

SUBJECT	BROCK COMMONS TALLWOOD HOUSE STUDENT RESIDENCE – BOARD 4 REPORT
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MEETING DATE	SEPTEMBER 12, 2019
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Forwarded on the Recommendation of the President

**APPROVED FOR
SUBMISSION**



Santa J. Ono, President and Vice-Chancellor

FOR INFORMATION

Report Date	August 15, 2019
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Presented By Ainsley Carry, Vice-President Students
 Gail Murphy, Vice-President Research & Innovation
 Peter Smailes, Vice-President Finance & Operations
 Andrew Parr, Managing Director, Student Housing & Hospitality Services
 John Metras, Associate Vice-President Facilities
 Jennifer Sanguinetti, Managing Director, Infrastructure Development
 Yale Loh, Treasurer
 Michael White, Associate Vice-President Campus & Community Planning
 Aubrey Kelly, President and CEO, UBC Properties Trust

<i>If this item was previously presented to the Board, please provide a brief description of any major changes since that time.</i>	As part of the Board-approved project management process, Board 4 is the project close-out report which is submitted following construction, occupancy and warranty period.
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EXECUTIVE SUMMARY

Brock Commons Tallwood House is an exemplary student residence as well as a showcase building for the Federal and Provincial governments and the wood industry to promote the use of engineered wood for tall buildings. Tallwood House was completed and opened for occupancy in July 2017, at which point the 18-storey 54-metre tall building was the tallest hybrid mass timber building in the world. Key factors in the success of this unique project were the highly integrated design process, with tight focus on safety and constructability, and the collaborative project team, in which all members (consultants, construction manager, key trades and suppliers) were engaged from the very start of the design process. The project demonstrated the schedule efficiency and construction logistics benefits of a pre-fabricated “kit of parts” design using engineered wood components. The final project cost was \$50.89 million, which was \$635,000 less than the approved Board 3 budget of \$51.525 million.

Brock Commons Tallwood House includes 404 residence beds for upper year and graduate students, in single-bed studio and four-bed quad units, each with integrated kitchen and bathroom facilities. Social gathering and study spaces, administration, laundry facilities, storage spaces and service rooms are located on the ground floor, as well as a collegium for commuter students. The Tallwood House has a total gross area of 15,120 square metres (162,750 square feet) and is in the final process of seeking LEED Gold certification. The building has garnered eleven design awards and has been the subject of many news articles and feature stories around the world.

Attachments

1. Photographs of Brock Commons Tallwood House Student Residence
2. Design Awards and Sample Review Articles

STRATEGIC CORE AREAS SUPPORTED

a People and Places a Research Excellence a Transformative Learning a Local / Global Engagement

DESCRIPTION & RATIONALE

The Brock Commons Tallwood House project provided a unique opportunity to both address a core University need for expanded on-campus student housing and a compelling Campus as a Living Lab opportunity for UBC researchers, students and local industry.

The emergence of engineered wood products and advances in connectors has made it feasible to utilize wood-based products and systems as structural elements for wood buildings higher than the traditional 4-6 storey heights currently allowed by building code and the wood-frame building system. The goal of the Brock Commons Tallwood House project was to take these systems literally to new heights, and develop solutions to associated structural, life safety and acoustic issues.

The result is a showcase building for the Federal and Provincial governments and the wood industry to promote the use of engineered wood for tall buildings. The building has reinforced UBC's reputation as a leader in sustainable and innovative buildings, and UBC has fielded hundreds of requests for information and tours to representatives of other institutions, jurisdictions, and industry.

At the time of completion the building was the world's largest wood building, comprised of 17 storeys of mass-timber hybrid construction above a one-storey base of concrete construction, with two 18-storey concrete cores containing exit stairs and elevators. The structure and building envelope were completed in less than seventy days after the prefabricated components were first delivered to site and ahead of the projected 112 day (16 week) schedule. The project approvals process, which was overseen by the Provincial Building Safety & Standards Branch (BSSB), included a rigorous third-party technical review and issuance of a unique Site Specific Regulation to address components of the project beyond current Building Code. This timely and effective process ensured that the building design met stringent standards for occupant safety.

