POLINA STEPANOVA

Columbia University GSAPP
Master of Architecture 2023

Polina Stepanova

Master of Architecture 2023

advanced standing

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Interwoven

Polina Stepanova, Paige Haskett
Core III FALL21 - critic: Erica Goetz

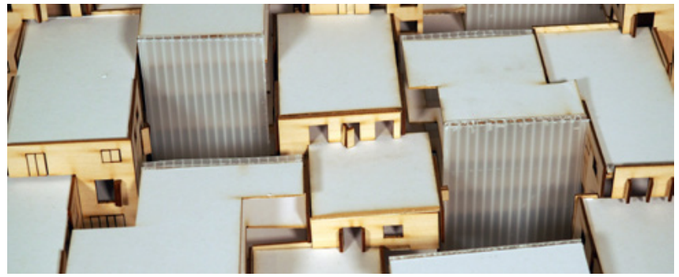
Interwoven

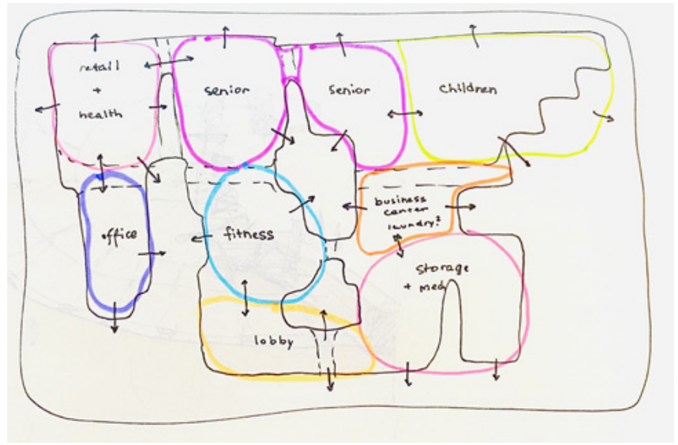
Interwoven is a housing project completed in 2021 during a Core III studio. The project was developed with my studio partner Paige Haskett under the guidance of our studio professor Erica Goetz.

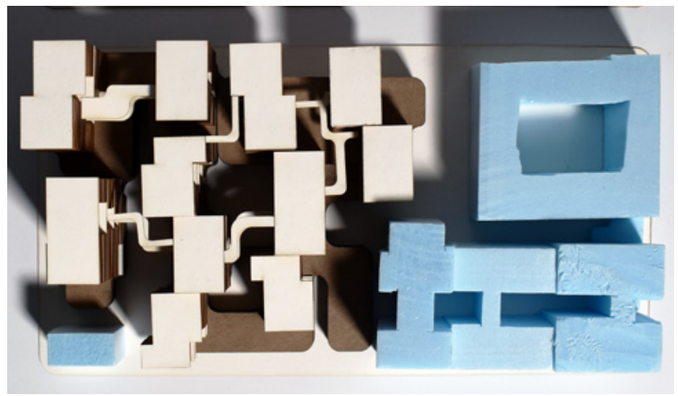
It explores the concepts of an interwoven affordable housing oasis in the heart of Bronx, NYC.

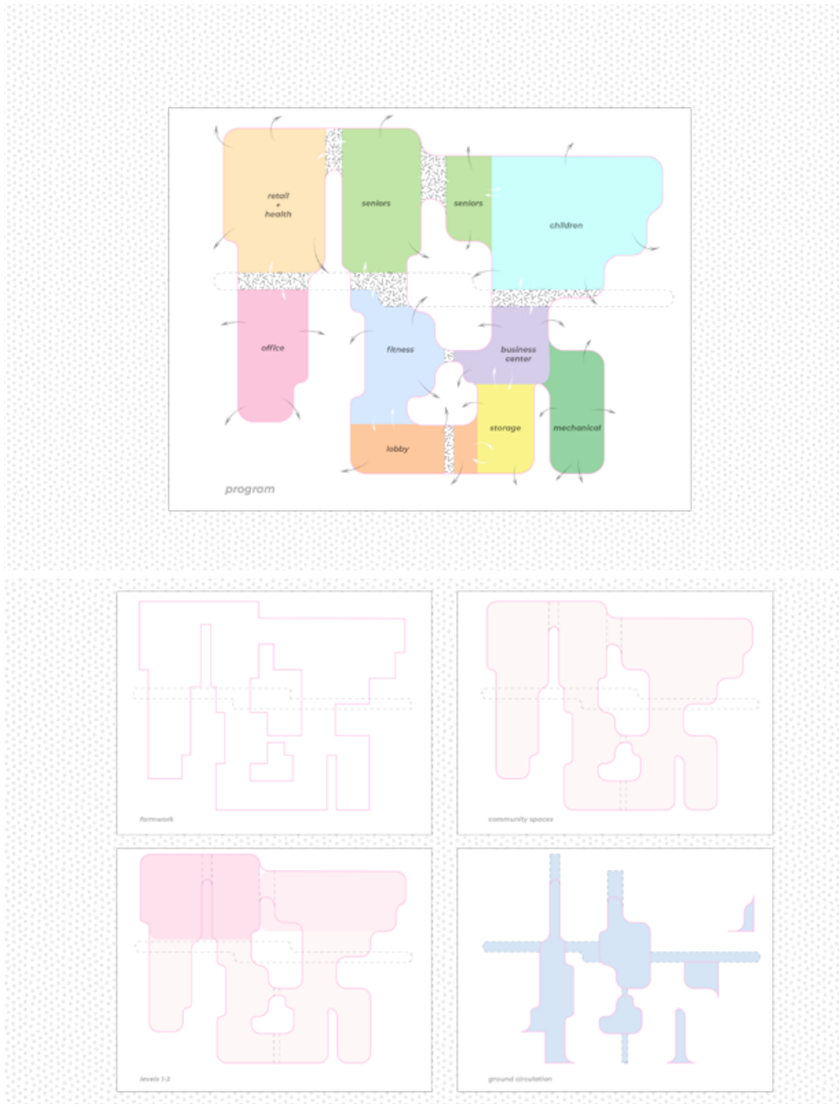
The project establishesw the notions of private and public within a mixed-use housing complex in a dense urban landscape. The intent was to introduce a comforting sense of community in a fast-paced megapolis like New York.

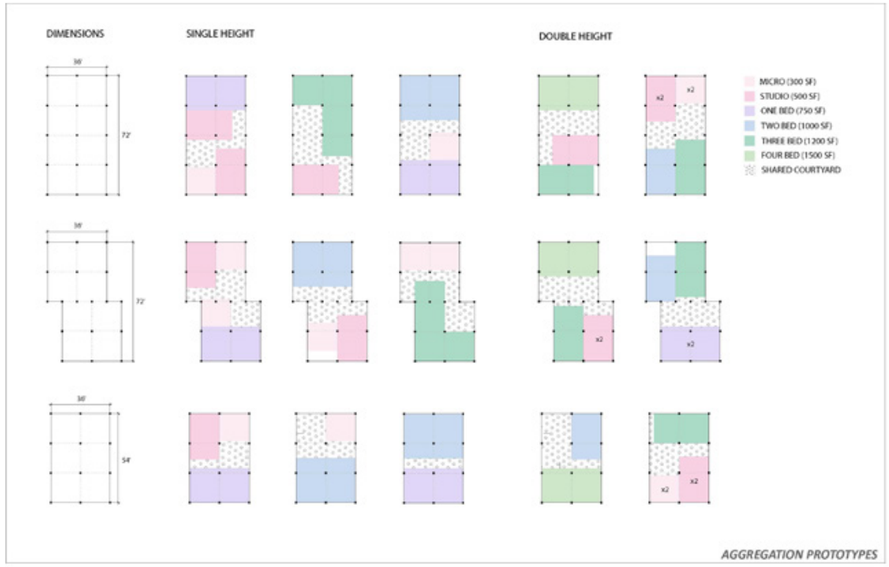
Interwoven dives into the relationships between the neighbors by proposing engaging floor plate solutions. Can neighbors become family across the hallway?

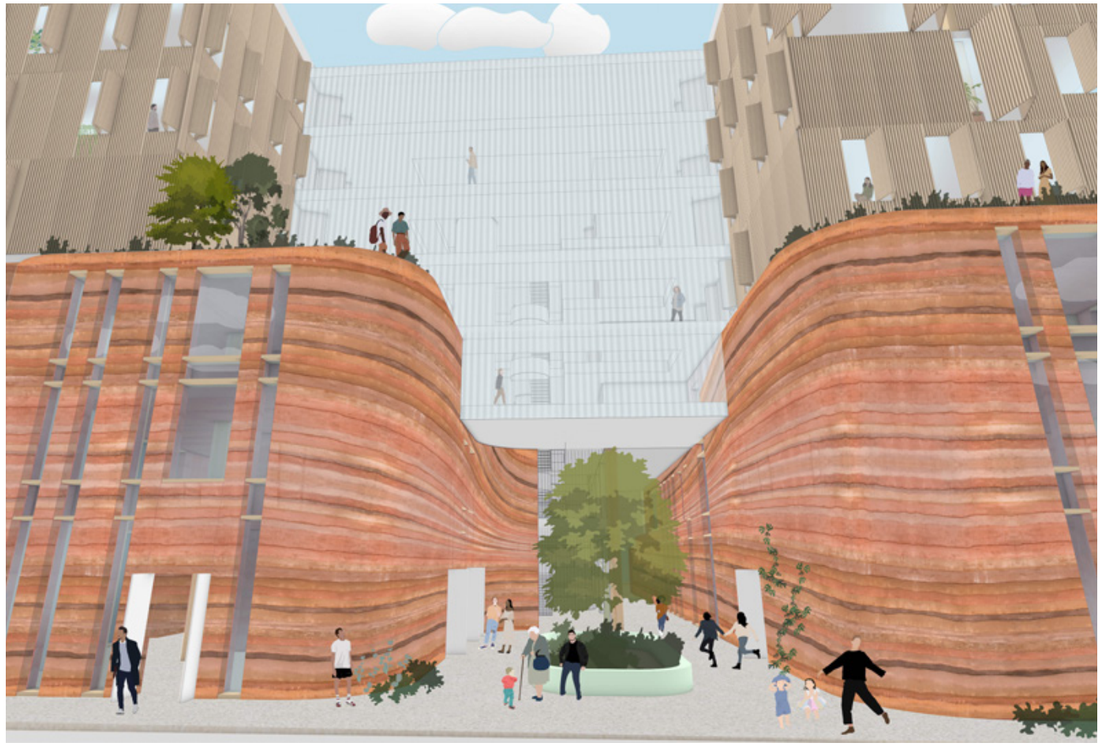


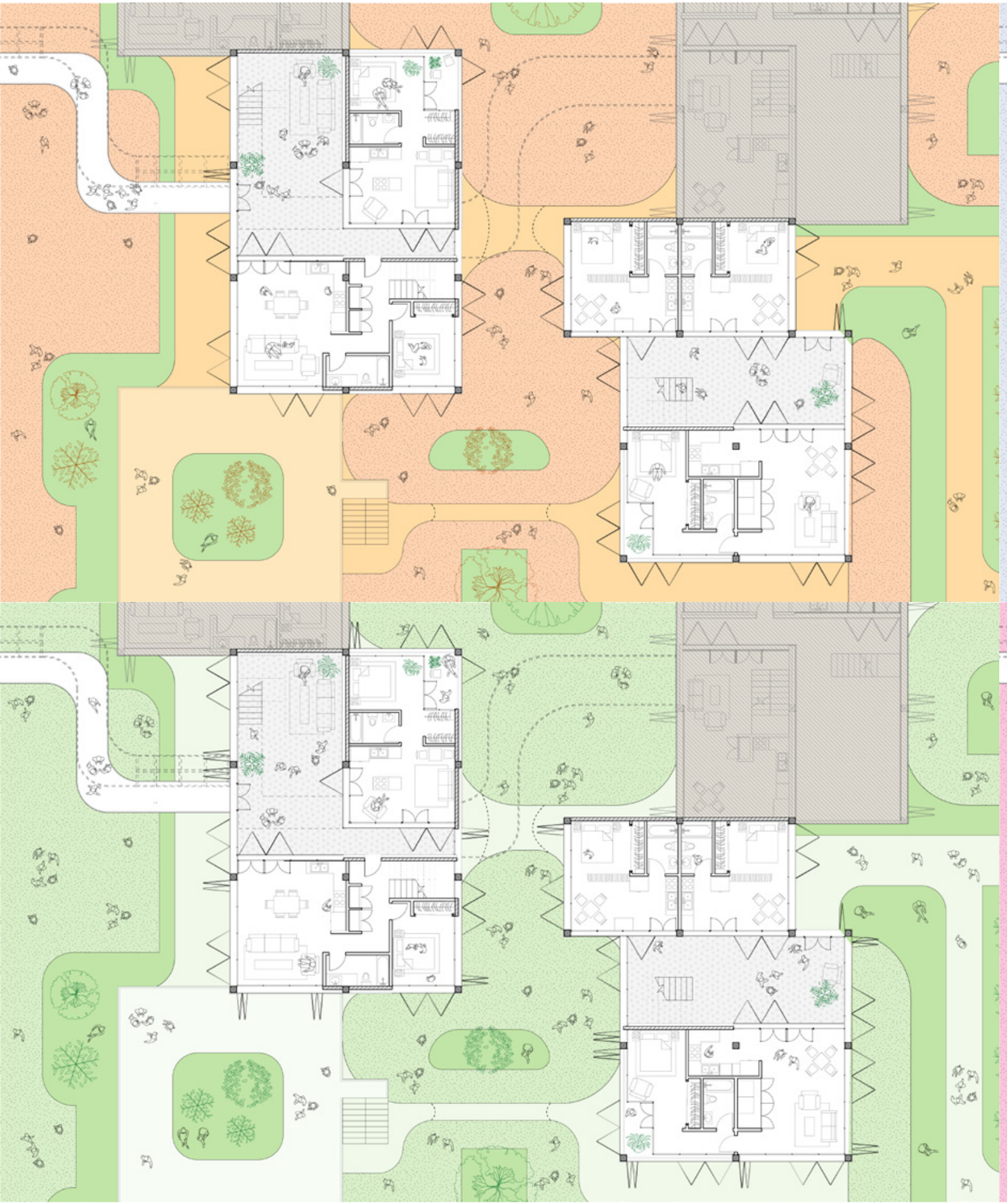


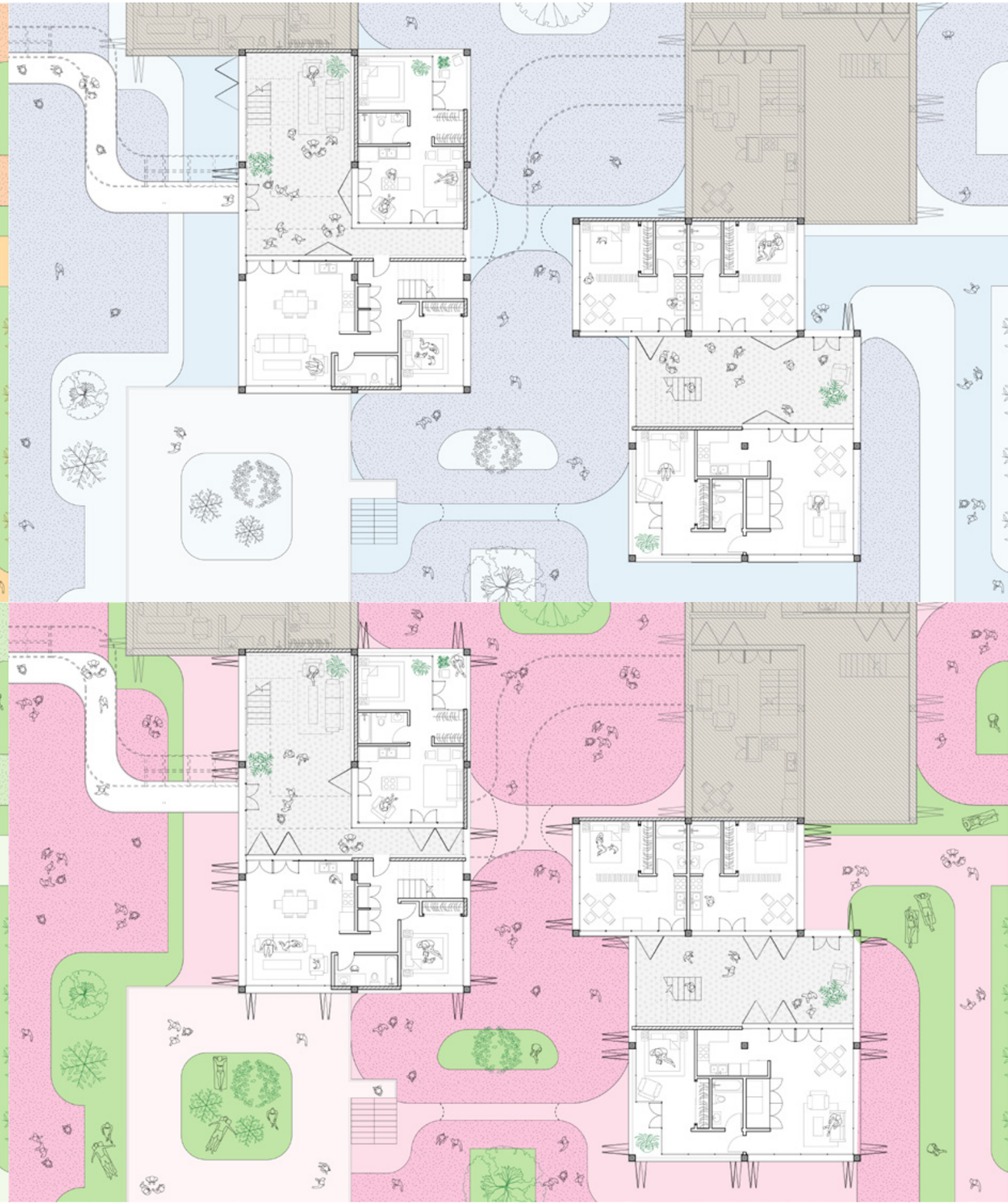


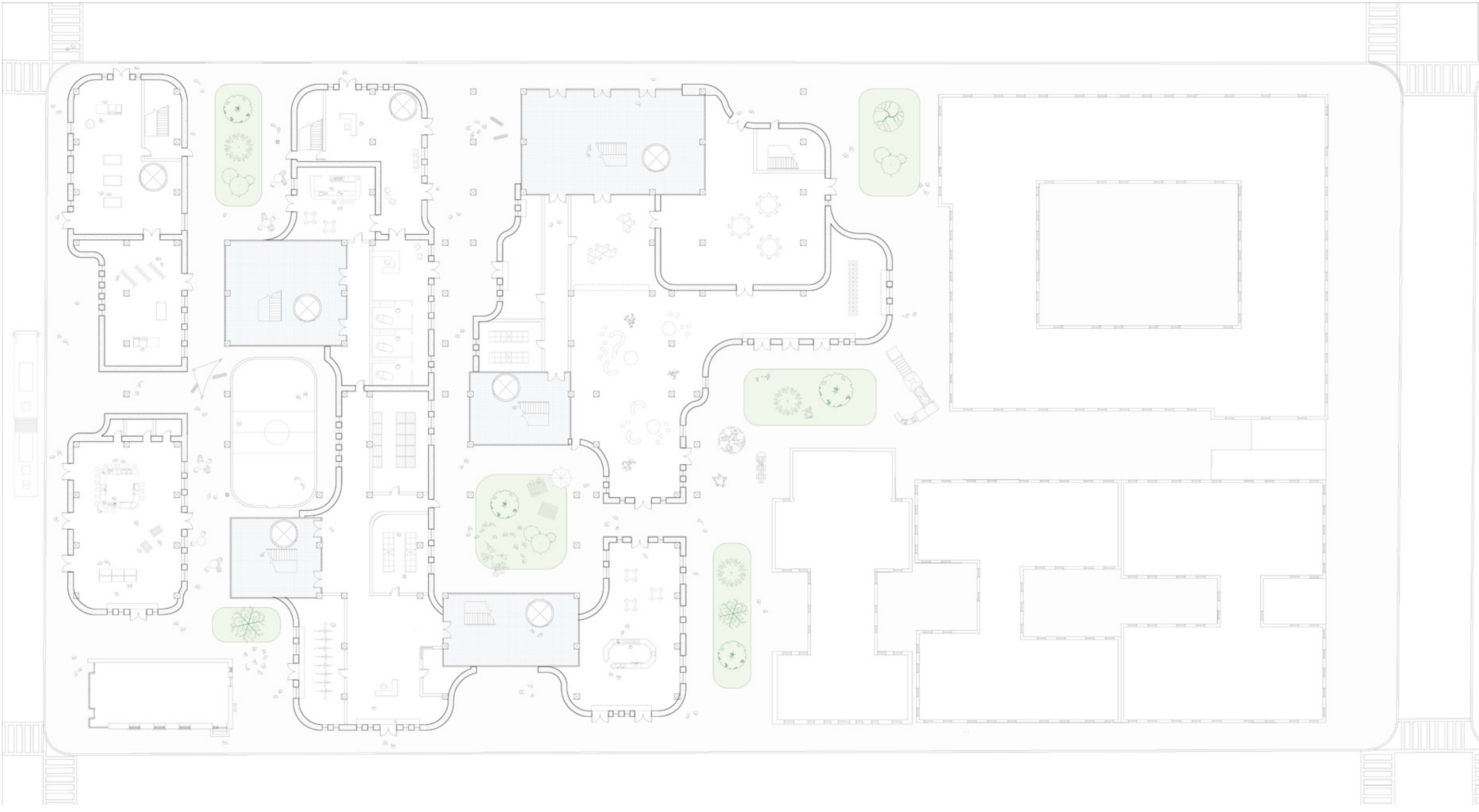



DIMENSIONS
SINGLE HEIGHT
DOUBLE HEIGHT
MICRO (300 SF)
STUDIO (500 SF)
ONE BED (750 SF)
TWO BED (1000 SF)
THREE BED (1200 SF)
FOUR BED (1500 SF)
SHARED COURTYARD
AGGREGATION PROTOTYPES



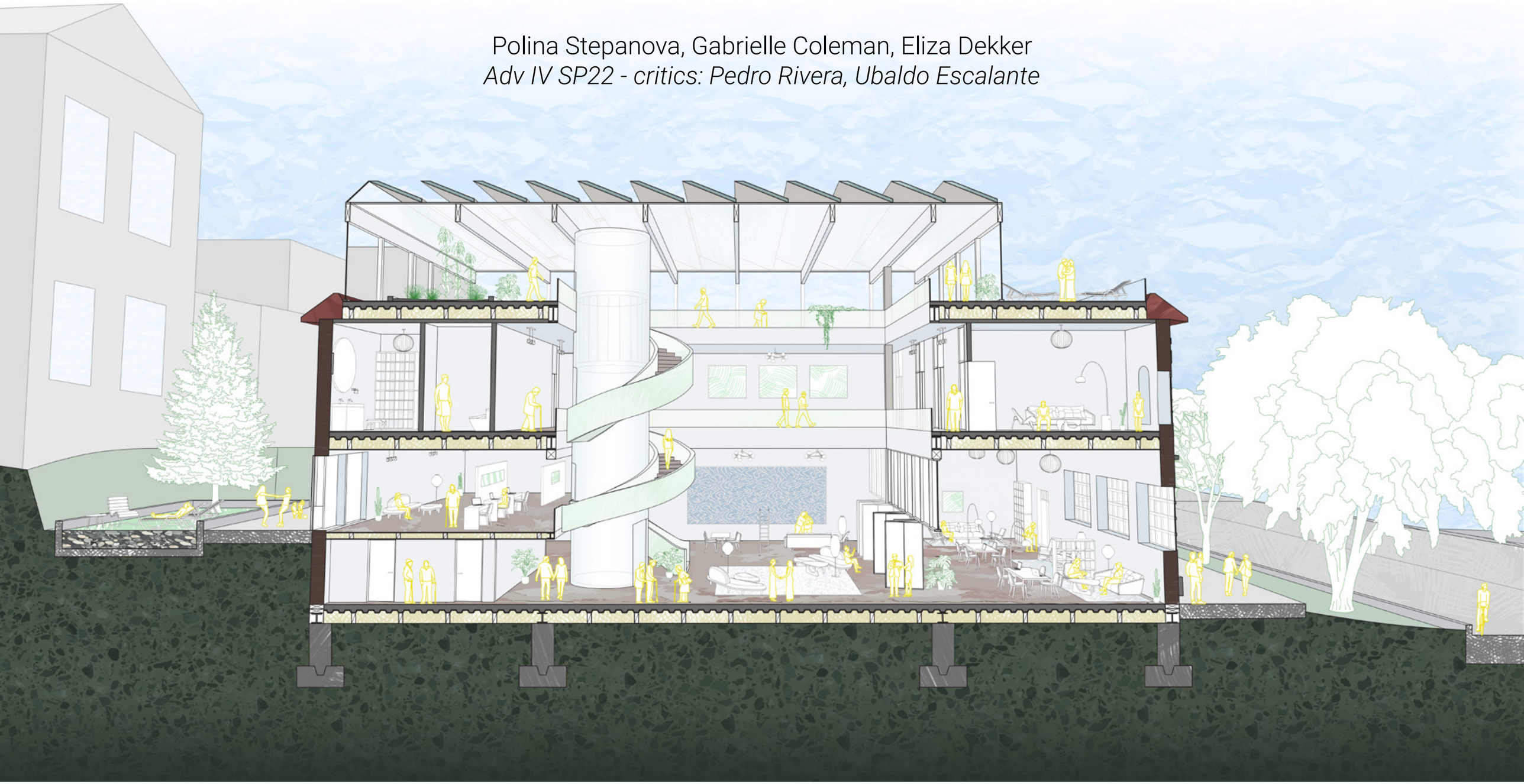






Bath House: Social Health Network

Polina Stepanova, Gabrielle Coleman, Eliza Dekker
Adv IV SP22 - critics: Pedro Rivera, Ubaldo Escalante



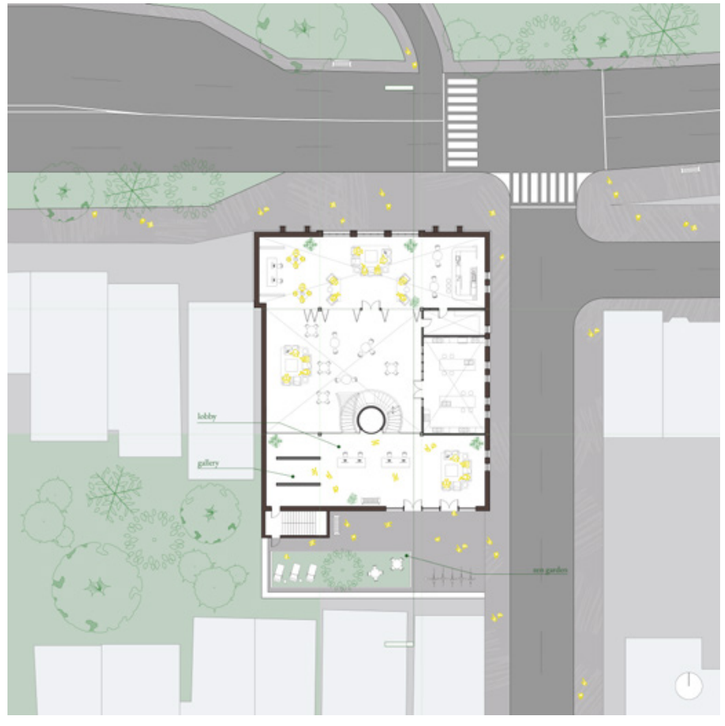
Bath House

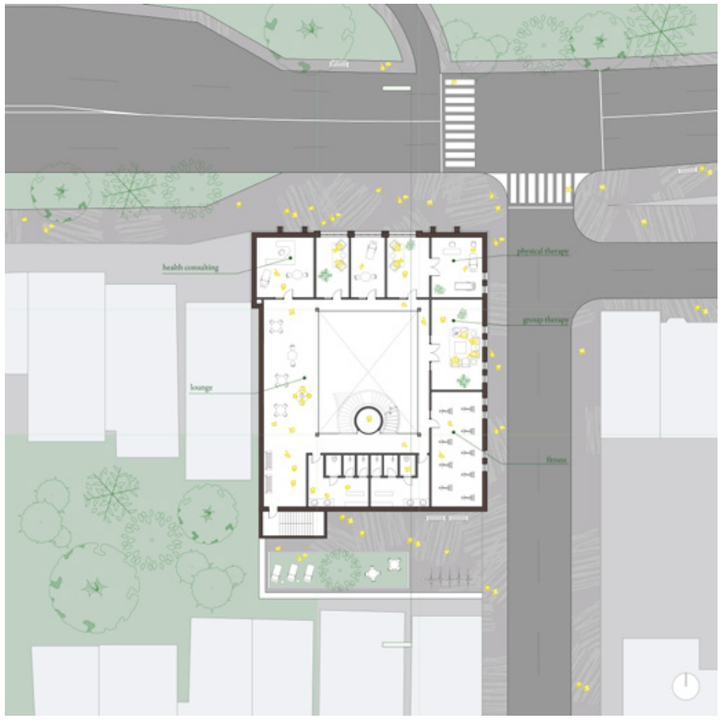
Social Health Network was a project completed during a joint architecture / urban planning studio at Columbia University GSAPP. The studio focused on identifying and repurposing stranded assets in the Hudson Valley, and I completed this project with Eliza Dekker and Gabrielle Coleman. My contribution included locating an abandoned bath house, analyzing the neighborhood through a climate justice lens, and proposing a new program and an architectural solution.

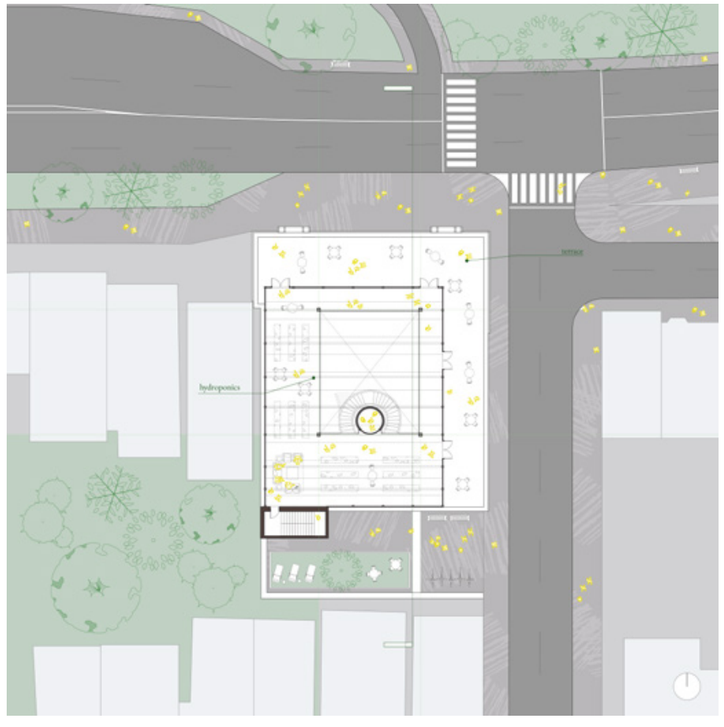
The project started with the research on Hudson Valley's community and environmental problems. We found that African Americans had the highest hospitalization rate in various Hudson Valley counties due to heart attack, stroke, asthma, and assault, according to Mid-Hudson Region Community Health Assessment of 2019–2021. Westchester County, home to the city of Yonkers, also had the highest uninsured population.

