



Hybrid Timber Construction – combining material properties for energy efficiency and sustainability

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Abstract

In the past Arup has been involved in various timber projects around the world developing its timber competence on real projects and through research activities. We believe timber is an outstanding structural material with a very small carbon footprint and that its strength/weight ratio is better than other conventional materials making it ideal for pre-fabrication. Considering not only structural performance but also acoustics, building physics, fire, façade engineering and sustainability we found that combining wood with other materials can have many advantages, expanding the potential for wood in construction. This paper looks at the forms of timber construction available and the advantages that hybrid construction can offer as part of the overall family of timber construction forms.

Keywords: Timber hybrid construction, sustainability, pre-fabrication, energy efficiency, fire, acoustics, carbon footprint, heavy timber, Glulam, CLT, LVL

1 Introduction

Timber is an outstanding structural material. While most timber constructions to date have used timber alone, combining timber with steel and concrete can help achieve larger and higher performance overall designs to address not only structural, but also acoustic, thermal and fire requirements.

This paper will compare the various forms of pure timber and hybrid timber construction available, by reference to several Arup projects, and show the types of projects where hybrid construction can offer an advantage to the overall building performance.

2 Forms of Timber Construction

In this article the phrase timber hybrid is used to describe material combinations of wood and other materials. The most often used combination is TCC – Timber Concrete Composite.

2.1 Lightweight timber frame

Timber has traditionally been limited to low-rise domestic construction – lightweight frames of wall studs and floor joists sheathed and decked in plywood or OSB. The small timber members can burn quickly and therefore need to be protected with plasterboard. By definition the walls are relatively weak and therefore need to be closely