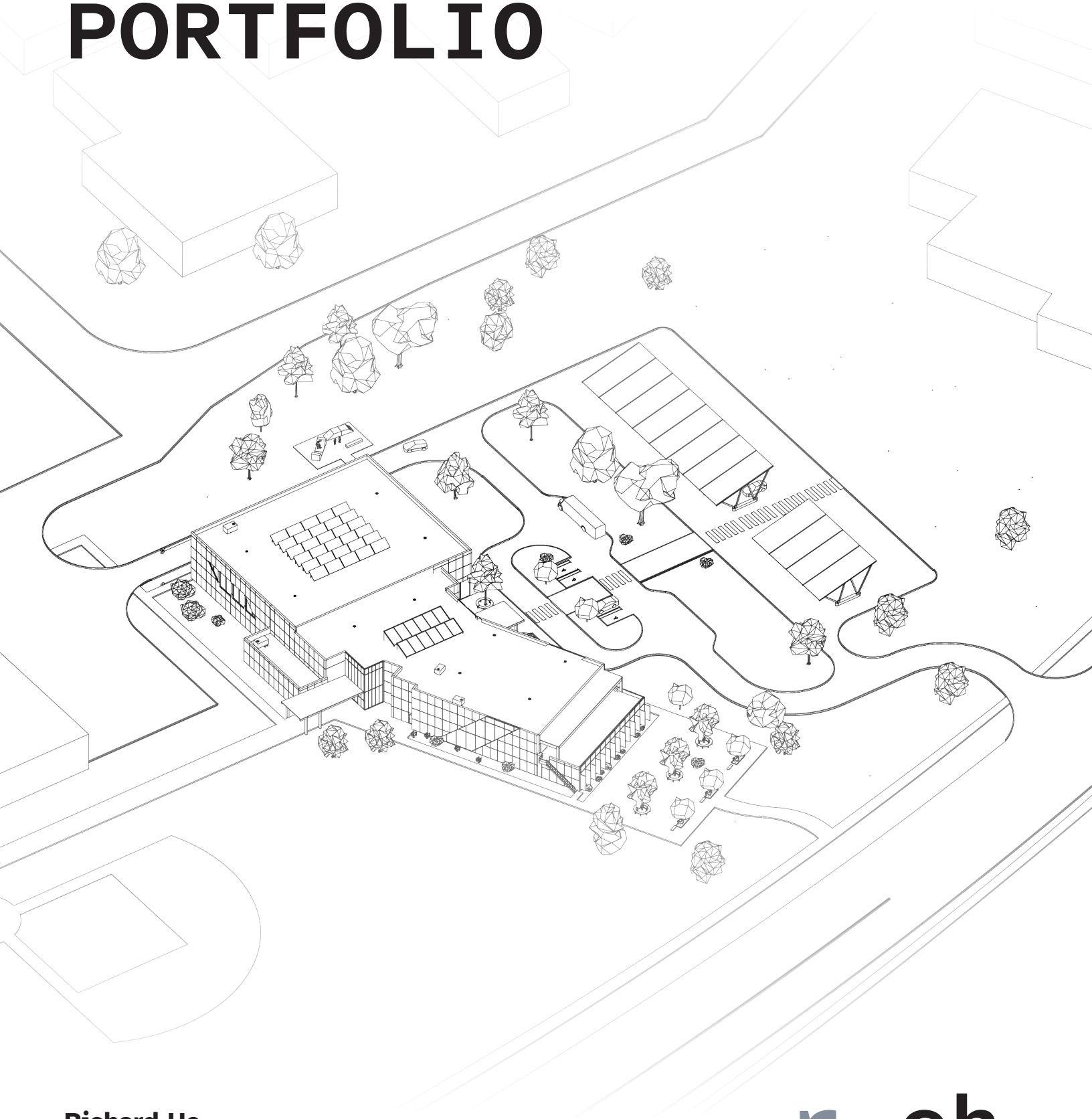
PORTFOLIO



Richard He

Bachelor of Applied Science,
Architectural Engineering

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About

Richard He graduated from the University of Waterloo in 2025 with distinction, with a degree in Architectural Engineering and specializations in Building Systems and Building Structures. He has a wide breadth of work experience in structural engineering, urban design, graphic design, and building science.

The samples of work within this portfolio are wide-ranging in scale and scope, and reflect an interdisciplinary approach to the complex study of architectural design and engineering. Many of the projects share concepts of accessible engineering, sustainable design and community architecture, and the rewarding challenge of their synthesis.

Featured Projects

Tree of Life Campus
Capstone Design Studio, Spring 2024 & Winter 2025

School campus in Cap-Haïtien, Haiti, designed as a system for resilience and self-sufficiency in the face of climate risk and resource instability.

Living Gateway
Architectural Engineering Studio, Winter 2024

Mixed use residential and commercial building in Kitchener, Ontario, designed to meet the diverse needs of a growing city.

Georgetown Apartments
Warrior Home Student Design Team Project, 2024

Prefabricated and net-zero modular apartments in Georgetown, Ontario, designed to provide affordable housing with low construction and operational costs.

The Crank Community Centre
Integrated Design Studio, Spring 2023

Community centre featuring a pool, library, and gymnasium in Cambridge, Ontario, designed to expand existing amenities provided by the city.

Broadview House
Warrior Home Student Design Team Project, 2023

Net-zero, passive house single-family home in Kitchener, Ontario, designed to support affordable housing initiatives within the Indigenous community.

Universal Library
Environmental Building Studio, Fall 2022

Small-scale library designed for Waterloo, Ontario, designed to provide valuable library services in a variety of sites.

Curriculum Vitae

Education

B.A.Sc. in Architectural Engineering
University of Waterloo
2020 – 2025

Graduated with distinction; dual specialization in Building Systems and Building Structures

Work Experience

Building Science Co-op
Evoke Buildings Engineering | Burnaby, BC
Sep 2024 – Dec 2024

Student Urban Designer
Weston Consulting | Vaughan, ON
Sep 2023 – Dec 2023

Structural Engineering Assistant
Cucco Engineering + Design | Toronto, ON
May 2022 – Sep 2022

Web and Multimedia Design
Institute for Quantum Computing | Waterloo, ON
Jan 2021 – Apr 2021

Awards and Projects

Judge's Prize
Buildings Symposium | Toronto, 2025
Presented our capstone design project at a conference for student building design projects.

Finalist, Attached Housing
US Solar Decathlon Design Challenge 2024 | Golden, 2024
As architecture lead of Warrior Home Student Design Team.

Finalist, New Housing
US Solar Decathlon Design Challenge 2023 | Golden, 2023
As architecture lead of Warrior Home Student Design Team.

3rd Place Overall
TimberFever | Toronto, 2021
Designed a timber pedestrian bridge within 48 hours with an interdisciplinary team.

