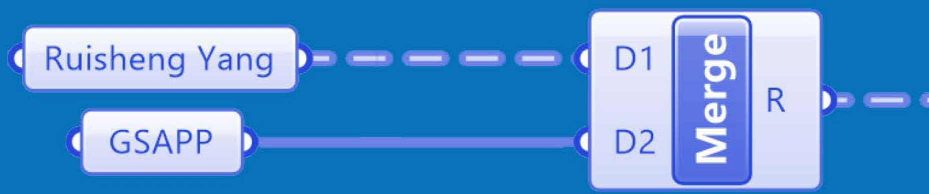
Ruisheng Yang
GSAPP
D1
D2
Merge
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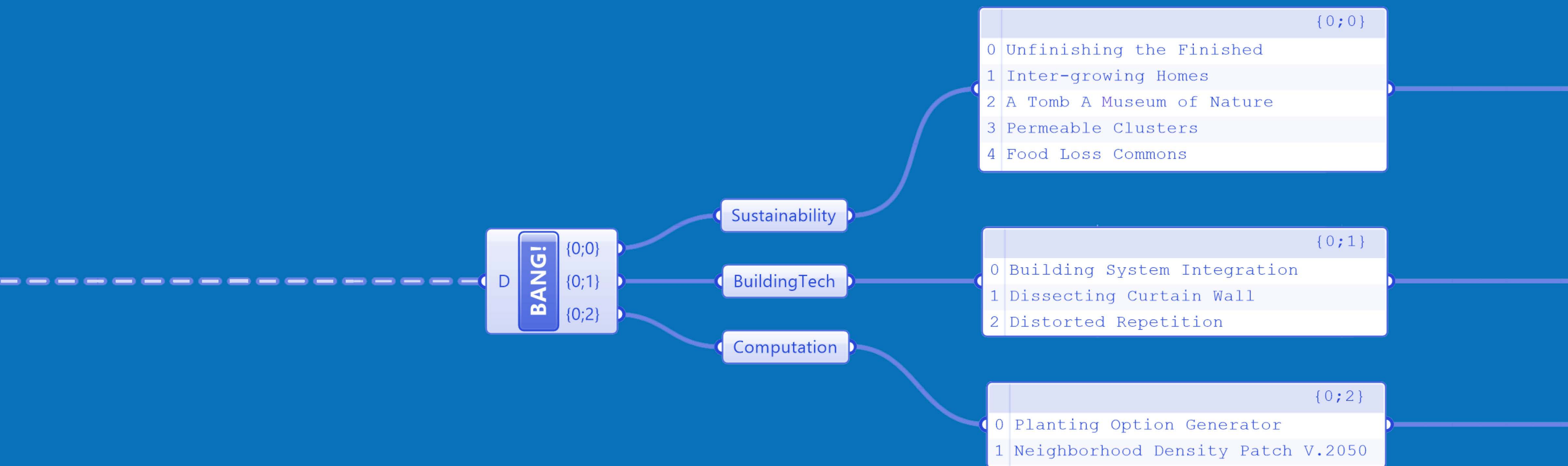
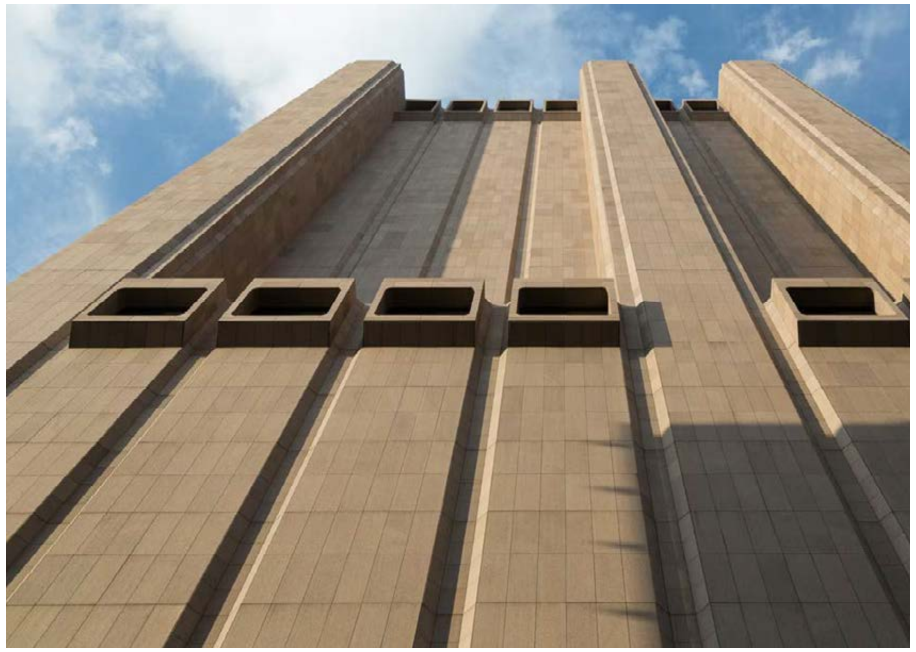

D
BANG!
{0;0}
{0;1}
{0;2}
Sustainability
BuildingTech
Computation
{0;0}
0 Unfinishing the Finished
1 Inter-growing Homes
2 A Tomb A Museum of Nature
3 Permeable Clusters
4 Food Loss Commons
{0;1}
0 Building System Integration
1 Dissecting Curtain Wall
2 Distorted Repetition
{0;2}
0 Planting Option Generator
1 Neighborhood Density Patch V.2050

AT&T Long Line Building designed by Warnecke & Associates
33 Thomas Street, Lower Manhattan, New York City



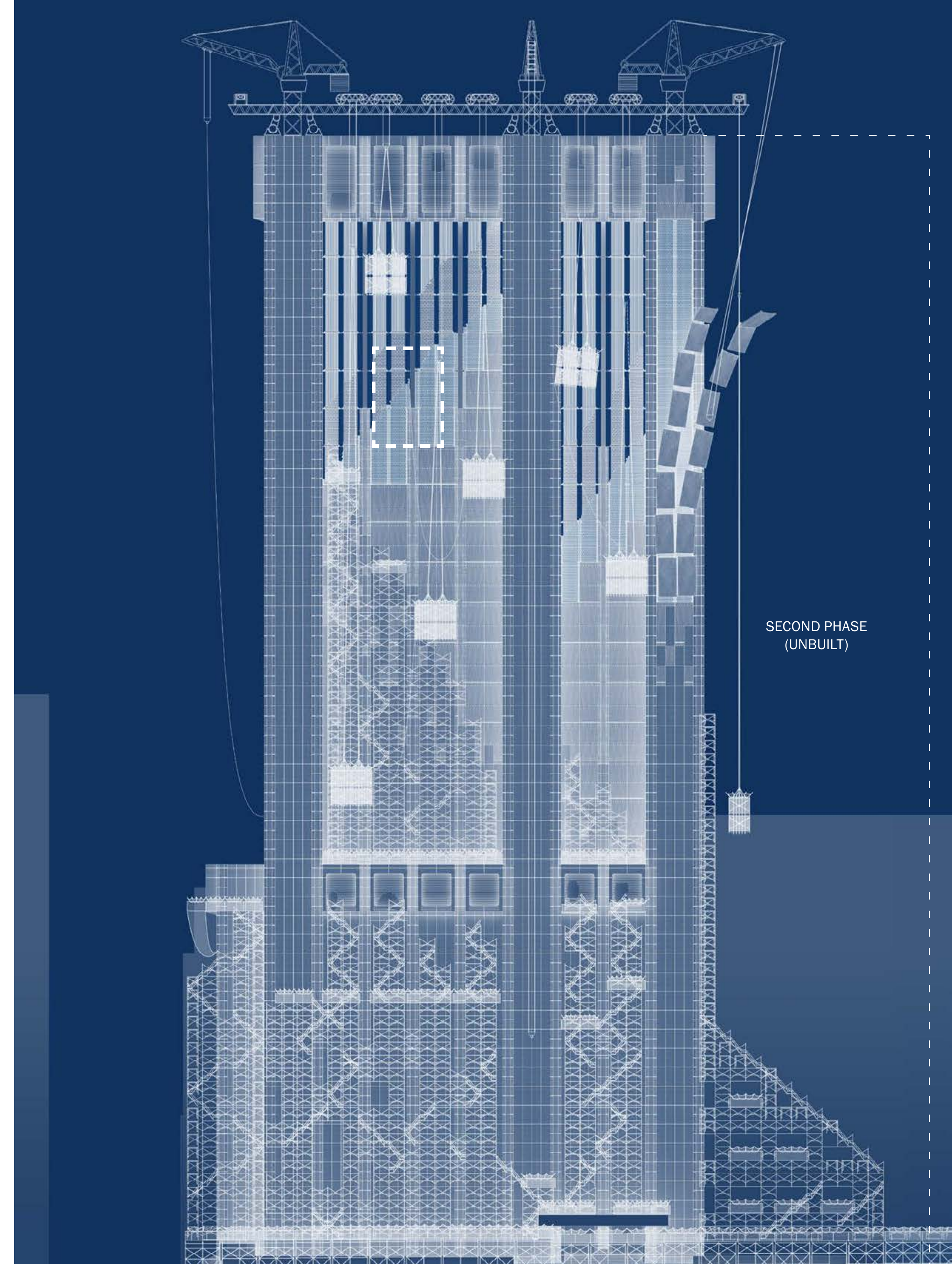
UNFINISHING THE FINISHED

M.ARCH_ADV STUDIO 5_2022 AU
TEAM ACADEMIC PROJECT
INSTRUCTOR: WONNE ICKX
PARTNER: ELENA YU

As the longline technology became obsolete and the nuclear threat disappeared, the fortress-like and windowless AT&T Longline Building lost the purpose it was initially designed for. What is left are a series of strangely layout floor plates concealed within opaque walls filled with an unnecessarily excessive amount of materials.

Instead of tearing down unwanted parts and sending them into waste piles, we see the building's opaque and thick walls that are now void of purpose as a quarry where most materials for adaptive reuse are sourced. A careful deconstruction that disassembles the structure into basic material units will take place while dense layers of scaffolding provide space for interactions between labor and materials. Materials that compose the facade, then, are collapsed into the interior of the building or expanded outward and form new spaces. The process of unfinishing a finished brutalist sculpture transforms the building into a vessel for social infrastructures and housing, retrofitting the obsoleted structure for a new era.

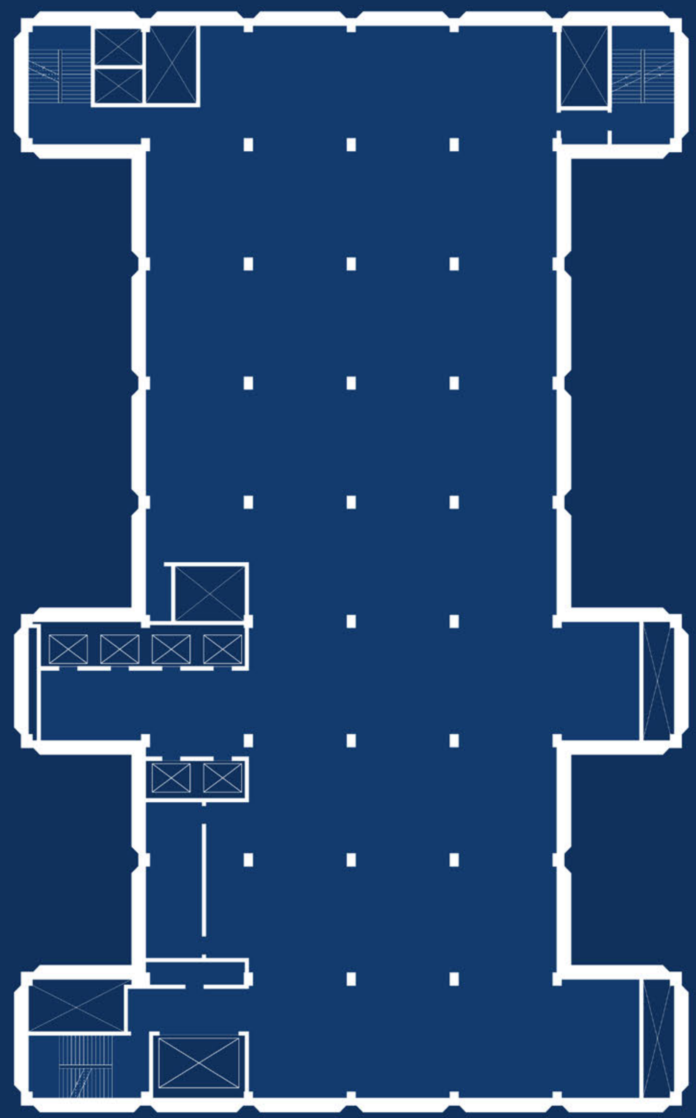
**This image is independently created with Grasshopper and Python scripts*



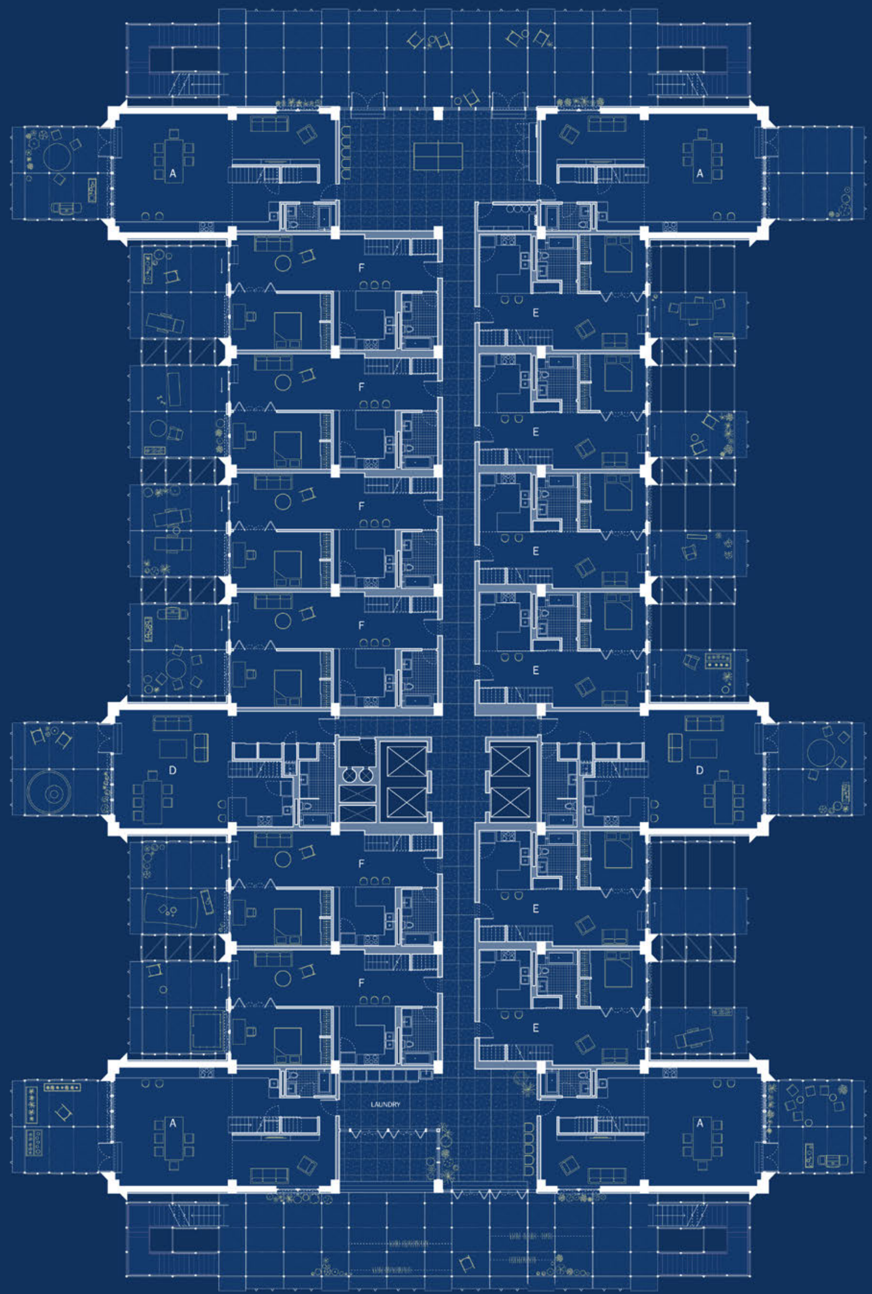
This drawing comes from an pre-design collaborative study with Nicolas Shannon

Following the existing building massing, the new proposal designates the shallower upper tower floors as housing (60%) that requires direct daylight access and natural ventilation, while transforms the deeper podium floors into social infrastructures (40%) that includes library, gallery, swimming, gym, theater, etc.

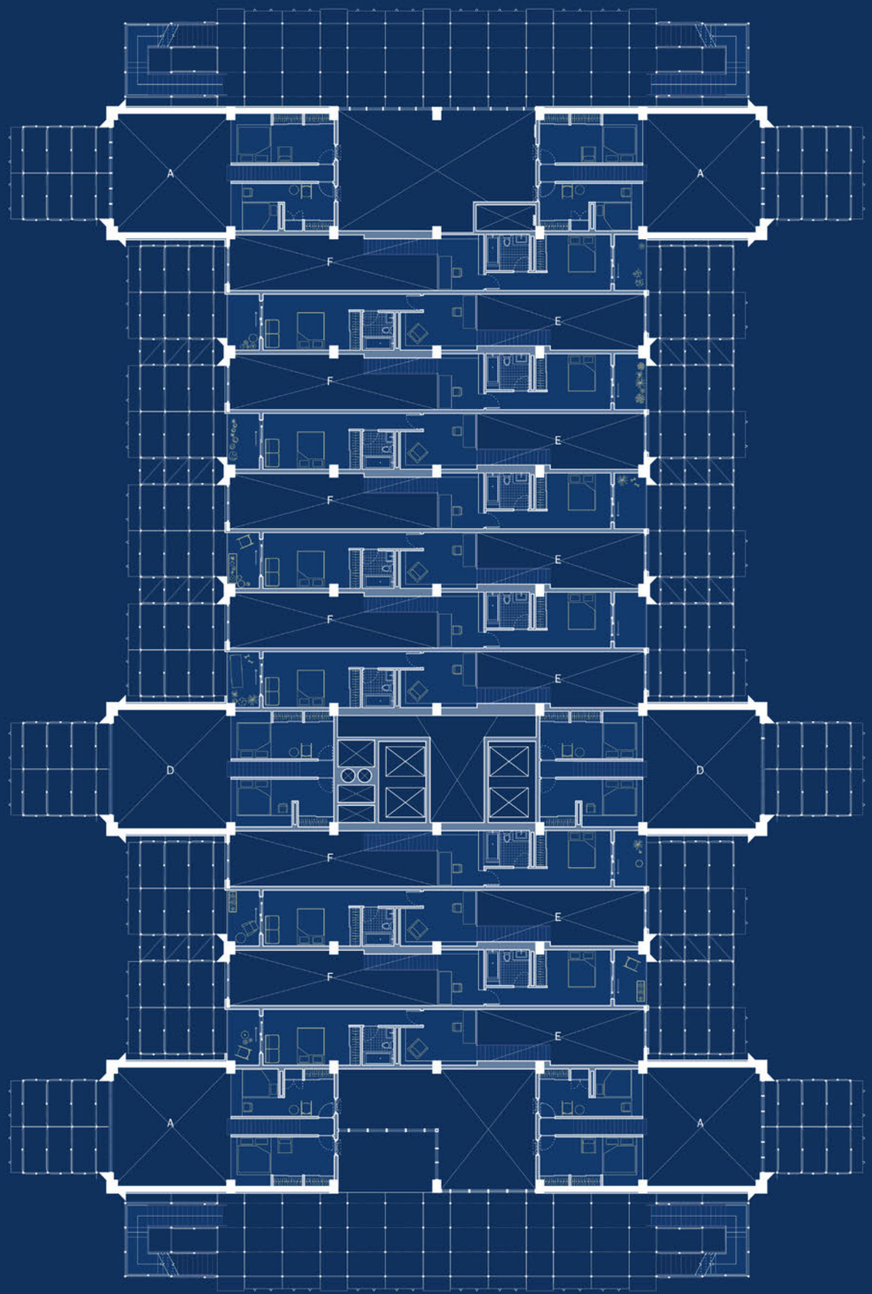
For the housing block, the large precast concrete panels that initially act as the base unitized modules that are rotated 90 degrees and attached to slab edges are made into balconies. Temporary Scaffolding structures that were used to deconstruct the facade of the building will secure these platforms in place and become permanent. The added square footage not only expands and expresses lives within the structure but also helps shade summer direct sunlight. Egresses are also hung outside existing floor plates, connecting layers of expanded living and social spaces transformed from the facade component.



existing floor plan - level 12 to 27



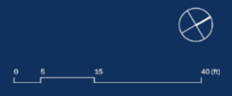
typical housing plan for floors with 18.5’ height - lower level



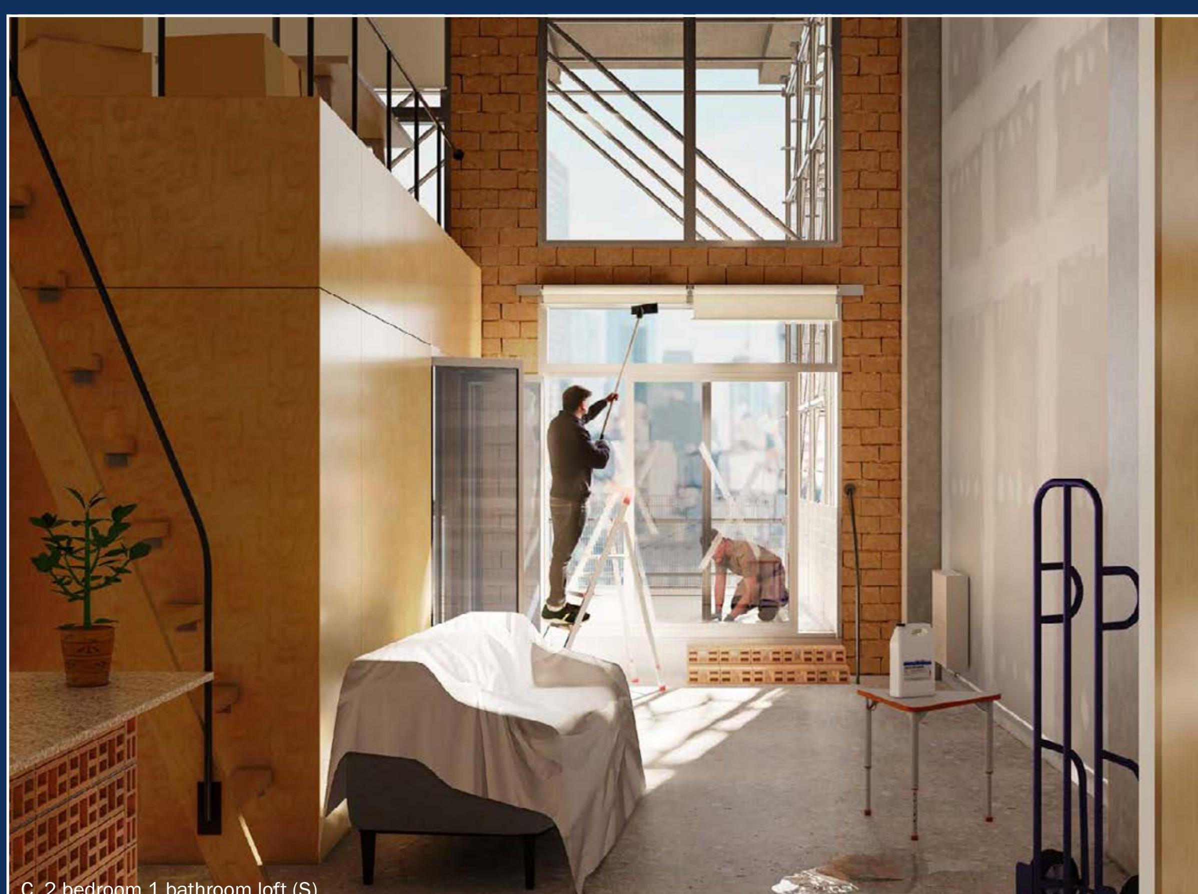
typical housing plan for floors with 18.5’ height - upper level

Considering different floor heights and the restricting NYC building codes, there are three housing unit types being embedded. Cross ventilated duplex unit types serve for 18.5’ levels, and loft units for 17.5’. All units have access to their balcony, the space created by flipping concrete panels and scaffolds. Public programs like laundry, lounge, or terrace are located within the housing block every four levels, acting as ties among residents, creating a supporting network within the building.

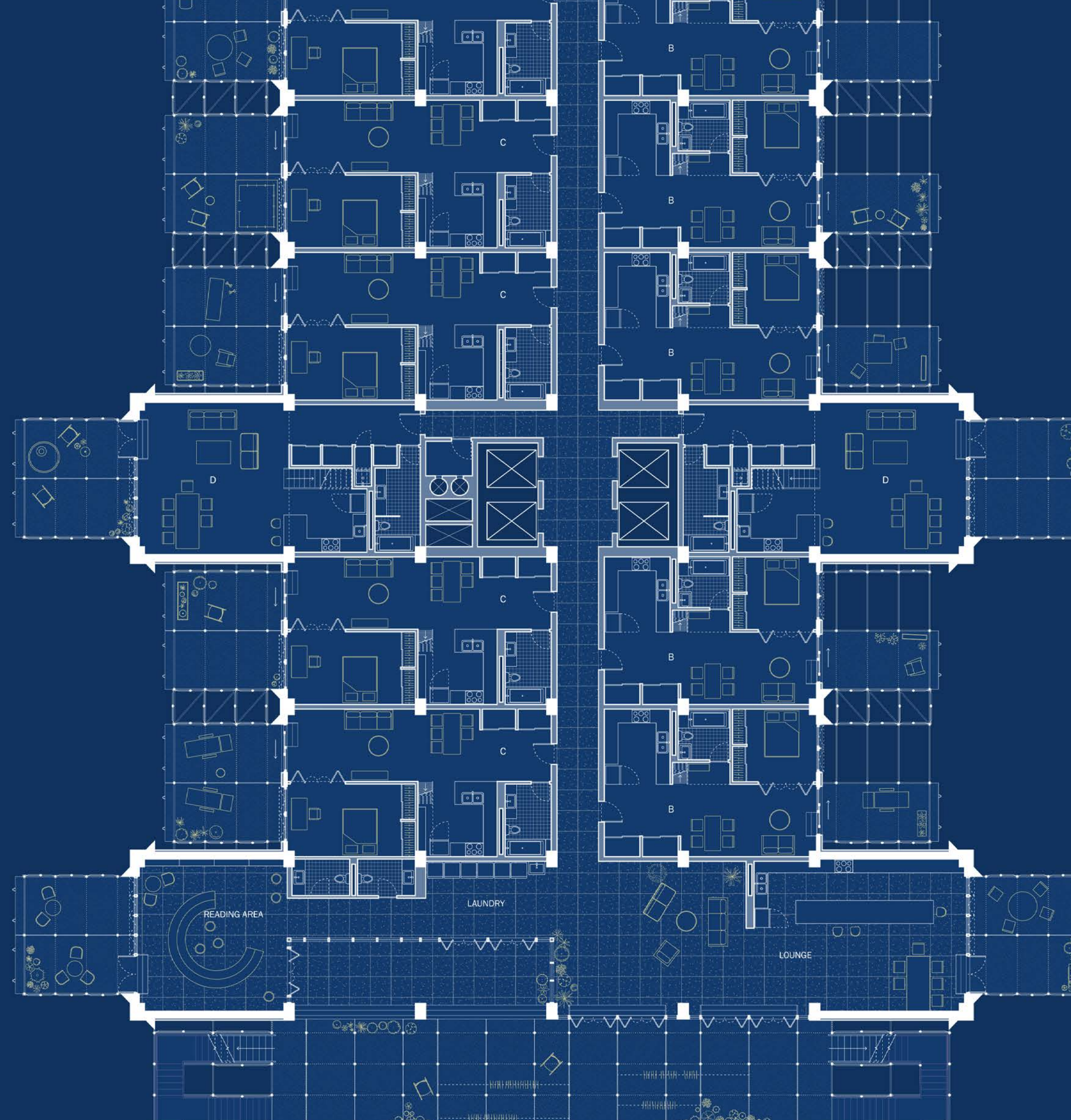
A. 2 bedroom 1 bathroom loft (N&S)
D. 2 bedroom 1 bathroom loft (N&S)
E. 2 bedroom 2 bathroom duplex (N)
F. 2 bedroom 2 bathroom duplex (S)



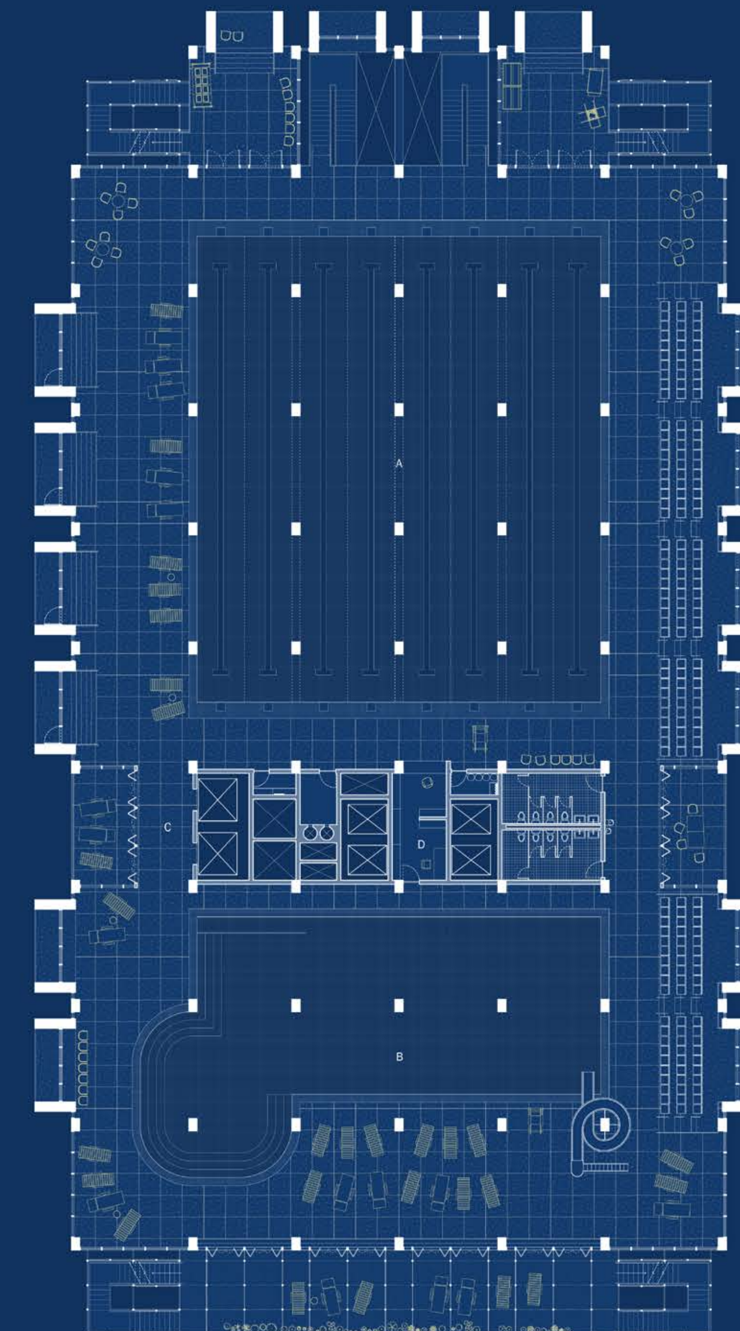
D. 2 bedroom 1 bathroom loft (N&S)



