

The Parametric Research of Prestressed Concrete Continuous Girder Bridge for High-speed Railway

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Summary

In this paper, the design parameters of prestressed concrete continuous girder bridge of the frequently used high-speed railway with the ballasted track and non-ballasted track has been studied. Then, the design conditions of high-speed railway prestressed concrete continuous girder bridges with the ballasted track and the non-ballasted track has been discussed, including secondary permanent loads, temperature mode, the control of stress level, the choice of strength safety factor, elastic deformation under live load and temperature load and the controlled factors of post-construction creep in non-ballast track beams. Next, based on the study of high-speed railway continuous prestressed concrete bridge with the main span of 56m, 64m, 72m, 80m and 100m, design parameters and the main influential factors of the prestressed concrete continuous girder bridge has been studied. So, these results could provide a basis for the selection comparison and economics of continuous girder bridge in the future.

Keywords: prestressed concrete continuous bridge, design parameter, deformation, post-construction creep

Introduction

In 1964, Japan built the world's first high-speed railway with operating speed of 210km / h-Tokaido Shinkansen. From then on, it has opened a prelude to the world's high-speed railway construction. The building of Qin Shen high-speed railway is the China's the high-speed starting point. And then, China has built a large of items about the high-speed railway, including the Beijing-Tianjin Inter-city Railway, which was formally operated in August 2008, the Wuhan-Guangzhou passenger dedicated line, which is in trial operation phase now, Furthermore, the Beijing-Shang high-speed railway, Zhengzhou-Xi'an Passenger dedicated line and many others are in the phase of construction. China will be the nation with the longest high-speed railway mileage when the Beijing-Shang high-speed railway is formally operated in the near future.

Bridges account for a large proportion of high-speed railway lines in the world. For instance, the total length of bridge in the Beijing-Shanghai high-speed railway being built is 1140m, the ratio of total line length up to 86.5%. Recently, seamless railway and non-ballasted track are the major forms in China. In that interval, it not only has simply-supported beam but also has prestressed concrete continuous girder bridge in order to cross the existing line and all kinds of rivers. Box girder is also featured with good integrity, vertical and lateral stiffness, torsion performance, durability of structure and so on. As the train speed increases, the requirements for the function of continuous bridge after construction completed will be higher, including the control of post-construction creep in non-ballast track beams, rotation angle in beam end, mid-span deformation and so on. These factors are closely related with the design parameters selected, so the rational selection of the design parameters of high-speed railway is very important.

In this paper, the objects of study were three-span prestressed concrete continuous beam of high-speed railway with a main span of 56m, 64m, 72m and 80m. The research contents contained the law of development, impact factors and control measures.