The project is part of UBC Campus as a Living Laboratory initiative. UBC researchers, students and staff have worked with government partners to prepare an extensive case studies on the building design, approval, construction and commissioning processes. These can be found on the Naturally:Wood website: <https://www.naturallywood.com/emerging-trends/tall-wood/brock-commons-tallwood-house>. The building has also been equipped with sensors that will allow UBC researchers and operations staff to monitor the structure over time. These sensors measure moisture content, vibration, vertical displacement of the mass timber structure.

The building is adjacent to the North Parkade (see Attachment 1) within the Brock Commons student housing "hub" site designated in the UBC Vancouver Campus Plan. The building is the first phase of Brock Commons.

Program

The 15,120 gross square metres Tall Wood Student Residence provides 404 beds, with 33 4-bedroom suites and 272 studios.

TALL WOOD Function	# Beds	# Units	Net Area (Sq M)
Housing Units			
1-Bedroom Units (Studios)	272	272	5,920
4-Bedroom Units (Quads)	132	33	3,602
Student Housing shared space			
Resident Social & Study Space			150
Laundry			23
Office			23
Collegium			167
Lobby			205
TOTAL NET SQUARE METRES			10,090
Gross-up (1.5x)			5,030
TOTAL GROSS SQUARE METRES			15,120
Total Gross Square Feet			162,750

UBC Properties Trust managed the project. The architect was Acton Ostry Architects in partnership with Architekten Hermann Kaufmann. The structural engineer was Fast & Epp. The construction manager was Urban One Builders. The engineered wood supplier was Structurlam from Penticton, BC.

Project Team:

- Architect: Acton Ostry Architects
- Tall Wood Advisor: Architekten Hermann Kaufmann ZT GmbH
- Structural Engineer: Fast & Epp
- Envelope Consultant: RDH Building Science
- Code Consultant: GHJ Consultants
- Construction Manager: Urban One Builders
- Project Manager: UBC Properties Trust
- Wood Erector: Seagate Structures
- Concrete Contractor: Whitewater
- Engineered Wood Supplier: Structurlam
- 3D Modeling: CadMakers
- Mechanical / Electrical / Plumbing: Stantec (design), Trotter & Morton (trades)
- Owner's Representative: UBC Infrastructure Development

BENEFITS

Learning, Research,
Financial,
Sustainability &
Reputational

Brock Commons Tallwood House provides a range of benefits for UBC and the wider community, including:

- Addition of 404 student residence beds to help address the growing student housing wait list.
- Creation of an effective, valuable and heavily demanded collegium to support commuter students.

- Successful demonstration of a sustainable, locally relevant construction material in an innovative high-rise building application, providing a compelling argument for the use of wood-based building systems in the medium-rise and high-rise building markets.
- Creation of a Campus as a Living Laboratory (CLL) opportunity for Applied Science, Forest Science and local forestry and wood products industries, offering research and learning opportunities for UBC students, researchers and faculty in the design, construction, evaluation and monitoring of advanced mass timber structural systems.
- Provision of a necessary visible reference and knowledge generation site for influencing the 2020 Canadian National Building Code.
- Development of UBC, BC and Canada as a global tall-wood hub that will support expansion in the areas of education/training, certification, global consulting and software development.
- Reinforcement of UBC's reputation for innovation and sustainable building design.
- Strengthening of relationships for further multi-disciplinary initiatives between UBC, Canadian Wood Council (CWC), Forest Innovation Investment (FII) and local forestry and wood products industry project collaborators.

RISKS Project is complete.

COSTS The final project cost was \$50.89 million, \$635,000 less than the Board 3 approved budget of \$51.525 million. The "innovation premium" for the tall wood design and construction process was approximately 7%.

FINANCIAL Student Housing & Hospitality Services (SHHS) contributed \$46.438 million to fund the project, which is financed through an internal loan at 5.75% annual interest paid back over 30 years from housing rental revenue.

The \$4.452 million wood innovation premium was funded from external sources as follows: \$2.335 million from Natural Resources Canada (NRCan), \$467,000 from the Binational Softwood Lumber Council (BSLC), \$650,000 from Forest Innovation Investment (FII), and \$1 million was from the Provincial government.

