Structures 9(2017)79-90
www.elsevier.com/locate/structures

Structural behavior of stud shear connections with solid and composite slabs under co-existing shear and tension forces

M.H. Shen, K.F. Chung

Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University, Hong Kong, SAR, China

Abstract

In order to qualify and quantify structural behaviour of stud shear connections with different configurations commonly adopted in building construction, a systematic experimental and numerical investigation into practical stud shear connections with both solid concrete slabs and composite slabs was carried out. This paper presents key findings of the investigation on these shear connections in both standard and modified push-out tests, and six test series with a total of 25 standard and modified push-out tests were conducted. It should be noted that while the shear connections in standard tests were under direct shear forces, the shear connections in modified tests were under co-existing shear and tension forces. For direct comparison, the measured load-slippage curves of these shear connections were rationalized to provide representative load-deformation characteristics of the connections which exhibited various degrees of ductility at both small and large deformations.

Moreover, advanced finite element modelling was also carried out to establish effective models to examine the structural behaviour of stud shear connections with different configurations under shear forces as well as under co-existing shear and tension forces. Based on the numerical investigation into the structural behavior of these shear connections, a dowel mechanism of these shear studs embedded in solid slabs as well as in composite slabs were identified, and local forces induced within the shear connections were quantified. Detailed data analysis and interpretation have been conducted and presented to provide thorough understandings on structural behaviour of these shear connections and load transfer mechanisms within the connections

Keywords

Shear connection
Push-out test
Shear resistance
Load-slippage characteristics
Dowel mechanism
Co-existing shear and tension forces