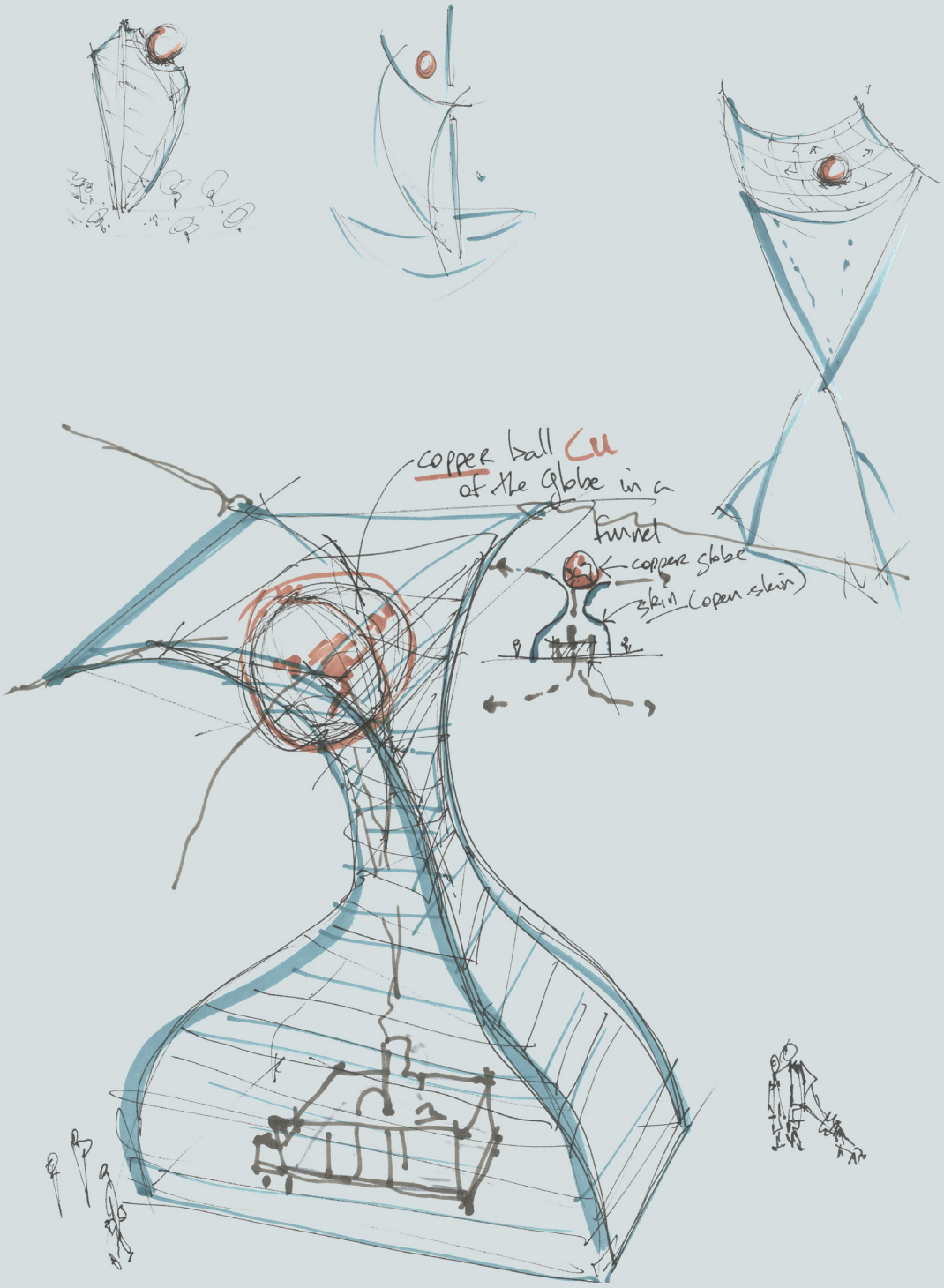

copper ball Cu
of the globe in a
funnel
copper globe
skin (copper skin)

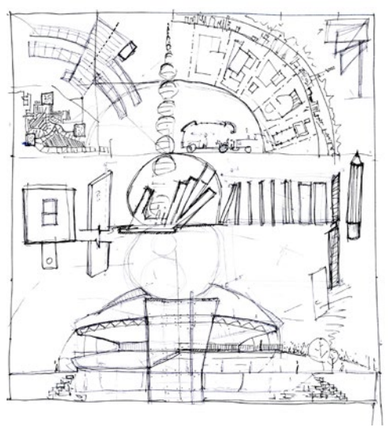
Table of Content

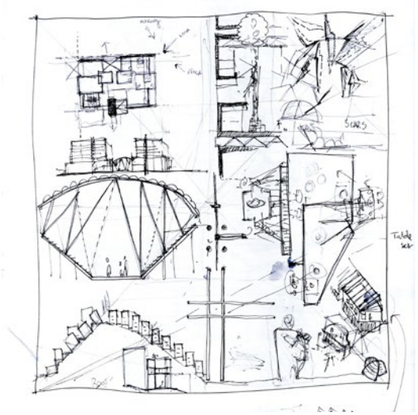
Foreword

This collection of works was only made possible with close collaboration and support from kind hearted, efficient and supportive individuals that allowed to me pursue the Advanced Architectural Design program at Columbia GSAPP .

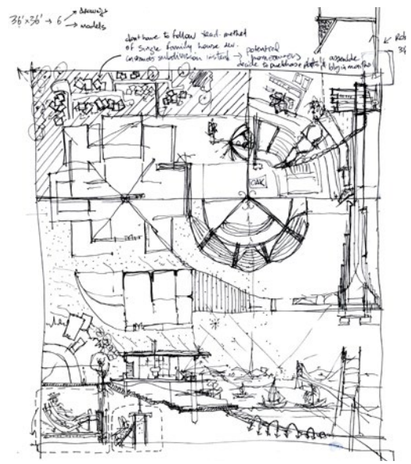
The following projects and research papers investigate architectural and legislative responses to impact of the clean energy transition, the historic waste management on Barren Island, the future of the housing market, the implementation of automated code compliance, the effects of central park on the real estate market and the small scale projects for big change.

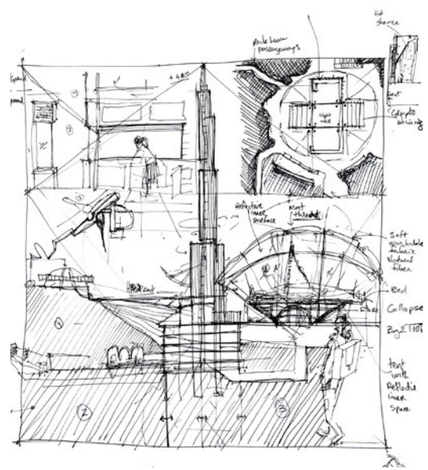
I would like to recognize my gratefulness towards the GSAPP faculty that continues to create a strong dialogue between interdisciplinary, intergenerational and interregional boundaries. A collective lecture series spearheaded by Dean Andrés Jacque, Bart-Jan R. Polman, Xiaoxi Chen and Mario Gooden continue to inspire me and the student body so as to enrich our design thinking and research trajectories by increasing our sensibility to social justice, geopolitical realities, climate change and resource extraction. It's these lectures entitled Transscalarities, Arguments, Affirmations, Practicing Uncertainties and the Library is Open that allow us to delve deeper into recent findings and perspectives that would fuel the next decades of our careers. I hope to continue to attend these snapshots from great minds to allow myself to develop further, but this year has been a thrilling experience that transformed my design thinking, knowledge base and allowed me to formulate my outlooks on various matters.





I attribute my work to the inspirations cultivated by fantastic academicians and professionals that I was lucky enough to be exposed to. Dan Wood in A New Architecture of Invisibility, Mark Tsurumaki in Constructive Entropy, Michael Bell in Reality stranger than Fiction have ignited a sensibility towards material, concepts, time-frames and cross disciplinary analyses. In addition to this, Professor Kate Ascher and Professor Andrew Smith have allowed me to delve into the intricacies of Technology, infrastructure, policy, partnerships, engineering, histories and futures of innovation to build the Future cities that we need. In my spring semester, I had the opportunity to take New York Rising, the Future of the city, and was highly inspired by the tenacity of Kate Ascher, and managed to write extensively on ideas of restructuring code compliance checking , the electric Grid and the effect of parks and recreation on the real estate value in New York City. In Rethinking BIM, I was able to collaborate with a strong team to deliver a full set of design documents using the recent interoperability between Rhino Inside and Revit. My research on the BIM methodology has connected me to Joe Brennan and I would like to thank him for exposing me further to the potential of applying this workflow for better and efficient project delivery. I had taken this class hoping that it would add to skillsets. These interests have taken my spring semester into an exciting journey as I interned at Kohn Pedersen Fox Associates and I would like to thank the design technology team at KPF, wider staff and leadership for allowing me to learn from them.



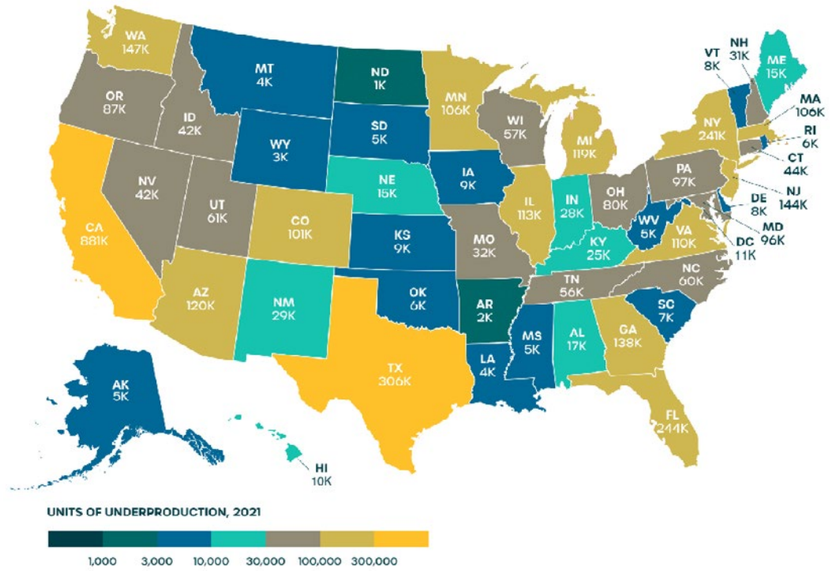


Rescaling Housing

Spring 2023
Michael Bell

Over the past five decades, the ebb and flow of urbanization and its pressure on housing valuations, particularly on land in regions rich with jobs, have turned housing markets into a casino. A market that excludes entry to vast numbers of people. The seminar explores where we can forecast new and unique convergences to imagine re-scaling housing.

Syllabus Prompt



Housing underproduction levels according to Up for Growth's2023 Housing Underproduction Report .[1]

[1](Kingsella, Kolachalam and MacArthur 2023)

Market Driven Housing Development

Deregulation of the exclusionary housing and zoning systems in the U.S. would reduce housing underproduction

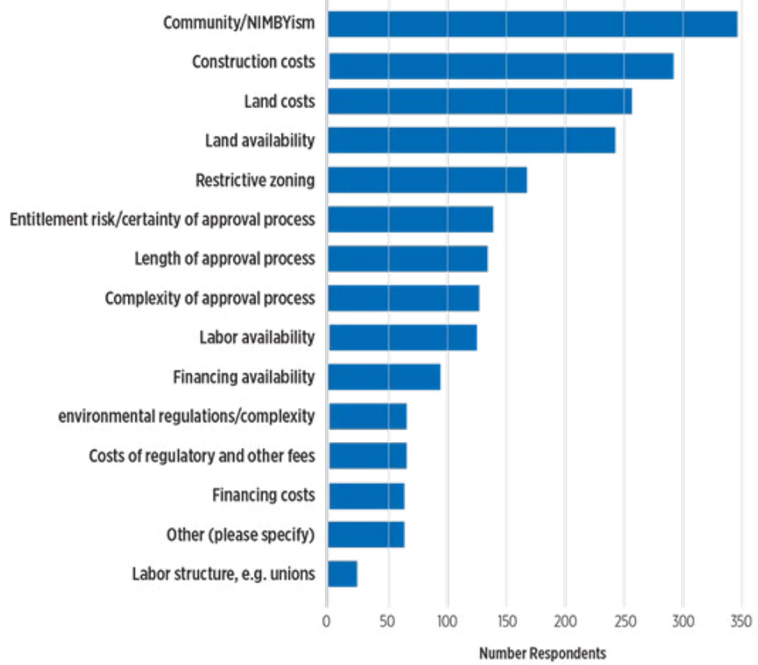
Unbeknown to many, the housing crisis in the US has its roots in the sequence of thousands of exclusionary housing regulations and single family zoning laws that were enacted since the 1910s. ***To fix a housing system it would be necessary to produce market driven development strategies by deregulating current exclusionary US housing policies.*** This would be a responsive market that would reinstate the average single family lot size and allow the dweller to initiate the production of a dwelling, whether this be an apartment unit or a single family house. A gradual reduction in the area allotted to living would be sculpted with analysis based of the functional needs and movements of dwellers through space. Much like certain consumer product sales strategies that are based on a direct demand and supply link, the housing market should reflect what a certain population can afford. This paper would analyze possibilities of implementing market driven housing development through deregulation of zoning laws to scale up housing development with new combinations of ordinance for better housing density and lower barrier to entry in the housing market for all.

Although single family zoning laws protected homeowners from factories or commercial zones to prop up next door, they proliferated the NIMBY (not of my backyard), a person or a group within a community which constrains new housing development to be built and meet increasing housing demands. Some global examples of meeting housing demand by providing more supply of housing through flexible zoning laws exist, as in the case of Japan. " In America, the average age of a demolished building is 67 years. In Japan, it's 32. ***The average home in the US is significantly younger than the average Japanese resident.*** More demolition means more construction."[2] ***Yet American policymakers don't embrace impermanence and suffer from the blindness of the imperial state and from American exceptionalism that hampers the natural development of cities.*** In fact, the proliferation of these zoning laws is reflected by the necessity of land-use attorneys and permit expediters to steer real estate development and navigate the discretionary zoning laws differing from state to state. This has effects on the lead time required to complete any development and thus further increases the cost of construction and prices of homes. "Single family zoning laws" are unknown to most Americans, but they were instrumental to the expansion of urban areas and the suburban ideal of owning a home with a front porch and backyard on a half-acre plot of land, post-World War II."[3]

Attempts in the second half of the 20th century to alleviate the housing crisis through federal funding prioritize the private-market provision of affordable rental housing[4] initiatives through incentives such as the Housing Choice Voucher Program, the Low-Income Housing Tax Credit (1986) and HOME funds from the affordable Housing Act (1990). These and many other neoliberal measures have not been able to bridge the housing demand gap for low- and middle-income households. Trends in U.S. policymaking had a significant collective push towards implementing a private-sector model in which non-governmental institutions are engaged by public policies to respond to individual needs rather than making an investment in rehabbing the old public housing stock or initiating the provision of new housing supply.[5] This is coupled with lawmakers influenced by lobbyists to act in the interests of a few. ***The US welfare state has shifted housing provision from the public sector to the private sector through policy reforms such as the LIHTC (1986) and HOME.*** Further heightening the pressure on private developers to supply the affordable housing demand needed. New reforms should craft new partnerships in which housing is still a product, yet it is initiated and built by the consumer with a 3rd party for profit developer that assists the design, construction and compliance checking of the ***housing product.*** Keeping in mind the necessity for ease of constructibility and rapid disassembly, housing provision can also be accelerated through automated code compliance checking which reduces lead time in construction permit acquisition. Although these technicalities to accelerate and reduce cost of construction always need to be ingrained in housing reform measures, the main topic in this research paper will only advocate the shift from NIMBYsm to YIMBYsm (yes in my backyard) or a deregulated housing policy structure.

[2](Relman 2023)
[3](Nathaniel Meyersohn 2023)
[4,5](T.Khare n.d.)

In September of 2023, when New York City Mayor Eric Adams unveiled his plan to build 100,000 new homes, he pointed enviously to ***Tokyo's ability to keep "housing costs down by increasing the supply of housing"***[6]. The extreme concentration of decision making at the national level sets Japanese housing policy apart from other advanced democracies by giving less power to residents to oppose new development and create an issue of housing underproduction. ***Between 2015 and 2019, housing underproduction in the US suburbs increased by 16% annually, compared to 9% in urban centers.***[7] ***The majority of housing underproduction is disproportionately held in the suburbs where the NIMBY has proliferated along with the typical detached single-family house that caters to only a few type of nuclear family structures, social classes and economic brackets.*** While homeowners enjoy the rise of property values in a skyrocketing market that grew at $6.9 trillion in 2021[8], rental cost burdening reached 49%, its highest percentage in twenty years.[9] The rippling effect of housing underproduction is severe and translates into the inflationary pressures around housing, then wages and price of goods and services. Circling back, renters earning lower incomes find it difficult to absorb marginal increases in cost, leading them to seek affordable housing elsewhere and therefore creating demographic shifts on a national level.



U.S. Most significant issues impacting Multifamily Development[10]

According to a 2019 survey of over 800 developers, investment firms, and property managers, the most common barrier to new construction is NIMBY complaints. Forty percent of developers stated that it is fairly or extremely difficult to build new multifamily housing.[10] Although difficult to accurately quantify, ***it is proven that projects are sometimes cut short even before construction begins because of the threat of NIMBYism further curtailing the possibility of even developing for-profit housing let alone affordable housing.***

[6](Relman 2023)
[7](Kingsella, Kolachalam and MacArthur 2023)
[8](Cortright 2022)
[9](Whitney 2023)
[10](Hoyt Advisory Services, Dinn Focused Marketing and Eigen 10 Advisors 2019)

The increase in value of existing real estate mostly accrues to homeowners.[11] Housing should not be viewed simply as a real estate asset and should be a basic need for human dignity. But the first step to decreasing barriers to new housing of all price levels is to recognize and eliminate exclusionary housing policies, zoning and density restrictions. To allow for this, the American Planning Association endorses the Bipartisan YIMBY Act which is intended to help communities recognize their agency in combating the national housing shortage and provide the federal government with a constructive role in reaching the end of important exclusionary policy trends initiated from neoliberal and discriminatory period. Understanding the existence of these regulatory boundaries is essential to create awareness within NIMBY groups and reduce the burden of housing underproduction on low-and middle-income people.[12] Despite attempts by the US supreme court to reverse the effects of racial zoning laws through the Fair Housing Act of 1968 which outlawed explicit racial discrimination in the sale and rental of housing units, ***the economically discriminatory government zoning policies still exclude low income and working class Americans from entire neighborhoods***, including substantial numbers of people of color, from attaining or initiating the market to fulfill housing needs.[13]

The hidden effect of local control on land use and zoning regulations has created expensive and expansive cities in American metropolitan centers. Geographically constrained, expensive cities such as New York, San Francisco and Boston, have high density and high cost of living. While expansive cities, such as Atlanta, Raleigh and Austin, continue to expand and enlarge their outer boundaries. In both cases, and also in small towns and suburbs, housing segregation by class reduces quality of life, access to transportation and employment opportunities and access to decent health care and decent schools, deemed as the "great equalizer" in American society.

Fortunately, there have been important milestones in the battle against exclusionary housing regulations to challenge the primacy of single-family zoning in the quest to increase housing unit density and proximity of deconcentrated low-income household to decent jobs. Some examples include Minneapolis and Oregon allowing duplexes, triplexes, fourplexes and "cottage clusters" to be built on formerly single-family lots in cities with populations over 25,000.[14] ***In 2017, recognizing the need for a more streamlined approach to address the housing crisis, California lawmakers enacted government code 65852.2,*** a legislative move pivotal in reshaping the single family detached neighborhood landscape by rendering all prior granny flat laws null and void. This has the potential to increase housing provision for people seeking affordable starter homes near transit or in affluent neighborhoods for better mixed income communities through Accessory Dwelling Units and rented garages. [15]

[11](Cortright 2022)
[12](American Planning Association 2024)
[13](Kahlenberg 2017)
[14] (Kober 2020)
[15] (Somers 2024)

As a frowned upon concept, ***informal and squatter settlements in developing nations might also serve as lessons*** in allowing dwellers to fabricate their dwellings according to their budget and spatial needs without being constrained by legislation and ordinance. Although it is necessary to have regulations and building codes, a relaxed approach to housing law should reduce the barriers to accessing affordable housing. ***"By adopting an integrative approach to conceptualizing urban informality, shifting from an oppositional dichotomy, it becomes clear that informality should be seen not solely as a symptom of poverty, but rather as an alternative and potentially superior method of creating urban environments"*** [16] designed and built around actually needs instead of inflated concepts of dream home ownership and real estate asset acquisition.

Acceptance of informality and a move towards "sufficiency" instead of just "efficiency" could also reduce the space requirements of an average household and thereof also reduce the impacts of our built environment on climate change. ***"Sufficiency" can be defined as "the adequate creation of space thoughtfully constructed and sufficiently equipped for reasonable use"*** . In fact, the Intergovernmental Panel on Climate Change (IPCC) 2022 declares that sufficiency policies are a set of measures and daily practices to avoid the demand for energy, materials, land, water and other natural resources of the lifecycle of building and goods while delivering wellbeing for all within planetary boundaries. The impact of this paradigm shift touches many relevant issues of our times such as effective responses to climate change, housing provision and poverty alleviation as opposed to poverty deconcentrating measures as practiced by many relocation and redevelopment projects in non-affluent neighborhoods.

Image of a township in Soweto, South Africa

[16](Connor and Rosmarin 2016)
[17] (European Environmental Bureauq n.d.)

"We would not wear shoes five sizes to big so why take up spaces beyond our needs and means."

The threat of economic vulnerability linked to the inability to afford basic housing needs does not only affect communities unable to induce an action upon the US housing market to provide housing but has also impacts on the national economy and the cost of goods and services. As a ***powerful nation, the health of the US economy and housing stock is crucial to the global economy*** and to climate change as witnessed during the economic crises of 2008. The agency of planners and lawmakers to reduce the housing burden should be shared with local communities and even low- and middle-income households instead of being concentrated in power structures, debt exchanges in an irrational banking system trapped in real estate asset accumulation for the few who can afford them. ***This can be cultivated by eliminating exclusionary zoning laws, reducing the per capita volumetric interior spaces of households, mixing social classes in denser neighborhoods and adapting the private housing market to the needs and construction systems of specific areas.***

Note: Further studies and cautious application of machine learning could help to shift the perception of NIMBY-ism by using social media and other mediums to unlearn the habits that segregate classes in single family detached neighbourhoods. This paper did not cover this final concept, but it recognizes the additional impact of psychological engineering currently being studied in research institutions that aim to reduce misinformation by inserting pop-ups with questions aimed at creating subconscious paradigm shifts.

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Reality Stranger than Fiction

Housing, Nonfiction & Architecture — *Spring 2024*
Michael Bell & Cohaul Chen

" We will begin work as a quasi-reporter taking on a careful transcription of single family housing. Initial efforts will take the form of BIM modeling of a house but also an economic analysis of its emergence and role in national and private wealth. How it performs in literal terms: its quantities of lumber, metals, concrete and glass— of plastics. Nails and screws and adhesives. "

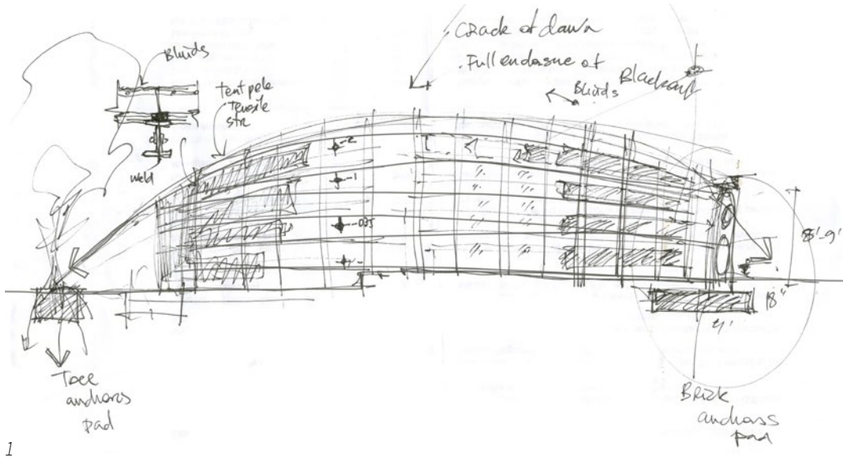
Syllabus Prompt for Advanced Studio VI

View from South East

A small scale house that bends space according to human scale, function and light is designed for manufacturing with Cold Formed steel, aluminum strong back mullions and a double cavity glazing system with air flowing through perforated fiberglass louvers that tilt according to the direction of the sun. Oriented towards Polaris, and electromagnetically wired so as to ground and cool off its inhabitants from the stress of life, this house is an initial thought in reshaping the single family housing landascape.

Future of Housing Prototypes for scale

Located across various landscapes in the form of Single Family Housing & Accessible Dwelling Units, designed with sufficiency, optimum interior space, light, art, grounding and manufacturing in mind



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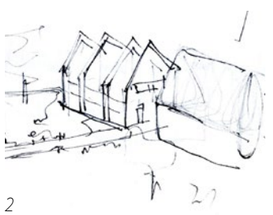

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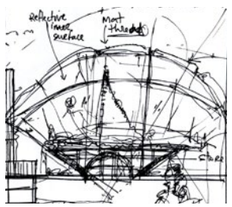
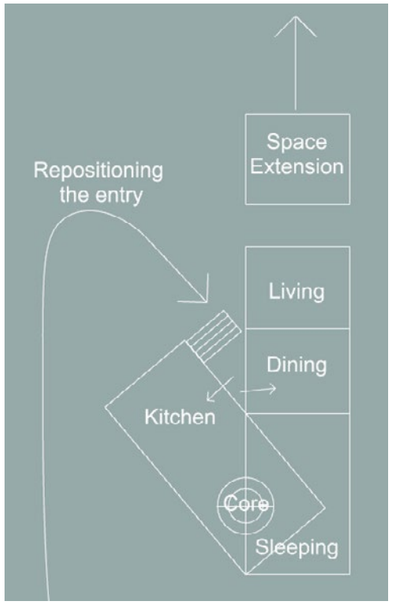
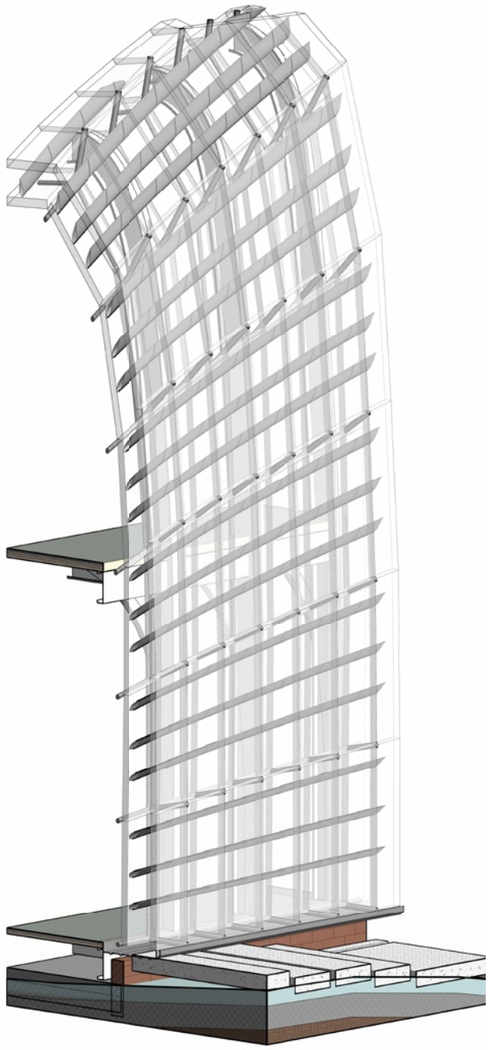


[1]Extending and framing the tension points and centre of 'gravity' outside a bent interior space
[2]De-constructing the wall, pitched roof and architectonic language into a space designed for "sufficiency".



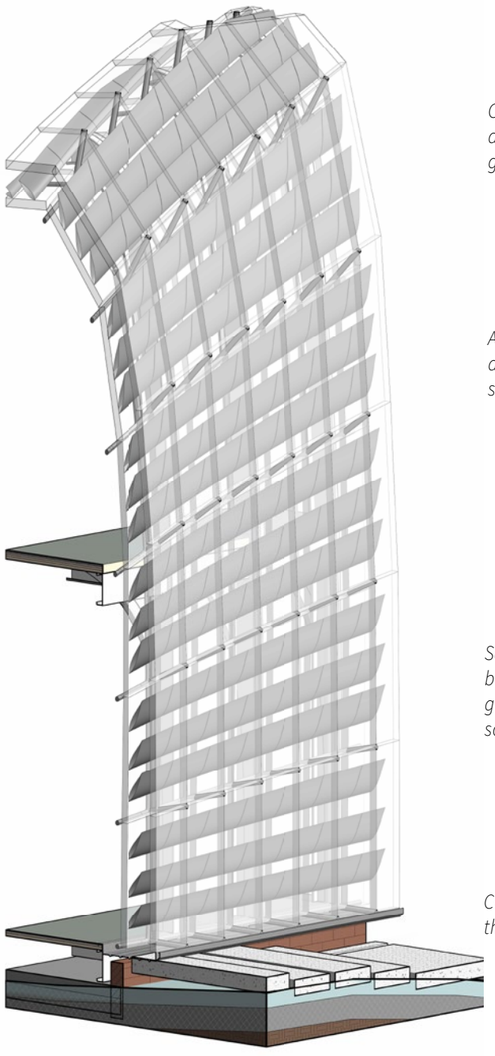
This 500 to 650 ft dwelling bends interior spaces according to human scale and space utilization norms. A direct response to daylight and solar energy through a double cavity ms-Free glazing envelop that circulates air continously is a standard within all variations of this typology. The particular interior and exterior volume is a direct reflection of sufficiency within the single family household. ***Although small in built up area this two bedroom, two bathroom unit also has an expansive interior space that is harmoniously connected with its surrounding.*** The tint variations on the 5mm Saint Gobain Vision glass panels create a gradient of privacy from sleeping spaces at the south wall towards living spaces on the northern section of the dwelling.

View from South West



Double Cavity envelop with louvers tilted at 40%

View from South East



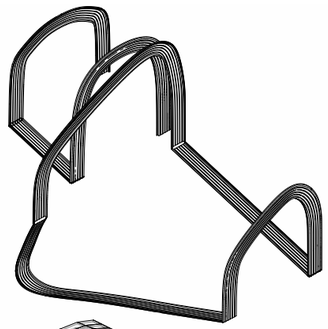
Chiaroscuro on facade achieved with double glazing tint variations

Air circulation in automatically controlled shading system

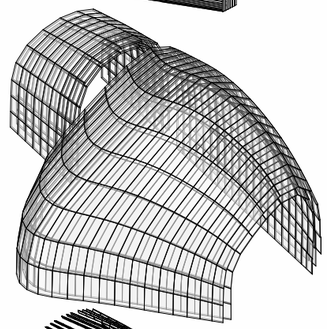
Saint Gobain PARSOL body tinted flat double glass panels with basic solar control properties

Continuous air inlet through trim nozzles

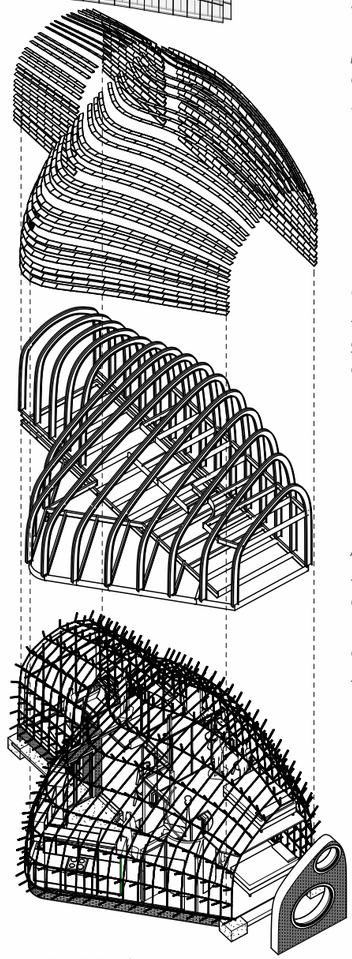
Double Cavity envelop with louvers tilted at 80%



Anodized aluminum Trim delineates model variety and circulates air through facade



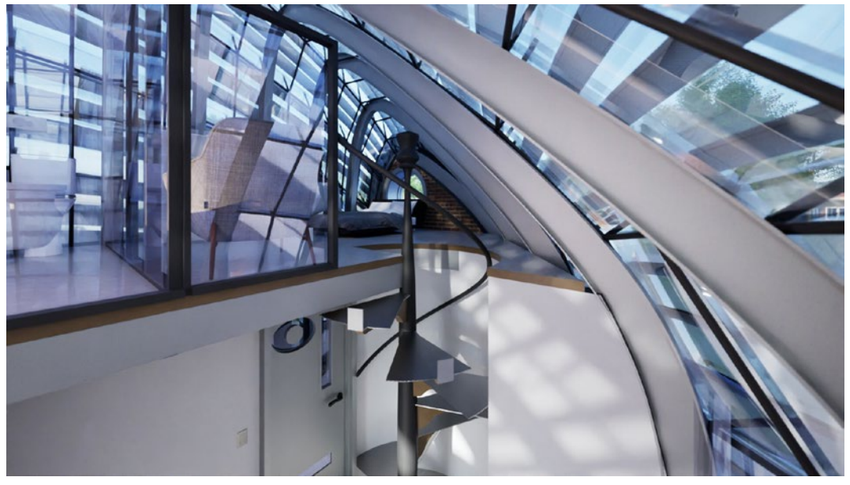
Curtain wall, Permasteelisa mfree-SCCF cost effective moisture dust free sustainable closed cavity facade



Flexible Fiberglass louvers with embedded photovoltaic cells and perforation from better airflow

Cold Formed Steel, Light gauge C channels duplicated and welded

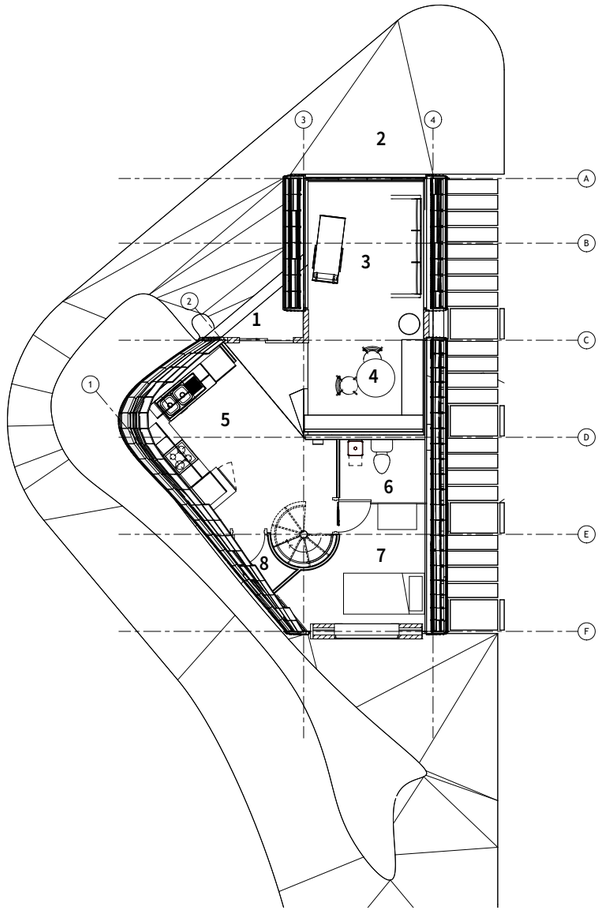
Aluminium strongbacks crossbraced for tensile strength and curtain wall support



At the crack of Dawn, represented in this symbolic break, the dweller has access to the sky and beyond. This 2'6" opening shows a balcony that is larger than it looks from outside and is in fact recessed within the larger bulge.

