GSAPP Portfolio

Qingning Cao

CONTENTS

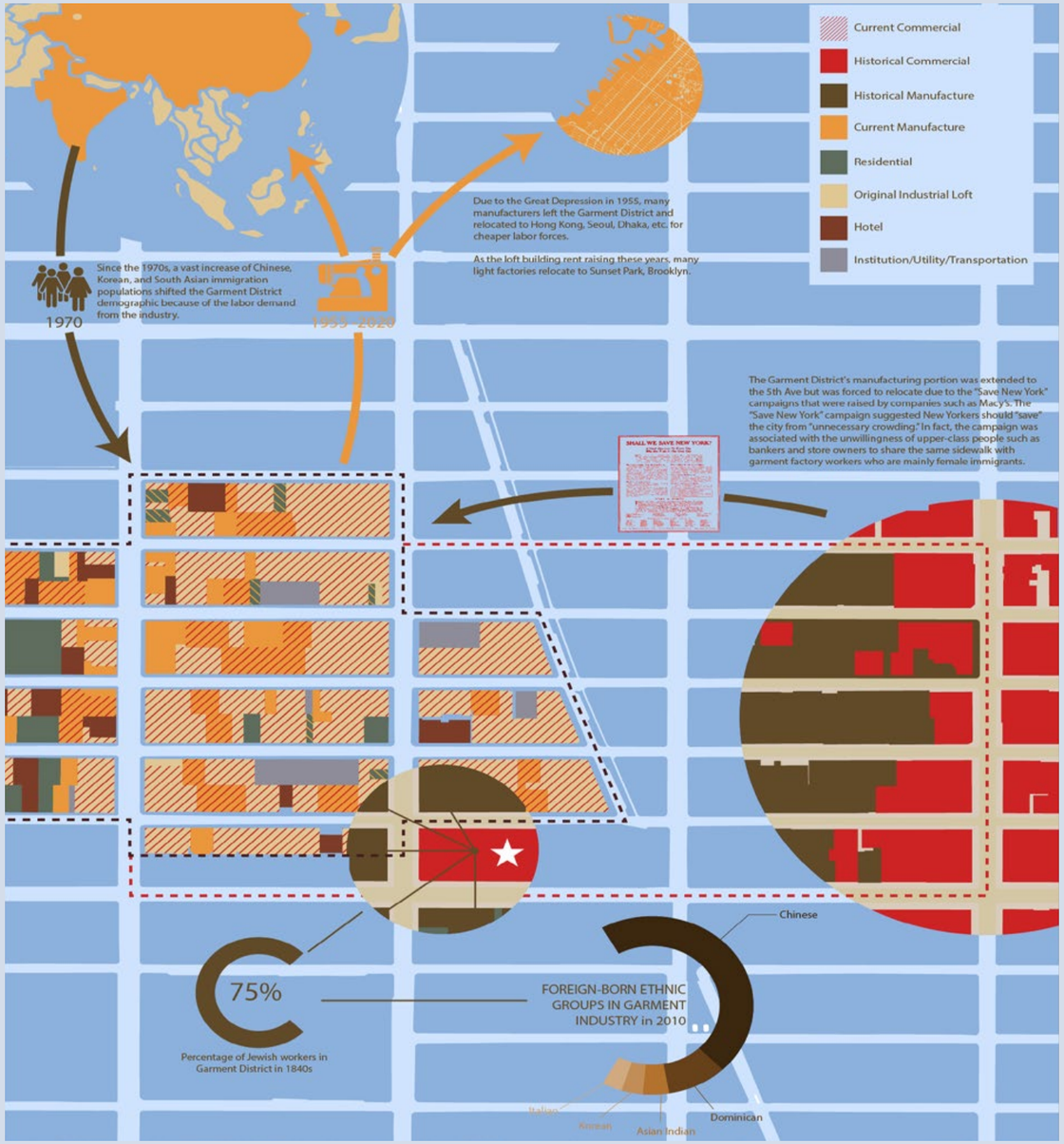
01 CONVEYING BELT

GARMENT DISTRICT
MUSEUM & FACTORY

Academic
Personal Project
My Contribution: Modelling and Analysis
New York, the United States
2020 Fall
Instructor: Emmett Zeifman
ez2148@columbia.edu

SITE MAP

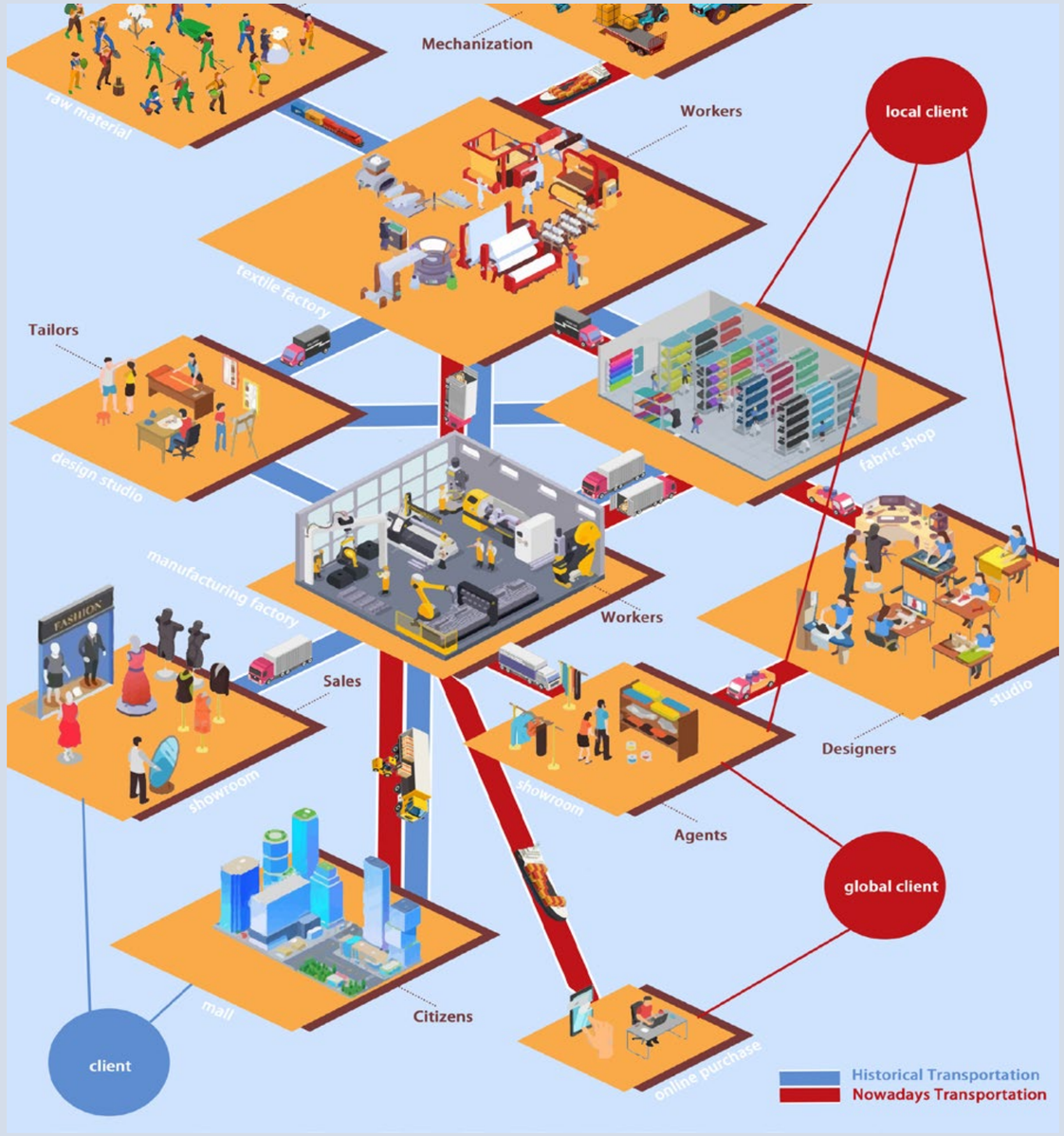
Cooperation with Zixiao Zhu



SITE ANALYSIS

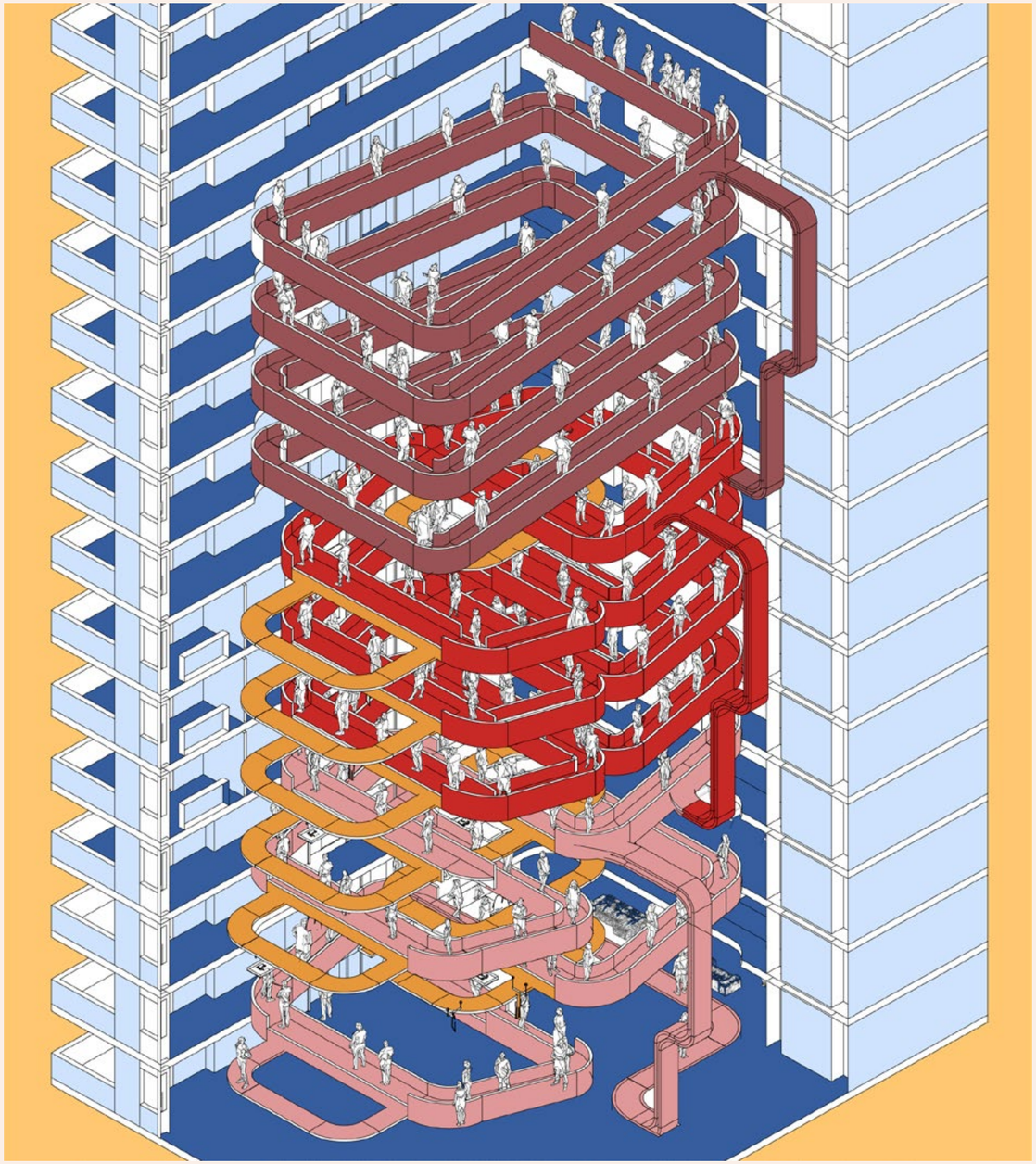
Garment District is an important historical district in New York City. It's important in history, but it's declining. I want to preserve this unique district in a special way. I want to compress it in one tall building, and make it like a combination of museum, factory and shopping mall.

Considering the global connection nowadays, it is harder for local producers to survive without global industrial chain.
The advantage of local agency is the quick feedback for clients and the visibility and accessibility of production.
In my design, I want clients to have more feedbacks on the goods they want. They can intervene in an early stage of production, and even design by themselves with a reasonable price.



AXONOMETRIC BELT SYSTEM

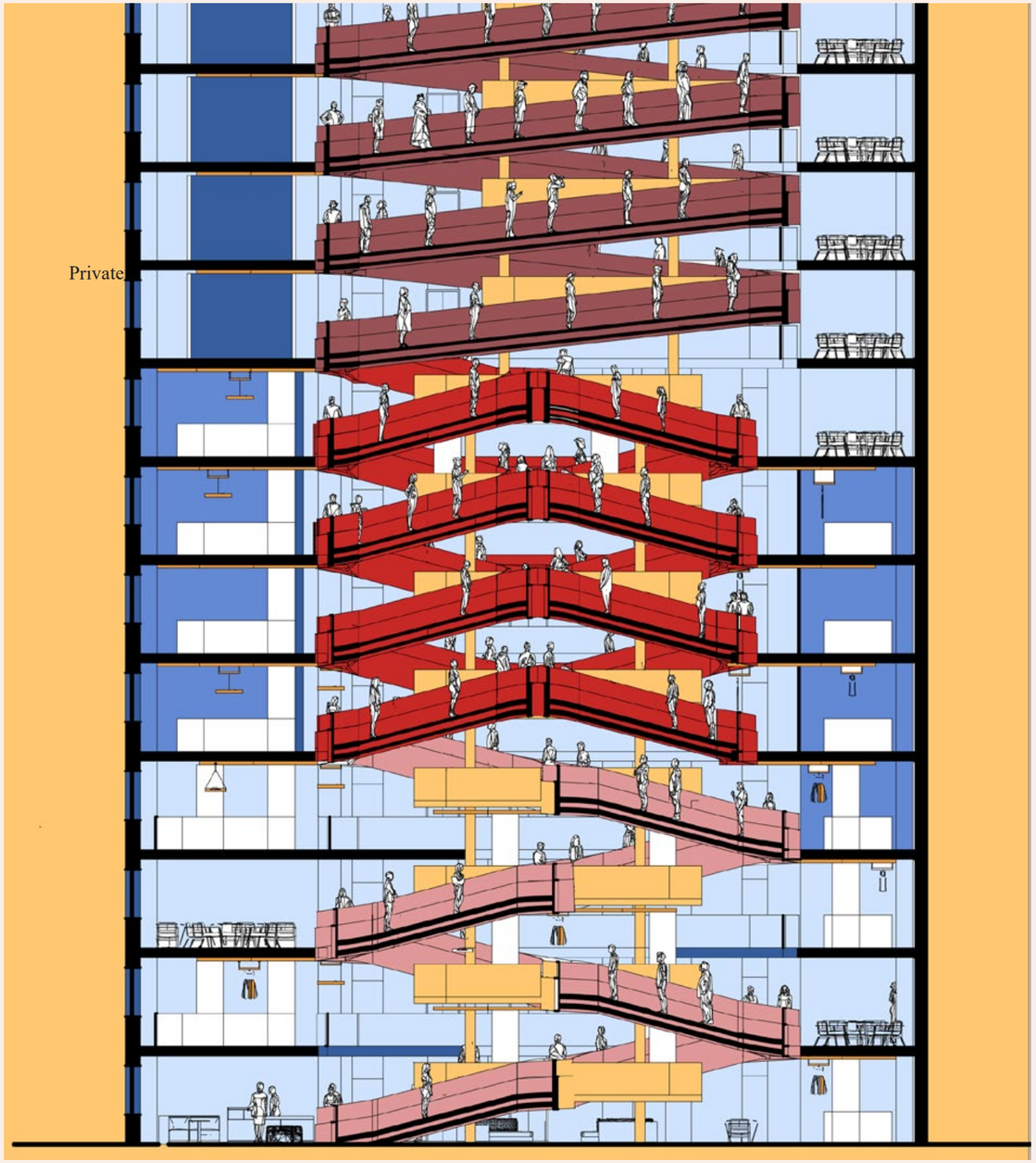
I choose the "Fashion Tower" to do my design. Its core is on two sides of the building, so I can make full use of the free center. Generally, I use the system of conveying belt. It is used in factories a lot for conveying goods. Also, this can convey visiting people. They can just stand on the belt and watch the production process of the garment industry. If they are interested in any particular process, they can just go down from the belt and particiate in that process by themselves.
To make the full use of the belts, I design a double layer belt system to convey people and products at the same time. The upper layer is for people and the lower layer for goods, they going in opposite directions.



SECTION FOR 3 MODES

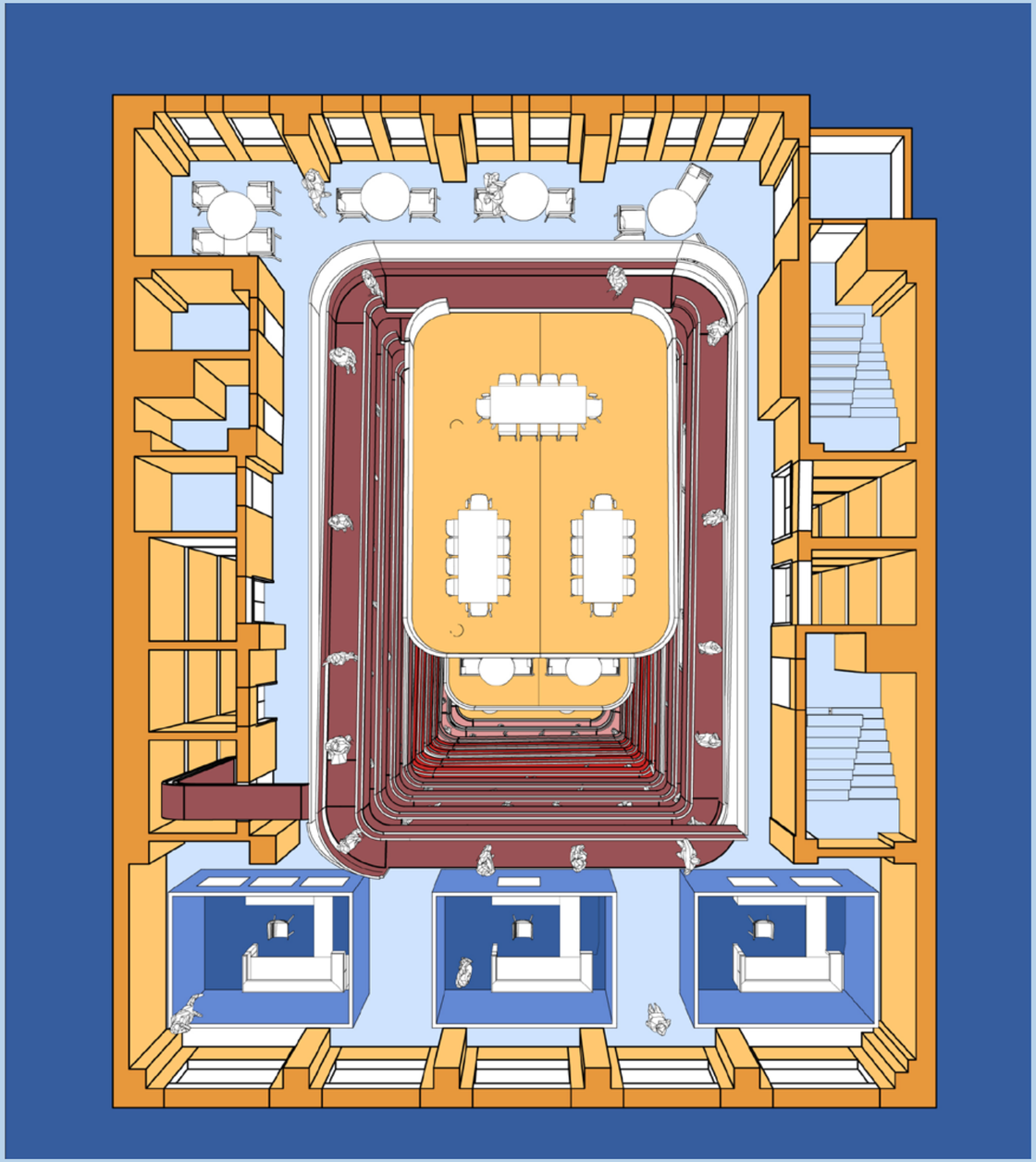
To make the space more flexible and changable in the future, I design three modes for different needs - public layer, semi-public layer, and private layer. Different modes have different space partitions and different movements of belts.

The more public, the more consumers can participate in the process of the production. In case that there are still some processes that are not suitable for consumers to watch, the private layer is designed for this kind of usage.



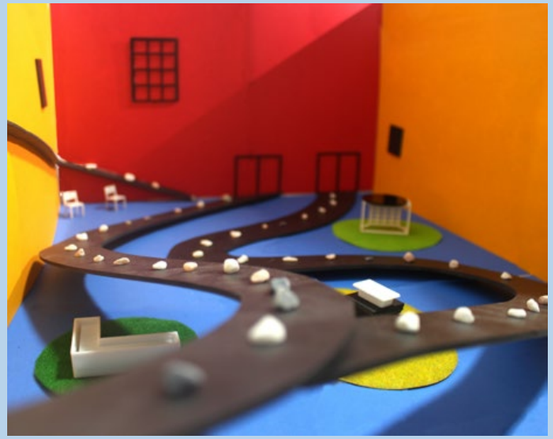
PLAN PERSPECTIVE - PRIVATE MODE

The core and service rooms are on two sides of the plan, and the south part is the main functional areas.
In this plan, I assume it as the personal studios for different designers. Clients can see their products in conveying belt, and they can enter some designers' rooms if they are interested in their designs. Also, conveying belt can help to convey materials and goods of those designs'.
The middle part is a shared workshop for designers and consumers if they want.



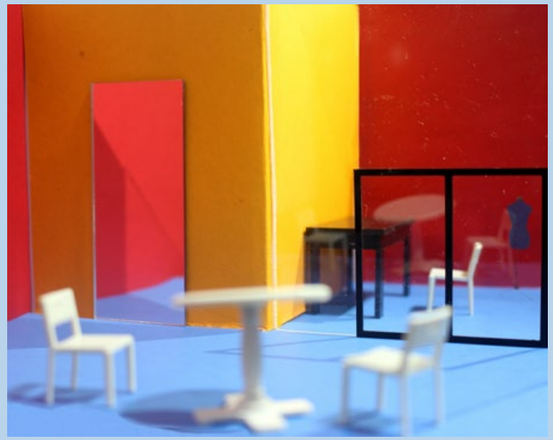
MANUAL MODEL

Public Space

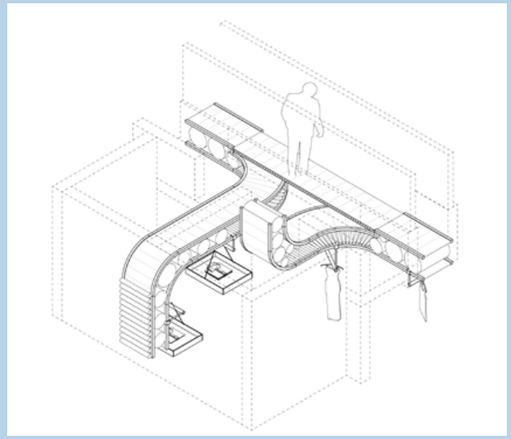


Semi-public Space

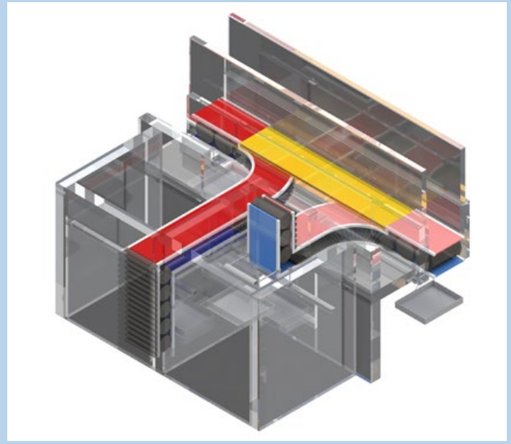
Private Space



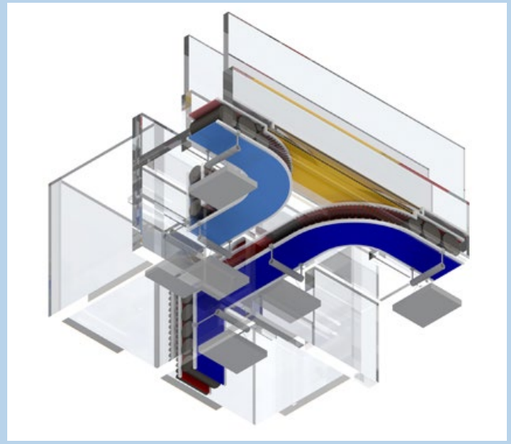
CONNECTION OF SYSTEMS

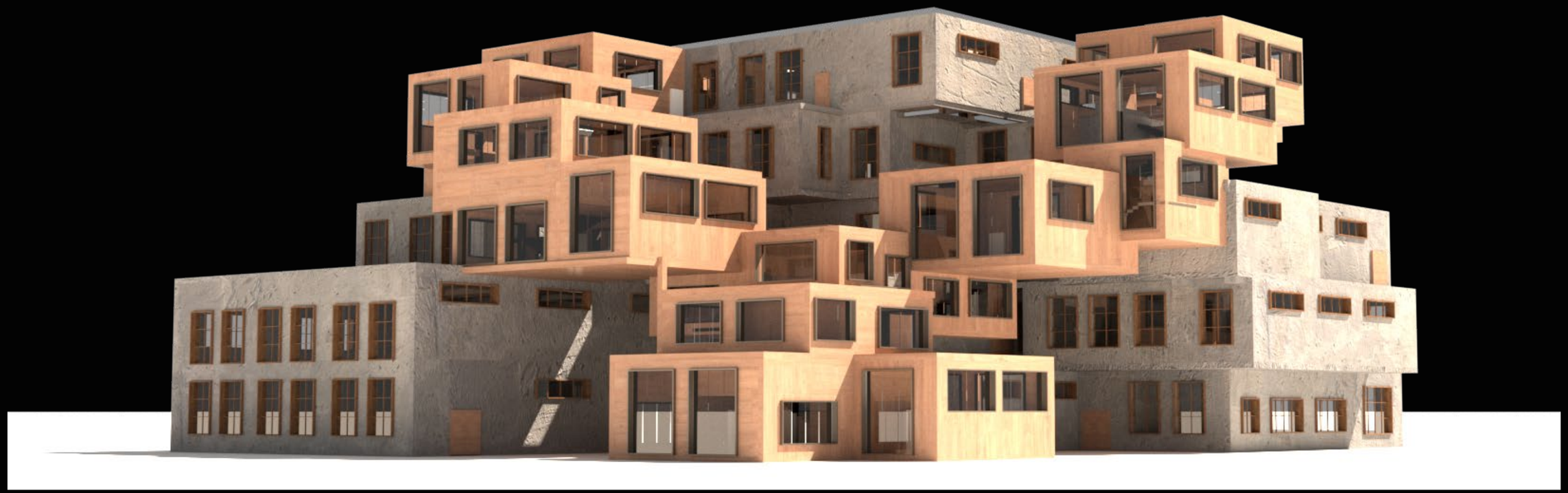


Upper Layer - for people



Lower Layer - for materials and goods





02 TWO SYSTEMS

SCHOOL

Academic
Personal Project
2020 Spring
Instructor: Amina Blacksher

My project emphasizes on the efficiency of the school. I know that there are already many schools built for more people than just students, but for the sake of students' safety, they are allowed to enter only after school. I think this is a waste of the facilities and space. So, the core purpose of my project is to improve the efficiency. I will divide people into two groups in my following presentation, students and all other people. which I call "the public".

AXONOMETRIC BELT SYSTEM

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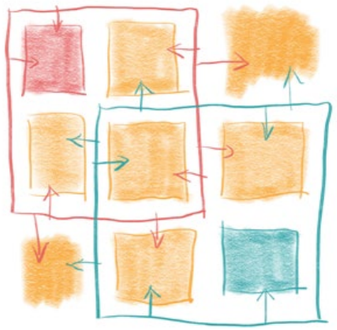
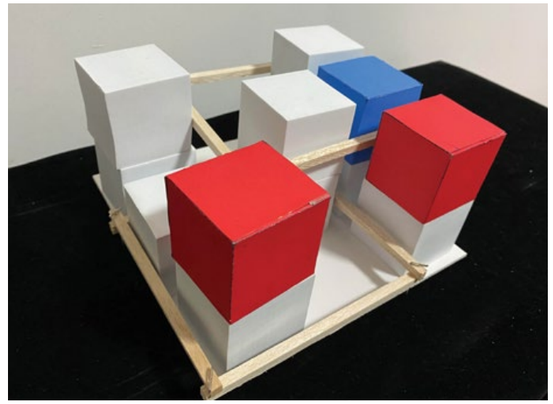
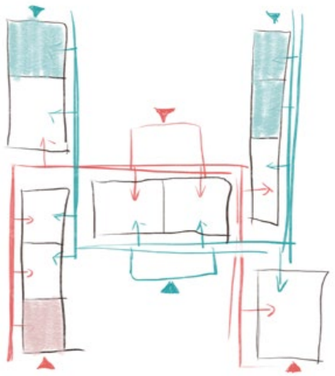
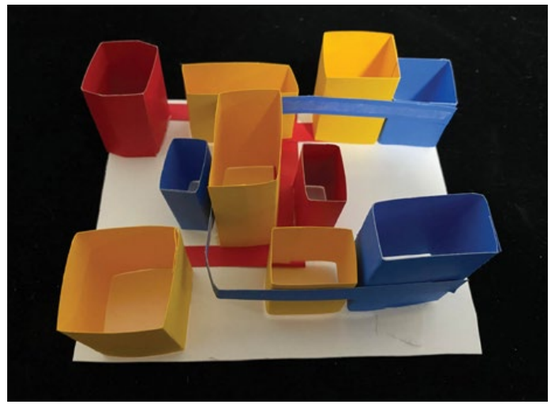
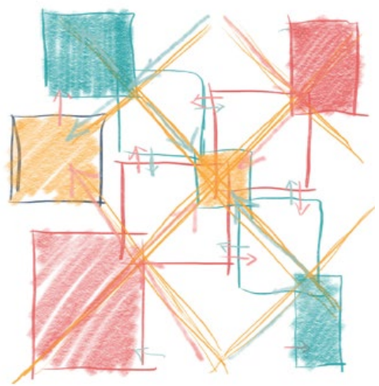
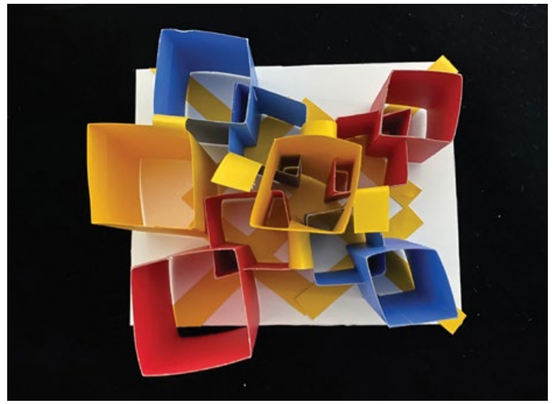






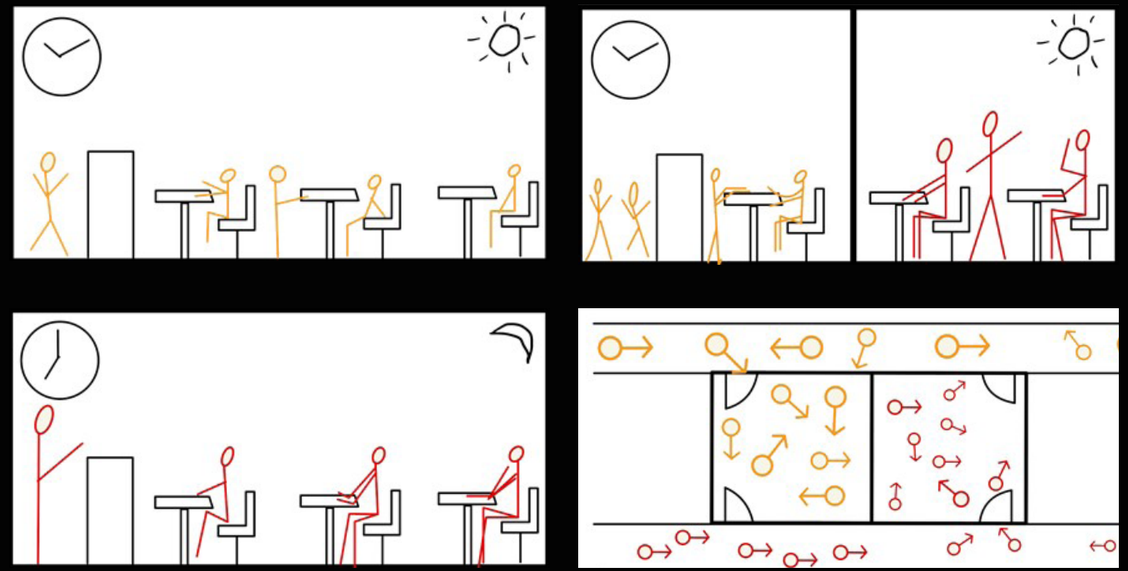






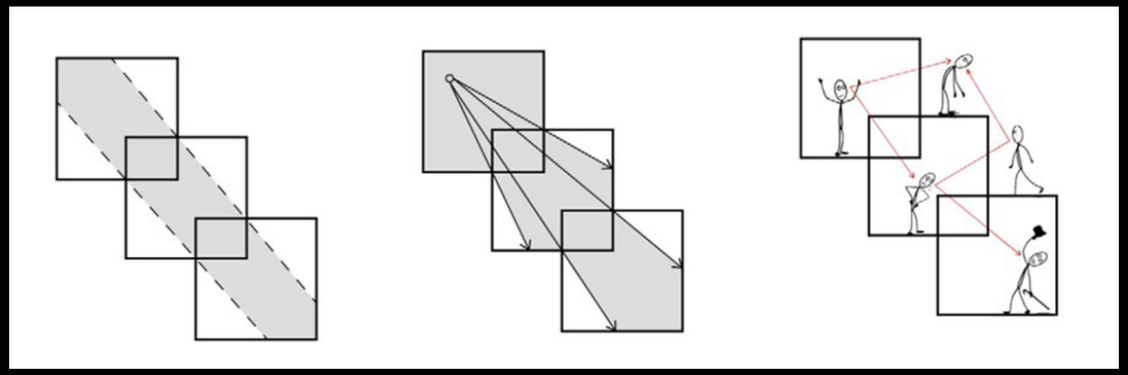
EFFICIENCY

My project emphasizes on the efficiency of the school. I know that there are already many schools built for more people than just students, but for the sake of students' safety, they are allowed to enter only after school.



