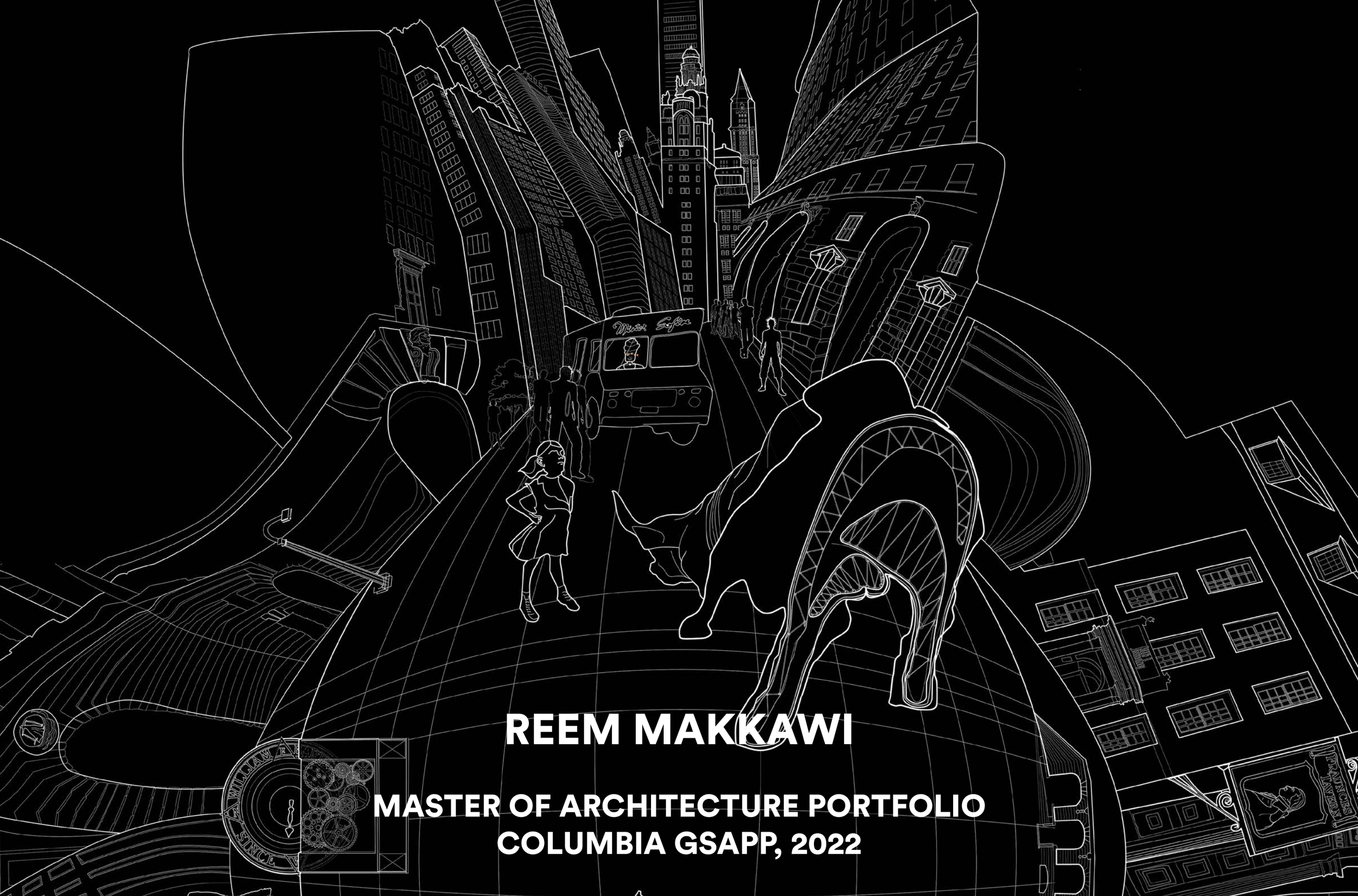