C. 2 bedroom 1 bathroom loft (S)

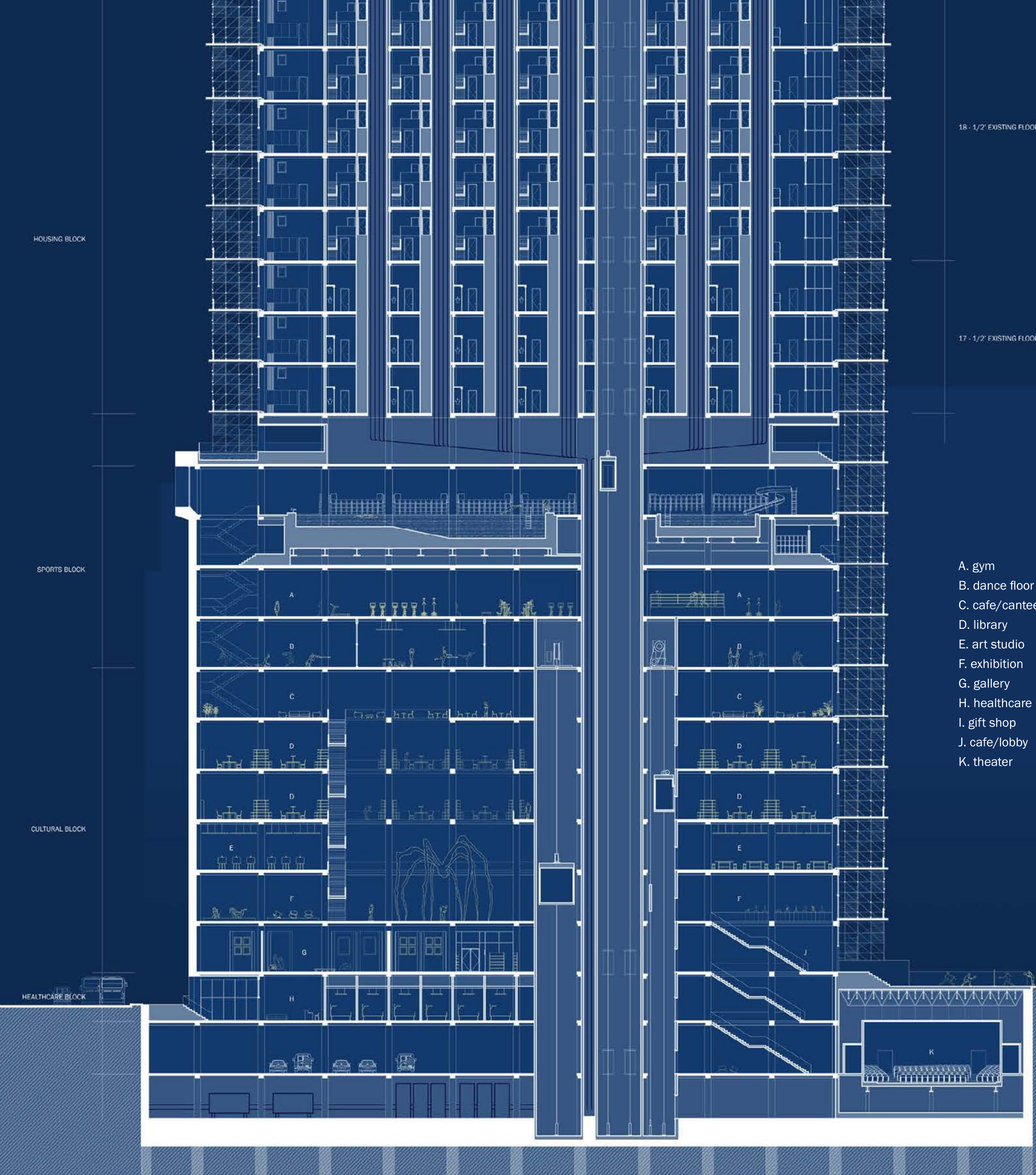


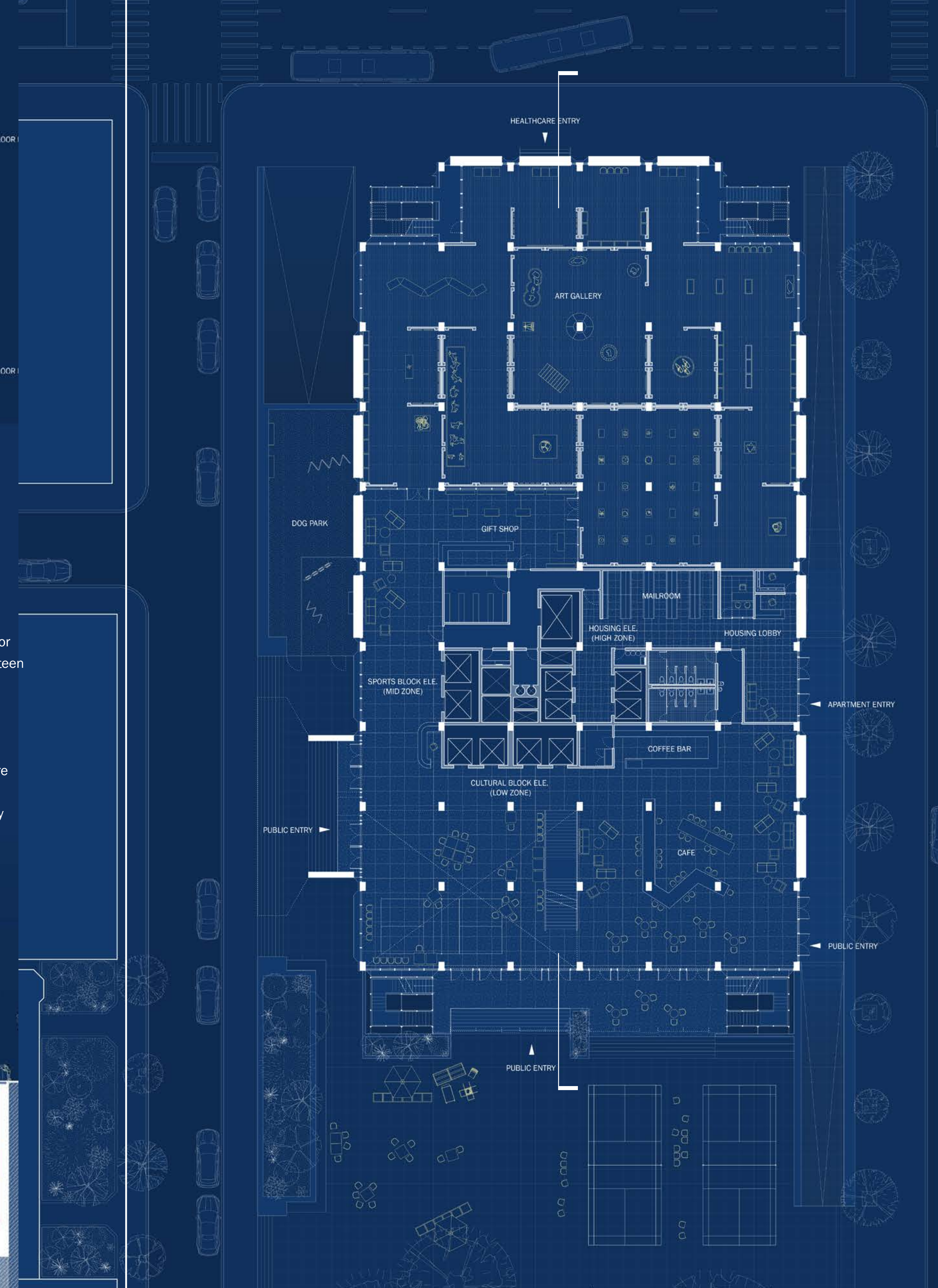
typical housing plan for floors with 17.5' height - amenity level



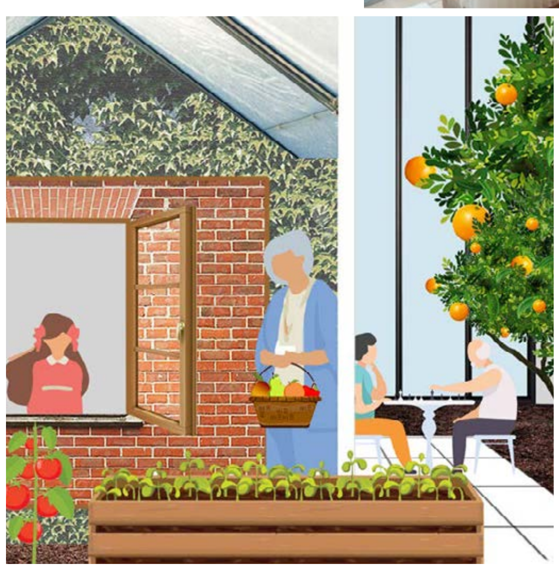
Located right below the mechanical transfer floor that separates the private and the public and redirects plumbing routes, the sports block starts with two public swimming pools at its top. Covered by granite tiles harvested from the building's exterior cladding, the space is completed with views of the city framed by the tower's 17.5 feet tall rectangular openings that are uniquely designed and highly recognizable from afar.

A. swimming pool (competition)
B. swimming pool (casual)
C. sports block elevators (mid zone)
D. staff office


HOUSING BLOCK
SPORTS BLOCK
CULTURAL BLOCK
HEALTHCARE BLOCK
18 - 1/2' EXISTING FLOOR
17 - 1/2' EXISTING FLOOR
A. gym
B. dance floor
C. cafe/canteen
D. library
E. art studio
F. exhibition
G. gallery
H. healthcare
I. gift shop
J. cafe/lobby
K. theater


HEALTHCARE ENTRY
ART GALLERY
DOG PARK
GIFT SHOP
MAILROOM
HOUSING ELE.
(HIGH ZONE)
HOUSING LOBBY
SPORTS BLOCK ELE.
(MID ZONE)
APARTMENT ENTRY
COFFEE BAR
CULTURAL BLOCK ELE.
(LOW ZONE)
PUBLIC ENTRY
CAFE
PUBLIC ENTRY
PUBLIC ENTRY

“mesocomfort” zone - the space between the “optimal” comfort standards and the actual point of physical discomfort

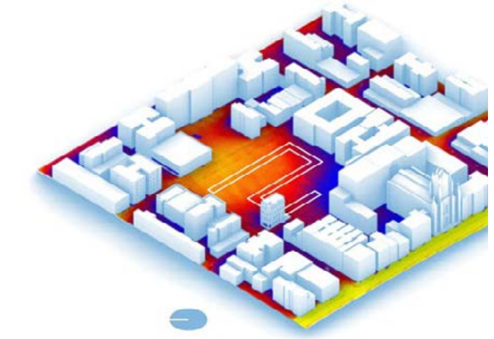


INTER-GROWING HOMES

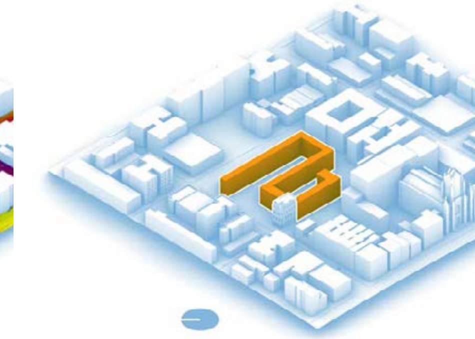
M.ARCH_CORE STUDIO 3_2021 AU
TEAM ACADEMIC PROJECT
INSTRUCTOR: ERICA GOETZ
PARTNER: ZIXIAO ZHU

The site contains an existing tower senior house that will be demolished and a pre-K to 8 school across the street. The generation gap between the two age groups is prominent as there are few spaces allowing interaction. Could we provide housing that accomandates social needs and helps to grow memories shared by both the young and the old?

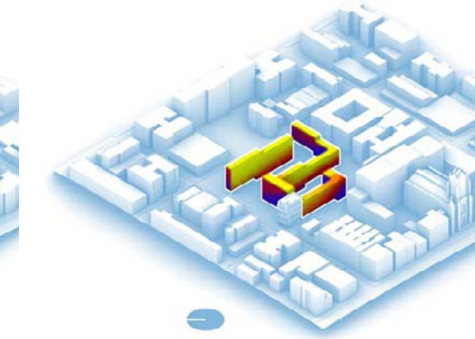
The proposed 92-unit housing project is located within Melrose, Bronx, which has a unique demographic composition of 30% under-18 population and a majority of single households. The site also houses a major local senior home that suffers from its outdated design and will be replaced. The new building’s architectural layout provides many scales of communal spaces that lace throughout the building: each apartment extends beyond its own walls into a meso-spatial zone which not only provides a thermal buffer to the exterior climate in either cold days or warm conditions but also creates a layered interior that extends as well as reconfigures inhabitants’ living spaces depending on the season and time of day.



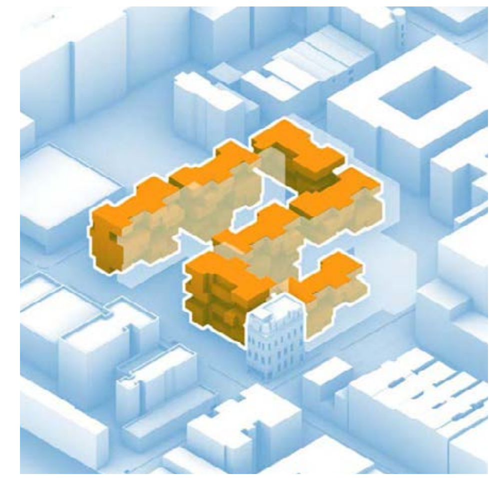
Prioritizing winter solar access



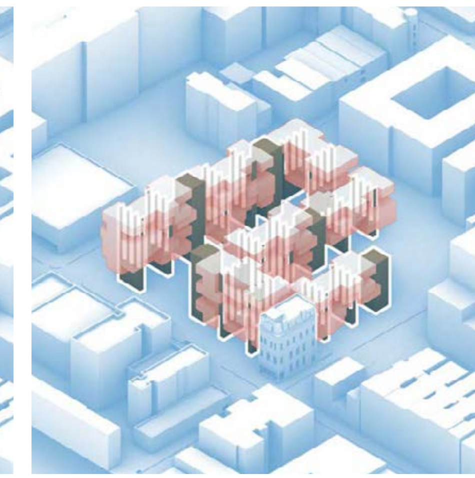
Extruding winter garden ribbon



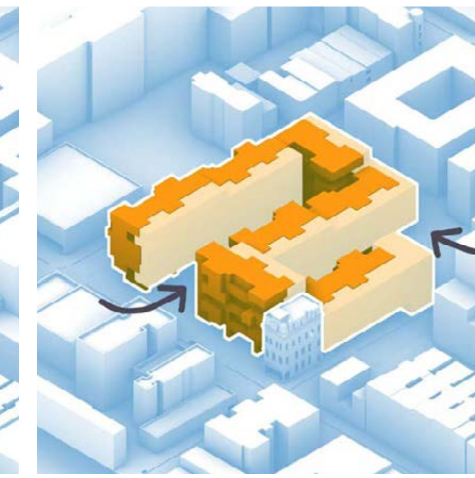
Optimizing form according to direct sun hours



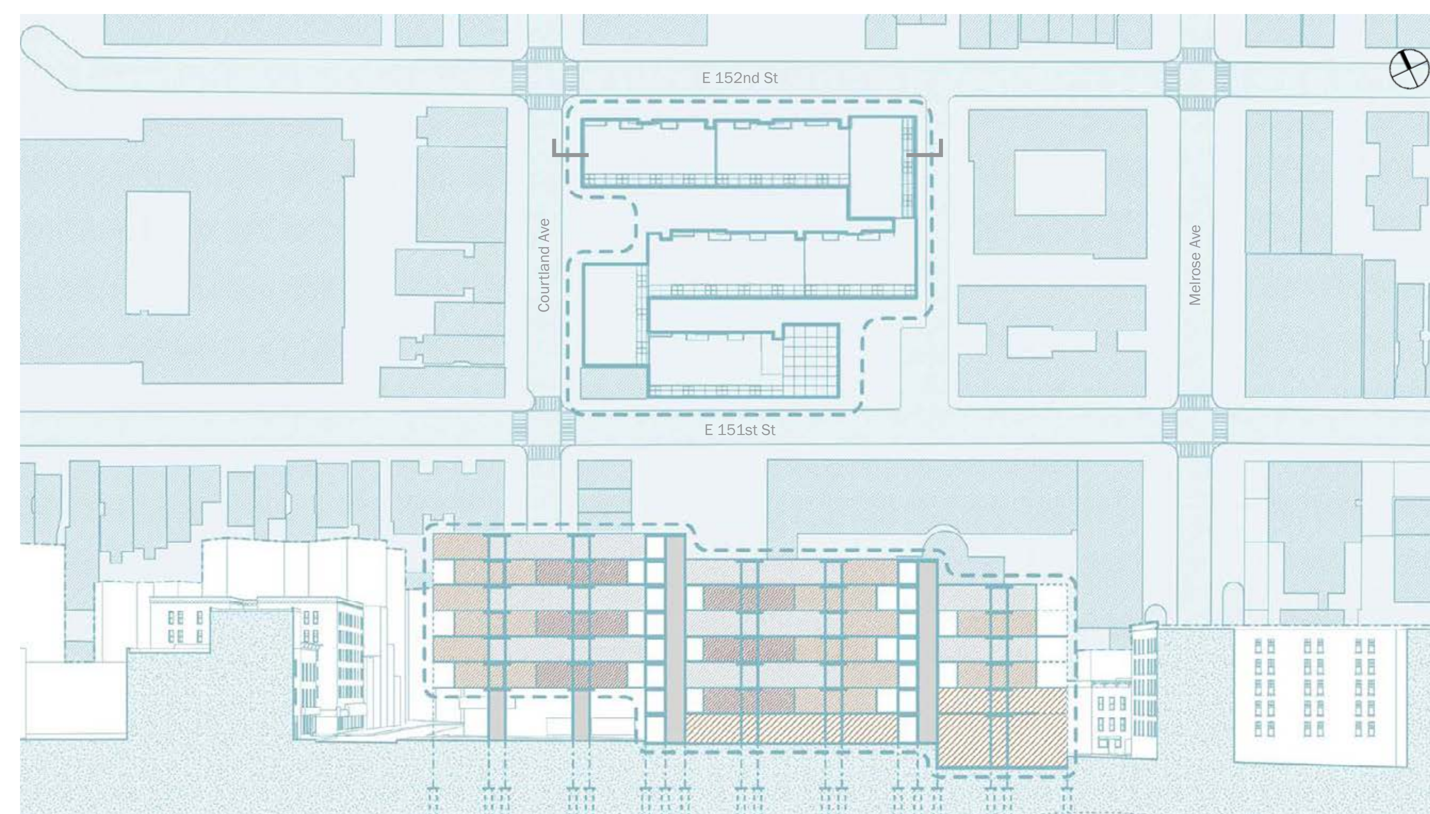
Plugging unit clusters into winter garden ribbon

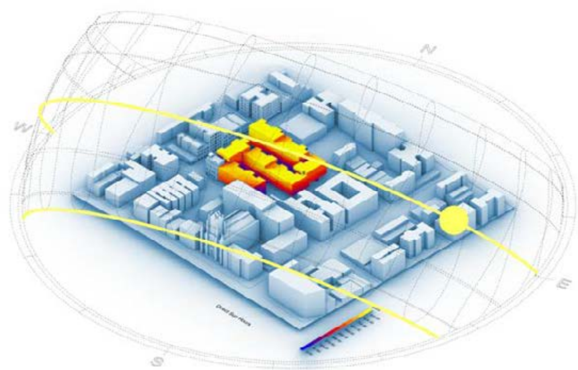


Arranging service and structural bays

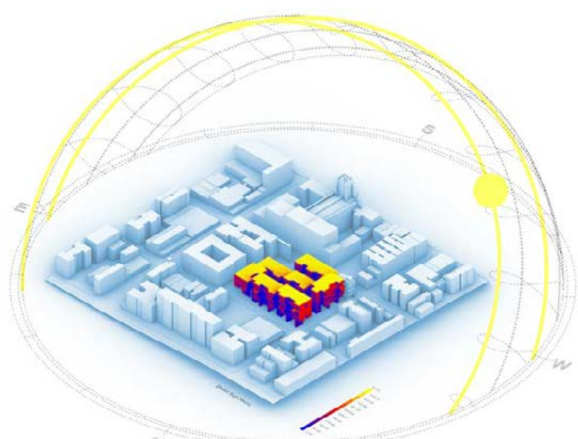


Engaging the public





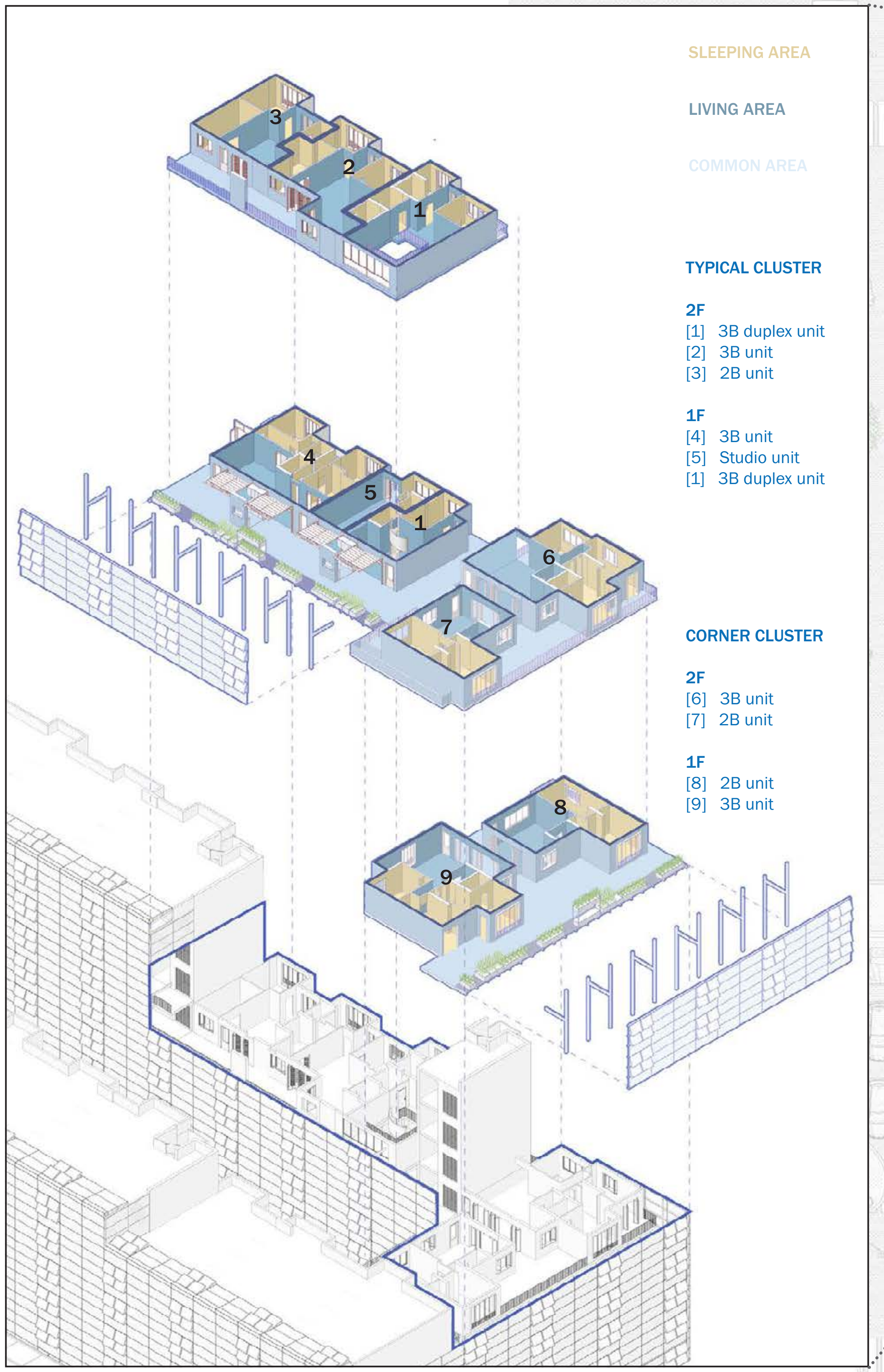
Winter direct solar energy heats south facade