Sfumato blends varying tint shades of glass panels with the sky and ground context.

Chiaroscuro creates a sharp contrasts of perceptions between inside and outside through the anodized aluminum trim.



1 *Entry*

2 *Porch*

3 *Living*

4 *Dining*

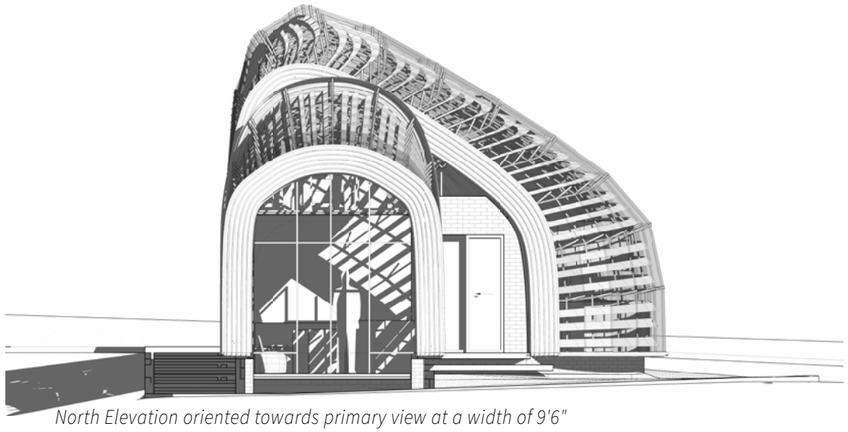
5 *Kitchen*

6 *Rest-room*

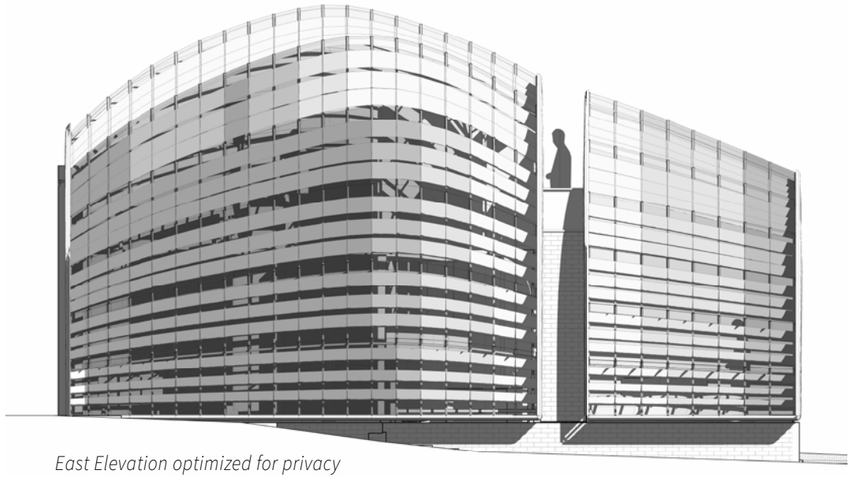
7 *Bedroom*

8 *Utility room*

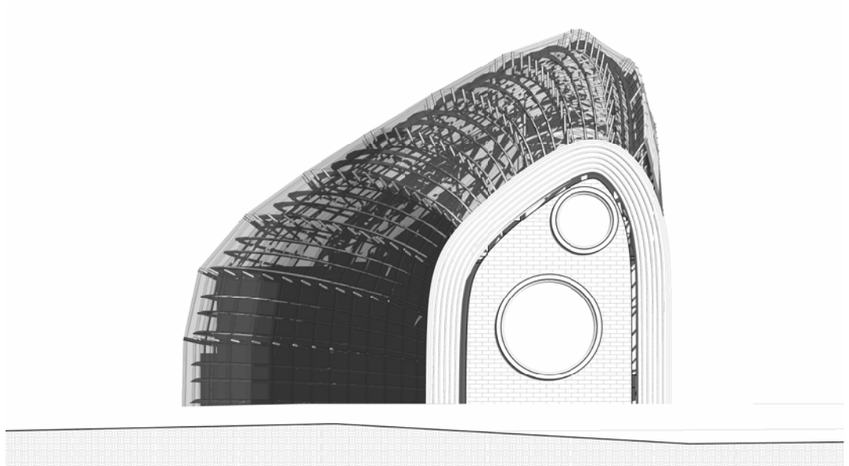
First floor plan



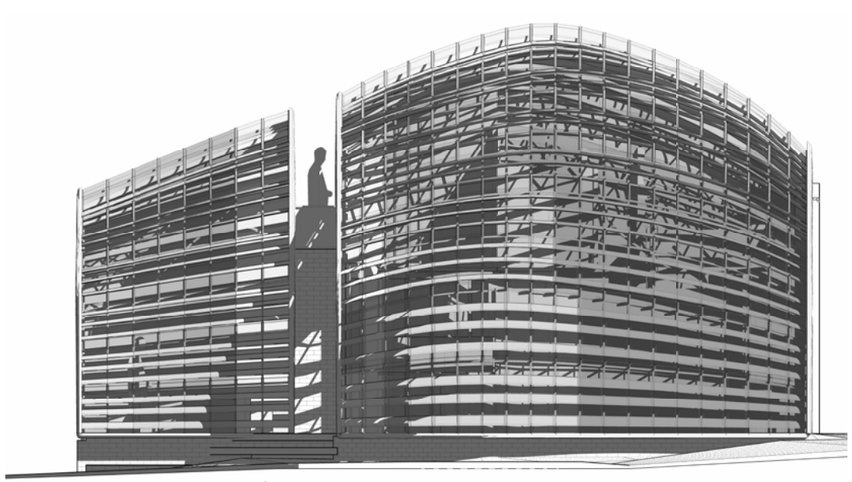
North Elevation oriented towards primary view at a width of 9'6"



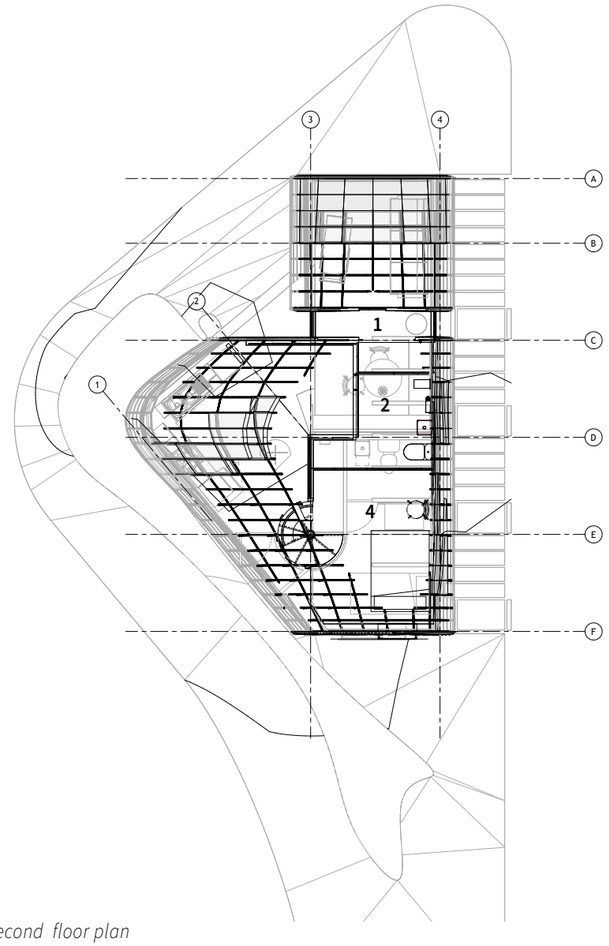
East Elevation optimized for privacy



South Elevation



West Elevation optimized for solar energy capture



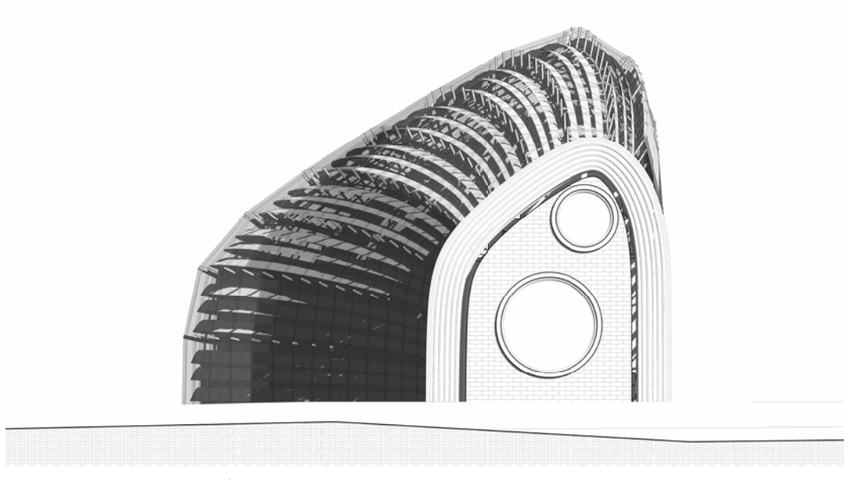
1 *Balcony*

2 *Rest-room*

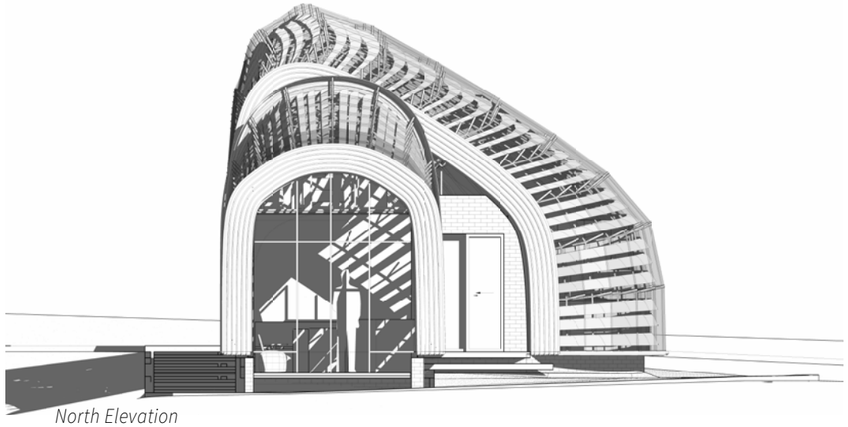
3 *Living*

4 *Bedroom*

Second floor plan

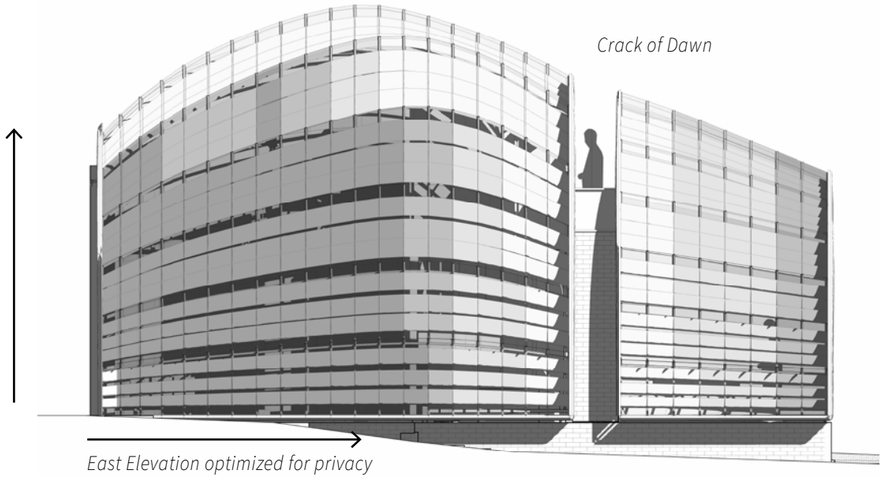


South Elevation frames extended tension points through circular windows



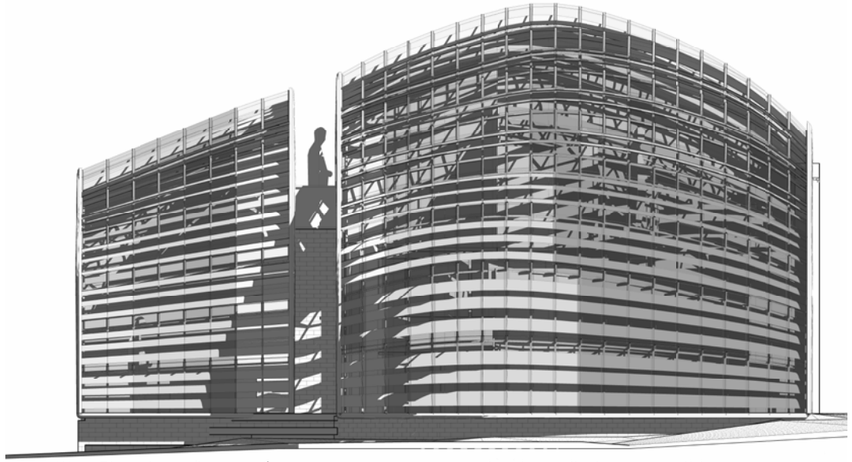
North Elevation

Crack of Dawn



Arrow represents a decrease in glazing tint

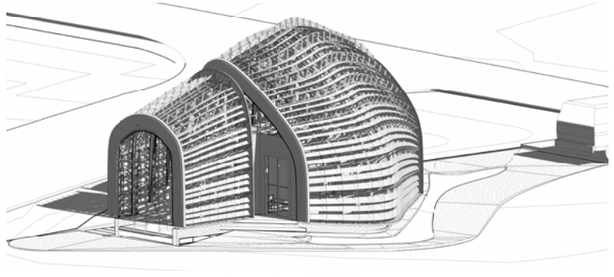
East Elevation optimized for privacy

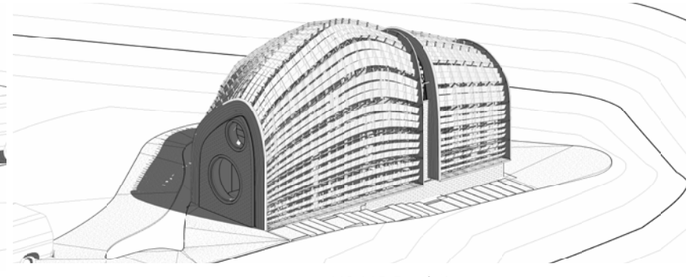


West Elevation twists on afternoons to capture as much solar radiation as possible
Lower panels are always tilted so as to screen the kitchen and living rooms

A quest to reformulate the architectonic landscape of housing typologies through design for manufacturing.

The largest surface on the envelop is oriented towards the South West so as to capture as much solar energy as possible.





A framed view that is filtered through constantly changing interior atmosphere and shadows.

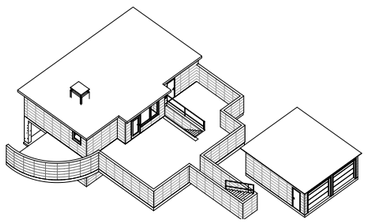
Two Cold formed steel structure profiles doubled, welded and spaced at 2'6"

Double glass fully enclosed cavity that circulates air and bounces light

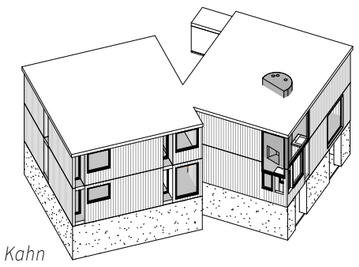
Aluminium Strongbacks

This house appropriates and reflects the expansive and cost effective concepts from four iconic houses.

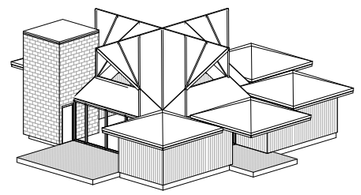
Holl



Wurster



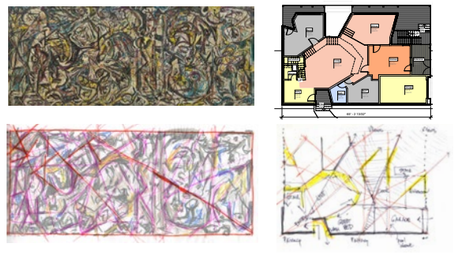
Kahn



Tyng

Writing with Light House

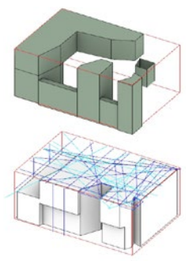
Long Island, United States 2004
Designed by Steven Holl



Studying the painting "Seven in Eight" by Jackson Pollock reveals an underlying grid by which light carves spaces.

Horizontal Wood Slats 2 x 3 inches(17,500ft) over Vertical wood batten EPDM plywood insulation in stud wall cavity. Metal flitch plates are cost effective methods sandwiched between wood slates to create a fading privacy screen for the terrace

EPDM fully adhered rubber roofing with 1/4" per foot slope is cost-effective and can last from 20 to 60 years ($4.25 to $12/ft)



2,671 Cu.ft

10,280 Cu.ft

6,844 Cu.ft

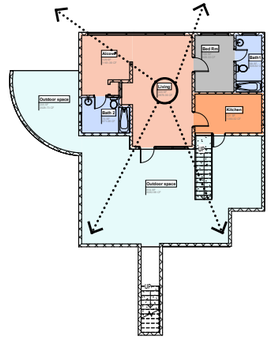
15,552 Cu.ft

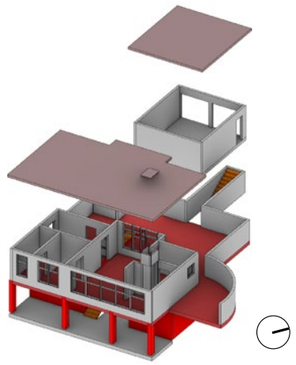
Footprint : *2,870 sq.ft*

Volume : ***51,000 Cu.ft***

The Mathurin Dondo House

215 Western Avenue, Richmond CA
Designed by William Wurster (1936)

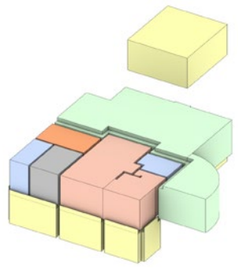




Wood framed roof with tar and gravel topcoat 1575sqft x 4.8lb/sqft = 7,560lbs
1575sqft x $4.25 to $5.75 per sqft = $6,700 to $9,050

Walls : prefabricated "underdown"block = 1857 cuft

"Employing the same materials inside and outside made the modest interiors appear generous", with views to the Bay and to a lush courtyard, the simple marine birch plywood doors and prefabricated underdown concrete blocks are answers to value engineering in the past century.



1,280 Cu.ft

2,090Cu.ft

6,840 Cu.ft

3,970 Cu.ft

868 Cu.ft

5,190 Cu.ft

11,865 Cu.ft

8,368 Cu.ft

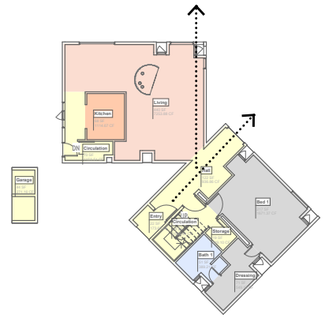
850 sq.ft

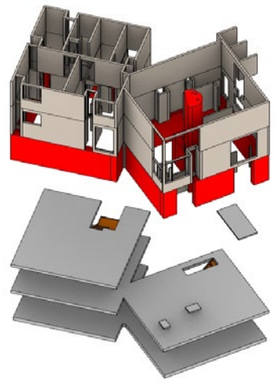
11,982 Cu.ft

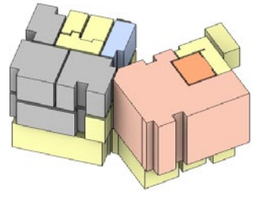
*A call for **Sufficiency** in domestic spaces "as a means to an end in the transition towards sustainable economies"*

Fischer House

Hatboro, Pennsylvania
Designed by Louis Kahn (1967)





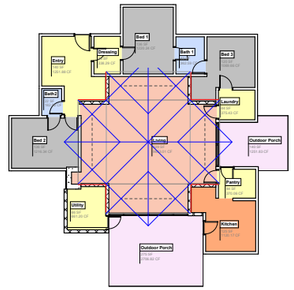


1,250 sq.ft

26,291 Cu.ft

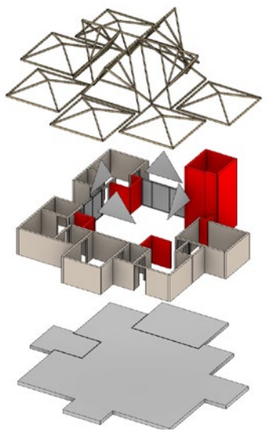
Clever House

Cherry Hill, New Jersey
Designed by Anne Tyng (1962)



Asphalt Shingle Roof 2,380sqft x 3,5 lb/sqft = 8,330 lbs

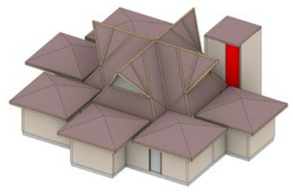
2,380sqft x 5 $/sqft = $11,900

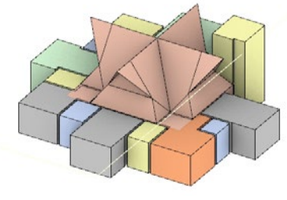


Douglas Fir Ridge Beams on triangular clerestory windows as shelter for hinged wooden ventilation panels , and add depth to natural lighting 135 Cu.ft x 31 lb/Cu.ft = 4,185 lbs

Masonry Walls 990Cu.ft x 150 lbs/sqft = 148,500 lbs

Concrete slab on pintle footings with concrete pipes beneath sub-slab for air suppl





813 Cu.ft

2,938Cu.ft

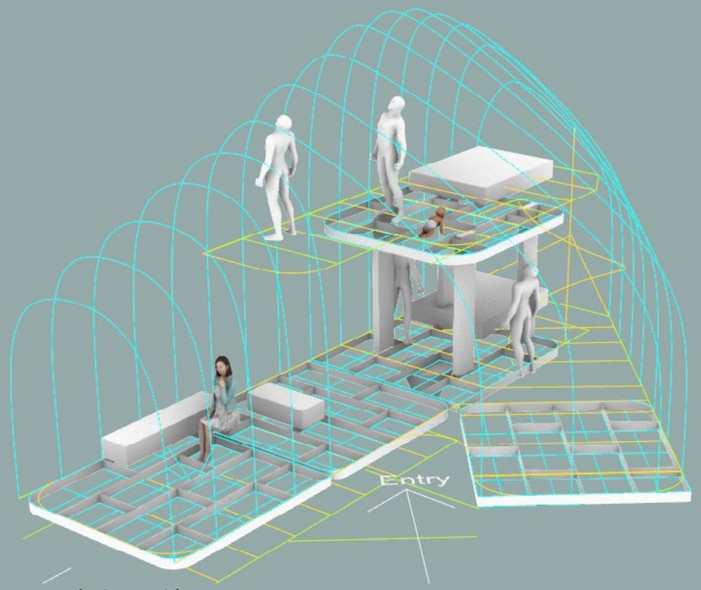
2,806 Cu.ft

9,785 Cu.ft

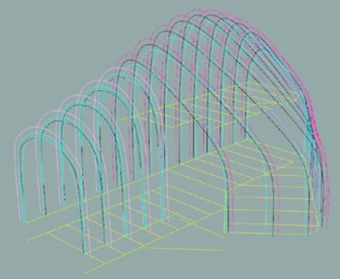
1,700 sq.ft

21,780 Cu.ft

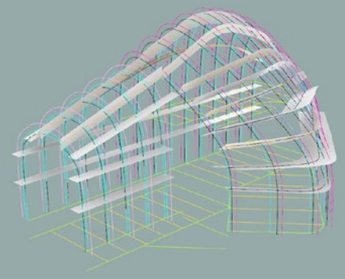
Interior view from sleeping space on level 2 as the crack of dawn bends space



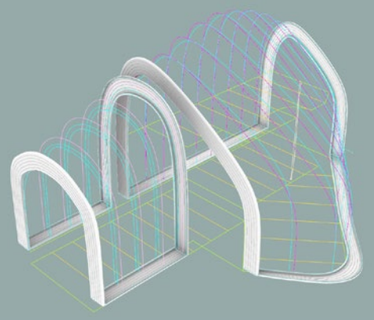
Optimum space for human life



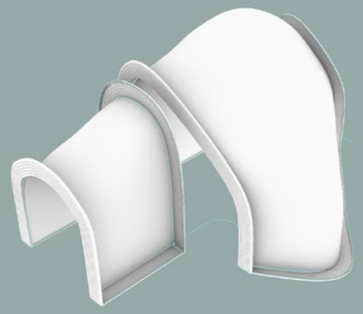
Offset curves drive structure and envelop



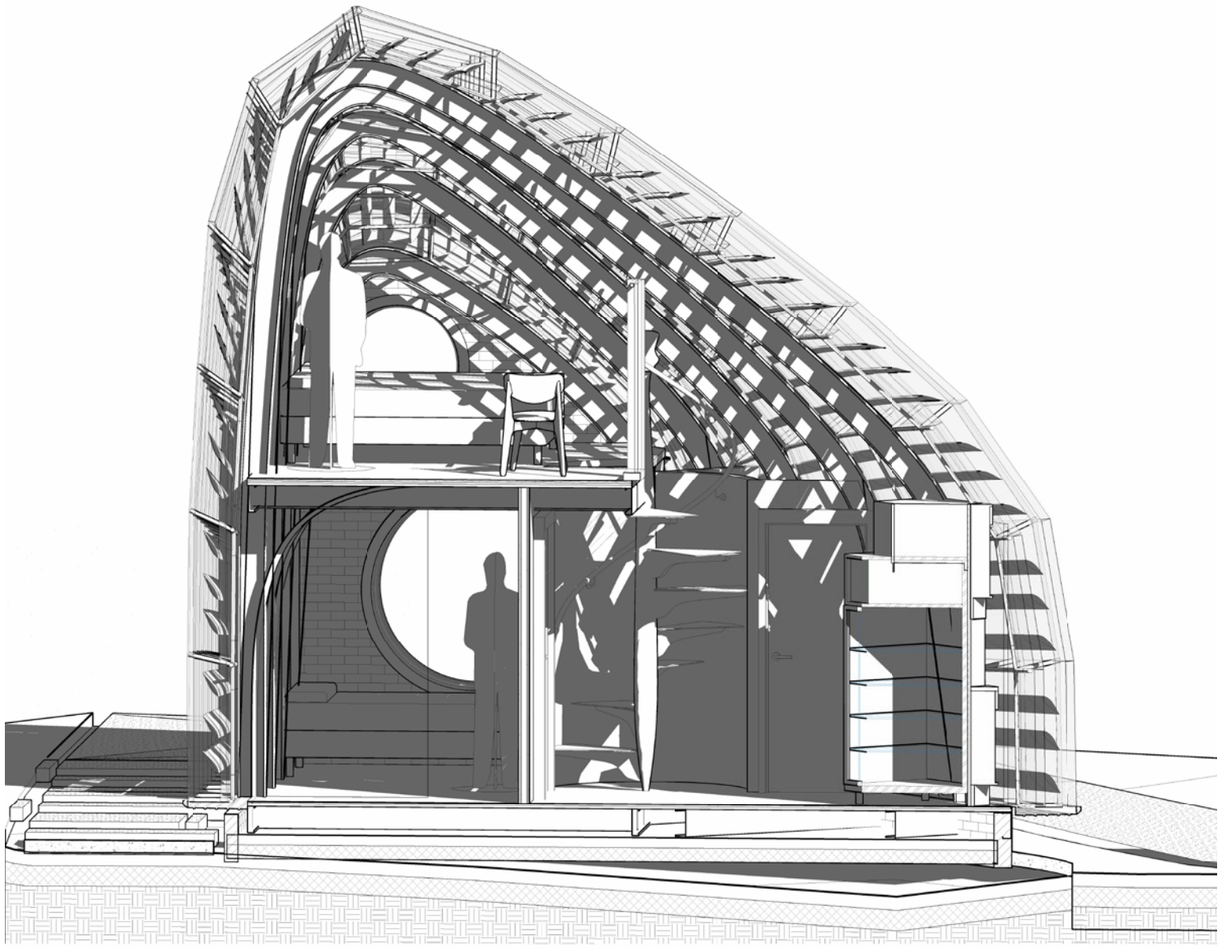
Aerodynamics, shade and formative lines



Aluminium edge trim locks the envelop



A reinterpretation of wall, fenestration and roof



Grounding to mother earth

The disconnection of the human species from Mother Earth due to the synthetic rubber in our shoes, the built environment and the automotive industry has many consequences. To name a few, “dis-ease” due to inflammation because of not being grounded or barefoot, depression, climate change, global economic and political instability and patriarchal dominion could be results of such a disconnect. Although these might not be related to one another, their presence in our lives demands a response to attain a solution for harmony, health and peace.

The congregation of man towards dense urban centers reduces the household carbon footprint as compared to living in suburban sprawls yet the necessity to have places of repose and respite where we connect with both nature and our communities is essential to the success of this model. Hence, the proliferation and benefits of parks and recreation combined with communal activities draws multicultural entities to metropolitan areas such as New York. The value of these spaces should be coupled with a deep understanding of how the electromagnetic charge of the Earth benefits us through practices of grounding and forming dietary habits around mushrooms. As we learn about improvisation and regeneration from mycelium, new practices focused on fabrication and recycling by using fungi could become alternative solutions to tackle the effects of waste and consumerism (i.e. cigarette buds recycling with mycelium in Australia).

As architectural designers, we should consider further the connections that we build between city dwellers, the earth and the cosmos. ***A deeper and wholistic understanding of homeopathy, grounding mats and beds as well as cosmic forces and metaphysics could aid in the creation of spaces that rejuvenate us by establishing connections with higher forces to reduce the anxiety and mental ailments that derive of this century.*** The flow of electromagnetic forces or the isolation from electrical signals in interior spaces should be considered.

Development and injustice

The feud between Communities and Power in New York City has been embodied by ideological clashes between Jane Jacobs and Robert Moses. This dialogue is valuable to the fabric of the city and awareness of it is important for responsible professionals in urban development.

Lincoln Center erased San Juan Hill but West Side Story (1961) preserved the memories of the site. Greenwich Village, marked by the tragic Triangle Shirtwaist Factory fire, created communities of strong local activists that were able to resist the leveling and grid structure of the Commissioners plan of 1811 as well as the vehicular passageway proposal through Washington Square Park. This was possible only through the role of the Village voice, grassroots activism to “Save the square” and even the “Listen, Robert Moses” song by Bob Dylan in 1962. Despite this being one of the few defeats of Moses the “power broker”, it exemplifies ***the difficulties in achieving a bottom-up approach to development instead of a top-down formula.***
Perhaps a move forward would be to look at how the Kensington Community Land Trust (KCLT) which acquired 54-56 Kensington Avenue in the diverse and historically vibrant Kensington Market in downtown Toronto. KCLT is a nonprofit cooperation aiming to preserve housing costs against real estate market pressures through financial contributions and loans for the acquisition, management and stewardship of community land. KCLT is also aware that it is a settler organization in the territory of the Mississaugas of the Credit, the Haudenosaunee Confederacy, the Wendat and Petun Nations. Making it a social responsible entity in a ruthless world.

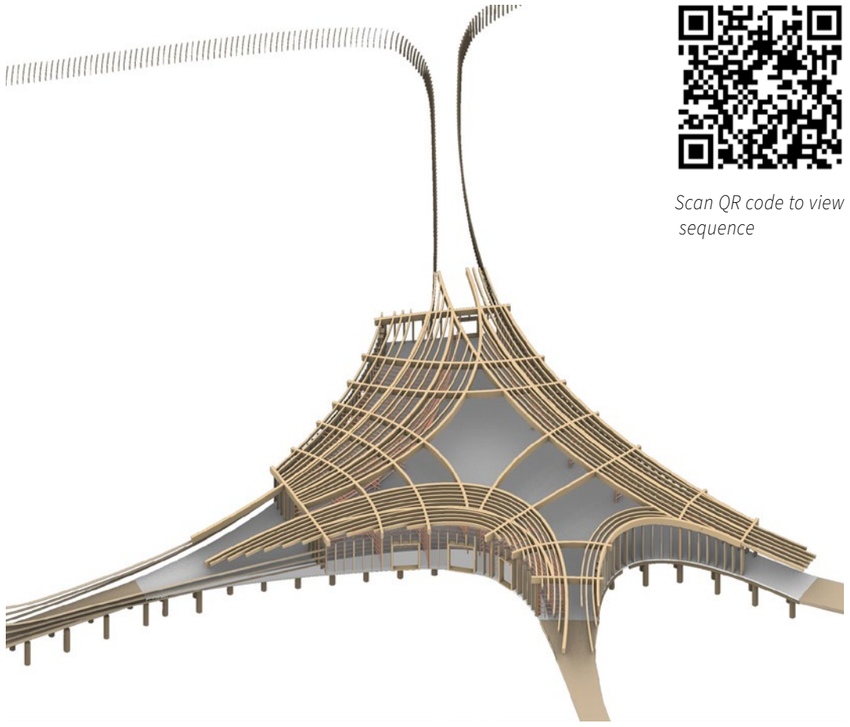
Like the layering of multiple design proposals for flood mitigation in the Lower East Side of New York, the development of the Downtown Lower Manhattan Association was formed in 1958 by David Rockefeller and condemned the destruction of the “blighted” Radio Row to pave way for the World Trade Center despite the infamous “coffin protests” of 1962. ***Communities facing land grabs fueled by power entities need to be organized, resilient and tactical for the bottom-up approach to work effectively or their efforts will be erased easily.***

Constructive Entropy

Impermanence, Biomaterials, and Regeneration in the Edgelands

Fall 2023
Marc Tsurumaki and Daniel Chang

Syllabus Prompt for Advanced Studio V

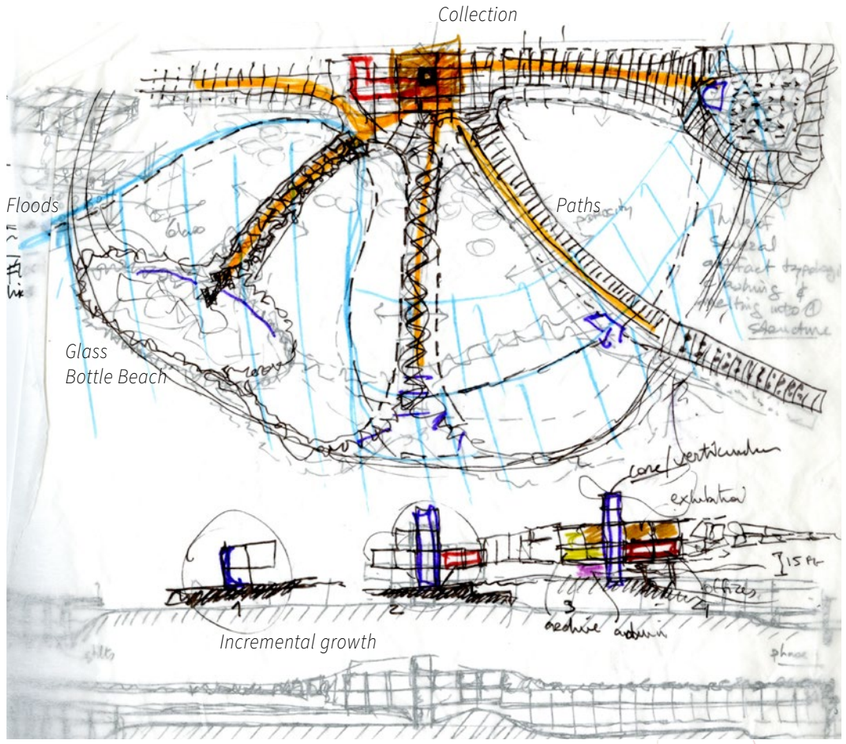


Scan QR code to view sequence

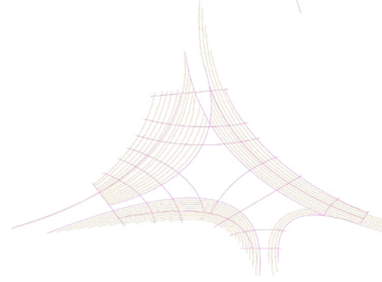
Isometric view of Collection Building

Historic Landfill Rehabilitation

Dead Horse Bay , Brooklyn, NY
Practicing entropic tactics for the rehabilitation of a forgotten island with historic remnants of a metropolis



How can a forgotten scavenging site drive the design and growth of the rehabilitation of an archaeological site of human waste?



