STRAW-BALE (SB)

PORTFOLIO

GSAPP- MSAAD

Lichong (Owen) Tong

"A COLLECTION BY AM UNTALENTED ARCHITECTURE STUDENT WITH HIS HUMBLE ENERGY, IN WHICH IS STORYTELLING AT '*THE LEAST WE CAN DO*' FOR SOCIETY, BY A '*SMALL FOOTPRINT*', DESIGN AMONG THE '*AFFORDABLE GROUP*' ON THE VACANT SPACES."

- OWEN(01) L.T.

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Reassemble Material

ADVANCED IV | SUMMER 2021

INSTRUCTOR: Emmett Zeifman

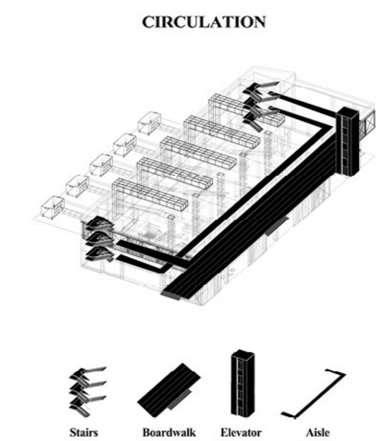
USE OLD MATERIAL TO TELL A NEW STORY IN THE RUINS.

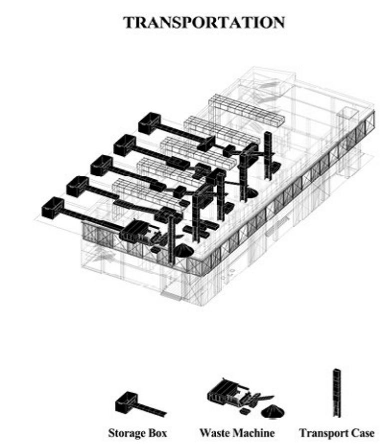
The topic is waste material, I believe wastes are materials without identity. Wastes can allow new stories to unfold into a vibrant and memorable backdrop. So my ambition is to use old material to tell a new story in the ruins. Ultimately, I did a waste recycling center, didn't achieve the goal, but left the potential.

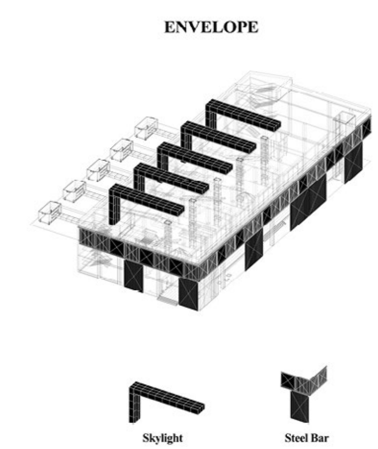
My speculation for 2035 based on the research is Residential communities will take place of Industrial areas. Industrial land will move to further fields. And the use of Industrial Land will be higher density. More farming lands will be returned to nature.

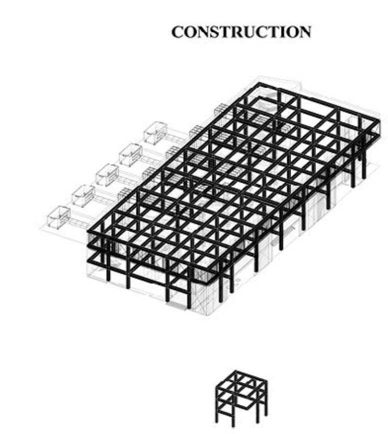
I did a research about the "waste reassemblly". The 'Rock' is reassambled by wastes collected from the local. T+E+A+M provides us with a method to reuse wastes. That is, the recycled product is formed either "in situ" where the materials are stacked and thermocast, or as "clastic," which derives its cylindrical shape from rotational thermoforming conducted in the lab. By varying the ratios of components in the mixture and forming a range of colors and texture, to demonstrate its usefulness as decoration. I think Reassembly brings together material fragments that have prior values, uses, and histories, into new architectural forms.

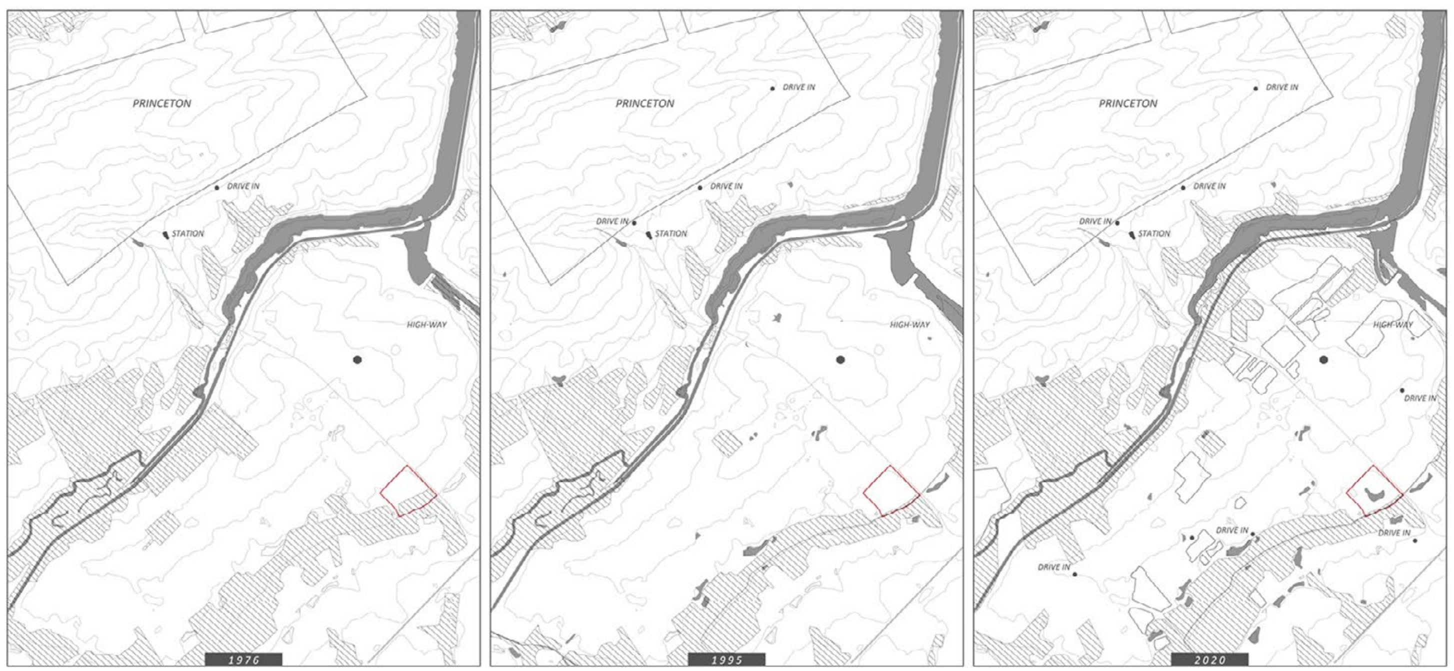
I designed three floors, two stairs and one elevator. The aisel is closed to the natural square and end both stairs. Transportation is from the first floor, collect waste from the garbage roadway, transport to recycling machines to seprate and break waste into pieces. Then transport to the second and third floor for study and research. The natural part I use thin steel bars intersect thick bars to show the forest feelings. While the industrial part is a concrete wall with five windows. The construction is the original one, I didn't change it.







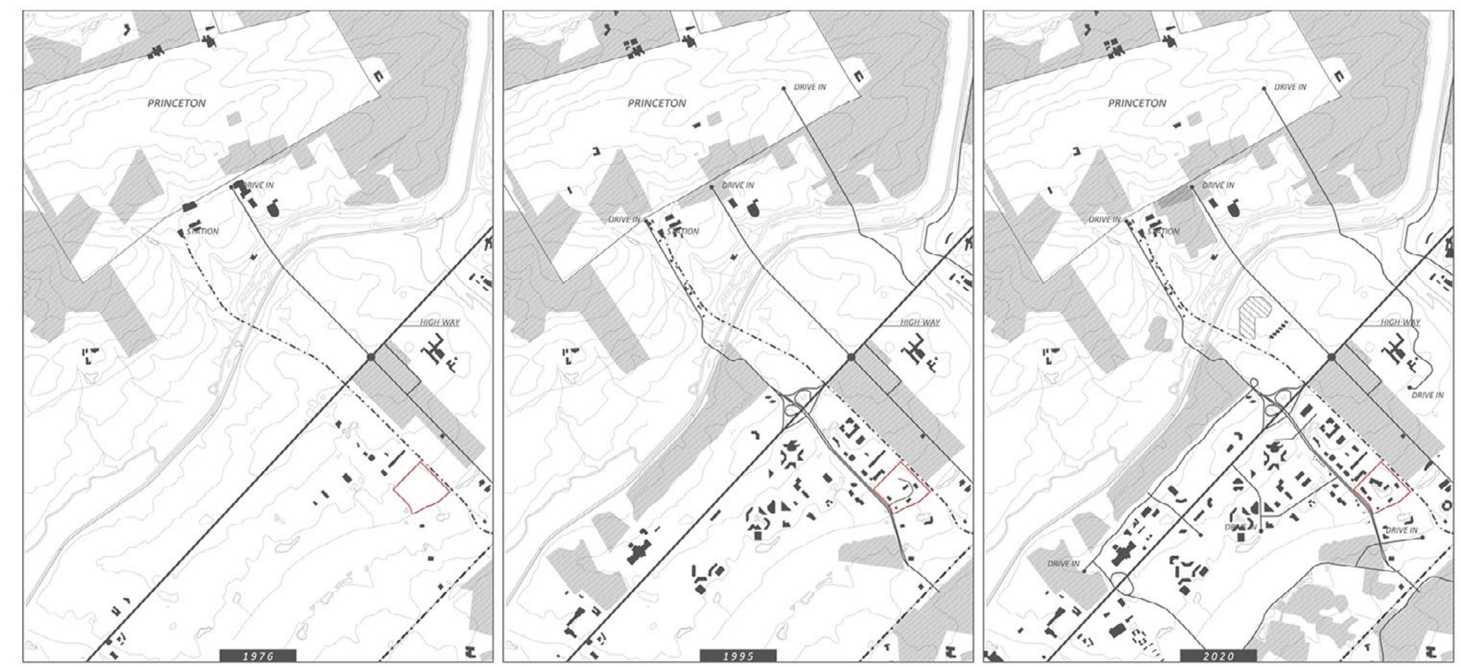




ECOSYSTEM OF PRINCETON, NJ 1976-1995-2020

0 0.5 1 KILOMETERS

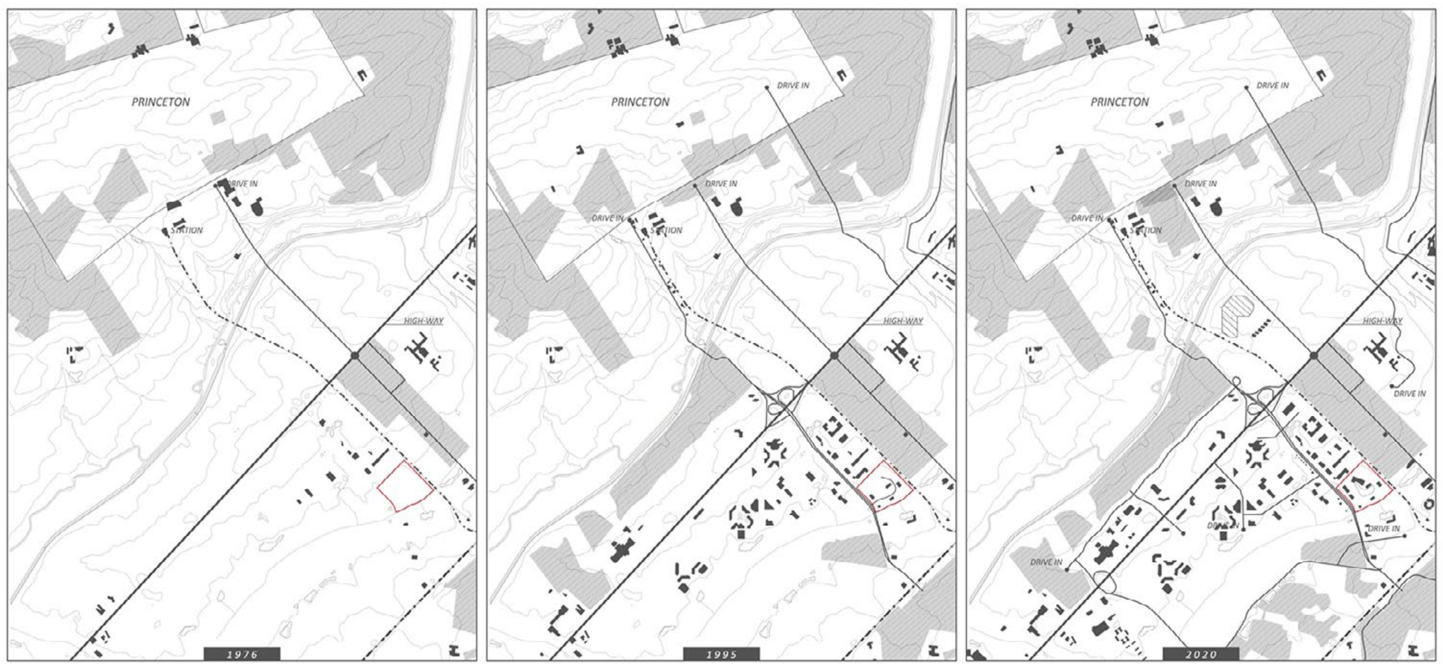
Princeton Range | Site Range | Solar Panel | River Channels | Greenland | Wasteland



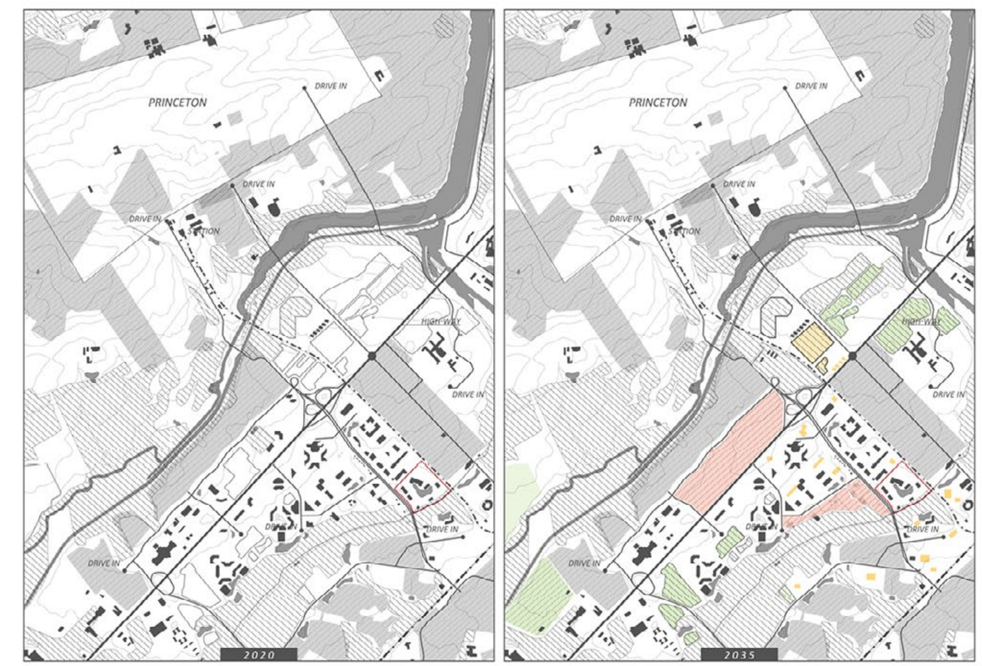
URBANIZATION OF PRINCETON, NJ 1976-1995-2020

0 0.5 1 KILOMETERS

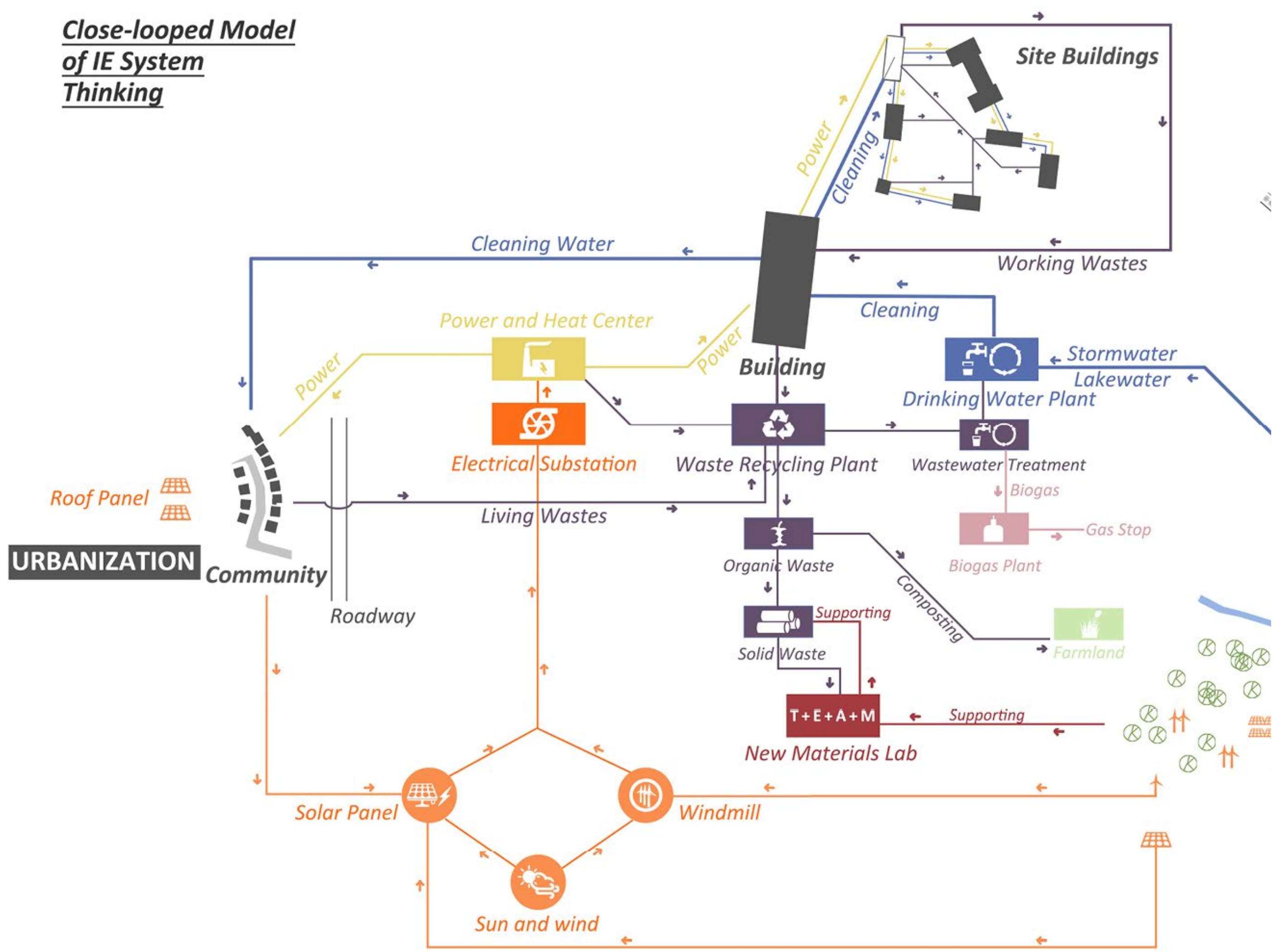
Princeton Range | Site Range | Solar Panel | Urbanization -Residential | Urbanization -Industrial | Roadway | Railway | DRIVE IN Entrance