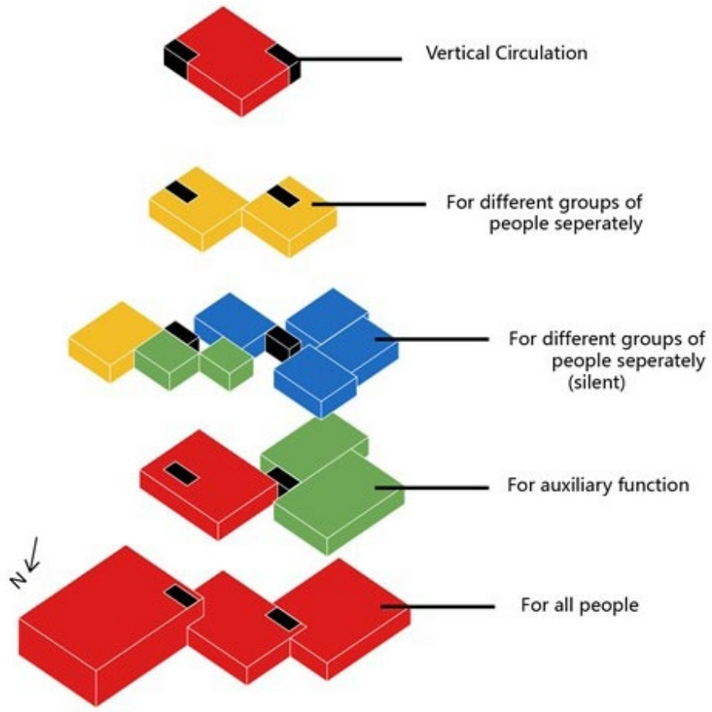
PROTOTYPE - OVERLAPPING & LIGHT

This is the prototype. Several boxes are overlapped, which can generate many kinds of interactions between boxes.
This prototype can be used in both section and plan, which can make interesting changes in interactions and light.
The degree of openness is flexible by partitions. It can be totally open, only eye contact and no contact.

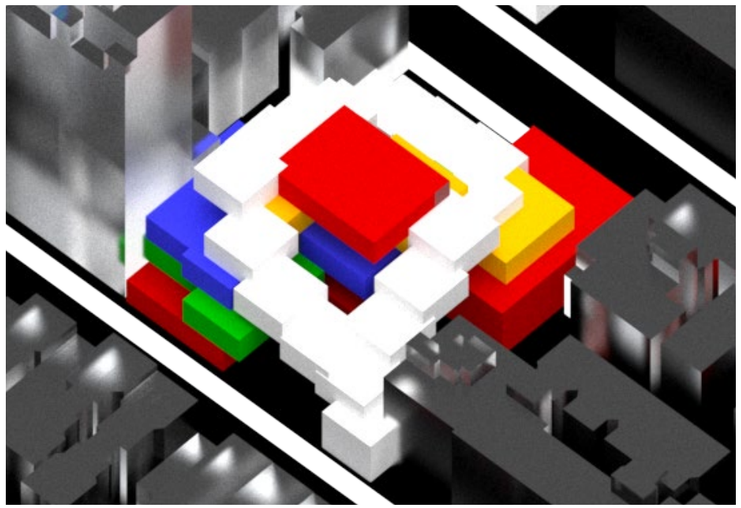


CORE FUNCTIONS

You can easily tell that there are two systems in the building. The middle core function part and the overlapping classrooms. Core functions are accessible for the public and students, while the classrooms for students mostly.



There are many functions suitable for the two groups to use together or separately in school. Like auditorium, gymnasium and many studios. So the core functions should be easy to access for both groups of people.

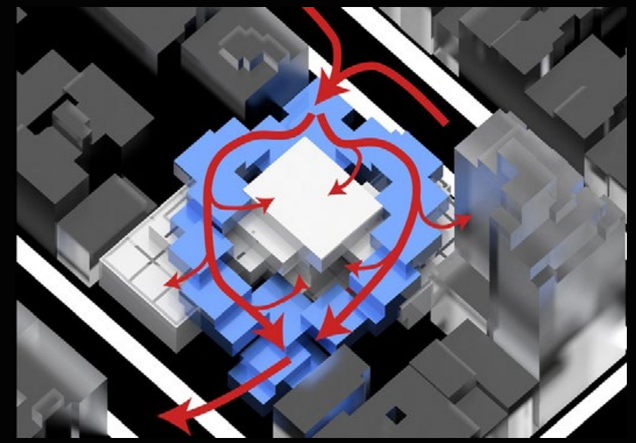


CIRCULATION - PUBLIC

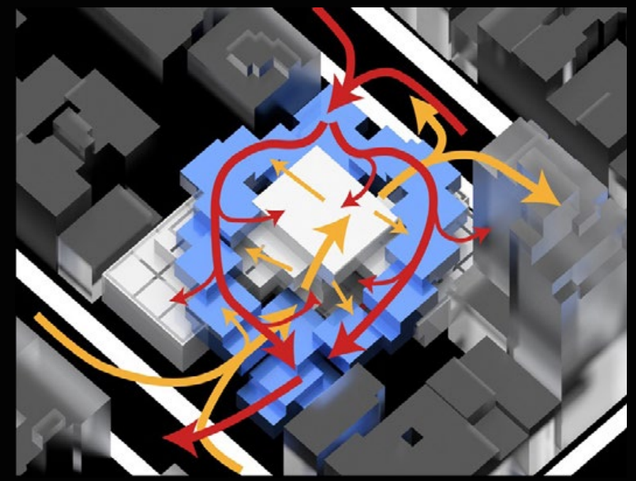
I want the public and students to use the school simultaneously. However, the safety of students can not be ignored.

CIRCULATION - STUDENTS

I learnt from the doctor-patient model. Both groups can use the same space but with different routes to enter, which can ensure the safety of students in my case.

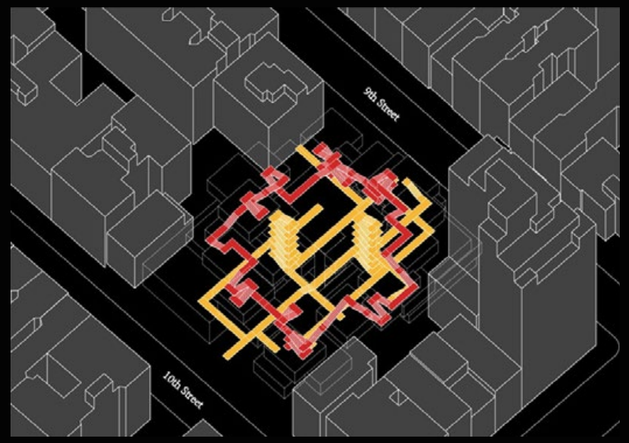


CIRCULATION

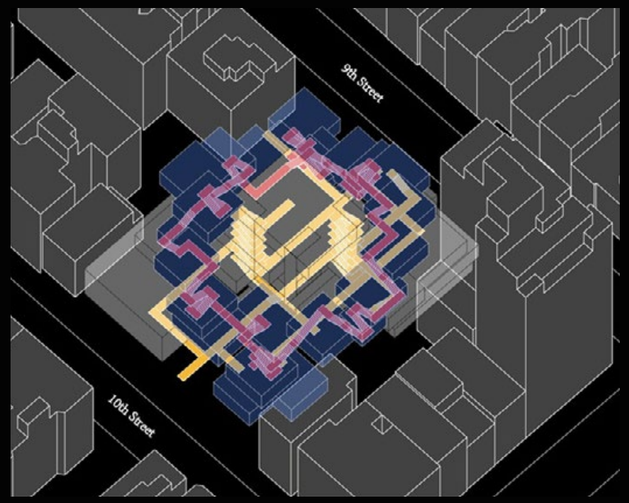


ACTUAL ROUTES

Here are the two routes. Red for students and yellow for the public.

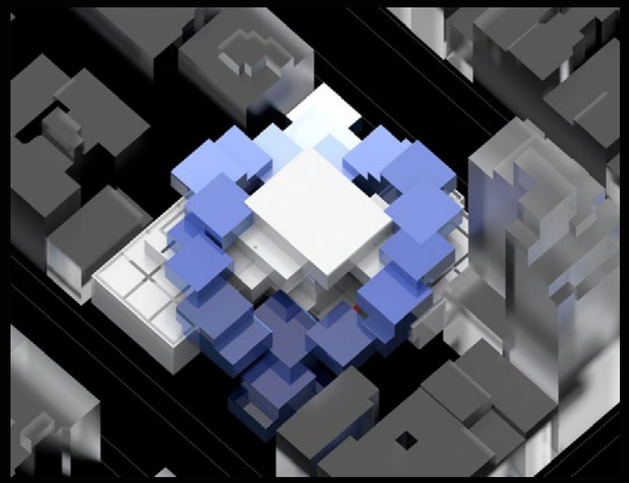


Classrooms are connected by the red routes. They are also accessible by yellow routes, but yellow routes can be locked due to different circumstances.



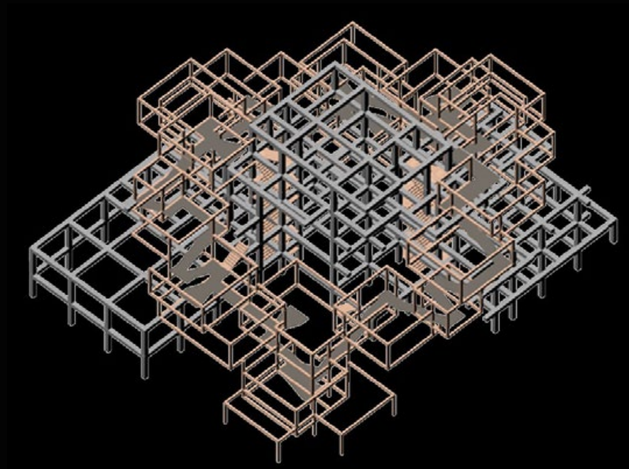
CLASSROOM SETTING

Because the classrooms are distributed on different floors, it is also a natural distinction of different grades.



STRUCTURE

To distinguish these two systems, each part has its own material and structure. Generally, I want the core function part to be heavy and the overlapping classrooms to be light. So I use core function with concrete, while classrooms with CLT.



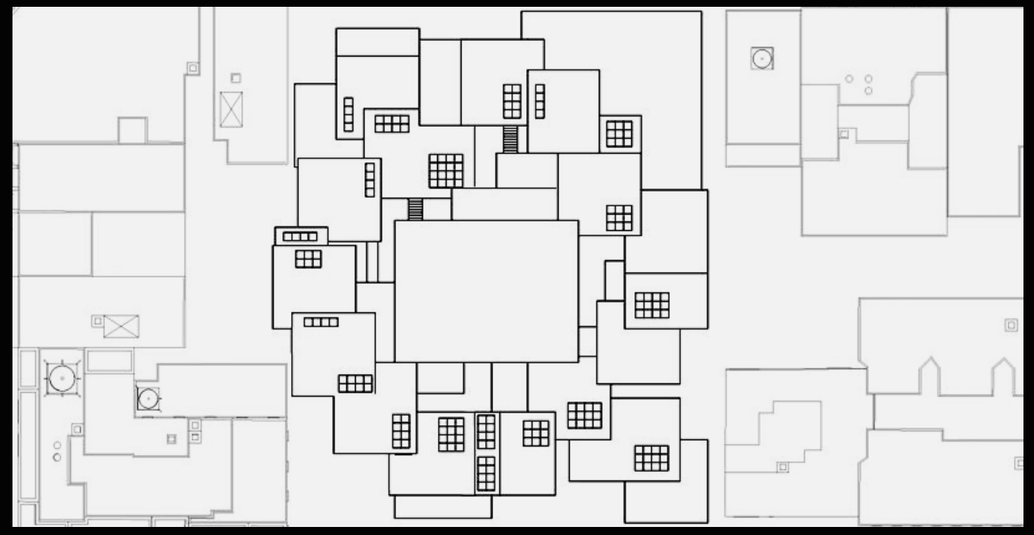
MATERIAL

To distinguish these two systems, each part has its own material and structure. Generally, I want the core function part to be heavy and the overlapping classrooms to be light. So I use concrete for core functions and wood for classrooms.

CONTEXT

Because the overlapping system, the light for classrooms is ample, while the core function needs more artificial light, which is more controllable for different functions. Also, I use the combination of skylights and side windows to avoid blocking the light path into core functions.

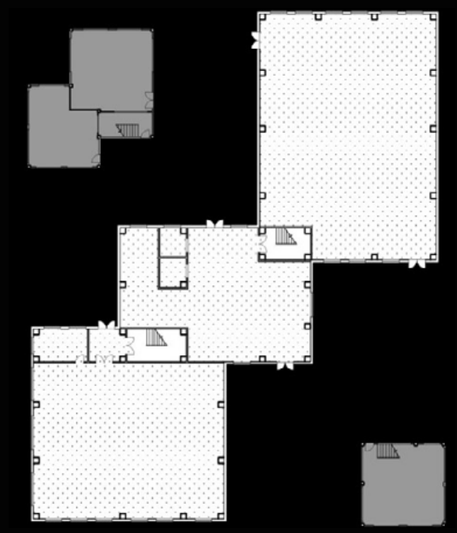
SITE PLAN



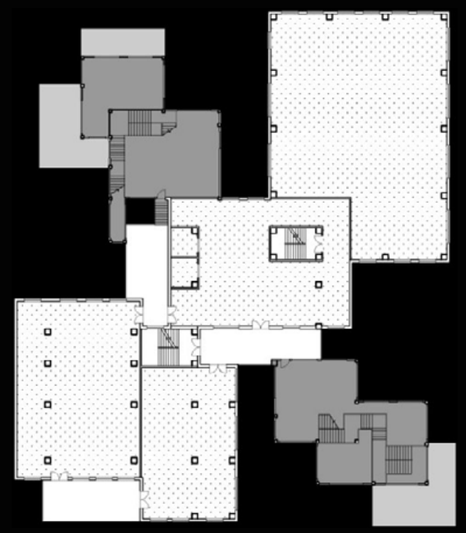
Skylights are mostly located on the overlapping part of the classroom, which is also the vertical circulation space. I want to use these skylights to create some rhythm for the route and also bring light into the core function part.

In core function part, the vertical circulation is located similarly.

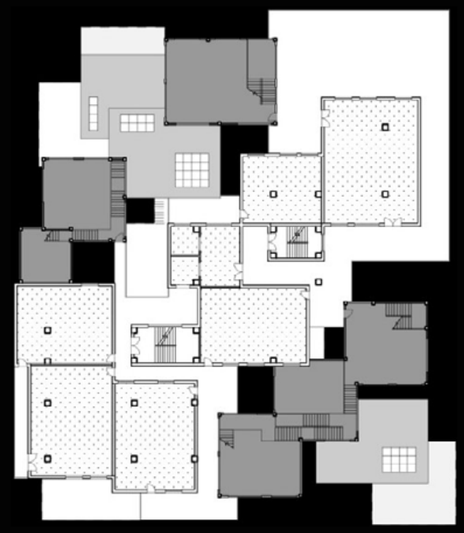
1F



2F



3F



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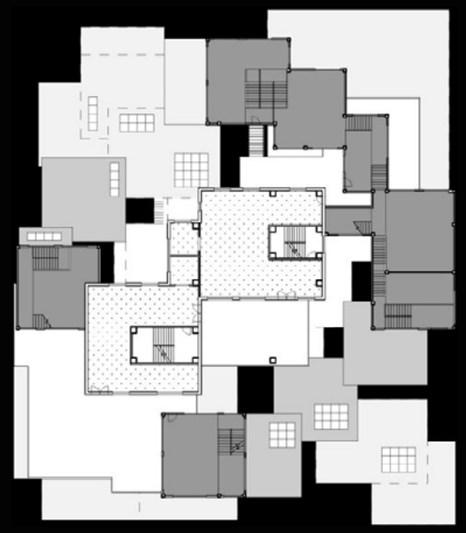
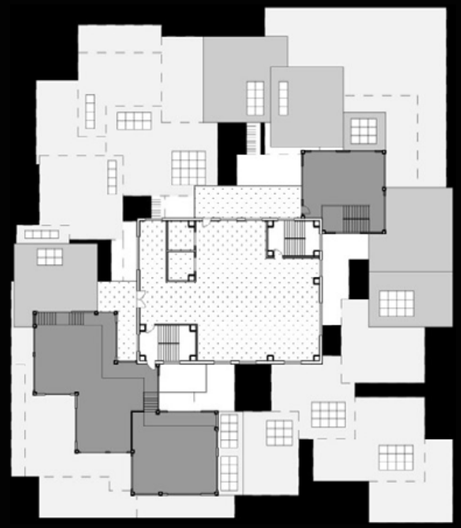


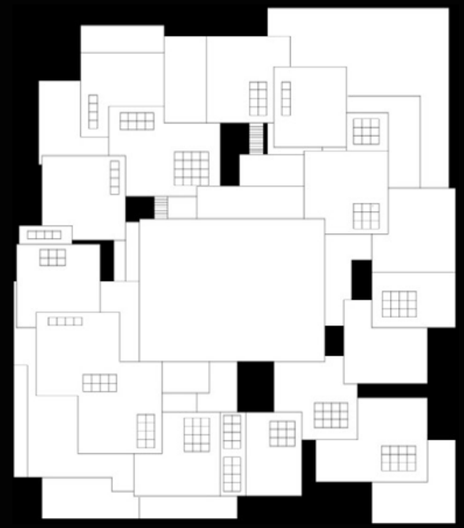
To solve the light of core function, I also set some small courtyards around the middle part to let light in.

Classrooms are overlapped on core functions. Although they have a unique route to reach inside themselves, they can also be reached through core functions when necessary.

5F



ROOF

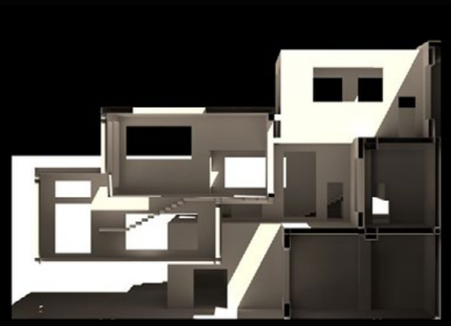


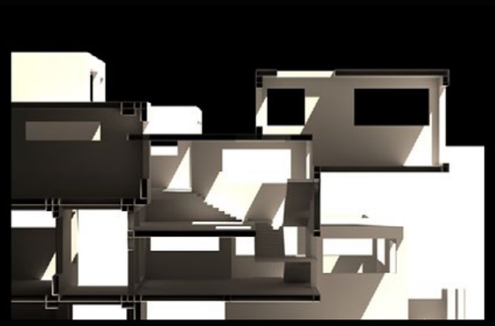
LIGHT ANALYSIS

The combination of skylights, side windows and courtyards can make up the light loss brought by overlapping.

Here are several zoomed in sections to show light path to enter the building.

The interaction of two systems is flexible and can be controlled by different partitions





INTERACTIONS BETWEEN TWO SYSTEMS

INTERACTIONS BETWEEN TWO SYSTEMS

TWO SYSTEMS

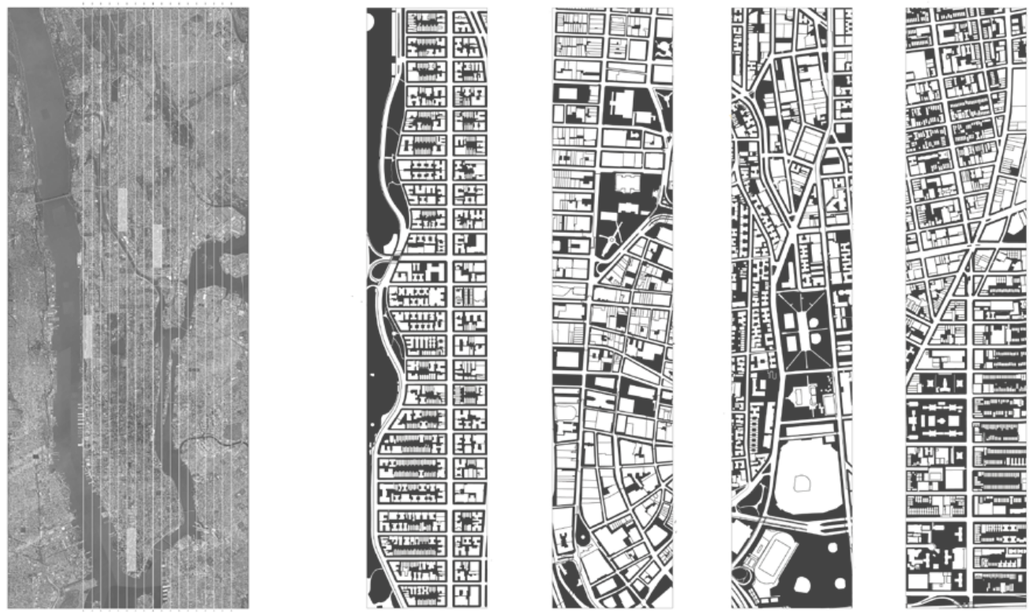
03 CURVING WALLS

HOUSING

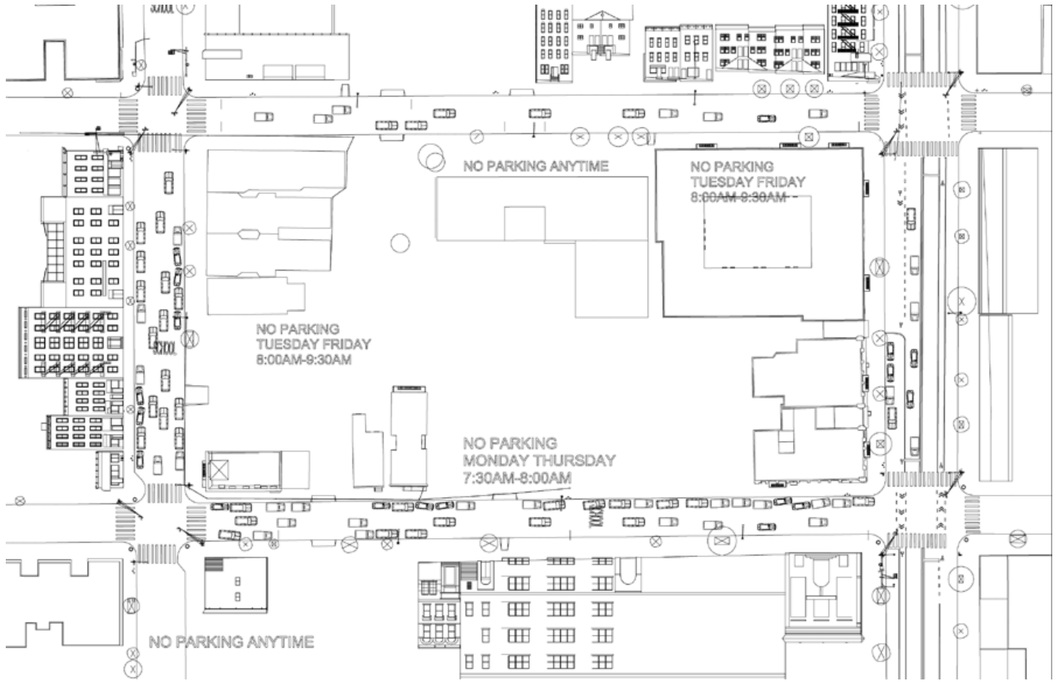
Academic
Teammate: Elena Yu
Bronx, New York, NY
2021 Fall
Instructor: Benjamin Cadena

In Bronx, the majority of the population is taken by immigrants from Caribbean region, while it has always been an issue of missing public space and community events. To create more opportunities for immigrants to meet people and integrate into the neighborhood, this project works from two aspects: adjacency, and hybrid space. Adjacency brings repetitive interaction between neighbors. Hybrid space is the mixture of multiple public programs, such as the laundry room, package delivery room, trash bin... The significance of these are often underestimated. This project sticks to existing programs and transfers the inessential space into a more occupiable room.

SITE - CONTEXT



SITE - TRANSPORTATION



UNIT TYPES

SITE - COMMUNITY

SITE PLAN - INTERACTIVE COORIDOR

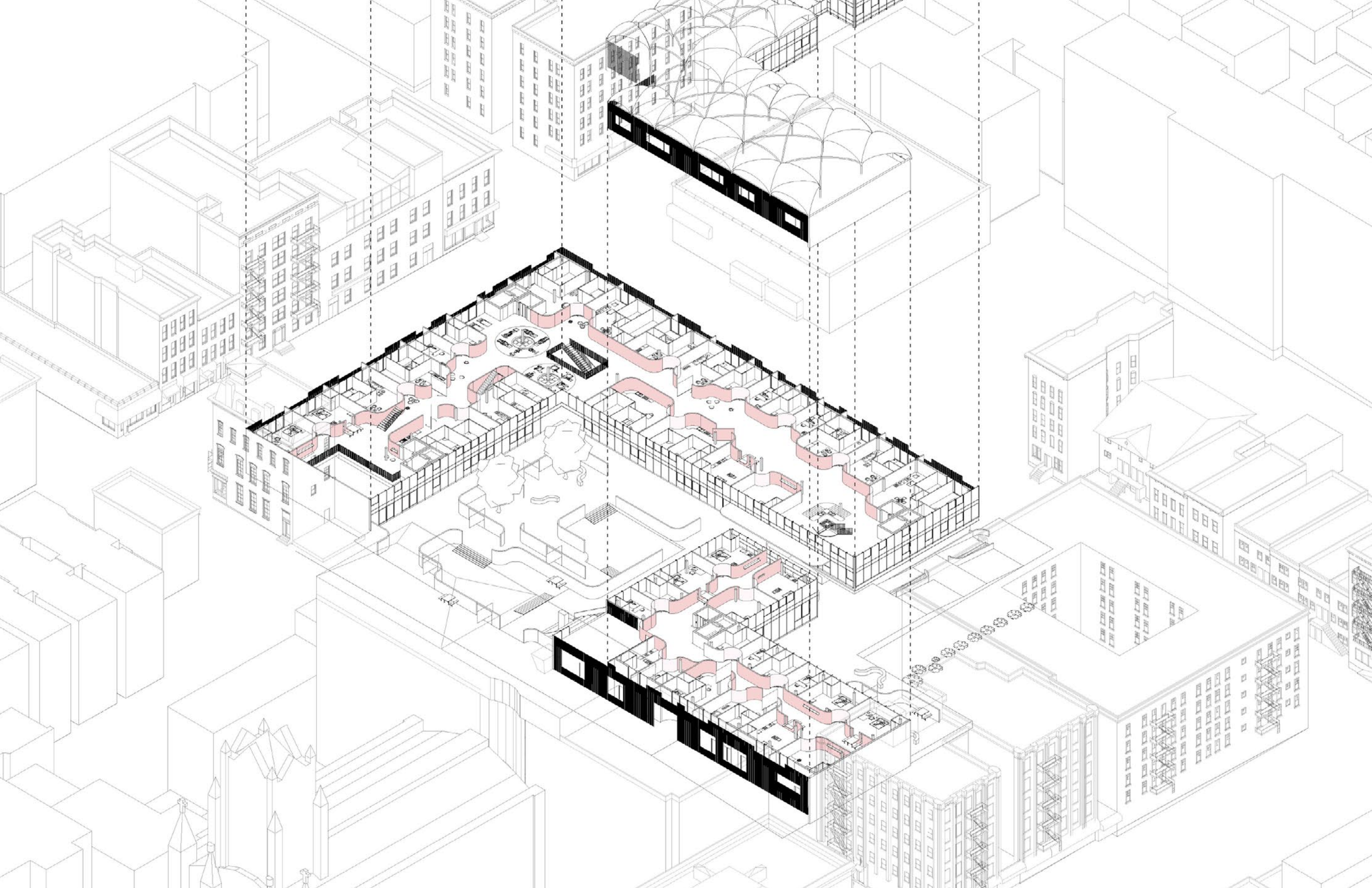
E 152nd St

Courtland Ave

SCHOOL

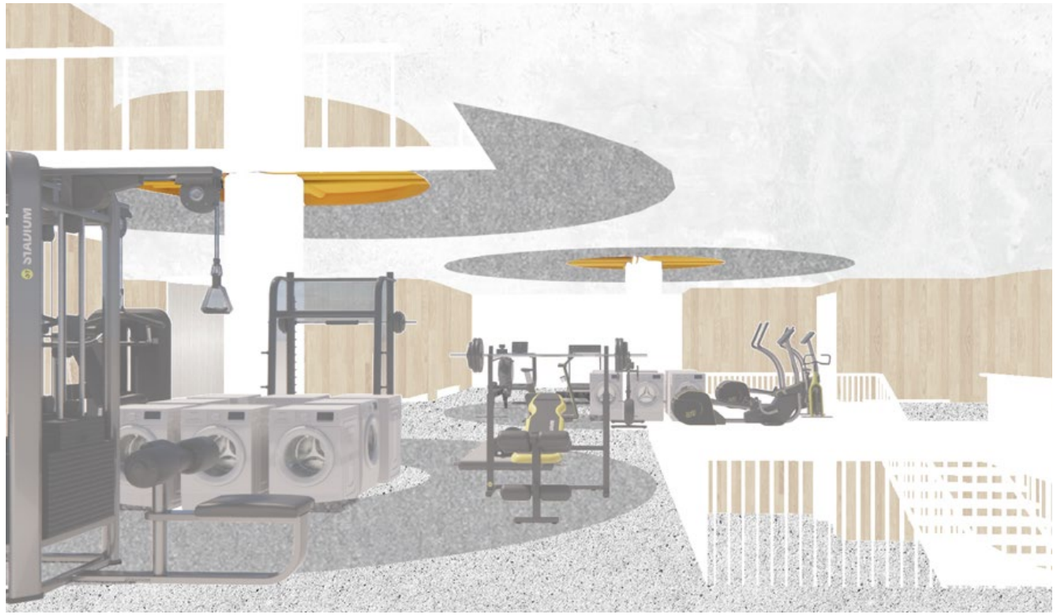
E 151nd St

SCHOOL



SMALL SCENES

Gym + Laundary room



Cooridor

Doors
Closed

Doors
Semi-open

Doors
Open

04 SOFT BREATH

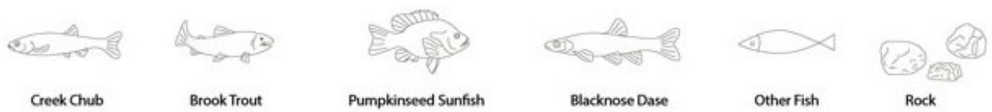
GARMENT DISTRICT
MUSEUM & FACTORY

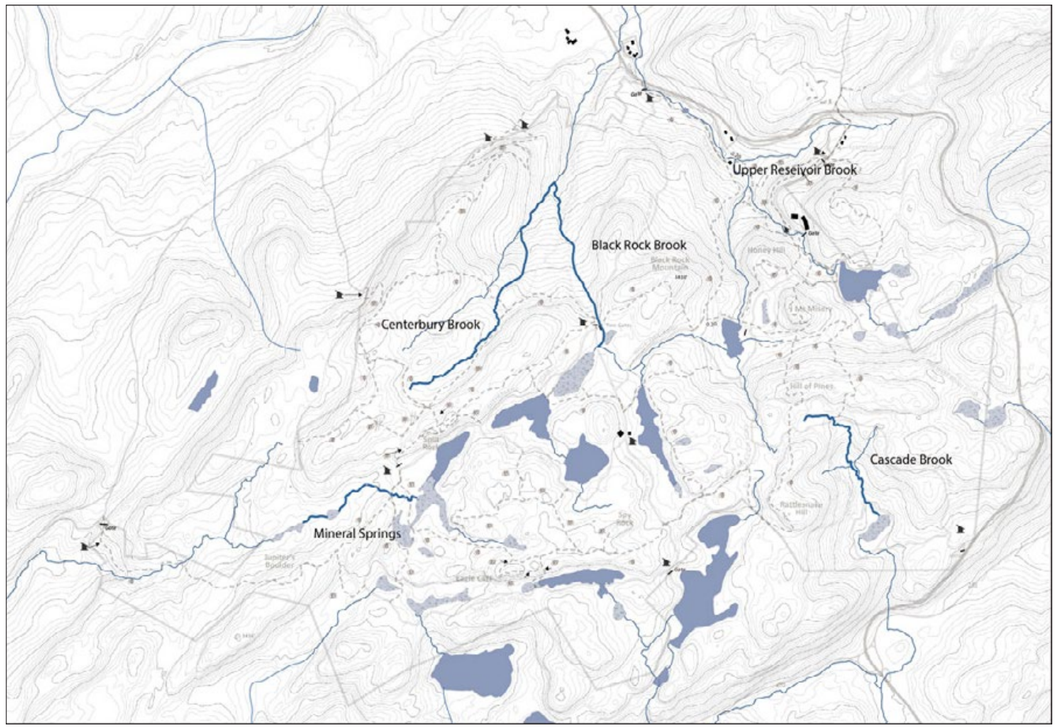
Academic
Personal Project
2022 Spring
Instructor: Lindsey Wikstrom
ez2148@columbia.edu

SITE: BLACK ROCK FOREST

When I went to Black Rock Forest, I noticed that there were many streams and lakes there. As it was winter, I couldn't hear much but the sound of running water. I always walked along the streams and rested near the lakes. They gave me the order and direction.

