract

There are three cable-stayed bridges in Nishi-Seto Expressway, the westernmost route of Honshu-Shikoku Expressway; Shin-Onomichi Bridge (maximum span of 215 m), Ikuchi Bridge (center span of 490 m), and Tatara Bridge (center span of 890 m). The results of seismic analyses of the bridges revealed the considerable sway-mode vibrations in longitudinal direction, and seismic devices such as viscous dampers and stoppers were found to be necessary to mitigate the above vibrations. In this paper, the vibration characteristics of the cable-stayed bridges of different sizes and the difference in the seismic retrofit design for the bridges are presented.

Keywords: cable-stayed bridge; seismic analysis; sway-mode vibrations; seismic retrofit design; seismic device.

1 Introduction

Japan consists of four main islands and numerous surrounding islands. Two of the major islands, Honshu and Shikoku across Seto Inland Sea, are connected by Honshu-Shikoku Expressway which consists of three routes, Kobe-Awaji-Naruto Expressway, Seto-Chuo Expressway and Nishi-Seto Expressway (Figure 1). There are three cable-stayed bridges in Nishi-Seto Expressway, the westernmost route of Honshu-Shikoku Expressway; Shin-Onomichi Bridge, Ikuchi Bridge, and Tatara Bridge (Figure 2).

Shin-Onomichi Bridge (Spans: 85 m + 215 m + 85 m + 80.5 m + 80.5 m = 546 m), which opened to traffic in 1999, is a combination of a 3-span steel cable-stayed bridge and a 2-span steel box girder bridge and its girder is 5-span continuous as shown in Figure 3. Ikuchi Bridge (Spans: 150 m + 490 m + 150 m = 790 m), which opened to traffic in 1991, is a 3-span continuous cable-stayed bridge with steel box

girder and prestressed concrete girder as shown Figure 4. Tatara Bridge (Spans: 270 m + 890 m + 320 m = 1480 m), which opened to traffic in 1999, is a 3-span continuous cable-stayed bridge with steel box girder and prestressed concrete girder as shown Figure 5.

Because of different size of the bridges, vibration characteristics and contents of seismic retrofit for



Figure 1. Outline of Honshu-Shikoku