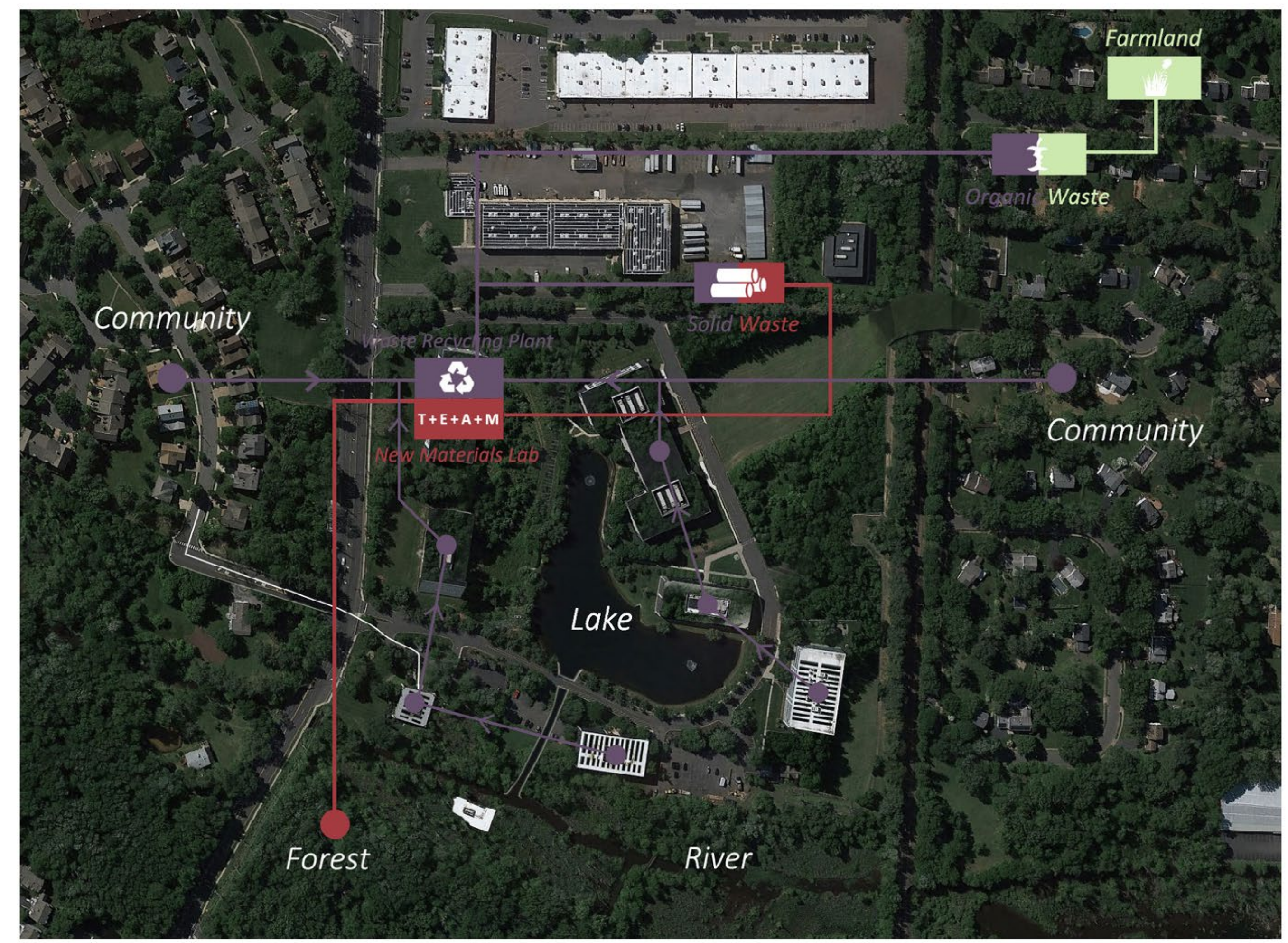


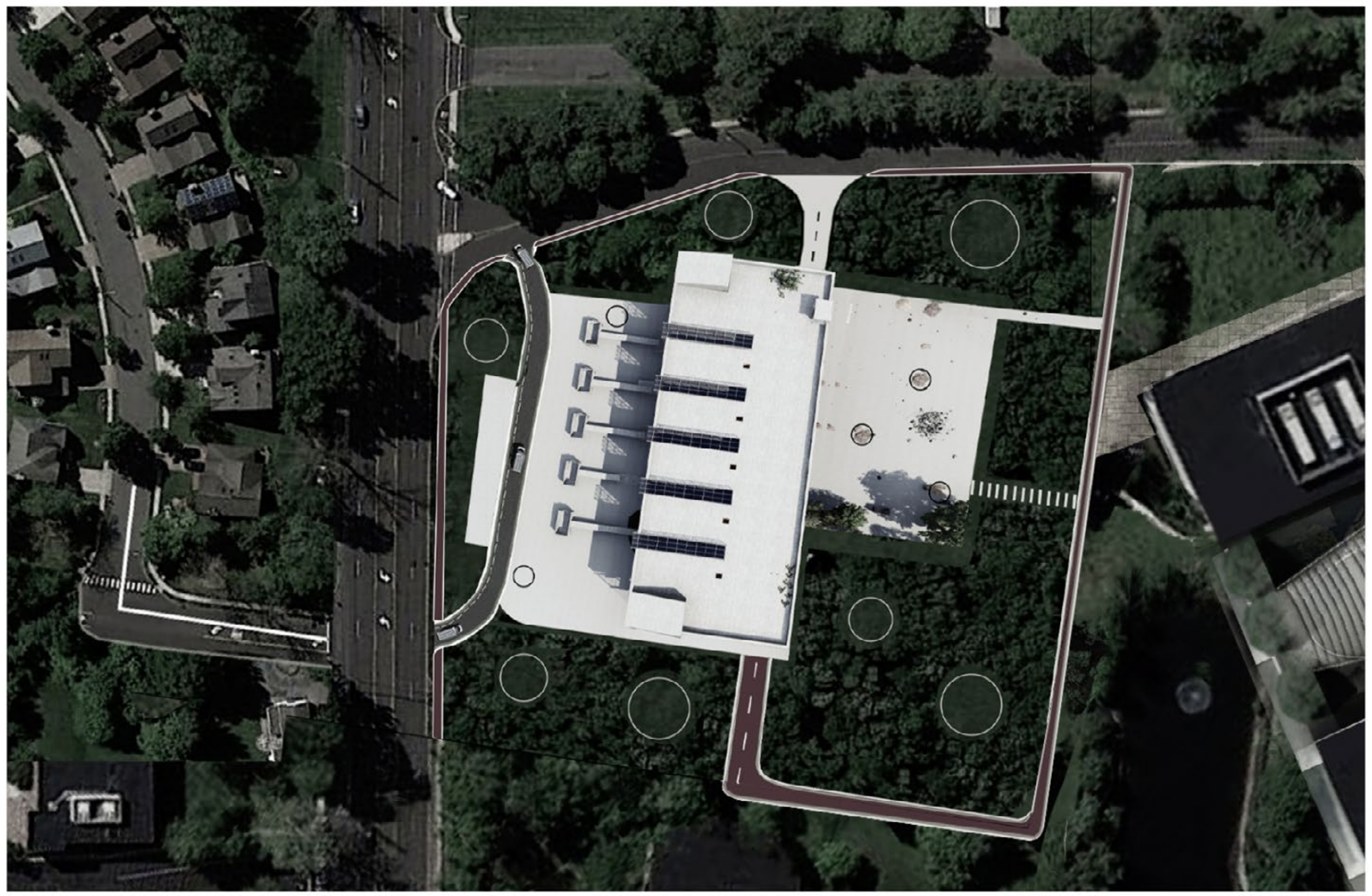
URBANIZATION OF PRINCETON, NJ 1976-1995-2020

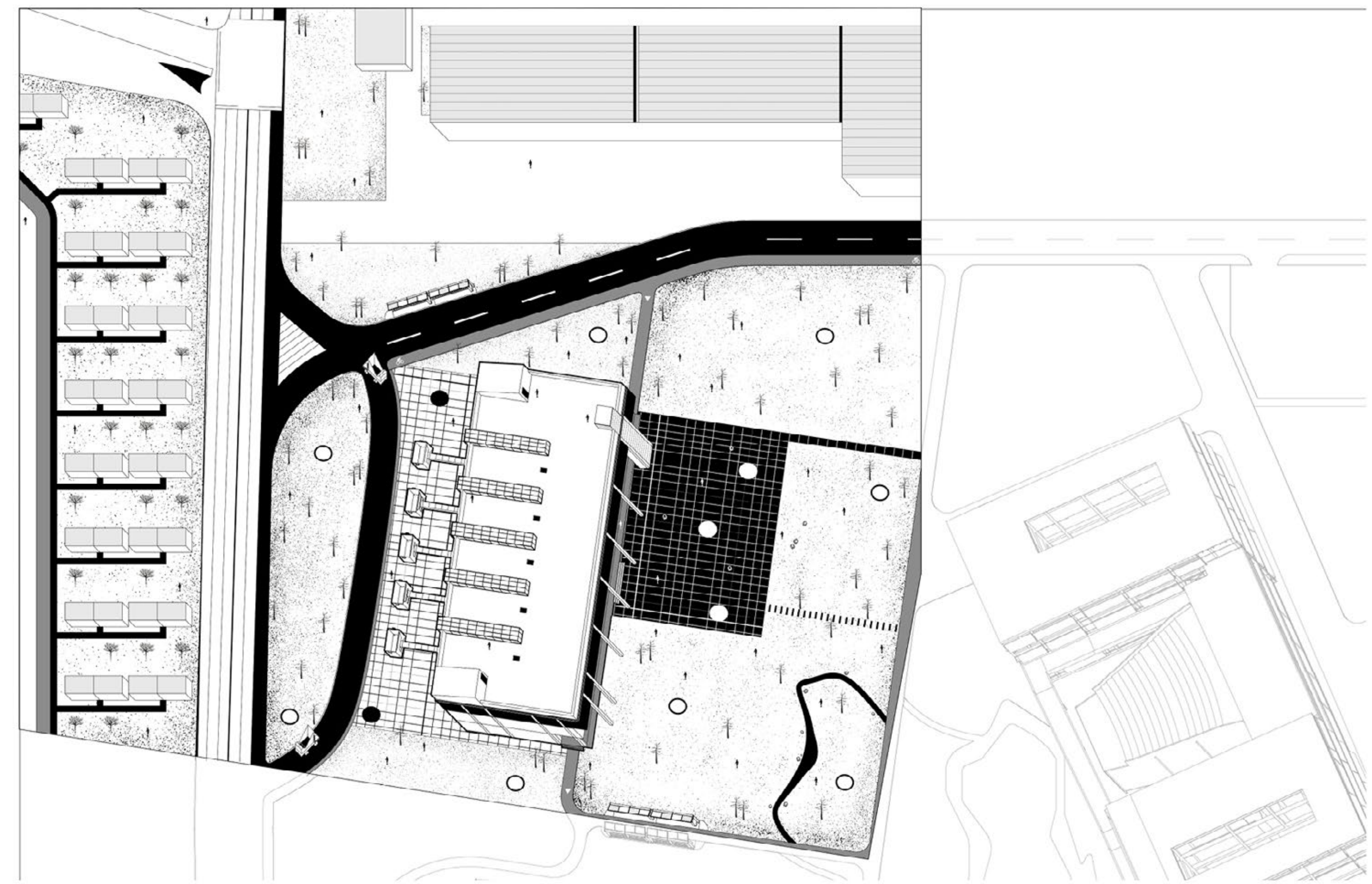


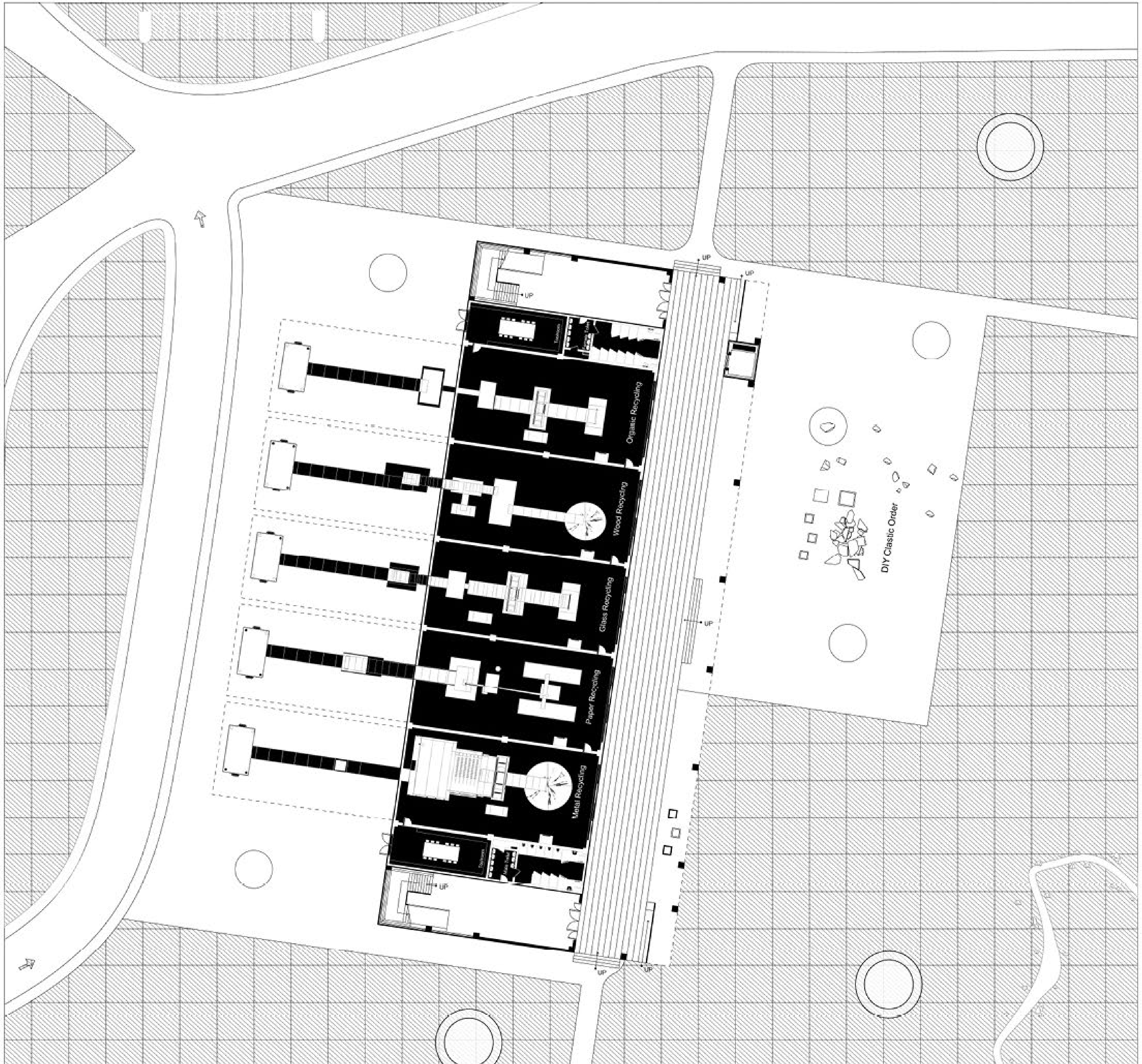
SPECULATION 2035: URBANIZATION & ECOSYSTEM OF PRINCETON, NJ 1976-1995-2020-2035


Close-looped Model of IE System Thinking
Site Buildings
Power
Cleaning
Cleaning Water
Working Wastes
Cleaning
Power and Heat Center
Power
Building
Stormwater
Lakewater
Drinking Water Plant
Power
Electrical Substation
Waste Recycling Plant
Wastewater Treatment
Biogas
Roof Panel
Living Wastes
Gas Stop
URBANIZATION
Community
Organic Waste
Biogas Plant
Roadway
Composting
Supporting
Farmland
Solid Waste
T+E+A+M
Supporting
New Materials Lab
Solar Panel
Windmill
Sun and wind

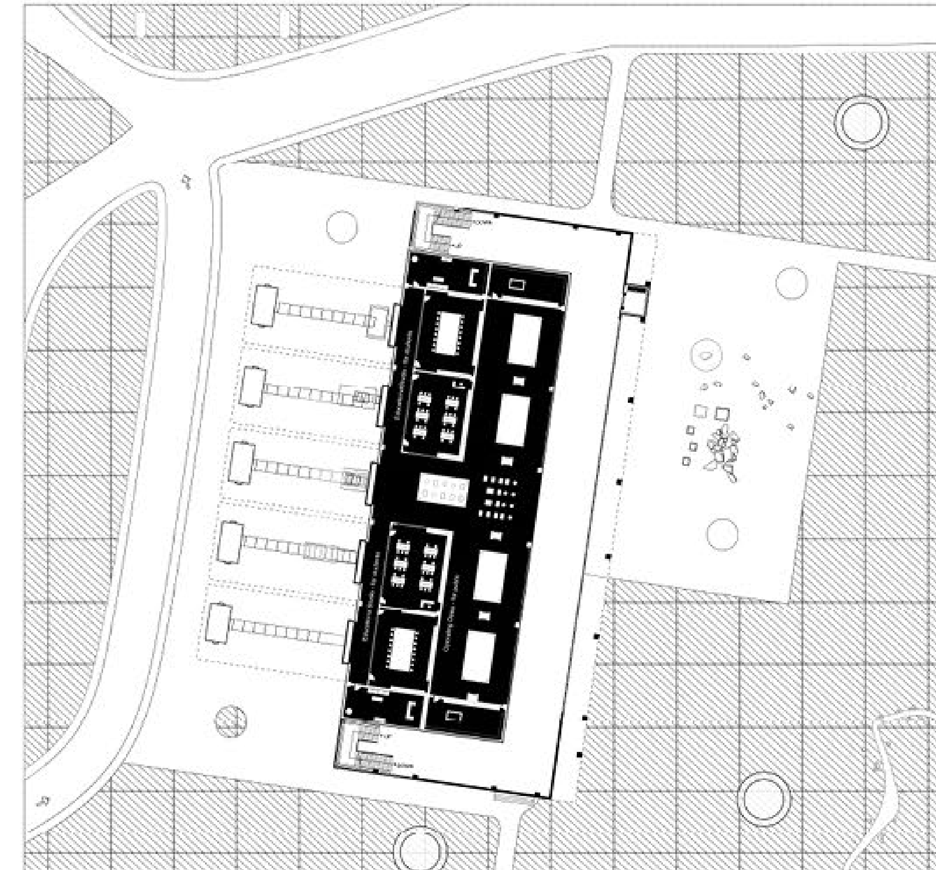

Farmland
Organic Waste
Community
Solid Waste
Waste Recycling Plant
T+E+A+M
New Materials Lab
Community
Lake
Forest
River



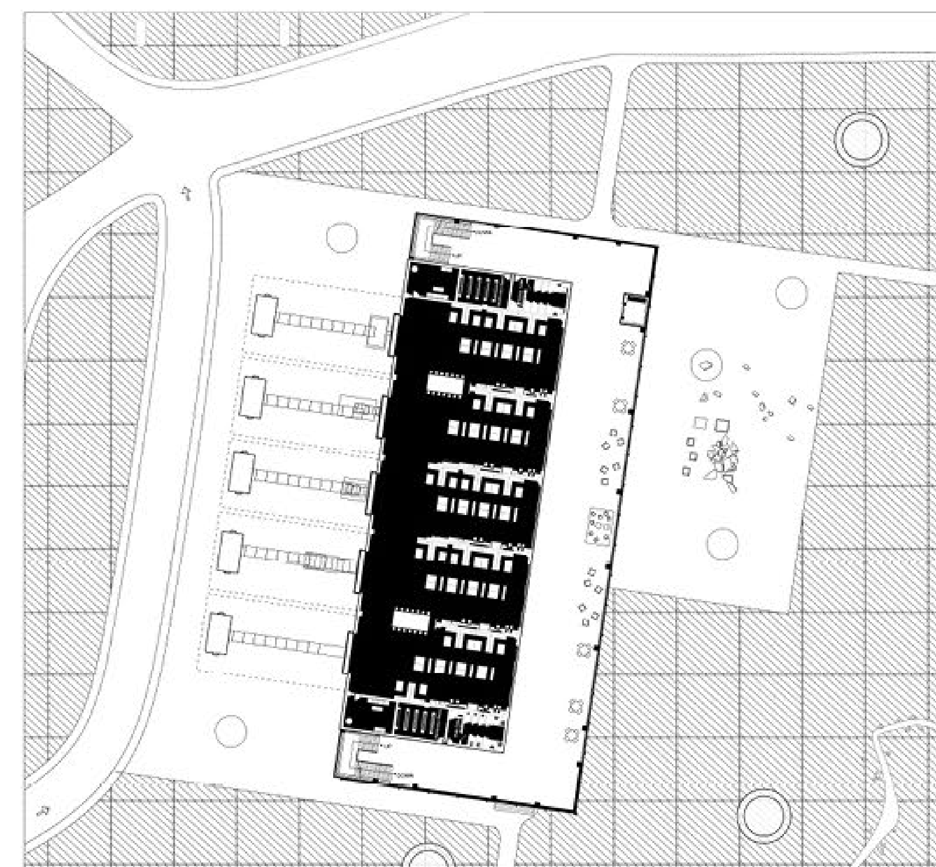




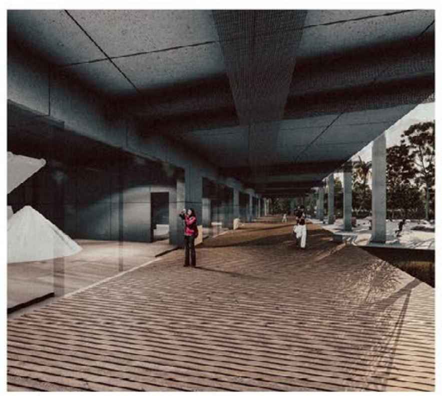
First Floor



Second Floor



Third Floor



First Floor's Scene

Visitors can see the process of five machines to separate different types of waste and breaking it into clastic pieces. Then the workers will put these debris into different vertically transport pipes to the second and third floor.

Second Floor's Scene

Visitors and students can reshape waste materials with the help of some devices. It's mainly through some molds, compressing and reassembling waste materials, which makes random textures. The process was both entertaining and educational.

Third Floor's Scene

The third floor is a scientific laboratory for researchers to study the possible recombination of materials at the chemical level. The results of the research will be displayed in the ground square.

Synthetic Rock

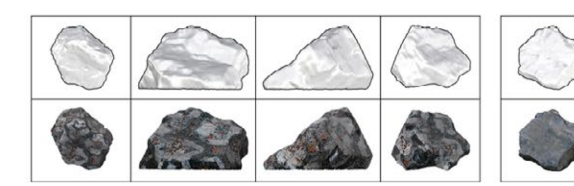
The 'Rock' is reassambled by wastes collected from the local. T+E+A+M provides us with a method to reuse wastes. That is, the recycled product is formed either "in situ" where the materials are stacked and thermocast, or as "clastic," which derives its cylindrical shape from rotational thermoforming conducted in the lab. By varying the ratios of components in the mixture and forming a range of colors and texture, to demonstrate its usefulness as decoration.

Local Wastes (Render)

Five types of waste materials are collected: wood, metal, concrete, plastic, organic. Some solid materials can be physically compressed and used for display.

"Clastic Order" - Texture

"Clastic Order" is an excellent practice, which suggests an approach to design based on material behavior under heat and gravity.



Rendered Rock

The left ten images are different parallel views of the Synthetic Rock, while the right one is the original rock before I replaced with different materials.