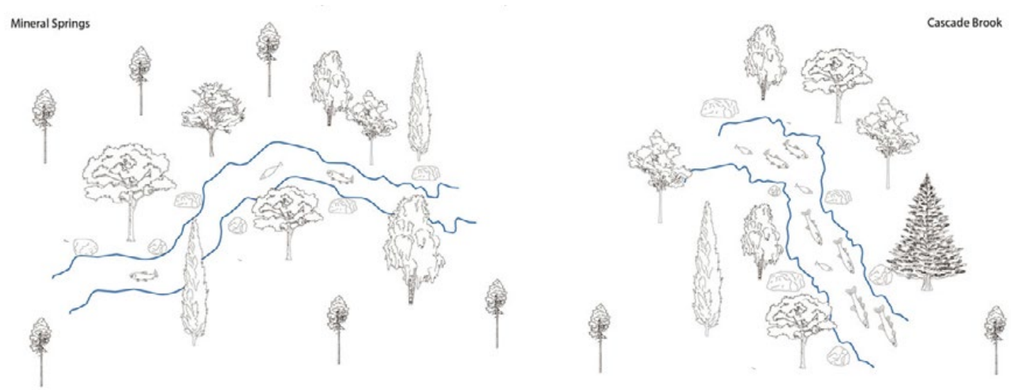
In the forest, there are two main streams with the biggest amount and species of fishes. I will choose the intersection of these two streams to be my site.

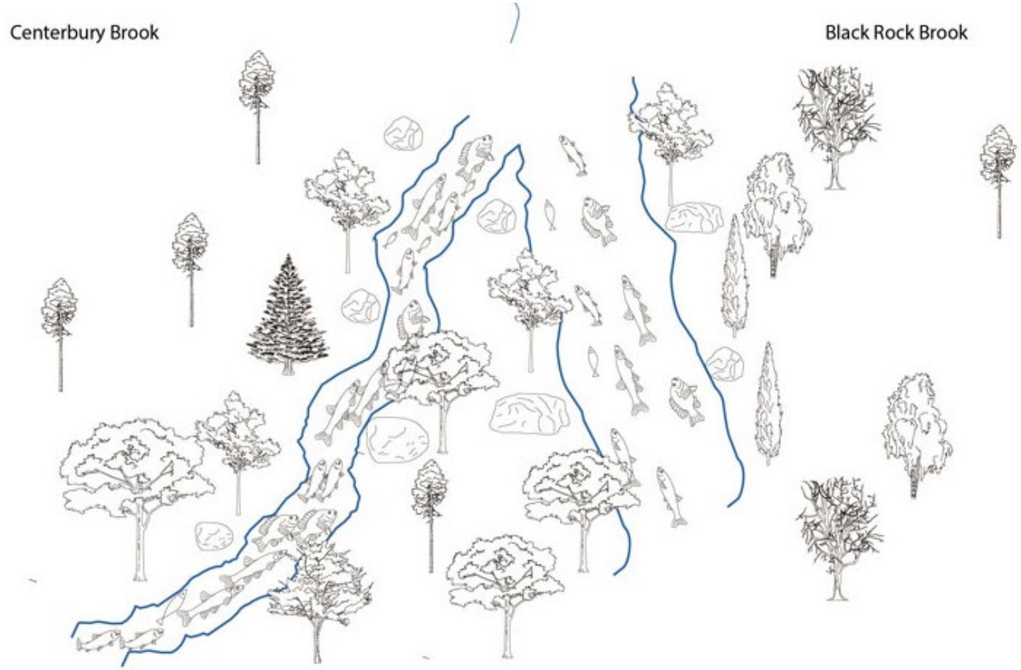




STREAMS AND FISHES

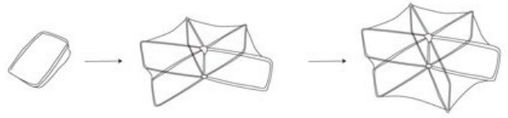
Fishes are important to the streams. Black Rock Forest also did some research about the water quality and different quantity and species of fishes in different streams of this forest. Also, there is an important species that represents the local - Brook Trout.



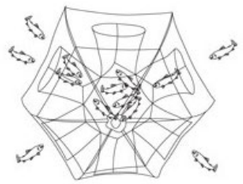


FISH NET STUDY

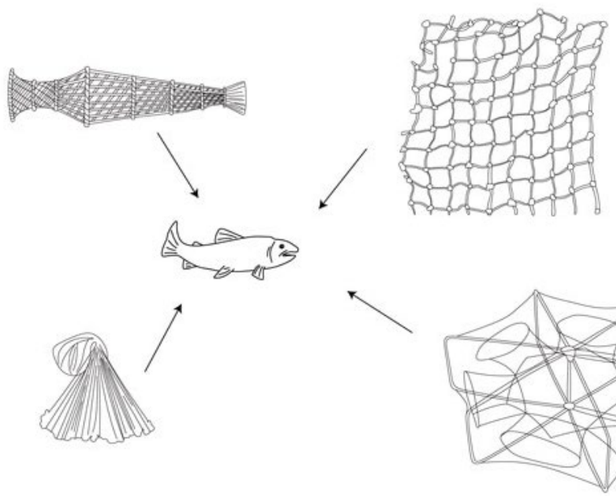
③ Easy to Build



② Double Layer - Easy to get in, hard to get out

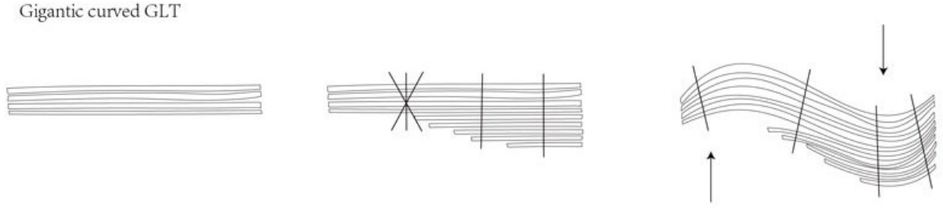


Fish Net



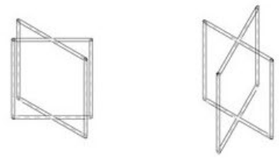
Wood Processing

Gigantic curved GLT

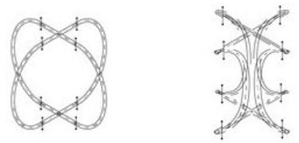


STRUCTURE INSPIRED

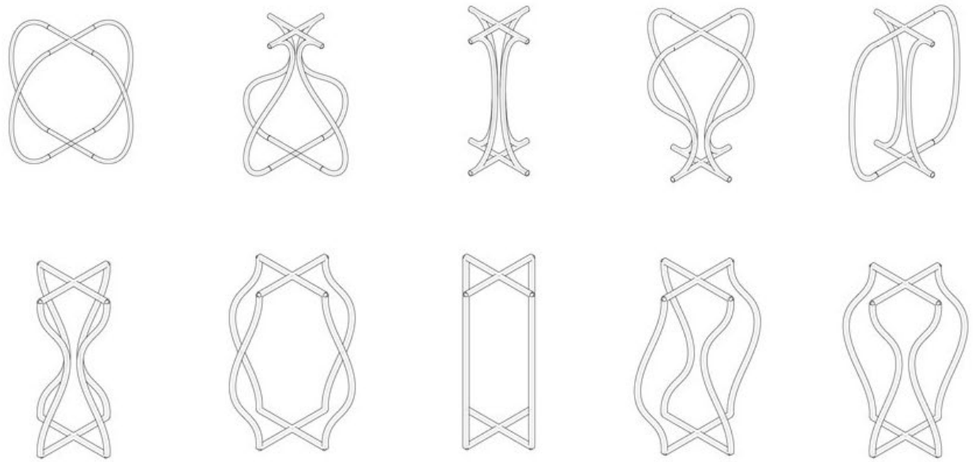
① Bones - movable joints



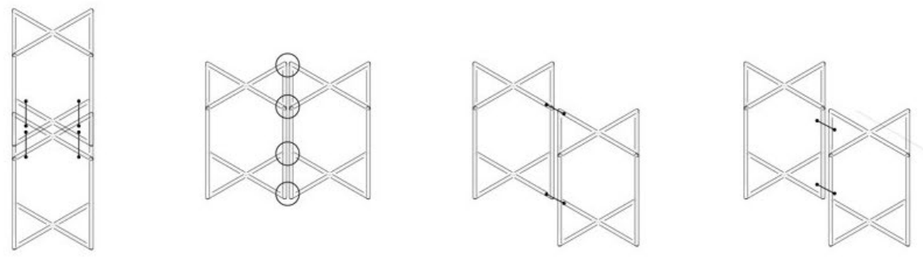
② Connections - inmovable joints

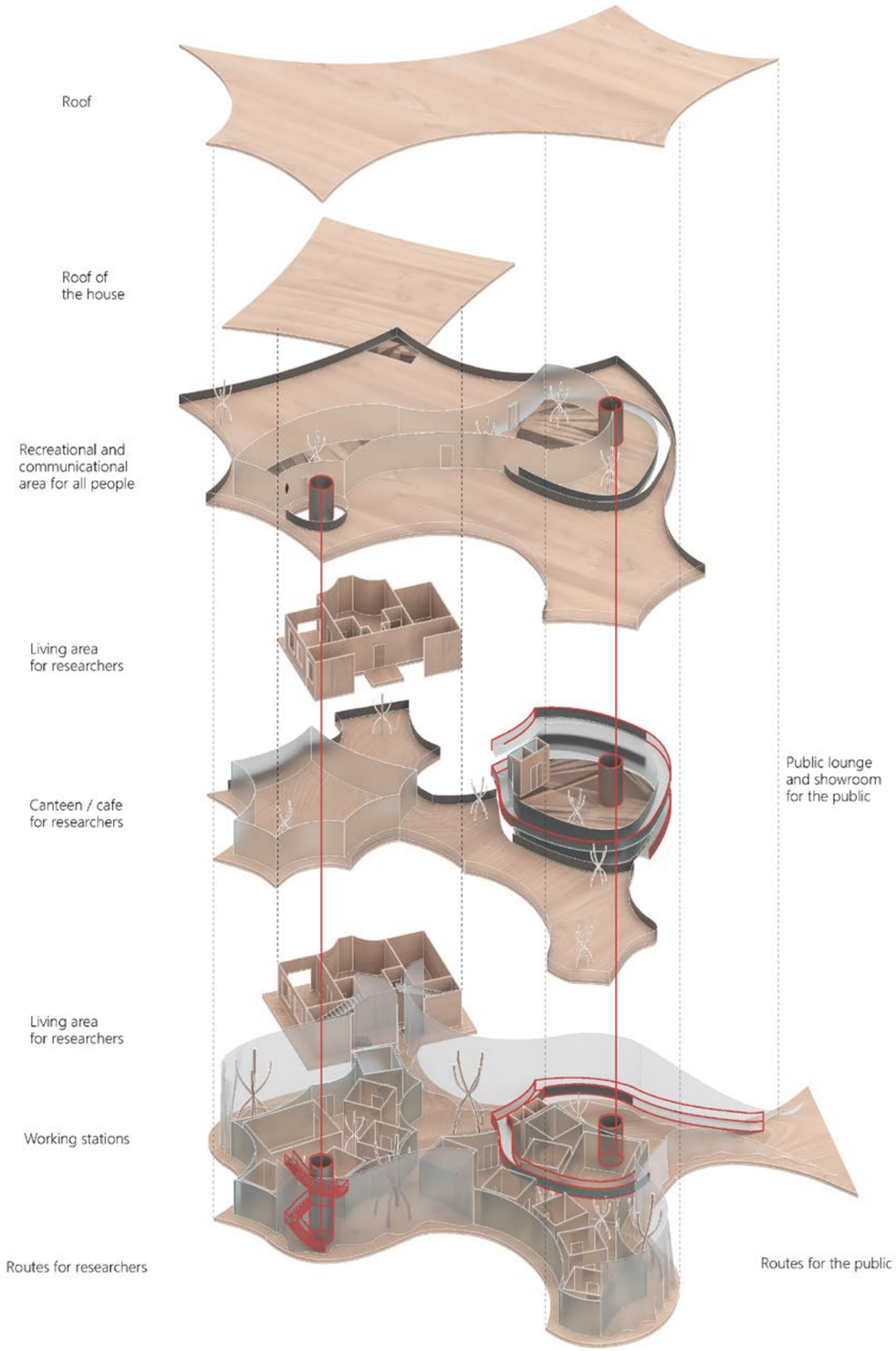


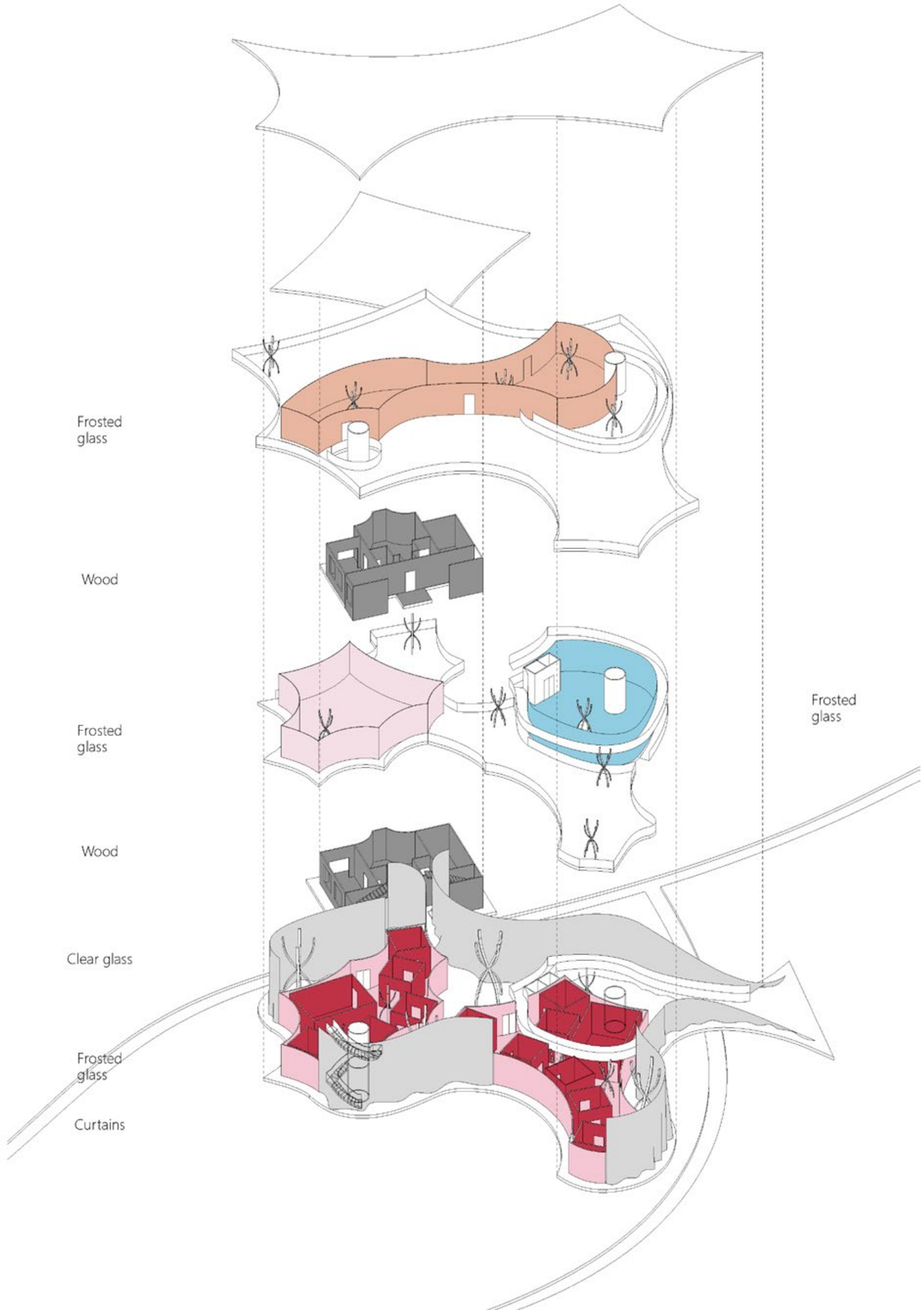
③ Module Possibilities



④ Module Connections Possibilities

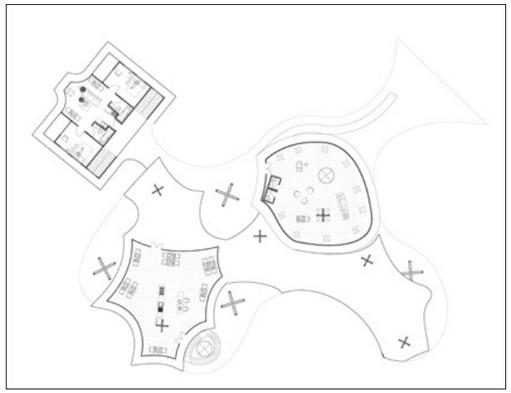


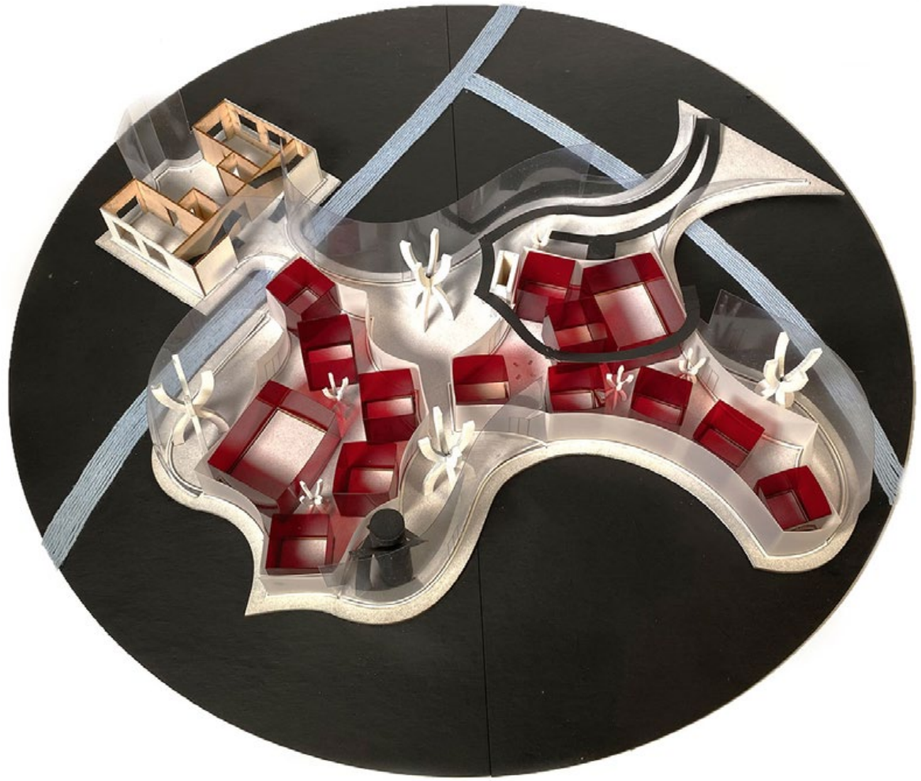

Roof
Roof of
the house
Recreational and
communicational
area for all people
Living area
for researchers
Canteen / cafe
for researchers
Public lounge
and showroom
for the public
Living area
for researchers
Working stations
Routes for researchers
Routes for the public


Frosted
glass
Wood
Frosted
glass
Frosted
glass
Wood
Clear glass
Frosted
glass
Curtains

SITE: BLACK ROCK FOREST

This research center may open to the public at some specific time. To avoid the public from disturbing the researchers, I designed two routes for them, and they can also come together when it's needed. Researchers use stairs and elevators to travel vertically, while the public use ramps.





05 CONNECTIVE BRIDGES

RESEARCH CENTER

Academic
Individual
Sao Paulo, Brazil
2022 Fall
Instructor: Vanessa Keith

Sao Paulo is an important transportation hub. Most lands here are occupied by buildings, which blocks the movement and activities of animals living on the ground. Rivers are extremely significant for the city, as they decide the direction of roads and buildings.
Climate devices are inserted with elevated transportations to provide energy. This infrastructure is elevated not only for the influence on the ground, but also for the flooding situation. The research center is close to the river and ponds, with eco lodge and residential buildings scattered throughout the network. Other than bridges, a system of aerial connection is also an assumption to connect these programs.

PRE-COLUMBIAN RISE AND FALL OF CITIES

GUCK
TREMEMBE
POTIGUARA
TUPIS
TABAJARA
CAETE
GES
TUPINIQUIM
AIMORE
LENGOAS
TEMIMINO
TAMOIO
CARIJO
CHARNIA

CARIJO (GUARANI)
TUPINIQUIM
TAMOIO
TEMIMINO
TUPI LANGUAGES
ARCHAEOLOGICAL POINTS
POSSIBLE CITIES

16TH C. INDIGENOUS PEOPLE
19TH C. INDIGENOUS PEOPLE

SALVADOR
BRASILIA
PORTO SEGURO
RIO DE JANEIRO
SAO PAULO
Paraguay
Argentina
Uruguay

COLONIZER ROUTE
INDIGENOUS PEOPLE ROUTE

POLITICAL BOUNDARY AND COLONIZATION

RASILIA

1534 PORTUGAL
1624 PORTUGAL
1650 PORTUGAL
1534 FRANCE
1754 PORTUGAL
1650 SPAIN

BELO HORIZONTE

1494
TREATY
OF
TORDESILLAS

SPAIN
PORTUGAL

CAMPINAS
RIO DE JANEIRO
SÃO PAULO
CURITIBA
PARANAGUA

SITE PLAN NOW

SITE PLAN 2180

FARM

HELICOPTER PLATFORM

H

POND

BUILDING & LIVING AREA

TROPICAL RESEARCH CENTER

ECO LODGE

DOCK

RIVER 2180

BIKE BRIDGES

REFORESTATION AREA

PEDESTRIAN BRIDGE

SMALL RIVER

FARM

POND

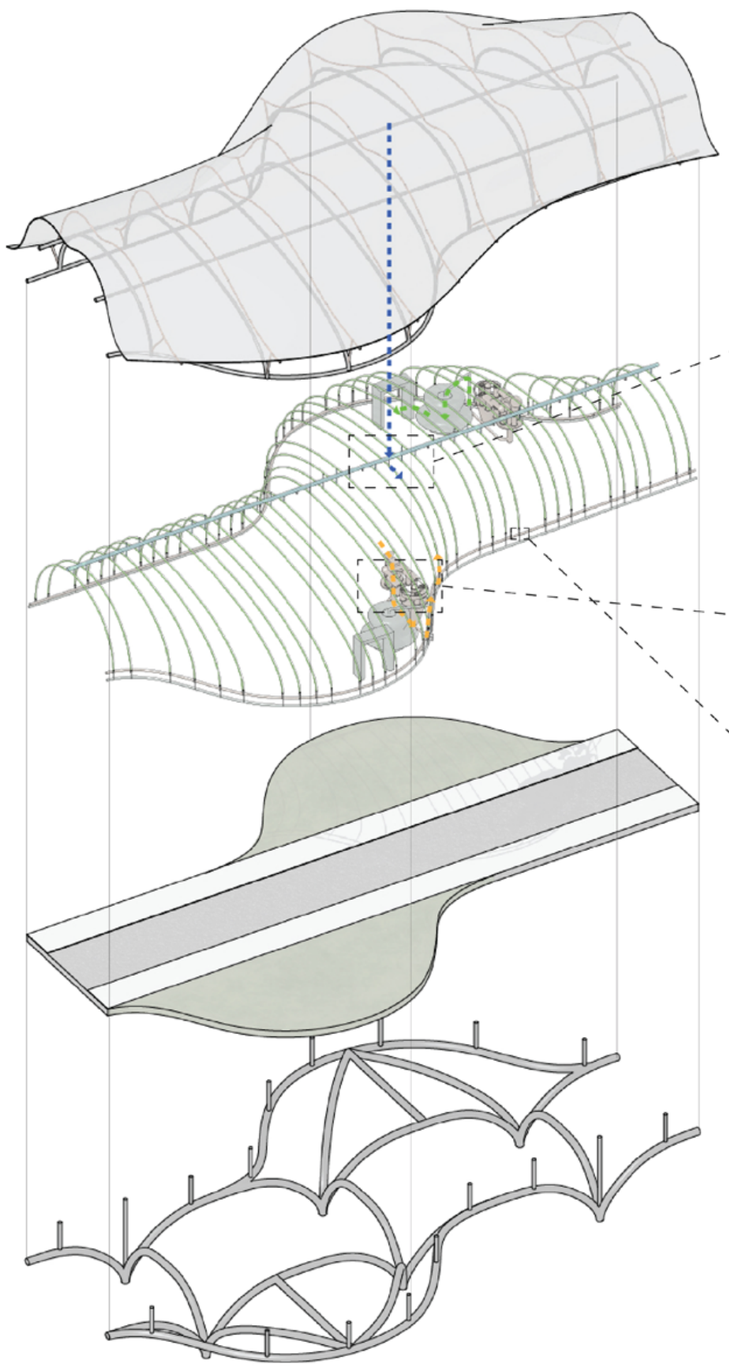
FLOODING AREA

CLIMATE DEVICE

- PROGRAMS
- AREA CHANGING
- TRANSPORTATION

RESERVOIR

FLOODING AREA

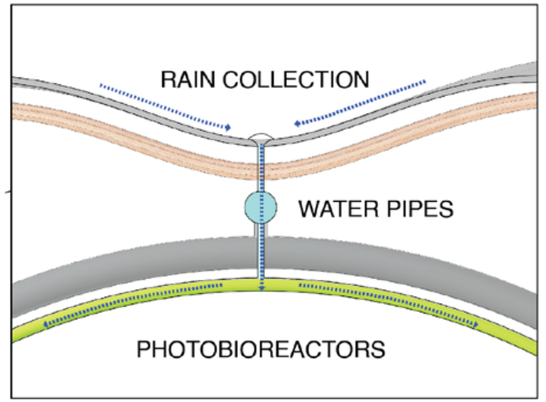


CANOPY

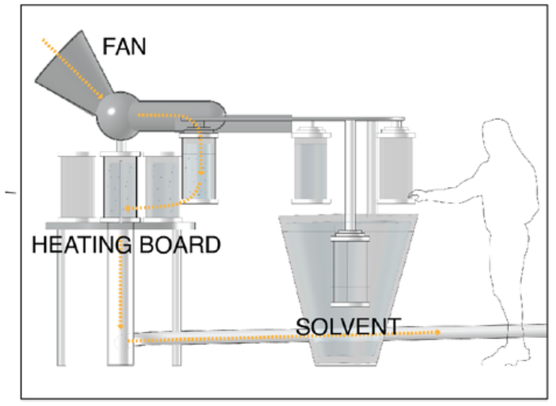
CLIMATE DEVICE

BRIDGE

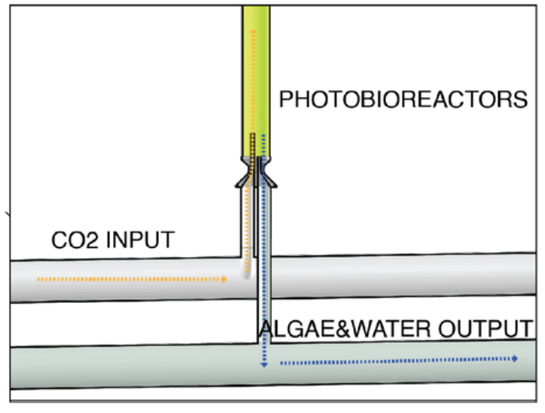
STRUCTURE



02



03



Imput 1: Water

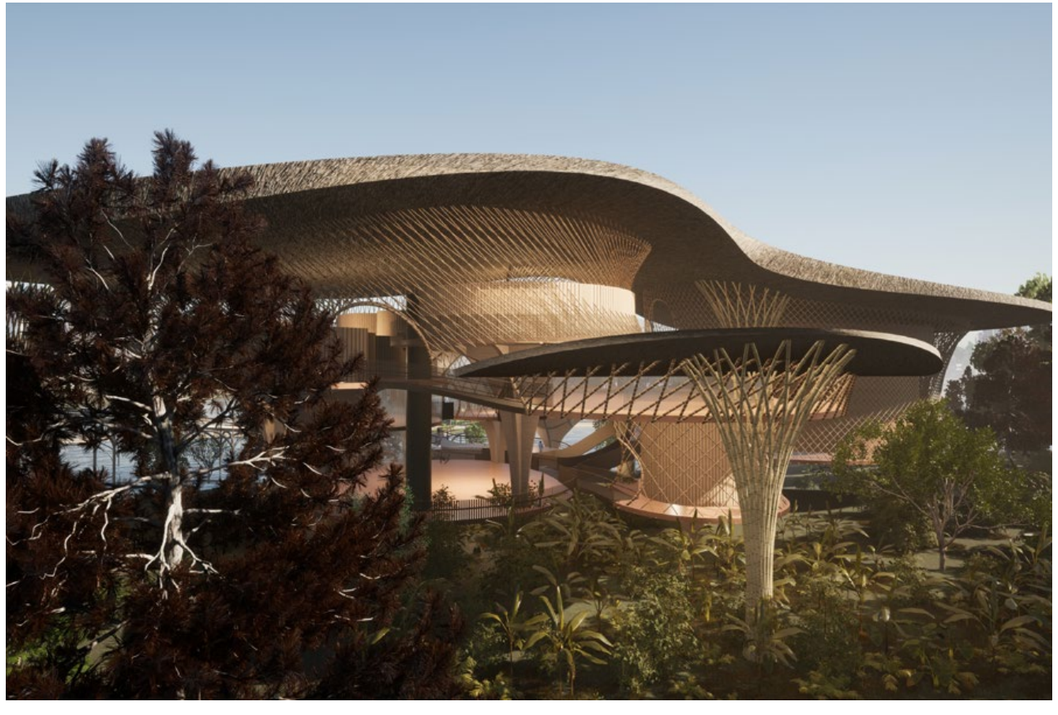
[02]
With 3 inputs, water, CO2 and light, algae can grow incredibly fast and be collected for biofuel. Raindrops can be collected in the middle recessed part of the canopy. Water goes down through the water pipes on the top of the structure, and input to these photobioreactor pipes.