Curves to Beams projected on Paraboloid

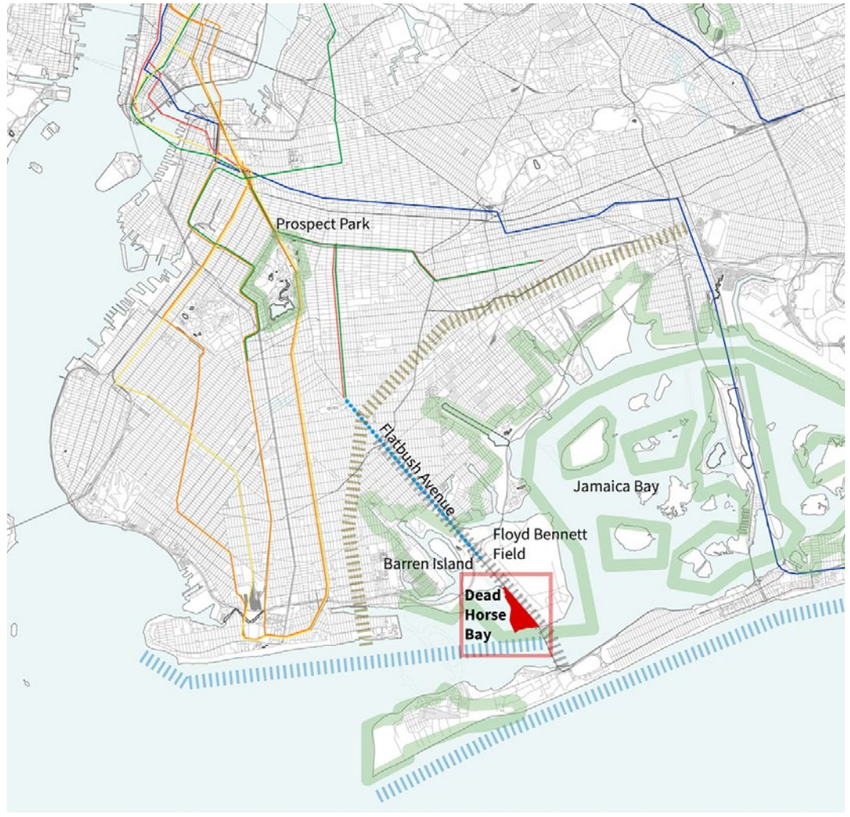
What is an “edgeland”?

“The word “edgelands” was coined by British environmentalist Marion Shoard (2002) to describe areas of sub/urban-rural interface. Edgelands are vast and proliferating zones which many people move through regularly in their daily lives, but which remain mostly unnoticed. Edgelands are characterized by “rubbish tips and warehouses, superstores and derelict industrial plant, office parks and gypsy encampments, golf courses, allotments and fragmented, frequently scruffy, farmland”.All these heterogeneous elements are arranged in an unruly and often apparently chaotic fashion against a background of unkempt wasteland frequently swathed in the riotous growth of colourful plants, both native and exotic.”

Cover of The Meadowlands : Wilderness Adventure at the Edge of a City, Sullivan, Robert. 1999

“In the U.S. context, edgelands find close physical parallel in the dark ecology of the Meadowlands, the area of half untamed marsh in New Jersey just west of New York City” and the remnants of thriving factories and trash dump sites of a growing consumerist society.

A site carefully chosen for the cultivation of Entropic tactics



Snapshots of Glass Bottle Beach

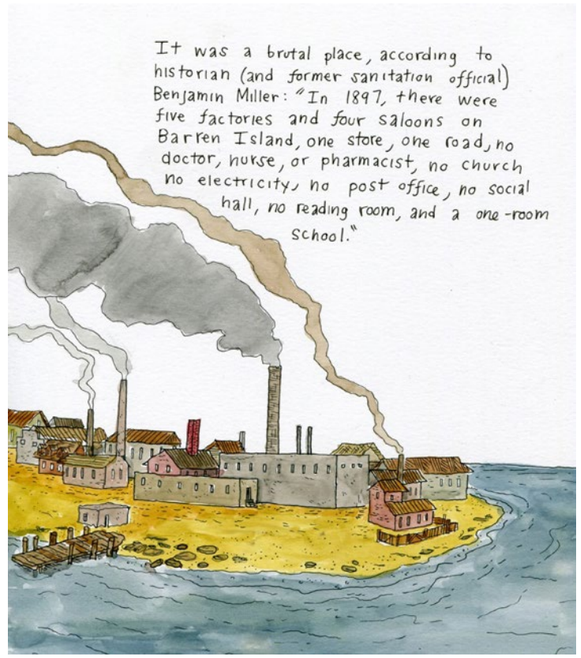
Overlooking the Marine Parkway Bridge

“There was once a place in Brooklyn called Barren Island; It doesn’t exist anymore”

“It lay in Jamaica Bay, east of Sheepshead Bay and south of Canarsie. A marshy, grassy, sandy land of wind and dunes, the island’s shape and size transformed rapidly as it was buffeted by changing tides and currents. Archaelogists believe it was never heavily settled by the local Canarsie Indians, though they likely used it as a base for hunting, shellfish gathering and fishing. In their turn, European settlers did the same and also grazed cattle and horses in the meadows.” It was later later “signed over” much of it to Dutch settlers

Barren Island was one of only three islands on the western side of Jamaica Bay that was inhabited or utilized during the Dutch colonial periods (the other two were Bergen and Mill islands). No one is really sure who owned Barren Island at any given time, but as early as 1664, several individuals laid claim to Barren Island or parts thereof, including William Moore and Rutgert Van Brunt. Once one of the largest of the islands in Jamaica Bay, Barren Island has been called by many other names during its history, including Equendito (the Native name), Broken lands, Bearn Island, Barn Island, and Bear’s Island

“As nearby cities grew, Barren Island’s combination of proximity and isolation made it a perfect spot for so-called ***nuissance industries*** - those smelly, disgusting, but essential activities that city dwellers prefer to keep out of sight. Until then , only a few families lived on the island.” Factories like the Barren Island Fertilizing Oil and Guano Company, the New York Sanitary Utilization Company, and the Brooklyn Ash Company cause ***nauseating and offensive odors*** which were carried by the wind for long distances in the late 1800s and early 1900s. If ***bone boiling, sludge acid, and decaying fish and animal flesh*** weren’t bad enough, the island was also the garbage dump for Brooklyn and a ***dumping ground for offal*** (the entrails of butchered animals) and ***dead animals, including horses, cats, and dogs.***



1600 | 1700 | 1800 | 1850 | 1873 | 1898 | **Consolidation of the five boroughs brought change to the forgotten island** | 1901

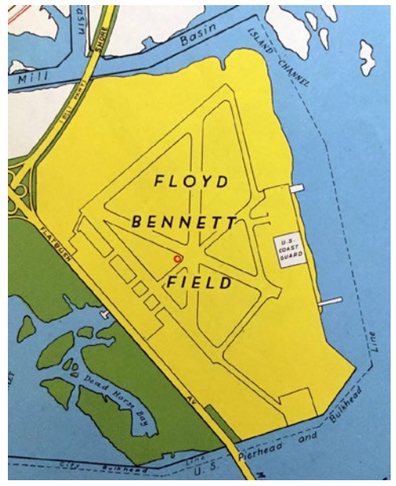
Dead Horse rendering activity

Dead Horse Bay got its name in the 1850s when horse-rendering plants surrounded the beach and bones and other animal body parts were dumped in the water.

Waste Processing on Barren Island, 1897

The exterior of the New York Sanitary Utilization Company factory on Barren Island, including, on the left, the apparatus for lifting garbage from scows. Garbage scows were brought from Brooklyn and Manhattan daily. At the factory, grease was extracted from the garbage in a process called reduction. Fish oil reducing, horse rendering, and waste processing made up the backbone of Barren Island’s community. Despite the community’s remote location, the odors from the smokestack, garbage, dead fish, and other dead animals freely wafted over to Coney Island, the Rockaways, and other nearby locations, causing countless complaints to health authorities.

Lee A. Rosenzweig collection From Scientific American, August 14, 1897.



Houses built on stilts over swamp land, Barren Island, Brooklyn, 1937. Photographer: Edwards. WPA Federal Writers' Project Collection, NYC Municipal Archives.

'Everything we ever made in the modern civilization is there"

"I've traveled to over 30 countries and never come across any place like it", Gerard Barbeau, a scavenger turned artist has problematic clash with preservationists. Hence :

Scanvenger VS Archeologists

Which artifacts can be turned into art ?

1919 — 1936 — 1940 — 1950 — 1970 — 2020

The City stopped dumping its garbage there in 1919.

A subsequent inspection of the island "found at the rendering plant dock three garbage scows, two of them being full and the other about half full… the plant is running night and day." An inspection report for January 1896 found the carcasses of 21 dogs, 17 cats, 35 rats, along with numerous dead cattle, sheep and horses, which led to the naming of the nearby Dead Horse Bay.

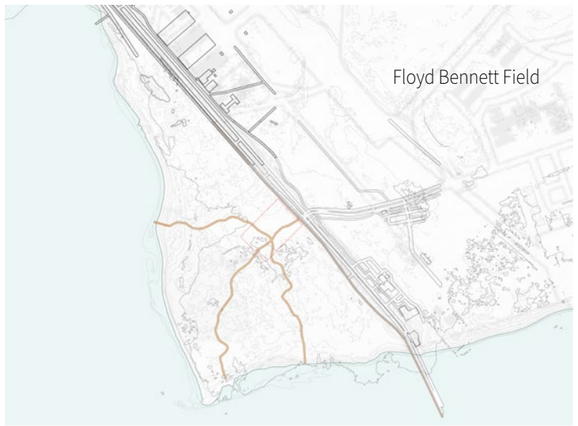
Robert Moses condemns Barren Island to build the Marine Parkway Bridge

In the 1940s and 50s, Dead Horse Bay was filled in with "great mounds of garbage from Queens and Brooklyn flattened into compact layers with sand carpeting 1 to 2 feet thick." As the former landfill erodes, waste materials are exposed along the shoreline, including an enormous number of bottles, ceramics, leather shoes, metal, and other refuse typical of life during the 1950s and earlier. Because of the risk of exposure to radiological contamination or man-made radiological articles, this area is closed to the public.

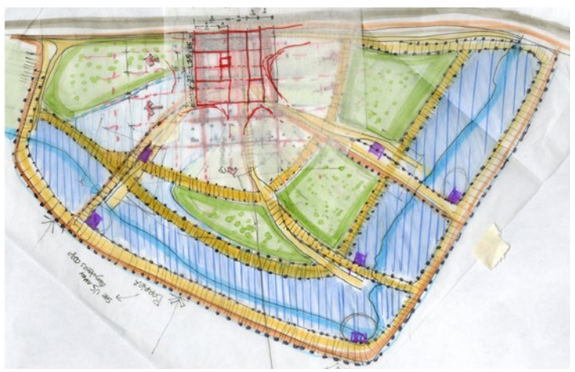
The Glass bottle beach, a threat to wildlife

Stilts remain on the site

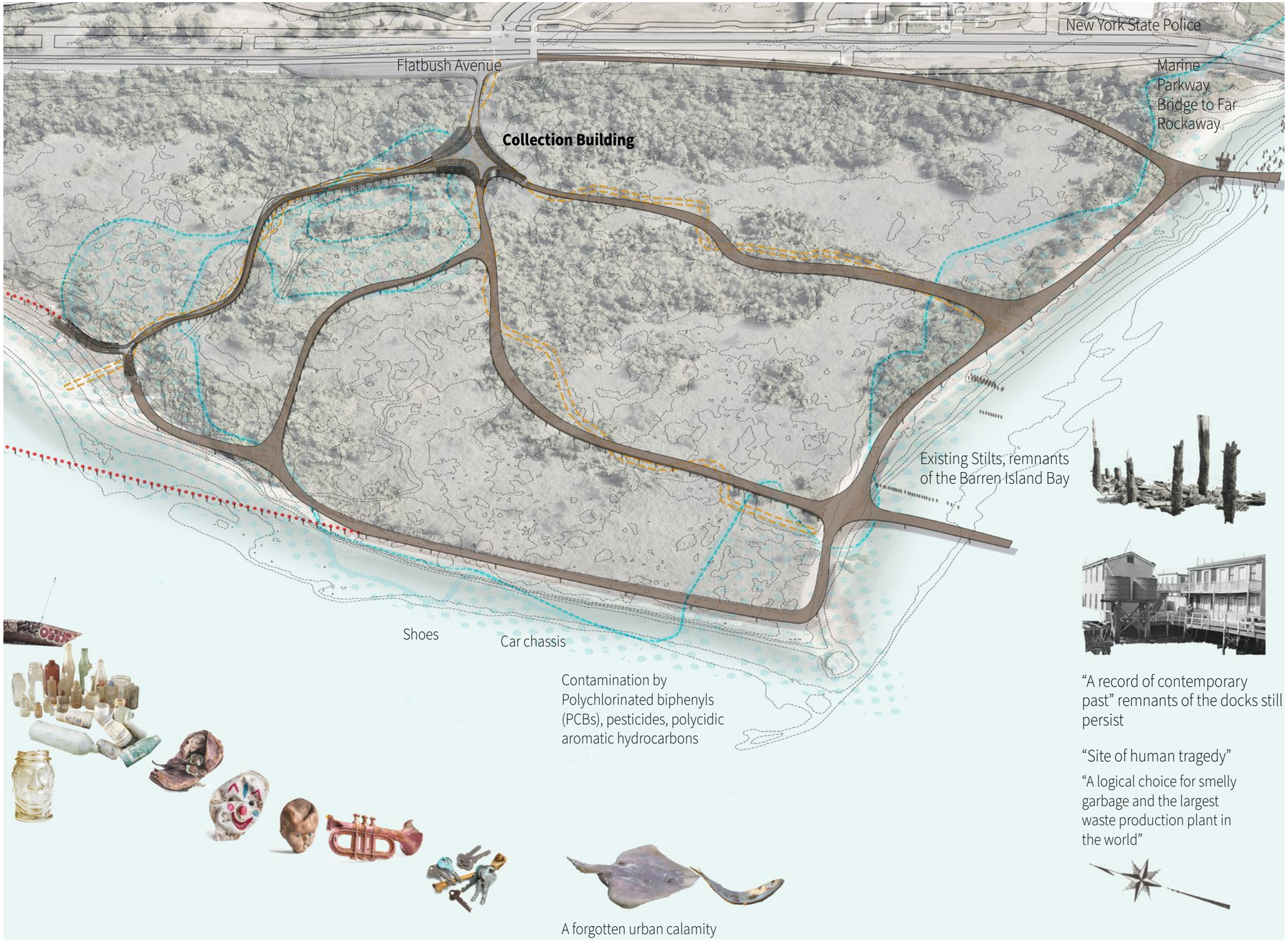
Overlaying flood zones with historical maps



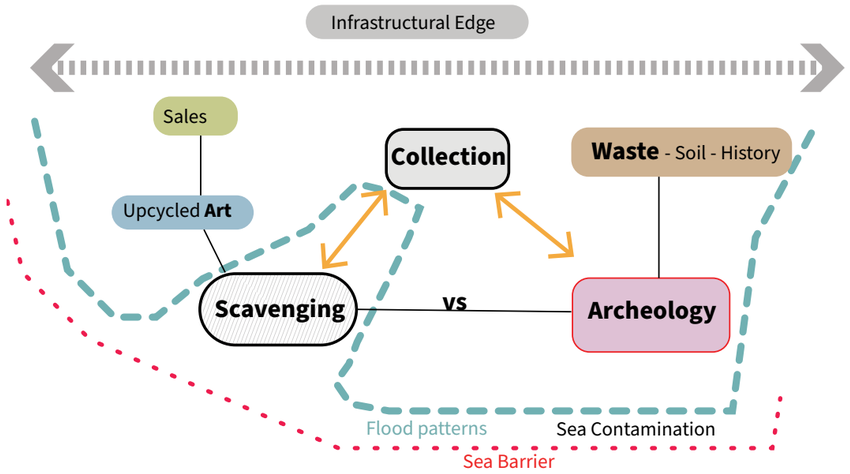
Existing paths set by scavengers drive the design of outposts and paths



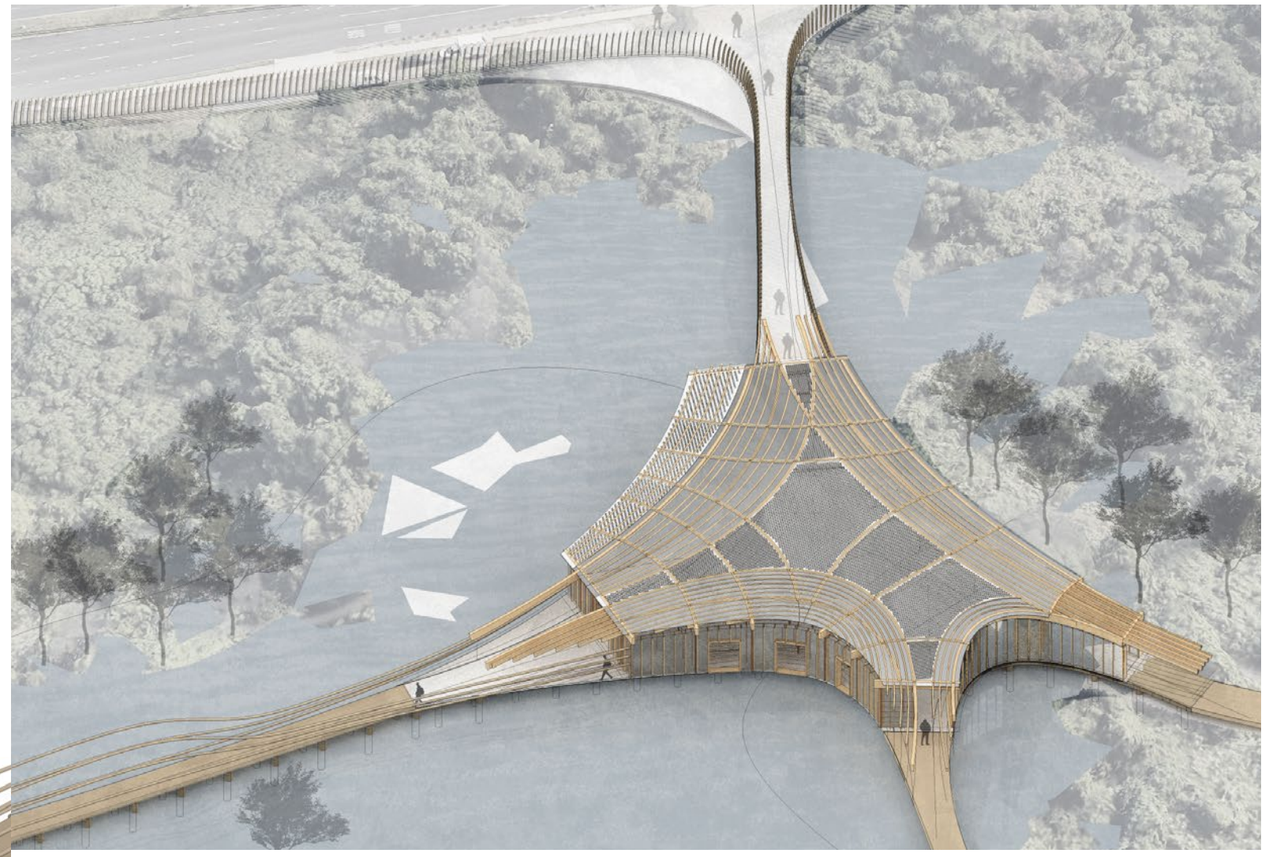
Build a permanent project core on elevated terrain and extend temporary outposts to accommodate increased scavenging and archaeological excavation.



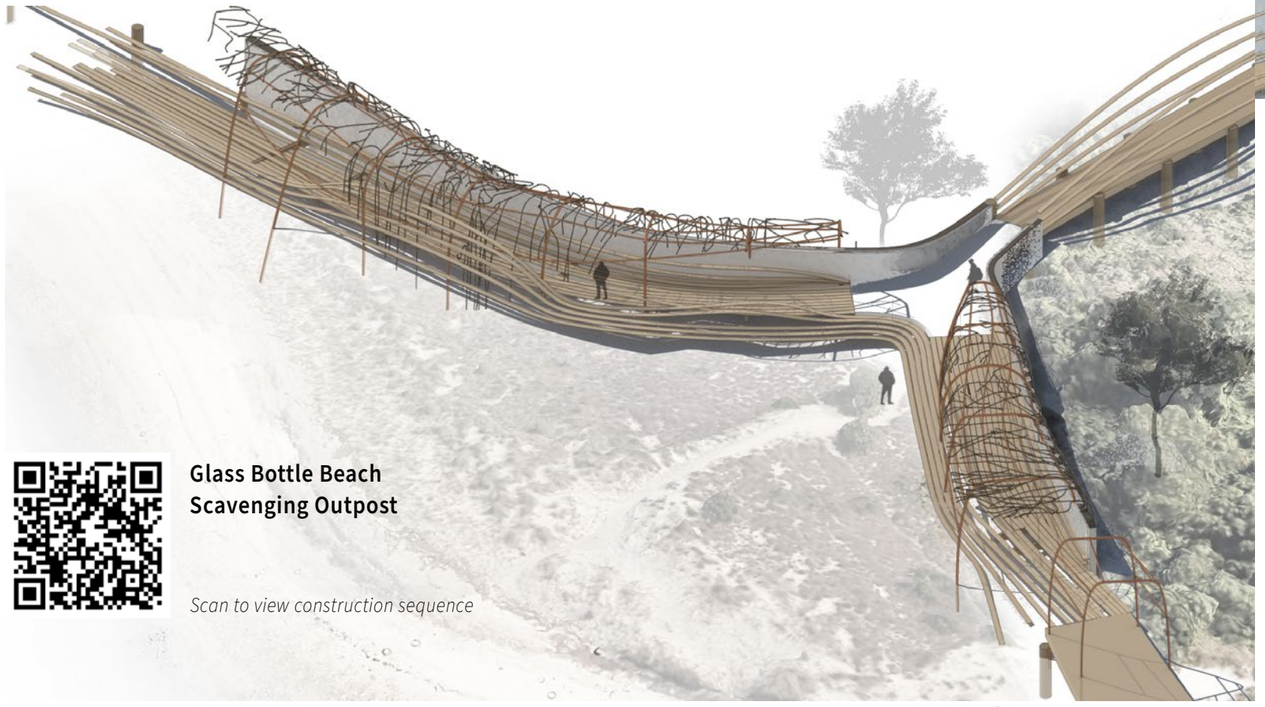
A landfill cap rehabilitation project will allow Dead Horse Bay to clean the shore, adapt to coastal flooding and allow for scavengers, archaeologists and park rangers to revive the site.



Process of rehabilitation and regeneration of an edgeland through partnerships between artists, scavengers, Gateway National Park Rangers, archaeologists and school teachers



Collection Building



Glass Bottle Beach
Scavenging Outpost

Scan to view construction sequence

Dead Horse Bay becomes an archaeological site to extract historic artifacts from a landfill by leveraging existing paths, the eagerness of scavengers to find valuable relics of the past, the expertise of archaeologists to classify objects according to inherent value to human history and the ability of park rangers to guide the project through safe and responsible public involvement.

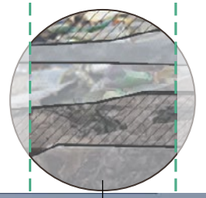
Tyres for Soil retention

Glulam perlin (40cmx20cm)

Glulam rafter (80cmx30cm)

Glass bottles inlayed on roof between opaque fiber panels

Weathered Hollow Structural steel posts as columns



Double Plexiglass Wall as a container for geologically excavated and layered Soil showing the effects of two decades of waste on Barren Island

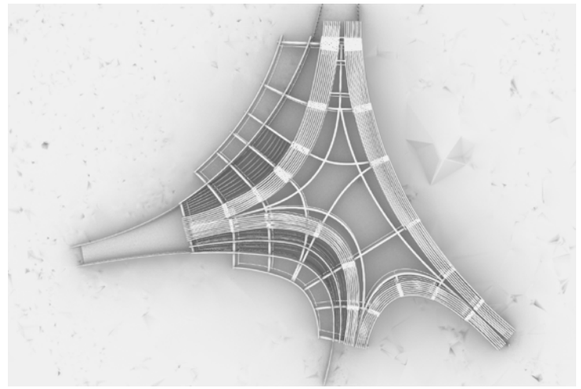
Sea Level in 2045

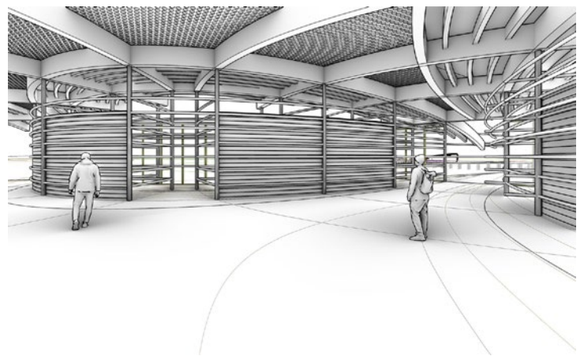
Current Sea Level

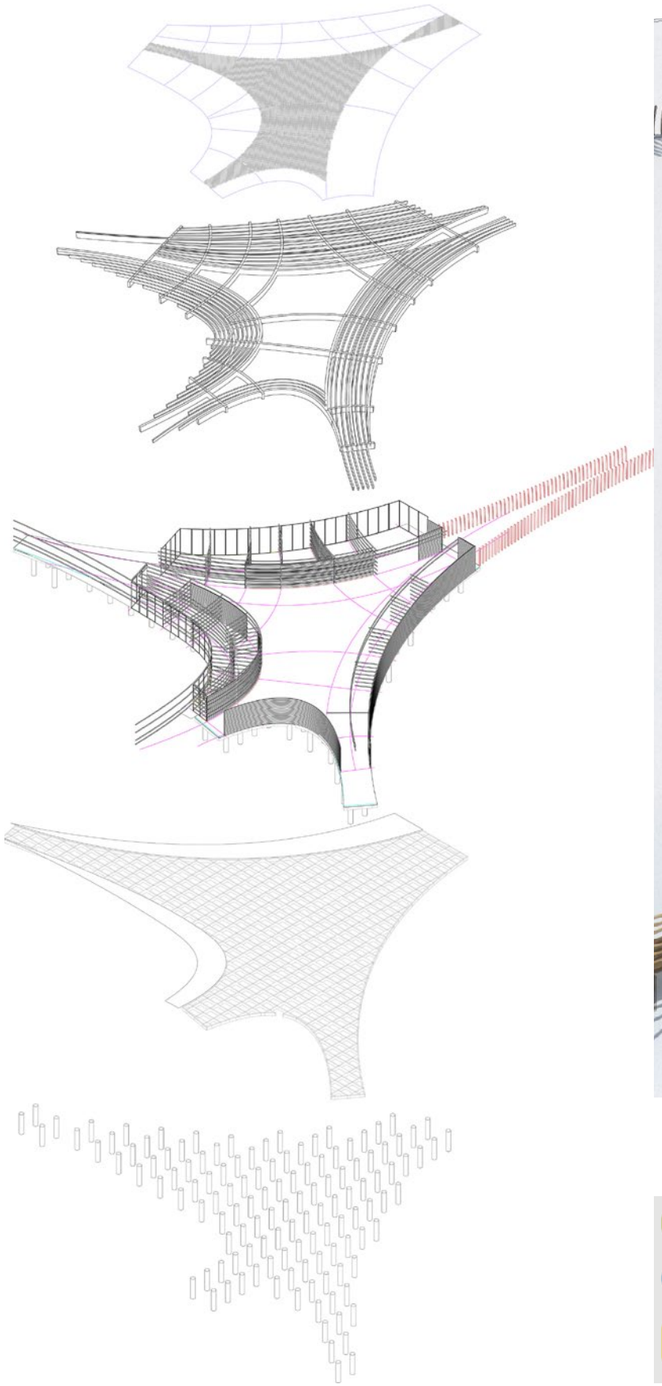
The longitudinal section perspective through the Collection Building illustrates a permanent structure that endures potential sea level rise and yet is constructed with biogenic materials and designed with a range of objects to be archived, auctioned and displayed in it so as to capture the historic layers of waste of Barren Island.

