Sierra Institute
for Community and Environment

# Some Recommendations to Advance Cross Laminated Timber Production and Use in California

April 16, 2018

Jonathan Kusel, Ph.D.

JKusel@SierraInstitute.us
530-284-1022

The mass timber conference was held in Portland, Oregon in March of 2018, the third year in a row in which it was hosted in Portland. Conference organizers touted the growth of participants at the conferences: 500 in 2016, 700 in 2017, and over 1,200 participants this year. The mayor of Portland provided one of the keynote speeches. He spoke eloquently about the commitment of the city to use a sustainable product, a local product, a carbon sequestering product, a product that is beautiful, a product that offers seismic safety benefits and creates employment in the region.

This is the second year in a row Sierra Institute for Community and Environment staff participated in the conference. On April 6 of 2018, Sierra Institute held a ribbon cutting to celebrate completion of the first full cross laminated timber building in California. This building houses a biomass powered boiler that will heat Plumas County's Health and Human Services Building in Quincy and produce electricity. This project was developed with funding from the California Energy Commission and Plumas County, an award from the Barrett Foundation through the National Forest Foundation, the U.S. Forest Service's Wood Innovation program, Sierra Nevada Conservancy, and Sierra Institute.

CLT use in the U.S. is in a dramatic growth phase. Proposed and planned CLT buildings include:

- The Spar (OR) -- 48 story building. Proposed by Ben Kaiser, builder of the Carbon 12 building. https://www.pdxmonthly.com/articles/2017/9/27/would-you-live-in-this-300-foot-wooden-skyscraper
- River Beech Project – 80 stories. Chicago. https://www.curbed.com/2017/10/9/16449494/tall-timber-building-skyscraper
- Hickok Cole Timber Towers – 60 stories. Philly. https://www.designboom.com/architecture/hickok-cole-architects-mass-timber-high-rise-us-03-22-2018/
- T3 Atlanta. https://whatnowatlanta.com/t3-west-midtown-moving-forward/
- T3 Goose Island (Chicago). https://www.woodworkingnetwork.com/news/woodworking-industry-news/massive-cross-laminated-timber-building-planned-chicago
- Flank (New York City). https://therealdeal.com/2017/11/20/shiver-me-timbers-flank-bringing-wooden-buildings-to-brooklyn/
- Newark, NJ Massive office complex. https://www.dezeen.com/2018/02/06/riverwalk-square-michael-green-architecture-newark-new-jersey-usa-largest-timber-office-building/
- Platte 15. Denver. http://ozarch.com/2018/02/platte-fifteen-construction-begin-soon-denver/

And these are just the big buildings; numerous small buildings have been or are being built and more big construction projects using CLT are scheduled to be announced this year. Concerns expressed by some presenters at the mass timber conference are that demand for the product may well outstrip supply in the coming year, and the wait for CLT machinery might have a similar or longer waiting period.

California is behind the curve, particularly compared to Oregon and the State of Washington, and an important market and carbon sequestering opportunity is slipping away.

CLT operations can be scaled and specialized, meaning that multiple manufacturing opportunities and niche production can be developed. Smaller rural production facilities can be established and competitive.

Why bother? The CLT industry can create jobs through wood product utilization, manufacturing and new product development. CLT is a less expensive construction alternative to steel and concrete, has a better strength to weight ratio, and leaves little to no on-site waste. CLT also sequesters $CO_2$ compared to concrete and steel, which are $CO_2$ emitters. Compared to a ton of framing lumber, which is used to make CLT, eight times the carbon is emitted to produce a ton of cement. Steel emits roughly 21 times as much.[1] This ignores the carbon that is replaced by older or newer tree growth on sites from which the trees used for CLT are harvested.

CLT's seismic safety capabilities appear excellent[2] and CLT appears to offer considerably less expensive retrofit solutions. This offers a tremendous growth opportunity that should be captured by the state. CLT structures recently passed blast testing, even blasts designed to push structures beyond their elastic limits. Unlike unprotected timber frame construction, CLT is fire resistant because it chars before it fully burns, retaining its structural integrity;[3] and unlike steel, it will remain structurally sound when exposed to high temperatures.