Software

AutoCAD
Revit
Rhino
Rhino.inside.Revit plugin
Grasshopper
Enscape
Lumion
Illustrator
InDesign
Photoshop

PROJECT Capstone Design Studio
INSTRUCTORS Shiyu Wei and Costa Kapsis
TEAM Emma White, Urooj Khan, and Jessa Sookbirsingh
SOFTWARE Revit, Rhino, Lumion, Illustrator, InDesign

Spring 2024 + Winter 2025

Tree of Life Campus

As the effects of climate change are felt increasingly throughout our world, the need for resilient design to endure the changing conditions is apparent. The Tree of Life Campus provides a framework for the design of buildings and community infrastructure that is suited to overcome the obstacles of the future.

Although the design concepts presented in the project could be applied to any programming, the choice of vocational school, residence, and community service buildings were intentional. In the coming years, practical education, housing, and community will be vital to humanity's survival. In its full realization, Tree of Life will equip both adolescents and adults with practical skills, as well as provide access to information, healthcare, food, and electricity.

To guide and inform the design process, the Tree of Life concept was applied to a site in Cap-Haïtien, Haiti. Lacking strong infrastructure, access to resources, and facing severe instability of decades of natural disasters and corruption, Haiti already faces challenges to stability that will only be further exacerbated by climate change.

Community Building

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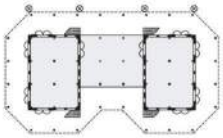
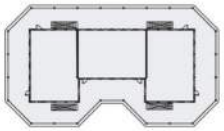




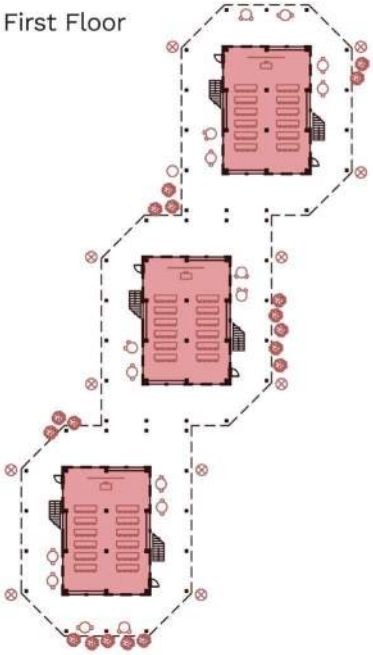
Programming Options for Community Building Typology

Administration
Workshops
Library
Study rooms
Clinic
Cafeteria
Laundry rooms

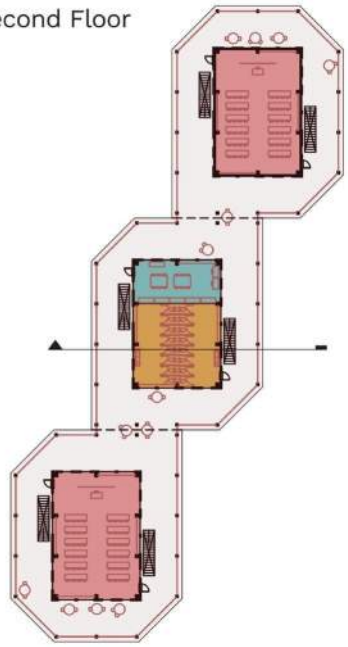
Academic Building

0 4 8 20m

First Floor



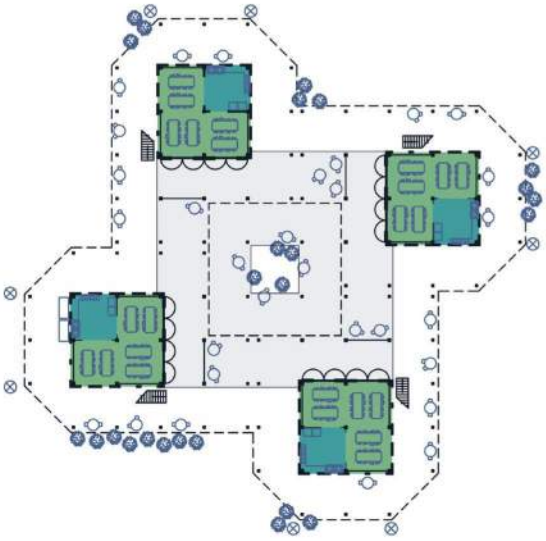
Second Floor



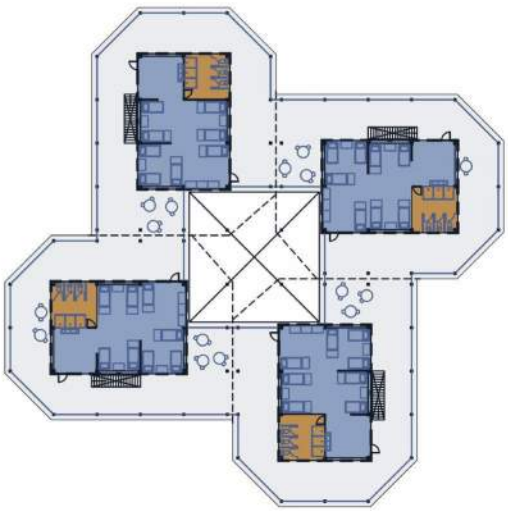
Residential Building

0 4 8 20m

First Floor



Second Floor



To meet the variety of occupants that the Tree of Life might have, the overall architecture is predicated on a simple modular unit, which can combine to form a complex range of building blocks that allow the campus to grow in a phased manner. This flexibility allows for communities to grow or adapt their facilities and infrastructure as needed, to reflect available resources and operational demands.

These plans represent just some of the possible variations that the Tree of Life Campus framework makes possible, with a focus on combining flexibility of occupant use, with intuitive layouts tailored to the different needs a campus might have. Shared community buildings, designed as blank canvases, provide additional program space as needed.

Programming Legend

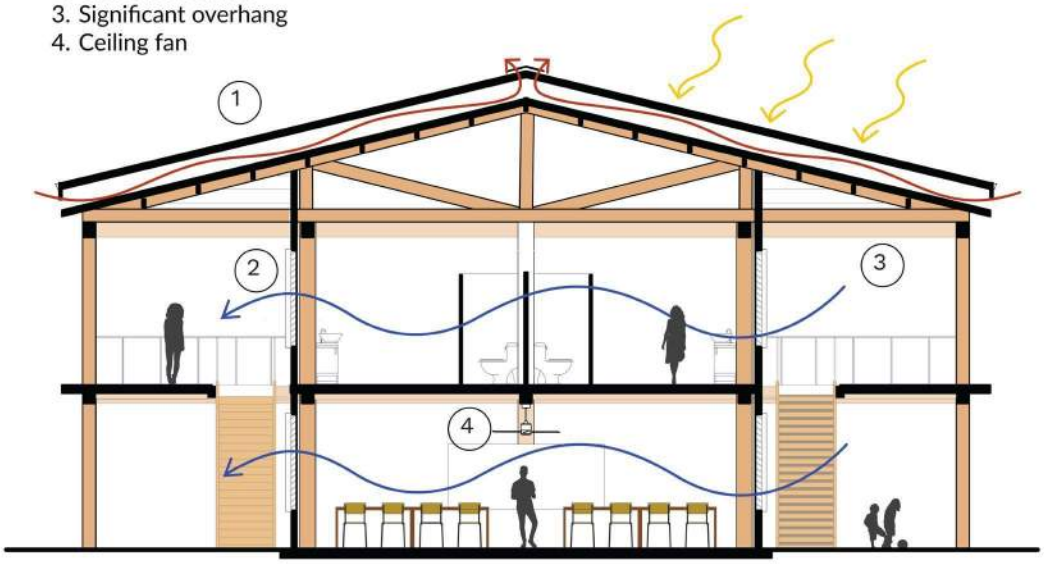
- Dining Room
- Kitchen
- Dorm Bedroom
- Bathroom
- Lecture Hall
- Equipment Storage & Staff Lounge