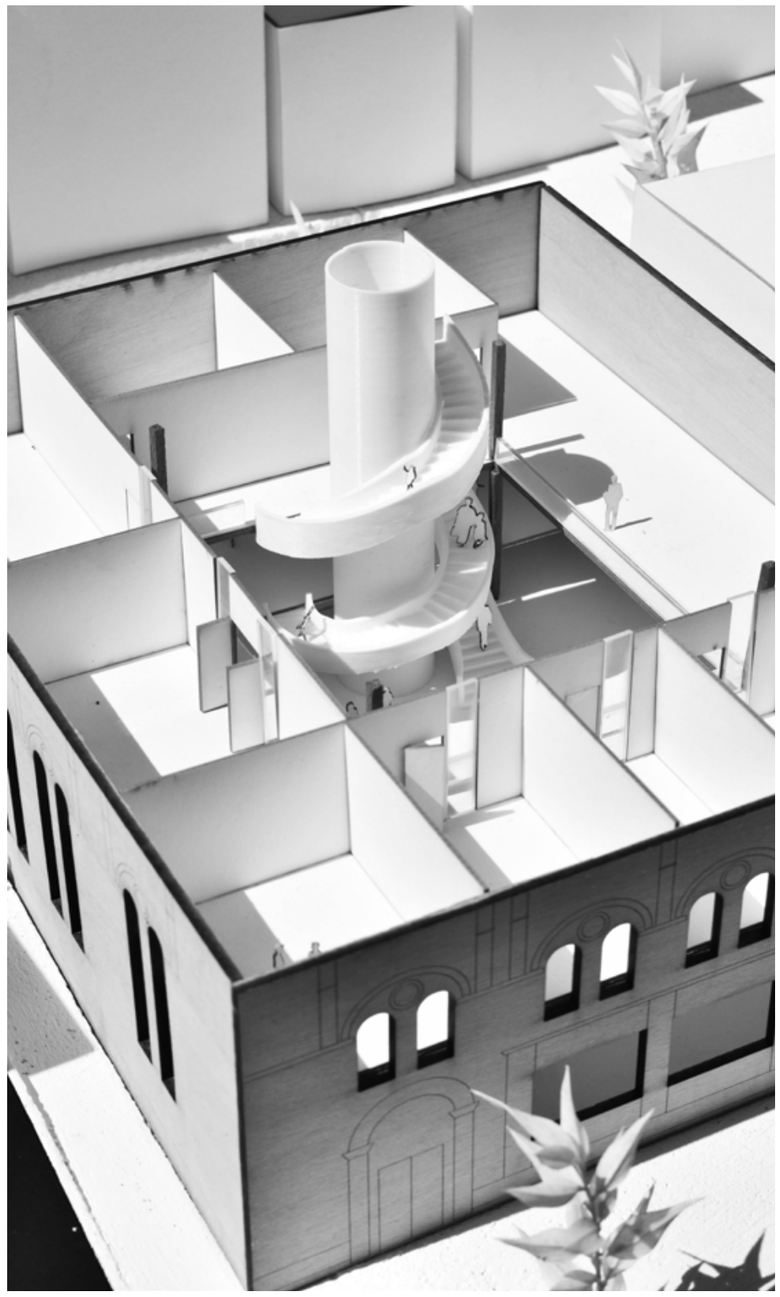
After this discovery, we identified a need for an accessible health network in Yonkers and found an abandoned bath house, located in the area with impervious surfaces and redlined by the Home Owners' Loan Corporation (HOLC). With the guidance of Groundwork and its Climate Safe Neighborhoods initiative, our team proposed transforming the bath house into a holistic health and community center servicing the local community (especially the most vulnerable population - African American elders).


coffee + library
storage
atrium
community kitchen


lobby
gallery
wet garden


health consulting
physical therapy
group therapy
lounge
fitness


terrace
hydroponics



creating a

social health network

in

yonkers, ny

polina stepanova, eliza dokker & gabby coleman | architecture and urban planning joint studio - spring 2022

1880s queen city on the hudson
yonkers flourishes as industrial hub of lower hudson valley

1900s rise of public infrastructure
municipal surplus funds new bathhouses, schools, libraries and city services

1920s rise of private infrastructure
proliferation of private social / recreation clubs to serve immigrant communities

1950s industrial decline / urban renewal
industrial decline feeds urban 'blight' and car dependence, rise in downtown renewal projects

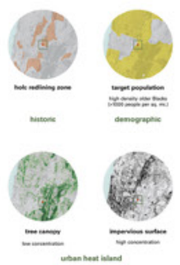
1970s daylighting of saw mill river
restoration of abandoned river leads efforts to bring city back to nature, the ultimate public infrastructure

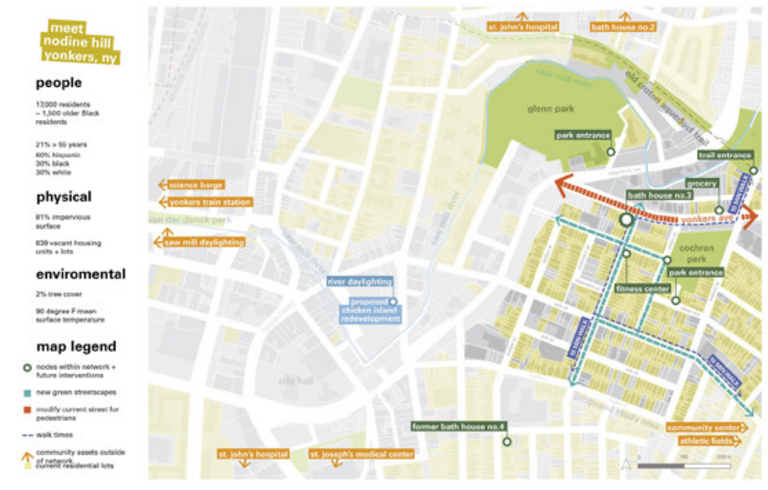
2000s social-health network
healthcare meets vulnerable communities where they live via social-health networks

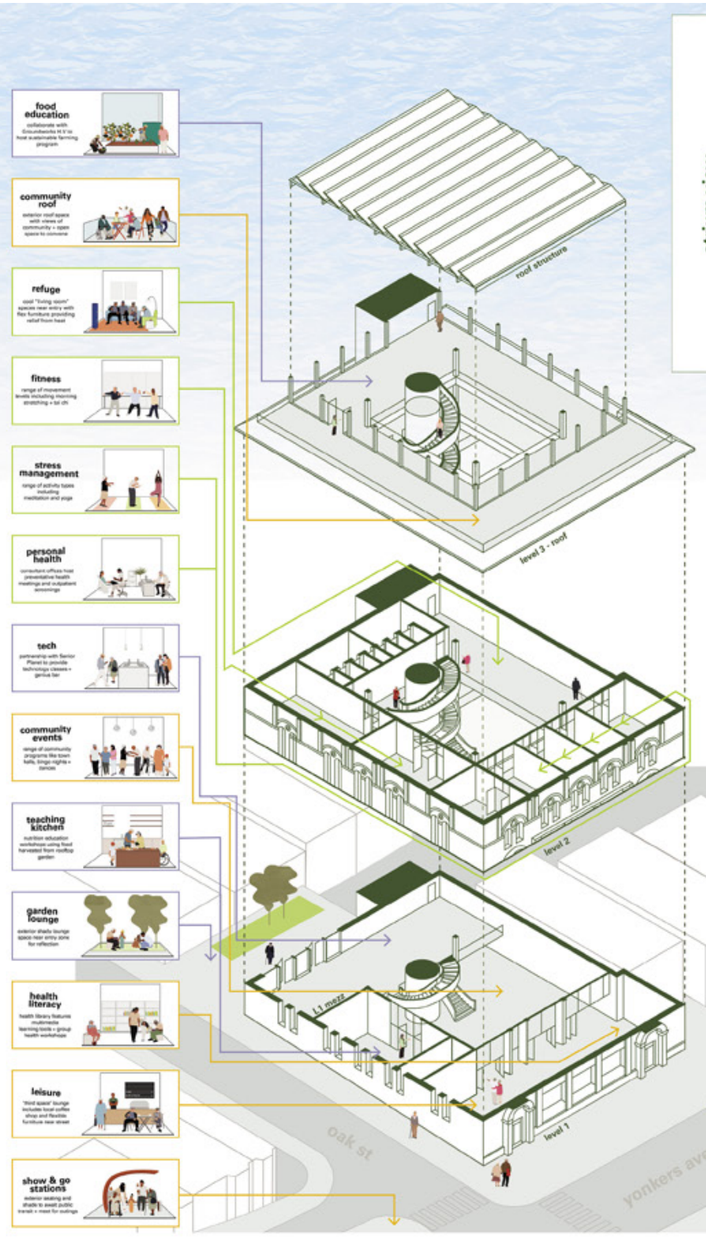
social health network

criteria

case study: yonkers, ny







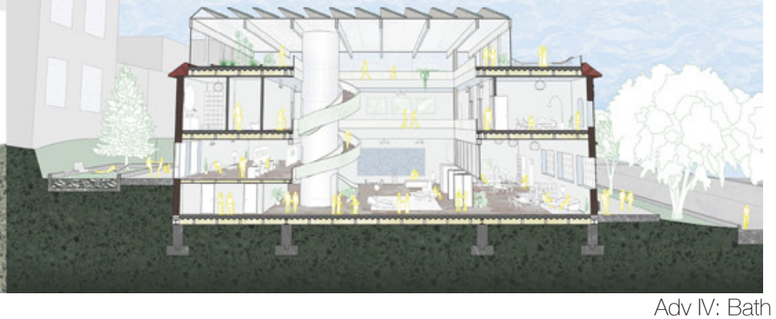
atrium view

ground floor @ 1'=1/16"

mezzanine floor @ 1'=1/16"

2nd floor @ 1'=1/16"

roof level @ 1'=1/16"



Arctic Light

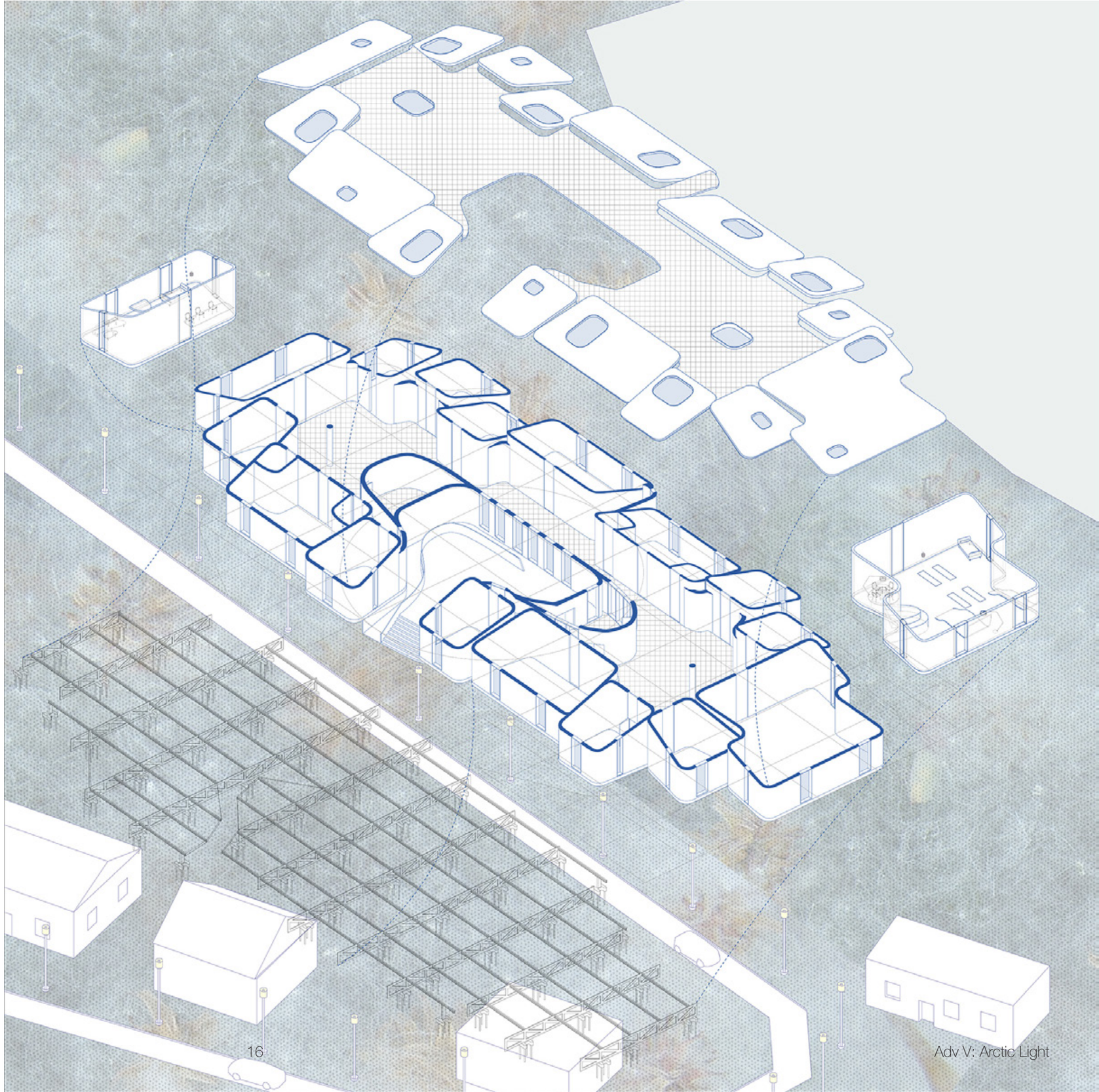
Polina Stepanova
Adv V FALL22 - critics: Leslie Gill, Khoi Nguyen

Arctic Light

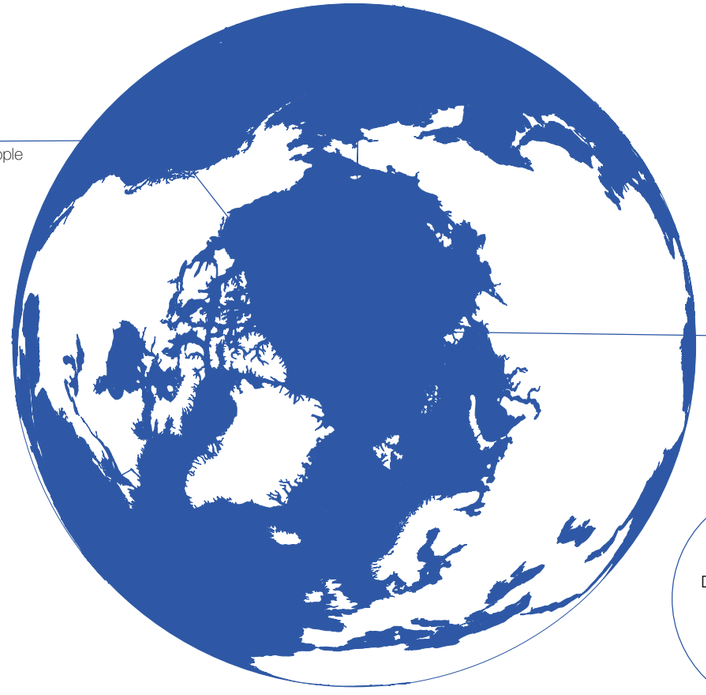
The polar research station was an individual project completed in “Are Icebergs Free?” studio at Columbia University GSAPP during Fall 2022. I started my design process by analyzing behavior of light through devising a shadowbox, and then I decided to focus on a territory with extreme climate conditions which has the highest suicide rate in the entire world – Nunavut in Canada.

Nunavut is very sparsely populated even though it has a large territory of 800,000 square miles. 84% of the population is Inuit, and the biggest city is Iqaluit, located on Baffin Island. Considering the extreme climate conditions of the Arctic region, I decided to look into the connection between the light conditions and the local human psychology patterns. I wanted to investigate how properties of light can relieve or exacerbate psychological conditions.

I also analyzed construction methods in the Arctic to ensure proper thermal insulation and financial reasonability, and employed raised foundations on steel trusses and prefabricated units. The windows of the units faced in all different directions to create various light conditions. The Life Cycle Analysis shows how the research units at the station can be transformed into living quarters to ensure the longevity of the building.



The World
7.753 billion people

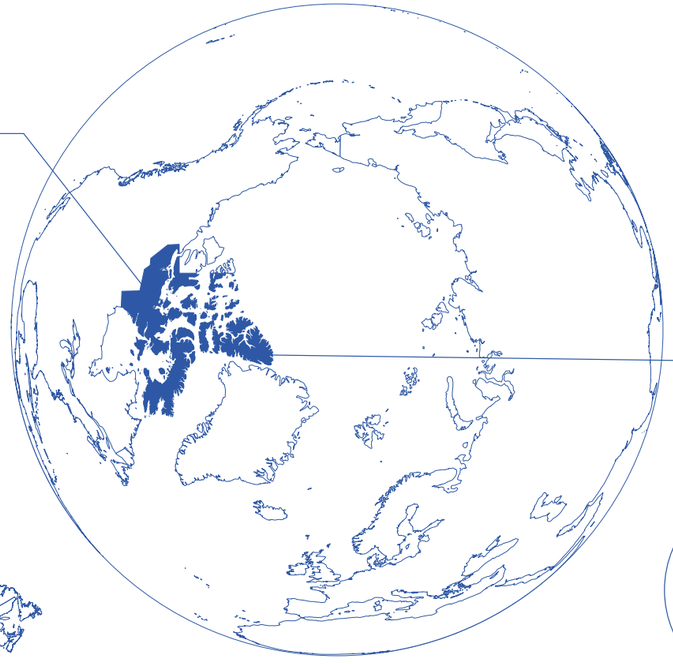


SAD + SSAD Rate
0.5-3 %

Depression Rate (WHO)
3.8%

Suicide Rate
10.5 per 100,000

Nunavut
38,780 people
84% Inuit

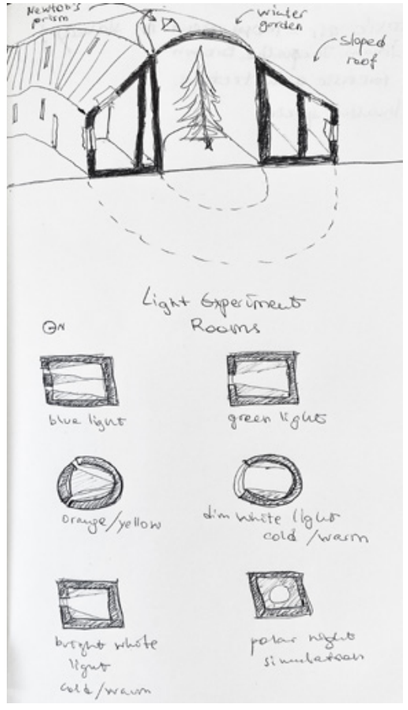


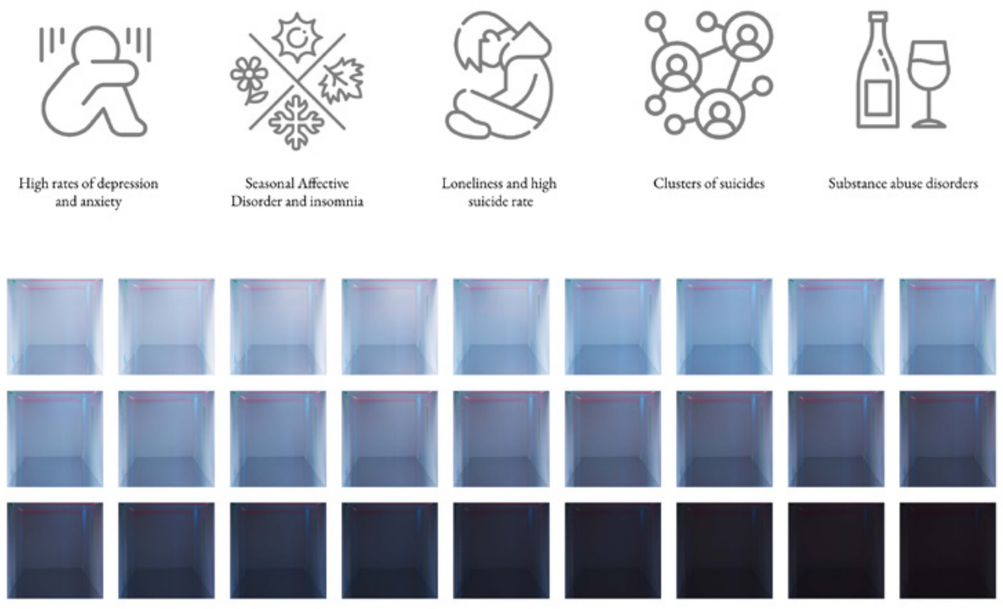
Nunavut
area 800,000
sq. miles
density 0.05
people/sq. mile

SAD + SSAD Rate
18 %

Depression Rate
22.6%

Suicide Rate
100 per 100,000





High rates of depression and anxiety

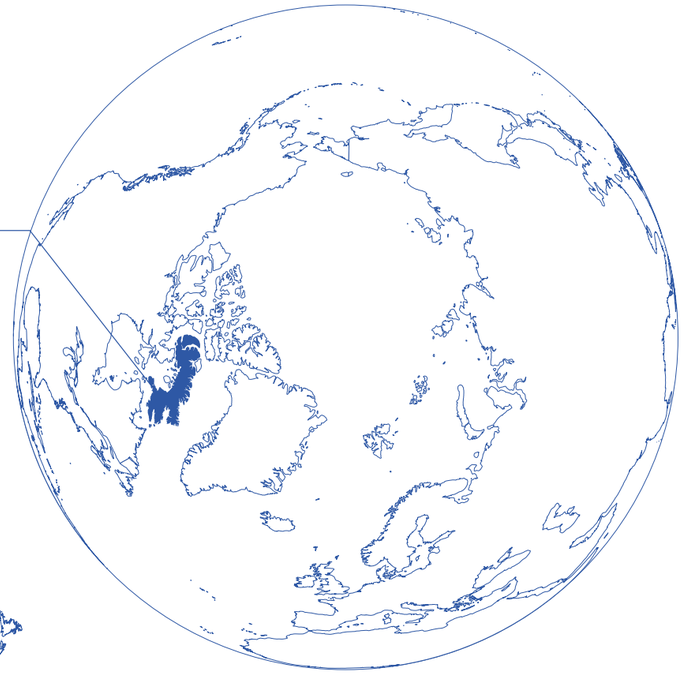
Seasonal Affective Disorder and insomnia

Loneliness and high suicide rate

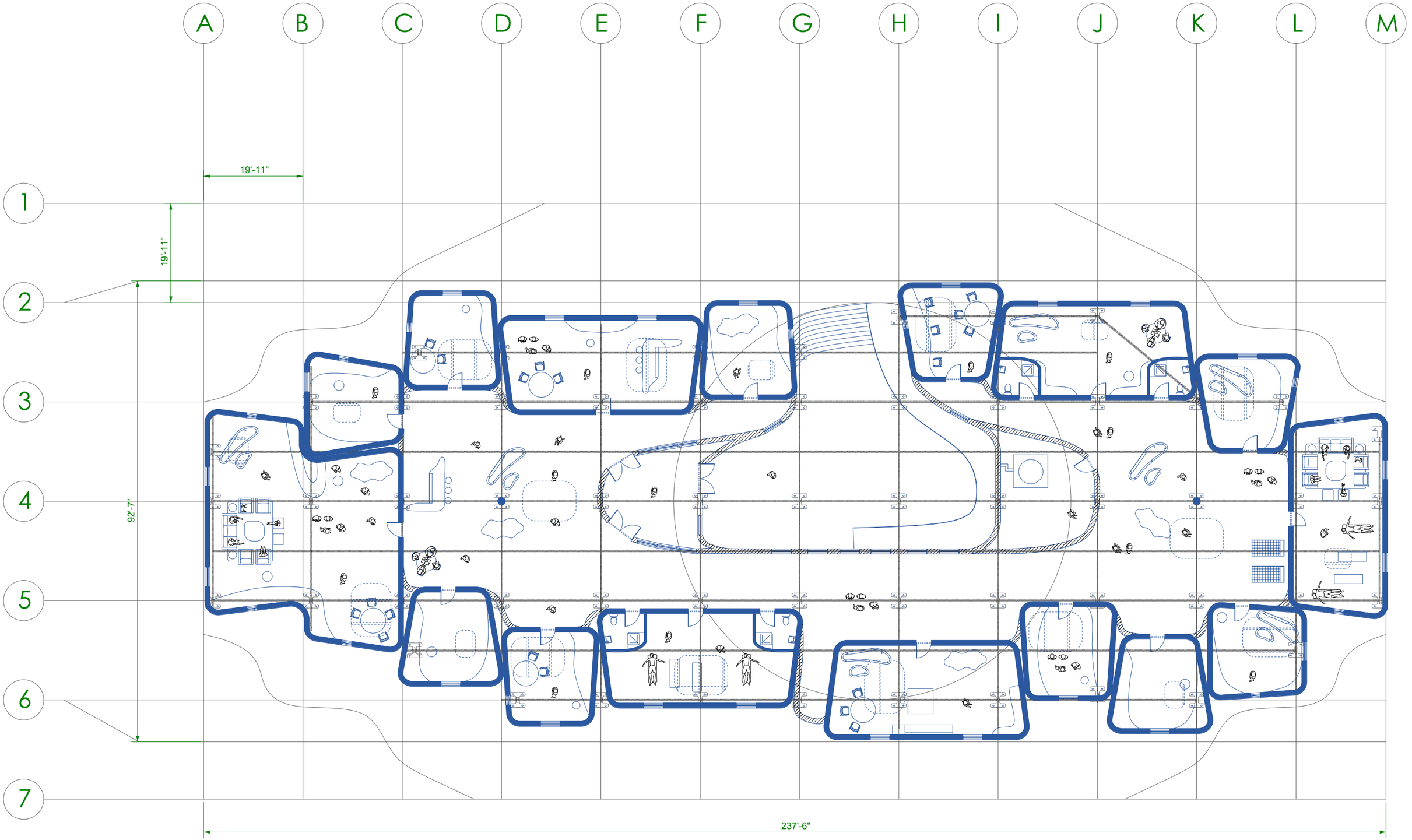
Clusters of suicides

Substance abuse disorders

Baffin Island
13,039 people
part of Nunavut territory



Baffin Island
5th largest in the world
area 195,000
sq. miles
density 0.07
people/sq. mile



N

1' = 1/8"

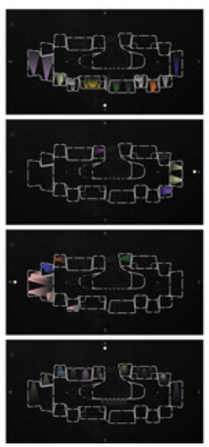

N
W
E
S

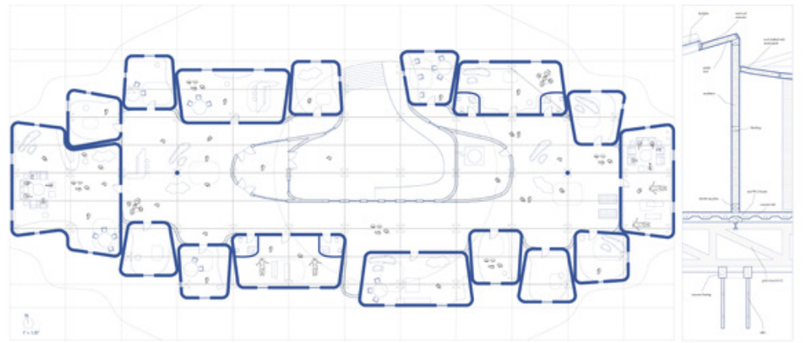

N
W
E
S

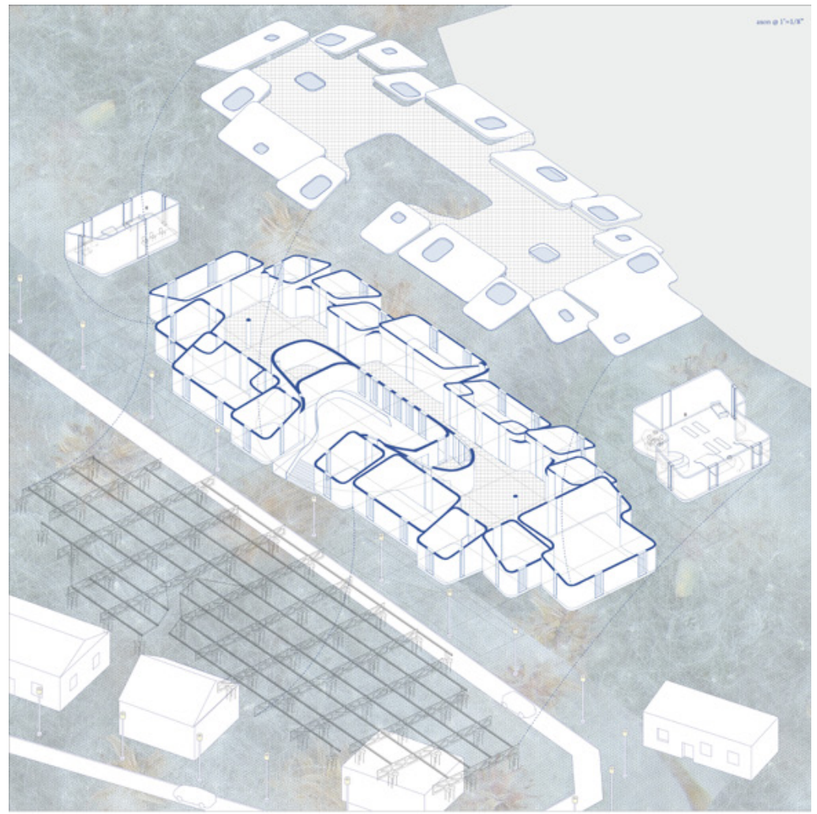
N
W
E
S

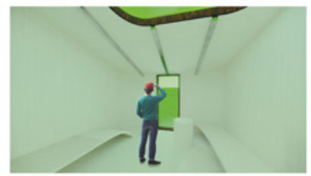
N
W
E
S

Arctic Light & Human Psyche









The Tactile Experience

Group work: Yiyi Gao, Candice Ji, Yang Fei, Polina Stepanova

Adv VI SP23 - critics: David Gissen, Alonso Ortega

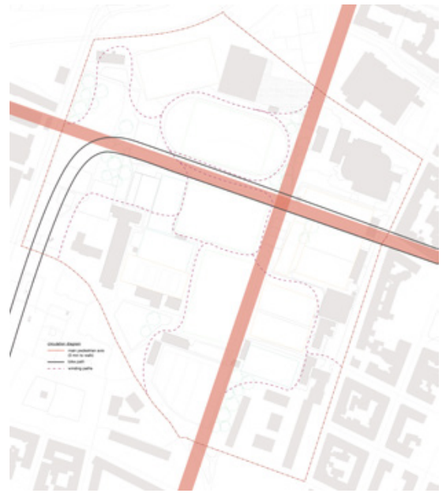
The Tactile Experience

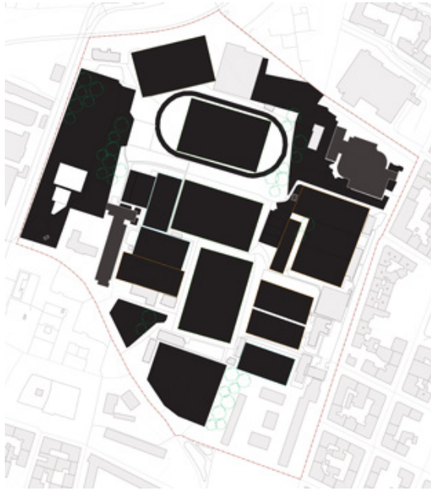
The Tactile Experience project was completed in “Disabling Modernities” studio led by David Gissen in Spring 2023. Half of the project was accomplished collectively (project contributors: Yiyi Gao, Candice Ji, Yang Fei, and Polina Stepanova), while the second half was done on an individual basis but still located on the shared site.

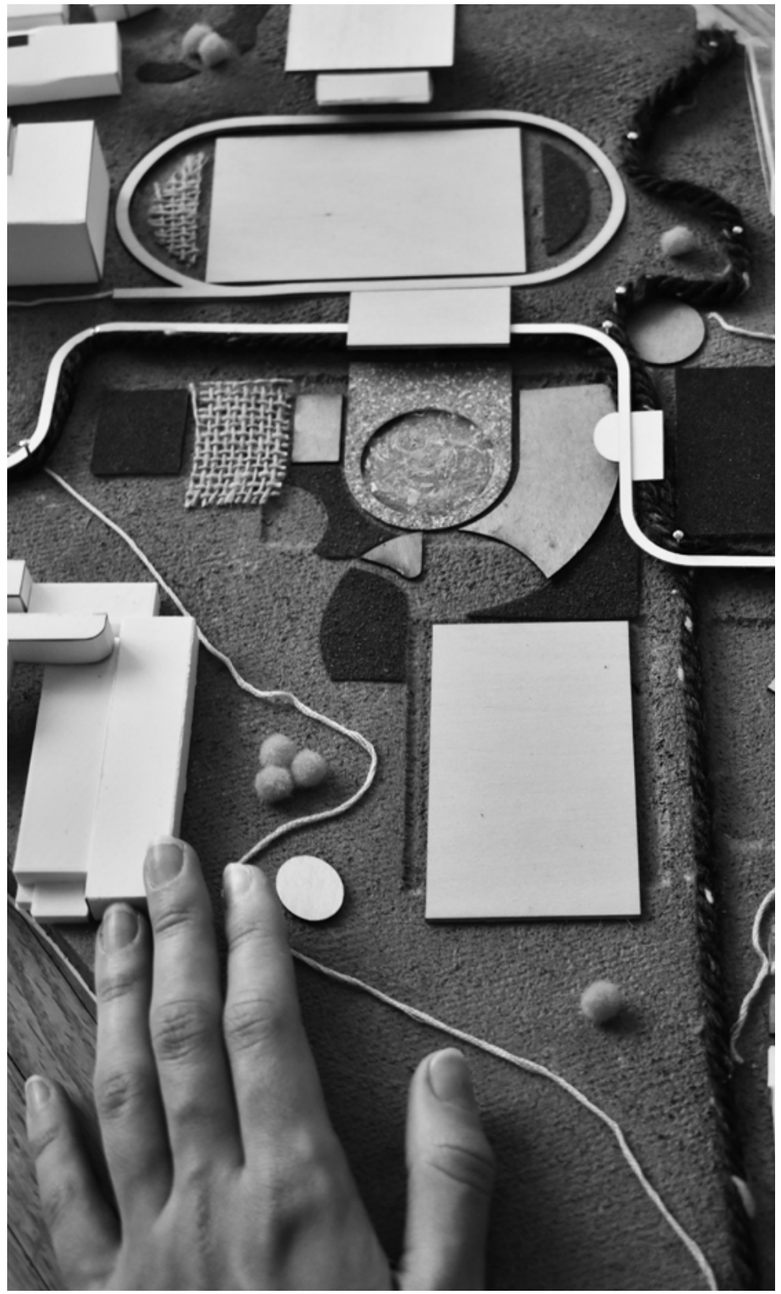
The studio narrative revolved around the topics of inclusive design, urban accessibility, and large city scale multigenerational compositions. The project team was assigned to Postsportsplatz site located in *Vienna, Austria*, and the team’s goal was to reimagine the site in an inclusive environment instead of catering to just those involved in high-impact sports. The question of circulation and clear wayfinding provided a clear direction for the project, and the studio explored methods of architectural representation through sound and tactile models to prevent over-relying on vision.

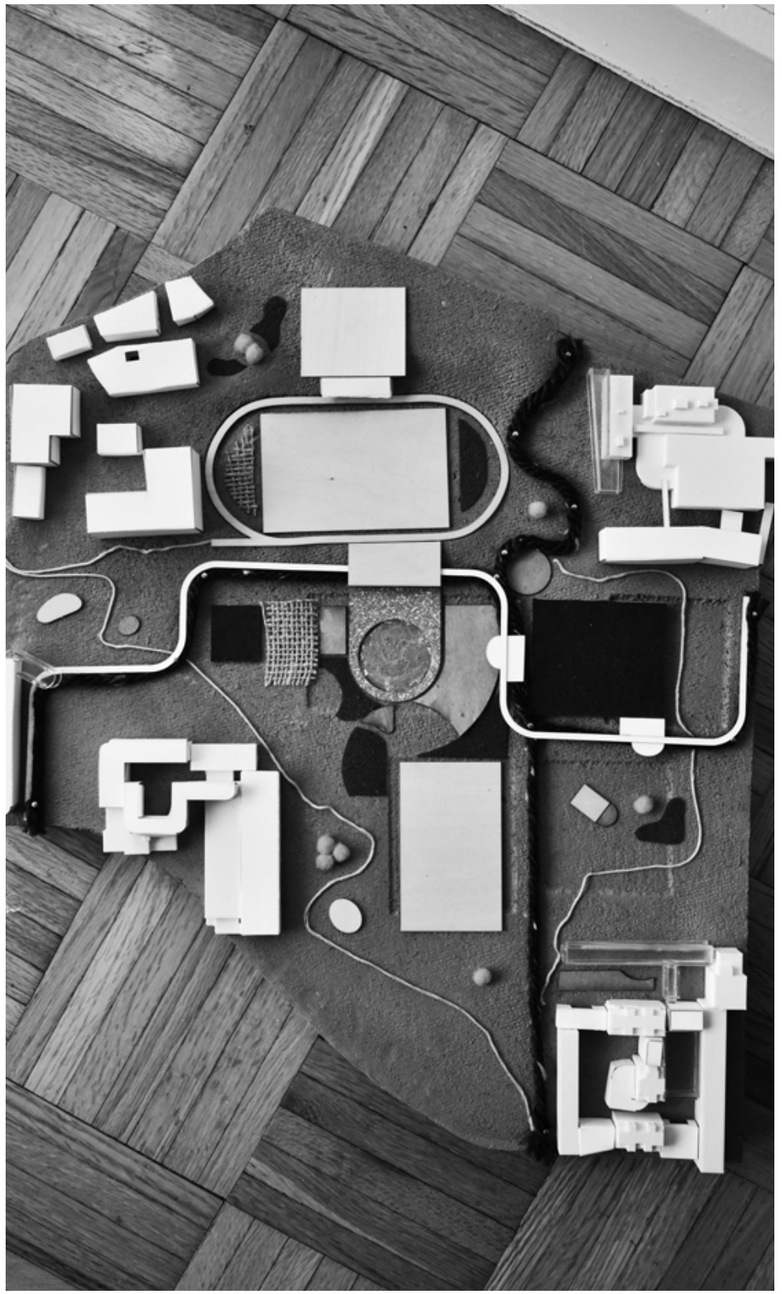
The individual part of the project focused on adapting an existing housing corner to the needs of aging community and on improving connectivity within the southeast corner of Postsportsplatz. Introduction of public rooftop also represented an invitation for the larger neighborhood to gather on the site.

