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PERFORMANCE EVALUATION OF INNOVATIVE COCONUT PALM STEM SHAPED STUD SHEAR CONNECTOR FOR COMPOSITE STRUCTURES

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ABSTRACT

Headed studs are the more frequently employable shear connectors in composite structures. Despite its prevalence, this connector has exhibited remarkable drawbacks, prominently the shear failure at the bottom of the shank. In this research, three novel coconut palm stem (CPS) shaped studs are proposed for composite constructions, aiming to improve the shear capacity and slip performance of the connection. The traditional circular headed stud (CHS) geometry has been restructured to a proposed CPS-shaped stud while maintaining total steel material volume to be the same. Pushout tests were experimentally performed on CHS and CPS-shaped shear connectors to investigate their performance evaluation for ultimate strength, stiffness, ductility, and failure mode. Moreover, the Abaqus/Explicit has been employed to model a pushout specimen. A proposed finite element model was successfully validated with the test results for further parametric analysis. Two distinct grades of concrete and three CPS

shapes were considered for the parametric investigation. Finally, three formulas were developed and proposed to predict the shear capacity of the CPS-shaped stud. The performance of the CHS and CPS-shaped stud connections was compared, revealing that the proposed CPS-shaped studs offer 37 to 47% higher shear strength, double stiffness, and slip with better ductility. So, CPS-shaped stud may substitute the traditional headed stud shear connectors in steel-concrete composite structures with added strength, stiffness, and ductility.

KEYWORDS

Composite structures, Headed stud shear connectors, Pushout test, Concrete slab-steel beam, CPS-shaped stud, Abaqus

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