Innovation with CLT
THE EARTH SCIENCES BUILDING

Perkins+Will:
• Multi-disciplinary architecture and design firm with 29 years experience in the Vancouver and Canadian market
• Nationally recognized for Sustainable Design Excellence and Innovation
• Wood used in projects across market sectors
• Award winning design excellence and collaboration including 6 Governor General Medals and 14 Lieutenant Governor Awards for Architecture and Innovation
• Numerous international and provincial awards for our use of wood in projects

Presentation Outline
• CLT
• Why Wood?
• The Earth Sciences Building
• Lessons

CLT
Structural Timber Systems

POST AND BEAM
Centuries old

STICK FRAME
Last Century

SOLID CONSTRUCTION
Last 15 years

Edge Laminated

Glued
Doweled
Nailed

Cross Laminated

Glued
Doweled
Nailed

Solid Wood Panels

CLT

LVL

LSL

Why Wood?
Climate Change / Climate Crisis

- Storms Threaten Ozone Layer Over U.S., Study Says
- Warming Turns Tundra to Forest
- Climate Change to Alter Global Fire Risk
- Humans are Primary Cause of Global Ocean Warming over Past 50 Years, Research Shows
- Hot Summers Increasing in the U.S.

Nearly One Tenth of Hemisphere’s Mammals Unlikely to Outrun Climate Change
Climate Change May Create Price Volatility in the Corn Market
Human-caused Climate Change a Major Factor in More Frequent Mediterranean Droughts

SOURCE: ARCHITECTURE 2030

Buildings are the #1 Contributor to CO2

U.S. Energy Consumption by Sector

- Buildings 48.7% (47.8 QBtu)
- Transportation 28.1% (27.5 QBtu)
- Industry 23.2% (22.7 QBtu)

SOURCE: ARCHITECTURE 2030

Earth Sciences Building
University of British Columbia

- Grown by the SUN
- Sequesters CARBON
- Low EMBODIED ENERGY
- REGIONAL material that supports the ECONOMY
- Reduced ECOLOGICAL and ECONOMIC impact
- SUSTAINABLY harvested renewable resource
Support Public Realm
• Create museum precinct
• Highlight research on display

Campus Connections
• Maintain E/W and N/S connections
• Emphasize exposure of program
Connections to the Outdoors
• Full-height glazing
• Canopy-to-ceiling extension

Promote Collaboration
• Visibility of departments
• Vertical circulation

Structural Materials in ESB:
• The two structural materials are wood and concrete:
  • Glulam for heavy structural members in north wing
  • LSL and CLT for structural decking
  • Steel beams for long spans and seismic
  • Concrete in south wing
Structural Innovations in ESB:

- Composite wood-concrete floor structure
- Glulam post and beam connections
- Transfer trusses over column free spaces
- Chevron Ductile Braces
- CLT Canopy and Roof
- Cantilevered glulam stair

Holz-Beton-Verbund-System™ (HBV)
Composite floor
Glulam Post and Beam Connections
CLT Canopy and Roof
Full Storey Transfer Trusses over Lecture Theatres
Ductile Chevron Braces
Cantilevered Flying Staircase
Lessons

Weather Protection
- Update and improve specifications
- Consider cash allowance for additional protection
- Review schedule to align wood construction in dry season
- Limit exposure during construction

Ceiling Heights + Exposed Services
- Consideration of alternative routes for mech / elect
- Commitment from contractor and consultants is critical
Dropped Beams
- Mechanical and electrical service runs

Service Runs
- Lighting
- Sprinklers

Finishes
- Not all wood substrates are equal
- Perform test patch or sample for review

Performance
- Vibration
- Acoustics
- Loading
- Seismic
- Passive design
Carbon

ESB:
6169 Tonnes embodied energy in total construction
1094 Tonnes CO2 stored in the wood
5075 Tonnes Net (negative)

Comparison project:
1076 Tonnes embodied energy in total construction
904 Tonnes CO2 stored in the wood
172 Tonnes Net (negative)

Schedule
• Requires proper planning
• Prefabrication can have significant positive impact
• Consider product availability
• Spend time planning ahead

Cost

Public Perception

(+) • Comfortable
     • Warm
     • Organic material
     • Beautiful

(-) • Less durable
     • Combustible
     • Increased risk
     • High Cost
     • High maintenance