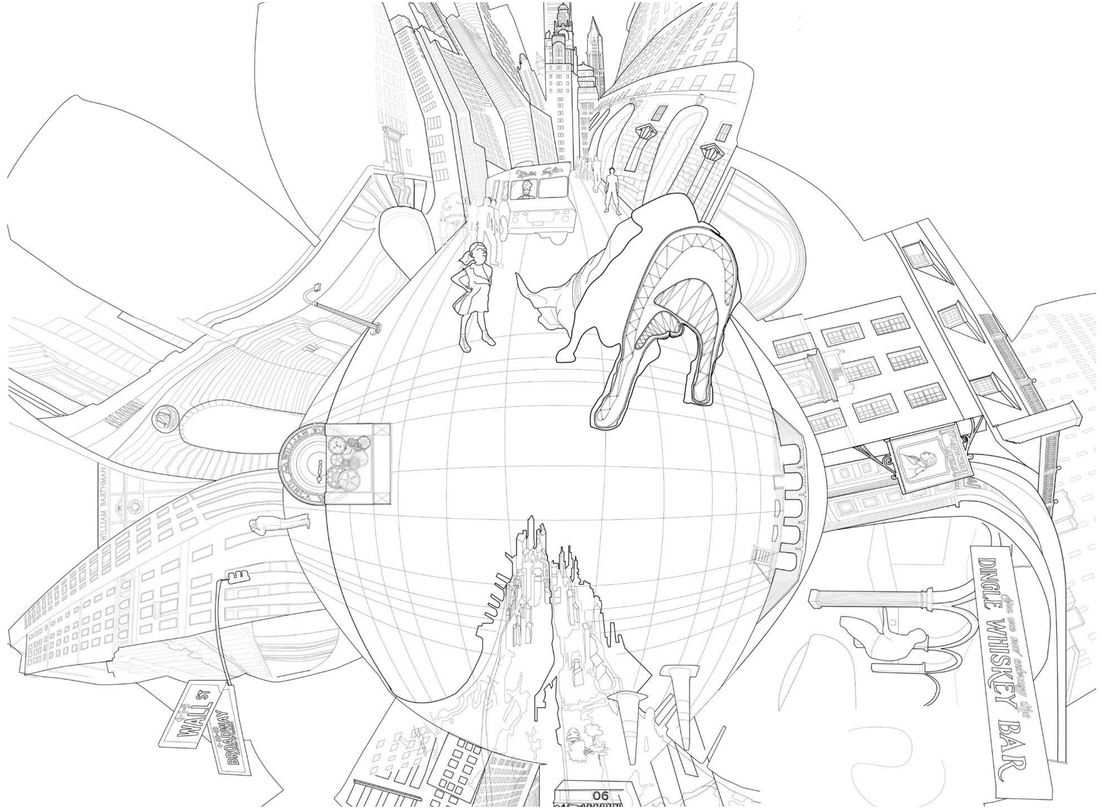