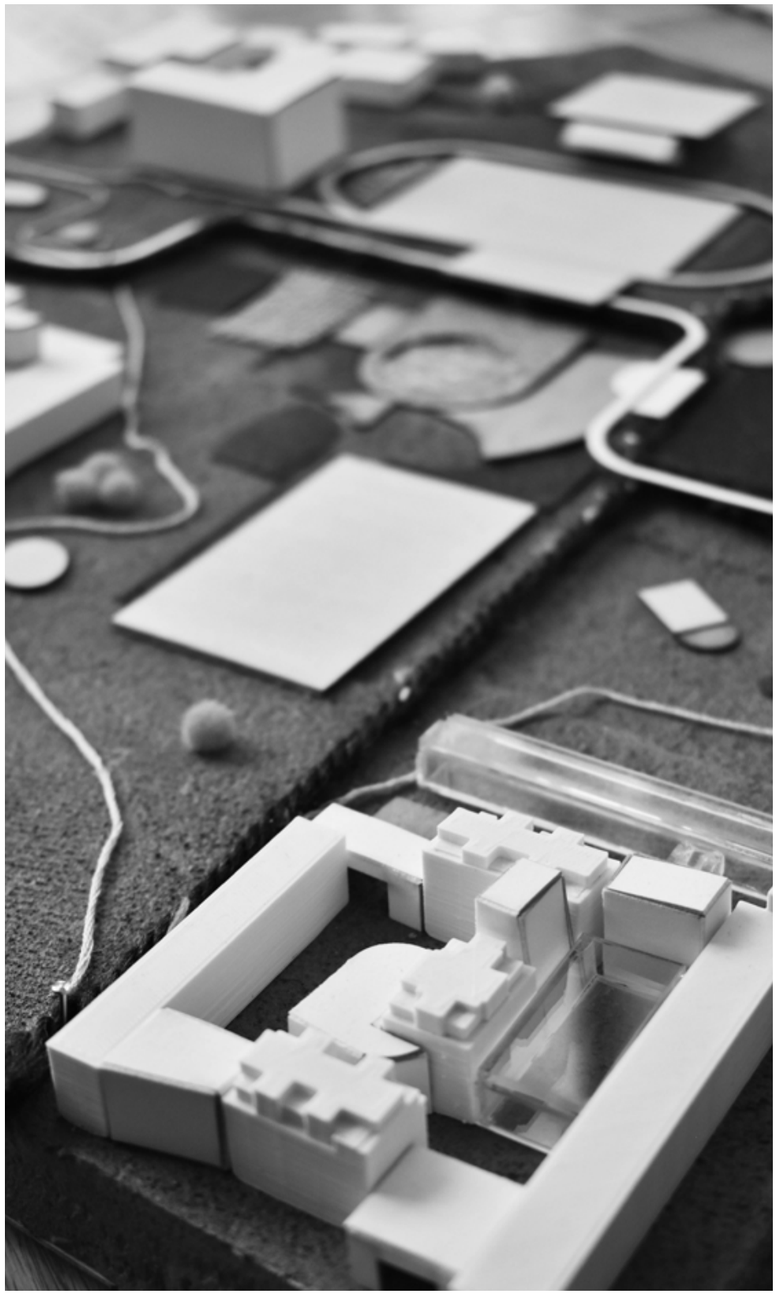
The Tactile Experience ultimately represented coming in touch with one’s senses and relating to other people and their perception, often different from ours.



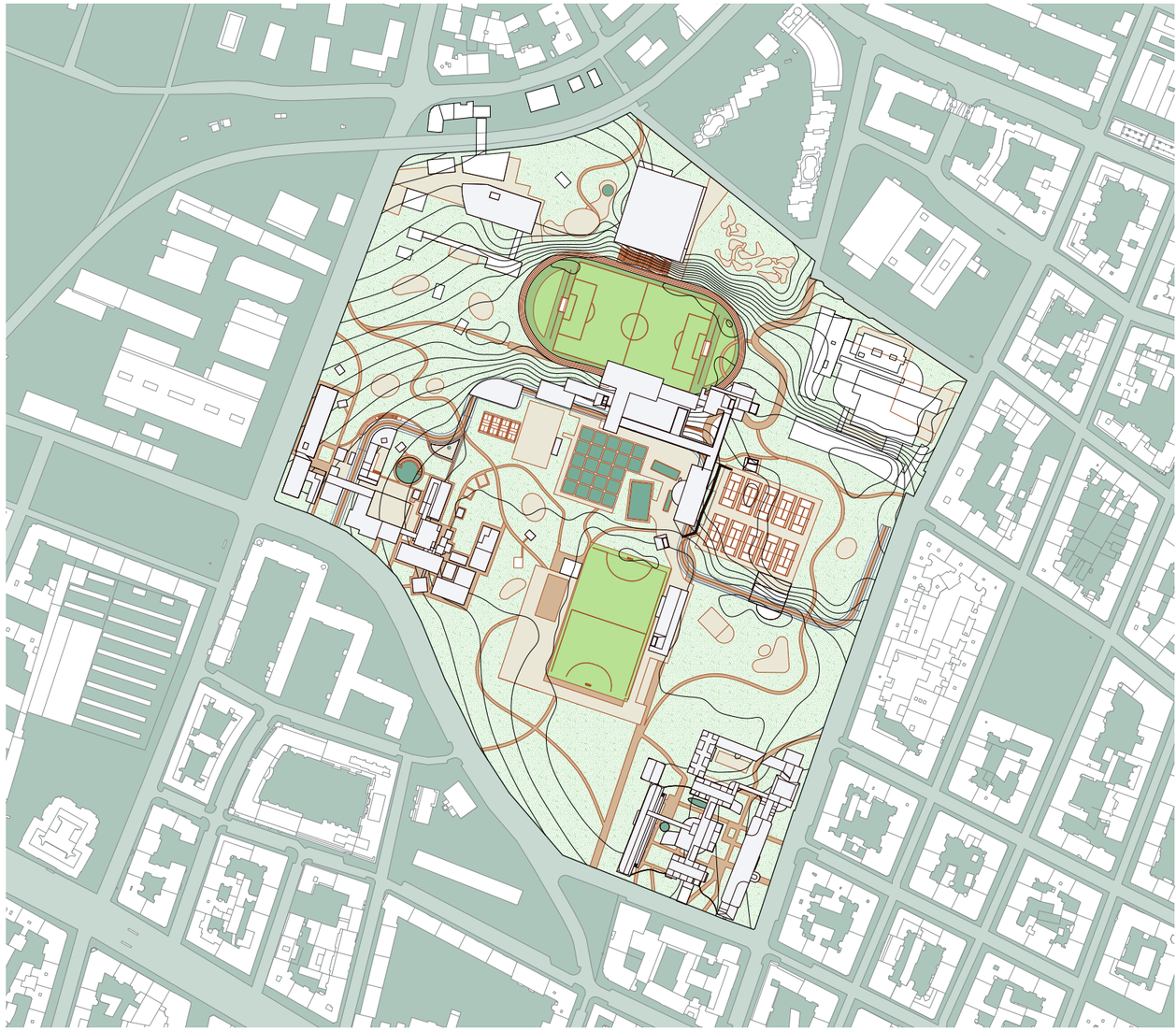






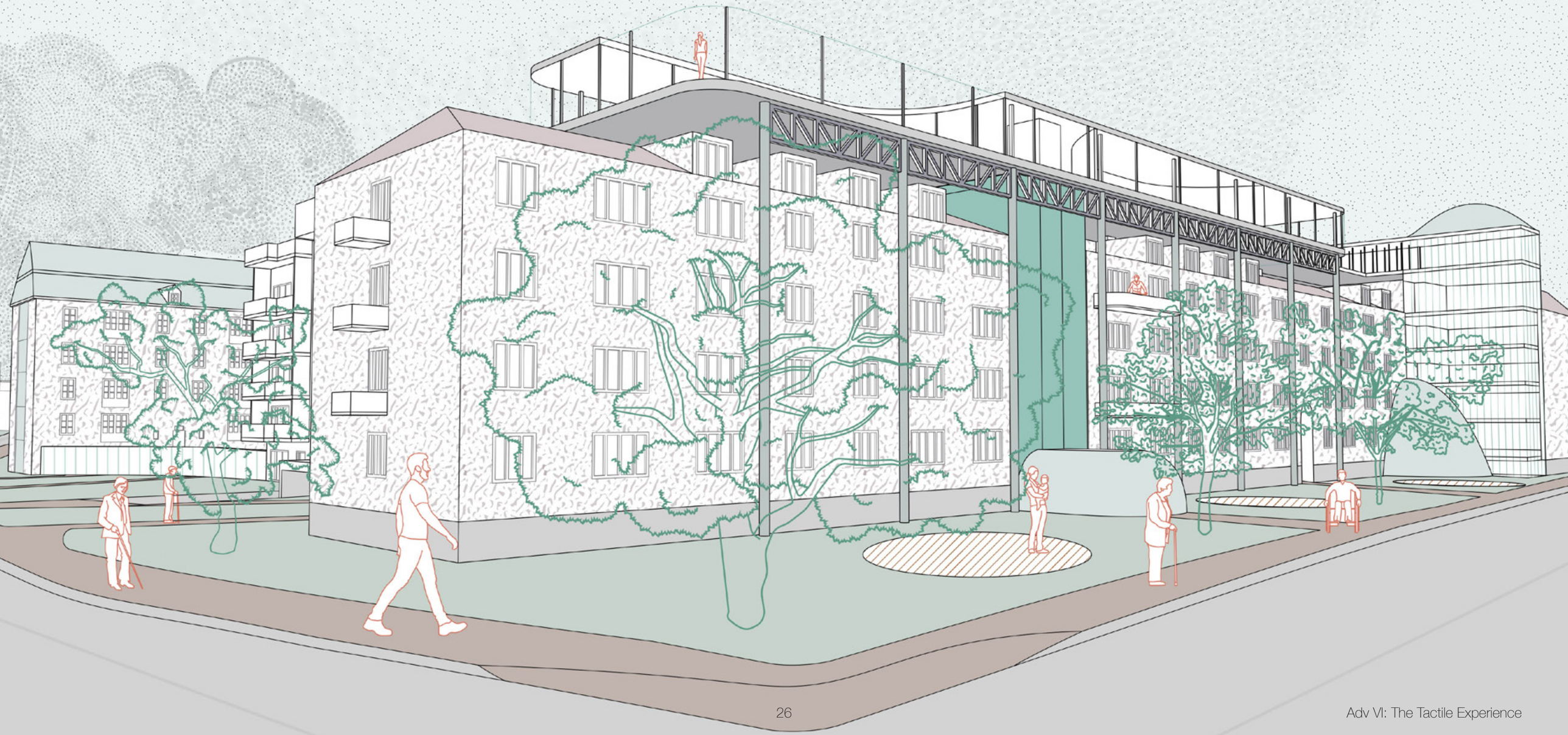


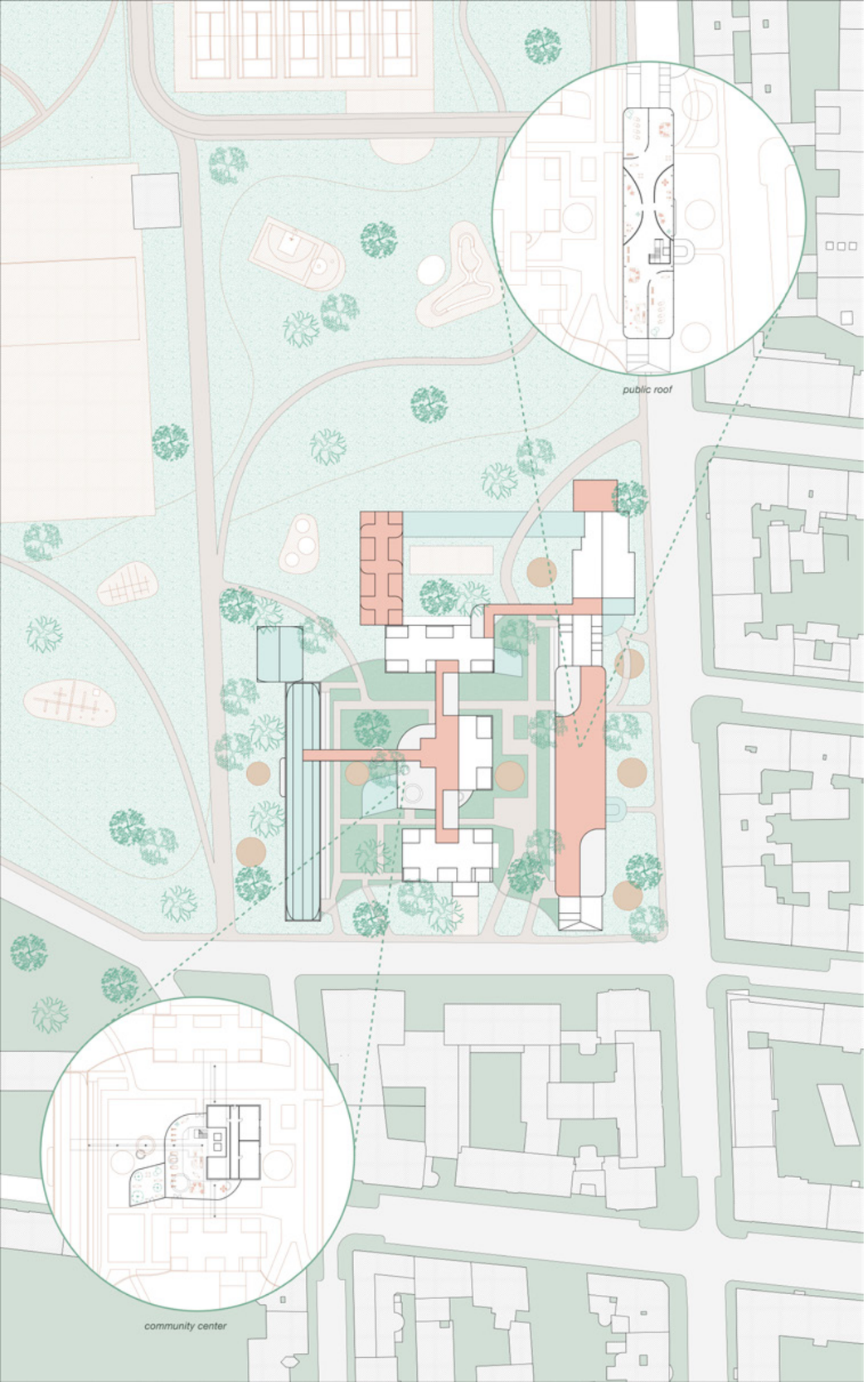

NEW CONSTRUCTION
EXISTING BUILDING
EXISTING BIKELANE
PROPOSED BIKELANE
RAILROAD
STUDIO GISSEN DISABLING MODERNITIES
POSTSPORTSPLATZ REIMGINED
YIYI GAO, CANDICE JI, POLINA STEPANOVA, YANG FEI

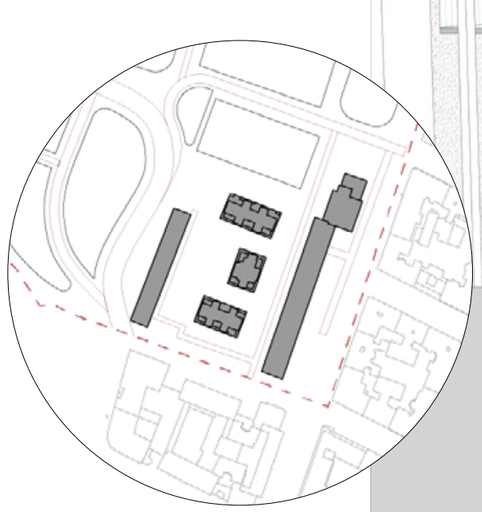


The Tactile Experience

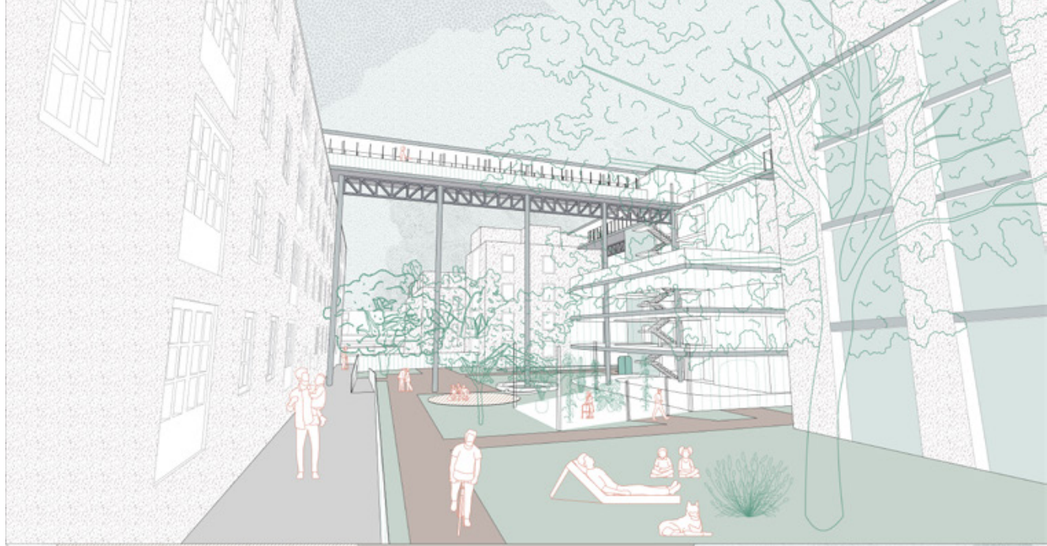
Individual work: Polina Stepanova
Adv VI SP23 - critics: David Gissen, Alonso Ortega

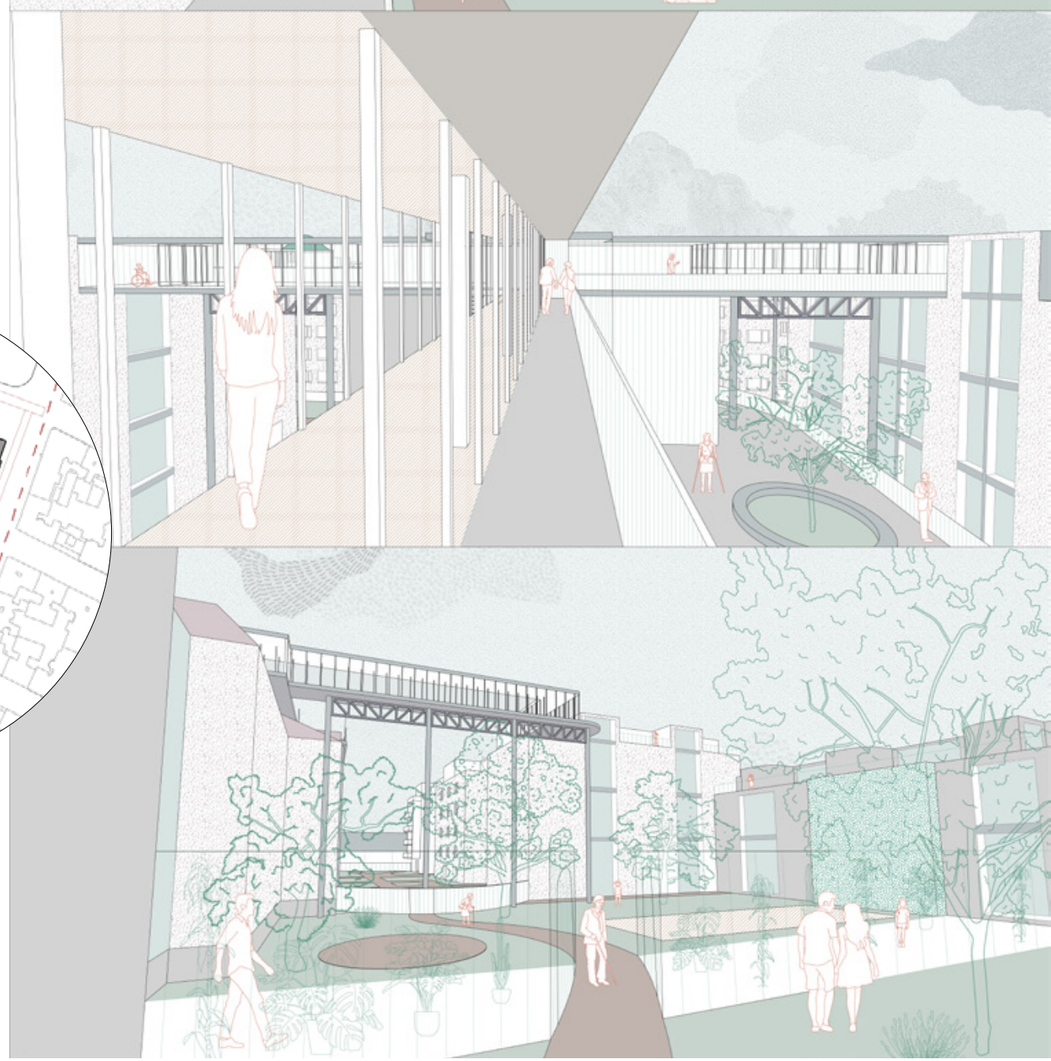


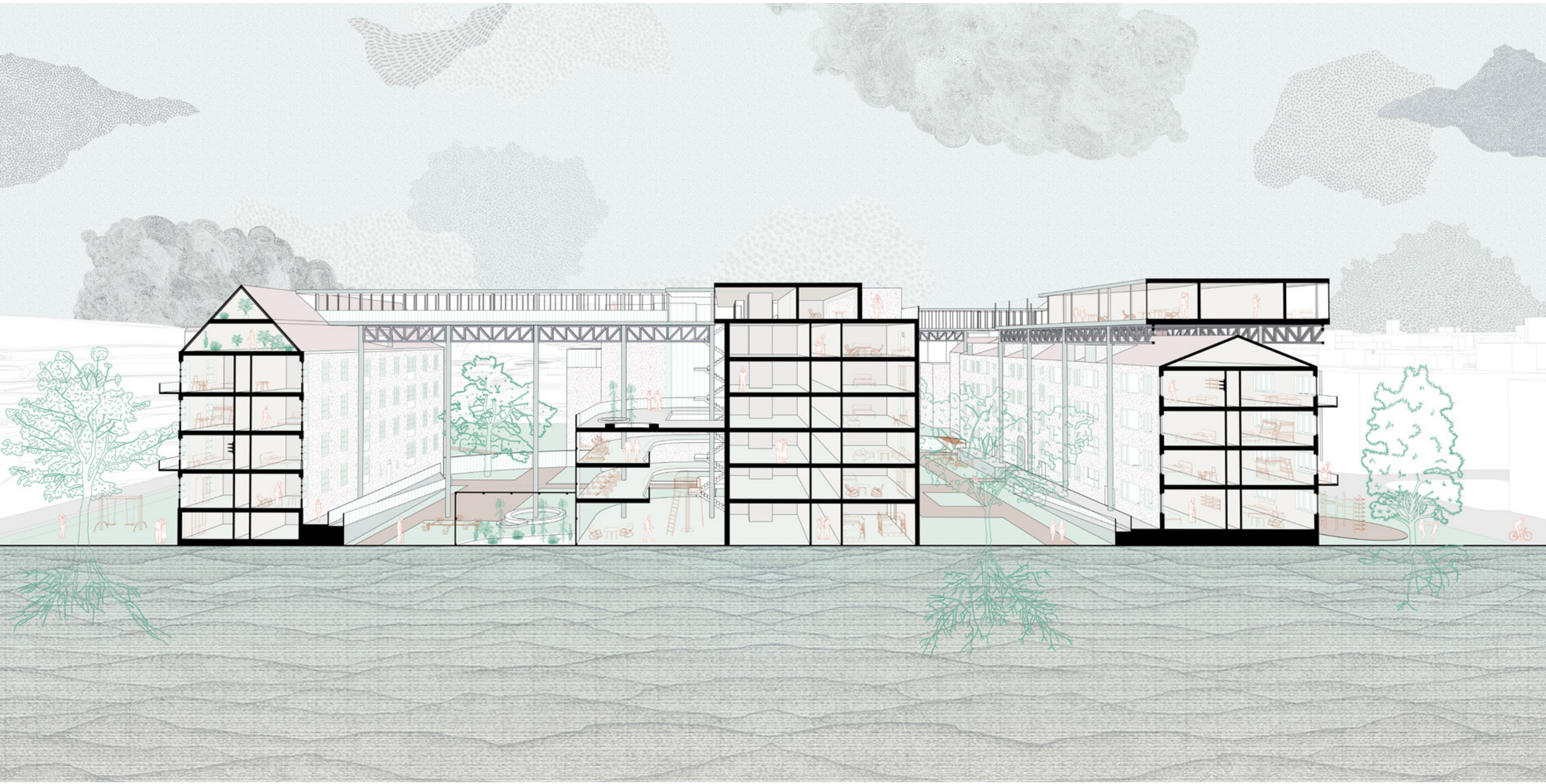




existing footprint

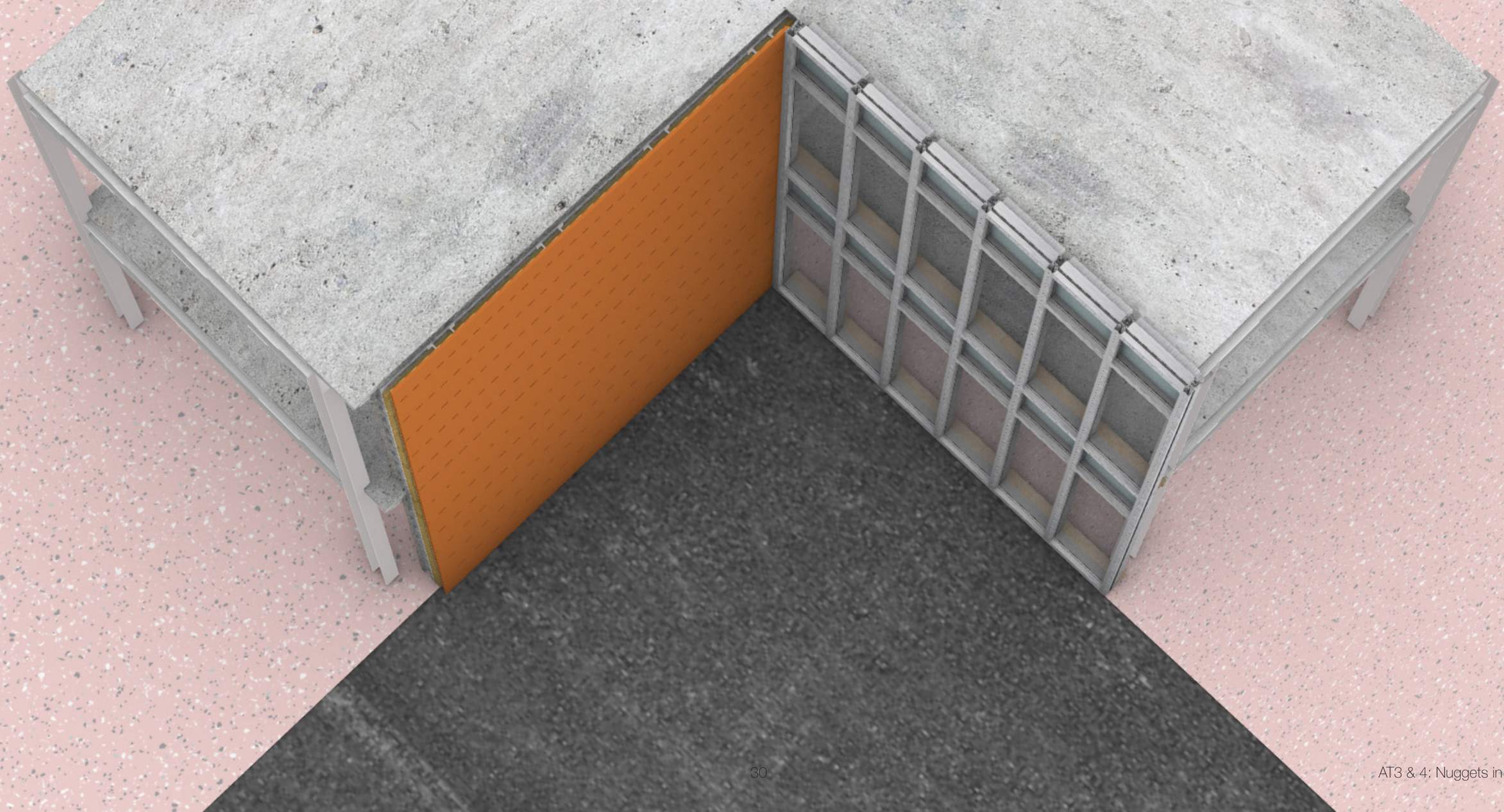


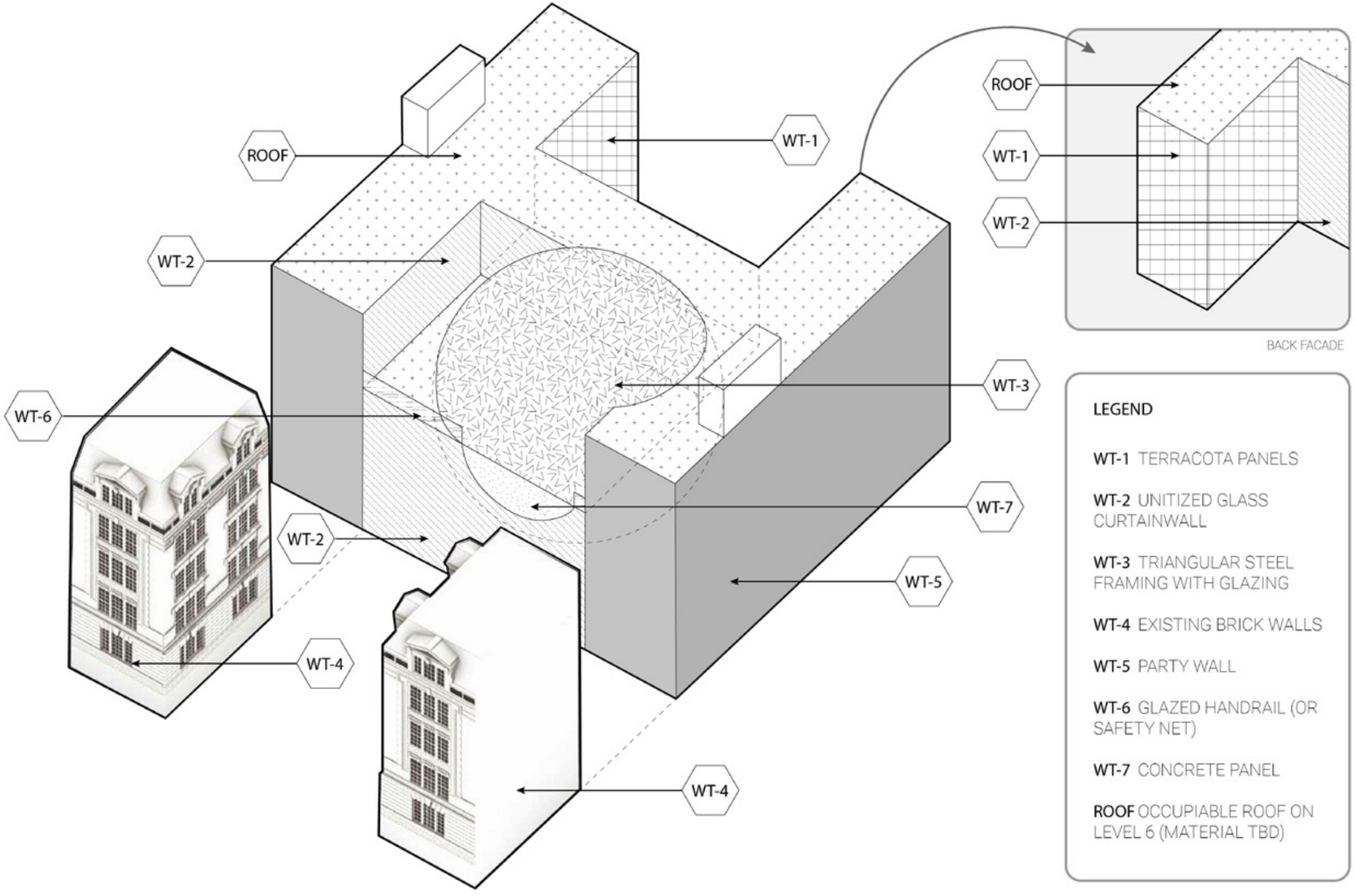




AT3 & AT4: Nuggets in Paris

Polina Stepanova, Paige Haskett, Brennan Heyward, Joachym Joab
FALL21 – critics: Gabrielle Brainard, Thomas Reiner, Berardo Matalucci





LEGEND

WT-1 TERRACOTA PANELS

WT-2 UNITIZED GLASS CURTAINWALL

WT-3 TRIANGULAR STEEL FRAMING WITH GLAZING

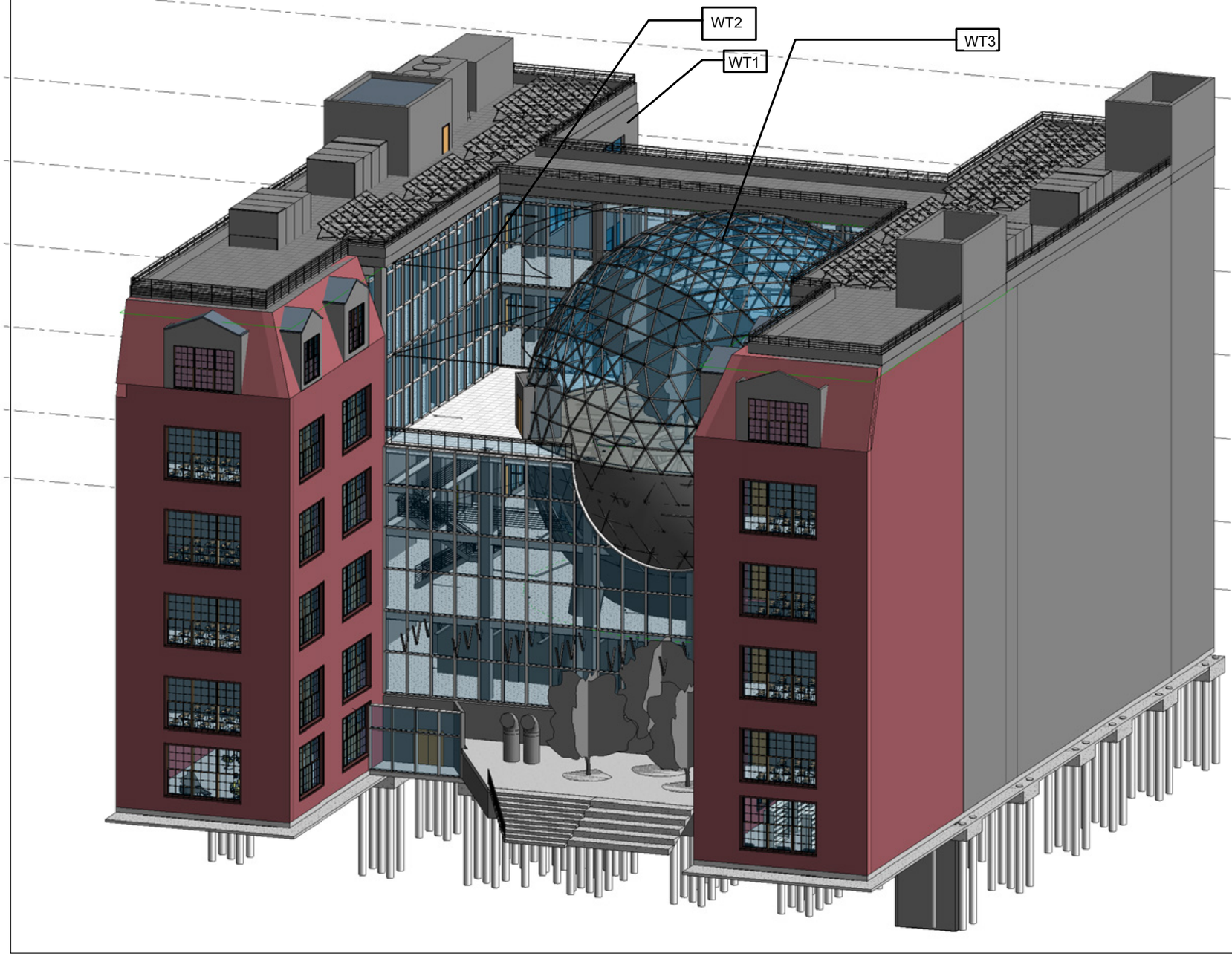
WT-4 EXISTING BRICK WALLS

WT-5 PARTY WALL

WT-6 GLAZED HANDRAIL (OR SAFETY NET)

WT-7 CONCRETE PANEL

ROOF OCCUPIABLE ROOF ON LEVEL 6 (MATERIAL TBD)



NUGGETS IN PARIS LLC
1172 Amsterdam Avenue
New York, NY 10027

DESIGNERS
Joachym Joab
Brennan Heyward
Paige Haskett
Polina Stepanova
Enrique Bejarano

