

## 2013/14 Undergraduate Research Grant Scheme

**Project title:** Reinforced Prefabricated Racking Wall Panels

**University:** Edinburgh Napier University

**Supervisor:** Robert Hairstans

**Student:** tba

### **Aims of research:**

The aim of the research is to carry out a feasibility study and a laboratory test of an innovative reinforced closed panel timber frame wall.

Multi-storey timber frame walls reinforced by steel plates and threaded rods has been investigated for seismic load conditions in countries such as US, New Zealand or Italy. Nevertheless, this technology may be of special interest in UK for situations of high winds and also, in situations whereas stiffness can compromise the structural design.

The undergraduate student will investigate the technical feasibility of a reinforced timber frame wall prototype for low energy prefabricated timber framed buildings where a very low envelop airtightness requires a very high wall stiffness.

### **Description of method:**

The research objective will be obtained by following a three-stage methodology: empirical testing, finite element analysis and analytical comparison of results.

The undergraduate student will firstly review existing literature on reinforced and standard timber frame walls and the methodology to test these type of walls under lateral load.

After this, the student will undertake stage 1 of the methodology: a full scale test of a prototype reinforced wall panel developed by the Centre. This prototype is the result of the ongoing research work being carried out at the Centre.

Stage 2 of the project will result in a finite element analysis of the prototype wall panel . Special attention will be drawn to the stiffness performance of the wall panel. The stiffness of the model created will be evaluated with the stiffness results obtained during the stage 1 of the project. A final refined FEA model will be suggested by adjusting the k value of the system in line with the results achieved in the test stage.

Lastly, the student will compare the strength value of at least five different racking walls obtained by the analytical Eurocode 5 with the results given by the proposed FEA model.

### **Benefits to structural engineering:**

The direct benefits of this research project to the structural engineering community are:

- understanding the behaviour of reinforced timber frame walls
- investigating new structural capabilities of closed panel products
- proposing a simple FEA model to determine displacements on racking walls

Finally, the findings of this research will provide a platform for future work and this may assist on future design guidance for advanced timber diaphragms.

**Proposed finish date:** May 2014