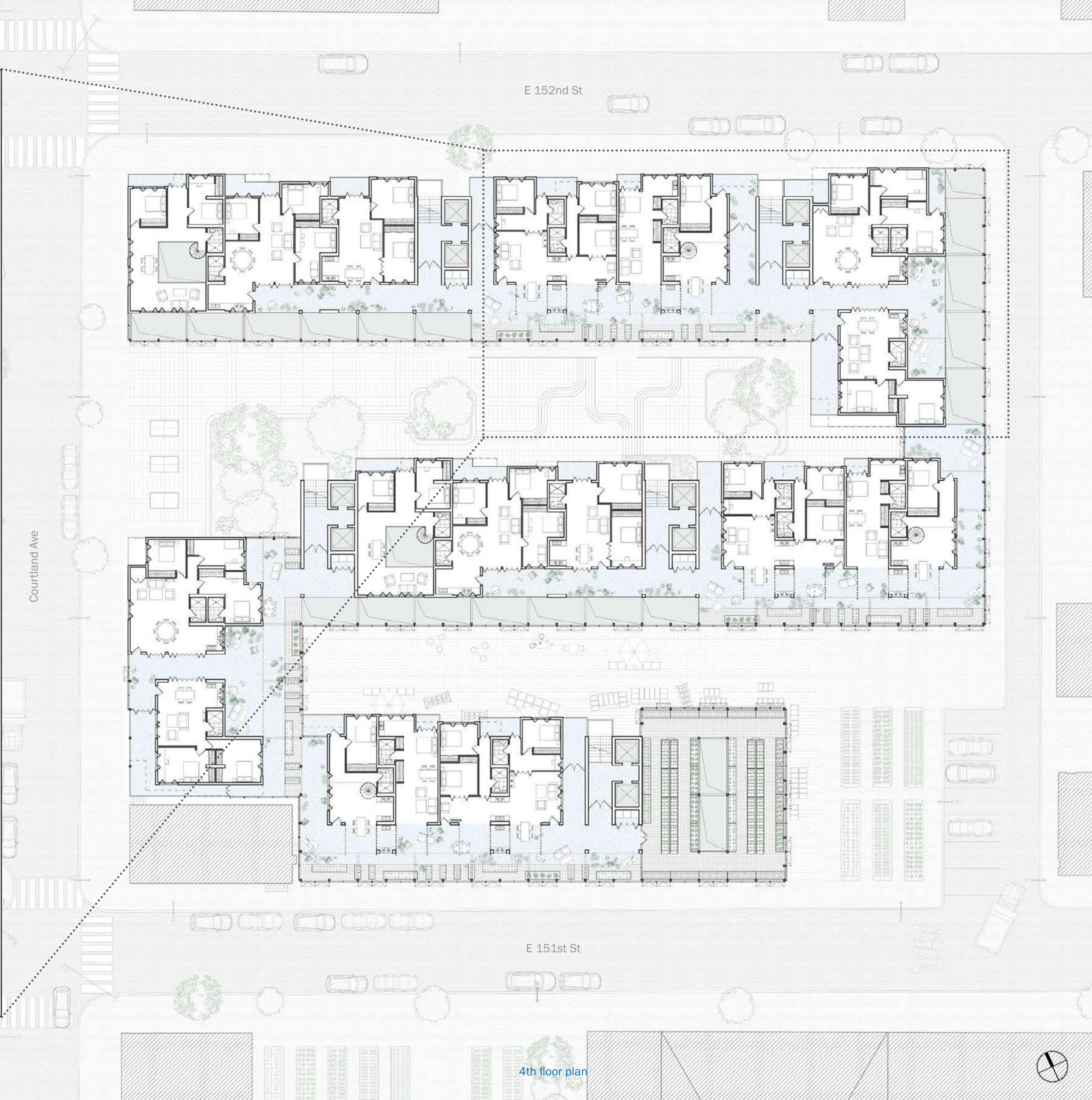


Summer direct light cannot reach north facade

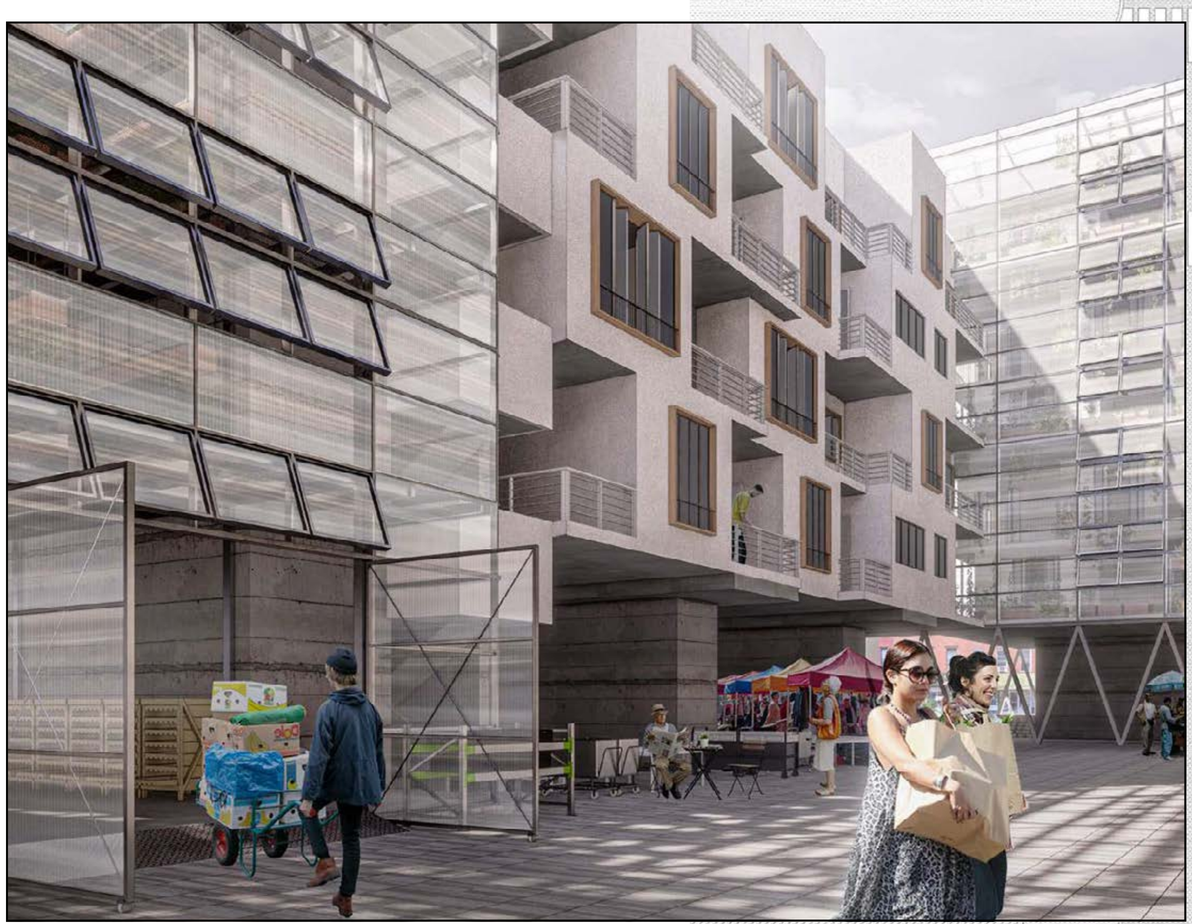
North elevation

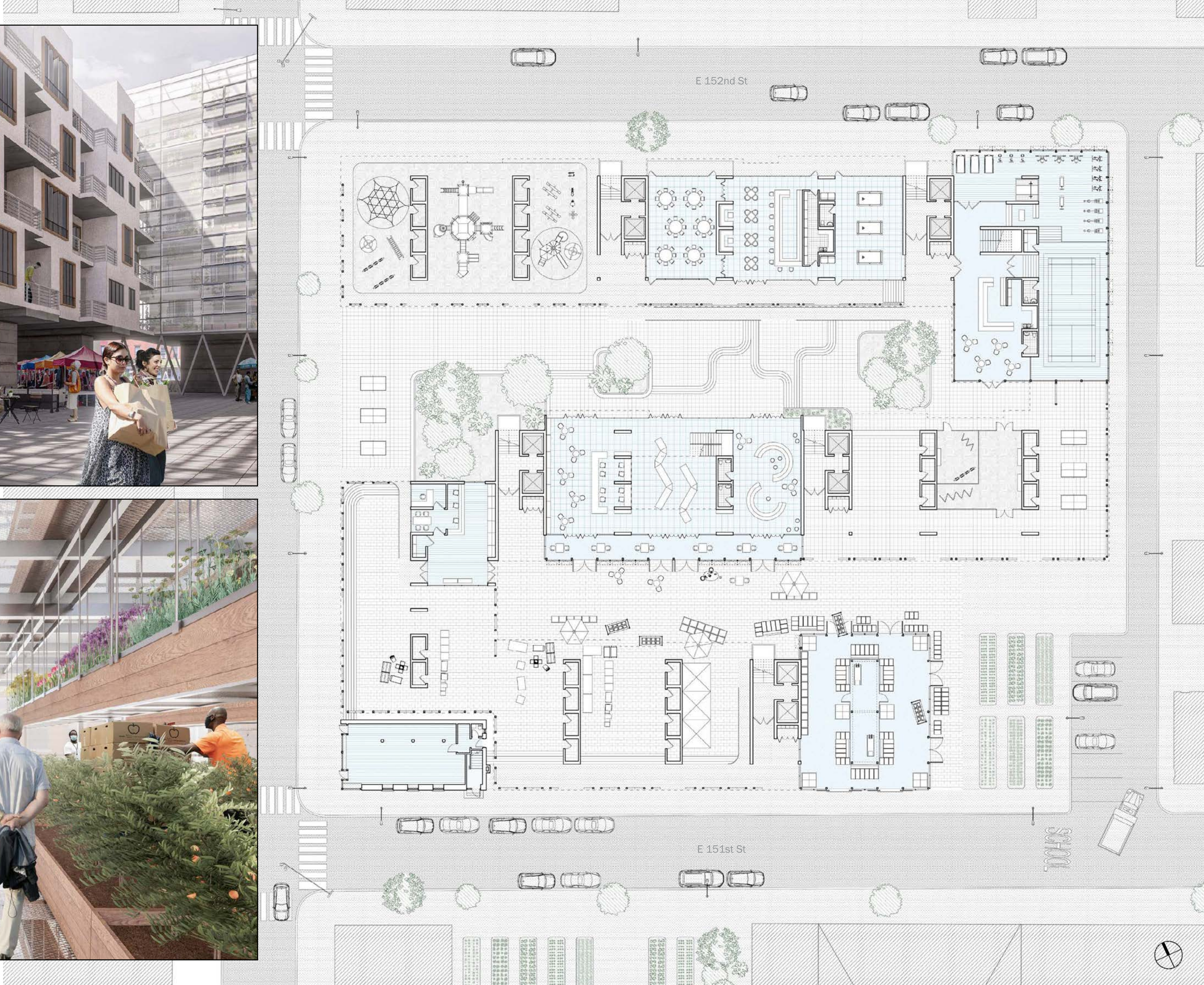
South elevation

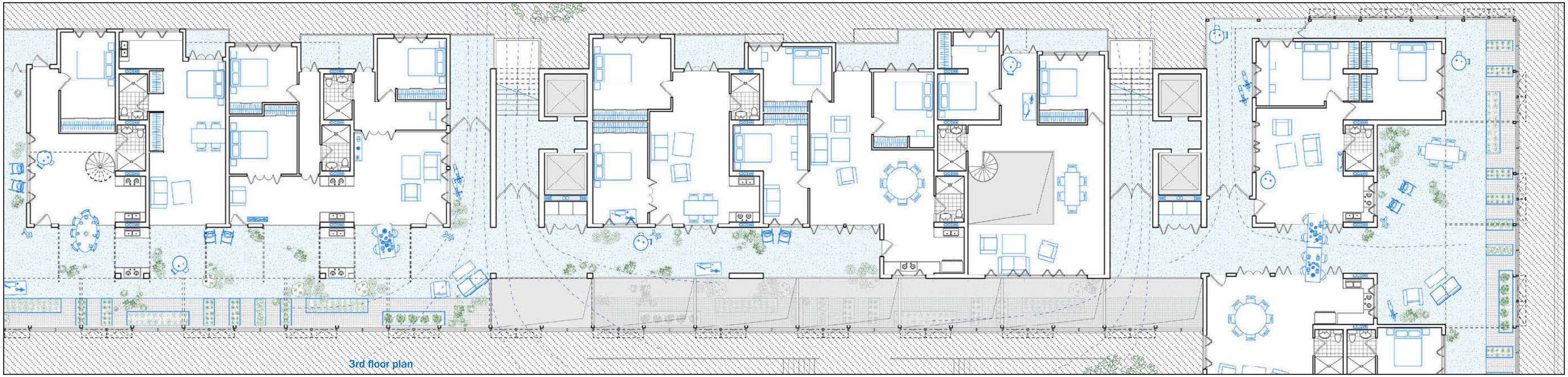


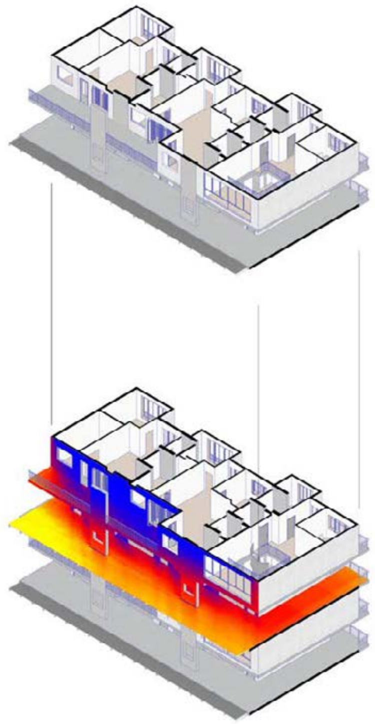


4th floor plan

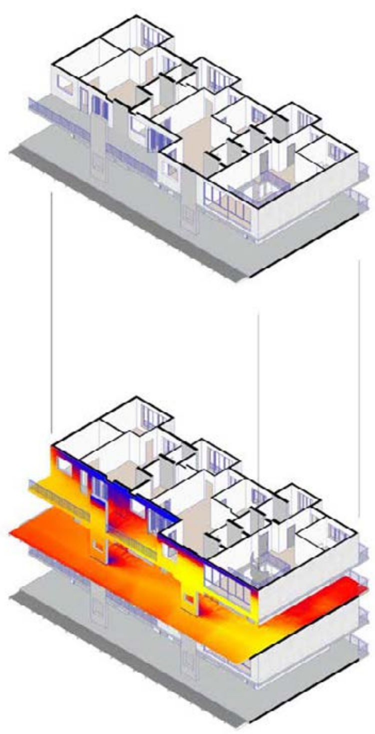



E 152nd St
E 151st St
SCHOOL


3rd floor plan

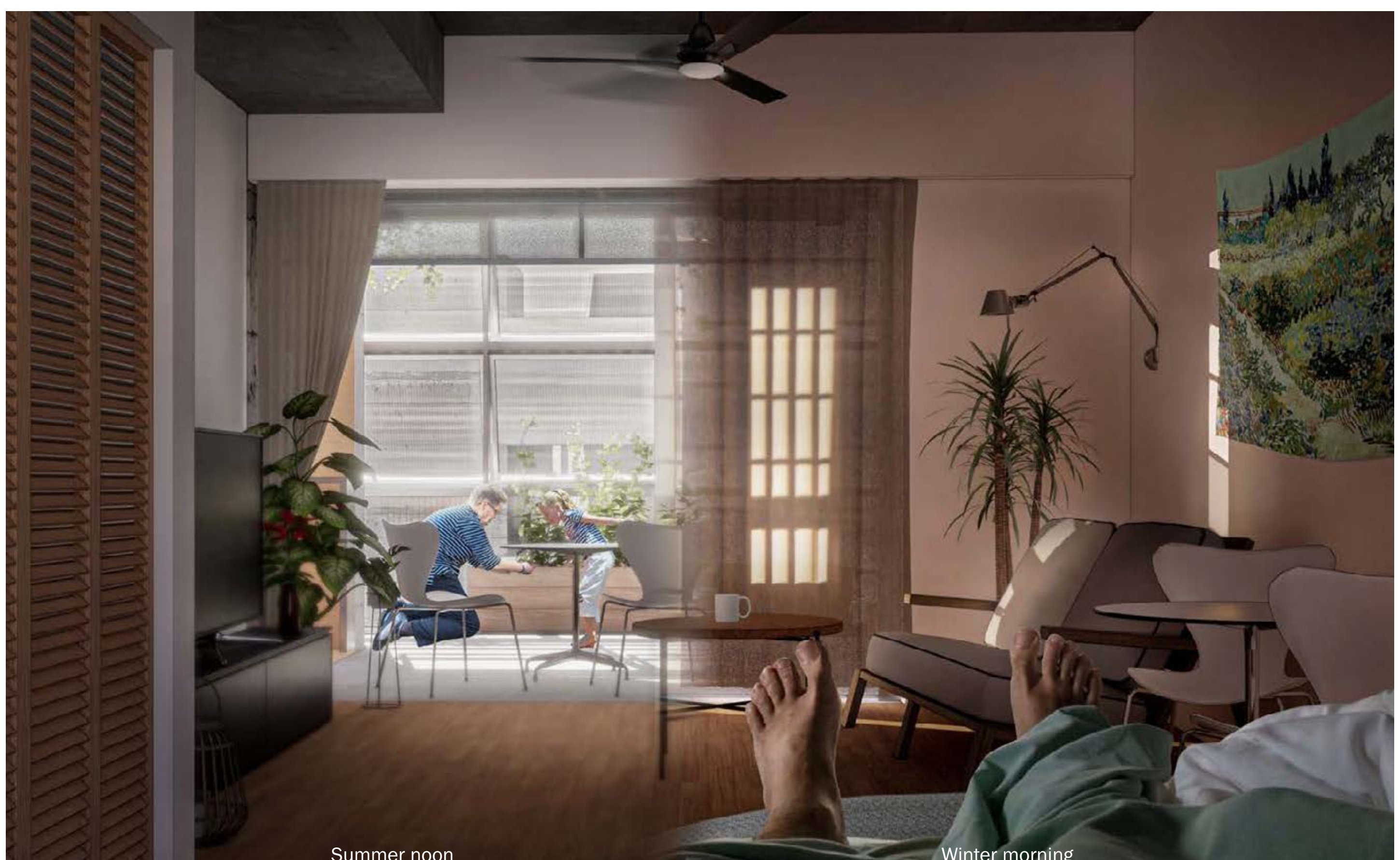


Summer direct sunlight is rejected



Winter direct sunlight is welcomed

"Meso-spatial zone"



Summer noon

Winter morning

South Tivoli Bay, Dutchess County, Upstate New York

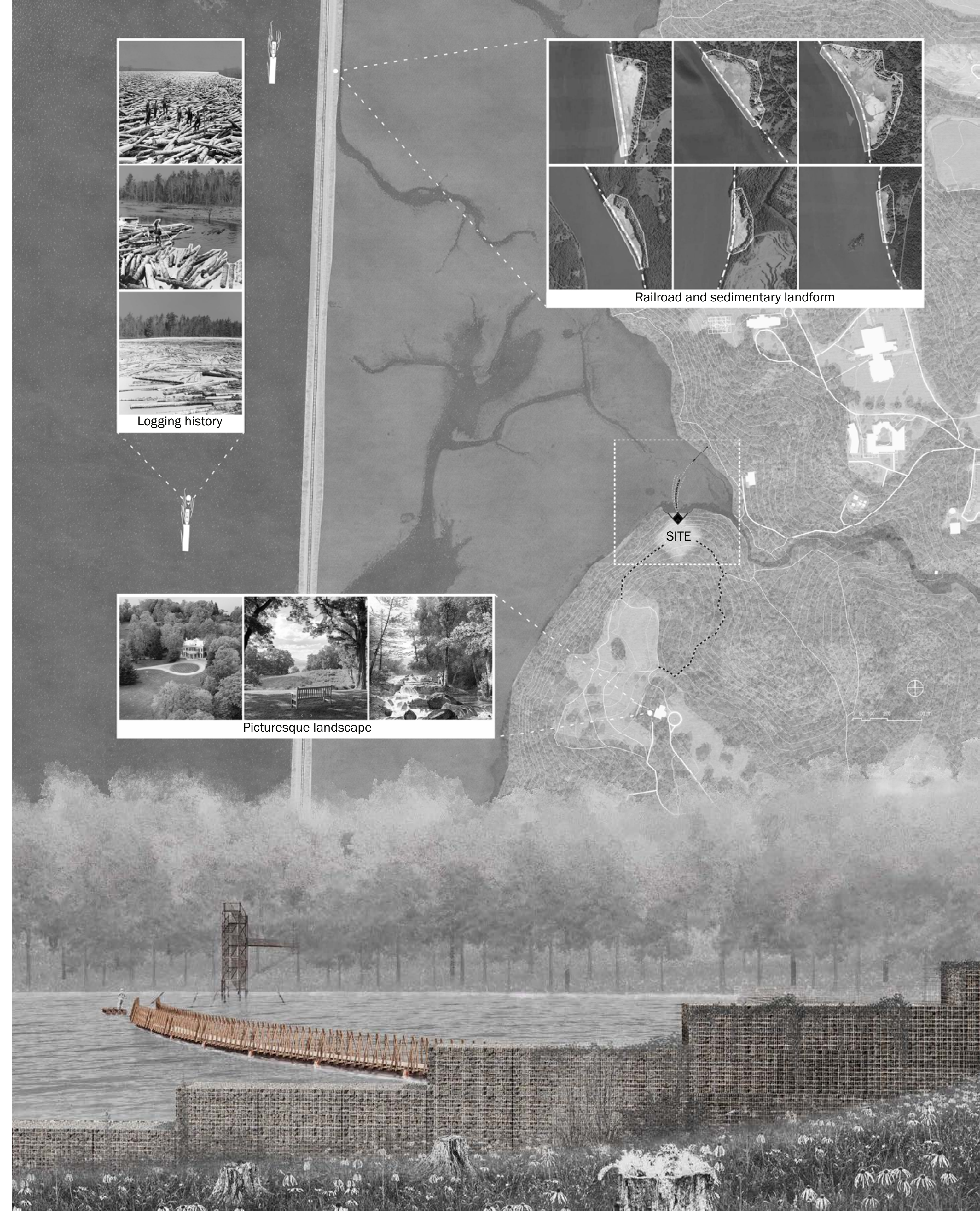
A TOMB
A MUSEUM OF NATURE

M.ARCH_ADV STUDIO 4_2022 SP
INDIVIDUAL ACADEMIC PROJECT
INSTRUCTOR: ROBERT MARINO

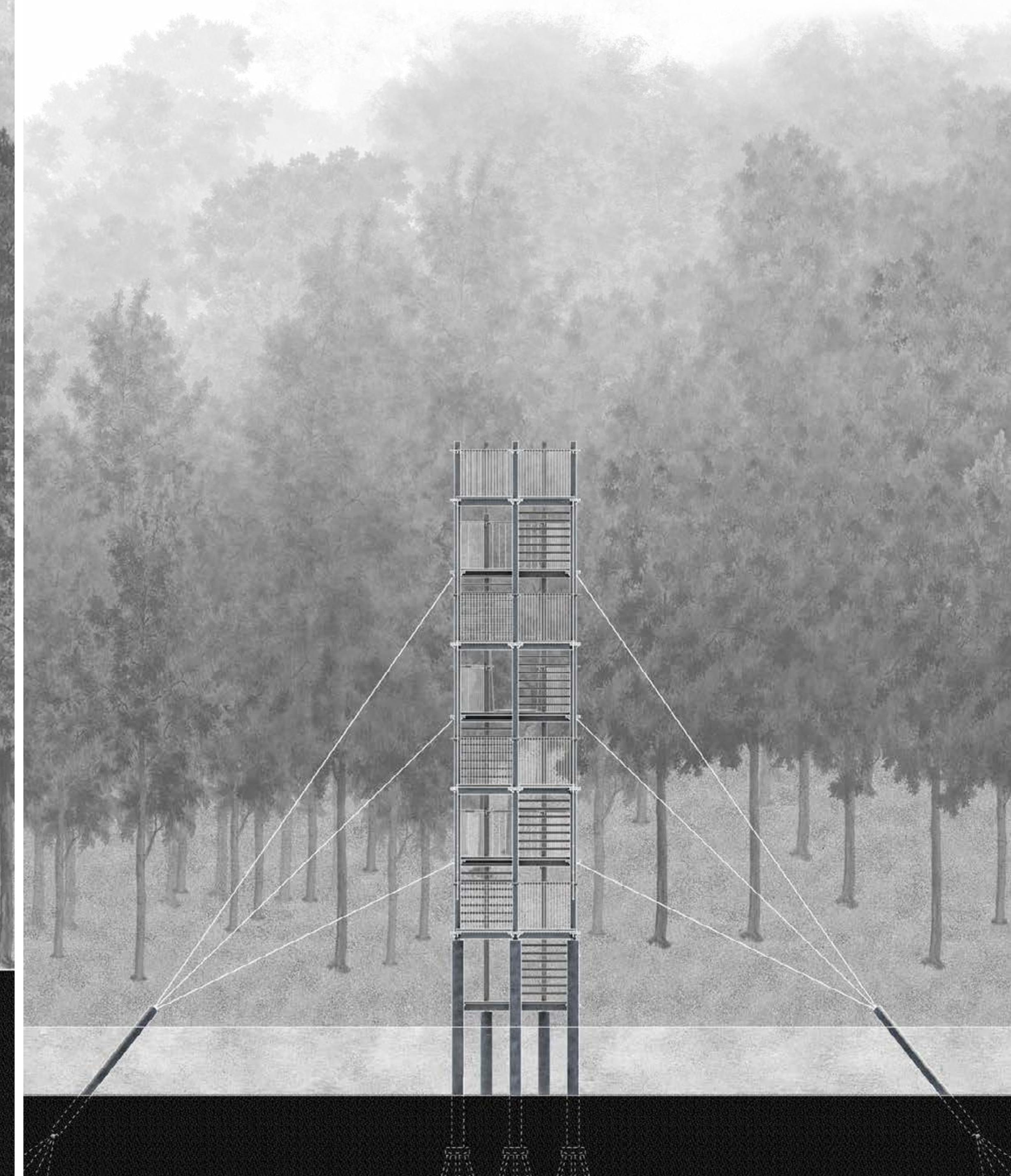
Wherever we build, we consume resources that are sourced somewhere. Whatever we construct, we bring impacts to the ground, water, and sky. Designing a museum of nature within the natural landscape is inherently paradoxical - we will have to damage and encapsulate the very subject that we are aiming to celebrate and worship.

South Tivoli Bay located next to Bard College in Upstate New York is separated from the Hudson River which records a heavy industrial history by an amtrack railway. Its mudflat landform is not a pure natural creation but a synthesized complex product of the presence of the artificially constructed railroad and the natural sedimentary process.

Therefore, the nature is not innocent or singular - it is a dynamically changing subject that records artificial forces. <u>This museum delivers a clear and bold sign of human intervention that is constructed out of many on-site and naturally sourced materials. At the same time, it becomes a tomb of everything that is consumed by the action of building</u>.

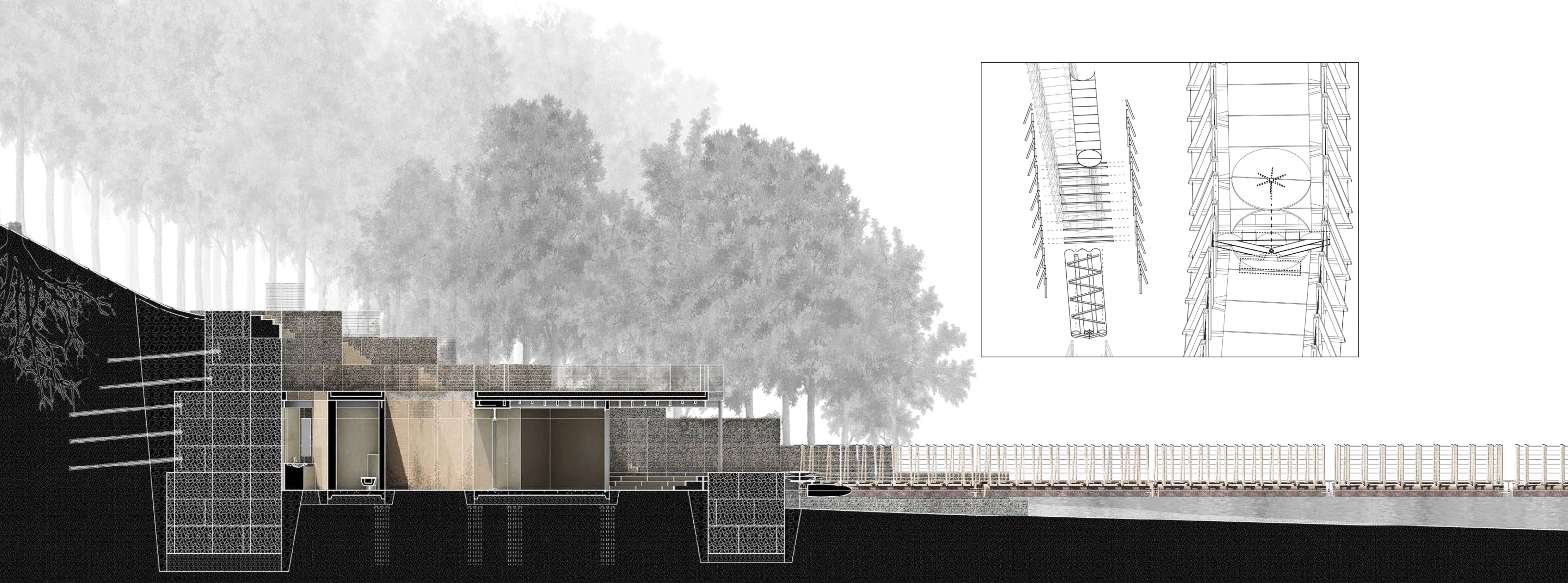


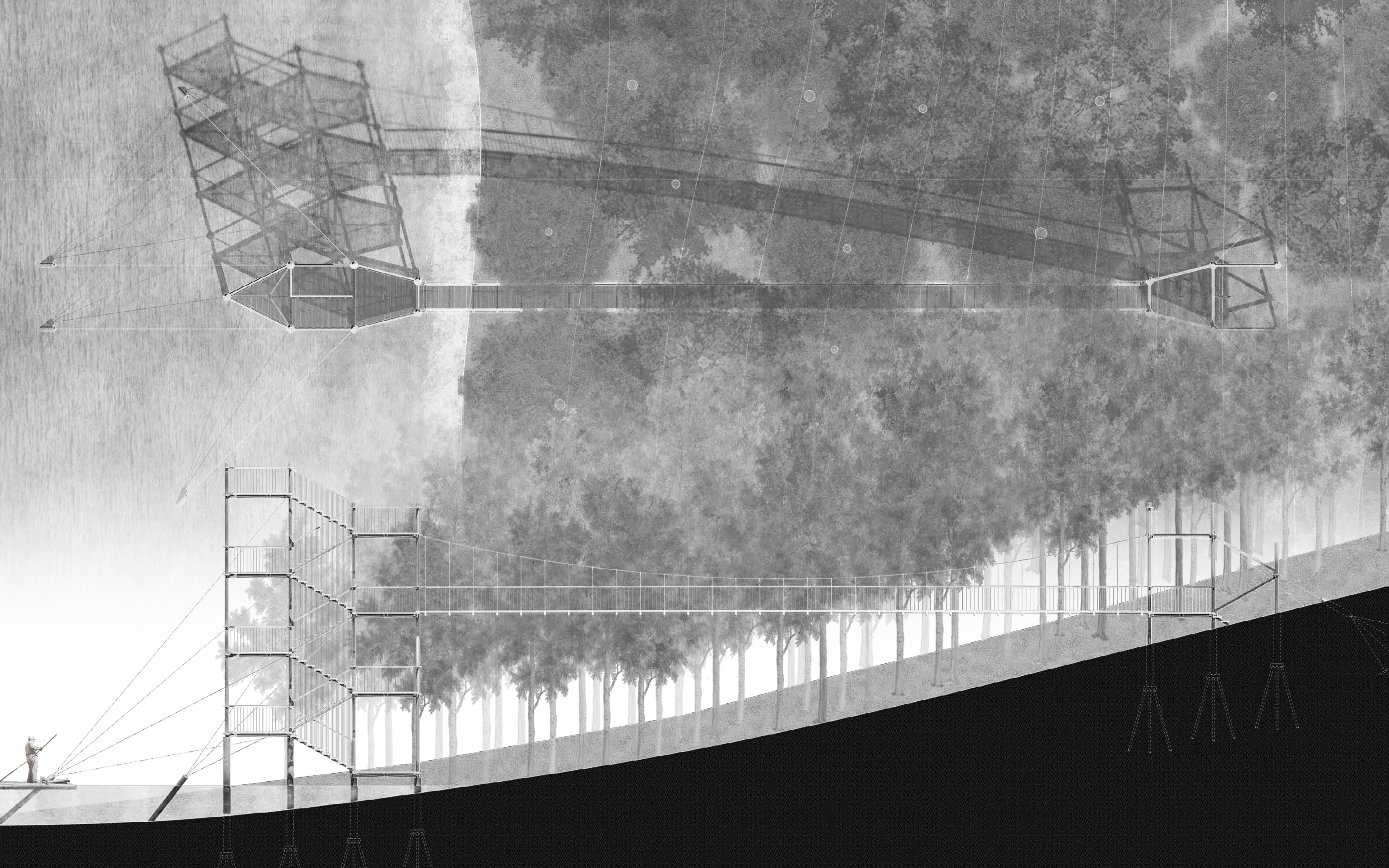


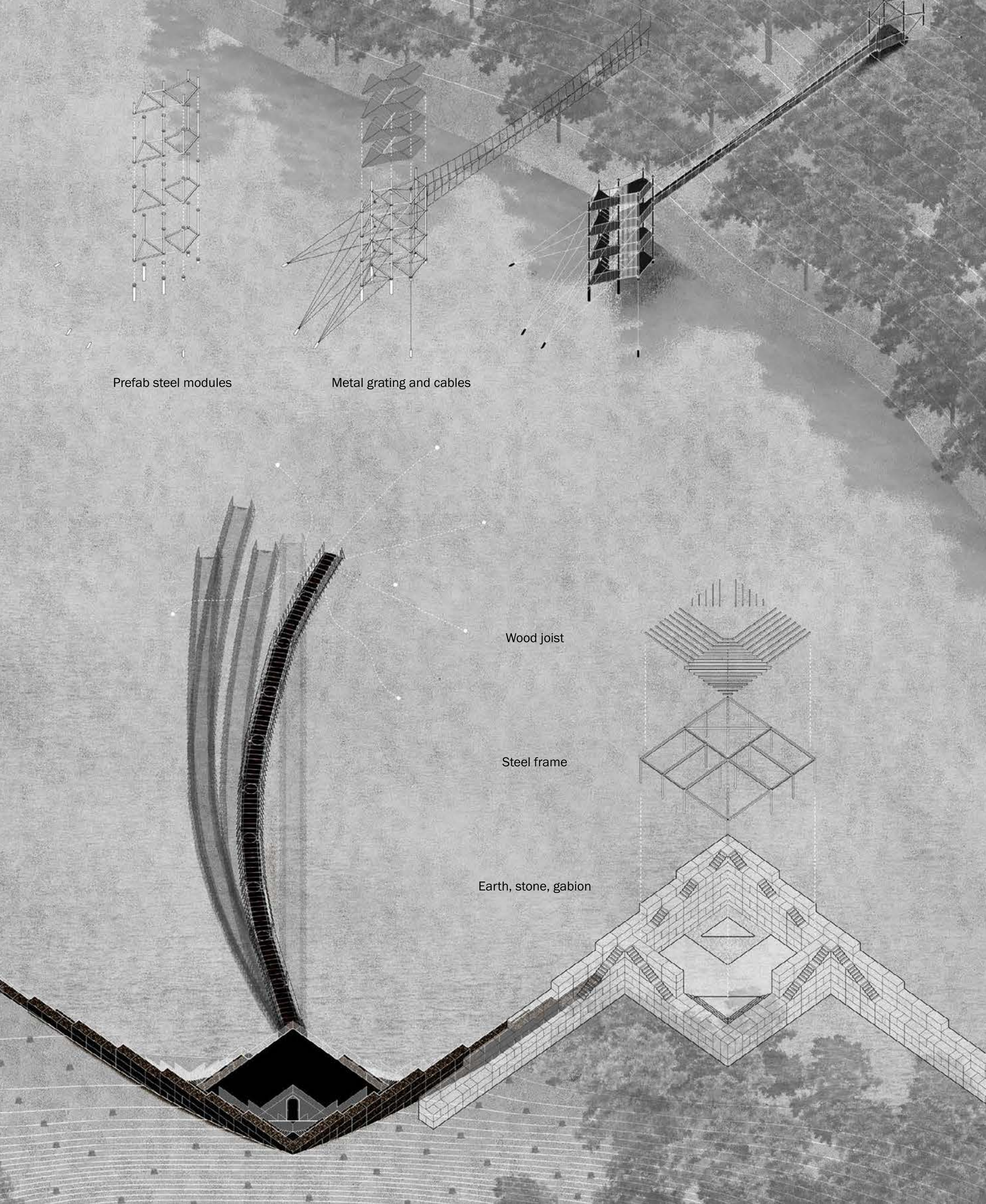


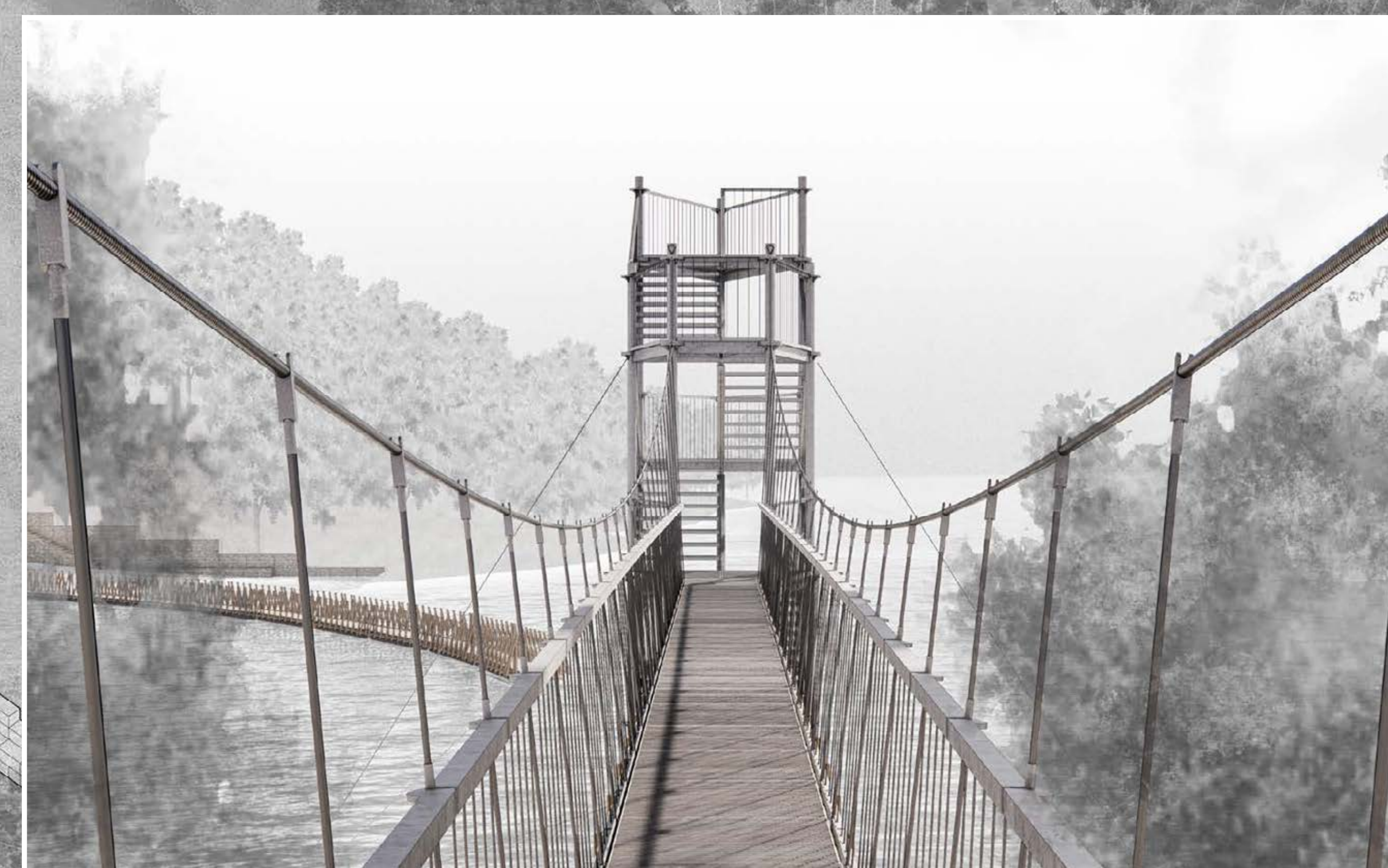









Prefab steel modules
Metal grating and cables
Wood joist
Steel frame
Earth, stone, gabion

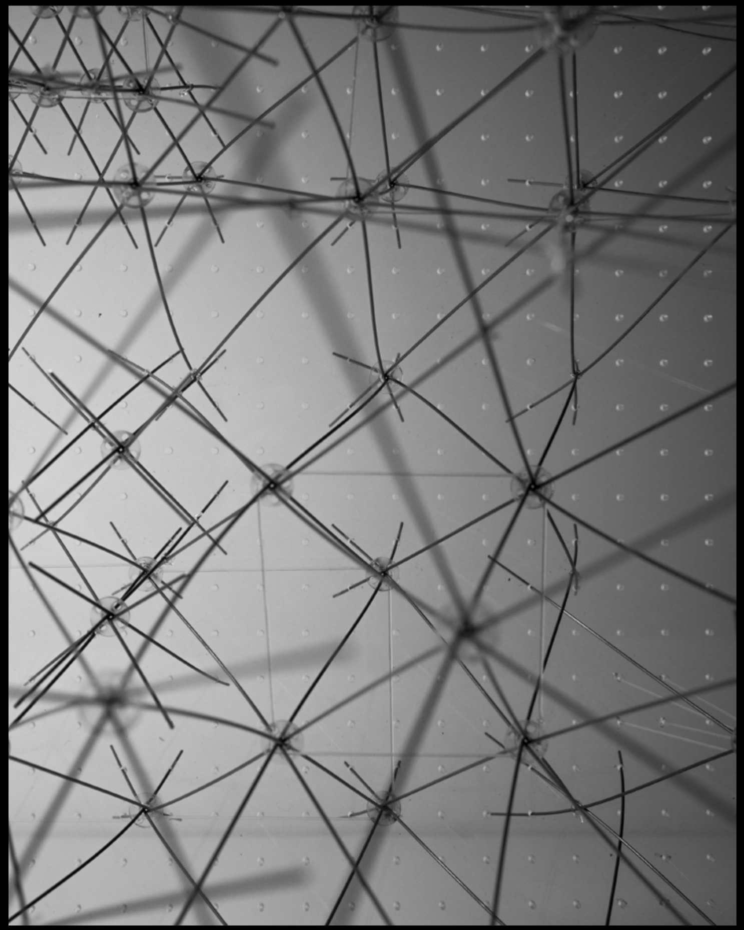


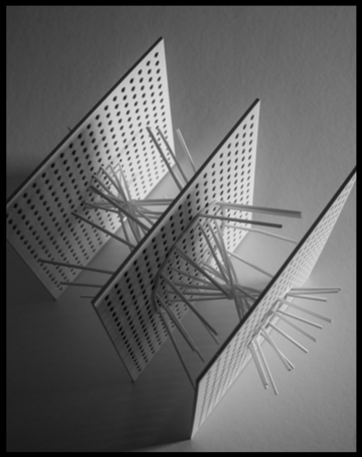
PERMEABLE CLUSTERS

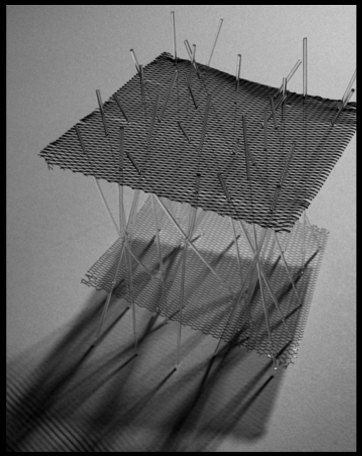
M.ARCH_CORE 2_2020 SP
INDIVIDUAL ACADEMIC PROJECT
INSTRUCTOR: KARLA ROTHSTEIN

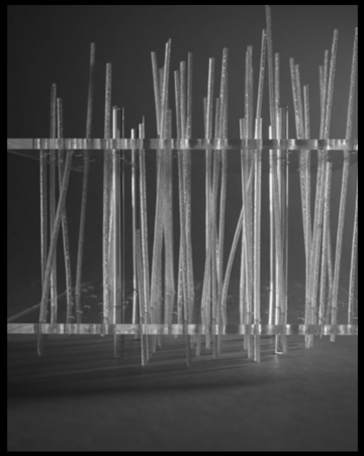
In the early materiality study, the grid is used as a scaffold system that anchors gradually accumulating parts. The two elements constructs a new system of coexistence in the form of permeable clusters that allow a gradient from porous to opaque, individual to interconnected.

