

IN THE DIRECTION OF CHANGE

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Professor Piermarini
8 August 2022

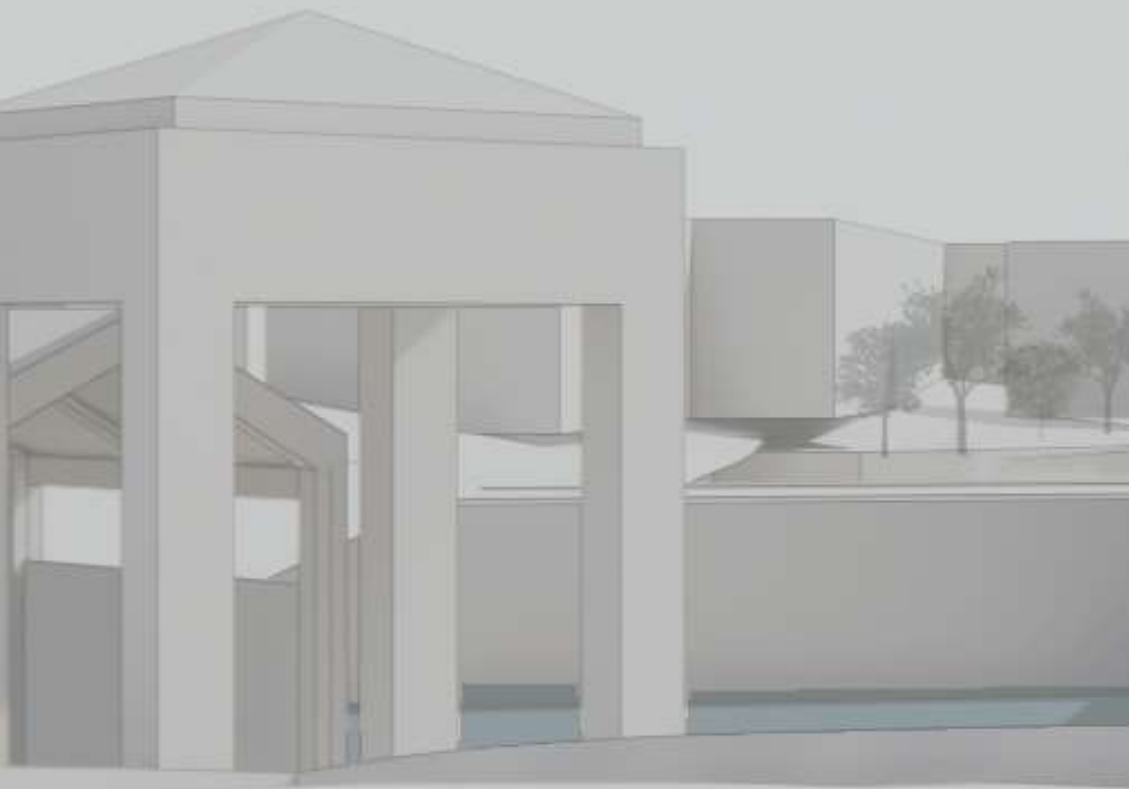


TABLE OF CONTENTS

03	Site Visit & Analysis
04	Design Charette
05	Precedent Study
06-09	Systems Research
10-12	Prototype
13-28	Phase 4B

SITE VISIT

Site Analysis

With the site located off the **Concord River**, in close proximity to the **Concord River Greenway Park**, and marks the end of the **Concord River Greenway**, it was important that our form connects and directly interacts with its context. The river marks Lowell's industrial past, while the park and greenway mark new beginnings and relationships to nature- a noticeable contrast to Lowell's past.






The ground floor and exterior spaces must activate this relationship to the existing green fabric. It must respond to the local level, through bringing people in, and marking comfortable places to spend outdoors while creating something new.





Upper layers must respond to the overall urban scale- we analyzed the **Concord River** and the **Greenway Park** as two **separate cultural nodes that defined Lowell and the site.** How could our form start to interact and connect to its context? Visual relationships to these spaces as well as being physically connected became equally important as we moved into the next design phase.

Parks and Outdoor Spaces



KEY: Parks/Outdoor Spaces

- A. Concord River Greenway Park 
- B. Lower Locks Plazas 
- C. Eastern Canal Park 
- D. Kerouac Park 
- E. Lowell Memorial Auditorium Greenspace 

- ### Overall Land Uses
-  Plaza & Multipurpose
 -  Park & Green Space
 -  Concord River/ Canal
 -  Concord River Greenway



DESIGN CHARETTE | Site Connections & First Forms

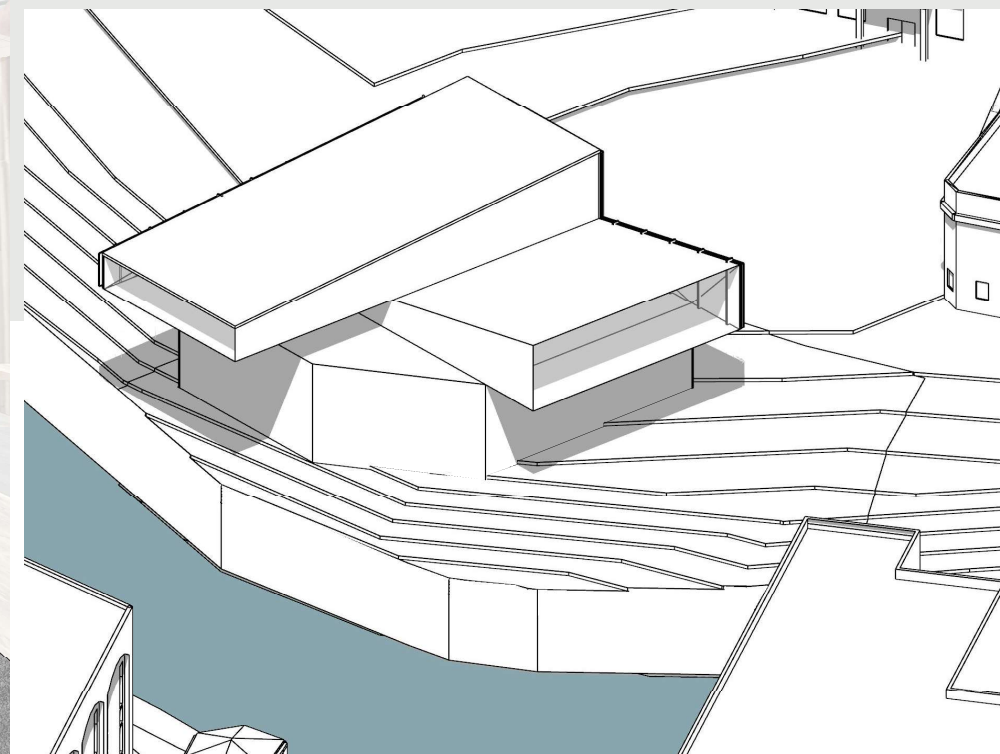
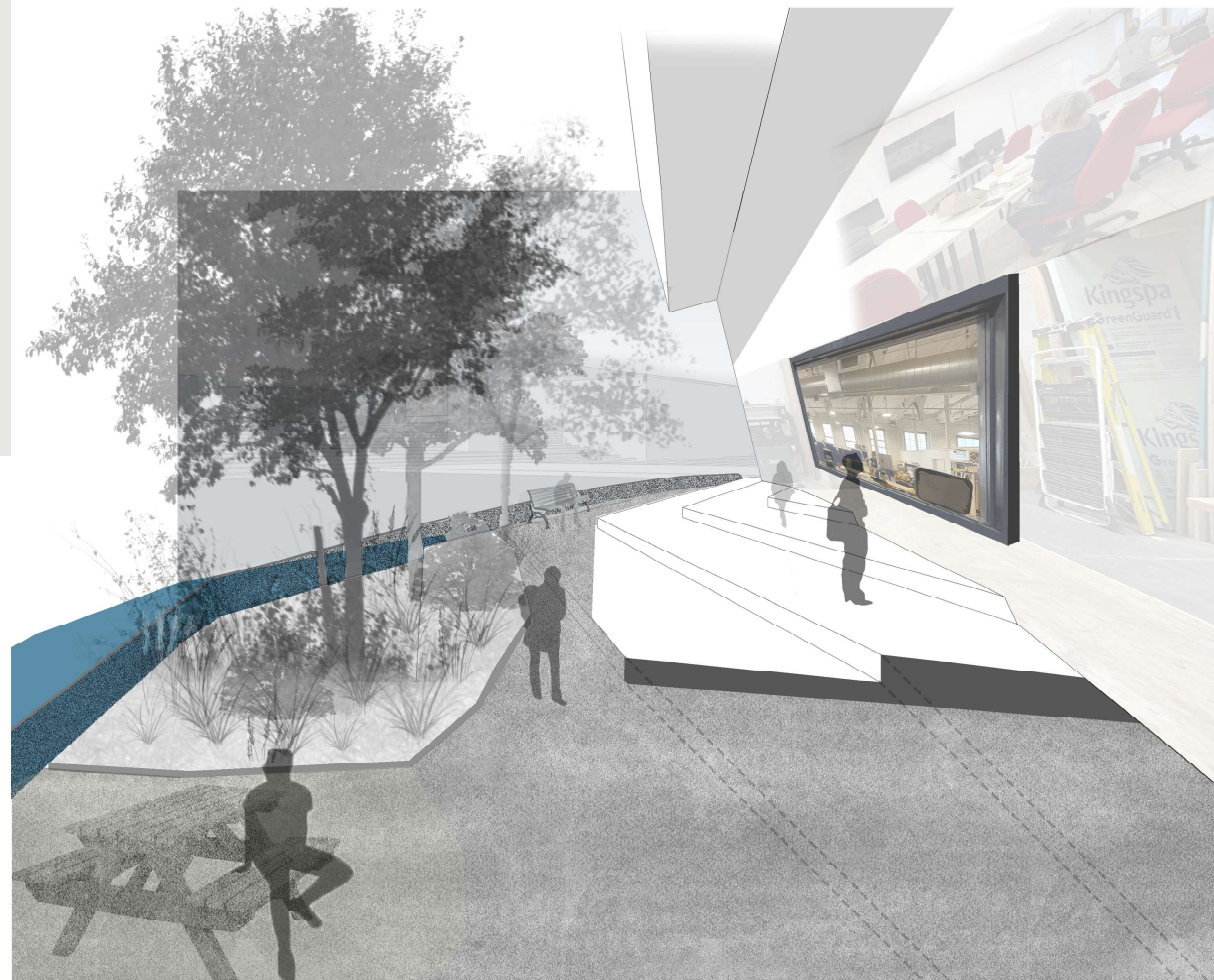
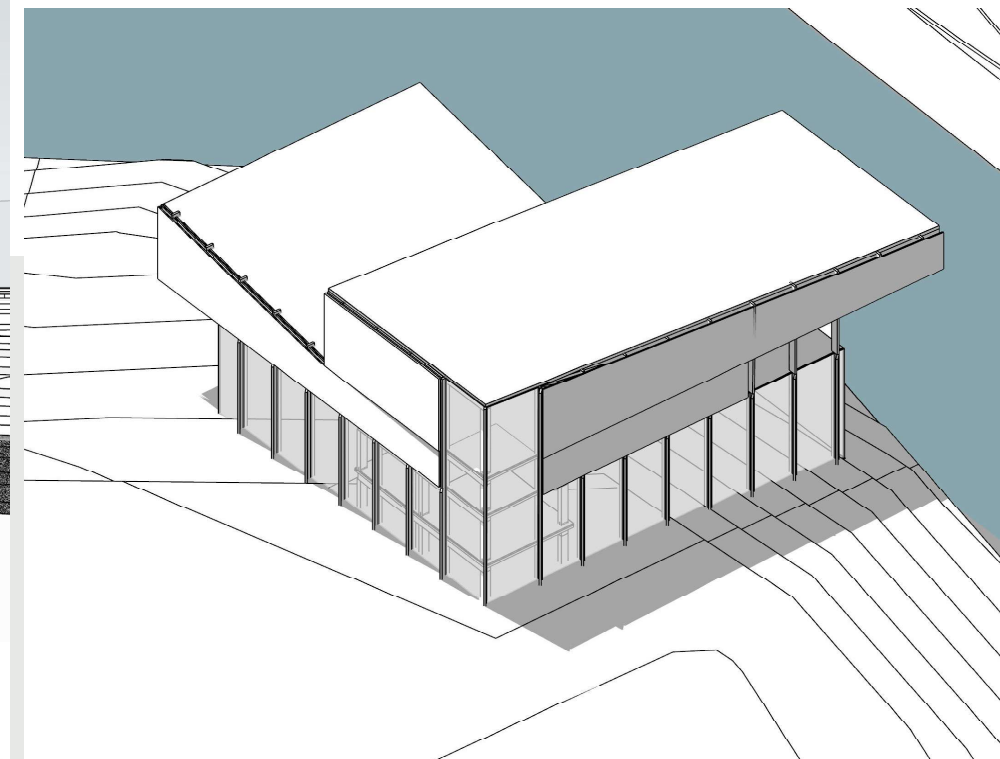
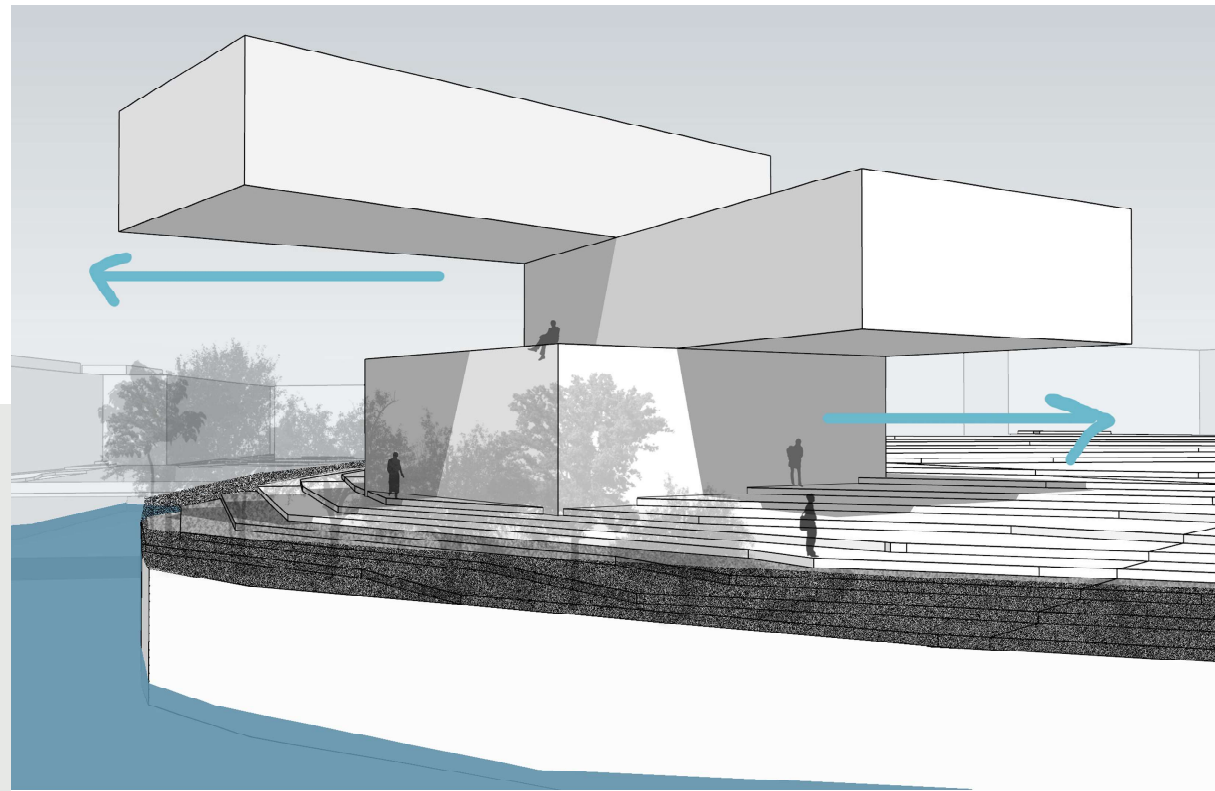
BEGINNING CONCEPT:

With the site located off the **Concord River** and in close proximity to the **Concord River Greenway Park**, our form begins to connect and interact with its context.

One main volume on the ground floor acts as the main public space- connecting the Lowell community through the act of creating.

The two main upper forms pivot on this main volume pointing towards the park and river as important cultural nodes.

Access & circulation will start to break apart the ground floor as more iterations are created.



PRECEDENT STUDY | UMass Amherst Design Center by Leers Weinzapfel Associates

Quick Facts About the Precedent:

CLIENT: University of Massachusetts (Umass)

LOCATION: Amherst, Massachusetts [551 N. Pleasant St. in Amherst, MA 01003]

SIZE: 87,500 square feet / four stories

TOTAL COST: \$52 million

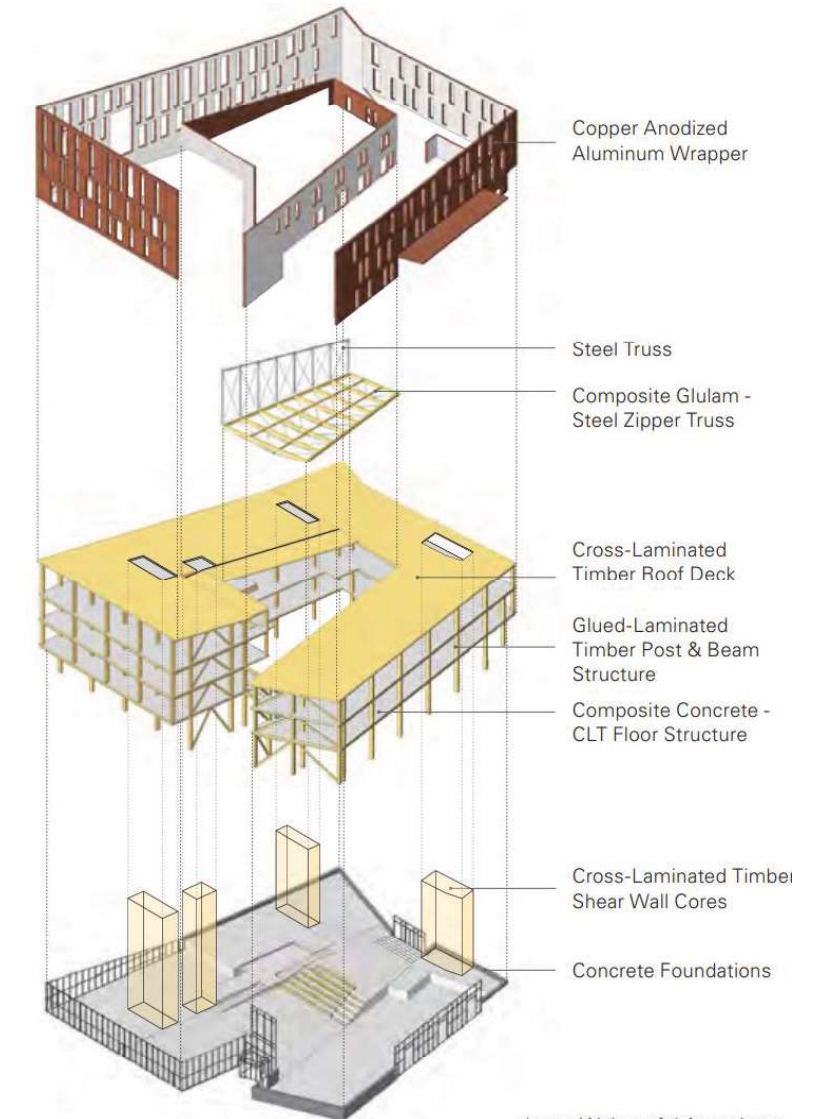
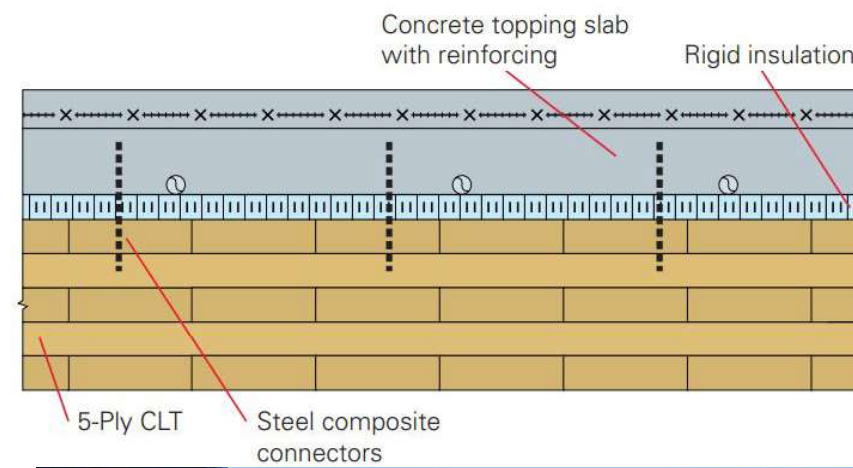
CONSTRUCTION COST: \$36 million

STARTED: August 2015 **COMPLETED:** January 2017

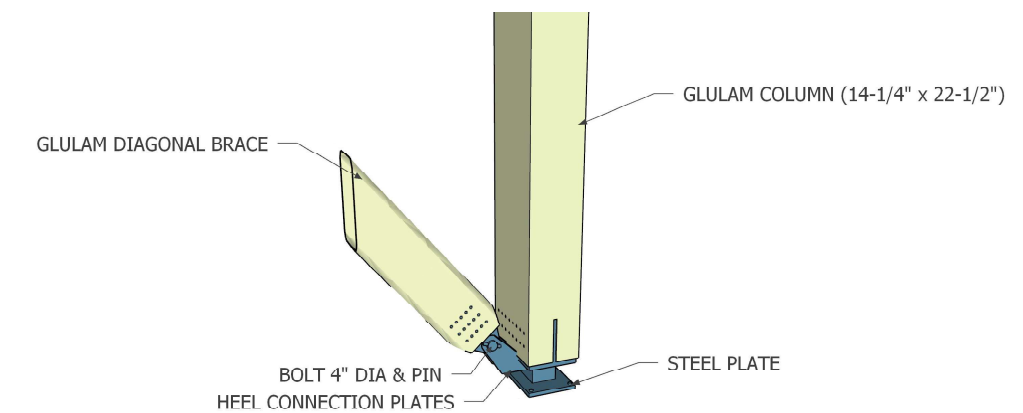
CONSTRUCTION TYPE: IV (Heavy Timber) 10% steel



Typical Timber-Concrete Composite Floor Assembly



Leers Weinzapfel Associates



Why We Chose This Precedent:

The angle & pointing towards specific moments in its context, glass & views on extrusions, connection between ground and above & a solution to spanning over 80 feet (truss system).

