PORTFOLIO

/ QIFENG GAO

MSAAD 2020'
GSAPP

The order of architecture lies in the chaotic facts.

STUDIOS

// OPEN WORK

// REBOOTING THE CITY

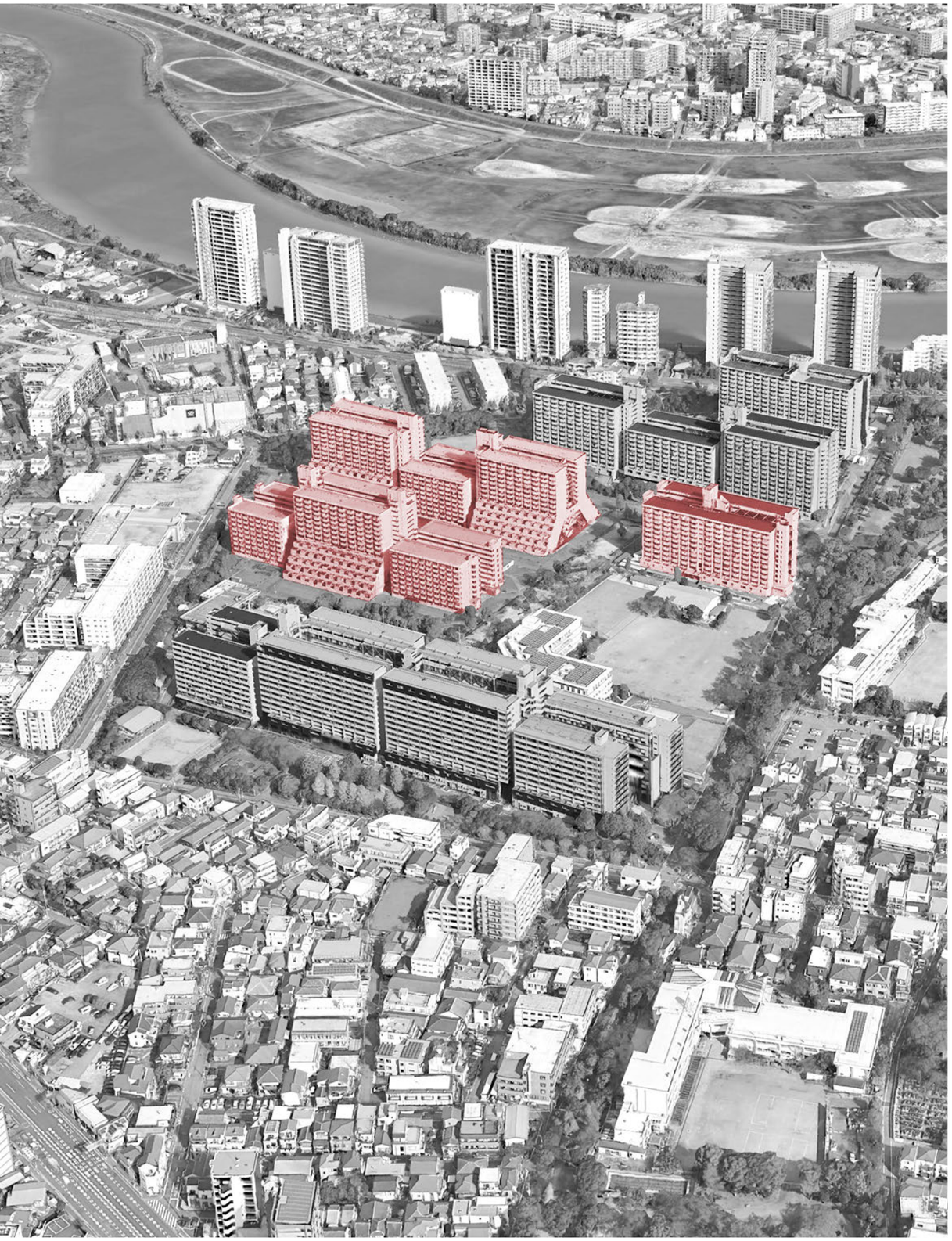
// CLOUD NURSERY

ELECTIVE

/ TENSILE-COMPRESSION SURFACE

/ RETHINKING BIM

/ FACADE DETAILING



// Open Work Studio

Kawaramachi Housing Project

May. 2020
Spring Studio, GSAPP
Critic: Enrique Walker
Collaborator: Yechi Zhang, Haitong Chen, Xinning Hua

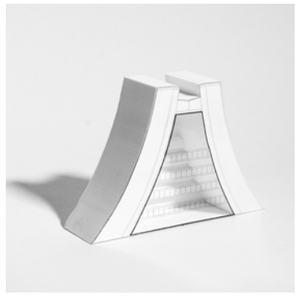
Over time with the aging of the Japanese population, eldery people encountered loneliness, depression due to lack of close family ties. The issues also applied to the A-framed megastructure Kawaramachi Danchi. Based on the knowledge of three threads (A-frame as Japanese Symbol, interior public space, and housing types in Japan), the Kawaramachi Housing project is reprogrammed as a collash of a community campus and housing units. By doubling its public space and transferring old interior A-frame space to a bigger A-framed campus, college and residence clashed into the new proposal bringing vitality back to the old community.

Ise Shrine, 500s

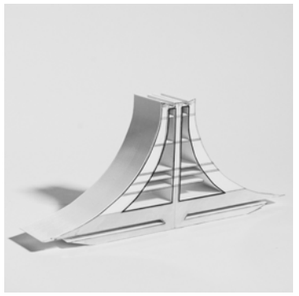
Gassho House, 1200s

Nagaya, 1500s

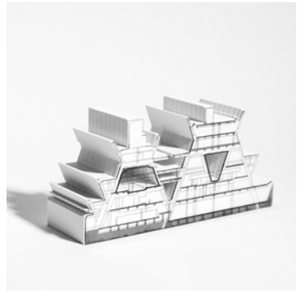
Machiya, 1600s



Boston Housing, 1959



Tokyo Bay, 1960



Kyoto Conference Center, 1963

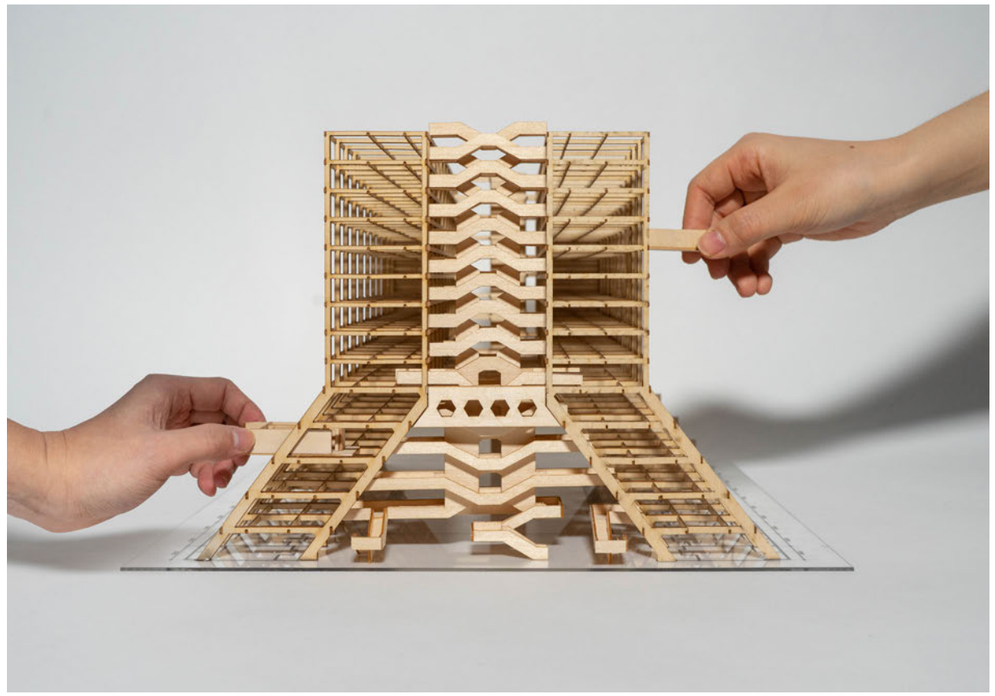
St. Mary's Cathedral, 1964

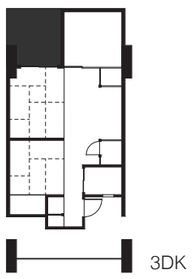
Tree Shaped Community, 1968

Kawaramachi Housing, 1970

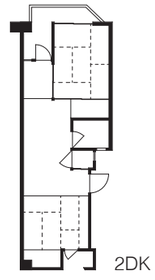
Pasadena Heights, 1972

Hirato Resort Hotel, 1977





3DK

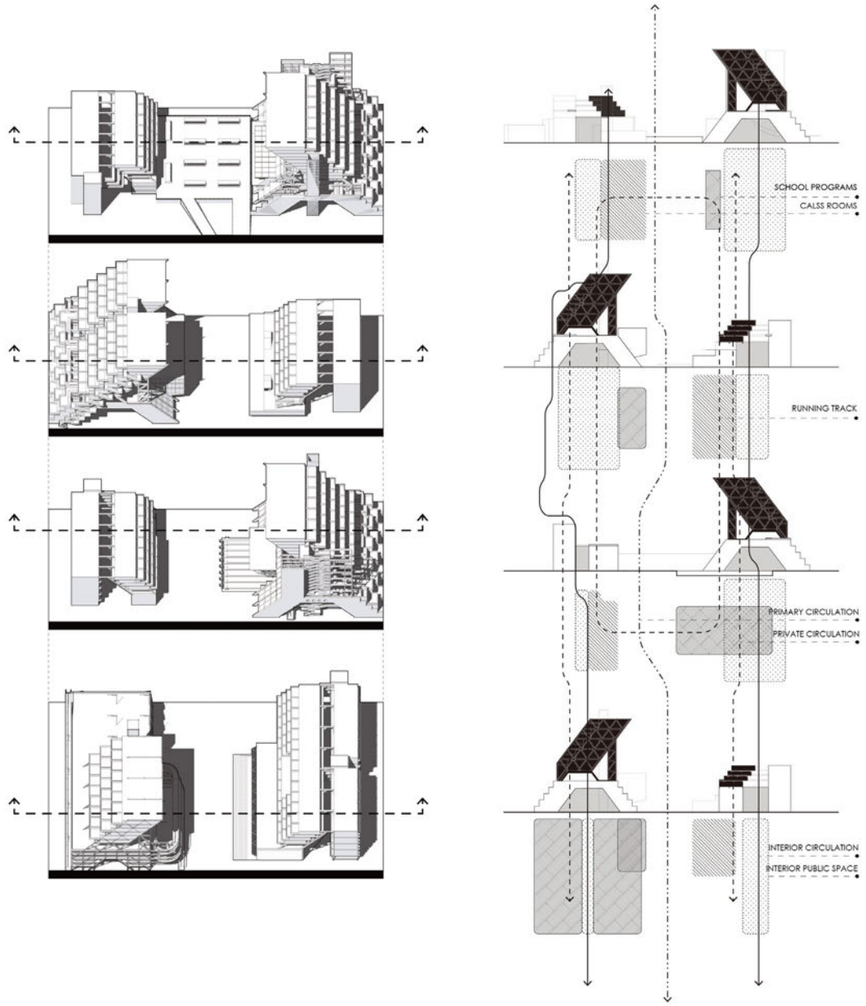


2DK

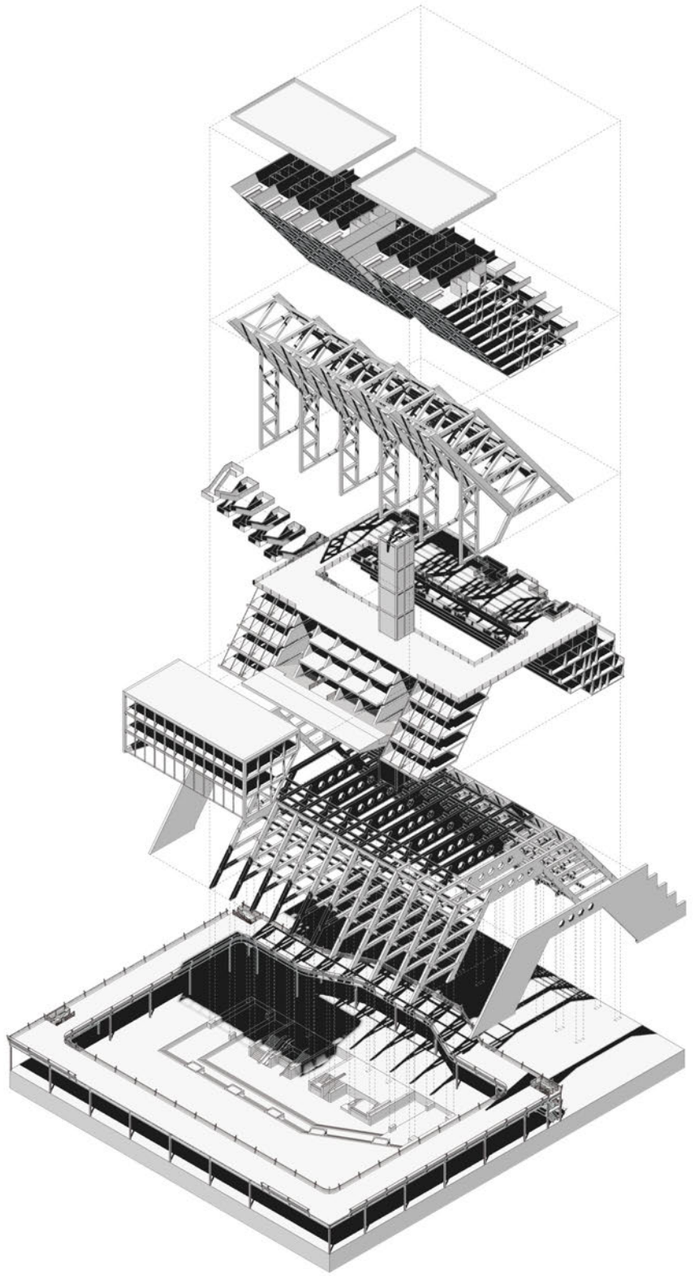
A-Frame
Interior Public Space
Japanese Housing

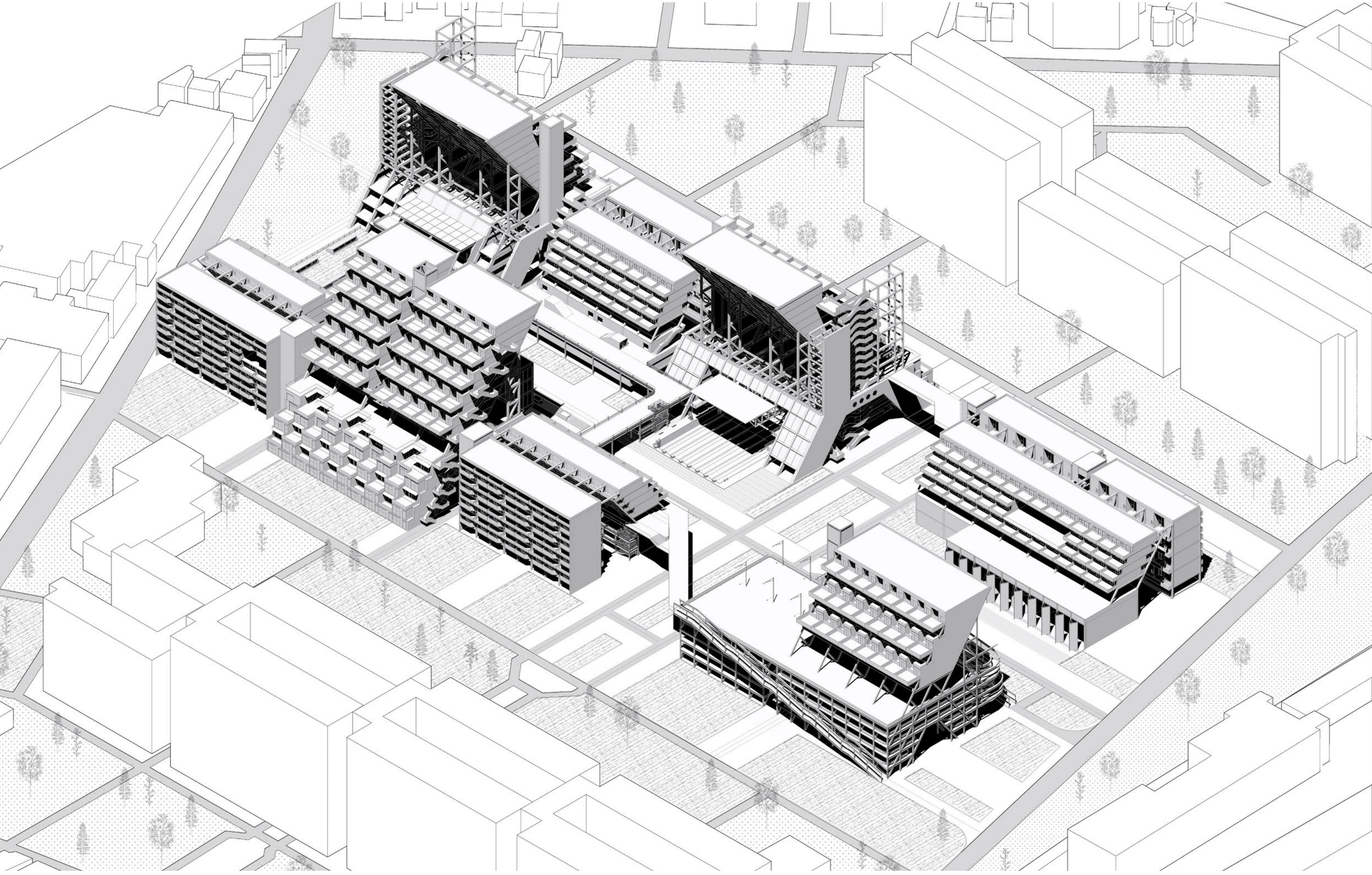
In its A-frame structure, there are two different types of housing units. As in most Danchi that were built in the 1970s, spaces there are cramped. Danchi was once popular among mid-classes 1950s, but after the post war housing crisis was solved, most Danchi residents moved away to single family detached houses, like nagaya, with family members.

