UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

C-Shore

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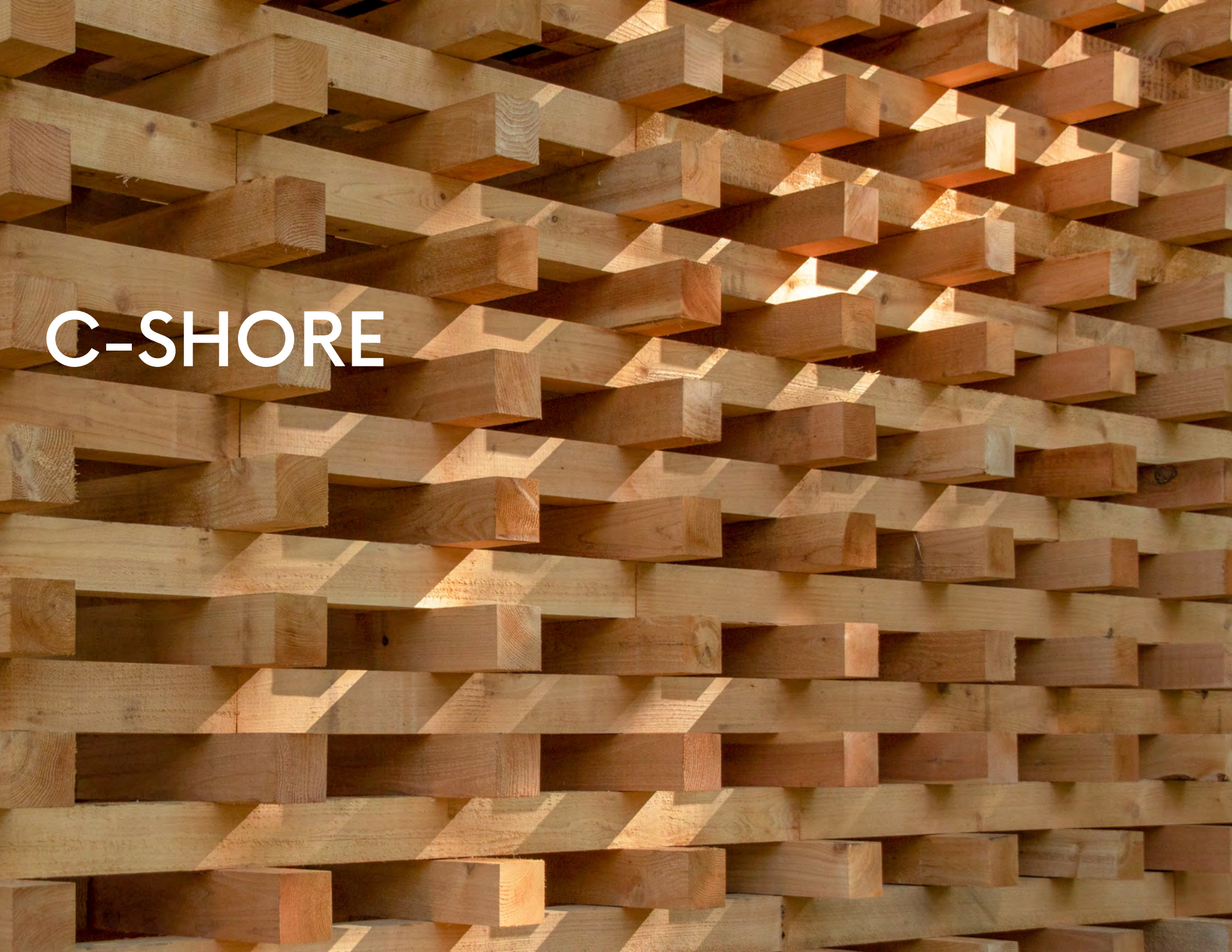
University of British Columbia

ARCH 544

Themes: Materials, Biodiversity, Community

September 25, 2019


C-SHORE

EXECUTIVE SUMMARY

C-Shore is a pavilion designed and constructed by graduate students enrolled in a two-term design-build course at the University of British Columbia School of Architecture and Landscape Architecture led by Associate Professor Joseph Dahmen. The project relates material ecologies to design poetics, providing an opportunity for students to develop their design process in line with ecological values in a collaborative environment.

Building on Peter Zumthor's design for the Swiss Sound Pavilion at Expo 2000, nine architecture and two landscape architecture graduate students designed and constructed C-Shore using cedar timber milled from native trees felled during site preparation at a nearby construction site. The student design provides a multi-sensory space of respite and relaxation at the heart of the busy university campus, in keeping with campus Well-Being objectives. The porous wall shoring ensures adequate airflow to dry the freshly milled cedar timbers under ambient conditions, creating a cool microclimate infused with the scent of drying cedar. The pavilion is secured with an adjustable clamping system that accommodates the shrinkage as the timbers dry and allows for efficient disassembly at the end of the project. After three years, the pavilion will be disassembled and the dried timber will be provided to local primary schools, where it will be used to construct planter boxes to teach ecology.

C-Shore attempts to address architecture's sometimes complicit relationship with resource consumption by highlighting ecological origins, using material flows as design opportunities, and engaging the full lifecycle of architecture. Expanding the boundaries of design to include upstream material processes and end-of-life considerations has the potential to deepen student understanding of architectural materiality, transforming items selected from cut sheets and catalogues into materials inextricably linked to environments, geographies, and processes.

C-Shore was made possible with the generous support of the SEEDS Sustainability Program, UBC Campus and Community Planning, UBC Sustainability Initiative, UBC Properties Trust, Alma Mater Society, Heatherbrae Builders, MyTiCon Connectors, UBC Building Operations, UBC Department of Geography, Centre for Advanced Wood Processing, UBC Parking and Access Services, and UBC Wellbeing.

Joseph Dahmen
September 25, 2019

OVERVIEW

C-Shore is a pavilion designed and constructed by Architecture and Landscape Architecture graduate students enrolled in a two-term design-build course at [name redacted]. The project relates material ecologies to design poetics, providing an opportunity for students to develop their design process in line with ecological values in a collaborative environment.