Fundamental to the Tree of Life is the use of passive design strategies within the unit module, combined with on-site solar and wind energy. By taking advantage of the local climate to reduce reliance on the local grid wherever possible, the Tree of Life is intended to withstand blackouts, system failures and cloudy days with ease.

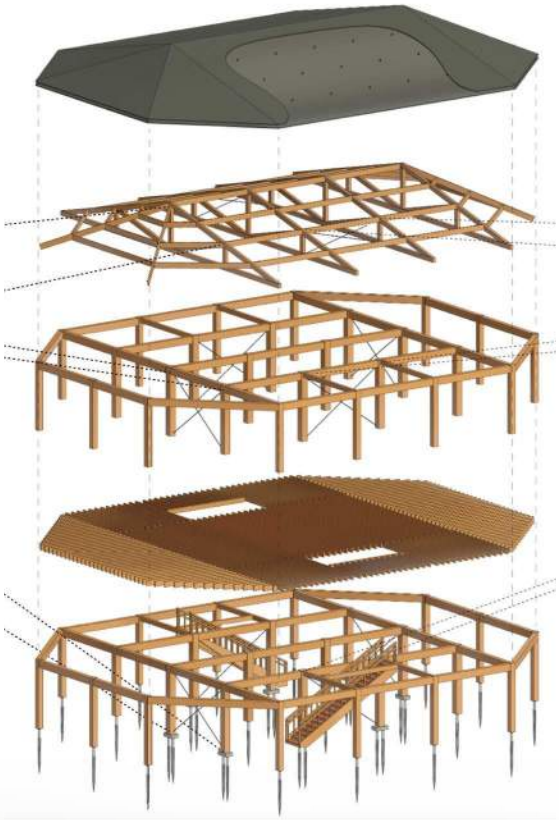
Additionally, as Haiti is prone to significant earthquakes, the structural system is also a core aspect of designing for resilience. Self weight is reduced with a lightweight wood frame, and elasticity is added with steel cross bracing. Combined with simple steel roof sheathing, the entire system is both designed to stay standing while being easily repairable in a disaster situation.

Key Unit Features

1. Insulated double vented roof
2. Operable louvers
3. Significant overhang
4. Ceiling fan



Weather data and ASHRAE references based on resources from the Center for the Built Environment (CBE).



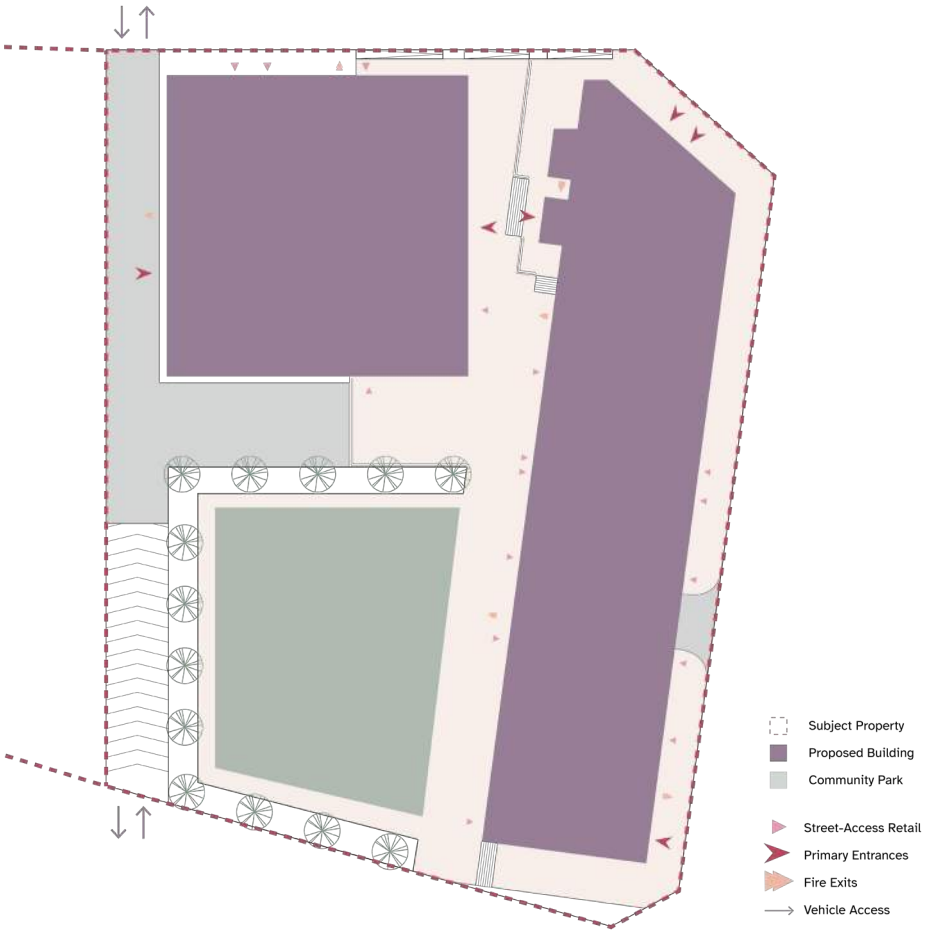
PROJECT Architectural Engineering Studio
INSTRUCTORS Mohamad Araji and Cory Zurell
TEAM Kerwin Ho, Edward Lee and Emma White
SOFTWARE Revit, Rhino, Enscape, Bluebeam, InDesign

