

The Study and Application on Girder-Conveying By Track Cable Method for Stiffening Girder of Long-Span Suspension Bridge

Ruili SHEN

Professor
Southwest Jiaotong
University, Chengdu, China
rlshen@163.com

Yong YAN

Postgraduate candidate
Southwest Jiaotong
University, Chengdu, China
mryan5@163.com

Nianlail ZHANG

Project Manager
Hunan Road Bridge
Construction Group Co.,
Changsha, China
248520065@qq.com

Maolin TANG

Professor
Southwest Jiaotong
University, Chengdu, China
tmlpl@126.com

Summary

This paper introduces a new construction method for the longitudinal transportation of stiffening girder of long-span suspension bridge, which is called *girder-conveying by track cable method*, and it is an original erection method for stiffening girder of suspension bridges. The method is applied to carry the stiffening girder longitudinally by *girder carrier* through traction over a flexible tensile track cable, which serves as a load carrying member suspended under the main cable and connected with suspenders. This new method overcomes the difficulties of traditional method in longitudinal transportation of stiffening girder, hoisting load constraint and poor economical efficiency for long-span suspension bridge construction in mountainous areas. By adopting this new method, the large stiffening girder sections can be conveyed and erected under various orographic condition. The method has been adopted in the construction of *Aizhai Bridge* in Hunan Province, China.

Keywords: suspension bridge; stiffening girder; track cable; *girder-conveying by track cable method*; *girder carrier*

1. Overview

Aizhai Bridge is a long-span suspension bridge with steel stiffening truss, the layout of the main cable is 242+1176+116m. The overall length of the stiffening truss is 1000.5m, which includes 69 sections. The standard section is 14.5m long, 27m wide and weighs 150 ton. The bridge crosses the U-shaped valley whose depth is over 500m, and the bridge deck is 335m away from the bottom of the valley.

In the construction of the *Aizhai Bridge*, if the stiffening truss is constructed by *erection by cableway*^[1], a carrying cable with a span of 1176m should also be erected. The span is so long that the diameter of the carrying cables are relatively large, but which provides low transportation capability, results in long-lasting work period and low economical efficiency. While by *suspension assembling method by deck crane*^[2], due to the restrictedness of transportation space and capability, only truss pieces can be conveyed. Assembling the truss pieces in the high altitude is a long-lasting period and high risk work. In order to convey truss pieces, connecting the erected truss section rigidly, and laying the tracks on the mounted truss, stronger stiffening truss should be designed to meet the requirements. The two traditional methods above both have the common weakness as low economical efficiency, long-lasting period and high risk. They are not the ideal methods for erecting stiffening girder of long-span suspension bridges, especially in mountainous areas.

In view of the existing erection methods cannot solve the problems well, *Girder-conveying by track cable method* was invented for erecting stiffening girder of long-span suspension bridge. The new method can solve the problem of horizontal conveying stiffening girder of suspension bridge as