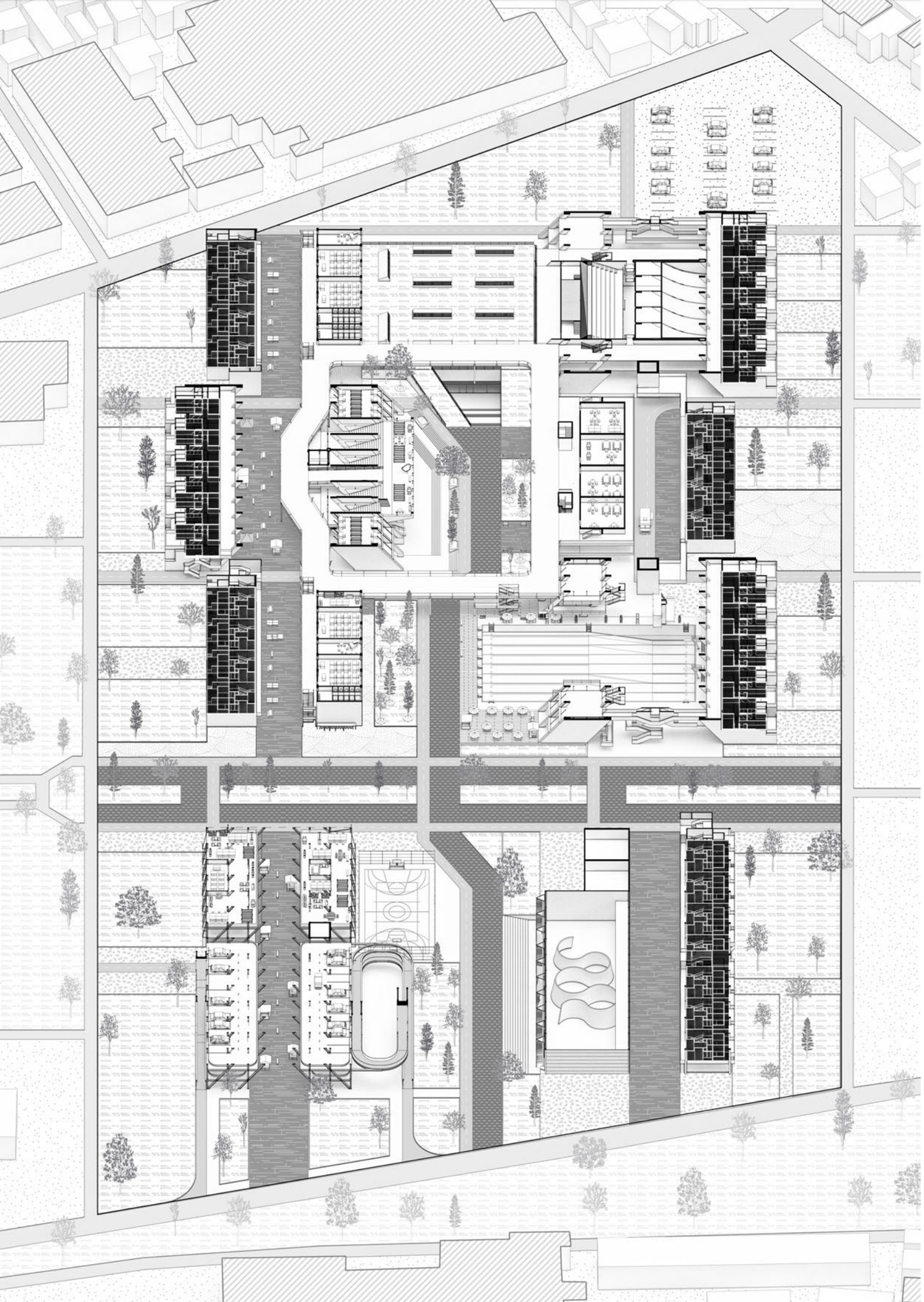
Layers of Circulation

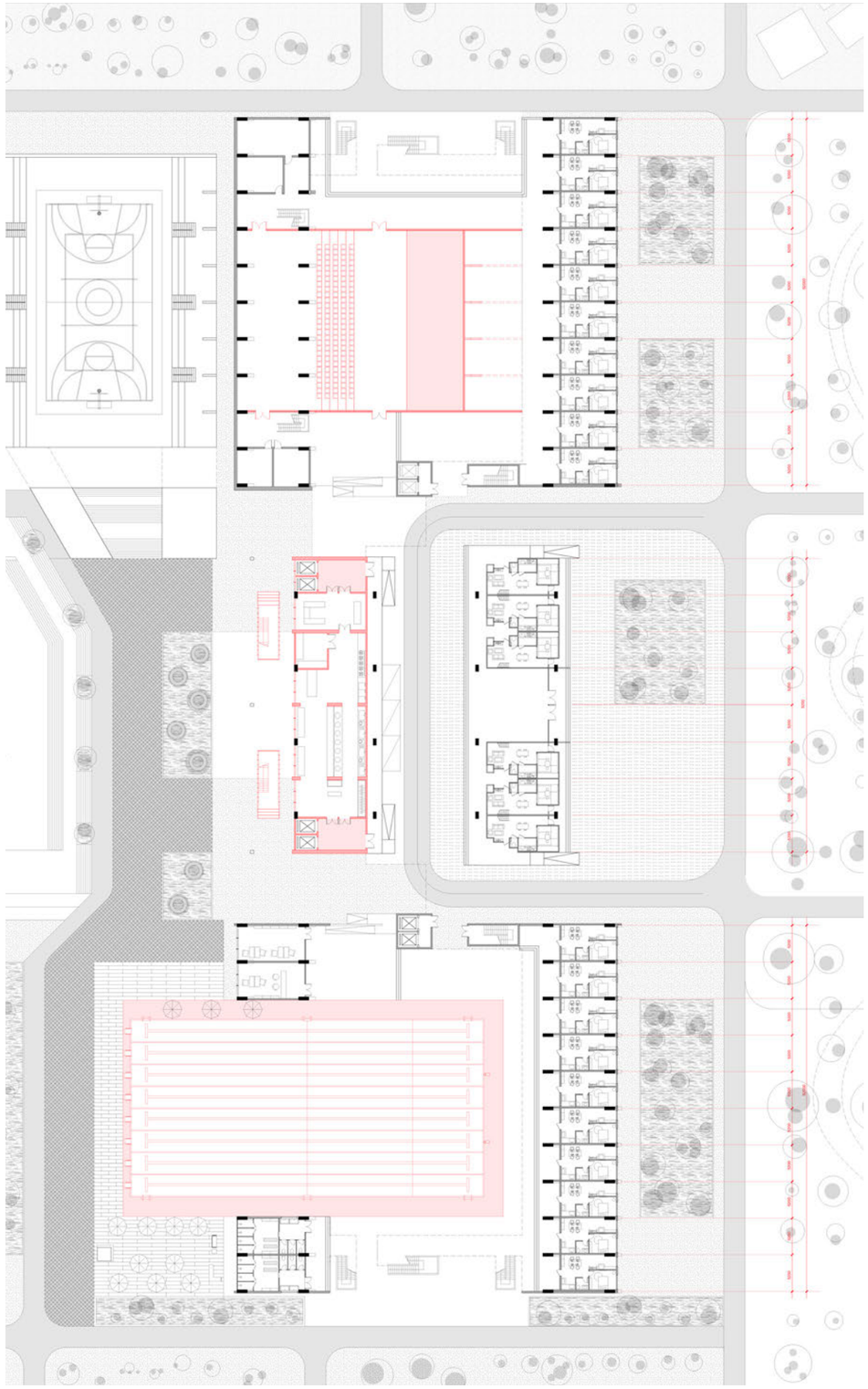


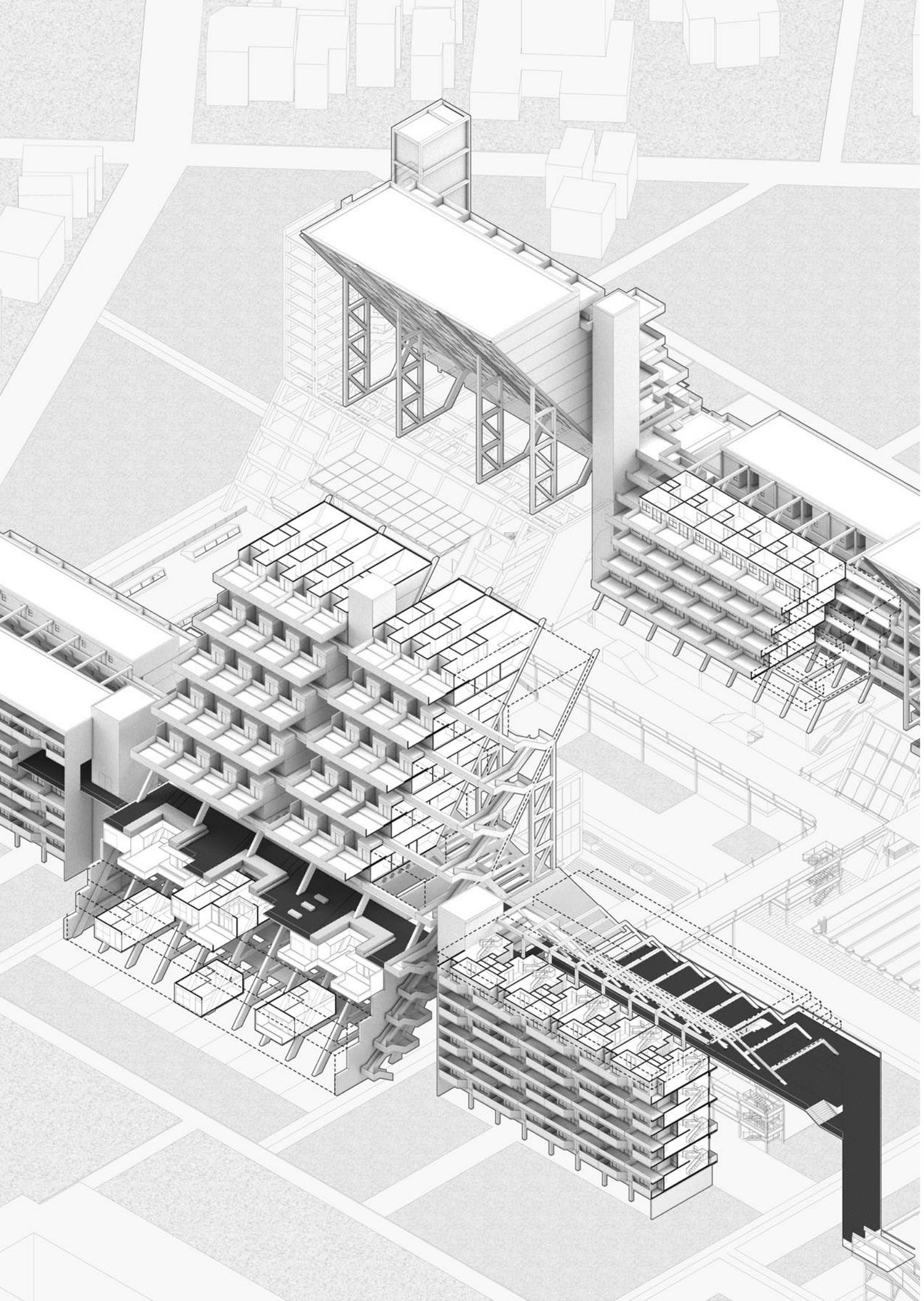
Exploded Structure

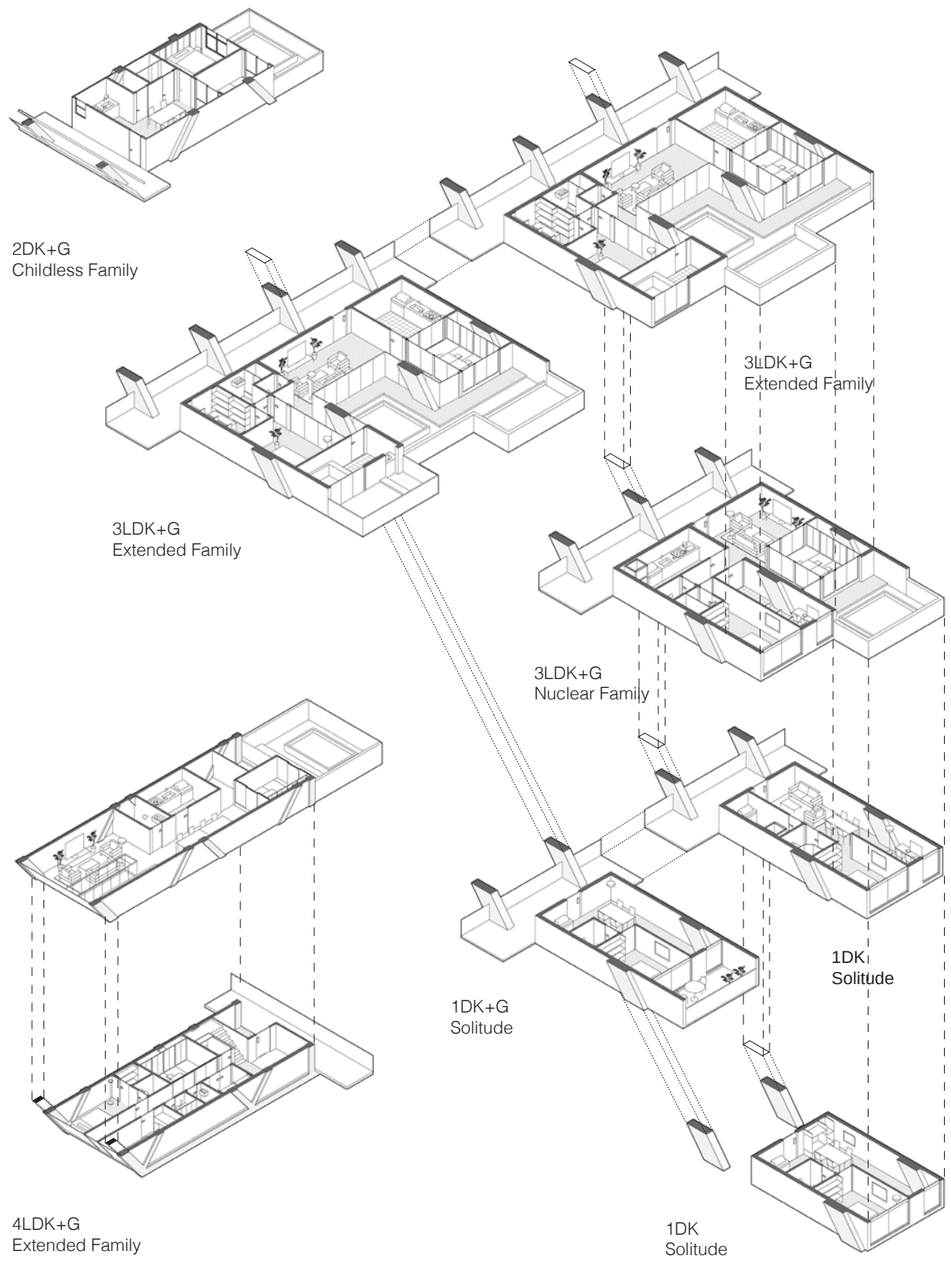


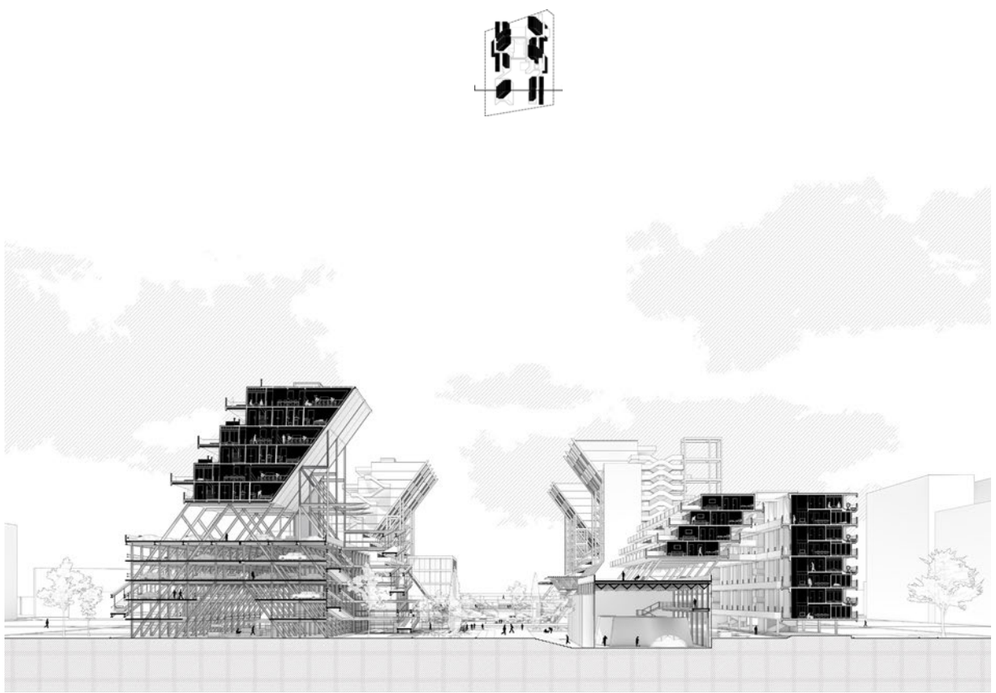


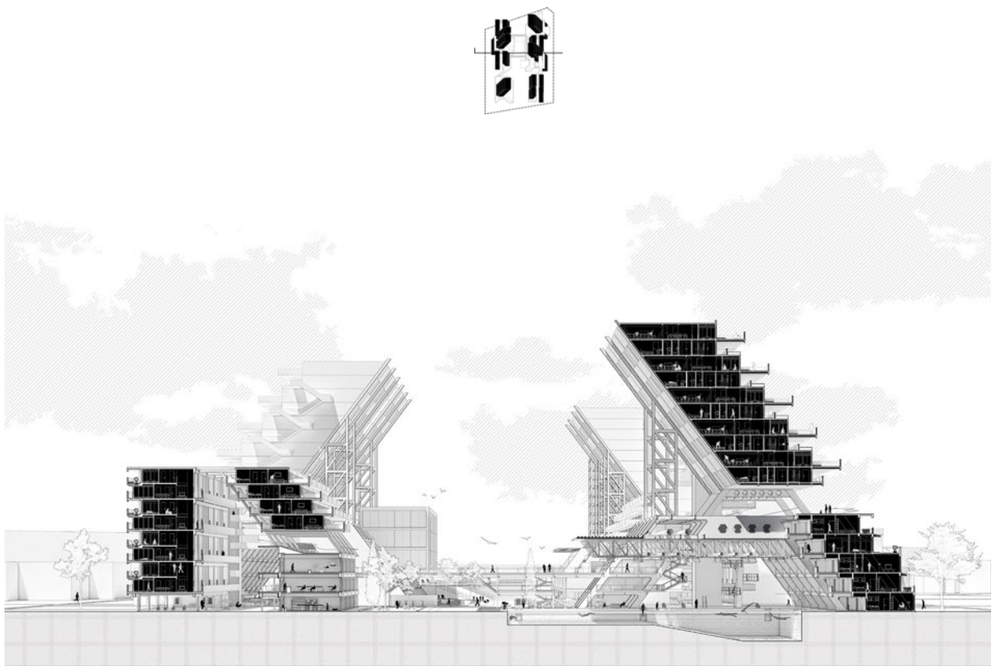


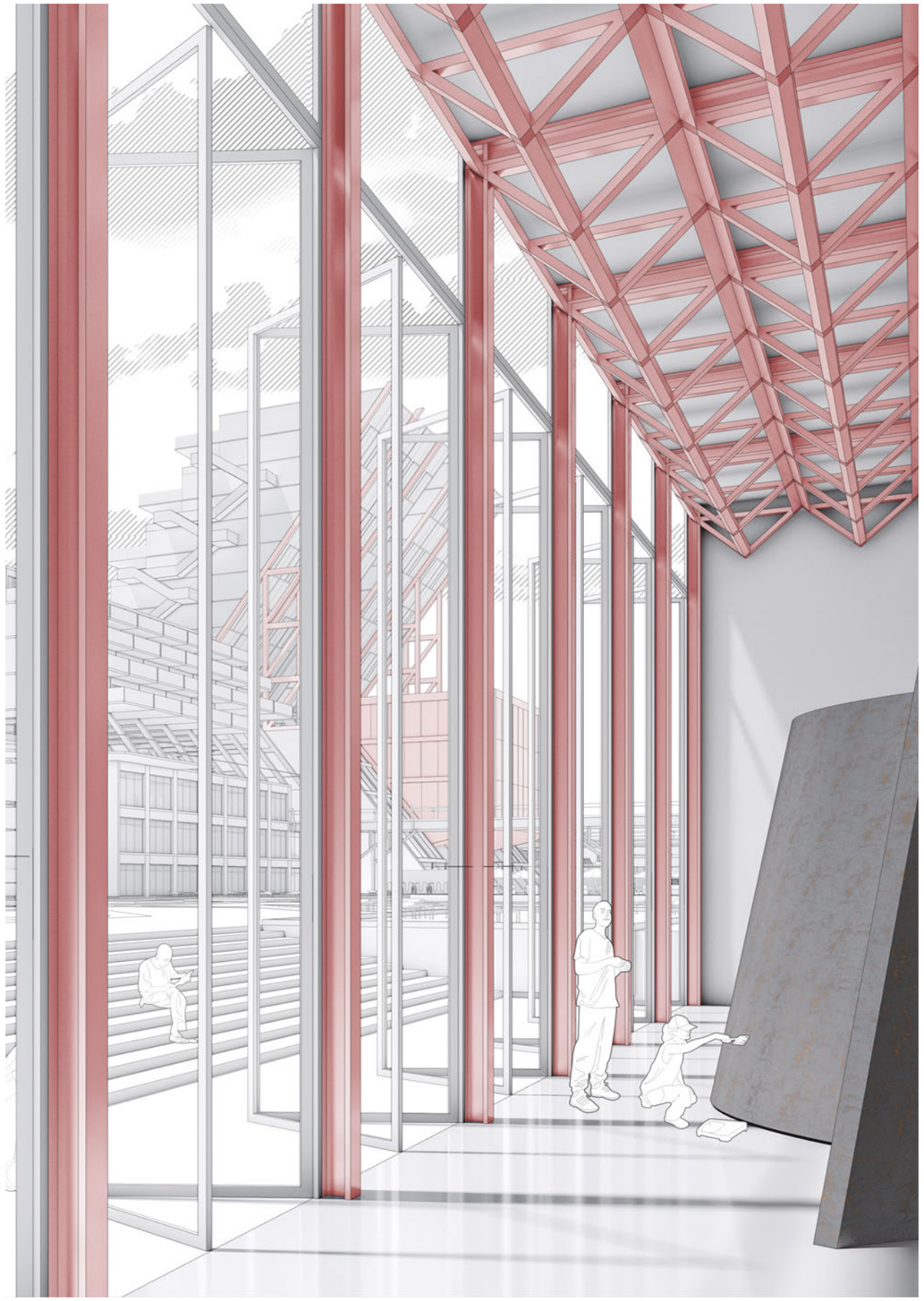


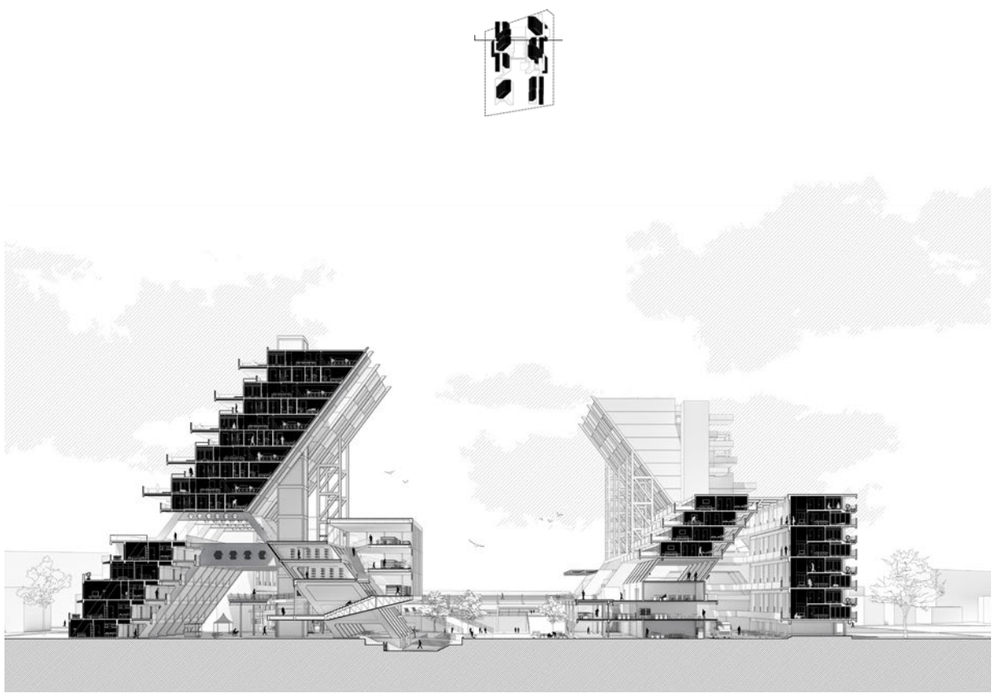


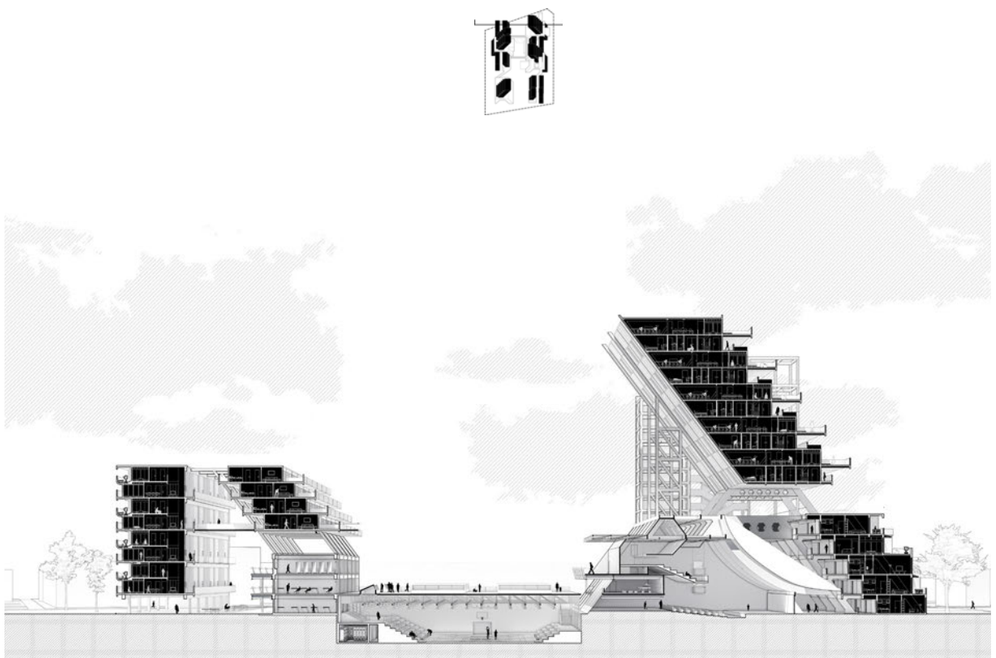

2DK+G
Childless Family
3LDK+G
Extended Family
3LDK+G
Extended Family
3LDK+G
Nuclear Family
1DK+G
Solitude
1DK
Solitude
4LDK+G
Extended Family
1DK
Solitude