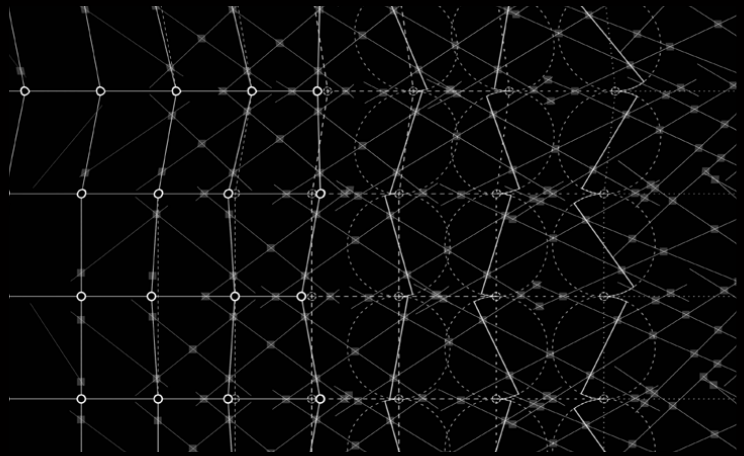
The existing H-plan Public School 64 is reduced to its west wing and two corners on the east side so that its void connects to the neighboring rear yard, exposes the school to the community, and channels light into the school. Three space frame clusters fill in the void and raise the long span space frame plane off the ground. The elevated courtyard plane is then used as the central school traffic junction, allowing E 10th street and E 9th street to be connected. The existing building parts are used as nodes that house school-wide shared programs and connect together classrooms on different levels and tether them to the courtyard plane and then to the ground where public programs are located.

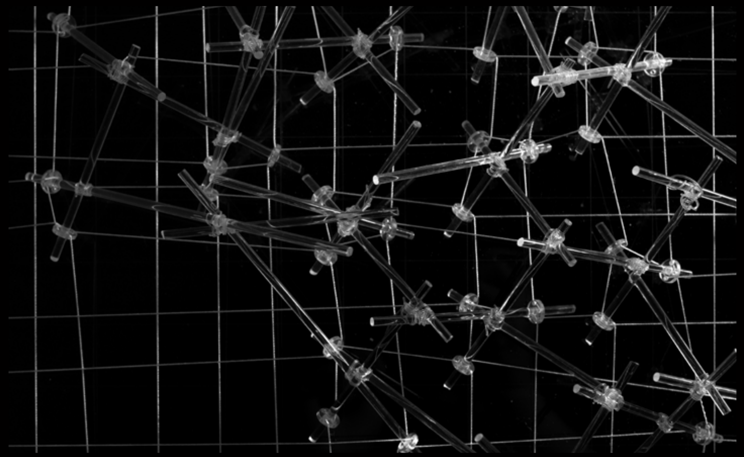


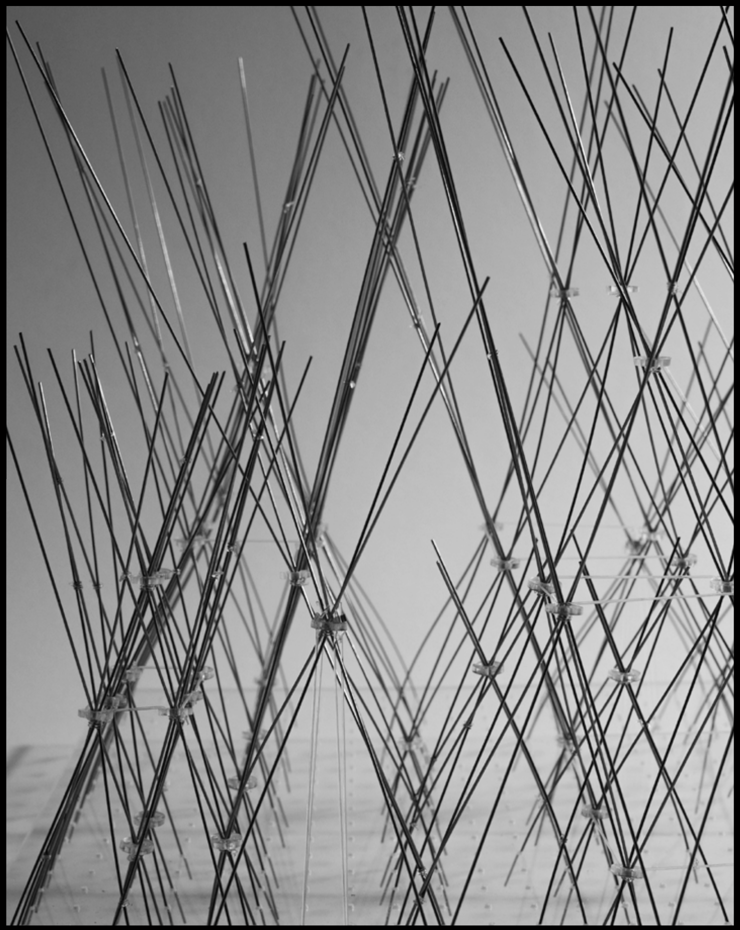


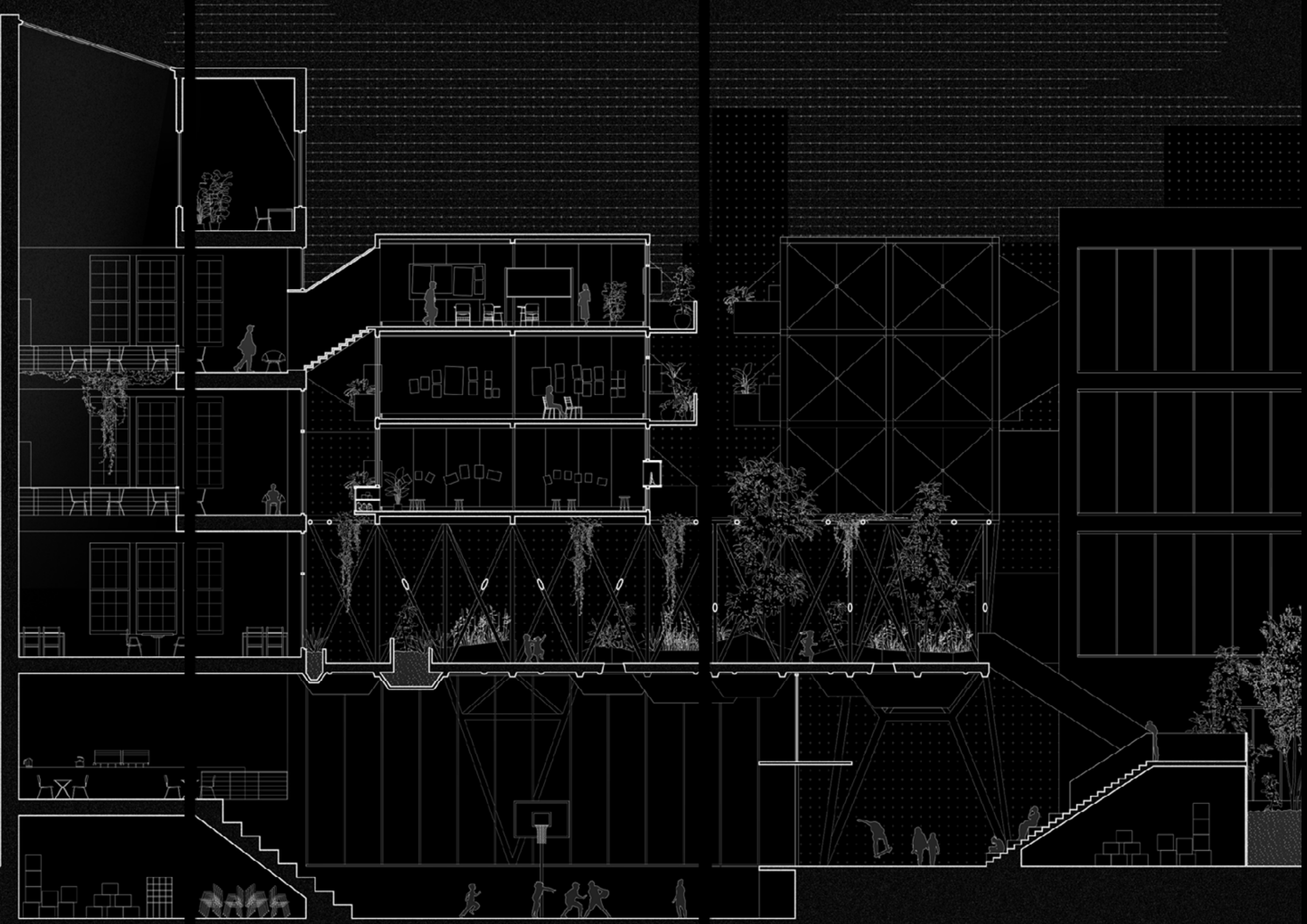






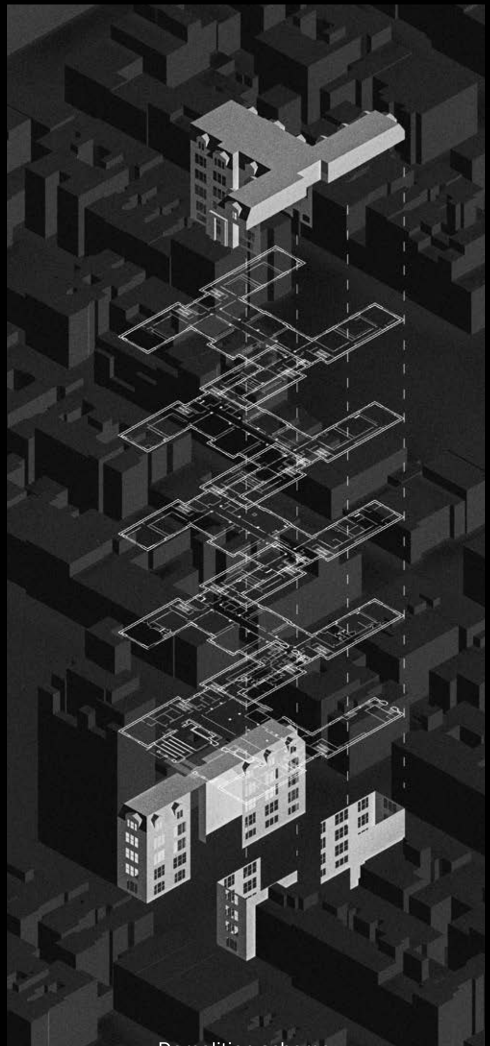


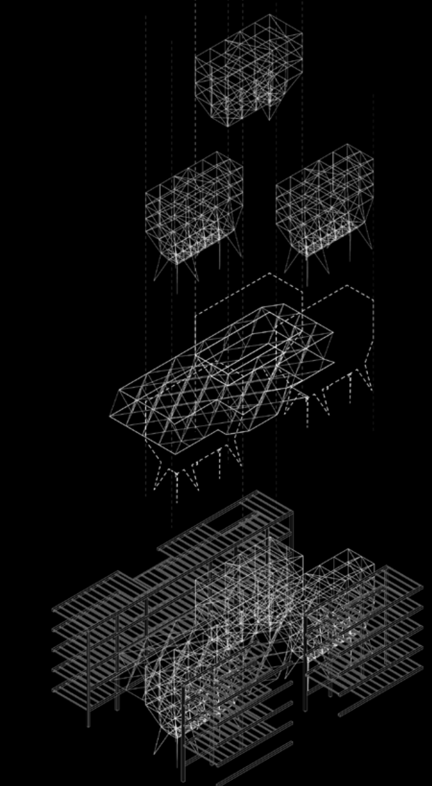


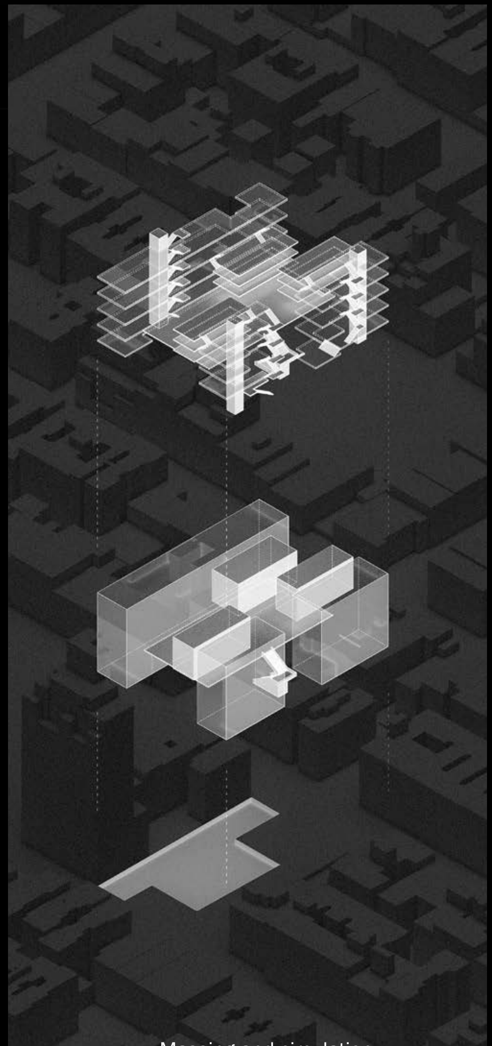


Classrooms are arranged to three clusters floating above the planted plane and each cluster is attached to its adjacent existing building portion with corresponding communal programs – main library next to the middle school, mixed-used library lounge next to primary school, and play area next to kindergarten. These exiting building portions confined behind solid brick walls and previously packed with pancaked classrooms are penetrated by giant light courts, which transform them into interconnected nodes that constantly ask student to permeate through the old school boundary defined by massive brick walls as they move between instructed intimate learning and self-guided study or play.

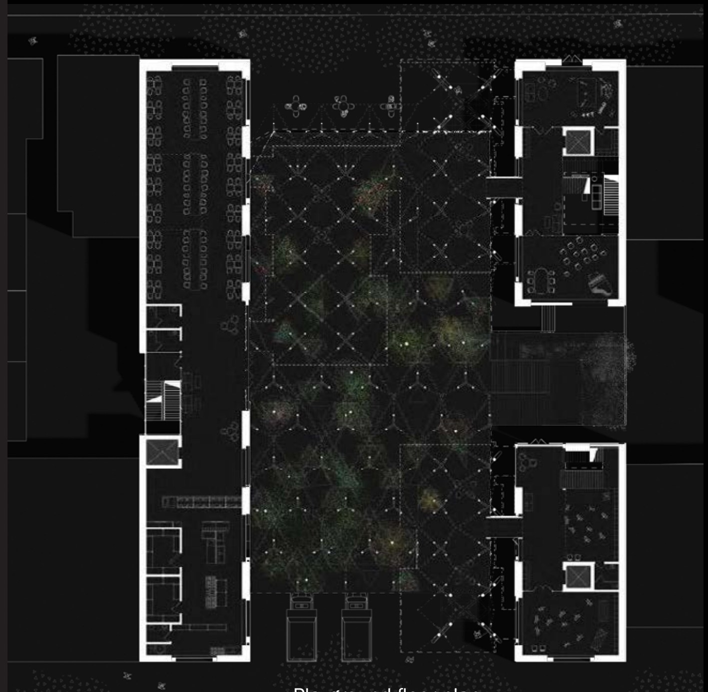
Inside the classroom, giant pivot panels are used as partitions, and can be operated by kids to reconfigure these spaces into galleries for exhibiting their artworks. The classroom's façade employs an infill system that accepts see-through storage and counter modules whose positions are calibrated to match children of various size throughout the school and thus such gradient of age is reflects directly on the school's exterior. Contrasting to the previous brick façade that presents the school as a singular established institution, the new one emphasizes individuals within collectives and offers a democratic learning and interaction platform.

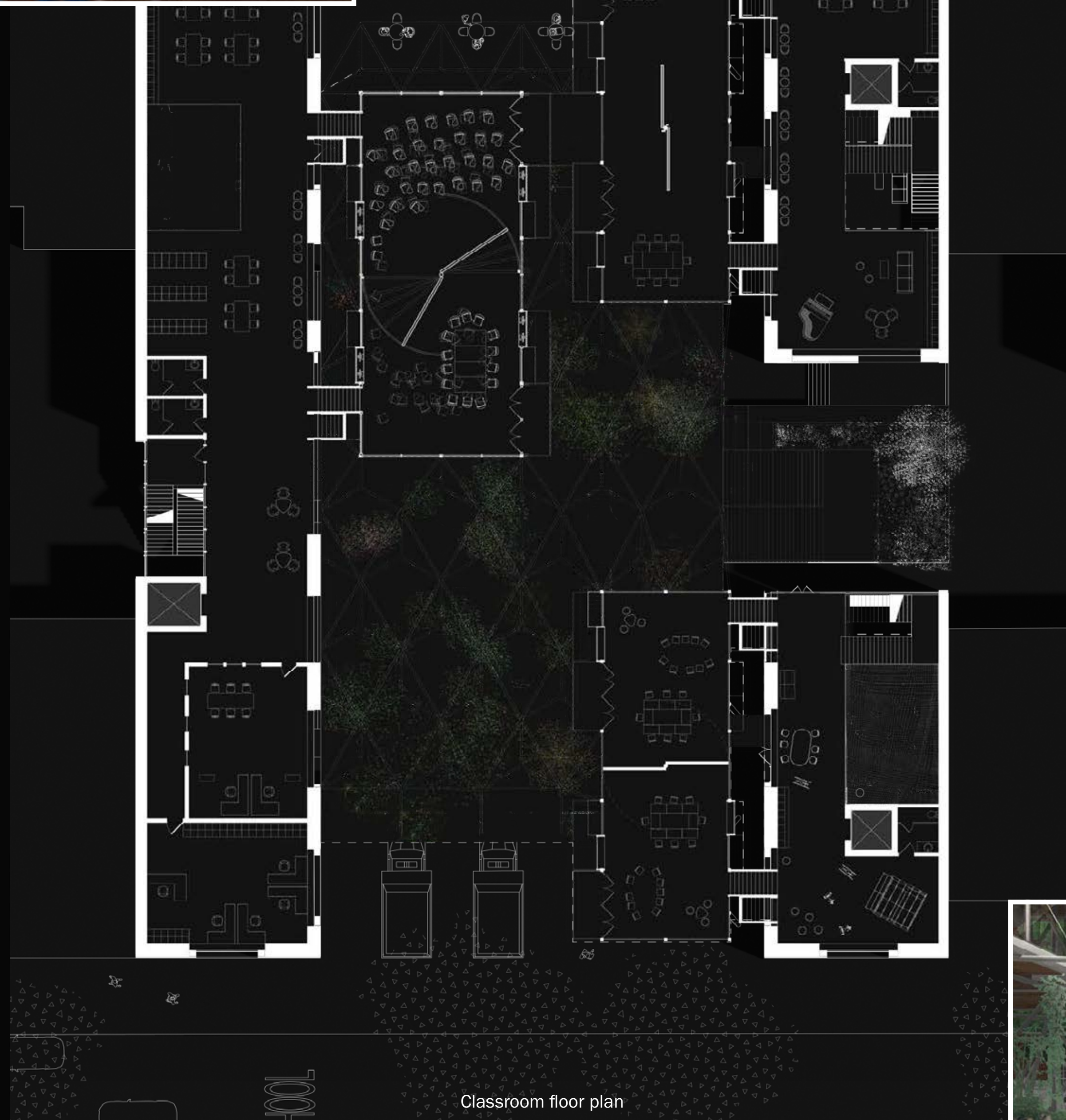

Demolition scheme


Structural scheme

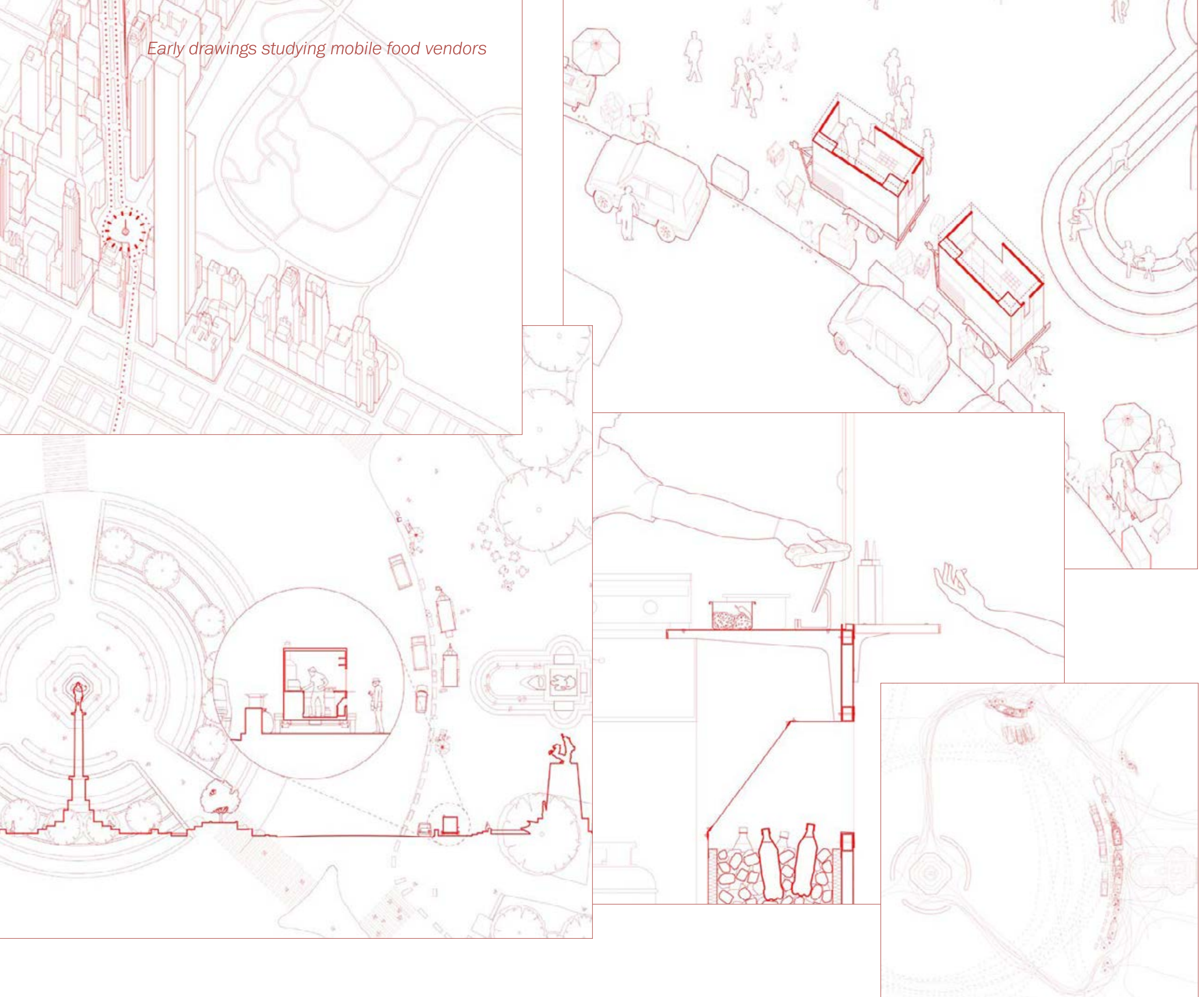

Massing and circulation


Ground floor plan

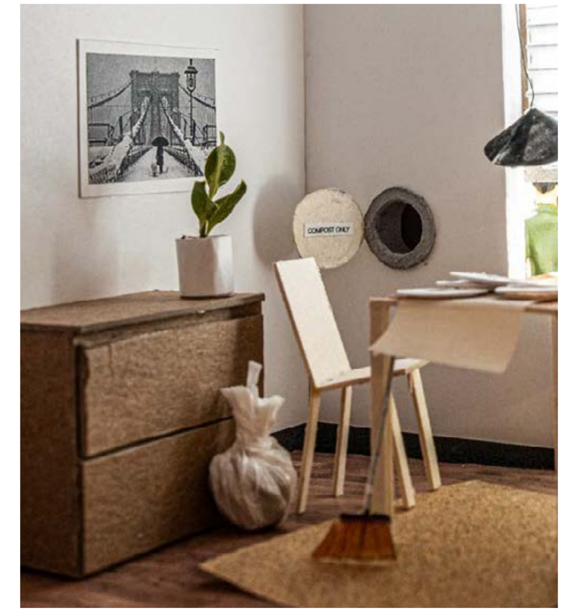

Playground floor plan

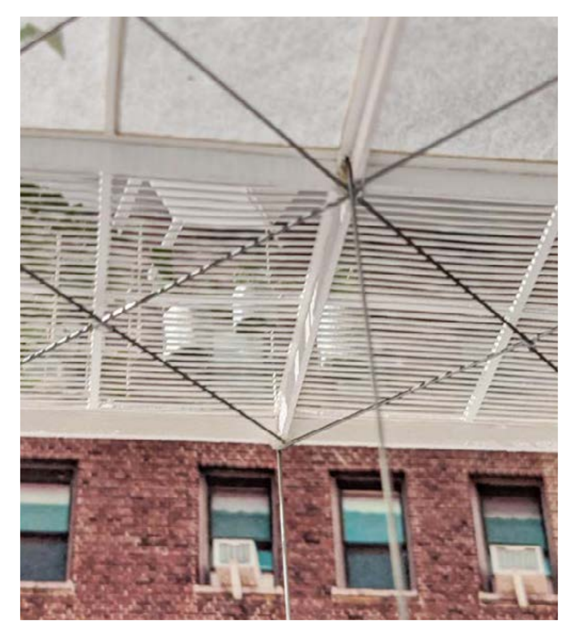


Classroom floor plan



Early drawings studying mobile food vendors





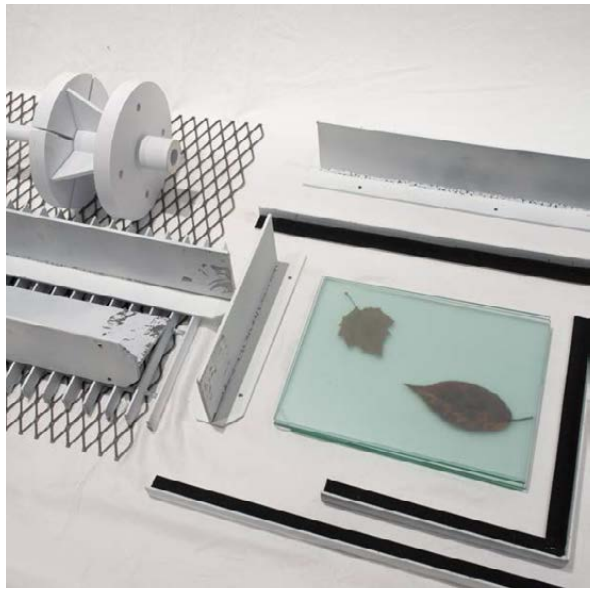
FOOD LOSS COMMONS

M.ARCH_CORE 1_2019 AU
INDIVIDUAL ACADEMIC PROJECT
INSTRUCTOR: ANNA PUIGJANER BARBERÁ

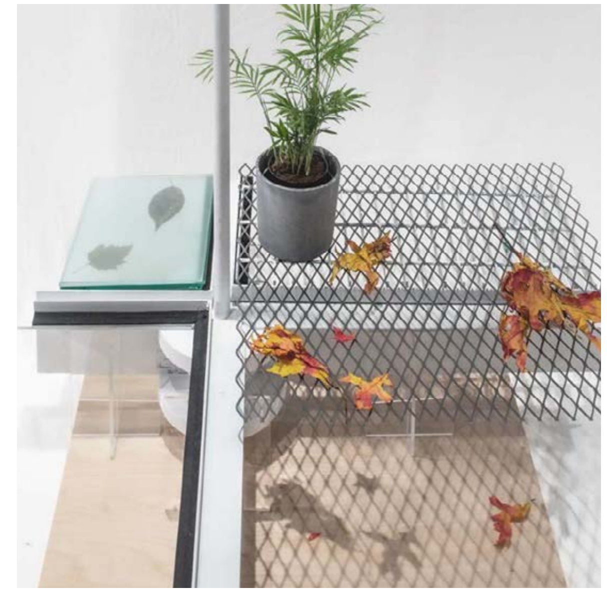
Food loss makes up to 20% of New York City's waste stream while a large portion of it can be compost and turned into fertilized soil. Can we localize public waste processing infrastructures and turn them into actual spaces?

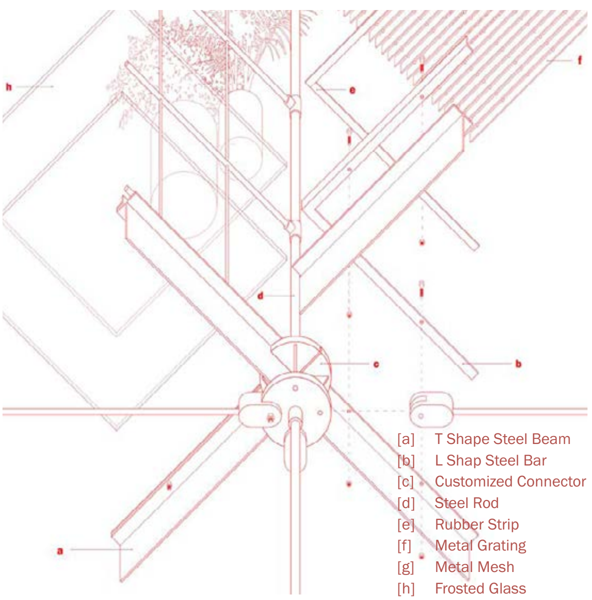
The project started with a series of drawings svtudying mobile food vendors near Columbus Circle in New York City. Its public attributes are not only signified by traffic or crowds but also by the visibility of garbage bags which hint the underlying waste management infrastructure.

In this new proposal for the 18-story prewar apartment building located on W 73rd St and Amsterdam Ave, food waste processing infrastructure is reimagined - it takes place on building facade in the form of food compost units that are directly installed outside kitchens.



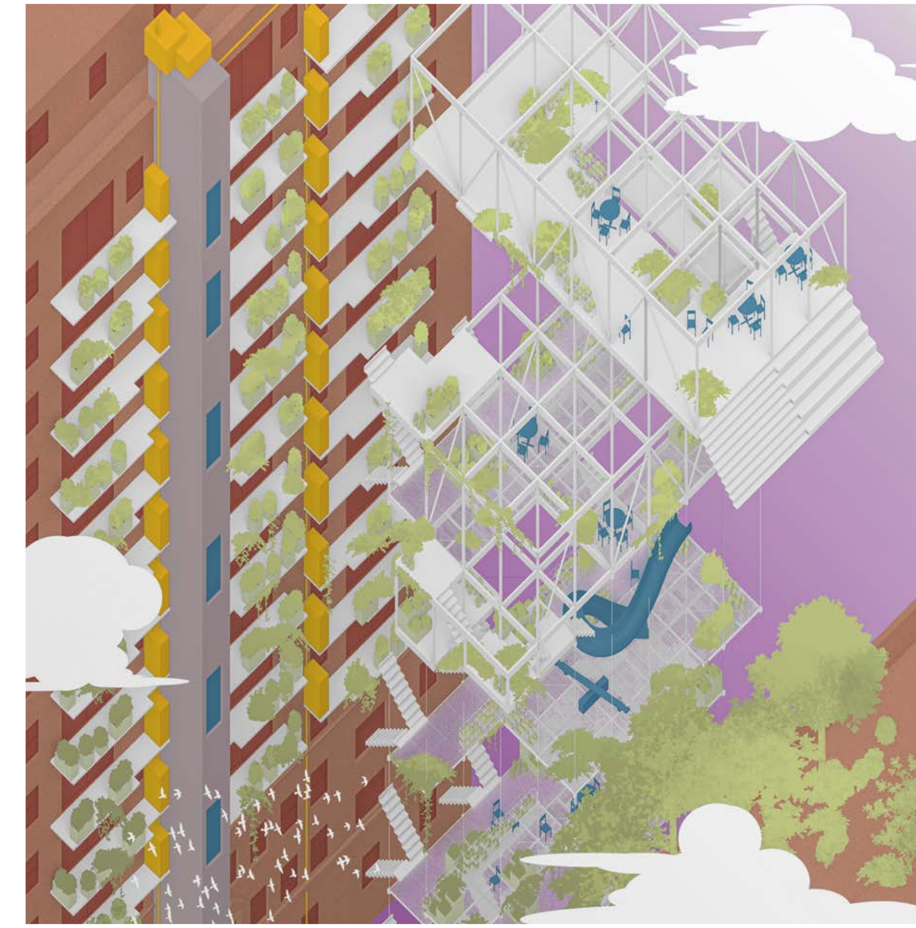
1:1 Tectonic mock-up

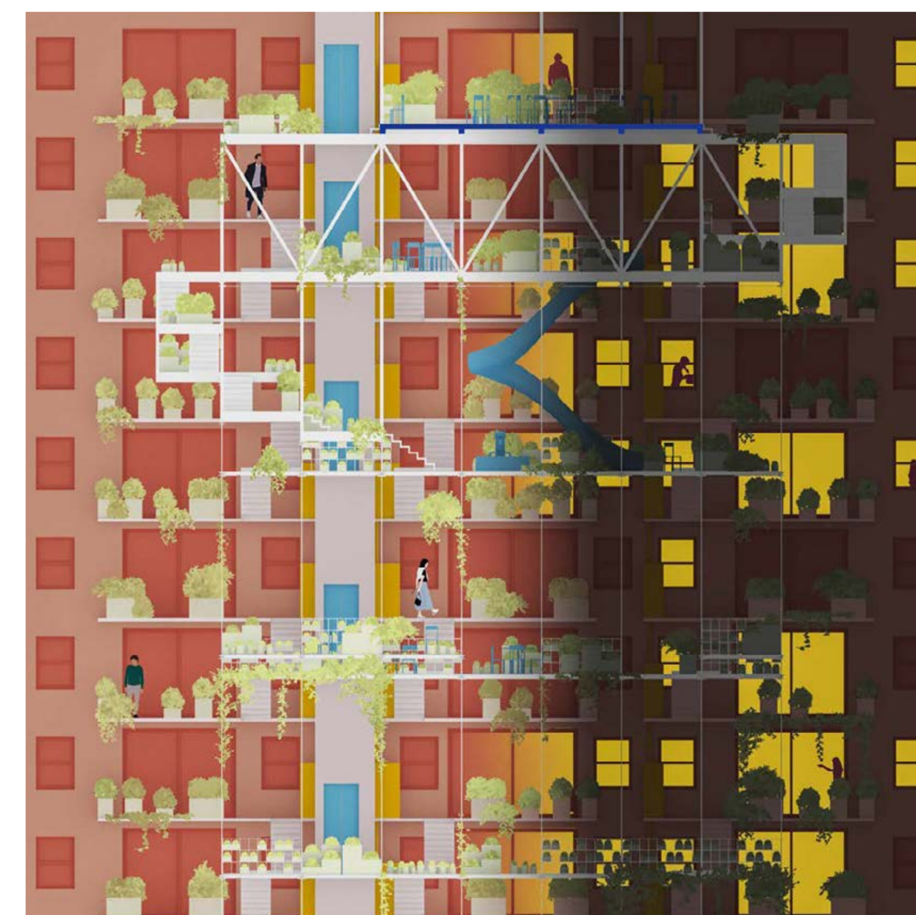


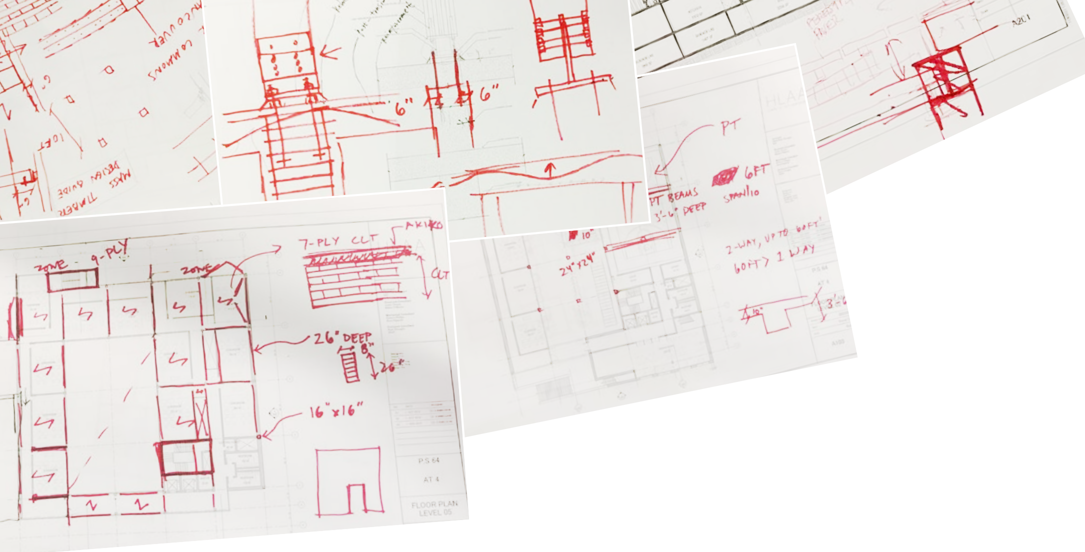


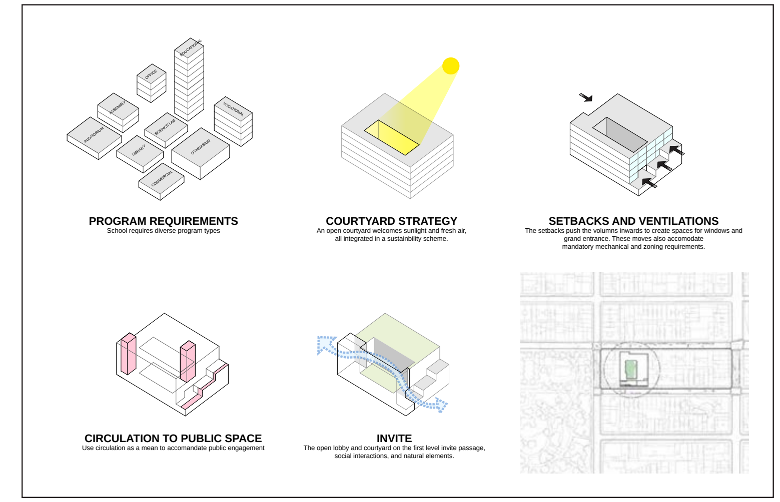
To obtain on site yard waste necessary for aerobic compost, domestic living space of each south-facing suites is extruded outward to form balconies where greenery inhibits. Further pathways connect adjacent floors and units through those extended balconies and creates small common areas shared by neighbors. The end product of aerobic compost - fertilized soil in the end goes back to the plants, forming a complete material cycle.

