



Shear performance of replaced bolt shear connectors in prefabricated composite beam

Tao Yang, Rongxian Xie

Yang & Xie, Guangxi University, Nanning, China

Milan Veljković

Delft University of Technology, Delft, The Netherlands

Contact: yangt@gxu.edu.cn

Abstract

Bolt shear connectors have the advantage of efficient installation and demolition when used in prefabricated composite beams. When bolt shear connectors are damaged in the service period and replaced by new ones, the shear performance of the replaced bolts will be affected by the existing structural damage. This paper experimentally investigates the shear performance of eleven re-assembled push-out specimens of bolt connectors. The experimental results show that the replaced bolts possess a similar shear resistance as the bolts in the original tests. In contrast, the relative slips at the interfaces between the steel beam and the prefabricated concrete (PC) slabs show a bigger scattering. A calculation method of shear resistance for the replaced bolts considering the influence of the existing damage was proposed based on the experiments, and comparisons show that the calculation values agree well with the experimental results.

Keywords: replaced bolt shear connectors, prefabricated composite beams; reassembly; shear stiffness.

1 Introduction

Steel-concrete composite beams possess superior mechanical properties [1-2] compared to no composite interaction between two materials. With the development of demountable structures in the past decades, researchers worldwide conducted much research on the shear performance of post-installed shear connectors, for example, on bolt shear connectors [3-5]. Ataei et al. [6] found that the smaller clearance between the bolts and the prefabricated holes could significantly improve the ductility of the composite connections. Hosseini et al. [7] found that blind-bolt shear connections show considerable shear ductility levels and had advantages compared to

the traditional welded stud. Chen et al. [8] demonstrated that bolt connectors with the corrugated pipe had higher shear stiffness than normally “reserved holes”. It is worth noting that the “reserved hole” is the hole made in the concrete deck in which the bolt is installed [8]. Yang et al. [9] found that the average ultimate shear resistance per bolt for multi-rows of bolt shear connectors is less than that of bolt shear connectors in a single row.

Nijgh et al [10] presented a methodology that quantifies the required hole clearance for a reusable composite floor system and illustrated it on an example of a car park building. A special type of bolted connector containing the embedded