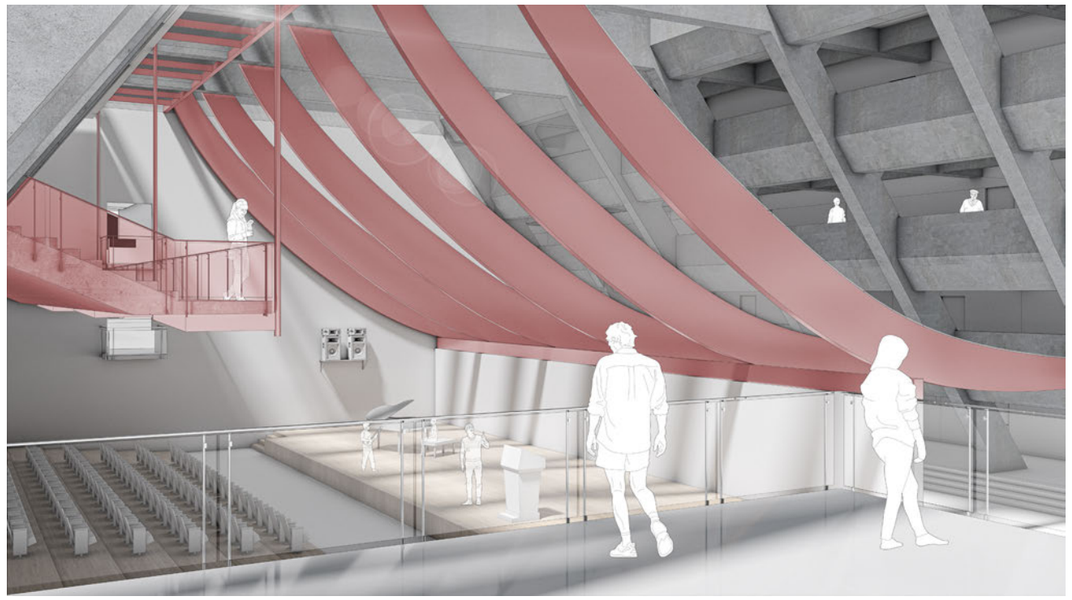




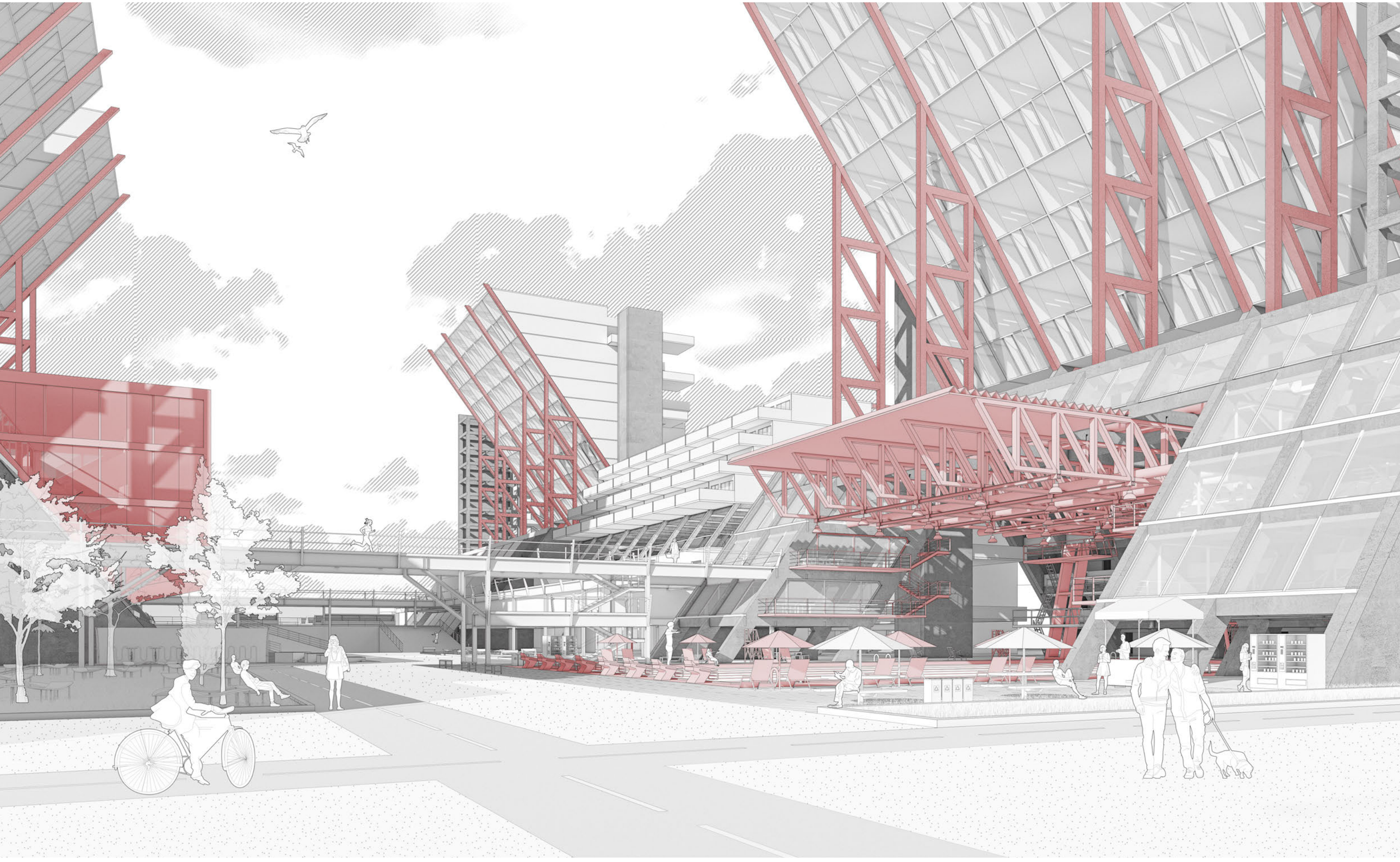


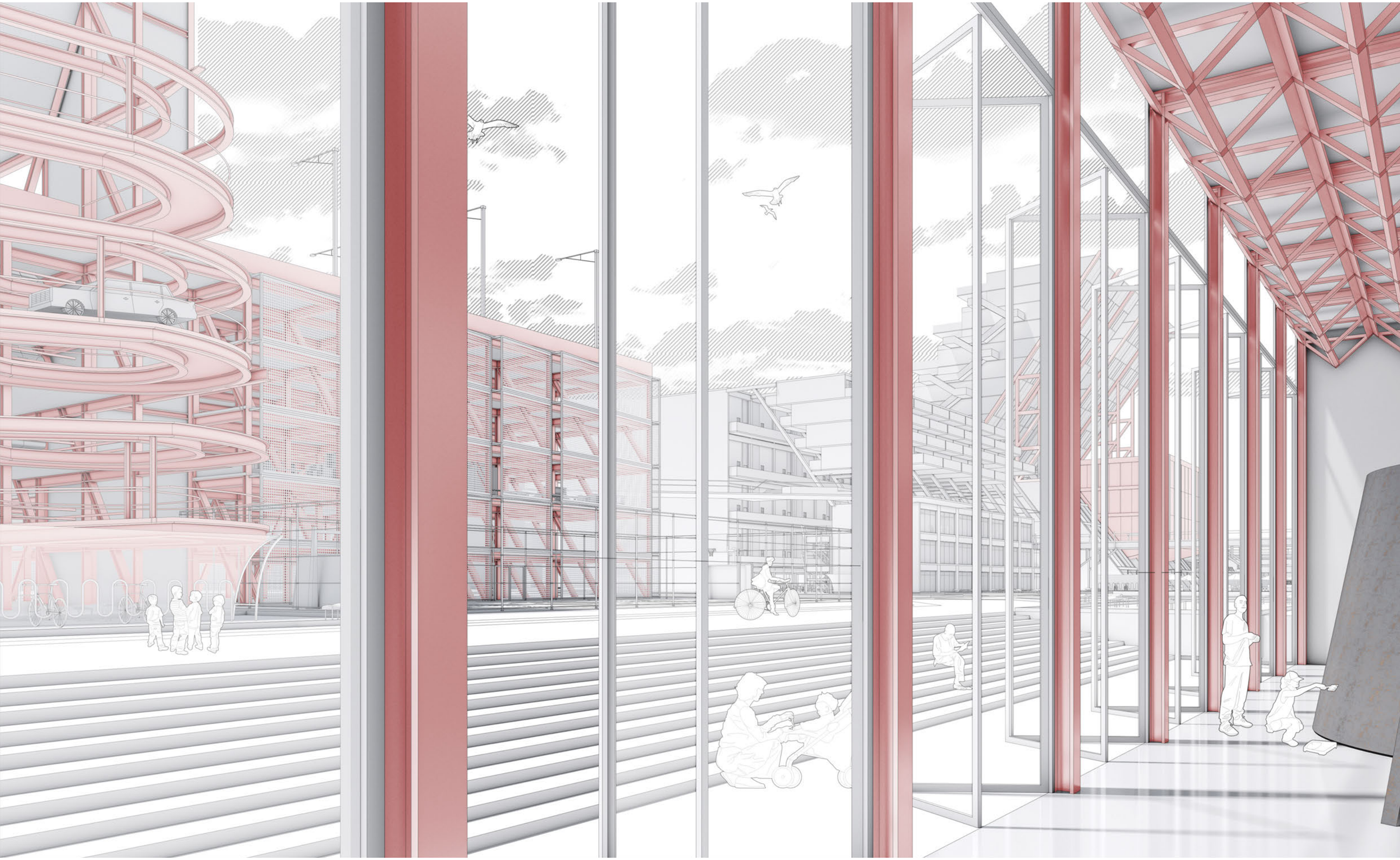


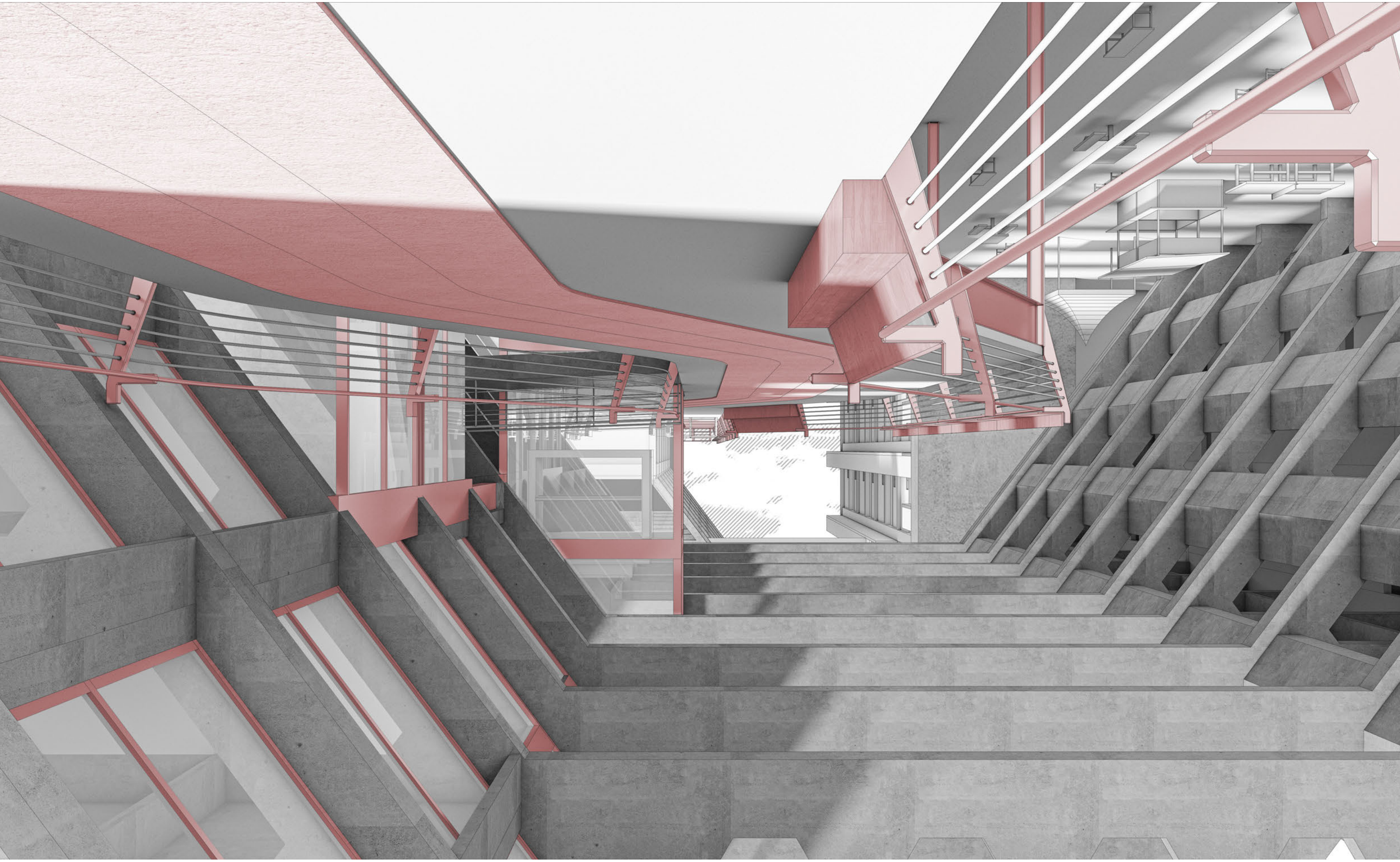


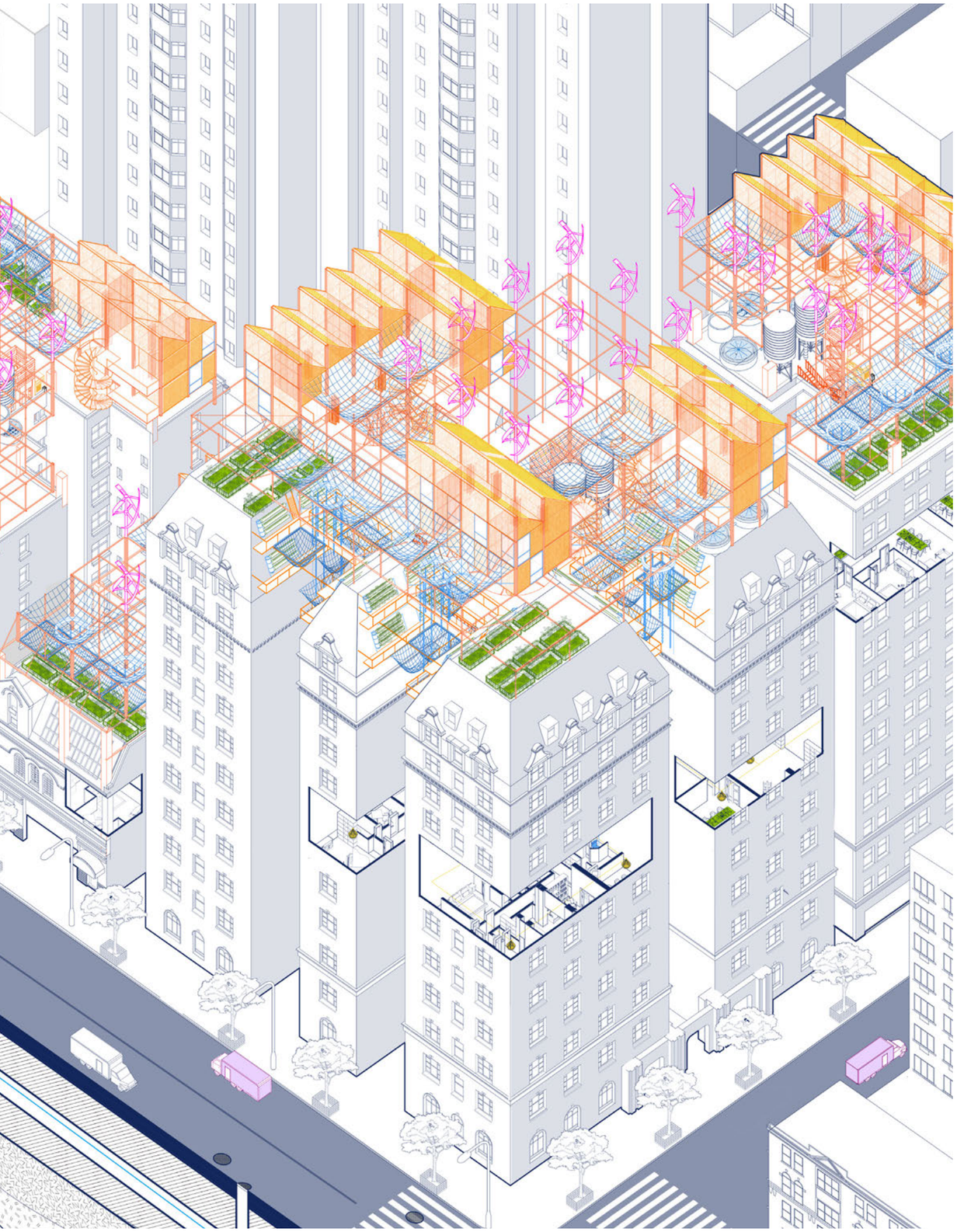


Auditorium









// REBOOTING THE CITY

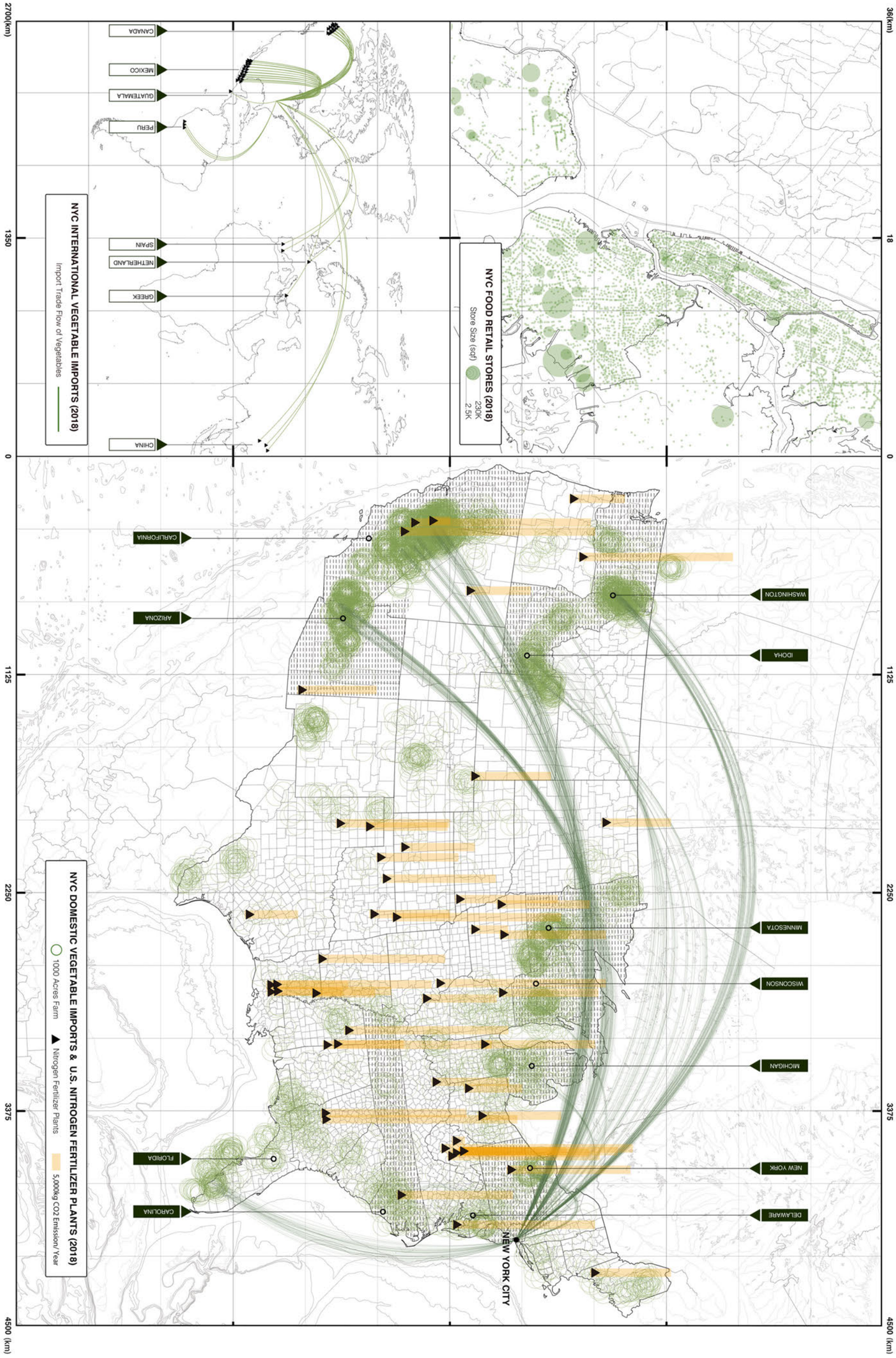
Urban infrustracture proposal facing climate change

Dec. 2019
Fall Studio, GSAPP
Abstract Selected
Critic: Andrés Jaque
Collaborator: Zifan Zhang

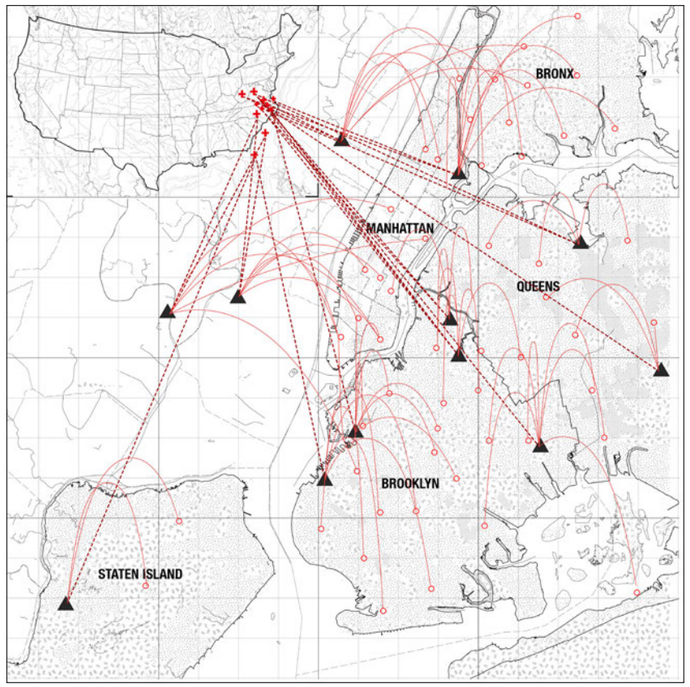
This project proposed a 2020 resolution ‘the crust’, which would be a new version of air rights utilization in NYC, to face the urgent climate change issue. Researching into the block running from 54th to 55th st and 6th to 7th Ave, the ‘crust’ would function as socio-ecological urban infrastructure in four aspects-energy, food, water and waste-by connecting itself with original buildings. All of the infrastructures would not only manage the City of New York to honor the 2050 plan target by 52%, but also it would move from a model of unequal territorial distribution of the environmental cost of its daily functioning, to an evenly distribution of environmental responsibility.

