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TIMBER FRAME ENGINEERING

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Assessment of Vibrational Performance of Timber Floors

Jan Weckendorf, Dr Binsheng Zhang, Prof Abdy Kermani, Robin Dodyk

Fig 1a (top row): Test floors during construction
Fig 1b (above): Full size floor under deflection test

Introduction

As current design rules in the UK do not control dynamic response of flooring systems satisfactorily, often the vibration of timber floors in residential housing is a common cause of inconvenience for occupants. Following a detailed parametric study to examine the applicability of the design requirements of Eurocode 5 (EC5) relating to the vibrational performance of timber floors and the assessment of the influence of individual floor parameters, a range of full-scale timber flooring systems was constructed. This was to examine and compare the effects of parameters such as floor dimensions, support conditions, decking board types and fixing methods on the dynamic response of the flooring systems. This paper provides details of the ongoing experimental programme and reports on the results of the research in comparison with EC5 design requirements.

Fig 2: Floor systems supported on shallow wall panels

Summary

A series of detailed studies was carried out on four (two sets of two) full-scale timber flooring systems constructed on shallow timber framed walls. A total 30 different configurations of decking materials/boards, fixing types and boundary conditions was examined. The first floor sets were 3.7m long x 4.4m wide with 200mm deep I-joists spaced at 400mm centres with decking materials being either screwed or screwed and glued. The next floor sets comprised 5.0m x 4.4m using 302mm deep I-joists at 400mm centres. The frequencies (FNF) of both floors was found to be well above the required minimum of 8Hz (EC5). The predicted values closely simulated the experimental results with the exception of floors with two decking layers (OSB plus particleboard) where the predicted results underestimated the actual performance by up to 23%. Provision of a small level of rigidity at the supports (i.e. by gluing, in addition to screw fixing, of decking to the joists) resulted in FNF increase of more than 9%, Figs 4 & 5.

Fig 3: Floor during dynamic test

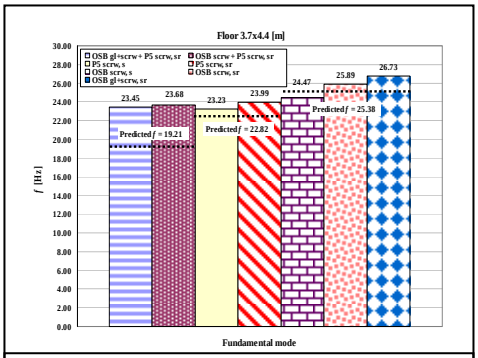

Fig 4: Comparison of predicted & test FNF results

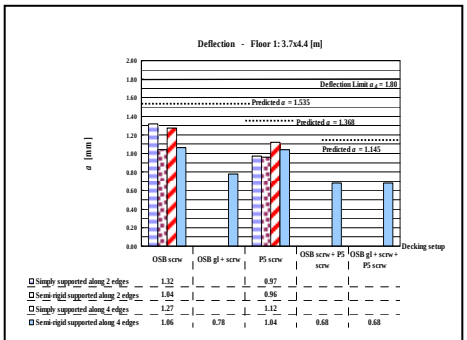

Fig 5: Deflections of a typical floor