FLEXIBLE NYCHA

ADVANCED V | FALL 2021

INSTRUCTOR: Juan Herreros

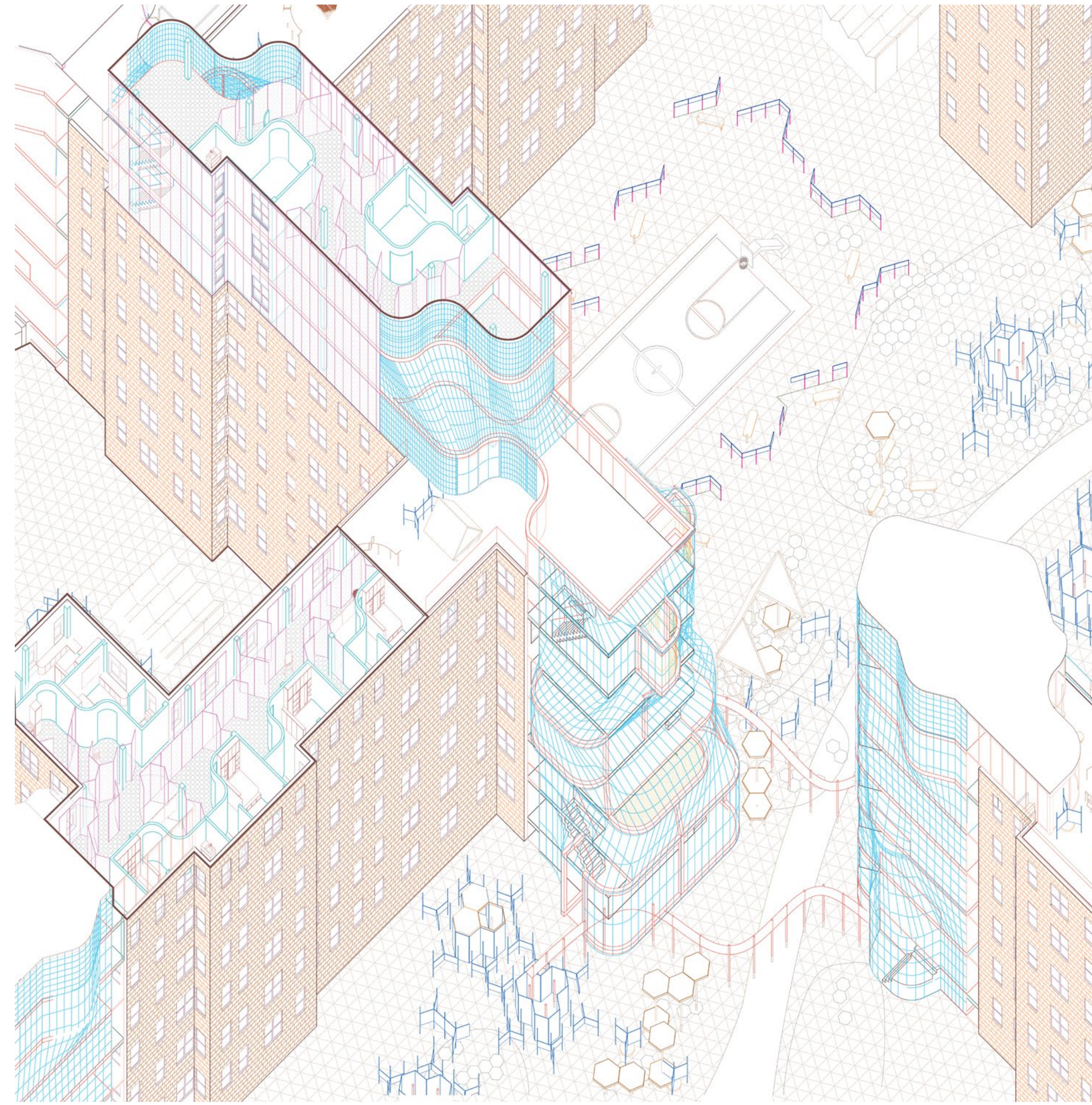
COLLABRATOR: Yiheng Lin, Wanting Sun

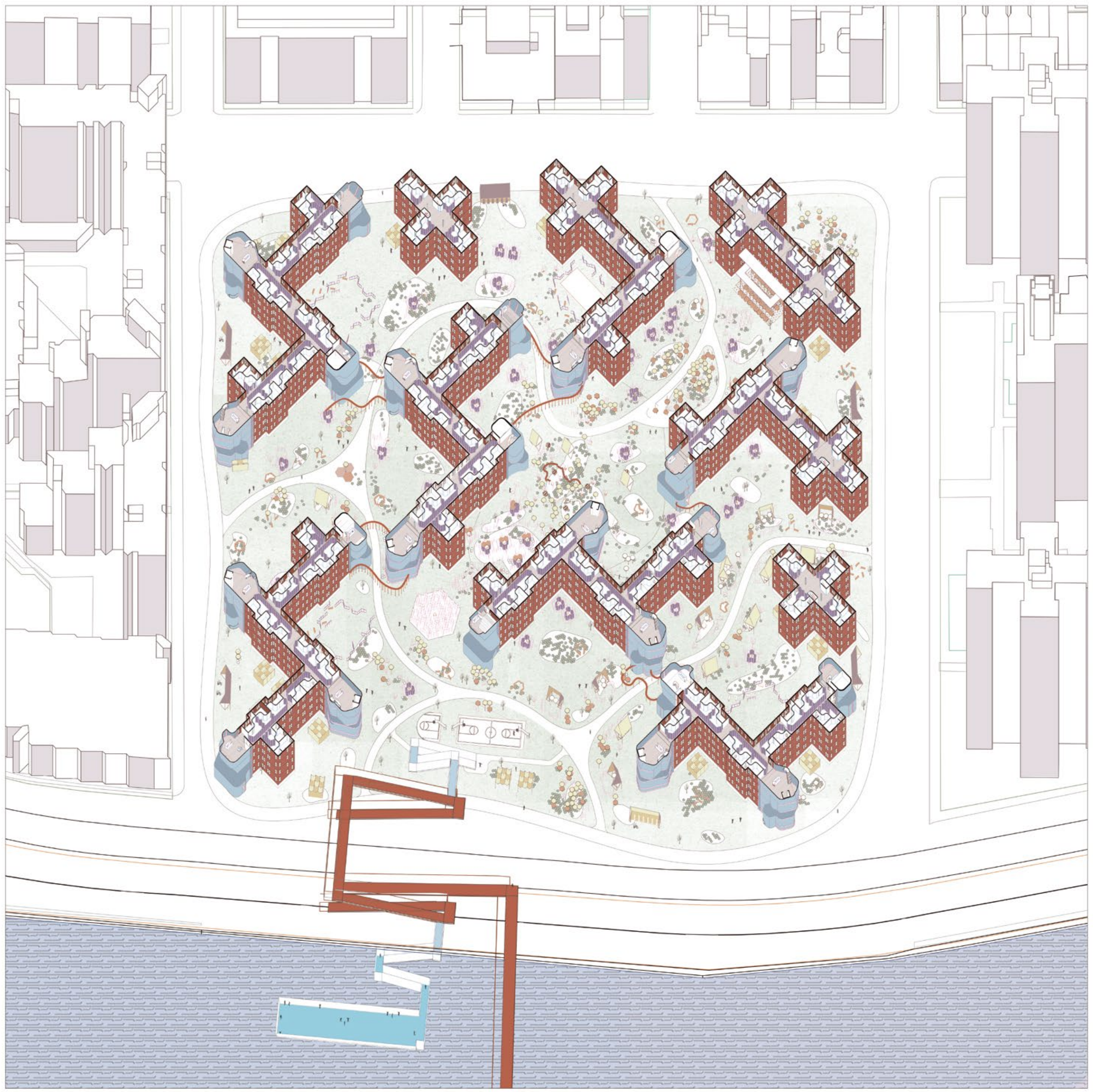
The renovation of affordable houses

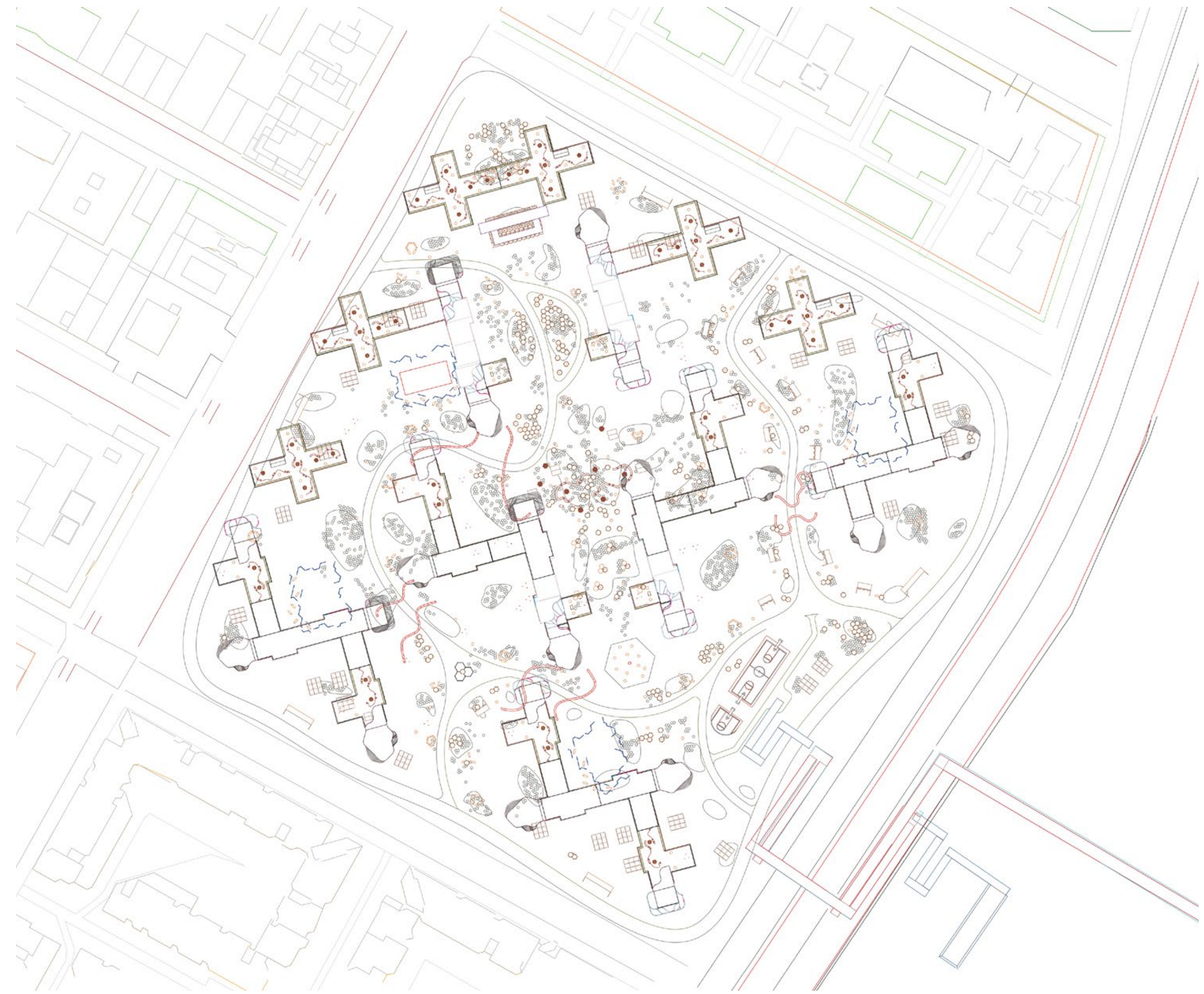
The project intends to give as many nycha residents as possible a better living experience by creating tidal spaces with flexible partitions that allow interiors and corridors to be shared.

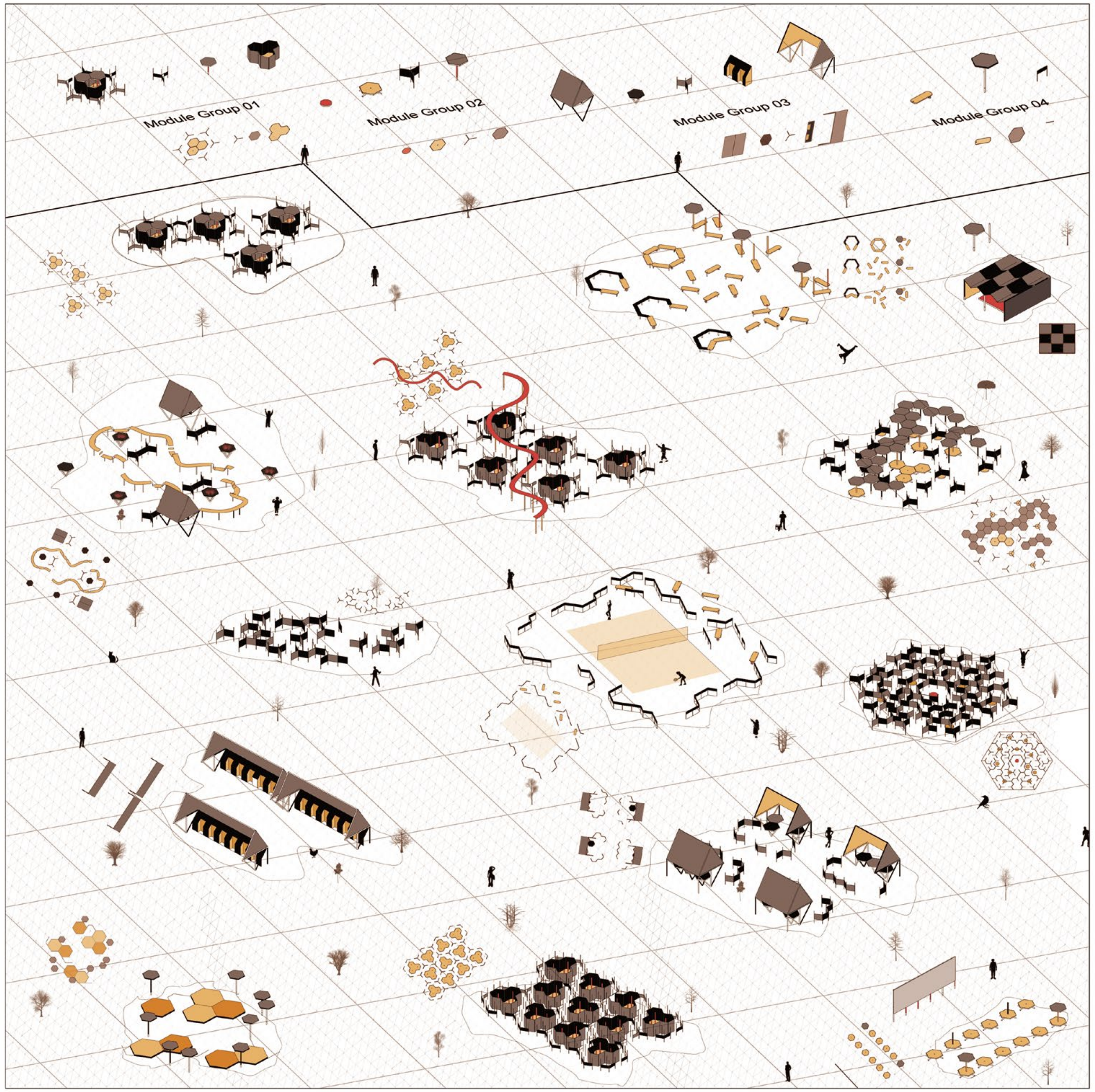
Affordable housing has income and credit requirements and it is for various income ranges. Applications are picked through a lottery system. When an applicant is chosen through the lottery, they have made it to the next step of the process and have to go to an interview to submit required documents. Being picked for an interview does not guarantee an apartment.

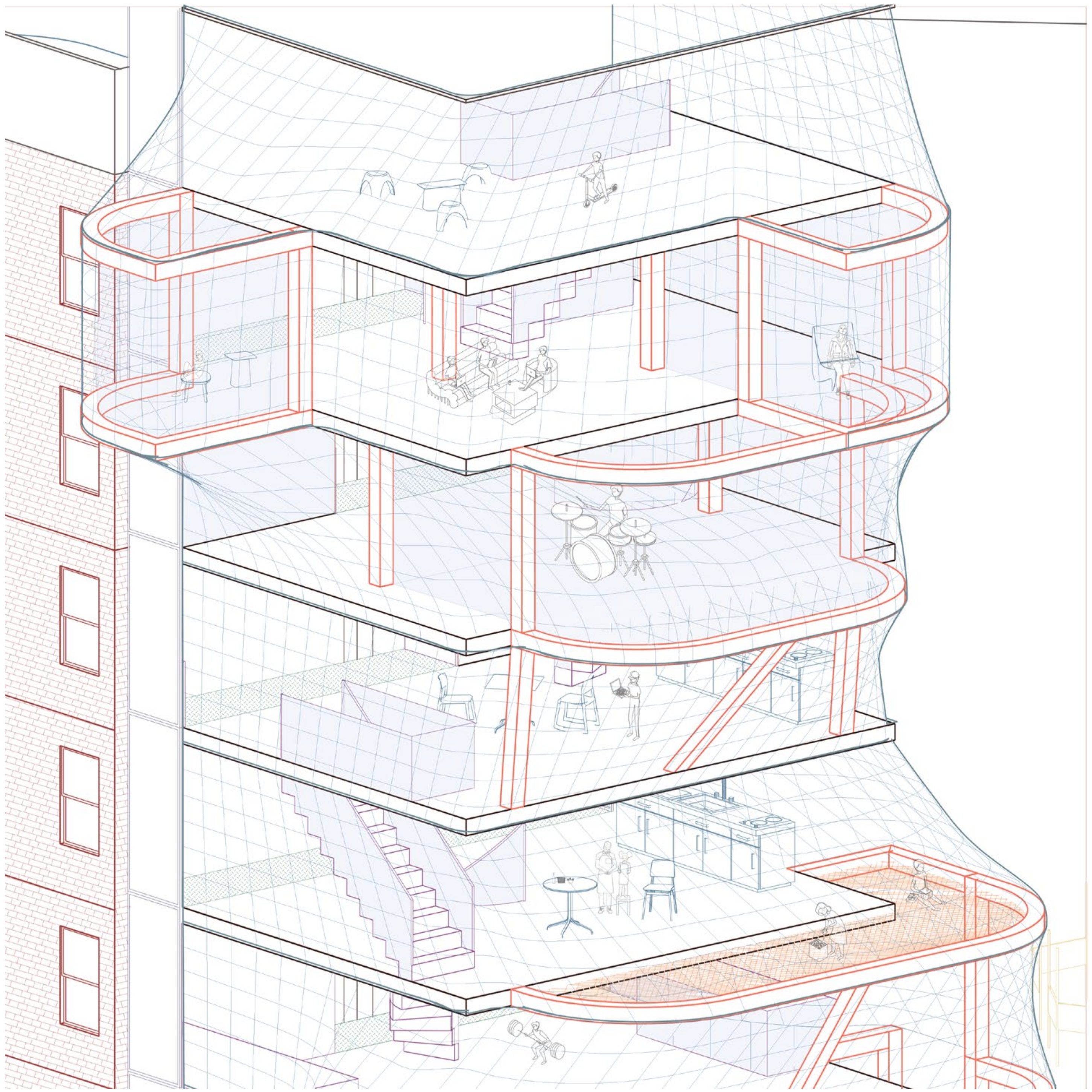
The project is divided into three urban, public, and residential scales. Under the urban scale, we created many variable modules based on a hexagonal grid, with various functions such as enclosure, guidance, rest, and movement. We distinguished between public and private, establishing 15 variations based on four module groups. The site is scattered with a sense of mess fragmentation, fitting the overall style of nycha. In the public space, we expand the platform mainly at the end of the building and put the vertical traffic on the platform, using a storyline to connect and make the vertical field more coherent. In the residential scale, we also use hexagons to separate the spaces, and use movable wall blocks to build different functional interior spaces at different times, which can open up the kitchen, connect the corridor to the living room, and allow other spaces to circulate as long as the bedroom is fixed with the toilet.