This memo is developed to offer suggestions 1) to jump-start use of CLT material in buildings in California and 2) identify ways to encourage and develop CLT manufacturing facilities in California through legislation. In addition to "taking over from steel and concrete as the architectural wonder material of the 21st century," as one architecture company stated, production of CLT in California offers opportunity to:

- use material from millions of dead trees in the state and lock up carbon in CLT products;
- use lower value, small diameter material that needs to be removed from high fire risk forests, storing carbon before it is released through stand replacing wildfire, and encouraging additional carbon storage through growth in the forest; and
- create needed jobs in lagging rural areas.

[1] Centennial Edition Wood Handbook: Wood as an Engineering Material. 2010. Forest Products Laboratory, USDA General Technical Report FPL-GTR-190 (p. 1-3). Oliver et al. (2014) report that substituting wood for concrete and steel can save 14 to 31% of global $CO_2$ emissions [Journal of Sustainable Forestry 33:248-275].

[2] "Timber rocking shear walls are an emerging solution for lateral stability in tall and midrise buildings. Rocking shear walls create a system to effectively dissipate seismic forces while reducing or eliminating the potential for damage to the building's superstructure, also minimizing permanent displacements after an earthquake." From Mass Timber/CLT & Washington Building Codes: A Technical Primer (2018), https://forterra.org/wp-content/uploads/2018/03/WA-BCTP-Jan.-2018-002.pdf (p.5).

[3] Tested by Oregon-based manufacturer DR Johnson, a five-layer unprotected CLT loaded floor panel lasted two hours; in another test, a gypsum protected five-layer panel lasted over three hours, https://forterra.org/wp-content/uploads/2018/03/WA-BCTP-Jan.-2018-002.pdf (p.7).

General considerations for encouraging the use of CLT and advancing development of manufacturing facilities include the following:

(1) Provide outreach and education to state agencies and others about the product and opportunities;
(2) Provide grants and subsidy for equipment: offer loan guarantees on equipment or other capital investments; offer tax subsidy associated with use of the product;
(3) Change building codes to encourage use of CLT;
(4) Provide streamlined permitting for CLT building projects; and
(5) Require CLT use in public buildings and use of California sourced CLT

1. **Provide outreach and education to state agencies and others about the product and opportunities**
   Wood Works is a non-profit organization funded by the U.S. Forest Service and others to provide outreach and offers a variety of educational programming. They have separate northern and southern California offices, among others. They have a large network of affiliated professional and industry partners. At the Regional Office in Vallejo, the Forest Service has staff knowledgeable about the product and available resources. They can provide recommendations of specialists and researchers in the state and can refer as well to agency leaders in the State and Private Forestry branch of the Washington Office of the Forest Service, which has been a leader in supporting information dissemination, education, and promoting and identifying values of increased use of CLT. There are an increasing number of engineers and architects familiar with use of the material, though few are located in rural areas.
   *Legislative recommendation-*
   a. *Require California's Department of General Services, Division of State Architects, Office of Statewide Health Planning and Development to designate program leads who will complete education programs offered by Woodworks and others and serve as agency leaders for their departments/agencies regarding use of CLT.*
   b. *Establish and support pilot projects at schools and hospitals that advance CLT use in new construction and retrofits at hospitals.*
   c. *Support contractor training by manufacturers, Woodworks and others to share information about CLT construction and unique construction challenges associated with CLT, identify programs that can offer workforce training. Work with agencies and others to establish a group of "master builder" contractors who will train and assist other contractors in construction and bidding.*

2. **Provide grants and subsidy for equipment; offer loan guarantees on equipment or other capital investments.**
   One of the major stumbling blocks for entry in CLT production are capital costs. This is particularly true for poorer rural areas that have lost manufacturing capacity and jobs. In these areas grants are more critical than loans. Entry costs

for building a CLT production facility range from roughly 3 to 15 million dollars depending on whether a facility produces panels along with the method of production, and cutting and other detailing services offered. Entry costs may be as low as two million dollars with some of the machinery on the horizon. After 20 years of CLT utilization, Europe has a number of smaller production operations as well as a few very large one.