What Was Carried Over to Our Project:

The UMass Amherst Design Center **utilizes a hybrid of concrete, wood, and steel as its structure:** incredibly strong, can span longer distances, with less columns and more open space. Structure is exposed for educational purposes.

CONCRETE:

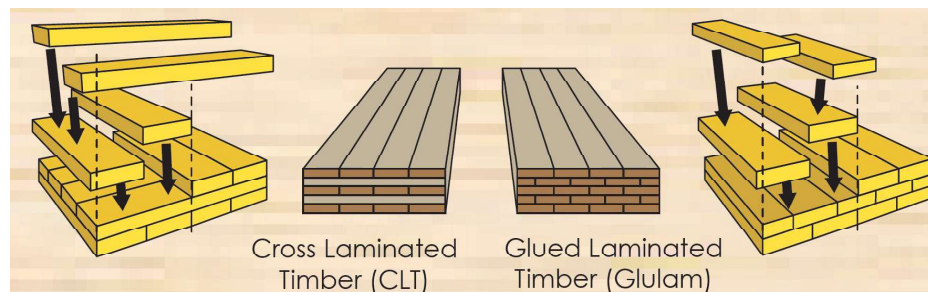
Floors & Base Structure: Wood-Concrete Composite; Reinforced Foundation Slab; Spread Footings

WOOD:

Cross Laminated Timber & Glulam-Glued Laminated Timber: Glulam Beams & Columns; Curtain Wall System (Mullions)

STEEL:

Any Cantilevering Edge; Hardware/Connections



What is the Difference Between CLT & Glulam?

CLT is used for surfaces such as walls, floors, and floor separation.

Glulam is primarily used for the loadbearing frame in a building such as rafters, beams, or columns.

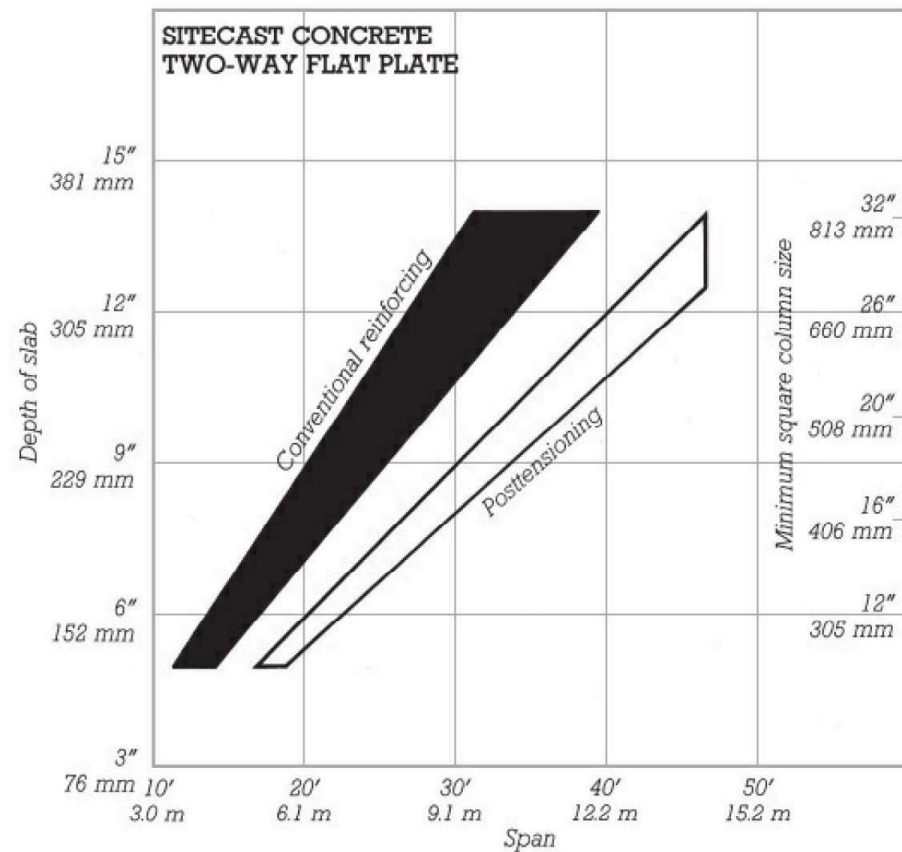
STRUCTURE | CONCRETE

CHOSEN TO USE IN OUR:

- Floors, (Wood-Concrete Composite)
- Reinforced Foundation Slab w/ Spread Footings.

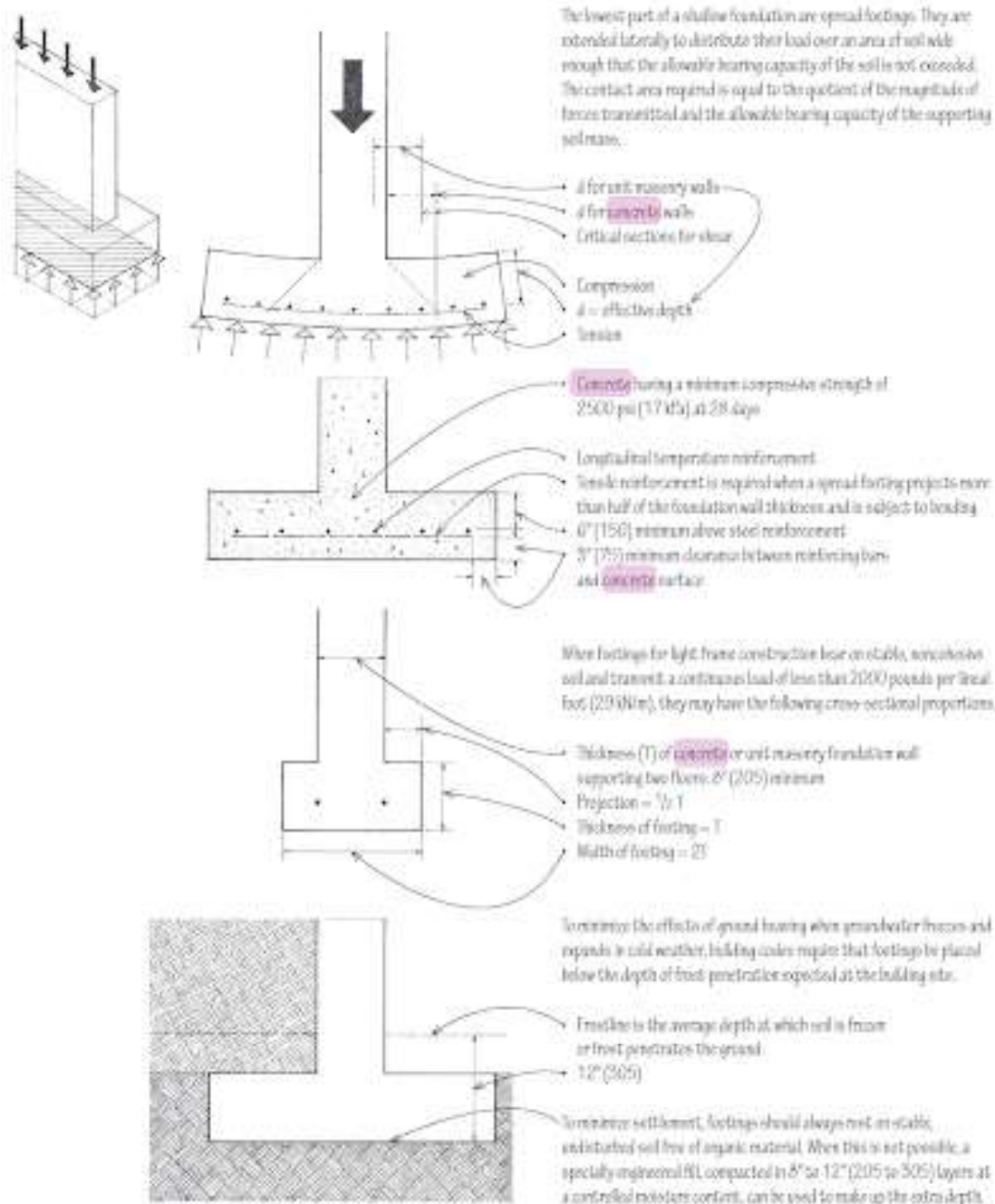
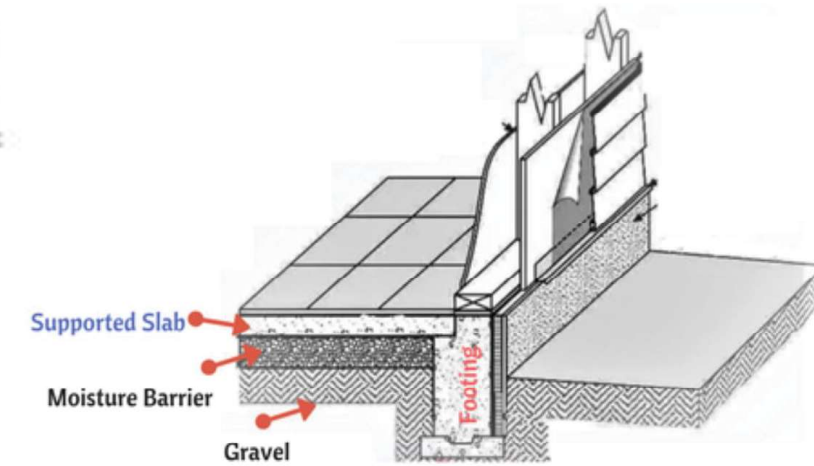
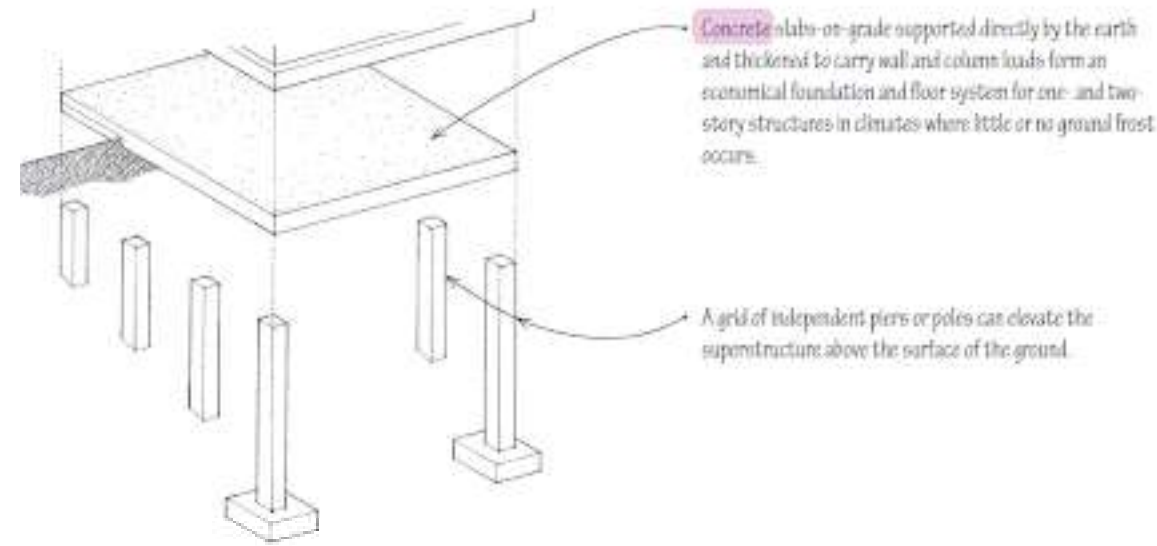
REASONING:

As a Plate Structure: Plate structures are rigid, planar, usually monolithic structures that disperse applied loads in a multidirectional pattern, with the loads generally following the shortest and stiffest routes to the supports. A common example of a plate structure is a reinforced concrete slab. It acts as a flat, deep beam that transfers lateral loads to the footings then to the ground. With a timber and steel combo, concrete is able to fill in the gaps to create a strong continuous plane/ connection from column/post to foundation.

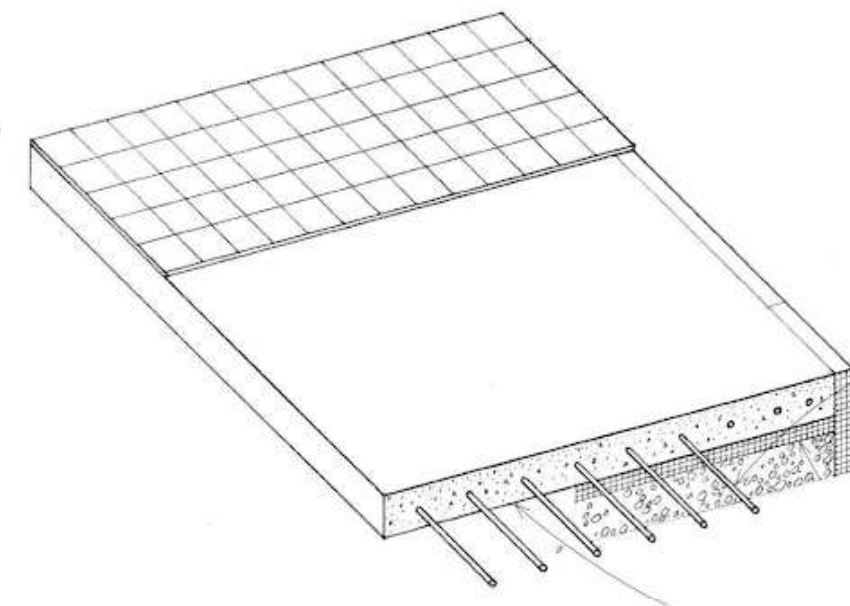


COLUMN SIZES FOR FLAT PLATE CONSTRUCTION

The shallow depth of the junction between the slab and the column in flat plate construction restricts the minimum column size in this system. The right-hand scale on the chart above provides minimum square column sizes for various slab thicknesses. The required minimum column sizes for this system also depend on the applied loads on the structure. For light loads, reduce the indicated column size by 2 in. (50 mm). For heavy loads, increase the column size by 2 to 4 in. (50 to 100 mm).



^ UMass Design Building Composite Flooring



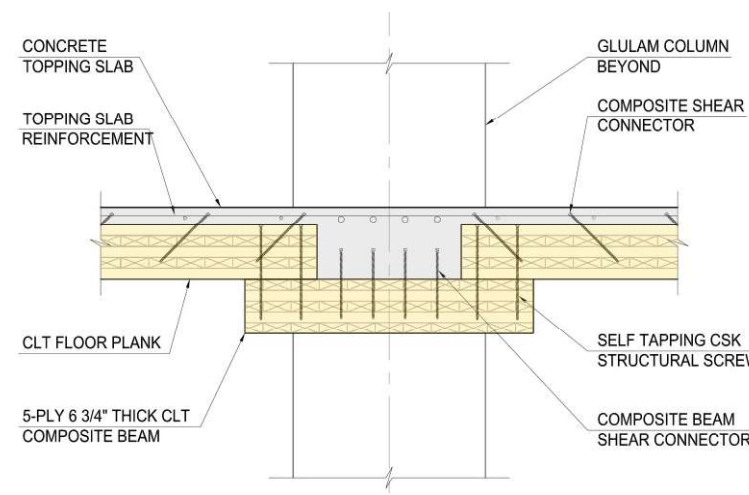
STRUCTURE RESEARCH | WOOD

CHOSEN TO USE IN OUR:

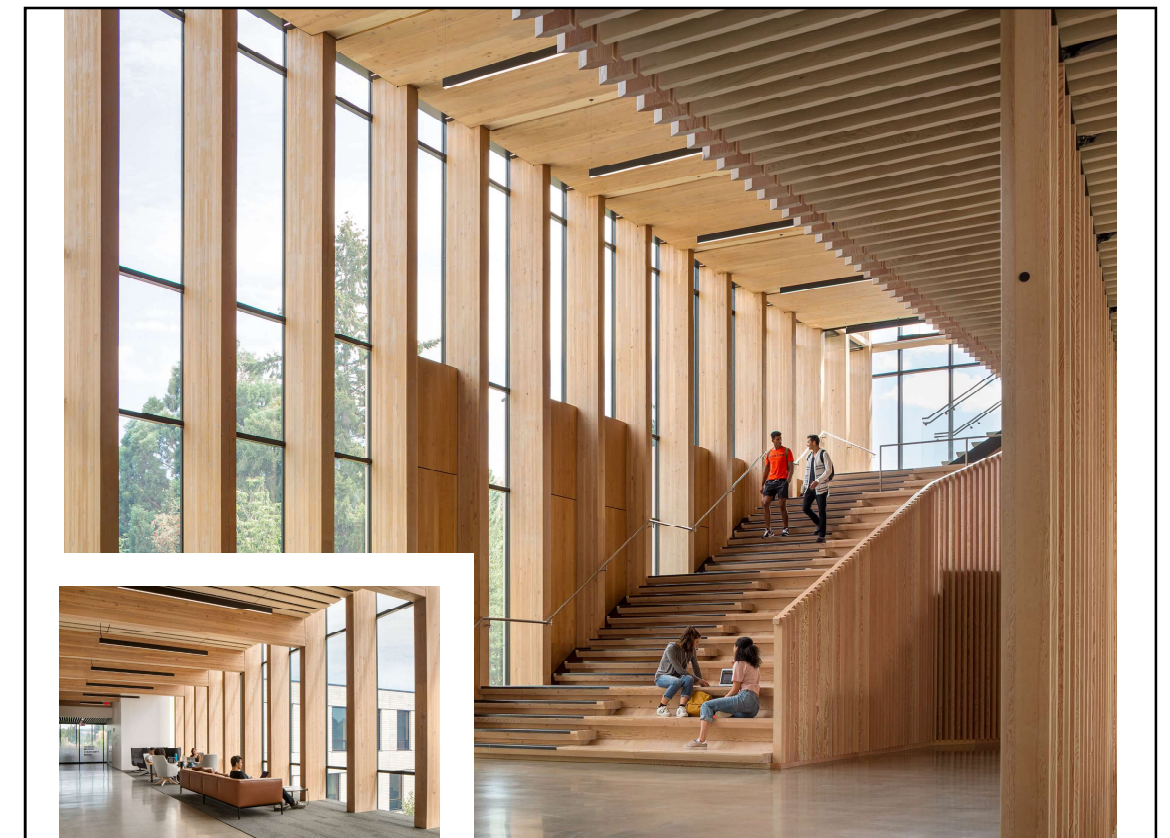
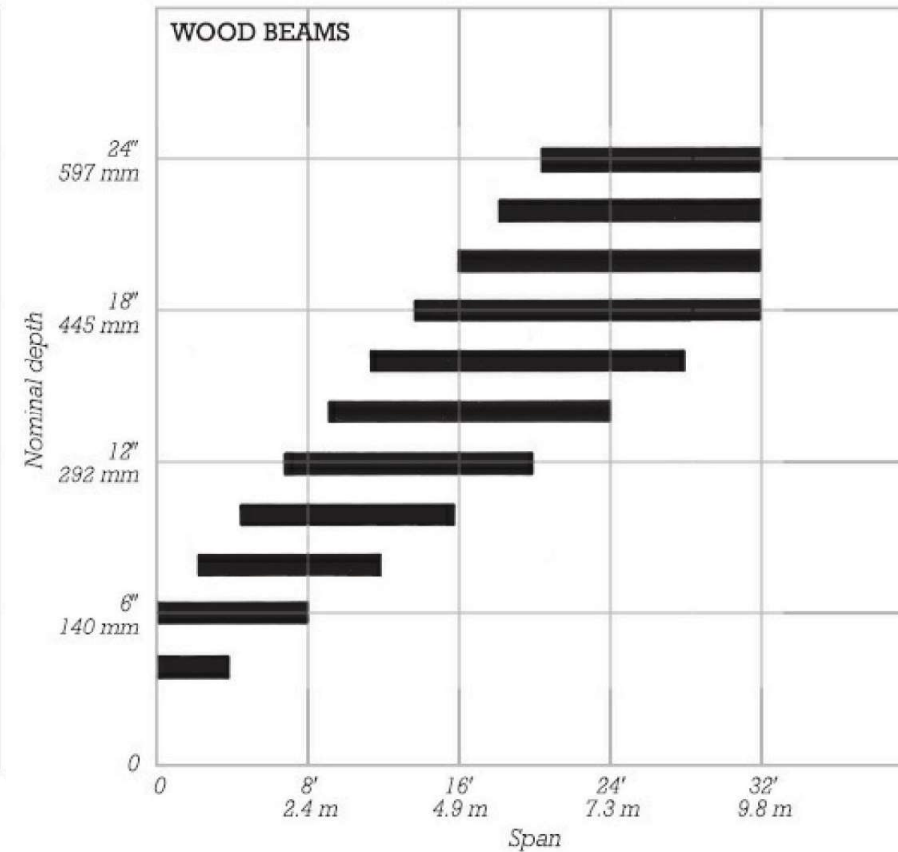
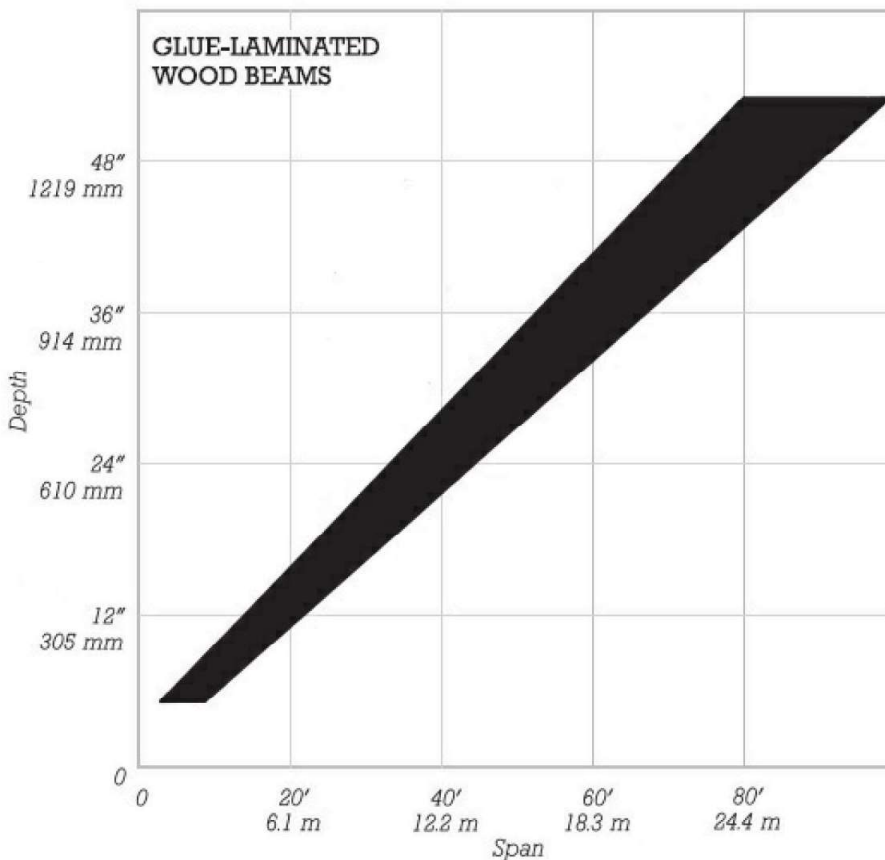
- Glulam Beams and Columns (Glued-Laminated Timber)
- Truss Design
- Curtain Wall System