CONSULTANTS

ARCHITECT
Joe Hand
SHoP Architects

STRUCTURAL CONSULTANT
Amy Harrington
Robert Silman Associates

MECHANICAL CONSULTANT
Chris Ashton
Buro Happold

ENCLOSURE CONSULTANT
Aaron Davis
Heintges Consulting Architects & Engineers

NO.	DATE	REVISION
01	12 OCT 2021	SD SUBMISSION
02	30 NOV 2021	DD SUBMISSION
03	17 DEC 2021	CD SUBMISSION

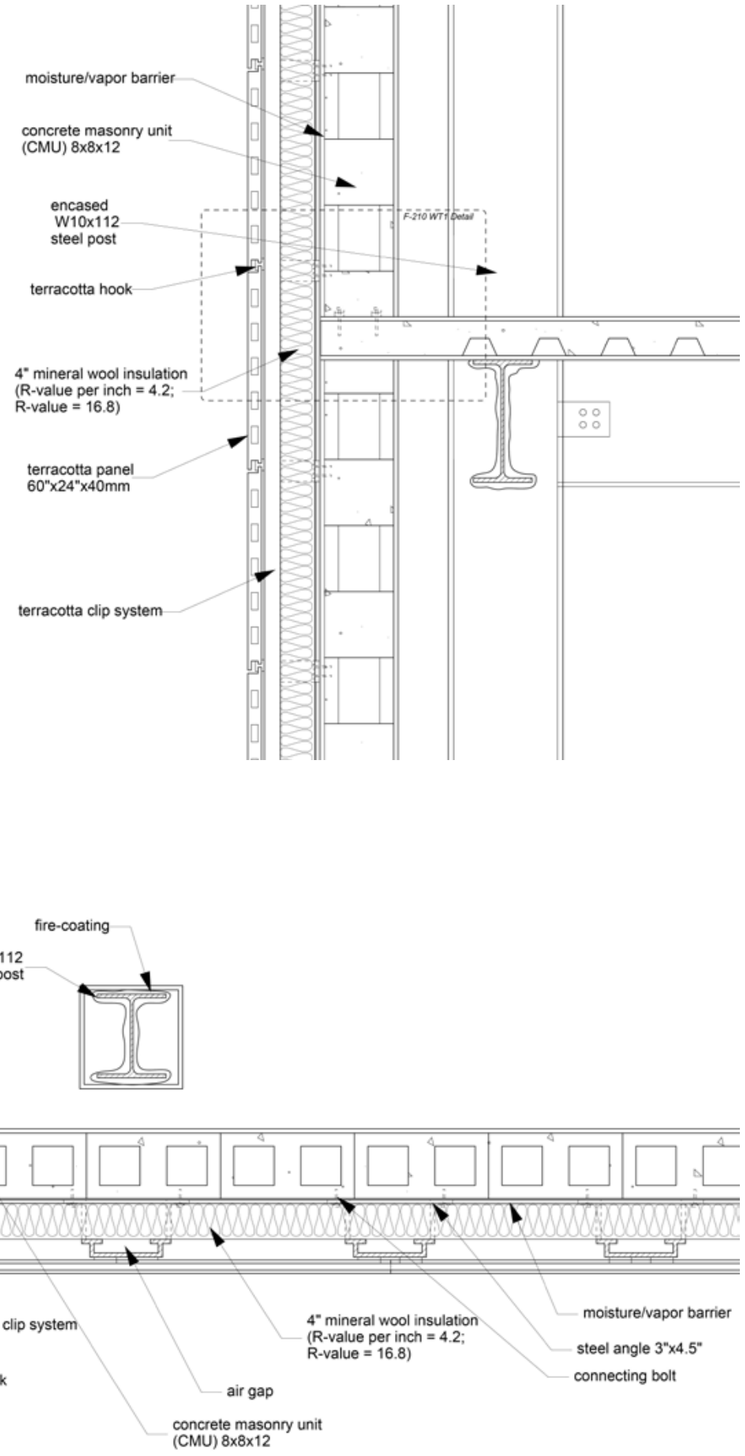
NEW YORK PUBLIC SCHOOLS
PS 64

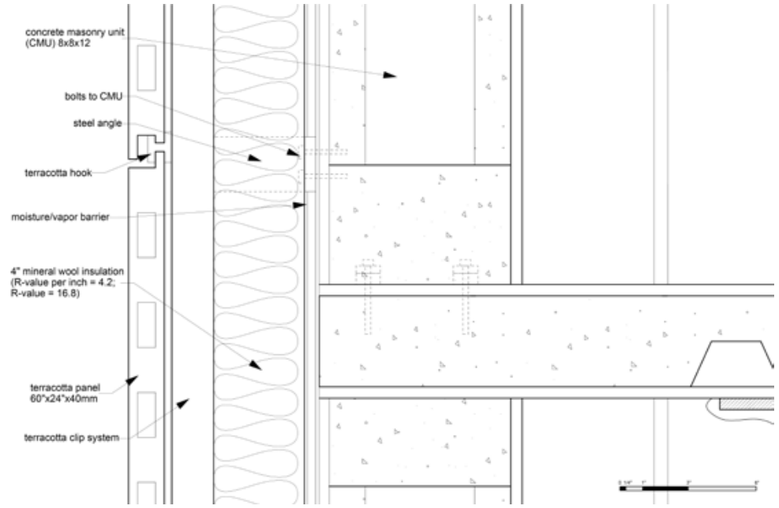
Facade Axon

Project number	000
Date	14 DEC 2021
Scale	Author

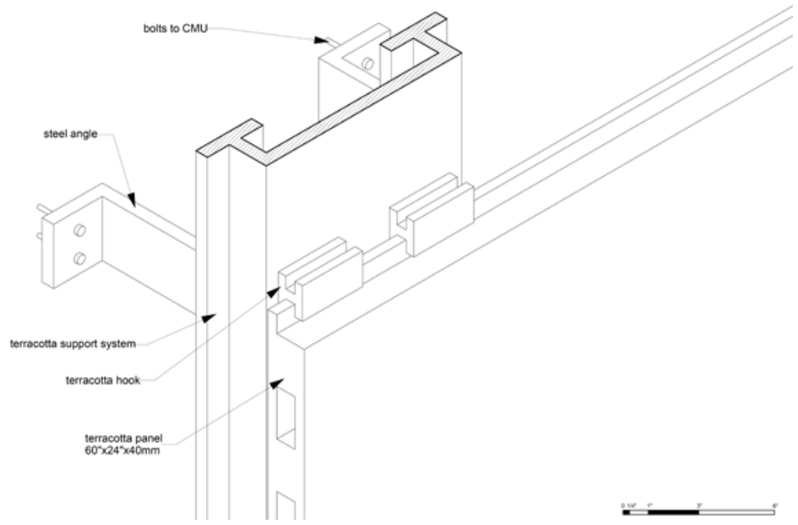
F111

3/30/2022 1:34:42 PM

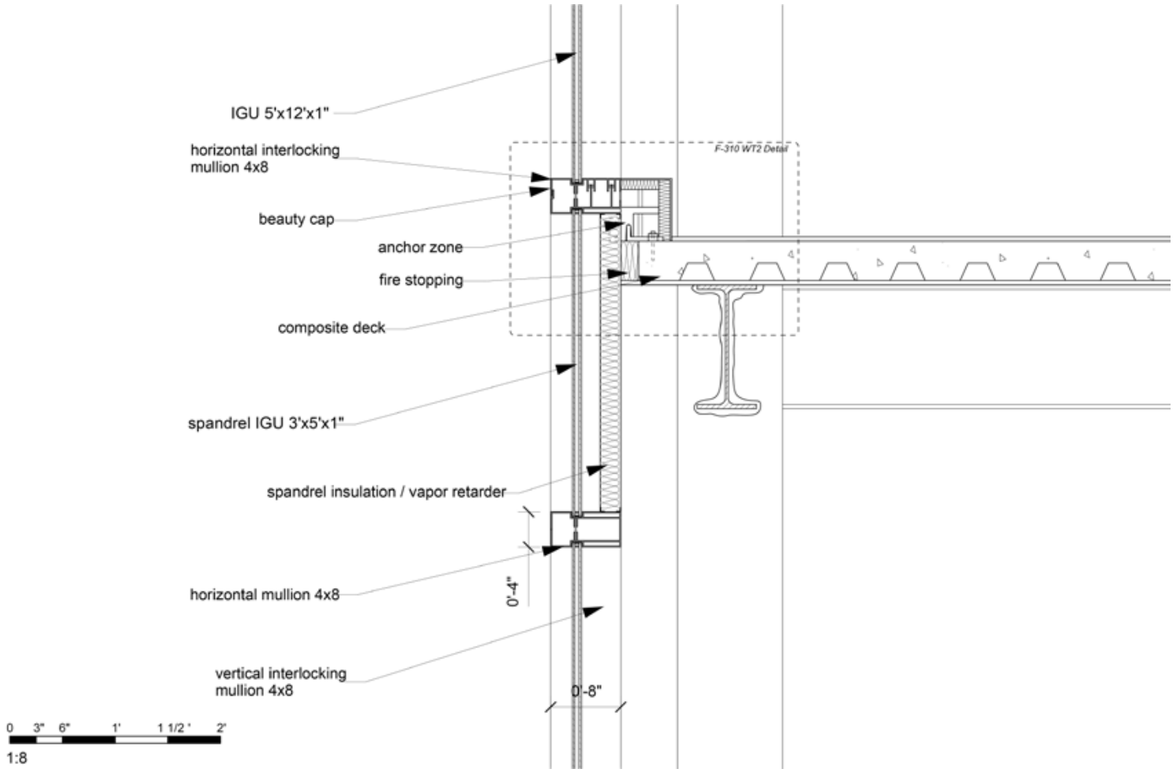

moisture/vapor barrier
concrete masonry unit
(CMU) 8x8x12
encased
W10x112
steel post
terracotta hook
4" mineral wool insulation
(R-value per inch = 4.2;
R-value = 16.8)
terracotta panel
60"x24"x40mm
terracotta clip system
F-210 WT1 Detail

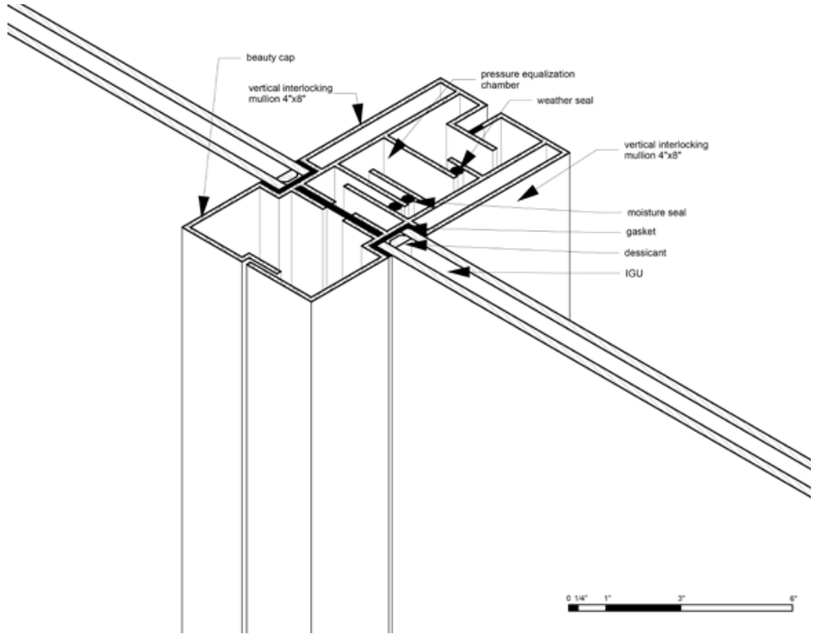

concrete masonry unit
(CMU) 8x8x12
bolts to CMU
steel angle
terracotta hook
moisture/vapor barrier
4" mineral wool insulation
(R-value per inch = 4.2;
R-value = 16.8)
terracotta panel
60"x24"x40mm
terracotta clip system

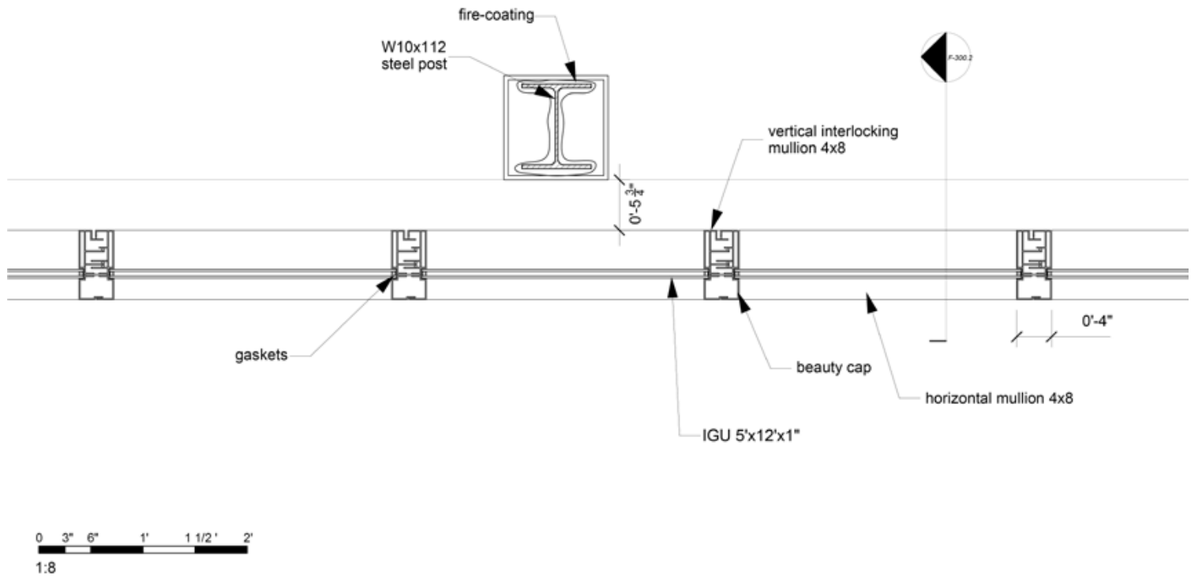
fire-coating
W10x112
steel post
terracotta panel
60"x24"x40mm
terracotta clip system
terracotta hook
concrete masonry unit
(CMU) 8x8x12
air gap
4" mineral wool insulation
(R-value per inch = 4.2;
R-value = 16.8)
moisture/vapor barrier
steel angle 3"x4.5"
connecting bolt

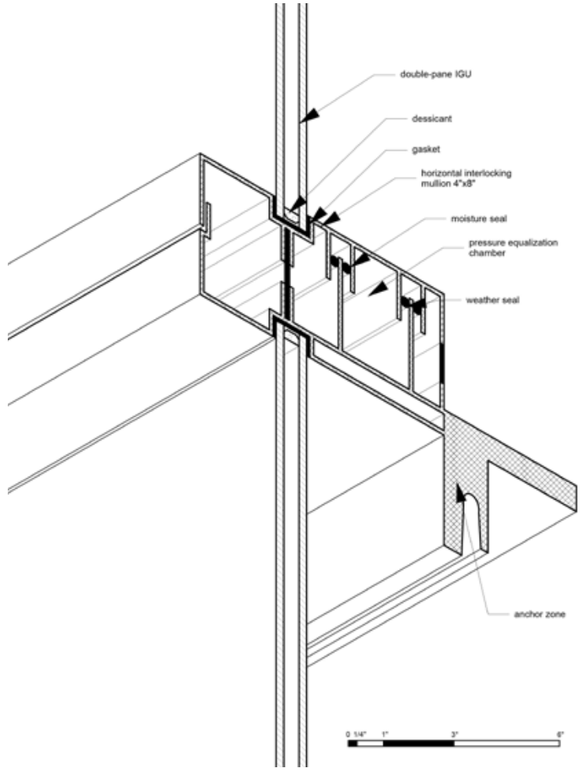

bolts to CMU
steel angle
terracotta support system
terracotta hook
terracotta panel
60"x24"x40mm

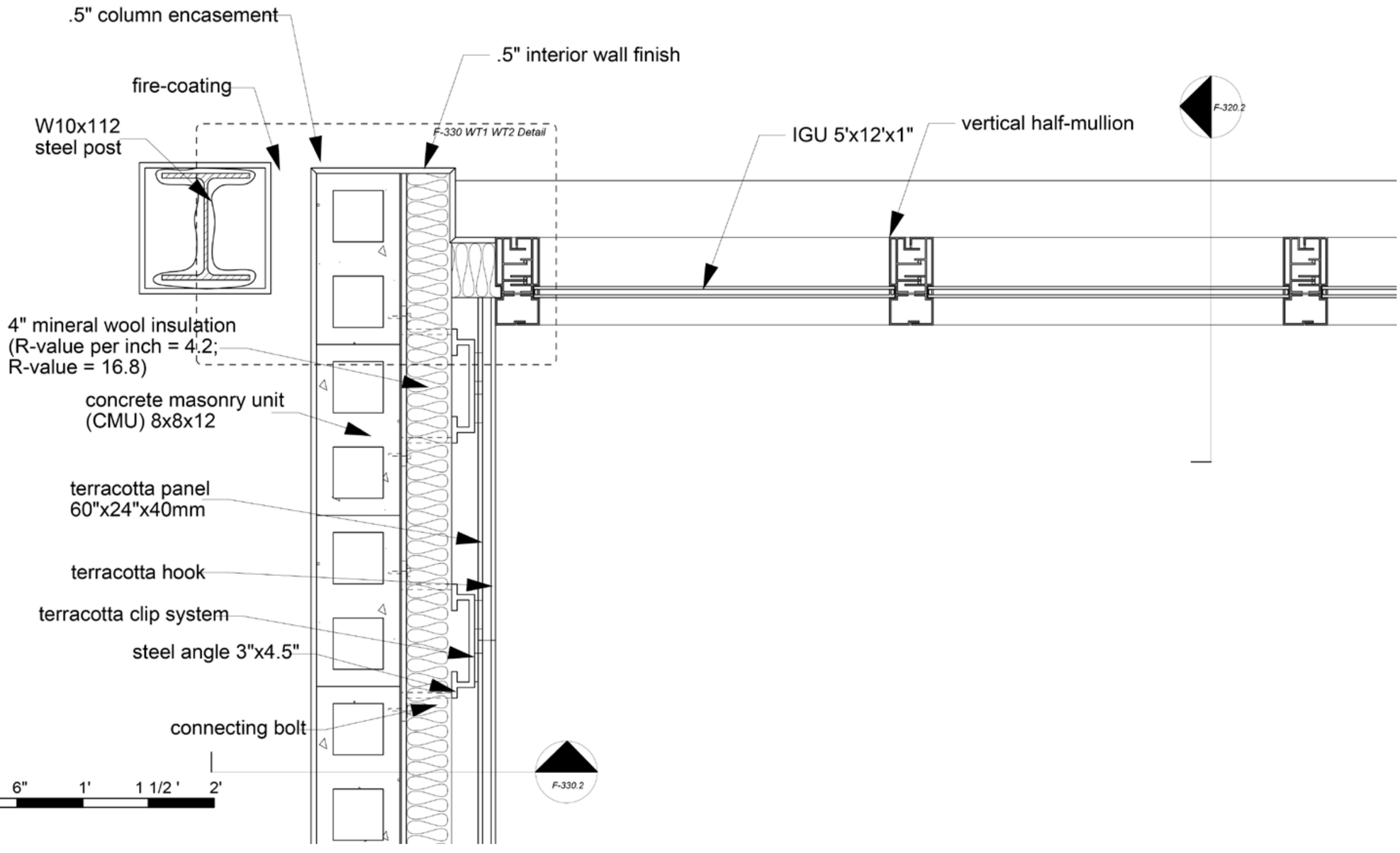
0 3" 6" 1' 1 1/2 ' 2'
1:8

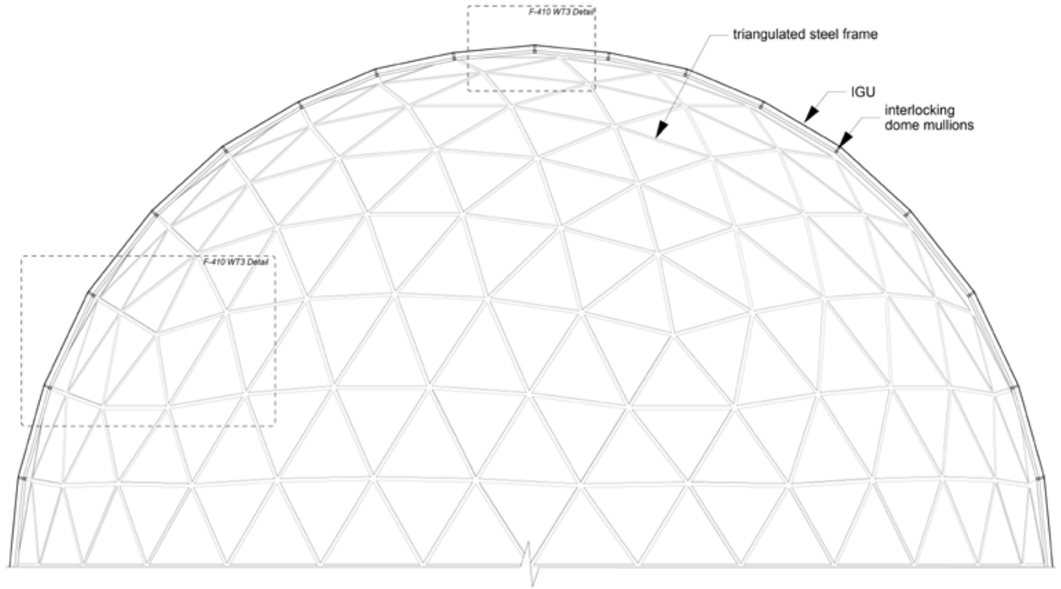

IGU 5'x12'x1"
horizontal interlocking mullion 4x8
beauty cap
anchor zone
fire stopping
composite deck
spandrel IGU 3'x5'x1"
spandrel insulation / vapor retarder
horizontal mullion 4x8
vertical interlocking mullion 4x8
F-310 WT2 Detail
0'-4"
0'-8"
0 3" 6" 1' 1 1/2 ' 2'
1:8

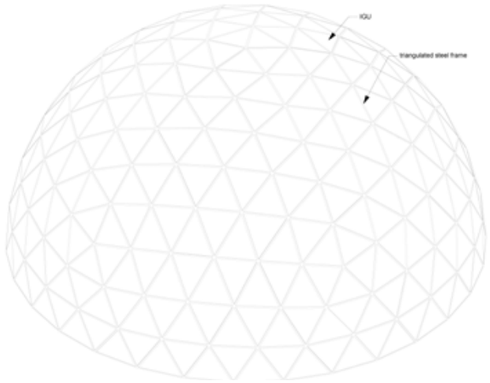

beauty cap
vertical interlocking mullion 4"x8"
pressure equalization chamber
weather seal
vertical interlocking mullion 4"x8"
moisture seal
gasket
dessicant
IGU
0 1/4" 1" 3" 6"

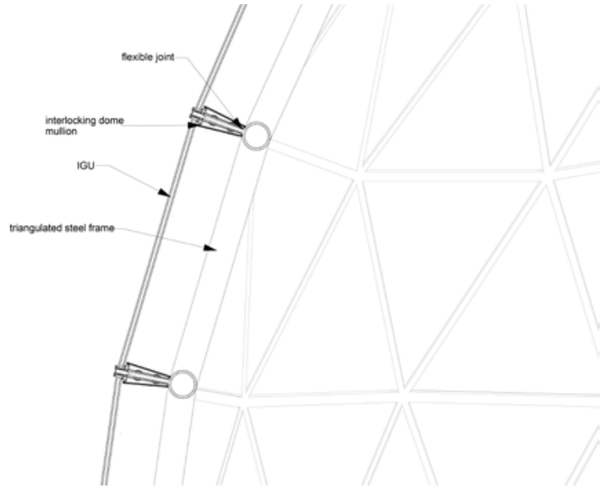

fire-coating
W10x112 steel post
vertical interlocking mullion 4x8
0'-5 3/4"
gaskets
beauty cap
horizontal mullion 4x8
IGU 5'x12'x1"
0'-4"
F-300.2
0 3" 6" 1' 1 1/2 ' 2'
1:8

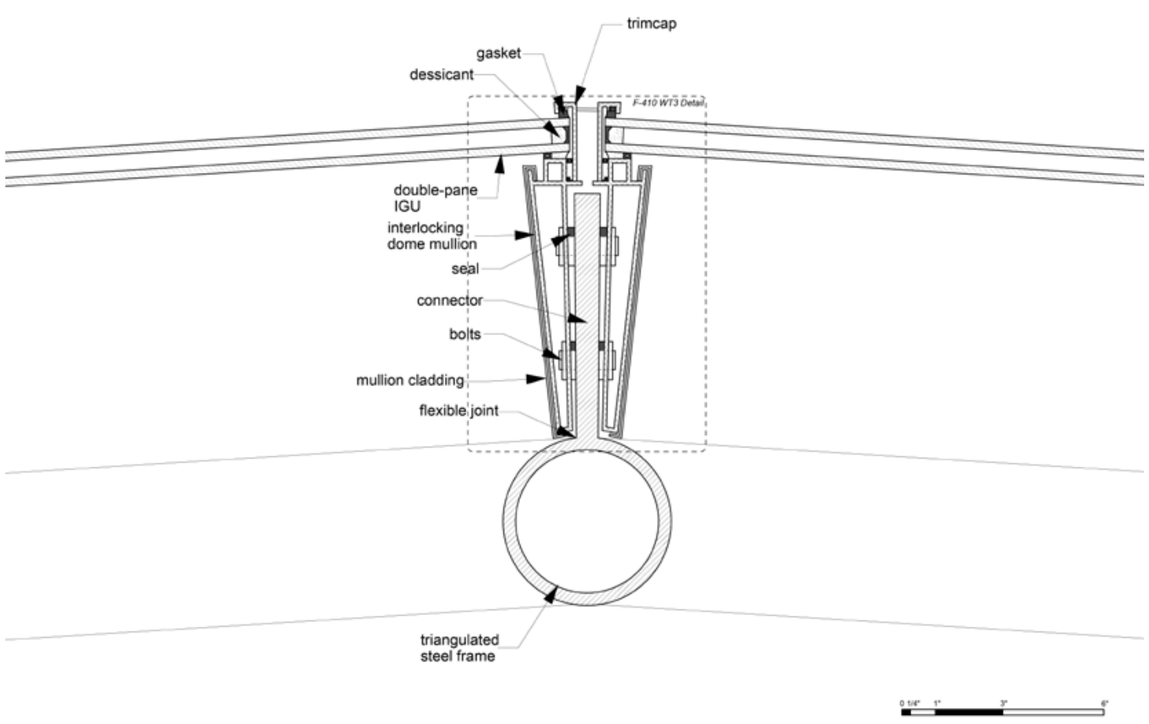

double-pane IGU
dessicant
gasket
horizontal interlocking mullion 4"x8"
moisture seal
pressure equalization chamber
weather seal
anchor zone
0 1/4" 1" 3" 6"

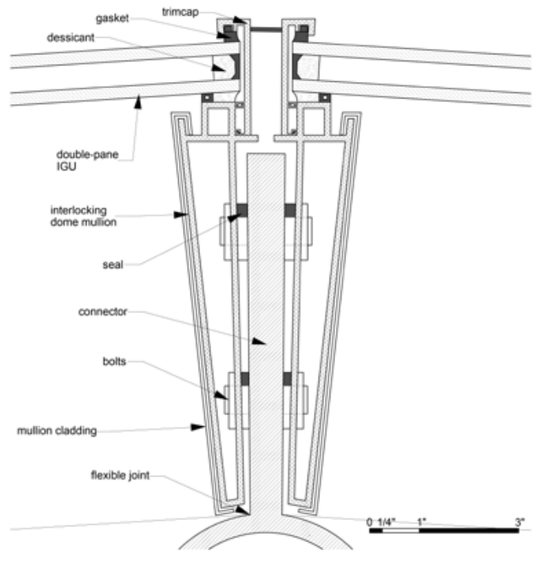

.5" column encasement
.5" interior wall finish
fire-coating
W10x112
steel post
F-330 WT1 WT2 Detail
IGU 5'x12'x1"
vertical half-mullion
F-320.2
4" mineral wool insulation
(R-value per inch = 4.2;
R-value = 16.8)
concrete masonry unit
(CMU) 8x8x12
terracotta panel
60"x24"x40mm
terracotta hook
terracotta clip system
steel angle 3"x4.5"
connecting bolt
F-330.2
0 3" 6" 1' 1 1/2 ' 2'
1:8

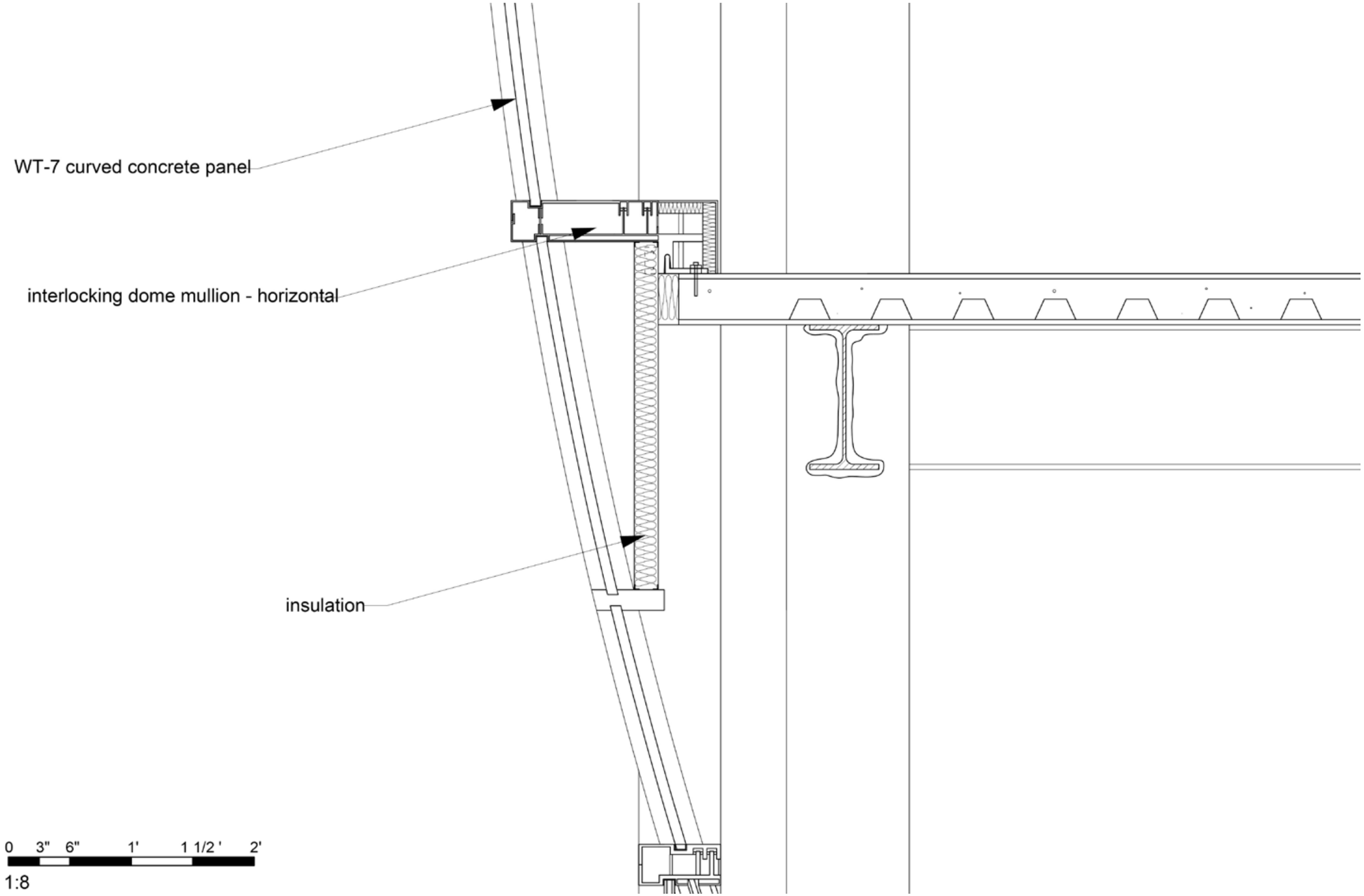

F-410 WT3 Detail
triangulated steel frame
IGU
interlocking
dome mullions
F-410 WT3 Detail

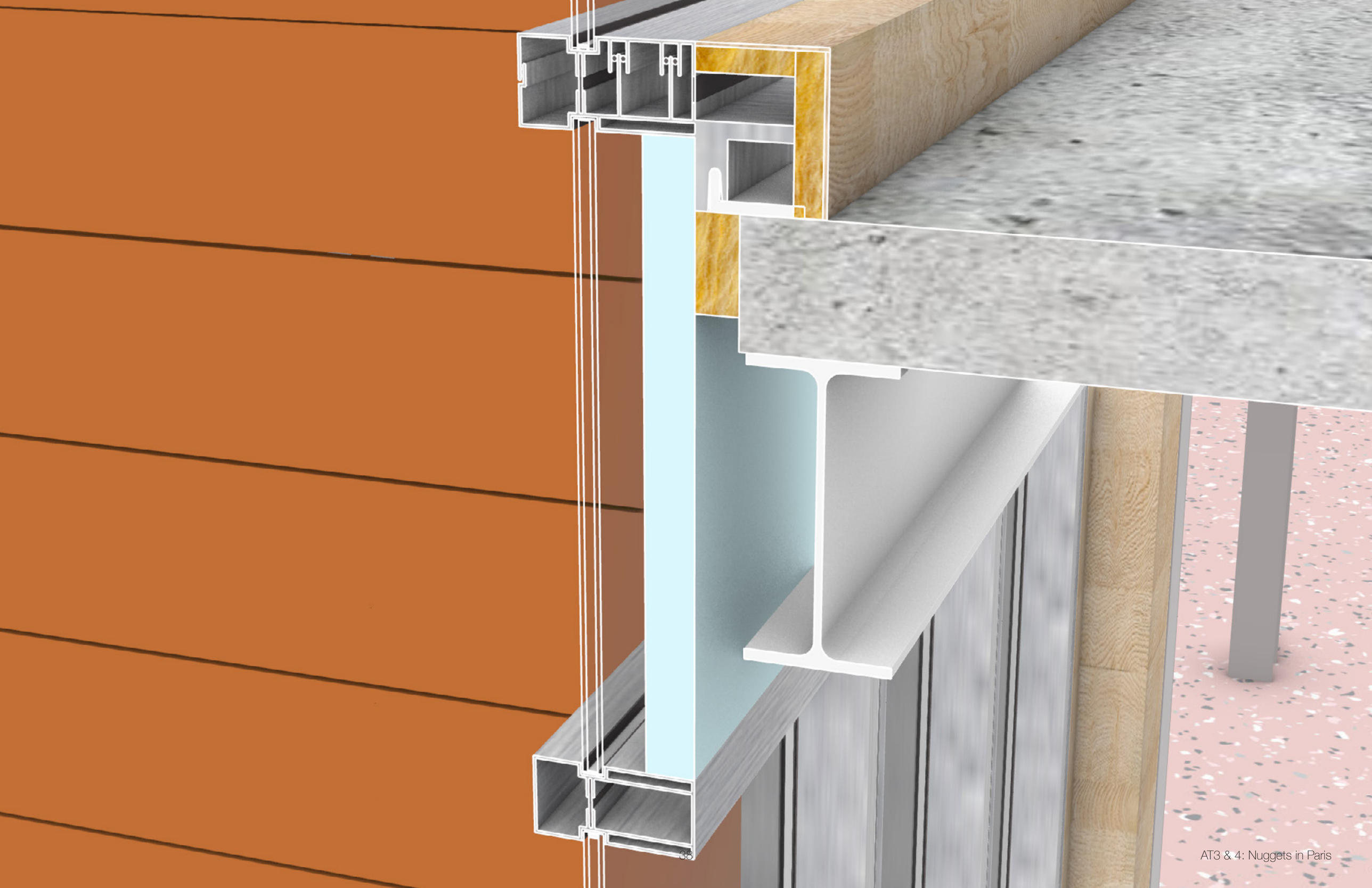

IGU
triangulated steel frame


flexible joint
interlocking dome
mullion
IGU
triangulated steel frame
0 3" 6" 1' 1 1/2' 2'
1:8


trimcap
gasket
dessicant
F-410 WT3 Detail
double-pane
IGU
interlocking
dome mullion
seal
connector
bolts
mullion cladding
flexible joint
triangulated
steel frame
0 1/4" 1" 3" 6"

