The potential use of juvenile wood in timber framing in Australian residential buildings

Degree programme: Bachelor of Science in Holztechnik
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Australia's growing demand for affordable housing calls for innovative and sustainable building materials. This study explores the potential of juvenile radiata pine, often underutilised due to its lower density and stiffness, for structural use in lightweight timber framing.

While radiata pine (Pinus radiata) is widely used in lightweight timber framing, its juvenile wood remains largely underutilised due to concerns about its lower density, reduced stiffness, and increased susceptibility to distortion. This study investigates the feasibility of using juvenile wood from second thinning logs, core wood from first logs of clear-felled plantations, and top logs from clear-felled plantations as a potential alternative for structural applications in lightweight timber framing.

The juvenile wood was sourced from logs harvested in plantations in the southwest of Western Australia. Various measurements, such as diameter, length, acoustic wave velocity, and drilling resistance, were taken in the log yard before milling to gain a deeper understanding of the resource. Since juvenile wood forms within the first growth rings of a tree, boards from near the center of the tree were of particular interest for this project.

A paper template was applied to each log face before milling, helping determine the radial position of each board. Additionally, a numbering system on the template linked the boards to their corresponding log yard measurements. The modulus of elasticity (MOE) and density were automatically measured on each board during processing in the dry mill. These values, along with the radial position, were used to classify boards as either juvenile or mature wood.

A batch of representative boards was then used to construct lightweight wall frames according to Australian Standard AS 1684. The frames were built from either juvenile or mature wood in combination with different bracing systems. A series of eight wall frames, constructed using either juvenile or mature wood, were subjected to real-life environmental conditions within a test cell to evaluate their long-term distortion behavior.

Findings indicate that while juvenile wood exhibits higher variability in density and stiffness compared to mature wood, appropriate selection and processing methods can enhance its structural viability. The inclusion of engineered connectors and bracing systems influenced frame distortion. These results suggest that, with proper grading and design considerations, juvenile wood can contribute to the sustainable expansion of Australia's timber construction industry, offering an economically viable and resource-efficient alternative for residential building materials.

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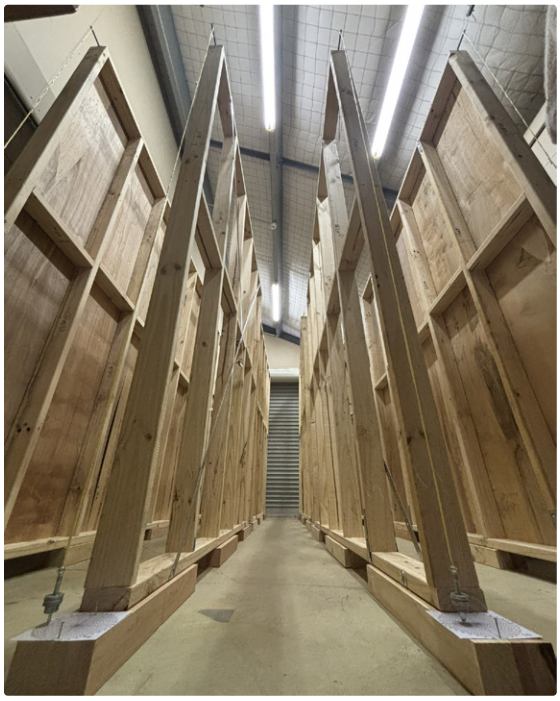

Test frames installed in the test cell for long-term distortion assessement