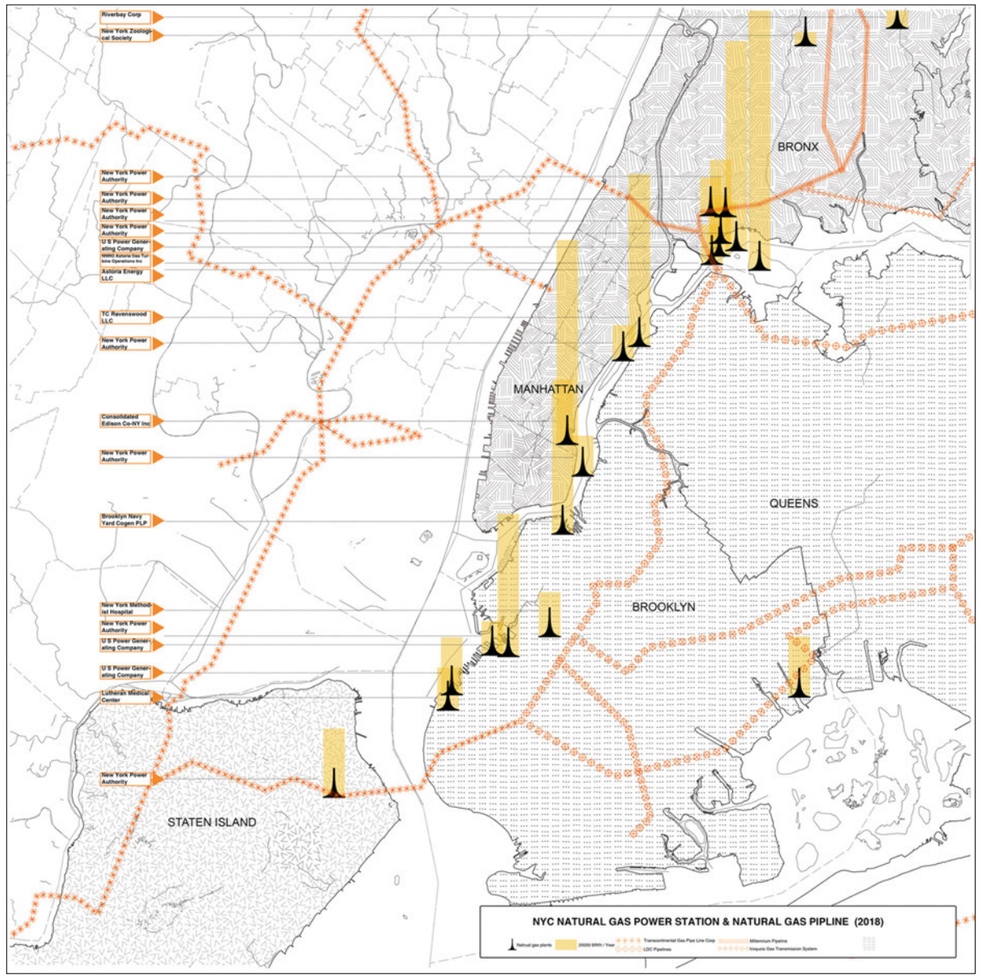
FOOD SYSTEM STATUS QUE

Behind the fact that citizens are used to purchase fresh vegetables from markets like wholefood and Trader joe's, these organic vegetables are transported through long-distance from states like California and Florida. Such food transportation emits 1.9 billion tons of carbon dioxide each year in US.



New York City sends 1.3 million tons of waste to landfill every year. When organic waste degrades in landfills, it produces methane, a kind of greenhouse gas. Removing organic material from landfills not only benefits the atmosphere, it also presents an opportunity to harness its positive value as a potential clean energy source or compost input. For these and other reasons, Mayor Bloomberg, Mayor Bill de Blasio introduced the “Zero Waste” initiative, aiming for a 90 percent reduction in landfill use by 2030. A cornerstone of the plan was a robust compost program, where organic matter would be placed in brown bins provided by the city, picked up by the Sanitation Department, and then sold or delivered to places that turn the food into compost for gardening or convert it to energy.





As we know, buildings in Manhattan are fueled by power stations in New York State, including 20 that are sourced with natural gas. 44 % of the mix in NYC is natural gas and 33% comes from thses 12 power plants. These powers stations together are responsible of 86,200 tons of CO_2 emissions annually.

CITY OF NEW YORK
BOARD OF ESTIMATE AND APPORTIONMENT

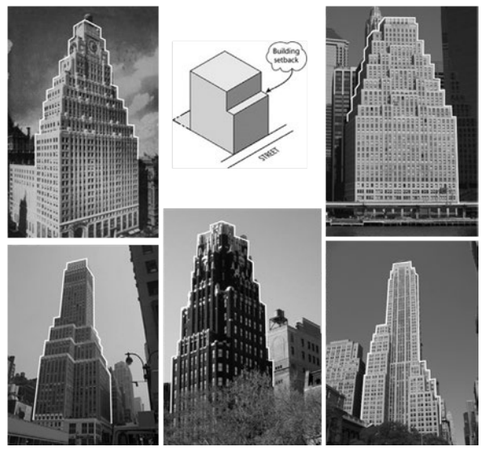
BUILDING ZONE RESOLUTION
(Adopted July 25, 1916.)

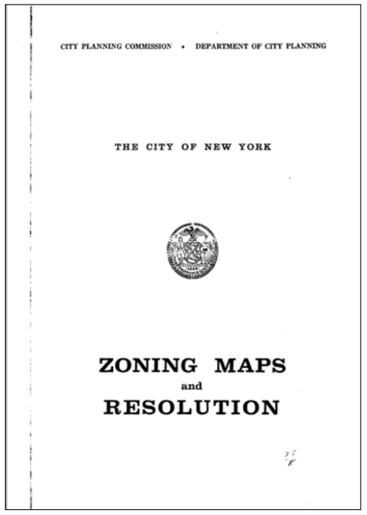
A Resolution regulating and limiting the height and bulk of buildings hereafter erected and regulating and determining the area of yards, courts and other open spaces, and regulating and restricting the location of trades and industries and the location of buildings designed for specified uses and establishing the boundaries of districts for the said purposes.
Be it resolved by the Board of Estimate and Apportionment of The City of New York:

ARTICLE I - DEFINITIONS

§1. **Definitions.** Certain words in this resolution are defined for the purpose thereof as follows:
(a) Words used in the present tense include the future; the singular number includes the plural and the plural the singular; the word "lot" includes the word "plot"; the word "building" includes the word "structure."
(b) The "width of the street" is the mean of the distances between the sides thereof within a block. Where a street borders a public place, public park or navigable body of water the width of the street is the mean width of such street plus the width, measured at right angles to the street line, of such public place, public park or body of water.
(d) The "curb level," for the purpose of measuring the height of any portion of a building, is the mean level of the curb in front of such portion of the building. But where a building is on a corner lot the curb level is the mean level of the curb on the street of greatest width. If such greatest width occurs on more than one street the curb level is the mean level of the curb on that street of greatest width which has the highest curb elevation. The "curb level" for the purpose of regulating and determining the area of yards, courts and other open spaces is the mean level of the curb on the street or streets where there is the highest curb elevation. Where no curb elevation has been established or the building does not adjoin the street the average ground level of the lot shall be considered the curb level.
(e) A "street wall" of a building, at any level, is the wall or part of the building nearest to the street line.
(f) The "height of a building" is the vertical distance measured in the case of flat roofs from the curb level to the level of the highest point of the roof beams adjacent to the street wall, and in the case of pitched roofs from the curb level to the mean height level of the gable. Where no roof beams exist or there are structures wholly or partly above the roof the height shall be measured from the curb level to the level of the highest point of the building. Where a building is a tenement house as defined in the tenement house law the said law for the measurement of the height of a tenement house and such measurement shall be from the curb level as that term is used in said law.
(g) The "depth of a lot" is the mean distance from the street line of the lot to its rear line measured in the general direction of the side lines of the lot.
(h) A "rear yard" is an open unoccupied space on the same lot with a building between the rear line of the building and the rear line of the lot.

I.City of New York Board of Estimate and Apportionment
Building Zone Resolution
Adopted 1916



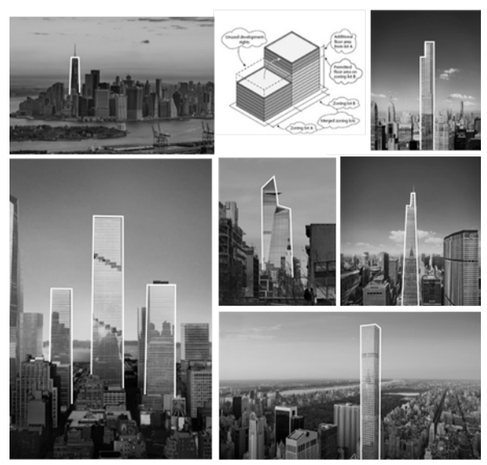


CITY PLANNING COMMISSION • DEPARTMENT OF CITY PLANNING

THE CITY OF NEW YORK

ZONING MAPS
and
RESOLUTION

II Zoning Maps and Resolution
City planning commission department of city planning
Adopted 1960



Now, existing buildings in NYC are standing at the frontier of the battle against global warming. The Building Industry accounts for 39% of global CO_2 emission, and since 80% of the buildings that will exist in 2050 in NYC are already here today.

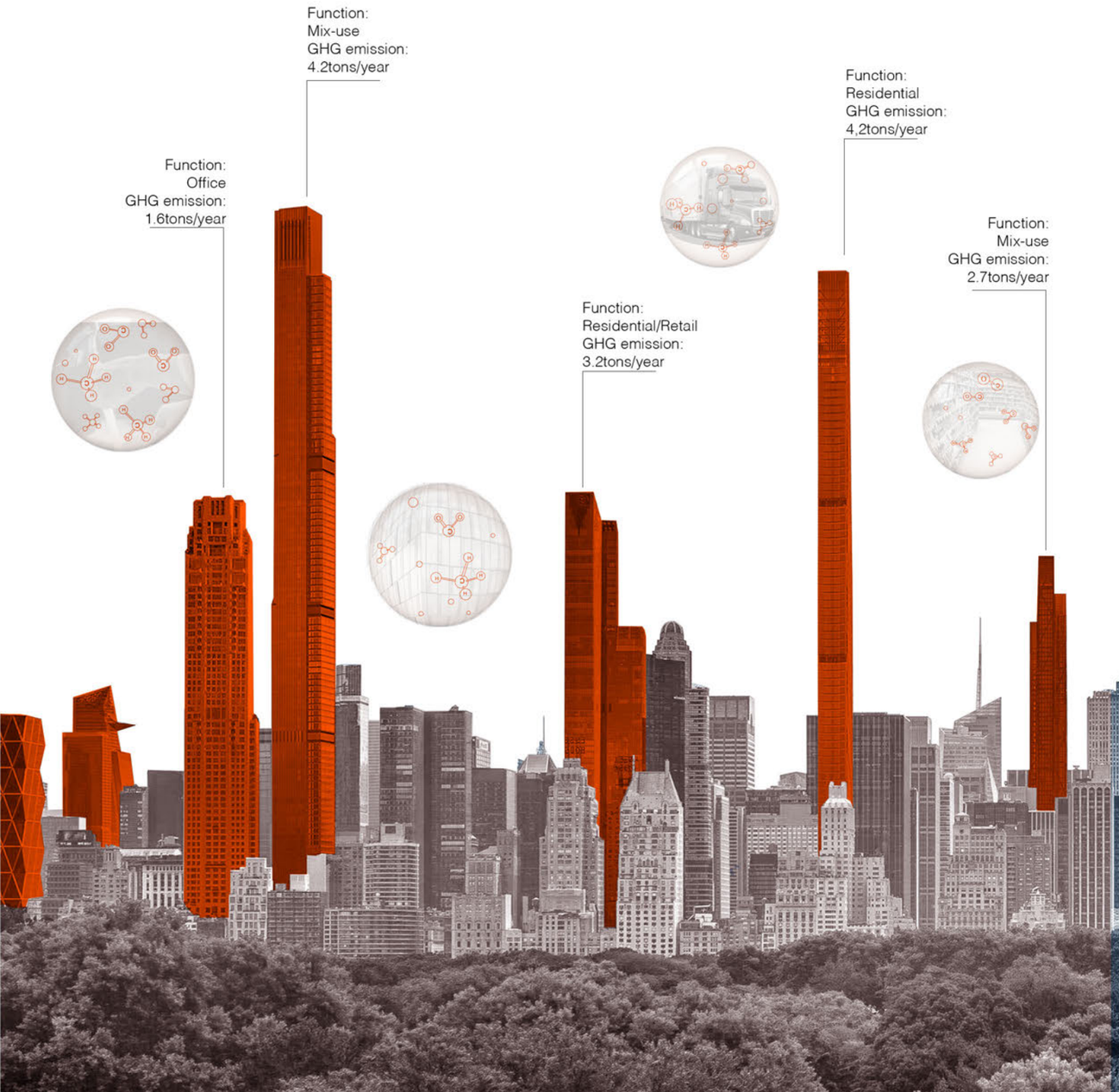
Intervening into existing building systems is the only opportunity to reduce GHG emission. Human beings are facing an unprecedented climate crisis. By 2018, GHG emissions have caused the Earth to warm up by 1 °C compared with in 19th century.

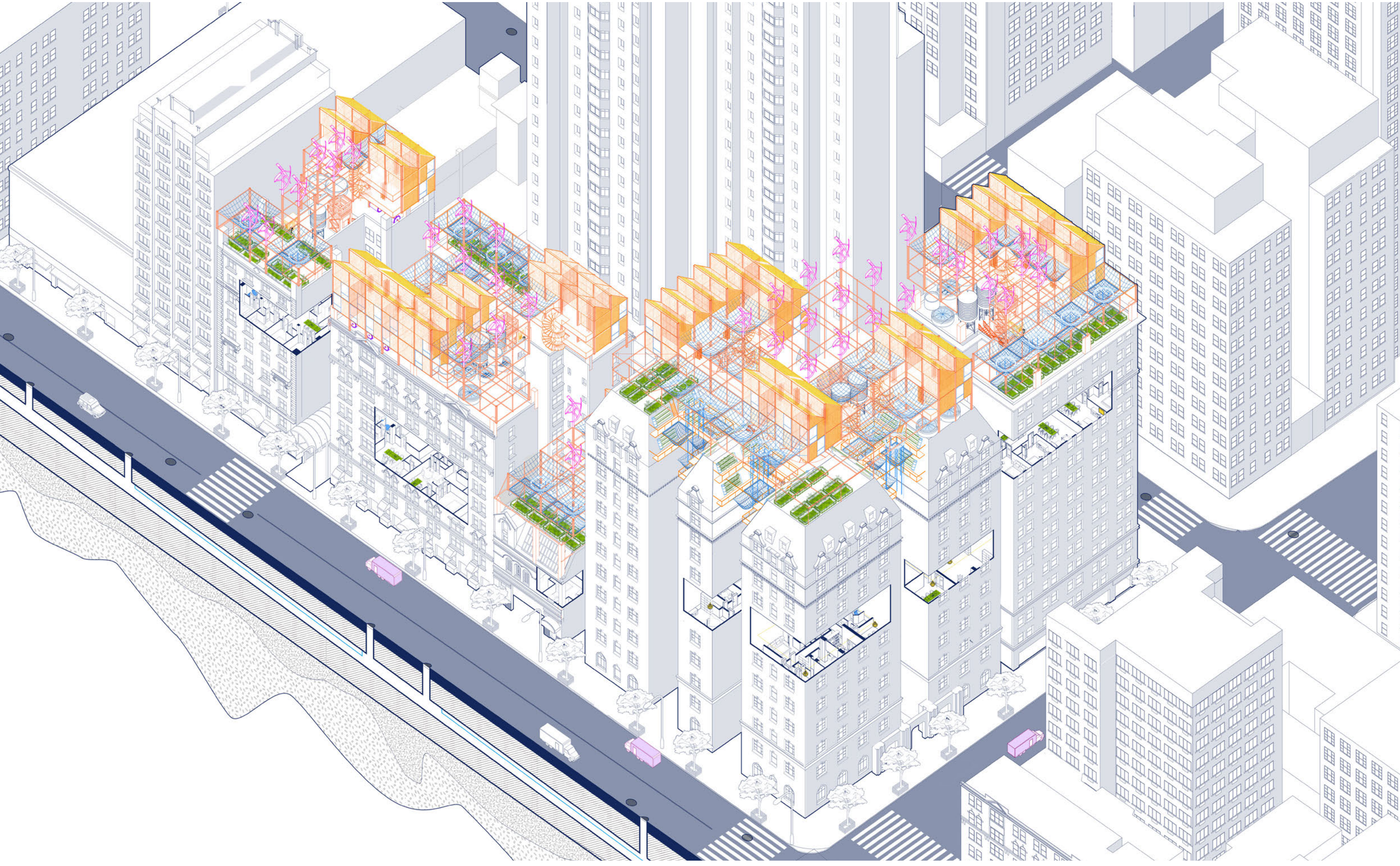
And even just an half degree increase is not a small deal: ice-free summers are 10 times more likely in the Arctic area; an additional 23% of the world population and 61 million people would be exposed to severe heat waves and drought and so forth.

Just as the 1916 zoning code lead to building setback, while 1961 resolution lead to high-rise skylines based on air right trading. We urgently propose a brand new ***2020 resolution***, which supports a public infrastructure named the ***CRUST***.

It would be a new version of air rights utilization in the climate regime. By intervening the inner systems including energy, food, waste and water, the ***CRUST*** will reboot the exiting building and the city.

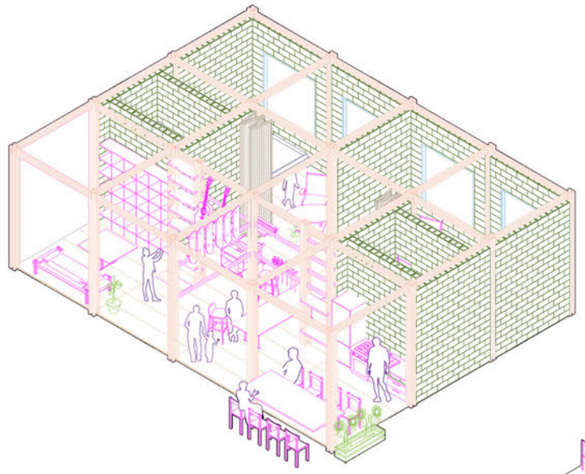
By carrying out the policy of using air rights, rather than continue building giant sky-scrapers and strengthen the empire of capital, a reformation in Manhattan would arise. Individuals has new opportunity to find their niche in social structures – the urban farmer.





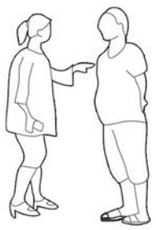
Urban farmer, a new social class

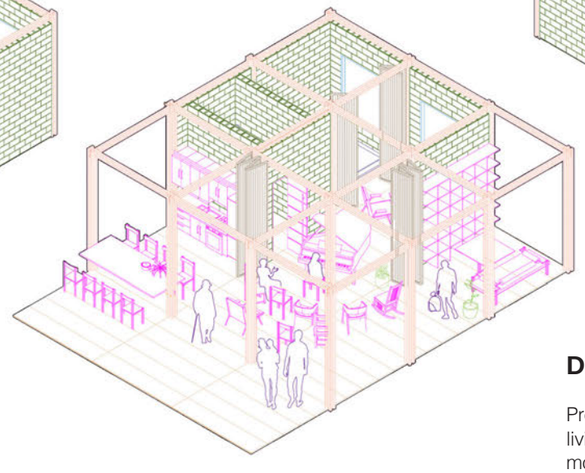
In fact, almost 300 people are moving out of the New York City per day since he average rent prices increasement by 4.1% year-over-year in Manhattan. While in the climate paradigm, part of them who are willing to offer labor in farming and monitoring infrastructures finally have the chance to stay but not flee from this metropolitan. The urban farmers share the same entrance with the original residences and live in the CRUST. The CRUST is supposed to develop into an urban layer that contains functions like education, children daycare, and community libraries, which make it a brand new and dynamic urban landscape, which reboost the city to step into climate paradigm.



Household Labors and Day-care

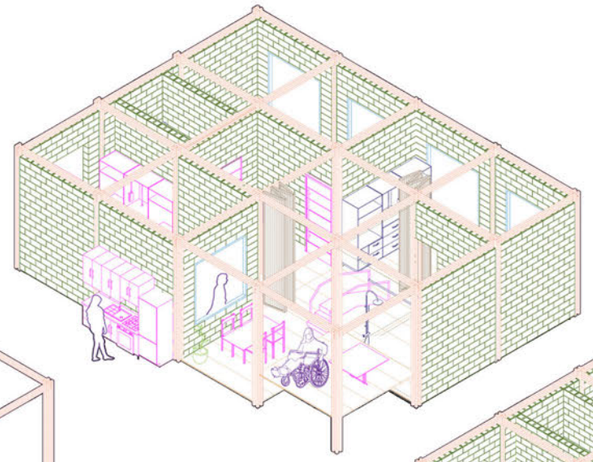
Household labors is able to take part in day-care working for children while their parents are out during daytime.





Mixed Living and Display Area

People can open flexible display spaces to share their art or music with neighborhood. Meanwhile, they can also enclose their private working spaces.