REEM MAKKAWI

MASTER OF ARCHITECTURE PORTFOLIO
COLUMBIA GSAPP, 2022



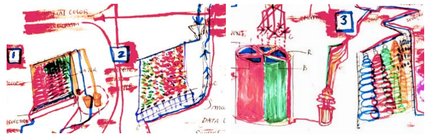
CONTENTS

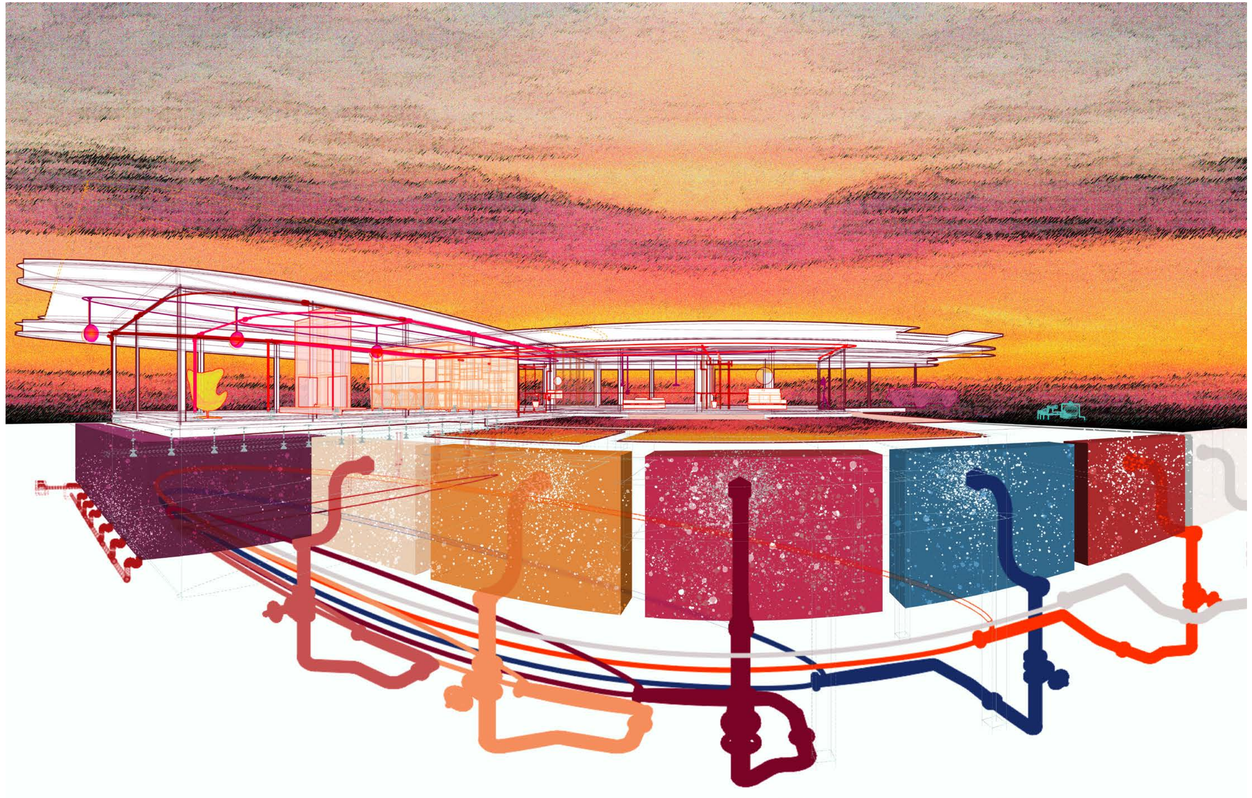
CHROMA COUNTERCULTURE
PAINT, GAS & GLITTER IN POSTWAR INTERIORS

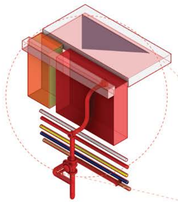
ADV VI STUDIO COLUMBIA GSAPP
INSTRUCTOR: MARK WASIUTA, SP22

Paint is a substance that covers every surface we touch, from coatings to lacquers and varnishes, it is a ubiquitous form of toxicity in the world to which complex commodity desiring effects were attributed in the post war. But paint itself is chosen based on physical attributes like smell, messiness, outside exposure, and visual attributes like sheen, hue, saturation and value. The combination of these properties and effects transform it into a marketable product, a fashionable commodity that attracts to the surface before the object.

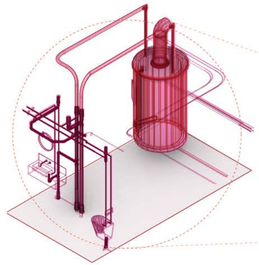
This proposal is a system of chroma that can apply pigments of various gloss to the interior of a space, without recurring to additives and chemicals that enhance its usage. A nozzle detail that applies paint in between two window panes hooked to the gas pipe and pulling from vats of color and metallic pigment around the house introduces an intravenous feeding network, and re-thinks the glass detail as the carrier of modernist culture in architecture.