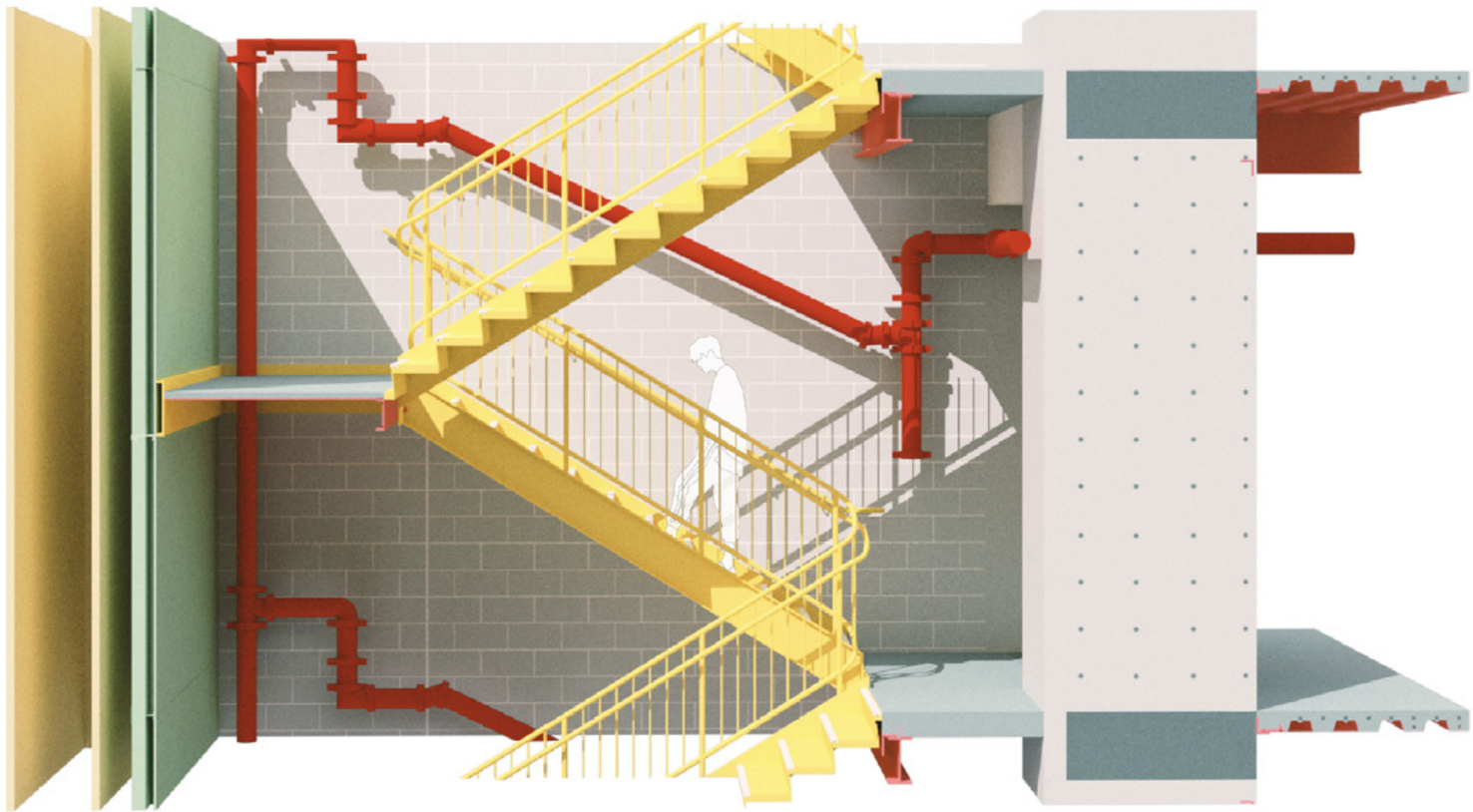

gasket
trimcap
dessicant
double-pane
IGU
interlocking
dome mullion
seal
connector
bolts
mullion cladding
flexible joint
0 1/4" 1" 3"

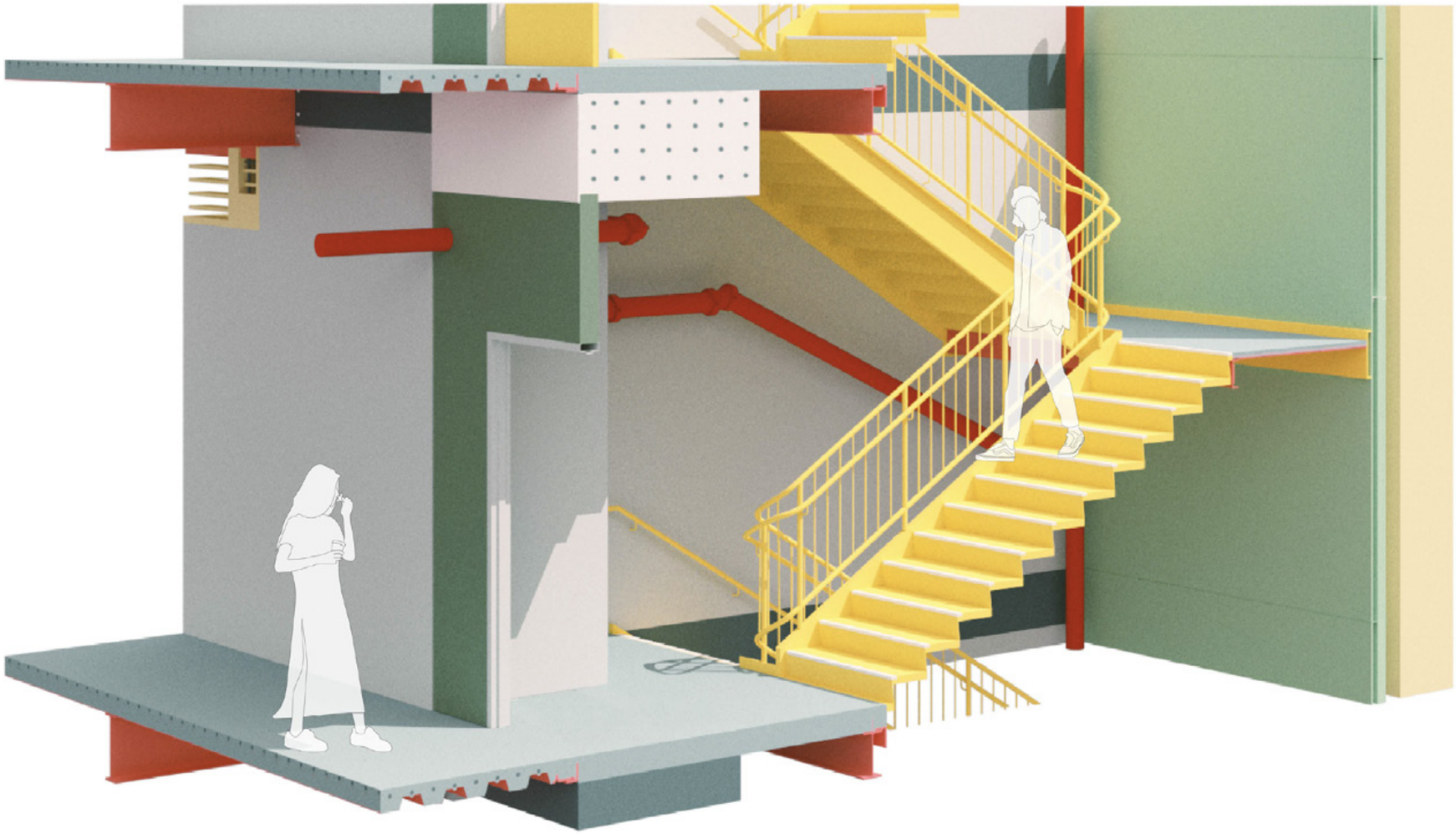

WT-7 curved concrete panel
interlocking dome mullion - horizontal
insulation
0 3" 6" 1' 1 1/2 ' 2'
1:8



AT5: Core & Egress

Polina Stepanova, Sam Bager,
Khadija Ann Tarver, Anya Ray
SP22 – critic: Nicole Dosso

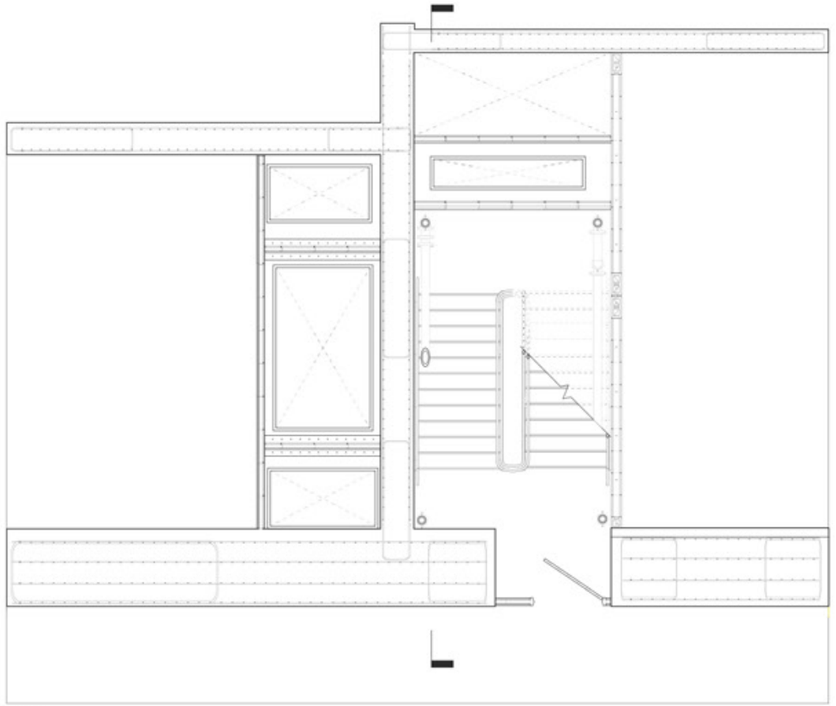




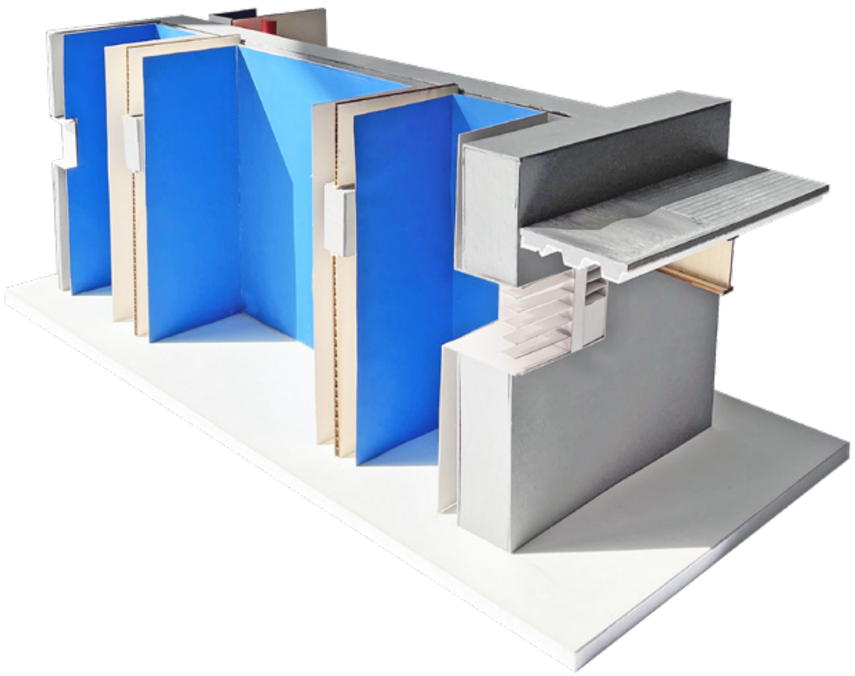
SECTION PERSPECTIVE_002

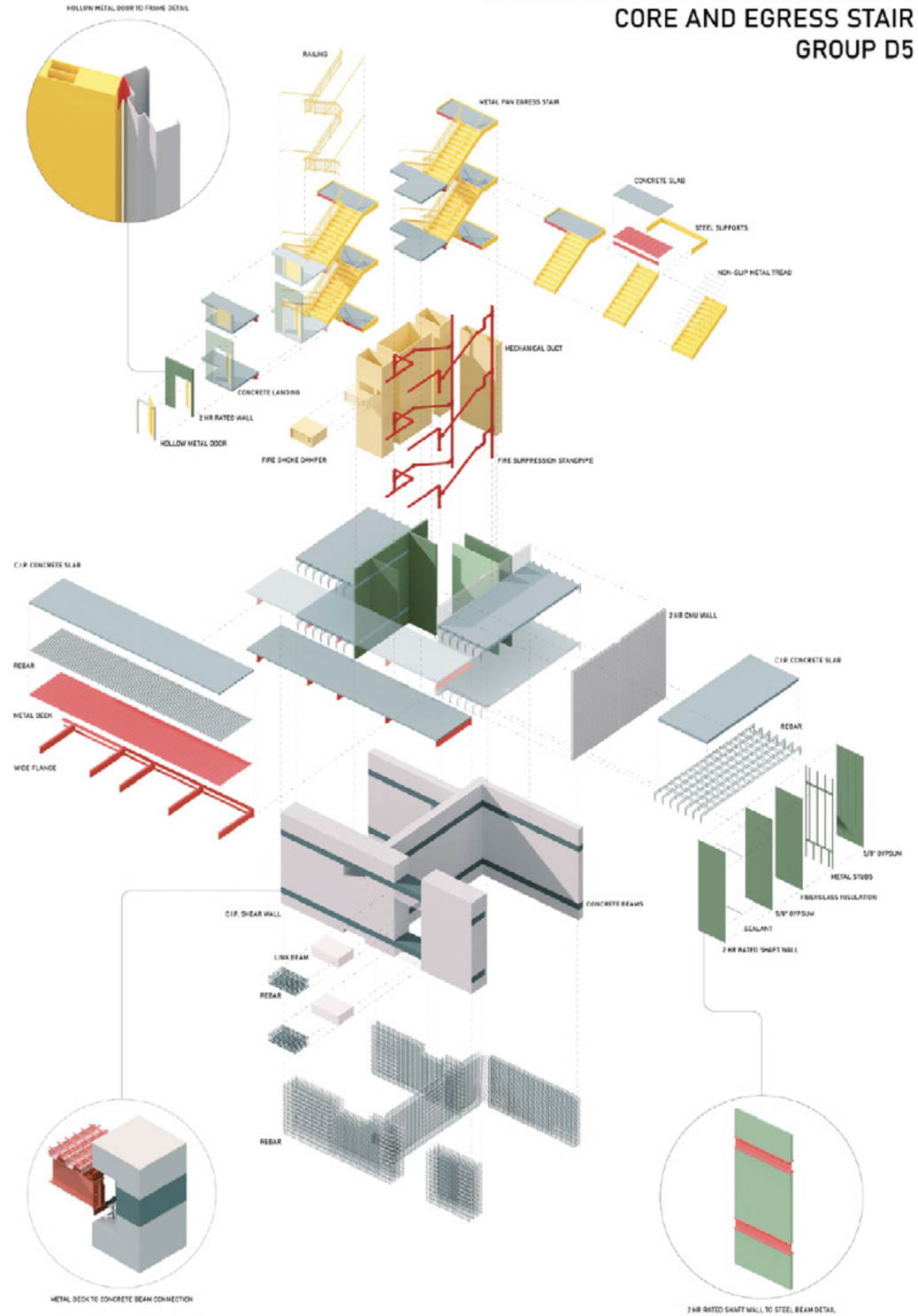
POLINA STEPANOVA, ANYA RAY, KHADIJA ANN TARVER, SAMUEL BAGER

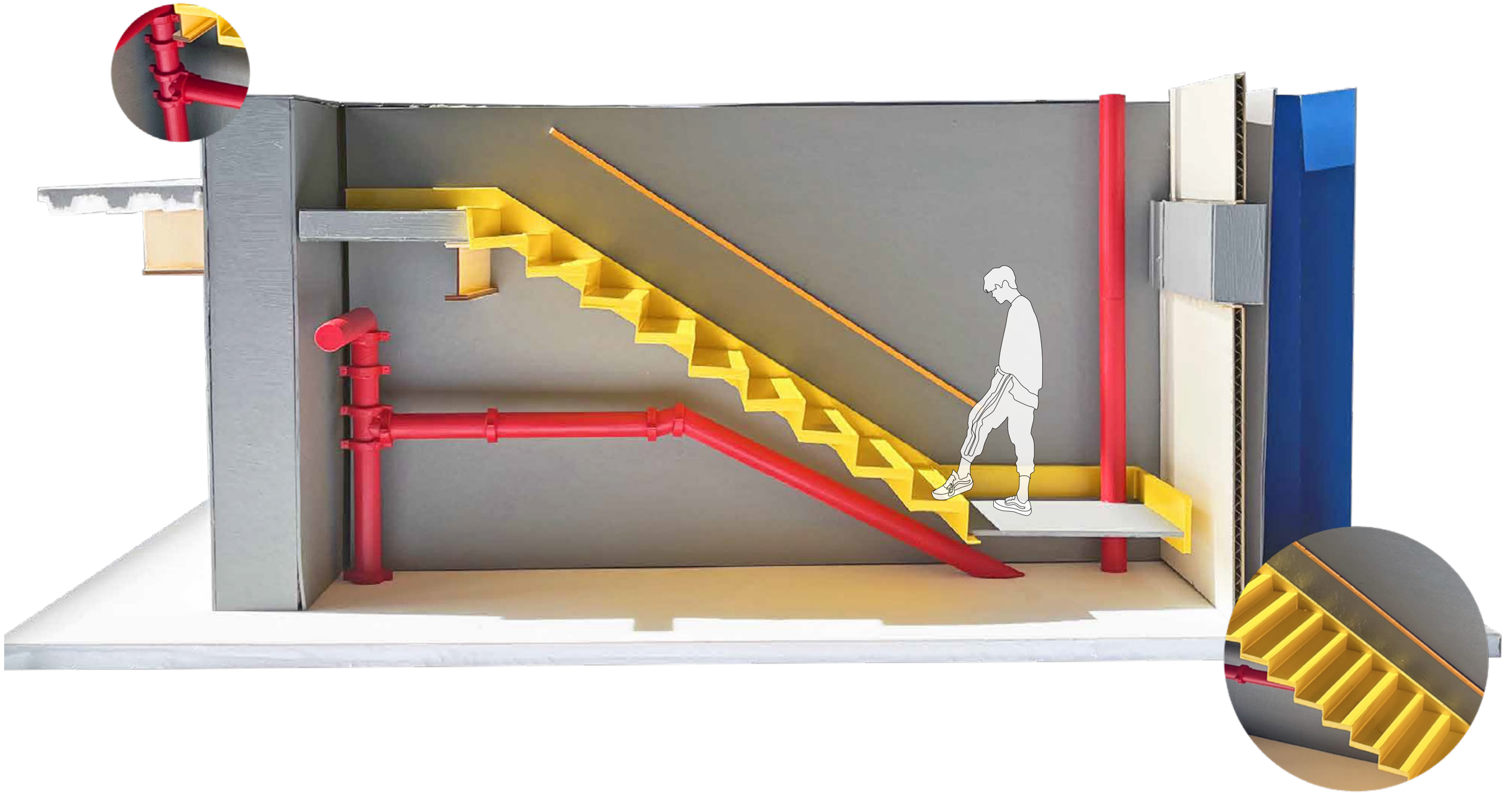
CORE AND EGRESS STAIR
GROUP D5



PLAN



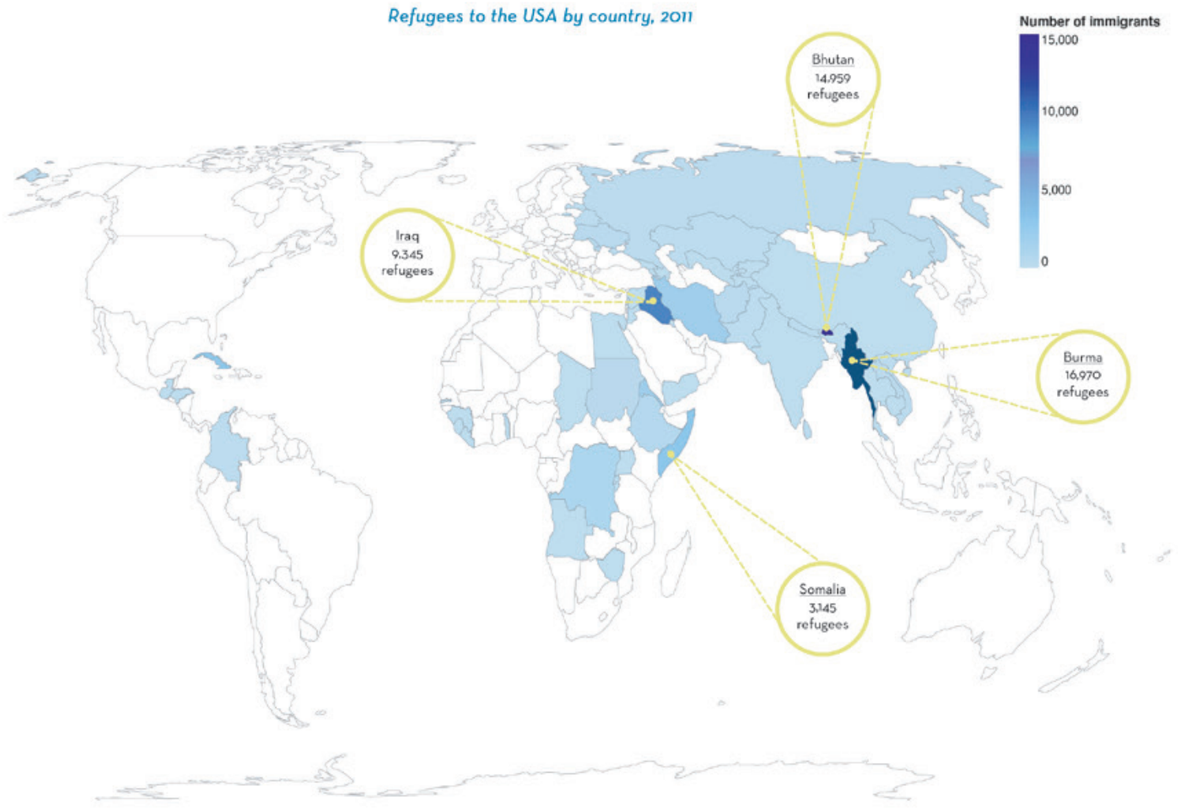


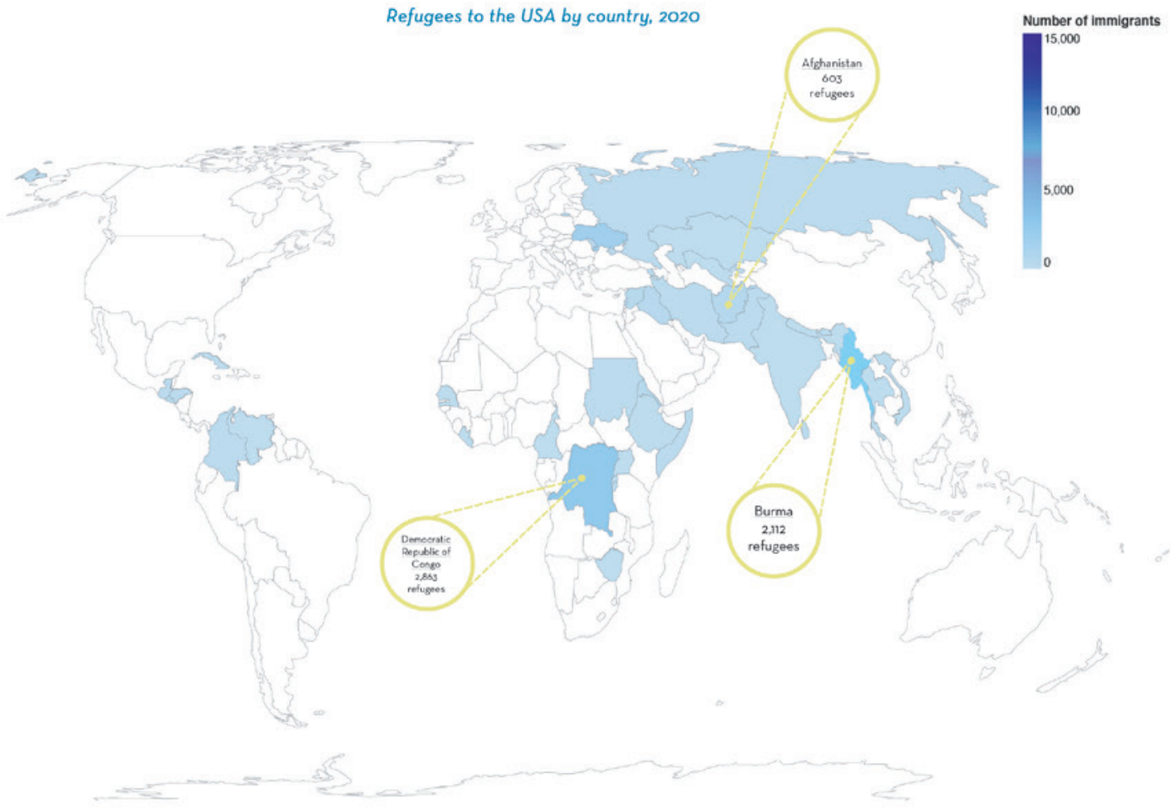


Points Unknown: Streetscape of Buffalo

weblink: *https://pointsunknown.nyc/final-projects/GSAPP-Spring-2022/Migration-2/index.html*

Polina Stepanova, Ruonan Du, Jie Kong
SP22 - critics: Michael Krisch, Juan Saldarriaga



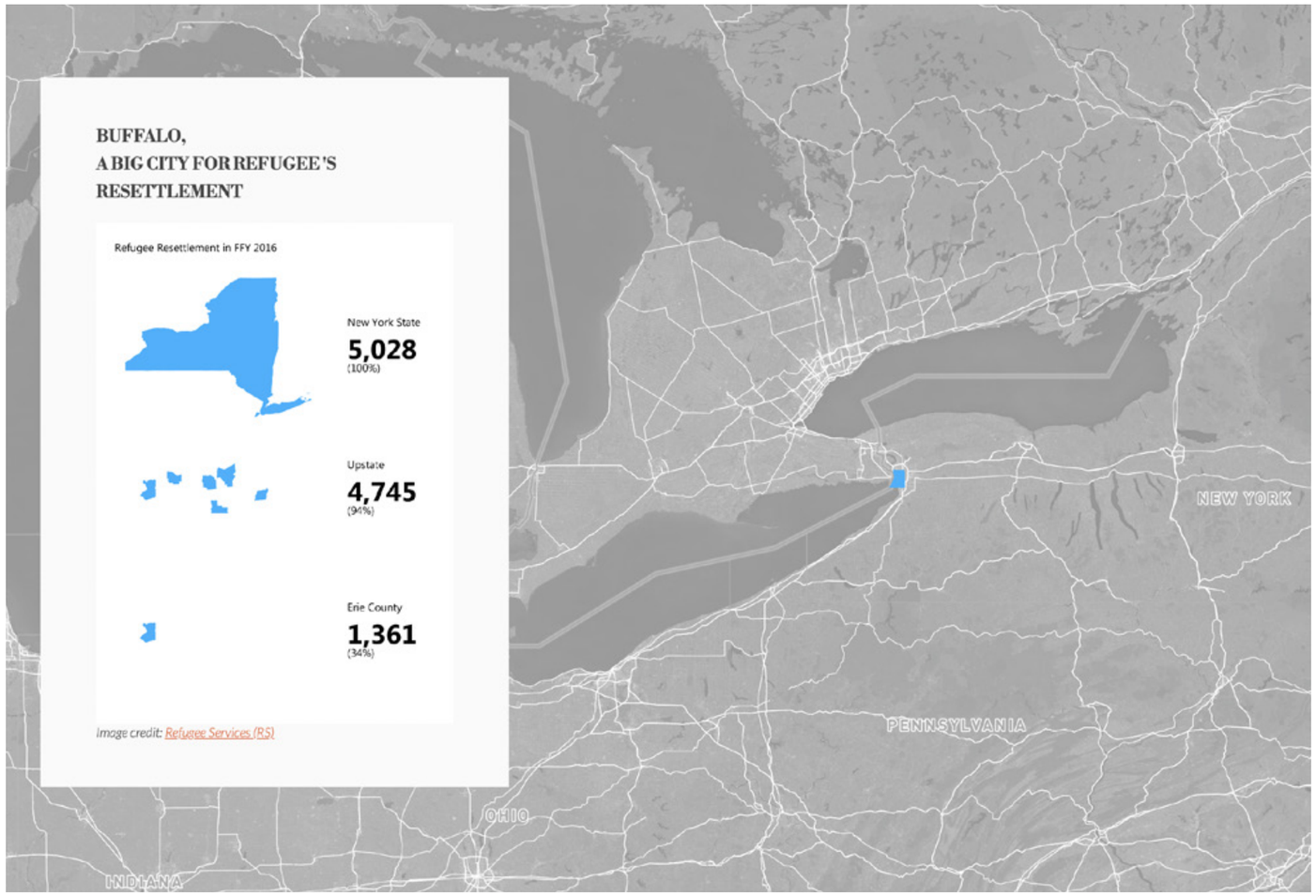


Points Unknown | Migration Team 2 Final Project

THE RECENT REFUGEE RENAISSANCE IN BUFFALO HAS TOTALLY CHANGED THE CITY'S STREETSCAPE. HERE IS HOW.

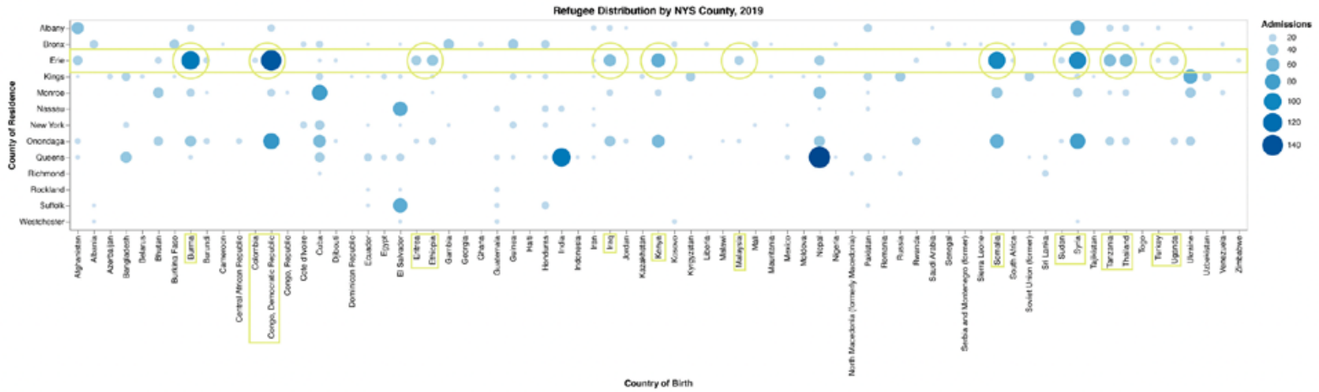
By Polina Stepanova, Joan Du and Jie Kong

Buffalo, the 2nd most populated city in New York State after NYC, has been home for many various cultures and populations over the years, but it has recently experienced an almost exponential growth in the number of refugees making this city their home. Burmese, Bangladeshi, Afghani, Thai, and other nationalities have been finding a refuge in the city of Buffalo and have been influencing the city making the culture more diverse and the streetscape more vibrant. In this article, we share the closer examination of how Buffalo became a blooming flower of cultural intersections, and how refugees from all over the world embellish the streets of this northern city.



Refugee Distribution in NYS

Erie county, which is home to the city of Buffalo, has been resettling the most refugees out of all counties in New York State, according to the Making Buffalo Home digital engagement project. This non-profit claims that 16,098 refugees have arrived in Western New York state since 2002, and that immigrants in Buffalo and Syracuse contribute over two million dollars spending power to these regions. The organization also says that refugees mostly arrive from Burma, Somalia, Bhutan, Iraq, Democratic Republic of Congo, and others. While researching this topic, we also established that Buffalo has recently started welcoming a lot of evacuees from Afghanistan.



In 2019, refugees from the followin countries were mostly placed in Erie county: Burma, Colombia, Democratic Republic of Congo, Eritrea, Ethiopia, Iraq, Kenya, Malaysia, Somalia, Sudan, Syria, Tanzania, Thailand, Turkey, and Uganda. This has made Buffalo much more diverse and contributed to its economy right before the pandemic started.

Data Source: Department of Homeland Security, Asylum and Refugees

Refugee Renaissance Timeline

Five Points' Thriving Businesses

Steven Sanyu, the president and the founder of Burmese Community Services, has told us that he established his business in the Five Points area in order to help fellow refugees find their path in a new country. After arriving in 2000 from Burma, he eventually became an owner of multiple businesses. He shares that besides his Burmese Community Services company, he used to also own a sushi franchise which he ended up selling to his friend. Steven Sanyu has truly become a guiding compass for many of his fellow nationals who sometimes struggled with the language barrier or assimilation in the new country.

Abyssinia Ethiopian Cuisine is another thriving business that is refugee-owned. Opened by Zelalem Gemmeda, a refugee from Ethiopia who also lived in Yemen, the restaurant is a tribute to one's powerful culture and was established with the help of Westside Bazaar. Zelalem demonstrates an ability to bring her culture wherever she goes, and the residents of Buffalo enrich their lives with the experience of visiting Abyssinia restaurant. Before the refugee business boom, the streets of Five Points were lacking such ethnic diversity – now they thrive in it.

