THE UNIVERSITY OF BRITISH COLUMBIA

BROCK COMMONS TALL WOOD BUILDING

STRUCTURAL SYSTEM

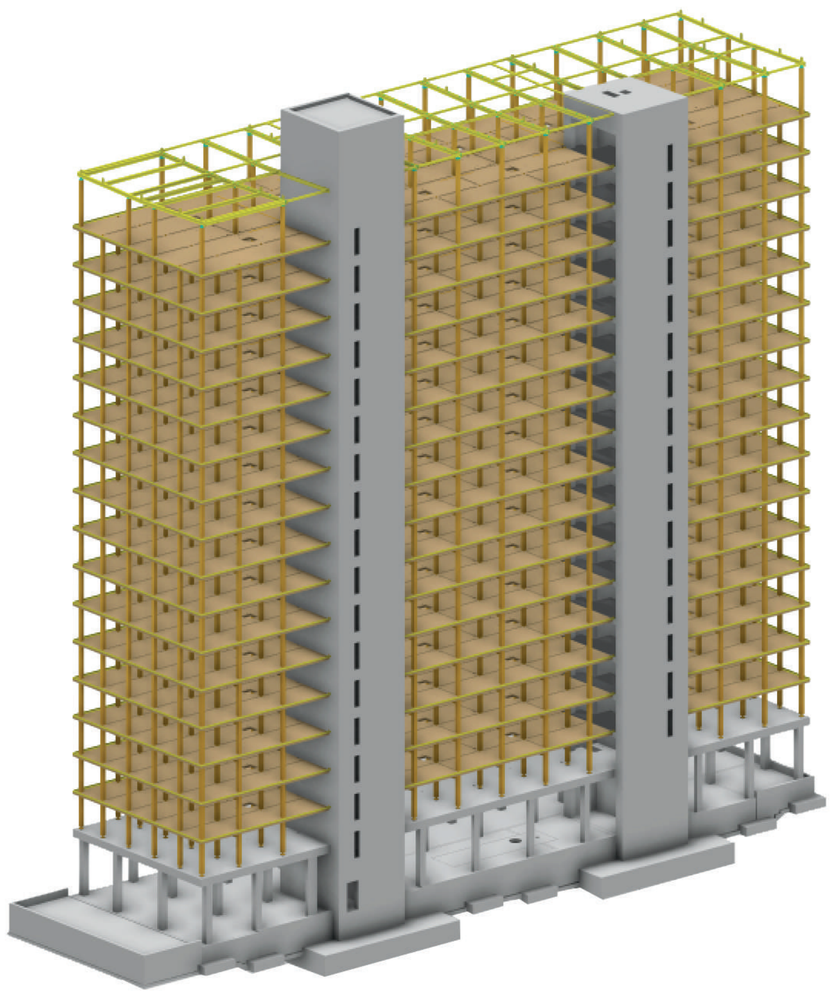
June 2016

The structural system for Brock Commons is designed as a hybrid configuration. The foundations and ground floor as well as the cores (which house stairwells, elevators and service risers) are cast-in-place concrete. The structure on Levels 3 through 18 is composed of mass timber columns and floor panels. Connections and specific elements, like the roof structure, are steel.

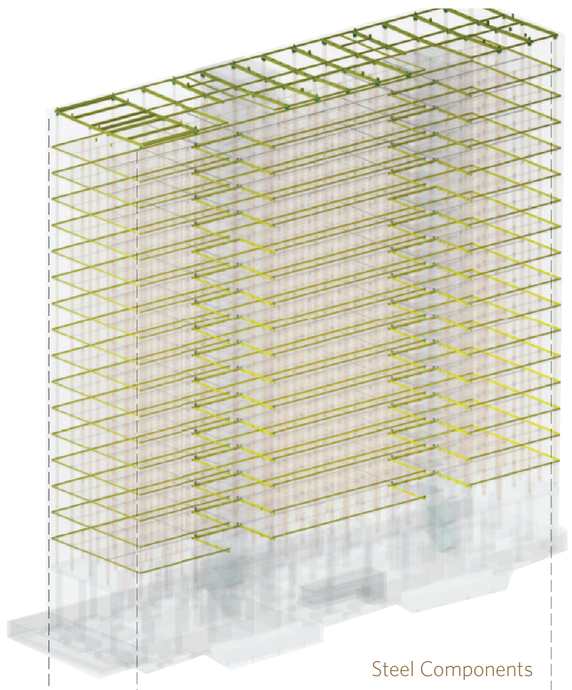
Specific design considerations for the hybrid structure were:

- Structural capacity
- Volume of lumber
- Constructability
- Cost
- Availability and sourcing of products
- Building services routes
- Settlement and shrinkage
- Fabrication and construction tolerances