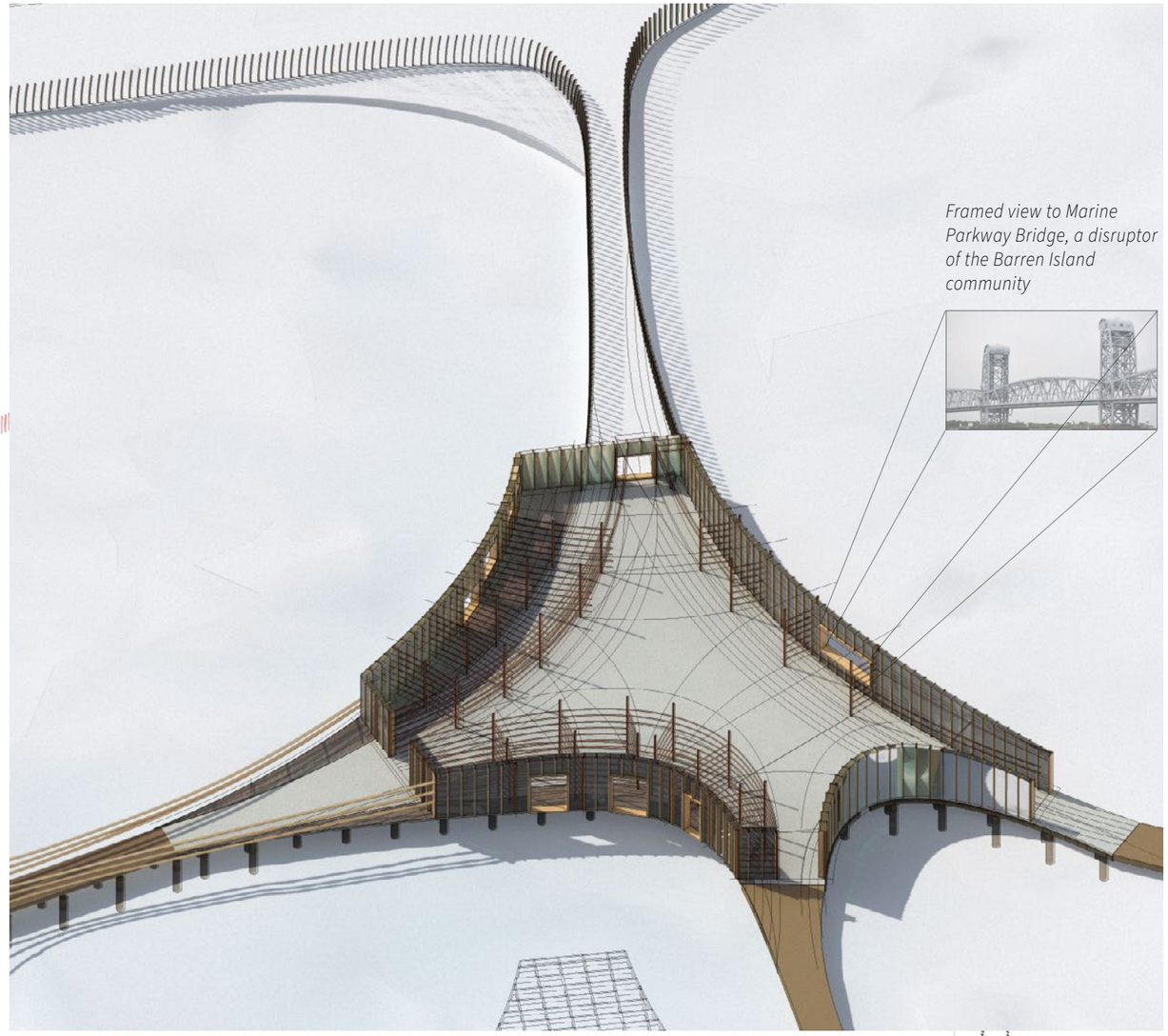
Concrete with Glass powder and aggregates for increased workability and for better strength, freeze-thaw resistance and sulfate resistance

Following trails set by scavengers to formulate patterns for rehabilitation of a site









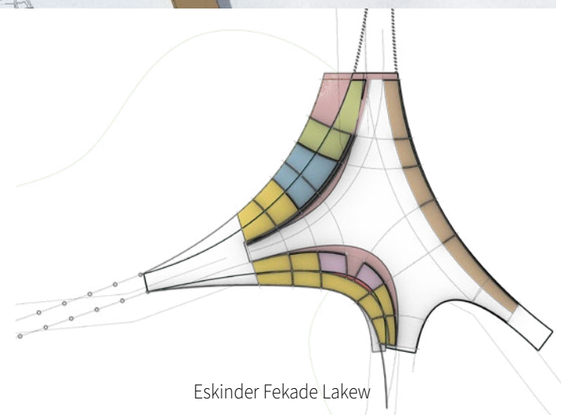
Auction and Sales Spaces

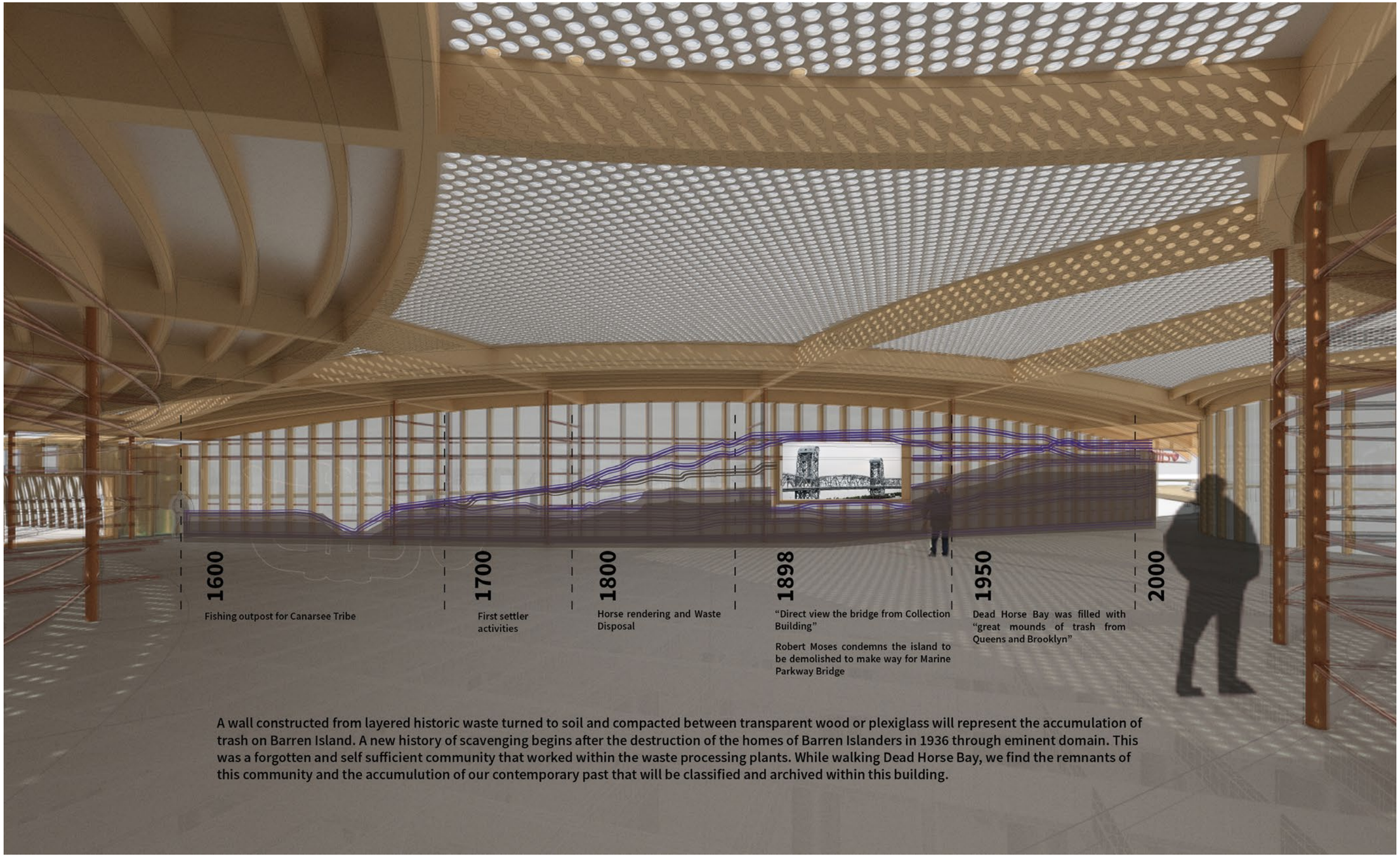
Scavenger's/Artists studios

Collection and Classification Artifacts (Value - Size - Age)

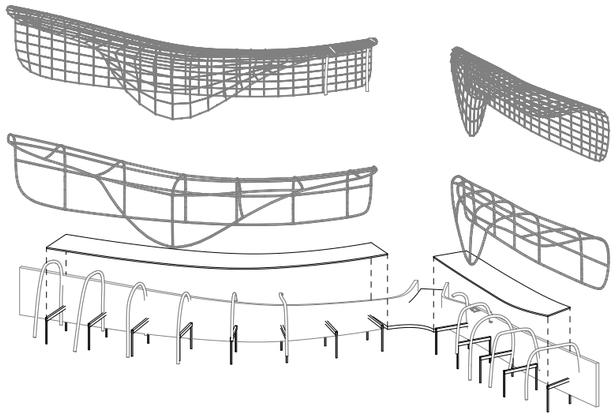
Historic Exhibition Wall of Barren Island's History through Soil Stratification wall and Artifacts

Archeologists/ Park Ranger

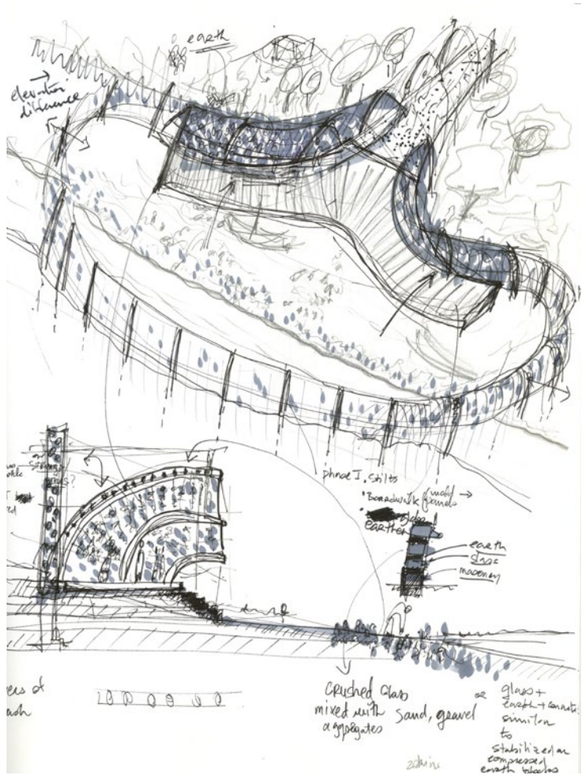




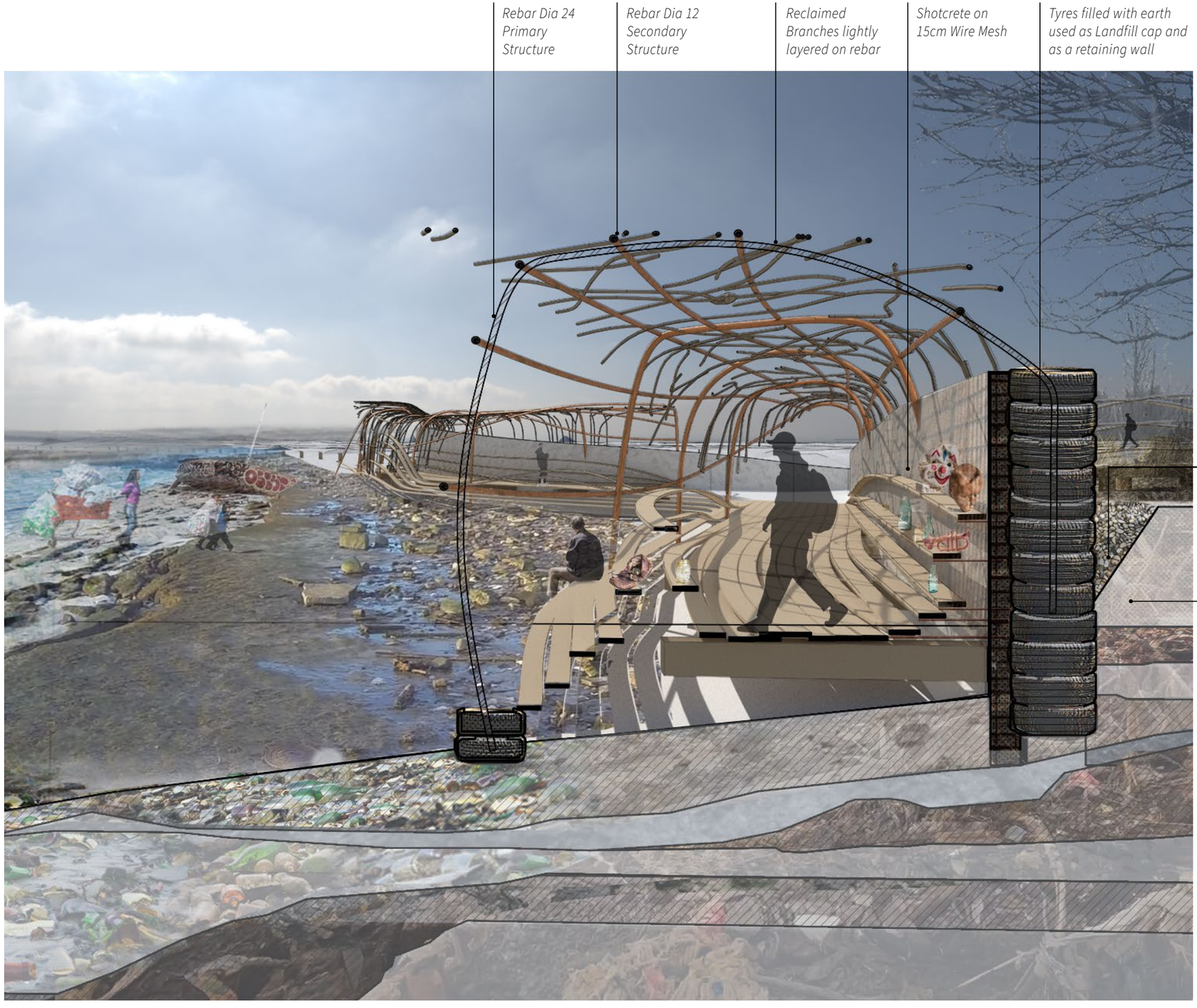
Interior view of empty collection building overlooking the wall of layered waste history and framing the Marine Parkway - Gil Hodges Memorial Bridge which defined to end of barren island



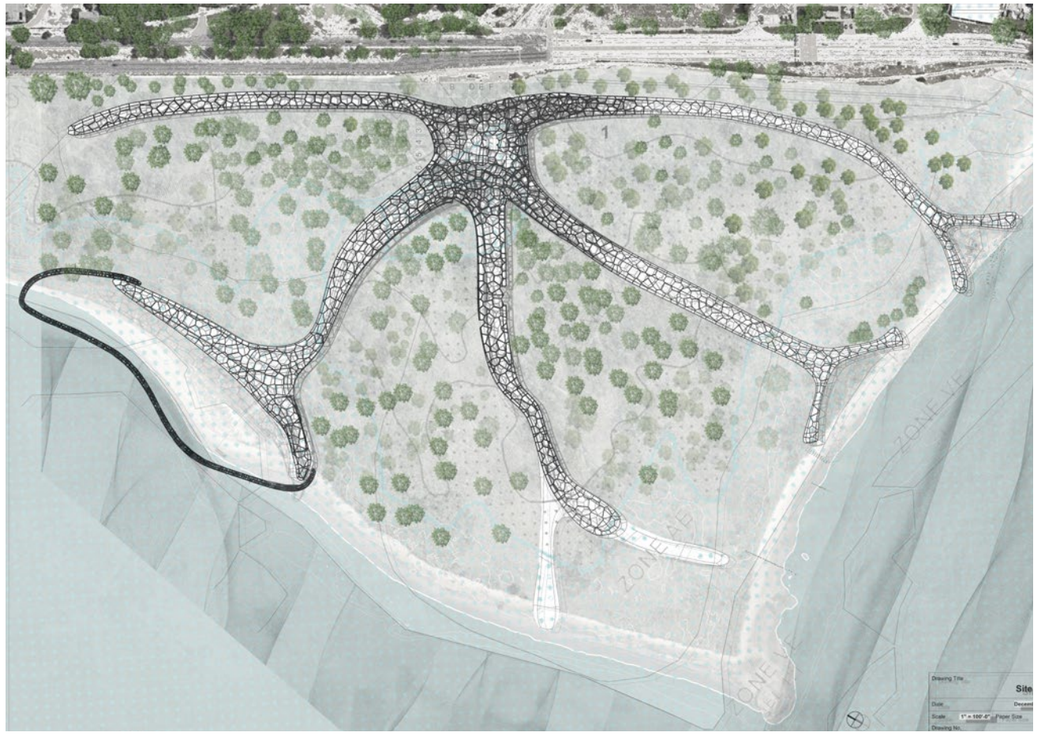
Architectonic systems of the second iteration of Glass Bottle Beach

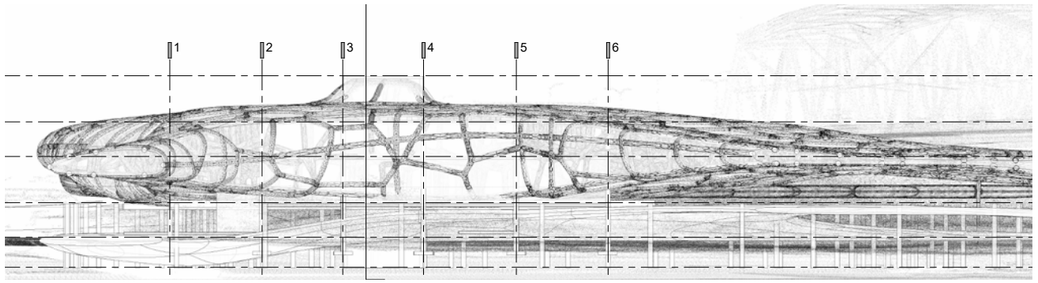


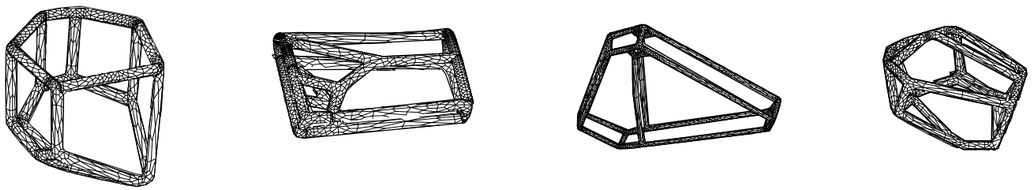
First iterations of Glass Bottle Beach outpost (Grey represents bottles)

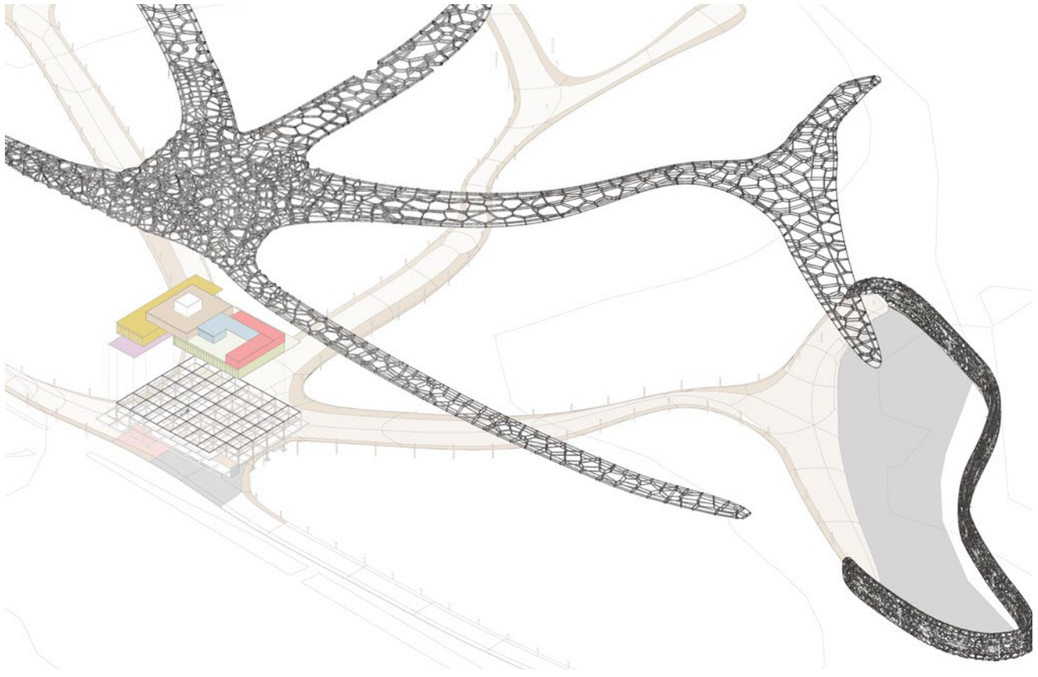


The Glass Bottle Beach outpost is a porous temporary structure that serves as the first soil retention system, landfill cap and also makeshift structure that allows for scavengers and archaeologists to temporarily store and examine the daily findings.









Drawings from the first iteration

Coastal Resilience and risk management

Challenges posed due to climate change and floods could be opportunities for improved coastal resilience through urban renewal. This would be a good reason to assess current infrastructural limitations of cities with aging infrastructure to meet coastal resilience. Hurricane Sandy and other detrimental disasters have allowed New York City to understand the loopholes in existing standards and solutions to protect coastal areas and urban infrastructure from flooding.

Klaus Jacob emphasized the necessity to measure and quantify Representative Concentration Pathways in W/m2. Asset values based on tax rates are multiplied with probabilities of hazard occurrences and vulnerability of assets (0-1 range) to adequately measure the risks of a given site. This would allow for better resilience developments based on responsible risk management and adaptation strategies.

A century of fossil fuel consumption, emissions of green house gazes, warmer oceans, stronger hurricanes, increase in impermeable urban surfaces, drainage limitations of public transportation, frequent and extreme precipitation have caused an increase in rapid urban flooding, which requires immediate adaptive solutions. The incomprehensible solution of the Army Corps of Engineers in proposing a $52.6billion flood defense arsenal of flood-walls, levees, berms and 12 storm surge barriers along the shoreline would inundate the tri-state area as it closes off the flow of rivers. Strategic relocation of dense urban areas through zoning regulations, relocation of airports to upstate areas with higher elevations and linking these with fast trains would be a comprehensive approach to reduce carbon emissions. This would minimize flood risks without reducing density and allowing for equitable and stable access to basic transport infrastructure. Increasing insurance rates in flood zones would be a legislative approach to discourage development in these areas no matter the real estate value associated with the land. ***Raising structures higher than building code requirements for flood safety, testing adaptive construction technologies and materials that would allow efficient road, building and infrastructure drainage, eliminating the need for basements, elevating MEP lines, replacing gas boilers would be adequate solutions to protect urban structures against flooding and other climate calamities.***

Environmental standards, engineering codes, zoning regulations should be points of interest to protect and defend urban zones from flooding without reducing urban density.

Yaro , Robert , and Daniel Gutman. n.d. "The Plan to Save New York From the Next Sandy Will Ruin the Waterfront. It Doesn't Have To." The New York Times.

Memory of Place

Redefining a sense of place through forceful interventions in the form of settler colonialism or attempts of reintegration in a post-colonial scenario needs to draw inspiration from well informed ethical research.

There is little to no digital documentation to illustrate the importance of the Great Tulip Tree, an seasonal gathering place Reckgawawang indians and the greater Lenape civilization. The attempts to recreate, dedicate and memorialize this place don't do justice to the deterioration of an idea of living, sometimes inscribed in well-known practices of bodywork and artistic performance. The memorial plaque in Inwood Hill Park where this tree stood for 220 years until 1932 doesn't fully represent the layers of time and place as best as it possible could. Best practices in Decolonial artistic expression, architectural commemoration of place, auditory and visual performance and any development efforts should be inspired and based on a strong, ethical research methodology to ***resolve drift continuity which can create forms of indeterminate specificity in the formation of altars to the past.***

Rayna Russom's artistic endeavors in the Secret Passage album captures the sound of rail cars, tunnels to evoke traveling to a place, the East Side Rail Tunnel in Providence. Although this is a forgotten urban edgeland and remnant of industrial manufacturing, the death of this place persists and is not definitive. The artists had to be aware and open to the existence of spiritual technologies coupled with digital inventions to capture this phenomenon. For instance, the Sapohanikan indian paths through the metropolis is grafted onto the landscape divot visible through google maps. Although the map of 1922 from the book "Indian paths in the great metropolis" by Reginald Pelham Bolton shows this, the severity of the population displacement to make way for the Dutch West India Company's plantation couldn't be fully commemorated as well, in spite of efforts by Beatriz Cortez's Sapohanikan Market monument at Gansevoort Market and failed proposals to name the 14st street park after the lost civilization.

Much like the blend of various west African spiritual practices embedded in the Kongo-Inspired society of affliction called Palo that "heals the heart by working with the dead to transform the fate of the living", the infliction of socialism on Cuba's diverse society doesn't recognize and appreciate the need to craft a specific political framework. Instead of importing ideologies on place specific societies, involved professionals, politicians and artists should strive to be inspired by existing ideas of living through informed immersive research and build on them for a transformative ethical future.

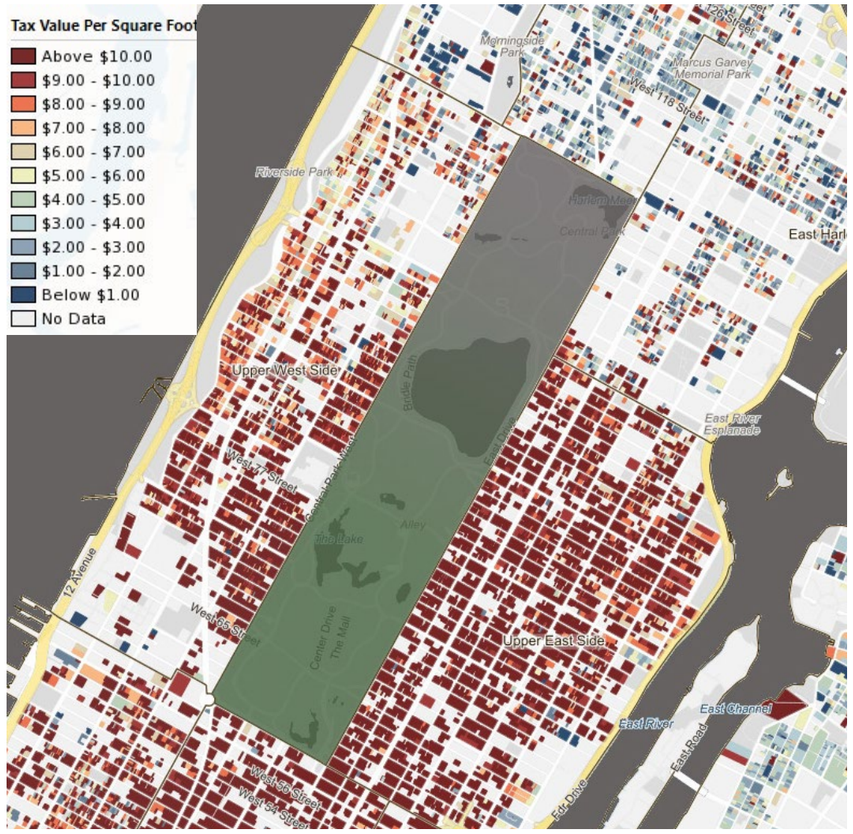
New York Rising

How Real Estate Shapes a city?

Fall 2023
Kate Ascher

This course offers a historical survey of the last two centuries of realestate development in New York City, with a primary focus on Manhattan. It relies on sources held by Columbia libraries and others, including material from the collection of Seymour Durst – the patriarch of oneof New York's foremost real estate families and a passionate collector of the City's historical memorabilia.

Syllabus Prompt



Tax Value Per Square Foot, NYC basemap,2021 NYC Dept of City Planning
A gradient overlay from green to grey shows the historical development patterns of Central Park.

Parks and Property values

A study of the varying influences of Central Park on property value on its Northern and Southern edges

Cities build parks to benefit communities as public amenities and add value to the quality of life of its residents. Property value of real estate adjacent to parks is generally higher than the value of property further away from parks. "The larger the size of a park, the higher the premium is likely to be"[1]. In New York, Central Park currently occupies 843 acres of land in the center of Manhattan. Over the duration of its 15 year construction period, Frederick Law Olmsted, the talented landscape architect that designed the sweeping man made naturalist landscape, found that "assessed values of nearby real estate increased from $1billion to $9.1billion in today's current dollar value"[2] . Although the success of Central Park has added value to land off the parks edge, and has influenced other cities to invest in parks, the value of property northward of 96th Street significantly drops, as shown in Figure 01. Despite sharing the same green frontage, "Central Park South had assessed valuation of almost $80-million in 1970, more than 30 times that of the northern boundary. It is the most valuable three-block stretch of taxable real estate around the park."[3]

It is therefore worth looking into ***what are the reasons that led to the differences in value between properties near the North Woods as compared to properties on the southern boundary near the Zoo, Bethesda Terrace and Grand Army Plaza?***

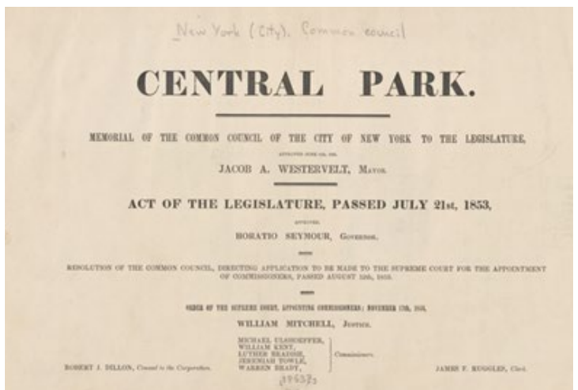
This research paper will highlight the features of successful parks, and then investigate the historical development patterns of the park and of Manhattan so as to assess the causes and the consequences of varying concentration of special features within the Park and the urban landscape that impacted and mutually benefited from the value of residential and commercial property. These attractions are not limited to ponds, meadows, lawns, pedestrian paths, cycling and automobile routes, and sculpture gardens that attract visitors, but also the lack of activity, maintenance and sense of safety in and around the northern edge of the park.

[1](John L. Crompton 2020)
[2](Israeli 2022)
[3](Amster 1970)

As the first landscaped public park in the United States, Central Park was initially conceived in the first half of the 19th century by Mayor Ambrose C. Kingsland and by ***wealthy civic minded philanthropists*** who were inspired by Hyde Park in London and public gardens of Paris. The intentions of creating a municipal park in New York was based on the idea that wealthy households would be able to ride their carriages through the park all whilst providing "a healthy alternative to the saloon" for the working class and ameliorating the international reputation of New York as a vibrant and healthy metropolis. Meanwhile, urban development was largely concentrated in the South and urban expansion towards to the North of Manhattan was pioneered by merchants transitioned into real estate moguls, such as John Jacob Astor, seeking to create luxury apartment residences catering to the wealthy and affordable tenements for the working class. ***The northward development of Manhattan is one of the reasons for the differences in real estate value between the southern and northern edge of Central Park.***

The proposal of Mayor Ambrose C. Kingsland to the New York City Common Council in 1851 started a search for possible sites. Jones' Wood, currently the site of Upper East side Lenox Hill and Yorkville, was a "150 acre dense forest, once a summer retreat for New York's wealthy" overlooking the East River. As the first choice for the city's park, Jones' Wood was owned by the Jones and Schermerhorn families who diligently "battled and obtained an injunction to block the acquisition of their property" by the city even though a bill to appropriate the land through eminent domain was passed in response to the efforts of State senate James Beekman. Furthermore, ***"residents of the West Side preferred a centrally located park"*** for reasons of accessibility and Andrew Jackson Downing, one of the first American landscape designers, preferred the park to be at least 500 acres, for reasons of studied positive impact on the urban landscape and to be located between 39th street and Harlem River.

As an alternative, a 775 acre rocky and swampy tract of land at the center of the island "bounded southerly by Fifty-ninth street, northerly by One Hundred and Sixth street, easterly by the Fifth avenue and westerly by Eighth avenue " was selected. This area was home to about 1,600 residents living in and around small farms and industrial uses scattered between areas of marshland and rocky hills. It was also home to a thriving community of about 225 people living in ***Seneca Village*** located within the


New York (City). Common council

CENTRAL PARK.

MEMORIAL OF THE COMMON COUNCIL OF THE CITY OF NEW YORK TO THE LEGISLATURE,

JACOB A. WESTERVELT, Mayor.

ACT OF THE LEGISLATURE, PASSED JULY 21st, 1853,

HORATIO SEYMOUR, Governor.

RESOLUTION OF THE COMMON COUNCIL, DIRECTING APPLICATION TO BE MADE TO THE SUPREME COURT FOR THE APPOINTMENT OF COMMISSIONERS, PASSED AUGUST 15th, 1853.

ORDER OF THE SUPREME COURT, APPOINTING COMMISSIONERS; NOVEMBER 17th, 1853.

WILLIAM MITCHELL, Justice.

MICHAEL CLASCOFFER,
WILLIAM KENT,
LUTHER BRADISH,
JEREMIAH TOWLE,
WARREN ELLIOT,
Commissioners.

ROBERT J. DILLON, Counsel to the Corporation.

JAMES F. RUGGLES, Clerk.

Central Park : memorial of the Common Council of the City of New York to the Legislature, approved June 11th, 1853...[title page]

boundaries of the park between West 82nd and West 89th Street. Seneca Village was community made up of "two-thirds African American and one-third Irish immigrants" seeking refuge from the treacherous conditions and racial discrimination in lower Manhattan. The Croton reservoir, the Kingsbridge Road, varied wooden landscapes and military fortifications were present on the north end of the park.

On July 21st, 1853, the Central Park Act was passed to develop the designated parcel of land under eminent domain and allowed three commissioners to assess the value of the properties. The land was subsequently purchased by New York City for $5million in 1856. The first commissioners were appointed by the Common Council and Egbert Viele, an engineer was selected to design the park. In 1857, an independent board of commissioners replaced the City appointed ones, and Frederick Law Olmsted, was appointed as the new superintendent of the Park to report to Viele, drain and clear the site to commence with development work in phases. Although the city first accepted Egbert Viele's proposal for the design of the park, Calvert Vaux, a British architect, convinced one of the commissioners to hold a design competition and in a turn of events, the "Greensward" plan, proposed by Olmsted and Vaux himself was selected out of 33 entries. Olmsted became architect-in-chief and Vaux was the consulting project architect. Inspired by Birkenhead Park, the first publicly funded park in England, the democratic designs were intended to create a haven for people of different social and economic backgrounds to congregate and escape the city. The "Greensward plan" featured sweeping meadows, winding paths, large lawns, wooded areas, large pastoral landscapes, sunken transverse automobile roads, segregated pedestrian, carriage and bicycle paths. It also incorporated the existing Kingsbridge road connecting Manhattan to the Bronx.

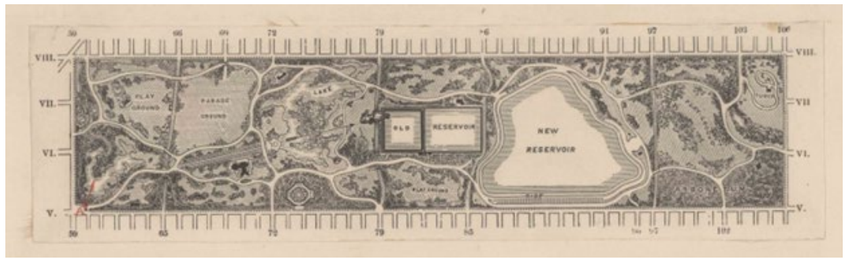
Over 15,000 Irish Americans gathered in Jones Wood in 1856, to greet countryman James Stephen

Construction on the man-made landscapes swiftly began in 1858 right after the design competition. ***The southern areas were developed in the first phases.*** The Lake, located between 72nd and 76th street was filled with water prior to the coming winter for recreational skating and opened to the public.[8] It took 15 more years to complete the park. The project's budget had to be increased from $5million to $14million to reach the completion stages. ***The project's phasing from south to north allowed for the public to access amenities completed in 1860.***

[4,5] (Blackmar and Rosenzweig 1992)[2](Israeli 2022)
[6] (Taylor 2009)
[7] (Kang 2017)

In a recognizable trend, most of these attractions street, such as the Pond, the Ramble, the Bow ridge, the Greywacke Bridge and the many arches and paths, were located below 79th.

The report written by the Board of Commissioners to the Common Council in ***December 1860 indicates that connectivity through Transverse Road crossings No.1 on 65th street and No.2 on 79th street were opened and conveniently threaded business traffic, forged infrastructure links for water and gas***. The safety and comfort of pedestrians, especially children, was taken into consideration by segregating footpaths from horse carriageways through a system of archways.



Map from Greensward Presentation board no. 2. 1858. Department of Parks and Recreation Drawings Collection, NYC Municipal Archives

The postcard below entitled "Hotels Along the Shore of the Lake" is located in the Seymour B. Durst Old York Library collection and shows the Dakota as well as buildings north of it.

The period between 1861 and 1864 was largely ineffective due to the unrest from the Civil War and partial resignation from Olmsted and Vaux. The acquisition of land from 106th to 110th street increased the park's area to its current 843 acres. ***This northward project phasing strategy will be a discernible characteristic of the Park's future development and restoration efforts.***

Bridge Spur Rock Arch, 1862

Belvedere Tower, Lake Ramb, 1862

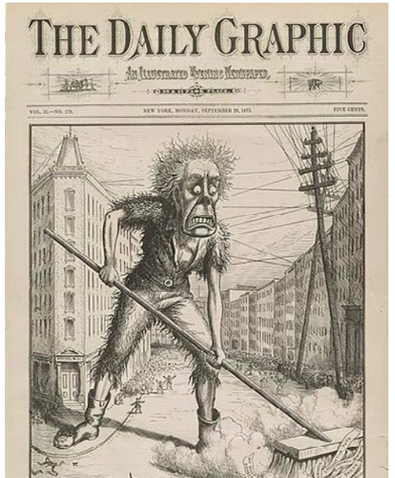
The attention to detail, remarkable craftsmanship and engineering prowess, as seen on the Trefoil Arch, the Bow Bridge, the Winterdale Arch, the Southest Reservoir Bridge, the pillars, arches and vaults of Bethesda Terrace, the Arsenal and other bridges, was concentrated for the most part below 80st street. It endures the test of time and draws visitors entering from the south towards the dense forest and lawns hidden in the Great Hills of the north end of the park but the ***40 minute walk would discourage visitors to wander into the relatively unsafe North Woods.***

Bethesda Terrace rendering, Board of Commissioners Annual report 1858

[8](Warsh, et al. 2023)

Corruption and inequitable park development

Nast drew a reader of the New York Times confronting Boss Tweed. Getty Images



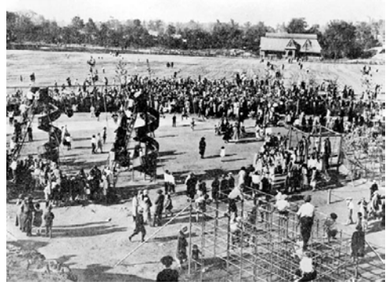
Banking Panic of the Gilded Ages, Federal Reserve History

The complicated politics, social dynamics and periods of economic decline of New York City had several implications on the development of the park in regards to its equitable distribution of attractions, project's management structure and maintenance protocols. Olmsted and Vaux were reappointed as landscape architects in 1865 and construction continues towards the north.[9] Drastic change in 1870 was ignited by William Tweed, a rising corrupt star in local politics who paid hundreds of thousands of dollars in bribes to enact the state legislature, also referred to as the "Tweed Charter", which transferred control of New York City's government from the state to a new City administration. The Tammany Hall's corrupt politicians, led by William "Boss" Tweed were infamous models of Gilded Age urban corruption. Olmsted and Vaux were shortly fired by Peter B. Sweeny, the new park commissioner who helped Tweed. Along with Mayor A. Oakey Hall and Comptroller Richard B. Connolly, the Tweed gang embezzled hundreds of millions of dollars from public projects backed by New York's wealthy, Central Park being one of them. The Tweed administration constructed the Sheepfold, housing 200 Southdown sheep, the Carousel, the Dairy, a popular eatery and the Zoo. Shortly exposed, the corrupt Tweed and his gang are overthrown from local politics and Olmsted and Vaux are reappointed again. Work to complete the park in the north and build the perimeter wall is negatively affected by lack of funds due to Tweed's corruption spree and the repetitive economic panics of the Gilded Ages, further contributing to the loss of influence and the final dismissal of Olmsted. ***The panic of 1873 arose from investments in railroads, shook the Global economy and forced the first shutdown of the New York Stock Exchange, which directly affected ongoing city projects.***

Tammany Hall's corruption and it's effect on the park

Vaux passed away in 1895 and the consolidation of the five boroughs in 1898 transferred control of Central park to one of the three commissioners overseeing the Department of Parks of the City of New York. The cumulative effect of these instabilities on the inequitable development of Central Park's attractions was aggravated in the 1900s due to increasing public use of park and lack of maintenance contributing to the deterioration of the Park's landscapes and facilities. Despite his reduced involvement in the maintenance of Central Park in the late 19th century, the death of Olmsted in 1903 also lamented the demise of any efforts towards equitable distribution of attractions and preservation of the naturalist pastoral landscape. In fact, Olmsted "regularly fought the city's Irish-American politicians who saw the park as a vehicle to expand patronage and wished to add amusements like the Zoo and restaurants such as the Dairy to entertain voters"[10] and gain public support.