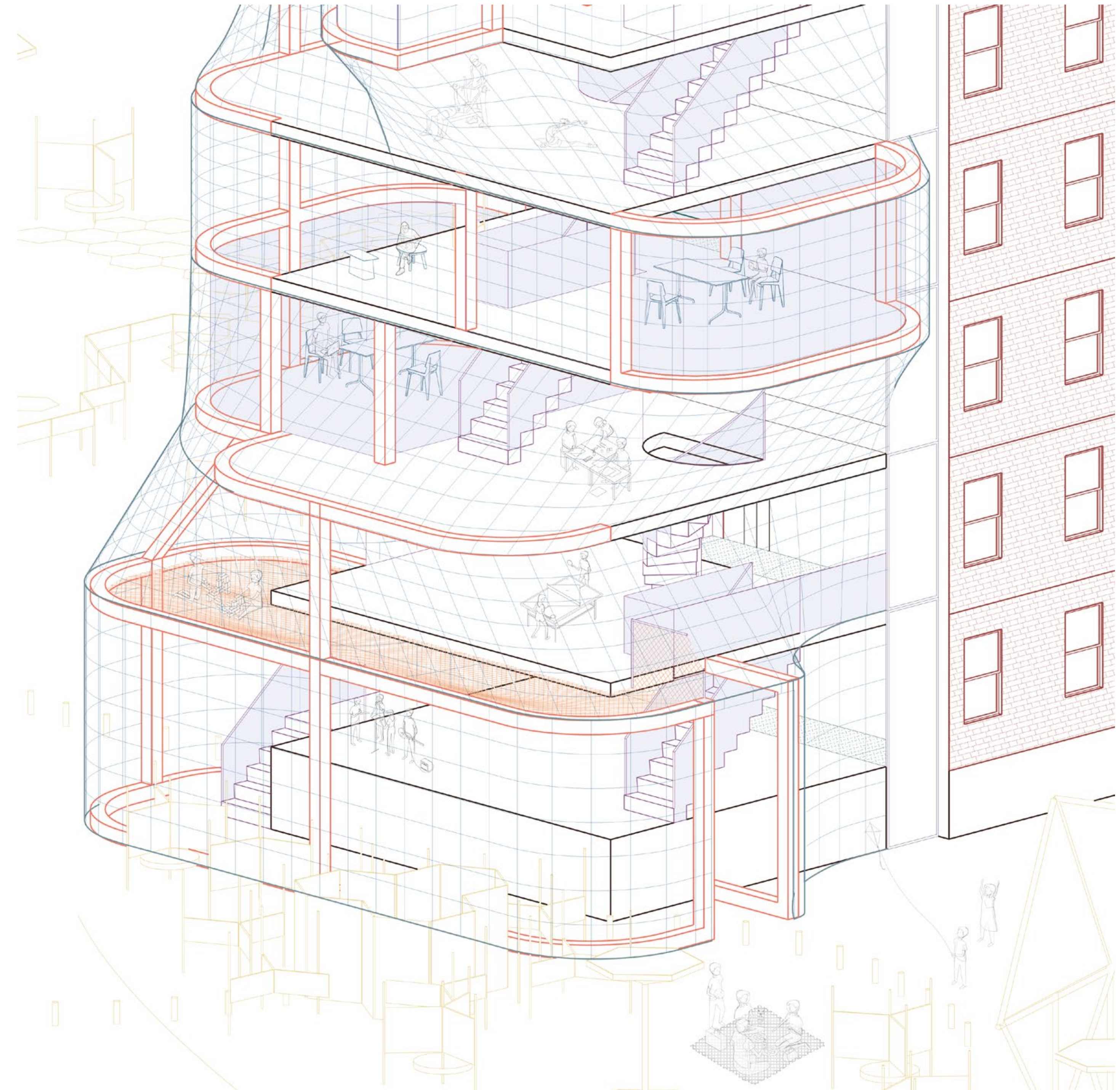


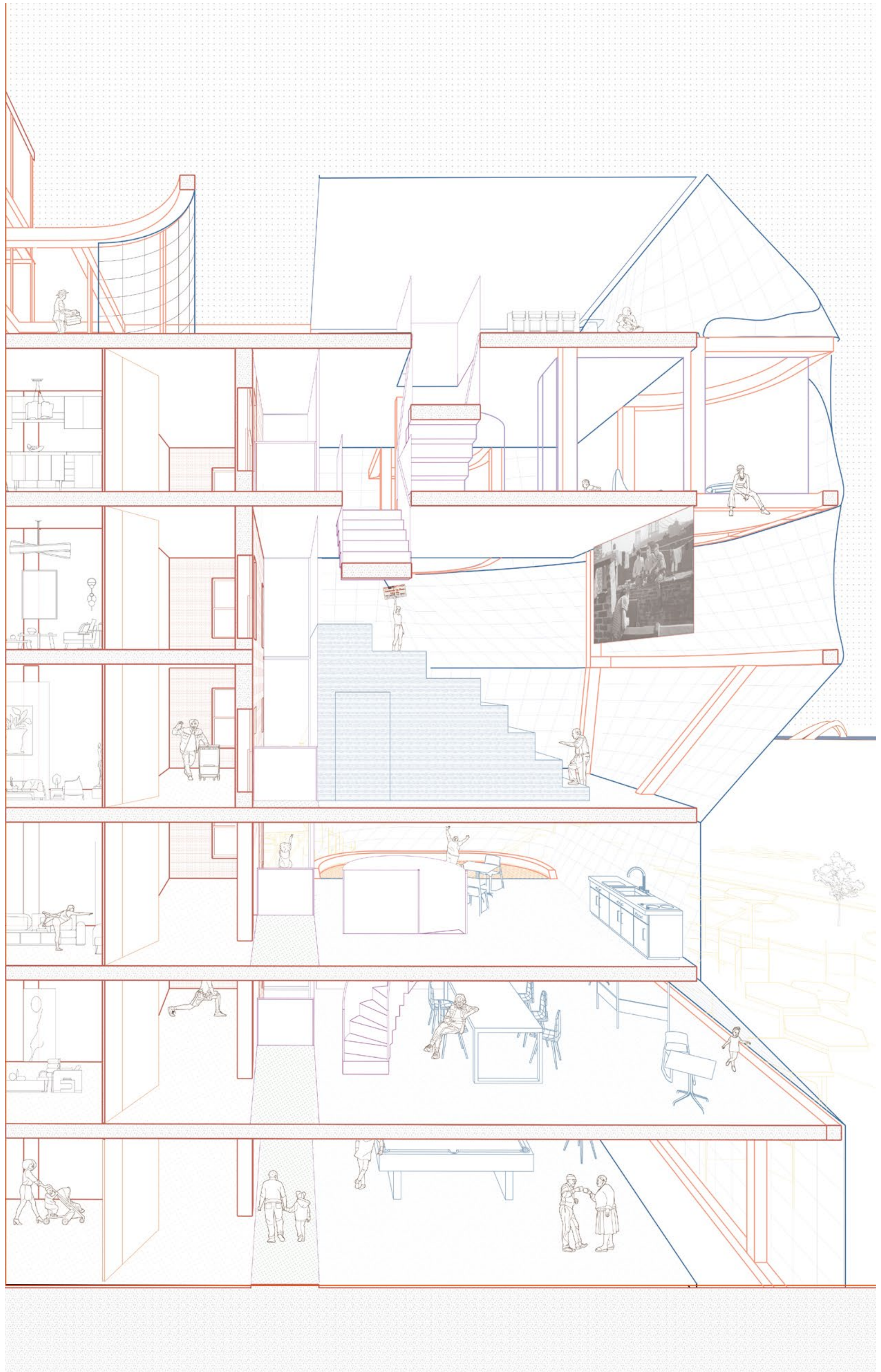


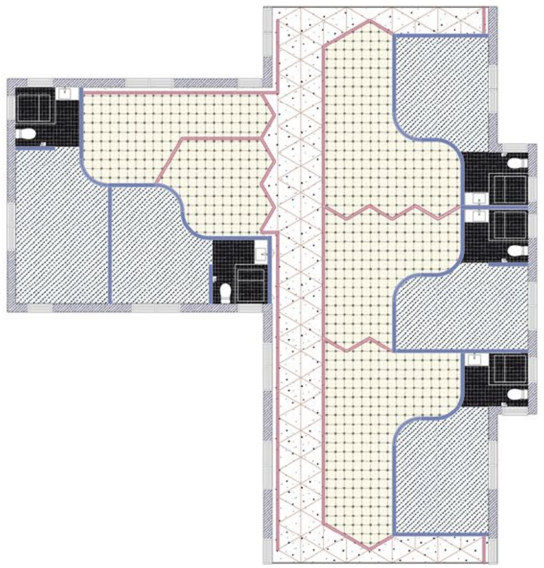


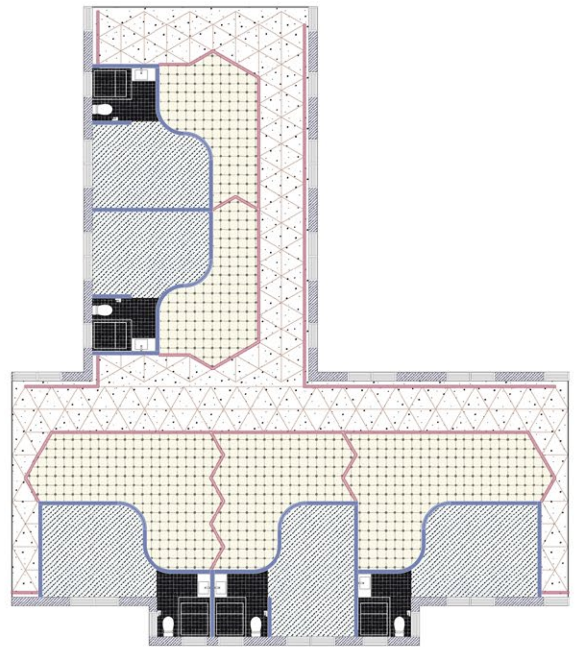

Module Group 01
Module Group 02
Module Group 03
Module Group 04

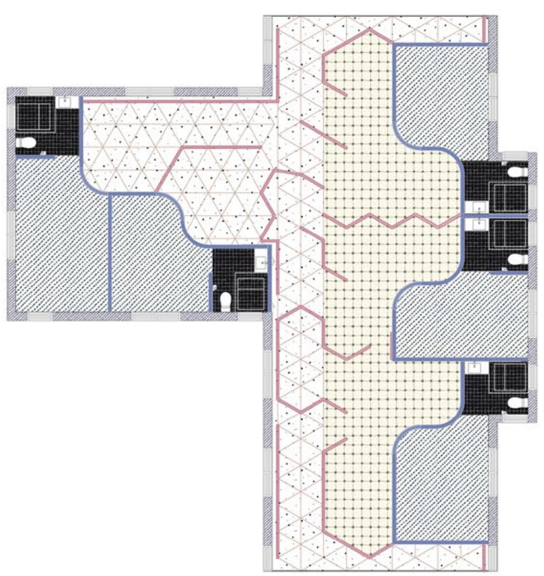


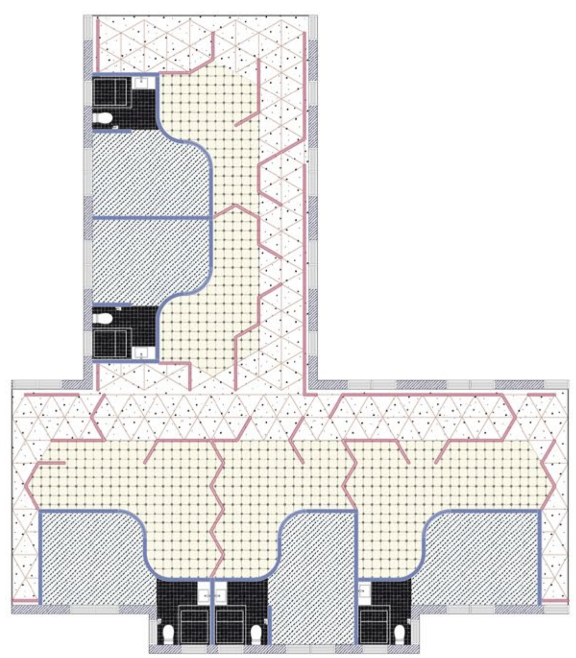


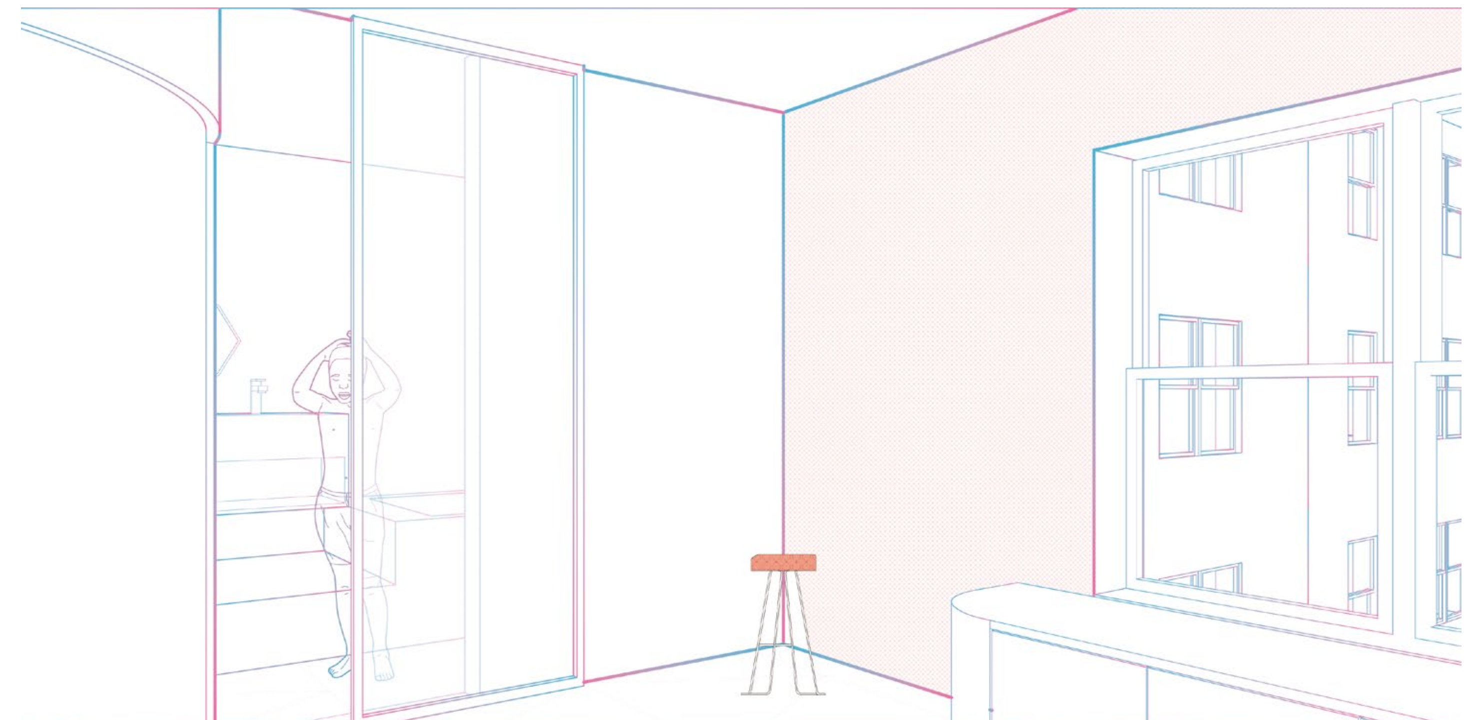


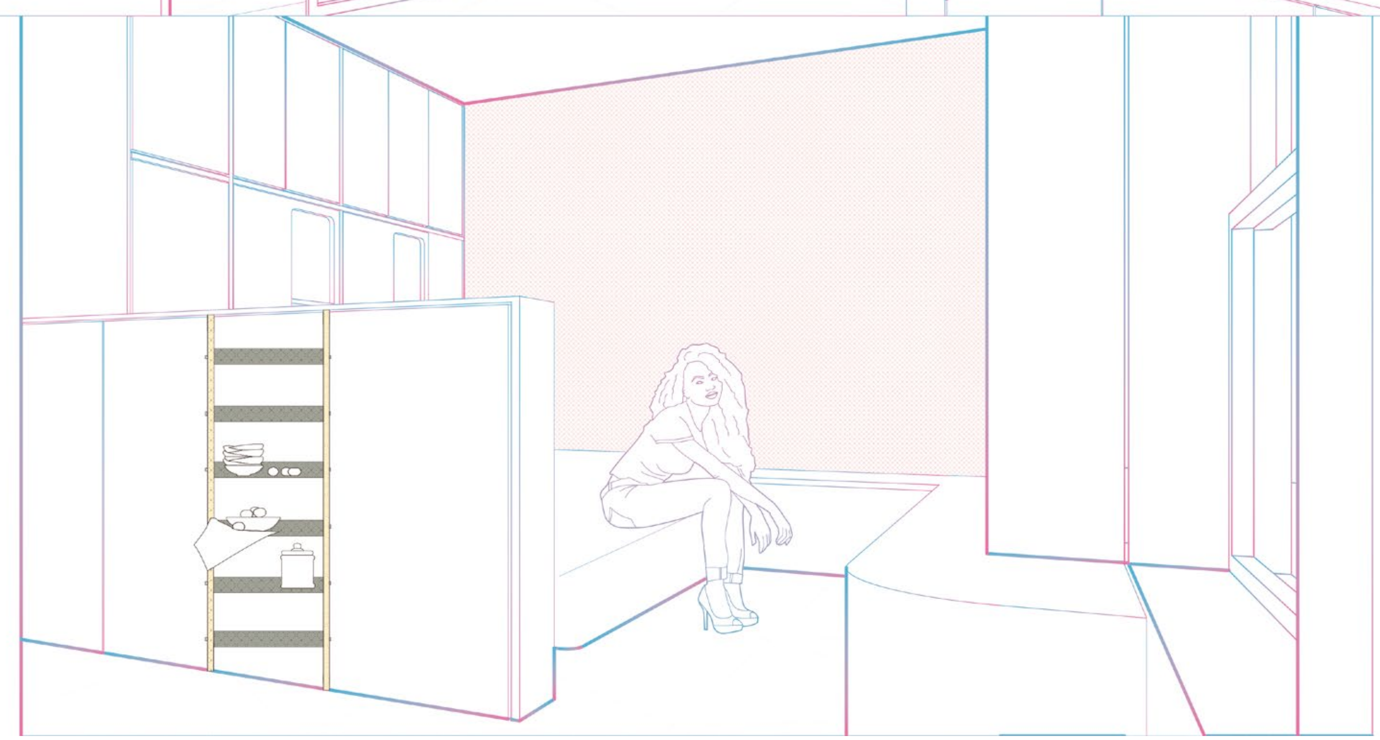


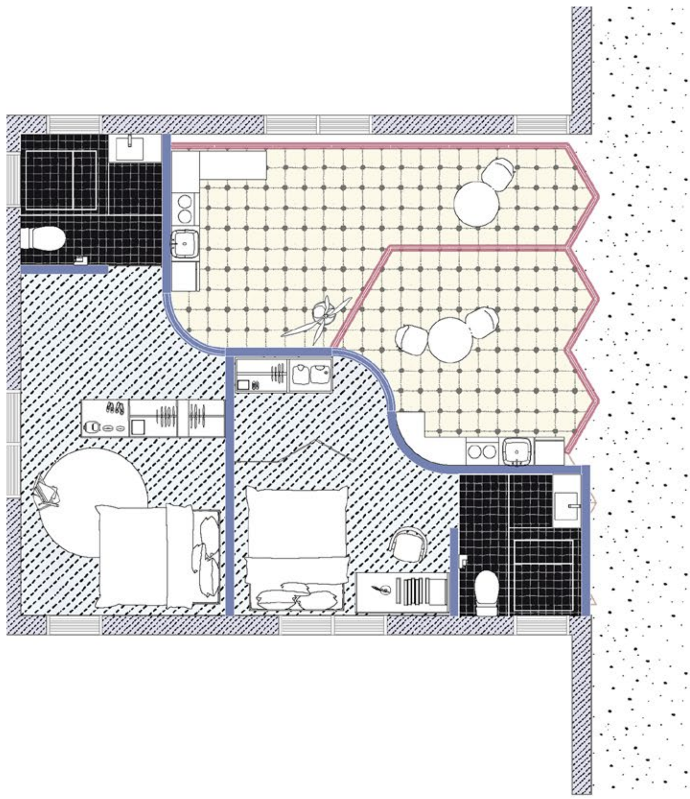


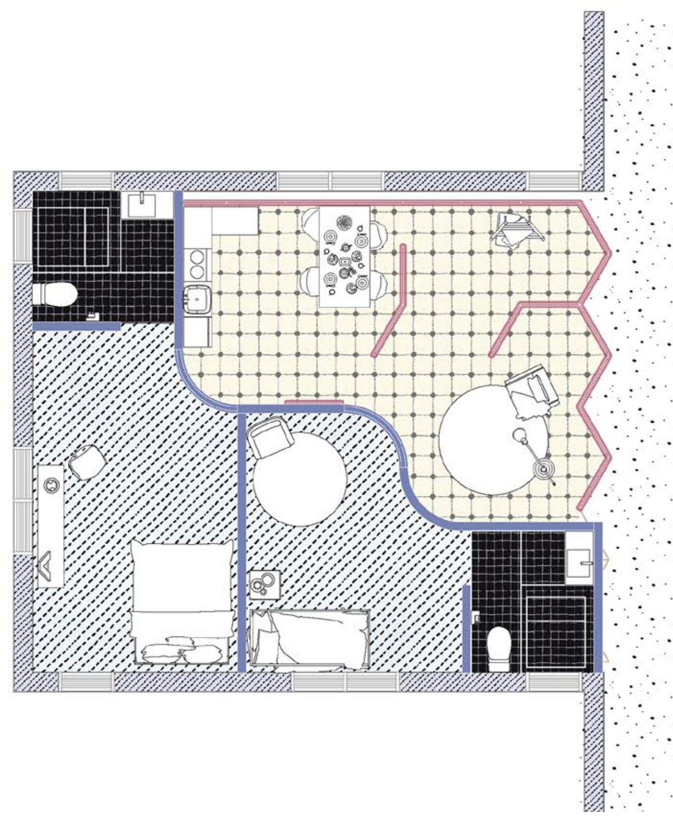


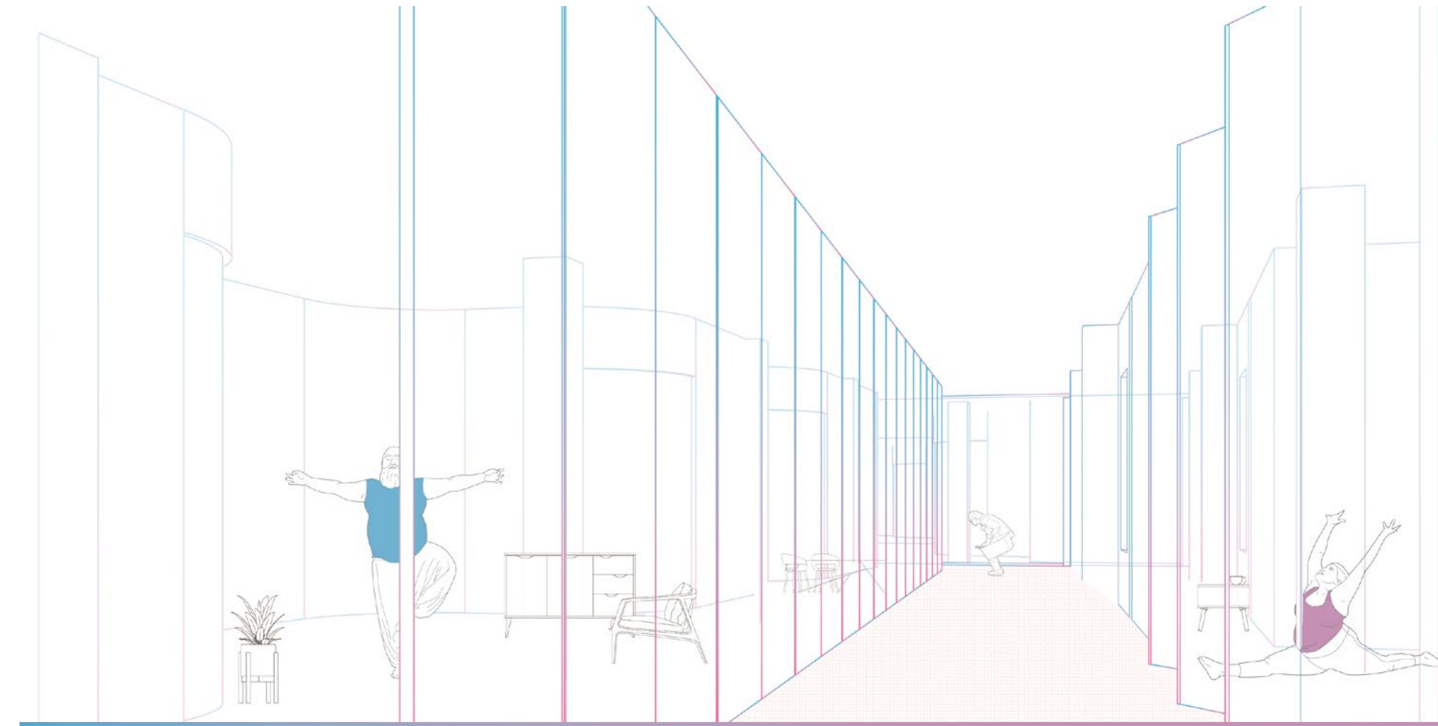


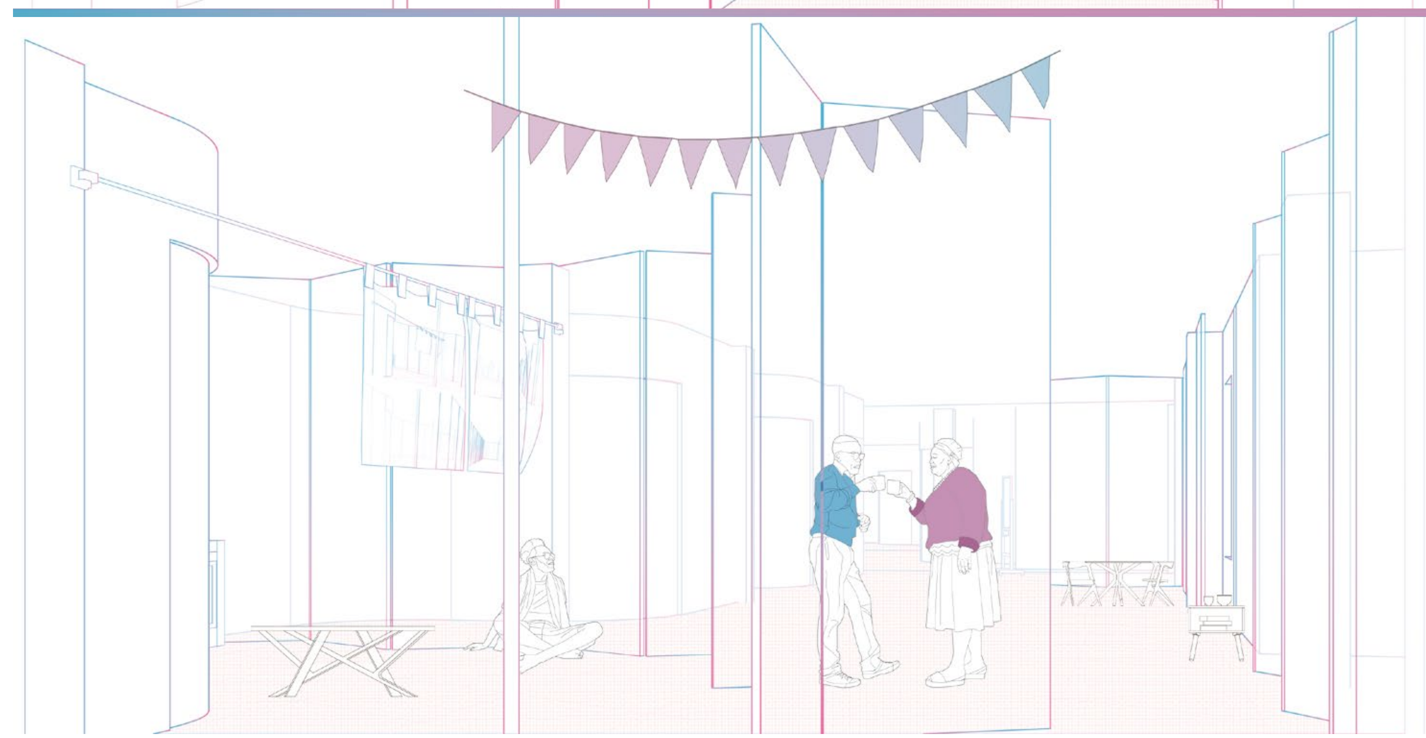


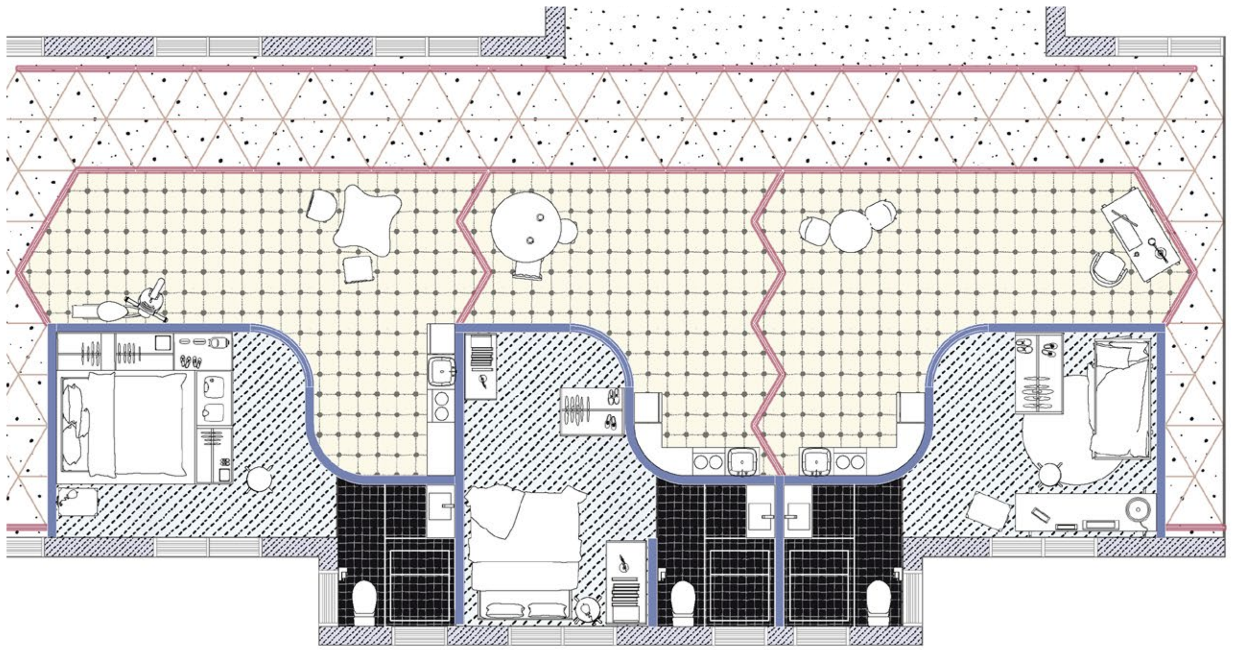


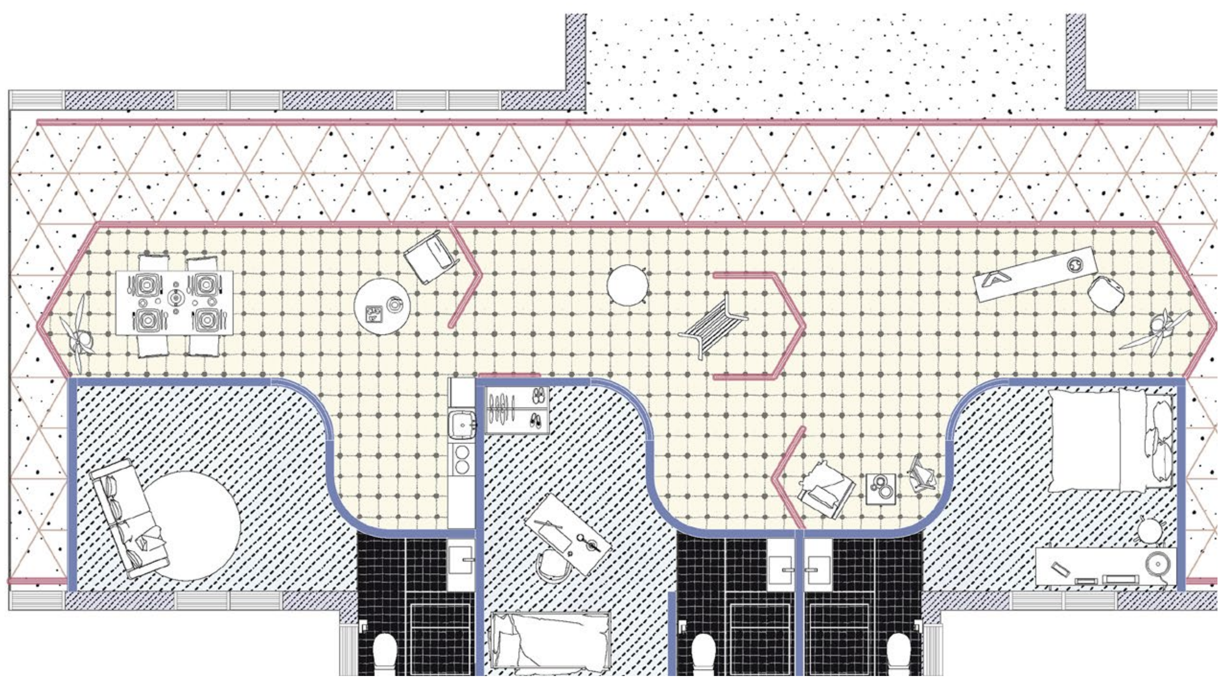


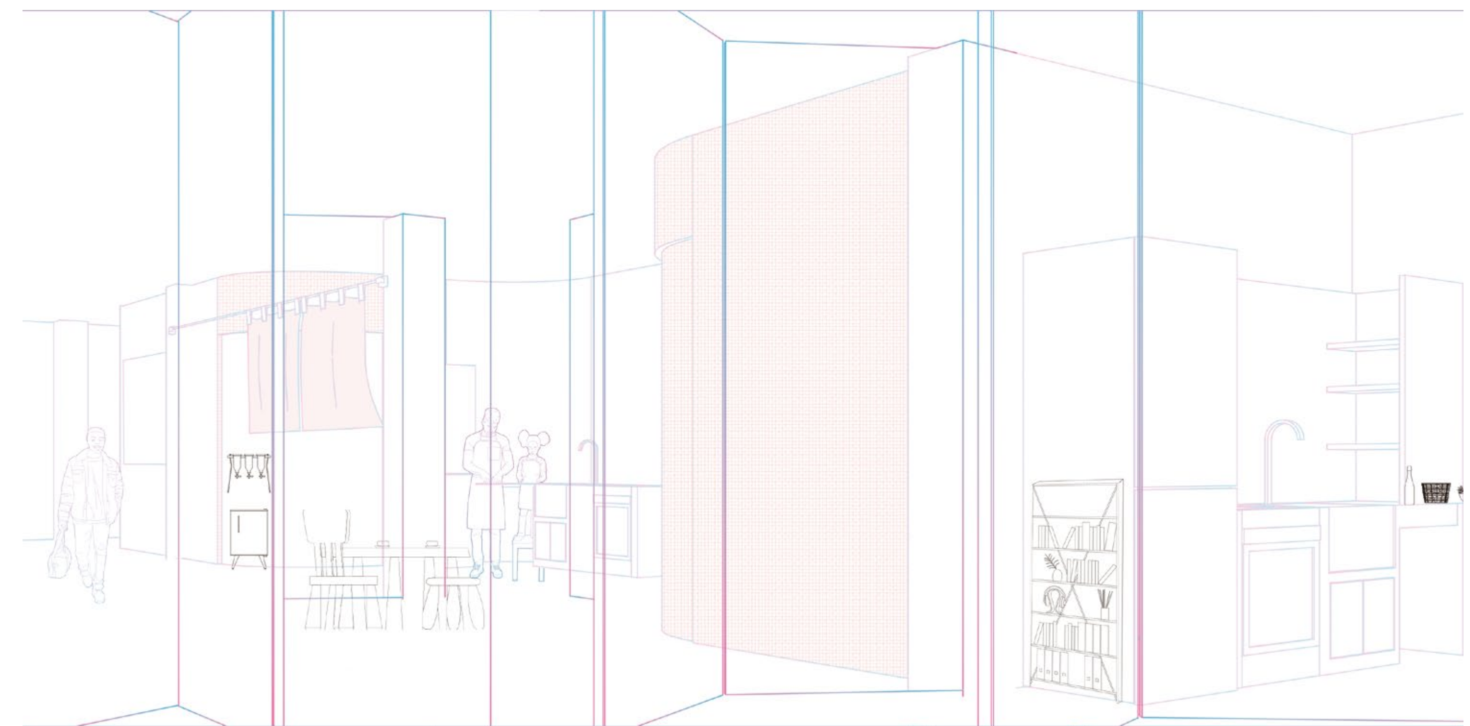


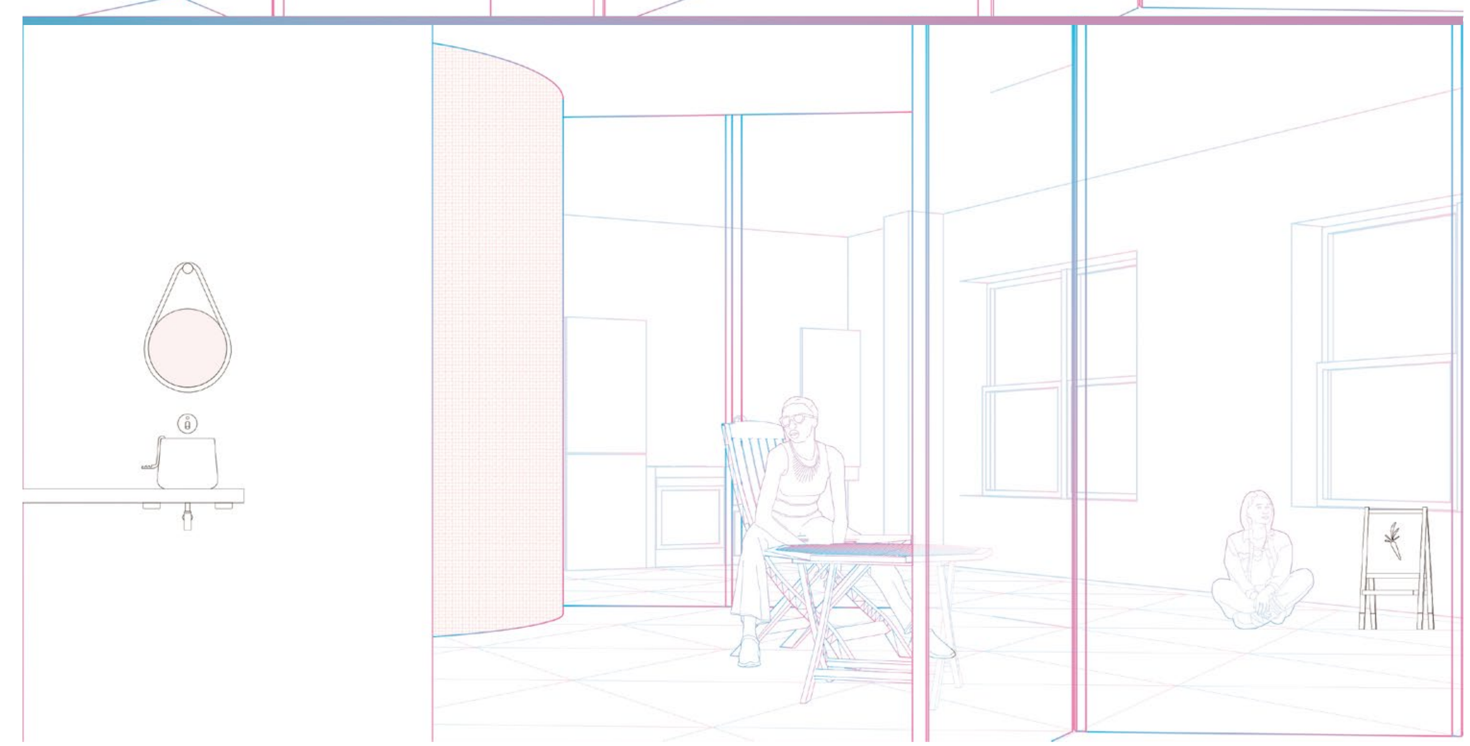


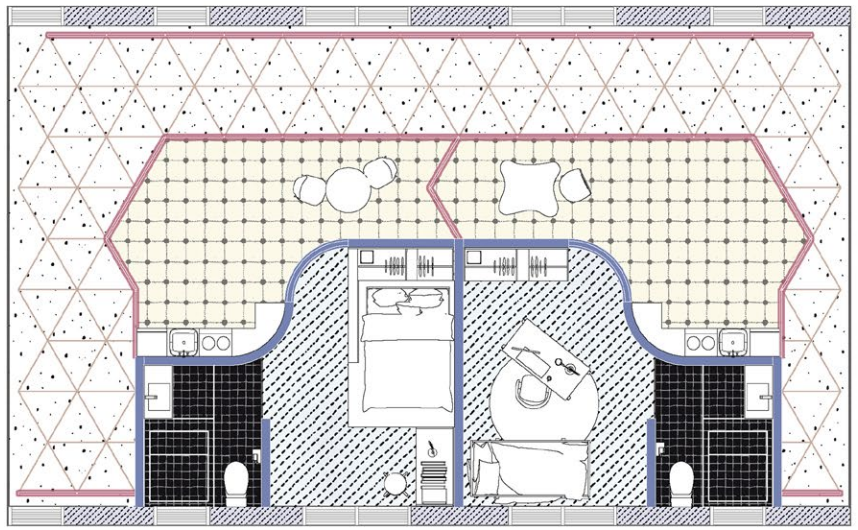


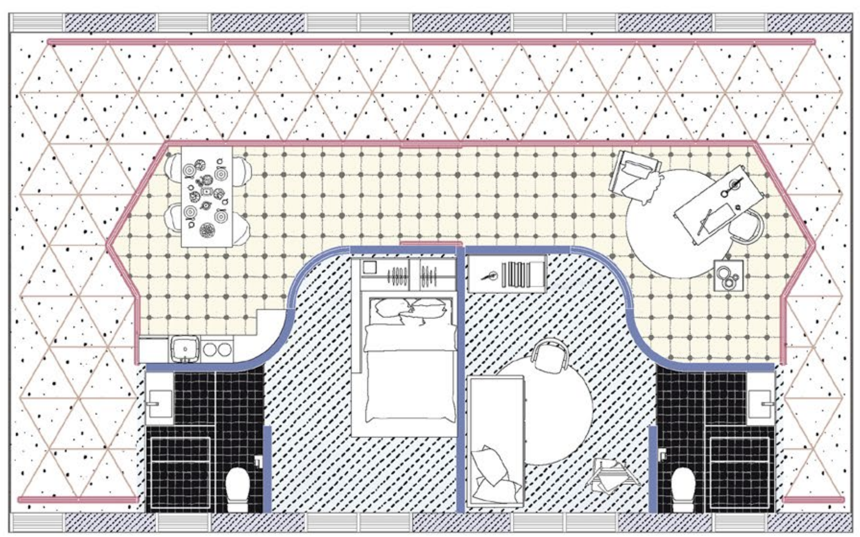


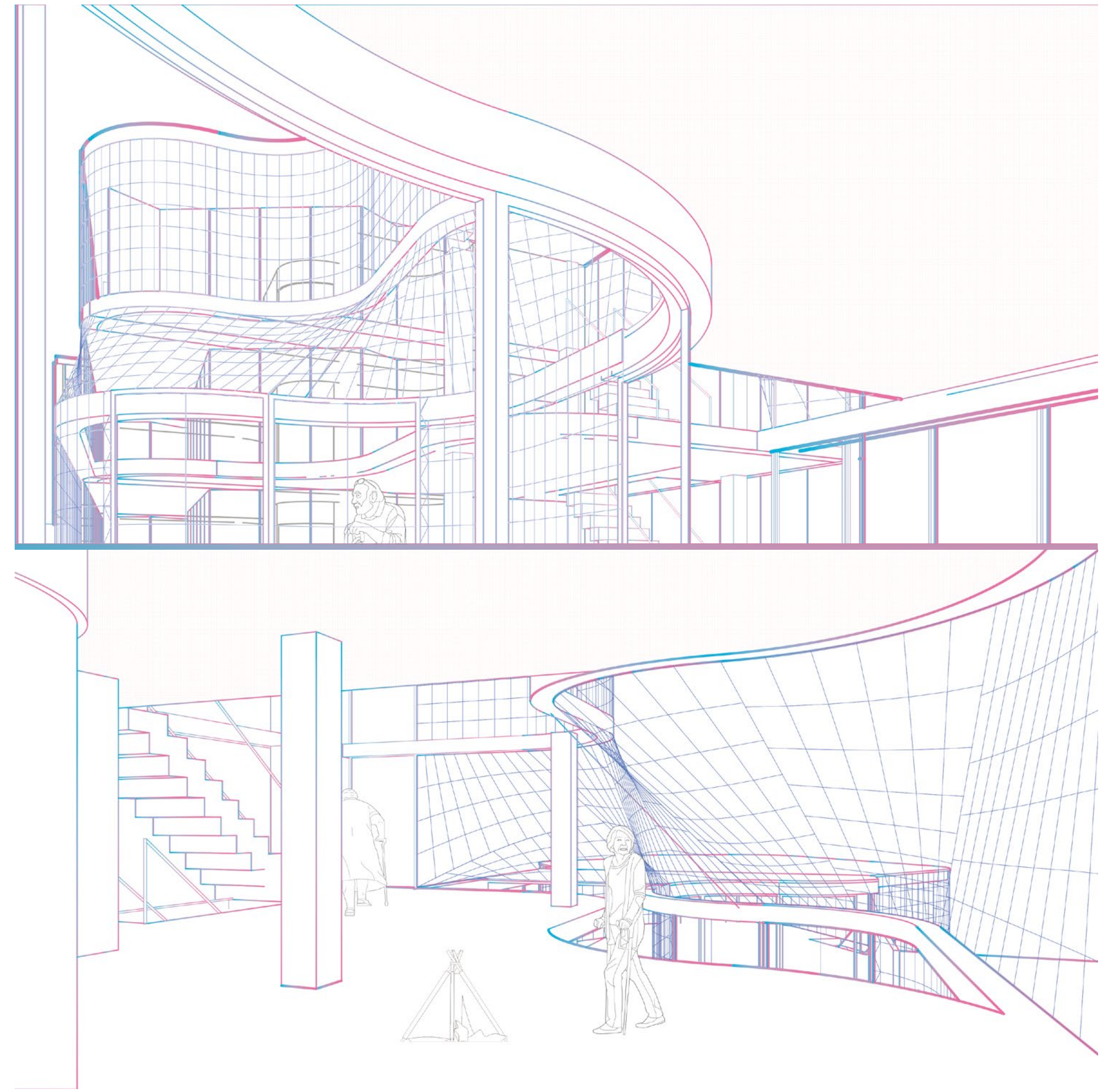












HEALTH CLINIC

ADVANCED VI | SPRING 2022

INSTRUCTOR: Hilary Sample

A traditional clinic in a historic district

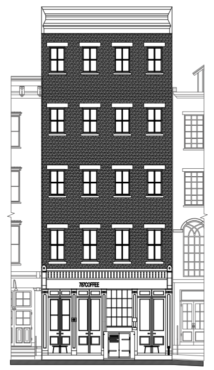
The project was designed in a small-scale vacant space in the urban scale of Manhattan. In the first phase, I researched the Frances Tarven Block and traced more than 10 facades to have an in-depth understanding of the most historical neighborhood on the island. In the later stage, I chose a small piece of storefront for rent in the block, which I wanted to transform into a health clinic, a clinic about the traditional Indian massage culture, using traditional culture and architecture, together to counter the development process of Manhattan modernization, and hopefully to retain enough history on the island.

The Fraunces Tavern Block, is composed of sixteen different eighteenth and nineteenth century structures. These contiguous but independent buildings exemplify the various architectural styles of the period. The block derives its name from the Fraunces Tavern, a reconstructed city landmark which houses a restaurant and museum dedicated to George Washington and the Revolutionary War. The Tavern is at the corner of Broad and Pearl Streets, at the northwest corner of the block. The area surrounding the Fraunces Tavern Block was radically affected by the enormous redevelopment of Lower Manhattan that occurred during the past decade. The adjacent landscape is characterized by a park awaiting future construction and by looming office towers. The massive structures nearby create a deep contrast with the antiquated design and small scale of the former mercantile establishments that remain from an older New York.