Winter 2024

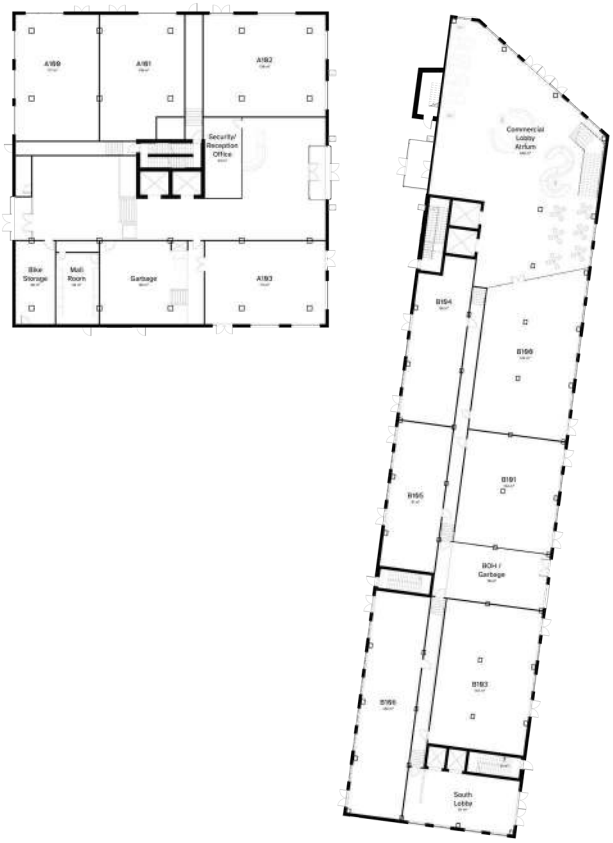
Living Gateway

With the closure of the old Kitchener Bus Terminal, the City is looking for alternative uses for the lot. Located in the centre of Downtown Kitchener, close to transit and amenities, the lot has the potential both to better provide services to the existing community, while also adding housing capacity to address the growing population of the city.

Making use of the unique form and slope of the site, the Living Gateway project combines a residential tower with a mixed use commercial building. The tower features a balance of 1-bedroom, 2-bedroom, and 3-bedroom units to meet demographic needs, and also provides residents with amenities and communal spaces, while the commercial building features ample storefronts for retail, modular office space and a community library on the third floor.



Ground Floor



Second Floor

Third Floor

Typical Residential

All layouts were designed with all applicable codes in mind, with adherence to the Ontario Building Code for fire safety, residential unit requirements, and ventilation. An underground parking lot was also designed to meet residential by-laws for the city, with special consideration given to ensure structural performance and building enclosure continuities.

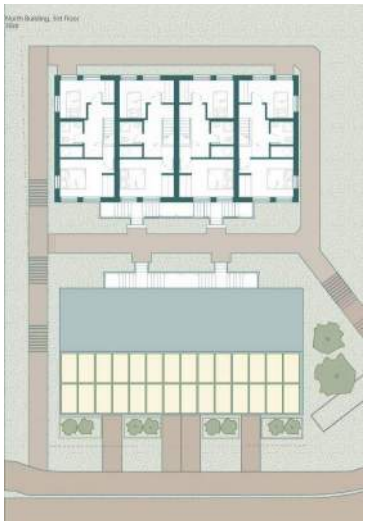
PROJECT US Solar Decathlon Design Competition 2024
CLIENT / DESIGN PARTNER Habitat for Humanity Halton-Mississauga-Dufferin
TEAM Warrior Home Student Design Team
SOFTWARE Rhino, Illustrator, InDesign

Fall 2023 + Winter 2024

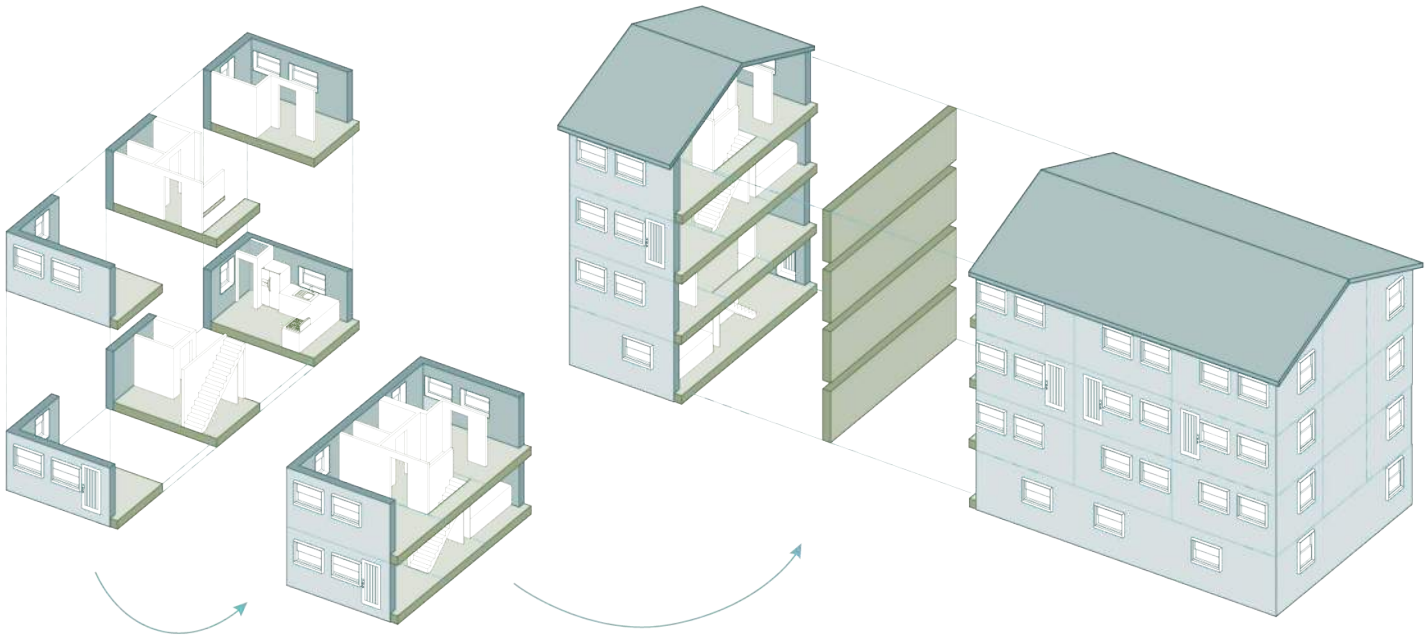
Georgetown Apartments

In 2024, to combat rising costs of living and the lack of new housing, many municipalities across Ontario began seriously considering introducing more mixed-used and medium-density options into traditional single-family zoning areas. Partnering with the Halton-Mississauga-Dufferin Habitat for Humanity, Warrior Home developed a prototypical apartment complex designed to make use of low-cost prefabricated modules to deliver a high-performance building with minimal on-site work.

Designing on a small, heavily sloped site, the team was able to put together a total of 14 units, with a mixture of 1-, 2-, and 3-bedroom sizes, while maintaining sufficient fire safety distances and entry requirements. Additional parking was provided on site to meet by-law requirements, but simultaneously provided the space needed to install the solar panels necessary to render the entire complex net-zero, throughout a year of operation.