REASONING:

In general, working with wood saves energy, cuts build/installation time, is naturally resistant to heat, helps the environment by trapping CO2 with little waste. Wooden trusses have built-in openings that could provide space for exposed HVAC & other mech. systems; they can span a much larger distance than standard beams giving us the ability to design open spaces for more collaboration between spaces; wood as a denser material, acts as an insulator while steel does not; incredibly versatile in terms of shape as well as aesthetics; and is sound absorbant-important for the acoustics in a loud environment (workshops, public spaces, etc.).



^ MX_SI's addition to the Serlachius Museum Gösta (Facade)



^ Oregon State University College of Forestry (OSU Forest Science Complex)

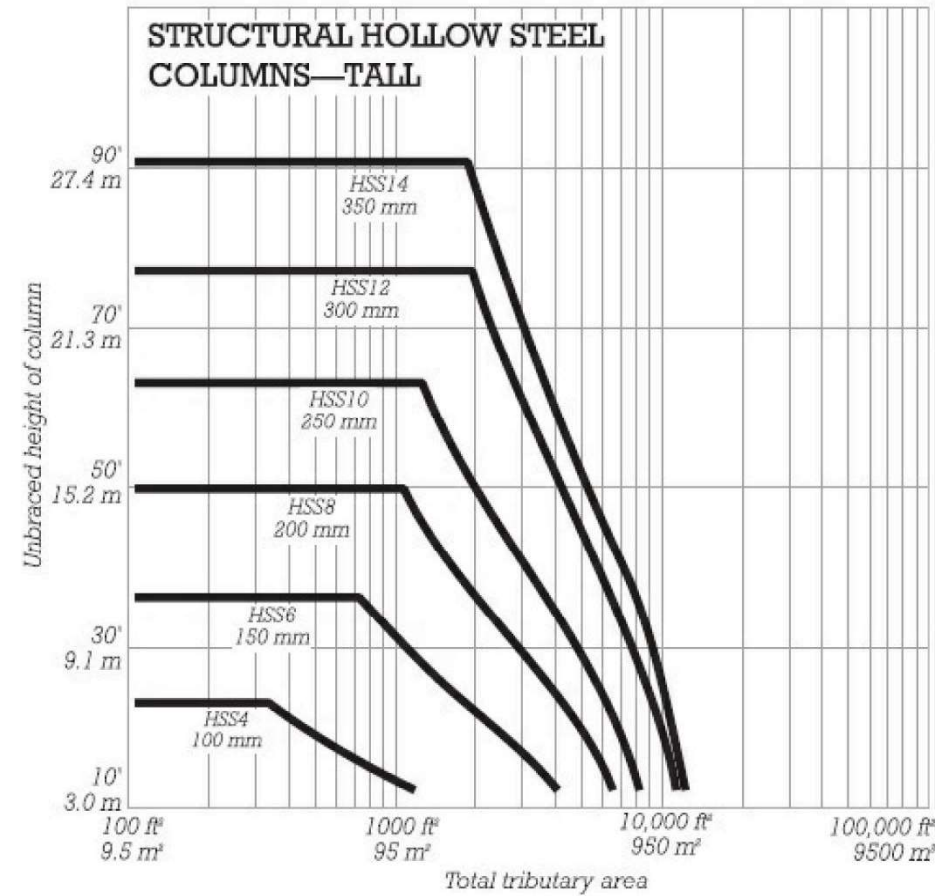
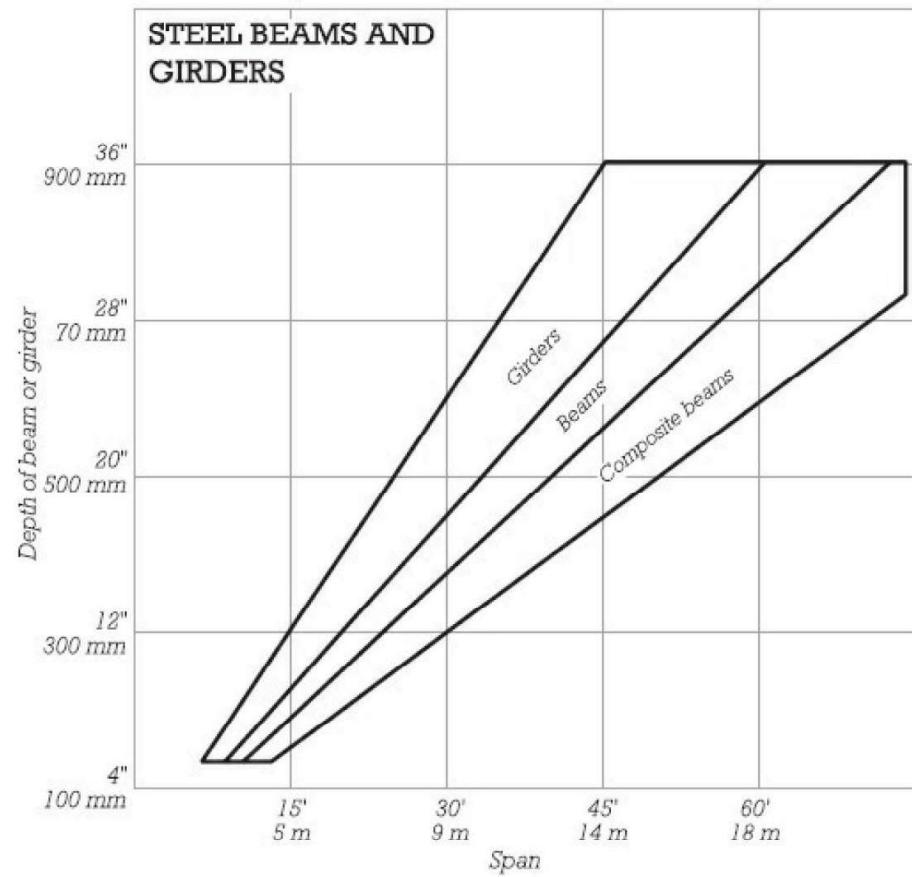
STRUCTURE RESEARCH | STEEL

CHOSEN TO USE IN OUR:

- Used With Any Major Cantilevering Edge
- Used as Hardware, Pieces that Connect Columns, Concrete, and Beams
- Used inside of Glulam Beams & Columns

REASONING:

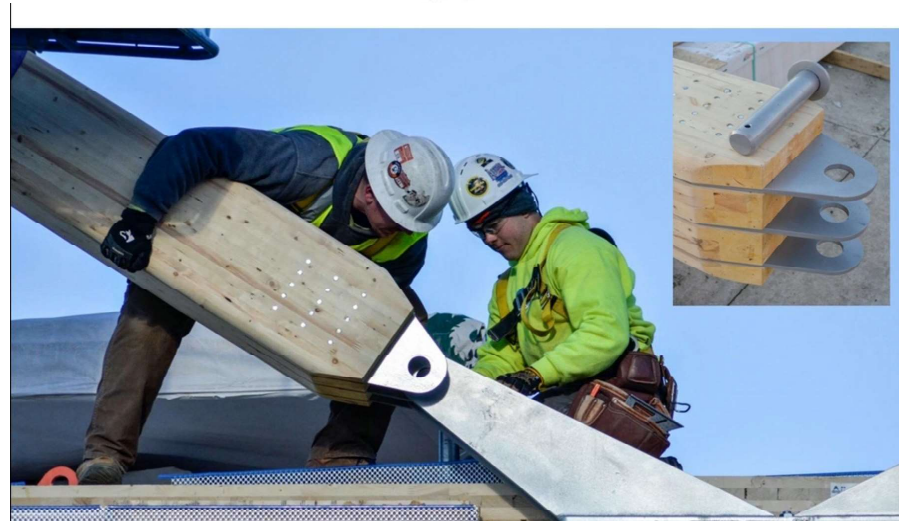
Steel can be used as a strong cantilever. Using steel as hardware & connector pieces meant for high strength as it is great in tension and compression as is wood (with the grain).



^ Fay Jones School of Architecture and Design



< House In Sèvres- Colboc Franzen & Associés



< Umass Design Building - Construction Steel Arm

STRUCTURE RESEARCH | HYBRID: CONCRETE, WOOD, STEEL

CHOSEN TO USE IN OUR:

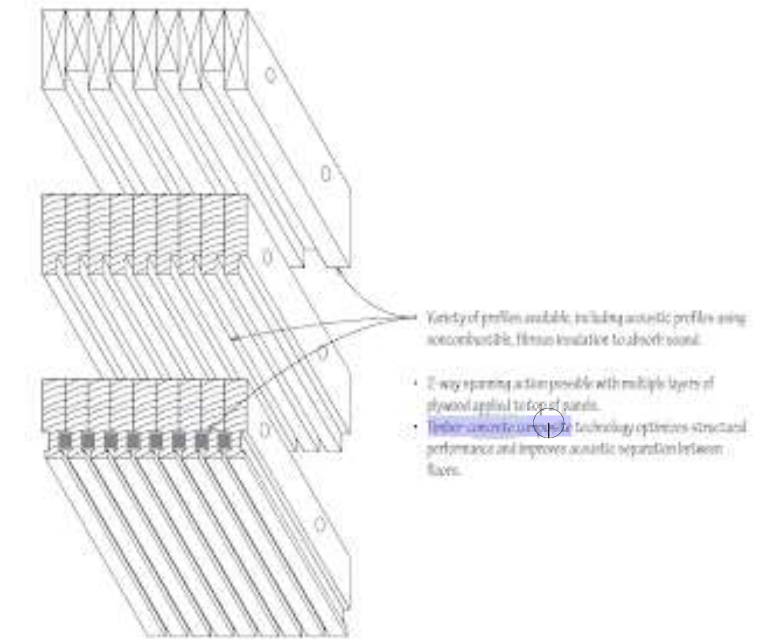
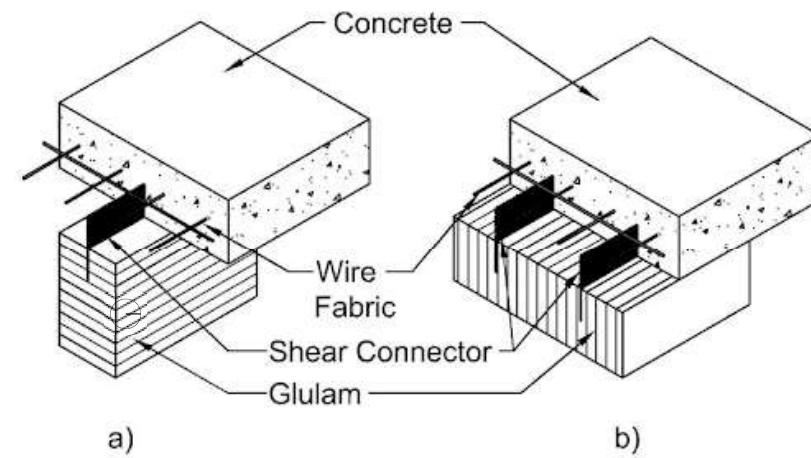
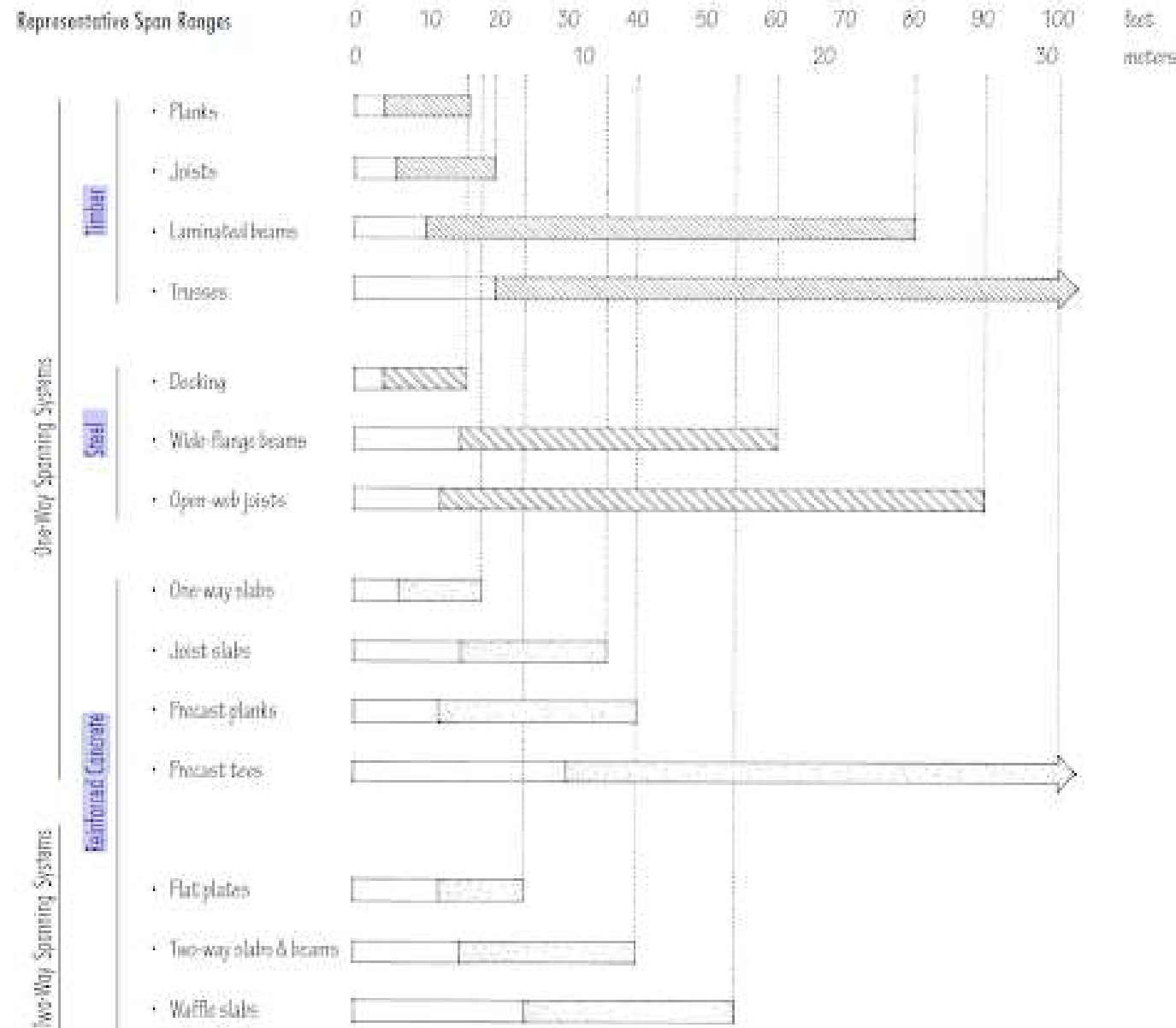
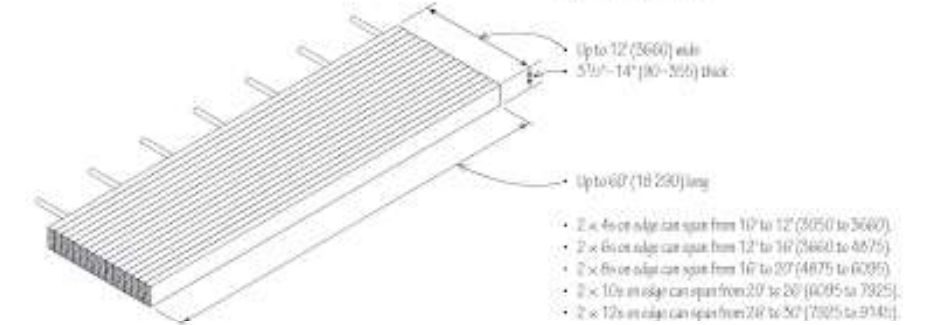
- Wood-Concrete Composite Flooring
- Glulam/Steel Columns & Beams
- Some Sort of Truss (like the Zipper Truss)

REASONING:

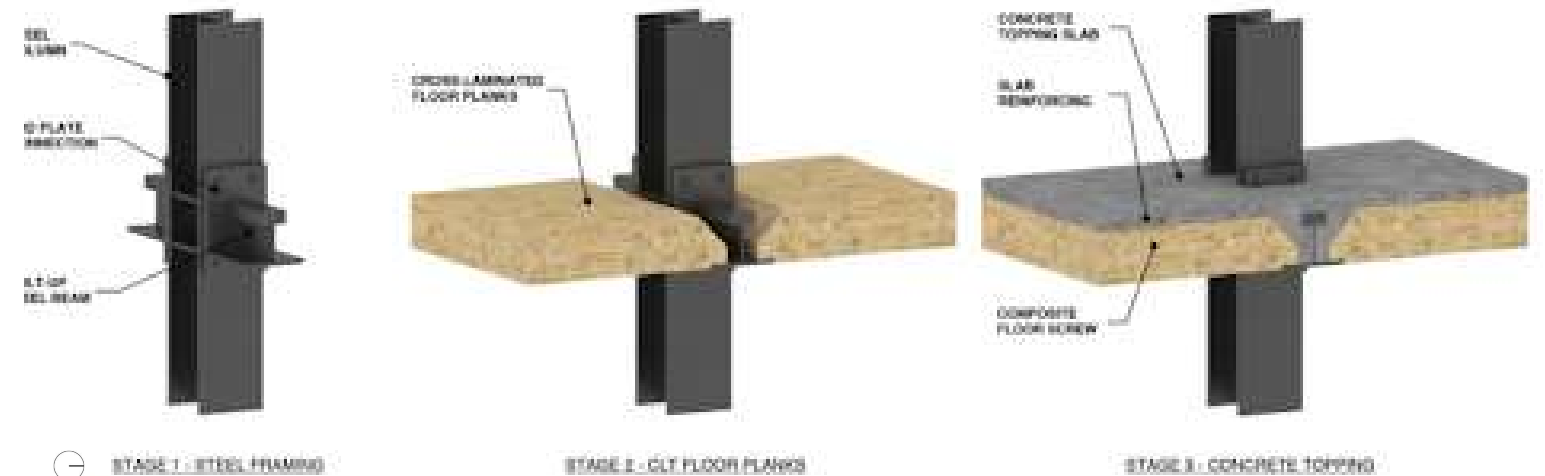
Incredibly strong, and can span longer distances, less columns & more open space!

