

2012 MSc Research Grant Scheme

Project title: Evaluation of timber soleplate and masonry plinth interaction and its effects on the racking performance of timber frame walls.

University: Edinburgh Napier University

Supervisor: Prof Abdy Kermani

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Aims of research: Previous research on the racking performance of timber panel systems have mainly dealt with the structural capacity of the panel fixed to the foundation with a set number of bolts. This is not representative of how the frame is fixed down to the foundation in practice. The connection of the sole plate to the masonry plinth is largely overlooked in design and typical connections and proprietary solutions are often unsubstantiated. The project aims to achieve a greater understanding of the connection types and their performance characteristics in varying conditions with particular reference to high shear and uplift conditions.

Description of method: The research project will be carried out in four stages to enable the MSc student to get the most out of the available time and resources.

Understanding practical applications: The first step will be to examine the most common methods that are used in the construction industry and understand the appropriate design capacities of each and the relevant research findings. The student will select three most common types of fixings to evaluate further.

The shear resistance of sole plate: Perform a laboratory based parametric evaluation of strength and stiffness characteristics of typical soleplate arrangements. The study will comprise evaluation in isolation of the effects of individual components of the connection arrangements and the influence of construction methods such as shot-firing and drilling. Centre for Timber Engineering (CTE)'s laboratory facilities at Edinburgh Napier University will be used together with a specially designed rig to carry out the required tests.

In a programme of controlled loading and fixing types the performance of the fixings will be evaluated and compared with the available research, design codes and manufacturers' information. The tests will be conducted on timbers with a similar grade and quality with constant cross sectional area and the same plinth material.

Racking resistance of panel: In laboratory conditions a series of load bearing racking wall panels will be manufactured and tested in a typical racking scenario. It is envisioned that the student will use the CTE's dedicated racking test rig to evaluate the performance of the walls.

Performance of soleplate connections: The collected data will be analysed to evaluate the performances of the soleplate and fixings, both individual and relative, and to characterise the interaction between the components of the connections. The overall aim will be to develop a relationship between racking resistance of a panel and the soleplate connection characteristics.

Benefits to structural engineering: The timber panel industry represents an increasingly larger proportion of new build houses due to its cost effectiveness, speed of construction and the overall benefits to society and the environment. Current timber panel design guides tend to overlook the soleplate connection and therefore how to fix the frame down to the foundation. Further information is needed of this critical connection be understood and optimized to aid and infuse confidence in designers. The study will provide experimental validation of the current methods used and highlight any limitations. Furthermore, the study aims to provide a best practice guide for designers and practitioners.

Proposed finish date: 09/2012