*Legislative recommendations:*

a. *Prioritize investment in areas where 10- and especially the newly authorized 20-year stewardship agreements are established on national forest land. This will link production to management on federal lands, which includes some of the forests most in need of restoration, tie production to supply—which is critical from an investor standpoint, and provide incentives for establishing longer term sustainable management operations.*
b. *Dedicate 25 million dollars of Greenhouse Gas Reduction funds/California Climate Investment funds, and/or future bond funds to serve as seed grants for manufacturing and fabrication facility development.*
    i. *Consider establishing a pilot facility at the Indian Valley Wood Products Campus, a 28-acre former mill site, near the first full cross laminated timber building in California.*
c. *Prioritize investment in areas where collaborative groups have been in operation for not less than 1.5 years. These groups are focused on landscape restoration and community improvement outcomes, many are actively seeking ways to increase wood utilization capacity and develop local jobs.*
d. *Prioritize support for CLT production facilities at old mill sites. This will support re-use of old industrial sites, avoid creation of new industrial sites and permitting challenges, and increase the likelihood that production facilities will be in areas of available supply, where fire risks are greatest, and where jobs are most needed.*
e. *Provide a business and occupation tax deduction for the manufacturing and sale of cross-laminated timber and a sales tax exemption for construction projects that use CLT.*[4]

[4] See, for example, State of Washington House Bill 2857 (2016): "The legislature finds that cross-laminated timber is a sustainable alternative to traditional building materials. The legislature further finds that construction using cross-laminated timber is currently cost-prohibitive due to a lack of supply of this material, despite the vast natural resources available in Washington to create this material and the strength of Washington's wood manufacturing and timber industries. It is the legislature's specific public policy objective to promote the manufacturing of sustainable materials for use in construction. The legislature intends to provide a business and occupation tax deduction for the manufacturing and sale of cross-laminated timber and a sales tax exemption for construction projects that use this material, thereby promoting the manufacture of sustainably harvested timber products, thereby stimulating economic growth and job creation in Washington's rural communities, and thereby encouraging the use of sustainable materials in construction projects."

3. **Change building codes to encourage use of CLT**
   The International Building Code (IBC) currently limits wood structures to six stories or up to 85 feet. CLT can be used prescriptively in smaller buildings, as was done in Plumas County for the first full CLT building completed in the state. The International Code Council established an ad hoc committee on Tall Wood Buildings to review amendments to the IBC code that will include CLT. Anticipate changes in the fall of 2018. Committee documents include "Definition of Load Bearing," "Definition of Mass Timber," "Definition of Noncombustible Protection," and more. (https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/)

   *Legislative recommendations:*
   a. *Call for immediate adoption of 2015 IBC Code and include modifications and code changes consistent with ICC findings pertaining to CLT anticipated in 2018.*[5]
   b. *Recognize that cross laminated timber is a subset of "mass wood" involving large panelized wood construction. Mass timber products include cross laminated timber, nail laminated timber, glue laminated timber, laminated strand timber, dowel laminated timber, laminated veneer lumber, structural composite lumber, mass plywood, and wood concrete composites.*

4. **Provide streamlined permitting for CLT projects**
   Considerable staff time of local agencies is spent working through state permitting processes. Opportunities to have projects prioritized and streamlined for permitting will stimulate CLT use.
   *Legislative Recommendation:*
   a. *Require the state agencies mentioned in 1 (above) to provide and assure priority and streamlined permitting for public structures using CLT.*

5. **Require CLT use in public buildings and require use of California sourced wood**
   As a carbon positive building material, use of CLT can reduce carbon intensity and impact of construction. Consider requiring not only California made CLT but California made with timber from California forests. "California made" will help stimulate immediate development of CLT manufacturing facilities. California made with California timber will stimulate utilization of dead and dying timber in hard hit areas as well as utilization of material in high hazard forests.

[5] See Washington State Senate Bill 5450 that requires the State Building Code Council to adopt rules for the use of mass timber products for residential and commercial building construction. SB 5450 passed overwhelmingly out of both the Washington State Senate (91-6) and the House (45-2), and has been signed by Governor Inslee.

*Legislative recommendations:*

a. *Establish and support pilot projects at schools, hospitals, firehouses and universities that use CLT in new construction and retrofits at hospitals and other facilities (with upcoming state seismic requirements for upgrades).*[6]
b. *Require that the proposed Capitol Annex and proposed Natural Resources building be constructed using CLT.*
c. *Require public buildings (to the extent practicable) to use CLT for construction.*[7]
a. *Establish a pilot project program for schools and public housing using CLT. Require in-state sourcing using California timber after 1.5 years.*

[6] See: firehouse example in Oregon: http://www.woodworks.org/project/fire-station-76/
University of Arkansas (2018): https://news.uark.edu/articles/40916/university-libraries-bring-first-cross-laminated-timber-panel-to-state

[7] See, for example, State of Washington Senate Bill 5379 (2017) "All new public buildings that are twelve stories or less must, to the maximum extent practicable, be constructed with cross-laminated timber…"