4.42 MASS TIMBER FLOORS

Dowel Laminated Timber
Dowel Laminated Timber (DLT) is made by placing 2x4 dimension lumber on edge (DLT) and friction-fitting together with wood screws.



Composite mass-timber floor system with steel structure

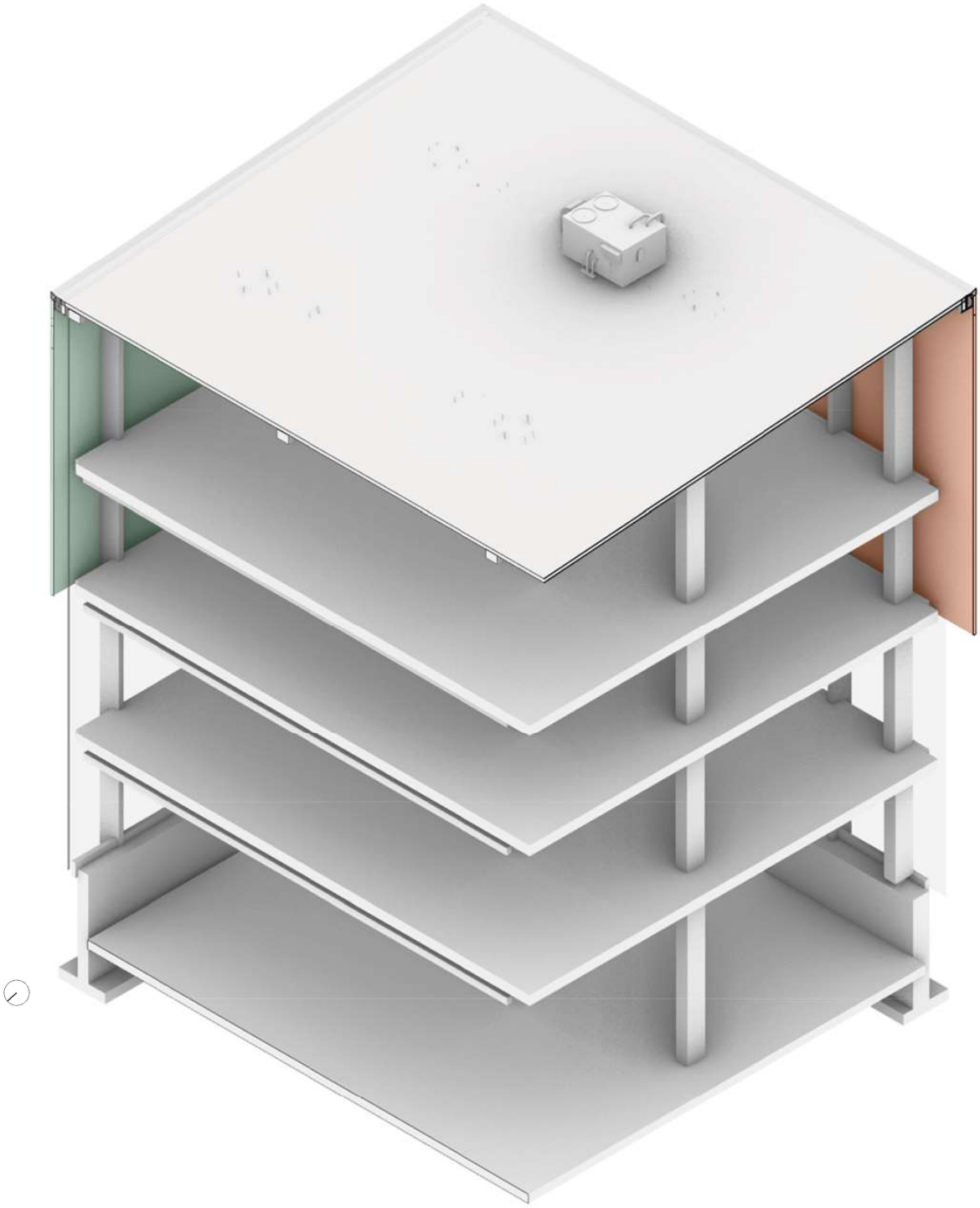
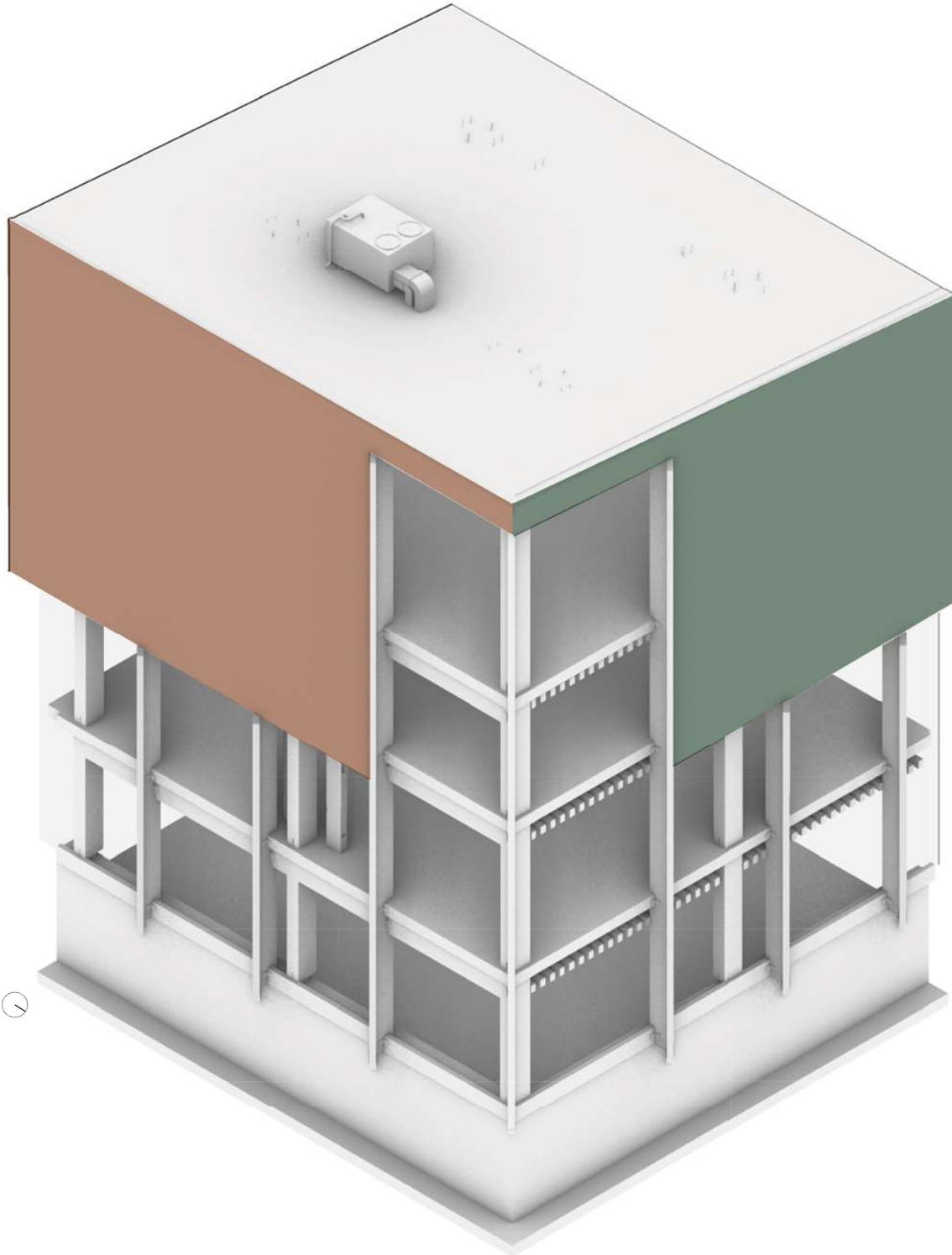


... courtesy Benton Johnson / SOM

Floor to column and beam connection



PROTOTYPE- DIGITAL MODEL | Overview Axons



SYSTEM | Structure

COLUMNS:

15 Ply Glulam
Columns 14 1/4" x 22 1/2"

BEAMS:

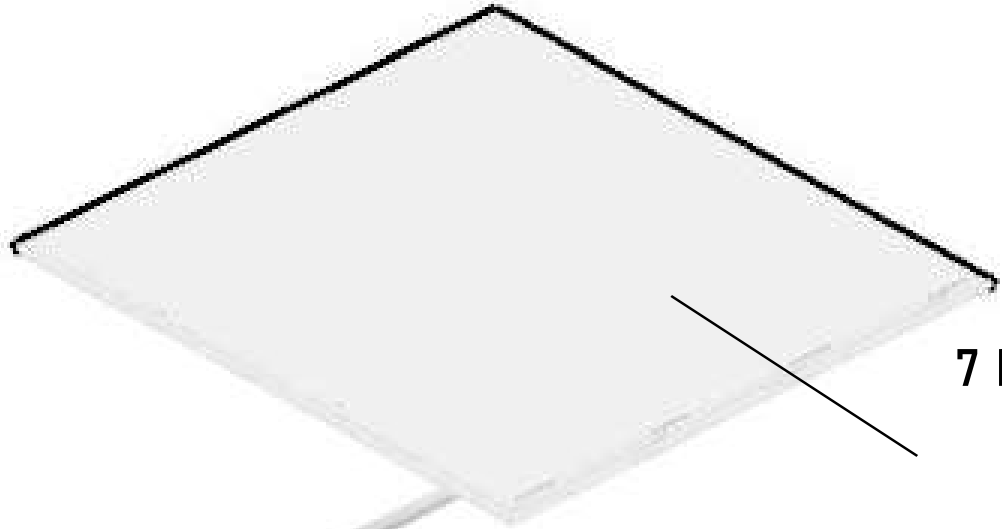
Glulam Beam
1'-10 1/2" x 1'-10 1/2"

STEEL CONNECTORS:

They connect the columns to the floor slabs.

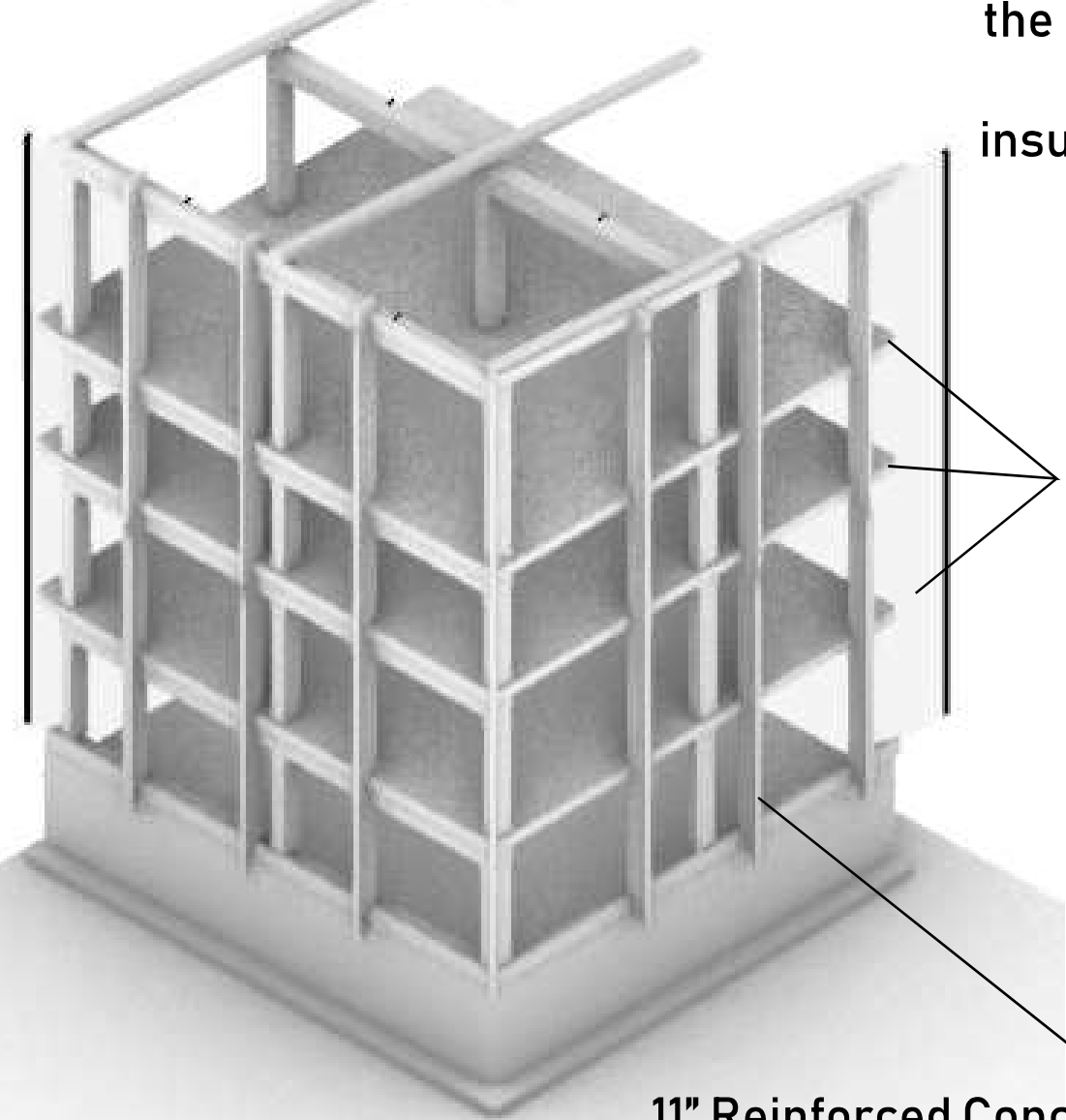
FROST WALL AND FOOTINGS:

Frost wall is 4' tall to the first floor then extends past the floor another 5 feet to the ground level.
Footings are one foot into the ground.



ROOF :

7 Ply CLT Roof (9 1/2"), 4-5" Cork Insulation, 0.06" Roofing Membrane. Then the edge is composed of typical blocking a 2" insulation, and a copper drip edge/flashing.



FLOORS:

4" Wood-concrete composite flooring, 1" Rigid insulation, 5 Ply CLT Panels (6 1/2" Thick)

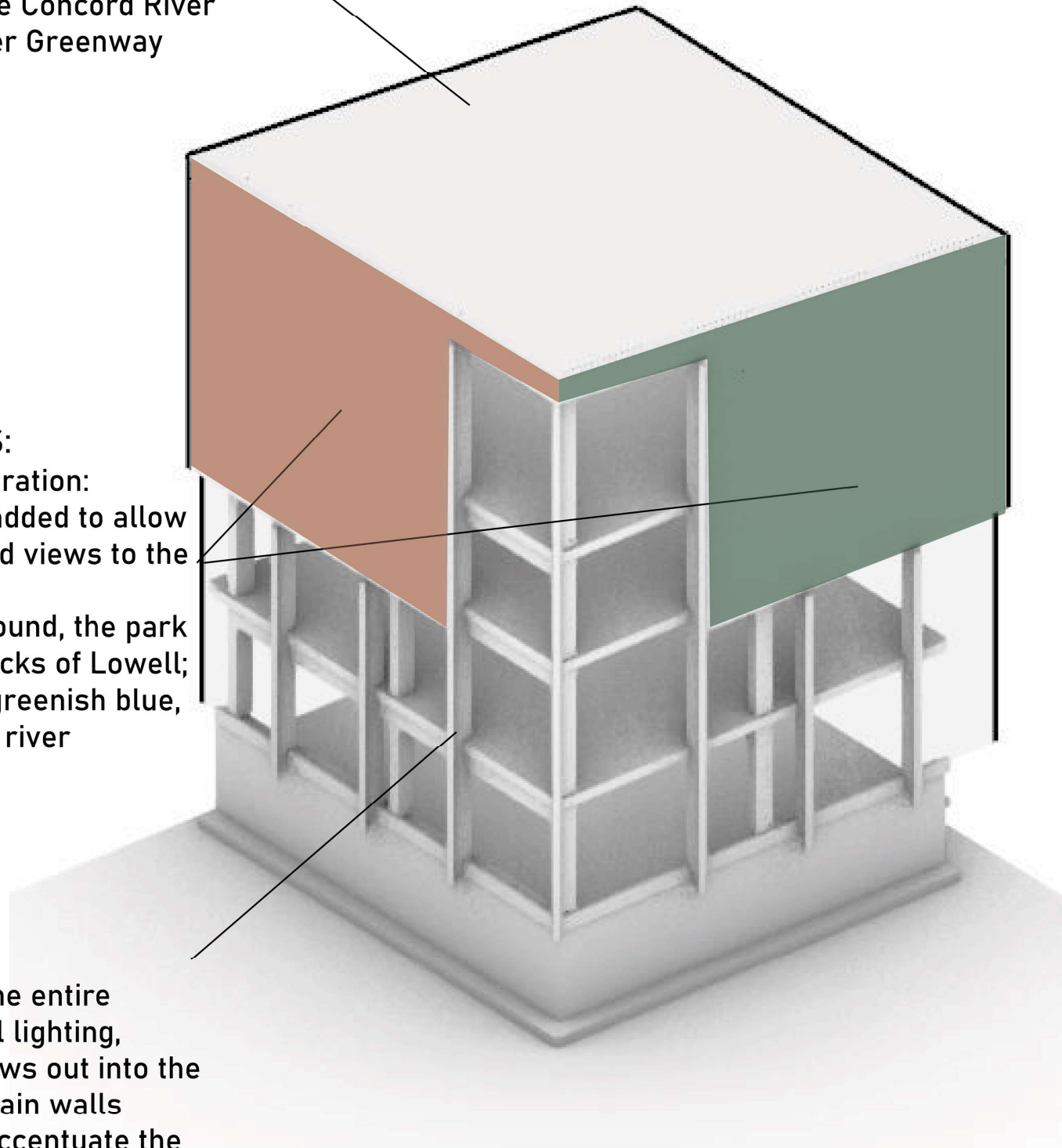
GROUND FLOOR:

11" Reinforced Concrete Slab with 1/2" Dia. Rebar and 4" Reinforced Mesh

SYSTEM | Enclosure & Solar Analysis

SLANTED ROOF:

The slanted roofs are there to help with the drainage of rainwater. Within the roof there is a layer of thin copper, a layer of insulation and, and a thinner layer of roofing membrane. The slanting relates to the site context: the Concord River & the Concord River Greenway Park.



COPPER PANELS:

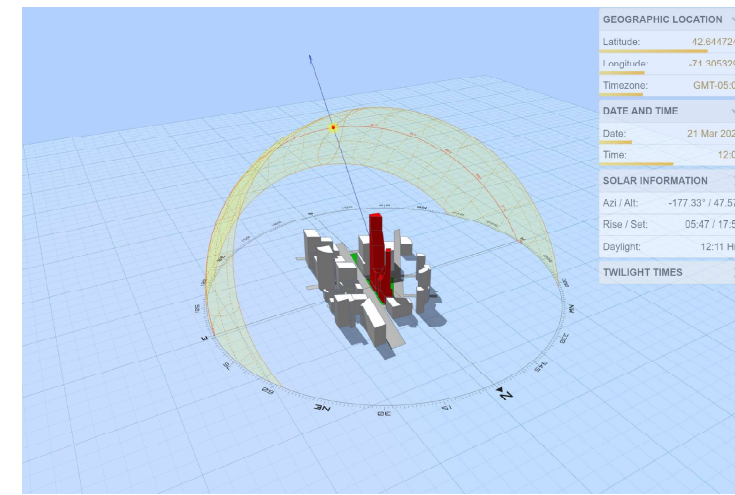
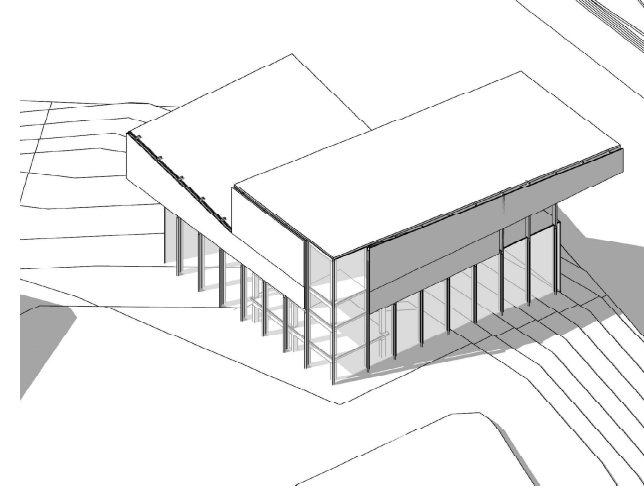
There Future exploration: Apertures will be added to allow for natural light and views to the outside.