Grand Army Plaza, William Tecumseh Sherman sculpture, Central Park Conservancy



Heckscher Playground, Ephemeral New York

Grand Army Plaza, designed by Carrère and Hastings, a lush square displaying a sculpture to honor William Tecumseh Sherman and a ***$50,000 fountain in memory of Joseph Pulitzer,*** an influential newspaper publisher, was built in 1916 between 58th and 60th street on the South-East corner of the park. The Pulitzer fountain, like most memorial sculptures and benches commemorated notable figures, connected authorities with civilians through the design and construction phases of philanthropic projects. In 1927, Central Park's first playground, "Heckscher Playground, was opened in the southern part of the Park"[11] after a report by Herman Merkel, a consulting landscape architect, suggested the addition of playgrounds along the perimeter of the park, construction of new paths for larger crowds, and benches with durable concrete footings. ***Focus shifted on creating "additional playgrounds"12 instead of finalizing and maintaining the northern woods.***

[9](Warsh, et al. 2023)
[10](Blodgett 1976)

[11](Warsh, et al. 2023)
[12](Department of Parks 1911)

Efforts by Commissioners and the Conservancy to revive the park

Attempts by the infamous Robert Moses, newly appointed as the Parks Commissioner, to revive the park between 1930 and 1950 was based on Merkel's proposal. Eighteen playgrounds were constructed in 1935 and the Great Lawn was opened below 84th street. Until his retirement in 1960, Robert Moses greatly influenced the demolition of old pavilions, contrary to public interest, and the construction of the Loeb Boat House, Kerbs Boat House, Chess & Checker house and the Carousel building. The Wollman Rink, a public ice rink, named after the ***philanthropist Kate Wollman, who donated $600,000 for its construction,*** was also opened in 1950 and conveniently located on the lower east side of the Park next to the Pond. The resignation of Moses left Central Park in dismay without adequate maintenance and no oversight translating into dusty meadows, broken benches, unusable playgrounds and a crumbling 100 year old infrastructure.

Before and After pictures showing the renovation of the Great Lawn

After the opening of the Delacorte, a classical music performance center for 1,800 people on 80th street, and an increase in the frequency of large scale events added pressure on existing infrastructure and the parks newly appointed Commissioner Thomas Hoving to accommodate the growing number of park visitors, especially in the mist of the 1975 New York City Fiscal Crisis which forced budget cuts and massive layoffs in the Parks Department. A report published by a Columbia University Professor E.S. Savas recommended the creation of a private citizen based board and the employment of at least one unpaid individual by the Parks Department to oversee the daily activities. This prompted private citizens such as Richard Gilder and George Soros to establish the Central Park Community Fund. The Park was designated as ***"the first Scenic Landmark "after the Landmarks Preservation Commission expressed unanimous approval to reverse the repeated incursions, invasions, violations of substance and style"*** [13] committed in the first century of the Park's life. Eyesores such as the brick refreshment at the Sheep Meadow, the skating rink at the Harlem Meer on 106th Street were considered as an erosion and destruction of Olmsted and Vaux's initial design intent. Elizabeth Barlow Rogers, an urban planner, writer and civic activist, who led the Central Park Task Force, was appointed as the first Central Park administrator with the support of Mayor Edward I. Koch's Parks Commissioner Gordon Davis. The Public Private Partnership between the Central Park Task Force and the Central Park Community Fund gave birth to the Central Park Conservancy on December 1980 so as to bring private resources to the public Park. The $100 million "Central Park Management and Restoration Plan" was a 10 year plan that allowed a pipeline of endowments to finance the restoration of the park's infrastructure and landscape. In 1981, a reported $2million in donations, most of which were at least $1,000 each, initiated the renovation of Bethesda Terrace, Belvedere Castle, the Strawberry Fields memorial to John Lennon murdered in the Dakota at 72nd Street, the Wollman Rink, the Grand Army Plaza and the Zoo. The Wollman Rink was taken over by Donald Trump and the Zoo was newly managed by the New York Zoological Society after a $35million renovation. Fundraising initiatives such as the Olmsted Awards Luncheon and "You Gotta Have Park Weekend" ameliorated the success rate of the Central Park Management and Restoration Plan but priority was given to park features located south of 80th street for the first phases of

[13] *(The New York Times 1974)*

Proliferation of Crime in the north prompts restoration efforts 'FINALLY'


TERROR IN CENTRAL PARK: VICTIM HAS 50-50 CHANCE

'WILDING' TEENS HELD IN RAPE

7 are called part of wolf pack

Seven teenagers were charged yesterday with brutally raping and nearly killing a jogger during a crime spree in which nearly three dozen youths roamed Central Park "wilding" — randomly attacking anyone they found.

Central Park Jogger Case, the Daily News, 1980

Belvedere Castle covered in Graffiti, subsequently cleaned by Central Park Conservancy, 1980

The restoration of the long neglected North East Section was only commenced at the turn of the 1990s after the southern portion of the restoration plan was completed and after several assaults on April 19 1980 by a group of 20 to 32 teenagers from East Harlem who entered the park through the North Entrance. Regarded as "one of the most widely publicized crimes of the 1980's" [14], ***the Central Park Jogger Case***, one of the many crimes committed that day, concerned the assault of jogger Trisha Meili and the unlawful conviction of dozens of teenagers. A topic of national interest, the case ignited discourse on lawlessness, criminal behavior by youths, violence against women, racial profiling, discrimination and inequality in the legal system, the media and public administration of the city of New York in the 1990's. ***A $51 million capital campaign*** enabled the completion of the restoration work on the Ravine, the Harlem Meer, the North Woods and the Dana Discovery Center financed by the Central Park Women's Committee and the Charles A. Dana Foundation.

Although Elizabeth Barlow Rogers stepped down as the Park's administrator in 1995, restoration and maintenance work on Central Park continues till today under more of less the same organizational structure led by the Conservancy, assisted by the Greensward circle of young volunteers and continuous endowments from wealthy citizens, often with concentrated interests in developing the southern portions of the Park. ***As of 2016, the Conservancy has spent a total of $800 million to improve the park***[15]***.*** Its annual budget grew to $67 million in 2016 and overall yearly endowments reached a ***record breaking $200 million with single donations of "$100 million in 2012 from hedge fund manager John A. Paulson***, who had deep rooted connections with the park as a child"[16] and multiple small donations from about 55,000 people living within a "10 minute walk from the park". In the face of President Obama's temporary tax increase for the super-rich, such ***large donations were viewed by many billionaires opposing his policy as a means of privatized taxation***[17] camouflaged by charitable donations.

[14](Farber 1990)
[15](Central Park Conservancy 2016)
[16](Foderaro 2012)
[17](Freeland 2012)

Studies on the increase in property value associated with the park

Despite the first research on the effect of parks on property value conducted in 1856 through 1873 by the Board of Commissioners of Central Park was naïve and unconvincing, the foresight of Frederick Law Olmsted in studying the increase in property values associated with parks was consolidated through the tenfold increase in value of three wards estimated at $26.4 million ($1billion in current dollars) in 1856 before the start of the Central Park's development and worth $236million after completion of the park in 1873 ($9.1 billion in current dollars).

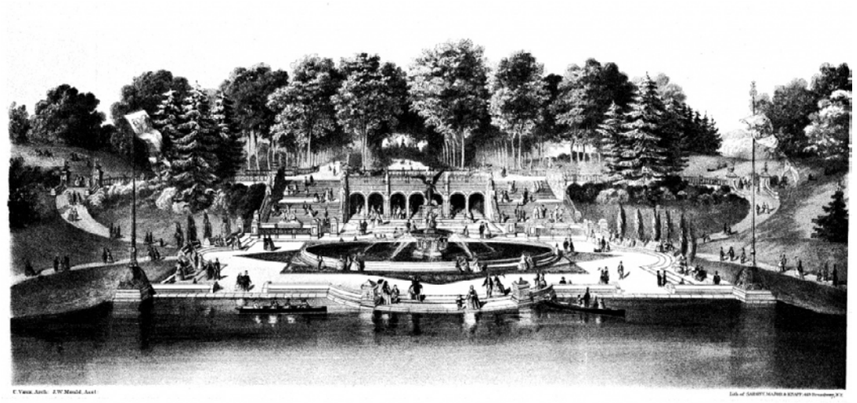
The Central Park effect has generated enough tax revenues to cover its construction and maintenance costs. ***According to a 2015 study, the park has added $26 billion to market values of properties around it. The internal rate of return of Central Park as an investment over the past 148 years is 40%.*** It is undeniably an urban planning success and a historic win for New York with the involvement of concerned citizens and intricate public partnership initiatives. Central Park has created the most prestigious views from the most expensive multi-family residential (432 Park Av, One57, Central Park Tower) and commercial units in the world mostly condensed on its southern edge, currently referred to as Billionaires Row. Some businessmen such as Peter Grimm, of William A. White & Sons prefer the setting of trees, pools and sculptures to close their business deals instead of meeting in the confinement of an office space.

"The city's books confirm that Central Park South has an assessed valuation more than 30 times higher than that of the northern boundary. It is the most valuable three-block stretch of taxable real estate around the park."[18]

John A. Paulson at the Bethesda Terrace after his substantial donation in 2012, The New York Times

Analyzing the historical development patterns of Central Park has given insight into ***how the inequitable distribution of attractions within the Park is linked to the legal and illegal interplay between politicians and wealthy philanthropists***, mostly located in the southern peripheries of the Park that dictated the purpose and the location of the some of the most attractive features of the Park.

[18](Amster 1970)



1862, Belvedere Terrace

1862, Belvedere Terrace, Lake Ramb

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New York Public Library, Rockefeller Center and One Vanderbilt

For projects located at the center of Midtown, near Times Square and Grand Central Station, spaces that draw people from all over the world, ***the relevance of open space to the perception and experience of the City and its monuments to power,*** resilience, intellect, economic might and technological advancement is noticeable. ***The multilayered programmatic arrangements, the direct connections to public transit, the charitable gifts of open space by the benefactors and the timeless architectonic languages reflecting the period are some of the features shared by the New York Public Library, the Rockefeller center and One Vanderbilt share, despite being built in different epochs (1897, 1933 and 2017 respectively).***

Sitting in the commercially active and lush 4-acre winter village oasis of Bryant Park, one can enjoy the performances in the ice-skating rink and benefit from views to the historic East façade of NYPL yet still witness the iconic design of One Vanderbilt with its interlocking tapering planes, spiraling up to the second highest observatory deck. A product of the historic east midtown rezoning, deemed the standard for 21st century development, urban planning and model for the Public Private Partnership projects, One Vanderbilt draws its planning ethos from the privately developed Rockefeller Center, the brain child and gift of John D. Rockefeller to the City, but also from NYLP which consolidated three libraries (the Astor Library, the Lenox Library and the Tilden or New York free circulation library). The democratic idea of multilayered planning efforts to create office space with stepped roof gardens, retail and restaurant on the street level and a sunken plaza connecting directly to transit through the processional majestic corridors and the 30 Rock Lobby, a space adorned with Jose Maria Sert's classical yet modern mural of "American Progress", Lee Lawrie's glass sculpture and a combination dramatic fluting columns, horizontal storefronts capped with bronze, rich dark brown black granite with terrazzo inlay and white plaster ceiling pulls visitors into the lobby much like the Astor Hall.

These powerful indoor spaces are extensions of the open civic spaces which lead the visitors in a processional sequence of spaces with sculptures that symbolize the ideas of the era and the diversity of design methodologies. For instance, NYPL is raised on a terrace, similar to the Beaux art European palace design and steps back two full blocks, along fifth avenue, a highly valuable piece of land, to allow 50,000 people to visit it on the first day it opened. Carrere and Hastings design of finely detailed lamps, pediments, lion sculptures (named Patience and Fortitude) within the largest marble structure of the times are set in stark contrast to the muted West façade of Bryant Park that relates more to modernism. Isomu Nagochi's "News" steel sculpture and Bas relief by Gaston Lachaise relate to the Associated Press and the workman that built the Rock. The feminine Art Deco stainless steel façade Radio city music Hall located on the corner of a block and the light coves within the long spanning stage, reminiscing Transatlantic trade harmoniously coexist with deeply masculine and heroic imposing volumetric towers of the complex. This coexistence is the mark of New York City that one feels but might miss while sitting in Bryant Park above the underground extension of NYPL with state-of-the-art compact storage of 4 million catalogues items along conveyor belts and while walking between Grand Central Station on 42nd and 4,000sqft Transit Hall in One Vanderbilt guiding 65,000 passengers to the new LIRR east side access platforms. The enclosed 30ft Borus Hall on lower levels, the impressive wooden ceiling vaults of McGraw Rotunda, the quiet Rose reading room, deemed the largest interior spaces spanning two city blocks without columns, domes or steel reinforced walls to support the tall ceiling are miracles of engineering, architecture and construction. The culmination of this in the 21st century, ***One Vanderbilt still respects the view corridors to Grand Central by creating angled sloped ceiling and lines on its podium rising 100 ft high above street***.

The juxtaposition of these complicated indoor and outdoor, quiet and active, large and compact, high and low, classical and modern design features define Midtown and the City grounded in the coexistence of people and the blend of heritage and construction efficiency.

Housing and Urban Renewal Reflections

The intentions of Robert Moses to create affordable and public housing through an early form of Public Private Partnership (PPP) was, in my opinion, a good step towards creating better living conditions for urban dwellers in a growing metropolitan area. This being said, ***uncontrolled institutionalized racial segregation*** was one of the reasons that led to the decline of his power as Chairman of the Mayor's Committee on Slum Clearance.

As an effective negotiator, Moses led the fast-paced urban renewal of New York City which created a thriving middle class, improved higher education facilities and the initiated many private companies to work through the incentives of participating affordable housing development projects. ***His actions at the height of his power left many scars associated to large scale ruthless slum clearance projects***, yet allowed New York to re imagine dilapidated and ignored areas with potential real estate value such as the lower east site. Although the effects of urban densification on carbon emissions were not quantified in the 20th century, it is currently accepted that urban sprawls and reducing densification increase emissions due to elongated commutes and the use of private transportation instead of public transport. Without knowing the implications of densification on household carbon footprints, Robert Moses was a pioneer at crafting ***Title I which improved the urban fabric by allowing for middle income and low-income households to coexist efficiently***, established cooperation between authorities and private companies all while increasing the federal grants for planning as compared to other cities.

The main reason for allow PPP projects to lead the way forward in creating housing is the mutual benefits of the city, private companies and labor unions. These relationships are lubricated by government led incentives to pull efficient private developers into these projects. The interaction of the city and the sponsor prior to selection and purchase of the site was the first crucial factor as it guaranteed prospective sponsors to trust the process and invest in the project due to clarity of the project parameters. Speculative redevelopment approaches as practiced by the Newark Housing Authority in1953 proved that interest of the private sector must be guaranteed before clearance and auction of the land.

Furthermore, site demolition, clearance, provision of basic infrastructure and dealing with tenant relocation were important factors that captured the attention of companies such as MetLife, which aimed to increase life insurance market share by keeping white middle classes in the urban core. It is also evident, that the bureaucracies and inefficacies of government entities in dealing with large scale renewal projects lead to the project failures.

Successful cooperation between authorities and privately operated companies to provide adequate services such as housing for city dwellers is one of the solutions to justify that the city is the world's greatest invention if it correctly densifies its urban core.

His discriminatory gestures in selecting the victims of his next demolition and slum rehabilitation projects were rightfully feared, contested, and protested against many New Yorkers. Although he enabled many to be housed in an increasingly expensive global metropolitan area, Moses was somewhat influenced by the senseless modernist principles invented by the likes of Le Corbusier. The absence of active street walls in NYCHA developments dramatically alienated these developments from urban economic activities and the verticality of slums created visual and auditory barriers to survey children's safety whilst playing outside. Allowing all class brackets to co-exist next to each other without eliminating a street wall would have been the correct measure to make dense urban centers such as New York to be solutions to allow humanity to inhabit this world effectively. Sensitivity to architectural interventions as illustrated by the works of Zeckendorf and I.M. Pei are crucial in establishing affordable housing yet most authorities and planners, including Moses, have shortfalls in setting regulations for quality of spaces.

Mutual benefits between private and public entities are avenues to create better urban fabrics in developing states as well. The World Bank states that government's role should be to enable environments for the private sector and including individuals to deliver housing.

A New Architecture of Invisibility

Wind, Electricity and Infrastructure

Fall 2023
Dan Wood and Layna Chen

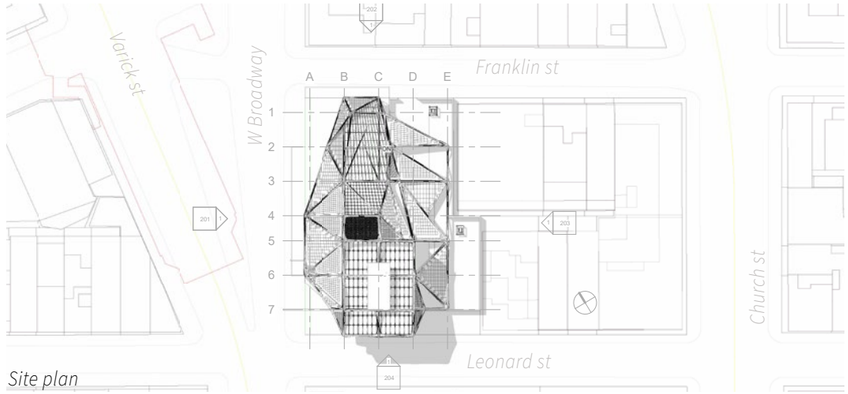
This studio studies the history of air architecture and work to understand how wind power works – at every scale from the atmosphere to the apartment - and its physical requirements for a new age of sustainable electricity. Representatives from NYSERDA lectured extensively on new wind power strategies for New York and its impacts on in building ports, power stationsand vessels.

Syllabus Prompt for Advanced Summer Studio

South Facade viewed from Leonard Street

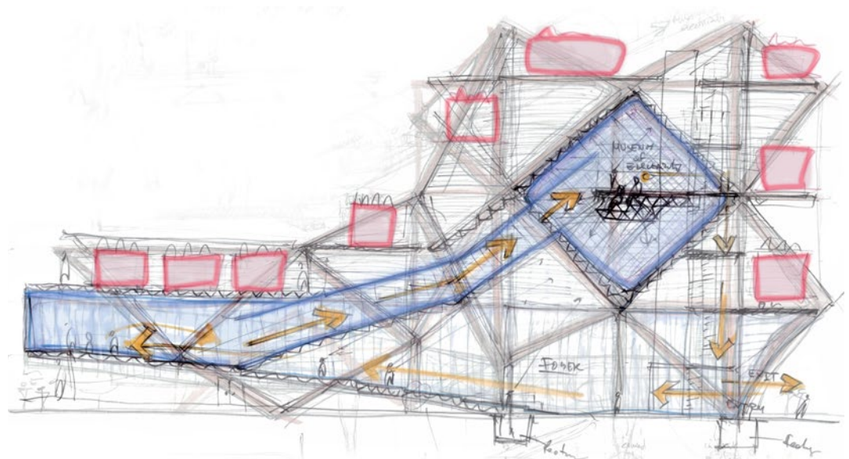
Mesh Substation & Museum of Electricity

Leonard Street, New York, NY



Site plan

The Experiential Journey through the Museum of Electricity would create awareness of the implications of the electric grid's transition to renewable energy consumption. ***Lifting the existing substation equipment*** will allow the public (highlighted in orange) to enter and experience the history of electricity as illustrated through the developments of transformers as well as household and industrial electricity equipment. The building will pull pedestrians into a foyer in which the ***buzz of lifted substation equipment*** (highlight in red) will help them experience the production and distribution of electricity.



Parti Diagram showing Cerebro Portal in Blue and Substation equipment in Red

Copper is the main conductor of Electricity used in all the cables, transmission, generators and other equipment.
The push towards renewable energy sources will drive the global copper (Cu) demand going forward.
Chile is the largest producer of copper and average ore grades have falled by 30% over the last 15 years. New sources of copper will be valuable in meeting the growing demand needs for the clean energy transition.

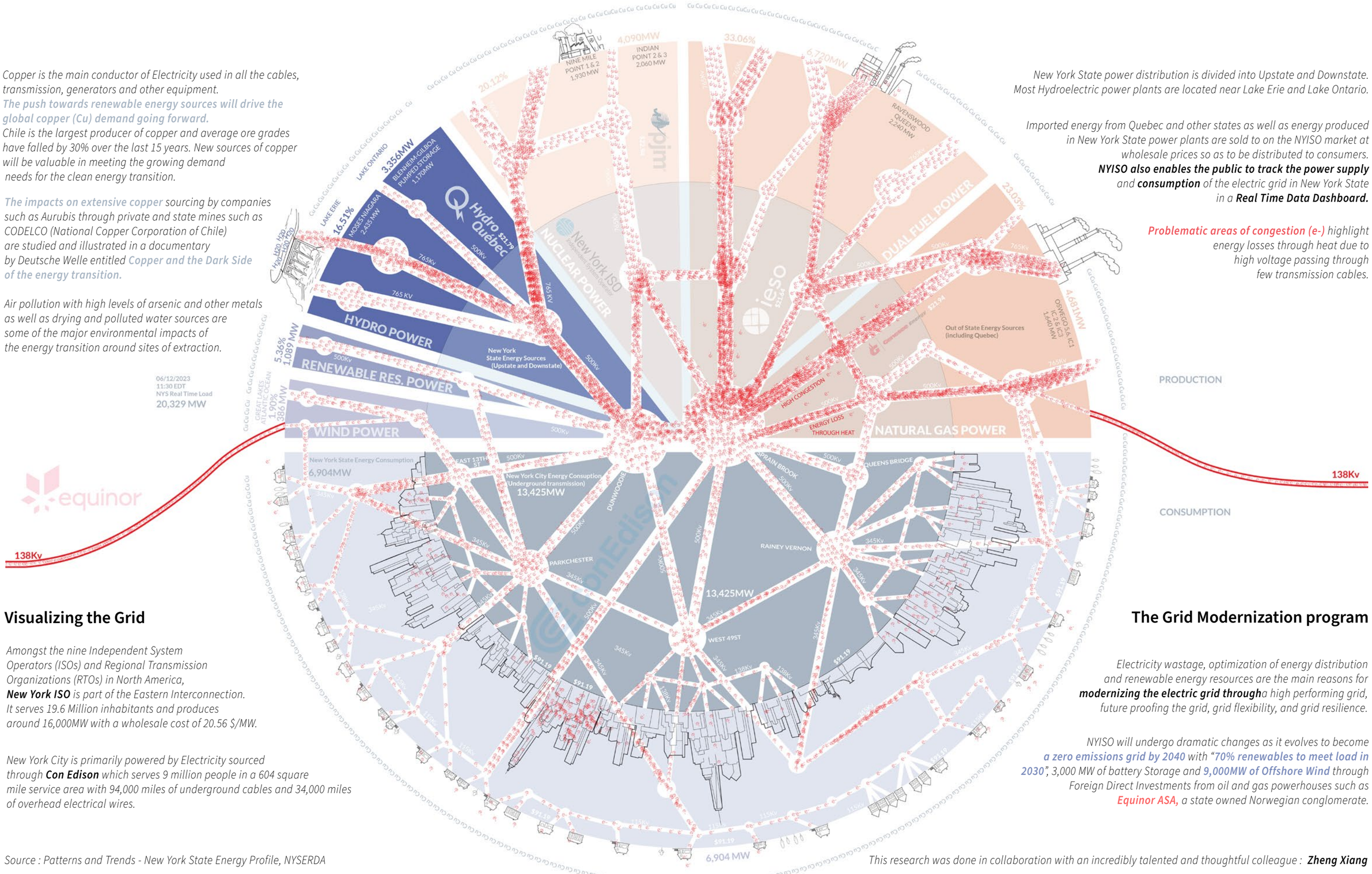
The impacts on extensive copper *sourcing by companies such as Aurubis through private and state mines such as CODELCO (National Copper Corporation of Chile) are studied and illustrated in a documentary by Deutsche Welle entitled* ***Copper and the Dark Side of the energy transition.***

Air pollution with high levels of arsenic and other metals as well as drying and polluted water sources are some of the major environmental impacts of the energy transition around sites of extraction.

New York State power distribution is divided into Upstate and Downstate. Most Hydroelectric power plants are located near Lake Erie and Lake Ontario.

Imported energy from Quebec and other states as well as energy produced in New York State power plants are sold to on the NYISO market at wholesale prices so as to be distributed to consumers. ***NYISO also enables the public to track the power supply*** *and* ***consumption*** *of the electric grid in New York State in a* ***Real Time Data Dashboard.***

Problematic areas of congestion (e-) *highlight energy losses through heat due to high voltage passing through few transmission cables.*



Visualizing the Grid

Amongst the nine Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) in North America, ***New York ISO*** *is part of the Eastern Interconnection. It serves 19.6 Million inhabitants and produces around 16,000MW with a wholesale cost of 20.56 $/MW.*

New York City is primarily powered by Electricity sourced through ***Con Edison*** *which serves 9 million people in a 604 square mile service area with 94,000 miles of underground cables and 34,000 miles of overhead electrical wires.*

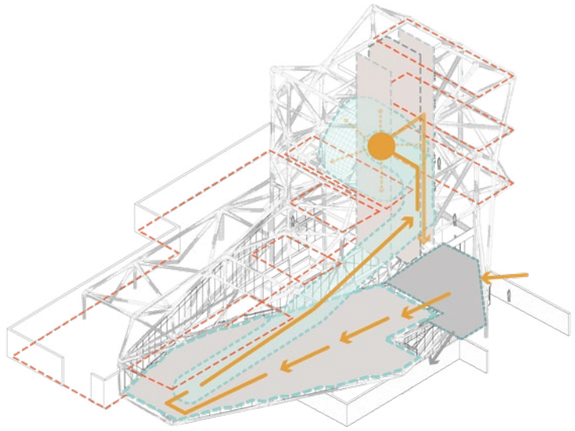
The Grid Modernization program

Electricity wastage, optimization of energy distribution and renewable energy resources are the main reasons for ***modernizing the electric grid through****a high performing grid, future proofing the grid, grid flexibility, and grid resilience.*

NYISO will undergo dramatic changes as it evolves to become ***a zero emissions grid by 2040*** *with "****70% renewables to meet load in 2030****", 3,000 MW of battery Storage and* ***9,000MW of Offshore Wind*** *through Foreign Direct Investments from oil and gas powerhouses such as* ***Equinor ASA,*** *a state owned Norwegian conglomerate.*

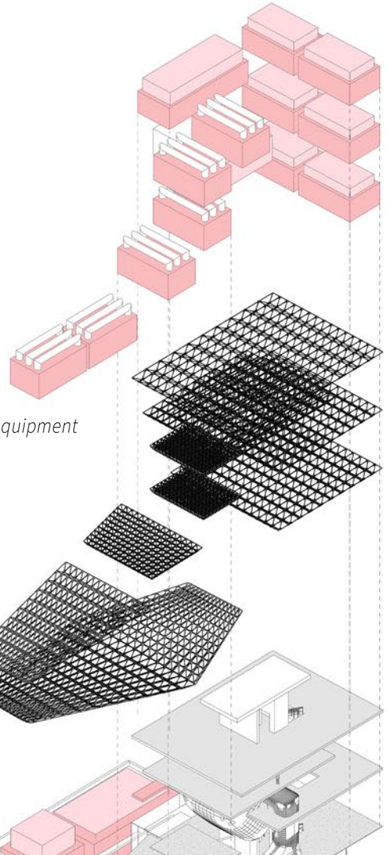
Source : Patterns and Trends - New York State Energy Profile, NYSERDA

This research was done in collaboration with an incredibly talented and thoughtful colleague : ***Zheng Xiang***

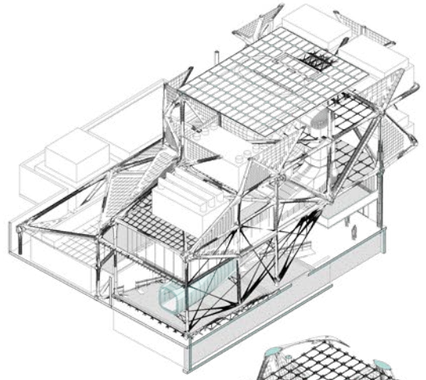


Circulation diagram through the experiential journey

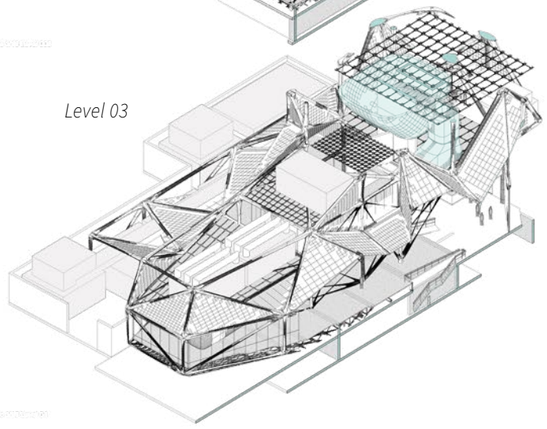
- Public circulation path
- Foyer
- Chronological exhibit
- Cerebro portal
- Substation equipment
- Building Core



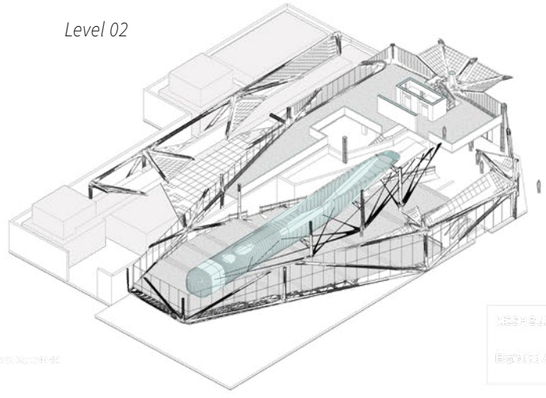
Lifted substation equipment



Level 03

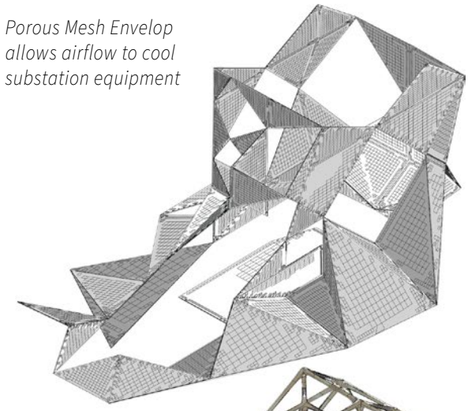


Level 02

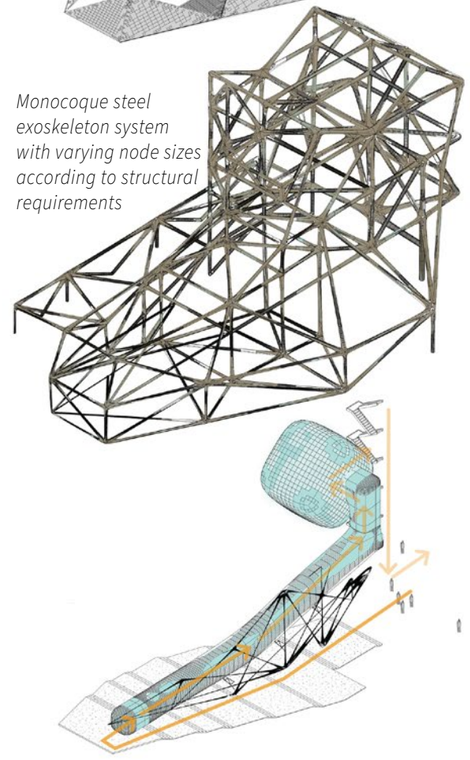


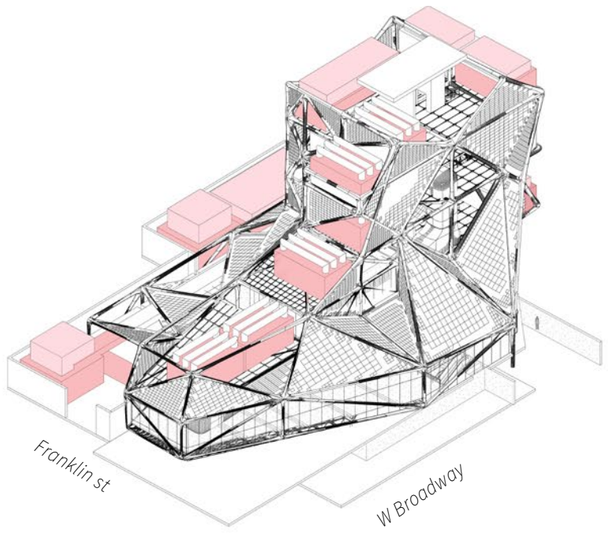
Level 01

Porous Mesh Envelop allows airflow to cool substation equipment



Monocoque steel exoskeleton system with varying node sizes according to structural requirements



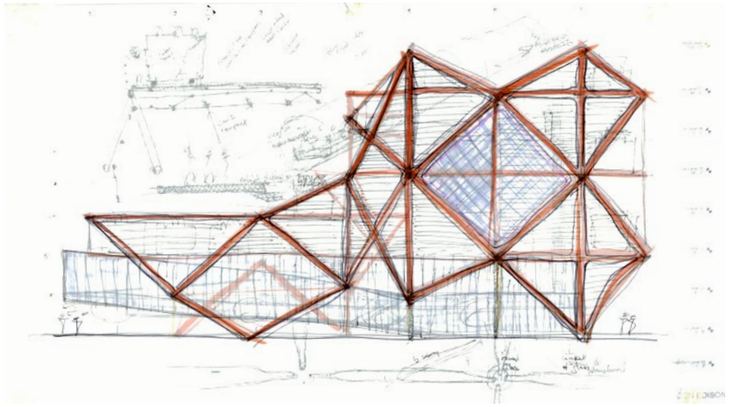


Overall Axonometric view from North East

Floor plates, Curtain wall glazing and large substation equipment

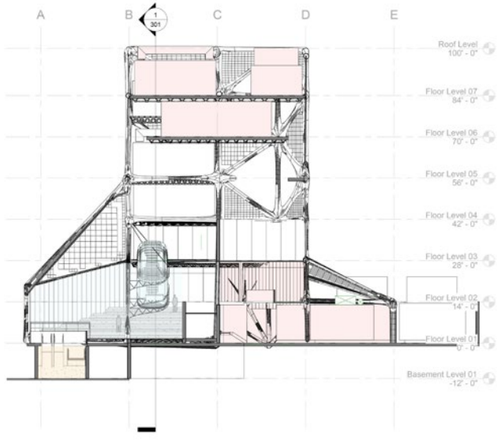
Level 01

Moving walking through Cerebro lightly supported by Web

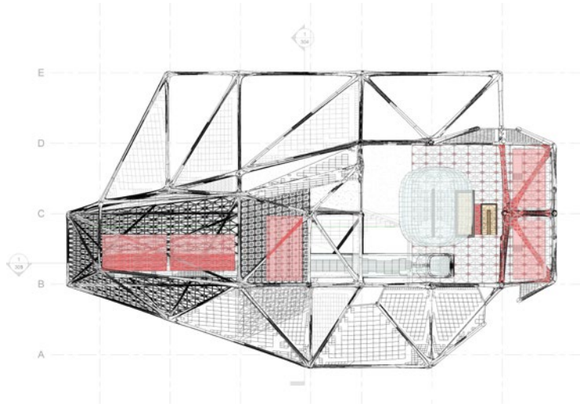


Working West elevation studying structural exoskeletal composition

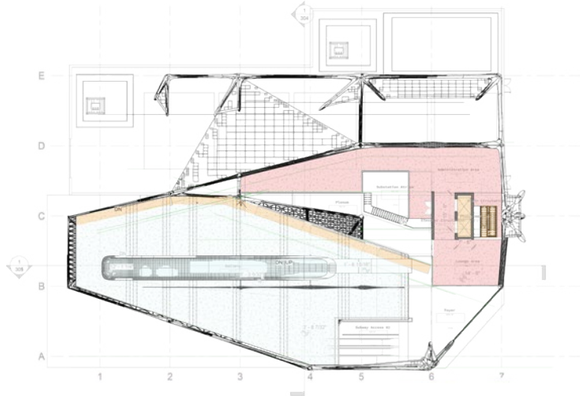
The electric grid and the green energy transition of the Global North will increase global consumption and extraction of rare minerals, people that visit this experiential journey will start by walking or scrolling up a gentle ramp in which the first electric substation equipments and household equipments will be displayed. Then, they will switchback on a cantilever landing and enter a futuristic portal (highlighted in blue) with a moving walkway proceeding into a 360° projection cube displaying the flow of electrons.



