BROCK COMMONS

TALLWOOD HOUSE

2017 | 12 | PROJECT OVERVIEW

TALL WOOD BUILDING DEMONSTRATION INITIATIVE

(Image: Zahra Teshnizi)

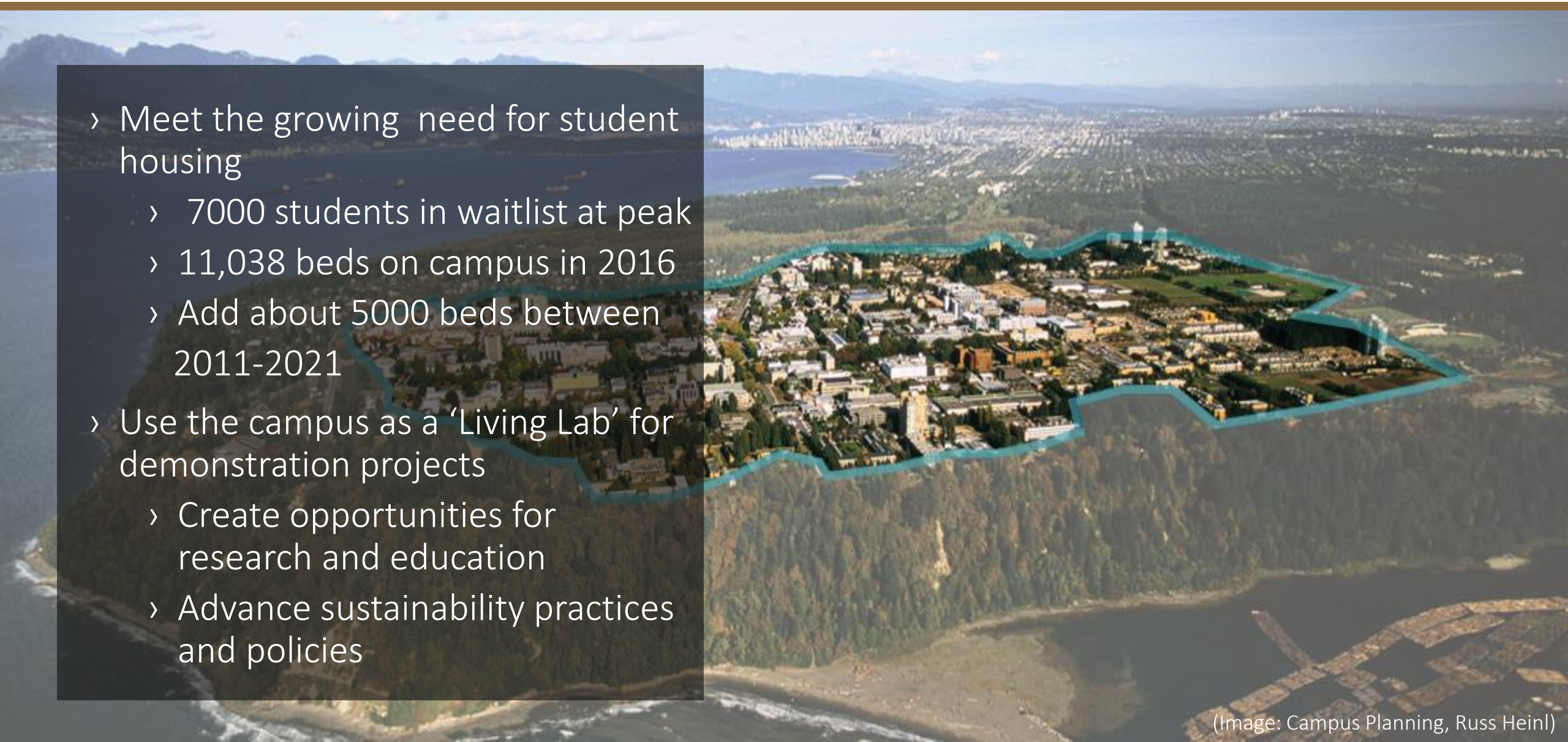
Natural Resources Canada (NRCan) and Canadian Wood Council (CWC) Joint initiative:

- Encourage use of mass timber in high-rise buildings
- Link scientific advances with technical expertise
- Foster growth in wood construction and forestry industries

Brock Commons was selected as one of the demonstration projects in 2013

UBC MANDATES

- Meet the growing need for student housing
  - 7000 students in waitlist at peak
  - 11,038 beds on campus in 2016
  - Add about 5000 beds between 2011-2021
- Use the campus as a 'Living Lab' for demonstration projects
  - Create opportunities for research and education
  - Advance sustainability practices and policies



(Image: Campus Planning, Russ Heinl)

TALLWOOD HOUSE OVERVIEW

Tallwood House was built in response to the UBC student housing need

- Site area: 2,315 m²
- Building Footprint: 840 m2 (15m x 56m)
- 18 storeys (17 storeys wood)
- 53 metres high
  - Maximum allowable height UBC Campus Plan
- 404 residence beds (single and 4-beds)

(Image: Acton Ostry Architects)

FLOOR PLANS

UBC sustainability

Ground floor

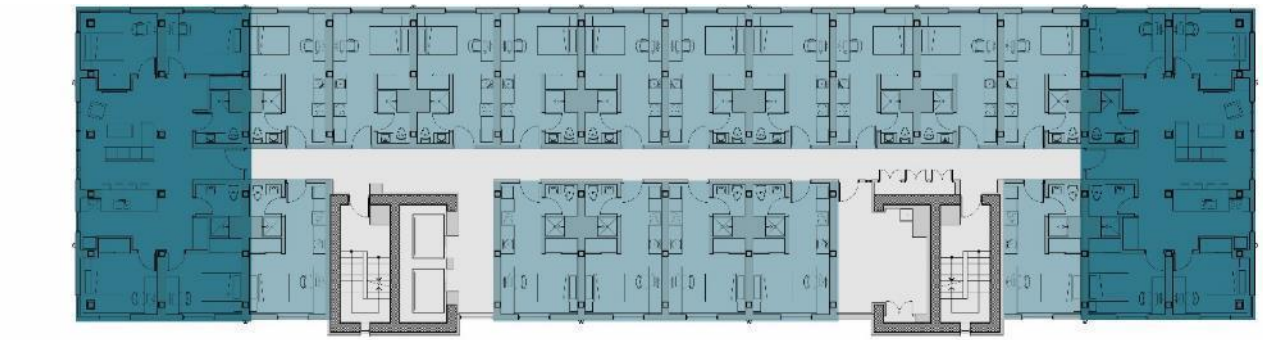
- Food services
- Amenities
- Service rooms

Upper levels

- 404 residence beds
  - 272 studios (25.4 m² each)
  - 33 four-bed units (115.2 m² each)