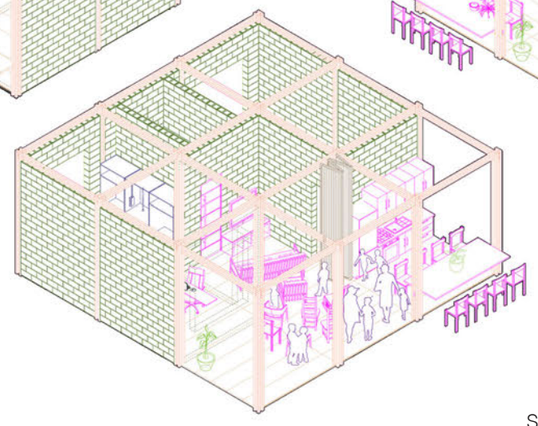


Disabled Residence

Provided with vertical movable living space, disabled people can move through floors easily to get in touch with their neiborhoods.

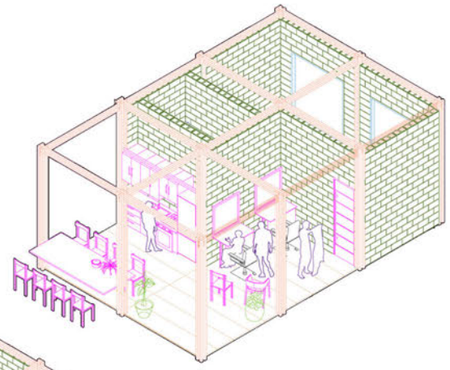
Inter-generation Co-living

Inter-generation co-living on one hand offers opportunity for conveying household skills, and on the other hand help the elders learn from the young generation in high-tech gadgets.

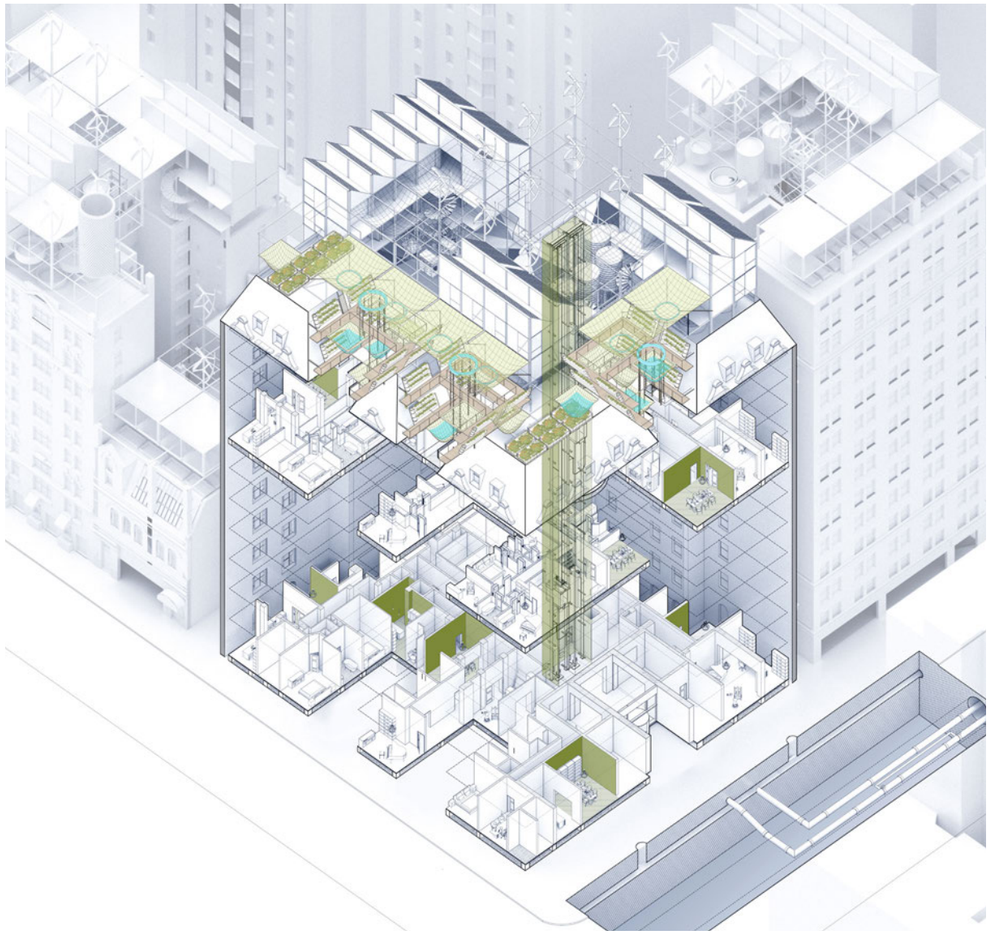


Seperate Privacy with Shared Working Space

Strangers live separately can share working space to lower the rent price, and this arrangement also create opportunity for cooperation.



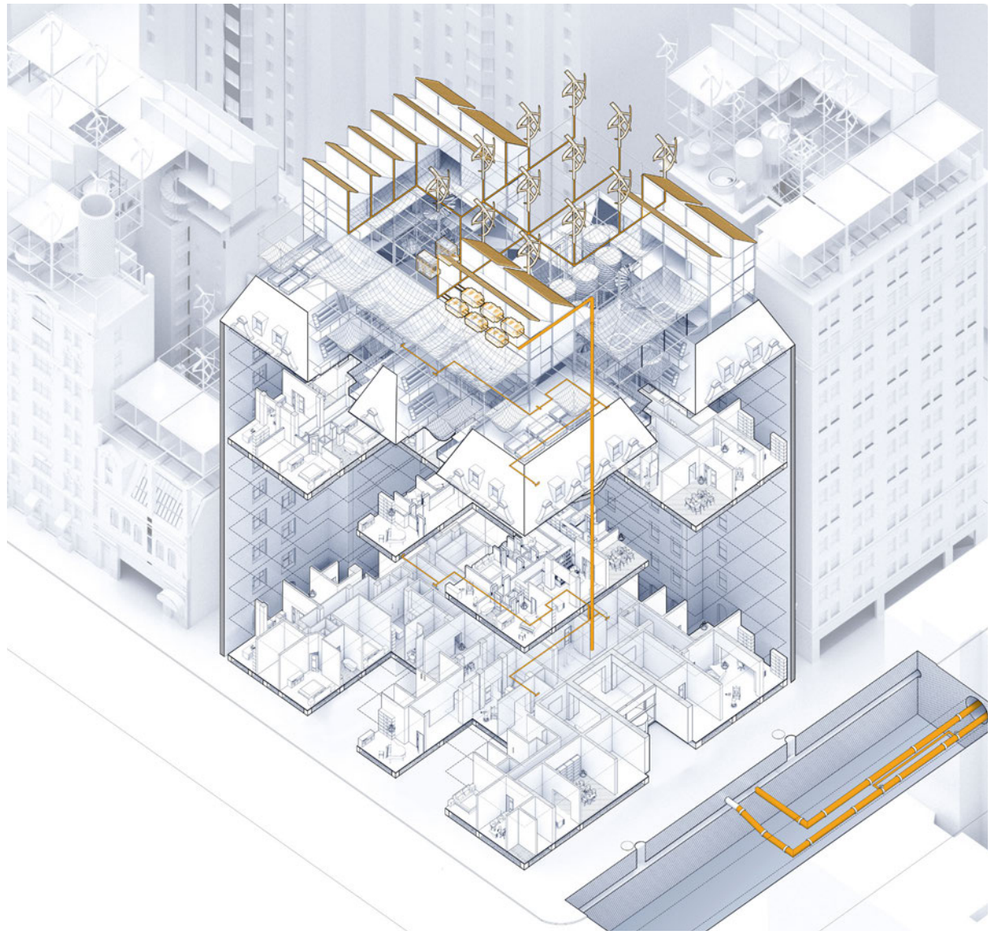
Based on the population investigation in NYC 2018, there would be 5 kids(13-), 12 teenagers(13-18), 50 adults (18-60) and 13 elderly people (60+) in a group of 80, which is the least population that can form a community. Among those people, various relationship would be built up. To situate both privacy and publicity for the community in the ‘CRUST’, changable modulars are being used.



Food System

The CRUST makes it possible to introduce a new urban food production strategy in the existing buildings. This is not unusual in NY, for instance, there is a dairy farm located in the Ansonian building on the Upper west Side.

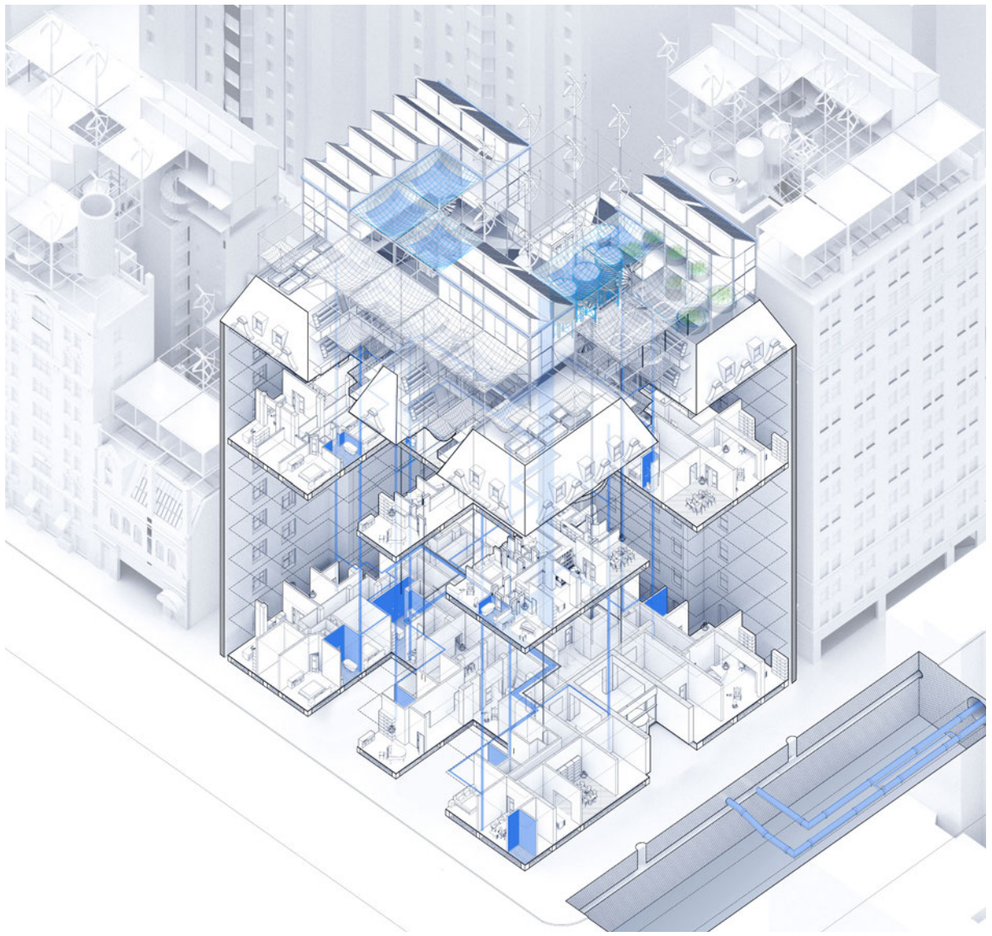
We are introducing the CRUST Farms as an urban strategy to reduce the impact of food production. In this block, enough quantity of vegetables can be grown in 1876 m^2 aquaponic farms for 683 people, which elimi-nates 847kg CO_2 per year caused by industrial fertilizer production and vegetable transportation.



Energy System

The CRUST replaces the 5 out of 7 boilers fueled with Natural Gas with a geothermal system operating not in the rock but in the sewage system.

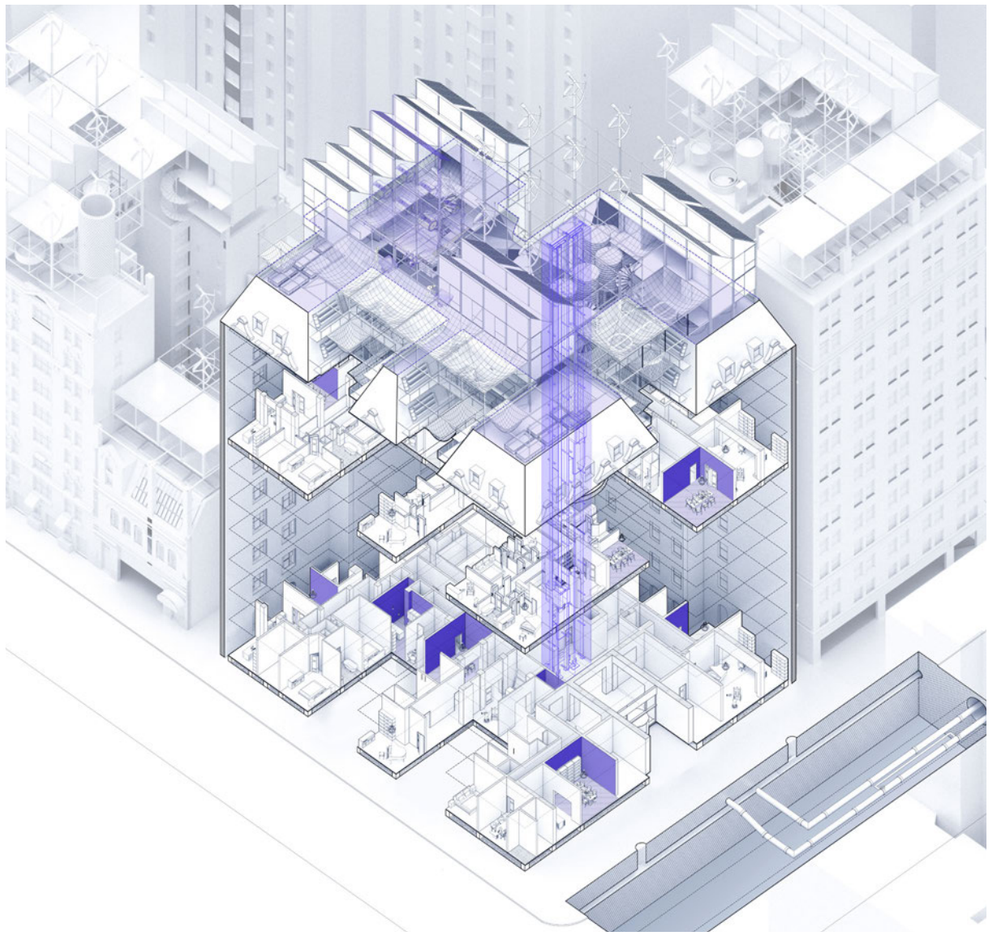
Such system has already be in application in Penyvesia. Taking ad-vantage of the stable temperature in sewer drainage underground from 10°C-20°C. The geothermal circulation can insure the heating under 0°C, cooling beyond 20°C, which reduce 74% of the natural gas used to fuel on-site boilers.



Water System

The NYC water supply system serves 8.5 million NYC residents each day. Thus the sewage produced by residential buildings flows to 14 waste water plants with flows of 6.8 million msewage water, 1.3 million tons of CH_4 emission per year in synthetic processes.

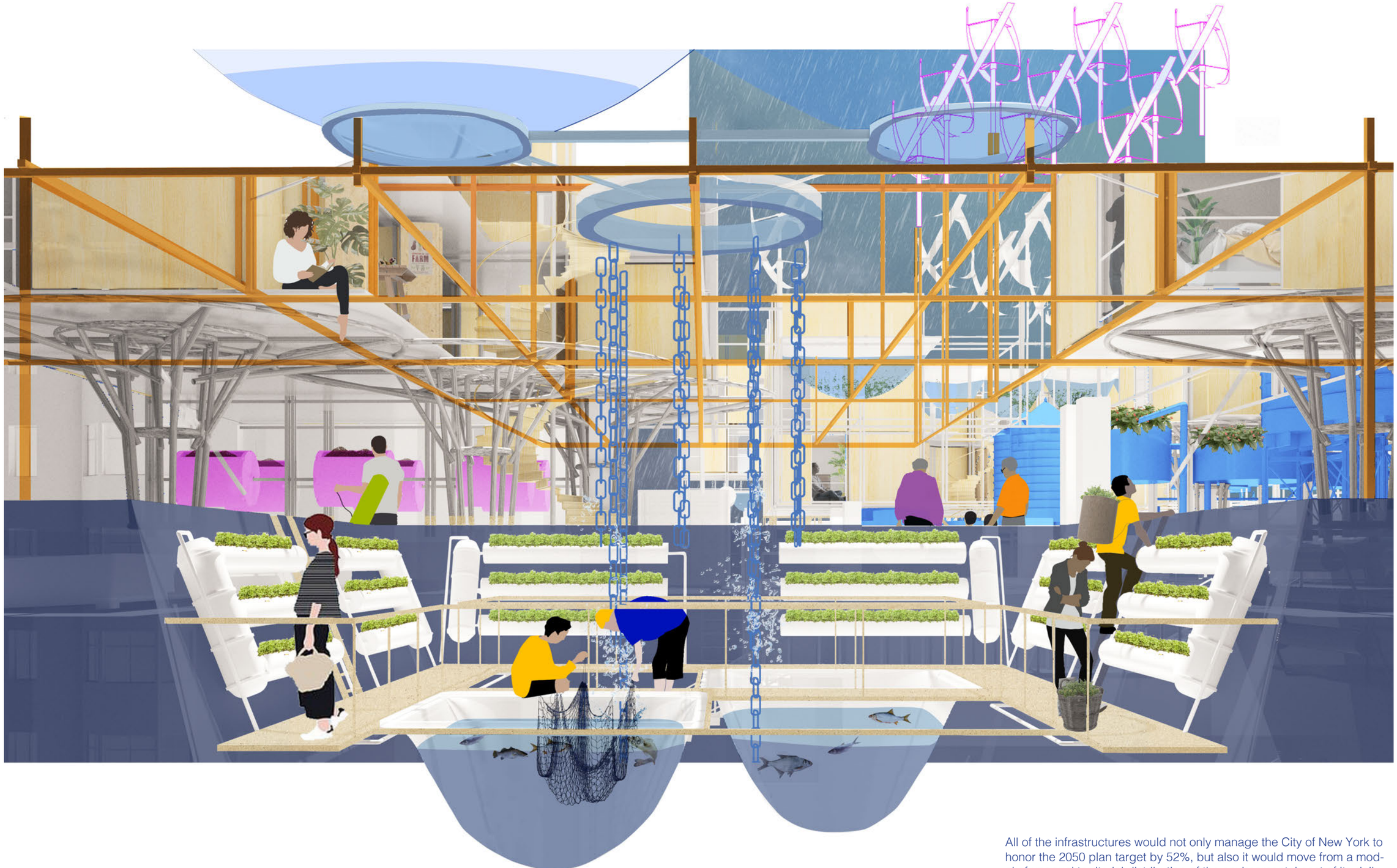
While in the CRUST, the biological waste water recycling system includes five steps will be installed. Waste water can be pumped into bio filter and reused in gardening, flushing, washing machine, mopping, which reduces 68,000kg GHG emission by avoiding transportation and absorbing GHG gas by plants.



Waste System

A waste collection and compost circulation is created. 49 tons of bio-waste including kitchen debris, cooked foods, garden waste are transported by elevator to the organic waste recycling bins built in the air and shred each week. After 4-6 weeks for a compost cycle, wastes are transferred into the fertilizer. Since the CO2 produced by compost causes 25 times less temperature arise than methane produced in landfill.

In the typical block, the on-site compost of bio-waste can avoid waste transportation and provide fertilizer to the urban farm, which in total leads to a reduction of 55 metric tons of GHG emission.



All of the infrastructures would not only manage the City of New York to honor the 2050 plan target by 52%, but also it would move from a model of unequal territorial distribution of the environmental cost of its daily functioning, to an evenly distribution of environmental responsibility.

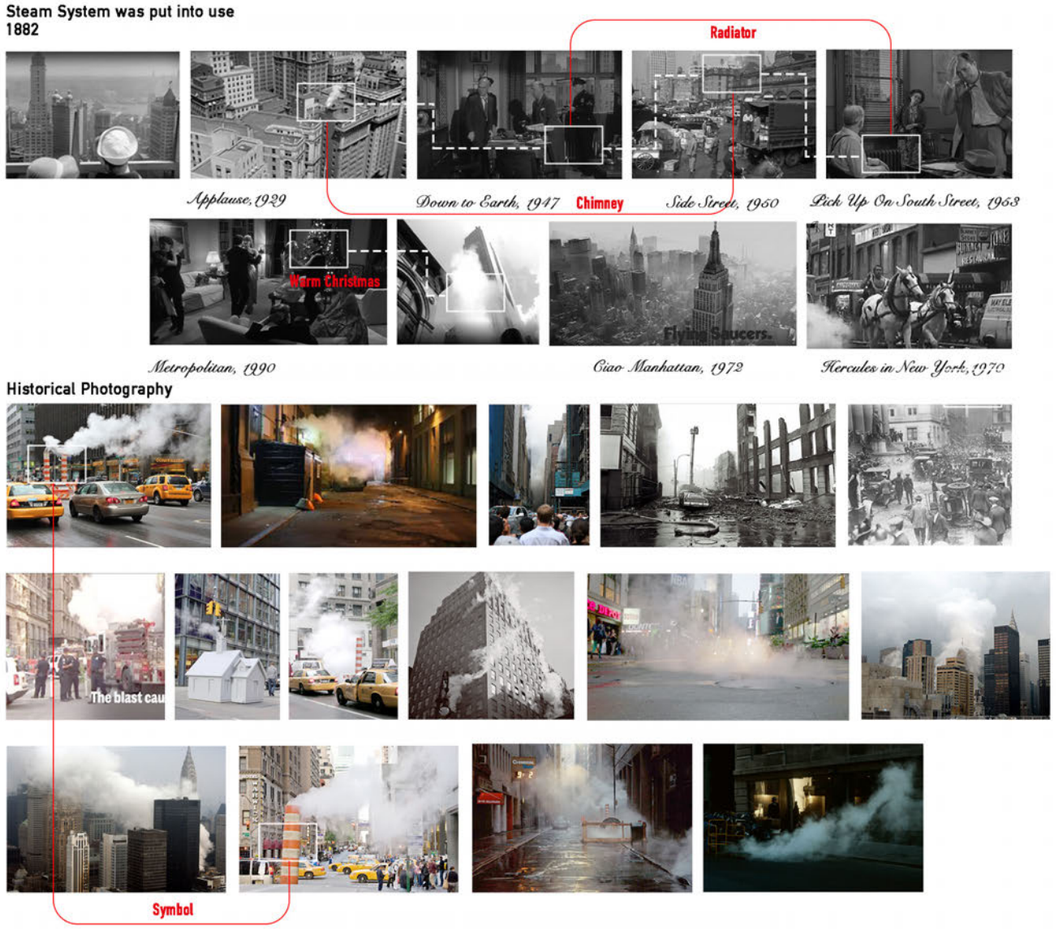
// CLOUD NURSERY

A new layer of nature nourished by city infrastructure

Aug. 2019
Summer Studio, GSAPP
Critic: Gabriela Etchegaray, Jorge Ambrosi
Abstract Selected
Collaborator: Miles Mao

This project utilizes water as an energy source, transporting it below NYC from a park to the metropolis. Steam is released in Central Park—a monument of nature—to create a heat-landscape that nurtures awareness in the city of the original of this energy source. In this way, Cloud Nursery serves as a reminder of natural conditions from which the city emerged and connects inhabitants to a paradigmatic vision of nature and the city as a whole.