The pavilion builds on Peter Zumthor's design for the Swiss Sound Pavilion at Expo 2000. Zumthor found design opportunities in material flows. The Swiss Sound Pavilion used precise stacks of timber 'borrowed' from the Swiss timber industry to create rich spatial and acoustic experiences. At the end of Expo, the pavilion was disassembled and sold as valuable seasoned timber.

Using Zumthor's approach as a point of departure, students designed and constructed C-Shore using cedar timber milled from native trees felled during site preparation at a nearby construction site. The student design provides a multisensory space of respite and relaxation at the heart of a busy university campus. After three years, the pavilion will be disassembled and the dried timber will be provided to local primary schools, where it will be used to construct planter boxes to teach ecology.

A ramp brings visitors into the pavilion along an oblique path that opens to a view of a water feature beyond.

C-shore overlooks an existing campus water feature whose native vegetation is home to birds and dragonflies.

Photo: Krista Jannke

PROJECT DESCRIPTION

The pavilion provides a space for casual relaxation, reconciling the need for private respite with openness and accessibility. The porous wall shoring ensures adequate airflow to dry the freshly milled cedar timbers under ambient conditions, creating a cool microclimate infused with the scent of drying cedar. The opacity of the walls varies with the angle of view, creating dynamic interactions between interior and exterior characterized by variegated bands of daylight and shadow. The pavilion is secured with an an adjustable clamping system that accommodates the shrinkage as the timbers dry and allows for efficient disassembly at the end of the project.

Top and right: Cedar cribbing members extend horizontally to provide seating for up to ten visitors.