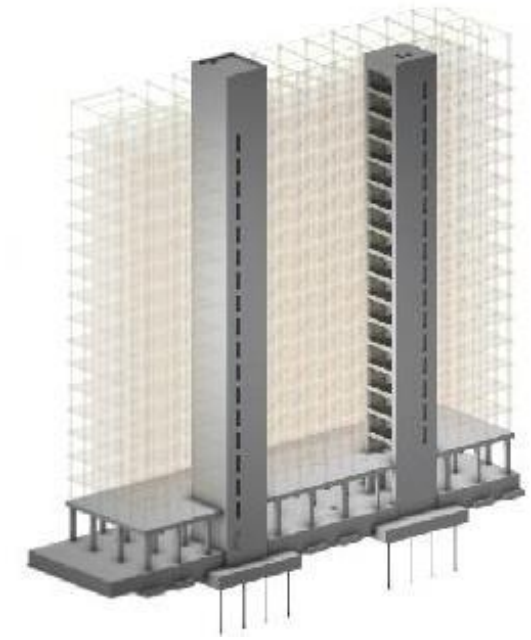
Ground Floor Plan

Typical Floor Plan



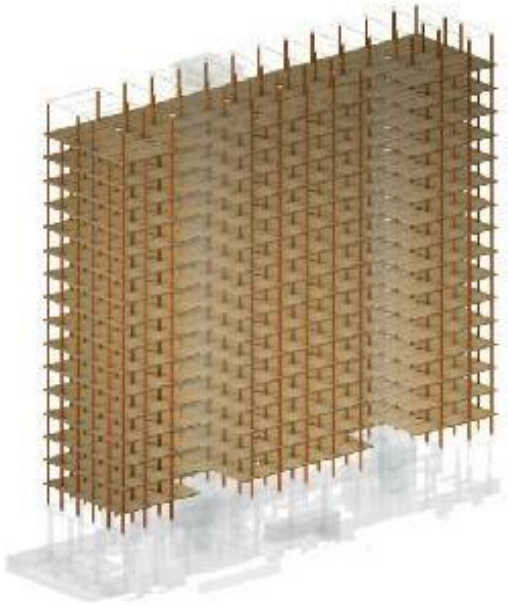
(Images: Acton Ostry Architects)

A HYBRID STRUCTURE



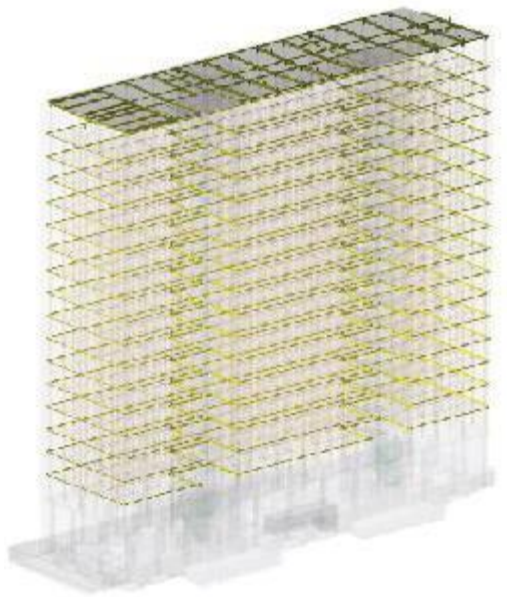
Cast-In-Place Reinforced Concrete Structure

- *Foundation*
- *Ground Floor*
- *Second floor slab*
- *Elevator and stair cores*



Wood Structure Components

- *CLT panels for floors*
- *GLT columns*
- *PSL heavy-loaded columns*



Steel Components

- *Connections*
- *Floor perimeters*
- *Roof decking + structure*

(Images: CadMakers Inc.)

