



Design Method and Finite Element Analysis of Precast Longitudinal Split-Piece Cover Beam

Qianyi Mao, Dong Xu, Yongxue Jin

Tongji University, Yangpu District, Shanghai, China

Contact: mao_qianyi@tongji.edu.cn

Abstract

In order to reduce the weight of prefabricated cover girders and solve the construction problem that it is difficult to realize one-time prefabricated assembly of large cantilever concrete cover girders, urban viaducts usually use large cantilever prestressed concrete cover girders. Taking a 2×30m simply-supported girder bridge as the superstructure, the paper proposes a precast longitudinal split type cover girder, and uses the large general finite element analysis software WISEPLUS to establish a finite element model to simulate and adjust the structural structure, prestressing distribution, and construction stage division of each cover girder (single 1,0m, 0,9m, 0,8m), and the cover girder under this design method in the construction stage and The design method is used to verify the feasibility and reasonableness of the design scheme, and to provide methods and references for similar designs.

Keywords: large cantilevered cap girder; prefabricated assembly; simply supported girder bridge; longitudinal splitting; WISEPLUS; finite element analysis.

1 Introduction

In recent years, Shanghai has taken the development of assembled buildings as a key task to promote the construction of ecological civilization, to promote the transformation and upgrading of the construction industry, and to build a green and livable city, and has been increasing its promotion efforts. Especially with the further promotion of the double carbon goal, the development of assembled buildings is imminent. As an essential building in the city, the assembly process of viaducts has also attracted much attention. Since urban viaducts usually use large cantilevered prestressed concrete cover girders, which usually have a self-weight of 200~400 t. In order to meet the requirements of assembly, it is necessary to reduce the weight of one-time lifting

cover girders. In this paper, we propose precast longitudinal split type cover beam to solve the construction problem that large cantilever concrete cover beam is difficult to realize one-time precast assembly.

This paper intends to investigate the reinforcement of precast longitudinal split-piece cover beam, which has been studied more by many scholars in China so far. A research team from the School of Civil Engineering, Hunan University proposed a fully precast lightweight pre-stressed ultra-high performance concrete (UHPC) large cantilever thin-walled cap beam structure with about 40% reduction in self-weight.^[1] Yuan Zihua, a member of China Railway 22nd Bureau Group 4th Engineering Co., analyzed the installation technology of prefabricated cover girders for urban expressway assembled viaducts.^[2] A research team