INTERLOCKING CROSS LAMINATED TIMBER
A Sustainable Use for Beetle-Killed Trees in the West

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BACKGROUND
In April of 2015, the Utah Biomass Resources Group (UBRG), in partnership with the Utah State University (USU) Botanical Center, received a Wood Innovations Grant from the USDA Forest Service to design the Nation’s first public building made from Interlocking Cross Laminated Timber (ICLT). USU is raising private funds for the construction of the building, which is the brainchild of the Utah Botanical Center Director, Jerry Goodspeed. Goodspeed expects this facility to serve many purposes for USU and the surrounding communities.

The original motivating force behind this project was Scott Bell, former Biomass Coordinator with the USDA Forest Service, who nudged the UBRG to pursue this grant. The objective of this article is to introduce readers to the many benefits of adopting ICLT construction methods. We believe it holds great potential for creating jobs in harvesting and construction, providing economical, safe, and pleasant structures for people to dwell in, while finding a use for beetle-killed timber that sequesters carbon and reduces hazardous wildland fuels.
WHY ICLT?
Insect epidemics leave swaths of dead and dying forests across the West every year. Beetle infestations translate to billions of board feet of wasted wood, increases in fuel loads that put communities and ecosystems at risk, and agencies faced with the monumental task of restoring degraded ecosystems. We suggest a solution that might tackle a number of these issues: the conversion of low-value, beetle-killed waste wood, into high-value massive wood walls, or ICLT. This will have environmental benefits, will increase building efficiency, and will have economic benefits as described below.

ENVIRONMENTAL BENEFITS
In the Intermountain West alone, there is more than a half billion board feet of beetle-killed wood available from National Forests annually, and much of this wood could be utilized. When insect damaged wood remains in the forest to decay, it provides massive amounts of fuel and greatly increases wildfire hazard that puts communities and remaining forests at risk. Removing beetle-killed wood from the forest is preferred by many forest managers, however creating valuable products from beetle-killed logs is challenging because they are vulnerable to cracking and checking, meaning they can’t be easily milled into traditional boards.

On the other hand, by joining beetle-killed wood together via four-way dove tails and butterfly joints, the damaged wood becomes an aesthetically pleasing, carbon-storing, massive wood wall, or ICLT. ICLT sequesters carbon because wood is a carbon sink - meaning that when trees are made into ICLT, the carbon remains locked up for the life of the building. This is in stark contrast with widely used, energy intensive, traditional building products such as cement, iron, and steel, which produce massive amounts of greenhouse gasses during manufacturing.

INCREASED EFFICIENCY
ICLT structures take less energy to construct than many other building materials, especially concrete. The relatively lightweight ICLT panels require less foundation material and provide insulation that better maintains ambient temperatures indoors thus increasing energy efficiency. While the cost of ICLT is approximately 25% more than traditional 2x4 stick construction methods, the savings accrued from having already finished interior wood walls and the insulation value of the wood can more than offset the additional construction costs. Further savings can come from reduced onsite construction cost, reduced jobsite construction waste, and fewer weather-related delays, especially in mountain environments or where the importance of a quick and quiet assembly of the building is important. Most of the construction of ICLT buildings happens in the shop, and it generally takes a fraction of the time to assemble the pre-made wood panels onsite than traditional construction.
**ECOLOGICAL BENEFITS**

Euclid Timber Frames, LLC. has been operating as a mass wood producer in Utah for more than 10 years. They have a successful reputation, local partnerships, and a passion to advance this timber building technology. Because of this, UBRG partnered with Euclid on this project, and expects to see their production of ICLT grow in the coming years. Currently, Euclid is producing 240 square feet of ICLT per day. By expanding the wood market of ICLT, we expect creation of well-paying rural and urban jobs in logging, milling, fabrication, and construction. Euclid is aptly located between the Uinta-Wasatch-Cache, Ashley, and Fishlake National Forests – all areas in urgent need of hazardous fuel reduction and forest restoration.

While ICLT is commercially available in Europe, it is still a new product in the United States. By promoting ICLT construction in the United States, we can help local businesses utilize ‘waste wood’ in an economically viable, sustainable, and energy-efficient way. Strengthening the wood construction industry in Utah can contribute to economic viability and forest sustainability. The capacity to process wood locally from forest thinning and wildland fire protection efforts can provide a tremendous opportunity for the local economies, and facilitate the advancement of this promising new building technology.

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**OUTREACH**

The prospect of expanding ICLT as a mainstream building material is rich with environmental and economic potential. One of the keys to making this successful is a consistent, effective outreach program. Utah State University Forestry Extension and the UBRG have a unique platform for offering such a program.

In some ways, an ICLT building will market itself because of its aesthetic qualities, as shown through the detailed plans created by Method Studio Architecture Firm in Salt Lake City, Utah. The building will be the centerpiece of the Utah State University Botanical Center facility, with greenhouse features and teaching kitchens. The USU Botanical Center has a strong reputation with existing orchards and edible demonstration gardens.

The addition of the ICLT building will add to the energy and material-efficient nature of the facility. This building will foster interdisciplinary Extension programming on topics such as horticulture, agriculture, home sciences, and farm-to-table demonstrations, just to name a few. With the capacity to hold up to 200 people in one room, it will be largest of the primary buildings at the USU Kaysville Campus. It will also be available for rent for weddings and celebrations, adding a potential income stream to the value of the facility.
This ICLT building at the USU Botanical Center will draw thousands of visitors annually, not only for its overall mission, but for its holistic design and aesthetics. Portions of the interior wood joinery will be showcased and demonstrated within the building itself, making it a place where we can conduct continued ICLT training for home-builders and architects, all within an actual ICLT building. An educational kiosk with information on the ecology of beetle-killed trees and forests and how that relates to this ICLT building will also be on permanent display for visitors to view. The objective of this building is to demonstrate how ICLT construction can be a sustainable, affordable, aesthetically pleasing, and renewable building alternative, while simultaneously improving forest health and decreasing hazardous fuel loads.

USU Extension Assistant Professor of Forestry, Darren McAvoy, is the primary spokesperson for this product at conferences, workshops, and online forums. His plans to disseminate information on this industry include presentations at regional, national, and international woody biomass utilization and sustainability conferences. These conferences facilitate cooperative partnerships that contribute to the expansion of wood utilization and wood markets, specifically relating to non-energy based wood building products. We will complete a Utah Forest Factsheet detailing the economic and environmental benefits from the expansion of this technology. We will conduct a Learn-at-Lunch Webinar, with video from the fabrication of the walls and the construction of the building, to highlight the construction process from start to finish.

We expect building construction to begin in 2018 and to be completed by 2019.

Some refer to CLT buildings as the modern log-cabin, which is fitting in some ways, as it was the log cabin that housed the original western pioneers. In Utah, that pioneering spirit is alive as we blaze the trail toward new frontiers in sustainable building construction.*

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