

Industrialization of Dowel-Laminated Timber (DLT) Panels for Building Construction

Only 25-40% of a log provides a structural grade timber for building construction. This makes the construction of timber buildings expensive. The remaining 60-75% is low grade and usually ends up in low value uses such as furniture, barbeque, or even landfill sites. We propose using low-grade timber for building construction. The challenge, however, was that it hadn't been engineered in a way that can be used as structural elements. This hinders adoption of DLT at a large scale in Australian building industry. We have partnered with a SME to see how we can do that at commercial scale.

Why the study:

- Research into DLT has increased over the last decade as it offers adhesive-free structural elements as opposed to commonly used engineered wood products, such as glulam and Cross Laminated Timber (CLT). The focus has been predominantly placed on improving structural properties of DLT members by using higher grades to advance its applications to, for instance, taller buildings, as an alternative to glulam and CLT or to replace steel and concrete.
- The low-grade timber is typically low cost. If it can be engineered for use in DLT for structural applications, it will result in a more efficient use of the timber resources and will save money.

What we did:

- We have conducted our research with a distinct proposition: utilising low-grade timber in DLT and focusing on its applications in low-rise buildings. We have utilised the findings of the past DLT studies particularly on dowel arrangements and load orientations in scoping DLT projects with low grade timber, but we have added novel variables and designs and tested numerous compositions of low-grade timber boards in the panelisation.

What we found:

- Through our 6-year plan for a comprehensive research, we have gone beyond laboratory testings by using AI in intelligent panelisation of the low-grade boards, a conceptual design of a modular DLT production line, and identification of common structural spans through pattern recognition in the design of 790 buildings and review of relevant BCA codes and industry practices.

What this means:

- This project is establishing an advance manufacturing facility for production of DLT for fully sustainable building construction. It is leveraging our 6 years of research on converting low grade and off cut timber to structural grade DLT as a new engineered product. We are developing novel hardware, software, guides, and domestic capabilities for a unique DLT factory, amplifying sustainability in timber and building industry and promoting the project collaborators for national and global impact.