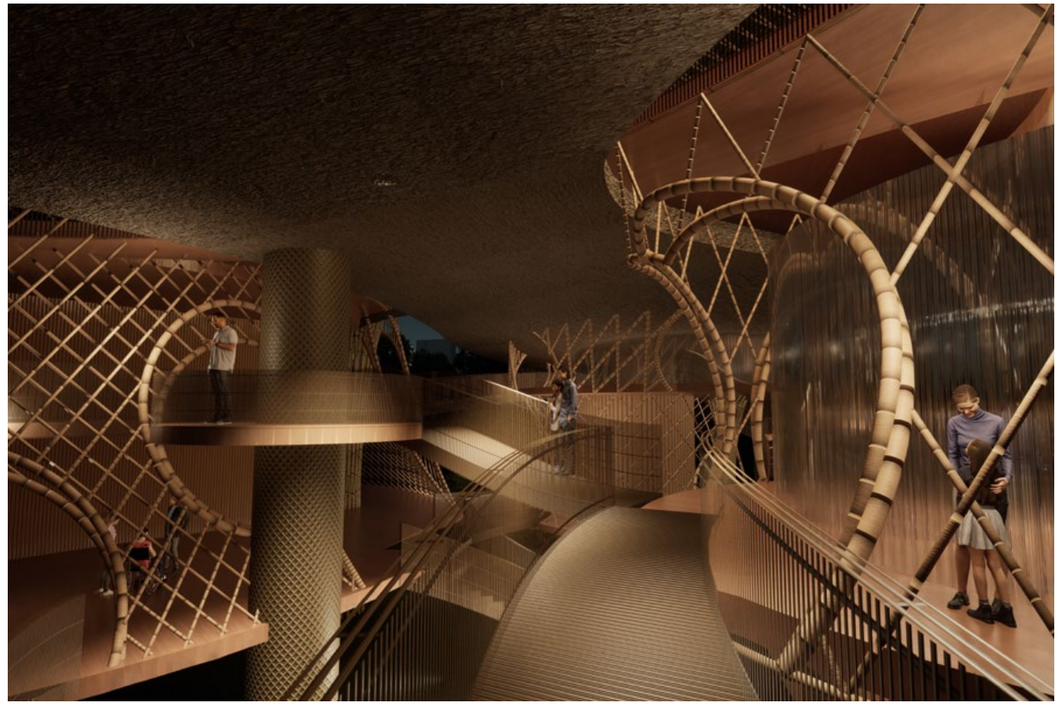
Imput 2: CO2

[03]
CO2 is also needed for the growth of algae. This CO2 collector is put along the road, so it can collect surrounding CO2 with the fan, and inject it to a capsule with amine solvent. CO2 is released again by heating the solvent, in this way CO2 can be conveyed through this pipe to all photobioreactors.

Output: Algae + Water

[04]
After all these reactions, wet algae is collected through another pipe, and it can be processed for biofuel.



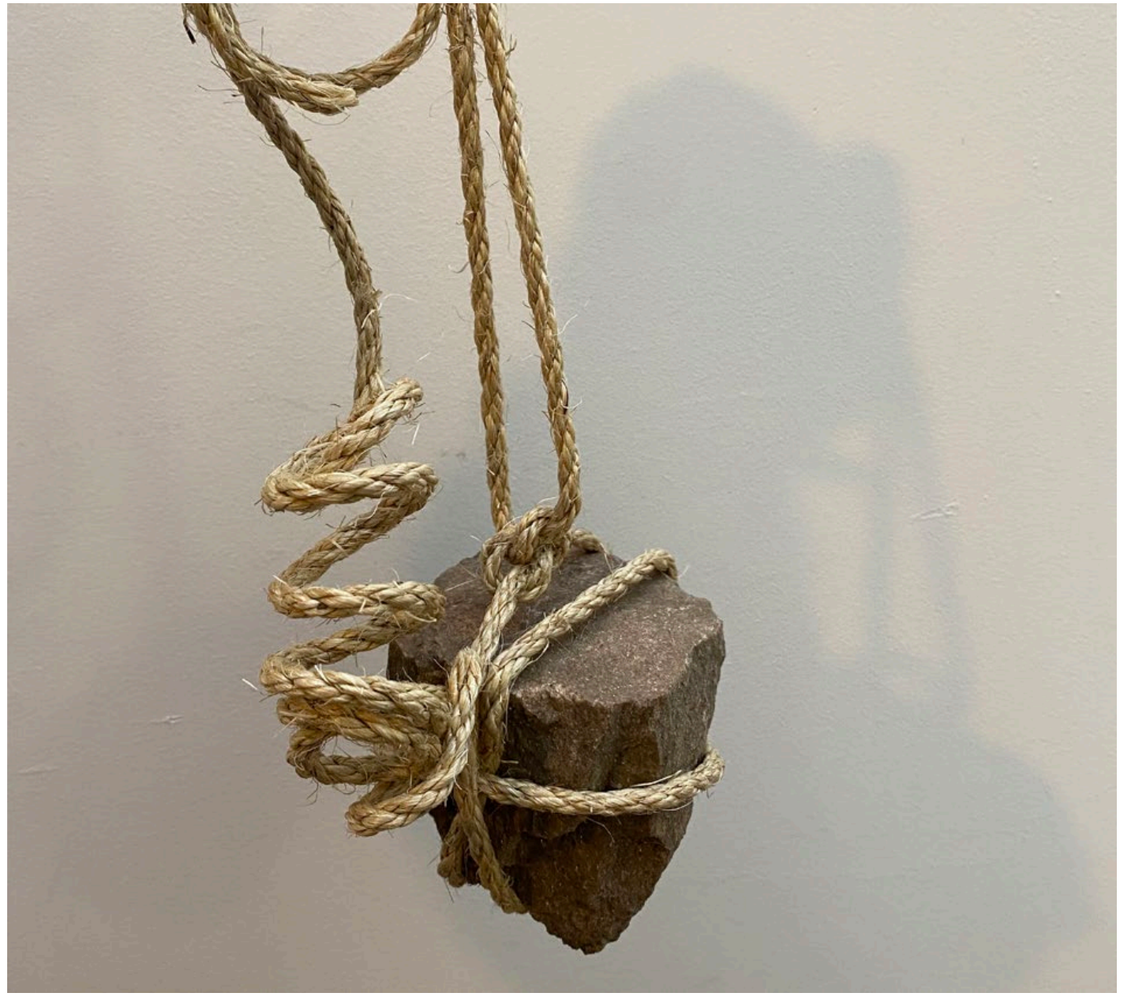


Academic
Individual
2023 Spring
Instructor: LOT-EK: Ada Tolla, Giuseppe Lignano

Chaos and Order

Qingning Cao

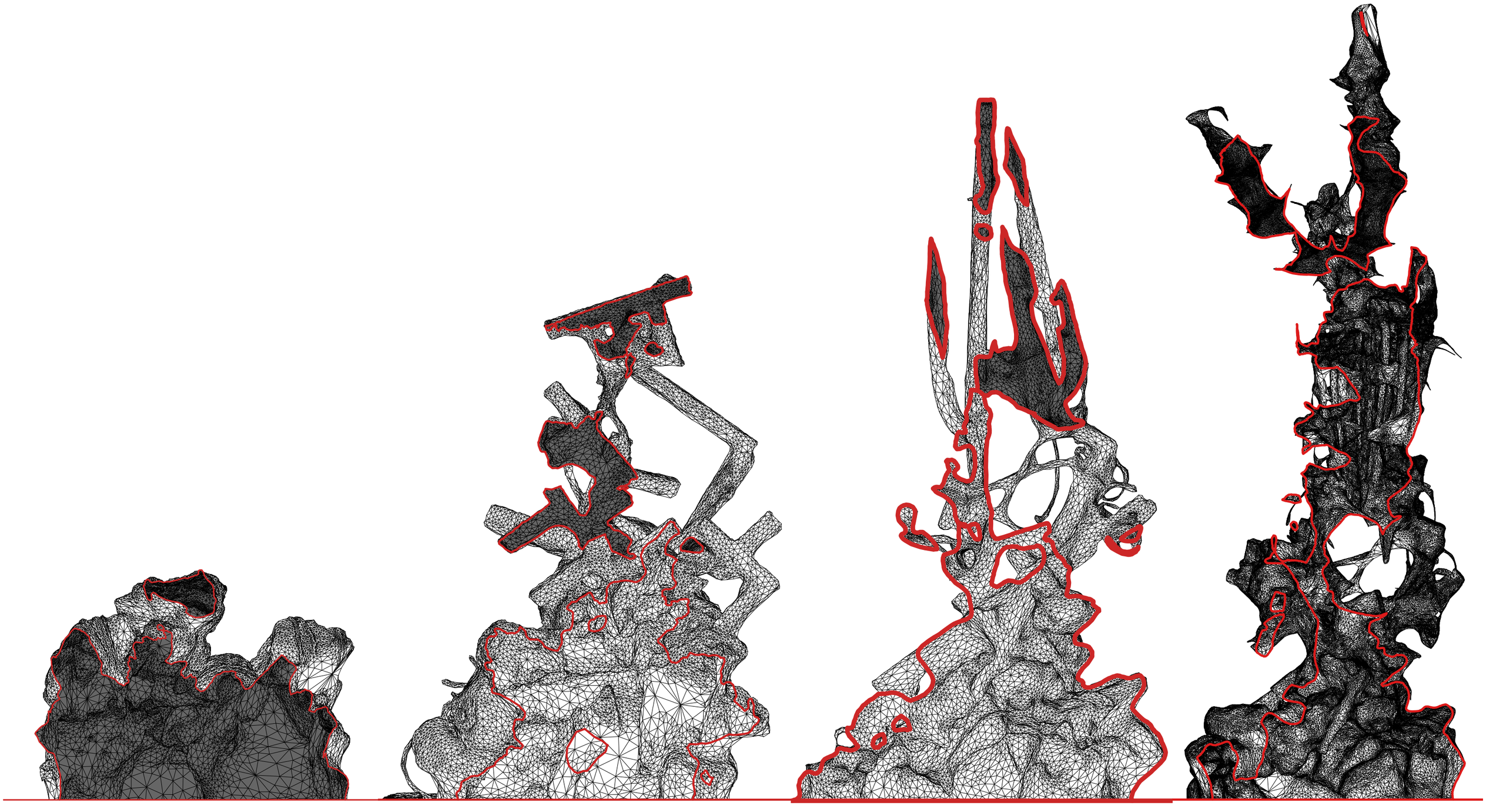
MASONRY




METAL

WOOD

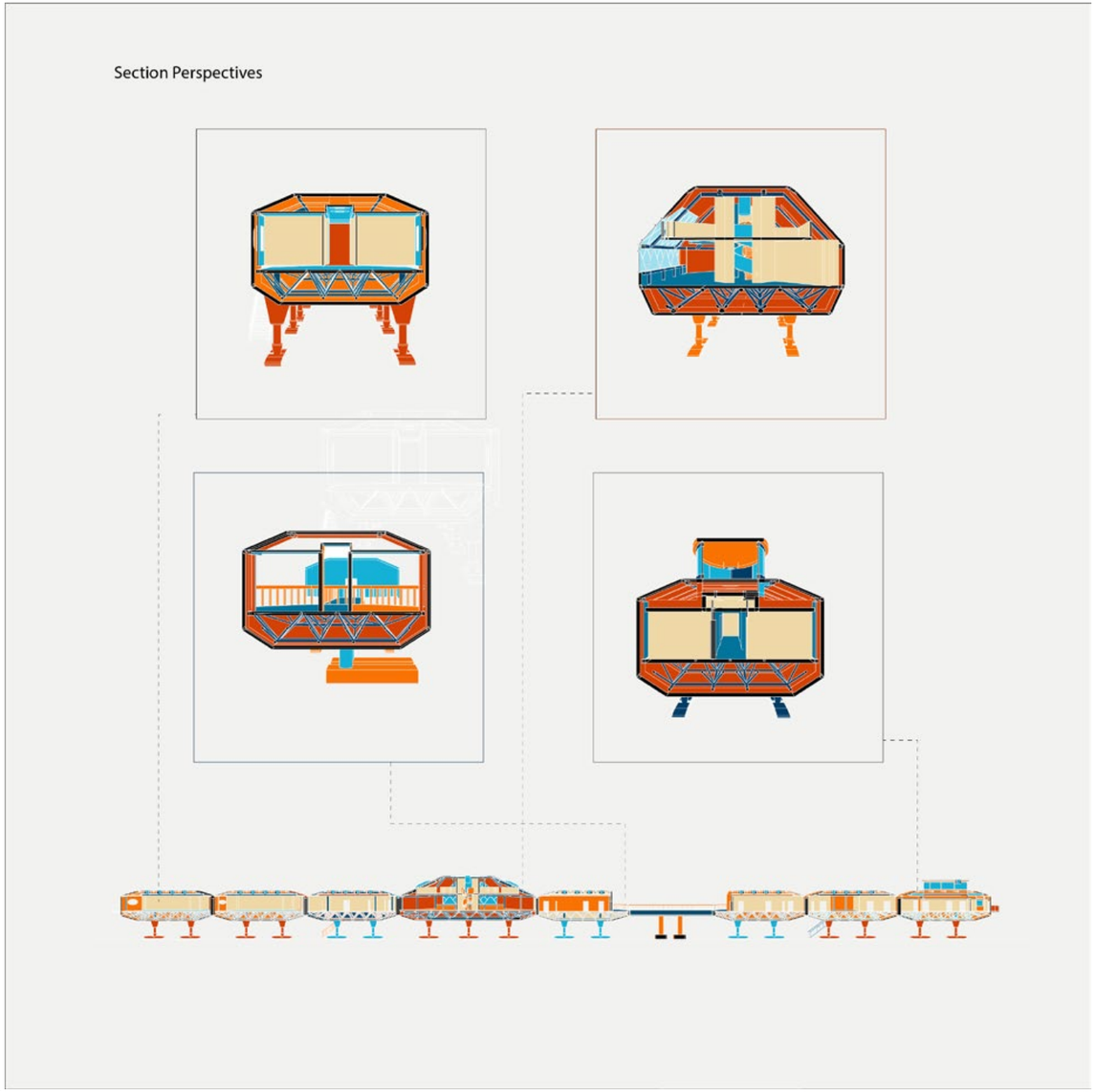
PLASTIC

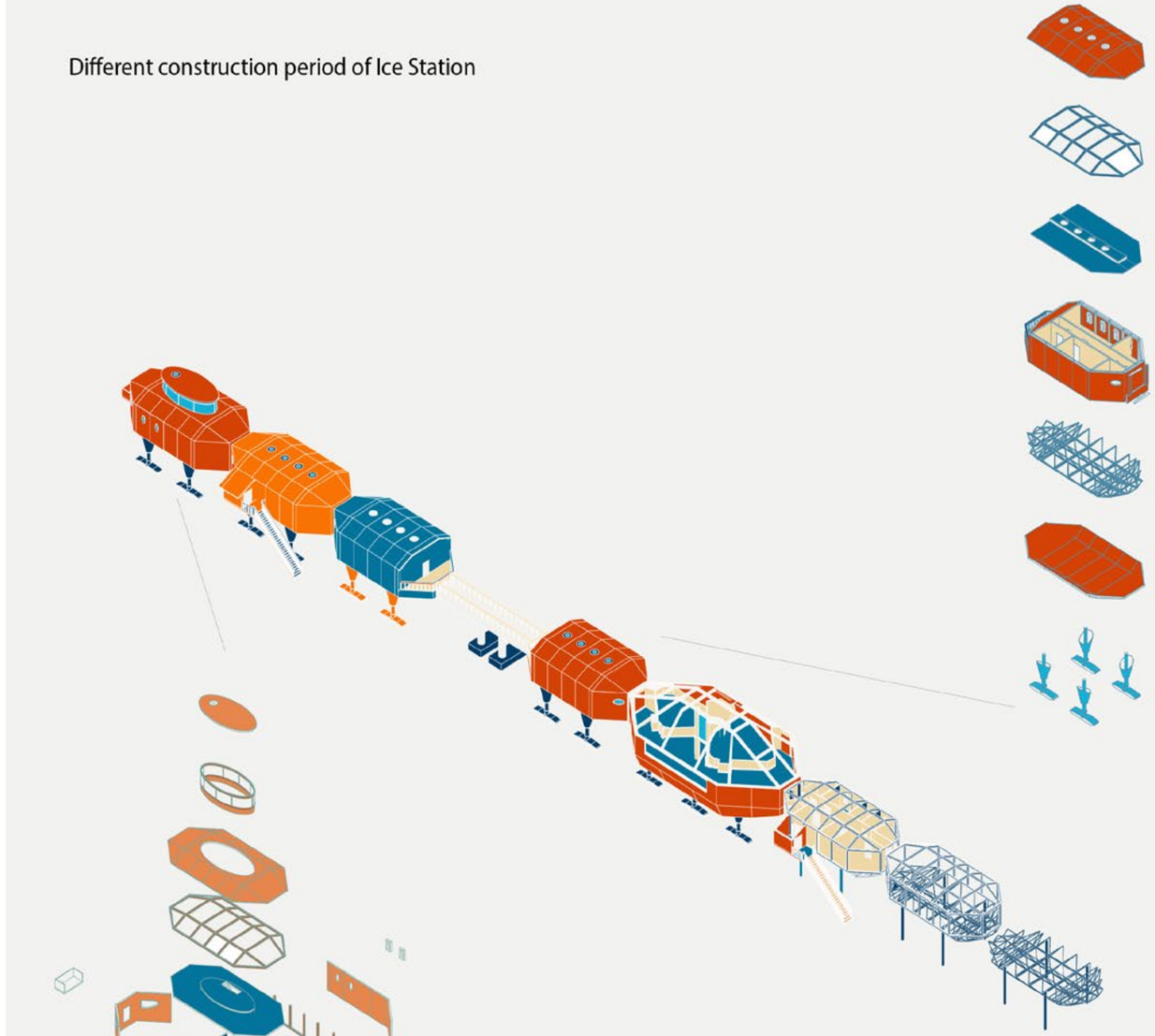


VISUAL STUD I - ARCH DRWG REP I

ICE STATION

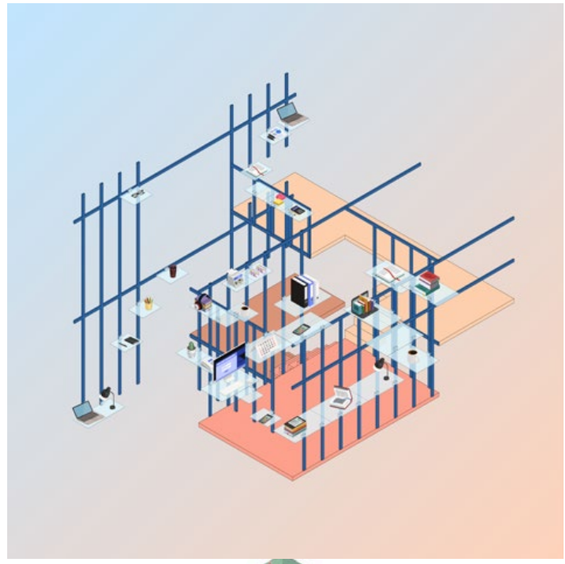
Personal Project
2020 Fall
Instructor: Alexa Tsien-Shiang

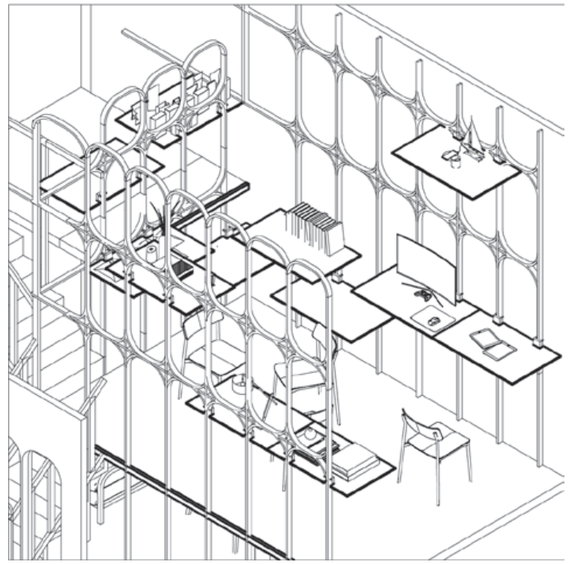


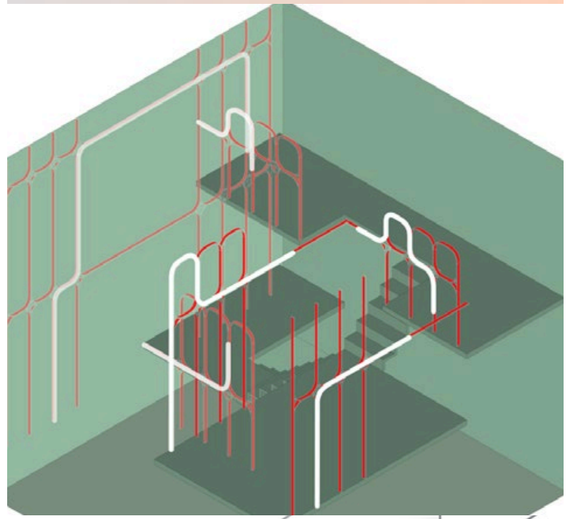


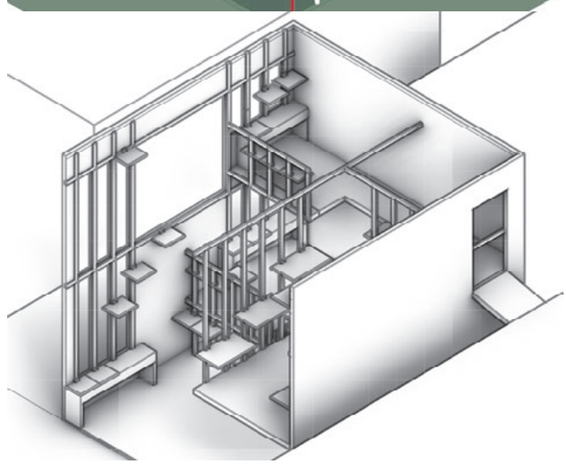
ARCHITECTURAL DRWG & REP II

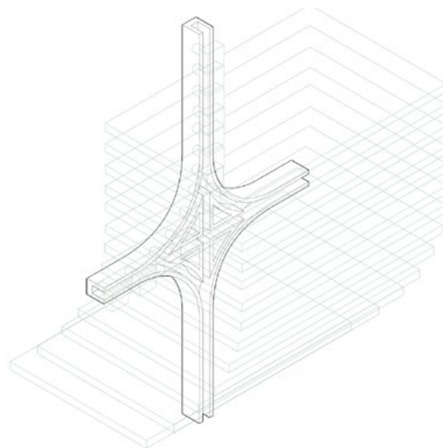
Group member: Jean Tzeng
2021 Spring
Instructor: Tsien-Shiang

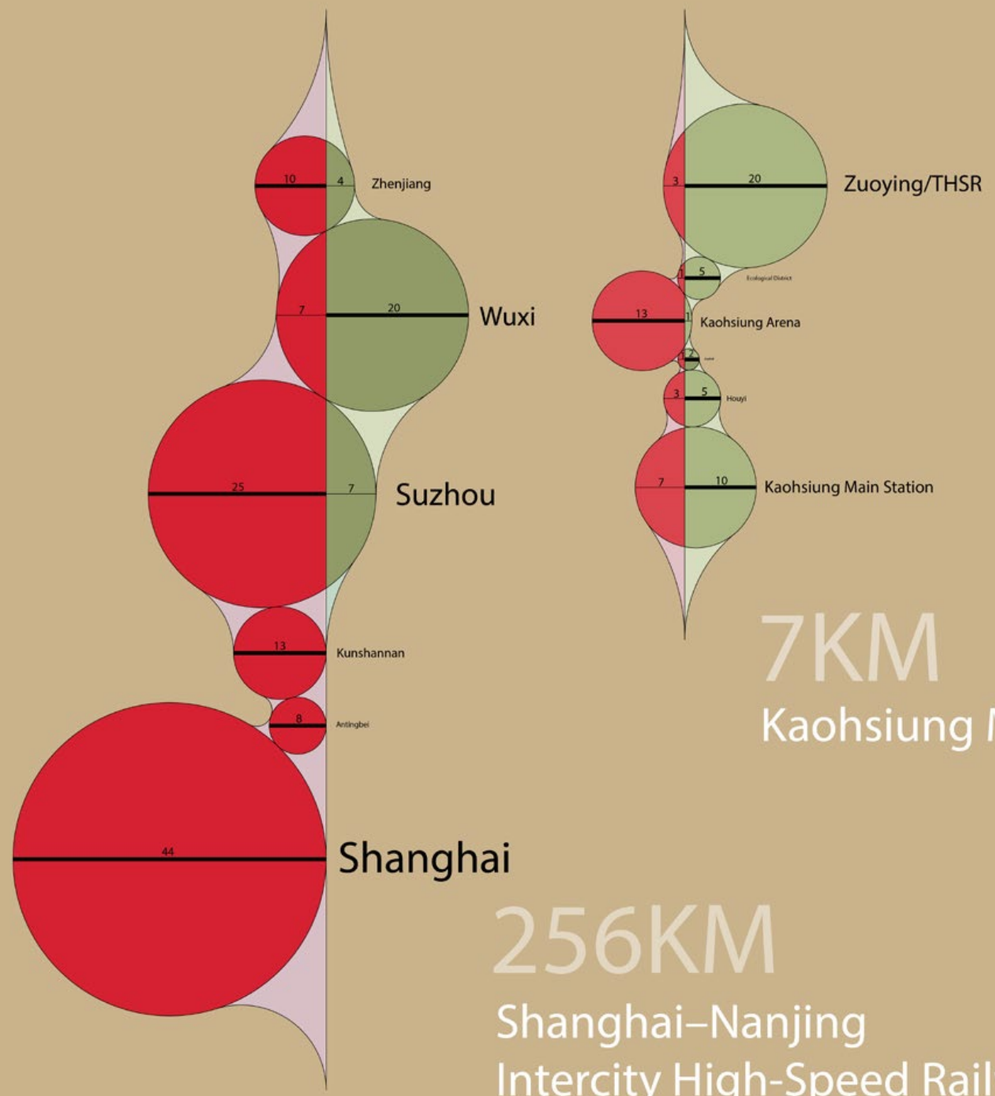








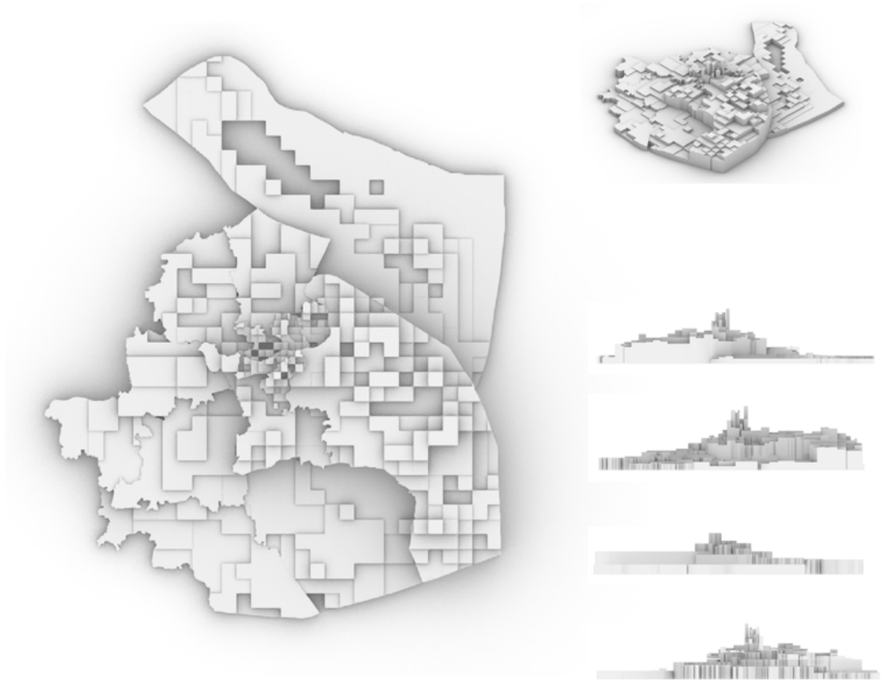


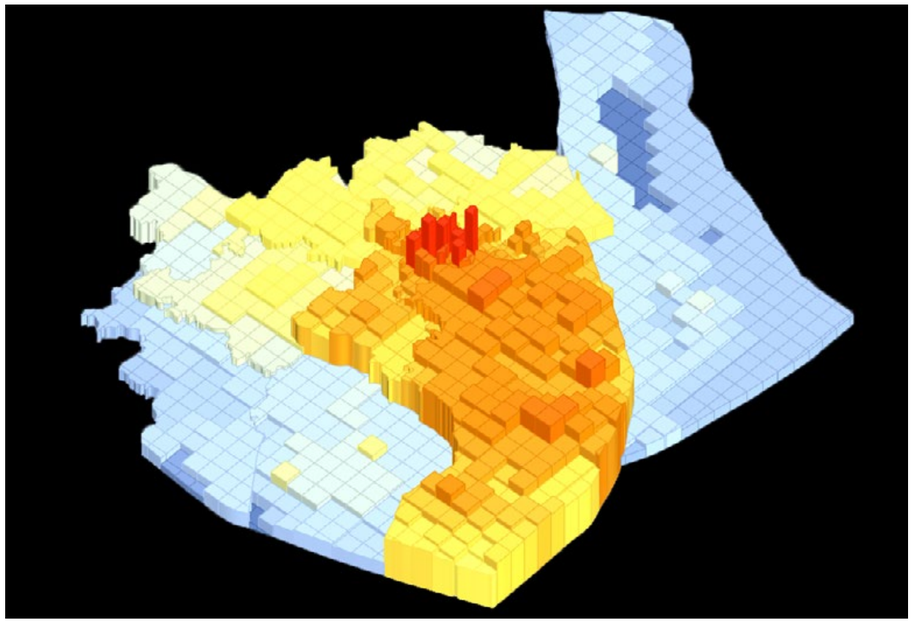


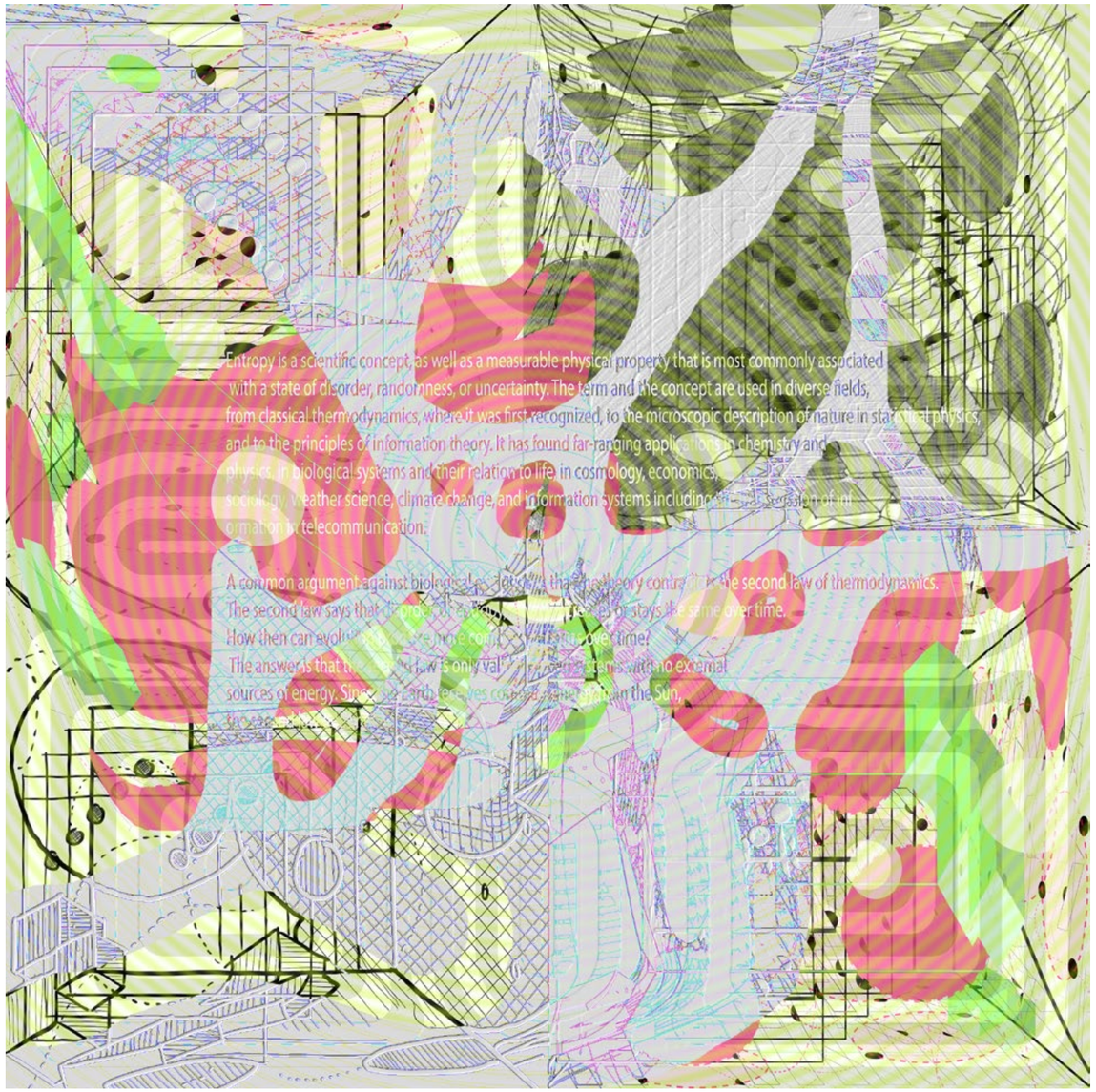
7KM
Kaohsiung MRT

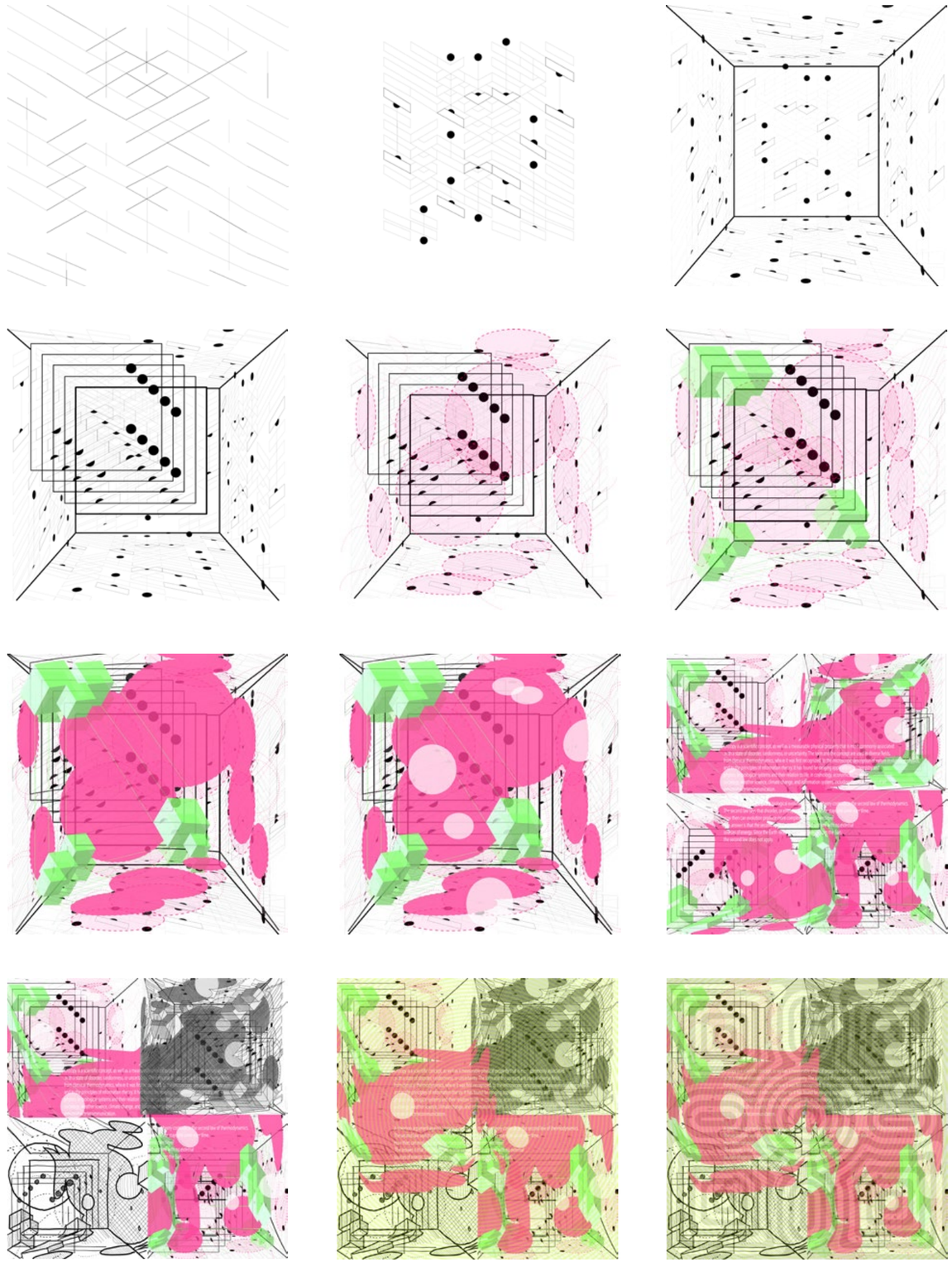
256KM
Shanghai–Nanjing
Intercity High-Speed Railway