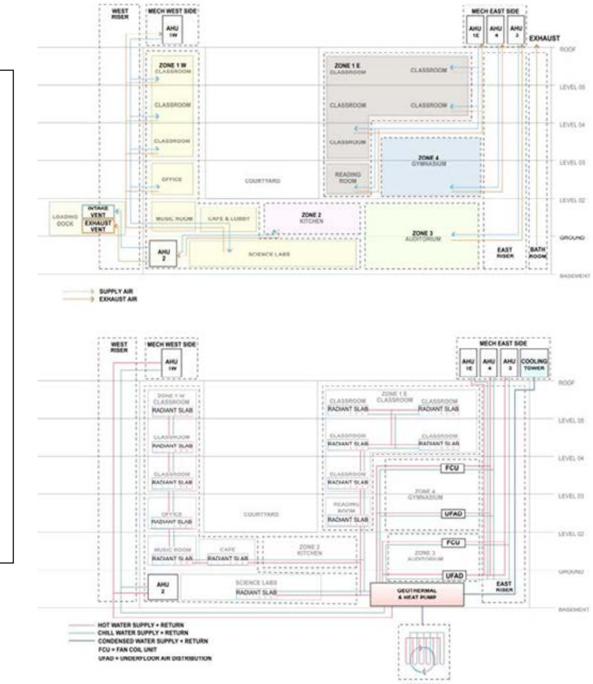
Creating shared family-friendly common spaces that implement the outdated and rigid existing apartment layout, the structure spans over the 18-story building and its neighbor apartment, and tapers down as sunlight diminishes. Exterior elevator gives general public access to the common during the day and helps transport excess waste onto the neighbor building's previously unused rooftop for further processing.









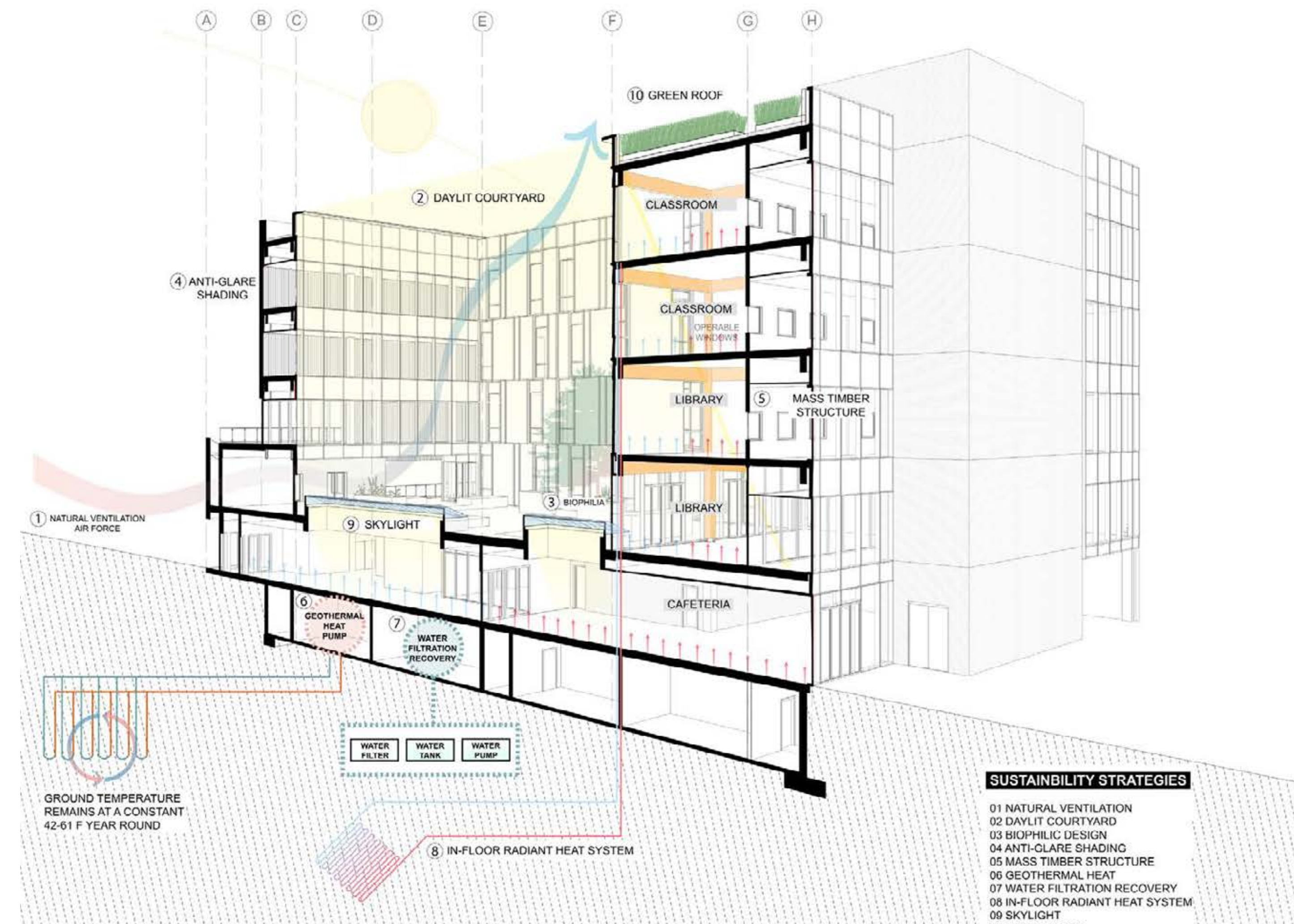


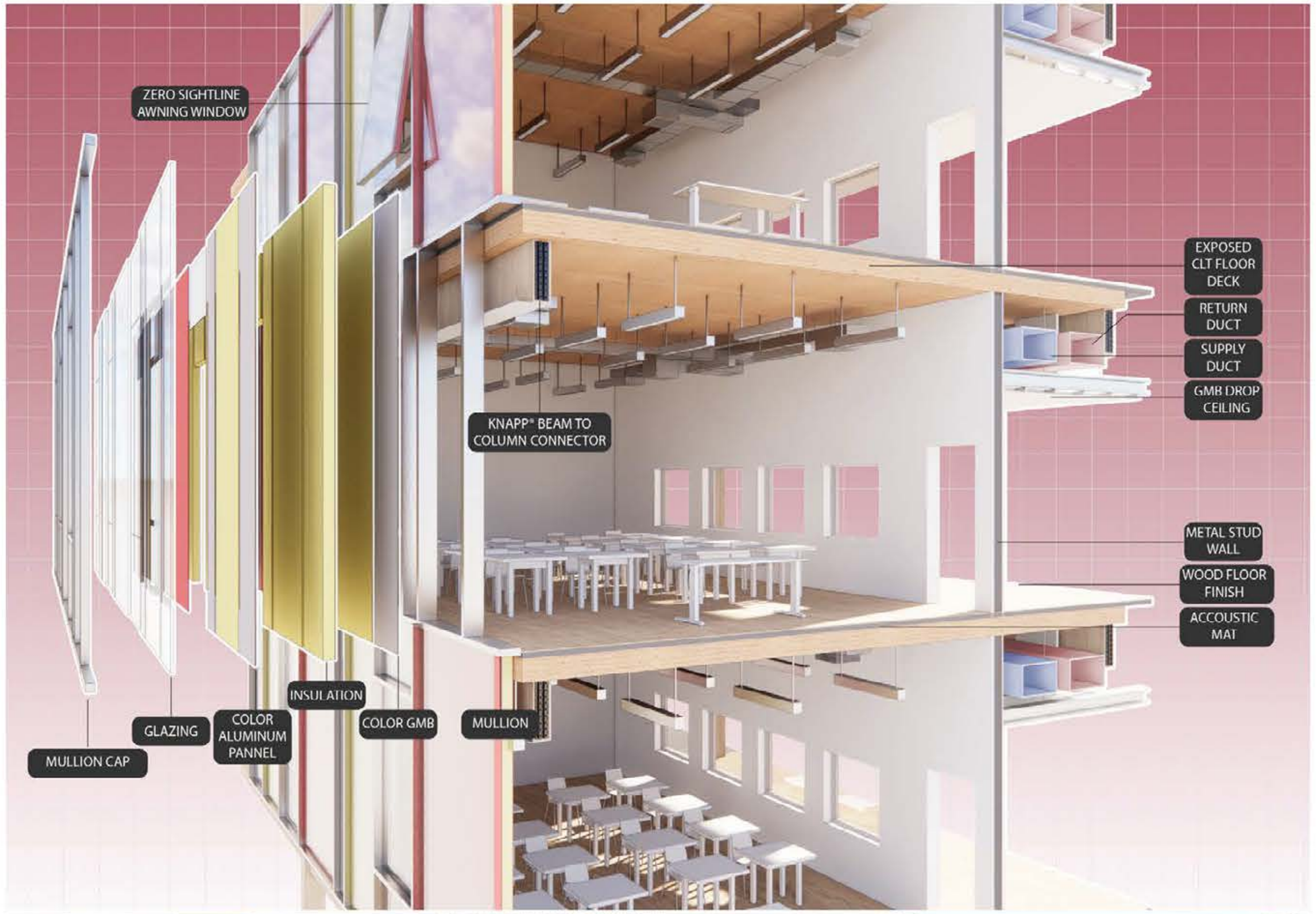
BUILDING SYSTEM INTEGRATION

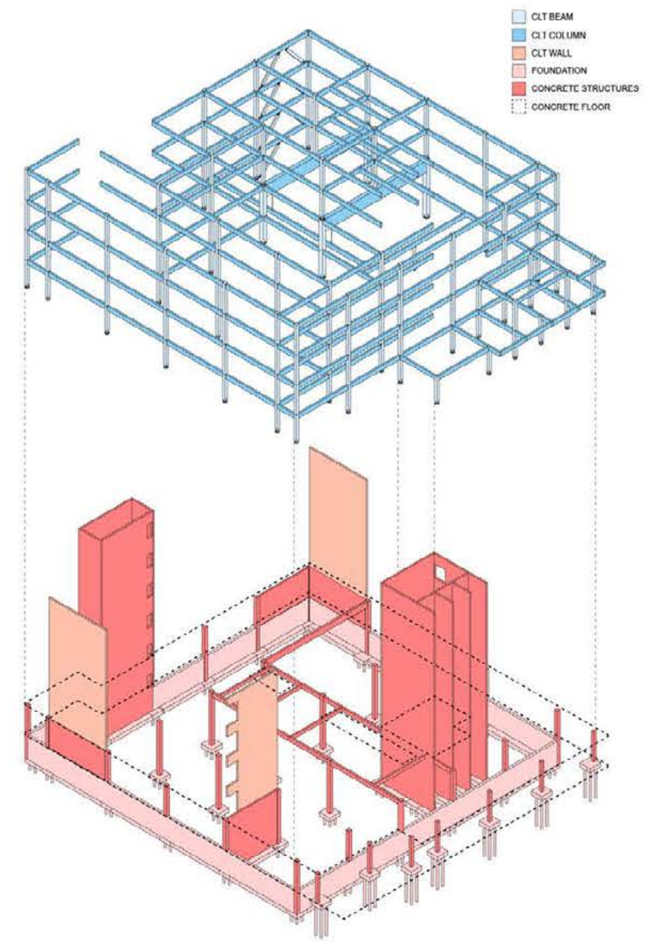
M.ARCH_BUILDING TECH 3 & 4_2021 AU
TEAM ACADEMIC PROJECT
INSTRUCTOR: BERARDO MATALUCCI
PARTNERS: ZIXIAO ZHU, HANYU LIU, KAIXI TU, DONGXIAO YANG
ARCHITECUTRAL CONSULTANT: AKIKO KYEI-ABOAGYE
MECHANICAL CONSULTANT: KENTON PHILLIPS
STRUCTURAL CONSULTANT: JUSTIN STOLZE
ENCLOSURE CONSULTANT: RYAN DONAGHY

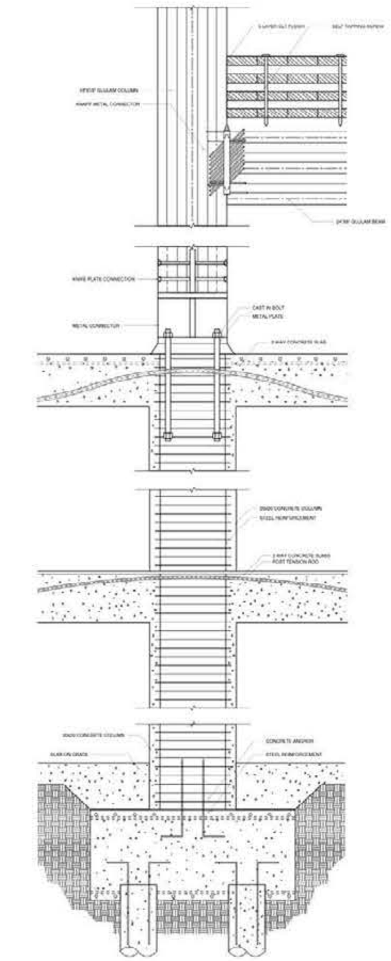
Alongside a regular design studio, we developed this project to DD phase from scratch in a group of 5 for our Building Tech Capstone. As the most experienced member of our team, I was responsible for team and project coordination and schduleing, as well as Revit 3D modeling (30%), Revit 2D drawings (90%), and enclosure detailing for two wall types.

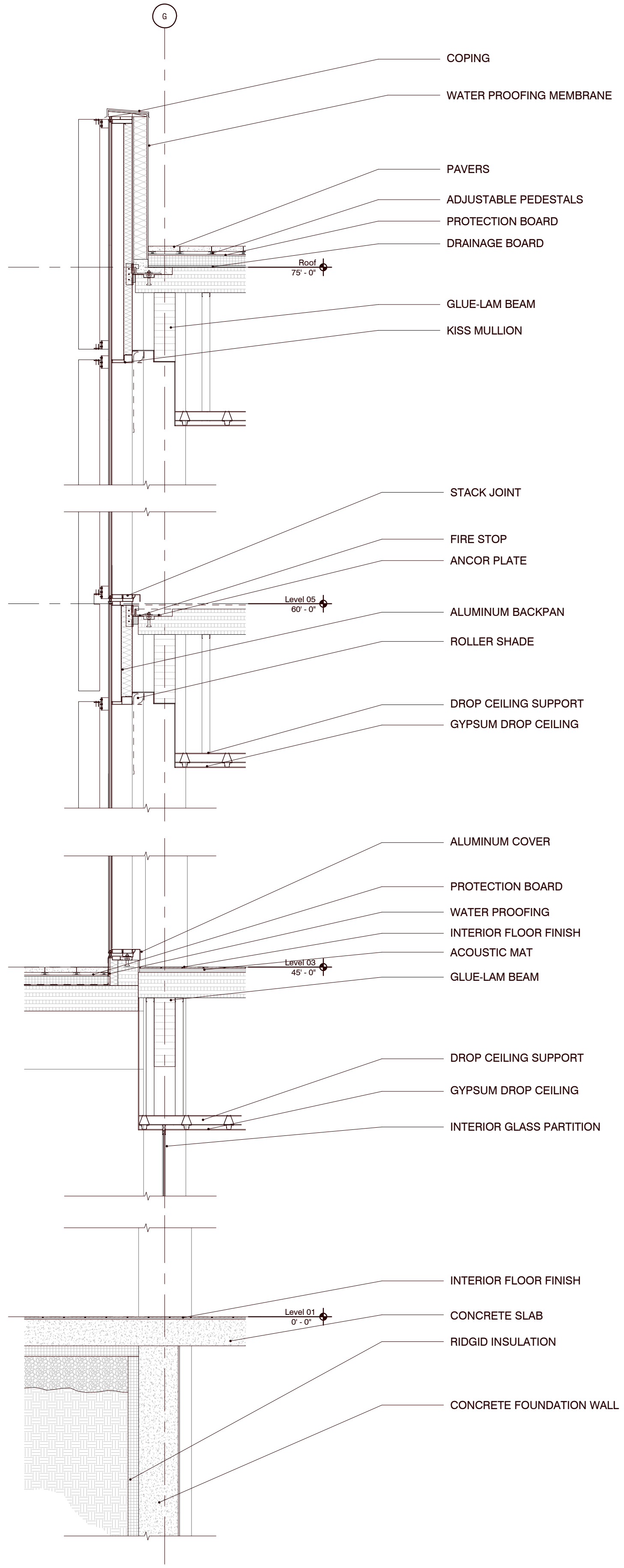
The existing H-plan Public School 64 will be demolished to make room for a new school that is more open and inviting. This new building will employ a courtyard layout with its elevated central open space accessible to the neighboring community through a set of prominent stairs on its south facade. The courtyard also helps classrooms located on upper levels get sufficient daylight and natural ventilations. We propose the use of glue-lam timber members as well as CLT slab as main structures in order to further reduce embodied carbon during construction. Two types of curtain wall systems are used to differentiate the street facing facade and the courtyard filled by a playground and plants.

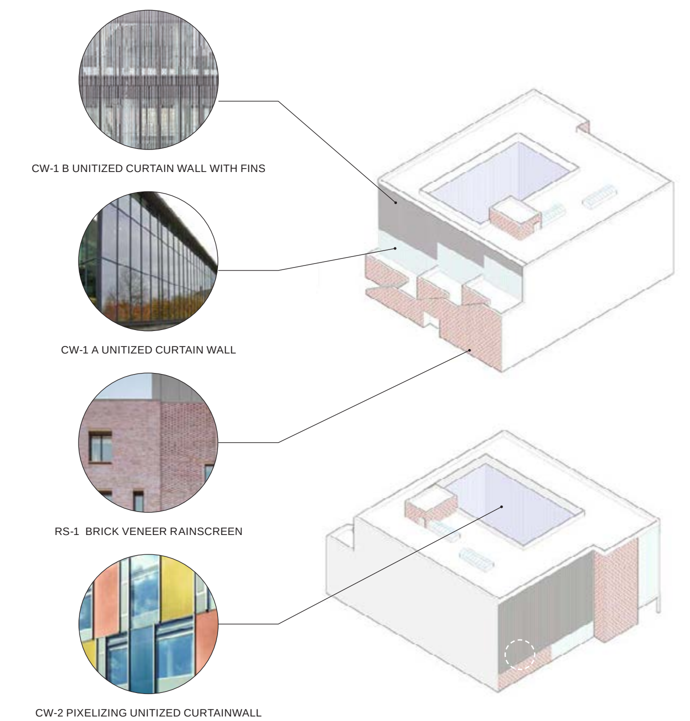


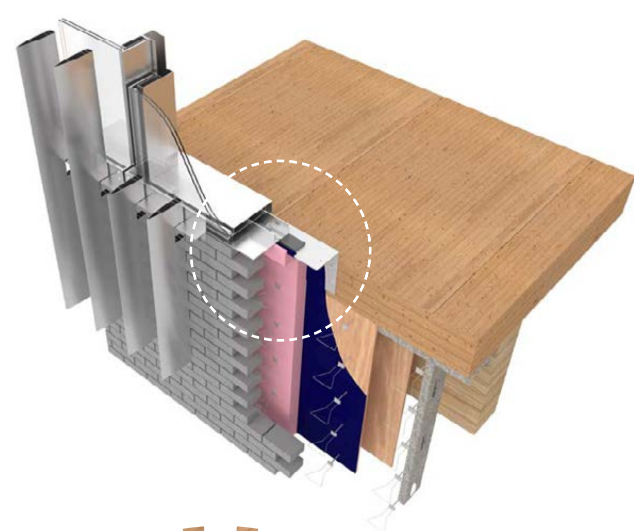

ZERO SIGHTLINE AWNING WINDOW
EXPOSED CLT FLOOR DECK
RETURN DUCT
SUPPLY DUCT
GMB DROP CEILING
KNAPP® BEAM TO COLUMN CONNECTOR
METAL STUD WALL
WOOD FLOOR FINISH
ACCOUSTIC MAT
INSULATION
GLAZING
COLOR ALUMINUM PANNEL
COLOR GMB
MULLION
MULLION CAP

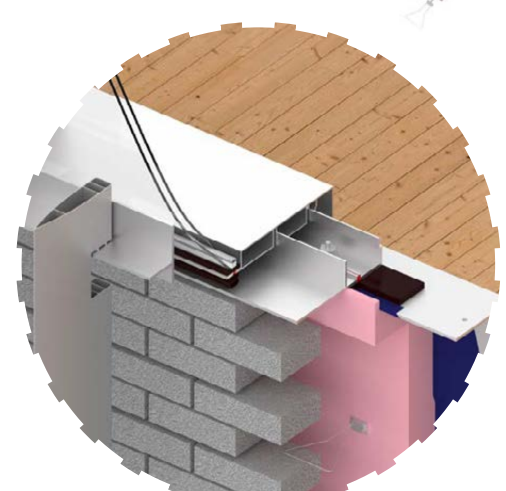

CLT BEAM
CLT COLUMN
CLT WALL
FOUNDATION
CONCRETE STRUCTURES
CONCRETE FLOOR

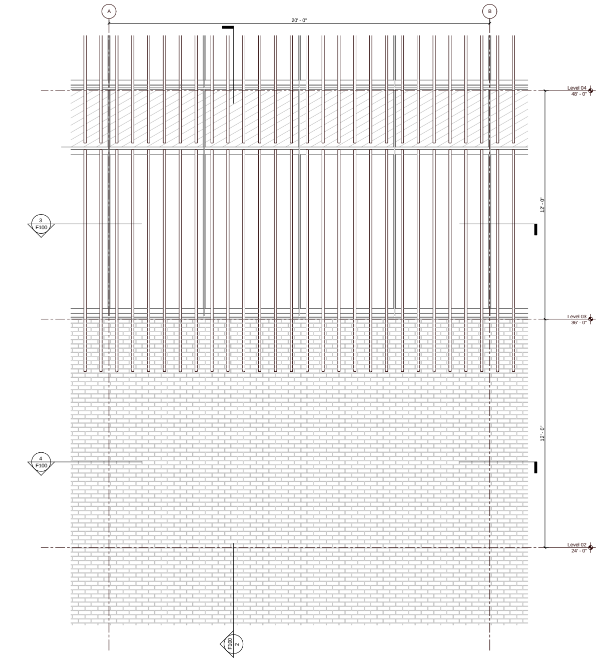




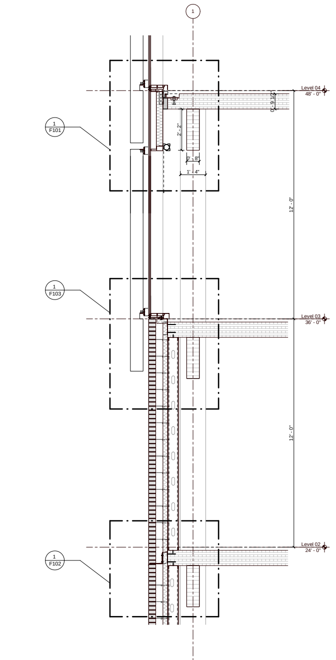




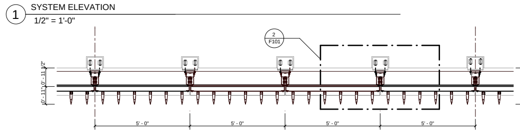




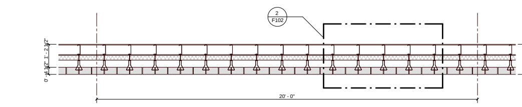
1 SYSTEM ELEVATION
1/2" = 1'-0"



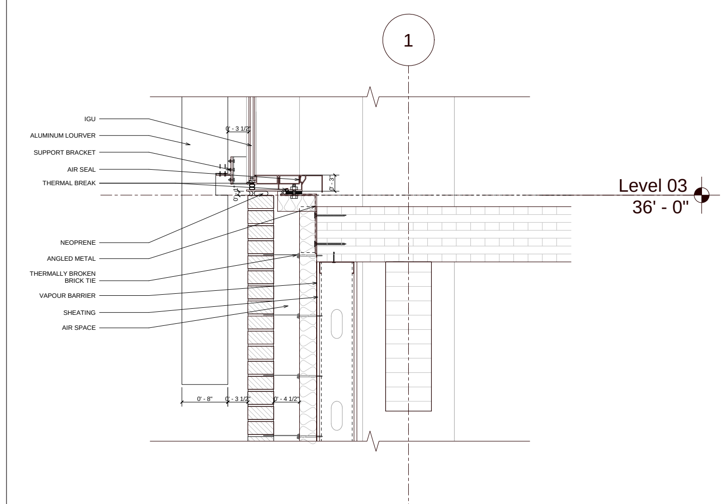
2 SYSTEM SECTION
1/2" = 1'-0"



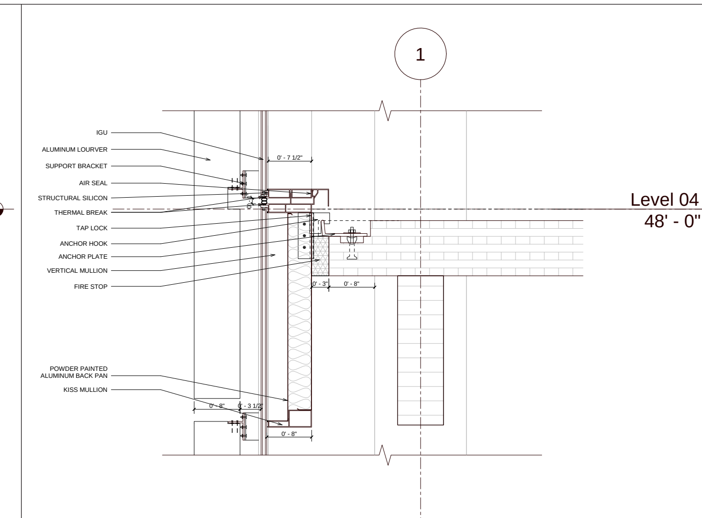
3 GLAZING SYSTEM PLAN
1/2" = 1'-0"



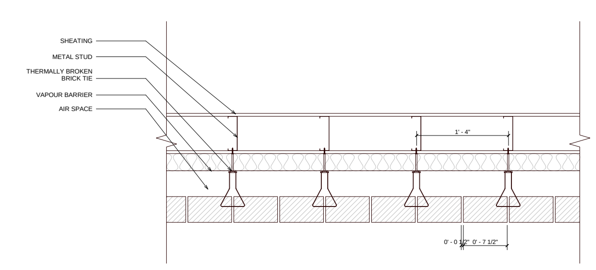
4 OPAQUE SYSTEM PLAN
1/2" = 1'-0"



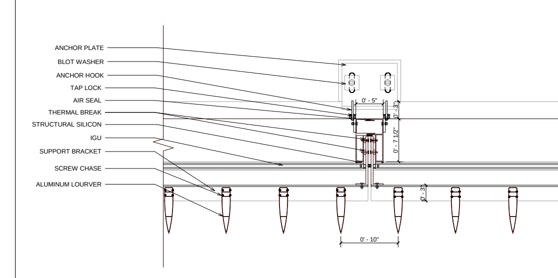
1 GLAZING AND OPAQUE SYSTEM TRANSITION DETAIL
1 1/2" = 1'-0"



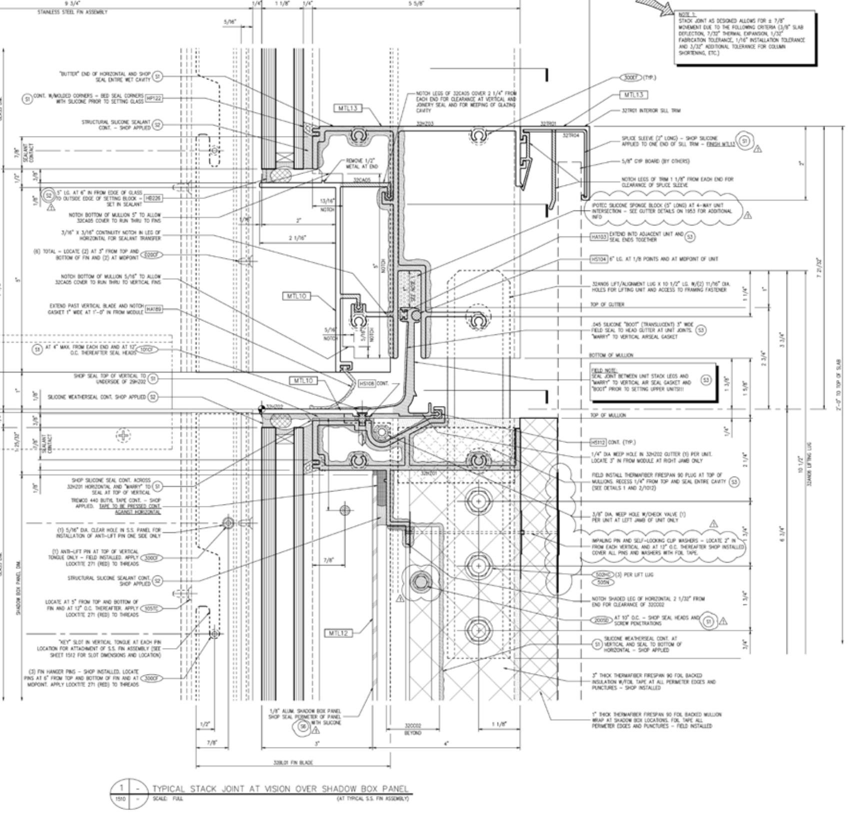
1 GLAZING SYSTEM DETAIL AT FLOOR SLAB
1 1/2" = 1'-0"



