

FINDINGS FROM THE 2021 INTERNATIONAL MASS TIMBER CONFERENCE

Justin Brown, PhD Candidate, University of Canterbury

Note: This summary was prepared independently of the International Mass Timber Conference and is not an official approved document.

The International Mass Timber Conference is an annual conference based in Portland Oregon, USA. This year's 6th annual International Mass Timber Conference was 100 percent virtual, held from March 30 - April 1 2021. The conference is co-produced by the Forest Business Network and WoodWorks - Wood Products Council. The conference delegates were from more than 30 countries and more than 800 companies / associations. These companies / associations were from all aspects of the mass timber market including supply chain, research, consulting, and government. This year was the first time Virtual Tours occurred and there were 9 tours to showcase outstanding buildings, innovative materials, and initiatives. In the future a hybrid in-person / virtual conference is expected in 2022 and beyond which will also include *Virtual Tours*.

Recently, Think Wood and WoodWorks - Wood Products Council released the first edition of the Mass Timber Design Manual, which is a free resource available through the Think Wood webpage (<https://info.thinkwood.com/masstimberdesignmanual>). Within this Design Manual, there are many free downloads to guides such as: U.S. Mass Timber Floor Vibration Design Guide, Acoustics and Mass Timber, Mass Timber Construction Management, WoodWorks Index of Mass Timber Connections, and numerous other technical documents and case study buildings primarily from the U.S.. Delegates of the conference also received their copy of the International Mass Timber Report, which was developed as a companion piece to the International Mass Timber Conference. The Report is updated annually and serves as a single, comprehensive source of North America mass timber information.

There were four conference tracks: (1) Reimagining our cities, (2) Project delivery with mass timber: new product, new processes, (3) Building performance: design and implementation, and (4) Overcoming barriers and growing the market. The following is a brief summary of the presentations that I followed during the conference.

CONFERENCE OPENING, AND GOOGLE KEYNOTE PRESENTATION

Presenters: Will Novy-Hildesley, CEO of Mass Susan Jones, founder of atelierjones

Michelle Kaufmann, Google Director of R+D for the Built Environment

Will and Susan opened the virtual conference. Then, Michelle discussed Google's Research and Development for the Built Environment Vision which has resulted in Google's new 180,000 square foot (16,700 square meter) mass timber pilot project. The presentation described the project from concept, through to design, early involvement from the mass timber supplier (Structurlam) and the importance of the entire team. MGA is the architect, and the project is currently under construction.

CROSS-LAMINATED TIMBER HISTORY: A WALK THROUGH TIME

Presenters: Andrew Waugh, Founding director of Waugh Thisleton Architects

Andrew opened his presentation highlighting that the history of timber is focussed on climate change. While a 1920 patent spoke of composite lumber, Gerhard Schickhofer was the inventor of CLT in the early 1990's. Waugh Thisleton Architects past built projects include the 9-storey Murray Grove, which was the world's first all-timber residential tower with CLT built in 2009. Since 2003, more than 600 CLT buildings have been built in the United Kingdom. Now, North America is fuelling recent growth. Andrew is passionate about seeking efficient, aesthetic solutions which require the least resources. In this regard, Andrew closed his

presentation with the powerful image of Univ.-Prof. Dipl.-Ing. Shickhofer's hand holding the number of tree seeds it took to grow the trees for Murray Grove.

BIOPHILIC DESIGN EXAMPLES FROM AROUND THE WORLD

**Presenters: Erin Rovalo (Moderator) - Director of Education, International Living Future Institute
William Browning - Managing Partner, Terrapin Bright Green
Nicole Miller, Managing Director Biomimicry 3.8**

Biophilia can most simply be referred to as a love of nature. William opened the presentation series by highlighting examples from nature. Fractal patterns such as snowflakes, fern leaves, and ocean wave breaks all allow for easier visual processing which lead to a drop in stress. Contour orientation can also facilitate visual processing. There are many patterns of biophilic design, and these patterns can be placed in a health outcomes matrix to facilitate stress reduction, cognitive performance, or emotion, mood and preference in building design. Some recommended readings on this topic include: Nature Inside, 14 Patterns of Biophilic Design, and The Economics of Biophilia.