Steam System was put into use
1882

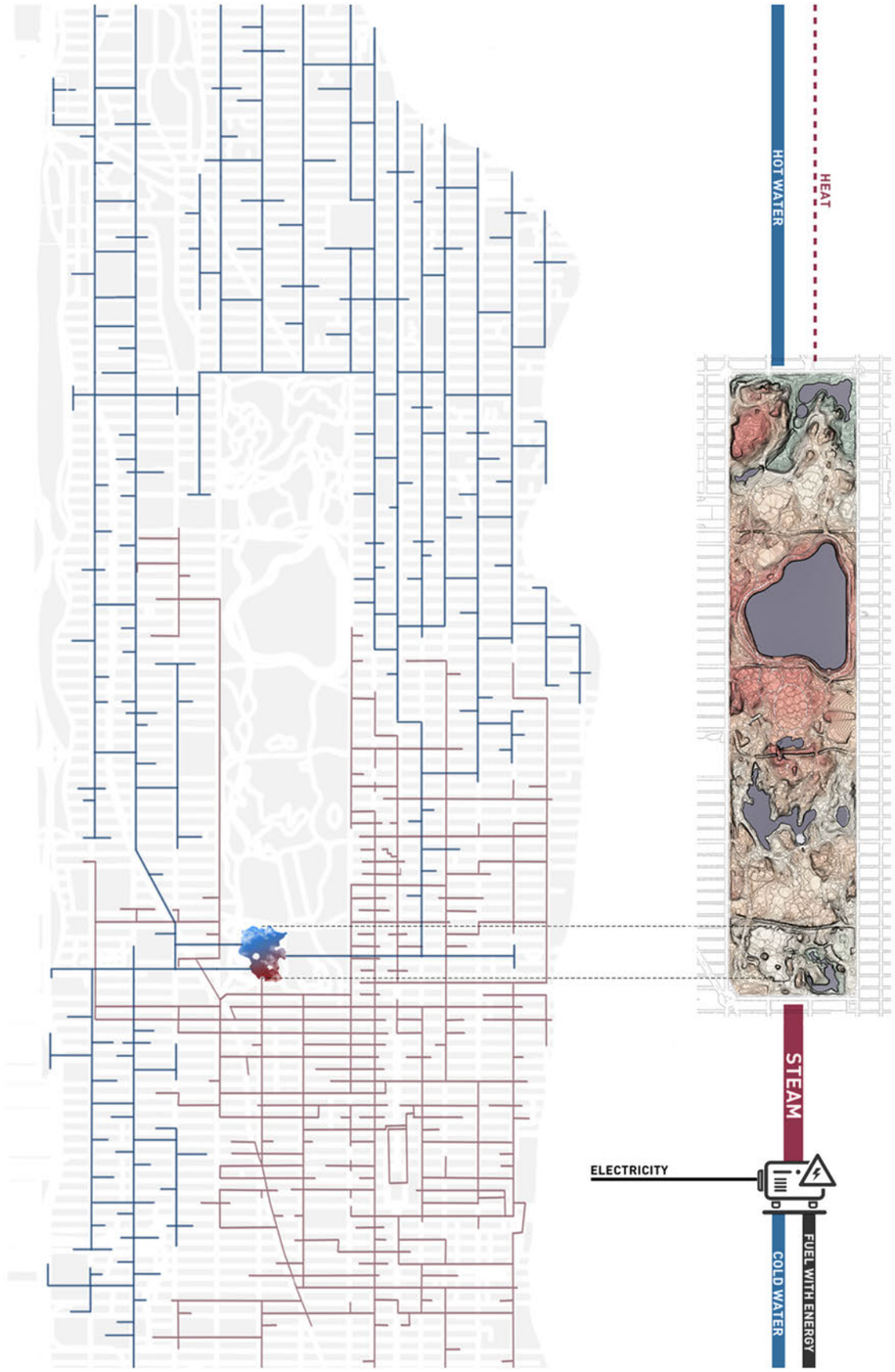


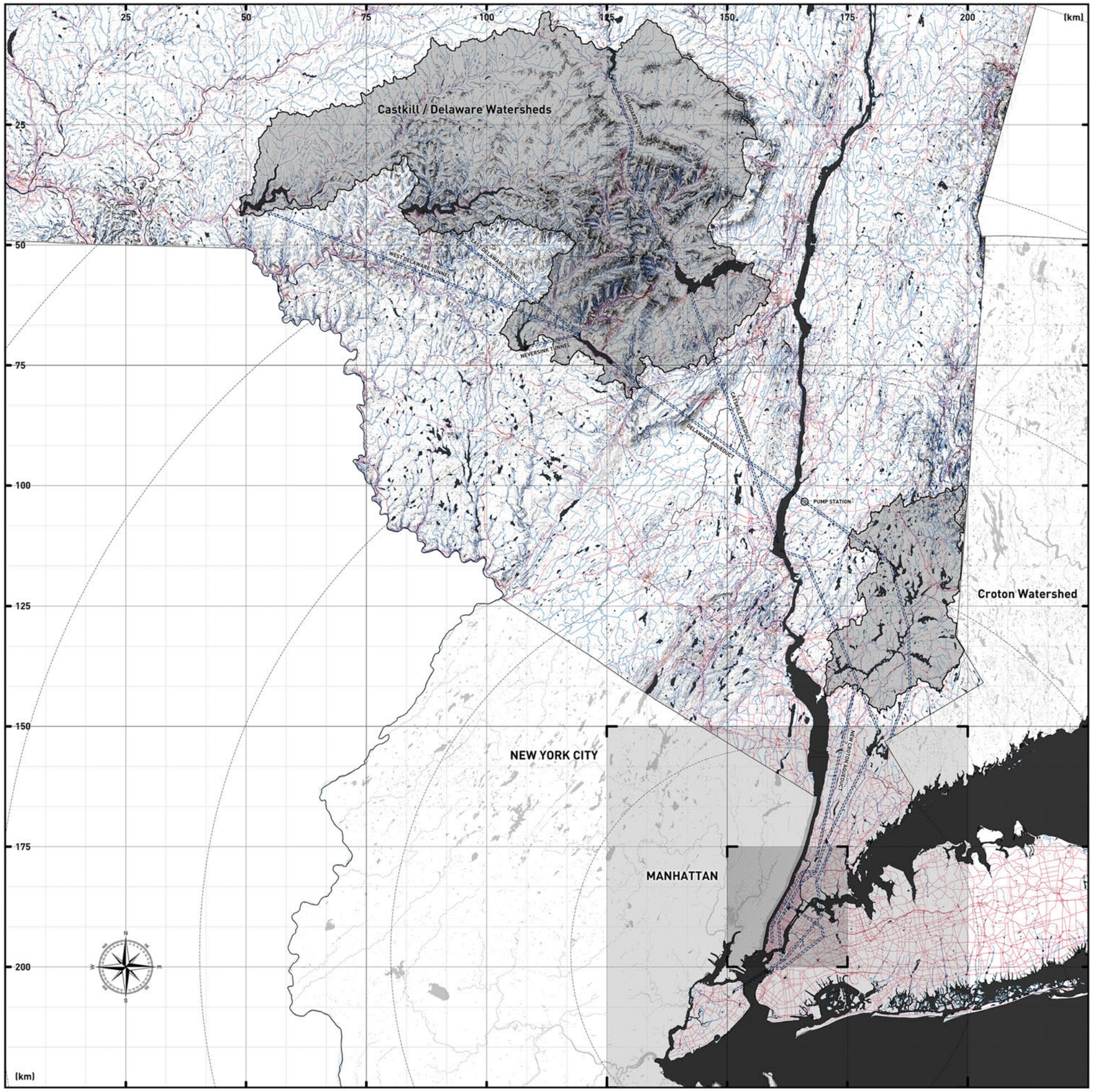
↑

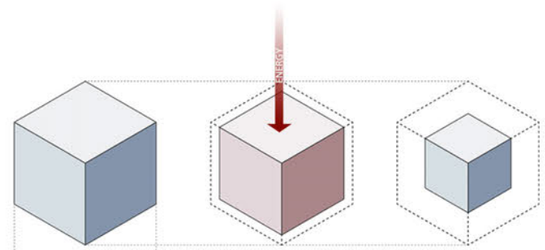
Through the research of NYC's water supply system, it is noticed that steam, as another state of water, plays an important role in New Yorker's lives. The NYC's steam system, which is the biggest among the world, is also the largest consumer of the NYC water supply system. Thus, several hidden aspects of this city are able to be noticed by analyzing steam system. Meanwhile, the invisible steam can be implied by visible clouds, vapor, and smoke. The 'visualized steam' also provides us with a new perspective to understand the relationship between human and environment, urban area and nature.

Nowadayse, Co.Edison is running most heating systems in Manhattan. According to the data from Co. Edison, hot water system would be 23% more efficiency than steam system in midtown and up-town area due to the long-distance transfer loss. As the steam system grows from downtown, our 'Cloud Nursury' also function as a transfer station from steam system to hot water system.

→







New York State
Daily Water Supply

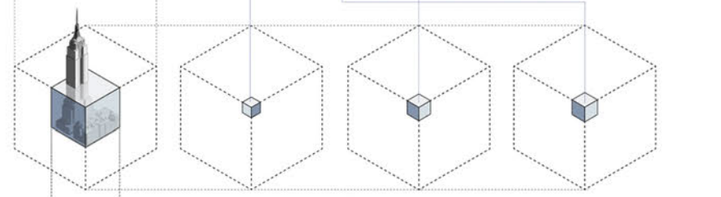
324m x 324m x 324m=34million m³

Daily water Consumption of Thermoelectric Power

284m x 284m x 284m=23million m³

Daily water Supply of Public Water

196m x 196m x 196m=7.5million m³



156m x 156m x 156m=3.8million m³

New York City
Daily Water Consumption

41m x 41m x 41m=0.07million m³

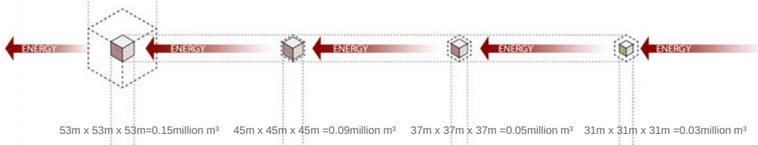
Albany

53m x 53m x 53m=0.15million m³

Syracuse

58m x 58m x 58m=0.2million m³

Rochester



53m x 53m x 53m=0.15million m³

Winter
Daily Water Consumption
for Steam System NYC

45m x 45m x 45m =0.09million m³

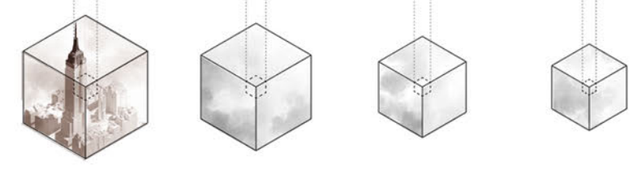
Summer

37m x 37m x 37m =0.05million m³

Spring

31m x 31m x 31m =0.03million m³

Fall



284m x 284m x 284m=23million m³

Winter
Steam Production in
Manhattan

252m x 252m x 252m =16million m³

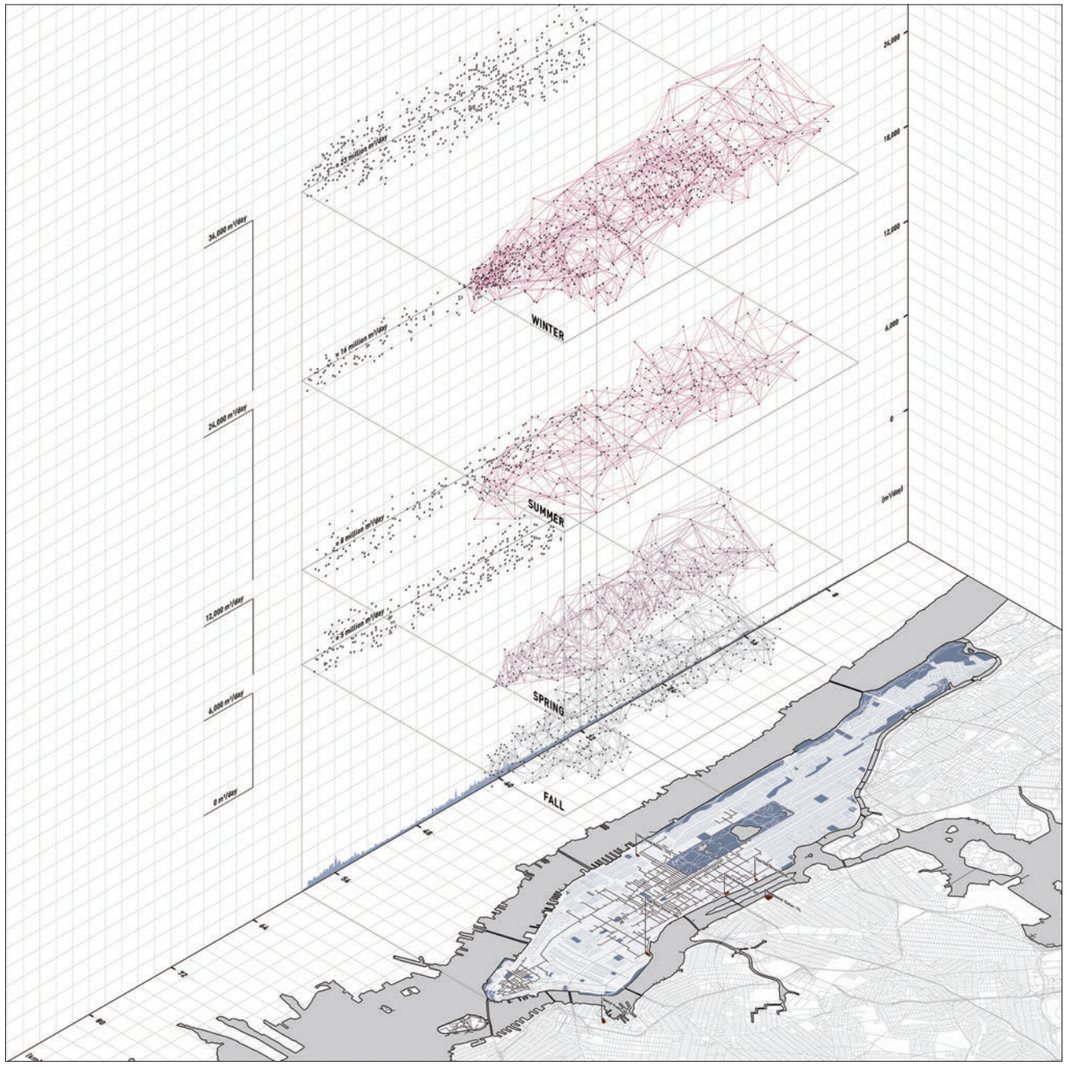
Summer

200m x 200m x 200m =8million m³

Spring

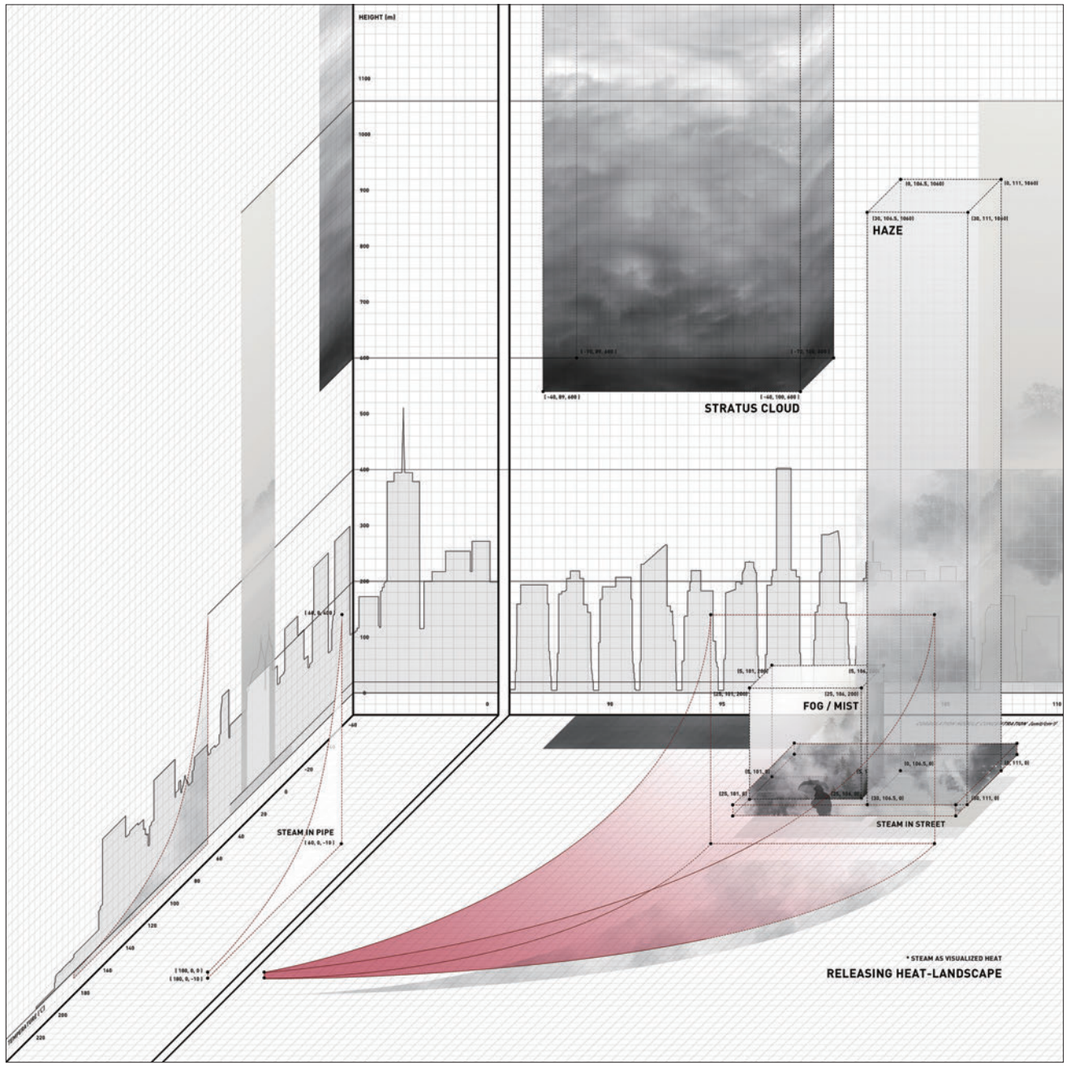
171m x 171m x 171m =5million m³

Fall



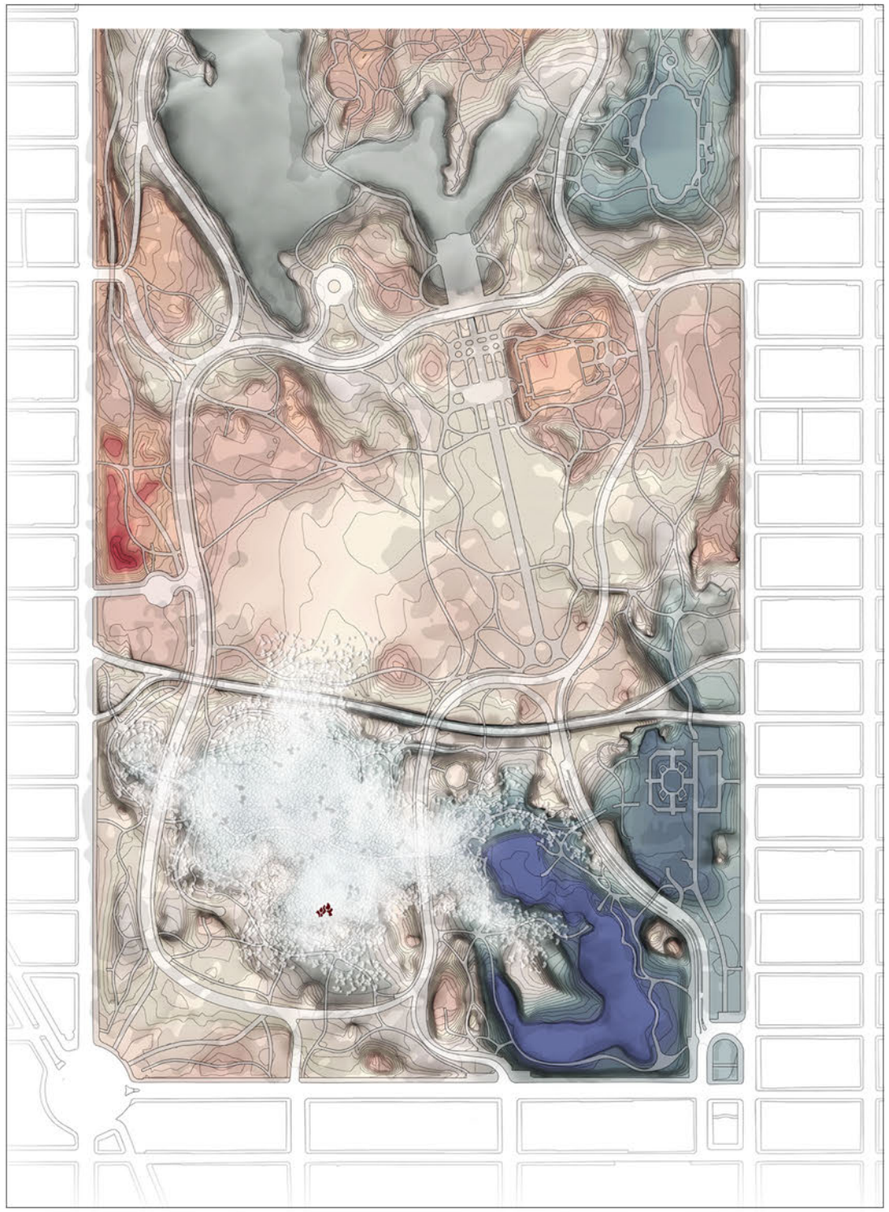
Seasonal Variation of Steam Consumption

The 'cloud' reflects the amount of steam varys among seasons and buildings.



