

Mechanically Fastened Cross-Laminated Timber System Feasibility

Cross-laminated timber (CLT) wall systems have been manufactured in Europe for over a decade, offering many economic, building performance, and environmental advantages to wood-based construction. By laminating several layers of lumber at right angles to each other, CLT panels provide structural, combustion, and dimensional stability properties more comparable to concrete than traditional wood-framed systems. Low-grade lumber can also be incorporated into CLT panels because the reinforcing that occurs with multiple layers overcomes the effect of localized weak areas in the lumber. Interest is growing to adopt this technology to U.S. building practices.

Background

CLT systems are typically manufactured by laminating layers of lumber with adhesives, ensuring that panels are rigid and that buildings made with them are able to withstand shear forces associated with wind and earthquake events. However, large presses are needed to create the pressure required to successfully glue CLT panels, which adds to the cost of production. If a mechanically fastened laminating system can be used to manufacture CLT panels, the cost of manufacturing could be reduced.

If mechanically fastened CLT systems can be economically produced and successfully utilized to create structurally sound buildings, there is an opportunity to encourage small CLT production facilities. This is especially important in rural areas where pine beetle infestations have created dead material that is presently unsuitable for use as dimension lumber but adequate for use in laminated timber systems.



Figure 1. Prototype of a mechanically fastened CLT wall section made from beetle-killed wood.

Objective

The objective of this feasibility study is to assess the cost and structural performance of a single-family house constructed with mechanically fastened CLT panels. Low-grade lumber produced from beetle-killed pine will be incorporated in the panels to determine the potential for maximizing utilization of this material.

Approach

We will document the design, fabrication, and construction of a two-story home in rural Utah



using mechanically fastened CLT panels made from beetle-killed pine. Our documentation will include an engineer's assessment of the structural integrity of the system, assembly details, and a cost assessment of the project.

Expected Outcomes

Our feasibility study will document how mechanically fastened CLT panels can be effectively produced to create structurally sound walls for residential construction and other suitable applications. This information will be useful to designers and builders interested in adopting the CLT system to create sustainable, energy-efficient, and cost-effective structures from material that would otherwise be unsuitable for construction. Increased markets for wood from beetle-killed trees will help forest land managers and improve local economies.

Timeline

Construction of the mechanically fastened CLT panel home is scheduled to begin in fall 2010. Documentation of the construction process will begin at that time and is expected to be completed by spring 2011. Published reports should be available by summer 2011.

Cooperators

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