MASS TIMBER PRODUCTS

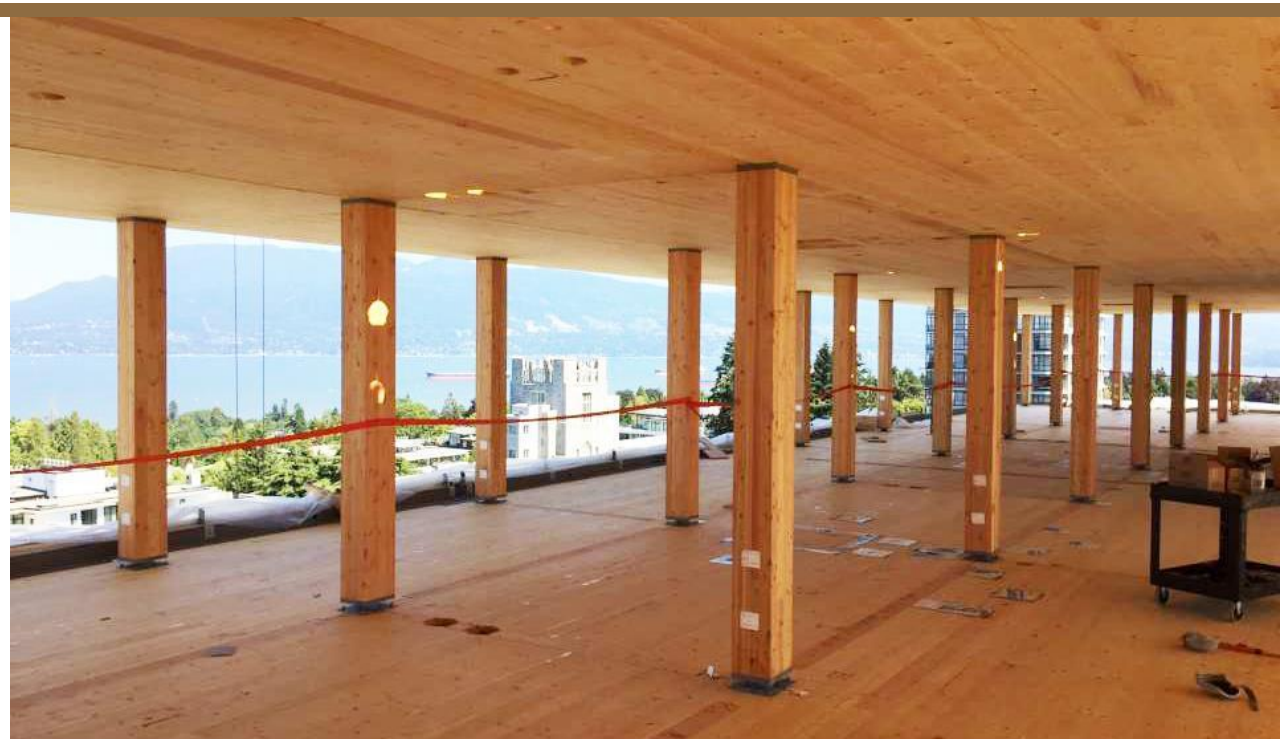
Cross Laminated Timber
Used for floor slabs

Glue Laminated Timber
Used for structural columns

Parallel Strand Lumber
Used for heavy-loaded structural columns

(Images:UBC)

GRAVITY LOAD DESIGN



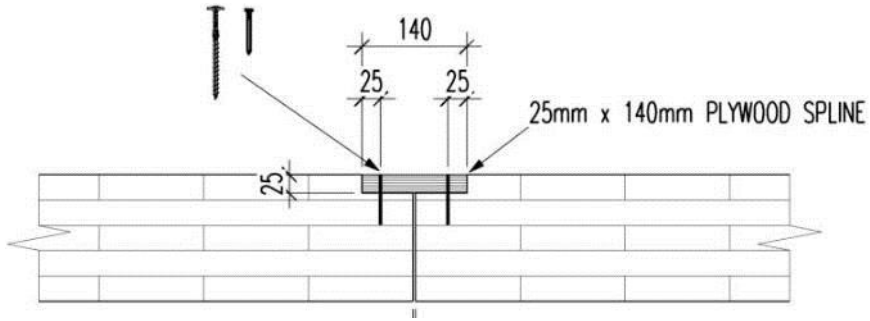
› The mass-timber structure is supported by the concrete second floor transfer slab, first floor columns and foundation

› Floor 3-18 structure consists mass timber 2-way floor slabs and columns, carried by point loads at the column connections

(Image: Fast + Epp)

LATERAL LOAD DESIGN

Concrete cores + slabs



Plywood splines

Steel drag-straps

(Images: UBC and Fast + Epp)

ENVELOPE

- Steel frame rainscreen panels with punched windows and wood-fibre laminate cladding
- Partially prefabricated
- Installed with the structure as weather protection and safety measure

Prefabricated assembly

- pre-finished wood-fiber cladding
- semi rigid insulation
- vapour permeable membrane
- exterior sheathing board
- steel studs

Layers added on site

- fibreglass batt insulation
- vapour barrier
- gypsum board

(Image: naturally:wood)

SITE SPECIFIC REGULATION (SSR)