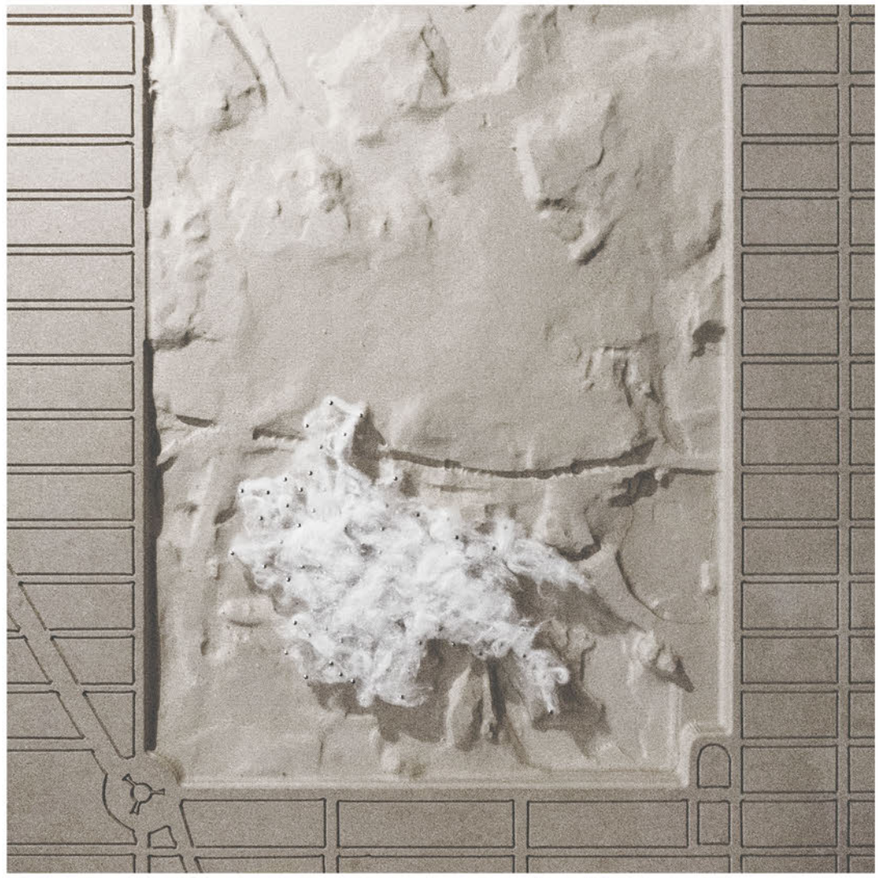
Energy Changes the Status of Water

Energy status of cloud, fog, haze, water and steam.



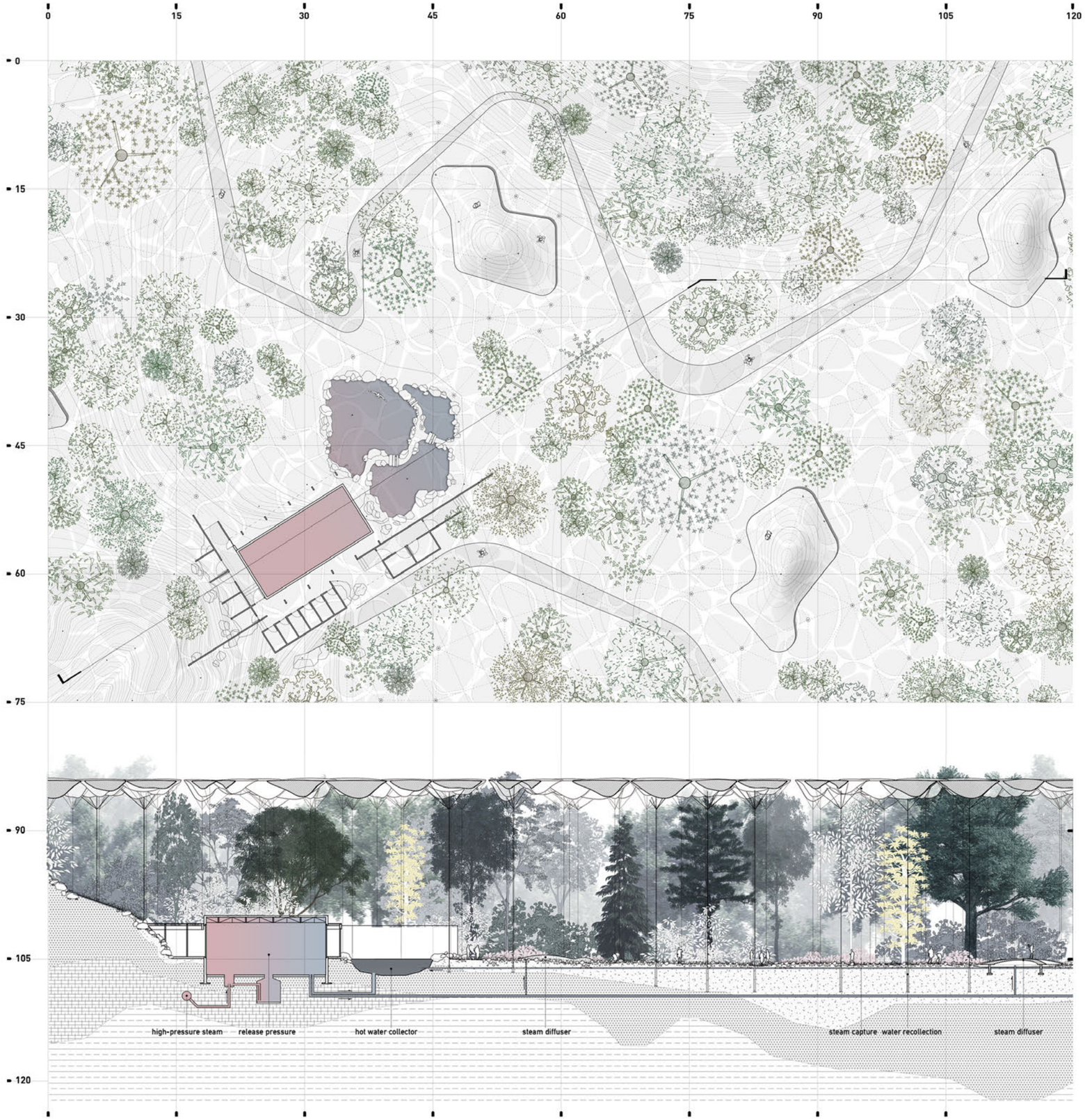
Masterplan of Cloud Nursery

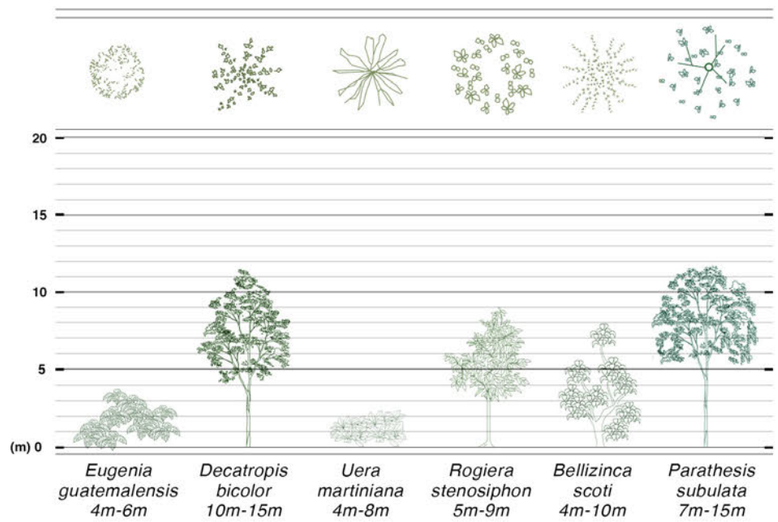
Taking advantage of the topography in central park.

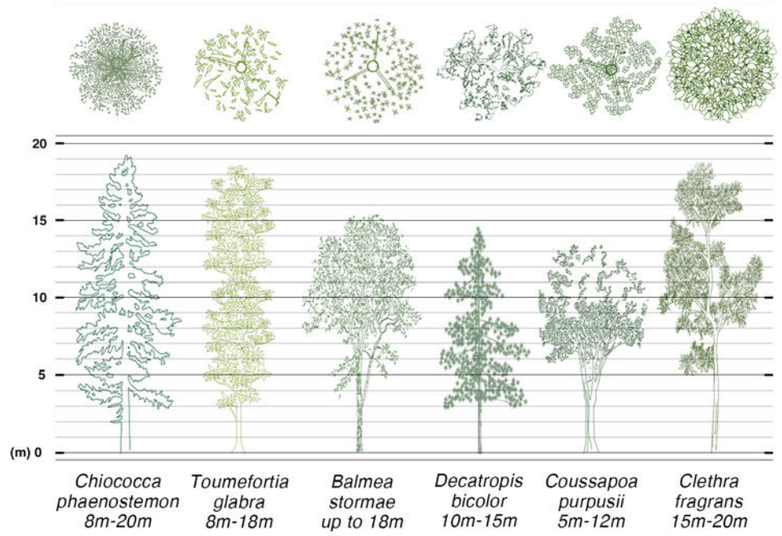


Topography model of the site

Capturing the steam and create a boundary between the valley and pedestrian level.



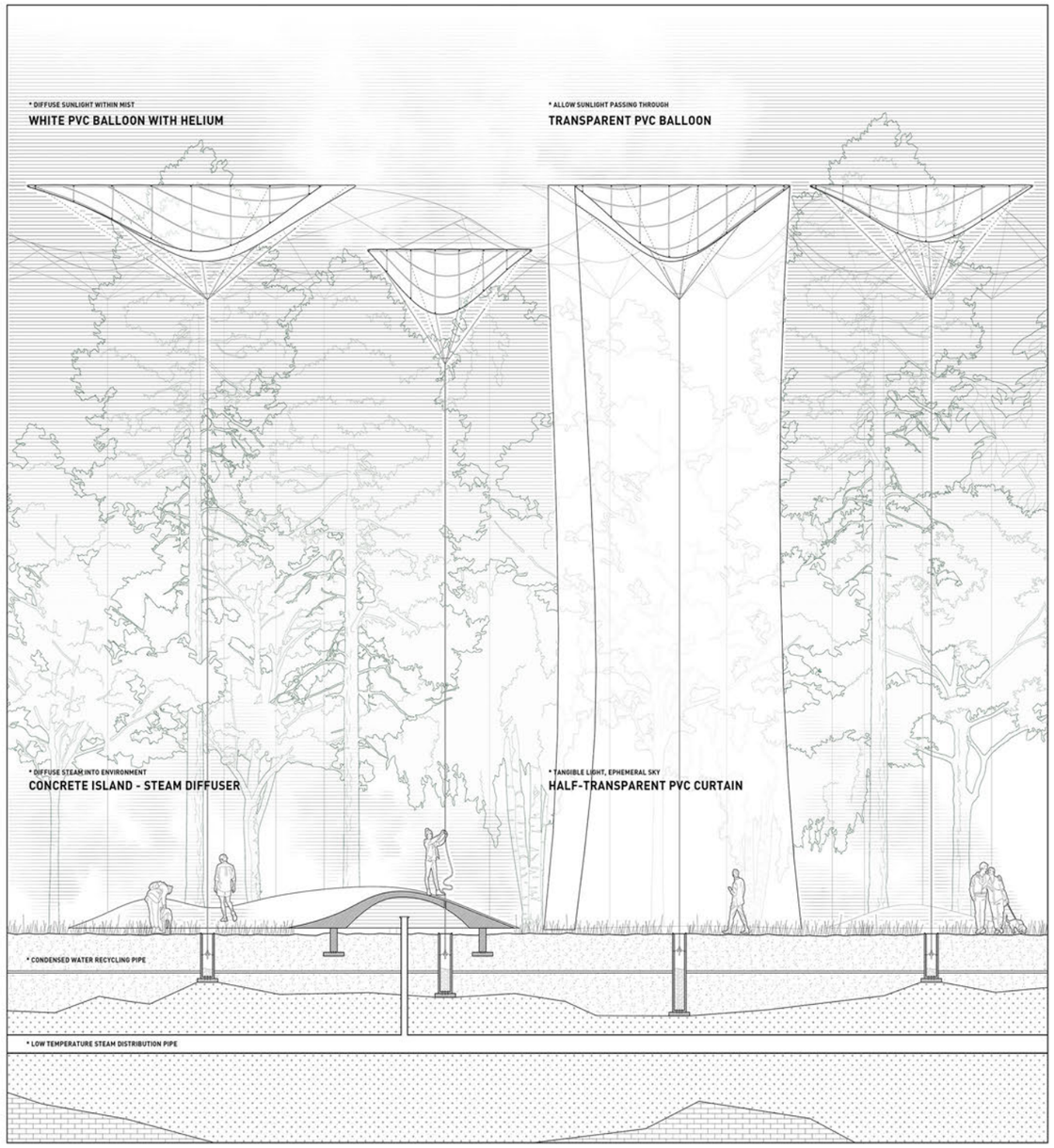




A heat exchange station is needed to cool down the 180°C steam. It lower the pressure and adjust steam to milder temperature around 24°C and keep it steadily.

The concrete islands function as steam vents spreads around. After cooled down, steam is released from the organically shaped boundary slowly and than fulfill the entire space. The island also serves as infrastructure, people can lean on it, sit beside it and touch it.

The graph analyzes the environment parameters and listed the new plant species might survive in this plant nursery.



Activities in Cloud Nursery

The secenery can be changed by dragging strips and letting steam leak out of the nursery.

Shadow of Objects

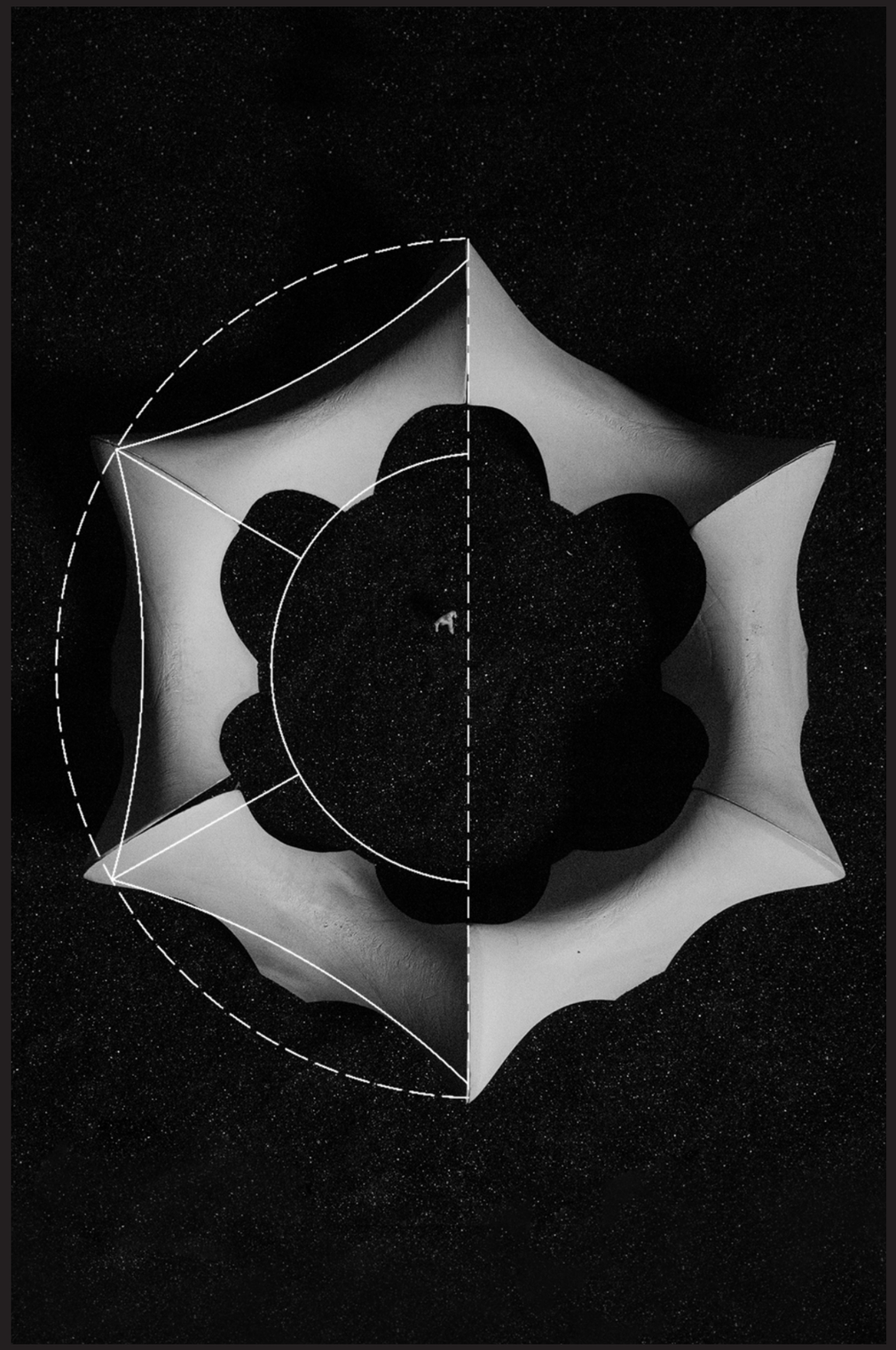
Balloons, plants and topography.