To lower construction costs, all units were designed from volumetric modules, that were all sized for a standard flatbed truck. These modules would be prefabricated in sets of three with Habitat for Humanity, before being assembled and installed on site. All inter-unit floors and walls were also designed for sound and fire ratings, as determined by the Ontario Building Code.



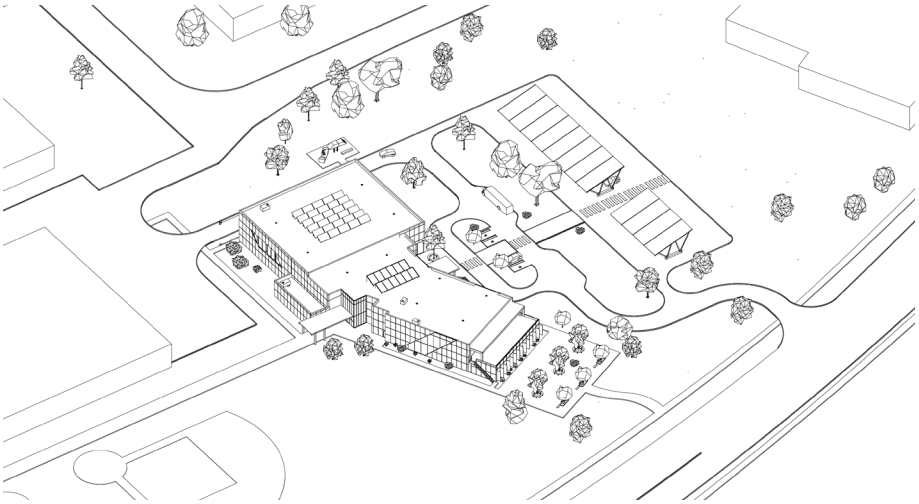
PROJECT Integrated Design Studio
INSTRUCTORS John Straube, Chris Schumacher, and Harry Wei
TEAM Rebecca Damsteegt and David Burtenshaw
SOFTWARE Revit, Rhino, AutoCAD, Illustrator, InDesign

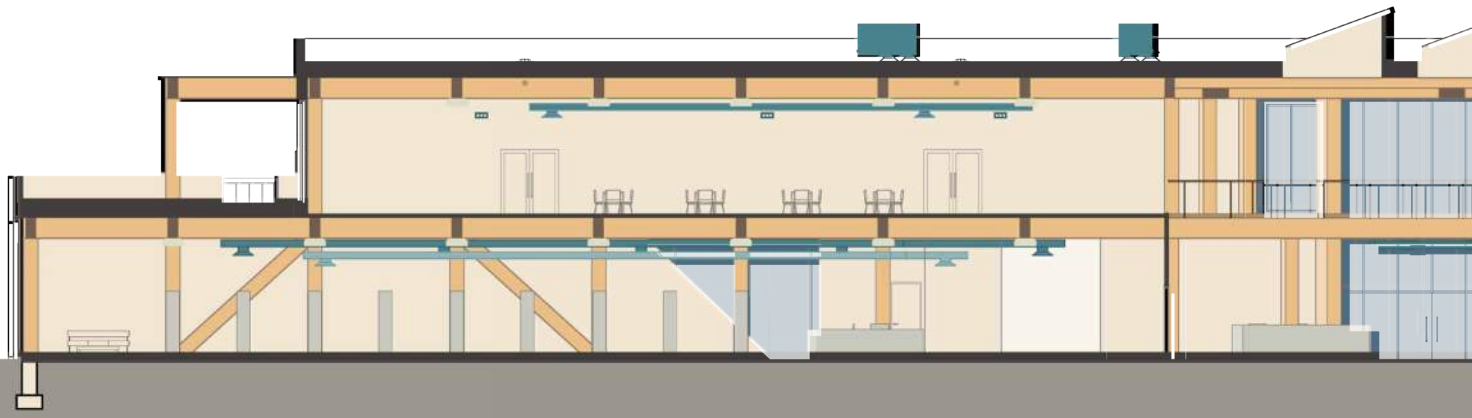
Spring 2023

The Crank Community Centre

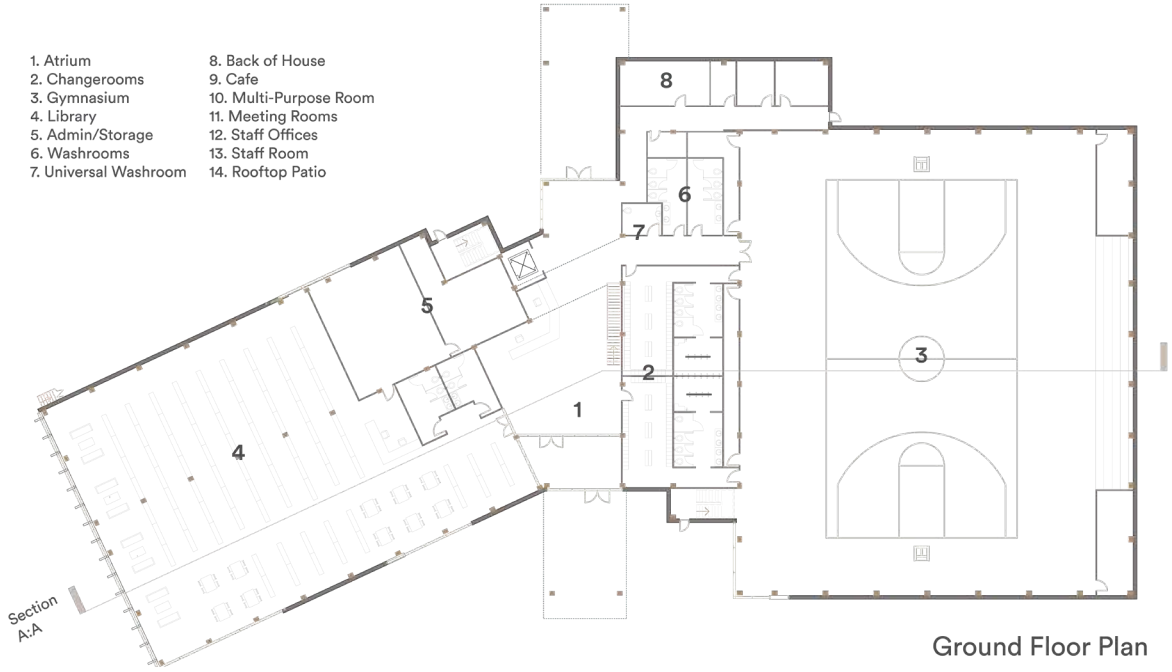
Situated between industrial and residential neighbourhoods, the Cambridge Sports Park, located in Cambridge, Ontario, is a popular public amenity, but is outdated and lacks versatility. In response, the city requests an expansion to add a 765 m^2 library, 1180 m^2 gymnasium, and various multipurpose and staff rooms to the space.