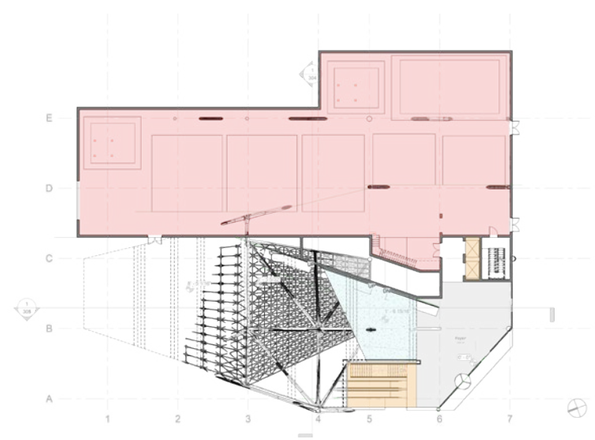
Transverse section showing nine levels. Notice roof level at 100'



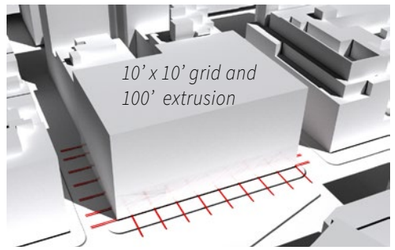
Floor plan level 05 (56' above ground)

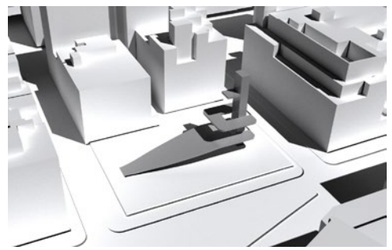


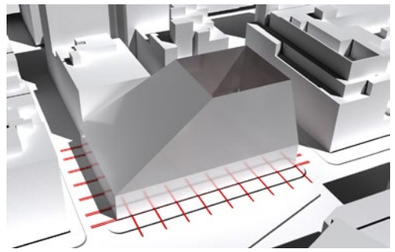
Floor plan level 02 (14' above ground)

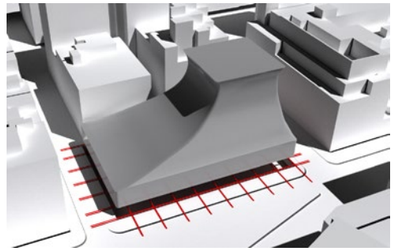


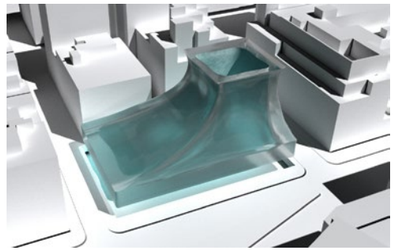
Floor plan level 01 (0' above ground)

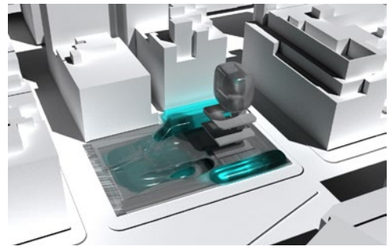

10’ x 10’ grid and
100’ extrusion

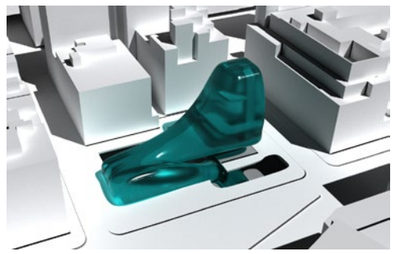


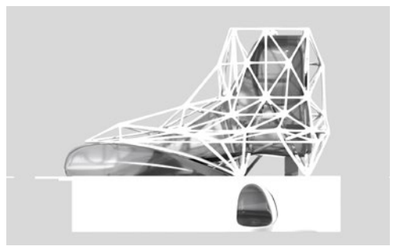


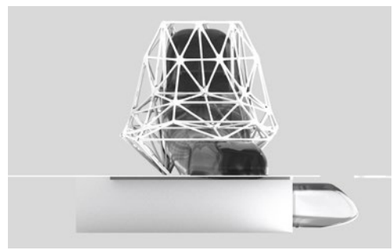


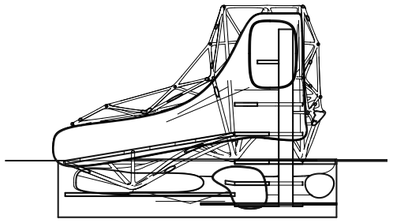


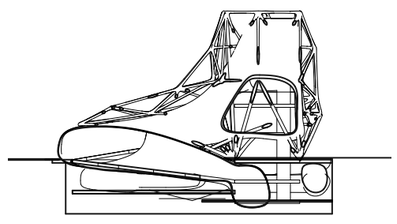


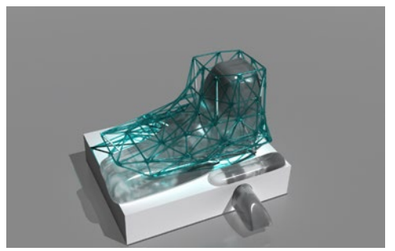


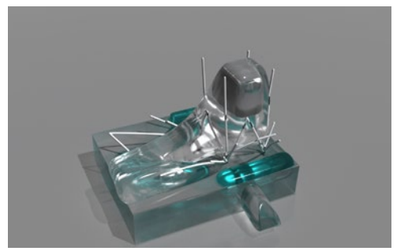


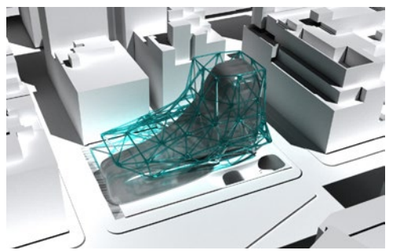


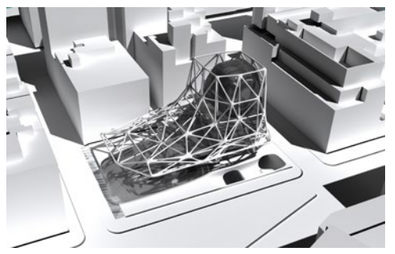


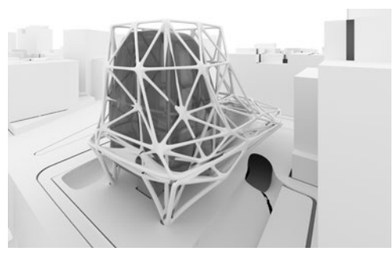








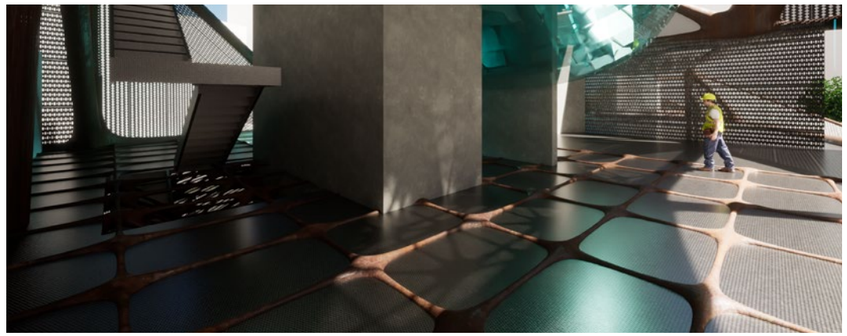




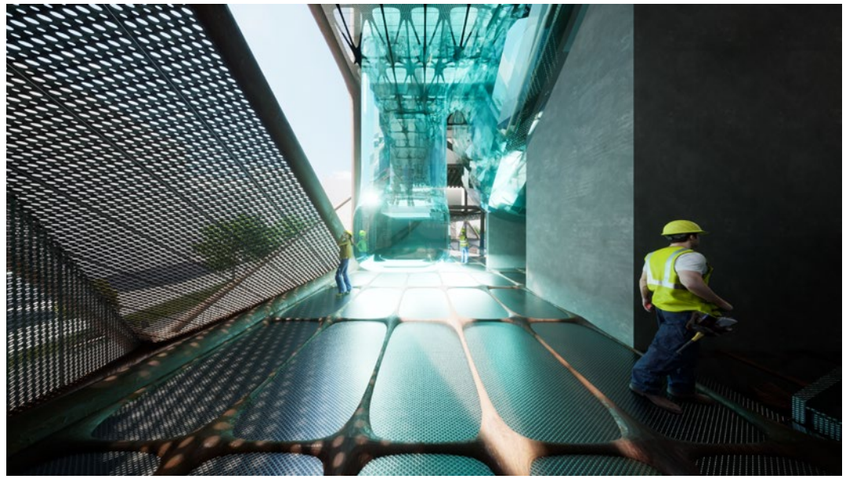
View from West Broadway and Varick street intersection
Raw model produced through Rhino Inside and Autodesk Revit.
Rendering in Twinmotion and postproduction in Adobe Photoshop

Section through Cerebro Portal

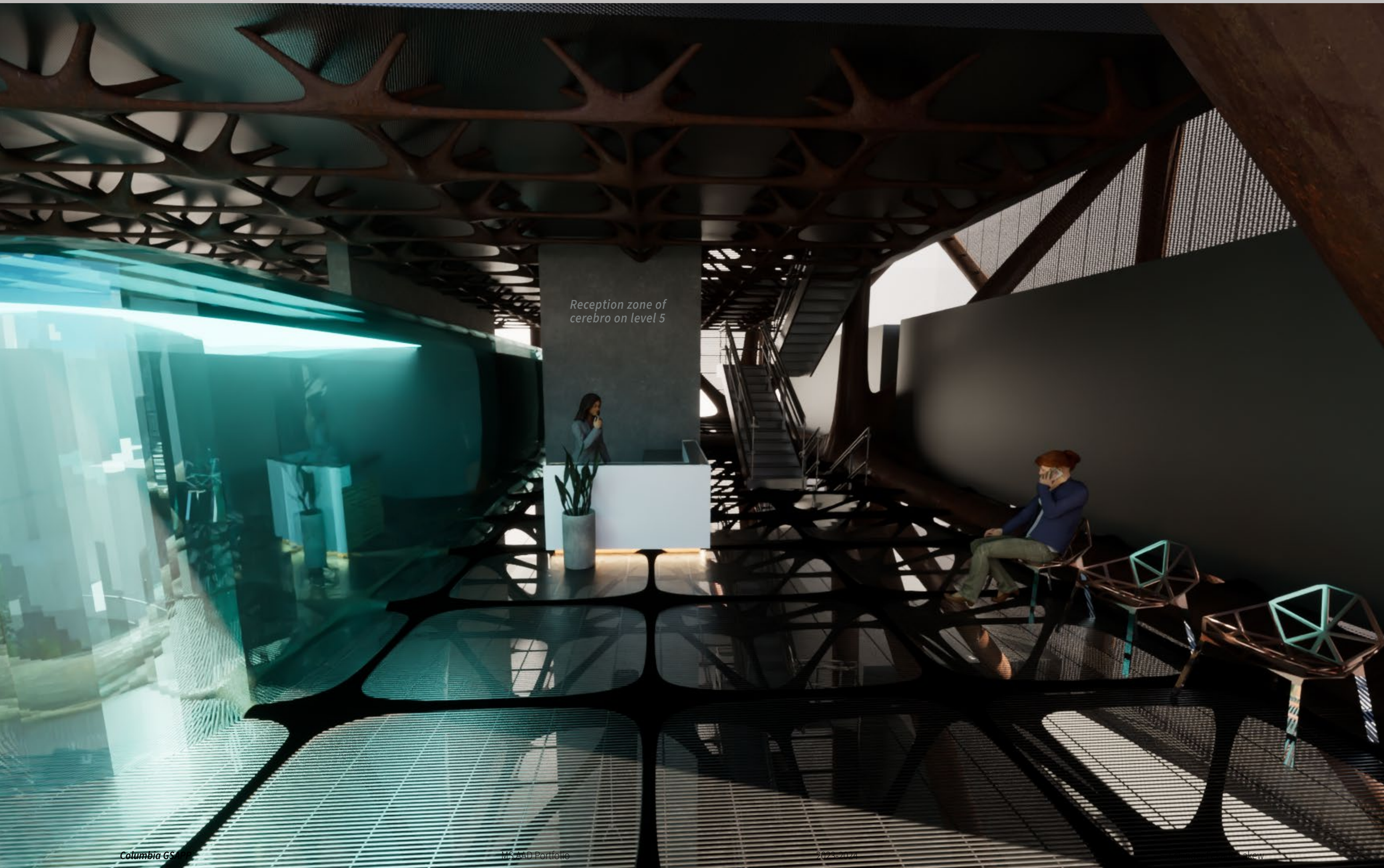
View of chronological Exhibit of the Electric Grid (right to left) Cerebro Portal (left to right) on level 1



View of Administrative zone on level 2 which contains Supervisory Control functions



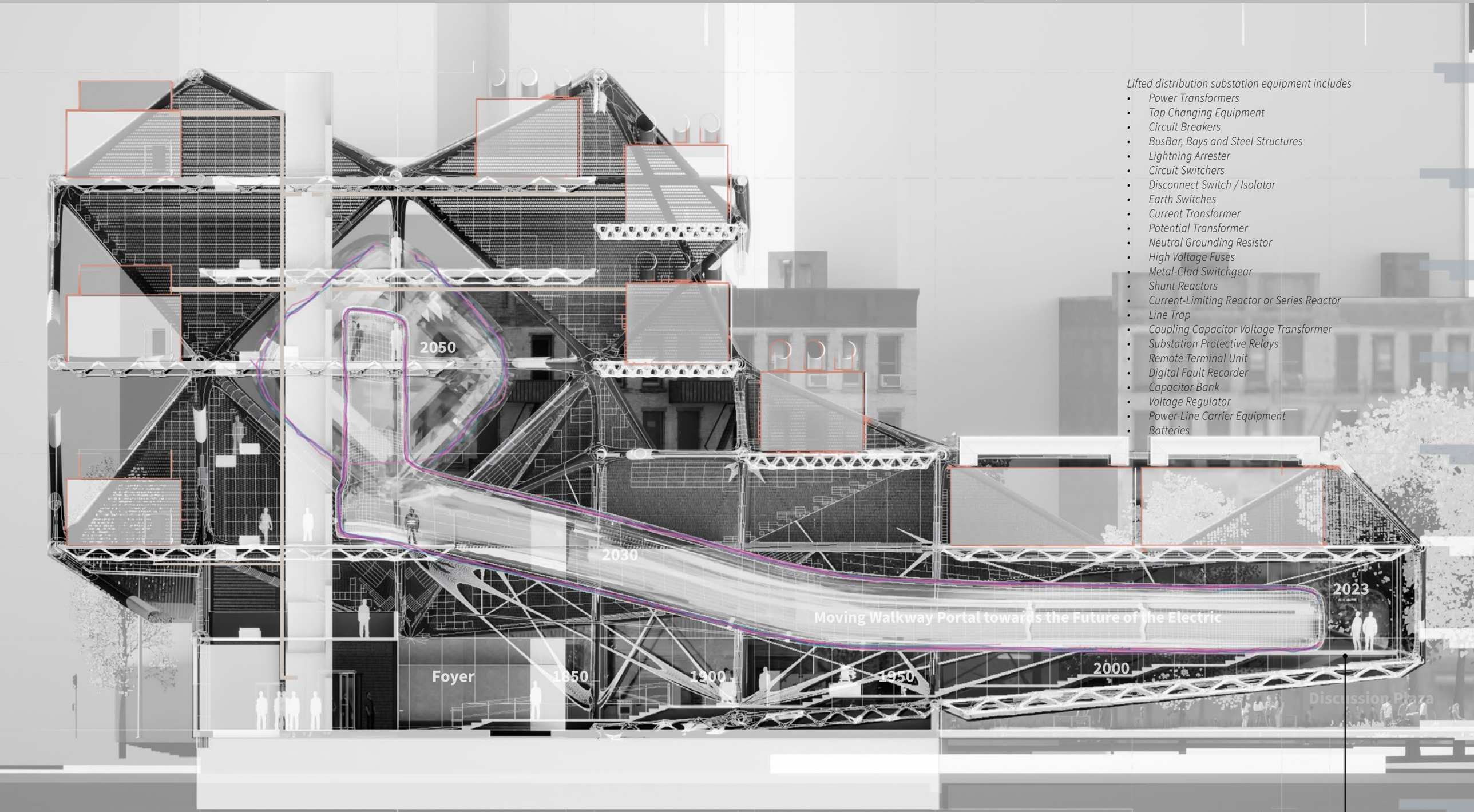
View of Administrative zone on level 5 where we locate the Control House and the Control Panel



Reception zone of cerebro on level 5

The underbelly next to the Discussion plaza

View from Franklin street

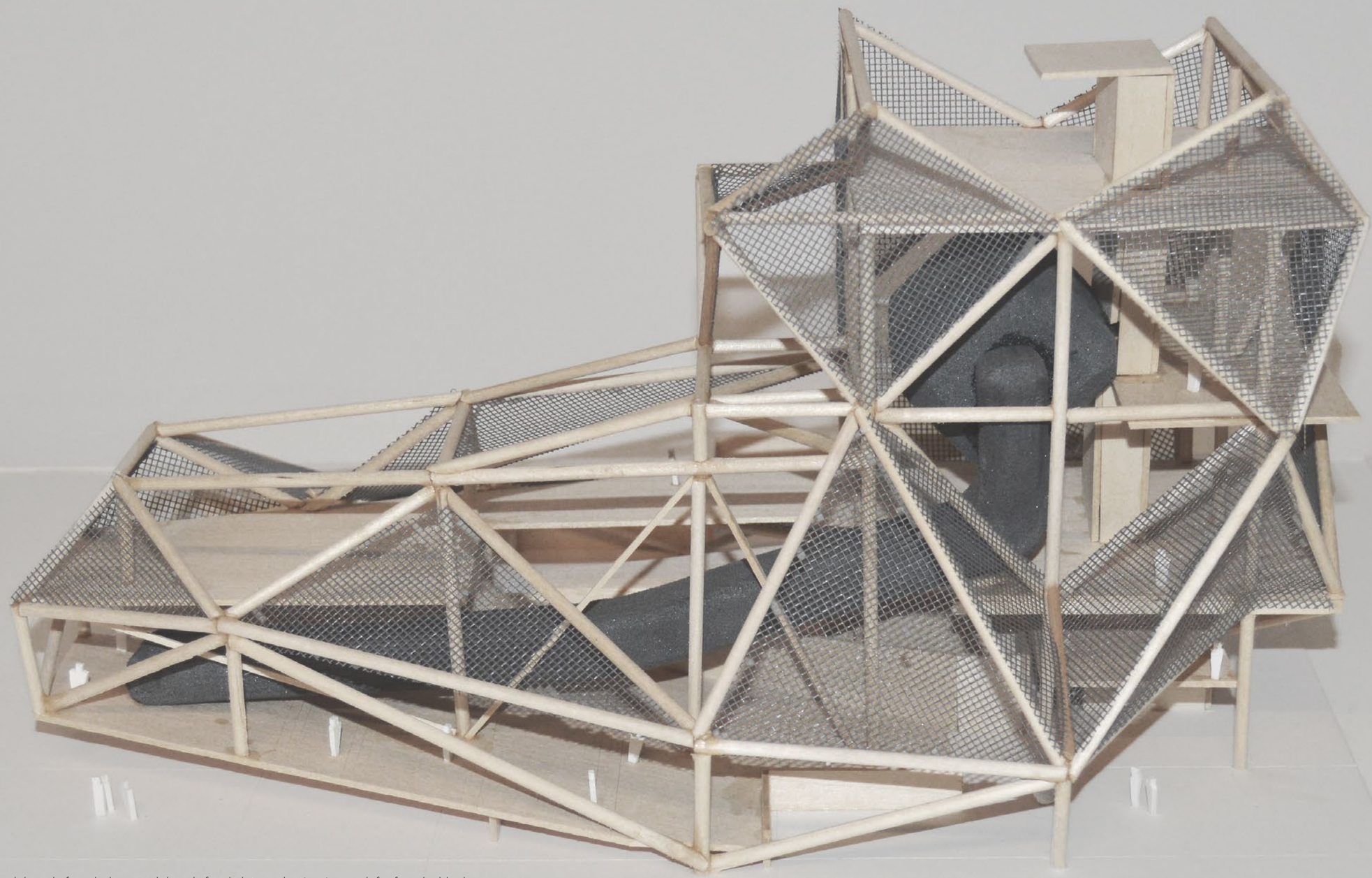


Lifted distribution substation equipment includes

- *Power Transformers*
- *Tap Changing Equipment*
- *Circuit Breakers*
- *BusBar, Bays and Steel Structures*
- *Lightning Arrester*
- *Circuit Switchers*
- *Disconnect Switch / Isolator*
- *Earth Switches*
- *Current Transformer*
- *Potential Transformer*
- *Neutral Grounding Resistor*
- *High Voltage Fuses*
- *Metal-Clad Switchgear*
- *Shunt Reactors*
- *Current-Limiting Reactor or Series Reactor*
- *Line Trap*
- *Coupling Capacitor Voltage Transformer*
- *Substation Protective Relays*
- *Remote Terminal Unit*
- *Digital Fault Recorder*
- *Capacitor Bank*
- *Voltage Regulator*
- *Power-Line Carrier Equipment*
- *Batteries*

Longitudinal Section, Model produced through Rhino Inside and Autodesk Revit followed by rendering in Twinmotion and postproduction in Adobe Photoshop and Illustrator

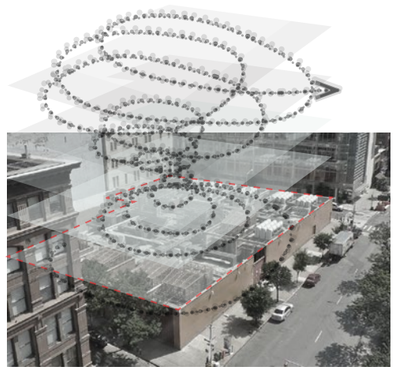
The turning point represents the switch from a journey exploring the history of the grid on level 1 and into a moving walkway towards the future of the electric grid.



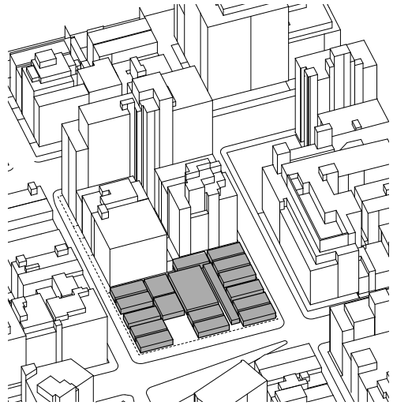
1/16" Physical model made from balsa wood dowels for skeleton, plastic wire mesh for facade, black styrofoam carved delicately for the Cerebro moving walkway and museum board and foam core for base

Schematic design phase

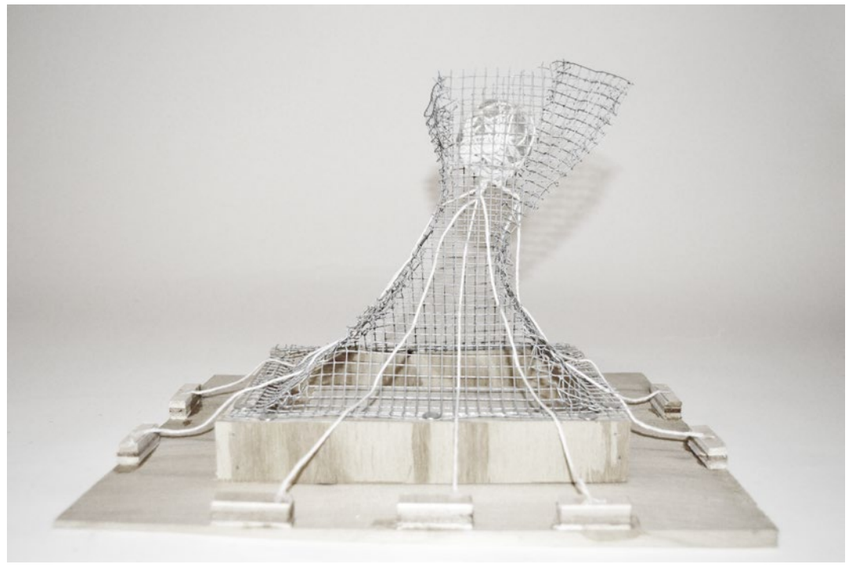
Lifting the copper ball to make invisible infrastructure visible



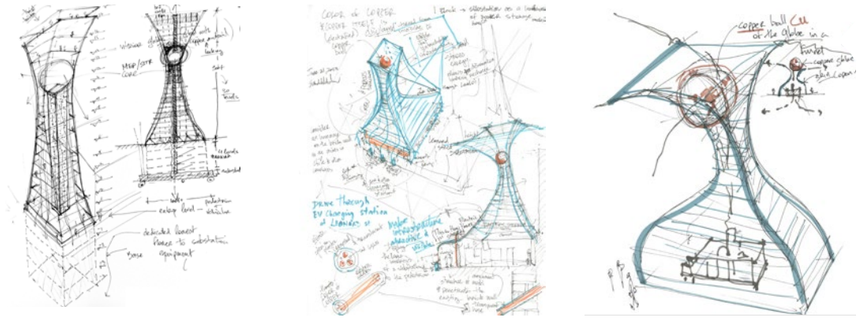
Google Earth view of Leonard street substation



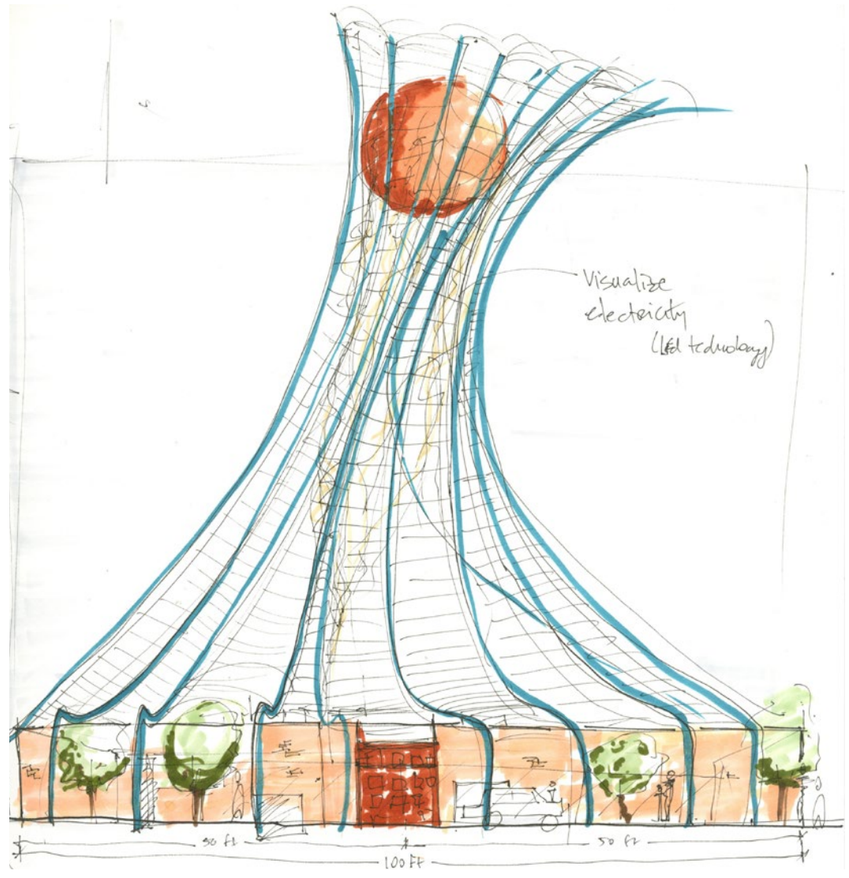
Modelling current substation equipments



Physical model made from scrap plywood 20" by 16", metal wire mesh, crumbled plastic to represent the electrified and lifted copper ball that charges seven charging pods scattered at the edge of the station



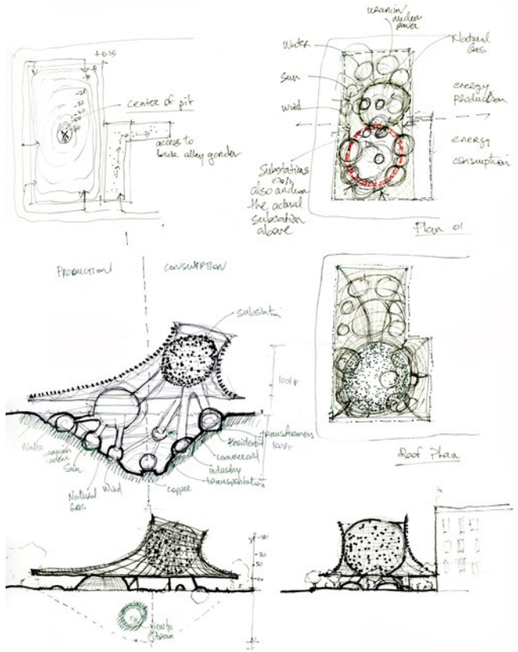
First parti diagram and conceptual sketching sequence

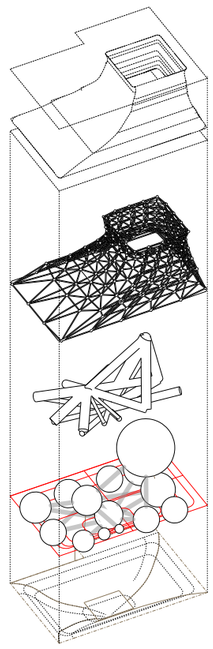


Elevation from W Broadway (making the invisible visible)

Preliminary design phase

An homage to the open pit copper mines in Chile





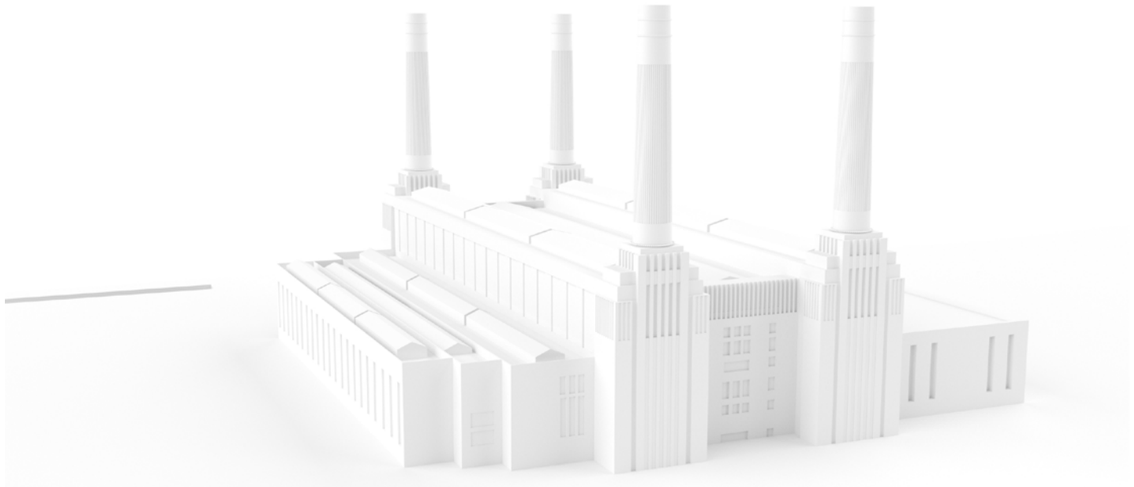
3D printed model 8" x 4" wide with plastic mesh overlayed

