

Numerical Study on 1200m-span Railway Cable-stayed Bridges with Four Different Girder Sections

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Abstract

The longest railway cable-stayed bridge, Hutong Bridge, with a 1092m main span, is going to be finished construction in 2019. It is no doubt that a railway cable-stayed bridge with main span over 1200m will come into being in the near future. This paper, basing on the design method of Hutong Bridge, extends a numerical study on cable-stayed bridges with 1204m main span. The numerical models adopt four different girder sections which are truss girder, orthotropic truss girder, box truss girder and box girder, aiming to find out the most suitable girder for the bridge. The advantages and disadvantages of these four kinds of sections will be valued by the effects on the pylons and piers, the stiffness of the girders, the effects on the railway and manufacturing cost. In conclusion, the mechanical characters of the box truss girder is better than other three sections and the cost of it ranks the third among these sections.

Keywords: Railway cable-stayed bridge; numerical analysis; truss; box; orthotropic truss.

1 Introduction

Since the Stromsund Bridge was opened to public in 1955 in Sweden, the chapter of modern cable-stayed bridge was begun. During 60 years of rapid development, the span of the cable-stayed bridges was constantly reaching new length (Figure 1). Nowadays, the longest cable-stayed bridge is the Russky Bridges which has a main span with 1104m. Comparing to the western countries, China started the construction of cable-stayed bridge late. In 1975, the first cable-stayed bridge in China, Yunyang Bridge, with 76m span, was finished construction. Although China begun to develop its cable-stayed bridge technologies late, they made huge progress in the past 40 years [1]. In 2008, China Sutong Bridge, the longest highway cable-stayed bridge in the world at that time was finished construction.

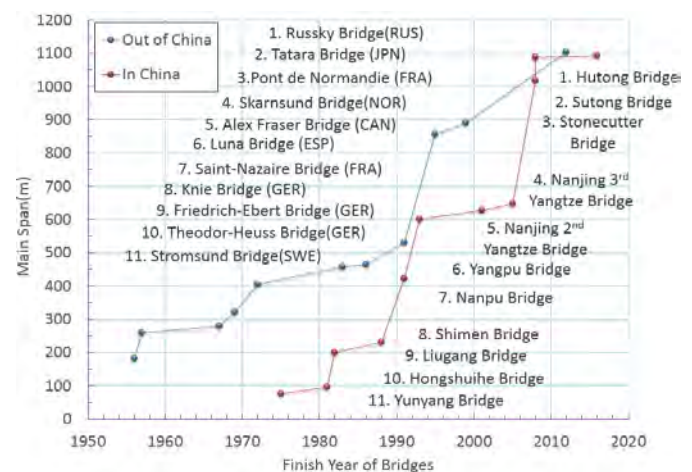


Figure 1. Development of worldwide cable-stayed bridges

Comparing to the highway cable-stayed bridges, the number of railway cable-stayed bridges in China is much less, which is amount to 30% of the numbers of highway ones. However, the development of railway cable-stayed bridges is also fast. Since the first railway cable-stayed bridge was