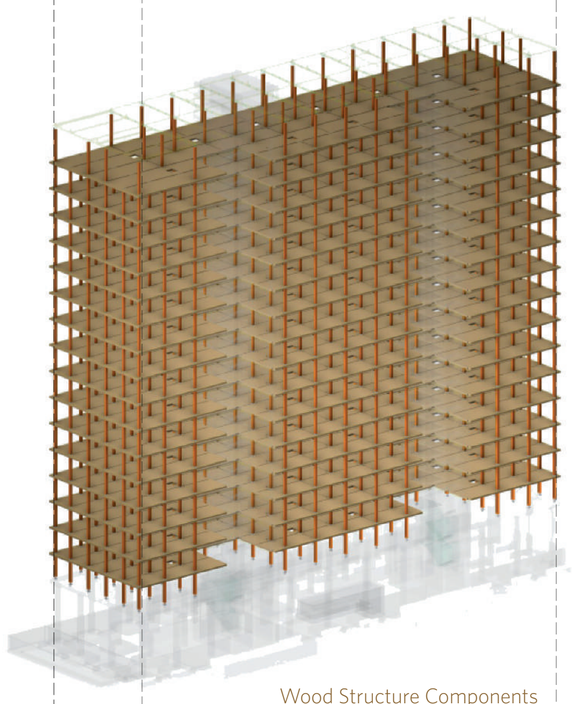
The choice of a mass timber superstructure is estimated to result in a building that is significantly lighter than its concrete equivalent.



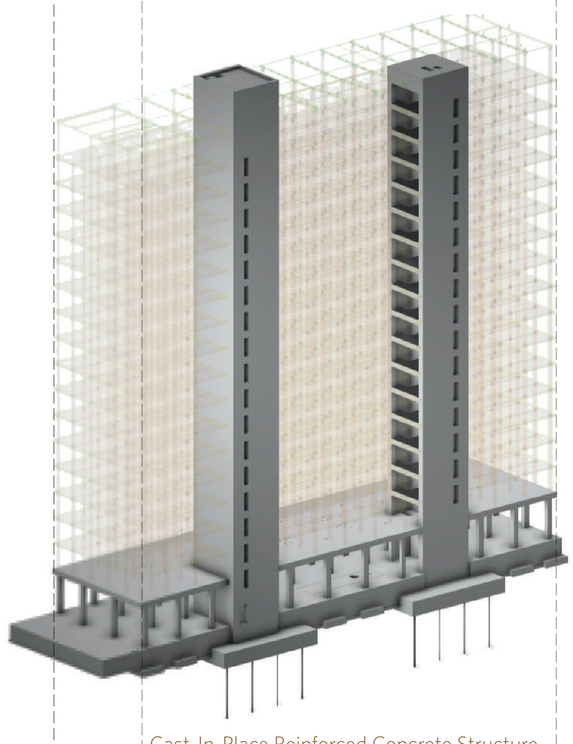
Images courtesy of Acton Ostry Architects Inc. and CadMakers Inc.



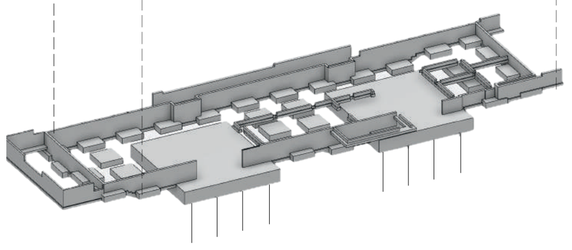
Steel Components



Wood Structure Components



Cast-In-Place Reinforced Concrete Structure



Cast In Place Reinforced Concrete Foundation

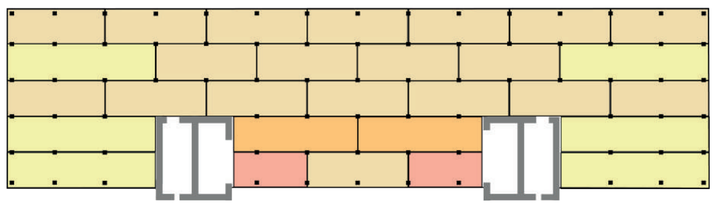
ROOF STRUCTURE

The roof will be built with steel decking and steel beams supported on the glulam columns. The choice of a steel roof was made to mitigate potential issues in the event of moisture infiltration.

COLUMNS

The floors and roof are supported by GLT and PSL columns, arranged in a grid measuring 4x2.85 m. Larger columns (265x265 mm) on the lower levels, and slightly smaller ones (265x215 mm) on the upper levels. PSL columns are utilized at points with higher loads in the middle of the floor plates between levels 2 and 5.

FLOOR SLAB DESIGN



The floor slabs are composed of CLT panels, oriented on the building's long axis and installed in a staggered configuration and secured with plywood splines to create a diaphragm. Panels are 169 mm thick, one bay wide (2.85 m) and of four different lengths to a maximum of three bays (12 m long). There are 29 panels per level and most are unique due to the configurations of pre-cut mechanical, plumbing and electrical openings.

CONCRETE CORES

The two cores house stairs, elevator shafts and mechanical services. Made of cast-in-place reinforced concrete (450 mm thick), they provide structural rigidity to resist lateral wind or seismic forces along the full height of the building.

PODIUM

The concrete podium houses the ground level amenity and service spaces, and supports the wood structure on the second level transfer slab (600 mm thick). The decision to build a concrete podium was driven by a need for large spans independent from the wood column grid, resistance to impacts and to house mechanical and electrical services in non-combustible spaces.

FOUNDATIONS

The foundation is reinforced concrete spread footings (2.8x2.8 x0.7 m) with a concrete wall and strip footing (600 x 300 mm) at the perimeter. Each core is supported by a raft slab (1.6 m thick) with four soil anchors at 1250 kilonewton tension force capacity.