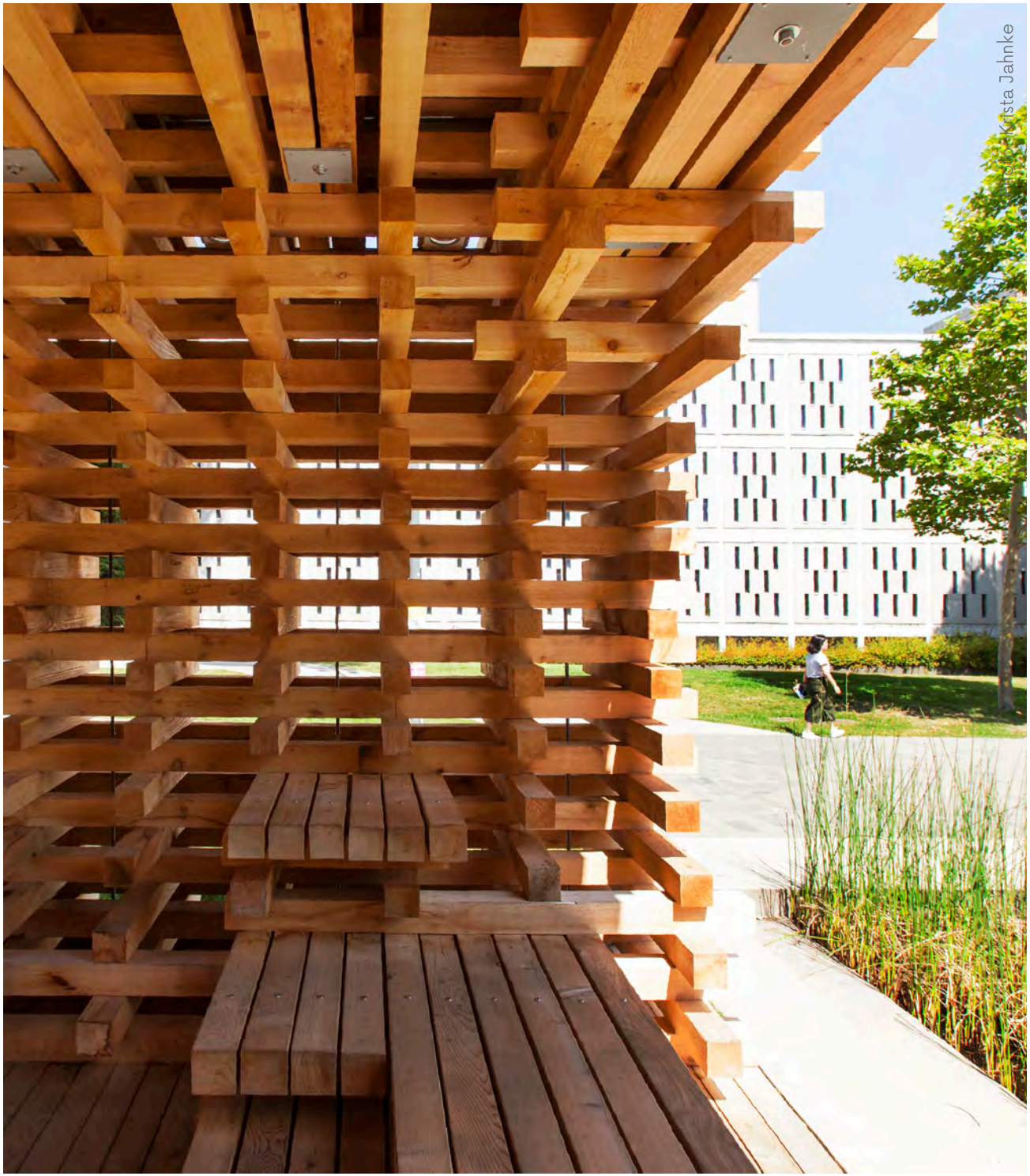


Photo: Krista Johnke

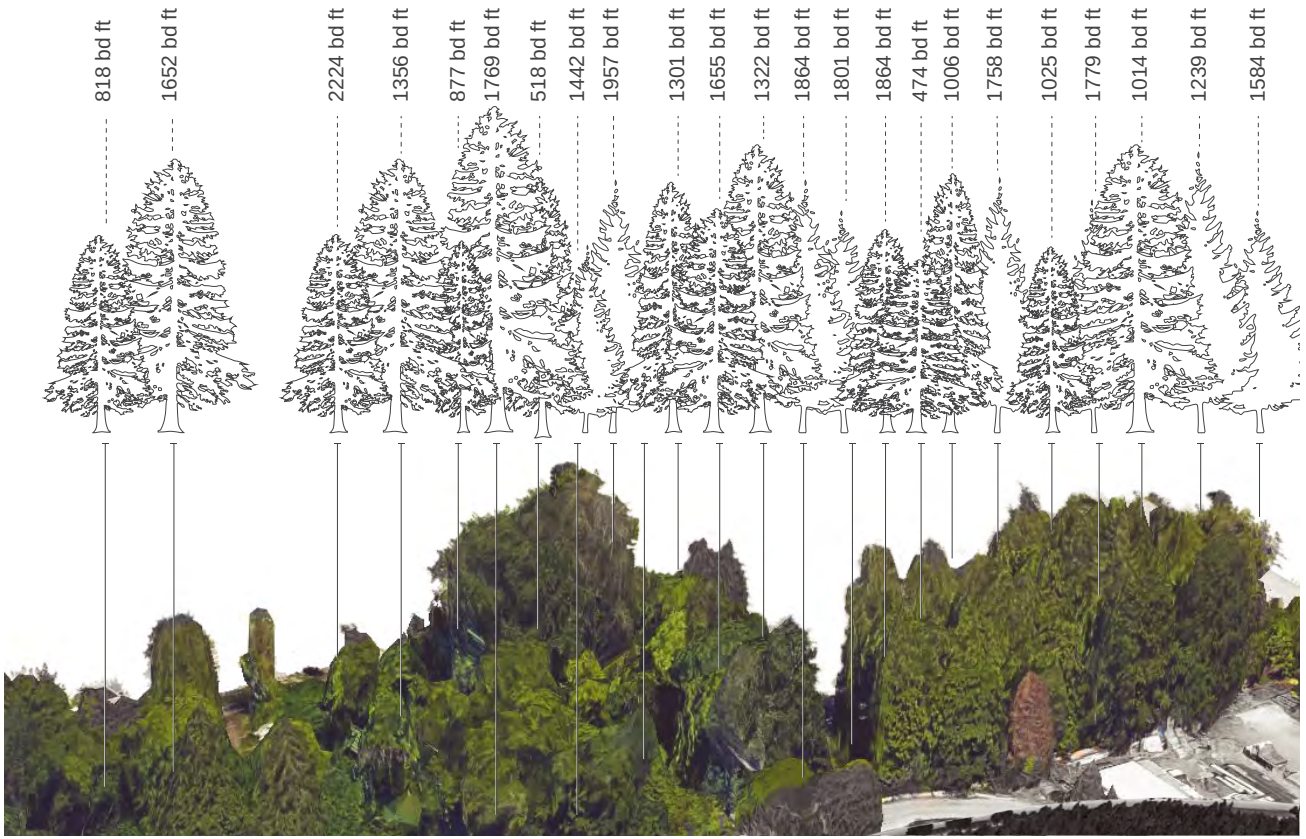
Looking back at entrance ramp from pavilion interior

DESIGN-BUILD PEDAGOGY

C-Shore applies the hands-on experiential nature of design build pedagogies to deepen student's understanding of the relationship of architecture to its constituent materials. The course aims to draw links to the local ecologies from which raw materials are drawn, encouraging students to find design opportunities in material flows that account for the full lifecycle of architecture.