Fraunces Tarven Block
- 66 Pearl Street

Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

Fraunces Tarven Block
- 64 Pearl Street



Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

Fraunces Tarven Block
- 62 Pearl Street

Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

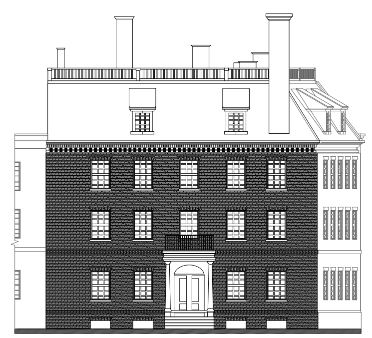
Fraunces Tarven Block
- 60 Pearl Street

Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

Fraunces Tarven Block
- 58 Pearl Street

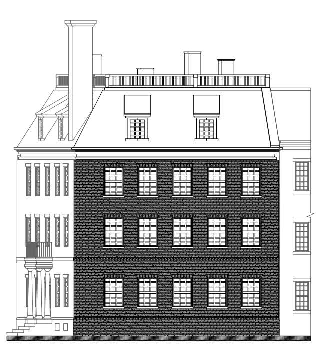
Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

Fraunces Tarven Block
- 54 Pearl Street



Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

Fraunces Tarven Block
- 97 Broad Street



Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

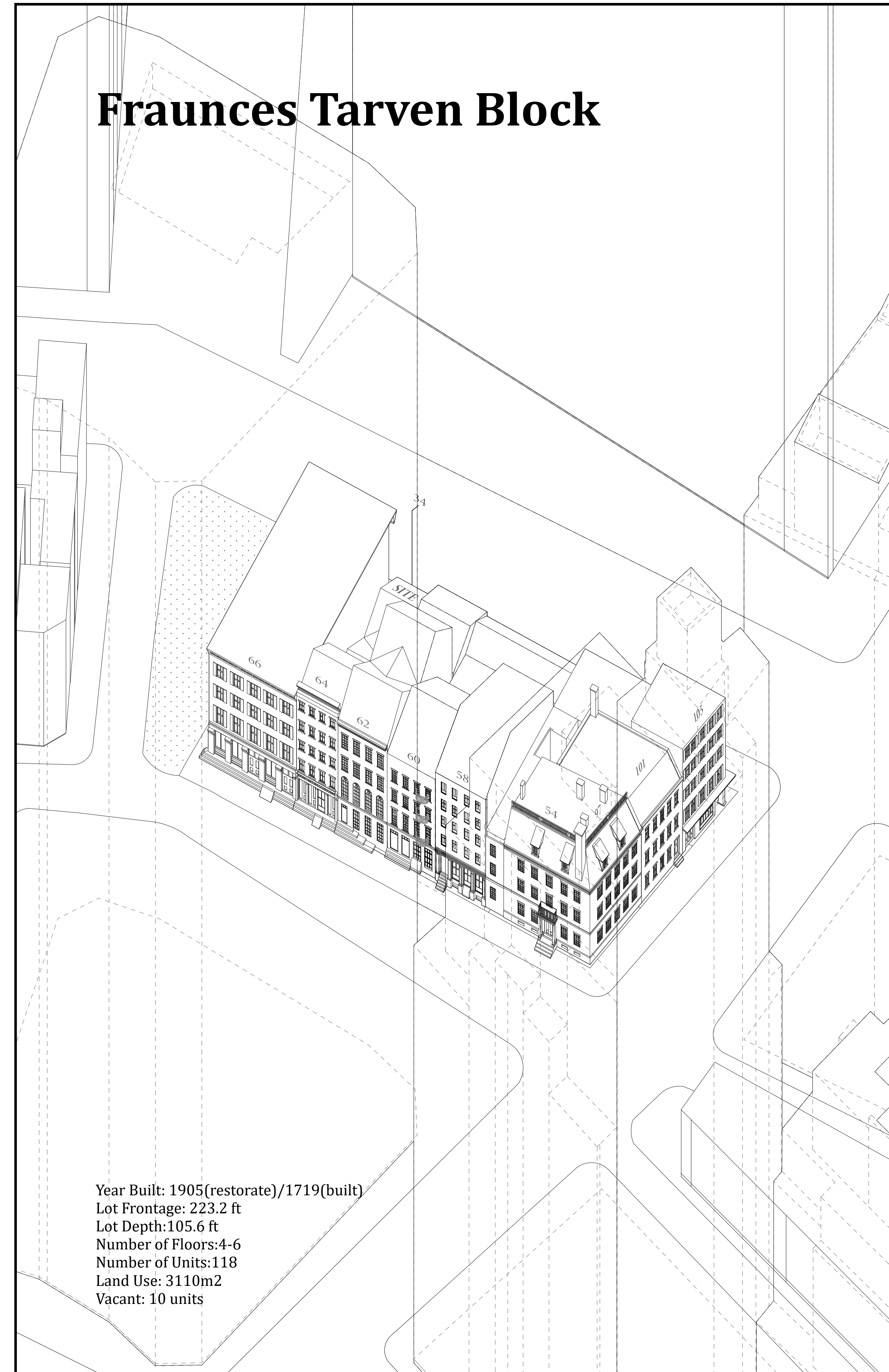
Fraunces Tarven Block
- 101 Broad Street

Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

Fraunces Tarven Block
- 105 Broad Street

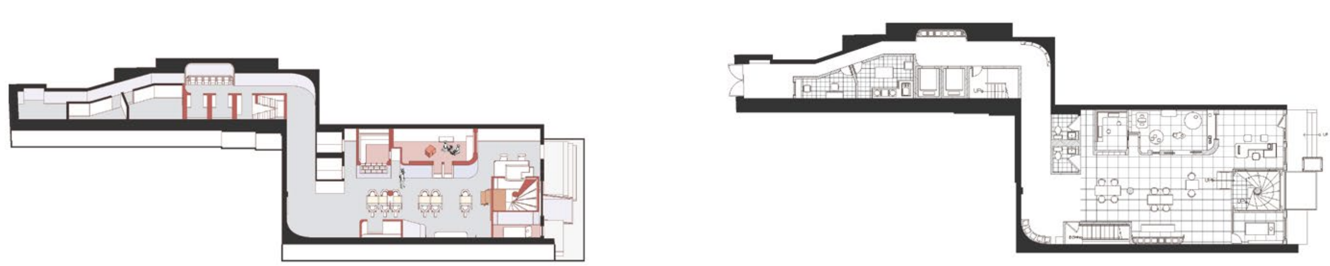
Year Built: 1905(restorate)/1719(built)
Lot Frontage: 14
Lot Depth:6m-13m
Number of Floors:3-5
Number of Units:/
Land Use: 3110m2
Vacant: 3-5 units
5’ 10’

Fraunces Tarven Block

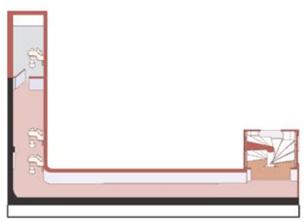


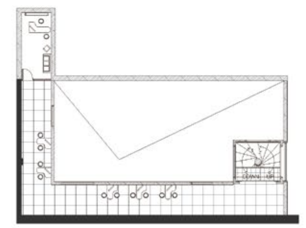
Year Built: 1905(restorate)/1719(built)
Lot Frontage: 223.2 ft
Lot Depth:105.6 ft
Number of Floors:4-6
Number of Units:118
Land Use: 3110m2
Vacant: 10 units

BASEMENT



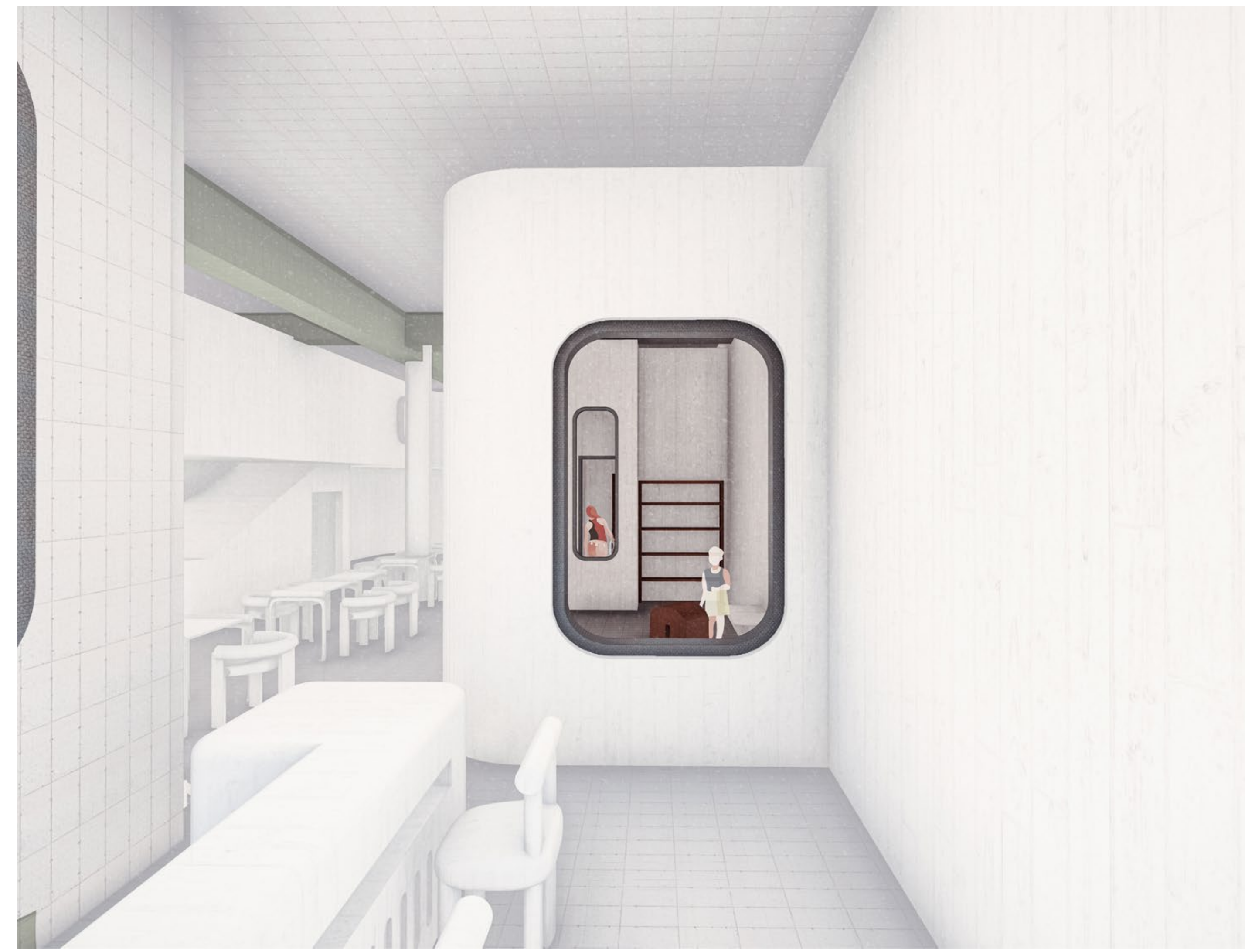
FIRST FLOOR



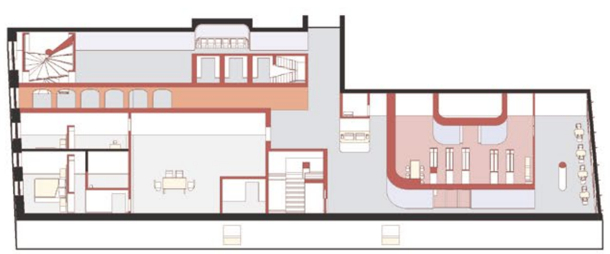


FIRST MID LAYER

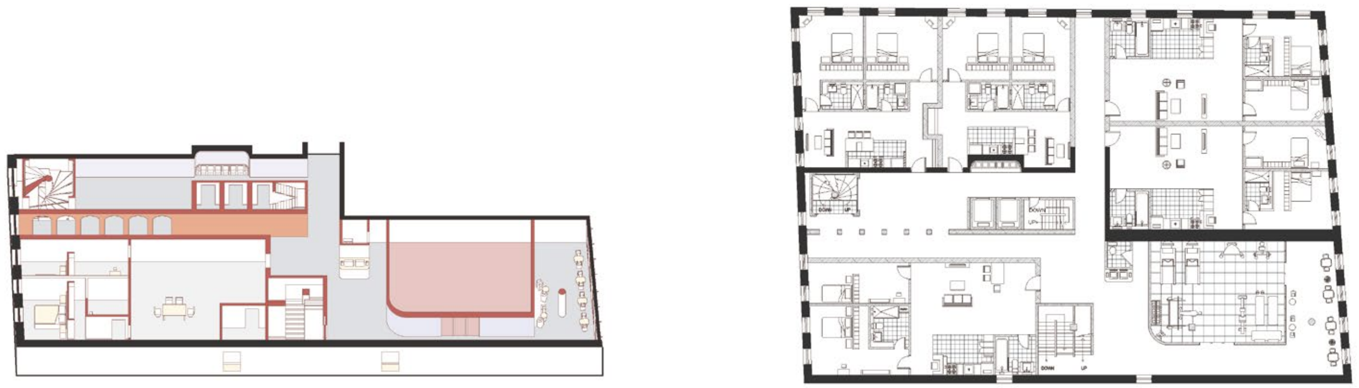
SECOND FLOOR



THIRD FLOOR



FORTH FLOOR



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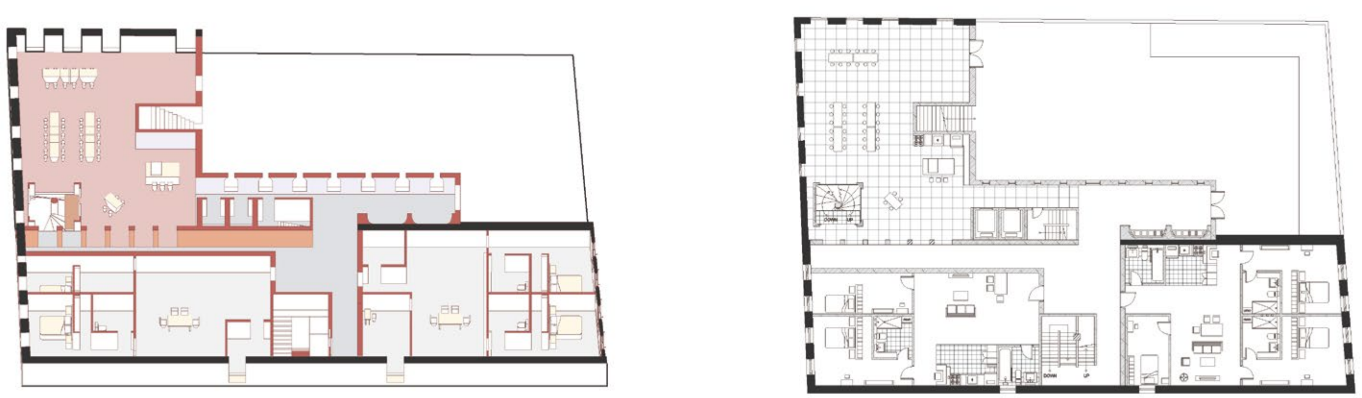

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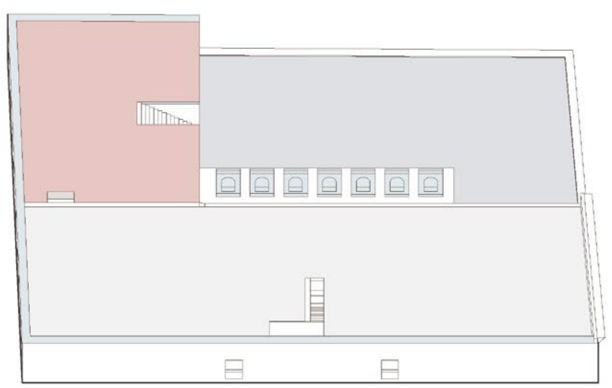
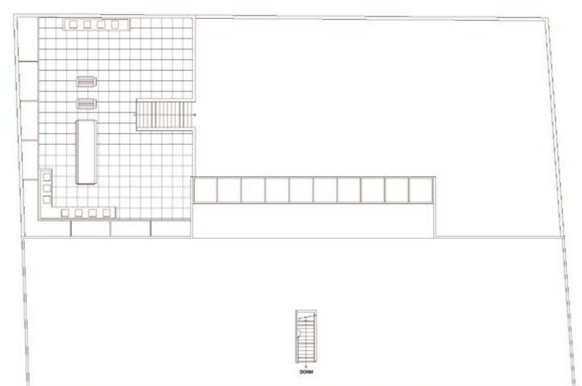
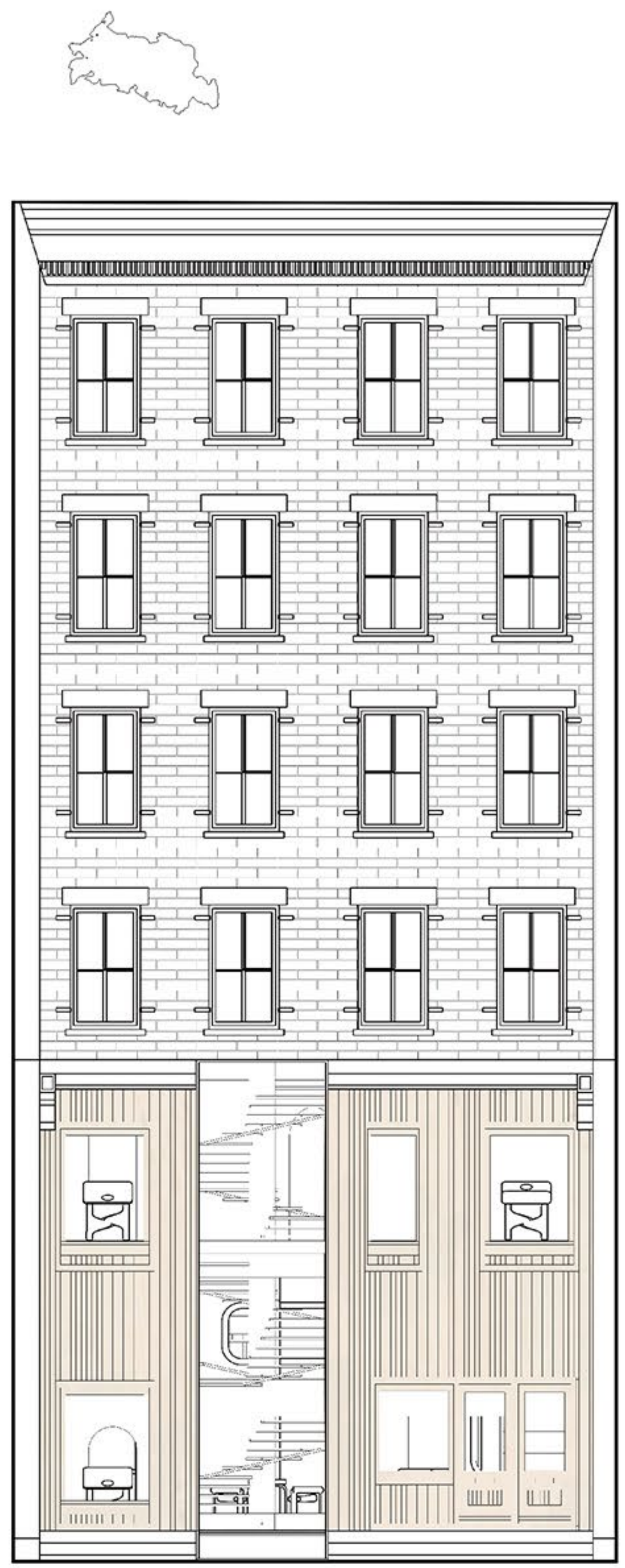
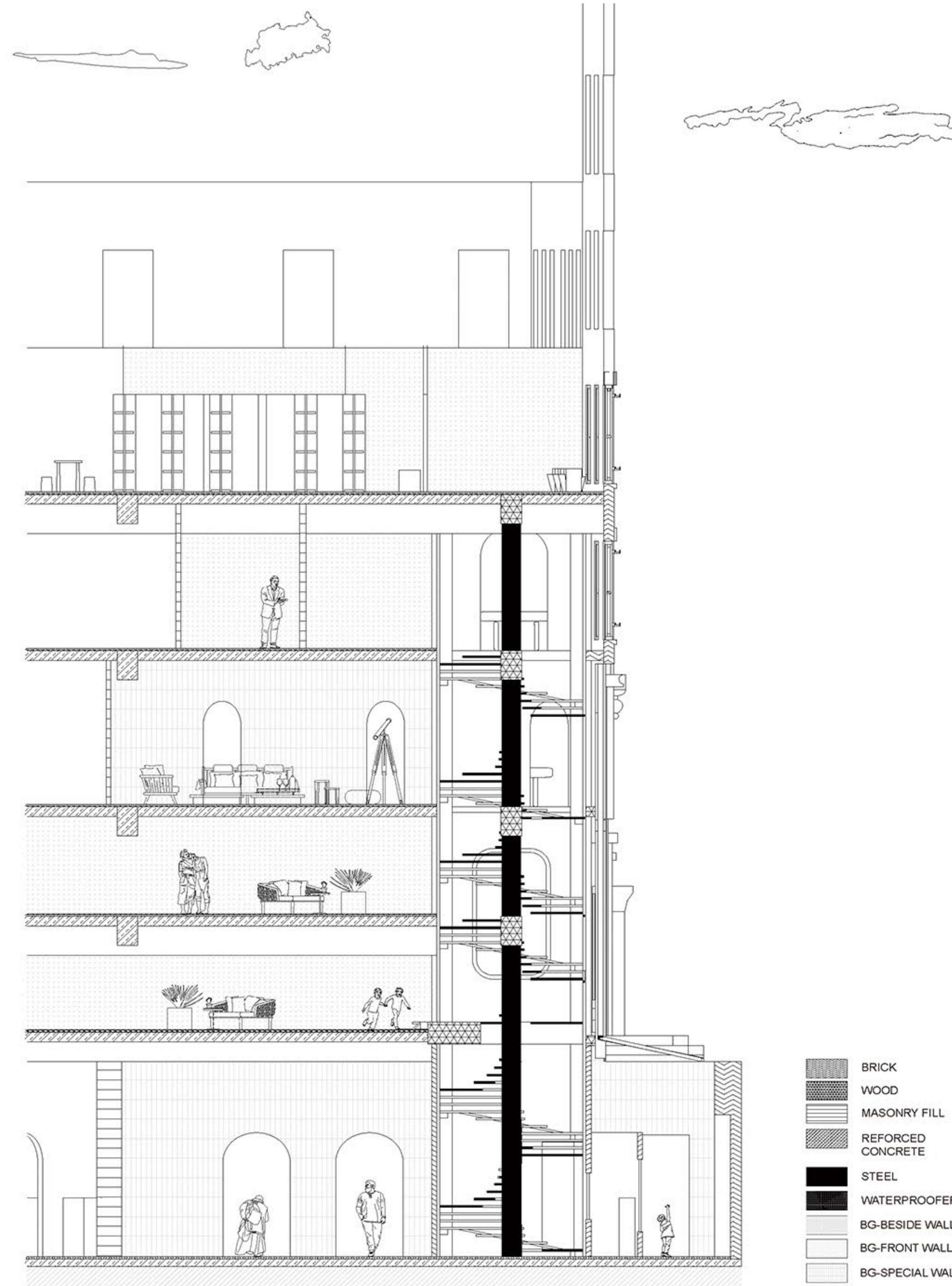
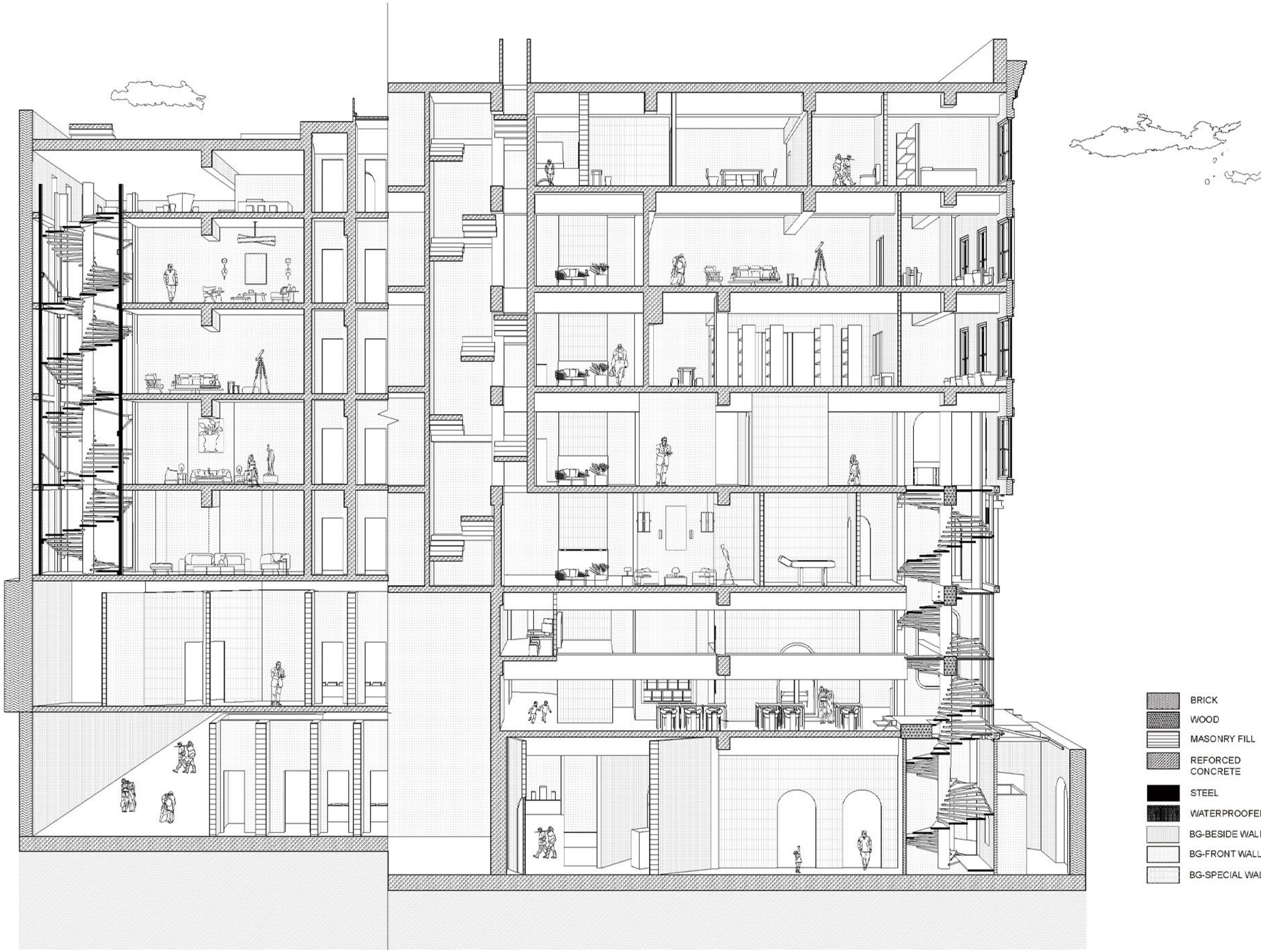




