Trial Design of a New Type of Large-Span Double-Limb Prestressed Concrete Box Girder Bridge with Corrugated Steel Webs

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Abstract

Owing to the buckling problem of corrugated steel webs, up to now the span of prestressed concrete box girder bridges with corrugated steel webs has not exceeded 200m . Based on the analysis of buckling strength of corrugated steel webs, a new type of large span prestressed concrete box girder bridge with double-limb corrugated steel webs is proposed in this paper. It reduces the free height of the corrugated steel webs by filling core concrete between the double-limbed corrugated steel webs, and increases buckling strength of the webs. Additionally, the optimization technique of strong top plate and thin bottom plate is applied to reduce the self-weight of constant load without reducing the cross-sectional stiffness. The result of the trial design shows that this bridge type is applicable and economical, which can achieve a breakthrough in the span of prestressed concrete box girder bridges with corrugated steel webs.

Keywords: girder bridge; corrugated steel web; double-limb; buckling strength; Core Concrete; Thin bottom plate.

1 Introduction

Prestressed concrete box girder bridges with corrugated steel webs are made by replacing the concrete webs of traditional prestressed concrete box girder bridges with corrugated steel webs, which have excellent mechanical properties and efficient material utilization. It is increasingly being used in bridge projects because it overcomes the problems such as web cracking and continuous deflection of conventional prestressed concrete girder bridges. With the development of application, the maximum span of prestressed concrete box girder bridges with corrugated steel webs has been broken through. At present, the world's largest span prestressed concrete box girder bridge with corrugated steel webs is the 179m Yasukawa Bridge in Japan [1-2]. In China, prestressed concrete box girder bridges with corrugated steel webs have made rapid progress although they started late [3]. In 2010, the 120m Juancheng Yellow River Bridge was built in Shandong Province completed [4]. In 2019, the 160m Qianshan River Bridge was completed in Guangdong Province [5]. In 2021, the 185m Feilong bridge under construction in Guangxi Autonomous Region is the largest prestressed concrete box girder bridge with corrugated steel webs under construction at present [6]. Despite the rapid development of prestressed concrete box girder

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