

Self-adaptive fairing of steel box girder design and studies of flutter stability by CFD numerical simulation

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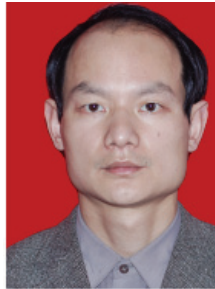
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**Summary:**

The long-span bridge is greatly influenced by the wind. This paper introduces the self-adaptive fairing with the wind guide pipe. The self-adaptive fairing are on both sides of the steel box girder, the angle is adjusted according to wind direction and the wind guide pipe opened at the same time. It can improve the aerodynamic characteristics and wind-resistant stability. Self-adaptive fairing is composed of the following parts: the movable wind guide plate, the fixed wind guide plate, the wind guide pipe, the cover plate of the wind guide tube, the servo system, the sensor system and the control system. Also in this paper, the computational fluid dynamic method was used to study flutter stability of the main beam with self-adaptive fairing. Establishes two dimensional bending and torsion fluid-structure interaction model to study how the angle of fairing and wind guide pipe influence flutter critical wind speed. The numerical simulation results shows that the angle of fairing changes with the direction of wind and opening of the wind guide pipe can raise critical wind speed of the flutter. This provides a new innovative way for designing a wind-resistant long-span bridge.

Keywords:

Self-adaptive fairing; wind guide pipe; fluid-structure interaction; critical flutter wind speed.

1. Introduction

With bridge span increase, wind-resistant design is becoming more and more important. Fixed fairing has limitations. In order to improve bridge wind-resistant capacity, it is necessary to design a self-adaptive fairing that can make real-time adjustments of the box girder aerodynamic characteristics response to airflow. Scholars have done much research about active control fairing. It can be seen in reference [1][2]. This paper introduces self-adaptive fairing with the wind pipe guide. It can adjust the structure of aerodynamic performance and improve the anti-wind capability of a bridge.