Wuhu Second Bridge: Development of Stayed Cable Anchorage System and Application of Structural Innovations

Ke Hu

Anhui Transportation Holding Group Co., Ltd., Hefei, People's Republic of China

Shengbin Wang, Dahai Yang, Wanyue Liu

Anhui Transport Consulting & Design Institute Co., Ltd., Hefei, People's Republic of China

Contact:2498975076@qq.com

Abstract

Based on the design and construction of the second Yangtze river bridge in Wuhu (hereinafter referred to as Wuhu Second Bridge), this article introduces the structure system of the full-floating cable-stayed bridge with four cable planes, single-column tower and separated steel box girders. A series of innovative structural measures have been taken to improve the safety and economy of the bridge, such as the looping stayed cable anchorage system, the diagonal damping constraint system, and the externally prestressed segmental assembled box girder used in the approach bridge. In addition, the finite element analysis software was used to study and analyse the mechanical characteristics of the bridge. The reliability of the structural anchorage system and damping constraint system was verified either.

Keywords: looping stayed cable anchorage system; diagonal damping constraint system; externally prestressed segmental assembled box girder; finite element analysis; symmetric cantilevered assembly.

1 Structural Design

The main bridge of Wuhu Second Bridge has a total length of 1622m. The span layout of the bridge is (100+308+806+308+100) m. It is a full floating cable-stayed bridge. There is no vertical support at the junction of tower and girder. Two-way sliding bearings are only set at side piers and transition piers. The bridge tower is of single-column type, and the main girder is flat steel boxes.

1.1 Looping Stayed Cable Anchorage System

The looping stayed cable anchorage system is an anchoring method of "surrounding on the tower and anchoring on the bridge deck", that is, the two ends of each stayed cable are anchored in the same direction on the bridge deck after turning around the bridge tower, see Figure. 1. Different from direct anchoring, this method gives full play to the compressive properties of concrete structures by converting the tensile force of the stayed cables to the bridge tower into radial pressure. It not only makes the bridge tower "slender", but also presses it stronger, thereby avoiding the formation of cracks in the bridge

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