



Advancements in Timber Construction: A Review of Prefabricated Mass Timber Floor Assemblies

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Abstract

This paper provides a state-of-the-art review of prefabricated mass timber floors, with a focus on composite floor assemblies for common residential and long-span office applications. The discussion relates to different design aspects, including connection systems and methods of assembly. Also, design methods and code provisions for the floor assemblies comprising ultimate limit state design, vibration control and long-term behaviour are expounded. A life-cycle overview of floor solutions is also presented to highlight their sustainability potential. The paper demonstrates how the building industry can leverage the structural performance, light weight and prefabrication capabilities of these innovative floor solutions for a better-built environment.

Keywords: sustainability; mass timber; composite floors; lightweight floors; prefabricated construction.

1 Composite floors: Overview

Composite floors are structural assemblies where composite action is developed through connectors that transmit shear and inhibit slip between structural floor components. These components are often slab and beam elements, or two joined slab elements. The most common forms of connectors used in composite floors are mechanical fasteners, adhesives, and interlocks. Composite floors are often characterized by some degree of slippage between the components leading to a partial composite behaviour.

Having been extensively studied for many decades, steel-concrete composite flooring systems are well-established in the building industry, having design provisions that are well-detailed in codes and standards internationally [1-3]. Whereas prefabricated timber-based composite floor

alternatives examined in this study are still emerging. The focus herein is on timber-concrete composites (TCCs), timber-steel composites (TSCs) and timber-timber composites (TTCs)

Other composite solutions built with timber and glass, or aluminium are beyond the scope of this paper. Experimental and numerical investigation of the structural performance of composite beams made of glass webs and timber flanges have been published in [4-6], while research into the behaviour of aluminium-timber composites has been reported in [7-9].

2 Timber-based composite floors

Figure 1 shows common section types and material combinations for prefabricated timber-based composite floors that have been studied and with published works. The T-shape arrangement, which is sometimes flipped to form an upstand beam, is