IASS Annual Symposium 2019 — Structural Membranes 2019
Form and Force
7–10 October 2019, Barcelona, Spain

Whole Timber Construction: The State of the Art

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Abstract

Forests worldwide are overstocked with small-diameter trees, putting them at increased risk of disease, insect attack, and destructive high-intensity wildfires. This overstocking is caused primarily by the low market value of these small-diameter trees, which are generally unsuitable for sawn timber production and yield low prices when sold for biomass fuel, paper, or fibre-based engineered timber products. Considerable research in recent decades has demonstrated the potential for these small-diameter trees to be used in minimally processed round segments as structural elements in large-scale buildings, bridges, towers, and other infrastructure [1]. Such "whole timber" construction serves as a low-cost, low-impact building system while providing revenue to forest owners to conduct harvests of low-value trees as required for sustainable forest management. This paper discusses recent developments in whole timber construction, summarising digital survey, design and fabrication methods, new processing technologies, and a diverse range of novel connection types and structural systems. A new online database of historic and contemporary whole timber structures, connections, and structural systems is presented as an up-to-date reference for researchers and practitioners in the field. Challenges for wider adoption of whole timber construction are identified and recommendations for future research directions discussed.

Figure 1: The Cedar River Valley logging trestle, built in 1925, used 30 metre whole timbers as primary structural elements (Courtesy of Maple Valley Historical Society).

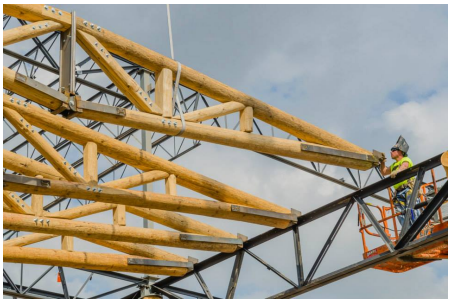

Figure 2: The Festival Foods grocery store, built in 2016, uses whole timbers from overstocked forests in 16 metre trusses (Courtesy of WholeTrees Structures).

References

[1] Bukauskas, A., Mayencourt, P., Shepherd, P., Mueller, C., Sharma, B., Walker, P., Bregulla, J., Whole Timber Construction: A State of the Art Review, *Construction and Building Materials*, 2019 (Under Review).