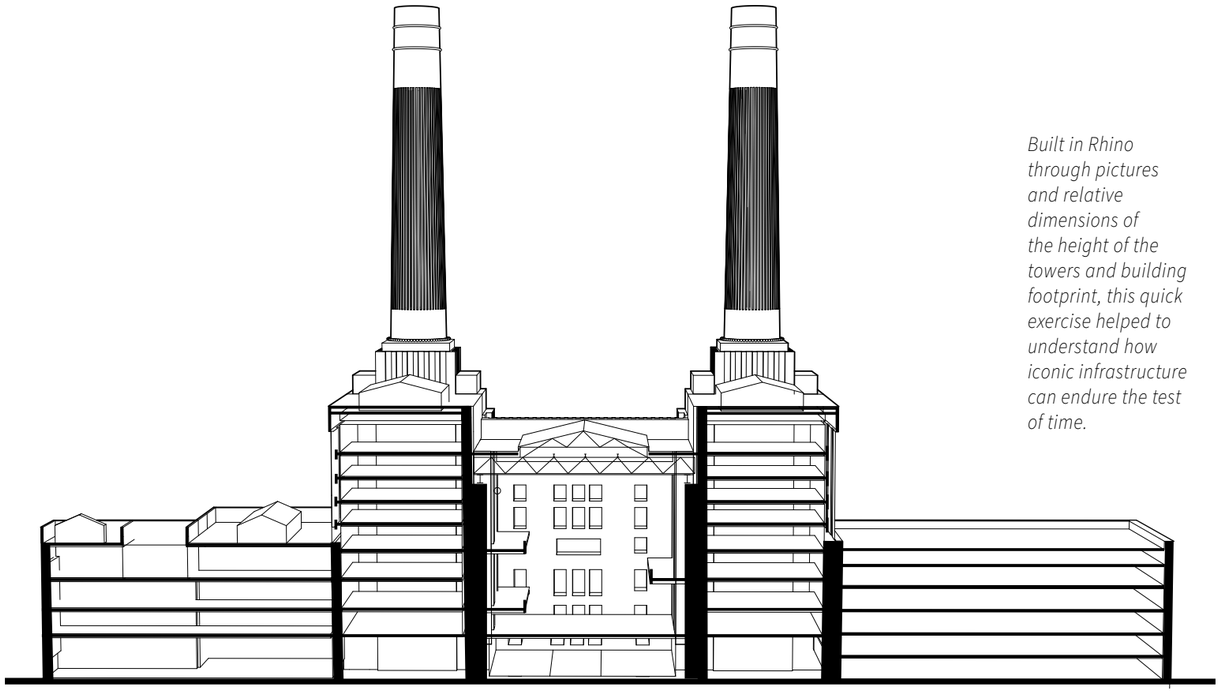
View from within

View from West Broadway and Franklin street

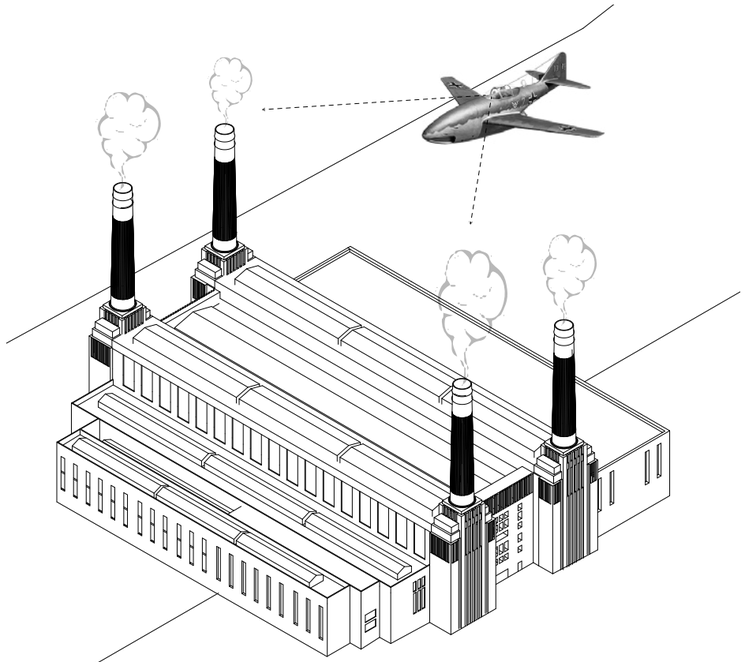
Battersea power plant

An iconic landmark of electricity in the urban landscape that persists through changing times
1929-2023 designed by Sir Giles Gilbert Scott who also designed the iconic of K2 Telephone Booth,a historic urban landmark. He is also responsible for the Bankside Power Plant (1891-1945), which is now the Tate Modern Museum after a refurbishment project by "the Swiss firm Herzog & de Meuron"

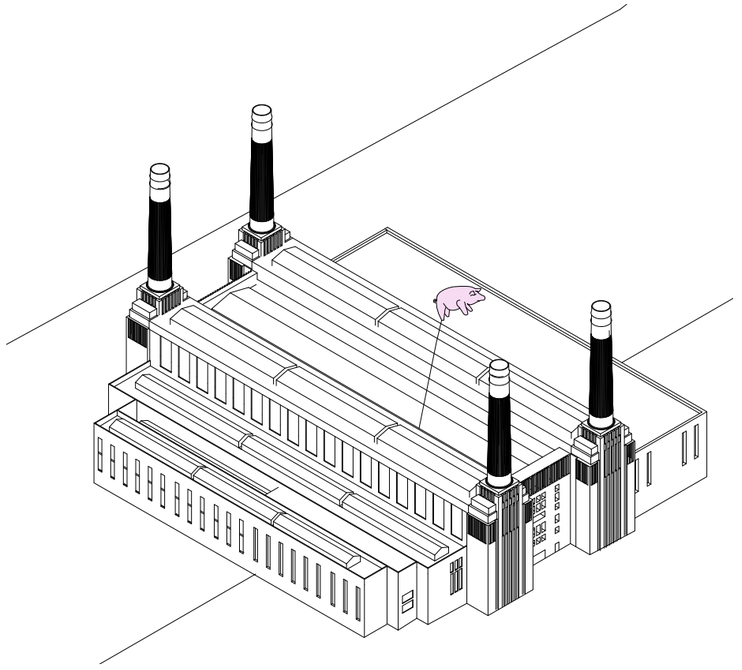




Built in Rhino through pictures and relative dimensions of the height of the towers and building footprint, this quick exercise helped to understand how iconic infrastructure can endure the test of time.



1940
"RAF pilots use the plumes of white vapour from the chimneys to guide them home in the mist. The Luftwaffe also used the plumes for navigation, which explains why the Power Station avoided extensive bombing."



1977
"An inflatable pink pig floating between the two southern chimneys appears on the front cover of Pink Floyd's album, Animals. The inflatable pig was tethered to one of the southern chimneys but lost its moorings and rose to the flight path of Heathrow Airport."

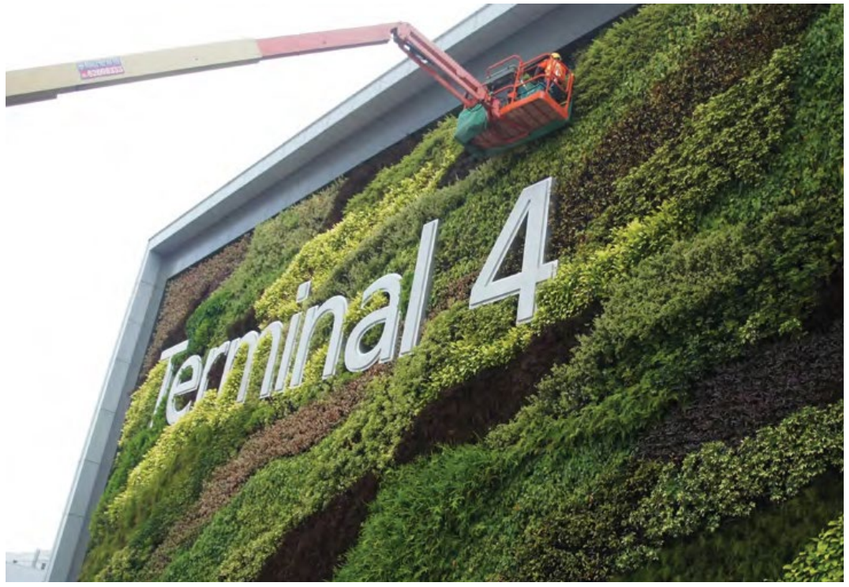
Album artwork, Animals, 1977. Design by Roger Waters. Graphics by Nick Mason. Production and art direction by Storm Thorgerson / Aubrey Powell at Hipgnosis

Arguments

Interrogating the way architectural devices and architectural practices gain relevance by participating in environmental, technological and representational alliances, solidarities, defiances, disputes and controversies

Summer 2023
Gabrielle A. Printz

Syllabus Prompt



A botanical green screen at Changi Airport, Singapore.
Source : Green Screensin Eight Channels, Shannon Mattern

Plant Intelligence and Arboreal ecologies

Reflections on lecture by Shannon Mattern on Tree Thinking,

In Tree Thinking, Shannon Mattern has investigated plant intelligence and arboreal ecologies in order to show the relevance of arboreal systems. It is essential to not only nurture trees but to also sustain the communities and body of knowledge that relate to the trees. Shannon Mattern was inquired as to "how the intersection between densely populated human worlds and non-human worlds should be investigated so as to illustrate how large metropolitan areas can meaningfully answer the global question of climate change without displaying arboreal smokescreens on the facades of megaprojects and green activism?". ***How do current global greening campaigns become smokescreens and alibis to climate activism?*** Delving into this question will help this study to ***explore solutions to reduce carbon footprints, increase biodiversity and food production without displaying arboreal smokescreens.***

Tree Canopy scores and forest data management are the new frontiers for carbon capture and many large conglomerates and nations intertwine their interests to find specific spots of land, ripe for seed injections. The United Nations Sustainable Development Goals (SDG) summarize the required actions to reduce the effects of climate change. SDG 15 aims to "Protect, restore and promote sustainable use of terrestrial ecosystems, manage forests, combat desertification, reverse land degradation and halt biodiversity loss"[1]. SDG 12 intends to "ensure sustainable consumption and production patterns"[2].

The polarity between greening and reducing carbon emissions is made visible through the actions of large corporate entities seeking Carbon Capture, Carbon Offsets and Carbon Credits. ExxonMobil defines "Carbon Capture and Storage" as the process of capturing CO2 that would otherwise be released into the atmosphere, and injecting it into deep geologic formations for safe, secure and permanent storage"[3]. ***Carbon Credit systems increase cost for companies in regulated markets by "charging them per unit of carbon they emit, which has the effect of dis-incentivizing future emissions"***[4]. While Carbon Offsets "counteract the impact of expected emissions by investing in projects that reduce emissions"[4] . These projects range from Wind farms to large scale forestry projects, which are sometimes monocultures with reduced biodiversity. These projects face two problems : first, natural disasters such as "wildfires, which ravaged an estimated 153,000 acres of forests that are part of California's carbon-offset project"[5]; second, reduced food production and biodiversity within large expanses of monotonous tree foliage.

[1](United Nations Department of Economic and Social Affairs n.d.)
[2](United Nations Department of Economic and Social Affairs: Sustainable Development n.d.)

Spanning across industries and localities, ***Greenwashing*** is a strategy that relies on "exaggerated or misleading claims to paint corporate or governmental actions as being greener than they are"[6]. ***The One Trillion tree campaign***, launched by Plant for the Planet, is "a project which aims to plant one trillion trees worldwide"[7]. Inspired by the Billion Tree Campaign, instigated by Professor Wangari Maathai who founded the ***Green Belt Movement in 1977***, the One Trillion tree campaign was fully adopted by the World Economic Forum and, as a result, trickled down to media frenzy political campaigns, corporate elites and charitable institutions. Although some critics of this global campaign argue that the science "claiming 1 trillion trees can significantly reduce greenhouse gazes, is disputed" . Joseph Veldman states that ***"planting trees where they don't belong can harm ecosystems, make wildfires worse, and even exacerbate global warming"***[8]. Also "planting non-native trees on savannas and grasslands could cause problems for local species"[8]. Nevertheless, the appearance of foliage in Singapore's hyper mediated official events, the self-proclamation of the city state as the Garden city, the "fantasy fulfillment machines" of state-sponsored community gardening initiatives and the Astroturfed green screen facades of mega-developments still fail to address the "soul sucking nature of capitalist modernity"[9]. Former President Trump, Sadhguru, Salesforce CEO Marc Benioff, Naturalist Jane Goodall, Rwanda's Minister of the Environment, Dr. Jeanne D'Arc Mujawamariya and the Ethiopian Prime Minister Dr. Abiy Ahmed Ali all have forcefully pushed the agenda of greening without acknowledging that the commodification of nature can lead to reduced biodiversity and more land degradation. Rwanda has reached its "2020 goal of increasing forest coverage by 30%"[10] and Ethiopia claims to have "planted more than 350 million trees in a single day"[11]. Green smokescreens associated with increased foliage and thus increase in photosynthesis do not have any impact on food production. There is also the unknown wild card of a "spill back of the huge carbon reservoir into the air"[12], essentially reversing the carbon capture process of trees and geological formations.

The interdisciplinary approach to tree thinking would be an ecologically and politically responsible methodology to dealing with how humans interact with non-human worlds. ***Forest restoration*** is one of the top solutions for climate change. Also, better city planning of ***dense urban areas*** and efficient organic agriculture methods supported by green logistical infrastructure would solidify the city as the greatest human invention. ***Roger Ridsdill Smith, in his lecture on "The Future of Tall Buildings" investigates "how the technical capabilities that enable tall buildings to be built fit with the climate emergency and with the need to reduce the production of greenhouse gasses?"***[13].

The Embodied Carbon, associated with materials and construction processes throughout the whole lifecycle of a building, combines with the Operational Carbon, associated with the energy used to operate the building, to form the Whole Life Carbon. The ***Household Carbon Footprint (HCF)***is another factor which measures the greenhouse gasses of a household's consumption throughout the year to show the importance of building use mix in an urban setting. ***A study by UC Berkeley CoolClimate Network of 31,500 zip codes*** in the Northeast of the US, shows "***a consistent pattern of lower HCF in urban core cities (~40 tCO2e) and higher carbon footprints in outlying suburbs (~50 tCO2e), with a range from ~25 to >80 tCO2e in the 50 largest metropolitan areas"***[14]. The ***reduction of private transport*** in dense urban areas due to improved public transport systems and better building use mix, directly translates in the reduction of HCF. Smith states that "tall buildings enable urban density and public transport to become economically viable. Thus, travel distances within city centers become shorter" as compared to the long commutes of suburban sprawls created as a result of building function segregation and low rise construction. Metropolitan areas also increase the productivity of workers, earning 30% higher incomes than workers outside metropolitan areas. The worldwide use of concrete for construction warrants innovations and rethinking in the manufacturing process of cement which releases the majority of its embodied carbon while burning fossil fuels to heat and convert limestone to lime. ***Theoretically, the supply and affordability of housing in dense urban areas should maximize the opportunities for city dwellers to live comfortably and reduce emissions for a better world.*** This is prohibited by insensitive policy making and the real estate market. Contrary to popular thought, city centers are viable alternatives to suburbs and need more attention while facing the climate emergency. Affordable, comfortable and sustainable cities can be the future of human life instead of off-grid detached living.

Furthermore, urban forestry, wildlife and community gardening are best practices that need to be nurtured so as to ameliorate the livable conditions within city centers. The Official website of the New York City Department of Parks and Recreation thoroughly documents, manages and plants trees so as to grow its urban forests and public parks. Ambitious projects such as the MillionTreesNYC, launched in 2007, helped plant more trees, map them and display tree data through a publicly available dashboard of taxonomy.

[3](ExxonMobil 2023)
[4](Hume 2023)
[5](Choi-Schagrin 2021)
[6](Telford 2021)
[7](World Economic Forum 2020)
[8](Calma 2020)
[9](Mattern 2022)
[10](Mlaba 2021)
[11](British Broadcasting Corporation 2019)
[12](Zimmer 2018)
[13](Smith 2023)
[14](Kammen and Jones 2013)

One quarter of the world's land, which accounts for " 17% of all forest carbon"[15], is collectively managed by Indigenous People and local communities as they have "long protected their lands and waters, guided by deep connections to place, culture and ways of knowing"[15]. The achievement of greater conservation results and sustained biodiversity as "a result of their stewardship and management" as opposed to government led initiatives should warrant the importance of these communities to the climate emergency. Colonialism has drastically disassociated these communities from their land and the thirst of global capitalism has dis-empowered Indigenous Peoples and their actions to preserve natural forests. Global conservation efforts should be spearheaded by institutions with similar principles to The Nature Conservancy working in partnership with communities in the Andean Amazon, Humboldt Current, Tapajos Basin, Gabon, Okavango Basin, Melanesi and Mongolia grasslands. These small communities are beneficial to the world within the scope of Half-Earth Socialism, developed by social and environmental engineers Troy Vettese and Drew Pendergrass.

Organic Biodynamic Agriculture farming methods as practiced by some smallholding cooperative farmers, Medium Small Enterprises and some large agro-processing corporations show the capacity of humans to effectively produce organic dairy products, vegetables, fruits, poultry, bovine meat and other processed products without overbearing the soil's fertility, productivity and biodiversity. This agronomic system, pioneered by Rudolf Steiner, currently has its integrity and uniform standard protected and certified by Demeter Associations Inc, the owner of the trademark terms "Biodynamic®" and "Demeter®". Aside from many of the benefits of this system, limiting cattle reserves to around ***2.5 bovines per hectare of land***, as opposed to holding large number of cattle in ***conventional dairy farmers, reaching 1000 bovines per hectare***, dramatically reduces global methane and nitrogen emissions. Operating in Egypt since 1977, SEKEM farms is a great example of a sustainable agricultural development producing and distributing certified Demeter products to Egyptian and global markets with a responsible corporate structure and a Fair-Trade supply chain. Its efforts to greening the desert through organic farming practices should be a model to help reverse land degradation and loss of biodiversity.

In conclusion, ***Greenwashing megaprojects and political campaigns could be more harmful to the climate than previously assumed.*** The increase in foliage and photosynthesis doesn't entirely reduce the impact of carbon emissions. Global climate measures should include but not be limited to sustainable global food production, agro-forestry conservation efforts in partnership with existing historical inhabitants, affordable dense multifunctional city centers, tree data mapping, social and environmental engineering simulation models, responsible corporate structures and equitable supply chains are all be plausible actions against climate change that should to be implemented in tandem.

[15](The Nature Conservancy 2023)

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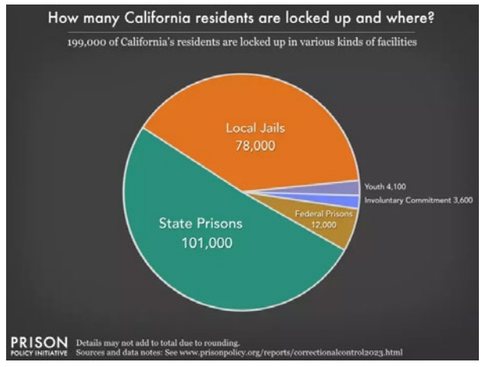
Transscalarities

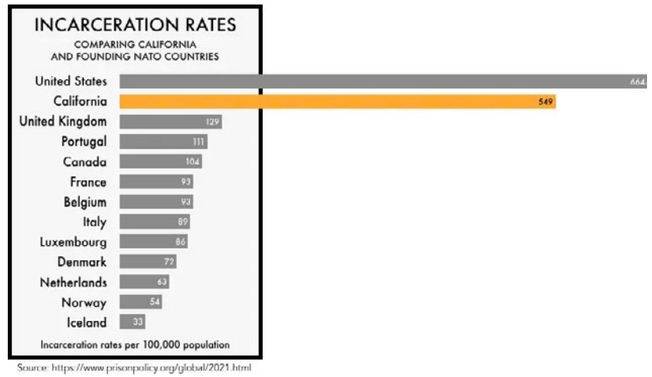
Arenas of Design

Summer 2023
Alex Kim

"This course queries the ways in which architectural devices of reference, which have shaped the discourse of the field over the last few decades, are characterized by their transitioning through spatial, material, and temporal scales. The course explores the agencies architectural devices unfold through transscalar conditions—that is to say, the specific forms of politics that architectural devices perform by participating in diverse dimensional and physical settings; and the way they multiply their reach, influence, and sensitivity by entangling, for instance, the microbiological to the mineral, the atmospherical, the ecosystemic, the genetic, and the planetary.

Syllabus Prompt





Source: https://www.prisonpolicy.org/global/2021.html

"The prison incarceration rate for Alameda County was 332.1 per 100,000. African Americans were 24.82 times more likely to be incarcerated in prisons than Asians and 20.16 times more likely than Whites" . California is also the worst state for human trafficking in the US with "1,334 reported cases and 2,122 victims". The social fabric of minorities is fragile and women face human trafficking, domestic violence and drug abuse in Oakland.

Small Scale, Big change

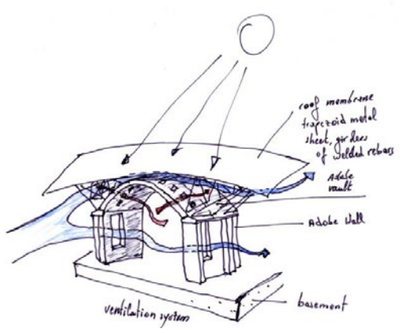
Designing Justice Designing Spaces (DJDS) aims to end mass incarceration in Oakland by designing spaces for peacemaking and reparation. Deanna Van Buren, as the co-founder of this nonprofit architecture firm and real estate development company, designed a Women's Mobile Refuge Trailer, together with Zoe Parsigian, Julia Grinkrug and Jess Pauly, for Five Keys Schools and Programs, a trusted non-profit organization that focuses on education, employment, social justice, housing, and revitalizing communities. The trailer temporarily shelters women upon their release from prison, usually surrounded by bail bondsmen that sometimes "solicit sexual favors in exchange for bond debt relief" . The mobile architectural device gives recently incarcerated women time and space to plan their next moves, thereby easing their reintegration into communities. Considering the agency and mobility of the trailer, we can observe the impact that intentional social design can have on disputing the carceral justice system. With restorative justice as its design philosophy, DJDS intends to reinstate justice for marginalized communities. The Women's Mobile Refuge trailer is a case study for how design can be politically engaging and contend with judicial infrastructure.

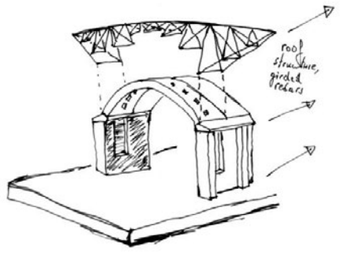
These communities find it difficult to nurture the needs of women released from prison on parole, probation, determinate release or community corrections. The mobile trailer ensures safety, food and sanitary services for 8 women at a time. The ***design criteria*** for material finishes and design program, which includes a kitchen, dining area and resting area, were ***discussed in a "series of workshops conducted with incarcerated women*** and with Five Keys Schools and Programs." In contrast to the cozy interior adorned with vibrant upholstery, the exterior paintwork of the trailer displays a lively green and blue color palette with the silhouette of a feminine facial structure. The Logo of Five Keys is displayed next to the entrance into the trailer. These design features advertise the purpose of the vehicle and ensure a feeling of safety and familiarity to the users prior to entry. As the trailer doesn't have an engine, it has very little idle time and its impact is not limited by periods of maintenance.

Police vehicles and helicopters move towards crime scenes and detain suspects. Afterwards, highly protected and retrofitted prison vehicles, aircraft or vessels transport inmates from a courtroom or a secure prison to another. Conversely, the agency of the refuge trailer is to rescue women upon their release from the carceral system and guide them to better locations. Thus, ***the designer is operating at various scales and localities for restorative justice through an architectural device capable of transporting its agency and operating all year round***.

[1](Rhoden 2019)
[2](Oakland 2022)
[3](Wisevoter 2022)
[4](Designing Justice Designing Spaces n.d.)

Gando Primary school extension inspires the community it serves and other designers to think critically, act creatively and independently using contextual problems such as ***limited budget, unaffordable construction resources, unskilled Labor pool, harsh climate and rural setting.*** Located in Gando, Burkina Faso, a small village where Diébédo Francis Kéré was born and had to leave because there weren't any school in the vicinity, the Gando Primary school is the first built project of the renowned architect completed in 2001. It was funded through "School Bricks for Gando", an NGO he founded after completing his architectural education in Germany. ***With a small budget of $30,000,*** the school accommodated only 120 students and has seen its student population grow to 700. The success of the first building, built on 520sqm prompted the construction of the extension building to be built on 308sqm. This second intervention would essentially build on the local capacity gained through the construction of the first project and improve on the design language of Kere Architecture acquired between 2001 and 2006 from projects such as the Gando Teacher's Housing and the Dano Secondary School. The extension was completed in 2008 in collaboration with Hevert-Arzneimittel GmbH und Co Kg., the community of Gando and Kéré Foundation.





Conceptual sketches by Diébédo Francis Kéré

Burkina Faso is a landlocked "low- income Sahelian country that ranks 184th out of 191 in the 2021–2022 HDI report". It's geopolitical ties with France, as a result of a colonial past, has pulled the nation into political turmoil, Islamic insurgency and economic instability after several coups d'états. The ***remoteness*** of the village of Gando increases the contextual problems of higher construction costs, humanitarian aid dependency, access to skilled labor due to rural-urban migration, access to electricity and water.

Gando Primary school extension (Photo sourced from Dezeen)

The new typology of the school complex features a s***elf-supporting series of vaults, built out of adobe blocks with air gaps*** to be left out during the construction, a ***continuous space frame girded roof structure***, made with recycled reinforcement bars, and a compacted earthen floor. These materials create interdependent construction systems that foster a comfortable learning environment for students. The vaults reduce the need for concrete columns and reinforcement bars in the core structure. The adobe blocks made from clay and cement act as a thermal mass to absorb heat and stabilize temperature. The addition of cement to the clay bricks increases fire, insect and mold resistance. This degradable biogenic material requires additional protection from the atmospheric conditions "since the main degradation mechanisms of adobe blocks happen by water attack." The ***corrugated metal sheet*** roof shelters this ***biogenic material***. The compacted earthen floors enable the building to breath and eliminate the requirement for expensive fit-out work by specialized labor.

The development and improvement of building materials and techniques with the involvement of the local community is a form of capacity-building to "strengthen the means of implementation and revitalize the global partnership for sustainable development" as advocated in the Sustainable Development Goal 17 in the 2030 Agenda of the United Nations. Featured on "Small scale, Big change", trademarked as intellectual property, ***Francis Kéré challenges the typology of a rural school project by initiating a global discourse on humanitarian aid dependency rot with inefficiencies, bureaucracy and high overhead costs.***

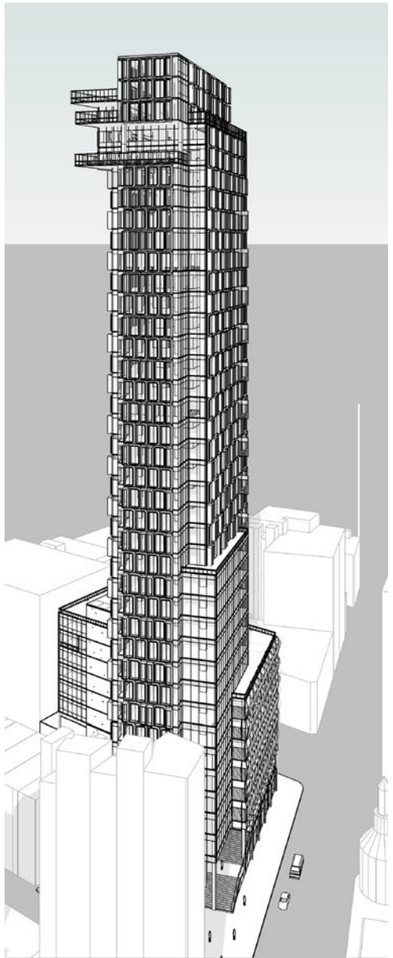
[1](World Bank Group - IBRD - IDA 2023)
[2](Brito 2023)
[3](United Nations Department of Economic and Social Affairs 2015)

Rethinking BIM

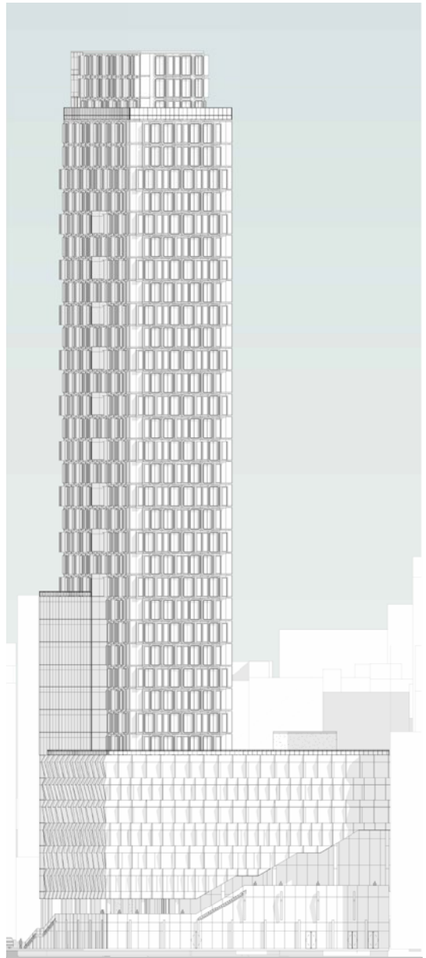
Exploring methods to leverage Building Information Modelling for seamless information exchange and collaborative workflow

Construction Tech sequence
Fall 2023
Joe Brennan & Jonathan Marcos

Syllabus Prompt



View from South East

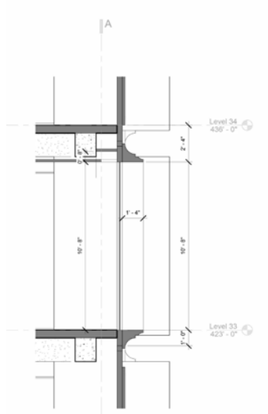


Elevation - North

Integrated Project Delivery Workflow

A mixed use tower located on Broadway and 30th st near NOMAD was pro-actively designed to respond to building ordinance, setback regulations, views and facade articulation for function and daylight