Shanghai House Price






Entropy is a scientific concept, as well as a measurable physical property that is most commonly associated
with a state of disorder, randomness, or uncertainty. The term and the concept are used in diverse fields,
from classical thermodynamics, where it was first recognized, to the microscopic description of nature in statistical physics,
and to the principles of information theory. It has found far-ranging applications in chemistry and
physics, in biological systems and their relation to life, in cosmology, economics,
sociology, weather science, climate change, and information systems including
mation in telecommunication.
A common argument against biological
The second law says that
How then can evolu
The answer is that
sources of energy. Sinc



AT I - ENVIRONMENT IN ARCHITECTURE

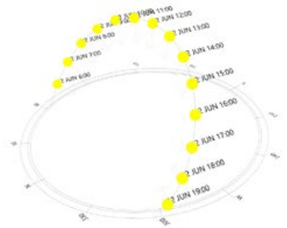
CLIMATE ANALYSIS

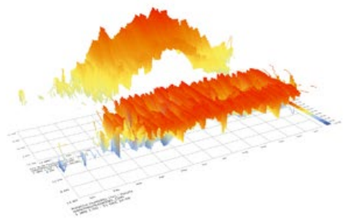
Personal Project
2020 Fall
Instructor: Rachel Ben Alon

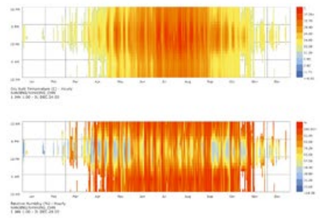
1 Weather Data

Nanjing, China is cold and hot at the same time with great humidity, of which heating is more severe for me to concentrate on.

2 Sun Path

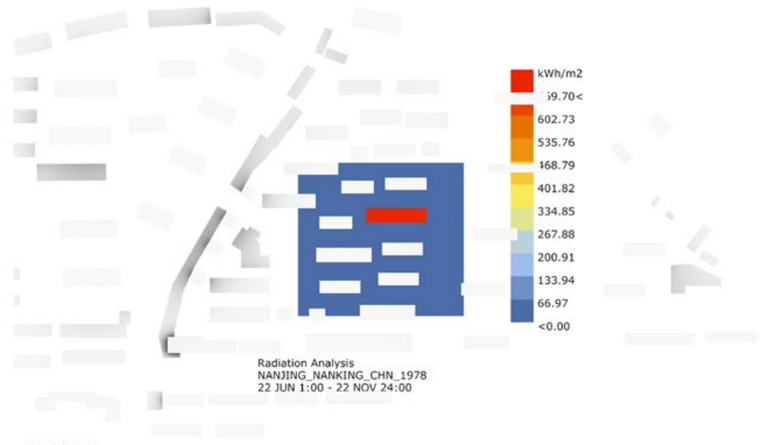




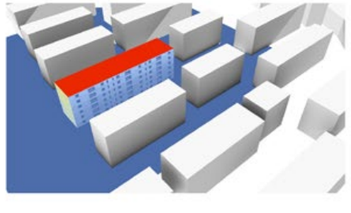


Under circumstances that T>10 and RH<70

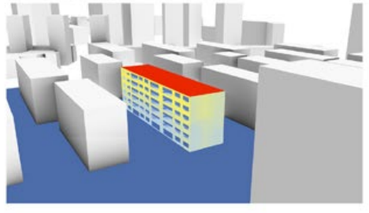
3 Solar Radiation



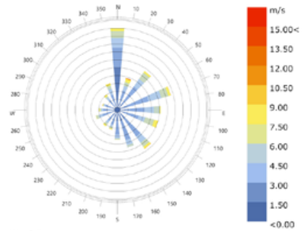
North Orientation



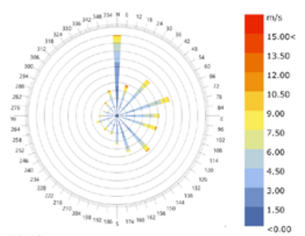
South Orientation



4 Wind Rose



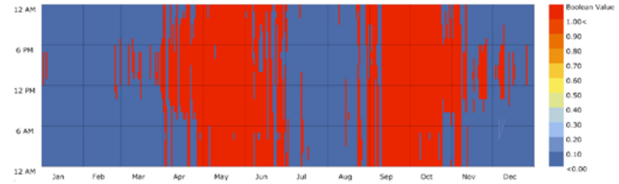
Wind-Rose
NANJING/NANKING_CHN
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Wind Speed (m/s)
Calm for 15.67% of the time = 1373 hours.
Each closed polyline shows frequency of 1.3%. = 111 hours.



Wind-Rose
NANJING/NANKING_CHN
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Wind Speed (m/s)
Calm for 15.67% of the time = 1373 hours.
Each closed polyline shows frequency of 1.3%. = 111 hours.

The wind is mostly from south-east and North.

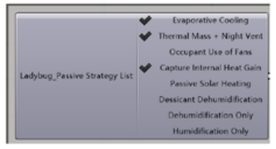
5 Pyschrometric Chart



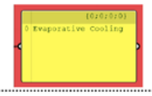
Comfortable Hours in All Polygons (Boolean Value) - Hourly
NANJING/NANKING_CHN
1 JAN 1:00 - 31 DEC 24:00

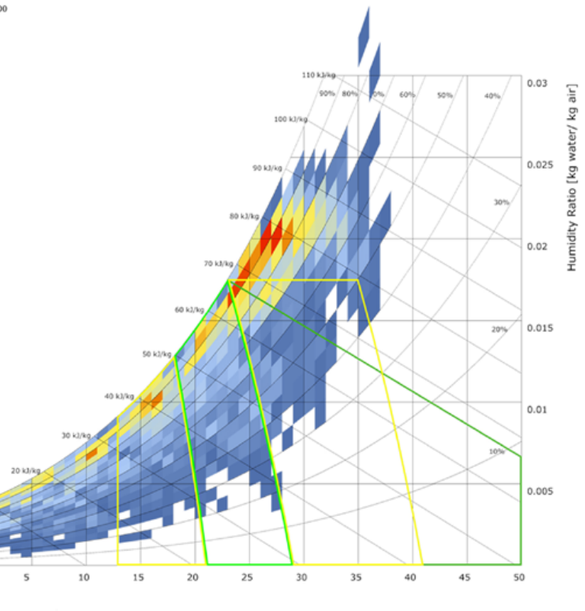
Psychrometric Chart
NANJING/NANKING_CHN
1 JAN 1:00 - 31 DEC 24:00

Yellow blocks are under passive strategies



In these passive strategies, evaporative cooling is the most useful.

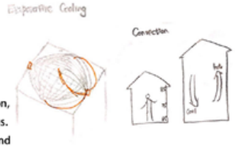




6. Some Passive Strategies

Evaporative cooling

According to the readings, buildings can be cooled by evaporation, and it is useful way to add water prays on the roof of the buildings. On the roof, we will design a semi-circular dome made of glass, and install fountains at two opposite tangent points, where the diameter of the fountain is the distance from the installation point to the adjacent tangent point. In this way, the presence of the fountain will increase the water molecules in the roof air, in order to increase more evaporation to cool down.The semi-circular roof is designed to prevent water from gathering on the roof and increase the load of the structure, and the use of glass will allow more sunlight to enter the room.



Convection

In the rooms, hot air collects near the ceiling and cold air near the floor. Therefore, in order to enhance convection, we increase the height of each floor to achieve a larger temperature difference in the room and increase convection.

Energy-Transfer Medium

In addition to increasing evaporation, the water from the rooftop fountain has another important function. Since water has a high specific heat capacity and is maintained at 16-18 degrees Celsius in the natural environment, which is also a comfortable temperature requirement in human living spaces. Therefore, we design to embed water pipes in the building structure, and the water flows in the water pipes to meet the requirements of maintaining the temperature of the space.

Optimization Studies

Team 23

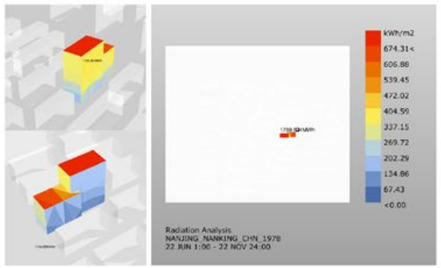
All optimization in this section is based on solar radiation. As Nanjing is quite hot in summer, I chose mininmon solar radiation in this analysis.

1. Orientation Analysis

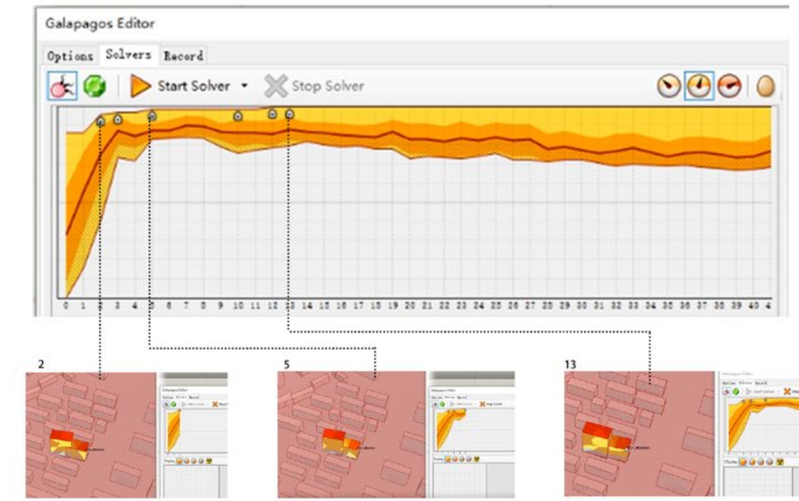
Original Orientation and its radiation:

Total radiation : 1759.52 WMh

Orientation: Straight to North and South



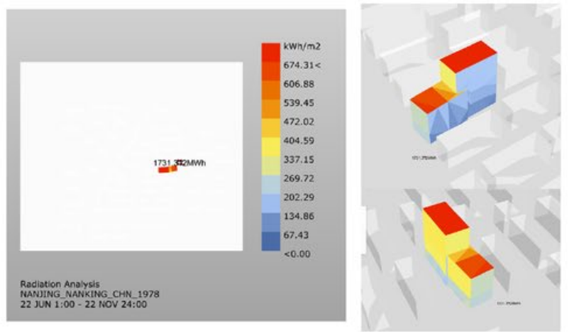
Process:



Final Orientation and its radiation:

Total radiation : 1731.31 WMh

Orientation: Right Part rotate Anticlockwisely a little bit



Optimization Studies

Team 23

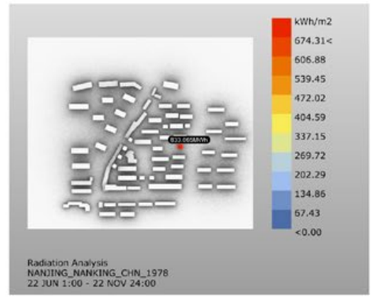
All optimization in this section is based on solar radiation. As Nanjing is quite hot in summer, I chose mininmon solar radiation in this analysis.

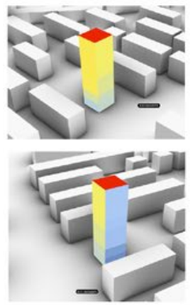
2. Building Form Generation

Original Orientation and its radiation:

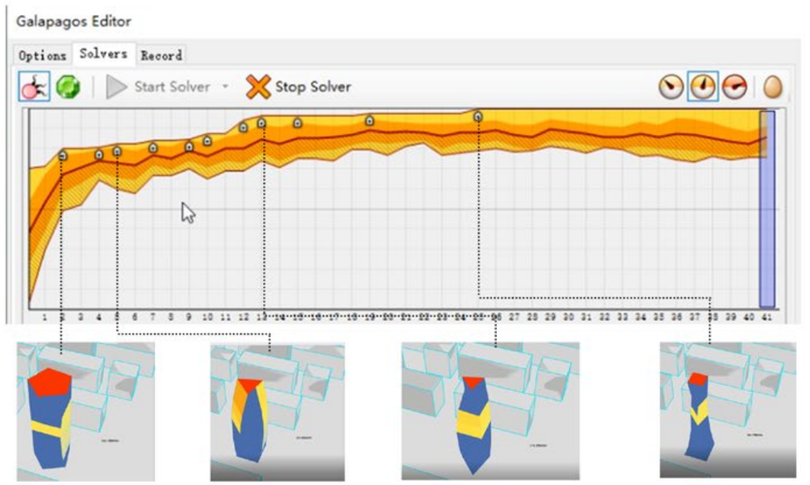
Total radiation : 833.67 WMh

Form: Square uprising straightly





Process:



Total radiation : 390.1 WMh

Total radiation : 357.4 WMh

Total radiation : 178.3 WMh

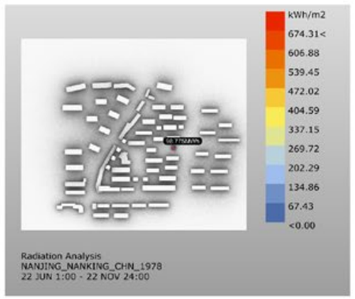
Total radiation : 99.7 WMh

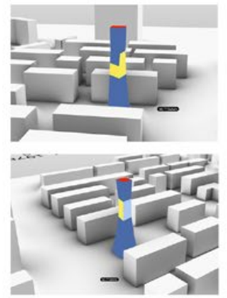
Final Orientation and its radiation:

Total radiation : 98.78 WMh

Form: Square uprising straightly

The thin middle part of the building is good for reduction in solar radiation.





AT Assignemnt 4 Energy Modeling

Team23: Qingning Cao & Yilun Jin

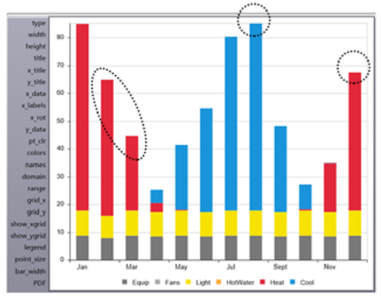
Window to Wall Ratio

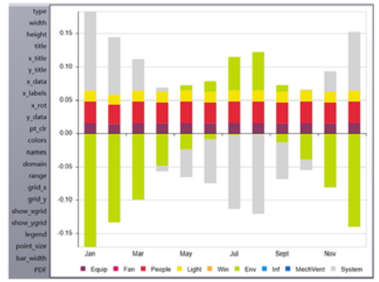
Energy Use Intensity

Energy Balance

0%

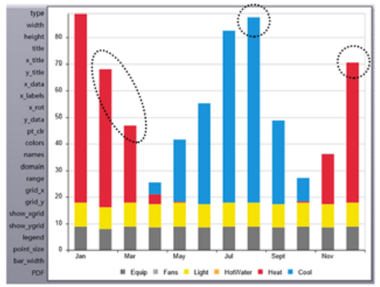
Total EUI

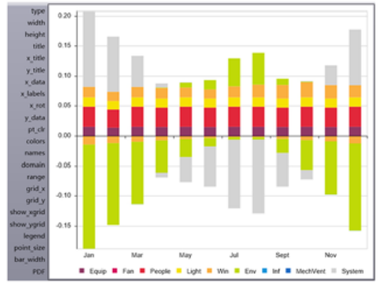




50%

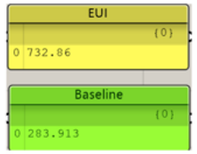
Total EUI

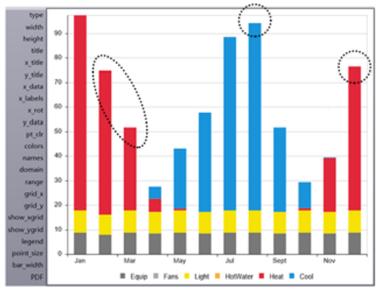


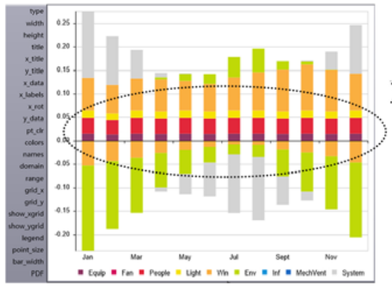


100%

Total EUI







Nanjing is a hot space more than cold place,
which can also be proven by the data in assignment2.

Because the difference of 20-40-60 ratio of window to wall is to subtle,
I choose the 0-50-100 ratio to analysis.

Generally, Nanjing, China is a hot place more than cold place.
However, it is still cold during Novermber to March.

1. It can be seen in the EUI chart that in Winter, bigger the window is,
   the more energy it needs to heat the room.
   This seems a little bit contrary to common sense.
   This means in winter, windows lose a lot of energy.
   This can also be argued in the Energy Balance chart.
   Alothough the window always lets in more energy than it lets out,
   the difference between letting in and out comes smaller in winter,
   which causes the shortcome of window in winter.
2. In summer, the bigger the window is , the more energy it needs to cool the room,
   which seems reasonable as in summer window lets so much sunshine in
   that would cause the room hotter.

It seems that Nanjing, China is not suitable for too large windows.

Assignment 5 - Passive Design

1 Basic Information and PV Watts

AT1 Environments in Architecture
Fall 2020
Instructor: Lola Ben-Alon
Teaching Associate for Software: Pragya Gupta

Team 23
Qingning Cao
Yilun Jin

Basic Information of the Building

The building is in Nanjing, Jiangsu Province, the southeast of China.
This part is hot in summer and cold in winter with high humidity.
Traditionally, ventilation is of great significance in this area.
Also, in this area there's no heating system in most residential houses,
people use air conditioners or other traditional ways to heat their houses.

The building is the most western part of the building, which allows windows in three directions. It has 6 floors and 2 apartments each floor in an uint. There units are combined to a whole building.

Appearance of the Building (one unit)

PV Matts Results

RESULTS

Print Results

4,899 kWh/Year*

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Value ($)
January	2.93	308	N/A
February	3.38	319	N/A
March	3.99	413	N/A
April	4.91	469	N/A
May	5.21	501	N/A
June	5.09	467	N/A
July	5.28	492	N/A
August	5.43	498	N/A
September	4.69	429	N/A
October	4.04	391	N/A
November	3.22	317	N/A
December	2.84	297	N/A
Annual	4.25	4,901	0

Location and Station Identification

Requested Location	Nanjing China
Weather Data Source	(INTL) NANJING/NANKING, CHINA 4.2 mi
Latitude	32° N
Longitude	118.8° E

PV System Specifications *(Residential)*

DC System Size	4 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	20°
Array Azimuth	180°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

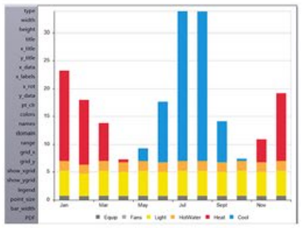
Economics

Average Retail Electricity Rate	No utility data available

Performance Metrics

Capacity Factor	14.0%

Total EUI



20864 kWh/yr

4901/20864 = 23.49%

PV Watts can give out 23.49% energy
the building needs

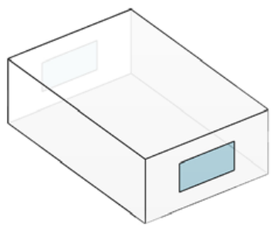
Assignment 5 - Passive Design

2 Simulation Results

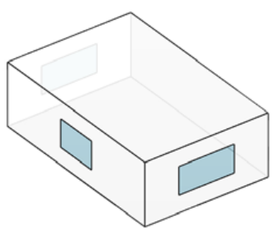
AT1 Environments in Architecture
Fall 2020
Instructor: Lola Ben-Alon
Teaching Associate for Software: Pragya Gupta

Team 23
Qingning Cao
Yilun Jin

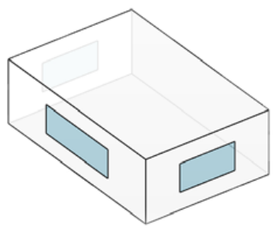
Window Configurations



Windows at northern and southern side

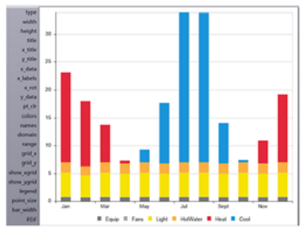


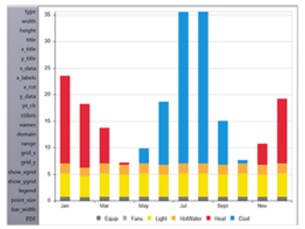
Windows at northern ,southern and western sides

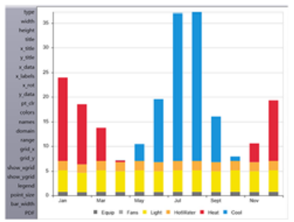


Windows at northern ,southern and larger at western sides

Simulation Results - EUI







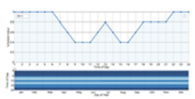
Uncomfotable Hours	Total EUI	Uncomfotable Hours	Total EUI	Uncomfotable Hours	Total EUI
3735 hours	208.641 kWh/m2/yr	3916 hours	215.237 kWh/m2/yr	4159 hours	221.837 kWh/m2/yr

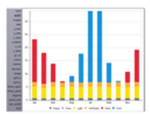
Comparation

The uncomfortable hours are clear that without windows in the west side, there are more comfortable hours. The larger the window is, the more uncomfortable it will be. Also, this can be indicated in EUI chart. It shows that more energy of cooling is needed in the window configuration that there is large window at the west side.
Therefore, the tradition mode of only windows at north and south side is best considered by EUI chart. But sometimes windows are needed for sake of beautiful view or the feeling of sunshine.

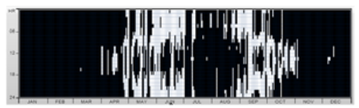
Simulation Results - Ventilation Schedules

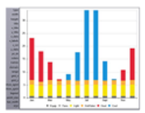
Occ Residential





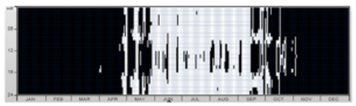
Comfortable Hours of Temperature (18-25℃)

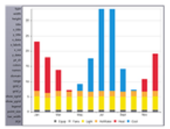




The result seems similar.

Hours of High Humidity (>60%) and >18℃





The result seems similar. I thought this would be different because Nanjing is really of great humidity, in which case ventilation would help a lot.

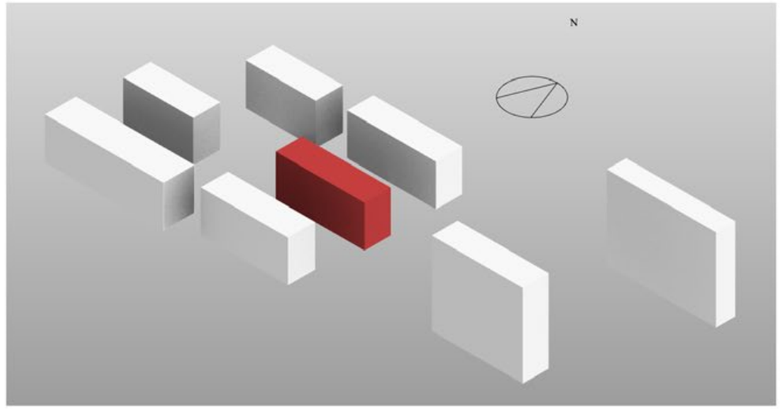
Assignment 6 - Daylight Design

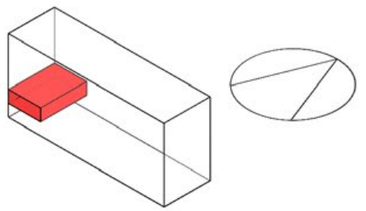
AT1 Environments in Architecture
Fall 2020
Instructor: Lola Ben-Alon
Teaching Associate for Software: Pragya Gupta

Team 23
Qingning Cao
Yilun Jin

1 Basic Information of the Building

Surroundings





The selected building is located in relatively high dense residential buildings but these buildings are not taller than 20 meters.

The room is on the second floor and can have windows on three walls. But in this assignment I won't add windows on the West because normally we don't have western windows due to the hotness it will bring in summer.

Appearance of the Building (one unit)

The building is in Nanjing, Jiangsu Province, the southeast of China.This part is hot in summer and cold in winter with high humidity. Traditionally, ventilation is of great significance in this area.Also, in this area there's no heating system in most residential houses, people use air conditioners or other traditional ways to heat their houses.

The building is the most western part of the building, which allows windows inthree directions. It has 6 floors and 2 apartments each floor in an uint. There units are combined to a whole building.

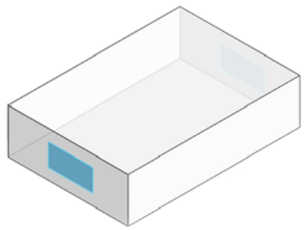
Assignment 6 - Daylight Design

ATI Environments in Architecture
Fall 2020
Instructor: Lola Ben-Alon
Teaching Associate for Software: Pragya Gupta

Team 23
Qingning Cao
Yilun Jin

2 Different window configurations

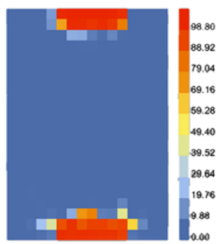
The three windows are all of the same size, but in different length-width ratio.



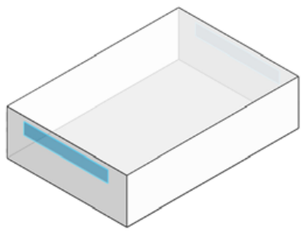
Window Configuration 1

Daylight Glare Probability (DGP): 0.52
Intolerable Glare

Spatial Daylight Autonomy (sDA): 8
Annual Solar Exposure (ASE): 7



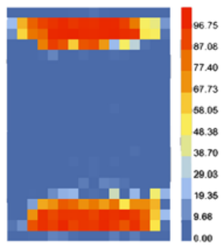
In this window configuration, light is different extremely in different area, some space is lightened a lot while others become dark immediately.



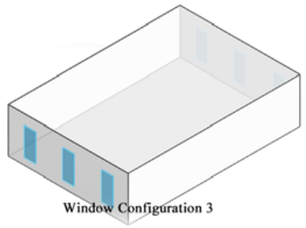
Window Configuration 2

Daylight Glare Probability (DGP): 0.56
Intolerable Glare

Spatial Daylight Autonomy (sDA): 20
Annual Solar Exposure (ASE): 13



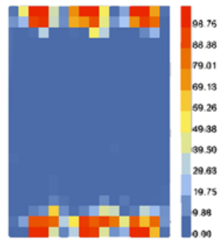
In this window configuration, light is relatively even spared in the space. This window is good for reading and drawing. Also, this has the most solar exposure of the three.



Window Configuration 3

Daylight Glare Probability (DGP): 0.54
Intolerable Glare

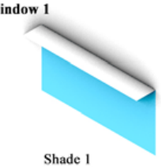
Spatial Daylight Autonomy (sDA): 10
Annual Solar Exposure (ASE): 6



In this window configuration, light changes a lot. Also, this has the least solar exposure of the three.

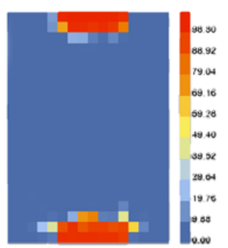
3 Different window shades

Window 1

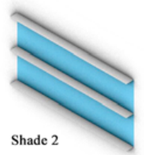


Shade 1

Spatial Daylight Autonomy (sDA): 8
Annual Solar Exposure (ASE): 7

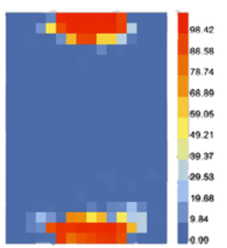


This shade lets the least light come in.



Shade 2

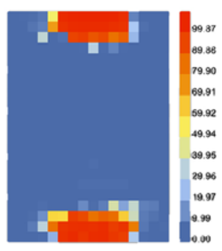
Spatial Daylight Autonomy (sDA): 11
Annual Solar Exposure (ASE): 9



This shade lets some light come in.

Shade 3

Spatial Daylight Autonomy (sDA): 13
Annual Solar Exposure (ASE): 10



This shade lets the most light come in.

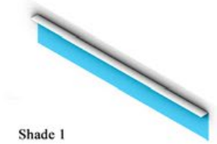
Letting how much light come in is not absolute. The amount of letting-in light is based on the orientation and function.

Assignment 6 - Daylight Design

ATI Environments in Architecture
Fall 2020
Instructor: Lola Ben-Alon
Teaching Associate for Software: Pragya Gupta

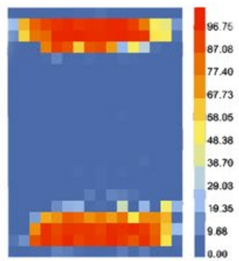
Team 23
Qingning Cao
Yilun Jin

Window 2

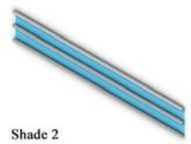


Shade 1

Spatial Daylight Autonomy (sDA): 20
Annual Solar Exposure (ASE): 13

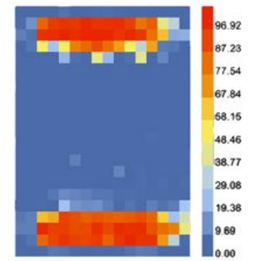


This shades can block more light in northern window than the southern one. This is very traditional and economical shades.

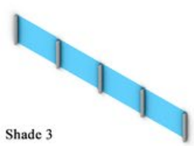


Shade 2

Spatial Daylight Autonomy (sDA): 19
Annual Solar Exposure (ASE): 14

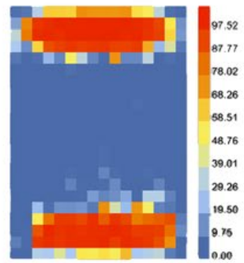


This shades can let light go in deeper than the other two.This kind of shades is more suitable for northon windows.