The project took place over two terms: a semester-long course in the Fall, in which a team of nine graduate students in architecture and two from landscape architecture documented standing trees, calculated available timber and designed the pavilion, and a seven week long intensive course in the Spring, in which eight students continued on to construct the project.

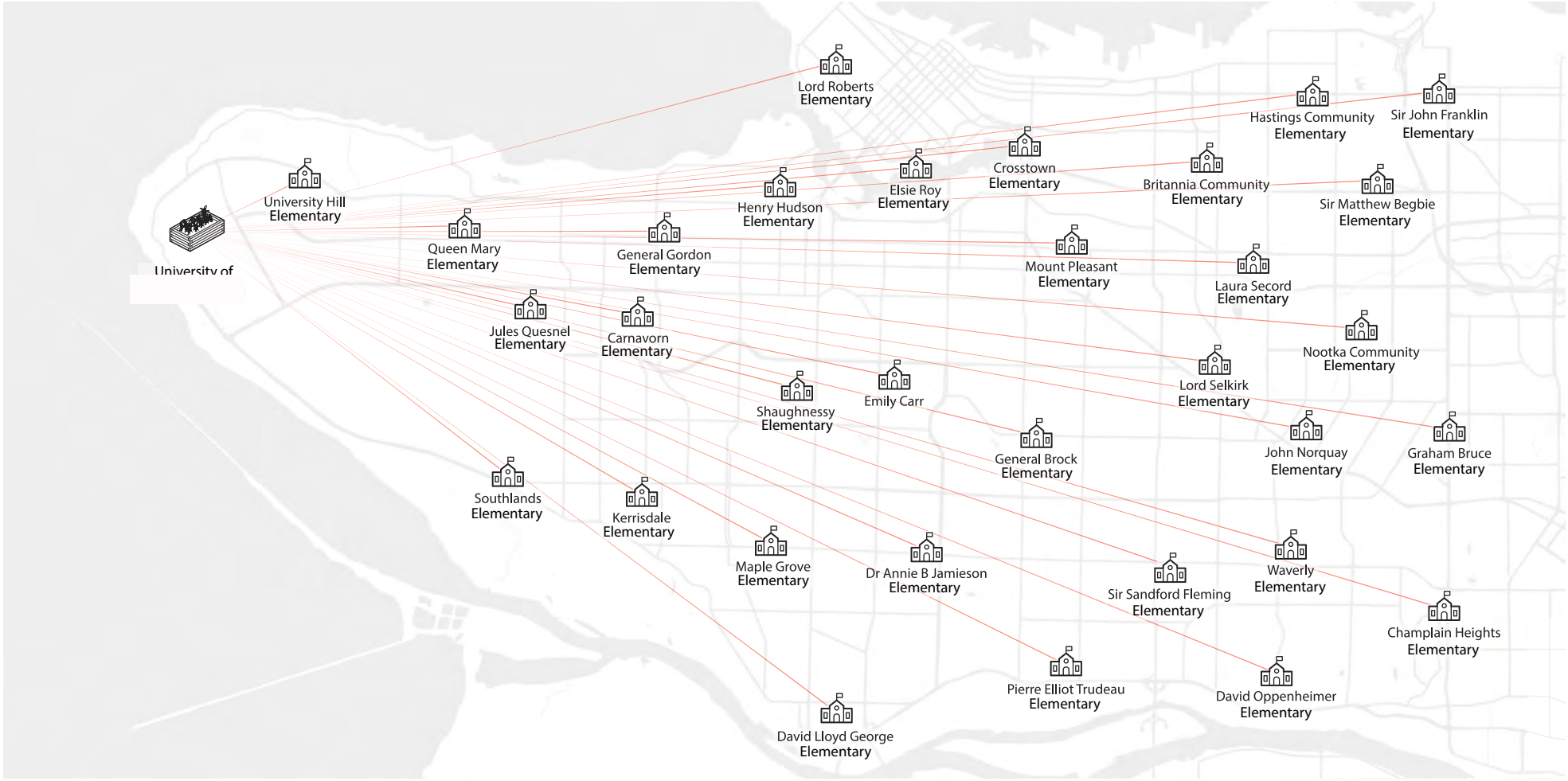
Pavilion walls appear opaque from oblique angles but provide perpendicular views through the structure