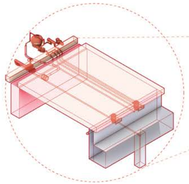




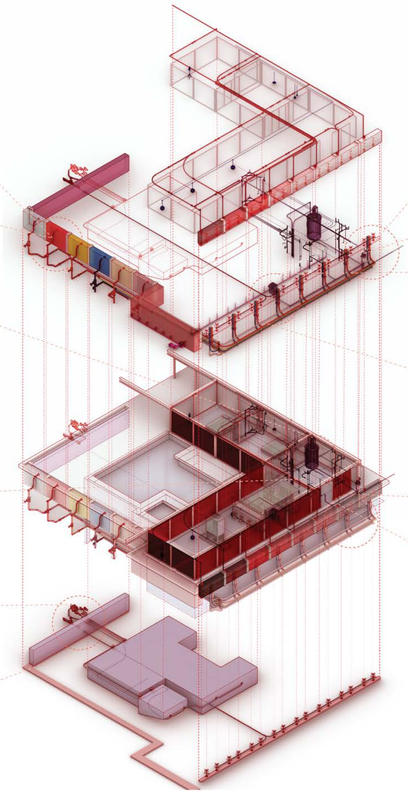
PIGMENT VAT SYSTEM

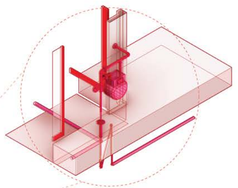


