HYBRIDISED AUSTRALIAN CROSS LAMINATED TIMBER (ACL T) AND ORIENTATED STRAND BOARD (OSB) WALL PANELS - A CASE STUDY

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ABSTRACT: Following on from the author’s recently completed doctoral research investigating Scandinavian industrially produced engineered construction methodologies and their potential application in Australia, this paper reports on the research and development of a hybridised nail laminated 3 ply CLT and OSB wall panel with a cavity through the design and construction of a prototype commercial building for Western Australia’s largest soft wood timber processor, Wespine.

KEYWORDS: Cross Laminated Timber (CLT), engineered timber, hybrid engineered timber, Orientated Strand Board (OSB), interlocking timber panels

1 INTRODUCTION

Findings resulting from the author’s doctoral research and research undertaken for New Zealand research consortium, Solid Wood Innovation, demonstrated the potential for rough sawn multi-grade Radiata pine to be used as a structural material with the capacity to be used in developments of five and six storeys when laminated via a simple gun nailing lamination process⁴. This paper introduces new developments on this concept through the hybridisation of a two ply cross laminated panel with OSB bracing to create a rigid modular wall element suitable for a range of building types.

2 METHODS

The development of modern prefabrication pioneered by the Scandinavian, German and Austrian timber construction sectors have clearly demonstrated the benefits of off-site construction and engineered timber structures. The development of CLT has effectively provided the timber construction industry with a new material capable of competing with modern concrete and steel construction. The increased load carrying capacity and dimensional stability that results from lamination, first optimised in LVL and glue laminated beams and posts and now in a panelised format, has many potential variations and hybridisations. Whilst gluing has emerged as the dominant laminating medium, the cost of establishing presses and gluing equipment capable of pressing, gluing and lifting large scale panels can be a significant deterrent to conservative timber processing sectors that have yet to establish a market for heavy weight panelised timber construction elements. The introduction of smaller scale, segmented panelised timber wall, floor and roof elements that can be laminated using an alternative readily available fixing method can offer a way for innovative timber processors to introduce new value added structural timber products to the market without the large investment and risk of importing existing technologies from Central Europe or Scandinavia.

2.1 NAIL LAMINATION

Almost without exception, most developed countries use gun nailing as the primary fixing method for residential timber frame construction. Gun nailing equipment is readily available and the construction industry is very familiar with its use. Panelised nailed timber plates are also becoming increasingly popular.

Figure 1: Nail laminated deck plate image [2]

Figure 2: Hand held nail gun and automated Nail gun machine [3]

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Australia has a well established forestry, sawmill and construction sector, yet no planar laminated structural elements such as CLT are manufactured there. Australia’s only CLT building, Lend Leases’ Forté building, has been constructed with CLT imported from Austria. The Forté building has generated much interest in planar timber construction in Australia and it is reasonable to assume that CLT may be produced domestically in the future as a market is established. Timber processors such as Boral already manufacture nail laminated timber sections using native hardwoods [4] and this demonstrates that there is existing commercial interest in the development and marketing of value adding nail laminated building products. This paper argues that small scale gun nailed solid timber panels have the potential to promote the establishment of solid timber panelised construction in Australia and even assist in paving the way for large scale domestic CLT manufacture.

2.2 TWO PLY CLT AND OSB PANELS THAT INTERLOCK
The author, in conjunction with Wespine Industries Pty Ltd and MLB Consulting Engineers, has developed a 1200mm long gun nailed cross laminated panel that hybridises with 6mm OSB bracing board to create segmented structural wall panels in modular format that interlock to create a desired wall length. Each panel segment combines multi-grade Radiata pine in a vertical and horizontal cross-laminated pattern with vertically integrated MGP10 studs at set distances and an OSB bracing element. As with all modular elemental construction, the design of the structure must conform to the modular units where possible to ensure the system is optimised.

3 RESULTS

3.1 WESPINE KILN CONTROL ROOM FACILITY
Wespine’s timber processing facility, located in Dardanup, two hours south of Perth in Western Australia, will be the site for the first 2ply hybridised CLT structure utilising this technique. A design for a free standing 9m by 4.5m Kiln Control Room has been developed as a prototype structure for this new structural system.

Figure 3: Plan detail and perspective views of 2ply CLT panels developed for Wespine’s new kiln control facility.

Figure 4: Concept drawings of the first structure using the Interlocking 2ply CLT wall panel

4 CONCLUSIONS

The use of nail lamination to create solid timber cross laminated timber panels in Australia as a precursor to glue laminated CLT will assist in establishing industry confidence that planar timber construction is possible in Australia using locally developed concepts. The 2ply CLT developed for Wespine’s Kiln Control Room building is a case in point that will pave the way for further developments in this field.

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REFERENCES

[2] Ref. No. EN 1995-2:2004: E, Eurocode 5: Design of Timber Structures – Part 2; Bridges, Figure 1.2a
[4] Boral Timber, Kiln Dried Solid Nail Laminated Hardwood,