BEHAVIOR OF STEEL-CONCRETE-STEEL SANDWICH STRUCTURES WITH LIGHTWEIGHT CEMENT COMPOSITE AND NOVEL SHEAR CONNECTORS

K.M.A. Sohel*, Jia-bao Yan, J.Y. Richard Liew, M.H. Zhang and K.S Chia
Department of Civil Engineering, National University of Singapore,
BLK E1A, #07-03, 1 Engineering Drive 2, Singapore 117576,
cvekmas@nus.edu.sg

Key words: Composite structures, SCS sandwich, Shear connector, J-hook connector.

Summary. In Steel-Concrete-Steel (SCS) sandwich structure design, mechanical shear connectors are commonly used to transfer longitudinal shear forces across the steel–concrete interface. In this paper, novel shear connectors such as J-hook and cable shear connectors are proposed and their performance to achieve composite strength of SCS sandwich structures with lightweight concrete core is investigated. This type of structural elements is developed to replace conventional stiffened plates. Introducing lightweight cement composite as a core material makes the use of this system in marine and offshore structures possible. Static tests were carried out on SCS sandwich beams with J-hook and cable shear connectors. The behavior of the connectors observed from the tests is studied and the contributions from various types of connectors to the load carrying capacity of the beams are quantified and compared. Different failure modes of beams with J-hook connectors and beams with cable shear connectors were observed. Based on the test results and analyses, some design guidelines are proposed.