MATERIAL ECOLOGY

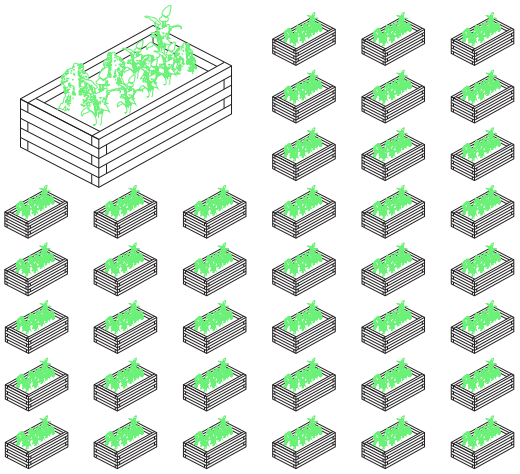
During the pre-design phase, students documented an existing stand of trees near campus that were slated to be removed for a housing development. Research included studying arborist reports, which was followed by measuring and cataloging trees on the site. Students met with experts from the Faculty of Forestry and the Centre for Advanced Wood Processing to learn about milling and drying considerations, and visited timber component production facilities. Following the research and documentation stages, students selected individual trees for the project from standing timber, developed mill specifications, and studied timber design precedents.

Top: timber quantities associated with individual trees; Below (l): a student measures tree girth; (r) harvested logs from the site await shipment to mill



MATERIAL GEOGRAPHY

The design accounted for end of life considerations. After three years, the pavilion will be disassembled. The seasoned cedar timber will be provided to local elementary schools, where they will be used to construct garden planter boxes that will support existing ecology curriculum. The foundation will remain in the ground to be used for future design-build courses.

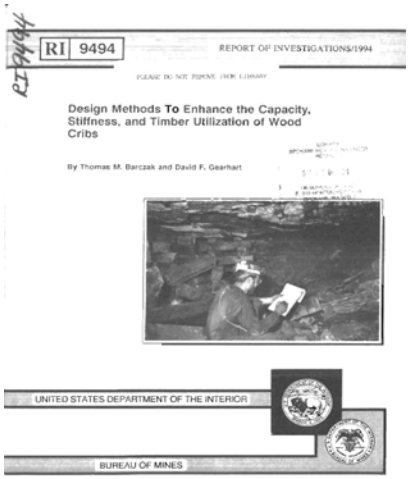


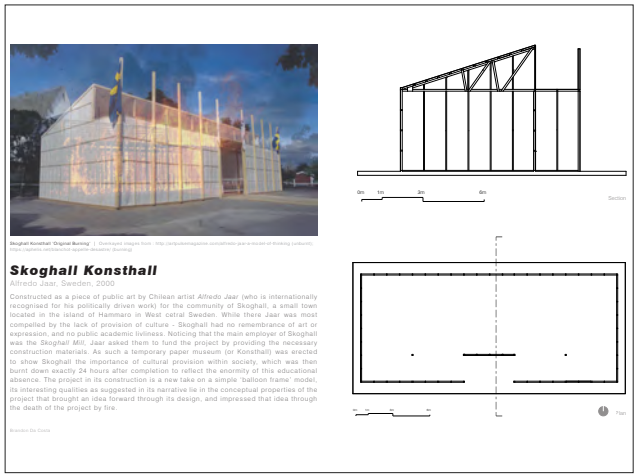
Top: Map of primary schools receiving planter boxes after project dissasembly. Bottom (L): Calculation of cedar planter boxes. Bottom (R) Typical planter box.

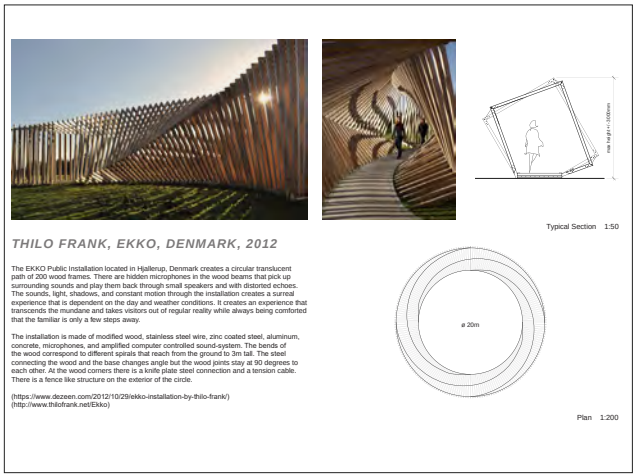
DESIGN PRECEDENT RESEARCH

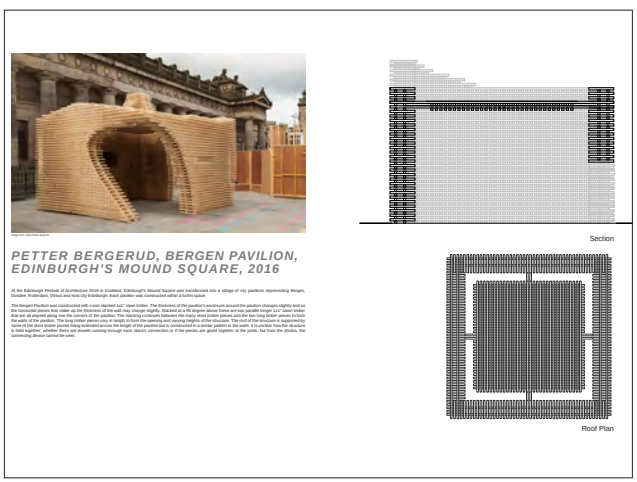
Concurrent with the site investigations, students studied design precedents of temporary pavilions by Peter Zumthor, Frei Otto, Alfredo Jaar, Interboro Partners, Peter Pichler, Ben Butler, Thilo Frank, Rintala Eggertsson, and others.