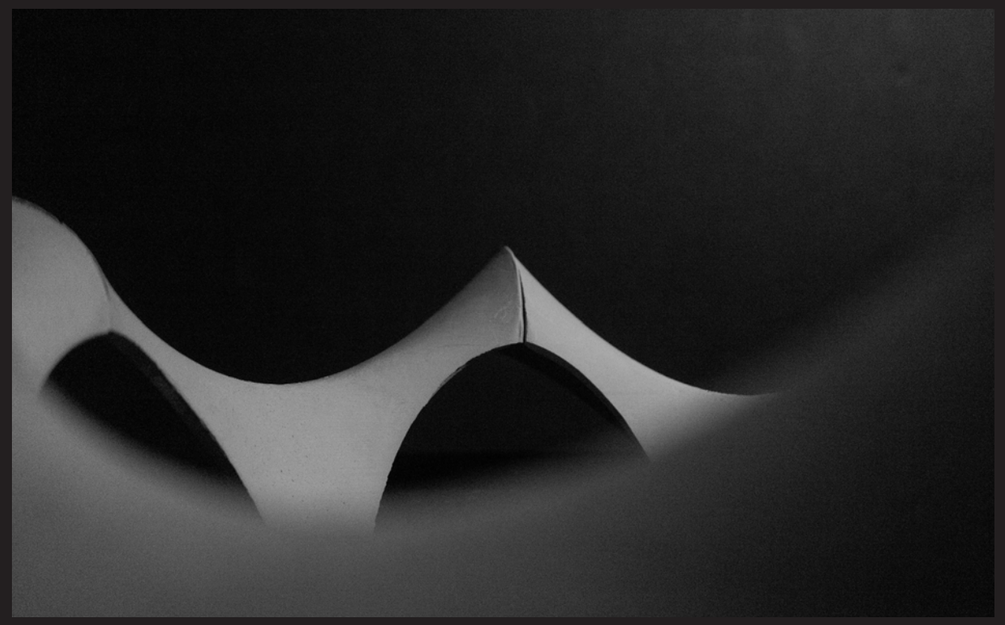
/ Tensile-Compression Surface

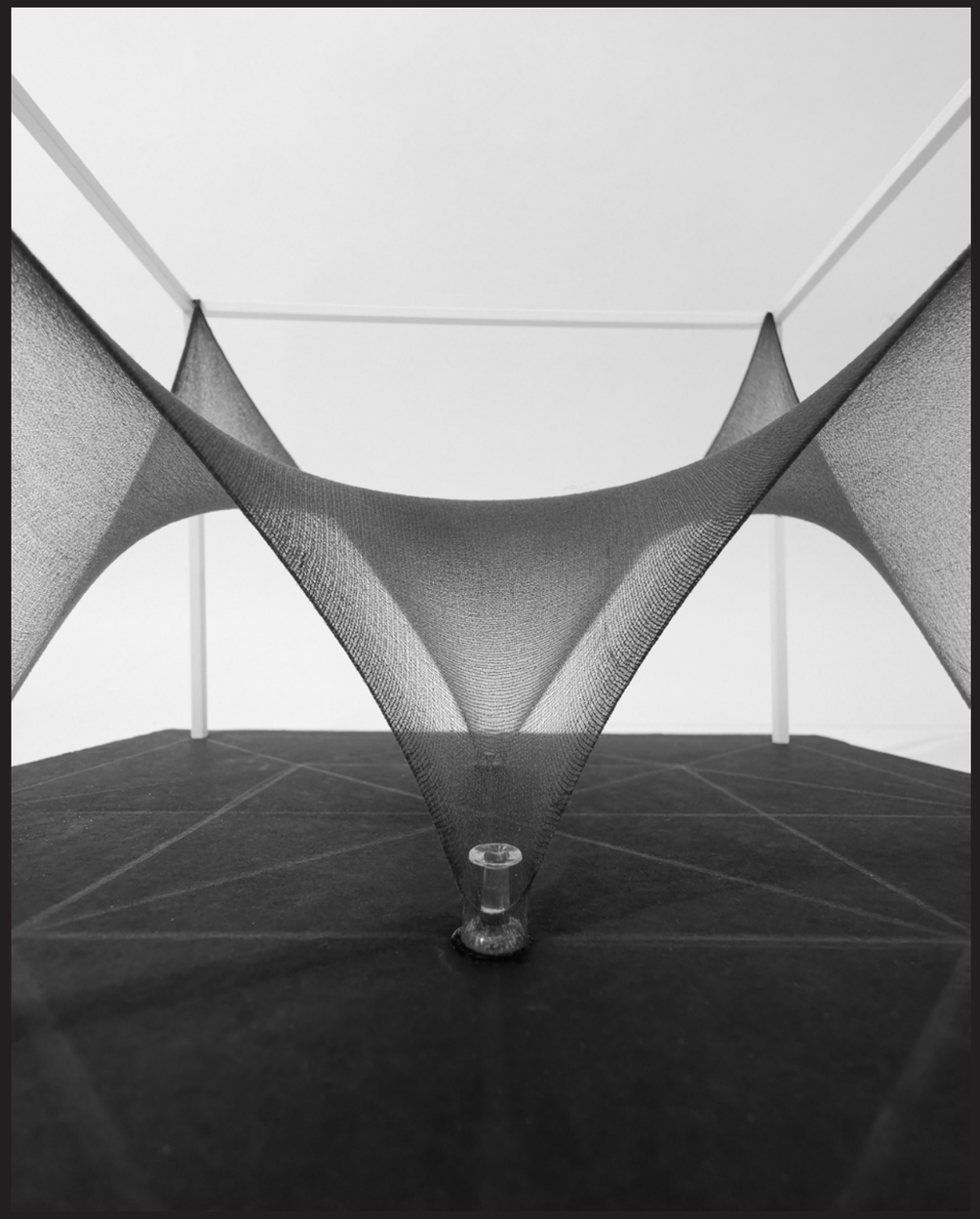
Collaborated with Shenghui Mao

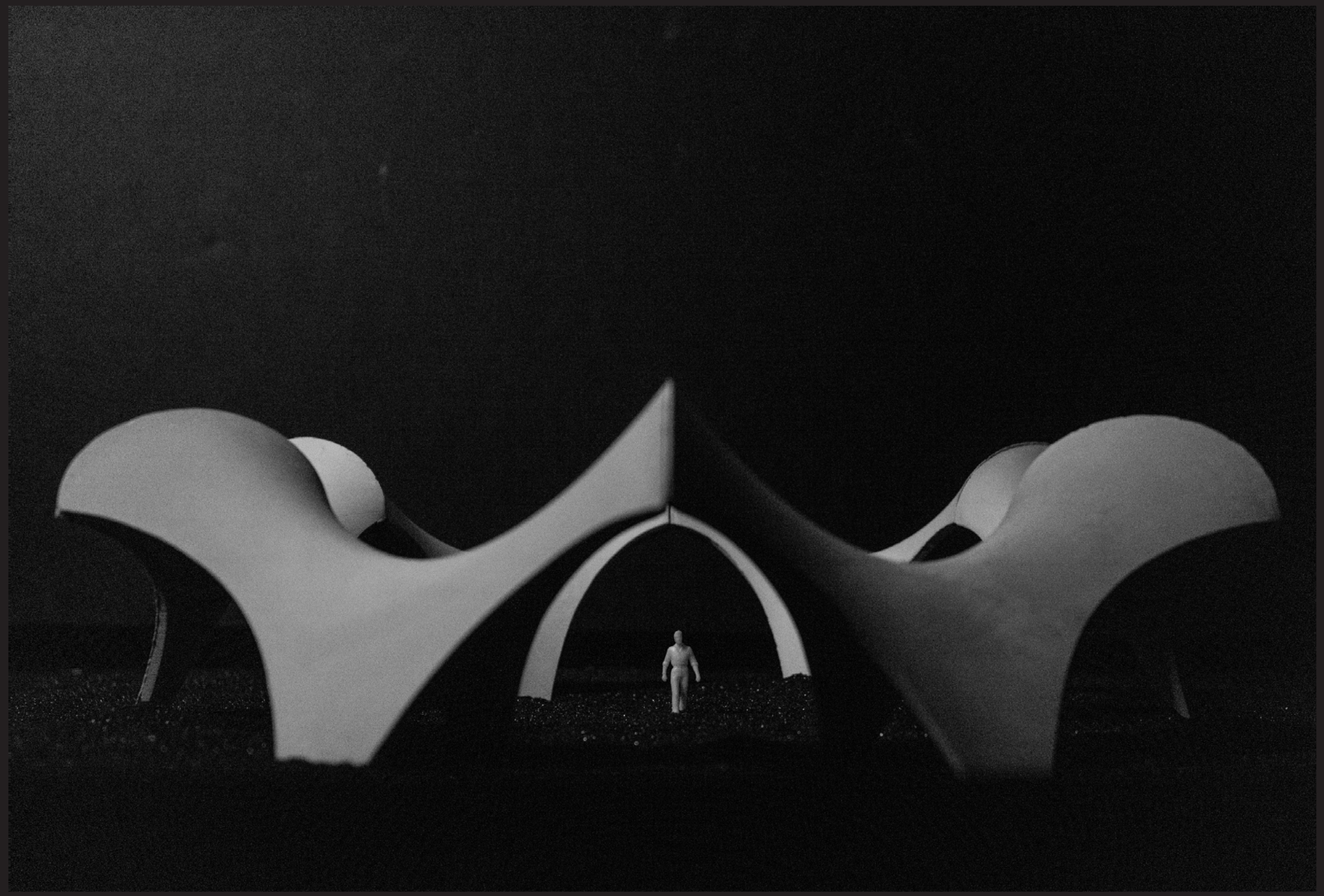
Tech Elective, GSAPP

Fall 2019







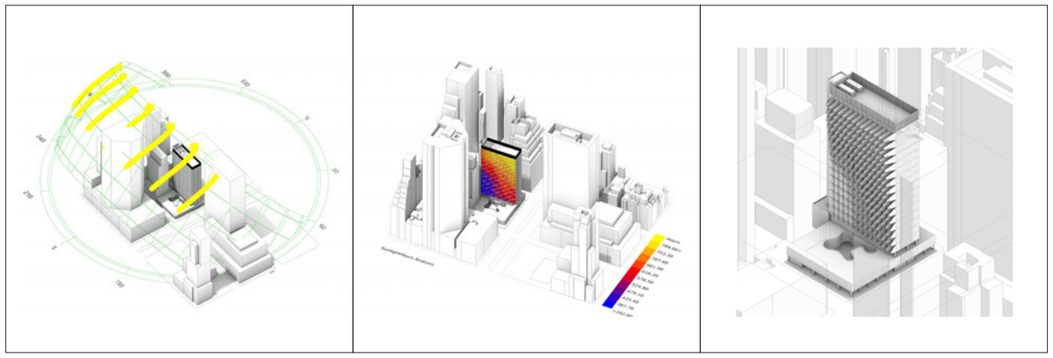


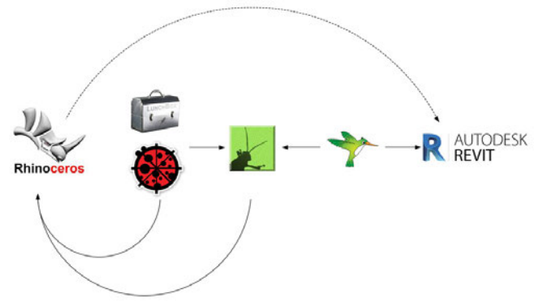
/ Rethinking BIM

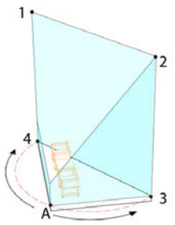
Individual Work

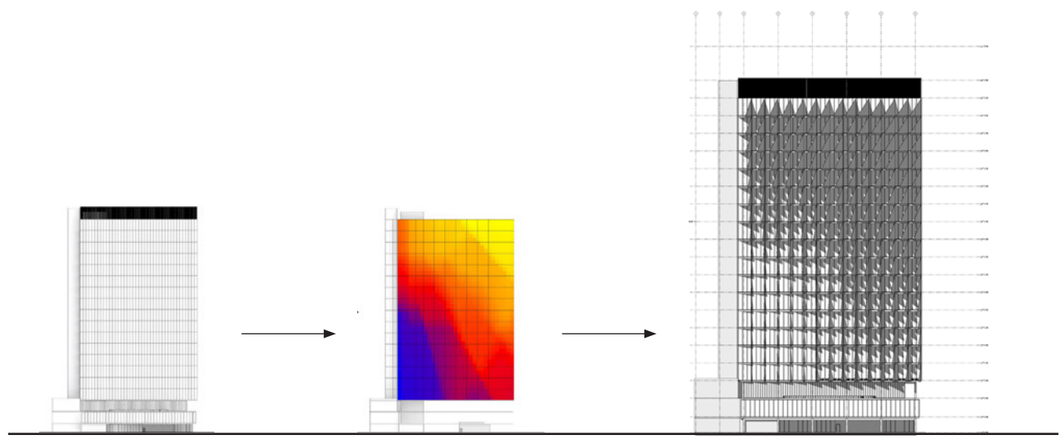
Tech Elective, GSAPP

Fall 2019







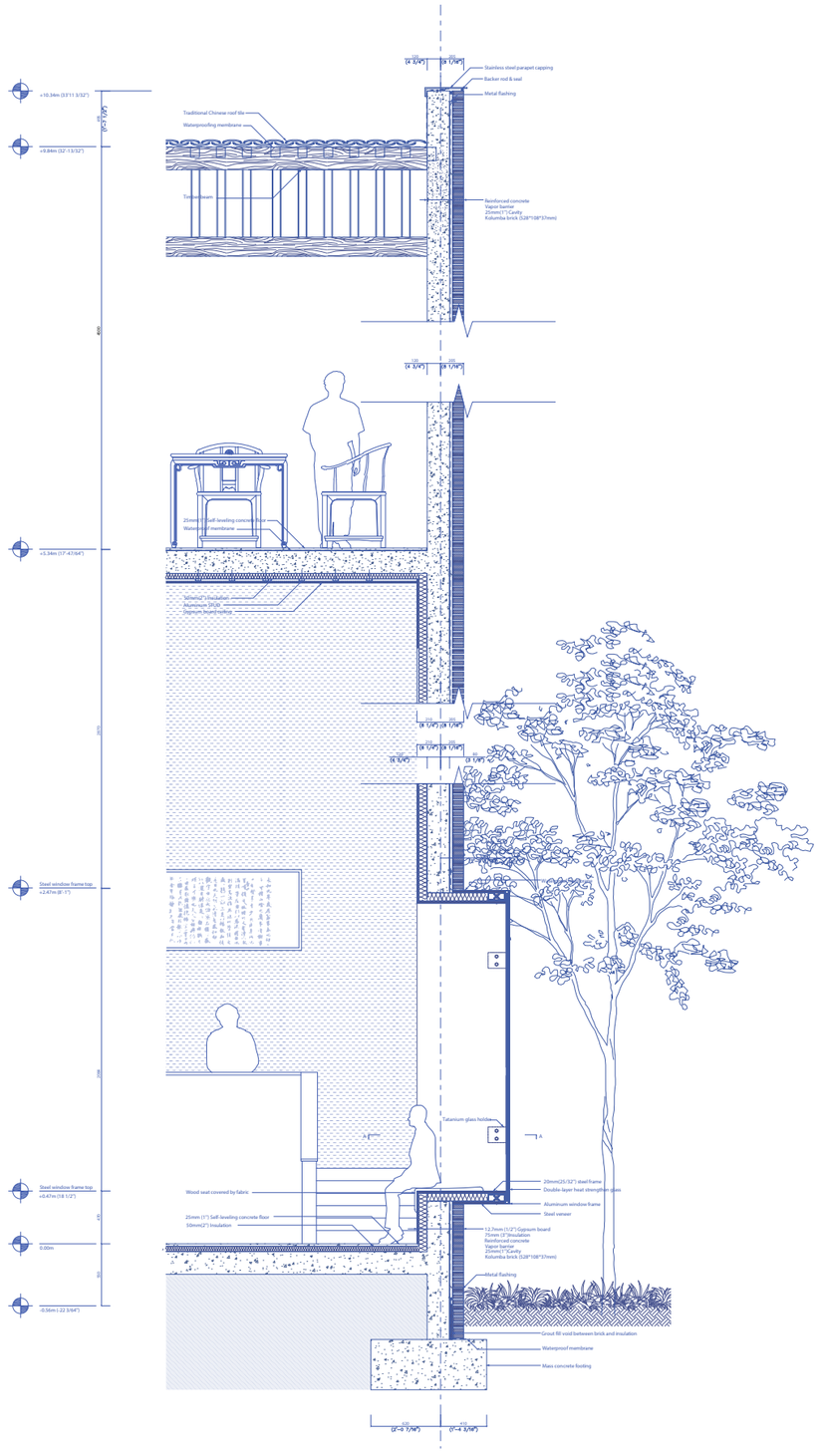


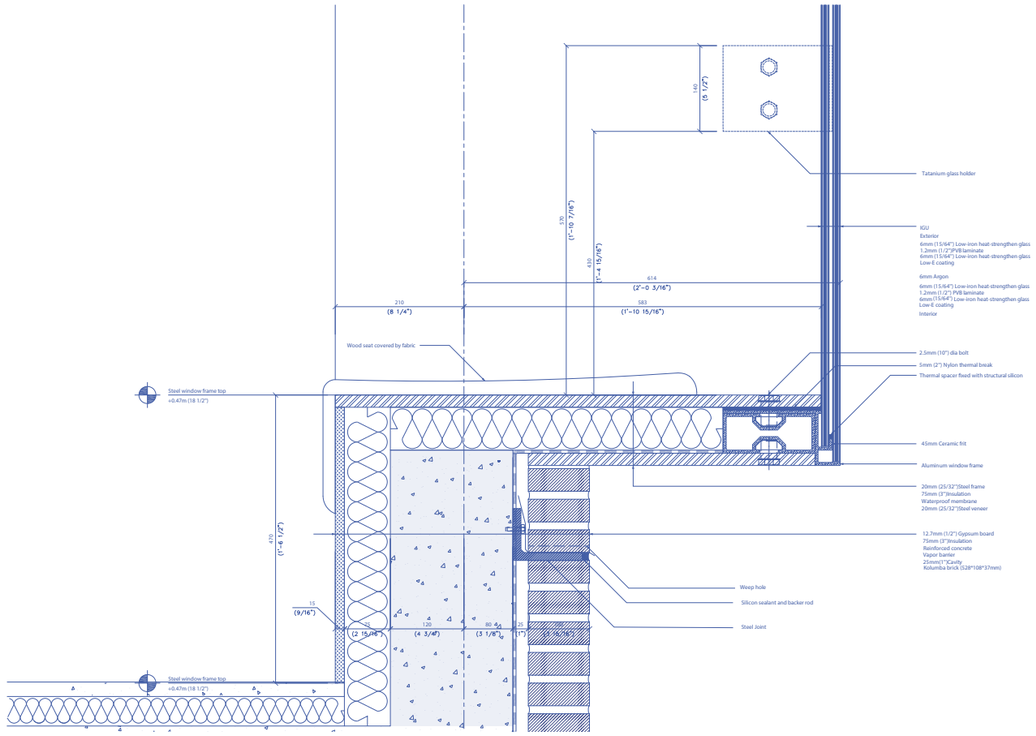
/ Facade Detailing

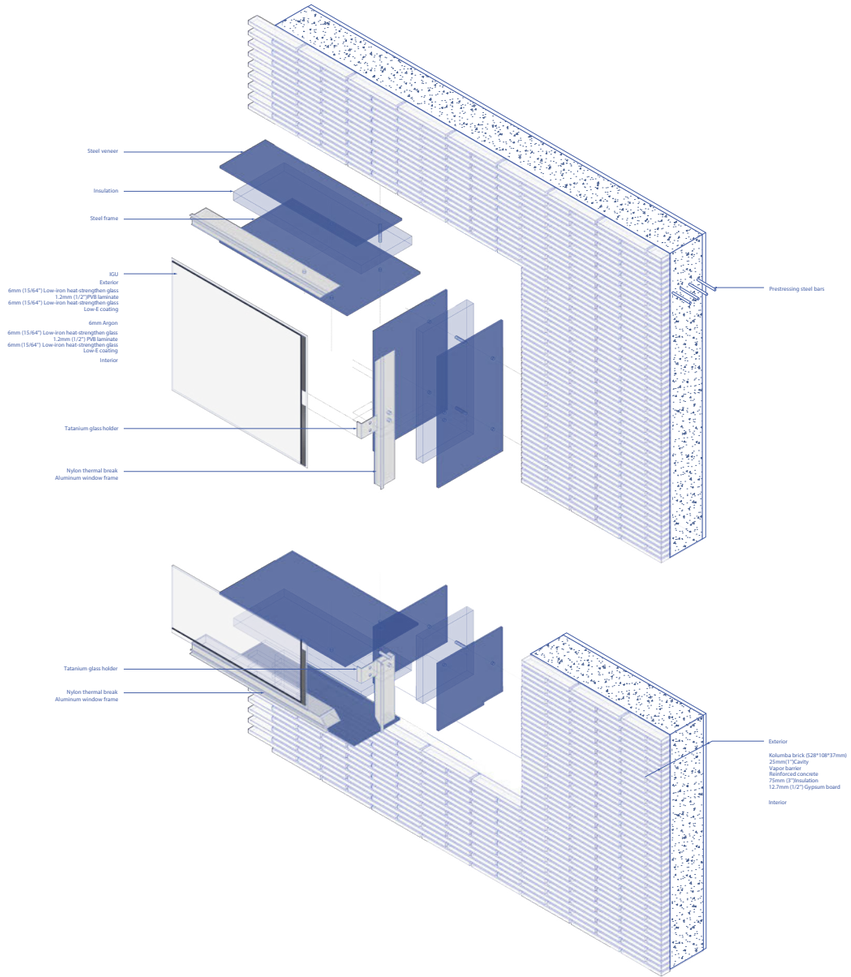
Collaborated with Shenghui Mao

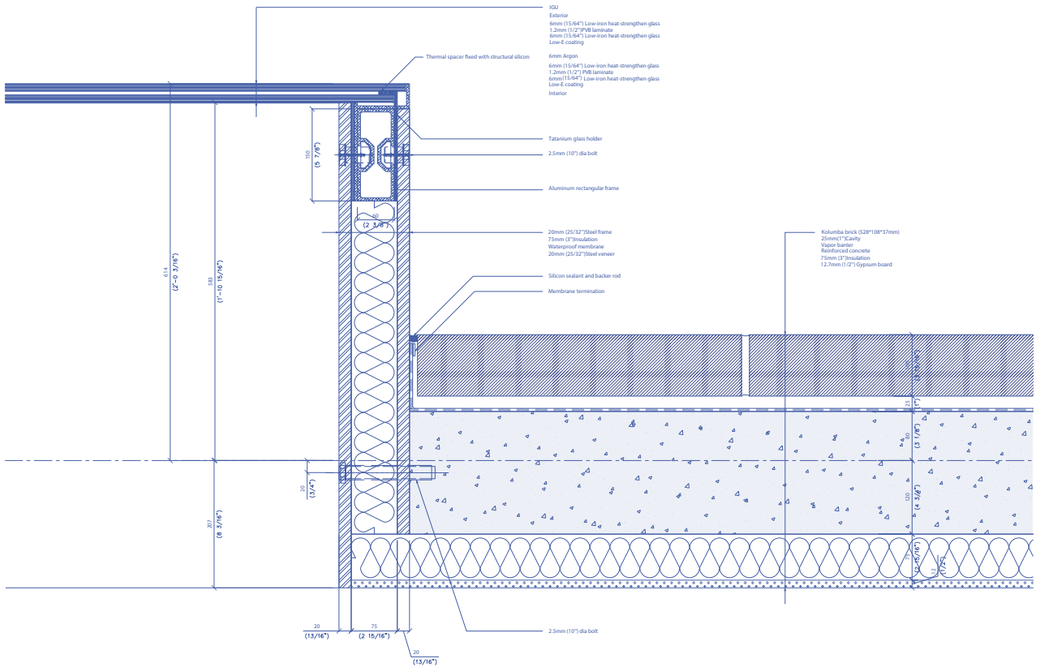
Tech Elective, GSAPP

Spring 2020




Tatanium glass holder
IGU
Exterior
6mm (15/64") Low-iron heat-strengthen glass
1.2mm (1/2")PVB laminate
6mm (15/64") Low-iron heat-strengthen glass
Low-E coating
6mm Argon
6mm (15/64") Low-iron heat-strengthen glass
1.2mm (1/2") PVB laminate
6mm(15/64") Low-iron heat-strengthen glass
Low-E coating
Interior
Wood seat covered by fabric
2.5mm (1/0") dia bolt
5mm (2") Nylon thermal break
Thermal spacer fixed with structural silicon
45mm Ceramic frit
Aluminum window frame
20mm (25/32")Steel frame
75mm (3")Insulation
Waterproof membrane
20mm (25/32")Steel veneer
12.7mm (1/2") Gypsum board
75mm (3")Insulation
Reinforced concrete
Vapor barrier
25mm(1")Cavity
Kolumba brick (528*108*37mm)
Weep hole
Silicon sealant and backer rod
Steel Joint
Steel window frame top
+0.47m (18 1/2")
Steel window frame top
+0.47m (18 1/2")
150
(5 1/2")
570
(1'-10 7/16")
430
(1'-4 15/16")
614
(2'-0 3/16")
210
(8 1/4")
583
(1'-10 15/16")
470
(1'-6 1/2")
8
(5/16")
20
(13/16")
75
(2 15/16")
120
(4 3/4")
80
(3 1/8")
25
(1")
45
(1 3/4")


Steel veneer
Insulation
Steel frame
IGU
Exterior
6mm (15/64") Low-iron heat-strengthen glass
1.2mm (1/2")PVB laminate
6mm (15/64") Low-iron heat-strengthen glass
Low-E coating
6mm Argon
6mm (15/64") Low-iron heat-strengthen glass
1.2mm (1/2") PVB laminate
6mm (15/64") Low-iron heat-strengthen glass
Low-E coating
Interior
Tatanium glass holder
Nylon thermal break
Aluminum window frame
Prestressing steel bars
Tatanium glass holder
Nylon thermal break
Aluminum window frame
Exterior
Kolumba brick (528*108*37mm)
25mm(1")Cavity
Vapor barrier
Reinforced concrete
75mm (3")Insulation
12.7mm (1/2") Gypsum board
Interior


IGU
Exterior
6mm (15/64") Low-iron heat-strengthen glass
1.2mm (1/2")PVB laminate
6mm (15/64") Low-iron heat-strengthen glass
Low-E coating
6mm Argon
6mm (15/64") Low-iron heat-strengthen glass
1.2mm (1/2") PVB laminate
6mm(15/64") Low-iron heat-strengthen glass
Low-E coating
Interior
Thermal spacer fixed with structural silicon
Tatanium glass holder
2.5mm (1/0") dia bolt
Aluminum rectangular frame
20mm (25/32")Steel frame
75mm (3")Insulation
Waterproof membrane
20mm (25/32")Steel veneer
Silicon sealant and backer rod
Membrane termination
Kolumba brick (528*108*37mm)
25mm(1")Cavity
Vapor barrier
Reinforced concrete
75mm (3")Insulation
12.7mm (1/2") Gypsum board
2.5mm (1/0") dia bolt
150
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(2 3/8")
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(2'-0 3/16")
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207
(8 5/16")
20
(3/4")
20
(13/16")
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(2 15/16")
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(13/16")
45
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120
(4 3/4")
80
(3 1/8")
25
(1")

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