In meeting these requirements, the Crank Community Complex is designed to keep the various programs distinct, while intersecting them with the existing site and each other. The gym is aligned with the existing building, while the quieter library and rooms align with the residential neighbourhood to the south. The atrium where the programs meet provides a unique entrance for both, and acts as a common gathering ground of all users of the building.

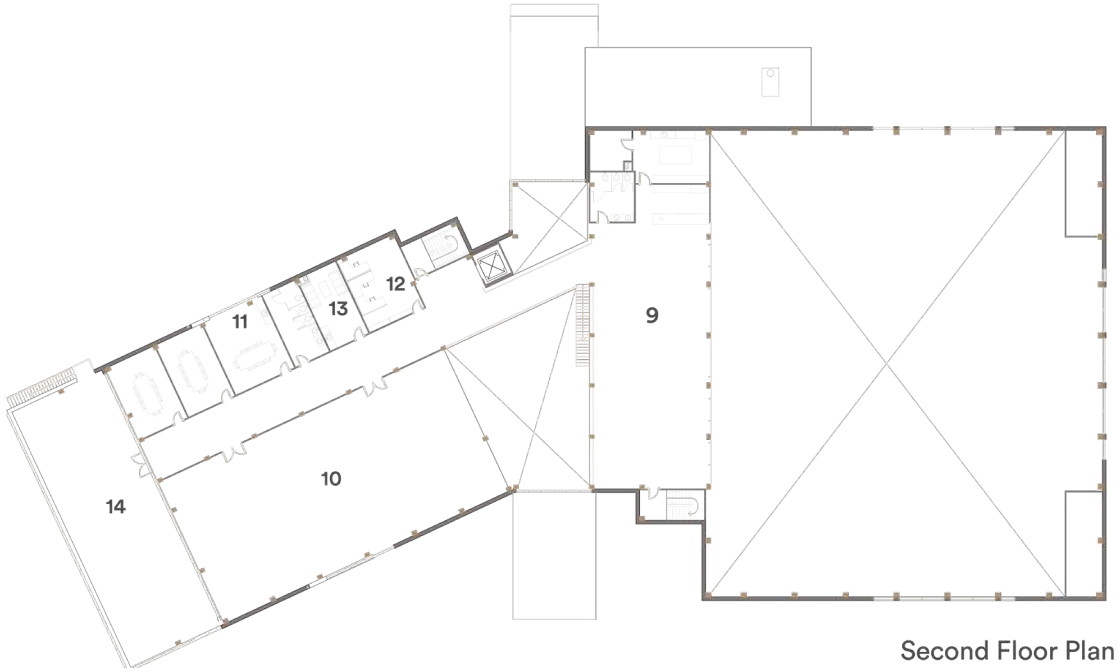




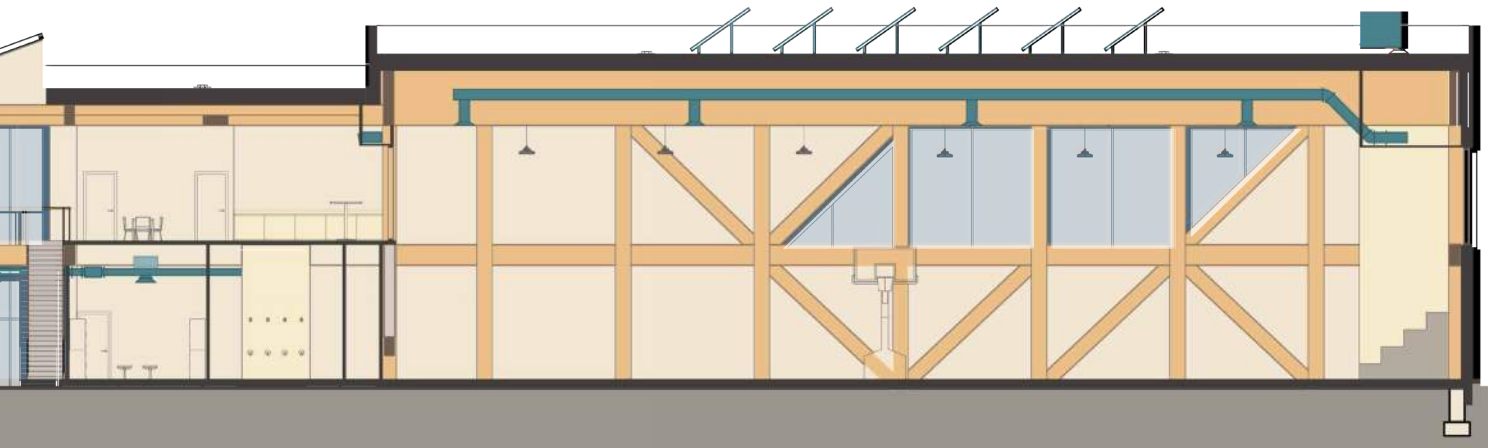
1. Atrium
2. Changerooms
3. Gymnasium
4. Library
5. Admin/Storage
6. Washrooms
7. Universal Washroom
8. Back of House
9. Cafe
10. Multi-Purpose Room
11. Meeting Rooms
12. Staff Offices
13. Staff Room
14. Rooftop Patio



Ground Floor Plan



Second Floor Plan



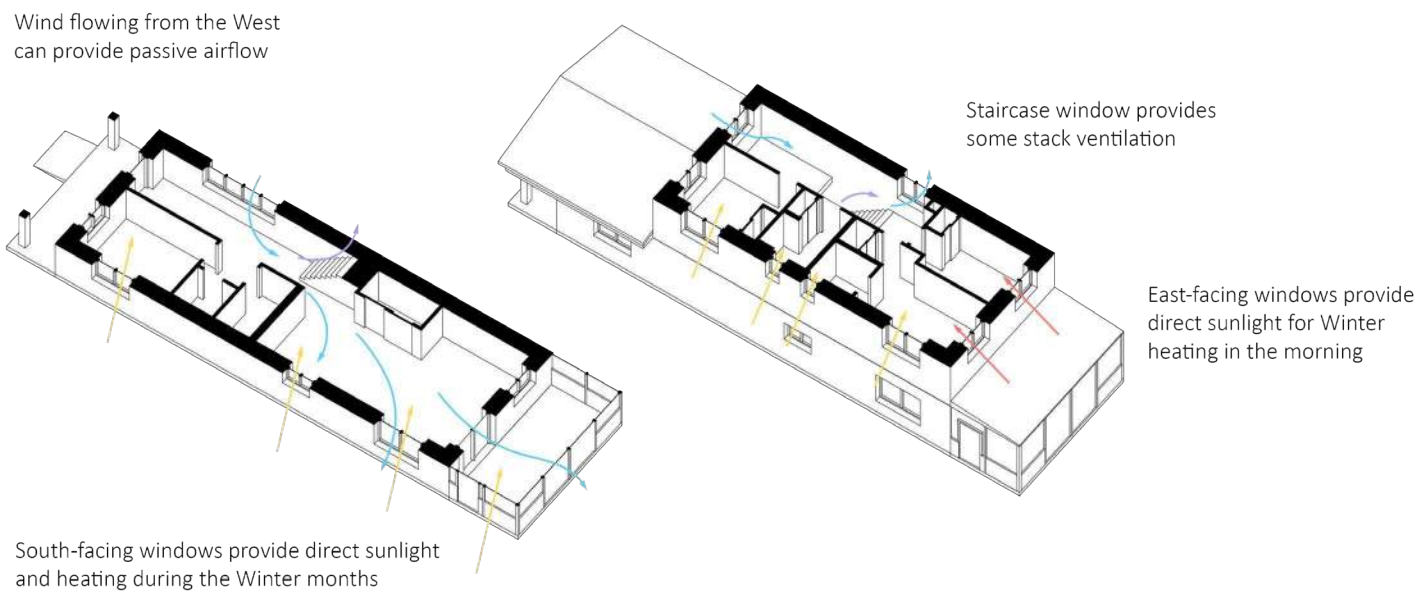
PROJECT US Solar Decathlon Design Competition 2023 Fall 2022 + Winter 2023
CLIENT / DESIGN PARTNER Kitchener-Waterloo Urban Native Wigwam Project (KWUNWP)
TEAM Warrior Home Student Design Team
SOFTWARE Revit, Rhino, Enscape, Illustrator, InDesign