PROJECT FUNDING & COSTS	BOARD 4
Student Housing & Hospitality Services	\$46,438,000
Natural Resources Canada (NRCan) contribution for innovation premium	\$2,335,000
Binational Softwood Lumber Council (BSLC) contribution for innovation premium	\$467,000
Forest Innovation Investment (FII) contribution for innovation premium	\$650,000
Provincial Government (through FP Innovations) for innovation premium	\$1,000,000
TOTAL	\$50,890,000

SCHEDULE The project was completed for July 2017 residential occupancy.

Implementation Timeline

CONSULTATION A stakeholder meeting of occupants, operators and the project delivery team was held on July 26, 2019 to review project successes, constraints and lessons learned.

Relevant Units,
Internal & External
Constituencies

Design and Project Development Process

The design of the project, both as a student residence and as a prototype tall wood building, was very successful overall. The building has garnered eleven design awards and has been the subject of many articles. UBC stakeholders are enthusiastic about replicating this building on another site.

Student Residence

SHHS's goal was to build an exceptional student residence, and this goal has been absolutely achieved. This is a great building, students love living there, and the decision to locate student lounges on both the ground and the top floor has been a great success. The building performs as well acoustically as a concrete building. The collegium for commuter students is well used and plays an integral role in UBC now being able to offer all 1st year students a spot in a collegium. The design team was able to fit more units on the site than initially planned and the small site is intensively utilized.

The residence is occupied year-round, and SHHS is finding that the units are over-heating in the summer, especially as Vancouver typically seems to be experiencing both rising summer temperatures and longer periods of high temperatures. Future student housing projects will require a combination of passive and mechanical cooling strategies.

Tall Wood Design

Key factors in making this project a successful prototype for tall hybrid mass timber building design were:

- Collaborative project team in which all members (consultants, construction manager, key trades and suppliers) were engaged from the very start of design.
- Integrated, iterative and disciplined design process with focus on safety and constructability.
- Simple, replicable design solution with identical floor layouts and “extruded rectangle” building form which facilitated use of pre-fabricated engineered wood structural components and building envelop panels. This allowed for just-in-time component delivery and rapid structural assembly.
- Full-scale structural mock-up and detailed computer modeling of building design and construction sequencing allowed for effective construction planning and execution.
- Rigorous and timely approval process for Site Specific Regulation overseen by the Provincial Building Safety & Standards Branch (BSSB). Their work, combined with that of the UBC building authority, ensured that all risk aspects of the project were carefully reviewed and addressed while at the same time allowing UBC to proceed expeditiously to meet required deadlines.
- Conservative approach to key risks which allowed for timely approval process.
- Relatively non-complex use and single internal clientgroup (SHHS) allowed for timely, straightforward decision-making during design and construction.

Benefits of pre-fabricated mass timber construction on Brock Commons Tallwood House included:

- Fast and safe assembly of structure and building envelope with a small crew
- Clean and quiet site with minimal waste
- Accelerated construction schedule
- Precise assembly due to pre-cutting and drilling of engineered wood components in the factory
- Reduced carbon footprint (2,432 tonnes CO₂e stored or avoided emissions)

The accelerated construction schedule associated with pre-fabrication of structural and cladding elements led to a building opening in mid-summer 2017, approximately 2 months ahead of original schedule, which was a significant advantage to SHHS. However, the project was unable to fully capitalize on the schedule benefits of mass timber because of a gap in industry preparedness for this type of construction. Mechanical and electrical trades are accustomed to working on buildings floor by floor on a staggered schedule as they are readied by other trades. They were not able to provide the trades on a continuous basis to fit-out a fully completed and enclosed building shell. Pre-fabrication of additional building elements or even entire rooms (e.g. bathroom, kitchen) could further improve on the construction schedule.

Operations

The project is meeting expectations operationally, and the pro forma is better than anticipated.

CASH FLOW PRO FORMA VS ACTUAL	BOARD 3	BOARD 4	VARIANCE
Rental Revenue	5,014	5,120	106
Less Rental Vacancy	(100)	(3)	97
	4,914	5,117	203
Less Student Housing Operating Costs*	(1,755)	(1,271)	484
Less Public/Other Operating Costs	(36)	(36)	-
	(1,791)	(1,307)	484
Net Operating Income	3,123	3,809	686
Less Debt Service	(3,032)	(3,244)	(212)
CASH FLOW	91	565	474

*Based on recent operating results from new Student Housing projects the 35% operating cost estimate has been reduced to 25% for BOG submissions.

