The Institution of Structural Engineers

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2013/14 Undergraduate Research Grant Scheme

Project title: Truss connector plate slip-tests

University: University of Sheffield

Supervisor: John Buick Davison

Student: tba

Aims of research:
In this project, the student will determine the slip characteristics of a novel timber-steel joint. Cross-Laminated Timber (CLT) slabs are proposed for use as floor slabs in multi-storey construction resting on the lower flange of asymmetric steel beams. Substituting the concrete from a conventional steel frame building with timber may yield benefits in terms of environmental impact, material efficiency, and material waste. Enabling composite action expands the limits if these benefits.

The results of this testing will contribute to determining the ability of the system to mobilise the longitudinal shear necessary to induce composite action between the CLT floor slab and the steel beam, allowing more efficient use of materials.

Description of method:
Truss connector plates (punched metal plate fasteners) fixed to the flange of a beam will bite into the CLT under load, forming a shear connection. The strength and suitability of this shear connection will be determined under varying levels of preload simulating the effect of the precompression arising from increases in variable actions on the slab.

The degree of shear resistance offered by the connection is hypothesised to depend on the interlock generated by the teeth of the truss connector plate biting into the wood. As such, the work will investigate the effects of connector plate tooth dimensions, layout and orientation. Further, the effect of varying the vertical load on the connection will be investigated.

Benefits to structural engineering:
As well as providing insight into developing composite action between steel and timber, the tests will increase knowledge of the failure behaviour of cross laminated timber under shear loading, in particular interface shear between cross-laminations. This will add to the knowledge base for CLT, which is currently quite limited, thus enabling designers to predict its performance and specifiy its use with more confidence.

Proposed finish date: May 2014