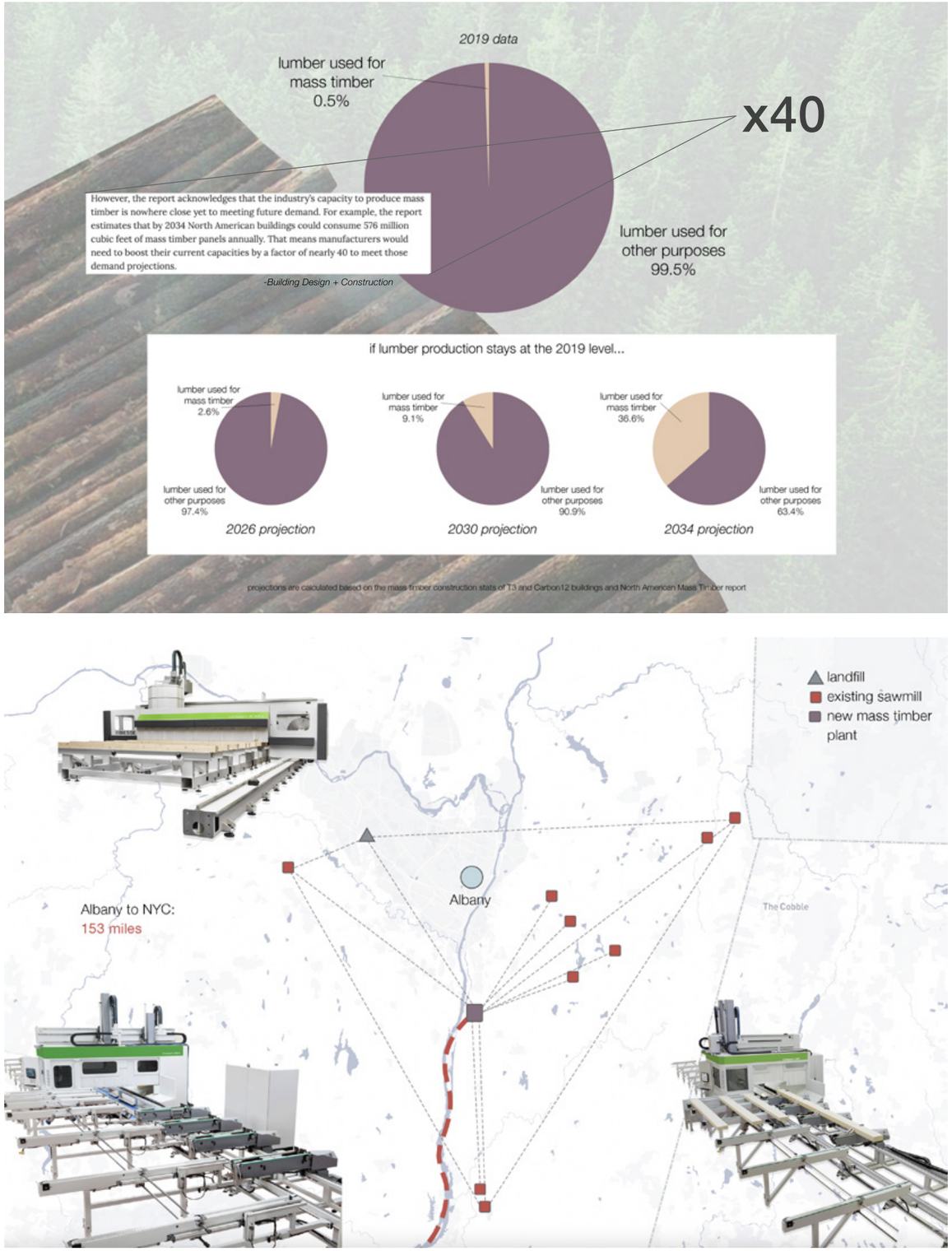
Burmese Community Services founded by Steven Sanyu
Photo Credit / Steven Sanyu, President of Burmese Community Services

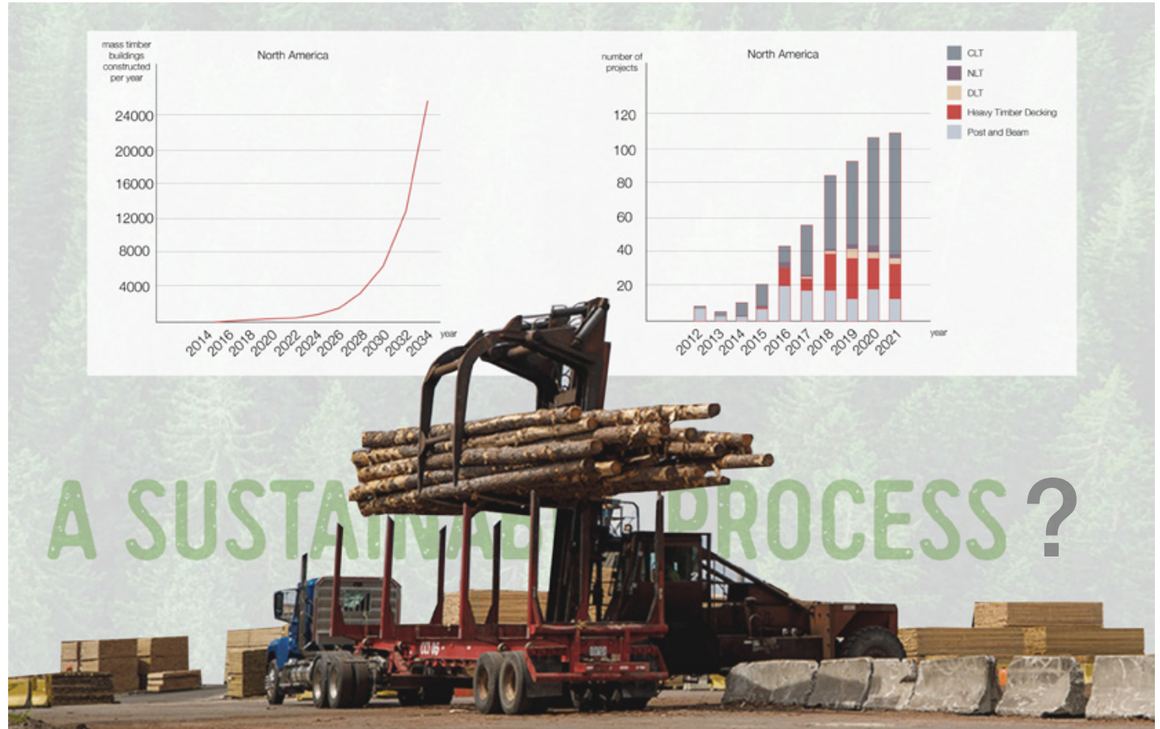
Zelalem Gemmeda at Abyssinia Restaurant
Akec Aguer is the chef and owner of Nile River Restaurant
Photograph By Brendan George Ko

Photo Credits / Google Maps

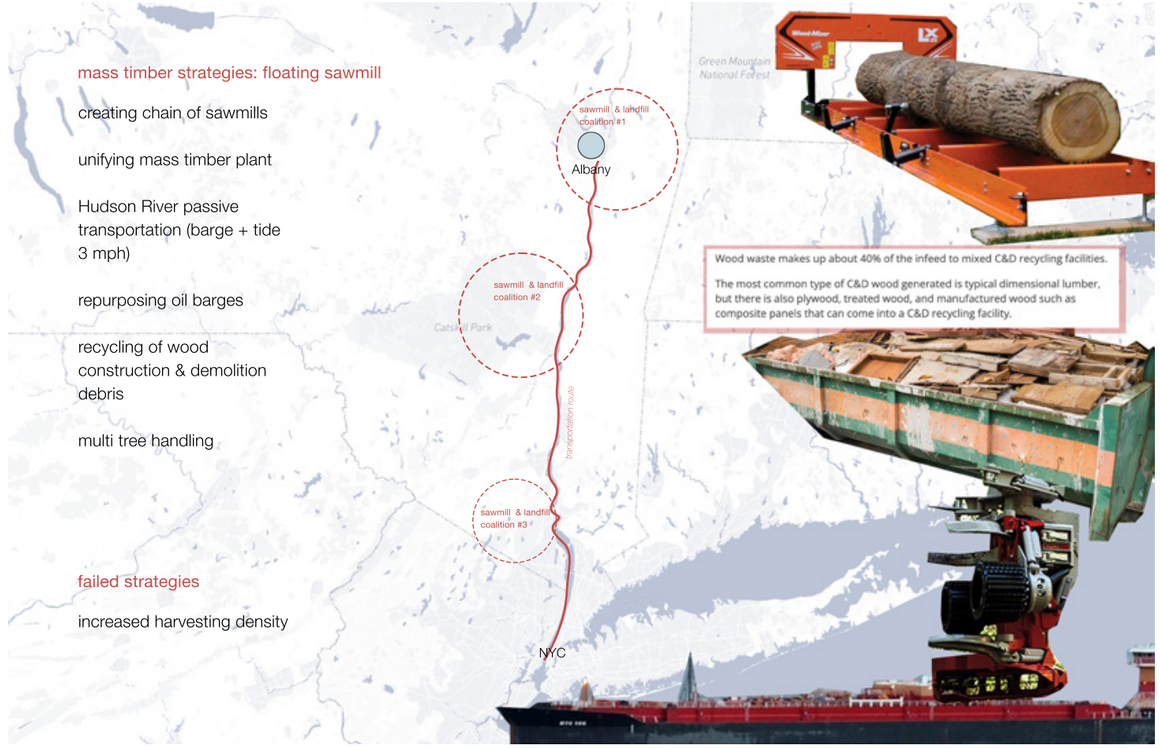
Man, Machine, & Industrial Landscape

Polina Stepanova
FALL22 - critic: Sean Gallagher

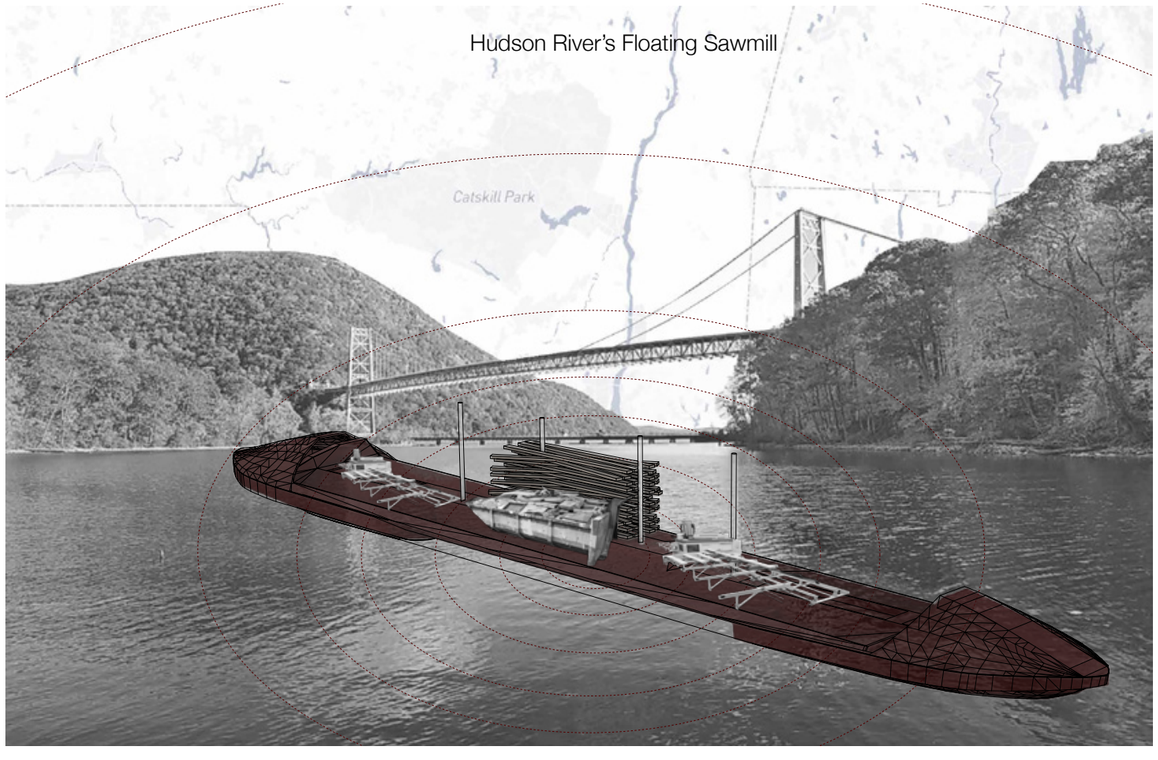




A SUSTAINABLE PROCESS?




TEB
Central Park
475 West
18th St
320 & 360
Wythe
283 Greene Ave
670 Union St
EWR -
Newark Liberty
International
Airport
Upper New
York Bay
Staten Island
TIMBER HOUSE
Most notable on the sustainability front is that NYC will now allow use of Cross Laminated Timber (CLT). This newer addition to the roster of mass timber engineered products (in conjunction with Glulam (GLT) columns and beams) allows for tall buildings made primarily from engineered wood.


Hudson River's Floating Sawmill
Catskill Park

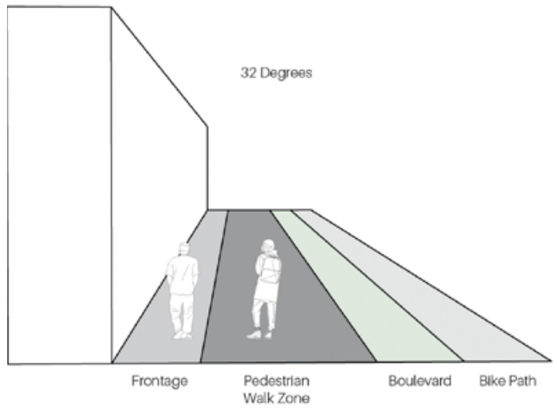

autonomous electric vehicles
logs from sawmills
recycled lumber
storage facility
barge parking +
macninery station
(located on a previously developed site)
reused oil barge – floating sawmill + tidal transportation

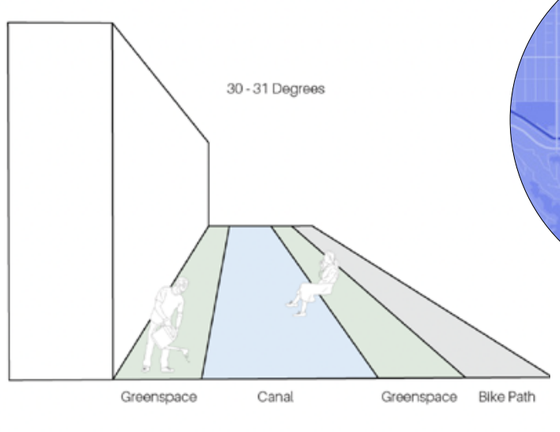

Grade I – Pine
Grade I – Spruce
Grade II – Pine
Grade II – Spruce
Grade III – Pine
Grade III – Spruce
repurposing & regrading used timber
repurposed on the barge instead
58%
of demolished timber
ends up in a landfill
source: scalerule.org

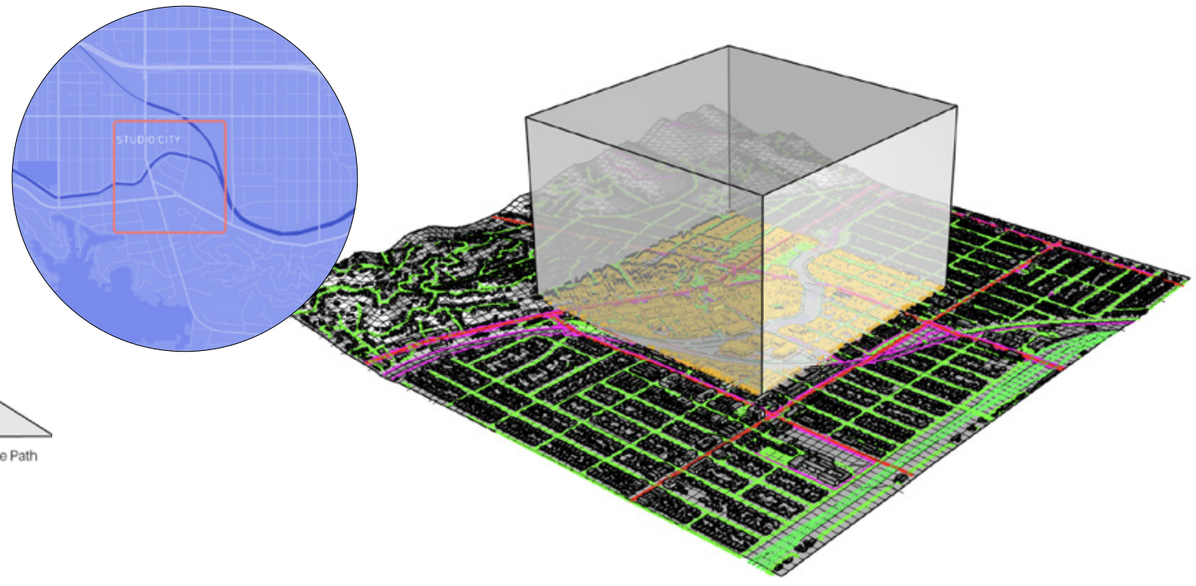
XIM: Studio City Venice Style

Polina Stepanova, Rush Majumder
SP23 - critic: Snoweria Zhang

Studio City site







hypothesis

Metric	Unit	How to measure
Amount of Sunlight Received	Watts per Square meter, %	With the LadyBug analysis tool
Proximity of the canals / shaded lanes	meters	Measuring how close each building's center point to a cooling lane (canals / trees)
Average street temperature	Degrees F	Compare how the presence of water and shading devices alters the measurable extreme heat. Compare to the climate data file for winter/summer
Humidity	%	How do canals help improve this from the baseline?
OPPOSING METRIC: street area preserved for traffic	Sq m	Subtracting new canal / alley area from the overall street area

1

Observation

Extreme heat / drought in San Fernando Valley have highlighted urban safety and health issues for Los Angeles population and its nature.

2

Question

How can the extent of the extr the Valley and subsequent dama minimized?

3

Hypothesis

Neighborhood-wide urban improvement with canal implementation & greenery would decrease overall extreme heat-related damage.

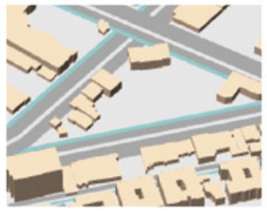
4

Design Challenge

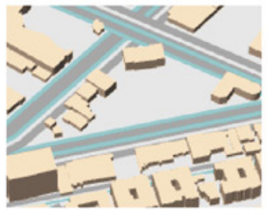
Design an urban narrative to red temperature and improve canal an accessibility in Studio City whi necessary urban density and stil circulation corridors.

INPUTS

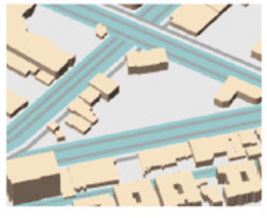
CANAL WIDTH



10%



25%



50%

what percentage of the street does canal take?

CANAL DENSITY LOCATION

center

near major street

scattered

where are the canals located?

CANAL PROMINENCE

5%

25%

50%

95%

what percentage of all the streets have canals?

AMOUNT OF TREES

25

75

300

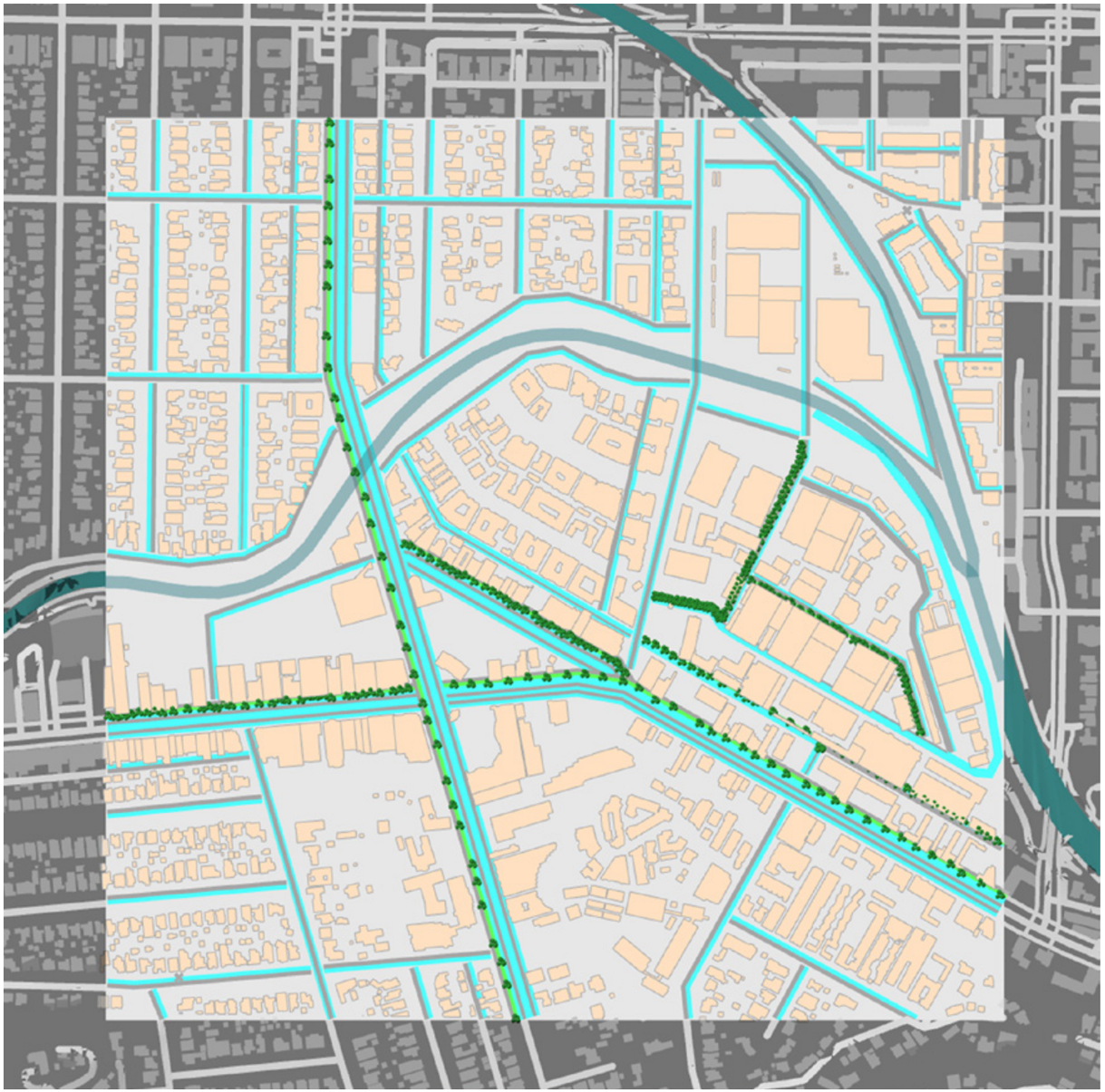
how many trees are there?

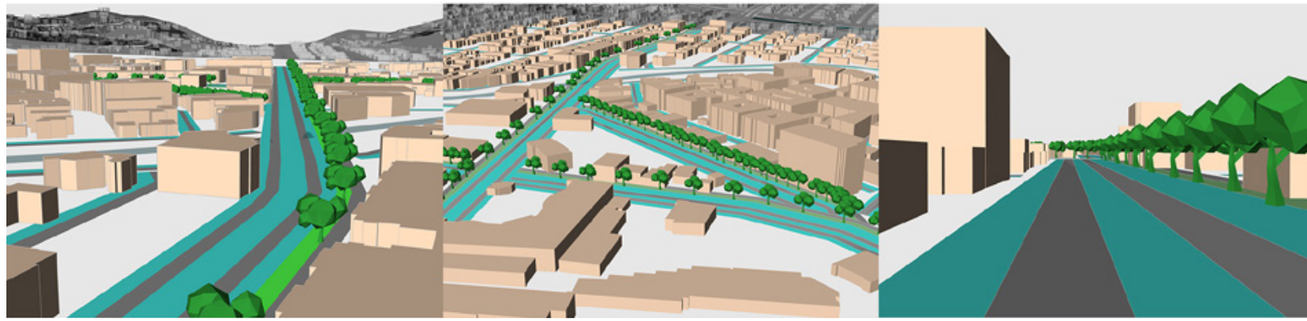
TREE DENSITY LOCATION

center

scattered

which streets have lanes for tree planting?





Domestic Abuse: Violent Acts Toward Self-Built Homes in Cairo and Los Angeles

by Polina Stepanova, Catherine Weilein
revised by Yasser Elsheshtawy
Columbia University

"Such is President Abdel Fattah el-Sisi's plan to make over Egypt's capital, a neo-pharaonic campaign so ludicrous it would be dismissible if it didn't actually involve the pillaging of Cairo as it has existed, in parts, for centuries, erasing whole swaths of the city's urban heritage and ravaging everything in its path, from the living to the dead."

–Yasmine el Rashidi, New York Review of Books

"Politicians very loudly claimed that all displaced residents would be in stable permanent housing within a year. Echo Park Lake has become both the exemplar and blueprint of this kind of displacement."

–Ananya Roy, director of UCLA's Luskin Institute (Smith)

Introduction

Self-built housing represents a unique typology of residential architecture. While many countries' citizens have been conditioned to think of self-built homes as outliers—an odd exception to those rented, mortgaged, and purchased—they are, in reality, not particularly rare. Many cultures not only have a centuries-old tradition of constructing their own homes, but it is often the main mode of dwelling production in those regions (Soliman). A prevailing misunderstanding is that these citizens of developing countries are economically forced into self-building their residences, while democracies have grown beyond such an occurrence; one of the many detriments of the developed-developing dialectic. However, despite the hierarchical rhetoric, the phenomenon of the self-built home can be located globally. In all contexts, governments enforce a top-down approach, ranging in visibility from apparent to imperceptible, and use force in order to devastate self-built settlements, enforcing a false idyllism of the state. In this article, we investigate two largely populated cities which both showcase frequent incidents of self-built housing: Cairo and Los Angeles. While the two cities differ in terms of history, population, and governmental approach, both identify with the violence of home destruction and silenced voices.

In Cairo, building one's own house is the principal mode of home formation. While this construction type is not unique to the Egyptian city––these structures exist in many other Arab countries and around the globe––the dominance and visibility of them here is, indeed, special. Self-built homes have a long history globally and locally, with their present condition in Cairo stemming from various socio-political factors. The income inequality plaguing the city, along with the insular wealth of the ruler's family and friends, affords only a small percentage of Cairenes to live markedly lavish lifestyles. The rest of its residents either struggle to meet rent or, alternatively, construct their own environments. The latter, the self-built homes, are what will be discussed in this article.

Cairenes of lower socio-economic status are those who construct and inhabit the self-built housing typology. They design and build

Figure 1. Street in Cairo. Photo credit: Claudia Wiens

their own homes in whichever manner most properly suits them, building as they are financially able to, and expanding in unison with the expansion of their families. This construction of their own surroundings allows for a concomitant construction of personal identity. The unmatched autonomy allowed in this mode of home formation is a more-or-less rare opportunity for residents, especially those bringing in little income. However, there are of course downsides to this freedom––many aspects of this living style are not ideal––with most variants of this typology lacking services as fundamental as water and sewage and being structurally unsound. Nonetheless, it is the only option for a large percentage of Cairo's residents since many Cairenes are unable to afford renting an apartment or buying a home.

However, while these self-built homes exist at a large scale, with many neighborhoods comprised solely of this housing typology, they are technically illegal settlements. The Egyptian government's approach in the handling of this illegality ranges anywhere from laissez-faire to dirigisme. This inconsistency and erraticism is relative to their varying interests. If the government does not feel like dealing with the self-built homes and their inhabitants, they will overlook them. If they find that there is something to be gained financially or politically from their eradication, then they will take whatever actions deemed necessary in order to rid the land of these

Figure 2. LA homelessness. Photo credit: Richard Vogel

homes and these peoples.

Due to the illegal nature of the settlements, along with the unpredictability of the government's dealing with them, the residents' homes may be torn down at any given moment, and without notice. The suddenness and irreparability of this operation of demolition is an especially violent approach. The homes have been built over decades, shared by varying extensions of the family, and are physical manifestations of the creators' identities; knocking them down and turning them to rubble at a moment's notice is traumatizing. Further, the unceasing fear of living in a space which could meet this fate at any point in time is an extreme stressor. The residents never know for certain whether or not they will be spending another day or night in their homes.

These events in Cairo, however, as stated earlier, do occur elsewhere. Albeit with differences, the self-built home can be found in many of Egypt's neighboring countries and beyond. They can be found, too, in Los Angeles, where there is also a very large population of economically poor individuals and, therefore, also a high volume of self-built shelters. While the self-built homes there offer a different presence than those in Cairo, they operate similarly in terms of their construction, location, illegality, confrontation, and identity-building. While Cairo's self-built homes may often be easily compared to those of the same housing typology in Egypt's surround, it is rare for them to be compared to those in a country that is as structurally different––in terms of economy, politics, society––as the United States. This is a productive comparison precisely because of that. The seemingly wide schism between the two is arguably due to the semantics prescribed to the situations, rather than to an inherent diametric opposition. The differing journalistic treatments of the two situations result in skewed perceptions of the matter, with subjective jargon defining which body is the primary problem maker: the government or the individual.

The degree of the problem differs between the two cities, with Cairo's metro population sitting at about 20.5 million and its self-built home residents at around 12 million. In Los Angeles, the metro population is about 13.2 million, with its respective self-housed population estimated to be 66,000. However, many Angelenos struggle to make rent, with many crowding large families into small apartments or making similar sacrifices in order to be able to have a roof over their heads. While fewer of these Americans come to the conclusion of building their own homes, there is still a large percentage of the population which––similarly to many Cairenes––cannot afford to live in the city in which they are residing. So while the situations certainly have their differences, they are more comparable than would seem at an initial glance at the numbers.

The two settlements are understood to be mostly illegal, if not entirely. As stated earlier, the self-built housing typology in Cairo has no legal standing. In Los Angeles, residing on public property is almost completely illegal. Under Municipal Code 41.18: Anti-Camping, it says:
No person shall obstruct a street, sidewalk, or other public right-of-way by sitting, lying, or sleeping, or by storing, using, maintaining, or placing personal property, within ten feet of any operational or utilizable driveway or loading dock; within five feet of any operational or utilizable building entrance or exit; within two feet of any fire hydrant, fire plug, or other fire department connection; within the public right-of-way in a manner that obstructs or unreasonably interferes with the use of the right-of-way for any activity for which the City has issued a permit (Sec. 41.18).

It is additionally illegal to dwell in/on "underpasses; bridges and tunnels; within 500 feet of schools, libraries, daycares and parks . . . and even within 1,000 feet of homeless shelters" (Ward). Most generally, "No person shall obstruct a street, sidewalk, or other public right-of-way by sitting, lying, or sleeping, or by storing, using, maintaining, or placing personal property in a manner that impedes passage, as provided by the Americans with Disabilities Act" (Sec. 41.18), or, "in other words, a homeless person (or anyone else for that matter) may not take up so much space that they make it difficult or impossible for people to pass through that area" (Blaine). It is also illegal for unhoused peoples to dwell on others' private property, unless specifically allowed to do so by the landowner. These laws are extremely convoluted and ever-changing, so what is legal one day could quickly be rendered illegal the next.

The term "homeless" is prescribed to those residing in the self-built homes of Los Angeles; those who similarly dwell in Cairo are not defined by this word. Though they are not called by this name, these Cairenes are not considered to be legally housed and therefore are rendered legally homeless. The pervasivity of this problem––of humans going without shelter––is evident in that these cities are of such starkly different geographies and histories. Modern Cairo's urban planning, architecture, and rich history span over thousands of years, while Los Angeles represents a newly established city founded in resource extraction. This dichotomy in roots crystallizes and exemplifies the disregard for the past that neoliberalism has as it pervasively and impartially attacks social structures.

The abuse within social structures is reflected in the concept of structural violence. This idea is, at its essence, one which reveals social forces as perpetrators of inequalities. Embedded within the institutional logic driving the destruction of these self-built homes is a system which is arguing toward the widening of a schism between the haves and the have nots; violent acts committed by the government against informal settlements and the less economically fortunate is a display of this enforced distinction between classes. In the government's destruction of self-built housing, the concept becomes embedded in the architecture, it becomes physically manifested. This specific form, therefore, offers a dual meaning to struc-

tural violence as it literalizes the term: a tangible violence enacted against built structures.

Destruction of Self-Built Homes in Egypt –
Maspero Triangle, Cairo

In many third-world countries, slums and self-built homes are a popular housing solution, just like they are in Egypt. Ahmed Soliman in his article "The Egyptian Episode of Self-Build Housing" published in Habitat International introduces the reader to the terrifying poverty statistics: "Of the world's 6.7 billion people, there are still 2.6 billion who live on less than $2 a day" (Soliman). The slum population of Egypt has often had to engage in self-help by constructing their own homes in informal settlements, and Soliman argues that it is not a novel idea. Self-built structures have been around for thousands of years, and for a large proportion of the population, erecting their shelter was often the only viable way to obtain one. Architectural services, financial security, and government permit issuance were seen as luxuries unattainable by many. Despite the apparent need for the poor to self-build, the Egyptian government has started shifting their views on the practices of self-built housing and utilizing its power to evict inhabitants regardless of their will. Cairo has been one of the cities with such intolerant and inhumane policies.

Cairo, one of the largest cities of the Middle East region, has been experiencing overcrowding for decades. An acute issue of overpopulation has driven many urban planners and government authority figures to develop the resettlement designs and to free up the space in the Cairo metropolitan area through demolition. The government strived to accomplish two goals in one go: follow Dubai's lead in building a megacity as well as provide housing for the lower socioeconomic classes. However, the noble ambition has not yet been satisfied as the plan has gone sideways. In her article "Shelter as Capital: The City as Prison/The Housing Question in Egypt", Sheetal Chhabria mentions the puzzling contrast that has emerged as a consequence of the authoritative effort: "Egypt has the largest number of empty homes on a per capita basis worldwide while at the same time having a significant proportion of its population sheltered under the threat of constant eviction" (Chhabria).

Despite these stark contradictions, Cairo has also been an example of the decades-long disputes between the overarching governments with their enforced top-down approach and the inhabitants of Cairo who often put their heart, soul, and hard work into making their spaces livable. The authorities, in a desperate chase after the Western ideals and inspired by the Dubai futuristic precedent, have over the years disregarded the lives and homes built by ordinary people and, at first, prohibited building renovations in certain districts and then started forcing inhabitants out in order to demolish the neighborhood and construct the new dream vision.

Chhabria is not alone in writing on the upsetting conditions in the streets of Egypt's capital. Yasmine El Rashidi in her article "Sisi's New Cairo: Pharaonic Ambition in Ferro-Concrete" refers to the president Abdel Fattah el-Sisi's grandiose ambitions to make over the entire city of Cairo which will "involve the pillaging of Cairo as it has existed, in parts, for centuries, erasing whole swaths of the city's urban heritage and ravaging everything in its path, from the

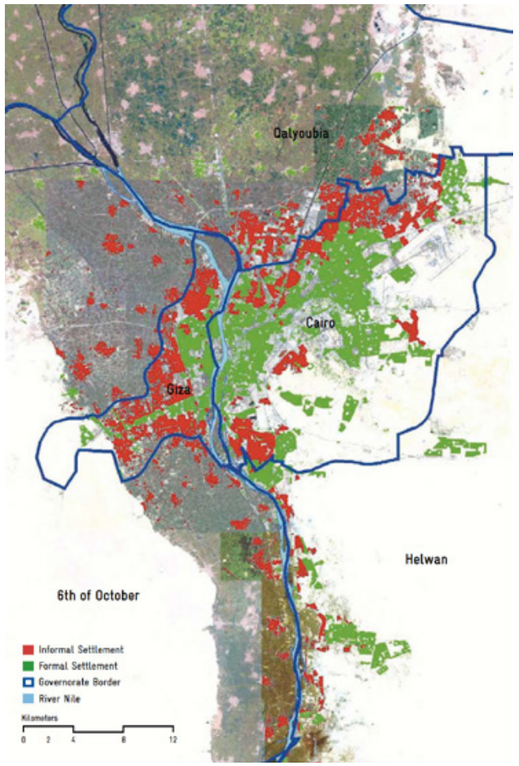


Figure 3. Settlement Map. Map credit: PDP / GTZ

Figure 4. Building undergoing demolition. Photo credit: Yasmine El Rashidi

living to the dead" (Rashidi). The "living" part of this quote makes one's hair stand on end, as it implies the demolition of self-erected homes and an unfair and forceful eviction of Egyptian citizens from their beloved homes. Rashidi proceeds to describe the brutality of the process with bulldozing the residential buildings and reminisces on her own experience of driving through Cairo and seeing exposed kids' bedrooms with colorful wallpaper in the devastating ruins (Fig.4). One of such unfortunate districts is Maspero triangle that is now just a pile of debris, rubble, and post-destruction dust (Rashidi).

Maspero Triangle has a long and rich history spanning multiple centuries. Despite always being owned by either wealthy upper class or government authorities, Maspero Triangle provided housing for the servants since the late 1800s (Rashidi). When the land was sold in the middle of the 20th century, the residents were guaranteed to stay in their apartments and to have stable rent prices. However, once the government took over the land in 1968, the policies were overlooked and those reassuring guarantees as well. Cairene authorities have decided to pursue their own improvement agenda instead of honoring the promises given to the servants decades prior. Maspero Triangle has eventually become one of the primary demolition sites in Cairo while the former residents were forcefully relocated to Asmarat – a model housing project for the slum dwellers and low-income families (Fig. 6). Asmarat represents a prototype village where even the stores will not open until the facades match each other perfectly (Rashidi). While on paper the newly constructed idealistic neighborhood might sound appealing, in reality the architecture feels cold, unwelcoming and inhumane. Former inhabitants of Maspero triangle are moved there without their consent, like cattle, from one plot of land to another. How fair is this to those inhabitants who loved and cared about their initial homes? And above all – they were promised a right to live there, a right that was rudely violated.