Shade 3

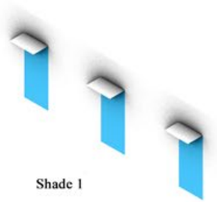
Spatial Daylight Autonomy (sDA): 26
Annual Solar Exposure (ASE): 19



The upright shades are nearly of no use when the orientation is north and south. So in this situation there's the most light in.

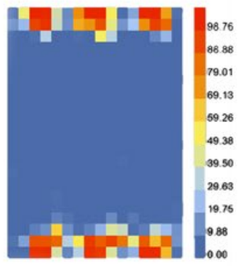
Letting how much light come in is not absolute. The amount of letting-in light is based on the orientation and function. Different shades are more suitable for different orientational windows.

Window 3

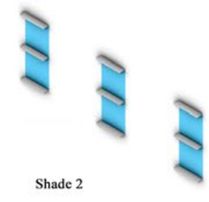


Shade 1

Spatial Daylight Autonomy (sDA): 10
Annual Solar Exposure (ASE): 6

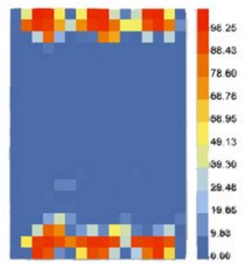


This shades can block more light in northern window than the southern one. This is very traditional and economical shades.

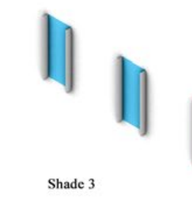


Shade 2

Spatial Daylight Autonomy (sDA): 13
Annual Solar Exposure (ASE): 9

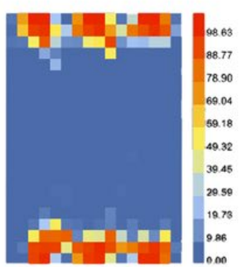


This shades can let light go in deeper than the other two.This kind of shades is more suitable for northon windows.



Shade 3

Spatial Daylight Autonomy (sDA): 14
Annual Solar Exposure (ASE): 9



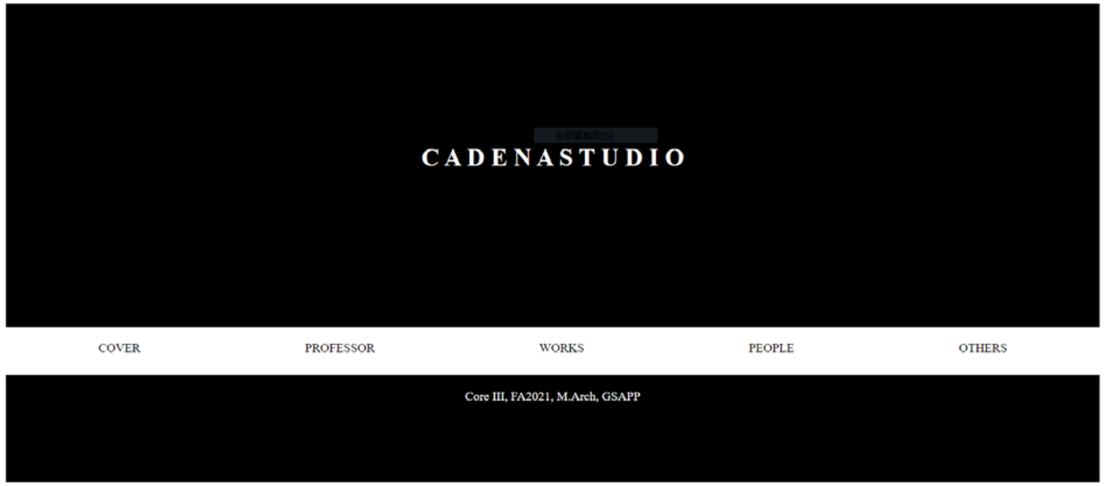
The upright shades are nearly of no use when the orientation is north and south. So in this situation there's the most light in.

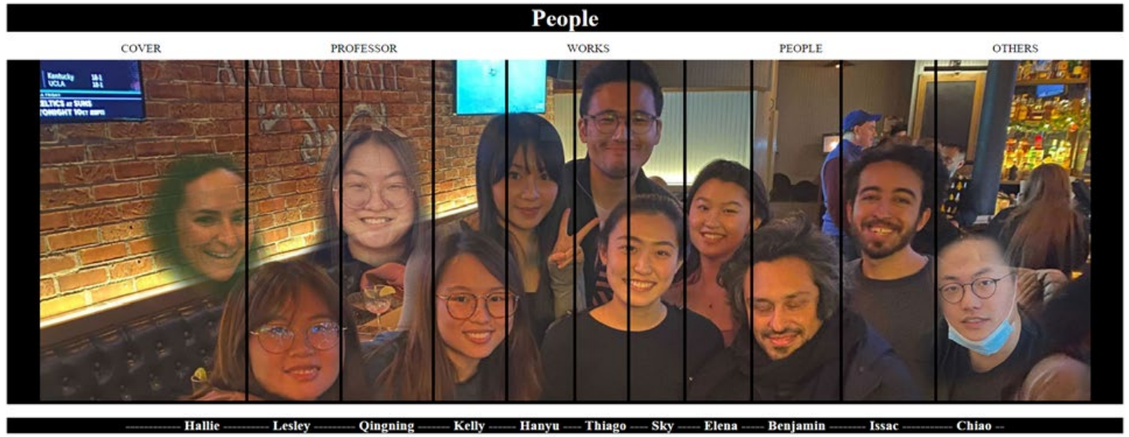
Letting how much light come in is not absolute. The amount of letting-in light is based on the orientation and function.

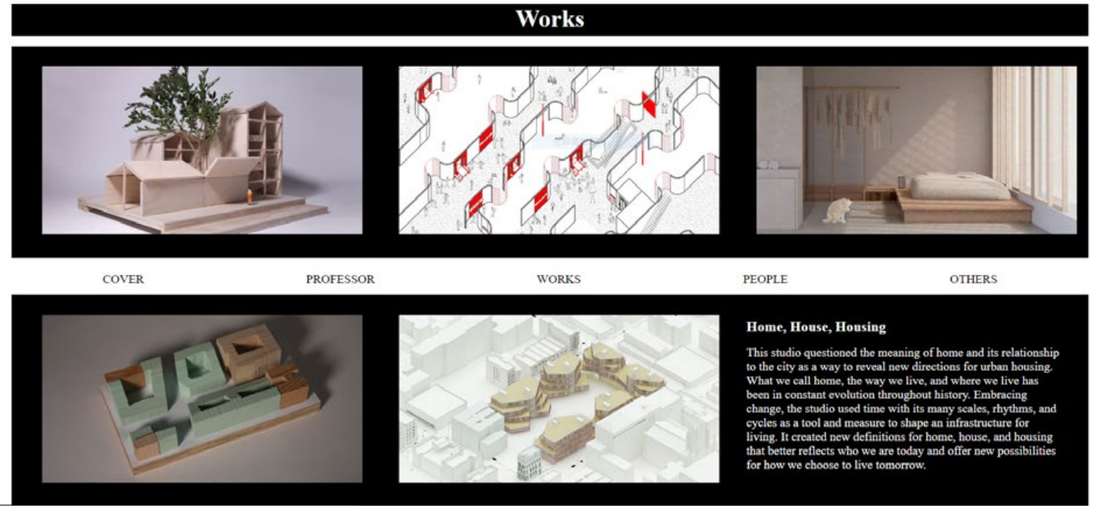
CODING FOR SPATIAL PRACTICES

WEBSITE

Personal Website
2021 Fall
Instructor: Felicity Scott



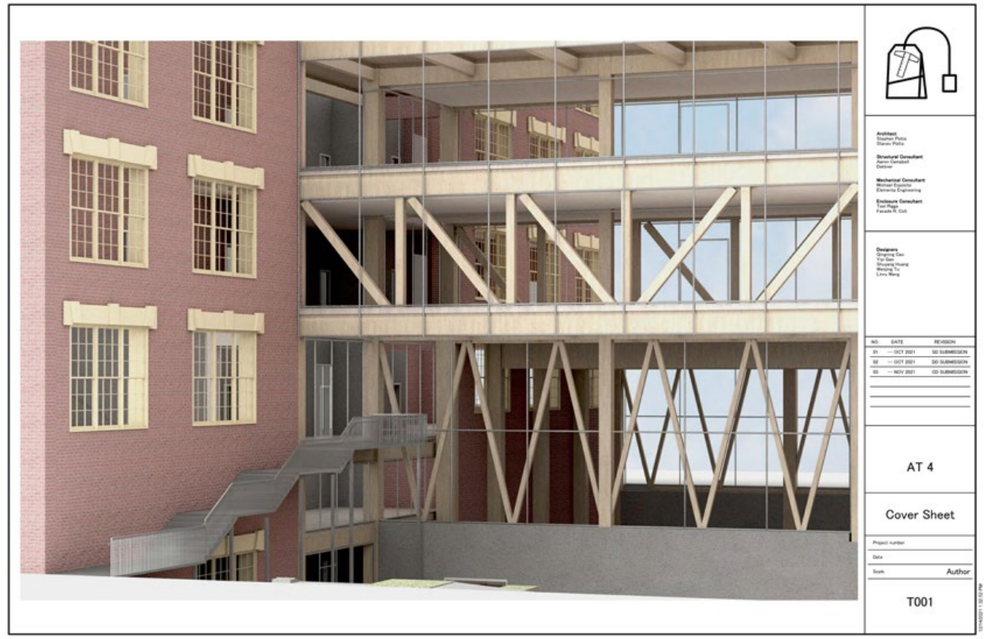


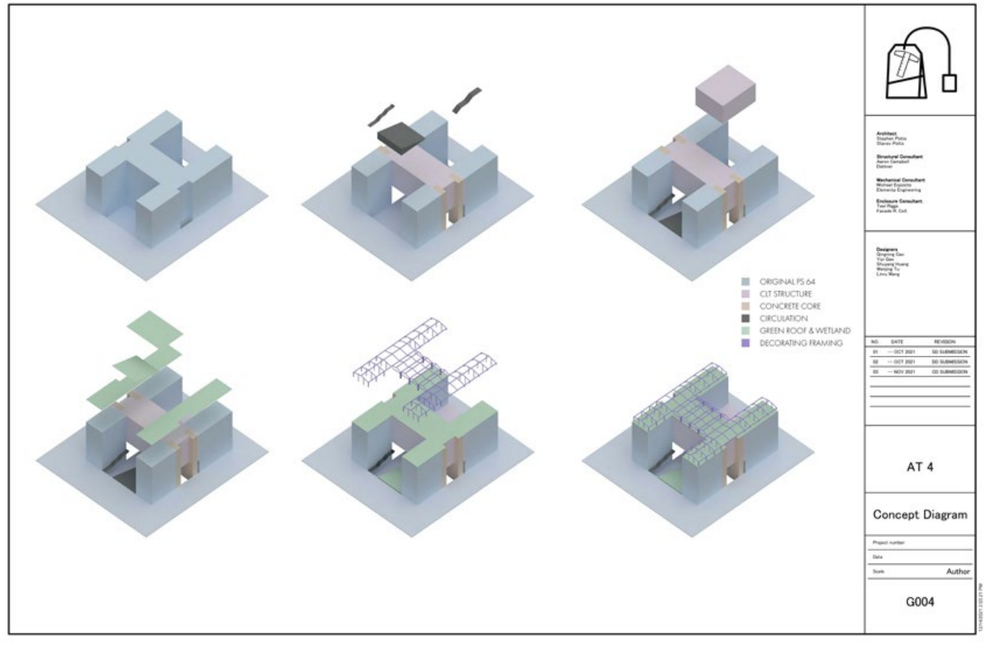


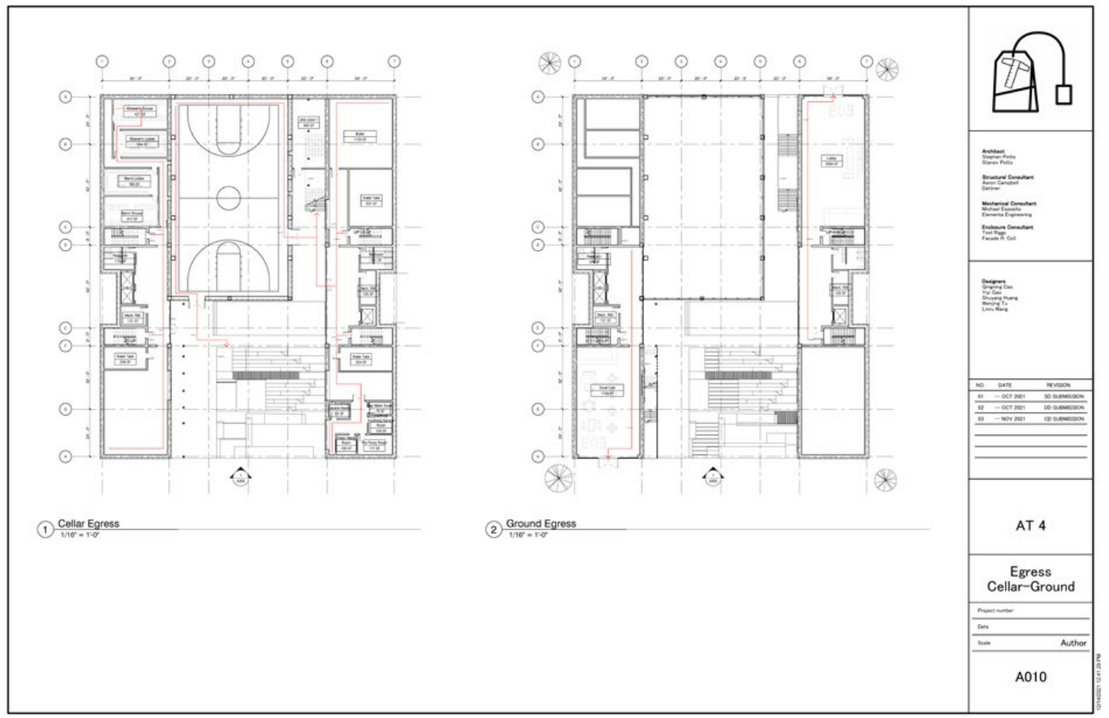
AT IV BLDG SYSTM INTEG

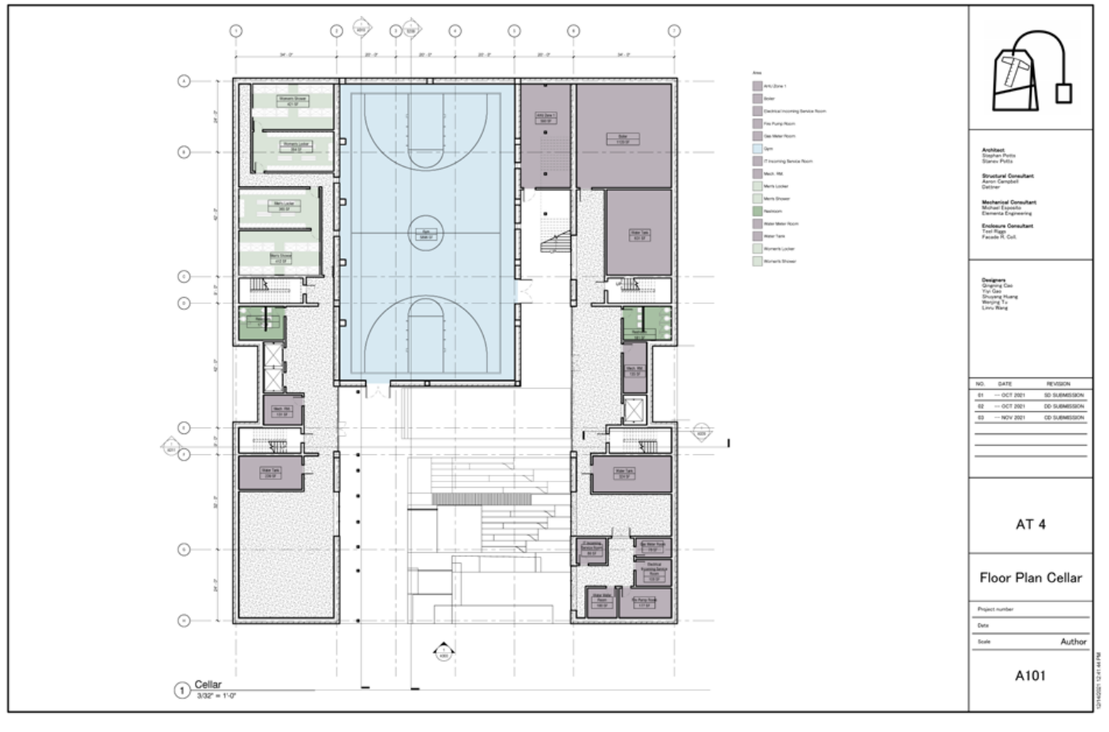
REVIT

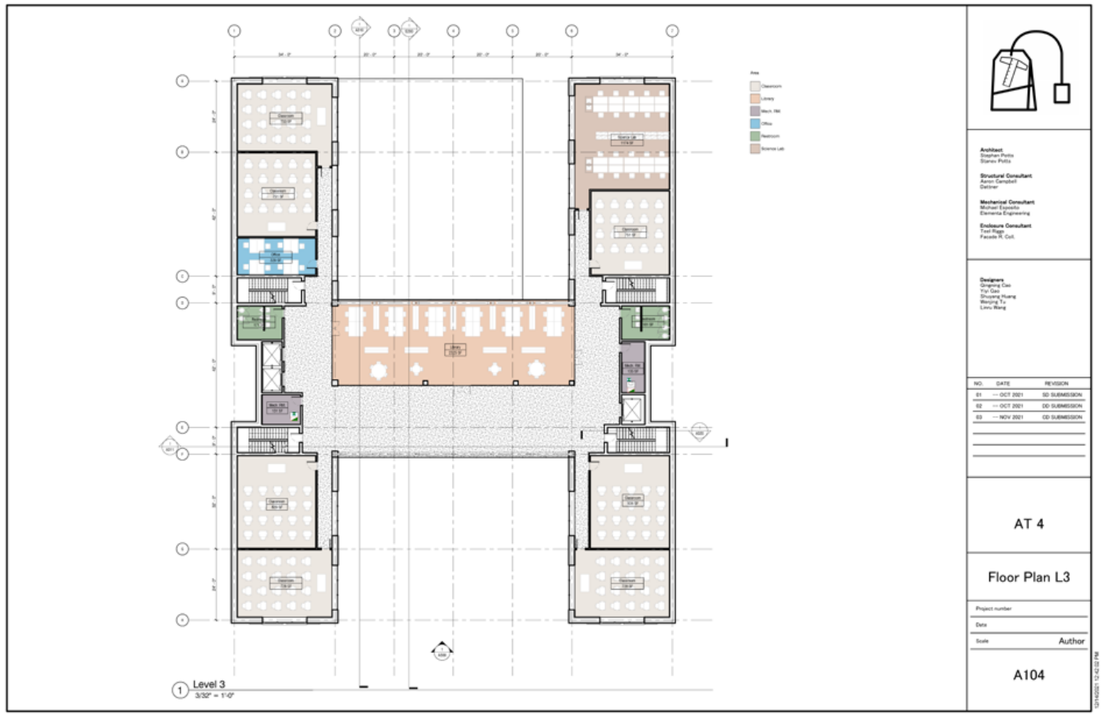
Group Member: Yiyi Gao, Shuyang Huang, Wenjing tu, Linru Wang
2021 Fall
Instructor: Berardo Matalucci











Architect
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Mohsen Esposito
Elemenia Engineering

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Toot Riggs
Facade R. Cot.

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Shuyang Huang
Wenjing Tu
Linru Wang

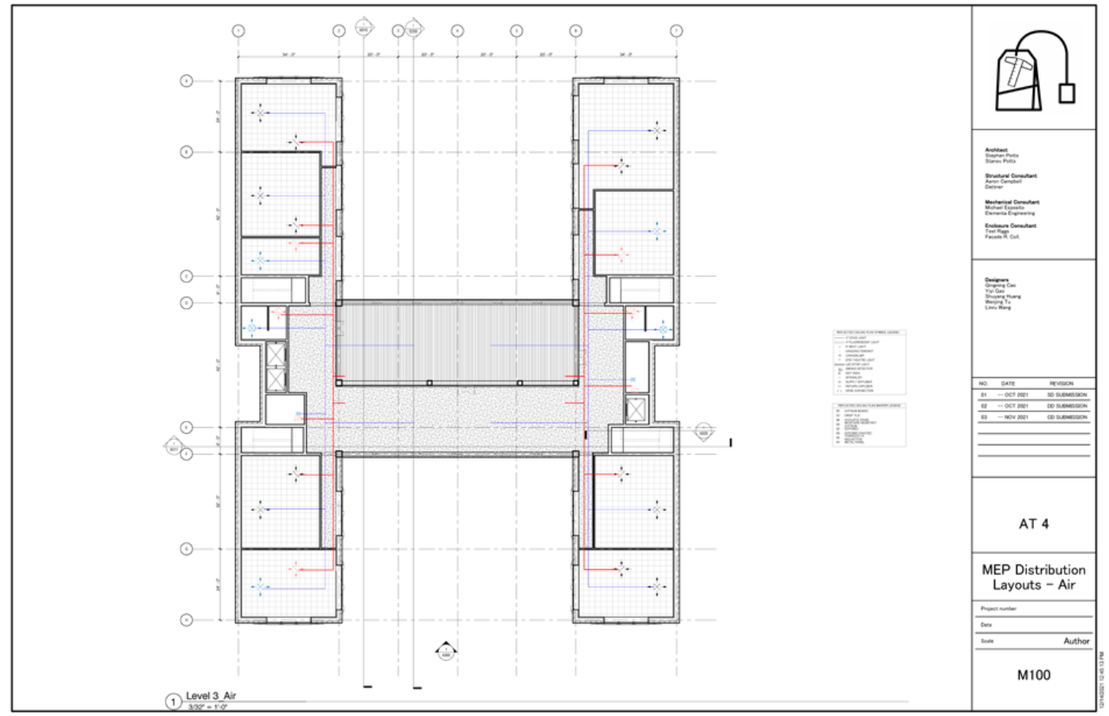
NO.	DATE	REVISION
01	— OCT 2021	SD SUBMISSION
02	— OCT 2021	DD SUBMISSION
03	— NOV 2021	CD SUBMISSION

AT 4

Floor Plan L3

Project number
Date
Scale Author

A104



Architect
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Elemenia Engineering

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Linru Wang

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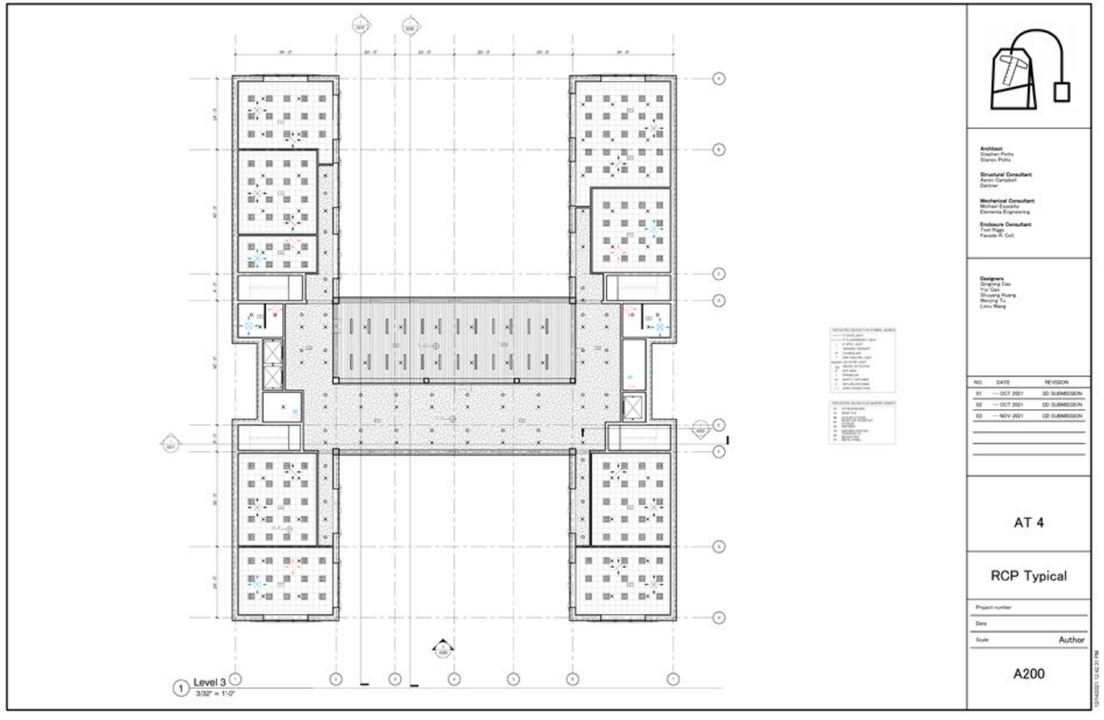
03	— NOV 2021	CD SUBMISSION

AT 4

MEP Distribution Layouts – Air

Project number
Date
Scale Author

M100



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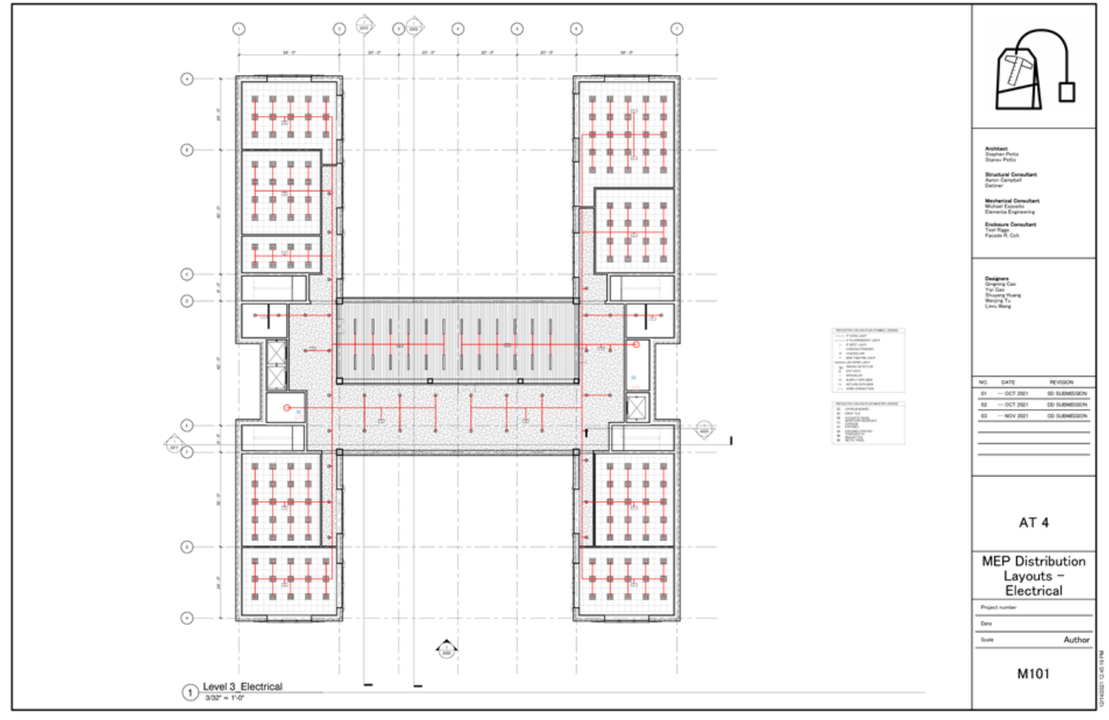
AT 4

RCP Typical

Project number
Date
Scale Author

A200



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Shuyang Huang
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Linru Wang

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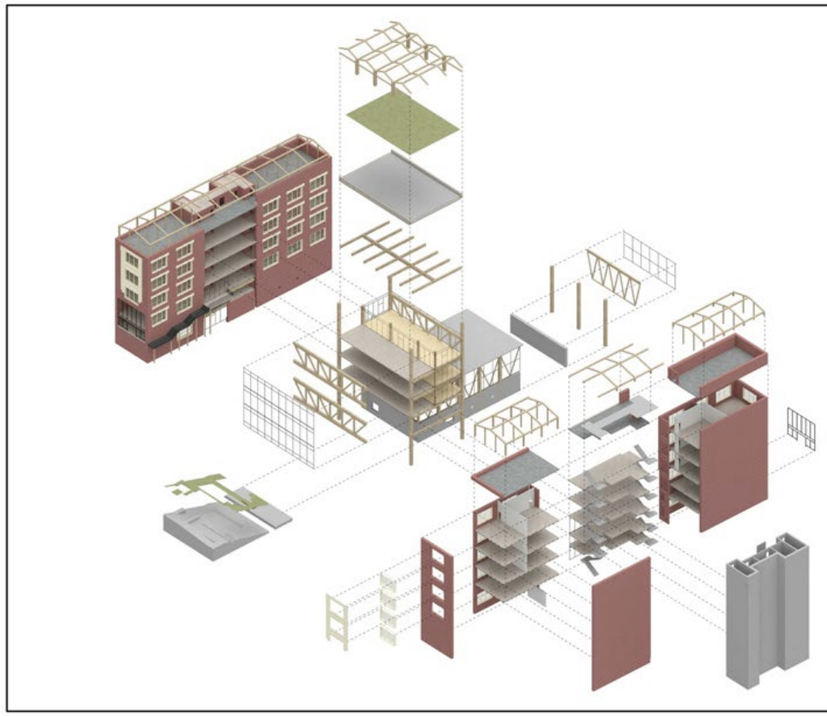
AT 4

MEP Distribution Layouts – Electrical

Project number
Date
Scale Author

M101



Architect
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03	— NOV 2021	CD SUBMISSION

AT 4

Exploded Axon

Project number
Date
Scale — Author

A800

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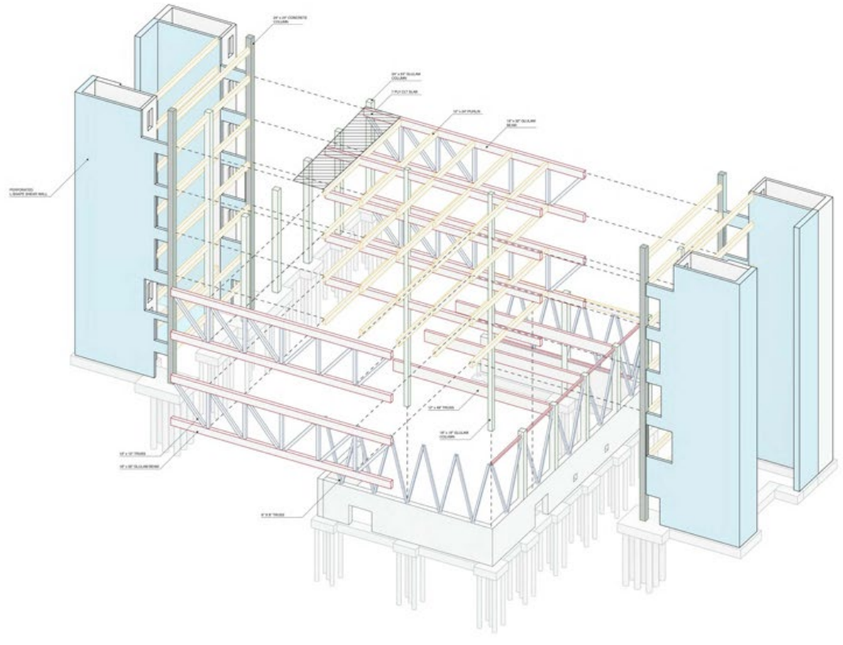

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03	— NOV 2021	CD SUBMISSION

AT 4

Exploded Structure

Project number
Date
Scale — Author

S100

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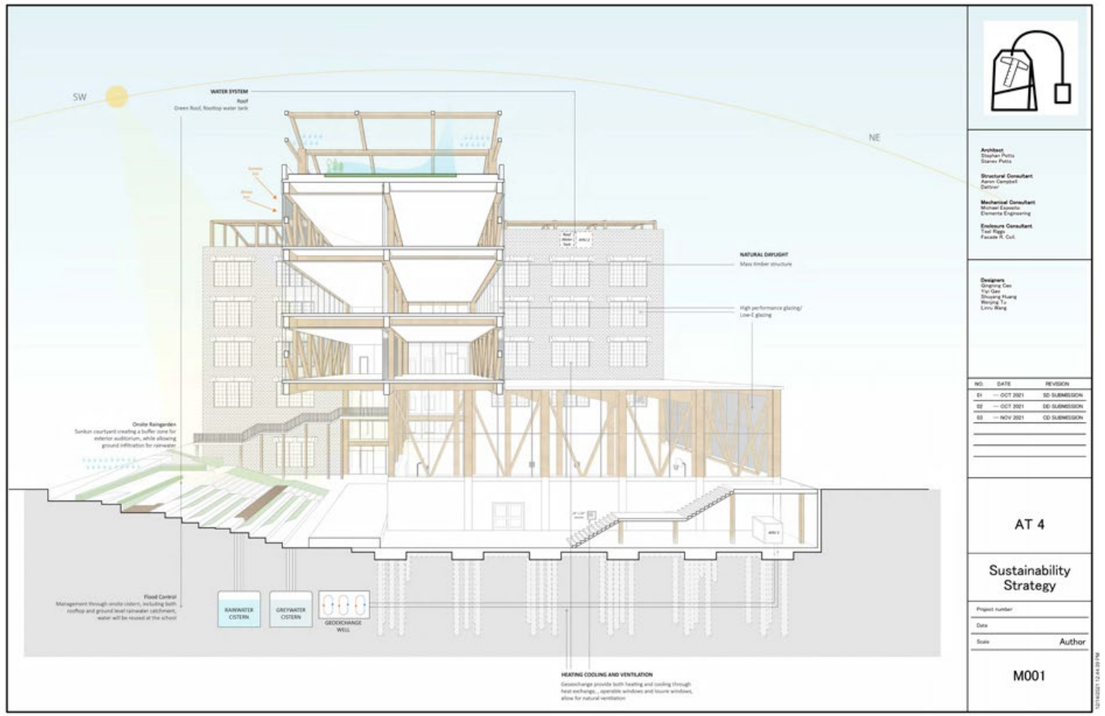

