Research on creep and shrinkage effects of steel-concrete-Ultra-High Performance Concrete (UHPC) composite structure under different construction methods

Deng guomin,Shi shudong

Shang hai Pudong Road & Bridge(group) co., Ltd, Shanghai, China

Ma xiaogang, Zhang dawei

Shanghai Pudong Architectural Design & Research Institute Co., Ltd, Shanghai, China

Guo songsong, Liu chao

Tongji University, Shanghai, China

Contact: dengguomin520@126.com

Abstract

The shrinkage and creep effects of concrete is an indispensable calculation content in the design of concrete bridges and composite bridges. Based on past experience, the deformation of concrete slabs is constrained by steel plate. As a special concrete material, the shrinkage and creep mechanism of UHPC is similar to that of ordinary concrete. However, the shrinkage and creep rate of UHPC is different. This paper mainly calculates and analyses the shrinkage and creep effects of steel-concrete-UHPC composite slabs under two different construction conditions (cantilever construction and full framing construction). Firstly, the solid finite element method is used to simulate the shrinkage and creep effects of composite slabs. Then, the stress and deformation of each component in the composite slabs under the two construction conditions are compared and analysed. Finally, the influence of construction methods on the shrinkage and creep performance of the steel-concrete-UHPC composite slabs is revealed and summarized.

Keywords: Steel-concrete-UHPC composite slabs; Cantilever construction; Full framing construction; Shrinkage and creep effects.

1 Introduction

In order to relieve the traffic pressure within the urban area, and taking into account the existing construction conditions in the meantime, the application of the City elevated in the urban area is gradually increasing. The main bridge is the continuous steel-concrete composite girder bridge with a length of 140m, a span arrangement of 40+60+40m and a width of 16.5m. The composite slab is a steel-concrete-UHPC composite slab with the thickness of slabs varying linearly from cantilever end to root, which is from 270mm to 370mm. And the thickness of bottom steel plate is 8mm. The concrete is connected to the steel plate by means of studs and steel ribs. And the concrete is connected to the UHPC layer after the surface of concrete has been chiselled.

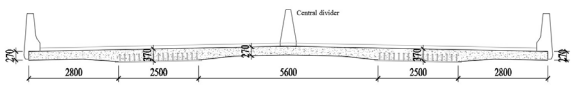

Figure 1Cross section of main bridge

https://doi.org/10.2749/newdelhi.2023.0770