2 OPAQUE SYSTEM DETAIL PLAN
1 1/2" = 1'-0"



2 GLAZING SYSTEM DETAIL PLAN
1 1/2" = 1'-0"



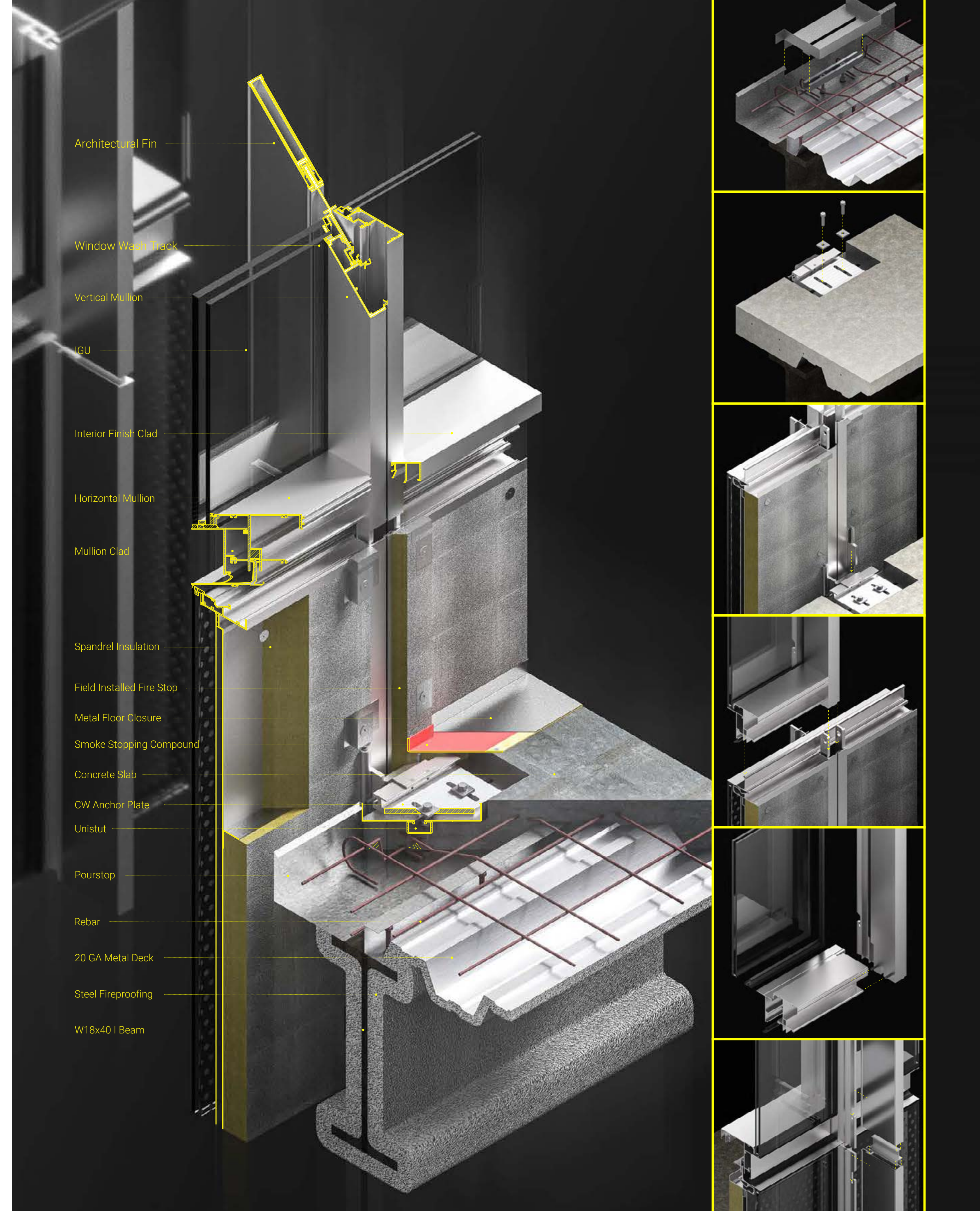
shop drawing of curtain wall system studied in detail

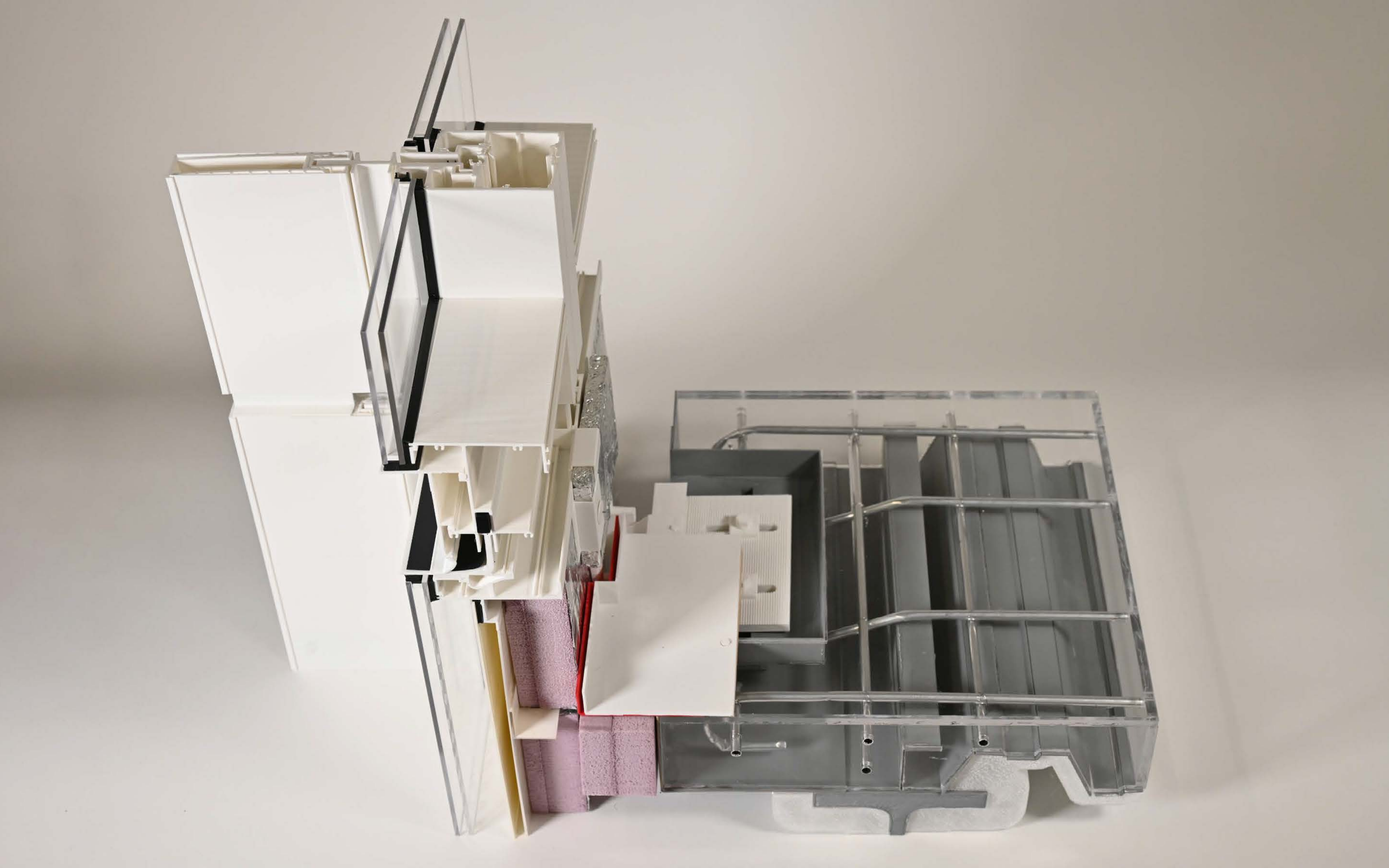
DISSECTING CURTAIN WALL

M.ARCH_BUILDING TECH 5_2022 SP
TEAM ACADEMIC PROJECT
INSTRUCTOR: NICOLE DOSSO
PARTNERS: NARA RADINAL, NICOLAS NEFIODOW, ZINA BERRADA

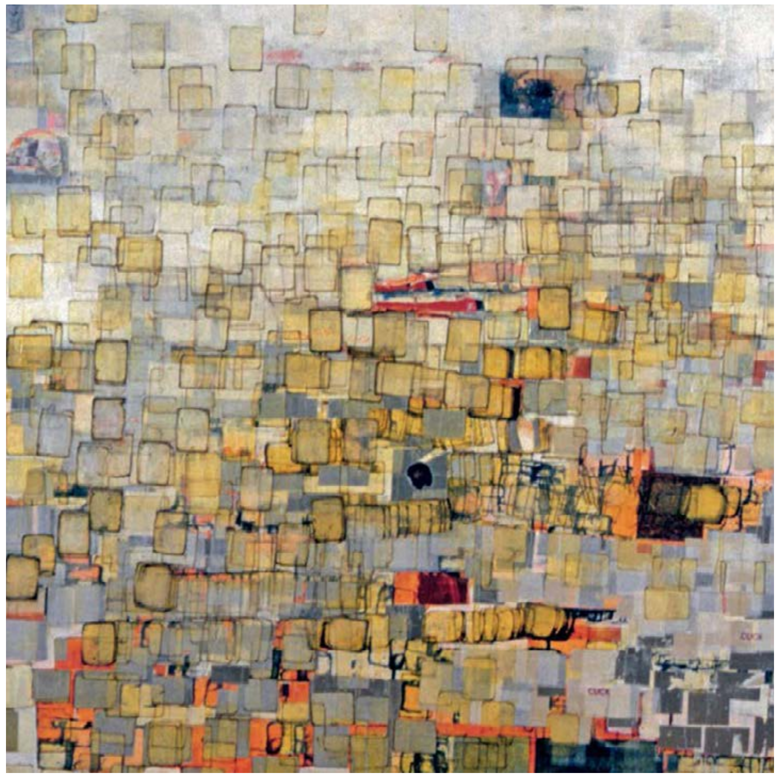
The fifth course in building technology sequence divided the class into groups of 5 with each of the group dives deep into studying construction sequencing of a selected building component - in our case, an unitized curtain wall system

We created 3D visualizations and 1:2 large scale physical model of a curtain wall system according to a set of shop drawings. Equipped with professional experiences and building enclosure design knowledge through previous course, I worked as the coordinator in dividing work according to construction sequence and trades, as well as internal progress scheduling, in addition to studying and building the four-way connection of the curtain wall system.





aesthetic inspiration
"Strawberry" - Mark Bradford, 2002

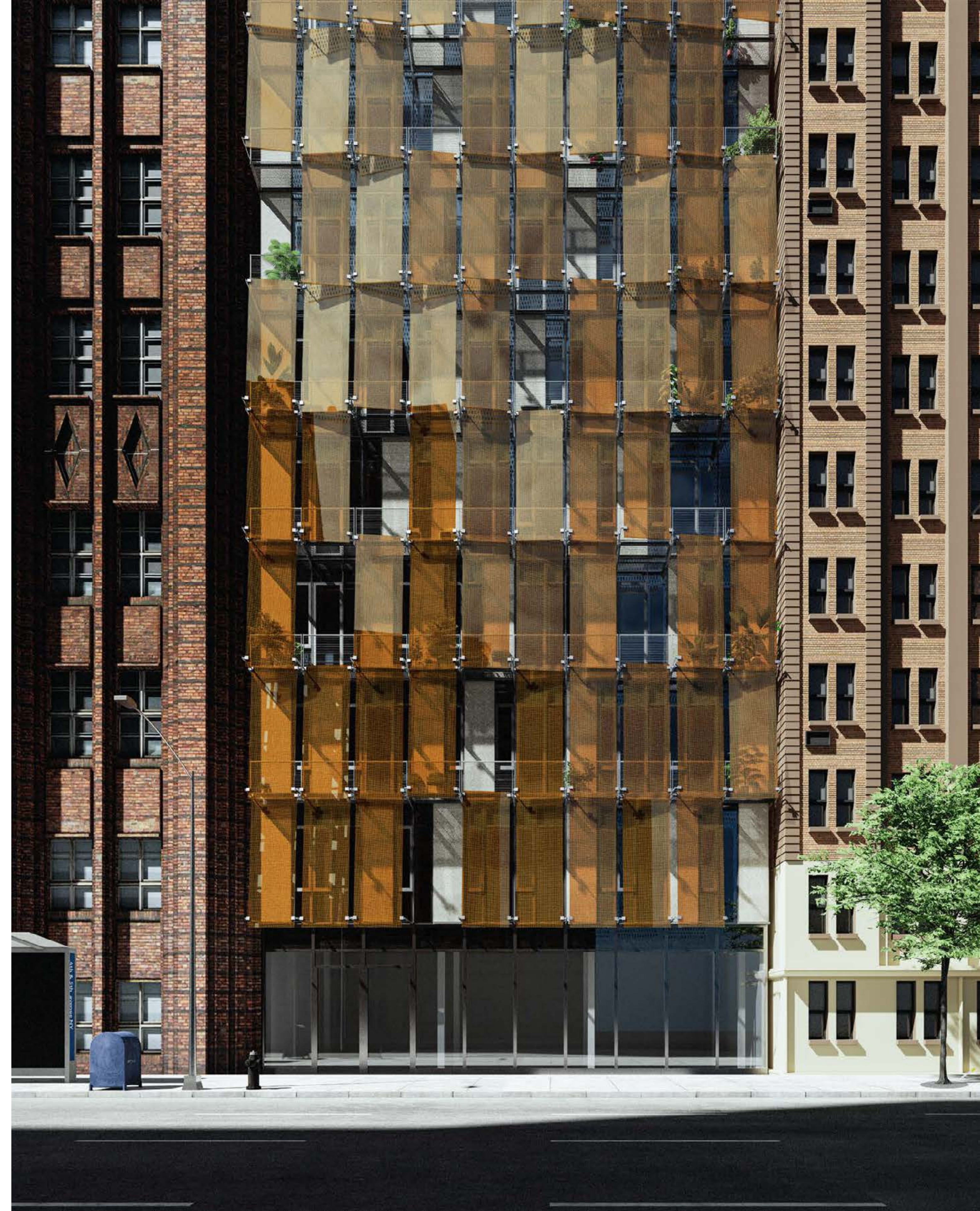


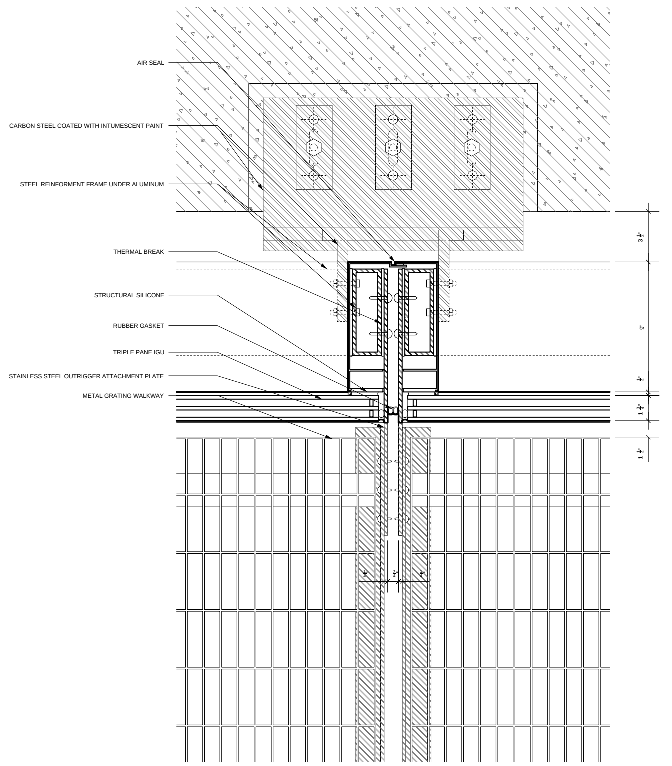
DISTORTED REPETITION

M.ARCH_ADV CURTAIN WALL_2022 FA
INDIVIDUAL ACADEMIC PROJECT
INSTRUCTOR: DANIEL A. VOS

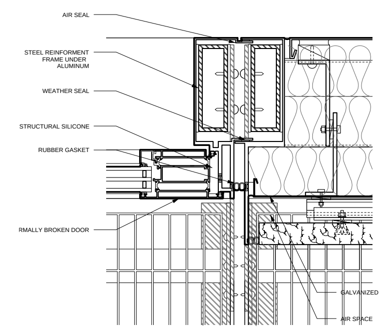
The painting is read as a series of rectangular repetitions, distorted and faded at times. A sense of freedom and even organic messiness is generated in the alternations and gradual changes among the regularity.

Embracing the idea of distorted regularity, the facade is composed of two layers: the inner layer of rectilinear and operable unitized curtain wall system that functions as the building envelope, and another layer of tilted glass panels that distorts what behind it and reflects the sky and the surroundings. An occupiable balcony takes place between the two layers of the facade and encourages tenants to bring an additional layer of messiness through living with and using the space.

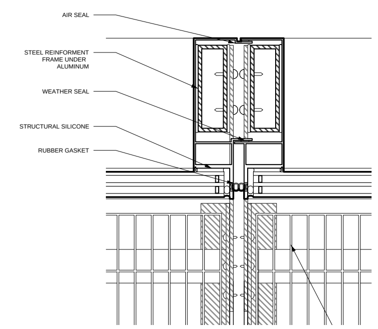




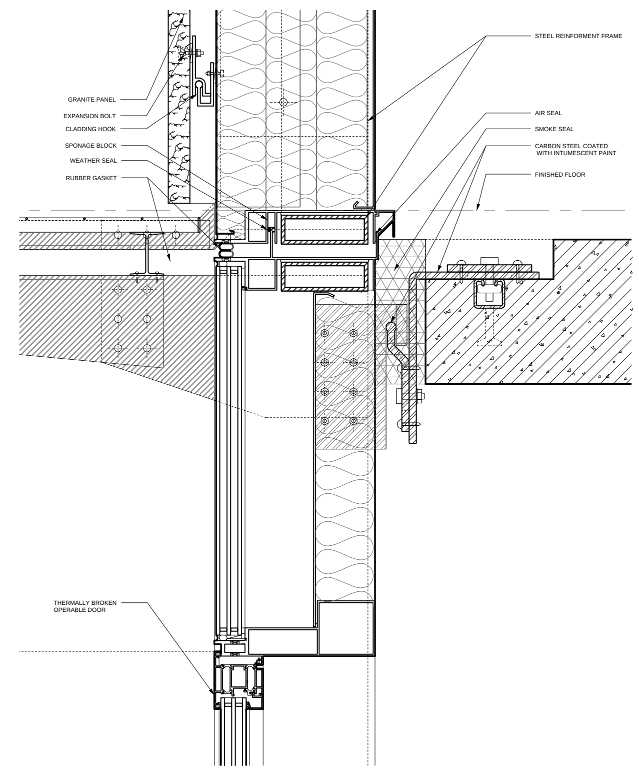
6 TYPICAL SYSTEM MULLION DETAIL AT OUTRIGGER ATTACHMENT POINT
SCALE 6" = 1'



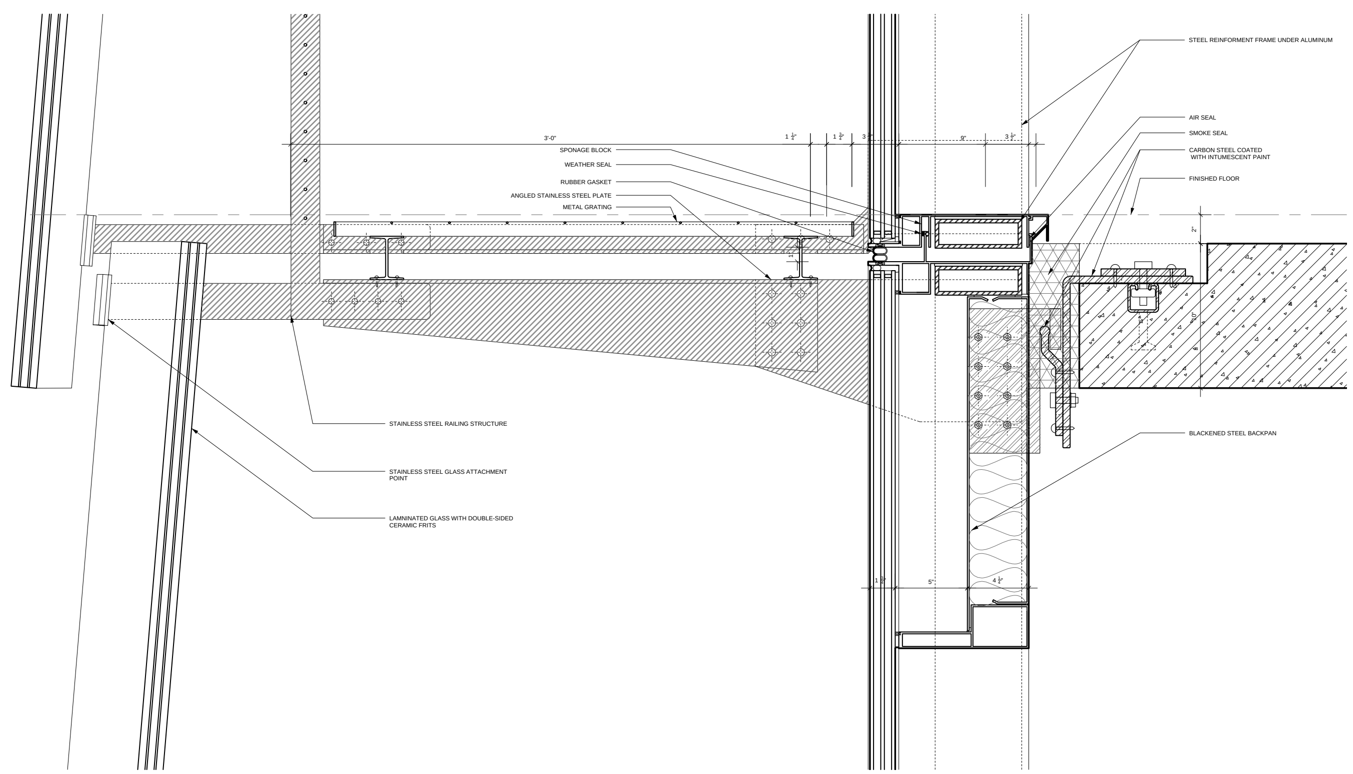
5 MULLION DETAIL AT STONE CLADDING AND OPERABLE DOOR
SCALE 6" = 1'



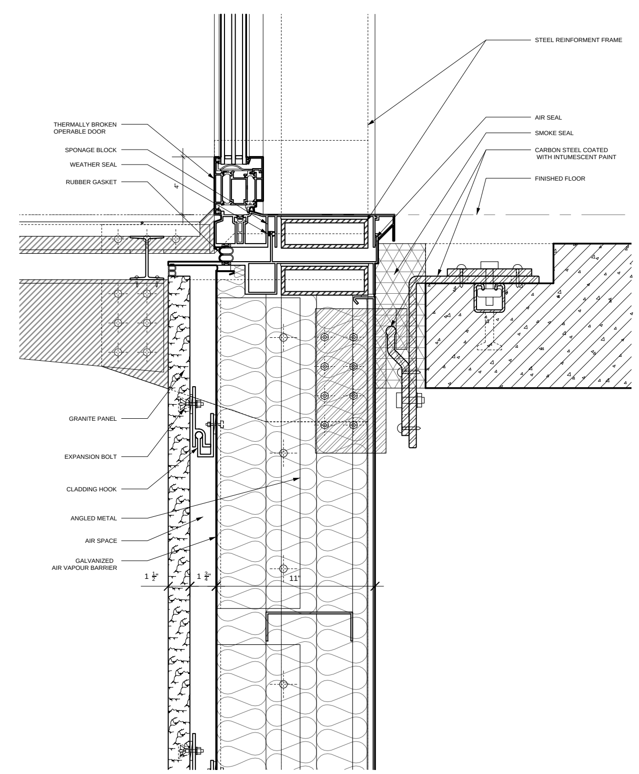
4 TYPICAL MULLION DETAIL AT GLAZING
SCALE 6" = 1'



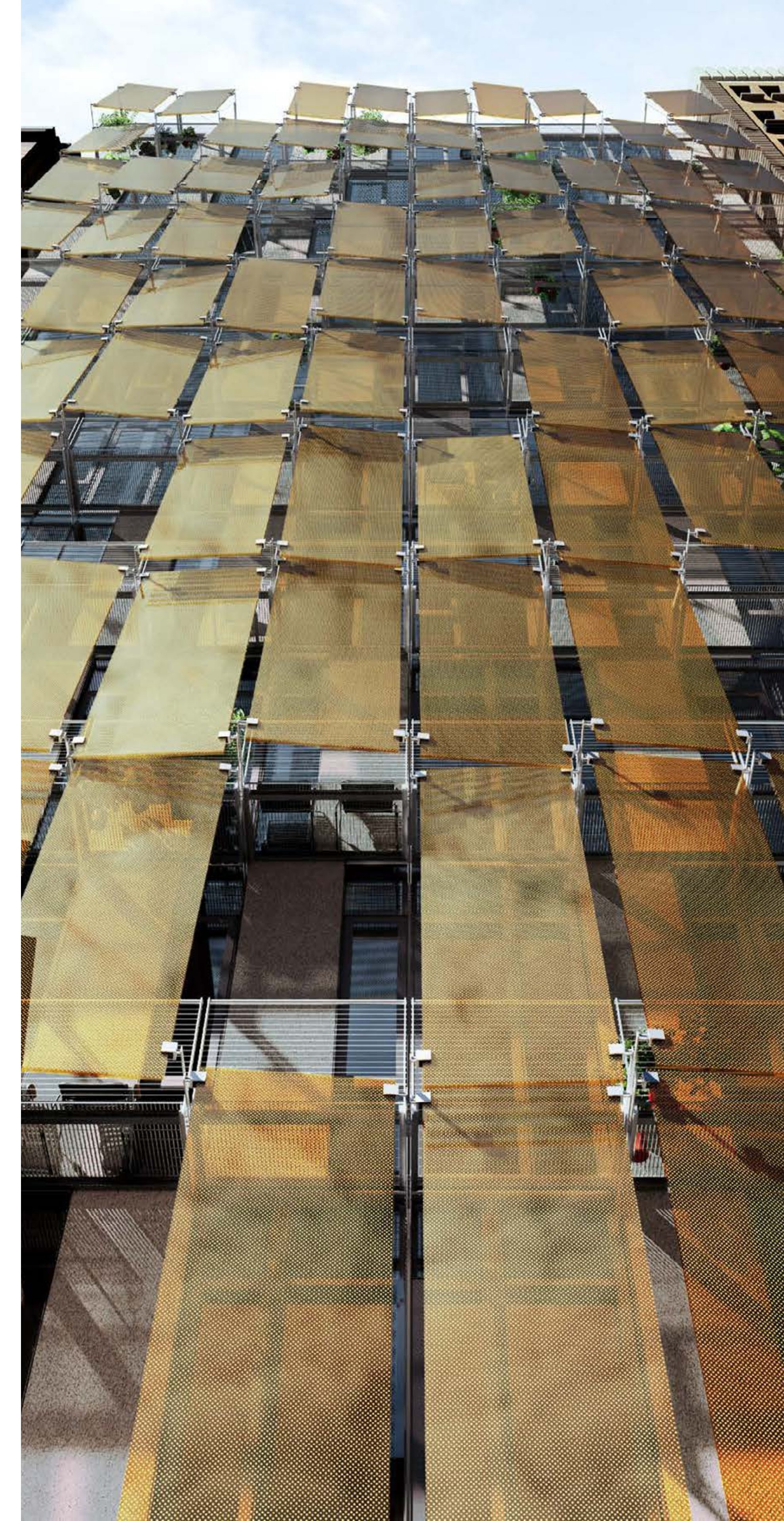
3 DETAIL AT OPERABLE DOOR TOP AND STONE CLADDING BOTTOM
SCALE 6" = 1'

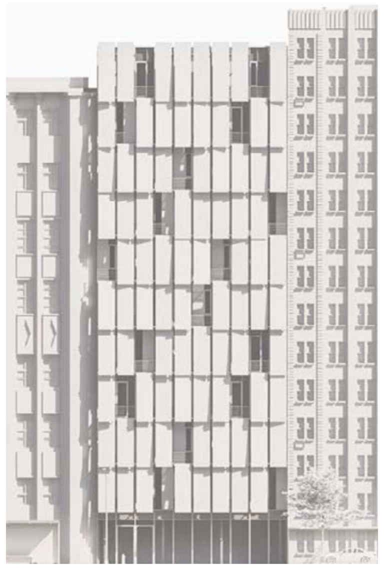


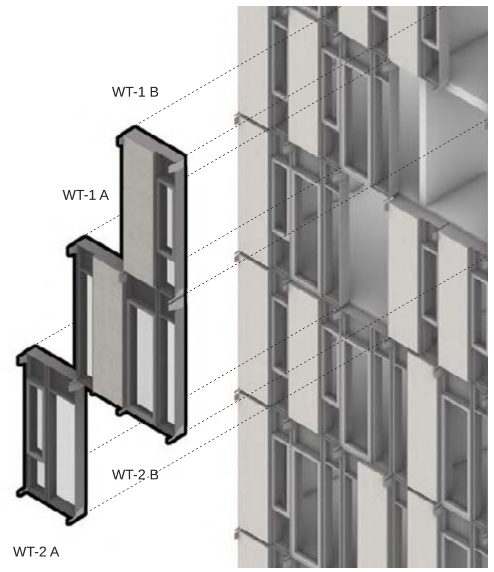
2 TYPICAL MULLION DETAIL AT BALCONY
SCALE 6" = 1'

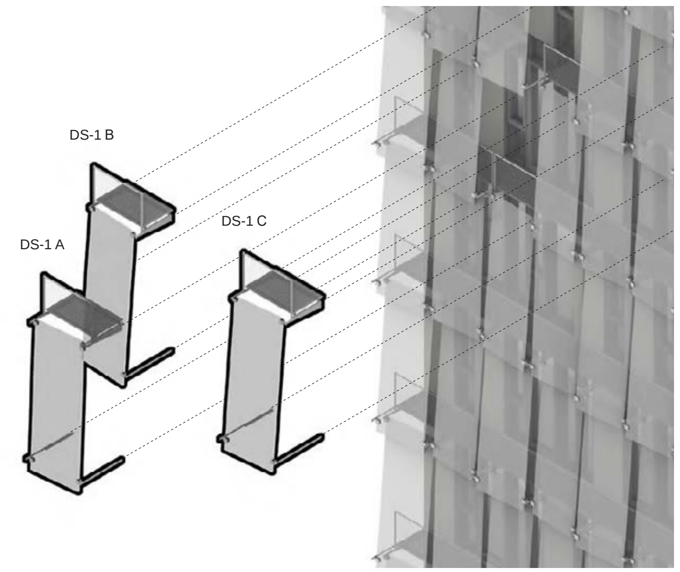


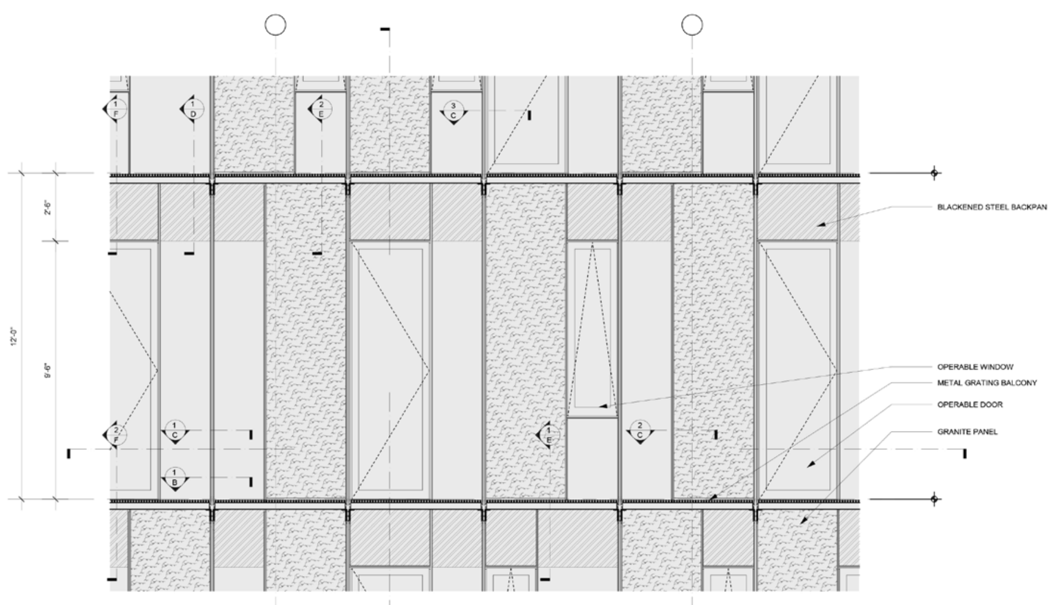
1 MULLION DETAIL AT STONE CLADDING AND OPERABLE DOOR
SCALE 6" = 1'