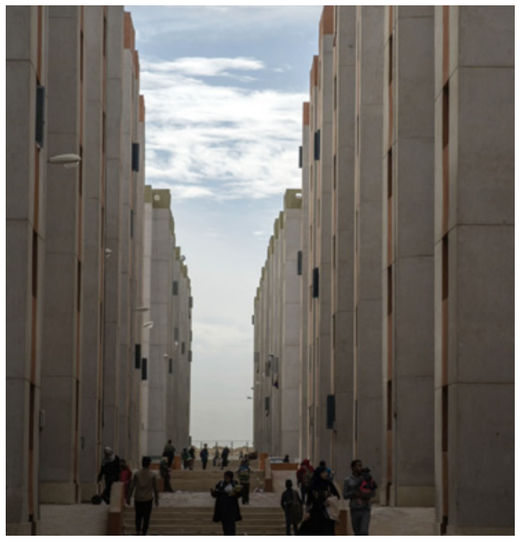


Figure 6. Asmarat. Photo credit: Mada Masr

Figure 5. Cairo.

Destruction of Self-Built Homes in the U.S. –
Echo Park Lake, Los Angeles

As in Cairo, the government of the City of Los Angeles commits violent acts toward communities that inhabit self-built homes, forcing their removal from the land on which they live. The living styles and forms of psychological harm, however, are quite opposite. In Cairo, the government's demolition of what are seemingly permanent residences is central to the violence; the destruction is done by an actor from within an excavation machine toward a built structure. In Los Angeles, the cruelty is embedded in forced nomadism and an ephemerality of living quarters; the destruction is committed face-to-face, between police officers and citizens. In living in these tented homes, the city is able to make these individuals—quite literally—instantaneously erased from space.

There are various reasons for people to experience homelessness in Los Angeles, and it has been a part of the city's story since the 1880s, with much of it rooted in redlining, prohibitive rent, and mass migration. Some of the key reasons for the continuation of such living circumstances, however, is poverty, lack of affordable housing, employment discrimination, substance abuse, mental health challenges, domestic violence, lack of familial ties, and kids who age out of foster care. However, perhaps the most forceful factor is the mass incarceration that exists in the United States; it has been found that 60% of L.A.'s homeless population has cycled through the criminal justice system (Ward). In the U.S., the notorious phenomenon of the "school-to-prison pipeline" is a system which over-utilizes disciplinary actions against minority students and, directly and indirectly, encourages them onto a path which results in their imprisonment. There is further the "prison-to-street pipeline," which means that most people who have been incarcerated will end up on the street (or back in prison); this happens for various reasons, especially the many difficulties encountered with that status being in the individual's background check when applying for jobs and/or living spaces as well as the lack of preparation provided by the prison system for individuals reentering life outside the penitentiary. So, essentially, it is a school-to-street pipeline; which is to say that the "homelessness problem" in the United States is very much embedded in the structure of the nation. This again takes us back to the concept of structural violence, with the structures of the education system and prison system directly preventing socially disadvantaged individuals from having an opportunity for equality. This social structure then translates into physical structure as the theoretical school-to-street pipeline physically actualizes into built space, into the formation of tent cities scattered across Los Angeles.

Instead of crafting space through composing various solid elements as in Cairo, the self-built homes in Los Angeles are readymades. The Cairenes' constructions look, more-or-less, homelike; or they at least appear similar to what a child would draw as a home and they are made of home-construction materials. The Angelenos' homes within this typology, on the other hand, are tents. These homes are prefabricated plastic assemblages of bright colors and thin materials, the same makeshift shelter one would take on a camping trip; they are as easily built as they are punctured and moved. Those who are unable to come into possession of a tent create a framework out of metal poles or wooden stakes and then place a tarp on top, collaging their own water-resistant shelter. These distinct building modalities are reflective of the social structures in their respective countries––for instance, the consumerist-based and neoliberal nature of the United States is represented even by those legally unhoused, as they reside in plastic and commodified readymades––as well as of their im/permanance, since the purpose of the tent is to be a mobile and packable temporary shelter.

A case study of this dissettlement in Los Angeles can be found in what occurred at Echo Park Lake (Fig. 7). Amidst the arrival of the coronavirus in 2020, the park morphed into a settlement for what would become over 200 unhoused individuals, tents erected everywhere. The space turned into this housing site since the rate of homelessness substantially increased, an influx which was due to global widespread lay-offs as well as to local homeless housing sites, which reduced occupancy levels in order to accommodate for social distancing. In fact, the space was so heavily populated that the new residents made the space into a commune of sorts, "complete with community gardens, makeshift showers, a food pantry and phone-charging station" (Schrank). As the park became almost entirely covered in personal belongings, the government decided to close the park for "repairs" and forcibly removed the residents, with many of them––along with protestors––being arrested (Smith).

The city invested $1 million worth of repairs––reseeding grass, disposing of waste, installing security cameras––and tied it all off with a chain link fence containing only four access points, as opposed to the infinite access points around the entire periphery which it had offered prior (Schrank). After the renovations, the entirety of the park is now under surveillance, with security systems and a privately contracted security company, in partnership with the Los Angeles Police Department, monitoring every grass on the land. The fence remains, and its few entry points are closed from 10:30PM until 5AM in order to enforce anti-camping laws; it has become an unquestionably defensive architecture (Denkmann).

During the eight months of their encampment, the LAPD approached the settlers on multiple occasions in an attempt to offer them a deal, hoping hotel vouchers would encourage them to leave the park. The hotel rooms where the individuals would stay was part of something called Project Roomkey, a government-funded initiative with the aim of getting people off of the streets during the pandemic. The program, however, was extremely restrictive and notably short-term (Schrank). Also, to note, the city did not mandate a deal between these citizens and the government in order to follow through with their removal. The situation was that the individuals were going to be forced off of the site no matter what, and while the city hoped they would take them up on their deal, their acceptance or lack thereof was, at the end of the day, inconsequential to the

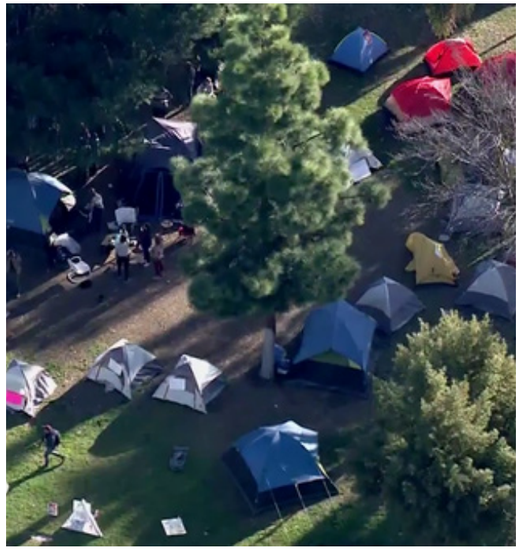


Figure 7. Tents in Echo Park.

city's dealing with the park.

The residents were told they would be moved out of Echo Park Lake and into permanent housing, but for the vast majority that never happened. In fact, a UCLA study found that of the roughly 200 individuals who had lived at the Echo Park Lake encampment, only 17 of them received long-term housing (Nally). A few others are on housing waitlists, but most are back to living in tents. While many of the park's displaced residents eventually did agree to Project Roomkey, most of them ended up leaving the facilities soon thereafter and returned to the street; they found the conditions of homelessness to be better than the government's offering.

These empty promises and dealings between the city and those experiencing homelessness in Los Angeles have resulted in a distrust in the government by the unhoused population. The inept response by the city in its handling of the issue displays an absolute disregard

Figure 8. Tents on a freeway.

for the lives at stake and instead places the emphasis on cleaning up "blighted" neighborhoods; much in the same way as the Egyptian government designates self-built neighborhoods as centers for filth and crime, so too does the city of Los Angeles employ the same rhetoric in its reasoning of displacing citizens. Instead of addressing the roots of homelessness, the city instead addresses those most affected by it, and does so in an extremely violent and disorienting manner. No true solutions are put forward, and the city masks its wish to render the unhoused invisible with a wish for sanitation. This is all accomplished under the false premise of supplying permanent housing for the displaced individuals, housing which, in reality, does not exist. Instead of looking out for these individuals, the city is looking over them via the implementation of extreme surveillance measures.

Conclusion

The case studies of Cairo and Los Angeles investigated in this paper have highlighted social issues that are globally perpetuated by an authoritarian approach. Despite the democratic regime promised in both countries and by both governments, those in the lower socio-economic classes struggle to claim their rights and have their voices heard. The legally-unhoused residents of both cities are yet to receive adequate assistance from their governments, receiving instead violence. It is a belittling practice to proclaim someone's dwelling less significant in its nature, disregarding the great efforts of constructing self-built housing.

This domestic abuse investigation highlighted the brutal nature of the destruction of homes in these two populated cities situated across the globe from each other. Regardless of whether a temporary tent is torn off the ground or a decades-old building is left in ruins, the psychological aftermath of the demolition is devastating: it is of families losing their homes and all those memories embedded into its fabric. The dilemma persists: how can governments respect all classes of people while working toward idealized aesthetics? And the answer is still out there, not fully found.

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Kremlin Fortification Typology and Radial Expansion of Moscow

by Polina Stepanova, M.Arch Candidate
revised by Victoria Sanger
Columbia University, 2022

Introduction

While the word "kremlin" automatically directs one's attention to the political and urban centerpiece of the Russian Federation's capital, it indeed has multiple meanings. Kremlin has been treated as a specific location, as an architectural masterpiece, as a UNESCO world heritage site, as a personified structure that represents Russian military intentions, even though it has a typological meaning as well – one that is applicable to many Russian cities such as Pskov, Novgorod, Smolensk, Rostov, and others (Britannica). A kremlin – a medieval fortress that served as an origin point for the further urban developments – defined the dynamics of future cities and massively influenced many political and architectural outcomes of the following centuries. This paper will consider the typology of kremlin and its military fortification history before diving into the case study of Moscow Kremlin as a basis for the capital's further radial expansion. By being triangular in its plan, the Kremlin has established Moscow's orderly urban growth radiating evenly from the center of the fortress outwards. This circular grid ensured the protection of the centerpiece of the city and an ample distance from the periphery of Moscow to the Kremlin itself. This paper discusses social and urban implications of the history of the Kremlin, as well as the aftermath of the urban radial expansion ruled and intensified by Russian military decisions.

Part I – The Kremlin

Kremlins as a typology originated in the medieval times – the establishment of Moscow's Kremlin dates back to 1147 when it was erected by Yuri Dolgoruki (UNESCO). In his "Russian Medieval Military Architecture", archaeologist Pavel Rappoport contemplates defensive structures and mechanisms in medieval Rus. He writes, "In towns of Ancient Rus the main fortification was not the feudal castle but the central citadel of the town itself," stating the difference between the castle-oriented Western Europe and medieval Russia. In Rus, castles were distanced from the towns, while in the West, castles were the center of the urban developments. One of the features was common – the proximity to a natural water resource which in the case of the Kremlin turned out to be Moskva river located to the south of the structure.

The central citadel in Russian urban areas was often categorized under the kremlin typology, which, according to Britannica, has the following definition: "central fortress in medieval Russian cities, usually located at a strategic point along a river and separated from the surrounding parts of the city by a wooden—later a stone or brick—wall with ramparts, a moat, towers, and battlements" (Britannica). Another word to describe the kremlin typology is detinets which means "the place of the elders", according to historian Valentin Yanin, and signifies a fortified location for the process of decision-making and important gatherings (Manaev). The oldest detinets in Rus is located in Novgorod with chronicles mentioning it in 1044 for the first time, but a radiocarbon investigation on wooden fragments of the fortress implies that Novgorod detinets might predate the Christianization of Russia in 988 (Manaev). This hints at a revelation that Christian religion did not influence the initial formation of the kremlin typology even though it has strongly affected the future development of citadels in medieval Rus.

Figure 1. Kremlin site plan. Credit: Wikimedia Commons

Figure 2. Novgorod *detinets*. Credit: Russia Beyond

Even though the Kremlin in Moscow is not the oldest citadel in ancient Rus, it carries supreme significance and provides deeper insights into the formation of the Russian capital. Unfortunately, the initial military fortress built on Borovitsky hill was not properly preserved due to the prevalence of wood as a building material. Pavel Rappoport mentions in his writing that "it is harder to ascertain the development of Ancient Russian defensive works because in Rus stone fortifications were rarely erected" (Rappoport). Wood as a building material has its own vulnerabilities such as susceptibility to catching fire, but the military engineers at the time of Kremlin's erection relied on my earth-related fortification techniques as well. "The earthen parts of the fortifications – natural slopes, scarps, walls, and moats – were the basic works of the Russian fortresses of the 11th-12th centuries," writes Rappoport. From a fortification standpoint, the position of the Kremlin on 125-foot-high Borovitsky hill is strategically justified. As the potential enemies approached, the guards had an opportunity to recognize the imminent danger and protect the citadel while remaining safe within its walls. In the absence of better protection strategies, locating the fortress on the hill ensured safety from a sudden attack, even though the wooden walls of the initial Kremlin had an element of weakness.

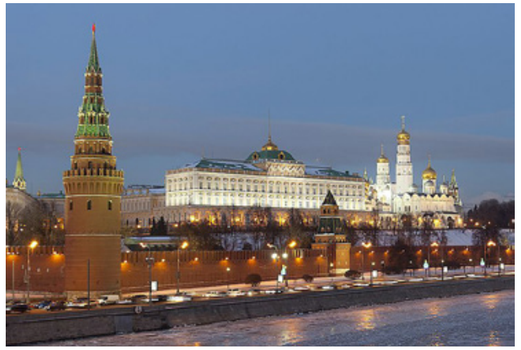

Figure 3. Red Square. Photo credit: Pavel Kazackhov

Another noticeable characteristic of the time that affected the design of kremlins around the country was the undeveloped state of offensive weaponry. Horst De La Croix in his account of the radial planning in sixteenth century Italy mentions that "during the Middle Ages, defensive methods has triumphed over offensive methods" and that "in many instances, costly and time-consuming blockades were the only effective means of forcing a stronghold to surrender" (De La Croix). Similar logic applies to the situation in Ancient Rus and explains the early fortification designs of the Kremlin.

The design of the wooden Kremlin lasted for multiple centuries, and then the material of the fortress was replaced with limestone by Prince Dmitry Donskoy which initiated the capital's historical period referred to as "White-Stone Moscow" (Dmitrieva and Abramova). Then, between 1485 – 1516 the outer walls and towers were again reconstructed in stone reinforcing the idea of stability and permanence (UNESCO). The stone structure remains in the center of Moscow to this day, and the design wonders associated with the Kremlin are attributed to talented Italian architects of the time – Aristotele Fiorvanti, Alevisio Novi, Marco Fryazin, Pietro Antonio Solario, and others (UNESCO). This invitation extended to the Italian masters represents a notable shift in mentality – the Kremlin departs from its sole purpose of a military fortification and participates in the inspirational Renaissance movement. It welcomes and accepts its multidisciplinary role as a cultural phenomenon as well as a Rus social center and a centralized fortress. The entangling of multiple important functions persist in the Kremlin to this day, as it has become an ephemeral symbol of Russian military power as well as of lofty cultural standards upheld in the Russian Federation. The religious aspect of human life also got expressed through the ancient churches of the Kremlin as it became the seat of the Orthodox Church, "the other major institution of late medieval Russia," according to an article from Yale University Press (Dmitrieva and Abramova). It is important to remember that while certain politicians throughout the centuries undermined the philosophies monumentalized in the Kremlin, the fortress has so far outlasted all of them – they are all just chapters in the book of Russian history.

The Italian masters' influence over the most important Russian political monument is essential to emphasize. While Eastern Europe followed its own developmental trajectory throughout the medieval period and the Renaissance, some of the most notable Russian aristocracy and royalty collaborated with the West creating intriguing cultural parallels and providing opportunities for Western craftsmen to do ancillary architecture work in the East. Filarete, a renowned Italian architect from the Renaissance era, greatly influenced the urban planning and the architecture of Milan, and similar designs were carried into the Russian Empire by Fiorvanti who directly participated in the continuous construction and improvement of the Kremlin (Hurst). Ellen Hurst from City University of New York describes the emergence of the Muscovite style which hinges on the intersection of Italian influence and Russian cultural identity. She refers to one of the most famous Russian churches, located on the Red Square: "The most famous Russian building from this period, St. Basil's Cathedral (1555), bears striking resemblance to architectural sketches from Renaissance treatises" (Hurst). The linkage that was established by the collaborative nature between European East and West had a massive impact on what became known as the Russian architectural aesthetic with golden onion domes, colorful baroque elements, and embellished fortress towers.

With the initial framework of Russian citadels and Moscow Kremlin presented, the question appears: how was the campus of the fortress arranged? What buildings comprised the triangular plan of the citadel? The Kremlin grounds house many structures for various purposes: churches and cathedrals for the religious services, towers and arsenals for the military purposes, courthouses for conducting justice, palaces and halls for state ceremonies and celebrations, museums for the preservation of culture, plazas for public gatherings, vaults for asset protection, and residences for the monarchs' occupancy. With the consideration in mind of the Kremlin being the oldest part of Moscow, it makes sense that the fortified campus hosted many important functions to represent the urban planning of a fully functioning village. However, the Kremlin's many functions morphed, expanded, and contracted over the centuries, with some of them ceasing to exist entirely. With time, as Moscow grew outwards, the demand for the variety of functions within the Kremlin decreased – and the situation even came to a point when the seat of power was moved by Peter the Great to another city altogether.

When the capital of Russia was moved to Saint Petersburg in 1703, the Kremlin retained its significance as the ceremonial and religious epicenter of the country. The rest of the functions within the Kremlin lost their relevance for a prolonged period of time. There were scattered attempts to revive its importance such as the construction of the senate inside the Kremlin's walls between 1776 – 1787 (UNESCO). The Senate held the seat of the "highest agency of State power of the Russian Empire", but the main authority at the time remained in Saint Petersburg. After some reconstructions, repairs, and renovations, the major shift in dynamics occurred when Bolsheviks came to power. They designated Moscow the capital city

once again, and repurposed and dismantled multiple buildings within the Kremlin to serve military purposes – for example, they opened a military school in place of Chudov monastery (Panova). They also employed a chameleon strategy to preserve the Kremlin during the World War II German invasion by covering the buildings in painted tents to mask them under the guise of regular buildings (Manaev).

This brief history of the Kremlin alongside the ancient fortification strategies in medieval Rus all point at the initial multifunctionality of the kremlins (which acted as tiny cities on their own) followed by their unstable role in the following centuries. As the cities grew outwards from the point zero, the citadels' status metamorphosed in the frame of military urbanism. Was their remaining significance only in the historical richness or were they still an important military fortification? To start answering the question, it is obligatory to review the development of the city surrounding the ancient fortification and whether the central role has permanently been ingrained in the stones of the Kremlin with the means of urban planning. In his "The Grand Manner", Spiro Kostof contemplates the planning endeavors undertaken in Washington D.C., but he also refers to an important historical example of Versailles. He writes, "Behind L'Enfant's Washington plan stand over two hundred years of urbanism whose main invention is in fact the capital city, dwarfing all others around it, pushing its avenues out to the country so that entire regions are seen to converge upon it" (Kostof). This remark is critical in its acute intentionality of the city planning which seems to be absent in the history of Moscow. Yet, the construction of the Kremlin and the subsequent expansion of the city has yielded a result similar to that outlined by Kostof and desirable by President Washington as a vision for the capital. Consider the sights of grandiose Tverskaya street which descends onto the Red Square providing an unspeakable procession of city spaces, and that alone raises the question of the true magnitude of meaning behind the long-standing Kremlin's structure on the Borovitsky hill. In order to dive deeper into this contemplation provoked by Kostof's writing, it is imperative to analyze the radial urban planning of Moscow next.

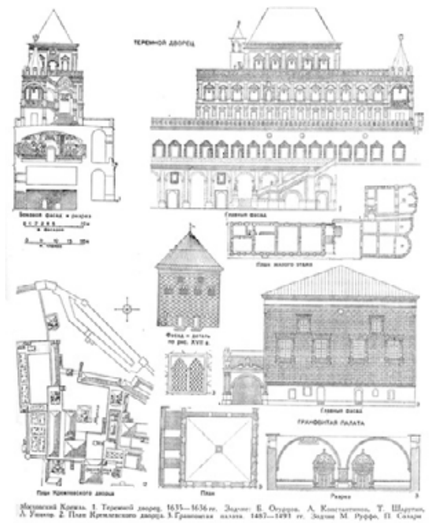

Figure 4. Kremlin drawings. Credit: kannelura.ru

Figure 5. Kremlin drawings. Credit: kannelura.ru

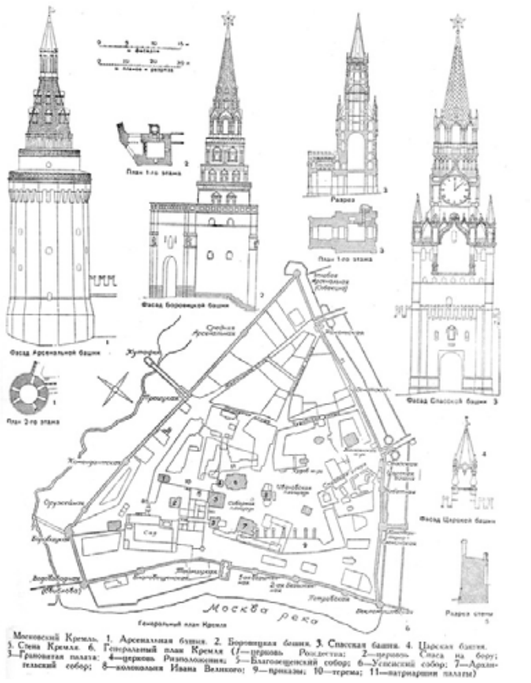

Figure 6. Kremlin drawings. Credit: kannelura.ru

Part II – Radial Planning of Moscow

Back in 1147, the Kremlin established the origin point of the urban development of the city of Moscow. From there it has expanded to a total metropolitan area of 10,000 square miles with the population exceeding twenty million people (Rosstat). From the origin to its current state, Moscow has massively evolved on its pathway to being one of the world's largest cities, and its urban planning analysis becomes instrumental in deciphering the efficiency and quality of life in the Russian capital. When discussing the construction of the Kremlin, the World Heritage Convention governed by UNESCO mentions that "This determined a radial and circular plan of the center of Moscow typical of many other Old Russian cities" (UNESCO). The triangular plan of the ancient citadel implied the circular expansion outwards, and the military fortification efforts only supported this type of urban planning strategy. Positioning the Kremlin on a hill amidst dense neighborhoods ensured obstructed and rather difficult access to the main political seat of the country. The plan has created a protective "cabbage" structure – one has to arduously keep peeling the layers off one by one in order to eventually reach the center. The enemies have succeeded once in making their way through the urban labyrinth onto the grounds of the Kremlin in 1812 under the leadership of Napoleon, but even then the French army eventually retreated destroying parts of the Kremlin in an explosion (Zamoyski). Overall, the military advancement and fortification of the Kremlin is clearly legible in the historic plans of the city, but was the circular urban planning truly intentional?

The radial expansion of Moscow has been prominent in the centuries following the initial establishment of the Kremlin. In this regard, Russian urban planning patterns resemble those of the Western Europe. Horst de La Croix in his "Military Architecture and the Radial City Plan in Sixteenth Century Italy" begins his writing by stating that "since its inception around the middle of the fifteenth century, the radial city plan has proved itself to be a popular and pliant tool in the hands of urban planners, whether artists or engineers" (De La Croix). However, while urban planners in Western Europe had the urban design calculated and prearranged, Russian cities surprisingly often spread out in a haphazard fashion. T. Gelman in The Town Planning Review magazine writes about the planning of Moscow: "until the twenties of the current century (20th), Russia took no part in the wide-spread town planning movement that was developing in the countries of Western Europe"

Figure 7. Map of Moscow. Map credit: Retromap, 1932

Figure 8. Aerial view of Washington D.C. Credit: Spiro Kostof

(Gelman). The author points out that the development of the city was rather chaotic and that the "unsanitary outskirts" formed "the breeding place of epidemics and tuberculosis" (Gelman). The distinction between medieval radial planning in Italy and the more accidental nature of radial planning in Russia is distinct, even though the center position of the Kremlin strikes the audience as very intentional. Gelman mentions that perhaps some generalized form of radial planning was followed but without an in-depth analysis and proposal due to the resistance from private landowners who feared the loss of power. While the fortification scheme was vaguely followed, any further urban analysis lacked attention and relevance at the time.

The growth of Moscow into a series of concentric circles proceeded unevenly. An article from Yale University Press reads, "At this stage the Kremlin was simply the inner fortification of the town of Moscow, which already stretched some distance beyond the open market to the east of the Kremlin that came to be known as Red Square" (Dmitrieva and Abramova). Red Square carried out the function of a marketplace for centuries to come, and to this day it hosts seasonal markets that attract visitors from around the world. This development has partially relieved the Kremlin of some of the programs within its fortified walls, but it would soon embellish itself with new layers of symbolism. Despite the initial one-sided extension of the city, Moscow has proceeded to embody a form made up of concentric circles in which the circular elements often represented the transportation around the city. Interestingly enough, with the addition of the Red Square, Manege Square, Aleksandrovskiy gardens and Moscow River embankment, the rigid triangular plan of the Kremlin softens into a shape mildly resembling a circle itself. It thus establishes a sequence of the concentric circles that acts as a skeletal spine of the Russian capital.

The phenomenon of concentric circles follows the logic of an efficiently connected and robustly fortified city. T. Gelman writes in his The Planning of Moscow in 1924, "In the center of these three concentric circles stands the Kremlin, that splendid monument of hoary antiquity through which the whole history of the Russian people has passed right up to the latest Red Days" (Gelman). The author then proceeds to describe the circles in more depth with the first one enclosing "the white trading town." The next circle encapsulates all of the central areas of the city, and the one after that joins all of the railway stations of Moscow. Beyond the third circle, Gelman sees the most beautiful and promising part of the city with "stretches of verdure alternating with inhabited regions" (Gelman). While this general description of the concentric circles from 1924

still holds true, the city has undergone many political and urban changes in the past century alongside with the rapid population growth. The circles outlined in the Town Planning Review article carry a certain symbolism beyond a mere architectural implementation – nowadays the circles are the veins of the cities overloaded with traffic and chaotic transportation. The circle that encapsulates the city of Moscow – the MKAD or Moscow Ring Road – has a length of almost sixty-eight miles, and the circular pattern does not stop at the boundary of the city (Google Earth). Moscow Small Ring Road (or locally called Betonka) which is another eighteen miles from the MKAD has a length of 215 miles, and the passengers can still travel in a circular motion despite no longer being in the confines of the city (Google Earth).

The ground-level transportation in Moscow is not the only one following the urban laws outlined by the Kremlin erection. The metro which dominates the underground domain of the city has multiple circular lines mimicking the concentric circles expression seen above ground. The oldest circular line is called Koltsevaya (translating as a Ring), and it was constructed between 1950 and 1954 to ease the passengers' way around Moscow's capital. The military urbanism notion comes into play here as well – Moscow metro has always served as a potential bunker space in the event of an attack. The fortification efforts also justify why the metro system has been buried so deep underground. Park Pobedy, the deepest station in Moscow, also happens to be one of the deepest metro stations in the world located eighty-four meters (276 feet) underground (. Thus, the metro system not only provides an efficient method of transportation circling around the city center, but also an underground system of linear and ring tunnels which could easily be used for military purposes.

Figure 9. Moscow metro map. Credit: metro.ru

The concentric circles of Moscow are crossed by outward radiating perpendicular roads such as Kutuzovsky avenue, Tverskaya-Yamskaya street, Komsomolsky prospekt, Leninsky prospekt, and others, many of which create a sense of abundance of space due to its width. This road system creates a parallel with The Grand Manner written by American architectural historian Spiro Kostof. After describing the "magnificent distances" in relation to European urban planning, the author mentions that "there is an earlier era when such consummate theatricality, the conventions of a hierarchic and ceremonial urbanism, had made its appearance" (Kostof 212). Even though Kostof writes about the Hellenistic period, the later planning of Moscow has a similar imagery with the grandiose distances and majestic procession of urban spaces. Kremlin remains at the center of the city surrounded and protected by concentric circles, both on the ground plane and on the underground one. The wide transportation veins of the city which cut through the circles perpendicularly all converge at the Kremlin creating a symbolic sense of direction inwards, into the historical and political heart of the country. Interestingly enough, Moskva river, which snakes around the city in a peculiar pattern, does not disrupt the rhythm of the rings – the planners of Moscow introduced many bridges in order to preserve the circular scheme of the city planning.

Moscow city and its historical center of the Kremlin call for an interesting comparison with one of the earliest cities in the United States of America – New York City. New York was founded in 1624, approximately 500 years later than the establishment year of Moscow. Because of this massive age difference and geopolitical location, two cities developed in distinctly different ways. Moscow, as mentioned earlier, did not follow a specific expansion plan until later in its history – it rather haphazardly expanded outwards, maintaining the Kremlin as its central core structure. New York, on the other hand, never had such a pronounced central fortress preserved to this day. Another consideration that is important to keep in mind is that another city in the United States was designed and founded in 1790 with a major purpose of becoming the new nation's capital – Washington D.C. New York City, therefore, was relieved of the need to construct spacious government-related buildings and to impress visitors with "The Grand Manner" outlined by Spiro Kostof.

Shortly after the foundation of Washington D.C. a commission was gathered to design the plan of New York City as it was rapidly and chaotically growing. Urban development researcher Diego Giron in his writing on the urban planning of New York City says, "The plan called for a pattern grid of twelve avenues from East to West and 155 streets from North to South, and the pattern would keep expanding as the city kept growing" (Giron). The initial urban plan was proposed in 1807, and the expansion of the city followed a similar grid-like logic. The geography of the city plays a significant role in its development as well. Moscow is located on a massive plain with rivers and seven relatively short hills with one of the hills, the Borovitsky hill, providing fertile ground for the construction of the Kremlin. New York City, on the other hand, is mainly located on the islands – Manhattan, Long Island, Staten Island, Roosevelt Island, etc. It is probable that a circular city planning and grandiose avenues would not be applicable in the case of Manhattan, where population density is currently at 72,918 residents per square mile (Mann, Valera). Moscow is significantly less densely populated with only 3,296 residents per square mile (Moscow Info). Many factors determine the ultimate vector of the development of the city, and Moscow and New York City have very different trajectories due to their histories, population growth projections, climates, and geographies.

Conclusion

In conclusion, it is instrumental to reassess the ultimate meaning of the Kremlin, as a typology, as a military fortification, and as a symbolic monument over the centuries of Russian history. Many of the developments relating to the Kremlin were novel at their time, but they also do not always seem logical or sensible when researchers analyze them in the twenty-first century. As the technologies advanced, as defensive and offensive weaponry improved, as the seat of power shifted back and forth, the Kremlin evolved in an organic manner often representing what was the most important movement in ancient Rus at the time. The Kremlin remained a structural and philosophical icon establishing the capital of Russia and encouraging the radial city expansion. In contrast with other foreign cities, such as Washington D.C. and New York, Moscow was not meticulously planned but the ultimate result still resembled a properly organized and easily legible form of concentric circles. As history keeps unfolding, the Kremlin and Moscow will continue their imminent growth in order to accommodate the incoming residents, preserve the historical values, and withstand political and social turmoils.

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Vitruvian Concepts in the Modern Age

by Polina Stepanova
Master of Architecture
Columbia University, 2021

Introduction

Some might argue that defining architecture started centuries ago, around 80 BC, with Vitruvius and his Ten Books on Architecture (De Architectura) – the first manuscript that was not lost and which dives into both the philosophy and the execution of the architectural craft. In his work, Vitruvius placed the architectural theory on a pedestal supported by three main pillars – firmitas, utilitas, and venustas (strength, convenience, and beauty) (Marder 3). He also emphasized the importance of human proportions in the architectural design, and by establishing this theoretical foundation the author gave guidance to architects throughout the centuries to follow (Marder 3). However, in the modern age did Vitruvian architecture become obsolete? Or does it stay as relevant as it was in the ancient history? This essay turns to the theories of three prominent modern architects – Louis Sullivan, Le Corbusier, and Peter Eisenman whose writings suggest a convincing parallel with Vitruvian manifesto. It argues that Vitruvian concepts are a powerful foundation that is rediscovered and reinterpreted over time – and this trumps the invention of completely new ideas.

Before diving into the core concepts of this research, it is essential to define the period of time explored – the modern age. The modern age in this writing refers to the late modern period of history which started in the 1750s and continued all the way throughout the 20th century eventually merging with the information era and digital age. While Vitruvius represents the ancient school of thought, other architects and philosophers who play an important role in this paper all happen to belong to the late modern period. The juxtaposition of ancient and modern is, therefore, established in these terms.

Vitruvian Wisdom

Humanity often believes that we are in the active process of evolution discovering surprising new ideas and ways of living decade after a decade. It can be argued, though, that our ancestors were way wiser that we portray them to have been as a lot of ancient texts on philosophy on various subjects are as relevant today as they were centuries ago. In other words, we are not really discovering better ways to live – better ways have already been described by ancient philosophers. In "Vitruvius and The Architectural Treatise in Early Modern Europe", Tod A. Marder opens his essay with a bold quote quickly stating his argument: "Vitruvius did more than anyone else to shape thinking about early modern architecture" (1). Vitruvius was a visionary that foresaw centuries into the history, and his theoretical work remains relevant and applicable not only in Marder's early modern Europe, but also in the 20nd and 21st century. Key figures in the field of architecture have recognized it and successfully applied and reinterpreted various Vitruvian concepts in their own work.

It must be mentioned, however, that Vitruvian legacy has reached the modern days in a modified and perhaps improved form as it has been molded and shaped by different thinkers throughout the century. In the aforementioned essay on Vitruvian architecture, Tod A. Marder claims that decoding Vitruvian original text was rather complicated due to the scattered and unclear writing manner of his architectural treatise (4). In an attempt to resolve this ambiguity, various people throughout the history reinterpreted and clarified Vitruvian original texts, often times building upon the presented knowledge. Leon Battista Alberti, for example, a Renaissance humanist, created an umbrella term concinnitas derived from Vitruvian ideas of "symmetry", "ordering", and "eurythmy" (Marder 7). The term concinnitas describes a design scenario in which "nothing could be added or subtracted without diminishing the composition" (Marder 7). This essay argues that Vitruvius provided a fertile theoretical ground for experimenters to draw from, and that the design and engineering ideas we receive in the 21st century are a product of perpetually modified sequence of thought started by Vitruvius and his predecessors. Based on these theoretical conclusions, it is also important to examine how Vitruvian theory manifested in his own structural projects since architectural theory without a real world application renders itself quite useless.

In his De Architectura, Vitruvius goes on a tangent from theory to applied architecture and starts book V with references to his own structural designs (Clini 121). Paolo Clini, a professor at Marche Polytechnic University, in his essay on Vitruvian architecture writes that "Vitruvius describes, synthetically though accurately, the fabric universally known as the "Fano Basilica", which he built around 19 BC in Colonia Juliae Fanestris, present-day Fano, Marche" (Clini 121). Clini focuses his writing on restoring the memories of Vitruvian basilica since the building was destroyed approximately in the 5th century AD and since then a lot of effort has been implemented to recover the architecture of the basilica through drawing, 3D modeling, and virtual reality all based on the ancient sources. The process of virtual reconstruction helps us understand what Vitruvius envisioned as a physical manifestation of his fundamental theory such as the Vitruvian triad and other concepts he outlined in his Ten Books on Architecture (Clini 121). Professor Clini outlines that Fano Basilica carries a very significant weight due to multiple reasons. First, it was the only building design of which Vitruvius attributed fully to himself, and for this reason, many scholars over the centuries were especially interested in this structure since they believed it would represent all the theoretical knowledge Vitruvius had. Second, research suggested that Fano Basilica does not fit under the basilica typology and, therefore, might have never existed in the first place. Clini refers to Fano basilica in his essay as "a building of which no trace apparently remains, a building lost to memory except for Vitruvius' own description and the drawings that have attempted to reproduce it" (Clini 122).