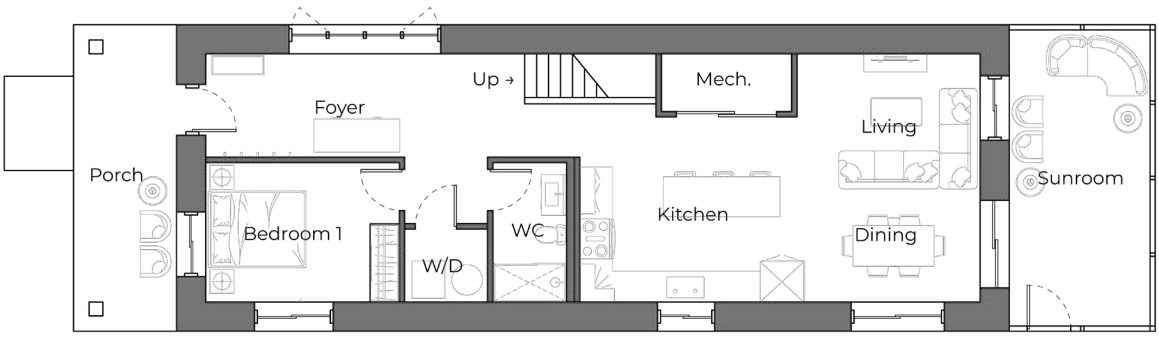
Broadview House

The Kitchener-Waterloo Urban Native Wigwam Project (KWUNWP) is a non-profit organization dedicated to providing affordable housing to the Indigenous community in the region. Many of their properties are old single-family homes or complexes geared towards transitional occupancy, with a growing need for multi-generational units.

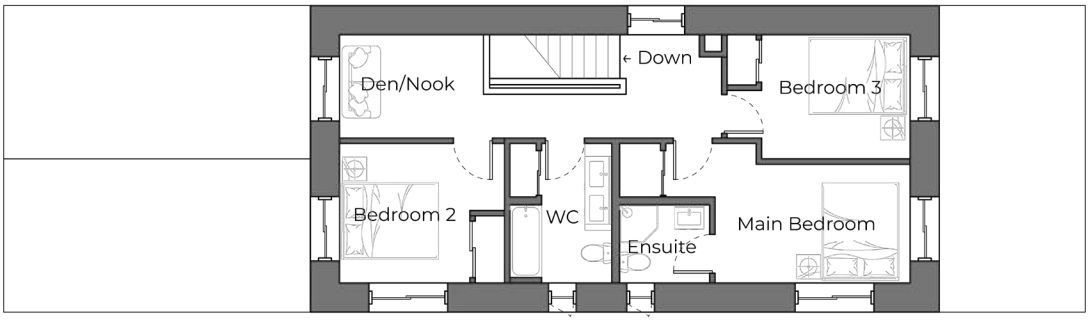
To tackle this need, the Warrior Home Student Design Team prepared a proposal for a new, net-zero building on a underutilized site, greatly expanding the usability of the lot without major rezoning costs, while delivering long-term cost savings and occupant comfort.

Passive Strategies





Ground Floor Plan



Second Floor Plan

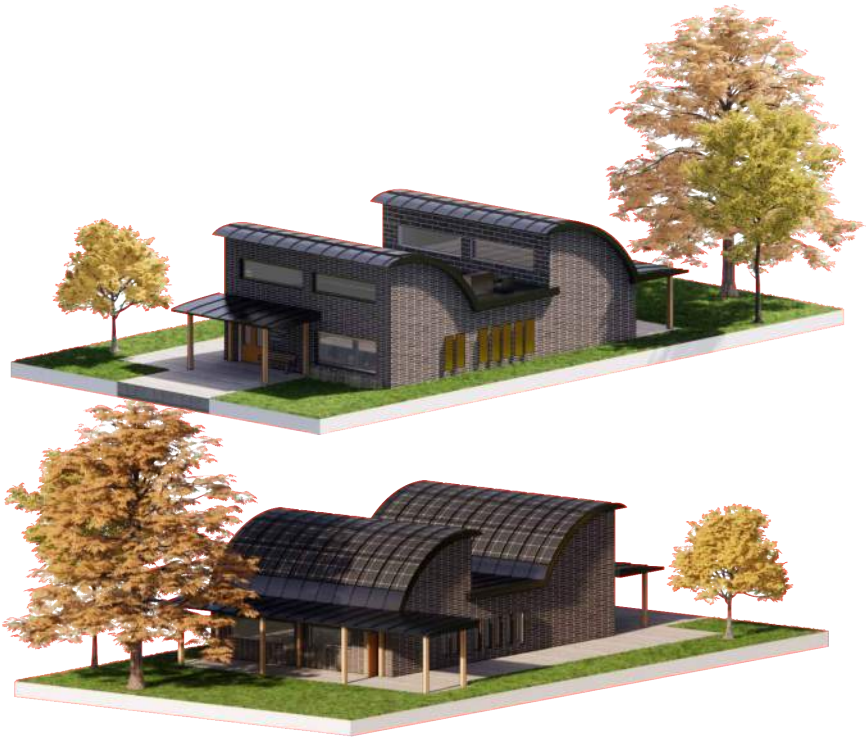
PROJECT Environmental Design Studio
INSTRUCTORS John Straube and Elizabeth English
TEAM Emma White, Urooj Khan and David Jung
SOFTWARE Rhino, Grasshopper, Enscape, AutoCAD