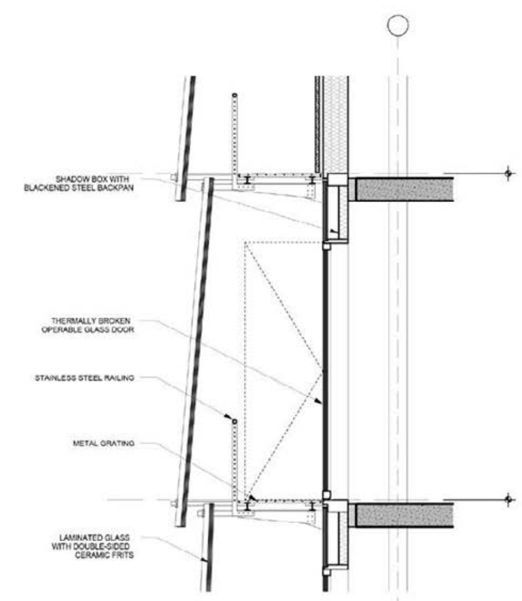




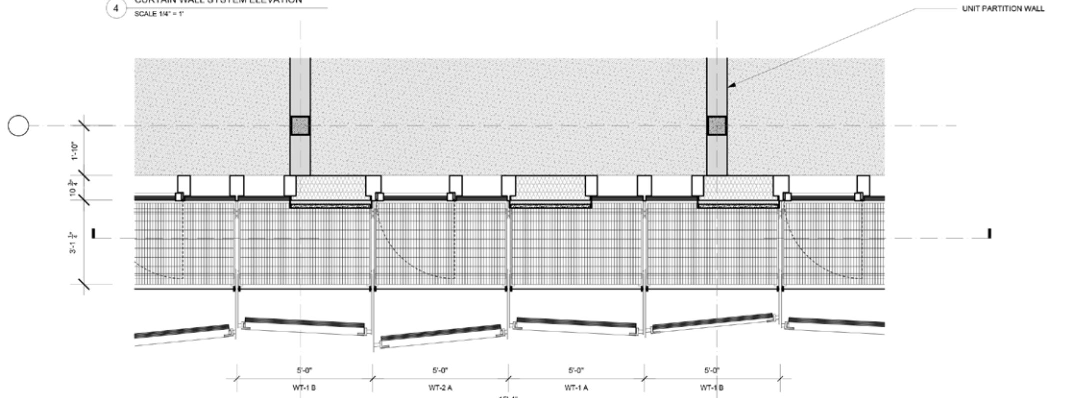




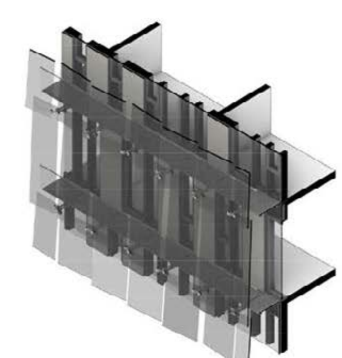
4 CURTAIN WALL SYSYEM ELEVATION
SCALE 1/4" = 1'



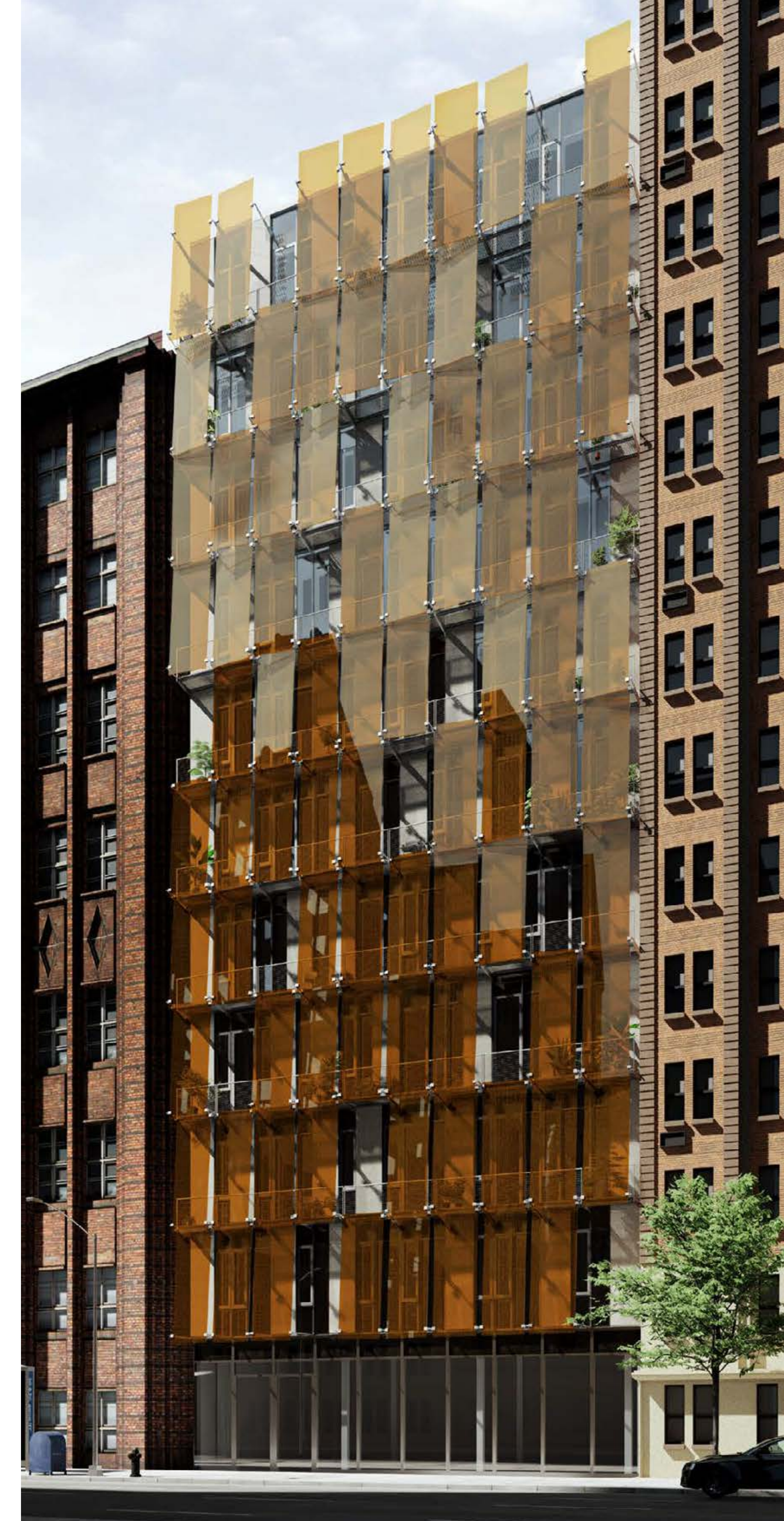
3 CURTAIN WALL SYSYEM SECTION
SCALE 1/4" = 1'

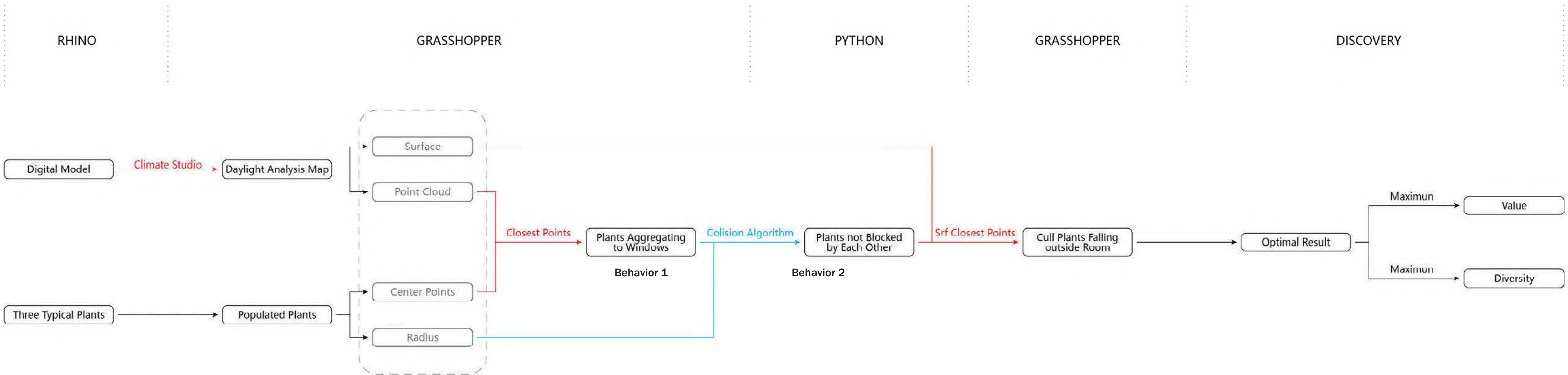


2 CURTAIN WALL SYSYEM PLAN
SCALE 1/4" = 1'



1 CURTAIN WALL SYSYEM AXON





PLANTING OPTION GENERATOR

M.ARCH_GENERATIVE DESIGN_2022 SP
TEAM ACADEMIC PROJECT
INSTRUCTOR: DANIL NAGY
PARTNERS: JIAFENG GU, YIFEI YUAN, WANQI JIANG, QINGNING CAO
https://www.youtube.com/watch?v=AI33OVHUnwc

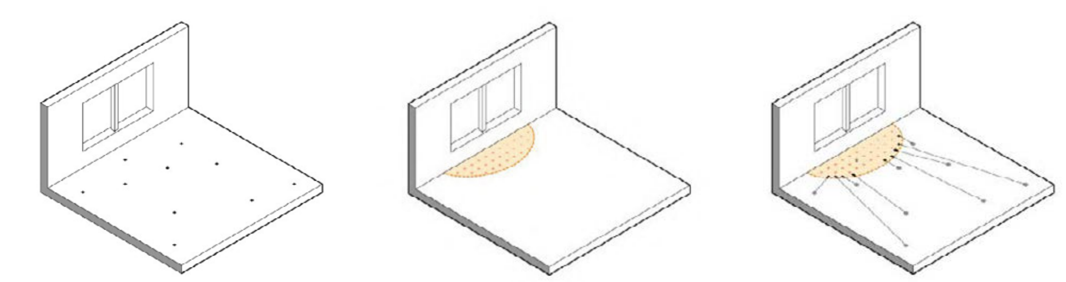
Our design goal is rather simple — how do we populate a room with different types of plants? Our aim is to create a planting layout that offers the highest possible total value while maintains a good plant type diversity. My role includes design proposal, core GH logic (70%) and Python scripting.

We recognize each plant as an agent that has 2 major needs - daylight requirement and space requirement:

The first property result in the clustering behavior - each type of plant has its own desired level of luminance, and therefore will be drawn to regions that receive sufficient daylight for that kind of plant.

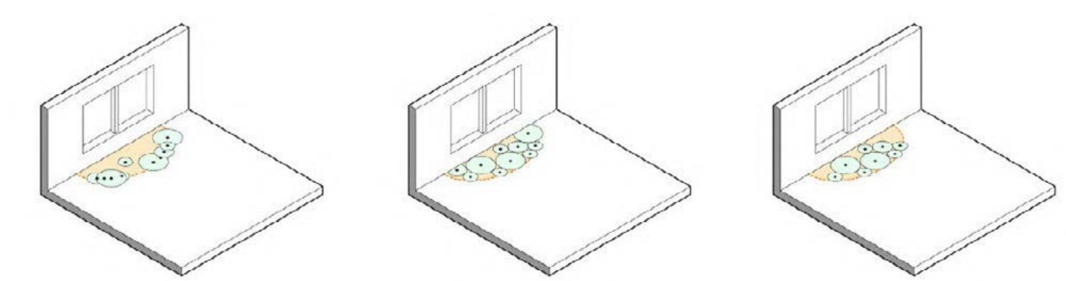
The second requirement is based on the fact that each plant creates a shadow radius, which means they compete with others for space. The collision behavior asks plants that are placed too close to move away from each other.

Behavior 1 - CLUSTER (Grasshopper)

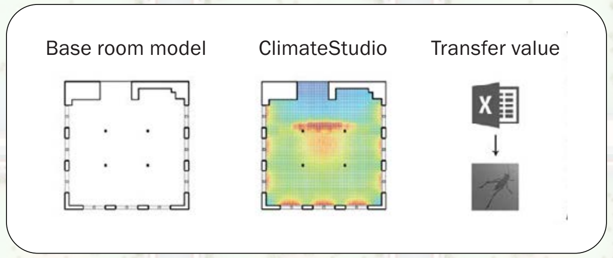


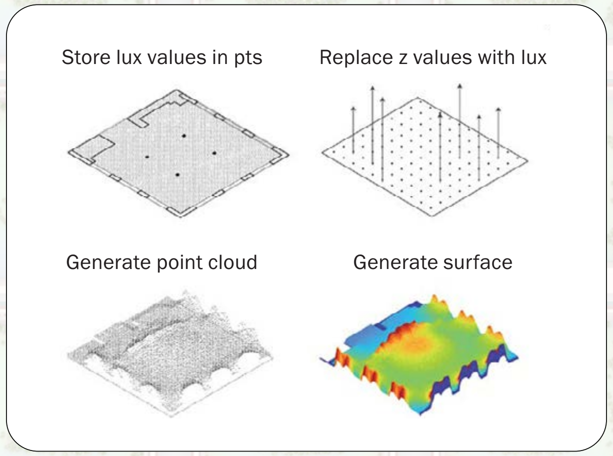
Randomly Populated Points — Targeted Points — Points Pulled to Targets

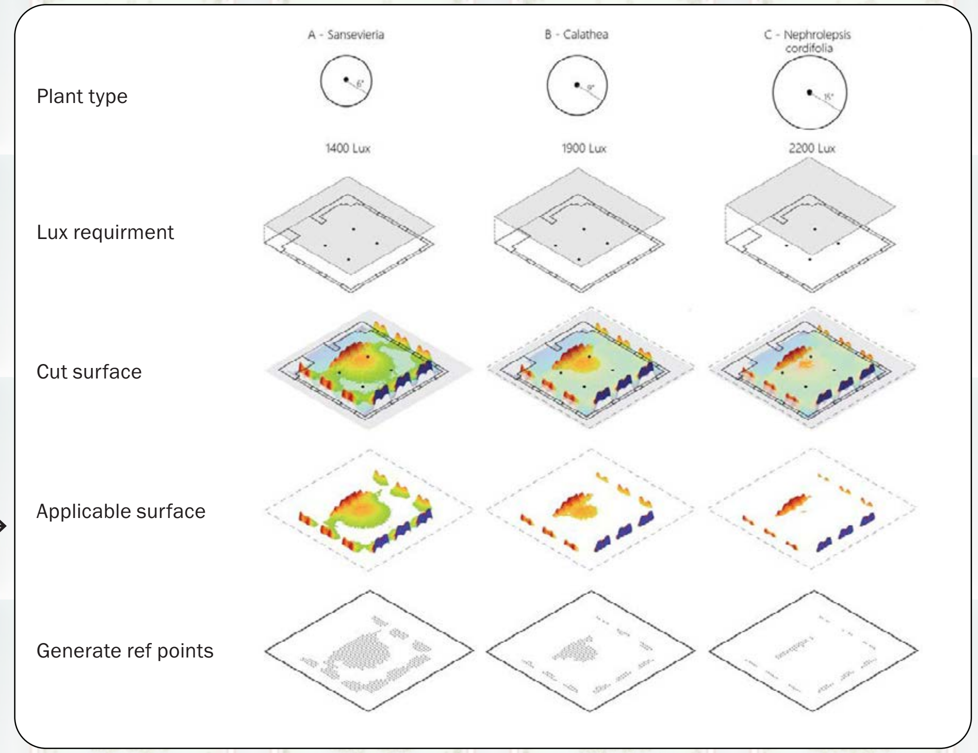
Behavior 2 - COLLIDE (Python)



Overlapped Shadow — Circles Tangent to Each Othher — Culled Circles outside the Room



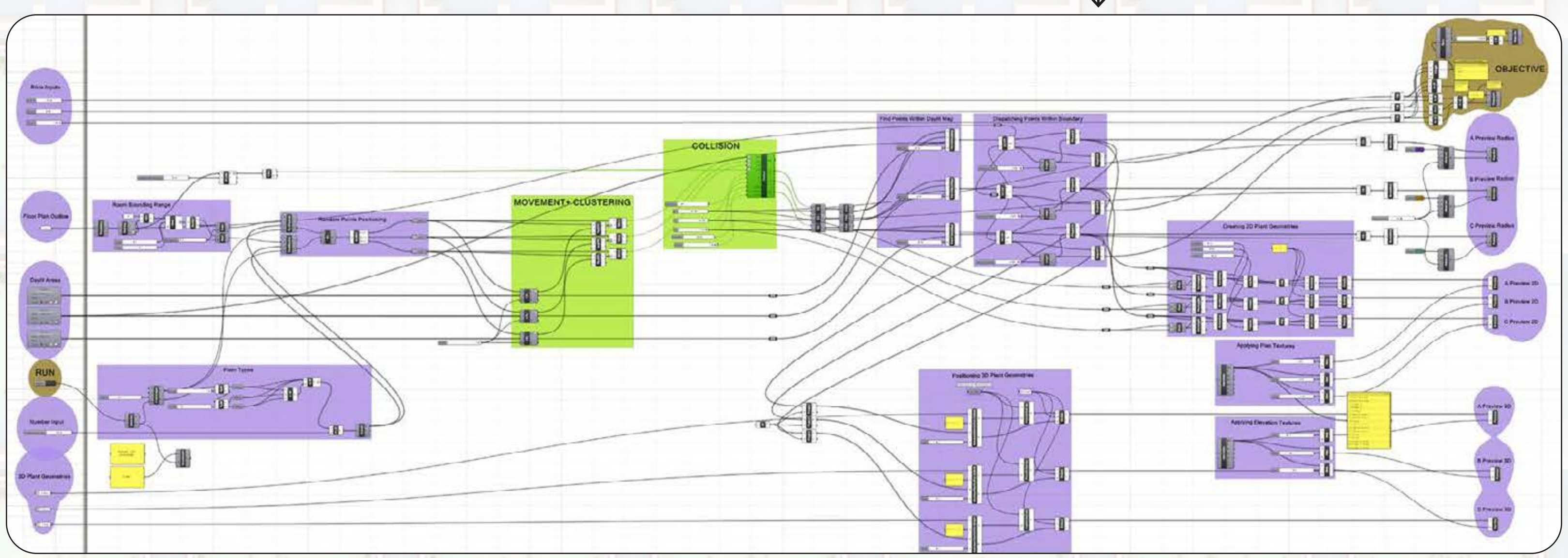




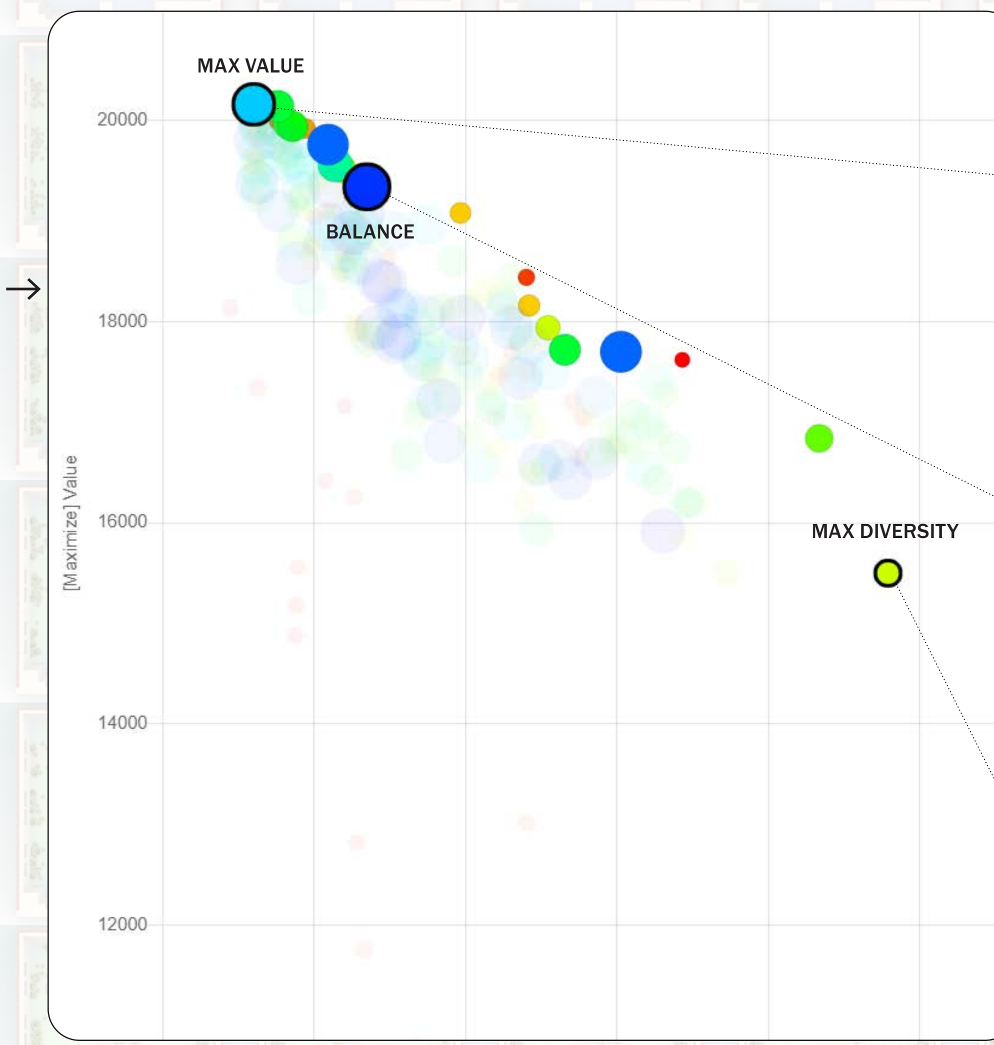
If a, b, and c each indicates the amount of plant A, plant B, and plant C, while, x, y, and z, each indicates the individual price of plant A, plant B, and plant c, our optimization goal will be maximizing the value of all plants within the room = ax + by + cz. Plant type diversity can be represented as the reciprocal number of the standard deviation among a, b, and c.

In order to solve this problem through generative design, we need three types of data input: (1) Desired total number of plants. (2) Basic parameters of each plant type. This part is composed by price, plant shadow radius, and daylight need in lux. (3) Daylight analysis of the chosen room. While the fist two types of data input are set directly according to our demo scenario , the third one requires some preparation. We chose to use our studio space as the demo space and created a digital model of it. Then, areas suitable for each plant are located through processes illustrated on the left side on this page.

The generative algorithm will start by populating the studied room with desired number of plants set by the user with center points that determine the location of plants. Then plants will perform clustering and collision behaviors explained in the previous section. The result will be documented and evaluated based on its total value and plant type diversity. The algorithm will run over and over again and the best option within its generation will be selected to develope the next generation of options. This loop will go on until it reach the limit set by the user and ideally will mature over time.



I contributed to 70% of Grasshopper generative logic scripting and all Python codes for this section



NEIGHBORHOOD DENSITY PATCH V.2050

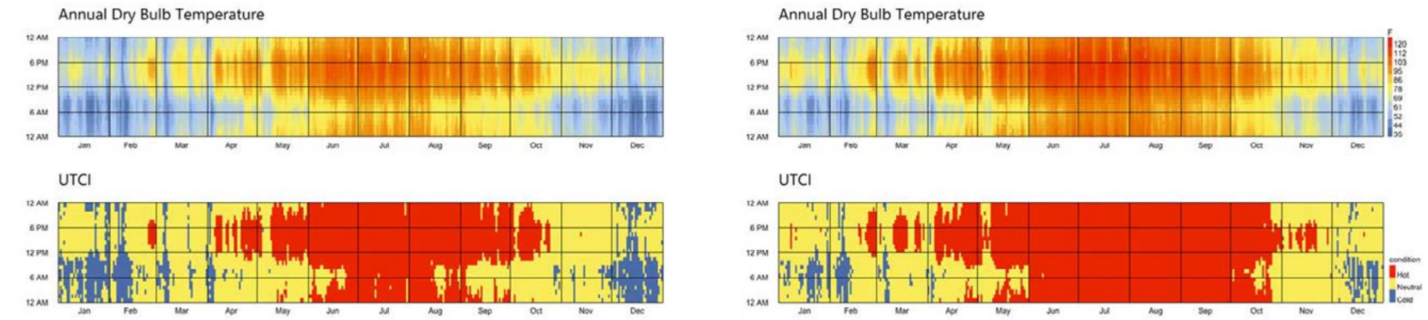
M.ARCH_ADV STUDIO 6 & XIM_2023 SP
INDIVIDUAL ACADEMIC PROJECT
INSTRUCTORS: DAVID BENJAMIN & SNOWERIA ZHANG

In this project, computational and generative design methodologies are employed to effectively address suburb densification challenge. The use of generative natural language AI aids designers by offering easily accessible technical expertise, while AI imaging facilitates swift visualization of various generative design options.

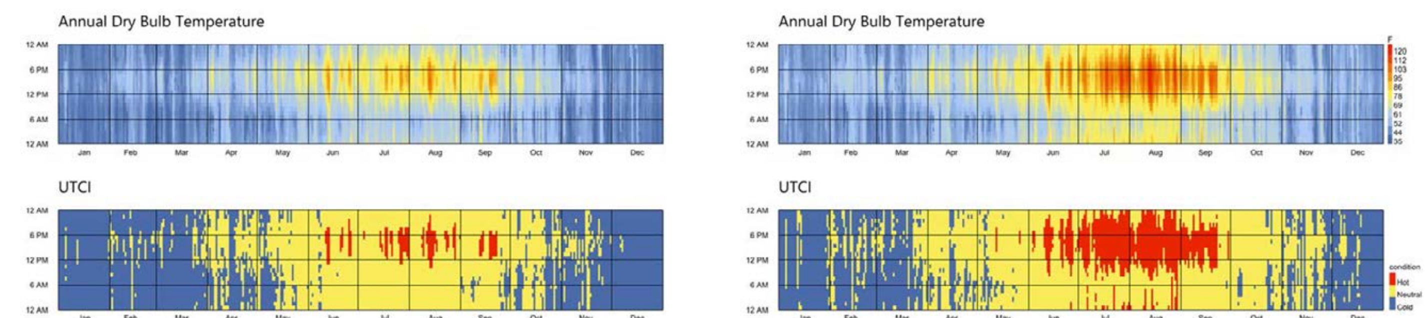
The rising global temperature is going to impact different regions differently. Although, using HadCM3 future climate scenarios distributed by the IPCC, we estimate temperatures in both Portland and Phoenix rise by the same amount, from a thermal comfort perspective, Portland will become more comfortable while Phoenix will suffer.

Alongside other climate disasters, millions of people in low latitude and coastal areas will migrate to high latitude regions.

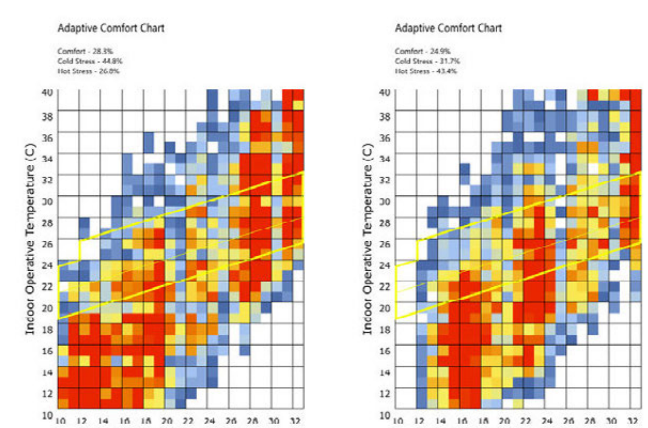
Self-driving cars will diminish ownership culture and encourage sharing. The car-centric low-density neighborhoods will become obsolete and insufficient in the event of climate migration.



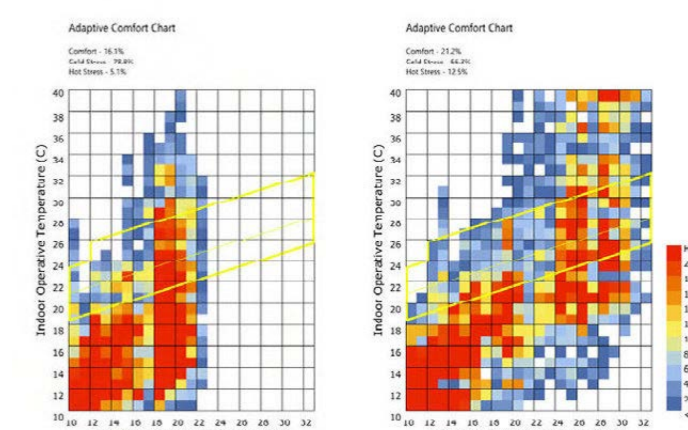
2005 **Phoenix, AZ** 2050
23.8 °C **+ 2.8 °C** **26.6 °C**



2005 **Portland, OR** 2050
12.0 °C **+ 2.8 °C** **16.6 °C**

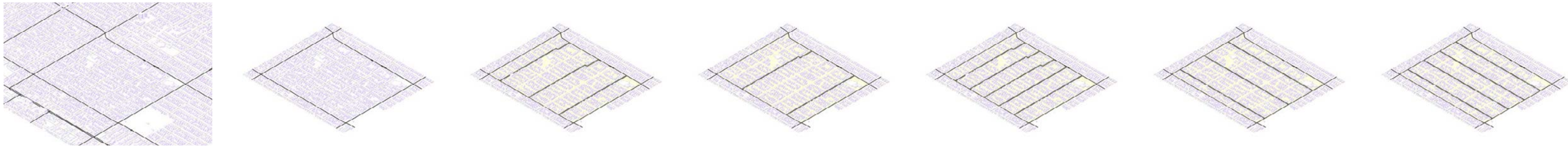


2005 **Phoenix, AZ** 2050
+ 16.6 % Hot Stress
- 16.6 % Comfort

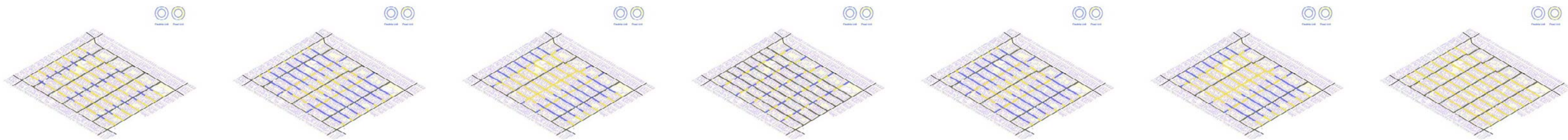


2005 **Portland, OR** 2050
+ 7.4 % Hot Stress
+ 5.1 % Comfort

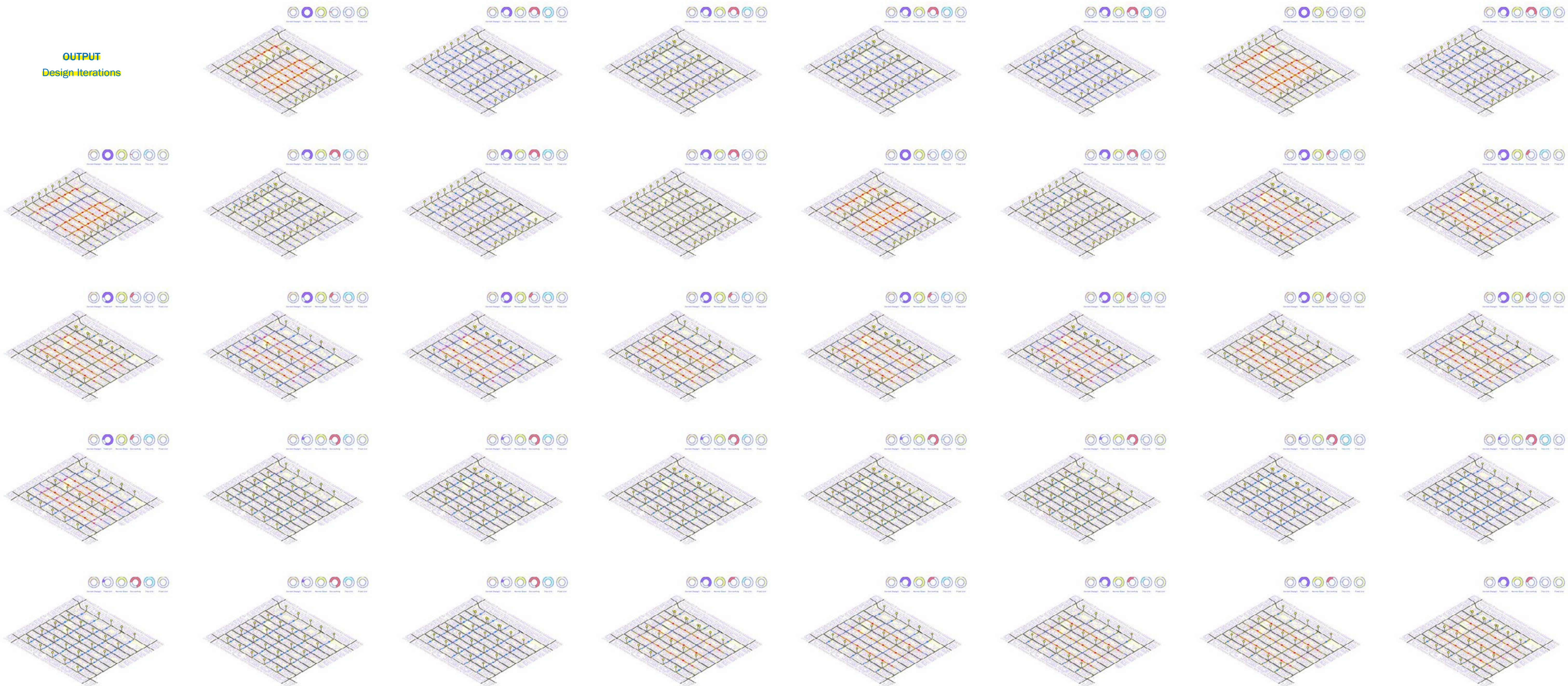
INPUT 1
Street Network Options

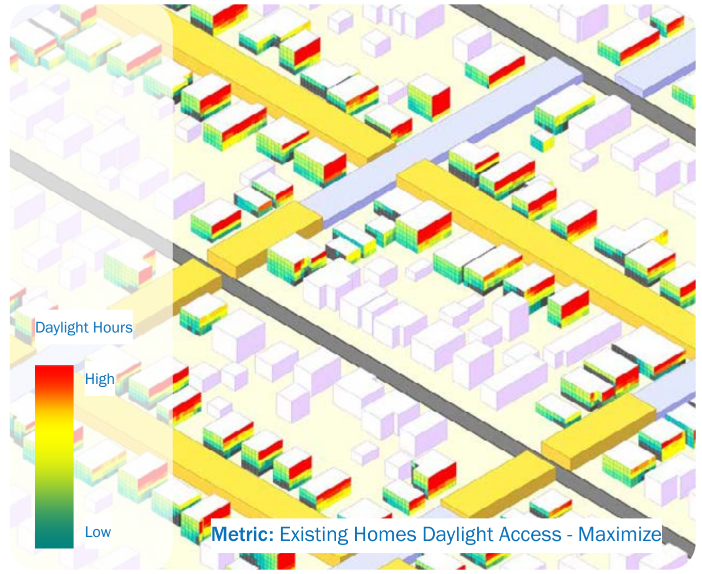


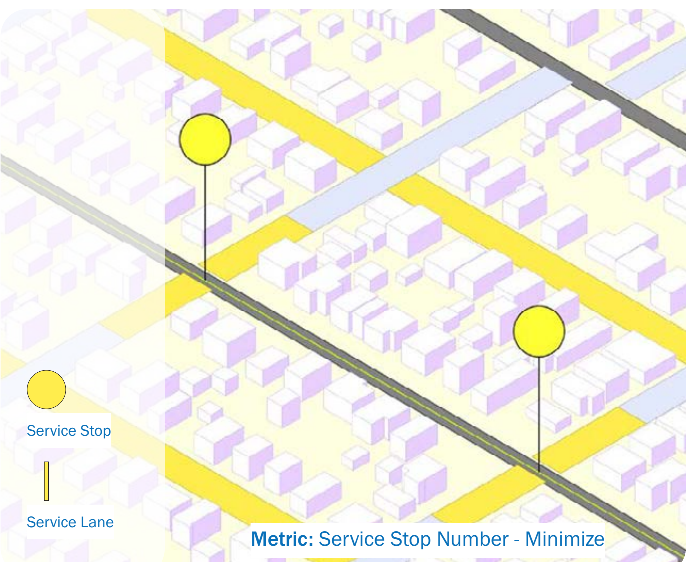
INPUT 2
Unit Type Ratios



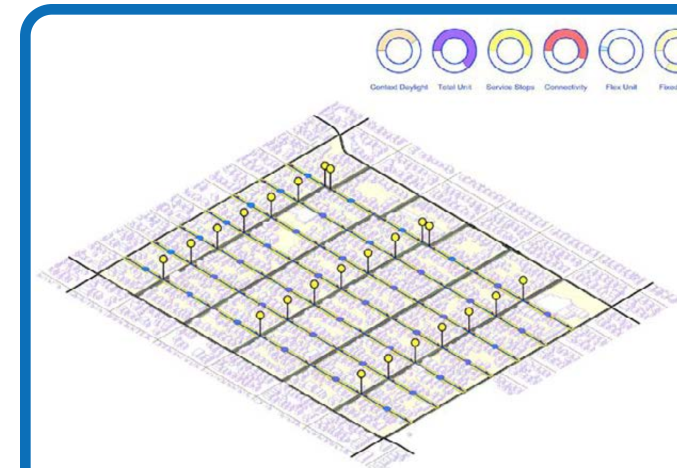
OUTPUT
Design Iterations







Iteration 25:
Good Housing Area - Both Housing Types - Good Service Stop Number
Bad Connectivity - Mid Context Daylight Impact