The next question is: how did modern architecture rely on Vitruvian concepts and how did it evolve from that fertile Vitruvian foundation?

Modern Theory

Throughout ancient and modern theory, there are curious overlaps that require closer attention and investigation. An interesting parallel exists between Vitruvian triad and modern design philosophy: the concept of "utilitas" and "venustas" carries resemblance to "form follows function" ideology which was coined by Louis Sullivan in his essay "The Tall Office Building Artistically Considered." Vitruvius claimed in his Ten Books on Architecture that "all these must be built with due reference to durability, convenience, and beauty" (Pollio and Morgan, 31), and it was repeated later as well. In his writing on Vitruvius, Tod A. Marder emphasizes that "architecture should embody the concepts of durability, convenience, and beauty, the famous Vitruvian triad" (3). The term "utilitas" accentuated by Vitruvius as one of the core principles of useful architecture renders a building "defective unless the spaces provided are adequate and appropriate for their intended usage" (Encyclopædia Britannica). This architectural philosopher argued against useless and meaningless spaces, and he also brought forth the concept of "venustas" – the aesthetic beauty of architecture (Marder 3). These theoretical explorations have not gone unnoticed: twenty centuries later Louis Sullivan famously exclaimed in his The Tall Office Building Artistically Considered: "Form ever follows function!" (6). The next paragraphs will compare Vitruvian "utilitas" and "venustas" to more modern "function" and "form." Ancient Roman concepts found their reincarnation in the minds of thoughtful architects of the modern era like Louis Sullivan.

Louis Sullivan, a prominent American architect of the 19th century, wrote an acclaimed criticism on the emergence of tall office buildings in the era of industrialization. He named it "The Tall Office Building Artistically Considered", and despite being written over a century ago, it carries importance today due to the profound ideas presented in it such as "form ever follows function" (Sullivan 6). Sullivan was very dissatisfied with the mindless, yet a too "educated" approach to mass-erection of the tall office towers happening towards the end of the nineteenth century (4). He called the structures "this sterile pile, this crude, harsh, brutal agglomeration" (Sullivan 1), and believed that the architects have departed from the laws of nature – and from the Vitruvian concepts of "venustas" and "utilitas" ("firmitas" from the triad is omitted in this discussion since it is already implied). To explain his concerns for the new construction, Sullivan turns to nature and its undeniable law of form following function: "unceasingly the essence of things is taking shape in the matter of things" (5). The author also insists that where function does not change, neither should the form (5). Vitruvian concepts of "utilitas" and "venustas" find their continuation in the words of Sullivan – he places them in logical sequence that it easy to comprehend. Vitruvius suggests an equal weight triad consisting of beauty, utility, and strength. Sullivan makes the point that the beauty must be derived from utility – and this is the natural law. Both architects were also turning to nature to answer their questions instead of departing from it – they believed that nature is the true basis of everything existing and it teaches us the fundamental truth about this world.

Beyond this similarity in both philosophies, the reader of Vitruvius and Sullivan would receive a close examination of types of structures prominent in the corresponding cultures. In building and visual arts, stating a dreamy theoretical concept rarely suffices – instead, there needs to be an applied real-life version of the philosophy. The triad and "form follows function" have to find their physical manifestation in the three-dimensional world. Both Vitruvius and Sullivan show how form and function can coexist, interact, and find unity in their architectural explorations. Vitruvius describes the architectural style of his B.C years while Sullivan observes the multi-floor towers rising to the sky at the end of the 19th century. The two

Figure 1. Wainwright Building by Louis Sullivan. Photo credit: Historic American Buildings Survey

seem unrelated at first, but references to the history take place in Sullivan's writing. To indicate the relationship to the past, Sullivan refers to a popular theory in his writing: "the true prototype of the tall office building is the classical column, consisting of base, shaft and capital" (4). While he does not indicate whether he supports this specific view, this instance is yet another link to antiquity – is it possible that all that exists today is simply those ancient Vitruvian ideas reinterpreted and reborn? Perhaps the core idea remains intact ever since Vitruvian times while the time-relevant seasonal decorations change. The wisdom discovered by Vitruvius profoundly carries itself – it is timeless.

Vitruvian triad was only one of the key fundamental concepts established by Vitruvius. The author then proceeds to the proportion of human to the space. Tod A Marder in his essay references the importance of proportions for Vitruvius and the origins for the famous Vitruvian man: "the design of temples had to depend on "symmetry" and, in turn, "proportion", which would correspond to the symmetry and proportions of a well-formed human being" (3). The idea laid out by Vitruvius echoes countless times throughout the history – and this powerful remembrance is achieved due to its impressive simplicity. Architects are professionals of artistic nature, and during their inspiration whim they can get carried away and forget who the design is meant for – the inhabitants, the occupants. These imaginative creators can fall prey to designing for their own ego instead of the users. Vitruvius gently reminds the artists of the human scale – and of optimal user and space interaction.

To the early architectural prodigy, human nature was one of the

most significant matters, rendering architecture as a servant to the humankind. In his De Architectura, Vitruvius draws a parallel between a person and a building: "Thus in the human body there is a kind of symmetrical harmony between forearm, foot, palm, finger, and other small parts; and so it is with perfect buildings" (Pollio and Morgan, 28). However, Vitruvius considers aspects of human nature way beyond the overall symmetry and proportions – he proceeds to dive deep into the human health and into an intuitive and integrated relationship of human to nature. To an uninformed reader, it might seem that Vitruvius's famous manuscript is solely about foundational architectural principles, while in actuality the author also focuses on nature, astrology, and human health (Pollio and Morgan). Clearly, the well-being of the inhabitants was one of the key postulates in Vitruvian theory since he was suggesting the optimal healing strategies via architecture: "...when their diseased bodies are transferred from an unhealthy to a healthy spot..."(Pollio and Morgan, 29) and comparing human bodily fluids to the composition of the earth itself: "...we should not be surprised to find in the great earth itself countless varieties of juices..."(Pollio and Morgan, 282). The ancient teacher was well-aware of the intertwining relationship of nature and humankind and often drew parallels between these two ubiquitous matters with architecture. Proportion and symmetry for Vitruvius were merely a representational medium of the great interconnection that exists on planet Earth.

The understanding of human proportions proposed by Vitruvius had a powerful impact on various figures throughout the history. One of the most well-known instances is the Vitruvian man (Fig. 2) drawing by an Italian multitalented master – Leonardo Da Vinci. However, this essay will particularly focus on another crucial piece of theory – Le Corbusier's Modulor (Fig. 3). How do Vitruvian proportions intertwine with the efficiency-oriented modern philosophy of Le Corbusier – one of the mist prominent architects of the 20th century? Modulor exemplifies yet another theoretical instance in which ancient Roman history provides a foundation for the modern age.

Le Corbusier's Modulor was established on a philosophy descending through time from Vitruvius: it places human figure at the center of the canvas and renders architecture as its supporting element. The proportion of humans and buildings was crucial to Le Corbusier, and while his architectural explorations followed a specific order, the logic behind it was human-centered. Le Corbusier advocated for a rather austere minimalistic design in which nothing can be added or taken away in order to create an optimal environment for the human development and unobstructed living and thinking. Grid explorations and the establishment of key elements in the form of five points of architecture create a parallel to how Vitruvius was contemplating optimal architectural forms with humanity at its core.

Le Corbusier considered human figure so important to the creation of architecture that he dedicated two theoretical manuscripts to the development of Modulor – Modulor I and Modulor II. In the first chapter of Modulor I, acclaimed Swiss-French architect describes the purpose of his writing: "To offer such a measure is the purpose of our enterprise. That is its raison d'etre: to bring order" (Corbusier 21). He precedes these words with descriptions of notational system in music, with origins of mathematical structures and with logic in early architecture, and just like Vitruvius he observes a multitude of domains of life to then establish the human guide to the quickly evolving field of construction and industrialization. The advocate of order, Le Corbusier relied on mathematics and geometries in order to extract the Modulor figure in his optimal environment. Few chapters of his manuscript are dedicated to calculations and grid explorations, but then he proceeds to write on "the position of the modulor in the present time" (Corbusier, 105). Le Corbusier gently reminds the reader of the aim in mind, his raison d'etre: "To harmonize the flow of the world's products" (107). While globalization was not as present in Vitruvian times as in Le Corbusier's, they both followed a similar goal of providing clear guidance on how to best serve the human race via architecture and they both relied on multiple domains (astrology, mathematics, nature, music) in order to extract the optimal solution.

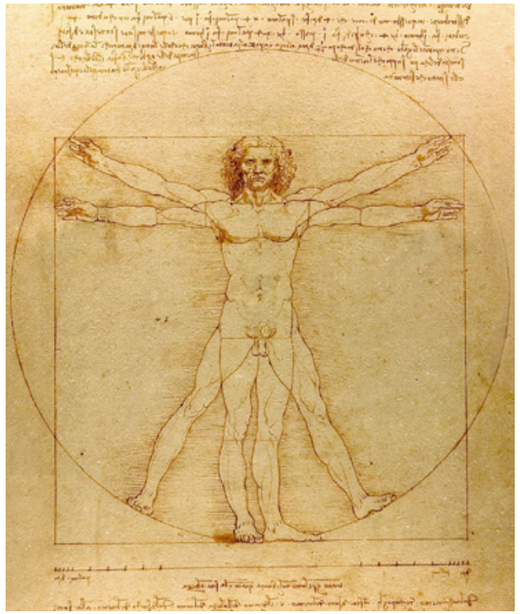

Figure 2. Vitruvian Man. Drawing credit: Leonardo da Vinci

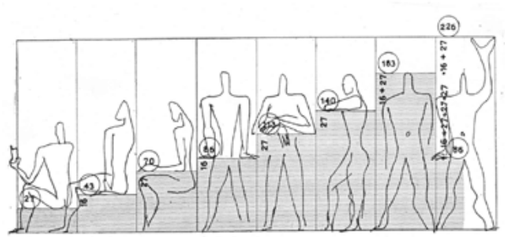

Figure 3. The Modulor figure by Le Corbusier

Ultimately, the intent behind Le Corbusier's creation was to derive an "ideal man" whose figure can be comprehended and applied universally (Les Coulers Le Corbusier). While Le Corbusier's work can be interpreted as the one significant to the modern architectural community, Vitruvius shall still be deemed a philosophical father who passes along the urgency and the need to place human characteristics at the utter core of architectural pursuits. The dialogue between the ancient and modern thinkers persists.

Besides influential base concepts introduced by Vitruvius and carried on by Sullivan and Le Corbusier, Vitruvian masterpiece De Architectura provides a multitude of insights into the architectural field. It is certainly worth it to discuss the organization and the core ideas of Vitruvian manuscript which contains his famous architectural theory. Tod A. Marder explains the sequence of Vitruvian books in his essay "Vitruvius and the Architectural Treatise in Early Modern Europe": "The treatise was presented in 10 sections, like chapters, that are conventionally called "books"" (2). However, it must be mentioned that Vitruvius's knowledge reached modernity in a very fragmented state, and the first attempt to structuralize it by Leon Battista Alberti took a lot of mental effort (Marder 7). Alberti felt confused about the text stating that "he [Vitruvius] wrote neither Latin nor Greek, so that as far as we are concerned he might just as well not have written at all since we cannot understand him" (Marder 7). Despite Alberti's claim, it must be acknowledged that Vitruvius laid the foundation to the tradition of writing on architecture and persuaded the readers on the design relevance of other fields of human endeavor – "drawing, geometry, history, philosophy, music, medicine, law, astronomy, and other" (Marder 2). Since Vitruvian times, many architects followed the pursuit of establishing their own theories as well.

Another globally acclaimed architect and theorist of the modernity – Peter Eisenman – shared his ideas in his The Formal Basis of Modern Architecture. One of the "New York Five", Eisenman wrote this theoretical piece as a submittal for his dissertation during his PhD degree at Cambridge University. Although an early piece, it demonstrates the foundation of Eisenman's thinking and provides yet another parallel with Vitruvian theory. In his writing, Eisenman identifies the void that he observes in the current state of architecture that stems from an overrated emphasis on history rather than a more general logic. Even though Vitruvius is an essential historical figure, the intention of both Vitruvius and Eisenman was to create a guiding system that is applicable rather than a custom monument that exists singularly in time. Eisenman pursues his goal of establishing a formal architectural logic which is applicable to any architecture regardless of its time period: "The principles in this discussion are rather to be thought as being universally valid" (Eisenman). The father of deconstructivism, Eisenman clarifies his thinking further: "By means of this reference, it will seek to clarify the relationship of form to any architecture" (Eisenman).

Despite his reluctance to stick to history, Eisenman views Vitruvian theory as fundamental contribution to the development of design thinking. He places Vitruvian De Architectura in the bulk of six influential meta-projects that shape how architecture operates today (Gannon 7). Non-surprisingly, Le Corbusier's theory concludes the meta-projects' sequence established by Peter Eisenman, which suggests that Vitruvian concepts, in one way or another, influenced architectural theory down the line progressing to Le Corbusier's

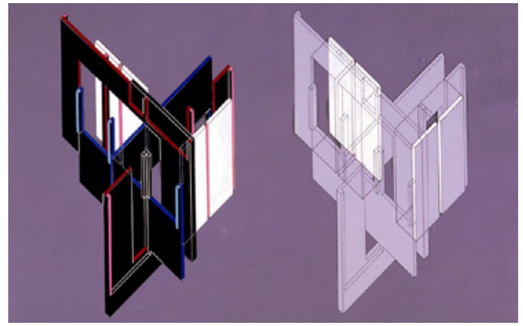

Figure 4. House VI forms. Courtesy of Eisenman Architects.

design thinking (Gannon 7). Eisenman sees Vitruvian philosophy as one of the theories "that propelled architecture forward by motivating projective ambitions well beyond individual concerns" (Gannon 7). It is reassuring to see how Eisenman gives proper credit to Vitruvian theory while so many contemporary art historians and theorists omit the true contribution of Vitruvius in modern age. Peter Eisenman is, in a way, a successor of Vitruvius, that learned from him but reinvented his ideas and suggested his own formal basis of architecture.

Conclusion

In concluding this paper, it is essential to notice the linkage that exists between the ancient ideas and the modernity. Vitruvius personifies the critical mass of knowledge that was accumulated in his B.C years while a multitude of modern voices – like Sullivan, Le Corbusier, and Eisenman – reinterpret these ancient theories to build a reinvented and new ideology. It is also important to notice how the underlying theme of all these explorations is the binding concept of powerful and all-knowing nature. Various masters throughout the history recognize the bigger forces that shape the human worldly experiences, and while Vitruvius might seem like the first architect whose words echo to us from the history, the landscape of nature serves as an ultimate guide to help architects understand the world. Thankfully, Vitruvius had a powerful intention to put these natural observations into written words.

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The Dematerialization of the New York Stock Exchange

by Polina Stepanova
Master of Architecture
Professor Andrew Dolkart
Columbia University, 2023

The building of the New York Stock Exchange is one of the most recognizable and influential structures in the Financial District of New York City. While the New York Stock Exchange was housed in various built structures in its initial stages with some early day trading being conducted even in local coffeehouses, as the trading volume increased and even surpassed 1 million shares in 1886, it became clear that a more suitable structure was needed for the operations of the rapidly growing stock market (The History of NYSE). Designed by George B. Post, a prominent architect and a former AIA president, the New York Stock Exchange building rose in the heart of the Financial District and immediately started attracting traders and investors to its Trading floor (*pic.1*). The placement of the building has prompted distinctive changes to the dynamics and circulation of Lower Manhattan, but the recent decades have shown that even a historical landmark can face an expiration date to its relevance when faced with technologically advanced modernity. What is the role of New York Stock Exchange building today and has the building itself gone obsolete? Has it lost its relevance in the presence of current financial technologies or is it still standing as important to capitalism as ever?

To establish the validity of the statement that physical New York Stock Exchange space has gone obsolete and archaic, it is essential to look at the history of trading equities in the United States starting with the Buttonwood Agreement of 1792. The document signed by twenty four brokers allowed the foundation of New York City trading operations, and it is considered one of the most important financial documents in the history of the United States of America (The History of NYSE). The inception of the New York Stock Exchange has introduced a new era in the New World, and as historian Robert Sobel pointed out, it occupied “a special niche in both the hagiology and demonology of capitalism. Among other things, it is the centerpiece for that great symbol Wall Street” (Sobel). With its philosophical controversy also came the initial volatility of its physical location. The New York Stock Exchange has changed its physical locations many times throughout the years, even being housed at a coffee shop named Tontine Coffee House until 1817 which implies the seeming informality of the trading operations in the beginning of the era (The History of NYSE) (*pic.2*). In the Journal of Legal Studies, Stuart Banner wrote that the early day trading was memorialized as “meeting of the dealers in the public funds in the city of New-York held at the coffee-house” (Banner).

The stock market had not been properly arbitrated in the beginning of the 19th century, and that was reflected in the constant migration of the emerging trading enterprise. National Park Service source indicates that starting in the second half of the 19th century, New York Stock Exchange has been occupying the current site, and the recognized NYSE building was completed in the very beginning of the 20th century (The History of NYSE). Current New York Stock

Figure 1. New York Stock Exchange Facade. Photo credit: nyse.com

Exchange building was constructed on the same site after the demolition of the previous Stock Exchange structure which became inadequate as the stock market was rapidly growing (Landmarks Preservation Commission).

The new building attained recognition and prominence and was designated a National Historic Landmark in the second half of the twentieth century (Landmarks Preservation Commission). The erection of the NYSE building and further development of the block with the completion of 11 Wall Street annex and 20 Broad Street provided a tangible substantial foundation and symbolized materializing permanence of the rapidly growing capitalism-based market.

For the design and construction of the building, the NYSE board decided to involve George B. Post, a distinguished American architect of his time who received his training in Ecole de Beaux-Arts and also served as a president of American Institute of Architects. Landscape architect Diana Balmori from Yale University wrote about George B. Post: “Post is especially interesting because his office represents the first of a new type, a type which became and has largely remained the standard for modern practice: the architectural office, as opposed to the design studio” (Balmori). The structured

Figure 2. Tontine Coffee House. Credit: Francis Guy

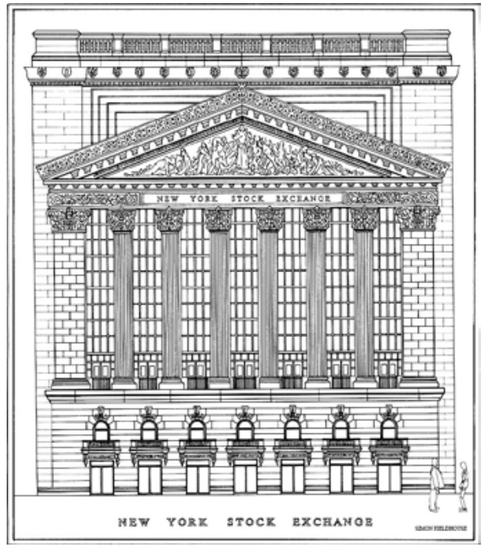

Figure 3. Front Elevation Drawing. Credit: George B. Post

Figure 4. NYSE Interior. Credit: nyse.com

architectural approach and top-tier European training of George B. Post have both served as excellent recommendations, and so he was deemed an appropriate candidate to construct a masterpiece which would propel the machine of capitalism forward and also serve as a grounded presence and a guiding light during occasional market volatility. Balmori also recounts various buildings designed by Post such as The Produce Exchange (1885), the Cotton Exchange (1885), and the Montreal Stock Exchange (1904) and comments on Post's extensive experience with the financial architecture: "These buildings and the many banks designed by Post in this period served to strengthen his ties with a small but powerful financial community" (Balmori). Post also built his professional reputation as a founder of new typologies – he restructured the architectural studio, and he also established "an important new type in American architecture – the corporate headquarters" (Balmori). Post was a prolific and versatile architect who incorporated his novel vision into his architectural designs – including the New York Stock Exchange building (*pic. 3*).

The New York Stock Exchange building carries itself with a pronounced monumentality, and before the obsolescence of its functions can be contemplated, the analysis of the history of the building precedes. In the report generated by the Landmarks Preservation Commission in 1985 to advocate for the NYSE building's designation as a historic landmark, the text reads: "The building ... symbolizes the strength and security of the nation's financial community and the position of New York as its center" (Landmarks Preservation Commission). The current building of the New York Stock Exchange was designed and constructed in response to the imminent expansion of the stock market and the need for the stable and accommodating structure with the much larger trading floor. The facade of the building is described by the Landmarks Preservation Commission in their Designation List 181: "the design with its giant portico, colonnades, and sculpture imparts a sense of austerity and massiveness coupled with security, in keeping with the wishes of the clients" (Landmarks Preservation Commission).

The architect was known to have a prominent signature design since the facade details from his competition submission for Dry Dock Savings Bank resembled certain elements in the design for New York Stock Exchange. The list of design similarities between the NYSE and the other George B. Post's buildings continues with the temple front and colossal order replicated throughout his architectural compositions. Landmarks Preservation Commission in its report recites other buildings which have similar characteristics to New York Stock Exchange building: Post's World building, Pulitzer building, Manufacturers and Liberal Arts Building, the Bank of Pittsburgh (Landmarks Preservation Commission). The collection of buildings designed by George B. Post implies that he was a master of coordinating multiple design directions simultaneously and choosing a holistic approach to design when developing ideas. The report further reads: "...illustrates Post's interest in orchestrating sculpture and architecture together in a way that offers variety and invention to his facades while enhancing their stylistic integrity" (Landmarks Preservation Commission). This excerpt conveys how detail-oriented George B. Post was with his architectural proposals, and this serves as an evidence to the importance and influence of the New York Stock Exchange structure. However, for now the question remains unanswered – does the significance of the twentieth century building still render it relevant in the current world?

George B. Post designed both the interior and exterior of the building holistically to have stylistic uniformity and tap into the ultimate design potential (*pic. 4*). Thus, the interior space was very thought-through and notable as well since it housed some of the most important financial operations carried out in the United States. An article on the history of NYSE emphasizes the beauty of the interior: "Post designed an impressive interior space, with paneled Georgian marble walls, huge windows and a gilded ceiling that stands four stories above traders' heads" (The History of NYSE). The interior emphasis was placed on the efficiency and spaciousness of the trading floor space which was imagined to be flooded by eager traders in the beginning of the day. Throughout his design process, Post invested sufficient effort into analyzing the predicted space demand even though the subsequent growth of the market was a difficult trend to forecast.

The brokers also demanded certain health-oriented key features from the Post's design: "more space, more facility and convenience for the transaction of business, more light upon the Board Room [trading] floor, and better ventilation" (Landmarks Preservation Commission). The demand for more light and ventilation represented some of the most basic occupants' needs , but at the same time it highlighted its even higher priority for buildings located in New York City – especially within the narrow grid of the Financial District with the street surfaces yearning for more daylight. George B. Post's expertise was useful in construction of the project since it required his engineering skills in conjunction with his architectural mastery, and the NYSE board thought that if the building optimizations were not implemented, "it was a foregone conclusion that the latter would prove a mammoth failure regardless of other qualities" (Landmarks Preservation Commission). With this demand set forth, the NYSE building exceeded expectations: "The building was the earliest in America to feature air conditioning, with a system designed by engineer Alfred Wolff" (Onion, Mullen, & Sullivan). The brokers and investors were expected to spend their days within the walls of the New York Stock Exchange building, and a further expansion of the market was anticipated so providing ample ventilation and light was of the utmost priority.

Another important part of the analysis of the New York Stock Exchange building is its location in the heart of the Financial District of New York City. While a structure located so centrally might never ultimately lose its relevance, the exponential and often unexpected advance of various technologies has made the prediction of the far and near future somewhat unpredictable. It is essential to analyze the relationship of the building to its surroundings in order to gather data on its usage and real estate potential, and this investigation gives enough room for educated guesses and speculation. The official address for the New York Stock Exchange building is 11 Wall Street which creates a mutually reinforcing reputation – Wall Street is known globally for its robust financial operations including those conducted at New York Stock Exchange, and vice versa the location of NYSE promotes the relevance and international acclaim of Wall Street. The street itself is quite short, spanning merely eight blocks, and it has been entrenched in Manhattan in the seventeenth century when the Dutch settlers were erecting defense mechanisms to protect themselves from the English attack (Onion, Mullen, & Sullivan). The wooden and earthen wall constructed at that time and bearing the name "de Waal Straat" lay the foundation for the street name ingrained in the global economic history.

Although Wall Street had pivoted from its primary early designation as a physical barrier to a center of capitalism and finances in the United States, it still carried some barrier-like elements like in the New York Stock Exchange Building: "beneath the building were hundreds of underground vaults where stock certificates were kept" (Onion, Mullen, & Sullivan). It was also the place for experimentation and innovation with the first electricity plant in the world being constructed on the nearby Pearl Street by Thomas Edison with the intention "to power 7,200 lamps on Wall Street" (Onion, Mullen, & Sullivan). Major historical events taking place in the Financial District and the dual nature of Wall Street with its perceived openness and transparency of monetary transactions combined with the guarded vaults and fragmented spaces ultimately create a unique environment for the New York Stock Exchange building. Since its inception, it remains in the heart of a bustling neighborhood crowning the capitalistic system, but despite its unparalleled locality, the NYSE building might still be rendered obsolete. What happens when the physical address is no longer relevant when everything is migrated to the cloud and executed by machines?

One of the key factors in determining a building's life trajectory is its programmatic assignment and functionality. The technology has misplaced and dematerialized a lot of mundane programs which ultimately rendered certain physical structures as stranded assets. In order to evaluate the obsolescence of the New York Stock Exchange building, the next step is to derive core functions of the financial establishment and perform the analysis on their usual execution pattern – have those functions become fully upgraded to exist solely in the virtual technological world? The excerpt on the official New York Stock Exchange website reads: "Though all of our markets operate electronically using cutting edge, ultrafast technology, we believe nothing can take the place of human judgment and accountability" (NYSE). While the world has been adapting to the rapid technological advancement over the last few decades, New York Stock Exchange maintains the dual model in which it attempts to provide full access to online traders and simultaneously invite brokers for in-person interactions. This trading model can potentially postpone stranding of the physical NYSE building, but it is still questionable whether the current model can prevent it altogether.

The core requirements for conducting financial operations have really expanded from the initial designated Stock Exchange location – Tontine Coffee House – to the early 1900s with the massive new NYSE building being erected in the heart of the Financial District to accommodate the rapidly expanding needs. The New York Stock Exchange had grown drastically throughout the 20th century, and even today it renders many international exchanges miniscule compared to the volume of its trading operations (Kiersz). Development in financial technology most certainly allowed for the expansion and growth of the market, which ultimately posed the thesis question – is historical NYSE building losing its programmatic relevance? The article published by The Economist describes trading in the 1970s as a "distinctly human affair" and quotes Ray Dalio, the founder of Bridgewater Associates: "People would have to take each other out, and dealers would entertain fund managers, and no one would know what the prices were" (The Economist). While Ray Dalio is not specifically referring to architecture of New York Stock Exchange or urban dynamics of Financial District, the liveliness and usability of these spaces are implied through this quotation. Besides occupying the spacious, properly ventilated and well lit Trading floor of NYSE, stock brokers filled the streets of lower Manhattan eagerly awaiting the Exchange's opening hour and populated local restaurants and coffee shops to extend equity trading beyond the walls of the designated building. The Economist acknowledges that "Since then the role humans play in trading has diminished rapidly" (The Economist).

In 1999, to evaluate the transition from in-person operations to In-

ternet-supported trading, researchers from Massachusetts Institute of Technology examined early trends in online trading and noted differences between the traditional trading model and emerging web-based market (Wu, Siegel, & Manion). The authors of the "Online Trading: An Internet Revolution" believe that "Notably, online trading, a popular notion among retail investors, is one of the most successful industries created by the Internet revolution" (Wu, Siegel, & Manion). The research paper assesses the history of financial technology with the initial DOS-based (DOS stands for Disk Operating System) trading tool invented in the 1980s by Charles Schwab who also later developed first telephone-based trading equipment and then pioneered a computer-based software package that dealt with portfolio and investment management. The MIT researchers also mention E*Trade as the first online brokerage which got established in 1992 and subsequently prompted an explosive growth over the next five years: "The number of online trading brokerages has also grown from 12 in 1995 to 100 or so firms" (Wu, Siegel, & Manion). While this research paper describes the early growth in the virtual financial spaces, the technological trends only keep rising, thus depicting the difference in use between physical and virtual spaces as more and more stark. The physical architecture of the financial world might be struggling to preserve its pertinence, but the technological realm needs its architects and designers as well as it inevitably expands.

The research conducted at MIT portrays the financial technology picture from the 1990s, and the more recent sources are confirming the further advance of the financial sector into the techno sphere. The Economist describes the emerging passivity and robotization of the market which can only further intensify the lack of need for human involvement and consequential abandonment of the physical financial structures. The article from The Economist states that in September of 2019 "for the first time, the pot of passive equity assets it measures, at $4.3trn, exceeded that run by humans" (The Economist) (*pic.5*). The automatization of the market will only continue increasing with the further advent of artificial intelligence

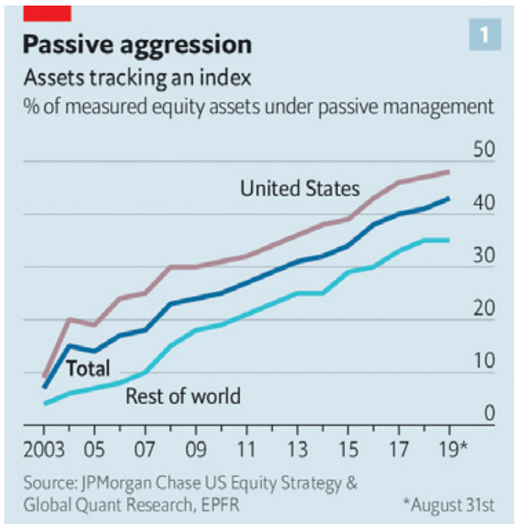

Figure 5. Passive Management Chart. Credit: The Economist

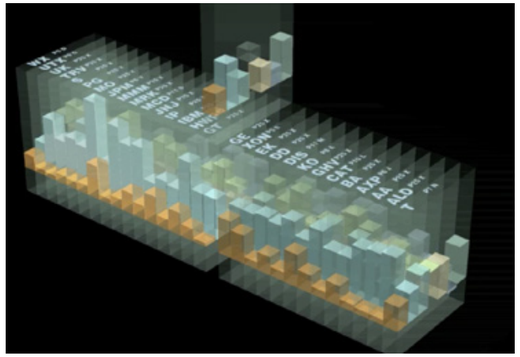

Figure 6. Virtual Trading Floor. Credit: Asymptote Architecture

which might become skilled enough to make market predictions much more accurately than humans. In that case, the need for buildings like the New York Stock Exchange can continue declining unless it is repurposed into a beautifully designed, computer-centered hardware warehouse in the middle of the Financial District.

The design of the imaginary New York Stock Exchange environment actually hinged on the existing physical trading floor of the George B. Post's building. The floor and the posts were reimagined to be color-coded with 3D bar graphs occupying the space and representing the market conditions. The authors comment that "The Virtual Trading Floor has proven to be very prescient about how we navigate the world today" including "the multiplayer online games or with augmented reality devices" (Rashid, Couture, & Lynn) (*pic.7*). This design experiment conducted by Asymptote Architecture illustrates how virtual environments can often provide better representation opportunities and easier access than the real ones which only serves as another proof of the inevitable abandonment of the physical architecture – including the building in question, the New York Stock Exchange.

While the NYSE was purposefully building a platform to attract more traders to the stock exchange, does it mean that the inevitable side effect was the reducing demand for the physical building? The financial technologies are further developing and virtual architecture is gaining momentum, and the state of the physical New York Stock Exchange building designed by George B. Post needs examination in terms of its relevance. Is the NYSE building on famous Wall Street managing to uphold its occupant use and liveliness or is it a mere symbol of the past activity? In order to evaluate the building itself, a good question to ponder is what makes a building obsolete?

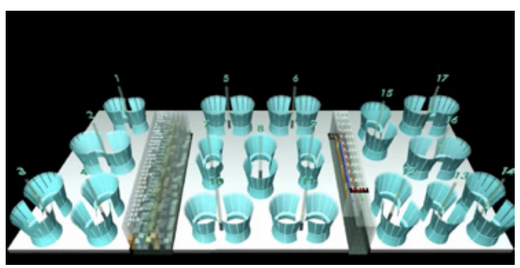

Figure 7. Virtual Trading Floor. Credit: Asymptote Architecture

One of the criteria suggested by Edwin Buitelaar, Stefano Moroni, and Anita De Franco in their work on property vacant in the evolving city is named "relative obsolescence" and reads: "a building becomes obsolete because it is outperformed by other (newer) buildings and/or because user demands have changed" (Buitelaar, Moroni, De Franco). The researchers of urban dynamics also refer to this phenomenon as "functional obsolescence", and they cite trends in global office markets as an illustrative example of such type of obsolescence. The need for hybrid work arrangement and extensive lift of human-centered amenities in the office has rendered conventional office spaces outdated, and without a proper reprogramming, repurposing, and renovation, such spaces will continue losing their demand (Buitelaar, Moroni, De Franco). With most trading operations having migrated to the technological platforms, New York Stock Exchange building might be experiencing a case of "functional obsolescence", even though some of the financial affairs still take place within its walls.

The article in Cities also mentions the importance of building's location since the structure is not a movable good. The researchers mention various contributors to the locality of the building such as proximity to various amenities, deterioration of surrounding buildings, or decline of the overall region and accentuate that "All such locational factors add to obsolescence of individual buildings" (Buitelaar, Moroni, De Franco). While the functionality of the New York Stock Exchange might be declining in the strong presence of technological alternatives, the Financial District location is on the opposite maintaining its relevance due to the high traffic and being situated in the most populous city in the United States (and in the most populous borough of the New York City). The functionality and locality of NYSE building stand on the opposite sides of the scale with one contributing to its obsolescence and another salvaging it from becoming irrelevant as a physical structure (the symbolic meaning of NYSE building is not in question).

One of the potential solutions on improving the usability of the New York Stock Exchange structure would be to consider alternative programs for its beautiful space designed by George B. Post over a century ago. The official New York Stock Exchange website declares: "Today, the NYSE building is one of the most exclusive and sought-after event spaces in New York City, poised at the center of global financial markets" (The History of NYSE). An event space which can remain malleable and flexible for various occasions can certainly be one of the solutions for the New York Stock Exchange building since there is a demand for hosting events in historic buildings, especially those with a unique architectural style and those preserved by the Landmarks Commission. While there could also be an alternative suggestion to repurpose New York Stock Exchange building to accommodate for the most pressing need (and in New York City this could potentially be the need for housing), the grandiose symbol behind the monumental George B. Post's design and the financial history of the strongest global economy would hinder the complete reassignment of the building's program. In addition, the building is still functional and is housing a percentage of large financial operations, even though most of the transactions have been moved to the web-based services. At the end of the day, if the financial program ends up fully migrating to the virtual realm, the New York Stock Exchange building can repurpose itself into a museum of finances.

The New York Stock Exchange building is truly one of the iconic landmarks on Manhattan Island which has been around for over a century. While its functional relevance is questioned and scrutinized in this paper, the symbolic meaning behind this grand monument of capitalism can not be exaggerated. From the Buttonwood Agreement and Tontine Coffee House to commissioning George B. Post to construction of the current Roman-inspired NYSE building and to the unbelievable technological progress, the financial market in New York City has seen many transitions, and there are many more to come. The conclusion drawn in this essay is that while not entirely outdated, the historic New York Stock Exchange building is experiencing partial obsolescence which is projected to become more severe and pronounced with time, advance of technologies, and development of artificial intelligence. Without a proper adaptive reuse plan, it will still remain an iconic symbol paying tribute to the history of the 19th and 20th century, but its structure might yearn for a missing occupant and for a specific purpose. Architecture is designed to be functional, and without a program to light up the building, the structure can fade and deteriorate - even if it is one of the main pillars of the capitalistic system. Valuable historic buildings deserve to be given a new life despite their loss of relevance, and this most certainly includes the New York Stock Exchange – a masterpiece hiding in the narrow streets of the Financial District.

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