ROOFTOP




BRICK
WOOD
MASONRY FILL
REFORCED CONCRETE
STEEL
WATERPROOFER
BG-BESIDE WALL
BG-FRONT WALL
BG-SPECIAL WALL


BRICK
WOOD
MASONRY FILL
REFORCED CONCRETE
STEEL
WATERPROOFER
BG-BESIDE WALL
BG-FRONT WALL
BG-SPECIAL WALL

Imaginative Canopy

GENERATIVE DESIGN | FALL 2021

INSTRUCTOR: Danil Nagy

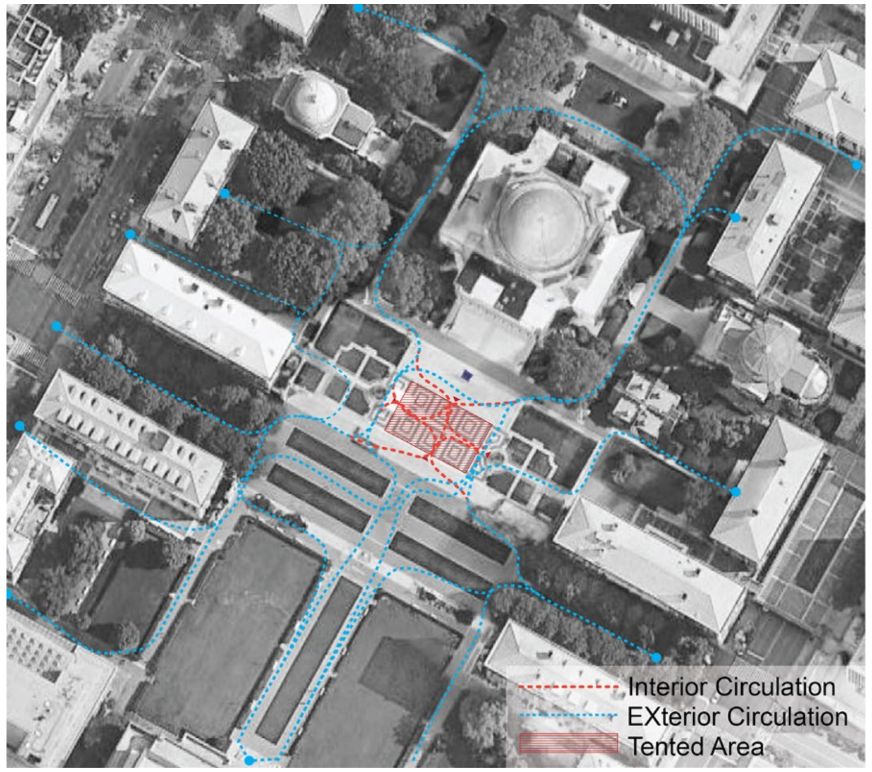
COLLABORATOR: Haotong Xia, Jiaying Qu, Ningyuan Deng, Shikang Ding

Redesign the canopy using generative.

INTRODUCTION

Under the influence of the epidemic, Columbia University students and faculties generally chose to have meals outdoors to reduce the risk of contracting COVID-19. For the safety and health of the community, Columbia University is opening some outdoor spaces on campus for use without reservation. Sheds were built on these outdoor open spaces to provide shade from the sun and rain for the users. However, these sheds are too large and located at some of the most important traffic nodes on campus, causing disruptions to the paths that people walk on a daily basis. In addition, when entering the interior of the tent, it is obvious that the space is not sufficiently lighted. At the same time, the overly large round table and the casual arrangement make the space underutilized and cannot meet the dining needs of a large number of people.

Considering the existing condition, for this design, we chose the shed in front of the Alma Mater statue which is located on one of the most important traffic spaces on campus, the Low Plaza, as the object of transformation. Our goal was to redesign the canopy using generative design ideas to reduce disruption to the flow of people, increase light, and improve interior space utilization.

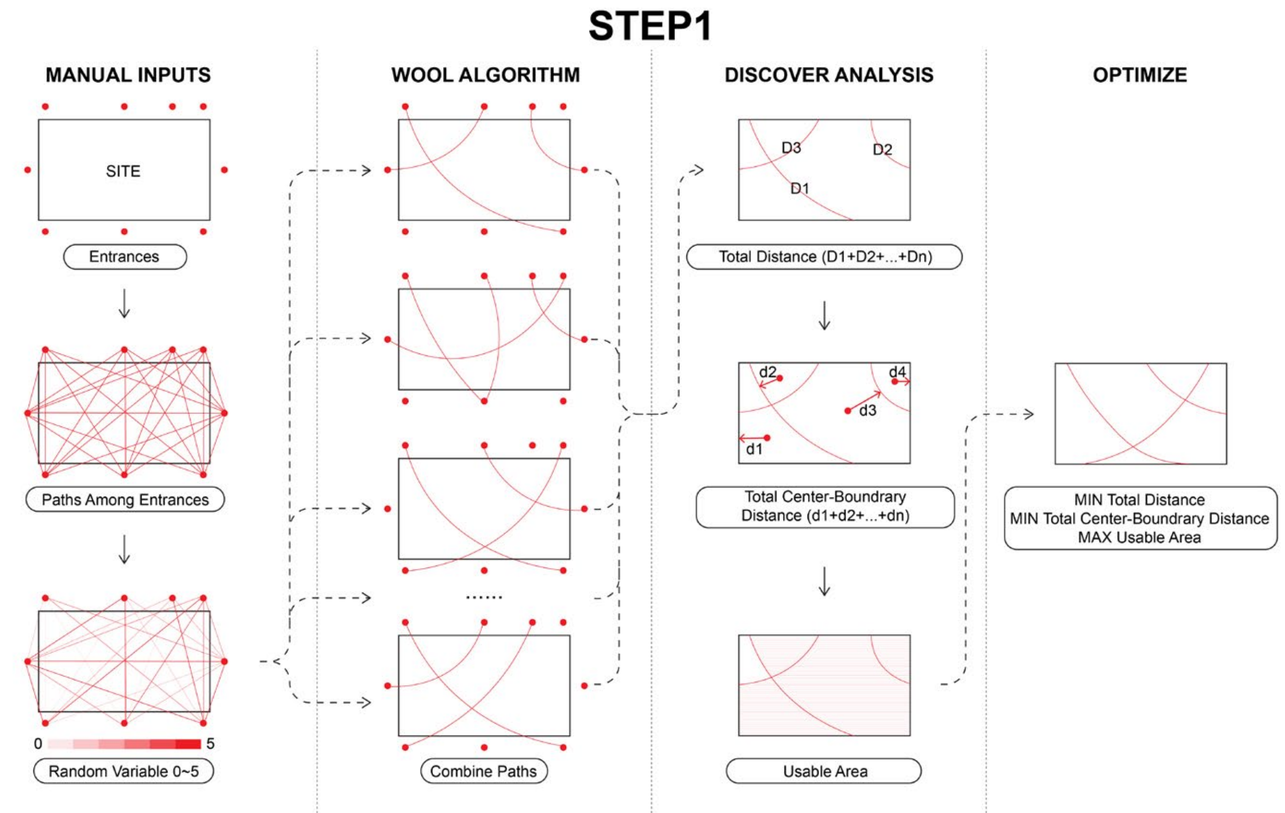


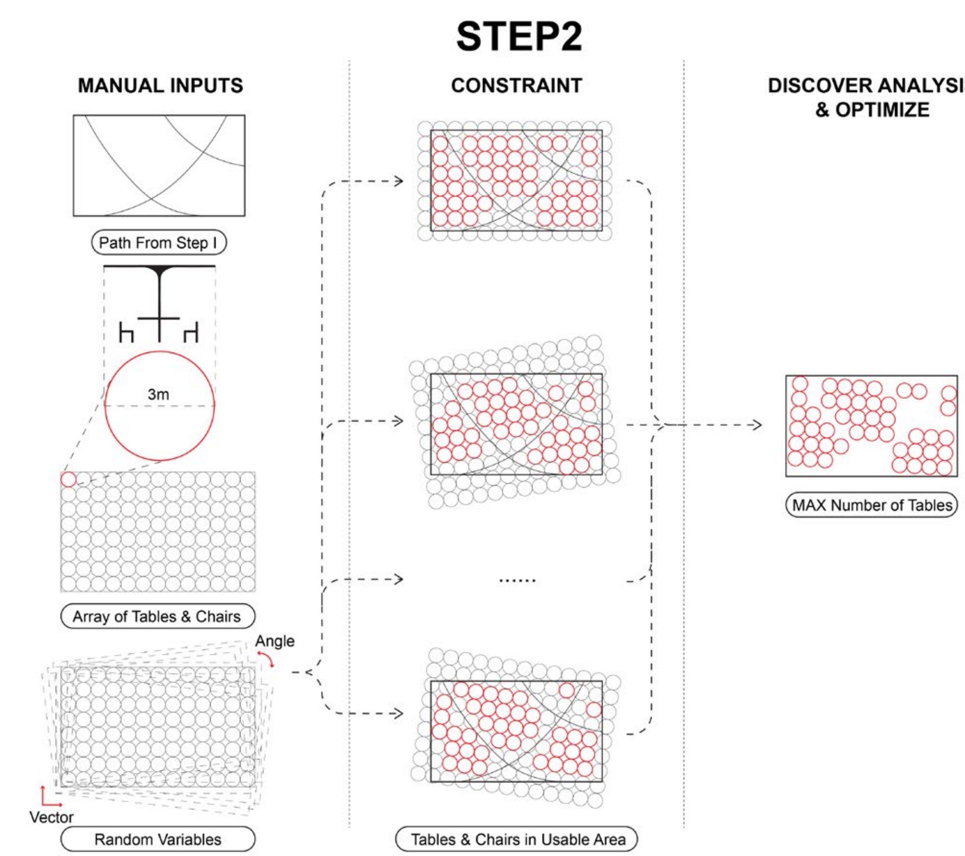
METHODOLOGY

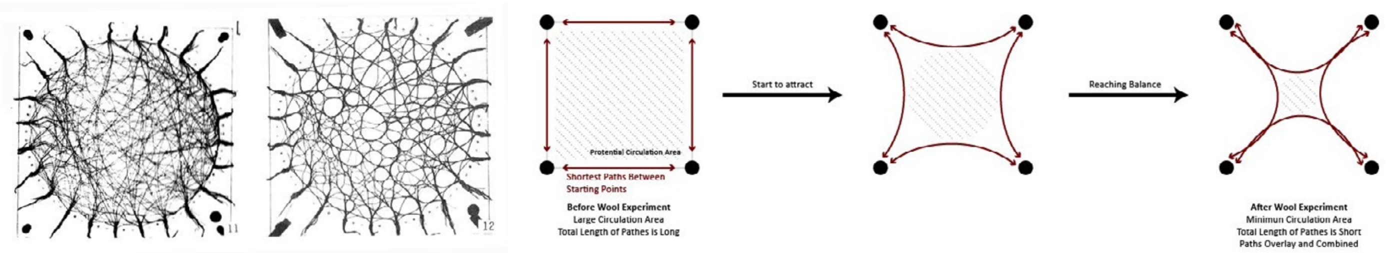
Design Space Model

To obtain more reasonable design results, we first applied Rhino and grasshopper to build a parametric model. Unlike the traditional design approach, we use genetic algorithms to automatically search for high performance solutions in our design model. And use Discover, a grasshopper plugin, to evaluate the search process.

The design process is divided into two stages. In the first stage, the table space and light/ circulation space are divided based on the flow of the people, and the total walking distance, usage area and light area are used as optimization targets to screen the results. In the second stage, the table and chair arrangement is further screened for the plan resulting from the first stage screening, and the one with the largest number of tables is derived. The final canopy form and table and chair arrangement planes are obtained.







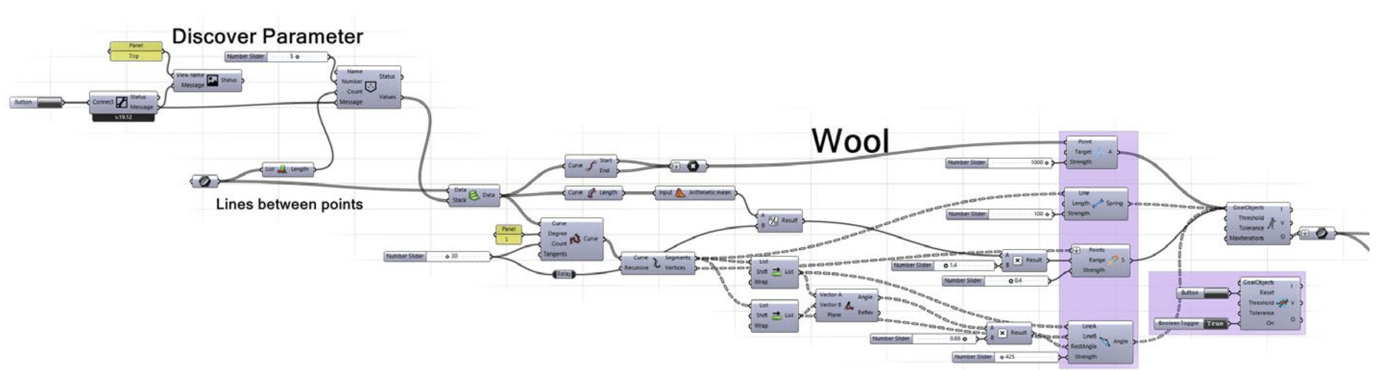
Step 1: Space Division Optimization

- Random Flow Simulation

First we identified several major pedestrian flow entrances around the base range on a plane, with points and points connecting each other to represent the paths of the crowd. Since the crowd flow of different paths is in a state of change, a random flow value is given to each path. The number of lines is used to represent the crowd flow for that path, and the path with more people flow has a higher number of lines superimposed on it.

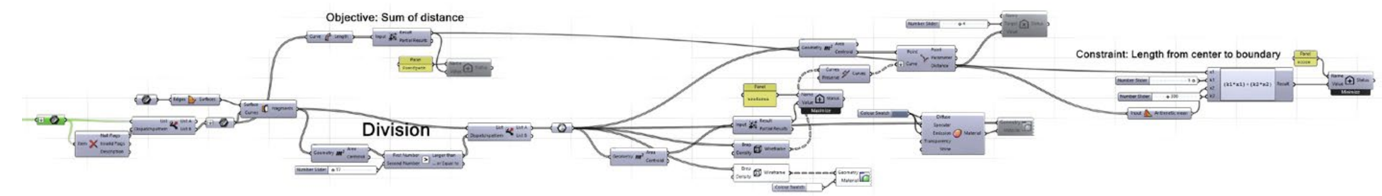
- Paths and Wool Experiment

The wool experiment was first carried out by Frei Otto, who immersed dry and slack wool in water and raised it slowly. The wet wool was held together by the tension between them. The simulation model finds the minimal path system. Each distributed point is reachable, but there are considerable forced detours between some pairs of points. The system is a branching system without any redundant connections.



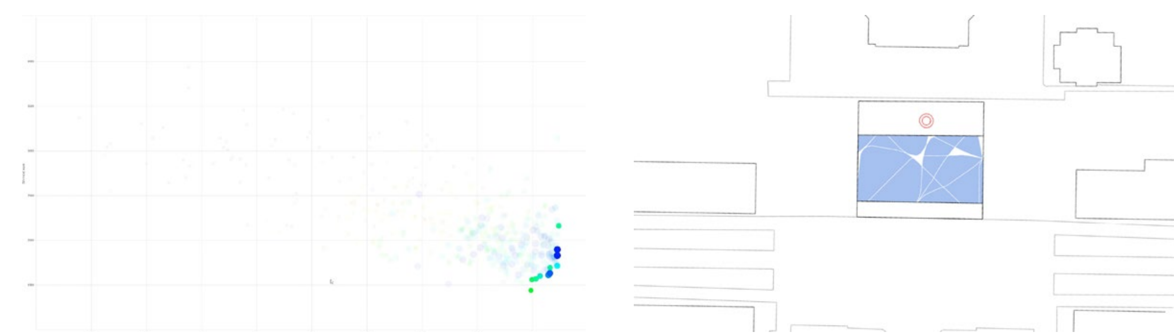
- Wool Algorithm

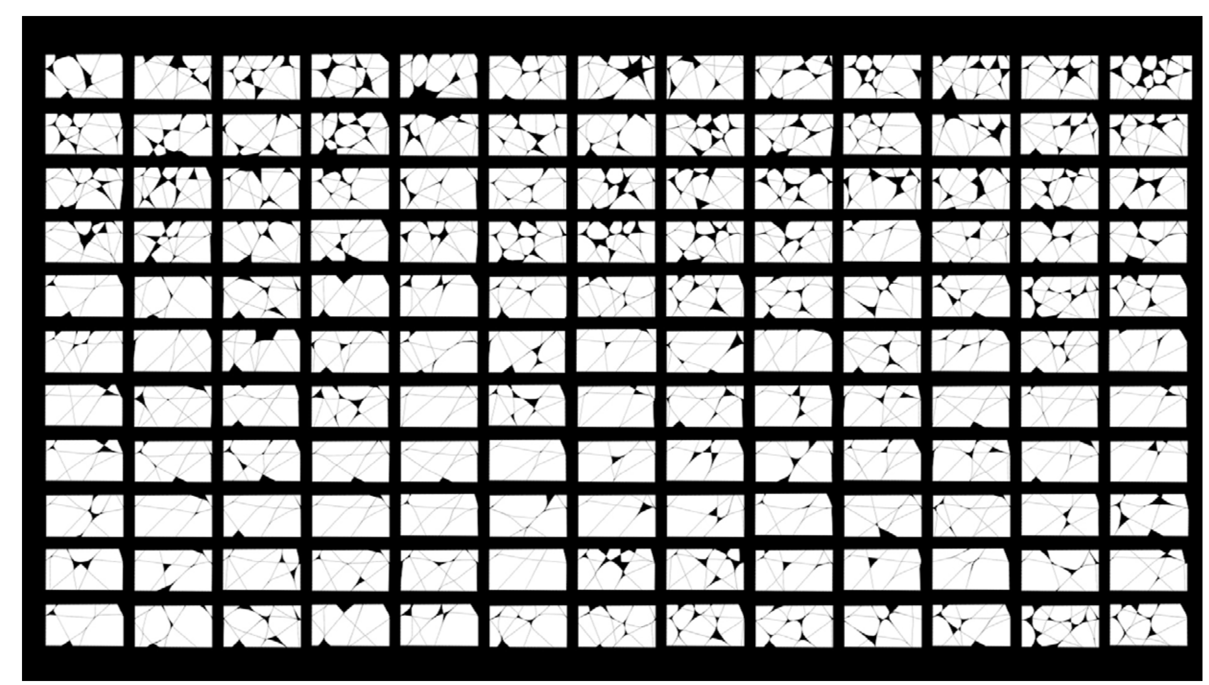
In the design, we optimize the paths in the model by simulating the effect of the wool experiment with the grasshopper plugin Kangaroo. Adjacent paths are attracted to each other under certain constraints and given attractive forces, and the original straight paths are bent and partially overlapped to form a new surface. The total length of the optimal paths will be shorter than the total length of the initial paths, effectively integrating the flow and improving the overall efficiency of crowd circulation.



