

Analysis of the Timber-Concrete Composite Systems

with Ductile Connection

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Abstract

In timber-concrete composite systems, timber and concrete are inherently brittle materials that behave linearly elastic in both tension and bending. However, the shear connection between the members can exhibit significant ductility. It is therefore possible to develop timber-concrete composite systems with ductile connection that behave in a ductile fashion. The analysis of the timber-concrete composite systems is laborious when connection ductility has to be accounted for. This study illustrates the use of an elastic-perfectly plastic analytical approach to this problem. In addition, the study proposes an incremental method for predicting the nonlinear load-deflection response of the global composite system. The accuracy of the analytical model is verified and confirmed with a computer model, and numerical solutions of the analytical model are compared to experimental results from the bending tests of timber-concrete composite beams with ductile connection conducted by previous researchers. Reasonable agreement is found from the comparisons, which validates the capacity of the analytical model in predicting the structural behaviour of the timber-concrete composite systems in both elastic and post-elastic stages.