

Vibration in Residential Timber Flooring Systems

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Abstract

Timber is increasingly used in Australia in residential and commercial framing buildings. However, its application as a flooring system has not always satisfied some residents and designers. As wood is classified as a “light weight” material, it is highly susceptible to respond to vibration when subjected to dynamic loadings such as walking. The first natural frequency, damping ratio and deflection of a floor under concentrated load are widely used parameters for the development of modern serviceability criteria regarding human comfort. However, such a development is challenging as vibration responses differ from floor configurations. This study aims to assess the vibration response of a type of cassette timber floor consisting of a set of evenly spaced floor trusses (or joists) within the cassette, built with hybrid timber and steel webs. Experimental tests examining the abovementioned three parameters under three different floor depths, two support conditions and with or without strong-backs have been performed. Data collected from accelerometers and displacement sensors have been used to provide guidance regarding the floor system vibration responses and evaluate its acceptability level regarding human comfort, using selected international design criteria. Test results indicate a linear correlation between the floor depth and both the natural frequency and the deflection under concentrated load. However, damping ratio was found to be independent of the investigated parameters. In addition, the type of support conditions has been found to dramatically influence the first natural frequency of the systems tested. Moreover, the addition of strong-backs only influenced the deflection under concentrated load.

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