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03	— NOV 2021	CD SUBMISSION

AT 4

Sustainability Strategy

Project number
Date
Scale — Author

M001

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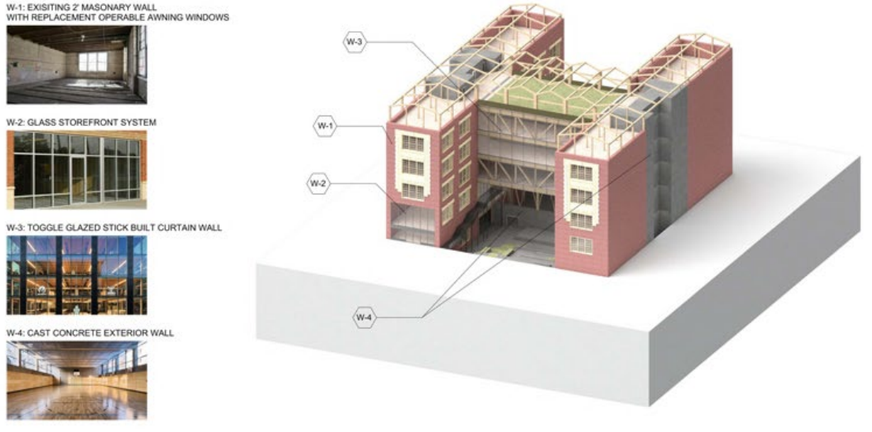

Architect
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Linru Wang

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AT 4

Facade Mapped Elevation

Project number
Date
Scale — Author

F100

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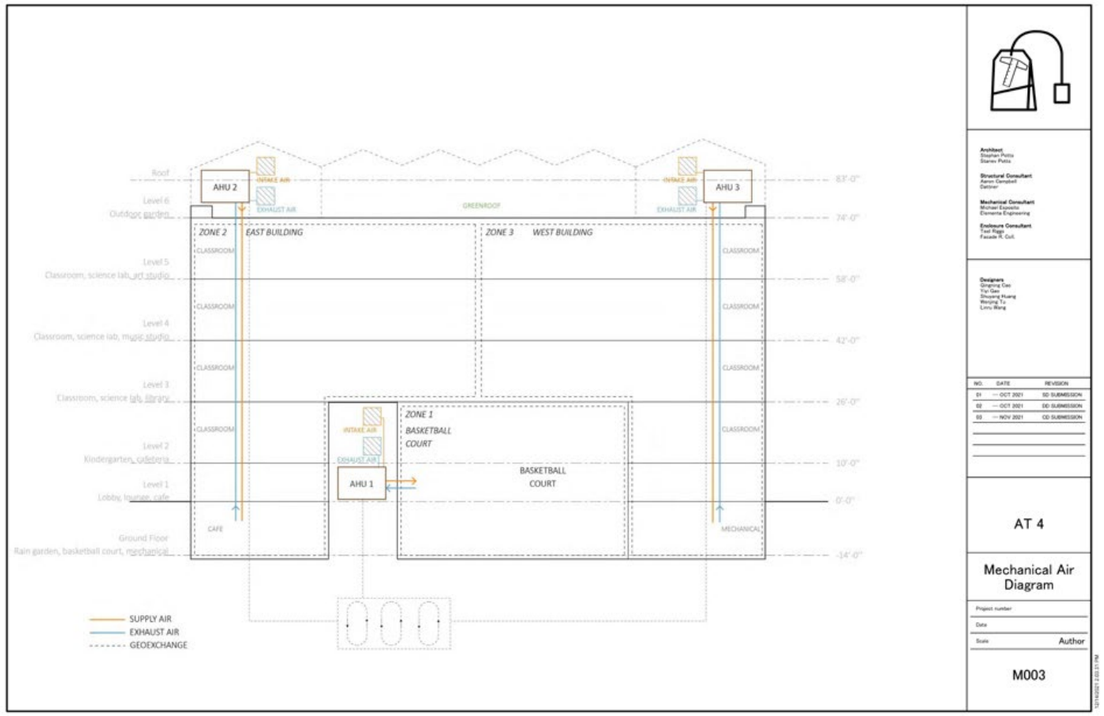

Architect
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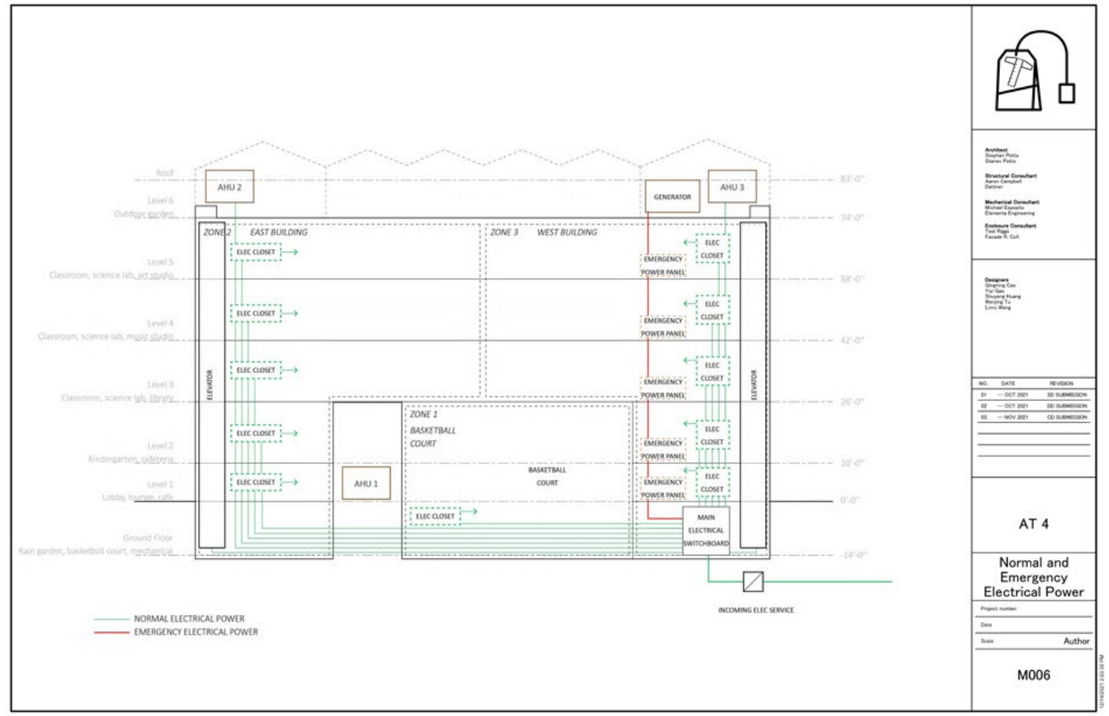
AT 4

Mechanical Air Diagram

Project number
Date
Scale Author

M003



Architect
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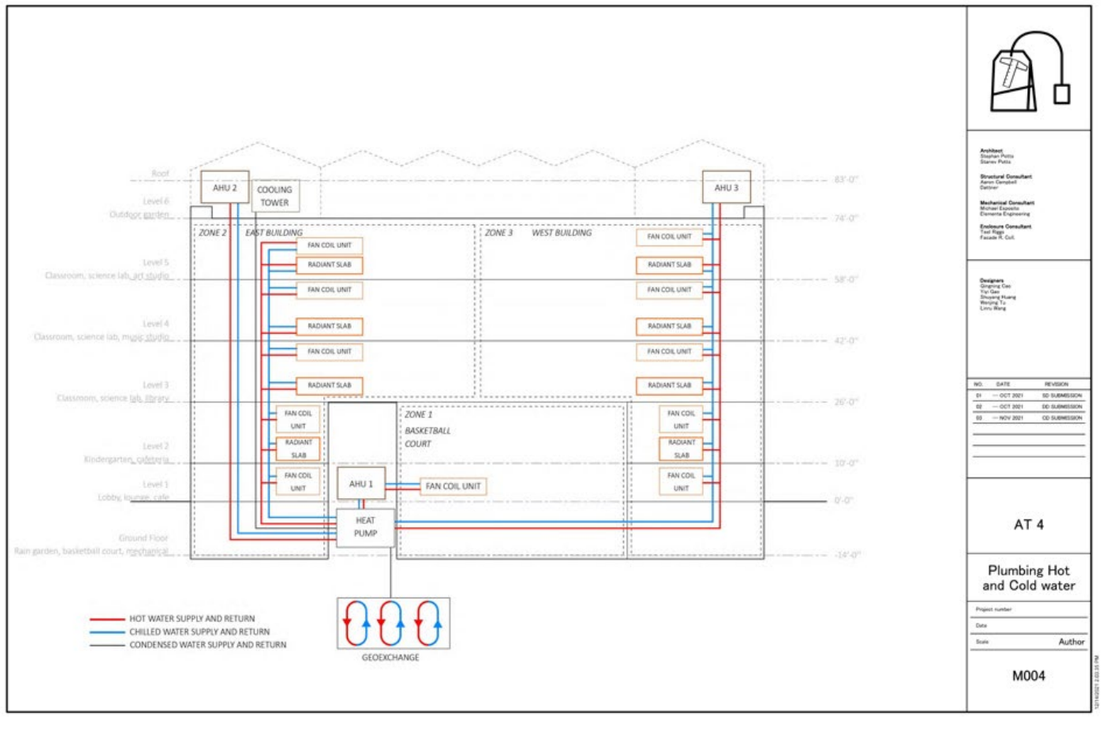
AT 4

Normal and Emergency Electrical Power

Project number
Date
Scale Author

M006



Architect
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Stanev Petto

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Aaron Campbell
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Michael Esposito
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NO.	DATE	REVISION
01	— OCT 2021	SD SUBMISSION
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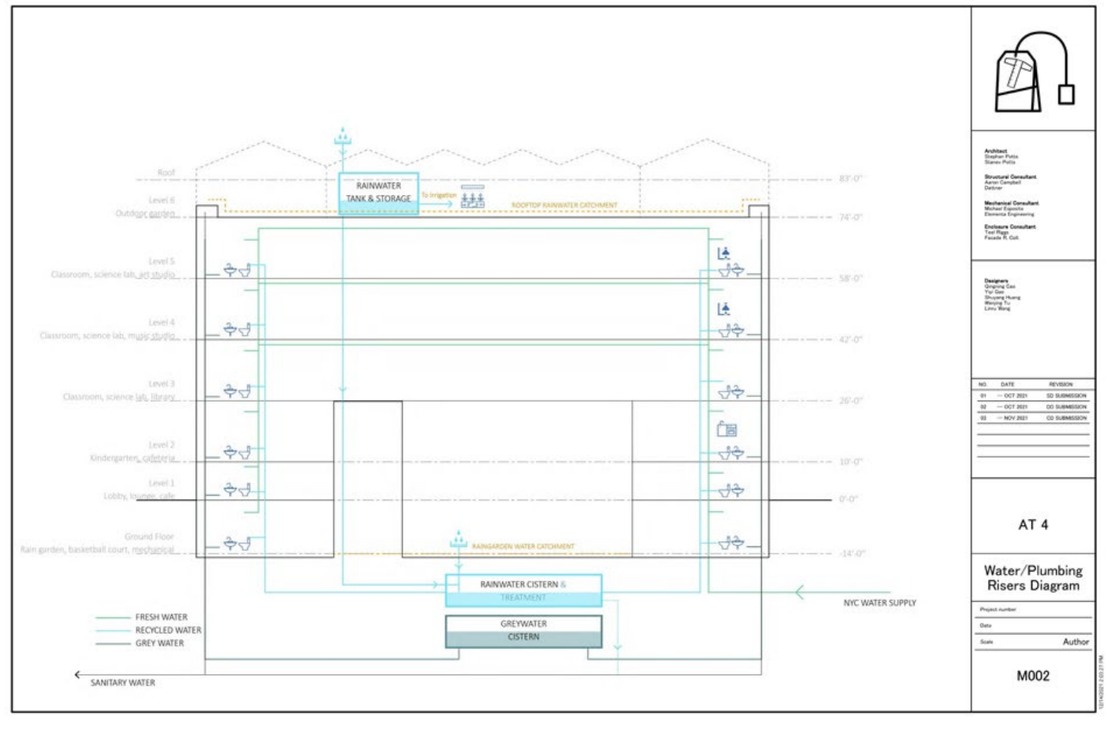
AT 4

Plumbing Hot and Cold water

Project number
Date
Scale Author

M004



Architect
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Tael Riggs
Facade R. Cut.

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Shuqing Huang
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NO.	DATE	REVISION
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02	— OCT 2021	DD SUBMISSION
03	— NOV 2021	CD SUBMISSION

AT 4

Water/Plumbing Risers Diagram

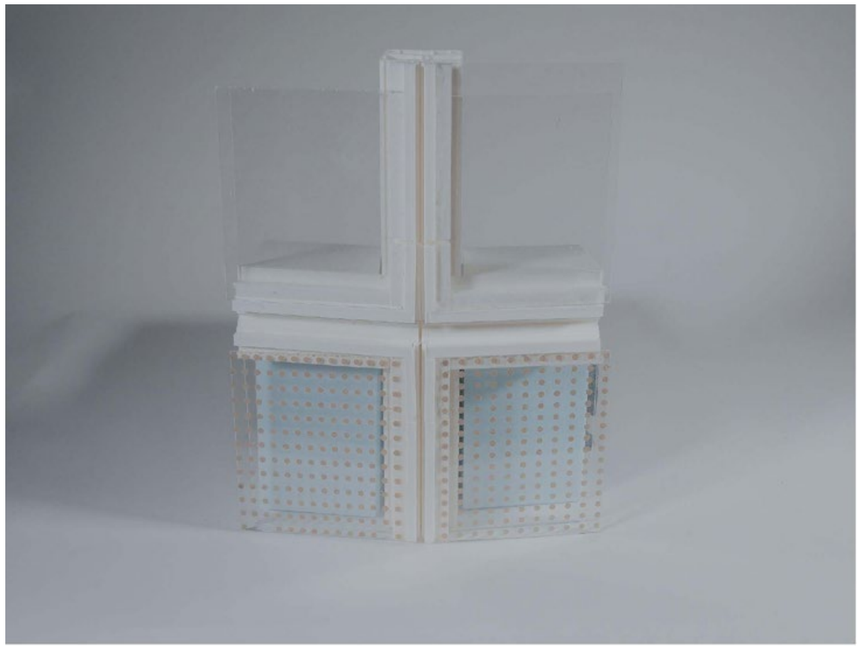
Project number
Date
Scale Author

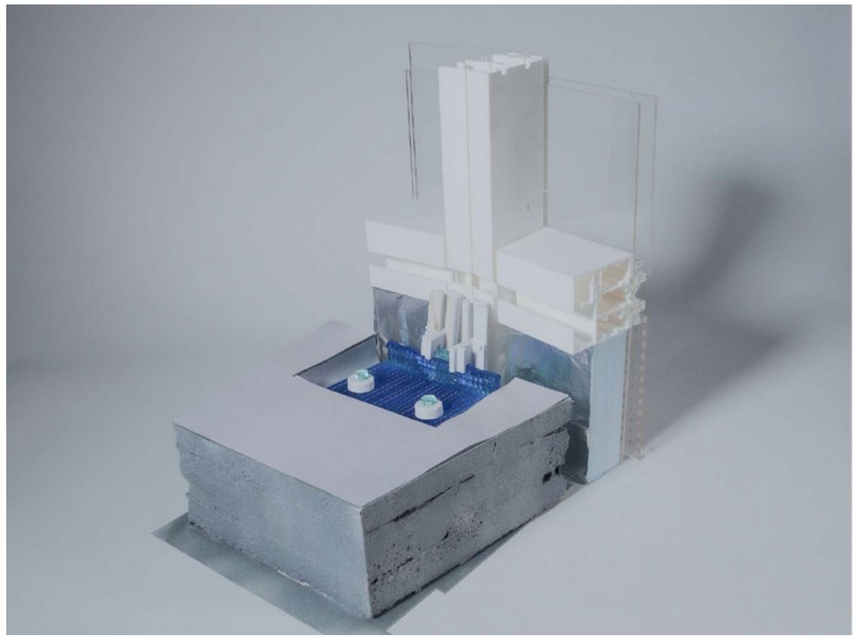
M002

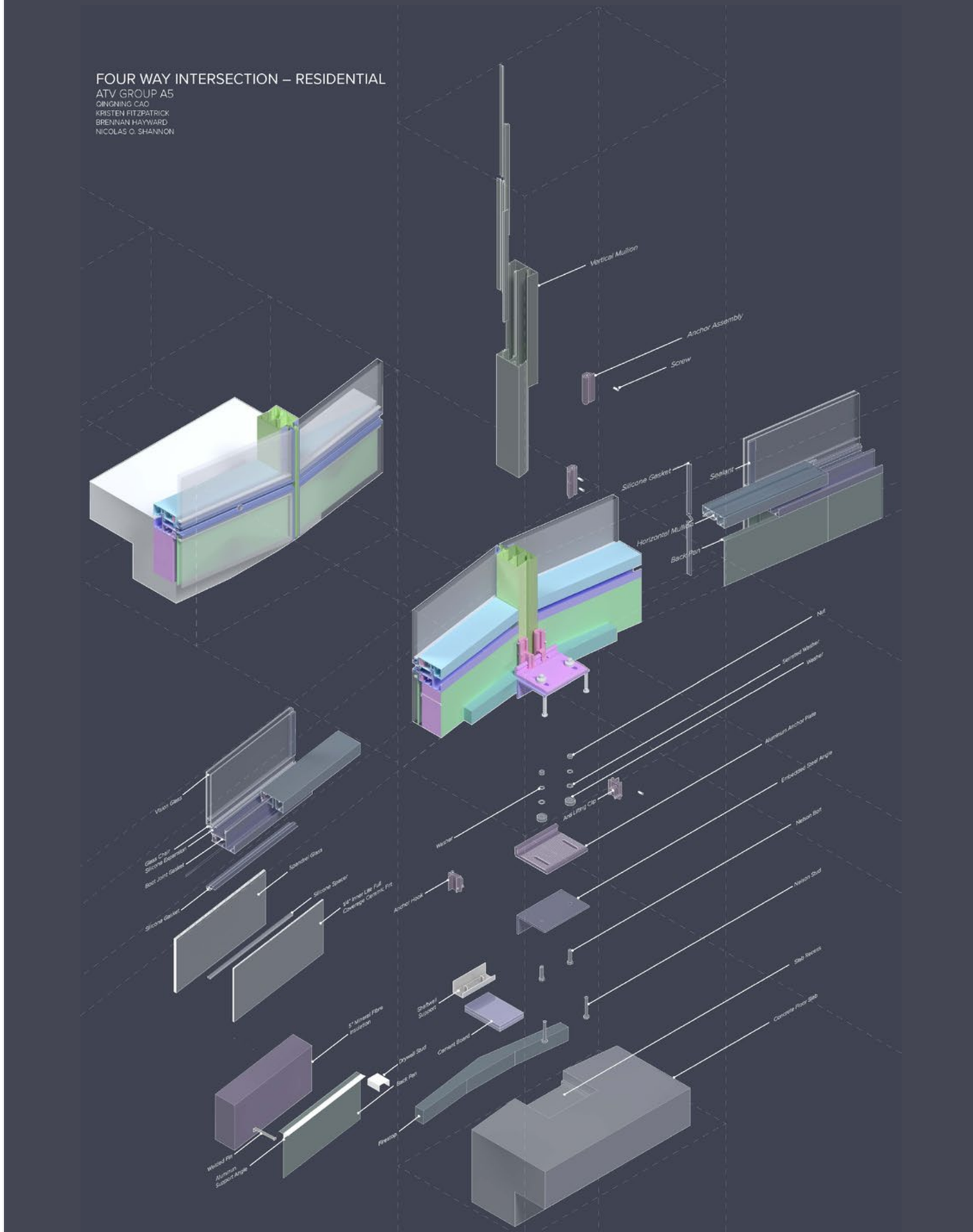
AT V

DETAILING

Group Member: Kristen Fitzpatrick, Brennan Hayward, Nicolas O. Shannon
2022 Spring
Instructor: Nicole Dosso



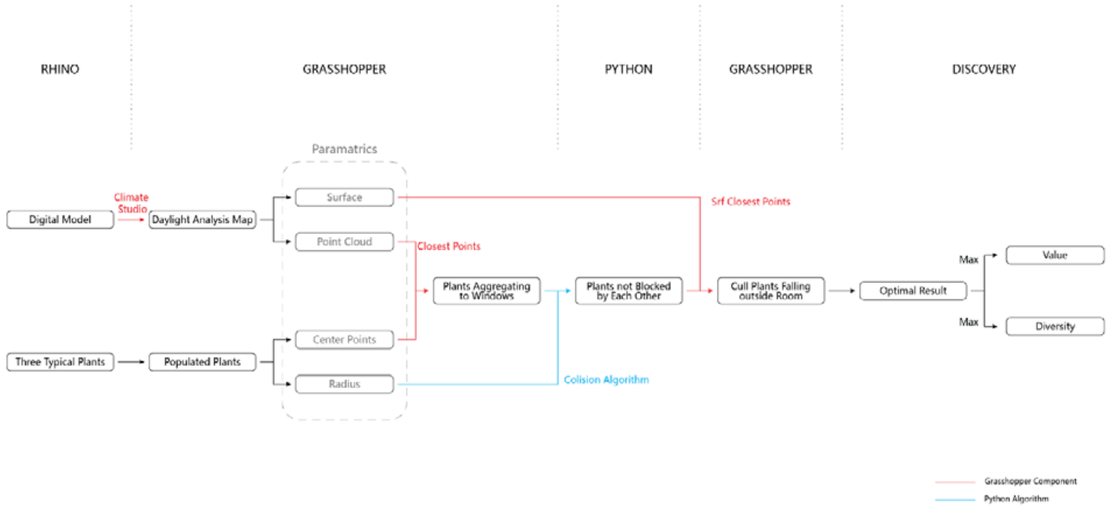


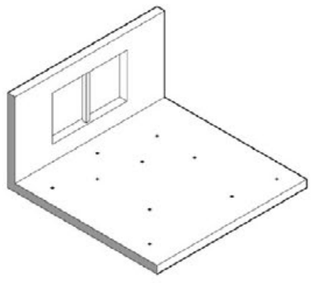


GENERATIVE DESIGN

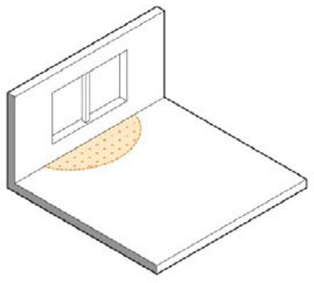
ENVIRONMENTAL ANALYSIS

Group Member: Ruisheng Yang, Wanqi Jiang, Yifei Yuan, Martin
2022 Spring
Instructor: Nicole Dosso

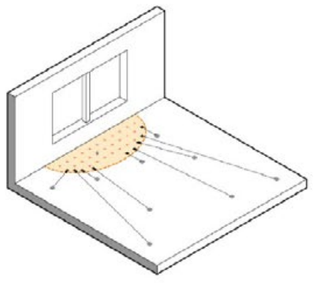




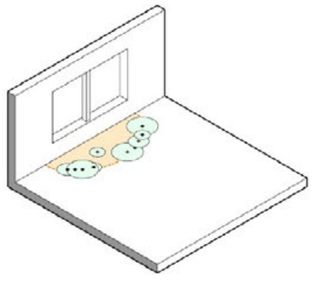
Randomly Populated Points



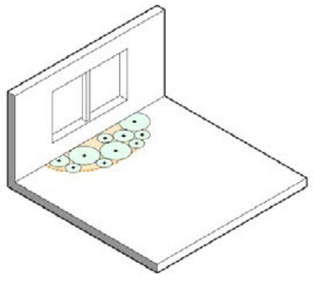
Targeted Points



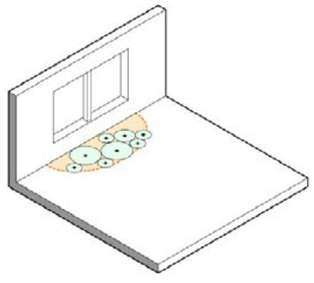
Points Pulled to Targets



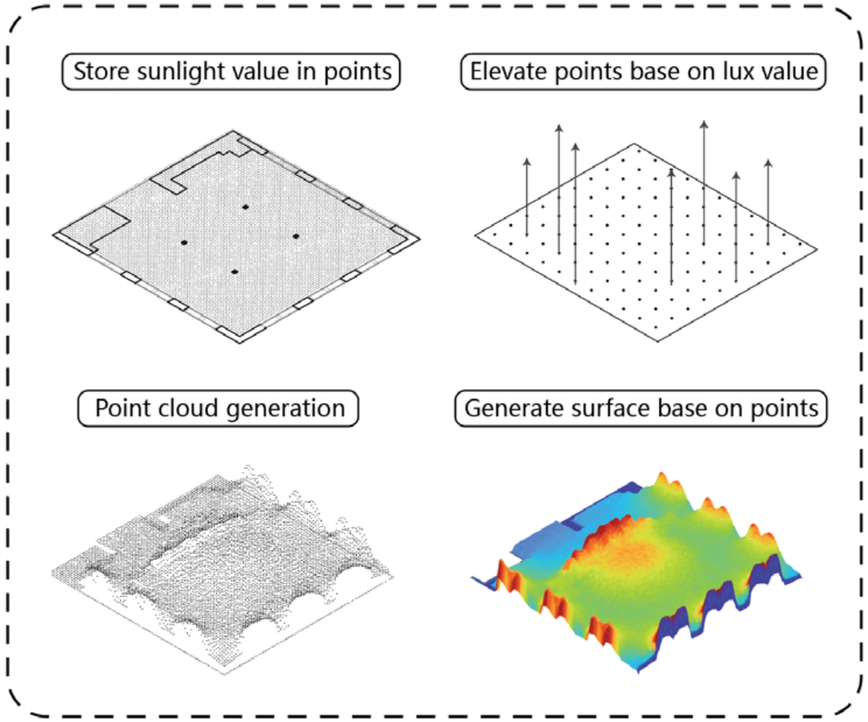
Overlapped Shadow

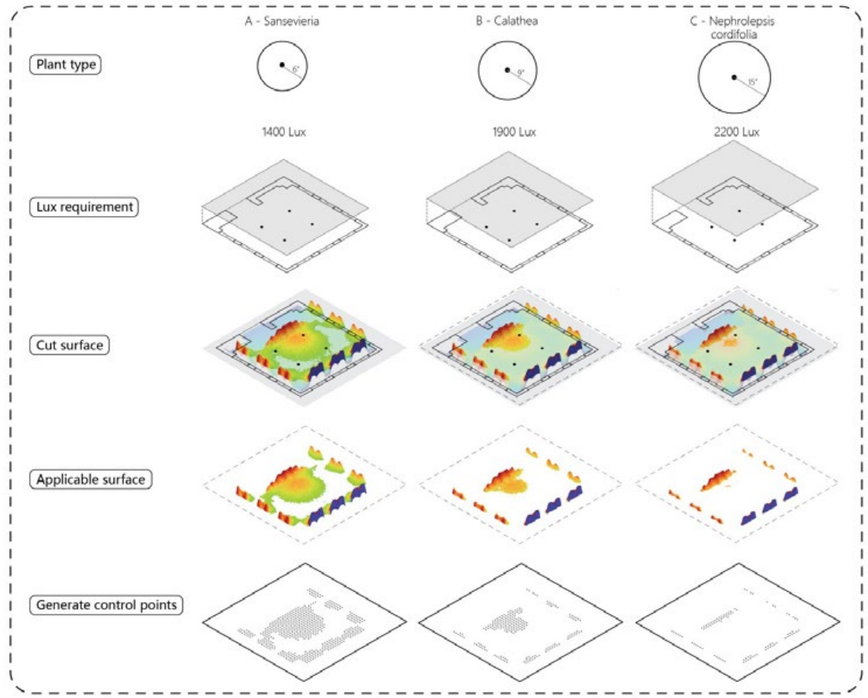


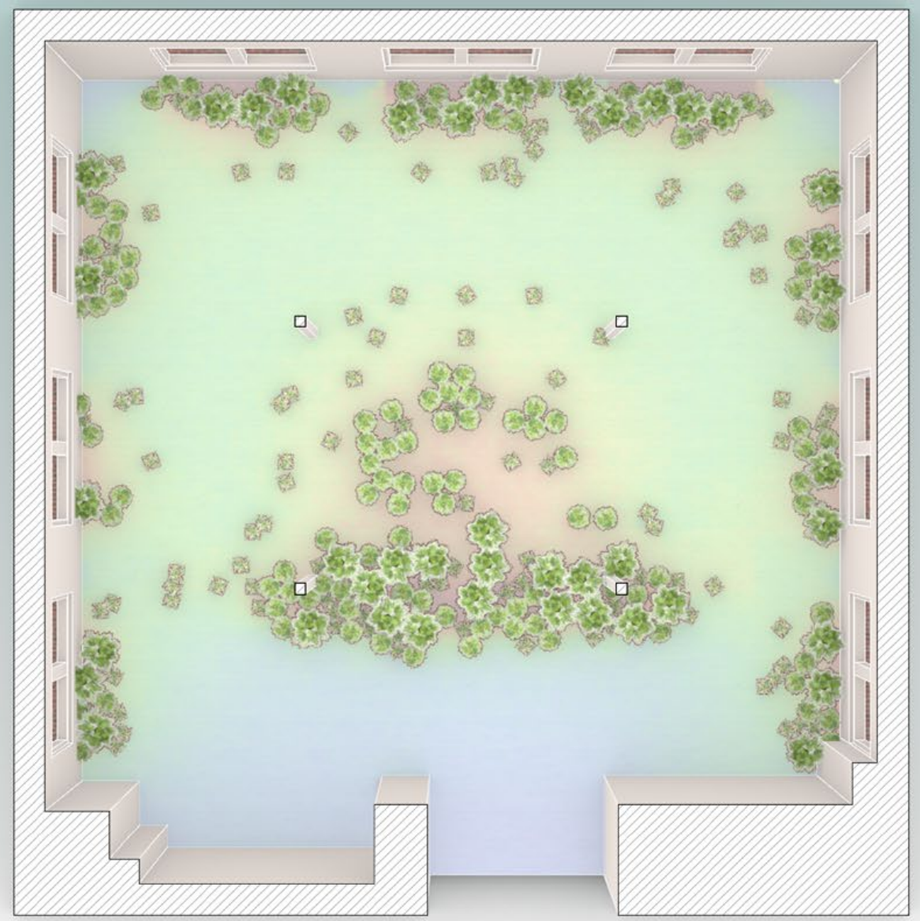
Circles Tangent to Each Othher



Culled Circles outside the Room







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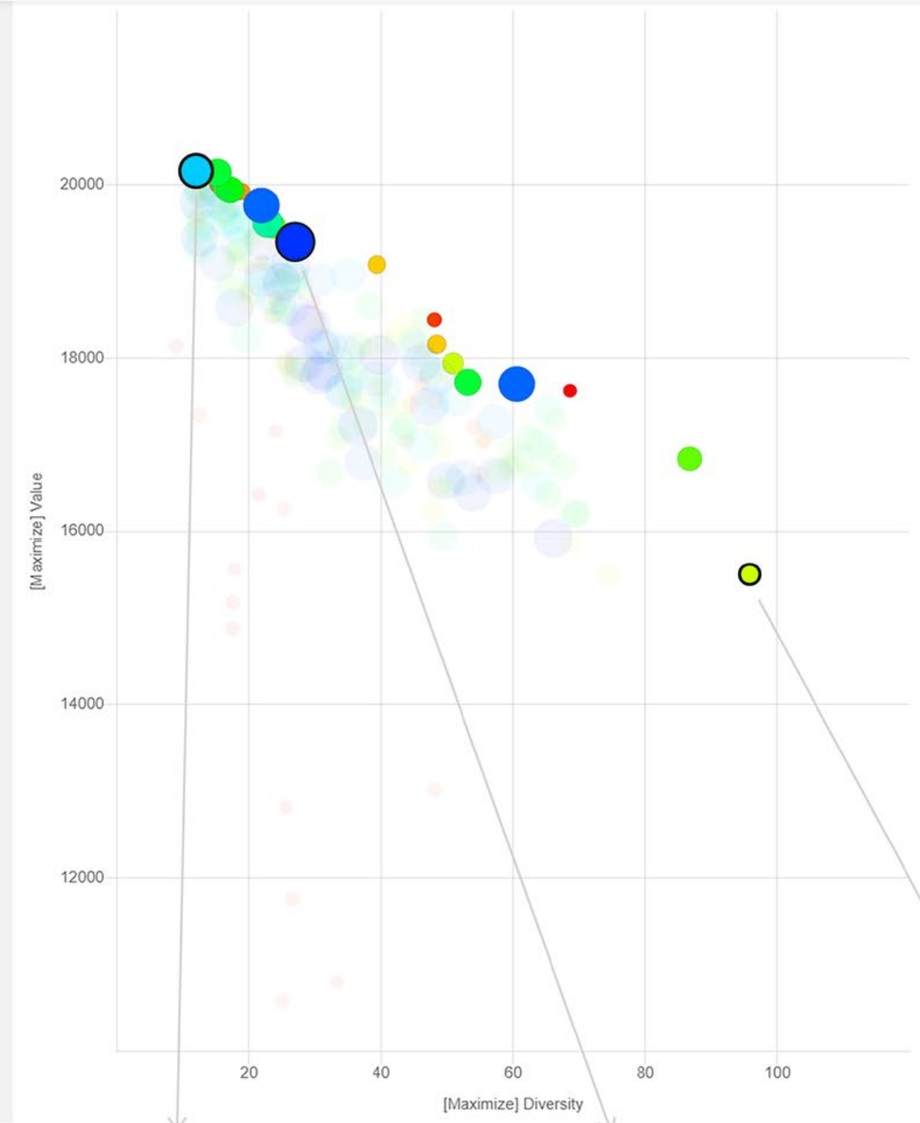


