Stability Analysis of a Super Long-Span Cable-Stayed Bridge in China

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Abstract

With a main span of 1176 meters, the Changtai Yangze River Bridge is a super long-span rail-cum-road cable-stayed bridge under construction in China. The steel truss girder is a transverse asymmetry structure. And the spacial diamond shaped pylon is applied in the bridge to ensure the stiffness of pylon. In this paper, the stability of the Changtai Yangze River Bridge is investigated using finite element method. Dead load, live load and wind load are considered in the analysis. Linear elastic buckling analysis and nonlinear stability analysis, in which both material nonlinearity and geometrical nonlinearity are considered, is performed. The failure mode of the nonlinear stability is presented and discussed. The results show that the minimum stability coefficients are 10,50 and 2,04, respectively for the linear elastic buckling analysis and nonlinear stability analysis. The crushing of concrete at the bottom of the pylon indicates the failure of the structure.

Keywords: rail-cum-road cable-stayed bridge; spatial diamond-shaped pylon; stability analysis; ultimate bearing capacity; failure mode.

1 Introduction

Cable-stayed bridge is one of the most common types of modern long-span bridges due to its advantages of reasonable force and strong spanning capacity. With the continuous improvement of material performance and design standard, the development of cable-stayed bridge presents a trend toward long-span.

For the pylon and girder of cable-stayed bridge are both compression bending members, it is necessary to study the stability of cable-stayed bridges. Many scholars conducted elastic buckling

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