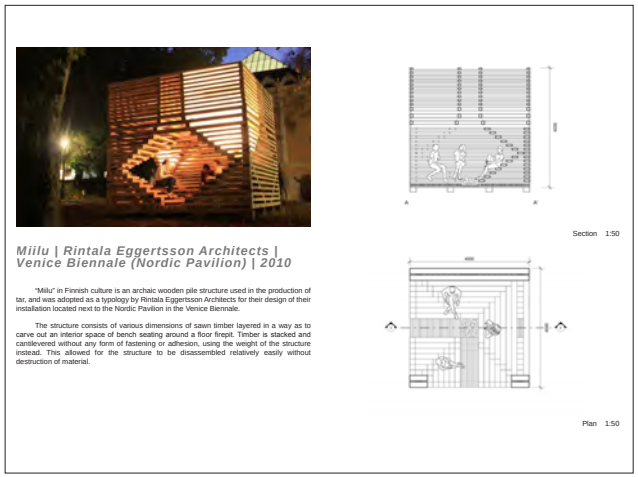
Right: Design precedent research of timber pavilions prepared by students. Above: technical guidelines for timber shoring.

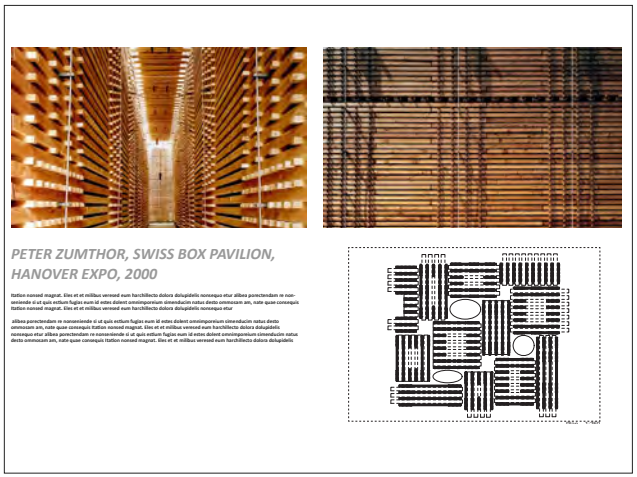


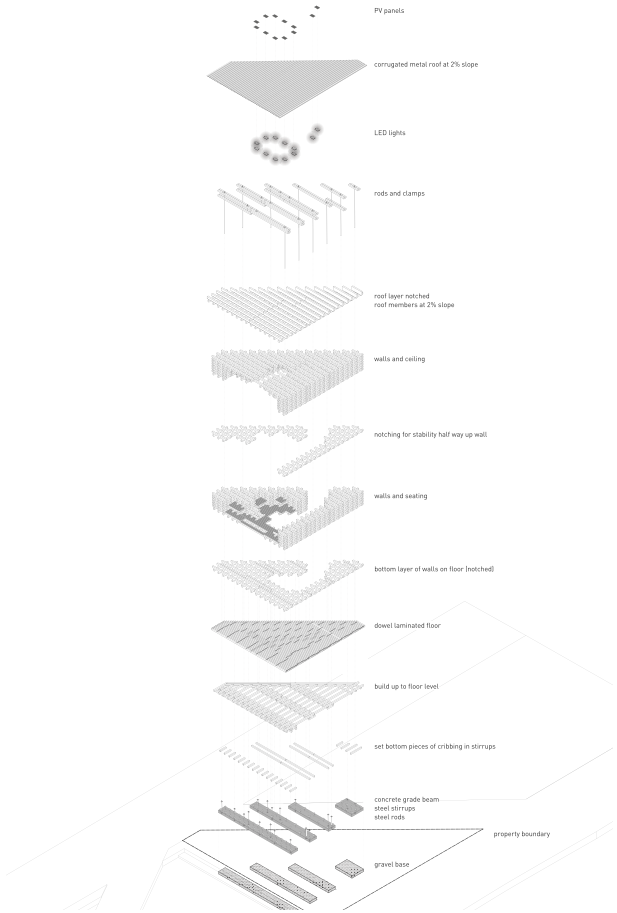


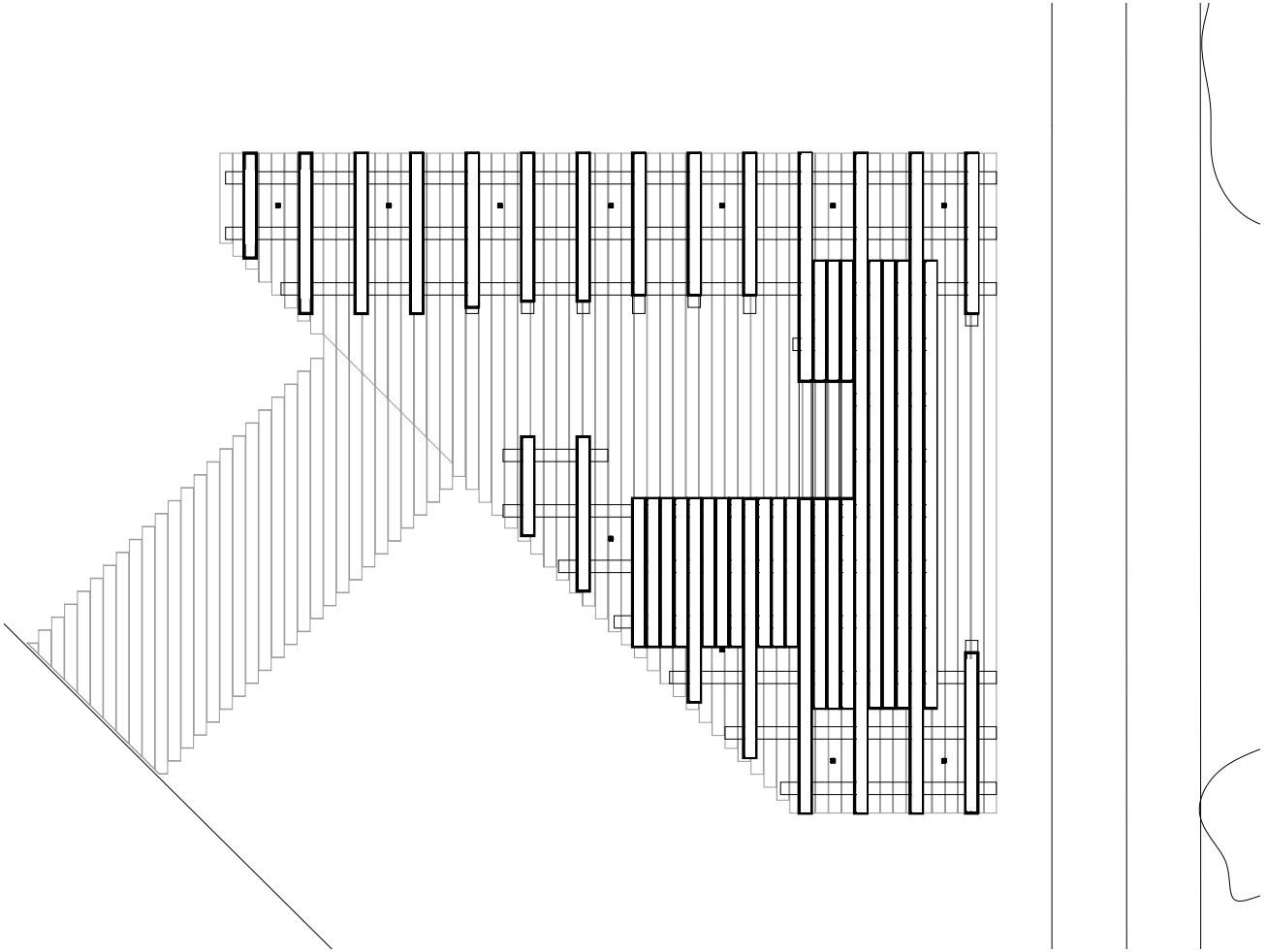






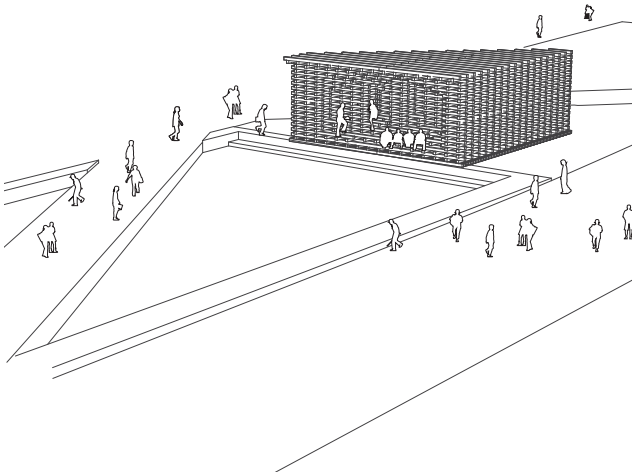


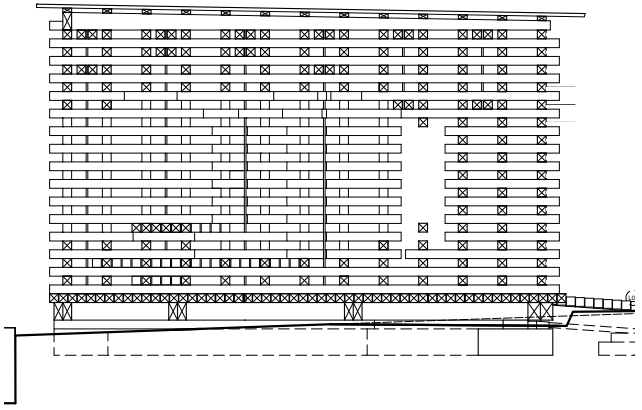




COLLABORATIVE DESIGN PROCESS

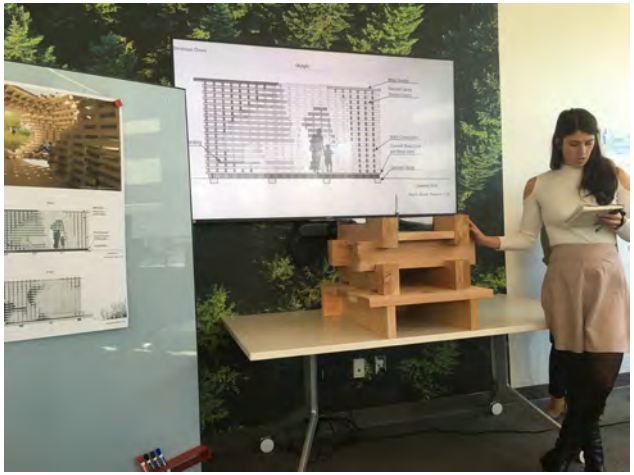
During the iterative design phase, students worked collaboratively to design a pavilion scaled to their calculations of available timber. The design was developed through sketching, physical and digital modeling, and mockup construction of key elements. During the Fall term, students presented design schemes to campus community groups and other project stakeholders, as well as technical experts.





Clockwise from upper left: Exploded view of construction elements; ground floor plan; typical section; axonometric view showing relationship to site.

