Analysis on Mechanical Performance of Rail-Cum-Road Double Deck Steel Truss-Arch Composite System Bridge

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Abstract

In order to research the mechanical performance of rail-cum-road double deck steel truss-arch composite system bridge, a rail-cum-road double deck steel truss-arch composite system bridge with 150m main span was analyzed. The overall spatial model of the bridge was established by using the general finite element software, and the structural response under dead load, vehicle load, rail transit load and temperature was calculated and analyzed. Dead load is the main factor causing the internal force of long-span composite system bridge. The stiffness of steel arch rib and steel truss is only 13.5% and 24% of the composite system, so the steel truss-arch composite system bridge has greater overall structural stiffness. In terms of dynamic characteristics, the overall stiffness of steel truss arch composite system bridge is great, the first five natural frequencies are all between 0.3Hz and 1.5Hz, and there is the possibility of simultaneous multi-mode excitation.

Keywords: rail-cum-road; steel truss-arch composite system; structural response; stiffness; dynamic characteristics.

1 Introduction

In order to greatly improve the utilization efficiency of urban traffic and improve bridge traffic conditions within limited land resources and layout space, urban bridge design with double-layer traffic or double-deck is a better solution [1]. At present, simply supported truss bridges, continuous truss bridges or truss arch bridges are commonly used. The truss bridges have high stiffness, sufficient space and good permeability, and are relatively competitive structural forms among such bridges.

Binzhou Huanghe River Rai-cum-Road Bridge is a typical double-deck continuous truss bridge, and its main bridge across the Huanghe River is a continuous steel truss girder with span arrangement (120+3x180+120)m. The main bridge is arranged on the upper and lower decks, with the highway on the upper deck and the railway on the

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