Alison Lam
Mingjia Hu
Steven Widyatmadja
Sonam Sherpa

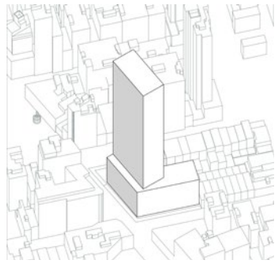


Hotel Facade Detail

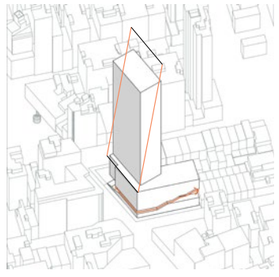
View from Broadway and 29th street

Building Mass Process

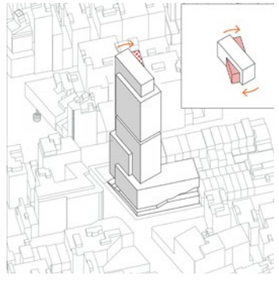
1. Site Constraints



2. Mass Extrusion

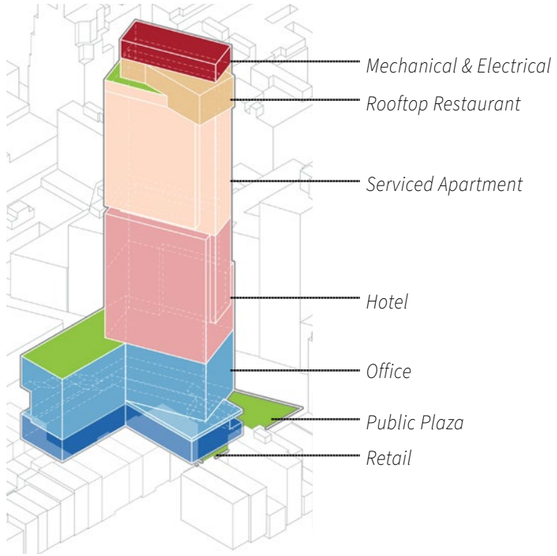


3. Public Plaza Connection: Carving mass to connect public areas with a sky exposure plane

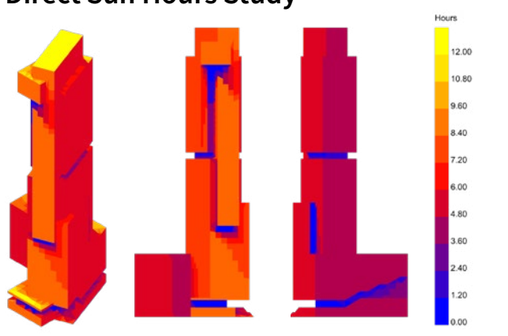


4. Massing Tweaks: Extrusions at the tower and

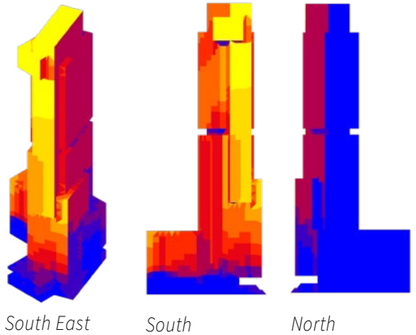
Programmatic Diagram



Direct Sun Hours Study

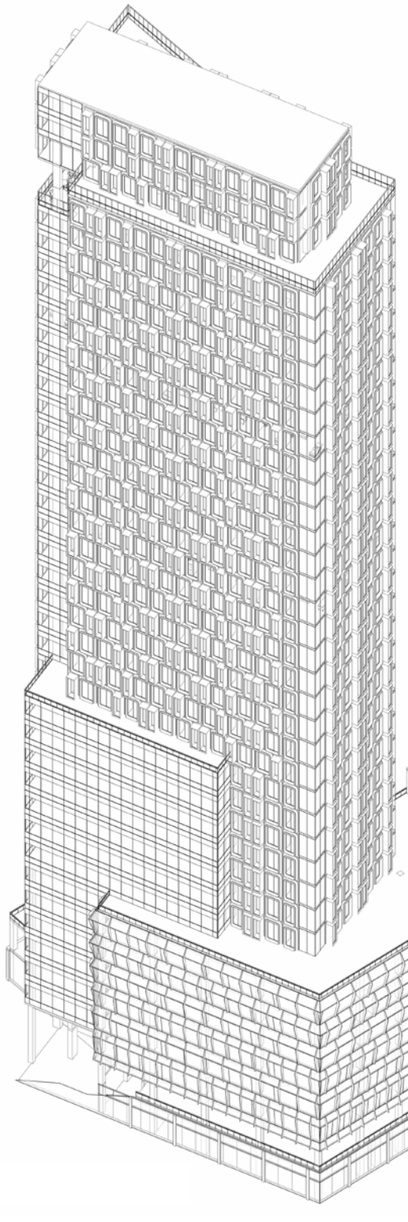


South East *South* *North* *Direct Sun*

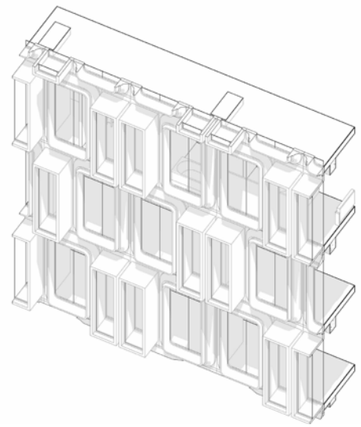


South East Axonometric *South* *North*

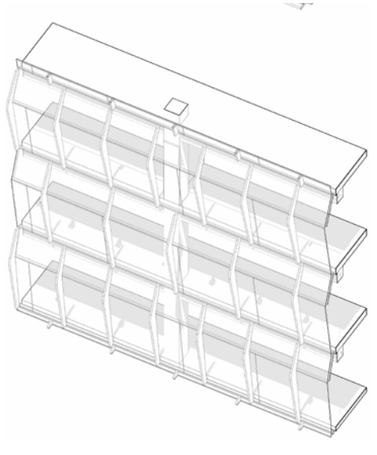
Facade Articulation



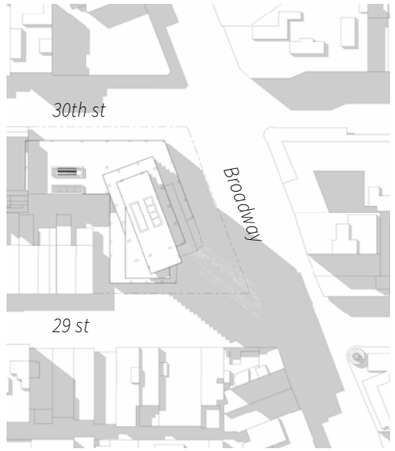
North East Axonometric



Tower Facade Axonometric

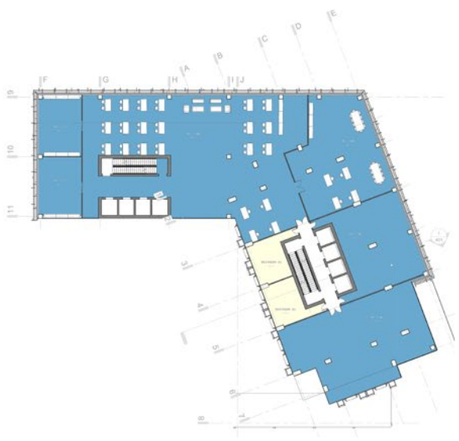


Podium Facade Axonometric

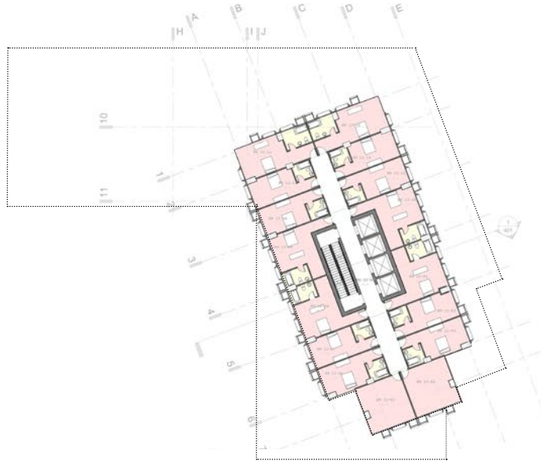


Site Plan

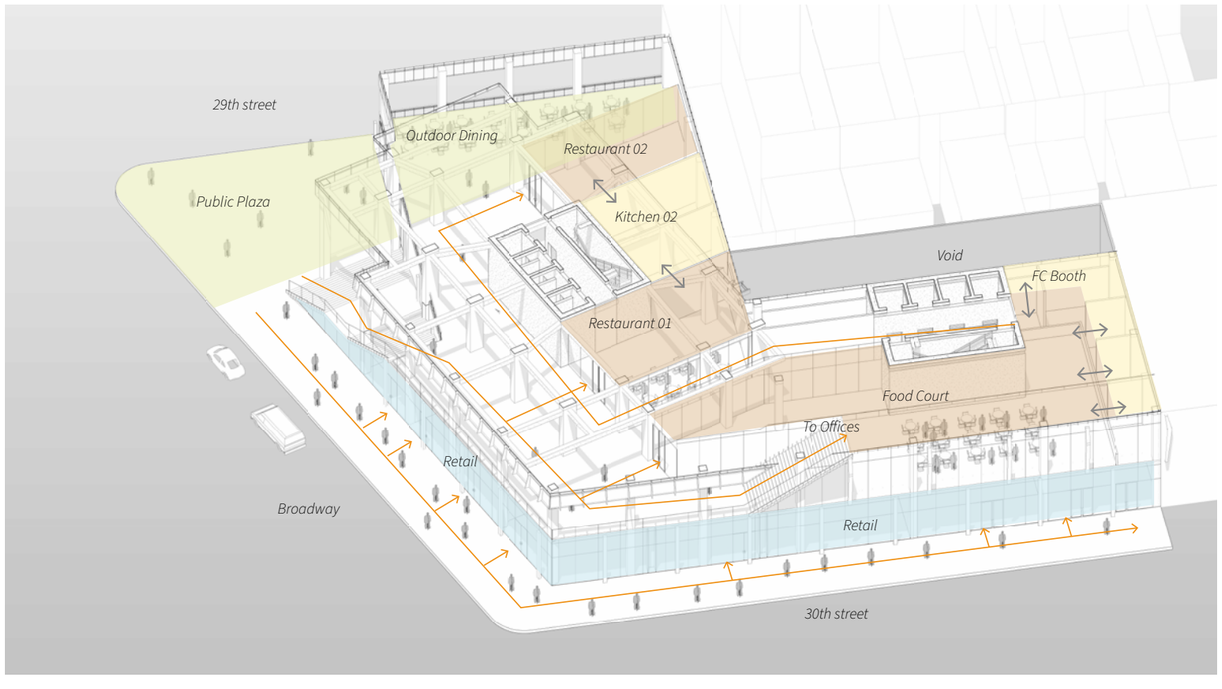
Ground Floor Plan



Office Floor Plan

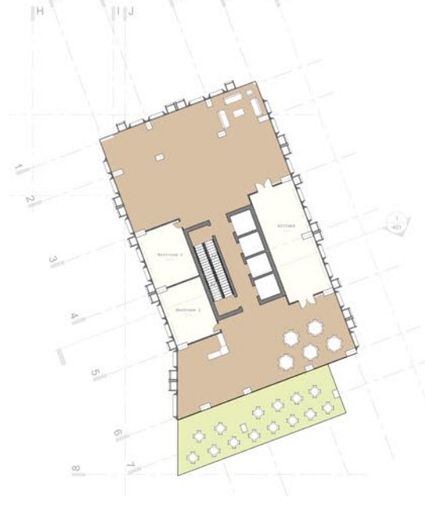


Typical Hotel Floor Plan



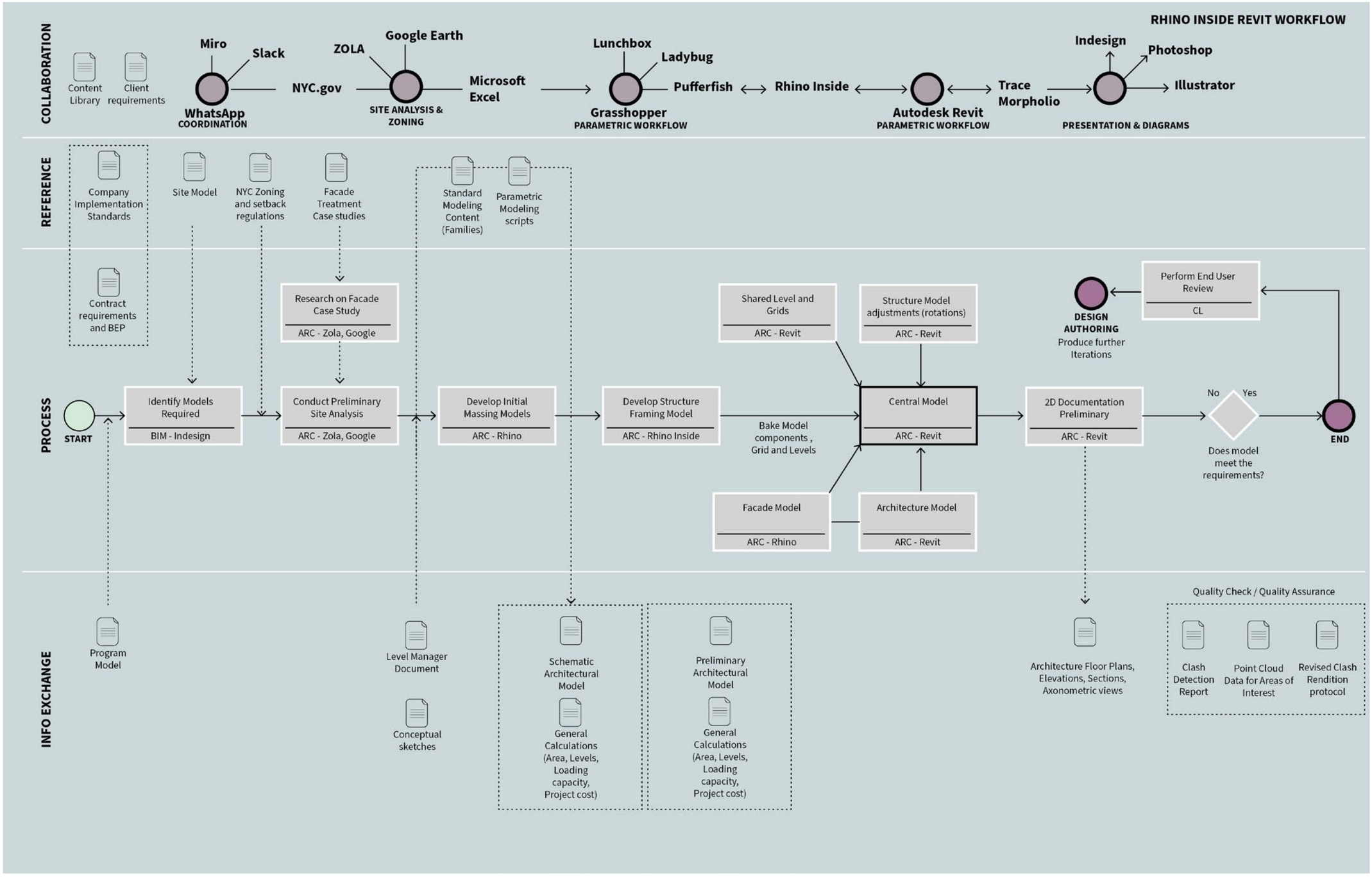
Retail and Restaurants on Podium

Typical Serviced Apartment Floor plan



Typical Hotel Floor Plan

Outdoor space
Retail
Office
1 Bedroom unit
3 Bedroom unit
Circulation
Facilities
Hotel
2 Bedroom unit
Restaurant


RHINO INSIDE REVIT WORKFLOW
COLLABORATION
Content Library
Client requirements
Miro
Slack
WhatsApp
COORDINATION
ZOLA
Google Earth
NYC.gov
SITE ANALYSIS & ZONING
Microsoft Excel
Lunchbox
Ladybug
Pufferfish
Grasshopper
PARAMETRIC WORKFLOW
Rhino Inside
Autodesk Revit
PARAMETRIC WORKFLOW
Trace
Morpholio
Indesign
Photoshop
Illustrator
PRESENTATION & DIAGRAMS
REFERENCE
Company Implementation Standards
Site Model
NYC Zoning and setback regulations
Facade Treatment Case studies
Standard Modeling Content (Families)
Parametric Modeling scripts
Contract requirements and BEP
PROCESS
START
Identify Models Required
BIM - Indesign
Research on Facade Case Study
ARC - Zola, Google
Conduct Preliminary Site Analysis
ARC - Zola, Google
Develop Initial Massing Models
ARC - Rhino
Develop Structure Framing Model
ARC - Rhino Inside
Shared Level and Grids
ARC - Revit
Structure Model adjustments (rotations)
ARC - Revit
Bake Model components , Grid and Levels
Central Model
ARC - Revit
Facade Model
ARC - Rhino
Architecture Model
ARC - Revit
DESIGN AUTHORING
Produce further Iterations
Perform End User Review
CL
2D Documentation Preliminary
ARC - Revit
No
Yes
Does model meet the requirements?
END
INFO EXCHANGE
Program Model
Level Manager Document
Conceptual sketches
Schematic Architectural Model
General Calculations (Area, Levels, Loading capacity, Project cost)
Preliminary Architectural Model
General Calculations (Area, Levels, Loading capacity, Project cost)
Architecture Floor Plans, Elevations, Sections, Axonometric views
Quality Check / Quality Assurance
Clash Detection Report
Point Cloud Data for Areas of Interest
Revised Clash Rendition protocol

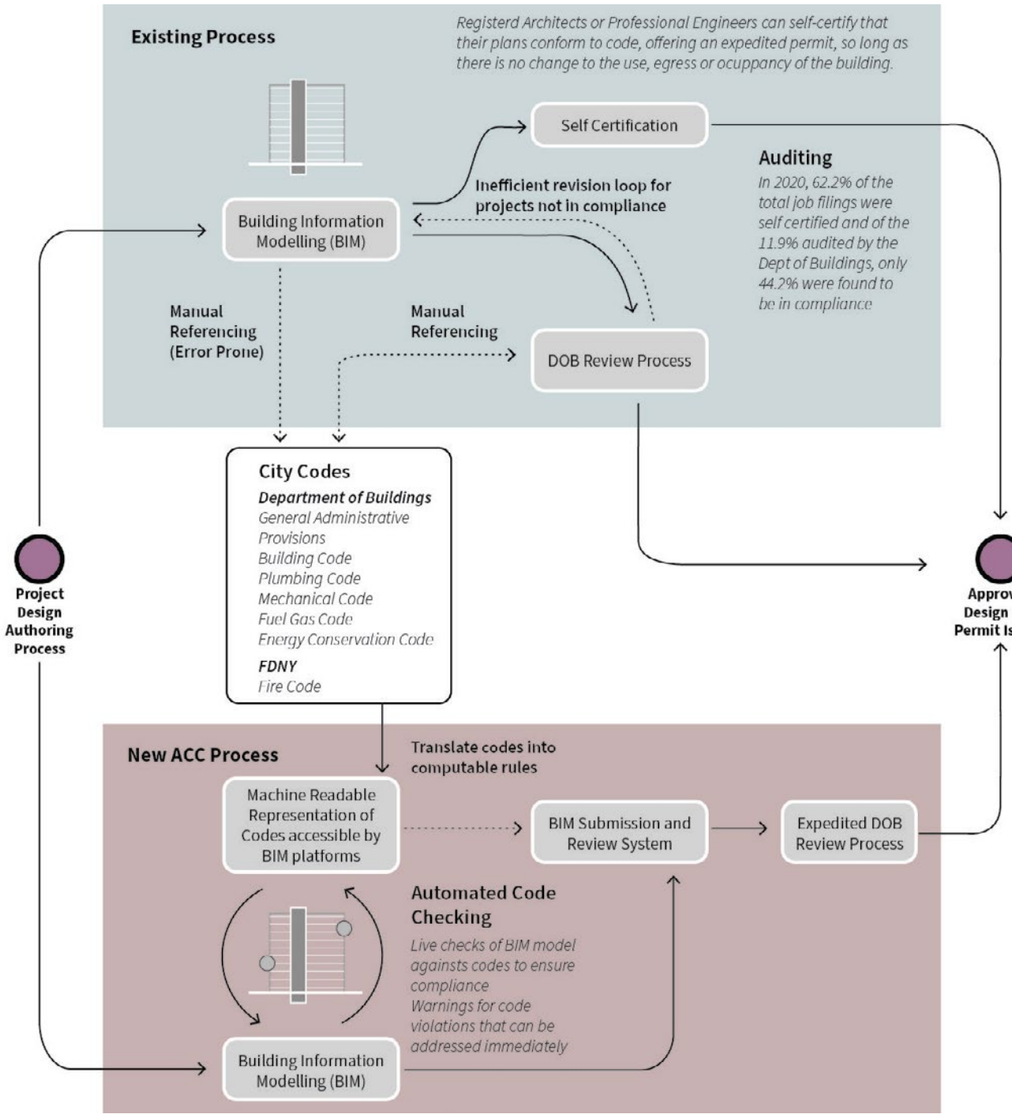
The Future of the city

Transforming Urban Infrastructure

Fall 2023
Kate Ascher and Andrew Smyth

This course explores technological innovations that are helping cities around the world create healthier and more resilient futures for their citizens. Based in two sets of disciplines (architecture, urban design, and real estate development ; structural, civil and mechanical engineering), it delves into data analytics, robotics and smart communication technologies.

Syllabus Prompt for GSAPP elective



Adoption of Automated Code Review in NYC

Streamlining Code Review in New York City through a collaborative working group to standardize acceptable BIM files by translating Paper Based Code into Digital Machine readable logic

Introduction

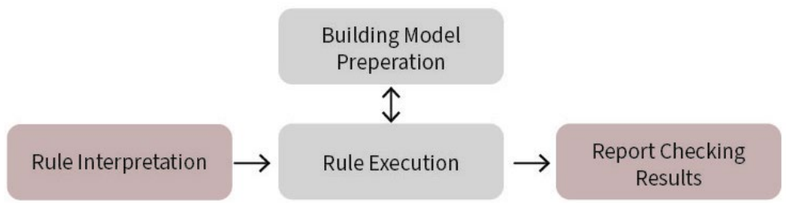
The construction permitting process is a time consuming and necessary process that checks compliance of projects with city codes and regulations. Cities' have not been able to fully leverage technology and ameliorate the building permitting process which permeates throughout the planning, design, construction and post construction phases, whether it is a skyscraper or a small bathroom renovation project. Manual Checking of code compliance imposes intensive demands on human examiners regarding time, cost, and error-prone processes.[1] ***Digitized Automated Code Review, also referred to as Automated Code Compliance (ACC) will drastically improve the efficiency of cities' construction permitting and review procedures.*** Building Information Modeling (BIM) allows for the Architecture, Engineering and Construction (AEC) industry to improve its efficiency in creating and managing data embedded in digital model replicas of proposed projects so as to create a single source of truth for better asset management for building owners and city administrators.

"BIM adopters can see that effective information management leads to business efficacy and profitability" but a number of roadblocks for BIM and ACC implementation exist. Lack of expertise, lack of consolidated standardized tools and protocols, lack of collaboration (between software vendors, governments, educational institutions and AEC professionals) and high cost of changing current practices and procedures are significant barriers for the transition.[2] Cities can achieve much greater strides in reviewing code compliance of new projects in detail if global BIM standards for interoperability (ISO19650) and classification systems in the AEC industry are adopted. ***This research paper will look into the challenges associated with developing a detailed BIM and ACC implementation roadmap to optimize the permitting processes in New York.***

[1](Zhang and El-Gohary 2013)
[2](Huber 2013)

1.Assess Past efforts in streamlining Code Review in New York City

Since 2000, the DOB has worked to upload paper based building codes to online platforms. This has allowed for permit applications to be submitted electronically. ***Implemented in 2016 at a cost of $29.6 million, the DOB NOW system has streamlined submitting and tracking applications in real time, pulling permits, scheduling appointments and checking inspection statuses***.[3] However, this has not changed the ways that examiners review plans. Examiners still review documents in paper-like formats such Adobe Acrobat files and submitted documentation is not machine-readable. The need for thousands of expediters to navigate the bureaucracy is still prevalent.[4] In theory, ***DOB employs 200 plan examiners to review 100,000 applications annually but only a portion of these are actually reviewed.***[5] To reduce the burden on examiners, especially in the field of smaller residential renovations, the Pro Cert program, implemented since 1975, enables state-licensed design professionals to self-certify their plans conformity to code. ***In 2020, after auditing 11.9% of self-certified plans, 44.2% were not compliant to city code.*** Thus, ProCert is not a plausible replacement of the labor intensive manual checking and review of plans. Further efforts to standardize BIM documentation were conducted by the Department of Design + Construction (DDC). ***In 2012, the DDC published guidelines to ensure conformity in the use of BIM for all public building projects.***[6] This is the initial step in crafting a trickledown effect of BIM adoption from large public megaprojects to private developments and then to smaller projects. This was followed in 2013 by the DOB BIM guidelines for use in Site Safety Plans Program, intended to increase safety of construction sites through virtual site tours.[7]



Common Structure of an Automated Code Compliance Checking Process

[3](Busta 2016)
[4](Kaufman 2014)
[5](NYC Mayor's Office of Operations 2020)
[6](New York City Department of Design + Construction 2012)
[7](New York City Department of Buildings 2013)

The technological opportunity of implementing Automated Code Compliance will serve as a catalyst to increase the productivity and innovation of New York City's AEC industry and become a national model for BIM and ACC adoption. Being one of the impediments to realize the promise of BIM technology, ***the cost of inadequate interoperability in the US capital facilities industry is estimated at $16billion annually and $400million in New York City.***[8] If the construction industry can move to a more seamless use of technology, it could unleash the same benefits that offices have seen in moving from WordPerfect and MacWrite to Google Docs and Microsoft Word. ***It is therefore within the interest of the national economy to select New York City and a few other metropolitan areas to become pioneers in integrating state-of-the-art implementation of BIM technology through more applied research and collaborative approaches for compliance checking.*** As one of the seven highlighted barriers to higher productivity, Technology and Innovation has the potential to close the ***$1.6 trillion opportunity gap*** that has persisted in the AEC industry.[9]

Automated Code Compliance (ACC), being the atomization of the process of manual code checking, requires the union and qualitative integrity of two main ingredients or data sources. These ingredients are the ***building model***, a digital representation of the design data subject to audit for compliance, and ***Normative knowledge***, a computable representation of normative provisions stipulated by codes and standards, which is the baseline for the audit. The ability to prepare adequate building models and rule interpretations are key steps for the promoted shift.

2.Craft Incentive based legislative framework

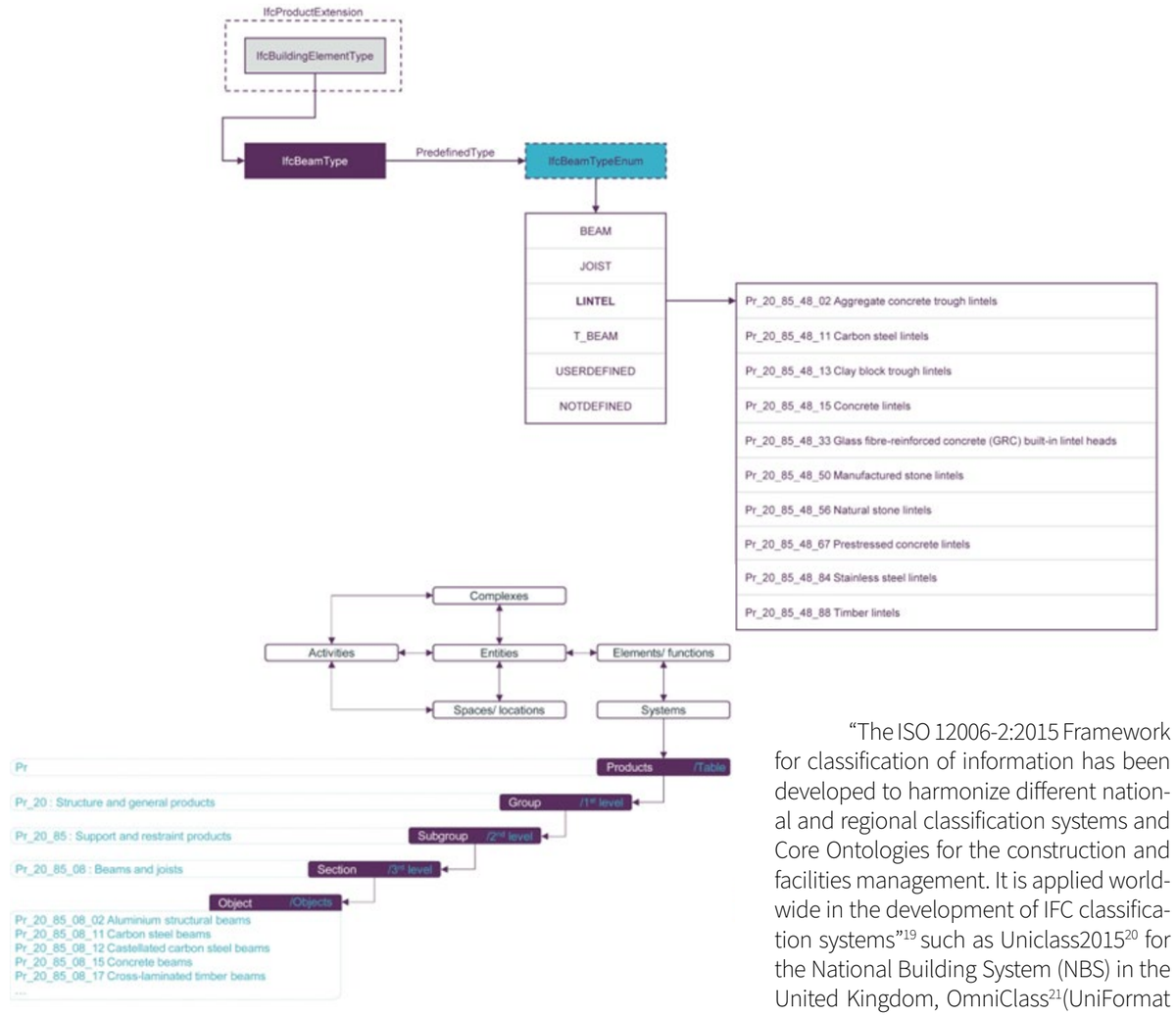
The most important push under a top down approach to implement ACC and accelerate BIM adoption is to enact into law a date certain (2032 or 2035) by which all permit applications will need to be submitted in BIM format.[11] Although this is an aggressive step, it would form a sense of urgency by which a reasonable deadline will force a shift towards a consorted effort. This shift should require a staggered realistic time frame by which large complex projects precede smaller projects in adopting a new standard BIM format. The City council should assist in establishing this new standardized BIM delivery framework that builds on proven global examples such as ***CORONET BIM e-submission system pioneered by Singapore***. This initial legislative approach should be incentive based and not a punitive approach that would penalize practitioners experiencing difficulties in implementing BIM. It must also be supported by clear a ***BIM Essential Guide document Series*** used as references on good BIM practices in an illustrated, easy to read format targeted at new BIM users. ***These guides should be part of the industry's effort to demystify BIM and give clarity on BIM usage at different stages.***

[8](Gallaher, et al. 2004)
[9](Barbosa , et al. 2017)
[10](Preidel, et al. 2015)
[11](Aggarwala, et al. 2022)

3.Collaborative working group to standardize acceptable BIM files

"New York City is often listed at the forefront of global cities embracing technology but ***agencies managing the City's technology needs are not properly organized***, staffed or equipped to materialize an intensive technology transition"[13] such as BIM and ACC adoption .The demand for technology expertise has far outpaced the City's ability to hire the necessary. ***Rebooting NYC*** suggests the need for the city administration to appoint a Deputy Mayor for Technology with responsibility for and control over all the City's technology related agencies. New York's prominence allows it to attract top global talent into leadership positions such as Chief Technology Officer.[13] For instance between 2006 and 2017, Singapore had appointed Dr John Keung as the Chief Executive Officer of the Building Construction Authority to lead nationwide efforts for BIM and ACC adoption. This needs to be coupled with ***Public Private Partnership programs*** and legislative frameworks that intertwine the interests of stakeholders of the built environment. These stakeholders include but are not limited to City agencies such as the Department of Buildings (DOB), the New York City Fire Department (FDNY), software vendors (Autodesk, Solibri Model Checker), members of the AEC industry (real estate developers, architects, builders, BIM managers), global BIM standardization institutions (International Code Council, BuildingSMART international, International Organization for Standardization), associations for professionals (American Institute of Architects, American Institute of Constructors), trade organizations (New York Coalition of Code Consultants), tertiary educational institutions and labor unions.

As a baseline development to emulate, the ***OpenBIM initiative*** based on the ***ISO-standard Industry Foundation Classes (IFC) data model***[15] is promoted by buildingSMART International as the de facto approach to represent and share rich physical, functional and interoperable building information among project stakeholders. Developed in the 90s, this initiative helped address the issue of standardization and interoperability with the ***International Framework for Dictionaries (IFD)***[16] , based on ISO-standard framework for classifications . IFD became the ***buildingSMART Data Dictionary (bSDD)***[18] and has recently been augmented with an API (Application Programming Interface) to ***empower practitioners to use industry-defined terms and attributes*** in their building design data set.



Uniclass aligns with IFC and classifies both information containers and their contents[22]

"The ISO 12006-2:2015 Framework for classification of information has been developed to harmonize different national and regional classification systems and Core Ontologies for the construction and facilities management. It is applied worldwide in the development of IFC classification systems"[19] such as Uniclass2015[20] for the National Building System (NBS) in the United Kingdom, OmniClass[21](UniFormat and MasterFormat) for the Construction Specification Institute (CSI) in the North American Markets.

[12](Singapore Building and Construction Authority 2013)
[13,14](Aggarwala, et al. 2022)
[15,16] (International Standard Organization 2018, 2022)
[17](Ekholm 2004)
[18](Bell and Bjørkhaug 2006)

[19](Ekholm 2004)
[20](National Building Specification 2023)
[21](Construction Specification Institute 2023)
[22](National Building Specification 2023)

4.Translating Paper Based Code into Digital Machine readable logic

The main hurdle to automating the compliance checking process is the ***challenge in extracting normative knowledge and translating*** it into a digital copy of the paper based code and standards.[23] The earliest successful attempt to represent normative provisions was that of Fenves Decision Table Formation published under the Introduction to SASE: Standards, Analysis, Synthesis and Expression.[24] This became the classic example of a successful implementation of Automated Compliance Checking Systems (ACCS). SASE, SICAD, and SPEX could check compliance with the AISC (American Institute of Steel Construction) specifications and served that domain well into the late 1980's. Computer interpretable versions of codes and standards are costly to develop when undertaken by humans as it would take approximately a day for an expert to translate a page of a code while managing the quality of the translation as seen through experiences in New Zealand. This would quickly add up to millions of dollars for the conversion of entire building codes for a city and nation. The specialized expertise and technical skills of the human translators would need to span Architecture, Engineering, and Construction and computer logic. Currently only a few people have a combination of these skills and there would need to be targeted training of many experts to form a useful team operating under the designated City agencies or private entities collaborating with the City.[25]

The frequent amendment and updates on codes and standards would also require maintaining computerized versions alongside paper-based versions. ***Natural Language Processing (NLP)***[26], a field of artificial intelligence (AI) which enables computers to analyze and process natural language text, has the potential of creating systems that understand the intent of codes and automate the translation process. After translation, it would be advantageous to publish and distribute computer analogues of paper based codes alongside the paper-based codes for legibility of open publication of codes through OWL/SWRL or LegalRuleML.

Quality Assurance and Quality Control (QAQC) of code translation through machine learning approach and human translation approach is of the utmost importance. The equivalence of codes translated into computer interpretable format and original paper-based versions needs to be monitored consistently. ***It is proven that code translation by two different highly experienced human experts of the same clause could produce varying resultant translations.*** Furthermore, computerized approaches of code translation such as NLP and AI techniques also exhibit varying results. Although there are no standards and recognized processes to guarantee robust QAQC of code translation , whether by human translators, machine learning systems or a combination of both approaches, there should a consorted global and national effort to research and develop less error prone systems of code translation.[27]

Domain Specific Language (DSL) helps with quality assurance [28] provides a higher level specification of a code, a more structured approach to translation of codes and is easier to read than lower level representation of code. In addition to code translation for ACC, the ability of BIM authoring tools, such as Autodesk Revit and Graphisoft ArchiCAD, to incorporate the codes themselves, through semantic enrichment tools, means they can provide the equivalent of spell checking to plans without replacing code review by experienced examiners.[29]This would benefit experienced design professionals and examiners in focusing on qualitative aspects of the project instead adhering to trivial prescriptive and/or performance provisions that can be automated to some degree similar to spell checking. As a result, ***a semi-automated human guided approach of compliance*** checking combined with pre-permit submission model checking through BIM authoring tools during the model building process ***is a pragmatic interim solution***.[30]

Two international case studies in rule interpretation and electronic submission are Singapore and South Korea which demonstrated the role of government in translating national building regulations into machine readable format. ***KBIMCode is the computer representation of the Korean Building Act and CORONET is the first electronic submission system***, developed by Singapore that standardizes BIM templates, guidelines and assists businesses in BIM adoption.

Furthermore the Java-based Solibri Model Checker (SMC), introduced by the Finnish software company Solibri, is a validation optimization and clash detection tool with a library of rule sets and guidelines. Although SMC is a great tool to check the quality, constructability and validity of imported IFC models, it is a very expensive tool and employs a black-box method which makes no information of the process and rulesets visible and editable. There is potential for this tool to be further developed in conjunction with the company Solibri and the Singaporean CORONET e-Plan Check system a widely used FORNAX Library system to develop custom rule sets applicable in the ACCS of New York City.[31]

Other efforts by ***Compliance Auditing Systems Ltd*** in forming the ACABIM's[32], a cloud-based solution to pre-validate consent submissions and US based prominent startups such as ***Upcodes***[33], which has translated more than six million sections of building codes, will add value to a consortium for ACC implementation in New York City.

[23](Amor and Dimyadi 2021)
[24](Fenves, et al. 1987)
[25](Amor and Dimyadi 2021)
[26](Zhang and El-Gohary 2013)
[27](Amor and Dimyadi 2021)
[28](Preidel, et al. 2015)
[29](Aggarwala, et al. 2022)
[30](Aggarwala, et al. 2022)
[31](Amor and Dimyadi 2021)
[32](Compliance Audit Systems (CAS) Limited 2021)
[33](Upcodes n.d.)

5.Progressive BIM training of AEC industry and regulatory city agencies

The BIM model to be submitted to a consenting authority is required to be of uniformly high standard and must contain appropriate objects, attributes and property sets to enable rule checks and simulations to be run for ACCS.

Creating a complete BIM model is therefore beyond the current expectation of BIM modelers and design teams and the extra effort required to do so drives up the cost of BIM implementation.

This should be recognized and compensated accordingly by the consenting authority to incentivize BIM implementation. Model Granularity, Level of Detail (LOD), Level of Information Need (LOIN), and Model View Definitions (MVD) for IFC export need to be clearly defined in BIM guidelines to control the size, detail and scope of BIM models for construction permitting.

An engagement with universities and other institutions, such as Zigurat Institute of Technology and BRE Academy , to offer courses and specialist certifications will resolve the steep learning curve to gain BIM expertise. A cost reduction through a BIM Fund, sustained by endowments, and collaborative actions between these institutions and the City should allow for professional accreditation to be affordable. The New York State Energy Research and Development Authority's incentive programs are exemplary cases to emulate.

[34](Zigurat Global Institute of Techonology 2023)
[35](BRE Academy n.d.)
[36](New York State Energy Research and Development Authority n.d.)

Conclusions

In light of recent developments in BIM technology, standards-based OpenBIM (e.g., IFC), normative knowledge representation standards (e.g., OWL and LegalRuleML), national BIM object libraries defined by recognized core ontologies (Omniclass) and BIM model QAQC checking software (Solibri), ***there is a recognized global effort to push for BIM and ACC adoption.***

Yet, it would be difficult to translate New York City's codes into machine readable language without establishing an experienced team of AEC and computer logic professionals supported by a consortium of City agencies, software developers, educational institutions and professional associations.

The code translation should be semi-automated meaning that it would combine Machine learning with human translators and semantic enrichment tools of BIM authoring software (equivalent to spell checking).

As with any PPP projects working towards major industry shifts, requiring at times a generational shift in thinking, there would be a need for these efforts to be expedited by time bound legislative frameworks and chaperoned by illustrative guideline documents crafted by senior leaders in the technology. These globally recognized BIM and ACCS experts would also manage the consortium for targeted efforts in research and application of the technology shift, with duly deserved compensation. The current shortcomings of the AEC industry in BIM adoption would be alleviated through a series of symposiums, funded trainings and incentivized programs sequenced throughout several decades and supported by a BIM fund for national interests to tap in the productivity opportunity in construction.

New York City should be able to capitalize on its developed urban environment, aging infrastructure and mature open-source database of urban conditions to construct a single source of truth to plan, design, construct and manage its future built environment.

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