

Creep Behaviour of Heterogeneous Timber-UHPFRC Beams Assembled by Bonding: Experimental and Analytical Investigation

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Abstract : The purpose of this research was to investigate the creep behaviour of the heterogeneous Timber-UHPFRC beams. New developments have been done to further improve the structural performance, such as strengthening of the timber (glulam) beam by bonding composite material combine with an ultra-high performance fibre reinforced concrete (UHPFRC) internally reinforced with or without carbon fibre reinforced polymer (CFRP) bars. However, in the design of wooden structures, in addition to the criteria of strengthening and stiffness, deformability due to the creep of wood, especially in horizontal elements, is also a design criterion. Glulam, UHPFRC and CFRP may be an interesting composite mix to respond to the issue of creep behaviour of composite structures made of different materials with different rheological properties. In this paper, we describe an experimental and analytical investigation of the creep performance of the glulam-UHPFRC-CFRP beams assembled by bonding. The experimental investigations creep behaviour was conducted for different environments: in- and outside under constant loading for approximately a year. The measured results are compared with numerical ones obtained by an analytical model. This model was developed to predict the creep response of the glulam-UHPFRC-CFRP beams based on the creep characteristics of the individual components. The results show that heterogeneous glulam-UHPFRC beams provide an improvement in both the strengthening and stiffness, and can also effectively reduce the creep deflection of wooden beams.

Keywords : carbon fibre-reinforced polymer (CFRP) bars, creep behaviour, glulam, ultra-high performance fibre reinforced concrete (UHPFRC)

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