



High Performance CFRP-Timber-Concrete Laminated Composite Members

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Summary:

This paper deals with laminated timber-concrete (LTC) composite beam members, for applications in sustainable building structures, in which the interlayer connection is achieved with adhesives, similarly to the glued laminated timber beams, instead of the classically used shear connectors (e.g. mechanical connectors or notches). Only a small number of studies of this type of high-performance members are available. The strength and stiffness of the LTC under short-term static ramp-loading were studied on new and retrofit (joist-type) floor members, through laboratory tests and non-linear finite element modelling. In the initial tests the typical failure mode observed was the failure of the wood in tension. Consequently, a carbon fibre reinforced polymer (CFRP) layer was added to the tension side of the timber layer, forming a multi-composite member. The research results indicate that the structural performance in terms of efficiencies and strength for the LTC beams exceeds the corresponding performance of similar classical timber-concrete beams with shear connectors due to the different shear transfer and failure modes. By adding the CFRP reinforcement to the tension fibres of the timber layer, the failure mode changed again, allowing for further increase in strength and stiffness.

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