



Experimental Study on the Dynamic Deformation of Simply Supported Beam in Chinese High-speed Railway

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Abstract

At present, Chinese high-speed railway operating mileage has exceeded 20 thousand km, and the proportion of the bridge is nearly 50%. Moreover, high-speed railway design speed is constantly improving. Therefore, controlling the deformation of the bridge structure strictly is particularly important to train speed-up as well as to ensure the smoothness of the line. This paper, based on the field test, shows the vertical and transverse absolute displacements of bridge structure by field collection. What's more, resonance speed and dynamic coefficient of bridge were studied. The results show that: the horizontal and vertical stiffness of the bridge can meet the requirements of **Chinese "high-speed railway design specification" (HRDS)**, and the structure design can be optimized. However, the dynamic coefficient may be greater than the specification suggested value. And the simply supported beam with CRTSII ballastless track has second-order vertical resonance velocity 306km/h and third-order transverse resonance velocity 312km/h by test results, which are all coincide with the theoretical resonance velocity.

Keywords: simply supported bridge; field test; dynamic deformation; dynamic coefficient; resonance velocity

1 Introduction

Over the past 40 years, Chinese high-speed railway are developing rapidly. At present, Chinese high-speed railway operating mileage has exceeded 20 thousand km, and the proportion of the bridge is nearly 50%. Moreover, high-speed rail design speed is constantly improving. For example, in the train passing test, the actual velocity of high-speed trains even reaches 420 km/h in Zhengzhou-Xuzhou high-speed line, which refreshed the high-speed train test records. In order to avoid the high speed railway bridge to become the short board of train speed-up, as well as to ensure the smoothness of the line, controlling the

deformation of the bridge structure strictly is particularly important^[1].

During the past few years, several scholars have studied on this issue^[2]. However, most of the previous researches^{[3]~[4]}, use finite element method or theoretical analysis to obtain the dynamic characteristics of bridge-track system, while the experimental research is less, and the long-term test is scarcer. In this paper, a research about the dynamic deformation characteristics of simply supported beam with CRTSII ballastless track in high-speed railway is present, based on the field test that CRH380A-001 trains pass through 32m simply supported beam with continuous slab track at the speed of 240 to 350km/h. By using field