Erin highlighted some recent winners of the Stephen R. Kellert Biophilic Design Award. These projects included the Khoo Teck Puat Hospital in Singapore, the Betty & Clint Josey Pavilion in the U.S., Heart of School: Bamboo Cathedral at Green School in Indonesia, and VanDusen Botanical Garden visitor centre and Phenix in Canada.

GLOBAL SUPPLY CHAIN - HOW IS IMPORT / EXPORT WORKING

**Presenters: Rose Braden (Moderator), President, Softwood Export Council
Ernst Woels, Sales Director Overseas and Northern Europe, Hasslacher Norica Timber
Paul Kremer, Founder and Editor-in-Chief, Mass Timber Construction Journal**

Rose moderated an informative session with Ernst and Paul which discussed the global CLT supply chain, past and future. When asked what factors have led to the expansion and adoption of CLT, Ernst highlighted that a few dedicated individuals worked tirelessly for many years in Europe to gain market share

from steel and concrete, and now he sees the same happening in North America. Ernst also highlighted the significant difference in maturity in the market, especially when comparing Central Europe to other areas globally. Hasslacher has to provide tailored service for each market in order to bring projects through to delivery. Paul highlighted that in Australia, Lendlease led the way bringing projects through to delivery acting as procurer, designer, developer, and builder. When asked where they see the adoption of mass timber building and manufacturing occurring next globally, Paul pointed to Russia where a number of new CLT plants are coming online. Paul further stated that South Africa and South America are areas to watch. Ernst stated that in the past CLT has been most successful in areas where labour costs are high. However, places like China are starting to adopt CLT and while the labour cost is not as high, there is a strong need to build their homes more ecologically. In addition to high labour costs, educated personnel is required. Because of these two key drivers, Ernst sees North America as the fastest growing market in the next 10 years.

CONNECTIONS FROM FORESTS TO BUILDINGS, THE MANY PATHS FOR SUSTAINABILITY

**Presenters: Katie Fernholz, President/CEO, Dovetail Partners
Kate Gatto, Vice President, Communications, National Alliance of Forest Owners
Thomas Robinson, Founding Principal, LEVER Architecture**

Katie and Kate's presentations were closely linked and discussed the forestland in the U.S. Katie first showed the ecoregions of North America, highlighting which areas are able to grow trees. By highlighting the many different categories of forest ownership, Katie noted the complexity of finding paths to sustainability. Kate showed that approximately 40% of the U.S. is designated as forestland. 70% of this is on private land, and approximately 2% of the total private forest land is harvested each year. In the U.S. they plant more than 1 billion trees per year, and the volume of trees growing has increased since 1953.

Thomas focussed on the importance of domestically sourced CLT as one path for sustainability. Thomas presented the Oregon Conservation Centre, Addidas

Headquarters Project, and Marbin Memorial Headquarters as three recent projects which championed this path to sustainability. Thomas closed with the analogy - *just as a chef thinks of his ingredients, as architects, we need to think about the supply chain to understand how our decisions impact our buildings* - and stated that the management of forests should be transparent for everyone.

CLT SHEAR WALL AND DIAPHRAGM DESIGN: CODE UPDATES AND DESIGN GUIDES

Presenters: Scott Breneman, Senior Technical Director - Mass Timber, Woodworks - Wood Products Council

In this presentation, Scott provided updates on prescriptive code provisions for CLT acting as a shear wall and diaphragm. Currently, all projects which use CLT as a lateral load resisting system in the US follow an alternative means approach as CLT is not explicitly recognized in the 2018 International Building Code (IBC), and no seismic R-factors are referenced in the ASCE/SEI 7-16. However, the upcoming 2024 IBC and ASCE/SEI 7-22 will include R-factors for design. These R-factors can be used for CLT shear wall systems which have specific aspect ratios ($2 \leq h/b \leq 4$) and use light gauge steel brackets to connect CLT walls to floors above and below and to adjacent walls or foundations. Provisions will also be provided for CLT diaphragm design.

