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Design of Composite Cold-Formed Steel Flooring Systems

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Abstract

Recently conducted experimental and numerical investigations have shown that mobilisation of composite action within systems comprising cold-formed steel beams and wood-based floorboards is feasible and can lead to substantial improvements in structural performance. However, no design rules have yet been established for these systems in order to allow the beneficial effect of composite action to be exploited. In this paper, proposals for the design of such systems are devised and their theoretical basis is presented. At the core of the proposals is the calculation of the attained degree of partial shear connection and the shear bond coefficient for the composite members as a function of the geometric and material properties of their components and connectors. The accuracy of the devised design method for the prediction of moment capacity and flexural stiffness is demonstrated through comparisons with the results of 12 physical tests and about 80 numerical simulations reported in the literature. The proposals provide practical design rules for composite cold-formed steel floor beams, which are suitable for incorporation into future revisions of the Eurocodes.

Keywords: cold-formed steel, composite action, degree of partial shear connection, shear bond coefficient, wood-based particle boards

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