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## Forced Vibration Response of Small Scale URM House with Flexible Timber Diaphragm

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### Abstract

The results of non-destructive forced vibration tests on a small scale URM house with a flexible timber diaphragm are presented. The primary purpose of this research programme was to investigate the system level response of URM buildings and to identify potential research areas that require further attention. The 4 m × 4 m URM house consisting of a flexible timber diaphragm was constructed and tested to determine the possible mode shapes of the structure. The frequencies of the diaphragm and walls were determined and the damping ratios were calculated from the frequency response function (FRF) curves. A finite element (FE) model of the structure was initially prepared in order to predict the frequency range of interest that needed to be applied during actual modal testing. A reasonably good match of frequency modes was found between the FE model and experimental data, specifically for NS excitation. However, the frequency mode in the EW direction estimated by the FE model was significantly greater than the experimental value. This may be due to the assumptions used in the FE model regarding material properties. It is proposed that, in future studies, FE model updating will be established as this enables better estimation of the mechanical properties of the structural elements and improves the modelling of boundary conditions (especially the joist-walls connections) in the initial FE model.

**Keywords:** non-destructive test, forced vibration test, modal testing, unreinforced masonry structure, finite element model