In-Situ Test and Simulation of the Web-Self-Supporting Construction for the Composite Bridge with Corrugated Steel Webs

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Abstract

In order to improve the safety and economics of the construction for long-span composite bridges with corrugated steel webs(CSWs), the web-self-supporting construction method with the characteristic of using the CSWs to carry the construction load is one of the effective ways. In this paper, a composite bridge with CSWs with a span of 55+100+55 m is taken as the research object. The stress distribution of main components and the stability of the CSWs in each segment during the construction process are analyzed by finite element simulation. The applicability of the construction method is verified by comparing the simulated with the test results of the practical bridge, and corresponding optimization measures are proposed. The results show that the stresses and stability within the scope of specification requirements, and the web-self-supporting cantilever construction method is safe. The transition sections between the concrete slabs and the cantilever CSWs are critical positions, which should be appropriately strengthened during construction. The arrangement of transverse braces can effectively prevent the lateral-torsional buckling of the CSWs.

Keywords: corrugated steel web; web-self-supporting construction; finite element simulation; in-situ test; optimization measure

1 Introduction

Composite bridges with corrugated steel webs (CSWs) have been widely used in China for the advantages of light weight, avoiding web cracking and superior seismic performance[1-3]. The construction methods are gradually enriched with the increasing number of these bridges. A new type of cantilever casting method is reported in [4], which is called the web-self-supporting construction by the authors. This method uses the CSWs to carry the construction load and improves the construction efficiency[5-7]. The CSWs are directly used as the main load-bearing components

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