Advancing Mass Timber Construction

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World Housing.....

- Worldwide, up to 3 billion people will need a new home in the next 20 yrs
- Push for urbanization: 50% today.. 75% in 2040!
- Cities are typically built from steel and concrete
- **However, steel & concrete contribute over 8% of World’s GHG emissions**
- Provide green building solutions that meet such evolving demands and wood can be a key part of the solution
Trends and Opportunities

- Growing interest in sustainability/green buildings
- Increased use of EWPs including mass timber
- Building codes evolving and permit more wood use
- Increased interest in larger and taller wood buildings using mass timber or hybrid wood and concrete or steel
- More prefabrication....panelized or modular construction
Engineered Mass Timber Products

- Glulam (since 1893)
- Structural Composite Lumber (since 1980)
  - LVL, PSL, LSL
- Cross Laminated Timber (CLT)
- Nailed Laminated Timber (NLT)
- Dowelled laminated Timber (DLT)
Over 90% of Residential Homes in Canada are Built with Wood
Traditionally Site Built

• Conventional wood-frame construction using lumber
• Structural systems are constructed entirely or largely on site
• Linear construction; requires each step to be completed before the next can begin

• But things are changing in Canada!! Interest in Industrialized Construction.. Panelized and Modular..
How to Build Faster, Safer and Better and do it for Less??!
Industrialized Construction
Future of the Timber Construction Industry!

- Learning from the evolution of the automobile industry!
- Same platform for different car models
- New trends.. “Mass Customization!”

Source: 2019, Swan Housing Association
Changing the Way We Build With Wood

- Typically the choice to use on-site wood framing vs. some level of prefabrication depends on many factors.
- Prefabricated and modular construction can offer a number of benefits.
Prefabricated Systems: Benefits

- Factory controlled environment: protected, unaffected by weather, year around protection
- Fast (i.e., house assembly within a day!)
- Reduced wastes
- Accuracy in cutting and assembly following a QA
- Trained and qualified staff
- Control of building process and project schedules
- Cost control for builders
- Repeatable process.. not repeatable products!

Source: Ken Koo
Mass Timber Lends Itself Nicely to Prefabrication
UBC 18-Storey TWB

Courtesy of UBC/FII
Emerging New Modular Concepts in Canada

Platform for Life Concept

- Flexibility
- Replicability
- Scalability
- Affordability
- Resiliency

Source: INTELLIGENT CITY + LWPAC
Government of Canada’s Programs/Initiatives

Supporting Advanced Timber Construction in Canada
Canada’s Support for Mid-rise Wood Frame Construction (WFC)

- Funded extensive fire, acoustics & structural research to support the adoption of mid-rise (5&6 storeys) WFC in the Canadian building codes (2010-13)
- The National Building Code of Canada (NBCC) and most of Canadian provincial building codes have adopted mid-rise WFC (over 750 Mid-rise WF buildings across Canada)
- Continue to fund critical educational & training activities to help implement mid-rise WFC
NRCan TWB Demo Initiative (2013)

UBC BC, Vancouver
18 storeys hybrid CLT/glulam

Nordic’s Origine, Quebec City
13 storeys CLT/glulam
Green Construction Through Wood (GCWood)

- New Program in Budget 2017; $39.8 million over 4 years under the Pan-Canadian Framework on Clean Growth and Climate Change, starting in 2018/19

- Supports key activities aiming at increasing the use of wood as a green substitute material in infrastructure projects, including:
  - Wood and hybrid demonstration projects (e.g., high-rise, low-rise non-residential construction and bridges)
  - Building code revision and supporting research including performance-based codes
  - Technology transfer, design tools, and education
GCWood — Demo Projects Update

• 3 calls for proposals targeting tall wood buildings, low-rise non-residential wood buildings & timber bridges since October 2017
• Over 20 demonstration buildings and bridges have been selected for potential funding from across Canada
• Several demo projects are at the construction stage with many others at the advanced design/development stage
• Extensive R&D activities conducted to support the design and approval process were funded by GCWood
Supporting Innovation

- Advanced floor systems using box beam/girder (i.e. longer spans)
- Advanced lateral load resisting systems using CLT shearwalls, braced frames, post-tensioning & innovative resilient seismic resisting systems
- Efficient multi-functional panels or envelopes that provide structural, fire and energy value
- Hybrid mass timber/concrete or steel systems
- Advanced connections systems
Supporting Adoption of TWBs In Canadian Building Codes

- The 2020 edition of the NBCC is expected to include provisions to allow up to 12 storeys Encapsulated Mass Timber Construction (EMTC)
- Funding extensive R&D activities on fire performance to address research gaps (i.e., room fire testing, water mist systems, etc.)
- The proposed changes will permit some exposed timber (up to 35% depending on the type of assembly and the fire spread rating)
- Technical Guide for mass timber shearwalls in tall wood buildings
- Extensive efforts to introduce performance-based codes by 2025/2030
Current Status of Code Development

- 3 Public reviews of Proposed Changes conducted since Nov. 2017
- *Standing Committee on Fire Protection* addressed the public comments, developed and recommended *Revised Proposed Changes* for final approval by the Canadian Commissions on Building and Fire Codes (CCBFC)
- Subject to the CCBFC’s final approval, National Building Code 2020 will permit tall wood buildings up to 12 storeys
- Expected to publish the 2020 Edition of NBCC in early 2021
- Extensive efforts to harmonize the building codes in Canada and introduce performance based requirements to facilitate trade
Advancing Education & Tech Transfer

Supporting key activities including development of:

- University and colleges curriculums at engineering & architectural schools (via a National Education Roadmap)
- Design and costing tools including BIM to support architects, engineers, and builders
- LCA data and tools to demonstrate the environmental benefits of using wood in construction
- Continuing education and training of professionals
The State of Mass Timber in Canada 2020

• First of its kind to capture mass timber projects and production capacity in Canada
• Presents a baseline dataset that includes 483 completed or currently under construction projects since 2007 and data on 23 mass timber suppliers in Canada
• First edition to be released in Winter 2020
• An interactive web-based map is planned
The State of Mass Timber in Canada 2020

- Number of mass timber projects has increased from 2007-2019 and the average size of projects is growing as well
- Leading jurisdictions in number of projects are BC (252) and Quebec (148)
- Projects are becoming more complex as there is more choice in mass timber products with structural capabilities and growing confidence among builders and designers and growing market acceptance
- In construction, mass timber products can lend themselves to a range of building types, most commonly for schools and colleges (18%), offices (14%), and community halls (11%)
Final Remarks

- Growing interest among designers, builders and governments in using wood as a green building material to reduce GHG emissions

- The Government of Canada, through the GCWood Program, continues to encourage greater use of wood in infrastructure projects including TWBs and timber bridges
Thank you

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