UBC Tall Wood Building Regulation

- Provincial code regulation issued by BC's Building Standards and Safety Branch
- Exempts the project from the size limitations on wood construction and includes strict technical performance requirements
- Ensures occupants' health and safety protection equal or better than a non-combustible building of the same size:
  - meets or exceeds the level of performance required by BC Building Code 2012
  - Structural system designed to National Building Code 2015 seismic activity
- Entailed a comprehensive peer and expert review process
- Only authorizes this specific project on this specific site

(Image: UBC)

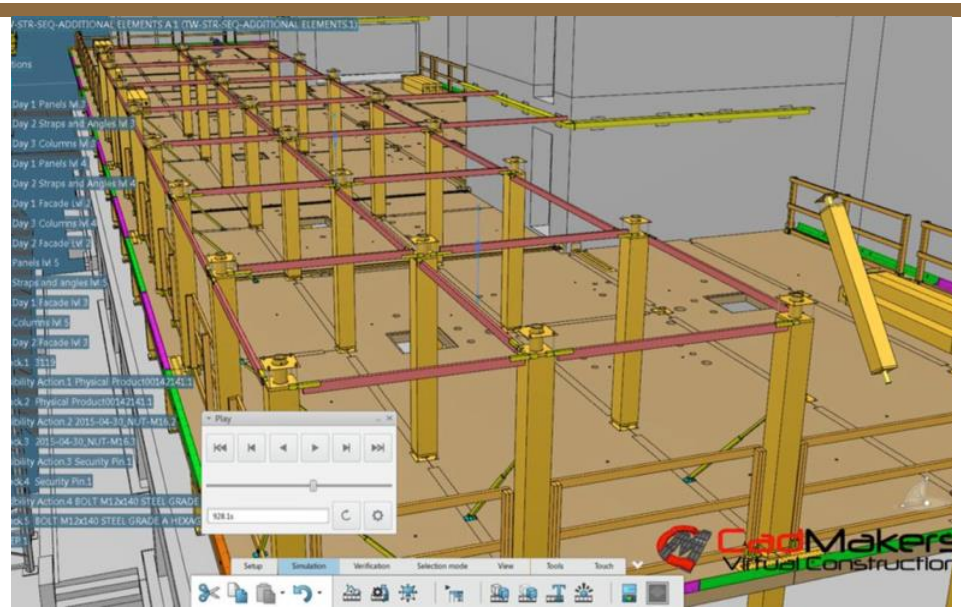
ENCAPSULATION

(Image: Acton Ostry Architects)

- Wood structure is completely encapsulated to provide code-required fire resistance
  - 2-hr for structure, floors, shaft and suite-to-suite walls
  - 1-hr for suite-to-corridor walls
- Typical fire suppression systems in residential high-rises are used
  - 20,000 litre on-site back-up water tank
- Acoustic dampening
  - Concrete topping with carpet/resilient flooring
  - Air space in ceiling assembly

VDC MODEL

- Design assist tool
  - Design options
  - System coordination
  - Clash detection
  - Quantity takeoffs
  - Constructability
- Construction assist tool
  - Trades communication
  - Construction planning and sequencing
  - Site safety



(Images: CadMakers Inc. & naturally:wood)