Designs

Design #198

Plant A (Sansevieria) 142 300
Plant B (Calathea) 143 300
Plant C (Nephrolepsis Cordifolia) 9 300

VALUE 19960

Plant A (Sansevieria) 86 300
Plant B (Calathea) 70 300
Plant C (Nephrolepsis Cordifolia) 57 300

VALUE 16460

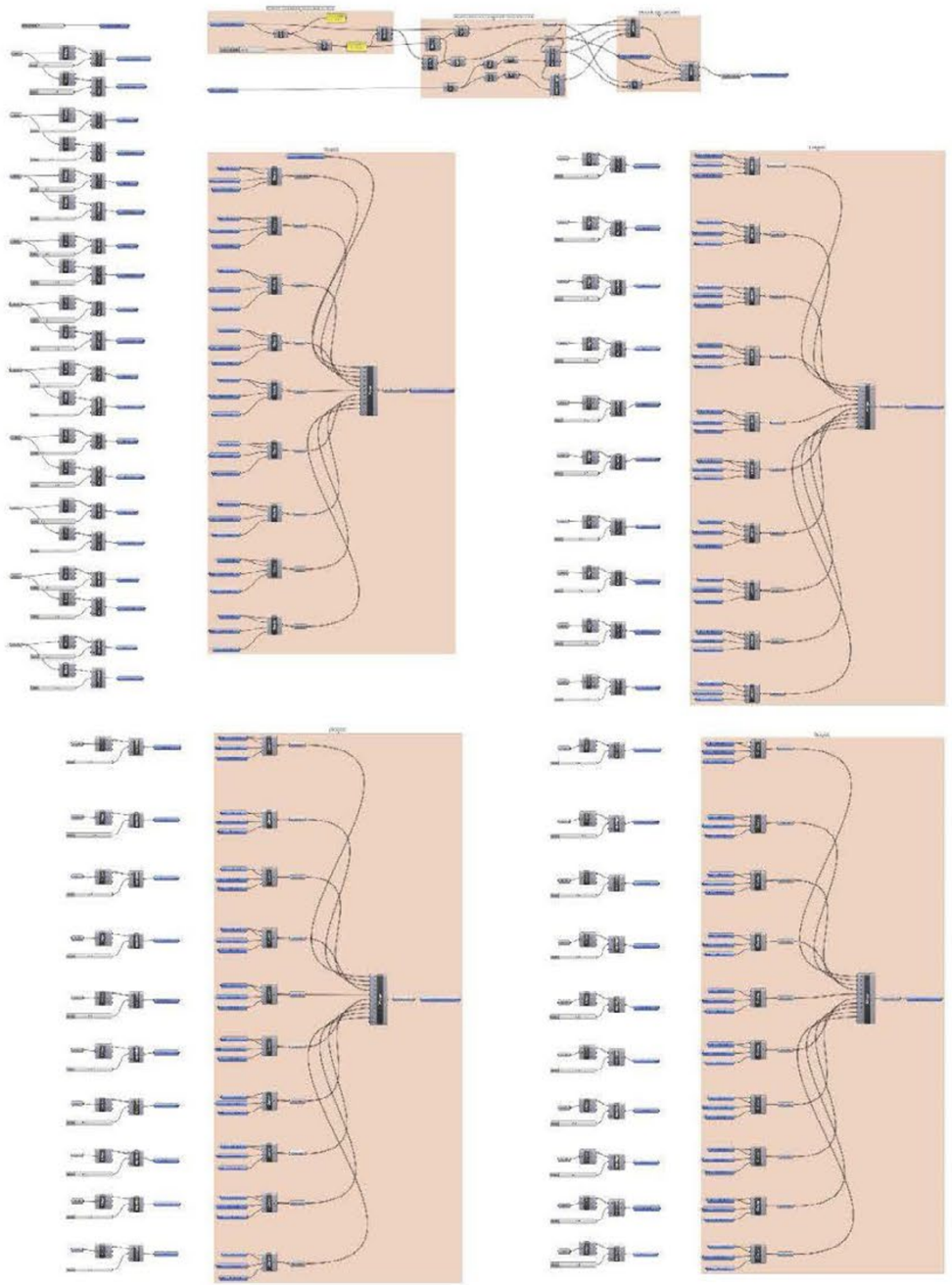
Plant A (Sansevieria) 101 300
Plant B (Calathea) 101 300
Plant C (Nephrolepsis Cordifolia) 45 300

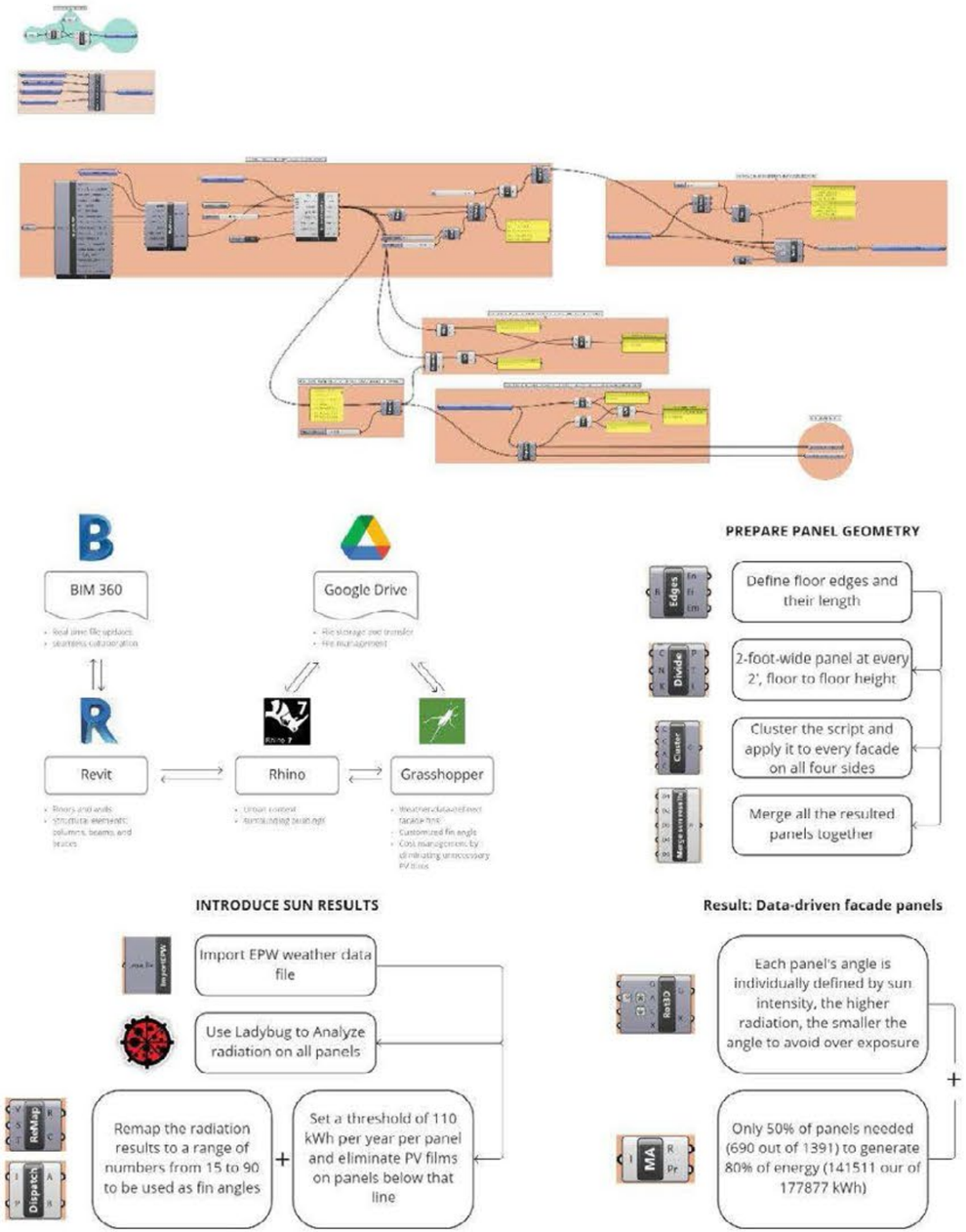
VALUE 18640

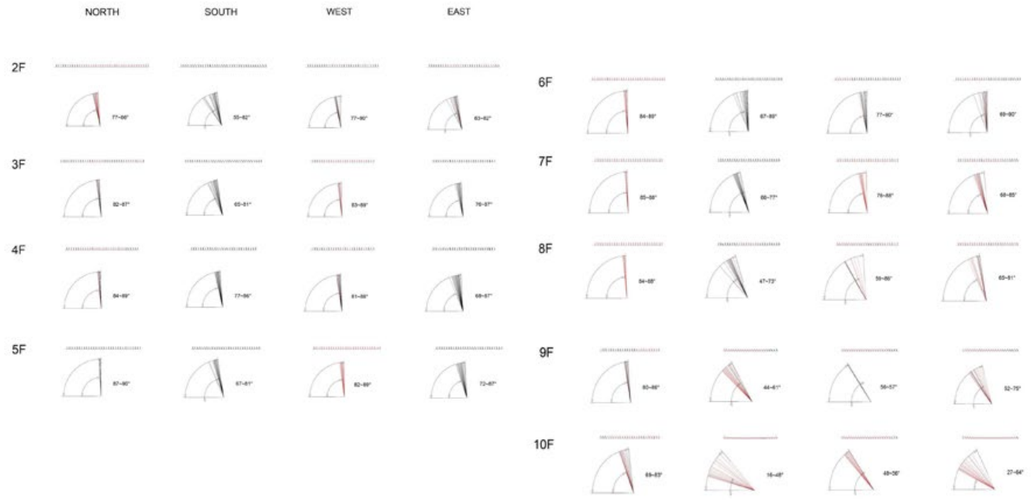
RE-THINKING BIM

NEW MUSEUM

Group Member: Lesley Li, Kelly Hong
2022 Spring
Instructor: Joseph Brennan



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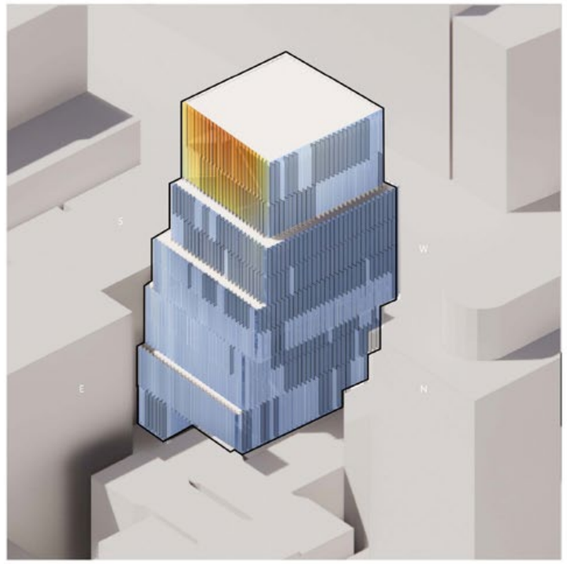
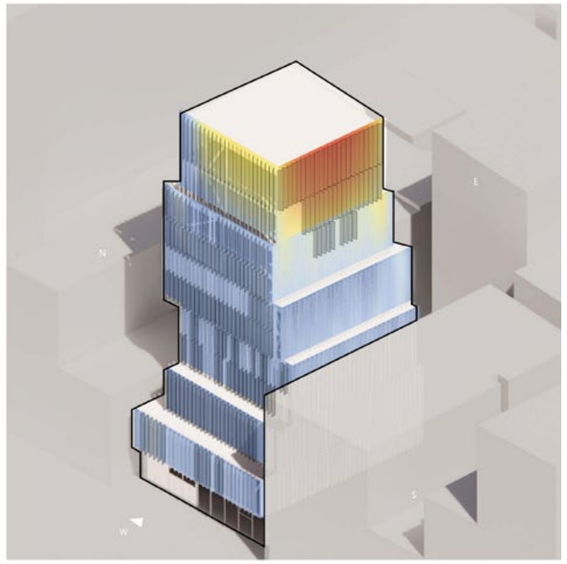
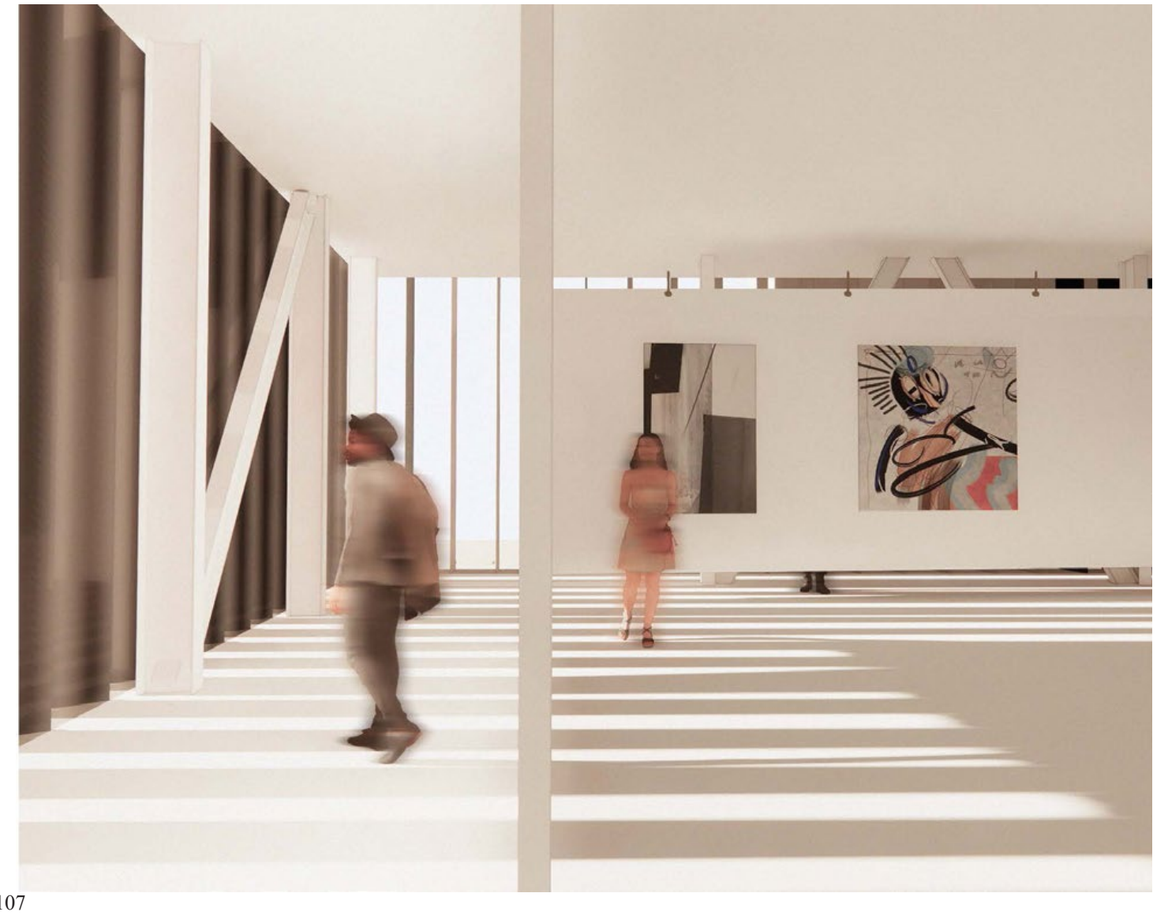




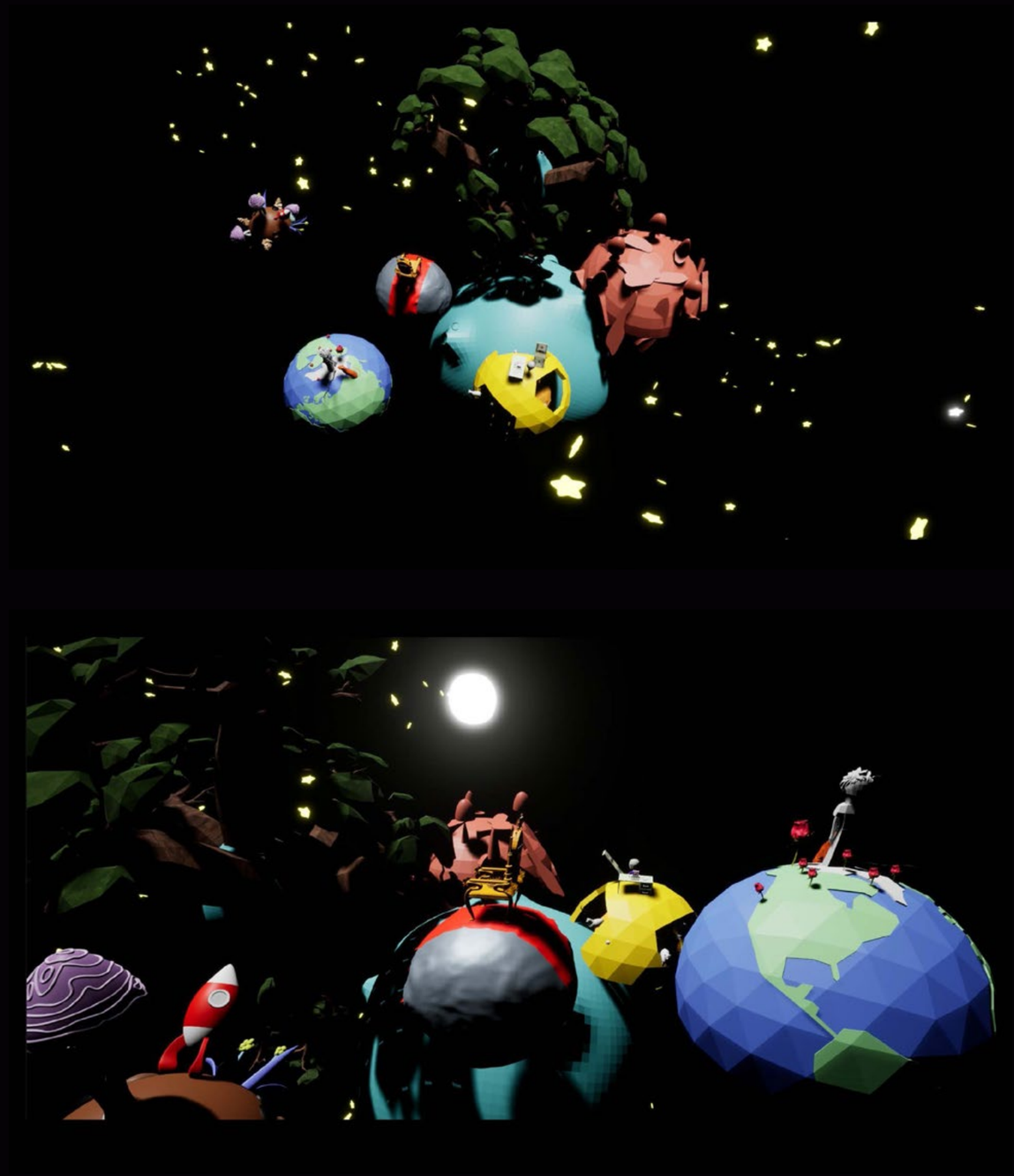



NEW
MUSEUM

VIRTUAL ARCHITECTURE

THE LITTLE PRINCE

Group Member: Christina Huang, Jingxian Huang
2023 Spring
Instructor: Nitzan Bartov



DECOLONIZING THE ARCHITECTURAL IMAGINATION

Group member: Weiyu Xu
2022 Fall
Instructor: Muhammad Muzaffar

The Pier System of New York City

Students: Qingning Cao, qc2290
Weiyu Xu, wx2258
Professor: [de]Unstellar
Decolonizing the Architectural Imagination

In the early seventeenth century, the place where the current New York City sits was opened as a port and Dutch concession. Despite several ownership transfers, the complexity of the territory's ownership didn't once interrupt all occupiers' ambition to expand NYC's importance in the world trade's place. In the course of its early urban construction, the global trade, especially commodity and slave trade by that special history moment, has given rise to its unique urban public space, forming a urban fabric which is surrounded by numerous piers.

The piers have hence become an important pattern of the NYC waterfront. Piers not only exist as an physical extension from the land to the ocean to receive the flow of commodity, but also fabricates a heterotopia which is at an intersection point of the different geo-political sphere from the triangular Atlantic trade. It is also the only medium of receiving the heterogeneous presence of trade ships, a never stopping enclaved territory on the ocean.

The paper examines the historical materials of New York City's pier trade history, such as maps, design paradigms and archaeological findings to uncover how the development of piers, as a symbol of slave trade, mercantilism and imperialism together facilitate the urban development of NYC.

What is the relationship between the land and the water? What defines the periphery of a geopolitical sphere? Taking the Little Island as a case study, this paper brings back the historiographical pattern of the piers as a neglected context of the existing design narrative, and thus seeks to find a different way of creating an alternative contemporary narrative of the design that it could be.

Case Study: The Little Island

Completed in 2021, the Little Island is a design for the adaptive reuse of the remnants of Pier 54. The design is composed of a series of structures rising from the ancient structural wooden piles standing in the Hudson river. As for the structures, the architect Thomas Heatherwick stated, 'their top surfaces had long gone, leaving only hundreds of ancient structural wooden piles sticking out of the river. We wondered if the identity of our new park and performance space could emerge from the water…'[3]

This almost pointed to the question of what is remaining in the water after all, and what symbolic meaning could the wooden piles possess.

In the remnant a composition of organic instances, forming a biosphere? According to the architect Heatherwick Studio and MNLA's landscape design, the piles are defined more as an ecological representation of the aquatic creatures. The variety of biosphere directed the park's overall landscape design, making it a 'maritime botanic garden with … 270 varieties of vegetation…'.[4] It is a success in attracting people as a public space- located in the pivotal part of lower Manhattan, this park attracts thousands of tourists every day.

But is it only this? Is there any further symbolism that hasn't been described? As the design description writes, "Little Island was built by New Yorkers for New York. The project brought together a robust collaboration of local fabricators and contractors, who… worked together… making Little Island a true New York story." But what exactly is the true New York story? Tracing back the function of the piers and what it served for during the past hundred years, we might come up with a completely different narrative.

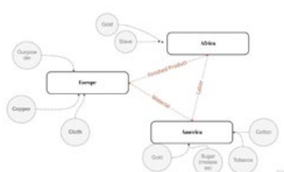
Re-imagine:

What Made the Pier System: Triangular Trade

On a calm day of 1524, marveling at the calm body of water and the surrounding wooded hills and luxuriant shorelines, Giovanni da Verrazano sailed north on his voyage to reach the New York Harbor, which he described as a pleasant situation for inhabiting. 100 years later, in 1625, the first Dutch settlement is established in New Amsterdam, which is now called New York City.

The triangular trade

Before long, this settlement became an irreplaceable spot in the Atlantic triangular trade. The word triangular not only indicates the shape of the route, but also stands for a multi-stop, multi-party involved trade chain. Stopping at multiple harbors, one single ship could make its way from one continent. The commodity within the trade chain also varies from stops to stops, as the ship departs from Europe with a load of gunpowder and sail along while buying enslaved laborers on the west coast of Africa from their kings or local slave masters. Afterwards, with a cargo carrying 300 to 400 slaves[5], the ship continues to sail to the Virgin Islands and Barbados to sell enslaved people and buy sugar, sailing to England to sell sugar and buy guns, and then sailing to the coast of Africa to sell guns and buy more enslaved people. It forms a closed loop of Product-Labor-Material loop.



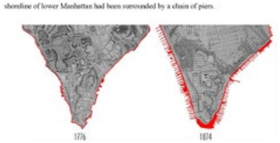
The relationship diagram of the triangular trade

In between the trade stops, the Atlantic ocean becomes an other-place, an elsewhere, or nowhere for every existence on the trade ships. The metaphor of non-terrestrial territory bears the indication of uncanny encounters that is not recorded on any of the documents that exist and deals with the territorial land. No one would anticipate what the ocean offers for them, it's an alien place for everyone.

For the slaves, they are brought away from their home and families, chained and packed as cargos in the container of the ship. For the sailors, a lot of them are in debt and lured to work on a slave ship to pay back their debts.[6] The ship is not only an embodiment of capital, but also the ship becomes a heterotopia, an uncanny mixture and collage of modernity of technology, barbarism of tyranny, commodities from everywhere but in the presence of nowhere. humanity of displacement for no matter what reason, departed from the original world.

Slave Cargo ships [5]

Therefore, the pier itself became a third place that linked this nowhere of trade ship with the everywhere of the land. As the number of vessels carrying consignees peaked in the years from 1729 to 1732, the trade market grew largely, followed by a mass construction of piers over New York City. After the Dutch surrendered to the English and then the liberation of the United States, New York developed rapidly, and numerous piers were built. By the end of 1874, the whole shoreline of lower Manhattan had been surrounded by a chain of piers.



The evolvement of NYC waterfront[5]

The Development of the Pier System:

the development of the urban grid and the slave trade

New York City has long been known for its diversity and progressive values — the city of immigrants, birthplace of the Harlem Renaissance — but the city has a brutal past, from the slave markets on Wall Street to the innocent black New Yorkers in 1863 were attacked and killed. The buying, selling and keeping of slaves in New York City has been common since the founding of the state until the practice was finally abolished in New York State in 1841. In 1991, an excavation uncovered a 6-acre cemetery containing more than 15,000 complete skeletal remains. The remains are of enslaved and free Africans who lived and worked in the new colonies. The African cemetery is now a public monument, a reminder of the city's often overlooked history. New York is connected to Upstate New York by the Hudson River and to the interior of the United States by the Erie Canal. It can be said that New York is the gateway of the United States, from where many goods and slaves from all over the world were transported.

Colonial Period

This history begins with the arrival of a black man. In 1613, a freelance sailor working for a Dutch fur trading company was left on Manhattan Island to trade with Native Americans. He was the first non-native permanent resident of Manhattan. In 1625, the Dutch built Amsterdam Castle on today's Manhattan Island and called it New Amsterdam. [11] The residents are concentrated in Lower Manhattan, extending from the lower end of the island to today's Wall Street. The Dutch West Indies Company imported African slaves as laborers, and slavery was introduced to New York City, bringing 11 African males in 1626 and three females in 1628. When the British took the city in 1664, nearly 9 percent of the 8,000 settlers were Africans (slaves and freed). The British

institutionalized slavery, classifying them as chattels for involuntary work. In British New York City, it was illegal to kill slaves, but they could not marry and families were broken up. By the early 1660s, New Amsterdam had a European population of about 1,500 people, only about half of whom were Dutch, and 375 Africans, 300 of whom were slaves. [12]

In 1667, after the Second Anglo-Dutch War, the British renamed New Amsterdam and changed the name to "New York". [13] The first Piers were established along the Hudson River. In 1659 the first pier was built. In the early 1700s, New York's growing importance as a trading port,[14] due to the high demand for labor, New slave market was established at the foot of Wall Street. Located at the intersection of today's Wall Street and Water Street, the market was used to hire, buy and sell slaves. At that time, the enslaved population—between 15 and 20 percent of the

NEW YORK SLAVE MARKET ABOUT 1730

population—actually built the city and was the engine that powered its economy. In 1730, 42 percent of households held slaves, making New York the largest slave colony in the North. [16] Slave labor in the port was inextricably linked to the way New York's economy worked, as most slave masters at the time kept several slaves for others to hire for labor. In 1741, a slave uprising burned down homes, businesses and the royal government. The uprising lasted six months and resulted in the execution of 30 blacks and the deportation of 72. In the decade after the 1740s, Manhattan's slave population would peak at 21 percent and then begin a slow decline. The Wall Street slave market closed in 1762, but men, women and children continued to be bought and sold throughout the city. By 1770, New York was the breadbasket of the Atlantic Ocean, shipping wheat to Europe, the West Indies, and the coast, and by the end of the American Revolution, the Port of New York ranked fourth in cargo tonnage. It soon became a marketplace for a variety of commodities, especially cotton.

During the British colonial period, New York City has always been one of the trading bases of the British in North America. It was not until 1783, when the last British ship evacuated the area, that New York City became part of the then newly formed country, the United States.

After the war, more prominent New Yorkers began pushing for gradual emancipation. The abolition of slavery took effect on July 4, 1827, but New York's shameful history of discrimination, racism, strict segregation and anti-Black violence continued.

The 1811 Plan

Before the grid, New York City grew organically, with no general order. The southern tip of the island of Manhattan is a string of short streets, some of which date back to the Dutch settlement of New Amsterdam. They are adapted to local conditions, built piecemeal, and lack a unified order.

The rest of the island is a patchwork of farms, meadows, ponds and marshes, dotted with winding country roads and with plenty of room to expand.

A visionary proposal called the Commissioner Plan of 1811 expanded the city's street grid to encompass the entirety of Manhattan. It was a straightforward and bold decision, simple but flexible. The opening of the Erie Canal in 1825, connecting Atlantic ports to the vast agricultural markets of the American Midwest and Canada, turned New York City into a hub connecting the interior of the United States to the Eastern Seaboard. By 1835, New York City was the largest city in the United States by population.

View of New York Harbor, c. 1770 [17]

The city was greatly affected during the American Civil War (1861-1865). Before the war, half the value of New York Port's export trade was related to cotton, including textiles from northern factories. At the outbreak of the Civil War, the immigrant population continued to grow. The conflict culminated in the draft riots in New York by white immigrants in 1863, when mobs raided

black neighborhoods and the homes of abolitionists.[11] Many blacks left Manhattan and moved to Brooklyn. The black population fell from 12,472 in 1860 to 9,943 in 1865. Until 1870, New York Harbor was the busiest port in the Western Hemisphere.

New York City 1879 [19]

Modern Reforms

If the building of the Manhattan grid was the story of the 19th century, the 20th century sequel tells of the grid's erosion, alteration, and erasure. While Central Park became a huge void and ambiguity in the grid, as the skyscrapers grew taller, so did the building density. Urban reforms gradually developed, replacing large swaths of the grid with superblocks starting in the 1930s.

Throughout the first half of the 20th century, New York City became a world center for industry, commerce and communications. In 1904, the Interborough Rapid Transit (Interborough Rapid

Transit) began to operate, connecting the five districts of New York City. Railway transportation also flourished. The establishment of Central Station and Pennsylvania Station in New York City made it an important gathering place for transportation. A series of planned transportation

network construction echoes the peak of immigrants from Europe and promotes the rapid development of New York City. No. 15-60 piers were built in the 19th and early 20th centuries, while 75-98 were built from the 1930s to the end of the 20th century. Among them, Pier 59, for instance, is where Titanic (1912) was scheduled to dock. Pier 54 was the final port call for Lusitania (1907). A 1921 compact between the states of New York and New Jersey created the Port Authority and officially established the Port of New York and New Jersey. Growth has continued over the years. There are marine facilities in Manhattan, Brooklyn and Staten Island, as well as in northern New Jersey. Until the trend changed in 1955, New Jersey began to build many new piers and became a more prosperous port. Until 1985, it remained home to the busiest container port on the east coast.

After World War II, New York's industrial base reversed downwards. The prosperity of the large-scale shipbuilding industry was no longer good. The port was also transformed into a container ship berthing and loading and unloading. Many dock workers and traditional port workers lost their employment opportunities. Afterwards, New York's piers began to decline, and many piers were sold to the NYC government, and many piers were turned into public green spaces and parks, becoming a part of residents' lives. Among them, the little island is one of the most famous ones.