Copper = Earth, ground, the park nearby, and the bricks of Lowell;
Oxidized Copper = greenish blue, relates to Concord river

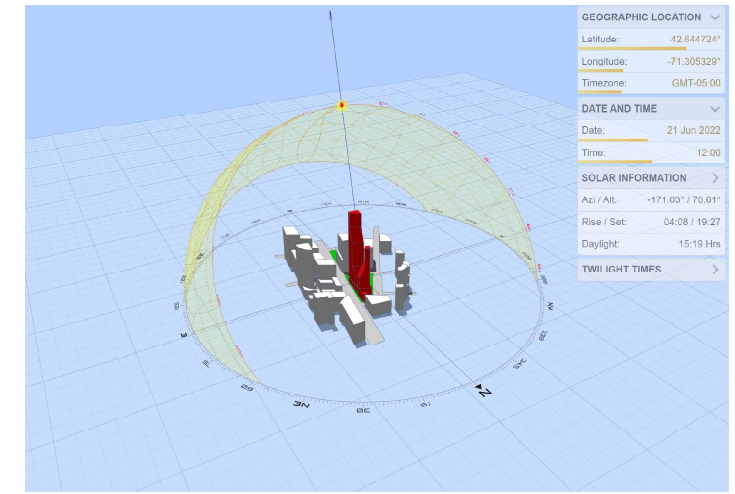
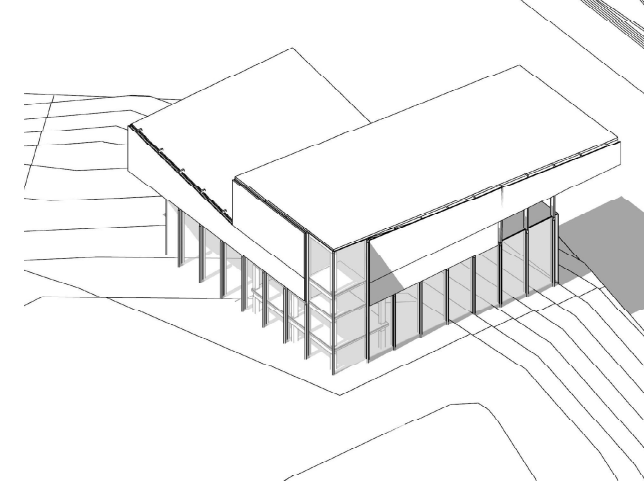
CURTAIN WALLS:

Used throughout the entire building for natural lighting, ventilation, and views out into the context. Using curtain walls became a way to accentuate the structural systems (mullions, columns, and the floor).

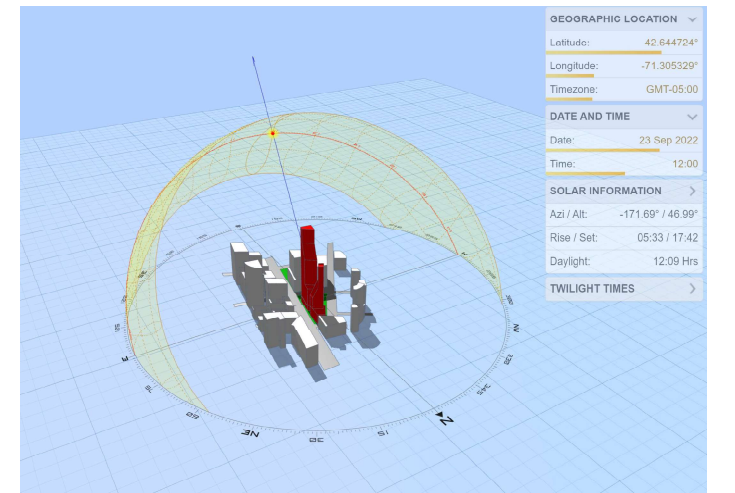
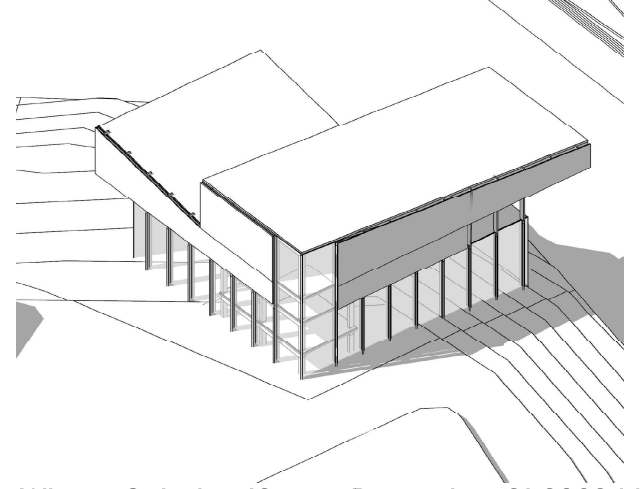
Vernal Equinox 12pm - March 21 2022 MODEL



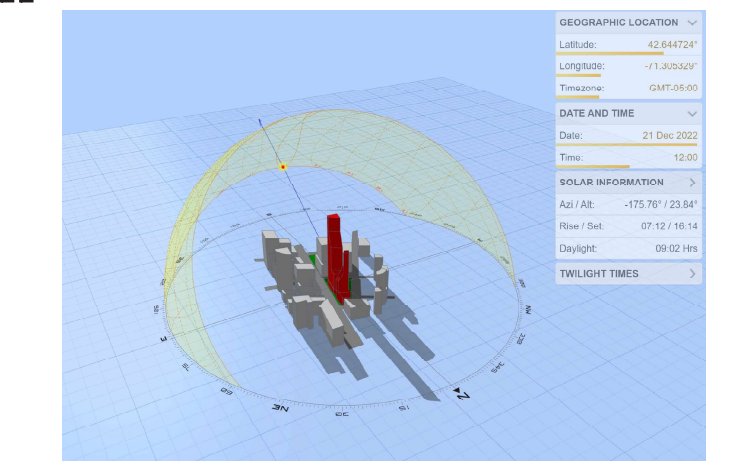
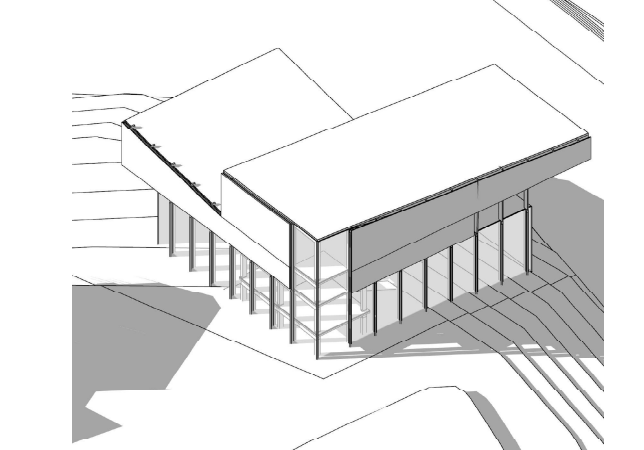
Summer Solstice 12pm - June 21 2022 MODEL



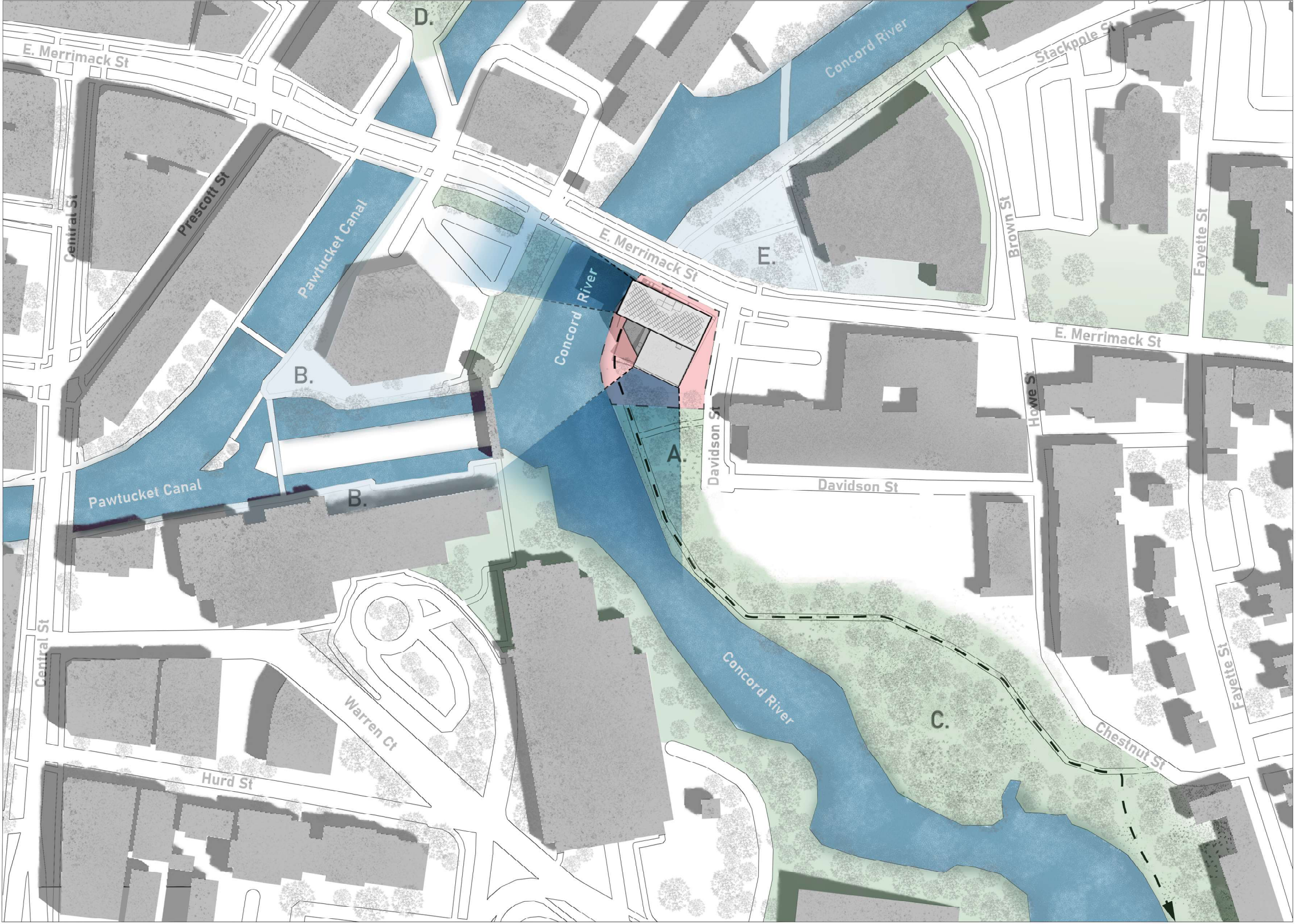
Autumnal Equinox 12pm - September 23 2022 MODEL



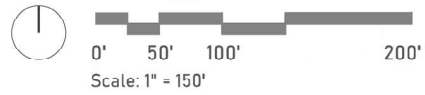
Winter Solstice 12pm - December 21 2022 MODEL



Site Plan | Physical Site Connections & Important Outdoor Spaces

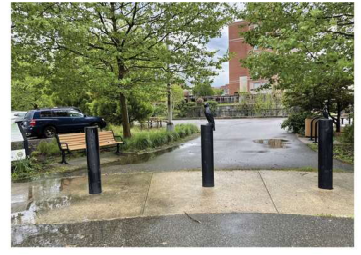


SITE SITE CONNECTIONS



KEY:
Parks/Outdoor Spaces

A. Concord River Greenway Park



B. Lower Locks Plazas



C. Eastern Canal Park



D. Kerouac Park



E. Lowell Memorial Auditorium Greenspace



Overall Land Uses

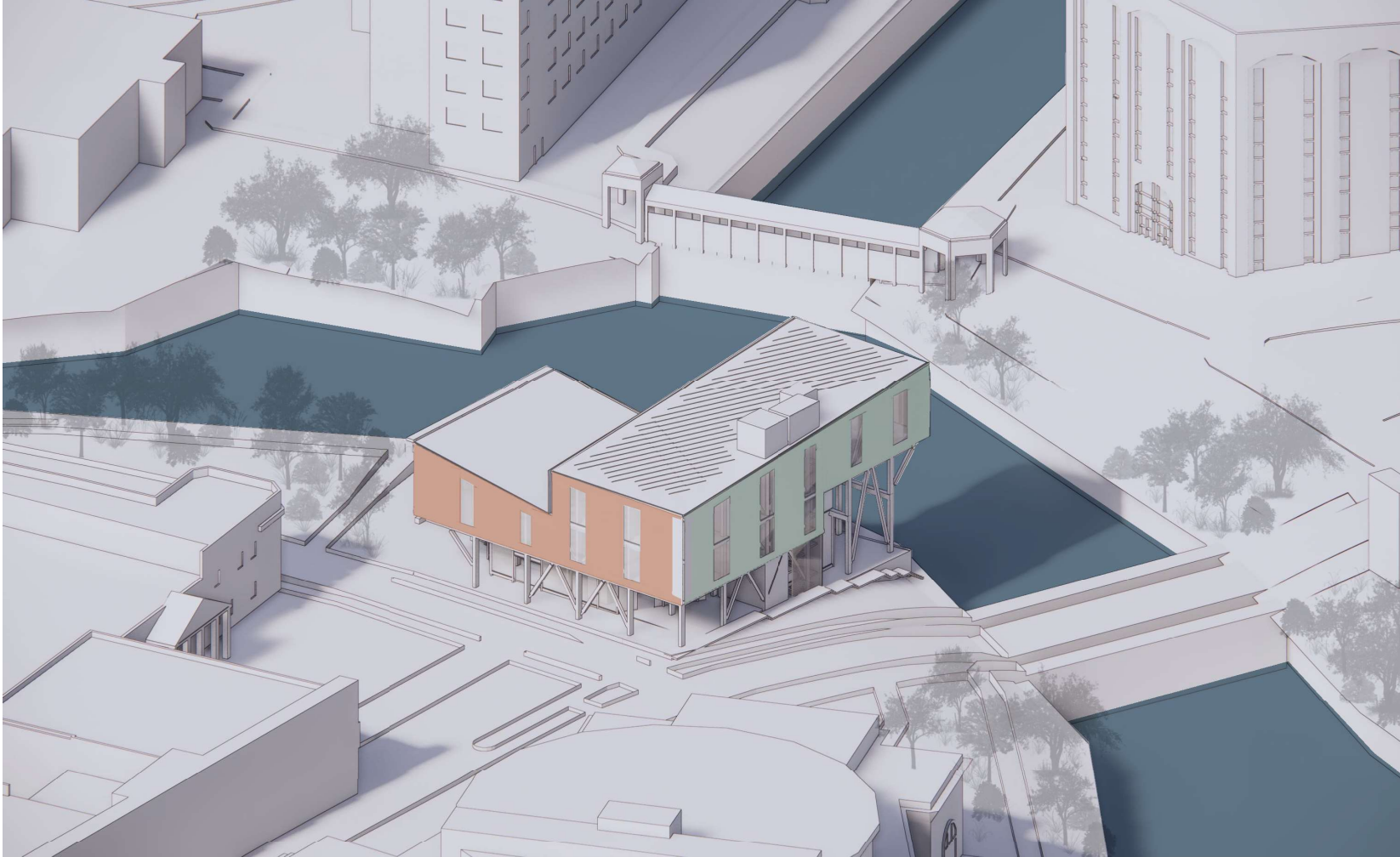
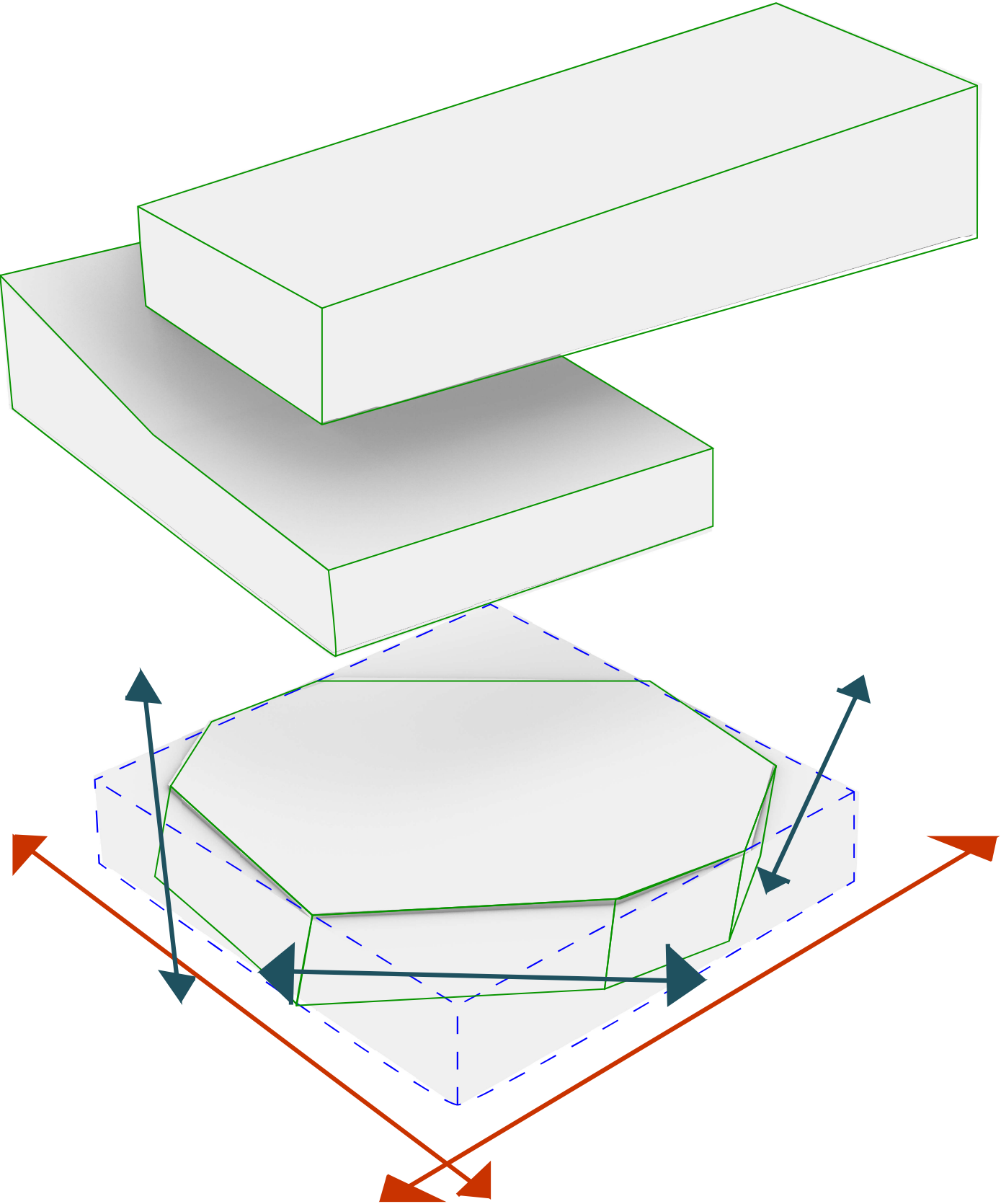
Plaza & Multipurpose

Park & Green Space

Concord River/ Canal

Concord River Greenway

PHASE 4B | Final Form



PROGRAMMATIC GOALS

TO CHANGE WITH THE TIMES | WORKING TOWARDS A SUSTAINBLE FUTURE



In Relation to the Macro Context The Location/Site:

To relate back to Lowell's industrial roots with an advancement/improvement in sustainable technologies and practices due to current sustainable conditions and concerns.



In Relation to the Meso Context The Building:

To support sustainable, low waste creative practices such as **woodworking; ceramics; 3D printing; gardening, rainwater management, compositing; paper making; photography, portfolio creating; and culinary/scrappy cooking courses**. Each set of programming becomes interconnected and supported through the act of reusing, reducing/minimizing, and recycling.