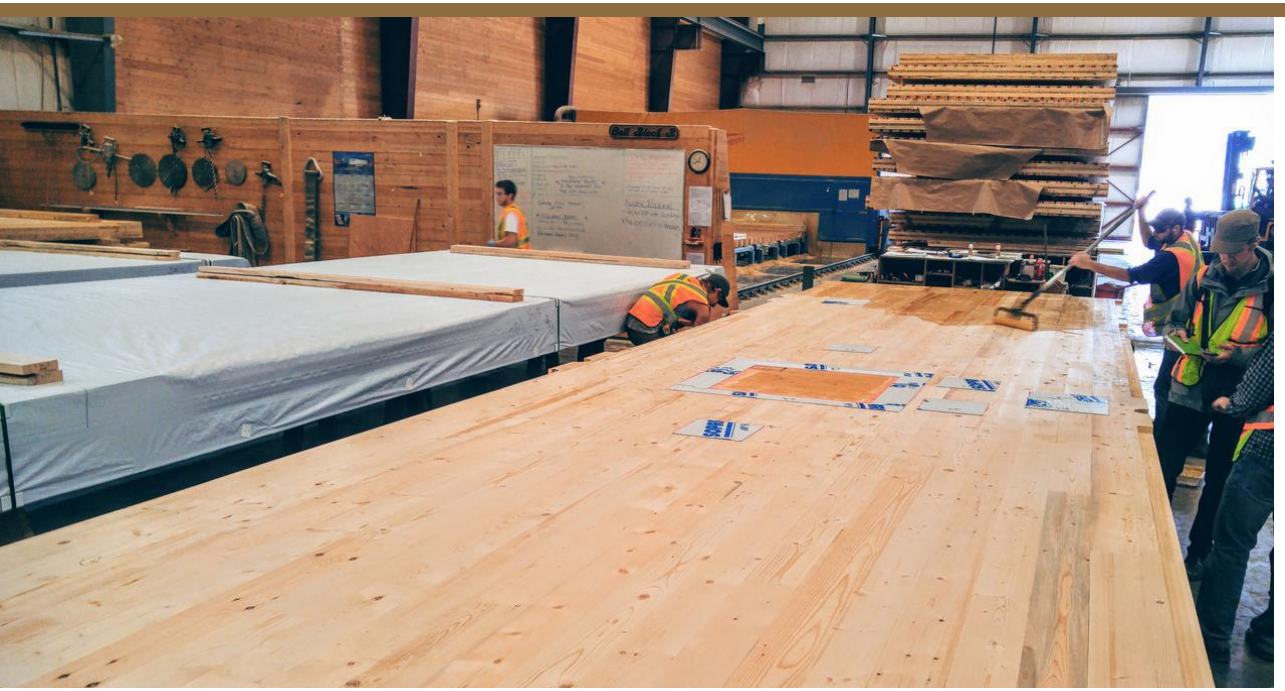
FULL SCALE MOCK-UPS

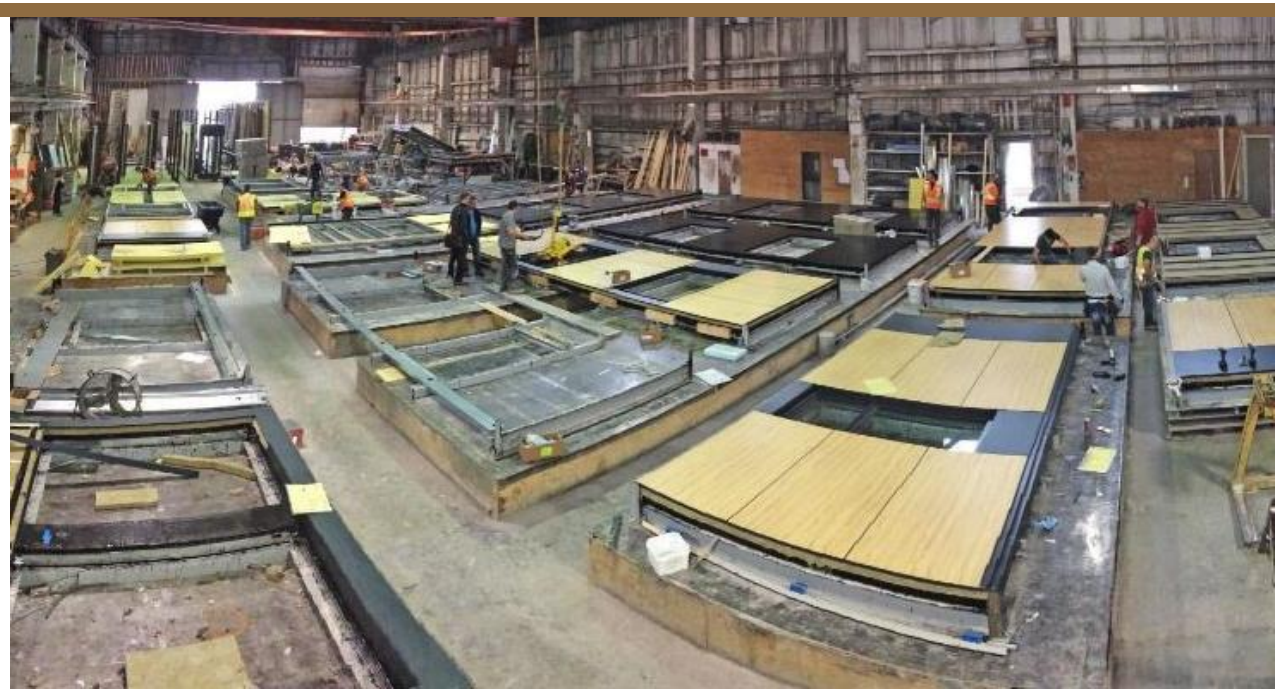
- The mock-up tested:
  - Finishes
  - Envelope materials
  - Concrete topping
  - Connection details
  - Construction sequencing