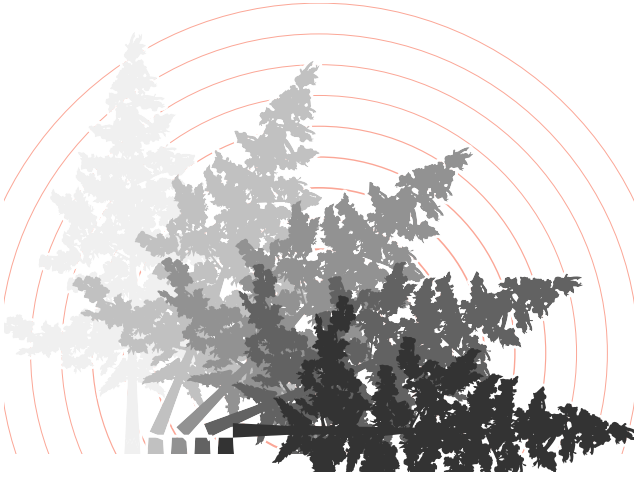
Students produced a set of construction documents at the end of the Fall term. During the Spring, students used the drawing set to gain the necessary engineering approvals and project permitting. During the Spring, logs were transported to the mill, where they were sawn according to specifications and delivered to the site prior to construction in June. Due to the collaborative nature of the work duruing the design and construction phases, peer evaluation was used to measure individual contributions.

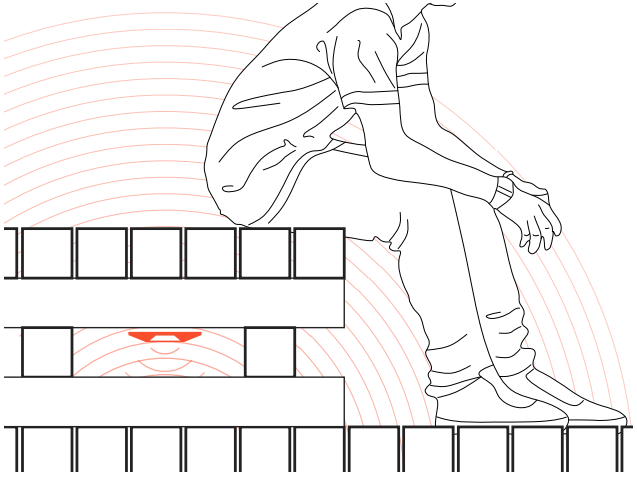


Top: students constructing 1:10 model; Bottom (l): presentation to stakeholders (r): 1:10 model interior

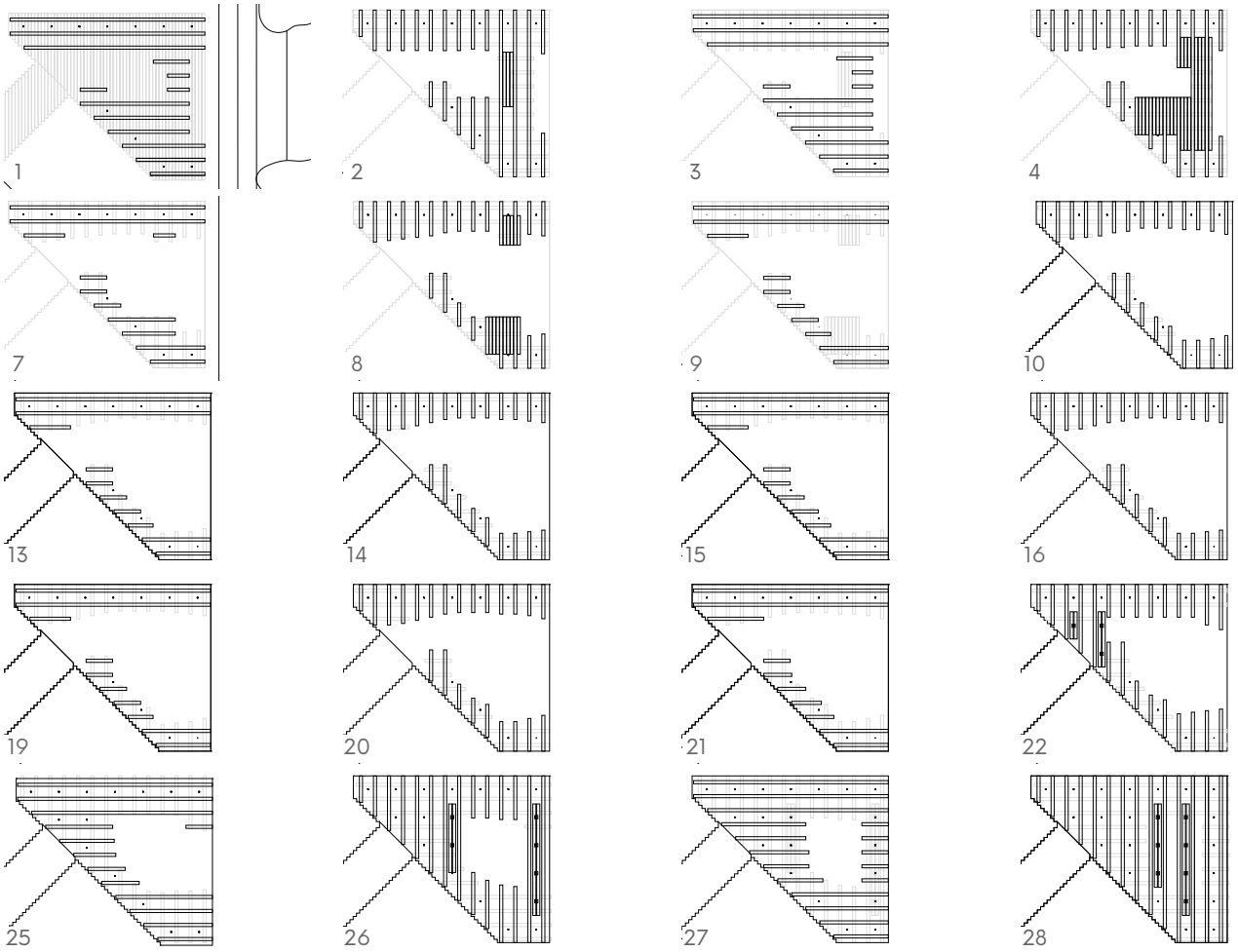
ACOUSTIC ECOLOGY

In a parallel collaboration, [name redacted], a sound artist, worked with students in the Geography Department to record the sounds of the forest ecosystem before, during, and after the tree felling took place. The finished pavilion resonates with these acoustic recordings on set intervals, drawing links between the pavilion and the vanished ecosystem that was cleared to make way for the housing project.