EUROPEAN MANUFACTURING: WHAT'S NEXT?

**Presenters: Jeff Spiritos (Moderator), Manager, Spiritos Properties
Carsten Hein, Associate Director, Arup
Roland Maderebner, Senior Scientist, University of Innsbruck**

In this presentation, Roland showed some research from the University of Innsbruck. One such project is Diagonally-Laminated Timber in which the layers of a panel are laminated at 45° to each other, and not 90° as is commonly done with CLT. Roland presented some advantages to this product which included: decreased deflections for two-way spanning point supported flat slabs, increased frequency for vibration performance, and reduced lateral deflection in shear wall application. Another project discussed was the

Sharp Metal connector, which is now available from Rothoblaas. Sharp Metal is a thin metal plate with small hooks on both sides to provide efficient shear transfer mechanisms.

Carstein presented new materials which Arup has explored in recent projects. Some such materials included Beech LVL as beams, columns, and Beech LVL concrete composite flooring. Laminated Bamboo and Oak was presented as an alternative high strength column and beam material. Finally, hybrid glulam beams where softwood is used for the core and hardwood for the outer lamella has been explored. A recent research project is trying to optimize timber concrete composite flooring systems where the timber-concrete connection is realized with a polyurethane based glue.

HOW DO WE GET RELIABLE COSTING?

Presenters: Ricky McLain (Moderator), Senior Technical Director - Tall Wood, WoodWorks - Wood Products Council

**Ralph Austin, President, Seagate Mass Timber
Lisa Podesto, Mass Timber Specialist / Senior Business Development Manager, Lendlease**

In this panel discussion, Ricky moderated a series of questions for Ralph and Lisa. Some key questions and responses included:

At what point in the design process is it good to start tracking cost?

Lisa responded that Lendlease is usually in a design-build format, so costing is built in right away. Ralph responded that as timber contractors, they are usually asked this questions at the go / no go stage. Ralph relies on Seagate's 20 years of past project experience to price future jobs.

A few interesting metrics were also mentioned:

1. If the volume of mass timber / floor area is less than 0.75, the project is probably viable.
2. Labour to material cost ratios:
 - a. If it is a hybrid light timber frame wall and CLT floor structure the labour to material cost ratio could be 40/60.
 - b. If it is a post and beam structure, the labour to material cost ratio could be 20/80.

3. Connectors and screws usually account for approximately 15% of the total material cost.

Both Lisa and Ralph agreed that speed of construction is key. Also, speed of construction in the timber structure requires speed in encapsulation for fire and façade for envelope closure to ensure project success. With regards to other trades coordination, Lendlease tries to implement mock ups on site.

TELLING THE STORY AND SHIFTING FROM NICHE TO MAINSTREAM

Presenters: Chris Evans, Mass Timber Director, Swinerton Mass Timber

Tim Gokham, Managing Director, New Land

Tim Gokham is the developer for the 25 storey

Ascent project (19 storeys of timber on a 6 storey concrete podium). Tim reflected on his experience on bringing this project to construction, admitted that he knew little about mass timber when he started, but stated his best advice for anyone who wanted to build in mass timber is to seek advice. The project turning point for him occurred when the project was presented at the 2018 Council on Tall Building and Urban Habitat conference. There, the project team met so many people across the industry that wanted to help and share their advice and experience. One unique component for the project was completing a 3-hr fire test for the columns.

Paraphrased from Tim, - *like Tesla, mass timber can check all three required boxes: (1) superior look, (2) performance, and (3) economics* -.