Development of cold formed steel-timber composites for roof structures: connection systems

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Abstrak

Cold formed
steel has relatively high width-to-thickness ratio elements, which causes it to buckle easily. Combining it with timber laminas would be an effective solution for reducing this buckling problem. This research focuses on the connection system of a cold formed steel-timber composite, which was obtained by attaching several timber laminas to the web part of cold formed steel using screws. The connection used two bolts that were 8 mm in diameter, as well as two different kinds of side plates: steel and plywood. Cold formed steel 75Z08 and Swietenia mahagoni
(moisture content 12.2%; specific gravity 0.77) were used for connections and were loaded in parallel and perpendicular directions. In addition, the connections of cold formed steel (without timber laminas) using self-drilling screw fasteners were tested until failure. Numerical analysis predicting the load-slip curve and apparent yield load of the composite joints was carried out using the DOWEL program and the European Yield Theory, respectively. The test results showed that the connection system with steel side plates is capable of accommodating the strength increase of composite member, as it has a maximum load carrying capacity and initial slip modulus of about 4.5 and 2 times larger than those of the cold formed steel connections, respectively. In the case of a connection system with plywood side plates, its joint properties are similar to those of the cold formed steel connection, except that it has larger joint deformation.