- Envelope mock-up tests included:
  - Structural testing
  - Thermal performance
  - Air and water tightness
  - Condensation testing

(Images: UBC and RDH)

PREFABRICATION



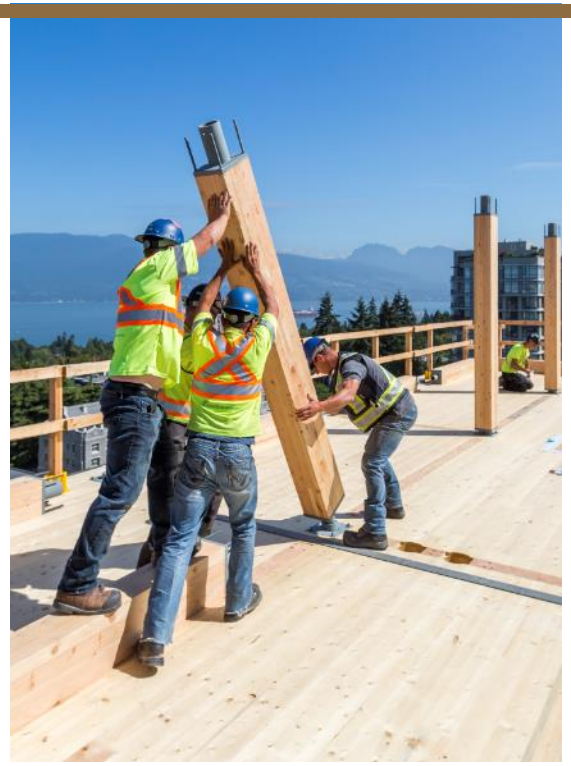
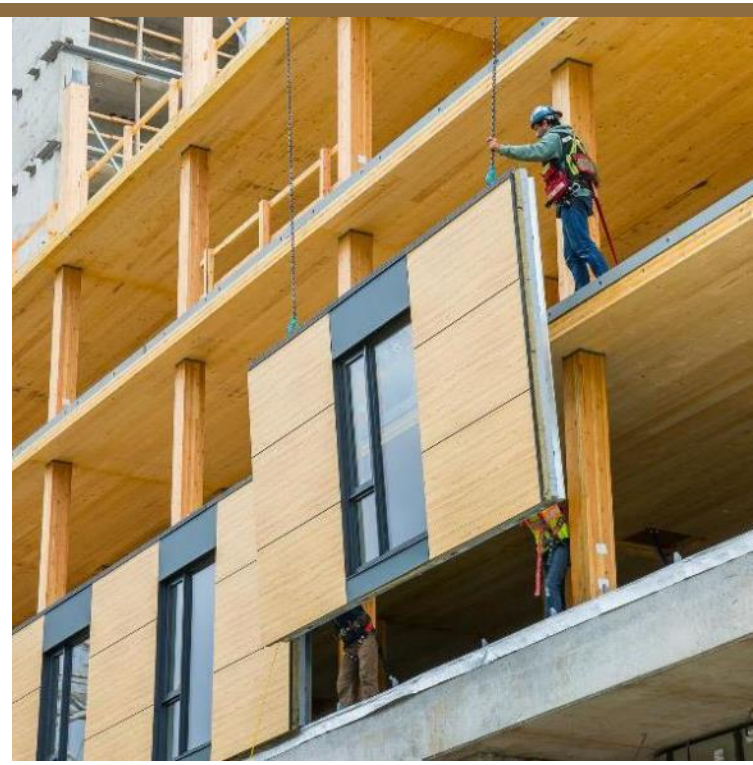


