Research on the Layout of Temporary Piers of Large-span and Super-Width Steel Box Girder during Incremental Launching Construction

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Abstract

It is difficult to understand the mechanical performance of large-span and super-width steel box girder during the incremental launching construction, and it varies with the number of temporary piers. Combined with the engineering example of Qilu Yellow River Bridge in Jinan, this paper conducts research on the layout of temporary piers. Firstly, stress envelope of main girder and maximum support reaction forces under different layout schemes are analyzed with the frame model. Then, the local plate-shell model is used to obtain stress distribution of main plates and local stability of main girder segment under the most unfavorable loading conditions. The results show that local mechanical performance of steel box girder plays a crucial role in ensuring its safety during the incremental launching construction. Besides, rational spacing between temporary piers is 70m for Qilu Yellow River Bridge.

Keywords: bridge engineering; incremental launching construction; steel box girder; layout of temporary piers; finite element analysis.

1 Introduction

The incremental launching construction method has no influence on the traffic under the bridge and does not require large lifting equipment, so it is widely used in bridge engineering. Nowadays, there has been a relatively complete method of force analysis for concrete beam bridges during the pushing process[1~4].

With the improvement of steel production and computer simulation technology, the incremental launching method is no longer limited to concrete bridges, but widely used in the construction of long-span steel bridges, such as Millau Bridge in France [5], Chiapas Bridge[6] in Mexico and Jiubao Bridge[7] in Hangzhou. In recent years, many scholars have carried research on the incremental launching construction of steel bridges. Gao Dong[8] has analyzed the influence of parameters such as

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