

## 2013 MSc Research Grant Scheme

**Project title:** New Hybrid Timber Concrete (HTC) system for timber floor

**University:** University of Bath

**Supervisor:** Dr Wen-Shao Chang

**Student:** t.b.a

**Aims of research:** This project aims to develop a new hybrid timber concrete (HTC) floor system for timber office buildings, as thermal mass is an essential factor to consider in the design process. There exists great potential for timber to be used in the construction of office buildings, and current application for concrete used in timber buildings is to cast on top of a timber floor, i.e. the compression side, to provide stiffness.

This project will develop a prefabricated system whereby a concrete layer is placed at the bottom, i.e. the tensile side, so that the layer will provide sufficient thermal mass.

**Description of method:** A new connector system is used in the HTC system that can increase friction between the timber and concrete layers so as to enhance composite action of the system. This new connection system has been developed by the applicant (the supervisor) and his industrial partner. This project will carry out floor vibration experiments in order to explore how potential factors will affect the efficiency of this system.

Two timber floor specimens will be constructed. Connectors will be embedded in a five-ply CLT timber floor with 1.5x1.5 metre dimensions; a concrete layer with 80mm thickness will be cast on top of the floor. Post-tension will be applied to the floor after the concrete layer is dried and dynamic tests will be carried out on the specimens with the concrete layer at the bottom. A shaker weight of 60kg will be mounted on the floor specimens and will generate vibration with varying frequency. The factors this project investigates include: (1) the spacing between connectors, and (2) level of tension applied. The spacing between connectors is 500mm and 300mm in two specimens and there are three different levels of stress applied through the connectors. The natural frequency and the damping ratio will be obtained; how the different levels of post-tension and connector spacing affect the composite action of the floor system will be analysed and discussed.

**Benefits to structural engineering:** Although investigations on composite actions between timber concrete composite floors have been carried out by other engineers and researchers, this project is the first attempt to put a concrete layer on the tensile side. The innovative connection system will provide a new solution for timber office buildings to meet the requirements of the structural integrity and thermal mass particularly suitable for the UK.

**Proposed finish date:** 09/2013