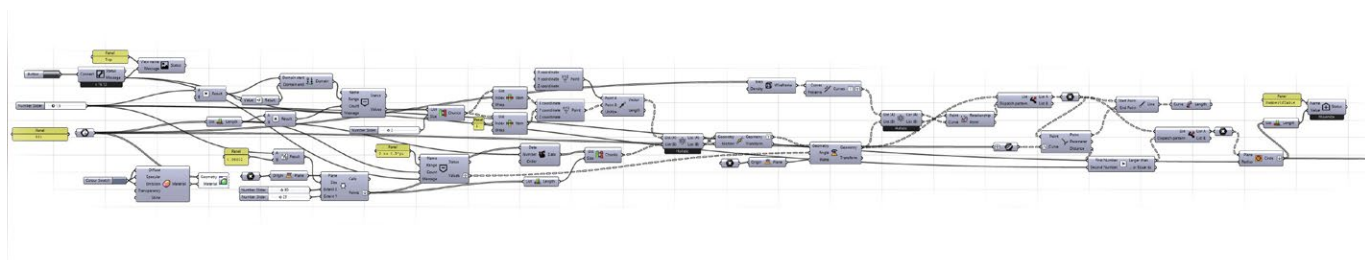
- Space Division Evaluation

We add up all the new path lengths processed by the wool algorithm and use the shortest sum of path lengths as the first objective value. The new paths divide the whole surface into several areas. We consider the circulation space as the main lighting area, and the area which is cut by the path is the space where the tables and chairs are placed. Therefore, in order to optimize the lighting conditions under the roof, we calculated the distance from the center point of each area to the nearest lighting point, took the average, and set the smallest lighting distance as the second optimization target. Meanwhile, the maximization of the total area of the table and chair areas was taken as the third optimization objective. These three variables will be evaluated in Discover and the situation that maximizes light, minimizes paths and uses the space most efficiently will be selected for the table and chair placement.



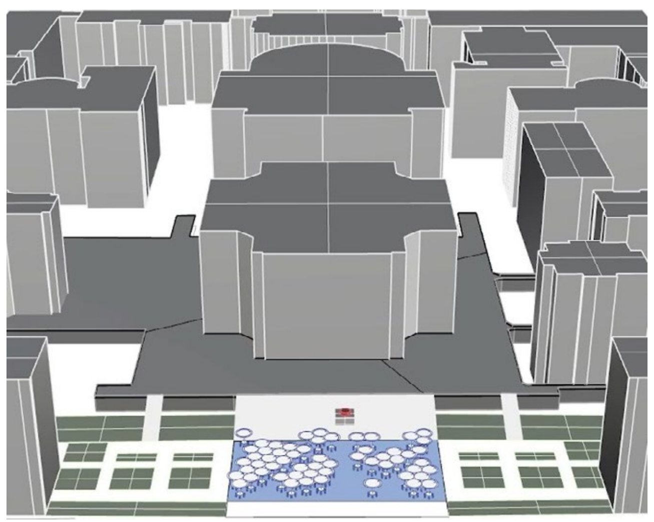


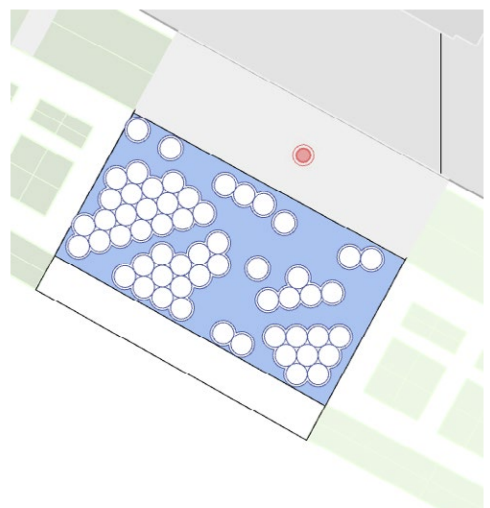
- Discover Results of Space Division

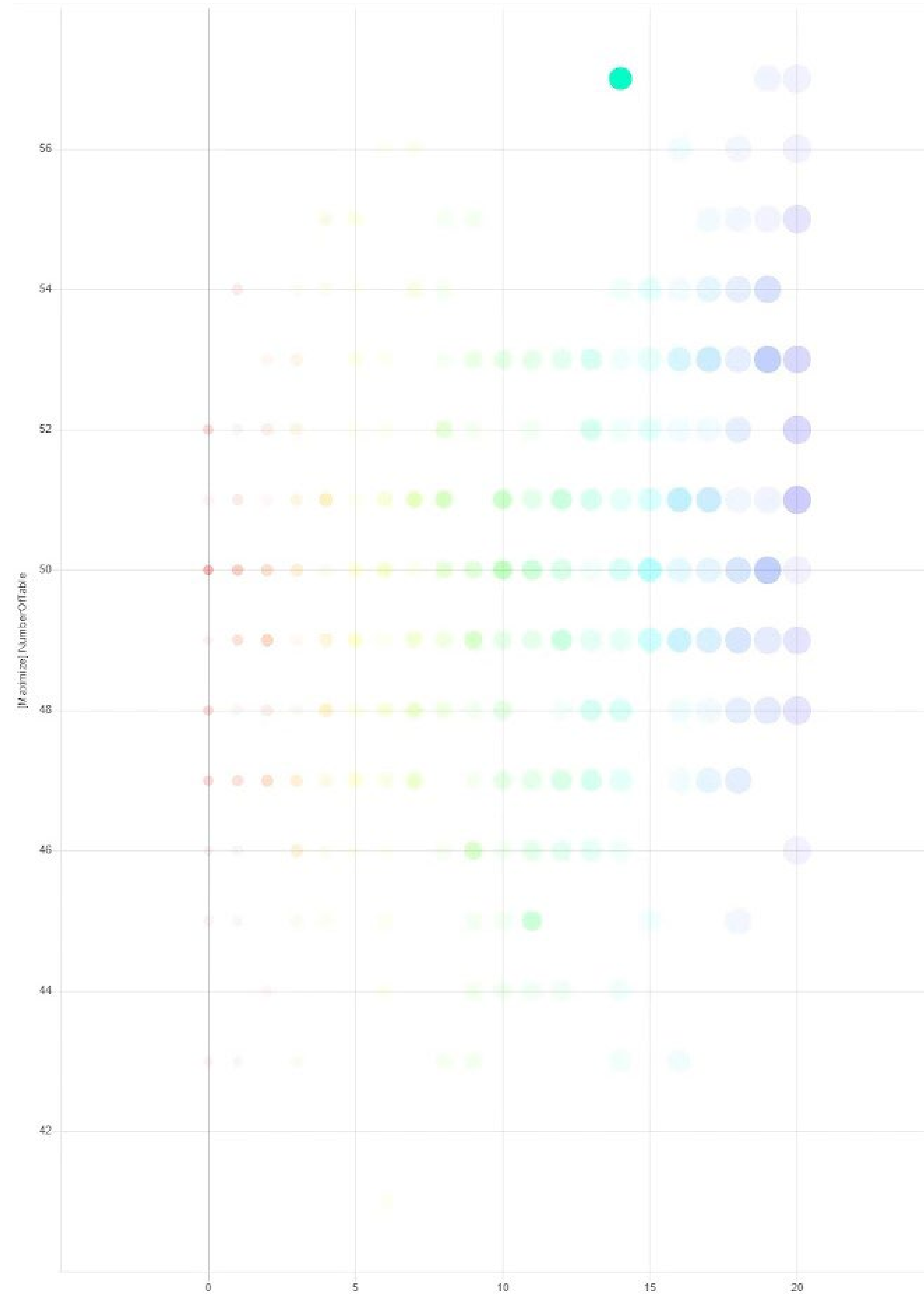


Step 2: Table Layout Optimization

After filtering the best space division results in Discover, we proceeded to optimize the table layout for the plan. Firstly, we set the size of individual table units, and the radius of one unit is 1.5 meters. It is ideal that the units are tangential to each other without overlap or excessive gaps. Place an array of units covering the base area. Given random numbers to move and rotate the array, and calculate the number of tables for each method separately, and perform a second evaluation in Discover to select the layout with the largest number of tables.







Input Parameters

Based on the needs of the model, two main variables are introduced in the model for calculation.

- People Flow in Different Paths (Discover Continuous Input):

Different flow values are randomly given to each population path at a preselected starting point. By changing this variable to simulate different kinds of possible changes in the flow of people passing through the Low Plaza at different times and under different circumstances.

- Table and Chair Unit Arrangement (Discover Continuous Input):

Change the position and rotation angle of the table unit array. By randomly varying the position of the table unit array, the variety of input cases is increased and more accurate cell arrangement results can be obtained by multiple calculations.

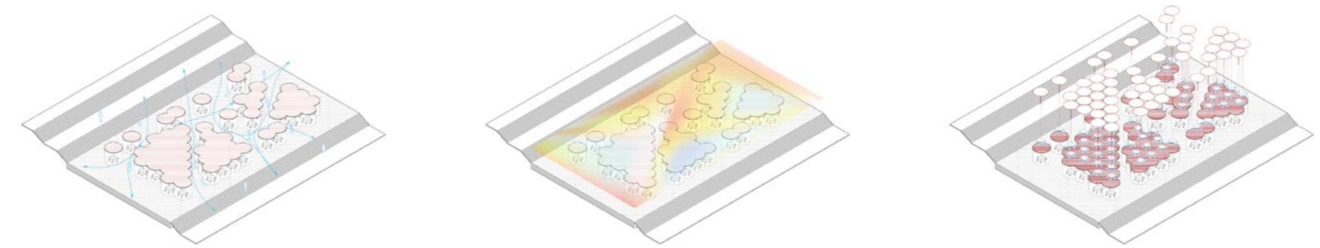
Performance Metrics

In order to optimize the process of calculation, we achieve the desired metric in two steps. To balance the usage of the space under the tent with the lighting conditions, we defined in the first Discover simulation three main matrices, the minimum lengths of the circulation paths, and the minimum of average lighting distance and the maximum of table areas. In order to make the results presented by Discover clearer and easier to filter, we combine the three objective values into two objectives. A function is used to combine the path length and the average lighting distance, and the minimization of the combined results is entered into Discover as the optimization objective. In the second simulation, maximizing the number of tables will be the most important metric to guide our choice of results.

For the whole selection process, in the first step, in order to balance the optionality of the three metrics and to quantify them at the dipolar level, we artificially integrate complex objectives by setting weights by means of functions, and among the selected results that fit the range, we artificially filter the unquantifiable objectives such as space separation and usage patterns to obtain more feasible results.

Results

By quantifying the performance of each two steps, we create evolutionary processes that allow computer to search through our design systems to find the canopy design and table layout with the least disturbance to the pedestrian path, the best lighting conditions and the highest space utilization.



Circulation   Light Condition   Table Arrangement

Conclusions

In generative design it is important to translate design goals into easily quantifiable parameters. In the design, we quantify the efficiency of the overall floor plan as the sum of path lengths, the light level as the distance from the center of the area to the light point, and the space utilization as the number of tables. We also used genetic algorithms to allow the computer to assist us in the evolutionary processes to obtain the best results from a large number of possible outcomes. This systematic approach to tent optimization can also be quickly and easily applied to other similar tent designs.

During the optimization process, we initially synchronized steps 1 and 2 in Discover, but this caused the software to run too slowly. After some adjustments, we split the optimization into two steps, which made the overall running speed smoother. However, by selecting the best results from the first optimization and then filtering them in the second step, the final results obtained may not be as accurate as if they were optimized at the same time. In the subsequent design process, in order to ensure the accuracy of the results, when we optimize in steps, we can select multiple best results for each step, and then perform the second optimization separately.

https://vimeo.com/658392936?embedded=true&source=vimeo_logo&owner=142027460

Ancestral Land

Virtual Architecture | Spring 2022

INSTRUCTOR: Nitzan Bartov

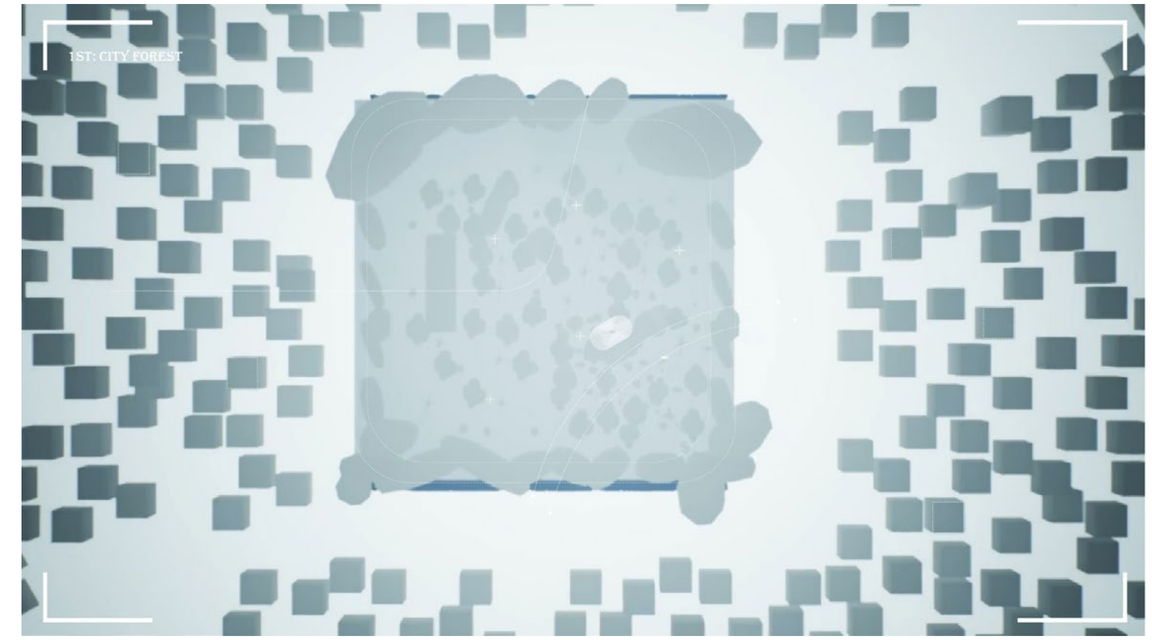
COLLABORATOR: Xin Chen, Jiazheng Zhang

Familiarity with and use of UE4 software

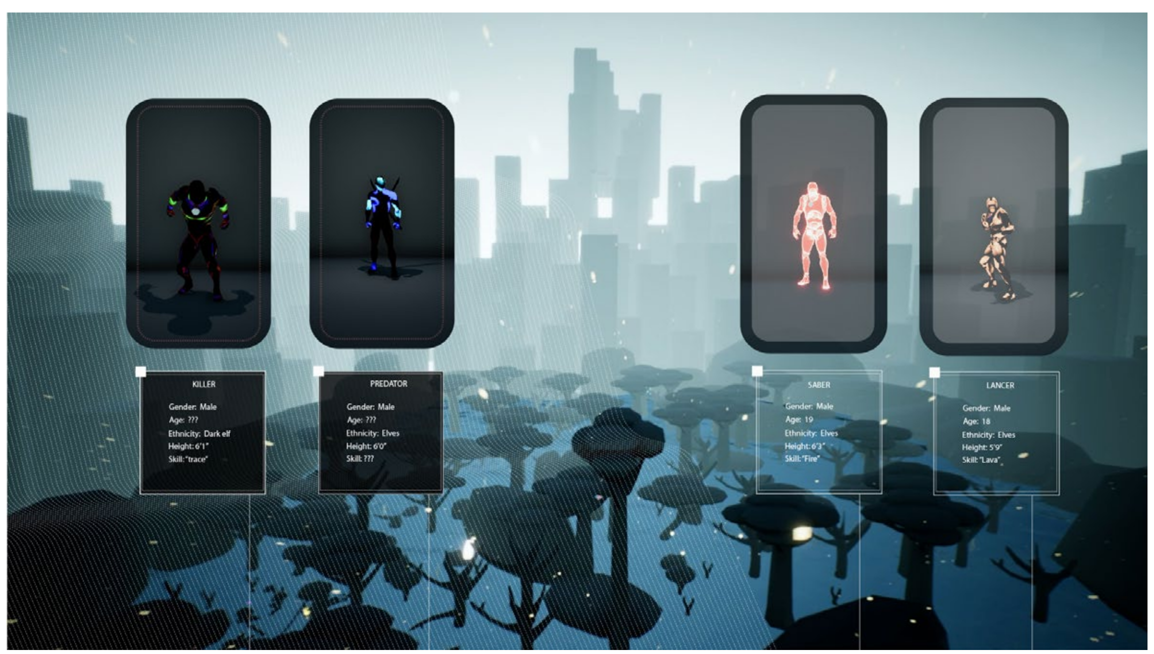
INTRODUCTION

This game unfolds the background narratively. The homeland is invaded, treasures are taken, and the strongest people of the village and town are trampled underfoot by the invaders. The killer was chasing the young man, suddenly the space-time broke down in front of him, and a space-time door appeared; the protagonist did not hesitate to step in and found himself in the legendary ancestral land. The land inside is black, the trees are withered, the sun is dim, and people live like the walking dead. The protagonist needs to explore in the darkness, find the direction of the stone of the stars, and open it, to light the next section of the road ahead. But leaving ancestral land may lose protection, need to find the exit within the 60s, or be brought back to the initial location; the good thing is that the star's opening will not go out. After exploring, again and again, a clear path appears in front of the protagonist; open the last lead, the portal is opened, and the protagonist enters a deeper space, where the fighters will help him improve his skills and tactics.

PROTAGONIST

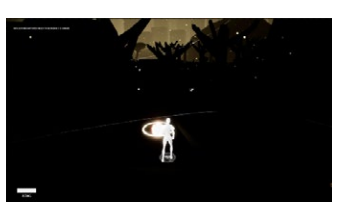


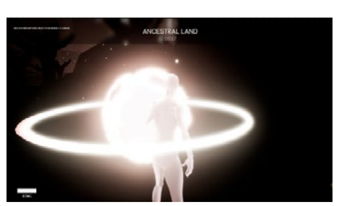
SITE MAPPING

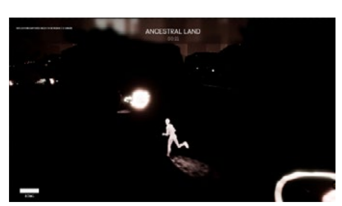


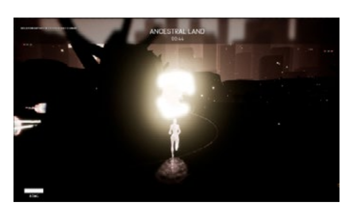
CHARACTERS

BIRD VIEW

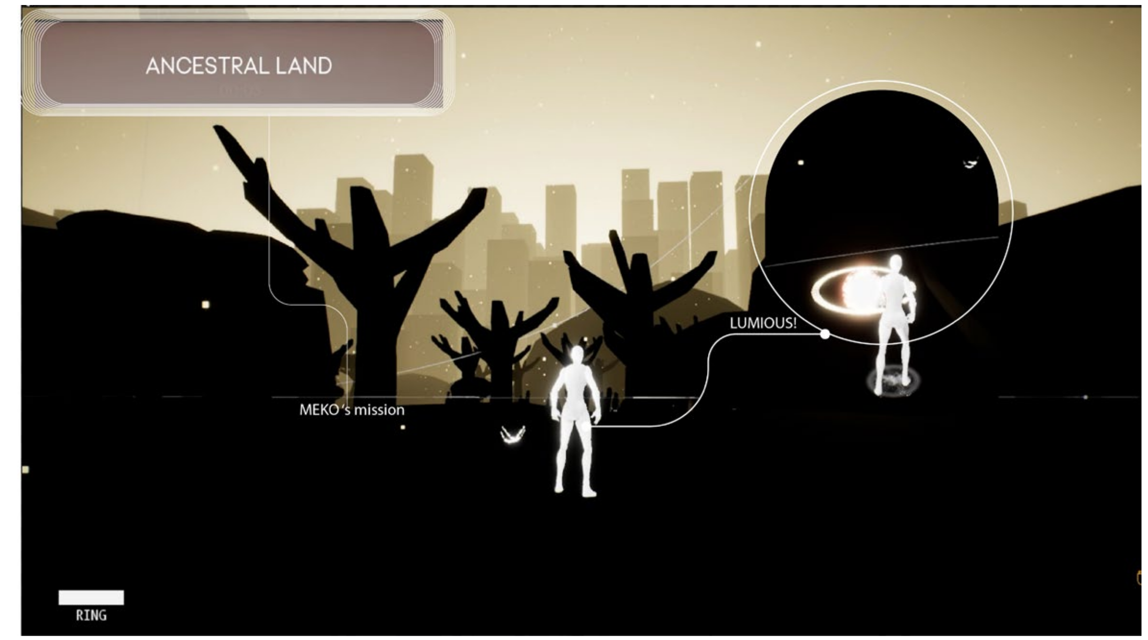




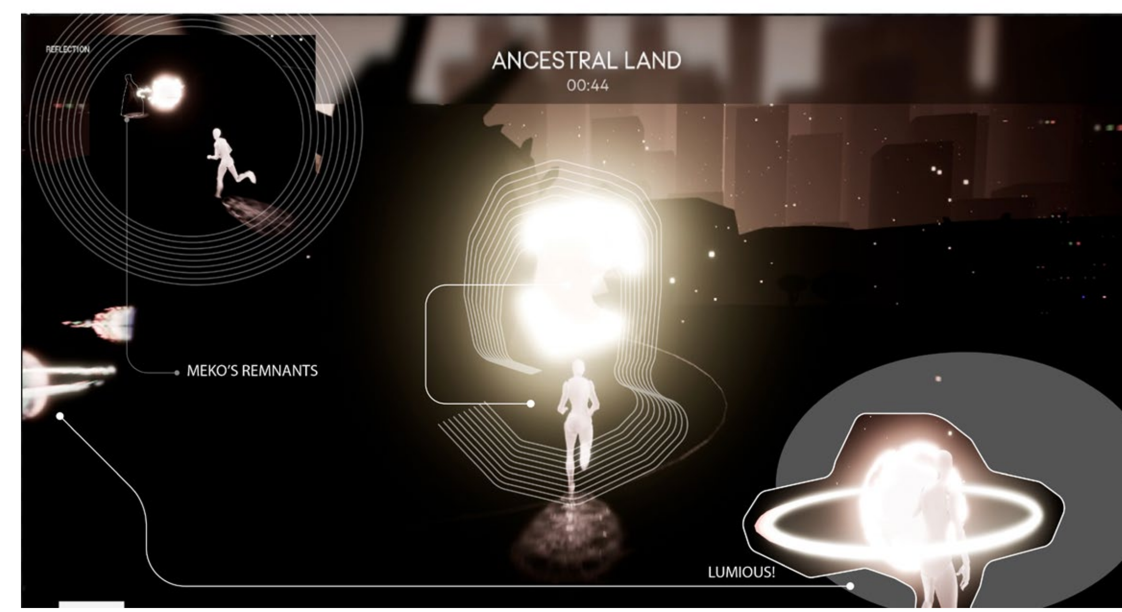




VIDEO PLAYING: https://www.youtube.com/watch?v=Nr2t7pnf3P0&t=17s



LUMIOUS



MEKO'S REMNANTS

STRAW-BALE (SB)

草包设计