- VDC model export to fabrication model for mass timber - coordination of cuts and MEP penetrations
- Precisions of +/- 2mm for CLT panels and +/- 1 mm for GLT columns were achieved
- Column steel connections embedded as part of prefabrication process
- QA/QC procedures in controlled factory environment

(Images: Structurlam and Acton Ostry)

ON-SITE CONSTRUCTION



- Concrete work completed ahead of the mass-timber assembly
- Just-in-time delivery of mass timber and envelope panels, craned directly onto building
- Assemble rate of 2 floors/week (total 9.5 weeks)
- Fast enclosure of the mass timber, reduced on-site work, noise, and waste

(Images: Structurlam, Acton Ostry, naturally:wood)

BUILDING PERFORMANCE MONITORING

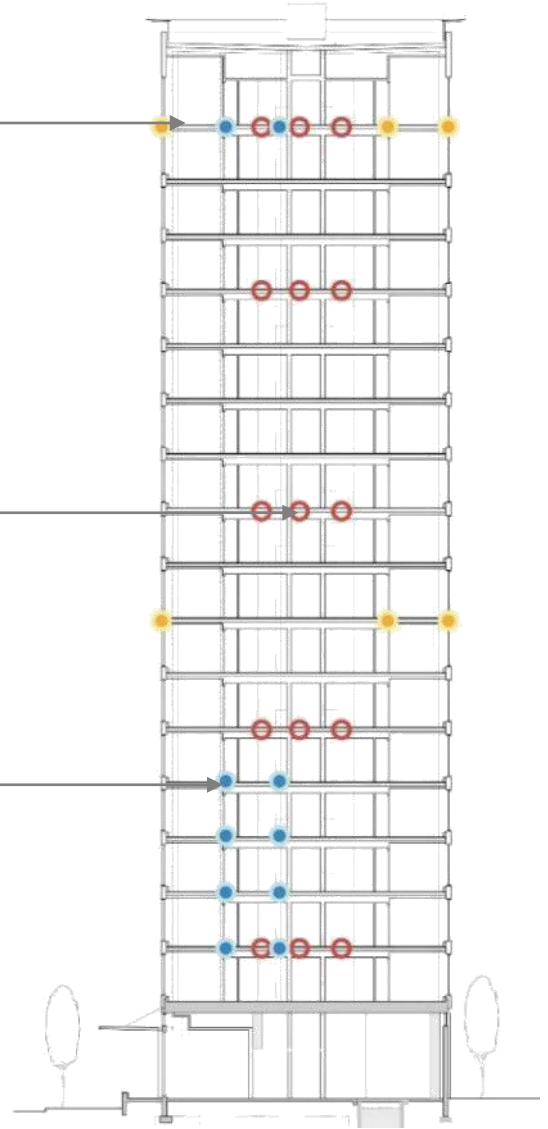
UBC sustainability

Goal

Validate design through performance and refine design strategies for future buildings

Monitoring Systems

- CLT Moisture Monitoring
  - Point Moisture Measurement (PMM) sensors for moisture content values
- Vibration Monitoring
  - Accelerometers for 3-Way vibration analysis
- Vertical Displacement Monitoring
  - String-and-Pot sensors for elastic and inelastic shortening measurement



(Image: Acton Ostry Architects)

ADDITIONAL INFORMATION

For additional information on Brock Commons Tallwood House please visit:

www.naturallywood.com/emerging-trends/tall-wood/ubc-brock-commons

Forestry Innovation Investment®

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