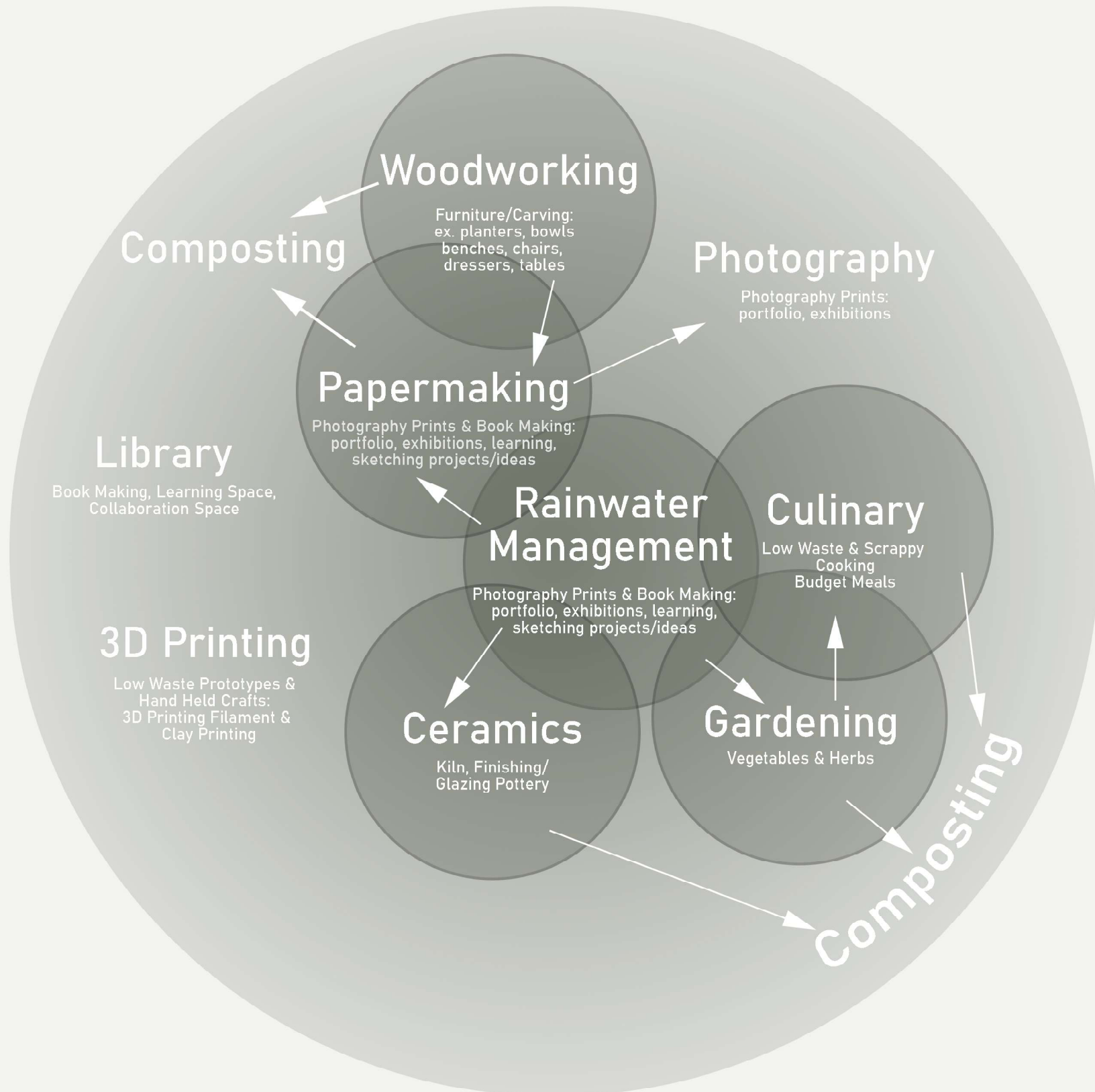


In Relation to the Micro Context The Users:

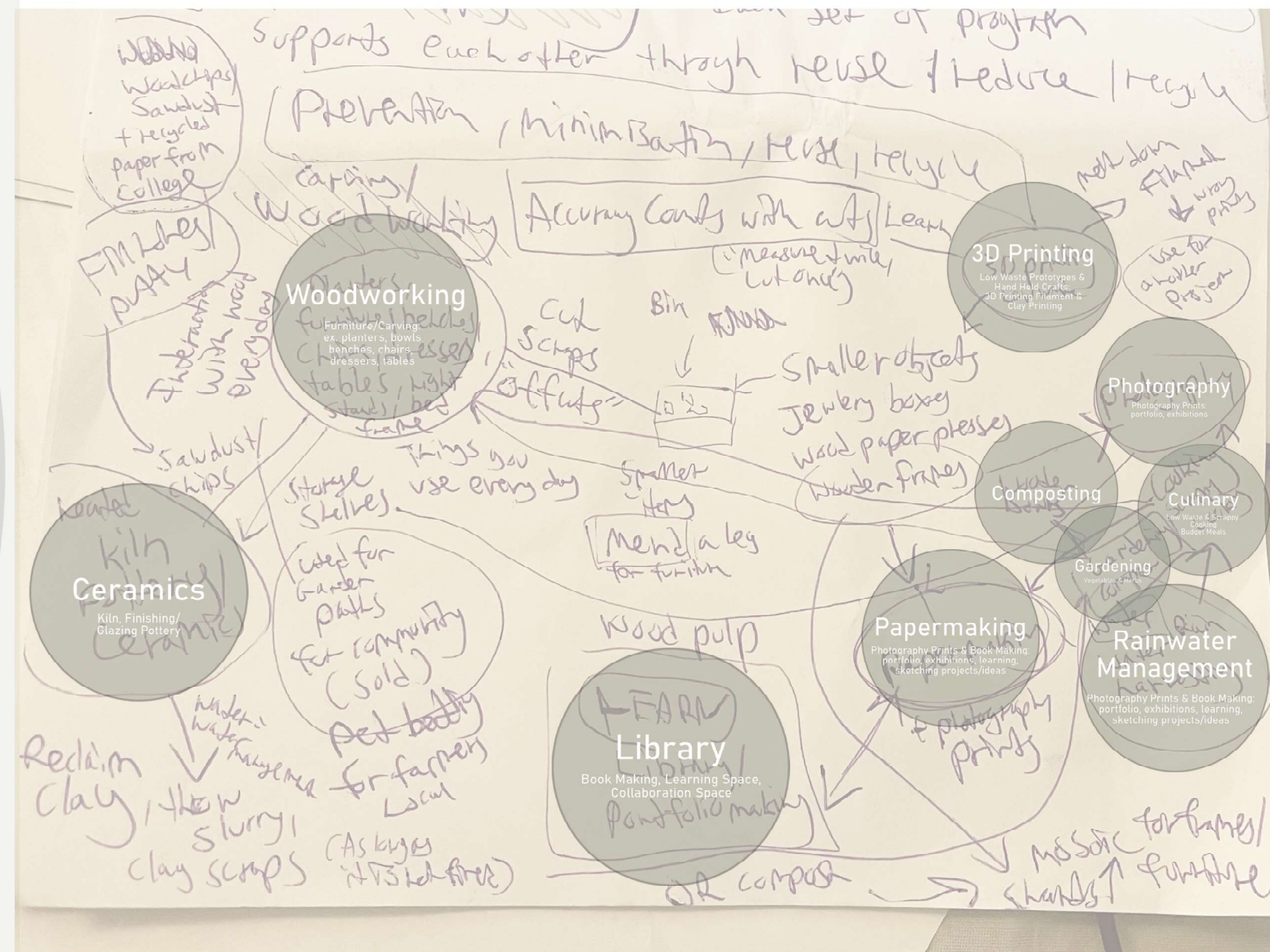
To educate the people of Lowell, and the surrounding communities, of sustainable, low waste living practices within their day-to-day lives and through the action of producing, exhibiting, and learning from others.

PROGRAMMATIC RELATIONSHIPS

INTERCONNECTIONS BETWEEN PROGRAM: Reusing, Reducing/Minimizing, and Recycling

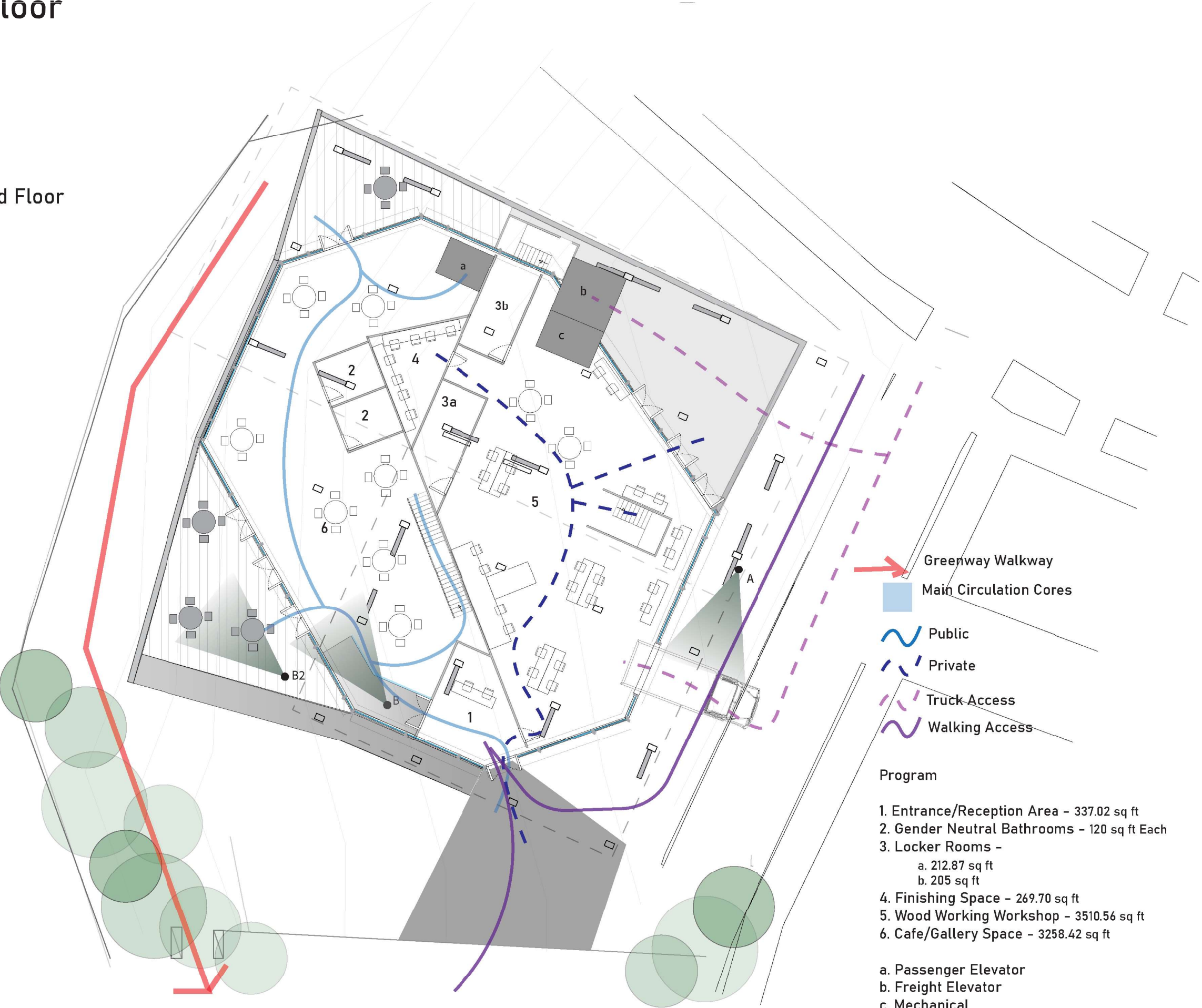








"WASTE" RELATIONSHIPS



PLANS | Ground Floor

Ground Floor



-  Greenway Walkway
-  Main Circulation Cores
-  Public
-  Private
-  Truck Access
-  Walking Access

Program

- 1. Entrance/Reception Area - 337.02 sq ft
- 2. Gender Neutral Bathrooms - 120 sq ft Each
- 3. Locker Rooms -
 - a. 212.87 sq ft
 - b. 205 sq ft
- 4. Finishing Space - 269.70 sq ft
- 5. Wood Working Workshop - 3510.56 sq ft
- 6. Cafe/Gallery Space - 3258.42 sq ft

- a. Passenger Elevator
- b. Freight Elevator
- c. Mechanical

PLANS | Second Floor

2nd Floor

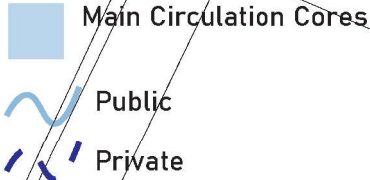
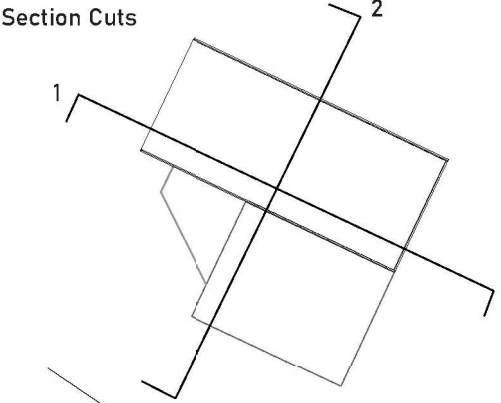


- Main Circulation Cores
- Public
- Private

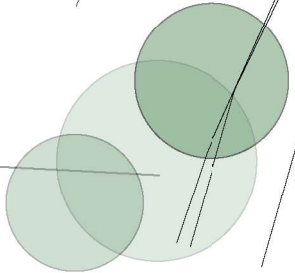
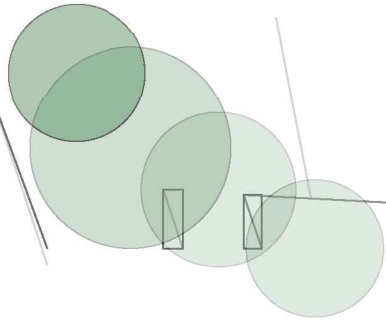
- Program**
- 7. Ceramic 3D Printing - 616.67 sq ft
 - 8. Pin Up space - 687.18 sq ft
 - 9. Exhibition Space/Gardening and water management classes - 1853.38 sq ft
 - 10. Photography Room - 488.96 sq ft
 - 11. 3D Printing - 480.13 sq ft
 - 12. Cooking Classes - 2211.62 sq ft
 - 13. Green Roof - 2659.86 sq ft
 - 14. Cooking Exhibition/Classroom - 1898.69 sq ft
- a. Passenger Elevator
 - b. Freight Elevator
 - d. Water Management

PLANS | Third Floor

3rd Floor

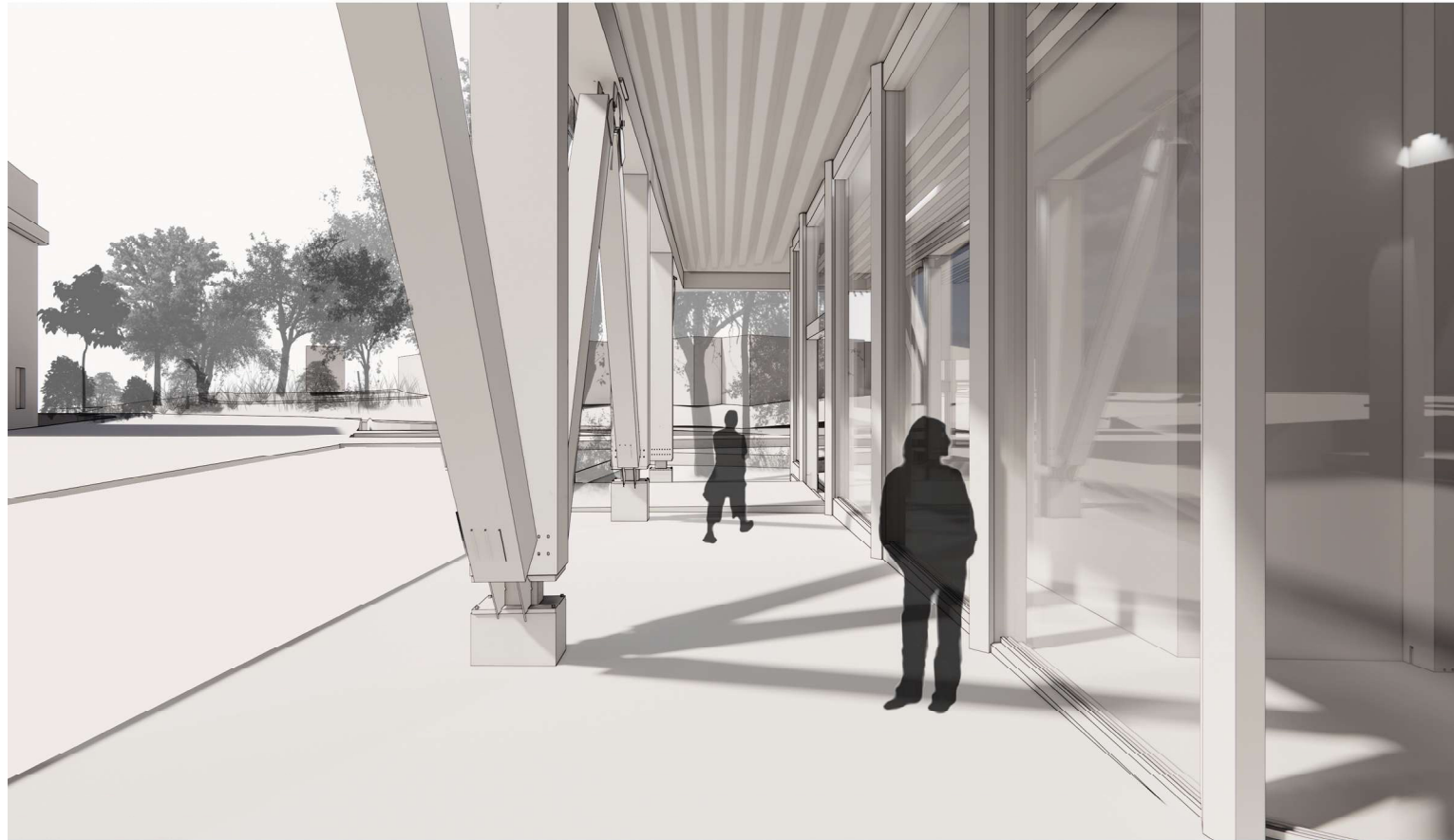


- Program**
- 15. Admin - 616.67 sq ft
 - 15a. Admin-Conferance - 480.13 sq ft
 - 16. Computer/Programing Lab - 511.43 sq ft
 - 17. Library and Multipurpose room - 2556.04 sq ft
 - 18. Pottery and Clay Room - 2709.39 sq ft
 - 19. Kiln
- a. Passenger Elevator
b. Freight Elevator



PERSPECTIVE VIEWS OF SPACES

A. Exterior Covered Walk



B2. Mixed Use Outdoor Space: Eating, Collaboration, Gallery, Learning Space



B. Interior Cafe/ Gallery Space

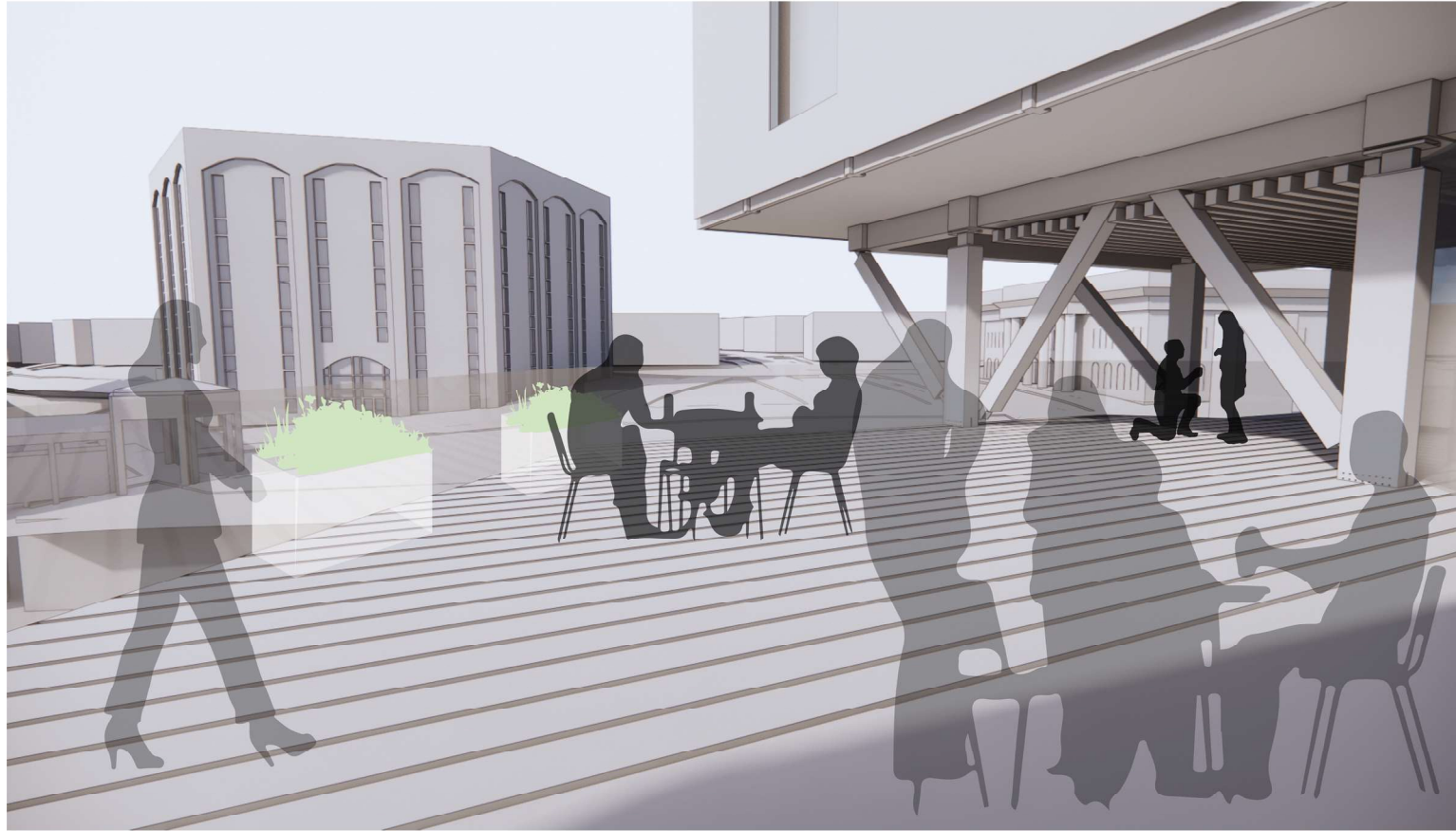


C. Exhibition, Photography & Gardening/Water Management Classes



PERSPECTIVE VIEWS OF SPACES CONT.