Fall 2022

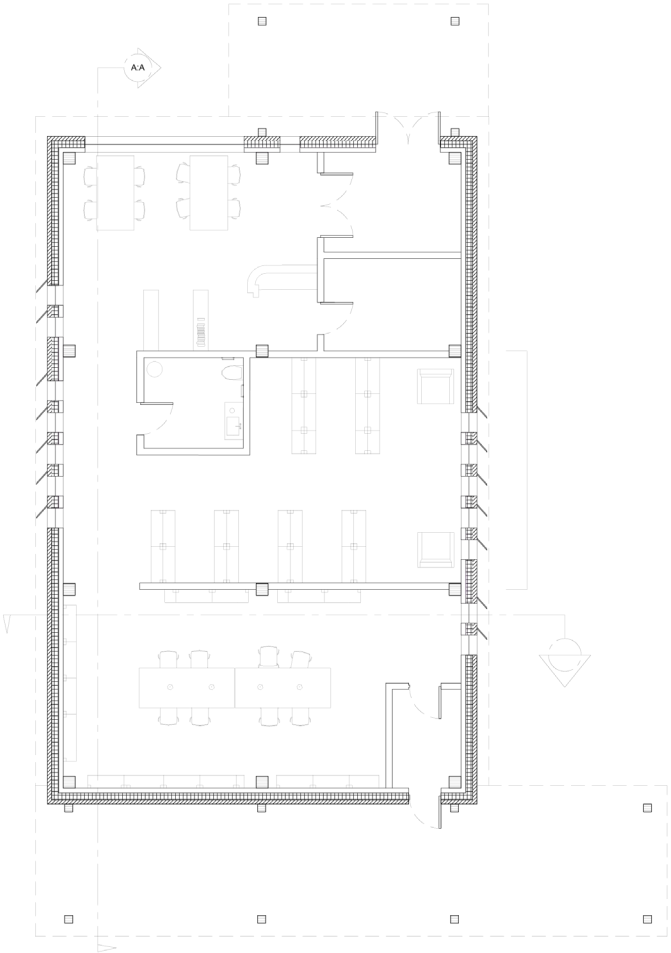
Universal Library

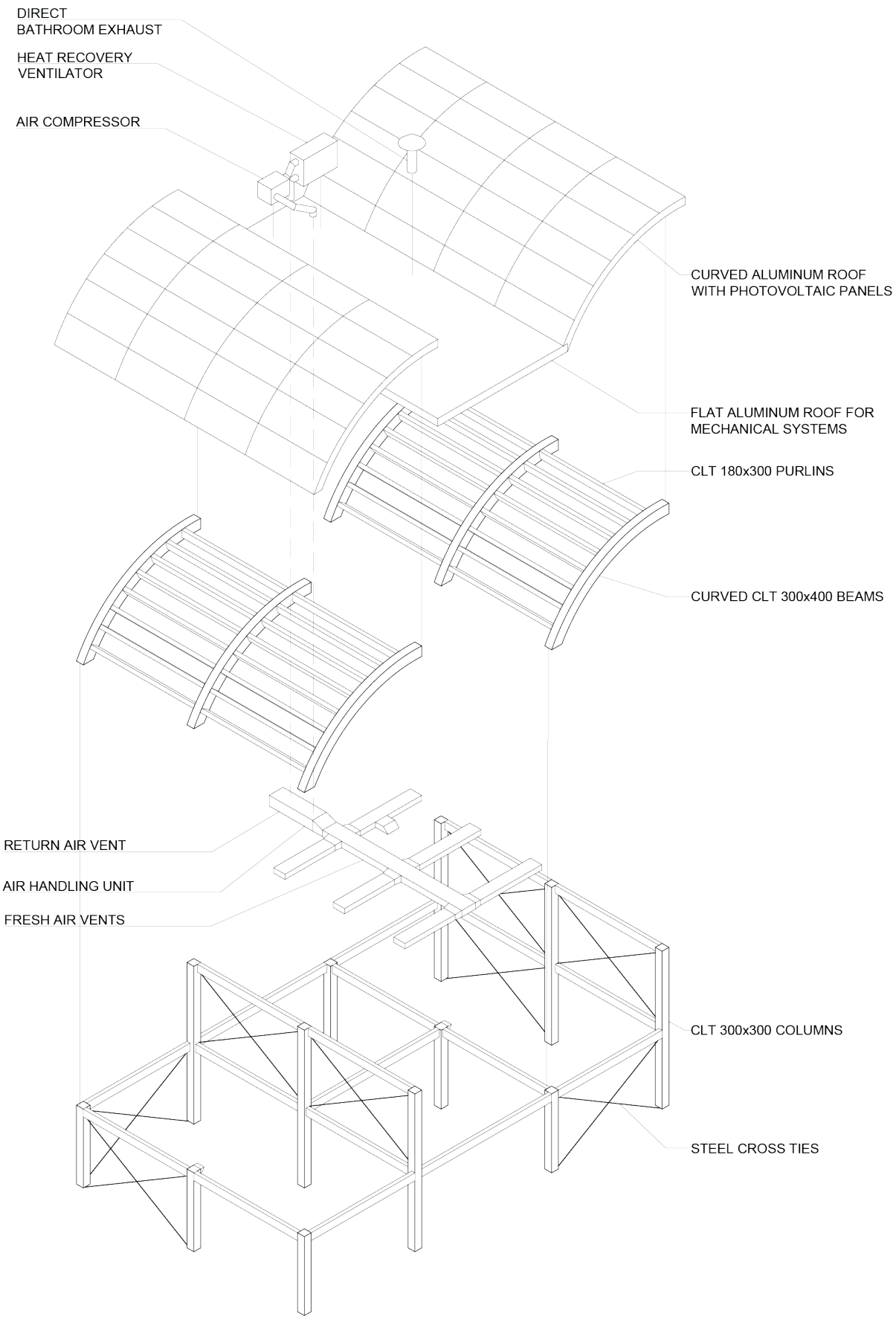
Libraries provide a vital service to local communities, but are challenging to design, especially on a smaller scale. This project, specifying only 160 m2 of space for a public library in the Waterloo, Ontario climate, is thus designed to be primarily efficient, and duplicable.

The plan features distinct spaces for quiet studying, reading, and social gathering, with vestibules for both the main and rear entrances. Curved roofs allow for diffused lighting and add volume to the smaller floor area, with a flat portion over the stacks to allow for ease of HVAC access.



Ground Floor Plan




DIRECT
BATHROOM EXHAUST
HEAT RECOVERY
VENTILATOR
AIR COMPRESSOR
CURVED ALUMINUM ROOF
WITH PHOTOVOLTAIC PANELS
FLAT ALUMINUM ROOF FOR
MECHANICAL SYSTEMS
CLT 180x300 PURLINS
CURVED CLT 300x400 BEAMS
RETURN AIR VENT
AIR HANDLING UNIT
FRESH AIR VENTS
CLT 300x300 COLUMNS
STEEL CROSS TIES

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