



Push-out tests of shear connectors for new fully assembled steel-concrete composite beams

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Abstract

To accomplish rapid installation and replaceability, a new type of connector for new fully assembled steel-concrete composite beams was studied. The connectors are fixed on the C-shaped channels of the prefabricated floor slab. The load transfer along the interface of the precast floor slab and the steel beam is primarily achieved through the friction between the beam flange and the channels. Push-out tests were conducted to study the mechanical properties of new composite beam. The effects of different C-shaped channel types, repeated loading and number of connectors were investigated. Test results showed that all the connectors exhibited satisfactory performance. When the section height of C-shaped channel is small, the restraining effect on the connector is more remarkable. The shear strength and shear stiffness of the connectors can be improved by reloading. The formulas for calculating the shear strength derived agree well with the experimental results.

Keywords: fully assembled; steel-concrete composite beams; replaceable; shear connector; push-out test

1 Introduction

Steel-concrete composite beam is a new type of structure which combines steel beams and concrete slabs through shear connectors. It can give full play to the mechanical properties of steel and concrete, and it is widely used in building and bridge structures. The most studied and applied shear connectors are stud [1-2]. PBL shear connector is another widely used shear connector, which structural form is steel plate with holes. Compared with the traditional shear connector, it has good bearing capacity and fatigue performance. Scholars at home and abroad have studied the influence of parameters such as the diameter of PBL connector, slab thickness and concrete strength on the slip performance, shear capacity and failure mechanism of composite beams [3-6].

Li Chengjun put forward a prefabricated composite shear nail, whose structure is that the shear nail is

embedded in the concrete precast slab through the lateral steel plate and welded with the steel beam[7]. The progress requires a large amount of field welding. A new type of fabricated composite beam uses high-strength screw as shear connector [8-9], which requires high installation accuracy.

A new type of fully assembled steel-concrete composite beam structure is proposed, which mainly includes prefabricated floor, fastener and steel beam, as shown in Figure 1. The embedded channel in the prefabricated floor slab provides the clamp position of the fastener. During the installation, the prefabricated floor slab is hoisted to the predetermined position of the steel frame beam, and then the fastener is placed in the clamp position of the channel. By applying torque to the screw of the fastener, the pre-tightening force is provided, and the vertical lift of the floor slab is limited. The friction between the prefabricated floor slab and the upper flange of the steel beam is used to prevent the relative slip between the steel