Top: section of acoustic installation; Bottom (l) site recordings include tree felling; (r) detail of tactile transducer that uses architecture as resonator



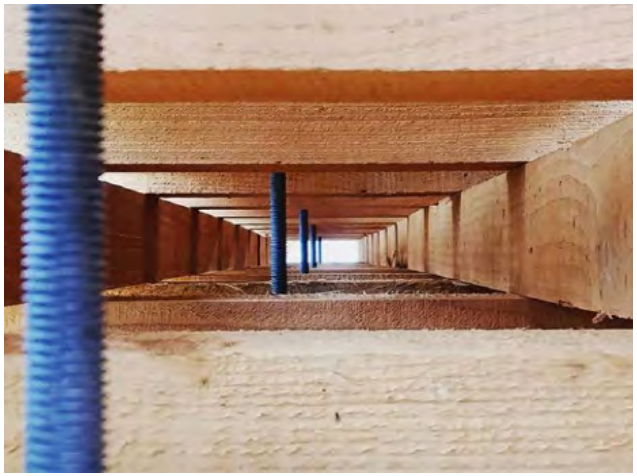
CONSTRUCTION PROCESS

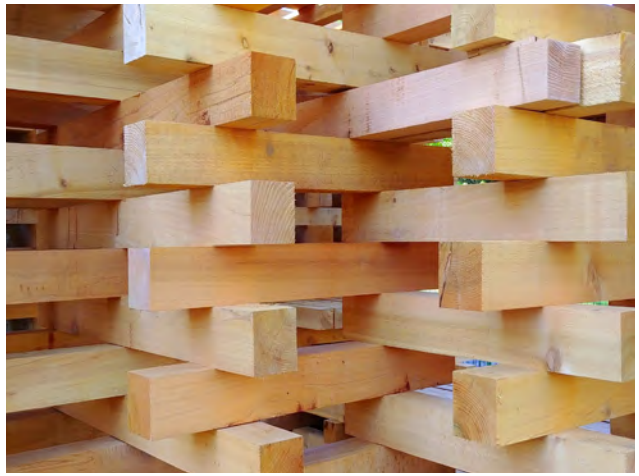
Eight members of the design team from architecture and one member from landscape architecture constructed the project over a seven-week period following the conclusion of Spring classes. During construction, days began with a brief overview of tasks to be completed, followed by instruction in the technical skills required. Teams of students then self-organized to accomplish individual tasks.

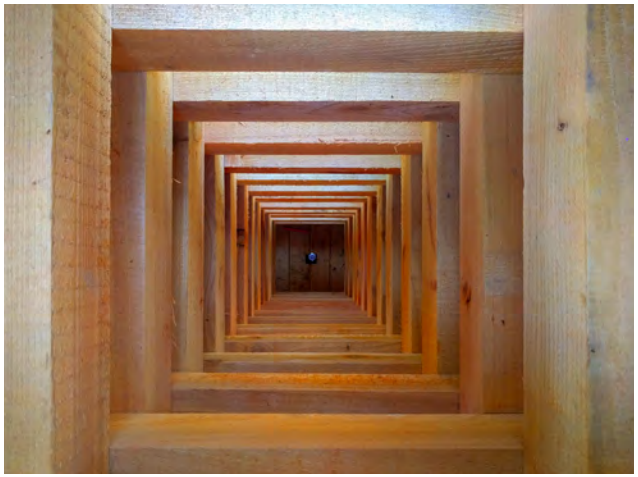
Clockwise from upper left: shoring plans for each level; students stack shoring; levelling shoring with cedar shims

Photo: Krista Jandke

Clockwise from top left: construction of timber sub-frame; sorting shoring timbers, securing decking; corbelling over entrance; ensuring shoring is square.








DETAILS

Students learned valuable lessons about construction tolerances as they translated construction drawings into built form.

Clockwise from top left: view of threaded rod clamps in shoring; looking down shoring from above; a typical shoring stack ; view looking upward at corbelled structure and flying clamp; native river stone prevents weed growth around base; staggered joints at entrance ramp; view down shoring void; adjustable clamp coupling


GEOGRAPHY OF SMELL

Cedar contains natural preservatives that are toxic to the microbes that produce rot The intoxicating smell of freshly cut cedar spread across the campus during construction, lending the project a multisensory presence beyond the visible. The smell gradually diminished until it was palpable only to visitors who venture inside.

DELIVERY

MONTH 1: 750m

CONSTRUCTION

MONTH 2: 150m

COMPLETION

MONTH 3: 30m

ECOLOGICAL AWARENESS THROUGH DESIGN-BUILD

According to the UN, the built environment today consumes 40% of all resources. C-Shore attempts to address architecture's sometimes complicit relationship with resource consumption by highlighting ecological origins, using material flows as design opportunities, and engaging the full lifecycle of architecture.

Approaching design in this way has the potential to deepen student understanding of architectural materiality, transforming items to be selected from cut sheets and catalogues into materials inextricably linked to environments, geographies, and processes.

Porous cribbed walls create dynamic lighting effects that change througout the day.

Expanding the boundaries of design to include upstream material processes and end-of-life considerations has the potential to replace tired paradigms of scarcity with the material abundance characteristic of natural systems. In the context of the contemporary ecological crisis, these methods also have the potential to build more nuanced relationships between materials and the natural and hybrid ecologies from which they are drawn, reducing or even reversing the ecological impacts of architecture.

Above: Planter box at University Hill Elementary.
Right: Pavilion interior

Photo: Krista Tabnke

DESIGN TEAM

Brandon Da Costa, Marion Gelinas, Jose Gottret, Emily Kazanowski, Sarah Klym, Karen Lai, Jia Liu, Jesse Martyn, Zoe Pierce, Leah Porter, Chris Walker

FABRICATION TEAM

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INSTRUCTOR

Joseph Dahmen, Associate Professor, UBC SALA

TECHNICAL INSTRUCTORS

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ENGINEER

Bush, Bohlman & Partners LLP

SPONSORS & PARTNERS

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