One challenge operationally has been the lack of experience in the insurance industry with this type of building. Because of the lack of claims history for encapsulated mass timber structures, there remains some uncertainty on the part of the insurance industry as to how to address these types of buildings. While the premium UBC is paying is the same as for a conventional structure, the reinsurance provisions are not as favorable. The terms have improved since the building was constructed but are not yet equivalent.

Sustainability

The project anticipates receiving LEED Gold certification in fall 2019. The building's energy use of 158 kwh/m²/year is one of the lowest in the SHHS portfolio, and there is no gap between the energy modeling and actual energy performance.

The strategic pursuit of one major sustainability goal for this project in order to best manage risk was viewed as a potential strategy for future projects.

UBCPT COMMENTS Complete for all reports that include a property component	Review Date	August 15, 2019	Signed off by	Aubrey Kelly
		N/A		

Previous Report Date	September 29, 2015														
Decision	<p>Board 3 Approval, Funding Release \$49,275,000</p> <p>1) Board 3 approval to commence construction on the Tall Wood Student Residence project at a revised total project cost of \$51.525 million based on 85% construction tenders received, with a final funding release of \$49.275 million to undertake and complete construction.</p> <table border="0"> <tr> <td>Revised Capital Budget</td> <td>\$51,525,000</td> </tr> <tr> <td>Operating Budget</td> <td>See report</td> </tr> <tr> <td>Schedule Program</td> <td></td> </tr> <tr> <td>Award construction contracts</td> <td></td> </tr> <tr> <td>Funding Release Information</td> <td>\$49,275,000</td> </tr> <tr> <td>Expenses to date</td> <td>\$700,000</td> </tr> <tr> <td>Funding released to date</td> <td>\$2,250,000</td> </tr> </table> <p>2) Approval an internal loan of up to \$47.1 million at 5.75% annual interest paid back over 30 years from housing rental revenue.</p>	Revised Capital Budget	\$51,525,000	Operating Budget	See report	Schedule Program		Award construction contracts		Funding Release Information	\$49,275,000	Expenses to date	\$700,000	Funding released to date	\$2,250,000
Revised Capital Budget	\$51,525,000														
Operating Budget	See report														
Schedule Program															
Award construction contracts															
Funding Release Information	\$49,275,000														
Expenses to date	\$700,000														
Funding released to date	\$2,250,000														
Action / Follow Up	Commence construction when tender conditions met.														
Previous Report Date	June 9, 2015														
Decision	Board 2 Approval, Funding Release \$1,500,000														
Action / Follow Up	Issue Development Permit and complete working drawings and tender documents.														
Previous Report Date	September 30, 2014														
Decision	Board 1 Approval, Funding Release: \$750,000														
Action / Follow Up	Commence schematic design.														

Attachment 1 – Photographs of Brock Commons Tallwood House Student Residence



Photo 1 – Exterior View of tower



Photo 2 – Exterior View showing detail of cladding and windows



Photo 3 – Interior View of resident lounge



Photo 4 – Interior View of studio



Photo 5 – Interior View of common room in 4-bedroom suite



Photo 6 – Interior View of bedroom in 4-bedroom suite



Photo 7 – Interior View of 18th Floor Lounge



Photo 8 – Interior View of 18th Floor Lounge

Attachment 2 – Design Awards and Sample Review Articles

Design Awards:

2018 International Prize for Wood Architecture
Lieutenant Governor of BC Award
Sustainable Architecture & Building Green Award
Canadian Wood Council Wood Works Architect Award
Canadian Wood Council Wood Works Innovation Award
Canadian Wood Council Wood Works Engineer Award
Lieutenant Governor of BC Engineering Excellence Award
Vancouver Regional Construction Association Award 2017
Premier’s Innovation & Excellence Award
Canadian Wood Council Special Jury Award
Institution of Structural Engineers Innovation Award
NCSEA Excellence in Structural Engineering Award
Construction Dive Five Favourite Projects of the Year

Sample Review Articles:

Naturally Wood: <https://www.naturallywood.com/emerging-trends/tall-wood/brock-commons-tallwood-house>
Canadian Wood Council: http://cwc.ca/wp-content/uploads/2018/07/CS-BrockCommon.Study_.23.Ir_.pdf