C2. Green Roof (Rainwater Management & Gardening Classes)



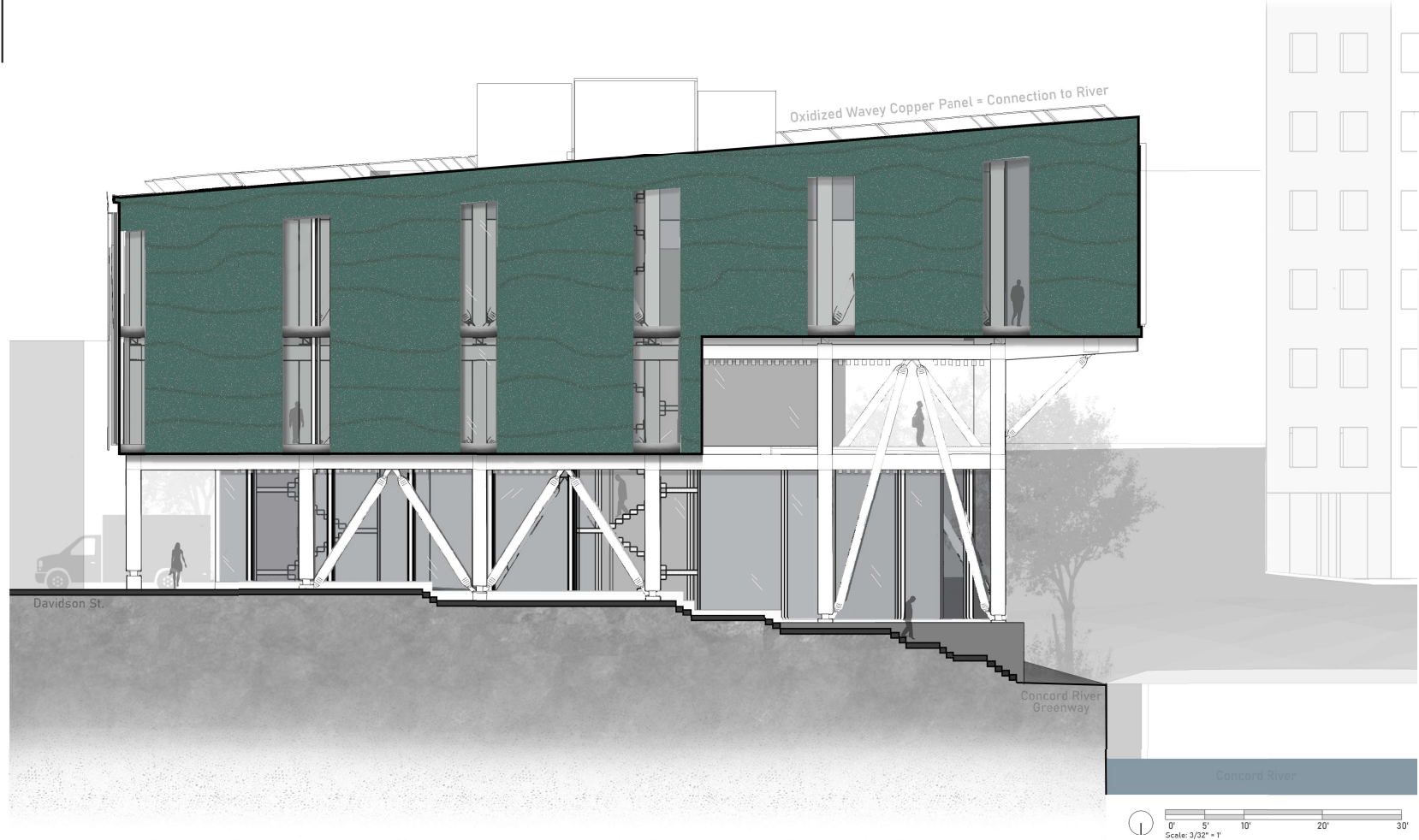
D. Cooking Classes



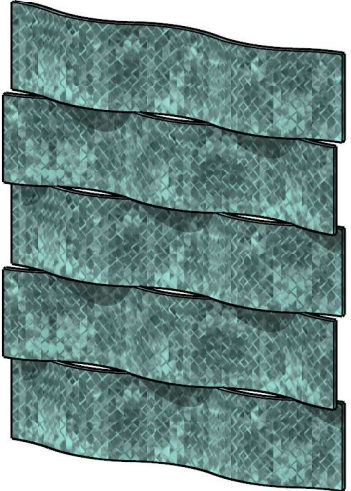
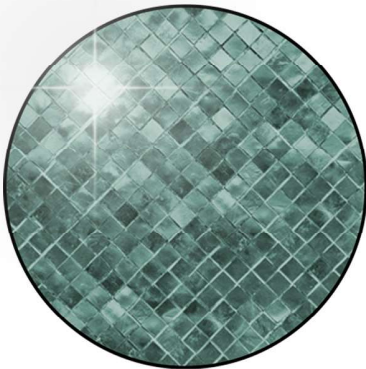
E. Ceramics Room



ELEVATIONS | Connection to Site Through Materials

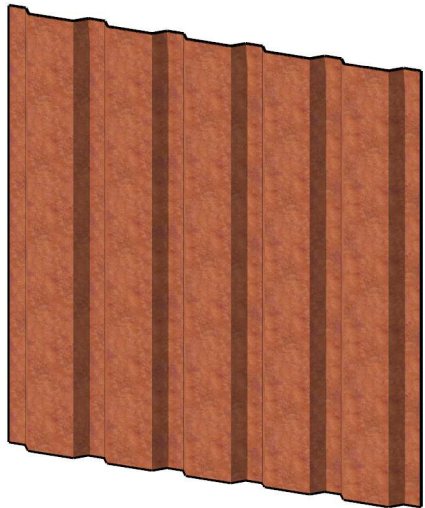
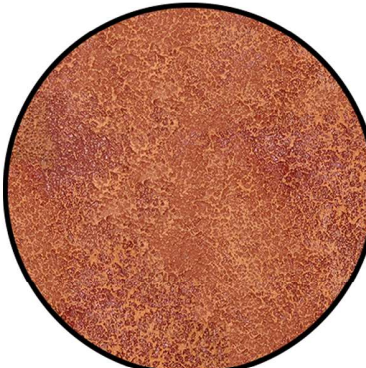


Panel Materials | Refer to Elevations



Oxidized Wavy Copper Panel = Connection to Concord River

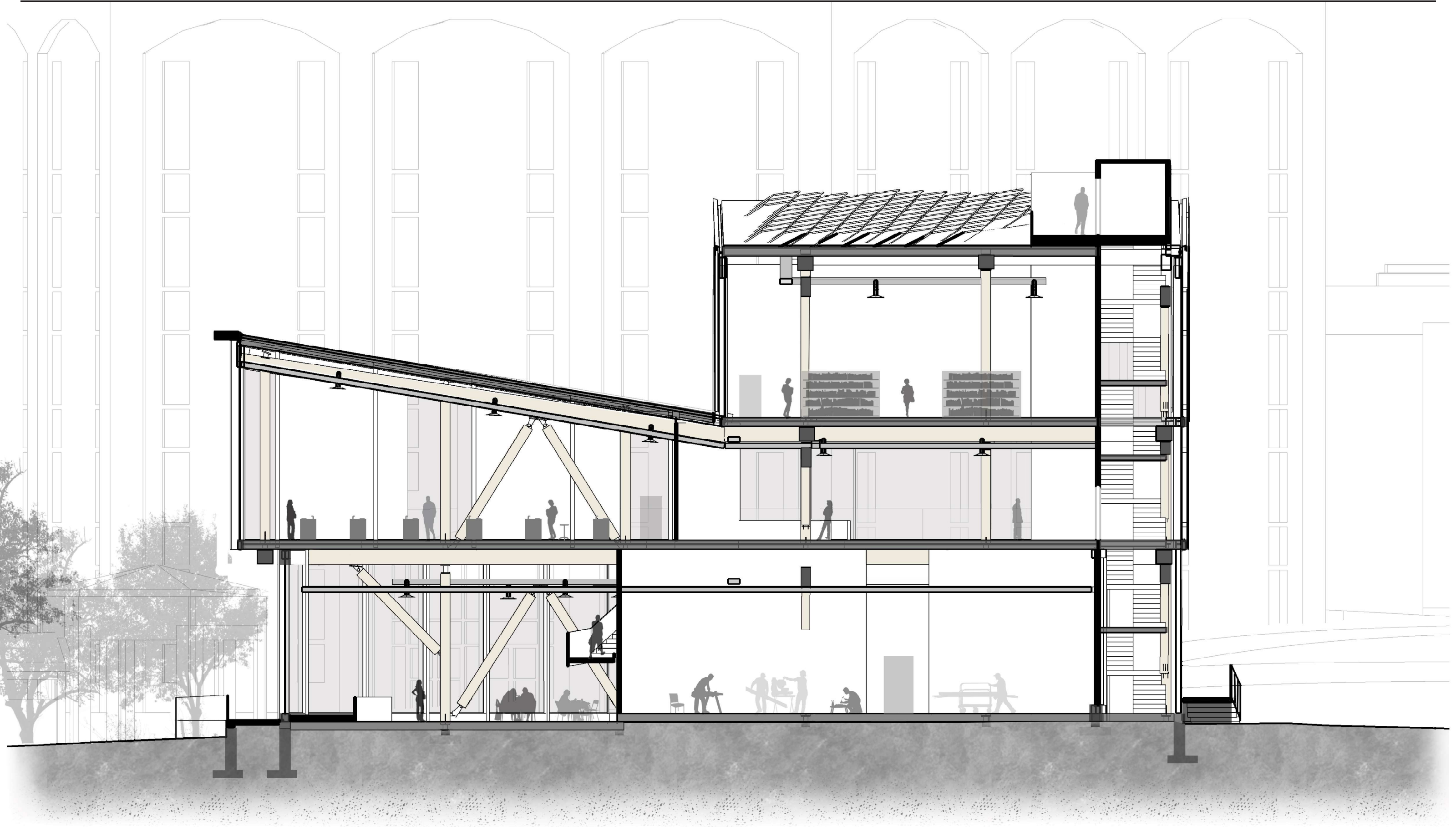
- Horizontal Directionality
- Resembles Water : Greenish Blue & Mosaic Reflections



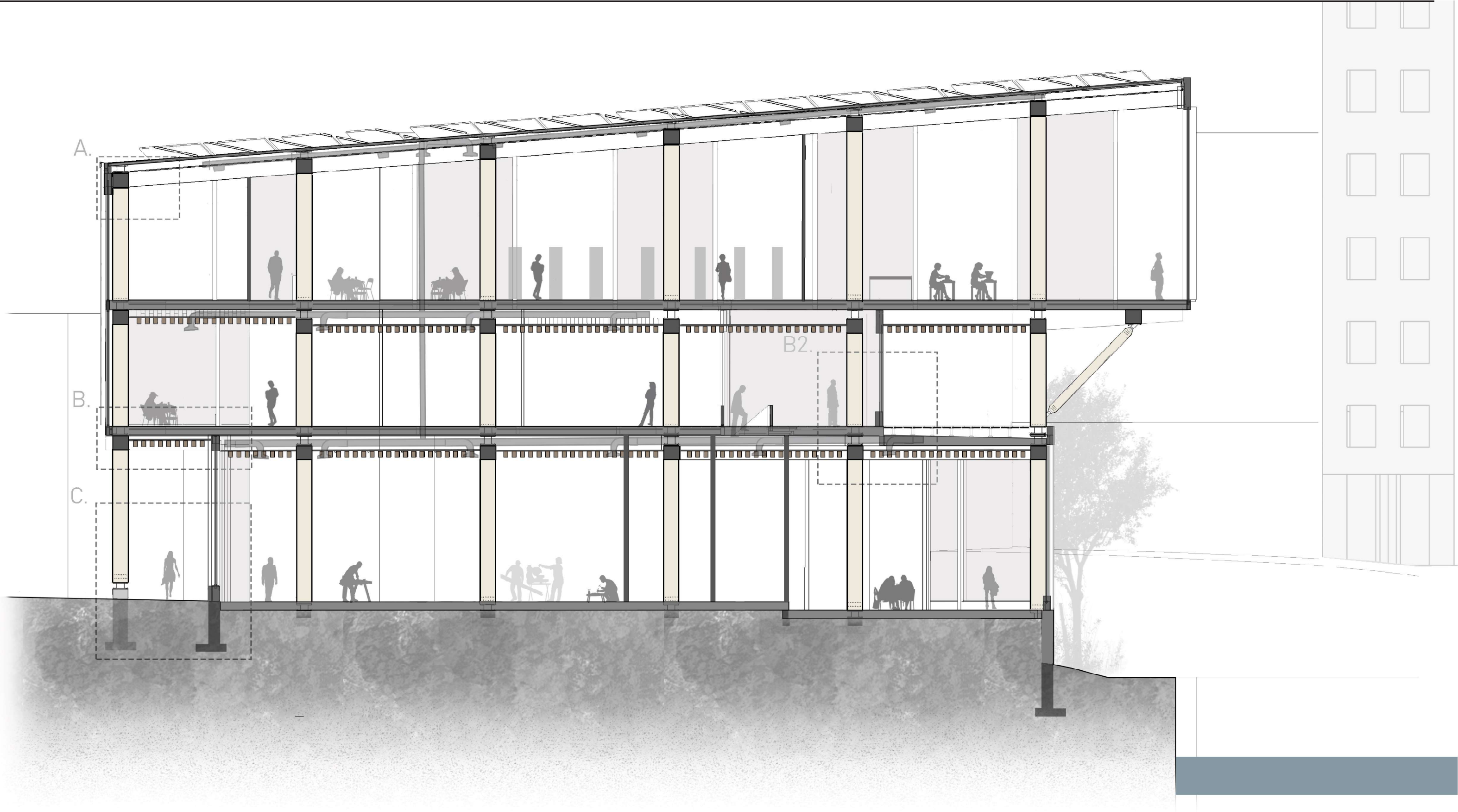
Corrugated Corten Steel Panel = Connection to Concord River Greenway Park & the Greenway

- Vertical Directionality
- Resembles Ground, Bark, Trees and Red Brick of Lowell : Brownish Red Tones

SECTIONS | Vertical Connections (Program)



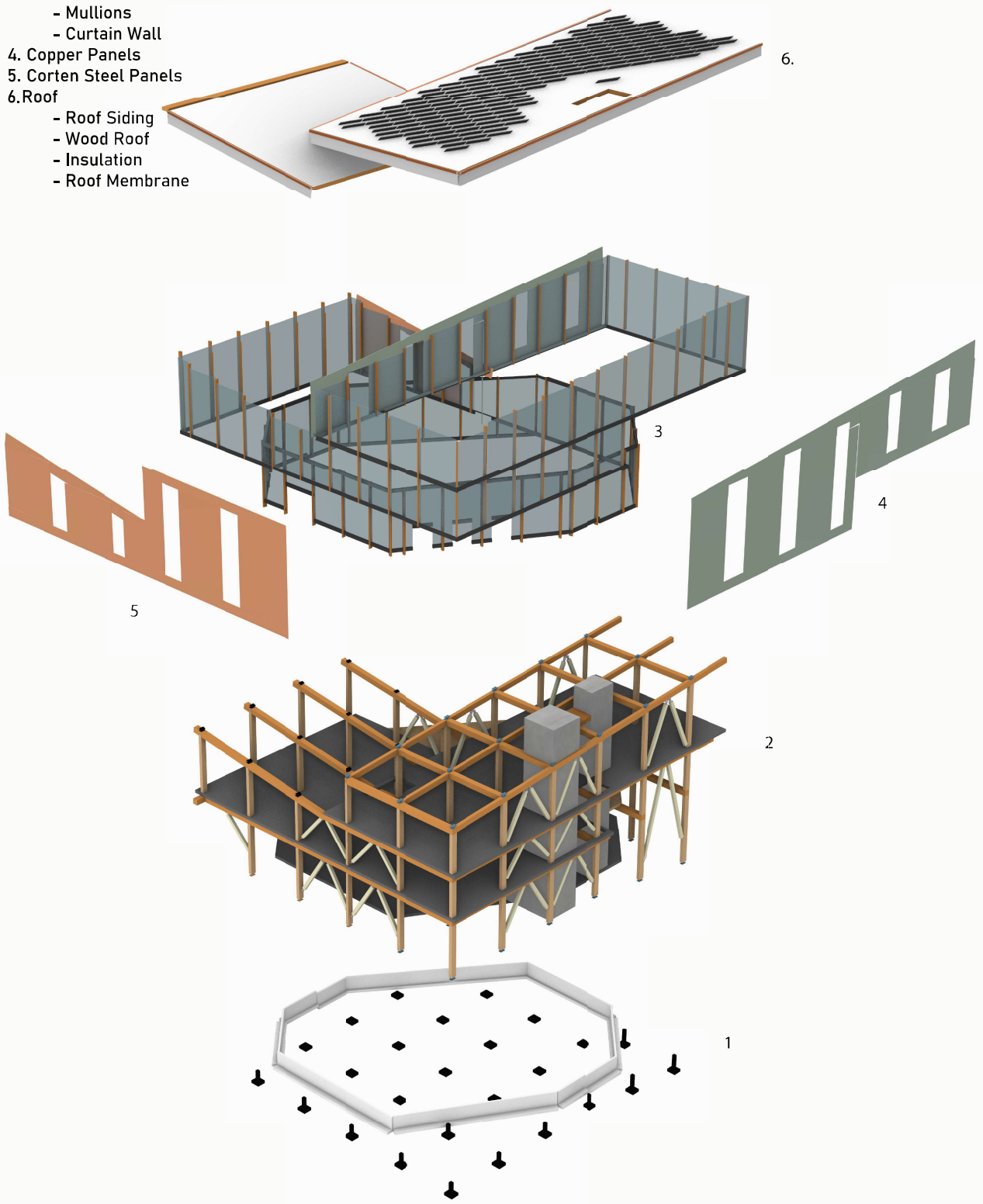
SECTIONS | Vertical Connections (Program) & Detail Connections