Iteration 6:
Mid Housing Area - Both Housing Types - Bad Service Stop Number
Good Connectivity - Mid Context Daylight Impact

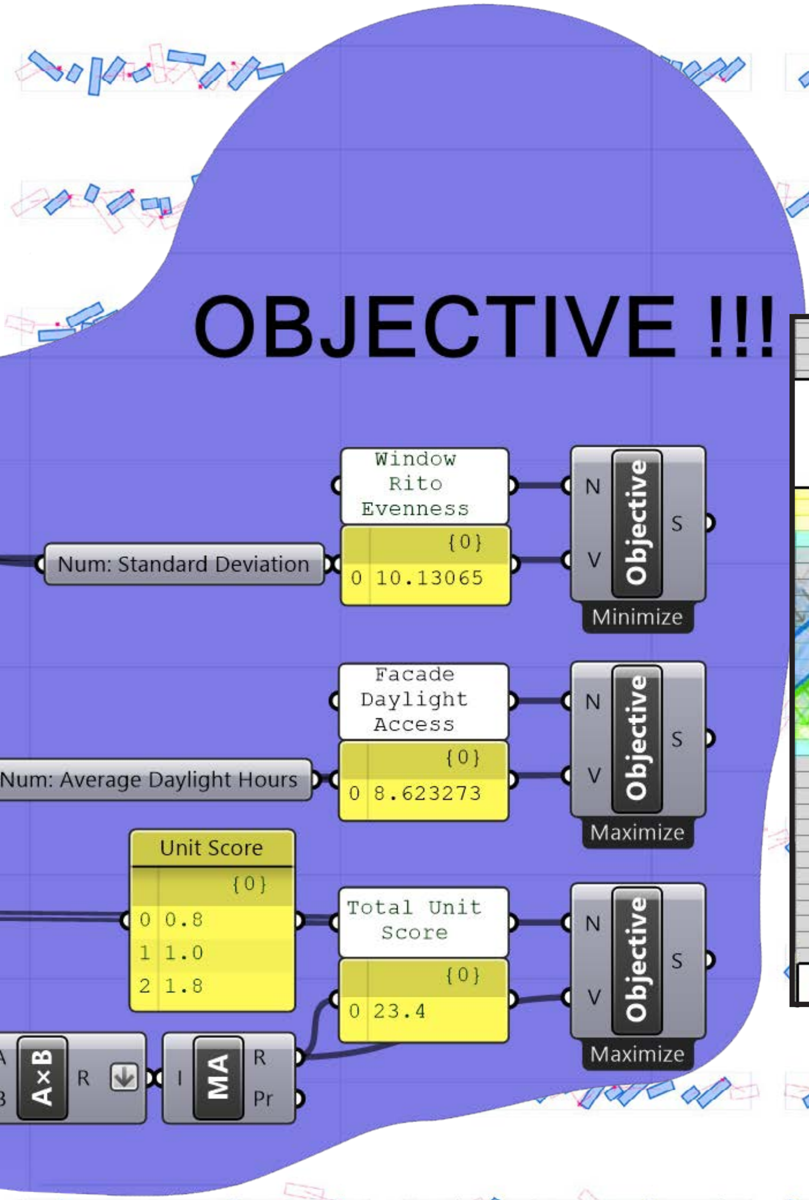
1	Iteration	In:Street-Directic	In:Service-Stree	In:Unit-Tpye-Pro	In:Street-Spacin	Out:Gained-Area	Out:Kept-Street-	Out:Fixed-Unit-A	Out:Flex-Unit-Ar	Out:Service-Sto	Out:Avg-Walking	Out:Context-Dayligh
2	18	0	0	4	2	950510	15.28%	950510		15	1.4	5
3	23	0	1	4	2	950516	15.28%	950516		14	1.4	5
4	10	0	0	4	1	869237	22.90%	869237		22	1.2	5
5	13	0	1	4	1	869237	22.90%	869237		15	1.2	5
6	32	1	1	4	2	804535	28.23%	804535		13	1.2	4.9
7	30	1	0	4	2	004535	20.23%	004535		15	1.2	4.9
	25	0	1	3	2	950516	15.28%	750354	200161	14	1.4	5
9	29	0	0	3	2	950516	15.28%	750354	200161	15	1.4	5
	6	0	1	4	0	709384	37.70%	709384		23	0.6	5
11	28	0	0	4	0	700384	37.70%	700384		20	0.6	5
12	54	1	1	4	1	703011	37.51%	703011		15	1	5
13	55	1	0	4	1	703011	37.51%	703011		18	1	5
14	16	0	1	3	1	869237	22.90%	676917	192320	15	1.2	5.1
15	17	0	0	3	1	869237	22.90%	676917	192320	22	1.2	5.1
16	35	1	0	3	2	804535	28.23%	660065	134560	15	1.2	5
17	30	1	1	3	2	804535	28.23%	009905	134509	13	1.2	5
18	51	1	0	3	1	703011	37.51%	577196	125816	18	1	5
19	51	1	0	3	1	703011	37.51%	577196	125816	18	1	5
20	53	1	1	3	1	703011	37.51%	577196	125816	15	1	5
21	2	0	0	2	2	951225	15.27%	550902	400323	15	1.4	5.1
22	5	0	1	2	2	951072	15.27%	550749	400323	14	1.4	5.1
23	31	1	1	2	2	805424	28.21%	536285	269139	13	1.2	5
24	39	1	0	2	2	805387	28.21%	536248	269139	15	1.2	5
25	26	0	1	3	0	709384	37.70%	532038	177346	23	0.6	5.1
26	30	0	0	3	0	700384	37.70%	532038	177346	20	0.6	5.1
27	15	0	1	2	1	869866	22.89%	485226	384640	15	1.2	5.1
28	9	0	0	2	1	869416	22.90%	484776	384640	22	1.2	5.1
29	52	1	1	2	1	703641	37.49%	452010	251631	15	1	5.1
30	50	1	0	2	1	703550	37.49%	451918	251631	18	1	5.1
31	37	1	1	1	2	806275	28.10%	402567	403708	13	1.2	5.1
32	40	1	0	1	2	800275	28.19%	402507	403708	15	1.2	5.1
33	44	1	1	4	0	398504	64.95%	398504		23	0.4	5
34	45	1	0	4	0	398504	64.95%	398504		25	0.4	5
35	20	0	1	2	0	709384	37.70%	354692	354692	23	0.6	5.2
36	27	0	0	2	0	700384	37.70%	354602	354602	20	0.6	5.2
37	3	0	1	1	2	951781	15.20%	351297	000484	14	1.4	5.2
38	14	0	0	1	2	951781	15.26%	351297	600484	15	1.4	5.2
39	58	1	0	1	1	704180	37.47%	326733	377447	18	1	5.2
40	60	1	1	1	1	704180	37.47%	326733	377447	15	1	5.2
41	41	1	0	3	0	308504	64.05%	208878	00626	26	0.4	5.1
42	43	1	1	3	0	398504	64.95%	298878	99626	23	0.4	5.1
43	1	0	0	1	1	870045	22.88%	293085	576961	22	1.2	5.2
44	4	0	1	1	1	870045	22.88%	293085	576961	15	1.2	5.2
45	33	1	0	0	2	806275	28.19%	267998	538277	15	1.2	5.1
46	34	1	1	0	2	806275	28.10%	267008	538277	13	1.2	5.1
47	56	1	1	0	1	704180	37.47%	200917	503263	15	1	5.2
48	57	1	0	0	1	704180	37.47%	200917	503263	18	1	5.2
49	42	1	1	2	0	398504	64.95%	199252	199252	23	0.4	5.2
50	49	1	0	2	0	398504	64.95%	199252	199252	25	0.4	5.2
51	21	0	1	1	0	700384	37.70%	177346	532038	23	0.6	5.2

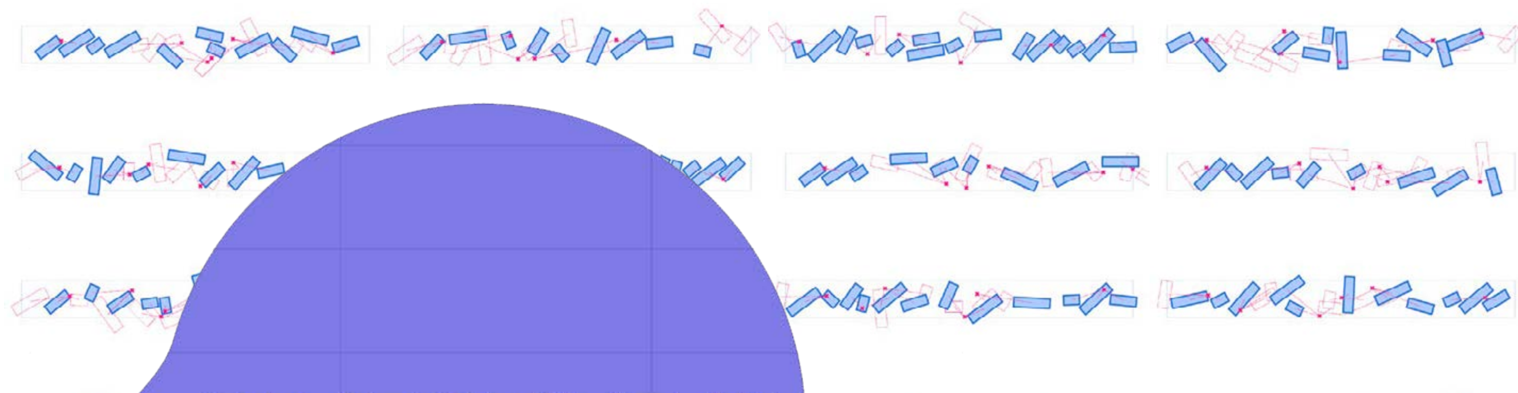
Housing units will arrive as either prefab modular houses on the back of trailers or mobile homes that come and go with climate migrants. Fixed units provide long-term accommodation, while mobile units improve community fluidity. Unit composition and road network options will be iterated through on the computational design model as inputs.

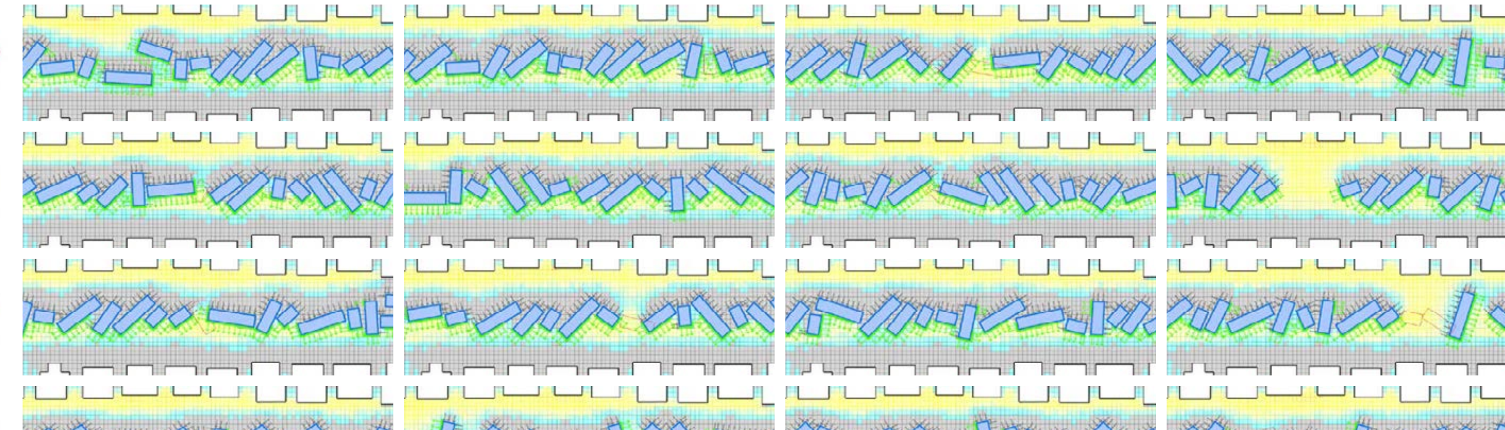
On the evaluation side, each road network option will be evaluated according to the number of needed service stops and average walking distance to nearby streets in order to access traffic.

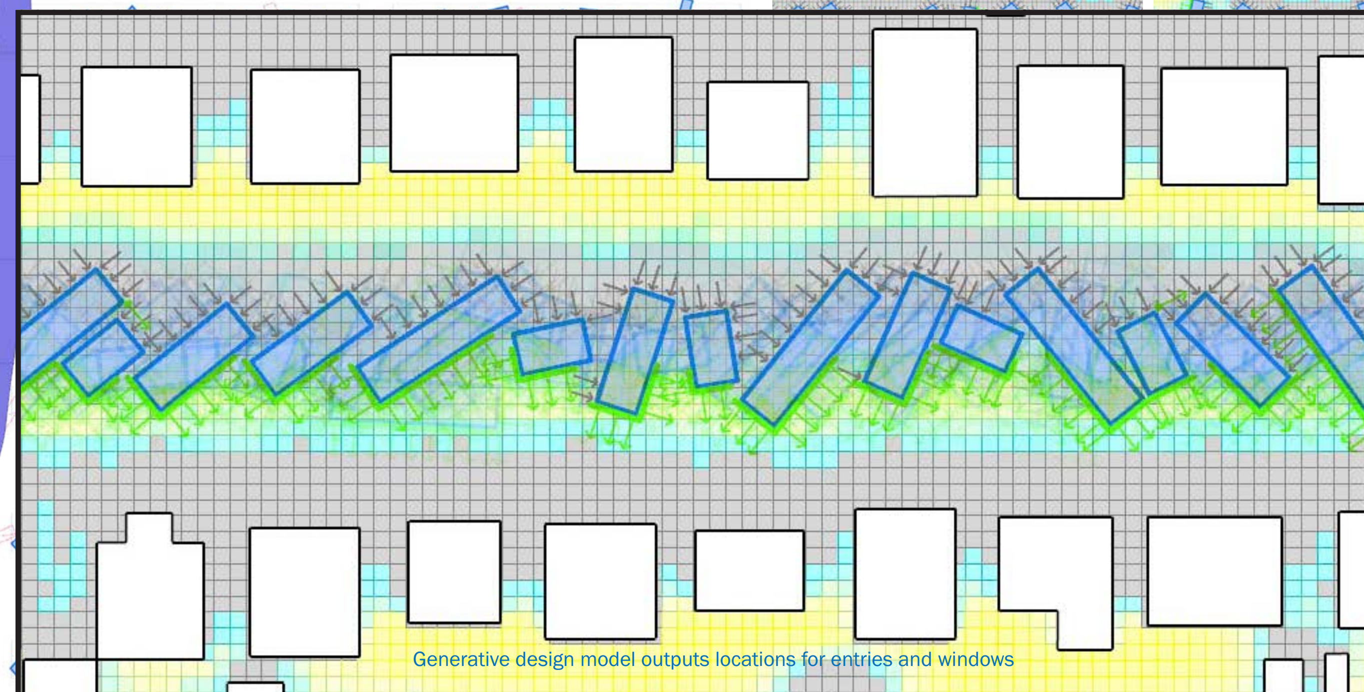
Also, existing units in adjacency to housing additions will be evaluated for daylight accessibility to understand how each design option impacts the existing condition of the site.

All these factors will be put together for computation. As a result, a CSV data file will be created to document inputs and outputs.

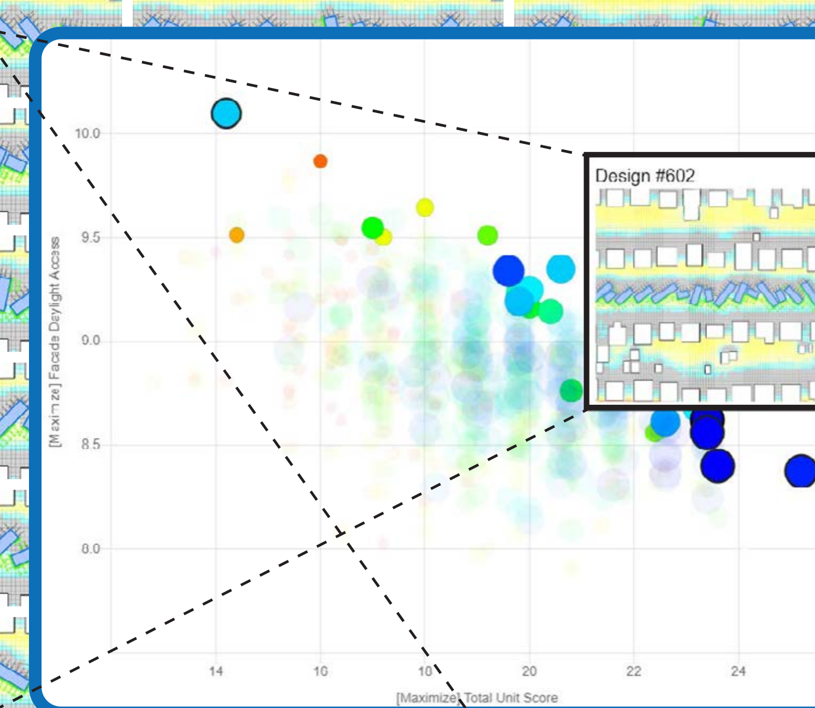


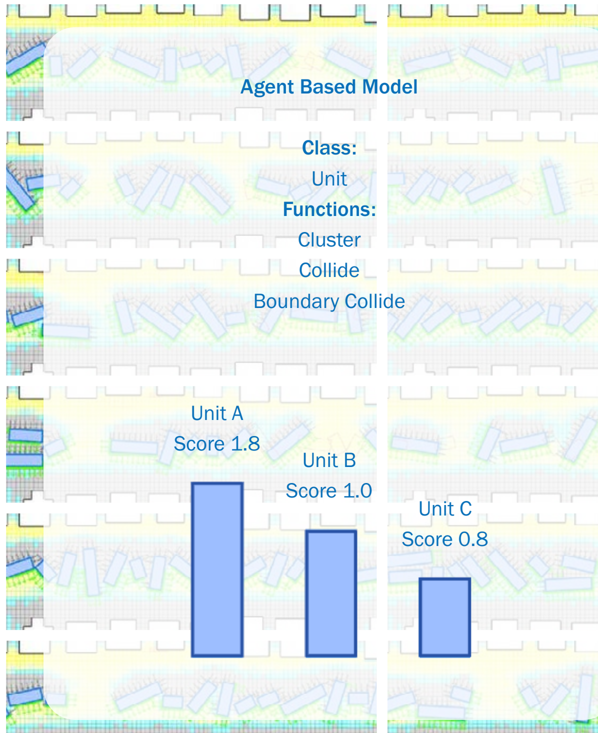


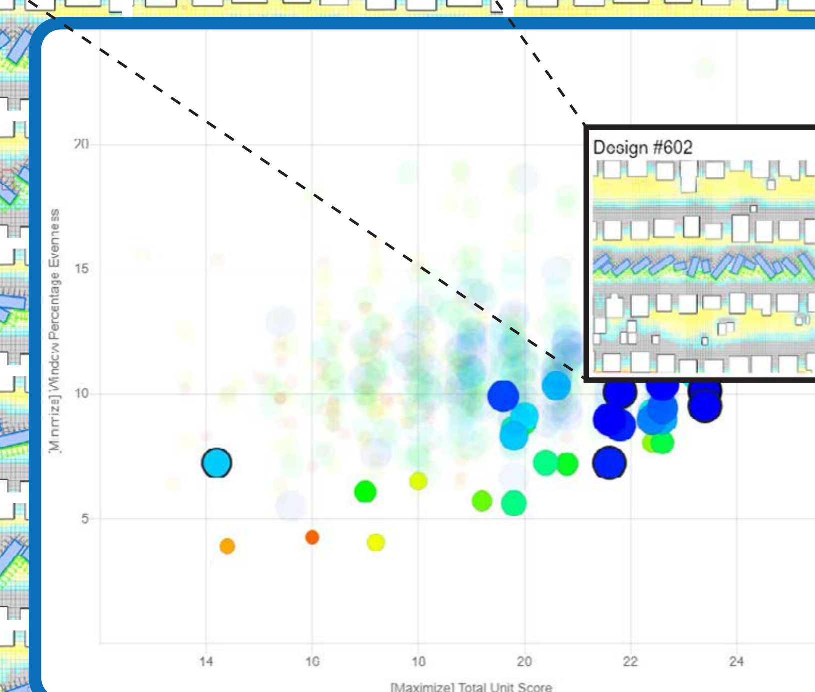


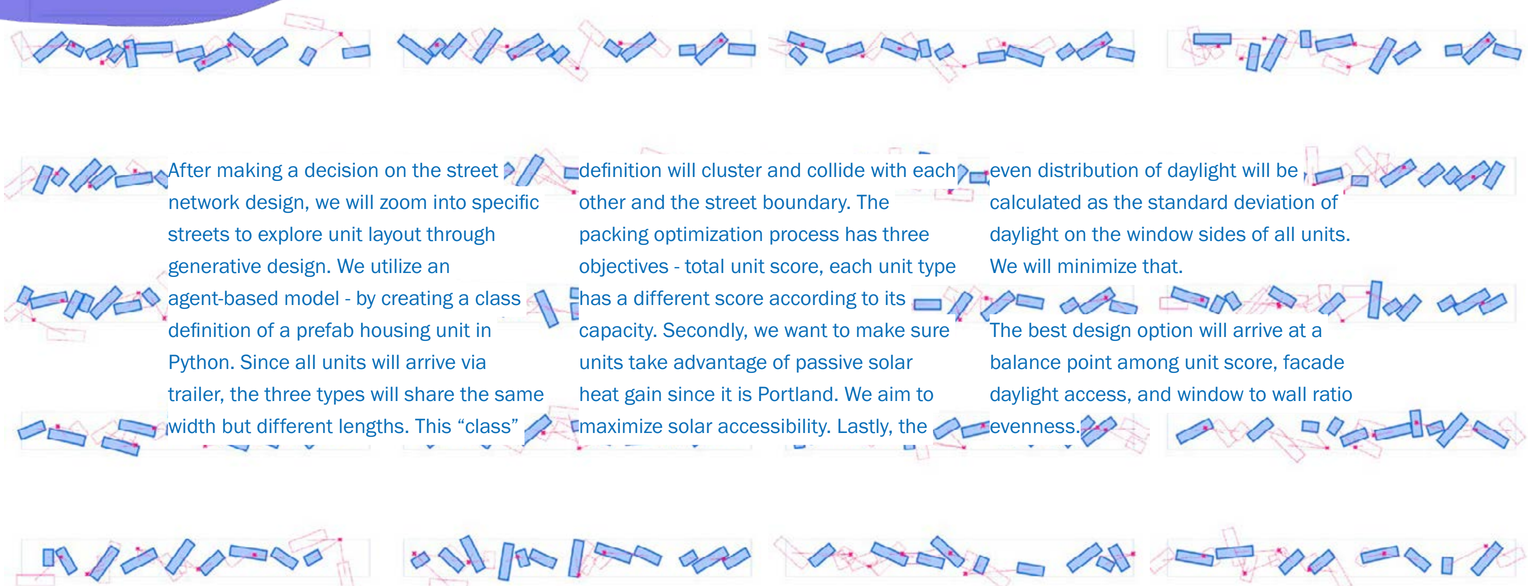


Generative design model outputs locations for entries and windows



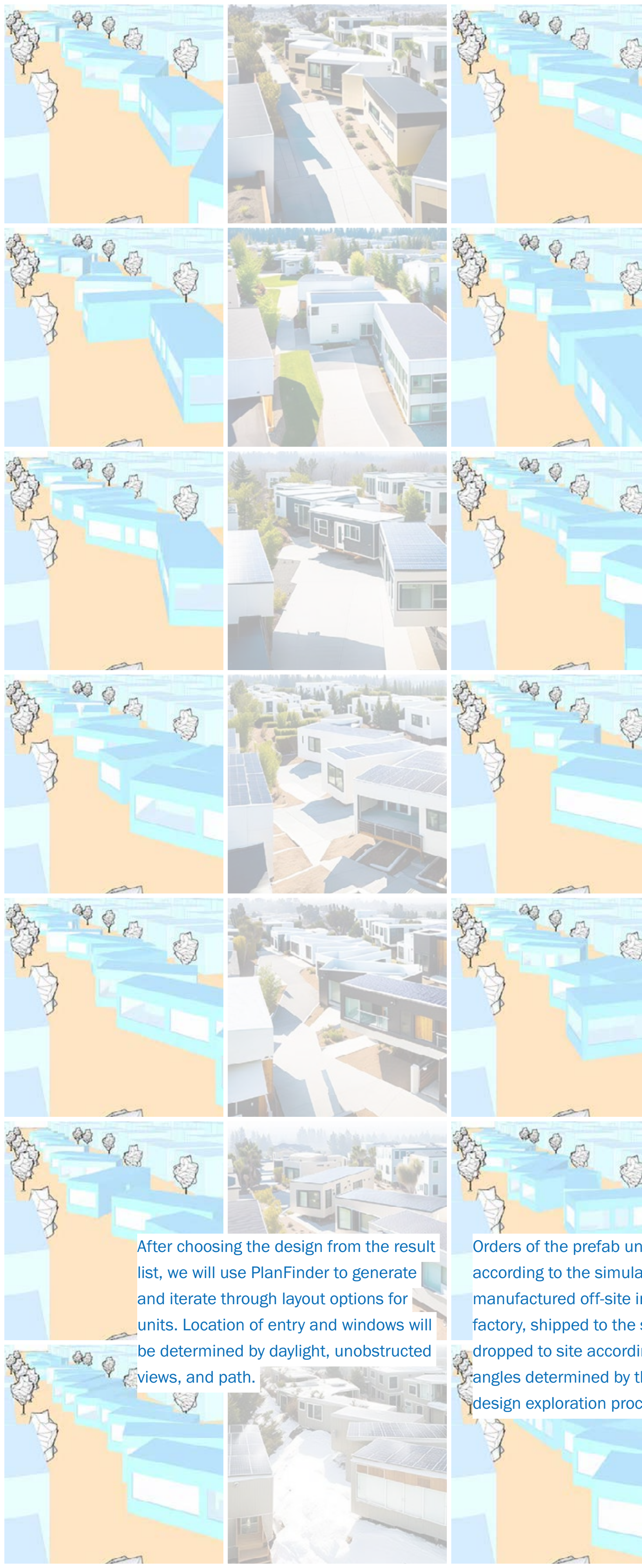






After making a decision on the street network design, we will zoom into specific streets to explore unit layout through generative design. We utilize an agent-based model - by creating a class definition of a prefab housing unit in Python. Since all units will arrive via trailer, the three types will share the same width but different lengths. This "class" definition will cluster and collide with each other and the street boundary. The packing optimization process has three objectives - total unit score, each unit type has a different score according to its capacity. Secondly, we want to make sure units take advantage of passive solar heat gain since it is Portland. We aim to maximize solar accessibility. Lastly, the even distribution of daylight will be calculated as the standard deviation of daylight on the window sides of all units. We will minimize that.

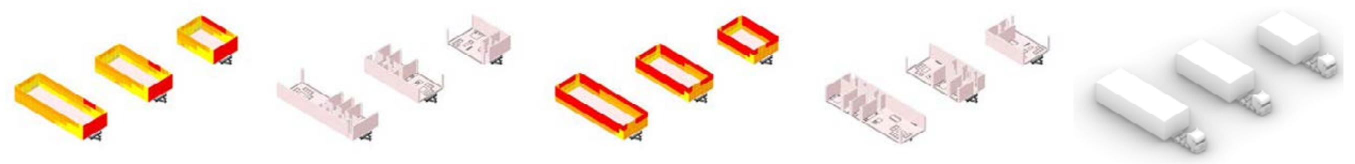
The best design option will arrive at a balance point among unit score, facade daylight access, and window to wall ratio evenness.



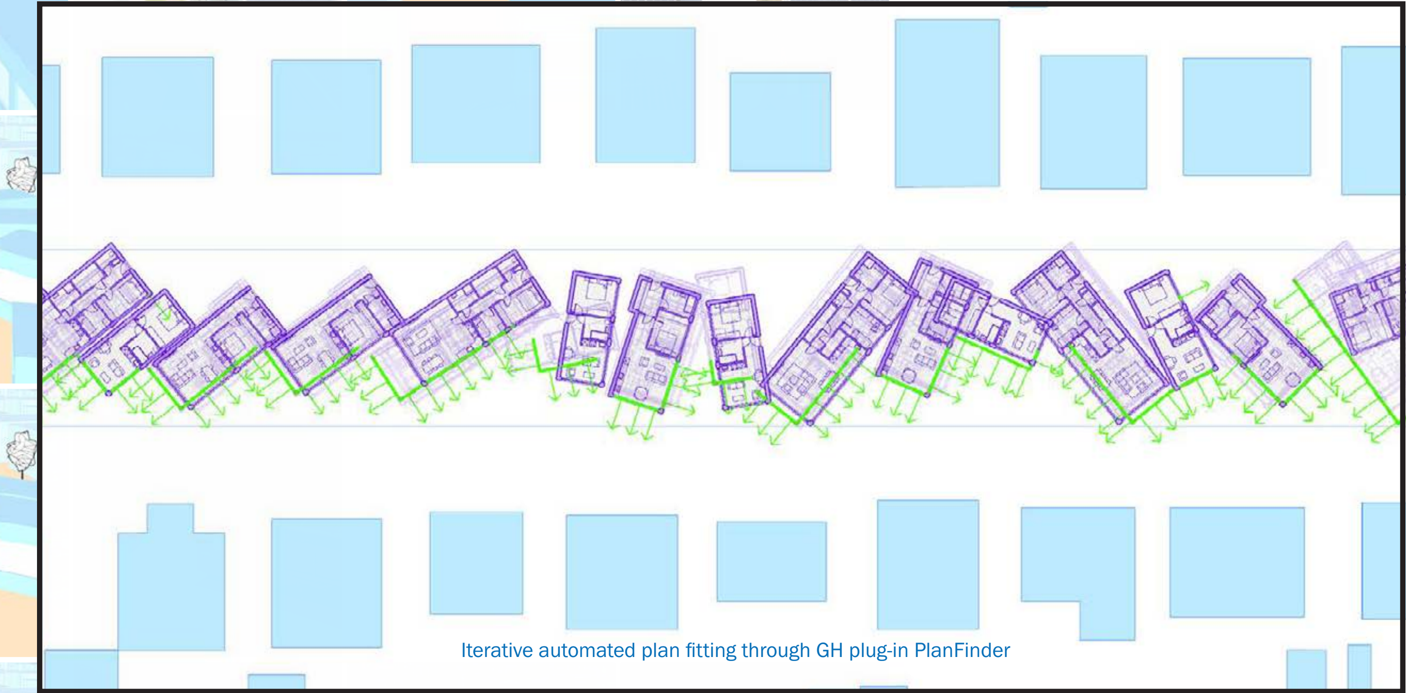
After choosing the design from the result list, we will use PlanFinder to generate and iterate through layout options for units. Location of entry and windows will be determined by daylight, unobstructed views, and path.

Orders of the prefab units will be placed according to the simulation, manufactured off-site in a controlled factory, shipped to the site via trailer, and dropped to site according to location and angles determined by the generative design exploration process.

But before anything, procedure massing of design options will be ported into Stable Diffusion to get iterative and real-time visualization through Generative AI engine.



Order customized units according to the selected optimized result



Iterative automated plan fitting through GH plug-in PlanFinder

Factory controlled prefabrication

Truck transportation

Quick on-site deployment