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Perforated Shear + Reinforcement Bar connectors in a timber-concrete composite solution. Analytical and Numerical approach.

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Abstract

This paper presents a study of a novel shear connector in a timber-concrete composite solution, focussing on the determination of an analytical expression that makes it possible to predict its behaviour and a numerical analysis that describes it accurately. The shear connector is composed of a perforated steel plate inserted into a slot within the timber rib and glued, in combination with reinforcing corrugated steel bars affixed to the top of the plate. Previous tests made it possible to establish failure mode in different T composite section plate-rebar configurations. These results determine the effectiveness of the system in terms of force-slip behaviour, with systematic failure in the timber section. A simple predictive model is proposed to determine the ultimate capacity of the joint, taking into account the mechanical properties of timber in relation with the fracture plane and the timber-adhesive interface. This model makes it possible to apply a design process that is able to predict the stiffness of the connection.

FEM models were analysed for each configuration in a variable load process equal to that used in the test, according to the standard procedure. A variable friction coefficient in contact definition made it possible to achieve an accurate descriptive model in association with the test procedure.

Keywords

A. Wood
B. Adhesion
C. Analytical Modelling
D. Mechanical Testing