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
› 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
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)
**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)

(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

BROCK COMMONS TALLWOOD HOUSE
(Images: CadMakers Inc.)
Cross Laminated Timber
*Used for floor slabs*

Glue Laminated Timber
*Used for structural columns*

Parallel Strand Lumber
*Used for heavy-loaded structural columns*
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.
BROCK COMMONS TALLWOOD HOUSE
LATERAL LOAD DESIGN

Concrete cores + slabs

Plywood splines

Steel drag-straps

(Images: UBC and Fast + Epp)
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
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
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

(Image: Acton Ostry Architects)
BROCK COMMONS TALLWOOD HOUSE

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)
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
BROCK COMMONS TALLWOOD HOUSE
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)
BROCK COMMONS TALLWOOD HOUSE
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)
Validate design through performance and refine design strategies for future buildings

- 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
For additional information on Brock Commons Tallwood House please visit:
www.naturallywood.com/emerging-trends/tall-wood/ubc-brock-commons