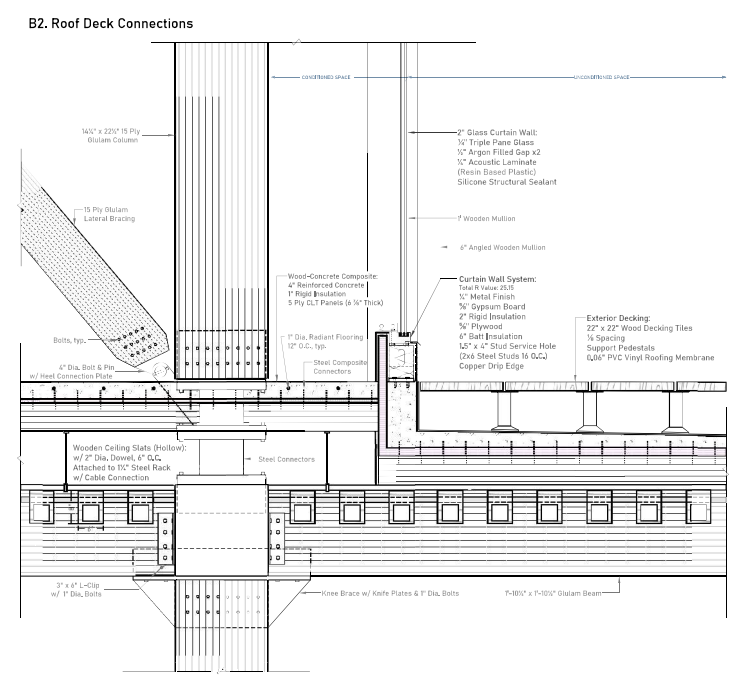
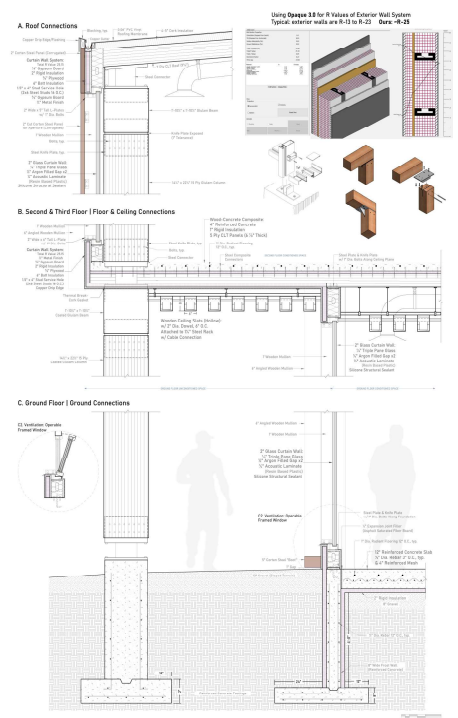
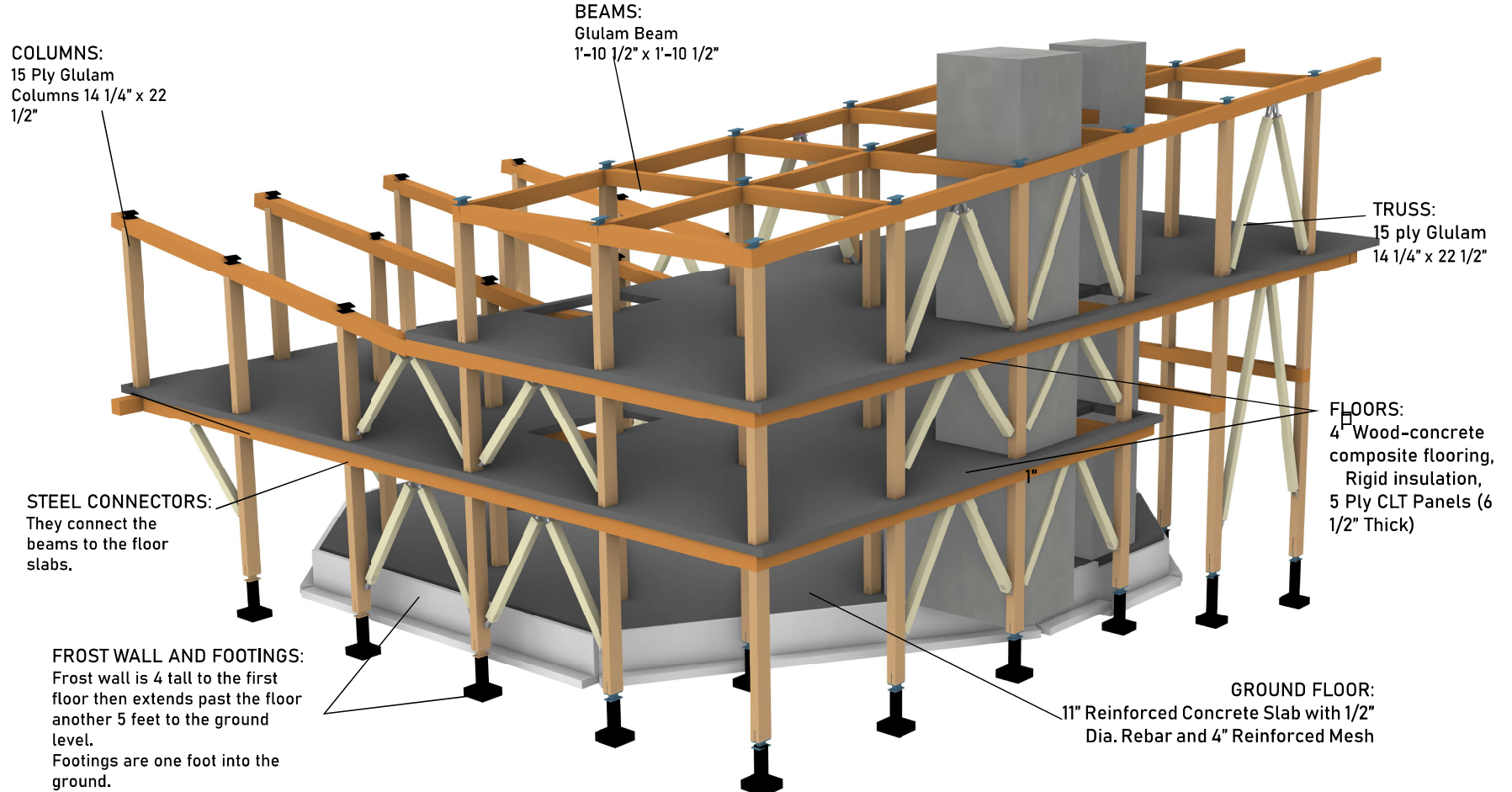
SYSTEMS | Intro to Systems, a Deeper Analysis

EXPLODED AXON

- 1. Footing and Frost wall
- 2. Structure and Circulation
 - Floor Plates
 - Beams
 - Columns
 - All clips and Connectors
 - Window Sills
 - Stairs
 - Elevator
- 3. Curtain Wall
 - Glass
 - Mullions
 - Curtain Wall
- 4. Copper Panels
- 5. Corten Steel Panels
- 6. Roof
 - Roof Siding
 - Wood Roof
 - Insulation
 - Roof Membrane

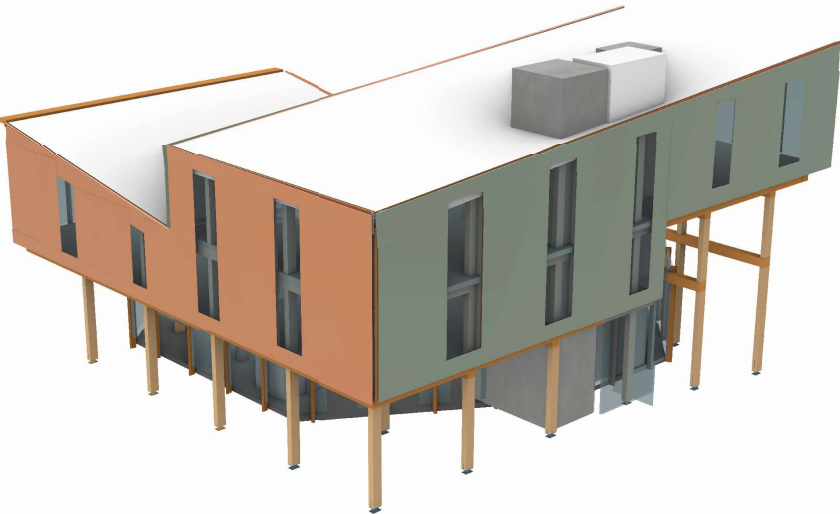


SYSTEM: STRUCTURE



Refer to Boards!*

SYSTEM: ENCLOSURE

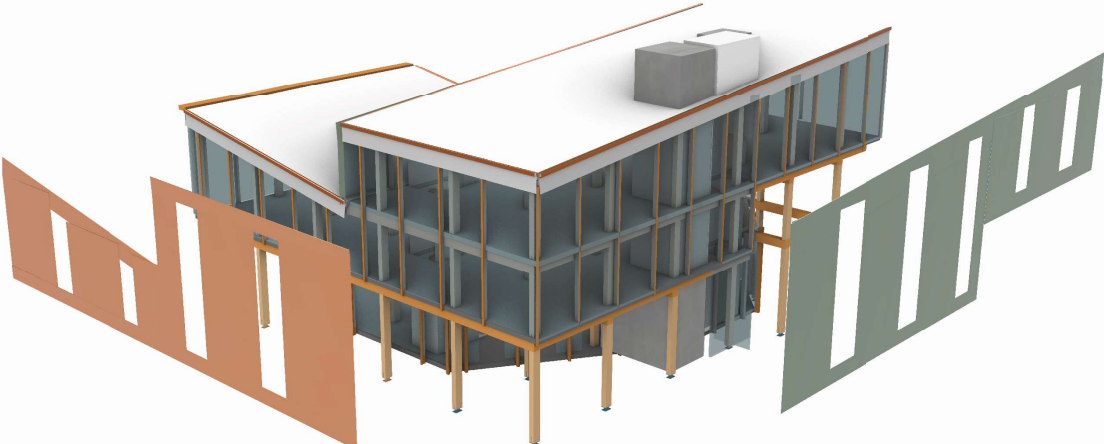


SLANTED ROOF:
 The slanted roofs are there to help with the drainage of rainwater. Within the roof there is a layer of thin copper, a layer of insulation and, a thinner layer of roofing membrane. The slanting relates to the site context: the Concord River & the Concord River Greenway Park.

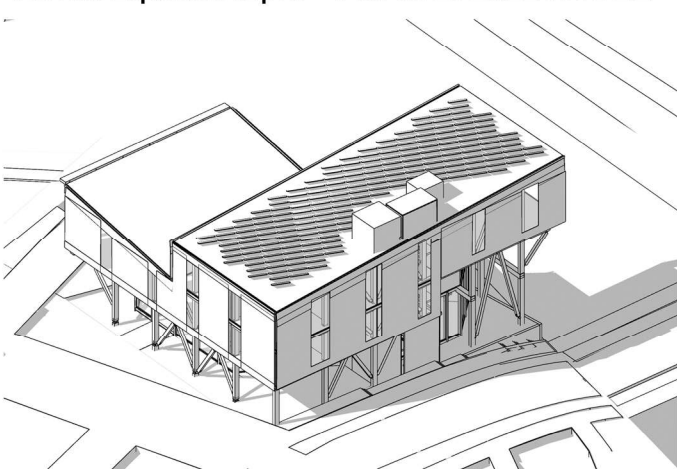
METAL PANELS:
 Apertures added to allow for natural light and views to the outside.
 Corten Steel = Earth, ground, the park nearby, and the bricks of Lowell; Oxidized Copper= greenish blue, relates to Concord river

CURTAIN WALLS:
 Used throughout the entire building for natural lighting, ventilation, and views out into the context. Using curtain walls became a way to accentuate the structural systems (Mullions, columns, and the floor).

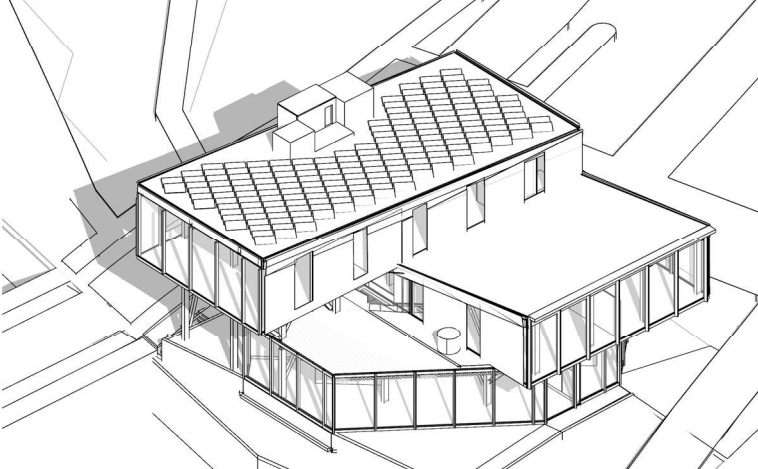
The Metal Panels are pulled off of the curtain walls so you can see that there is full glass curtain walls behind. The cutouts in the Panels are in line with the columns as well.



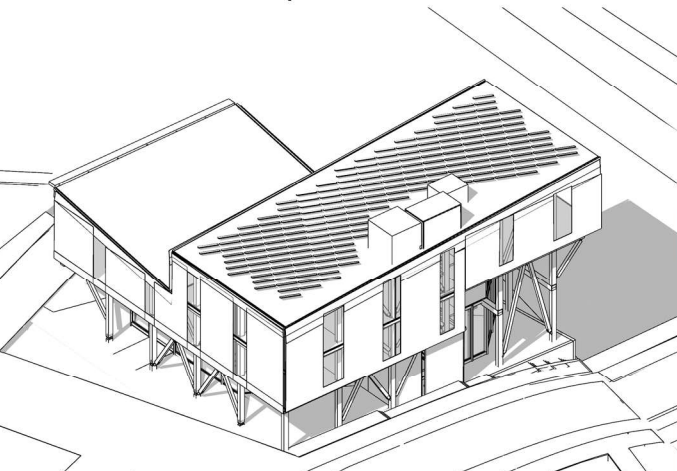
Vernal Equinox 12pm - March 21 2022 MODEL



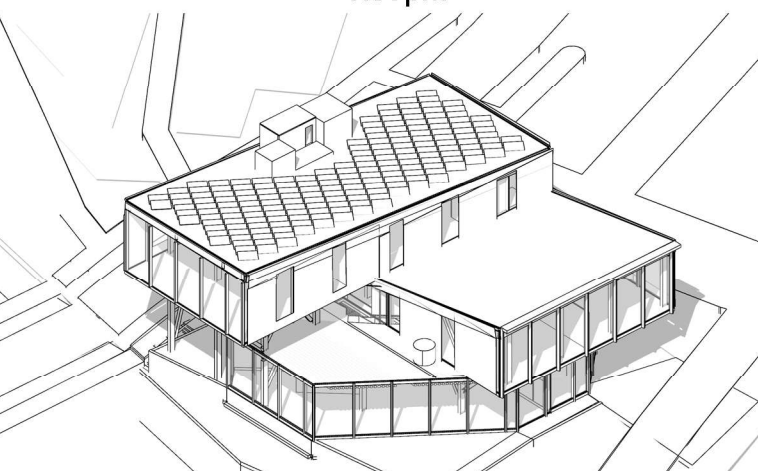
5:00pm



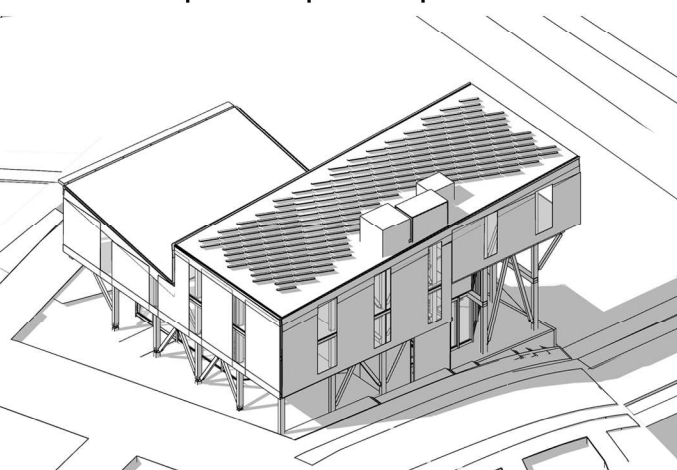
Summer Solstice 12pm - June 21 2022 MODEL



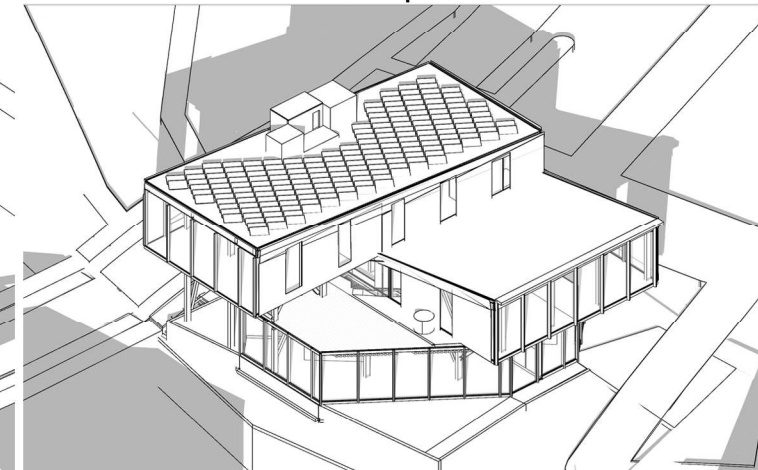
6:00pm



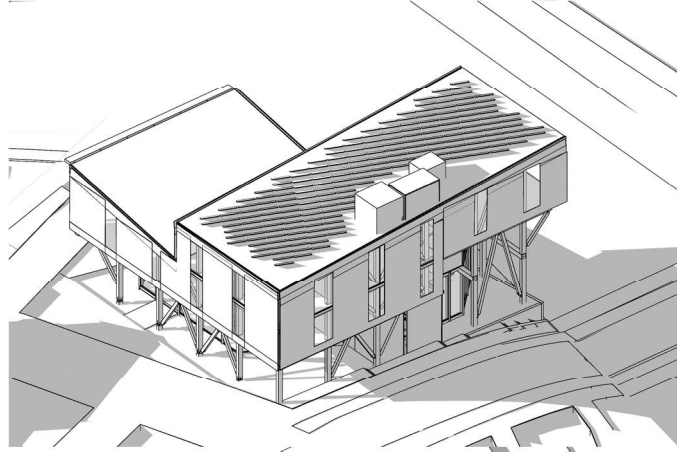
Autumnal Equinox 12pm - September 23 2022 MODEL



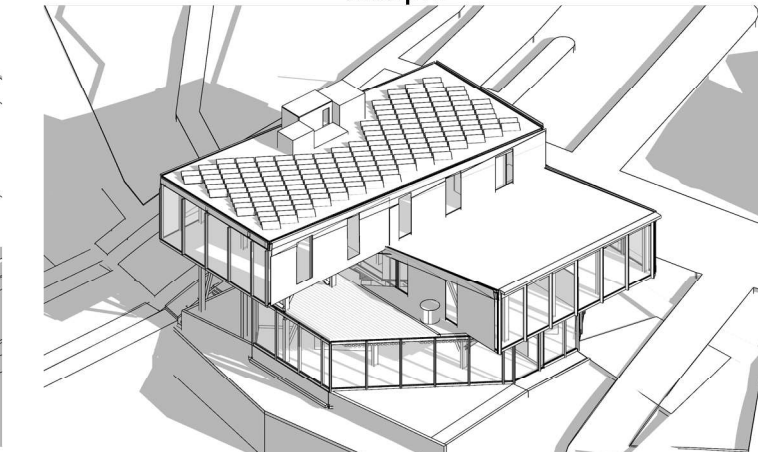
6:00pm



Winter Solstice 12pm - December 21 2022 MODEL



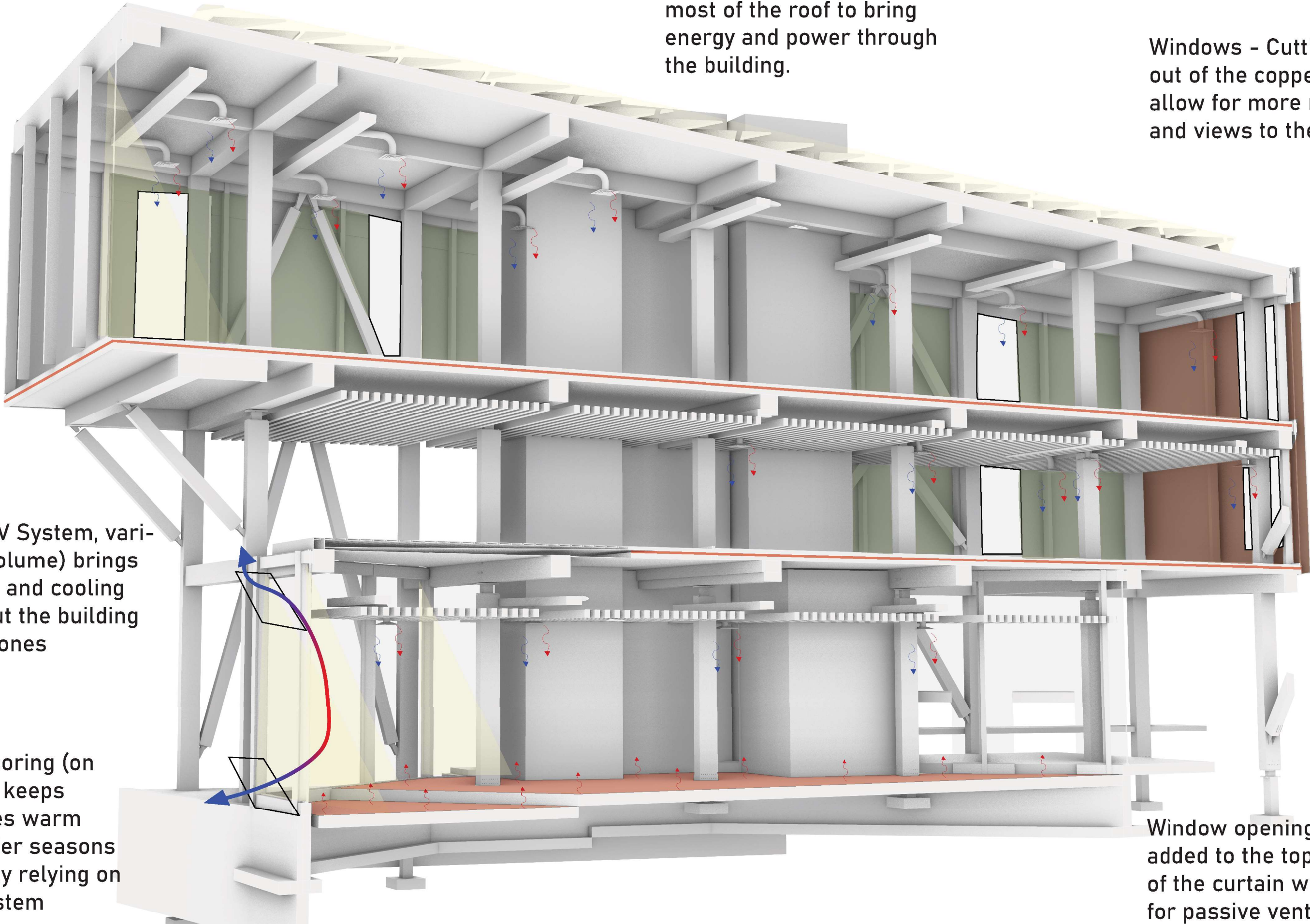
3:00pm



SYSTEM: PASSIVE AND ACTIVE

Solar Panels -
Solar panels are along
most of the roof to bring
energy and power through
the building.

Windows - Cutting apertures
out of the copper panel will
allow for more natural light
and views to the outside.



HVAC (VAV System, vari-
able air volume) brings
in heating and cooling
throughout the building
throughout zones

Radiant Flooring (on
each floor) keeps
larger zones warm
during colder seasons
without fully relying on
the VAV system

Window openings will be
added to the top and bottom
of the curtain wall to allow
for passive ventilation

SECTION PERSPECTIVE | Collaboration of Systems, a Part of a Larger Whole

Moments | Passive & Active Energy Strategies



THANK YOU!