PLUMBING SYSTEM

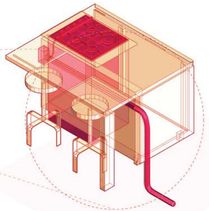


WATER PUMP & HEATER

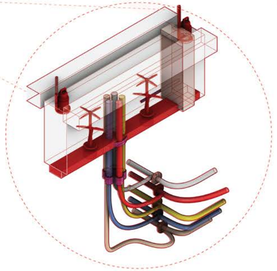




GAS METER

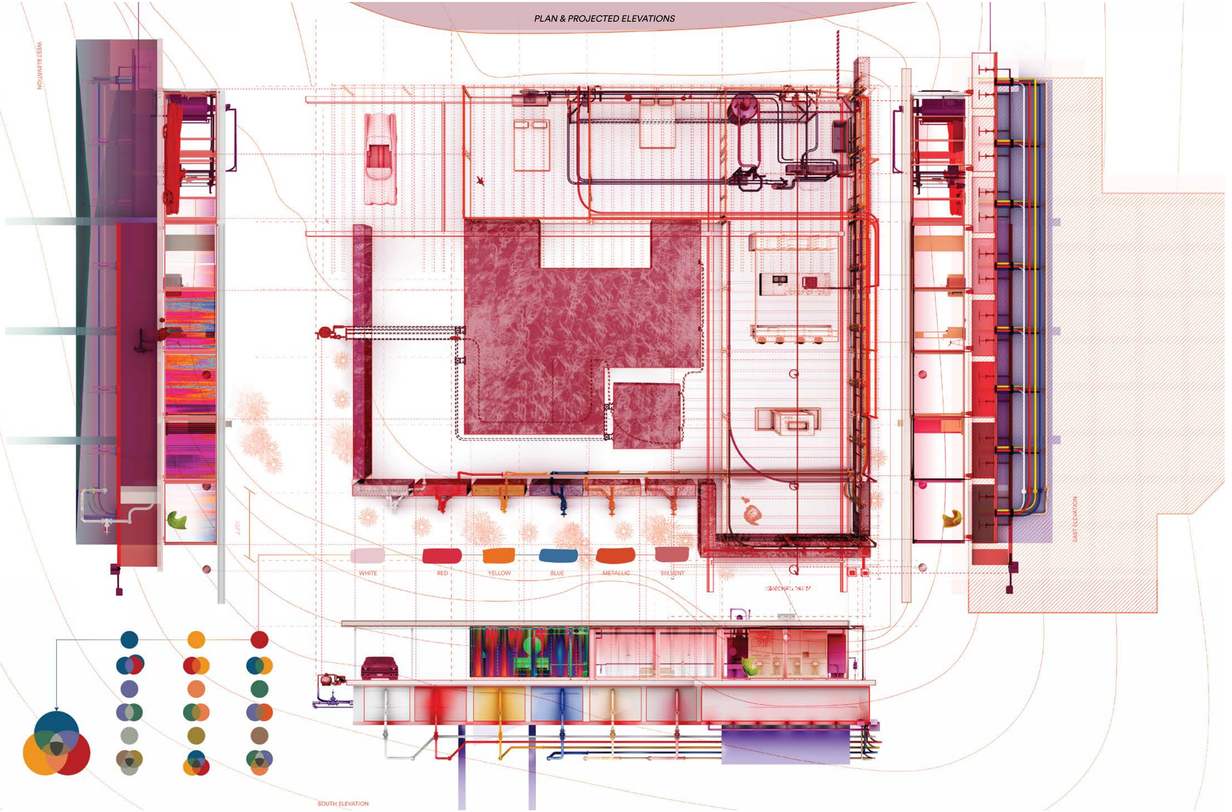


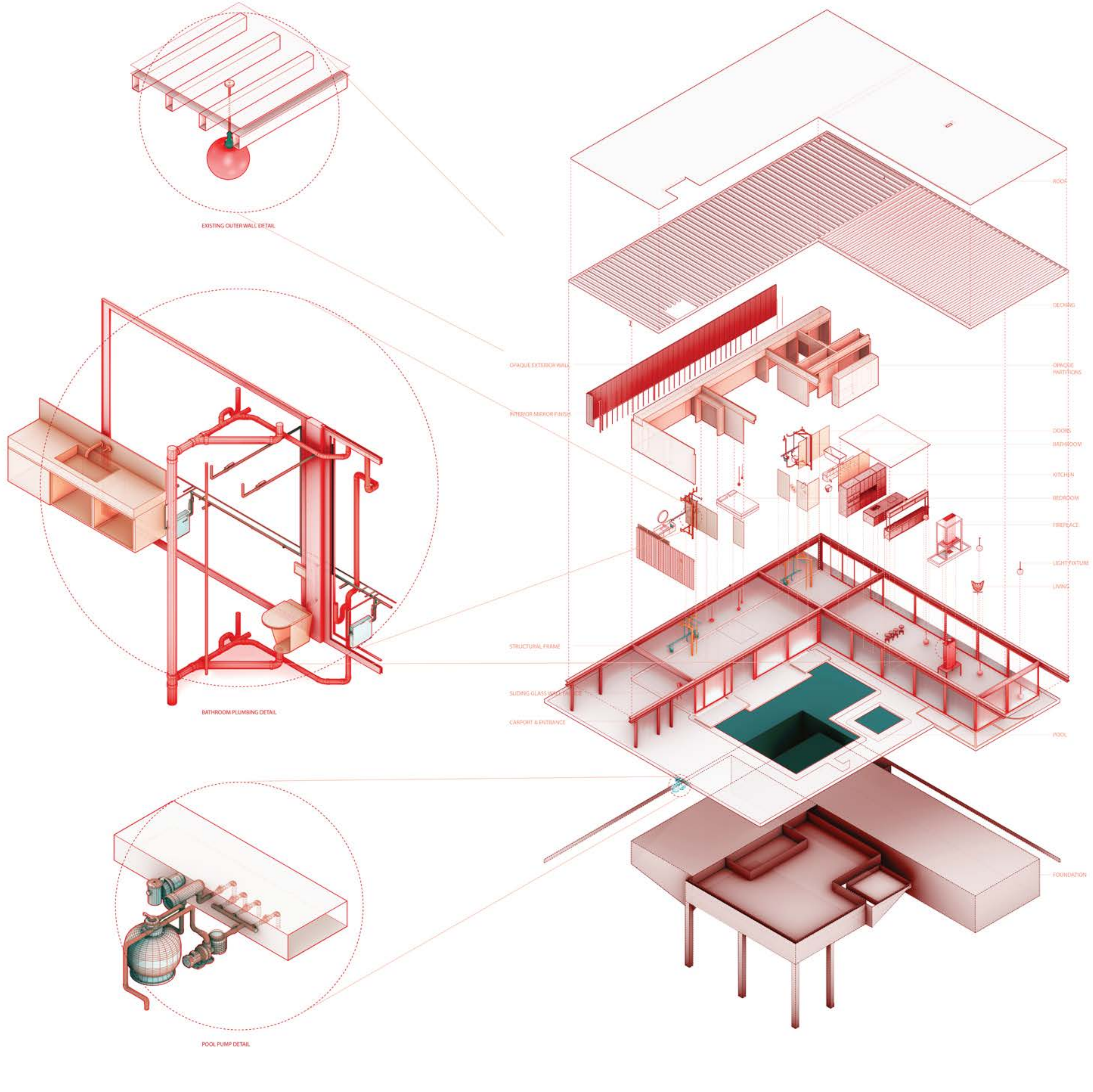
GAS STOVE CONNECTION

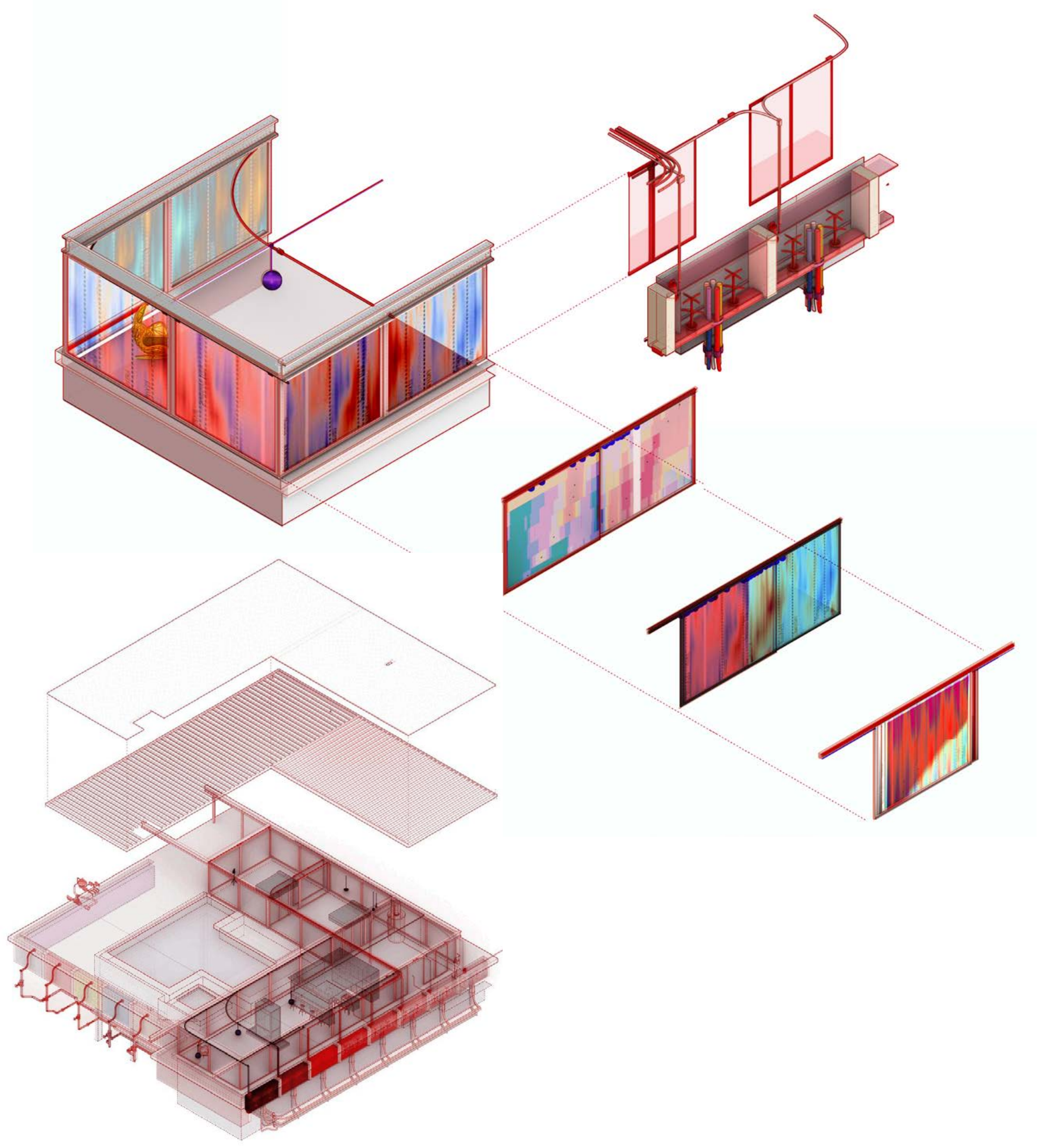


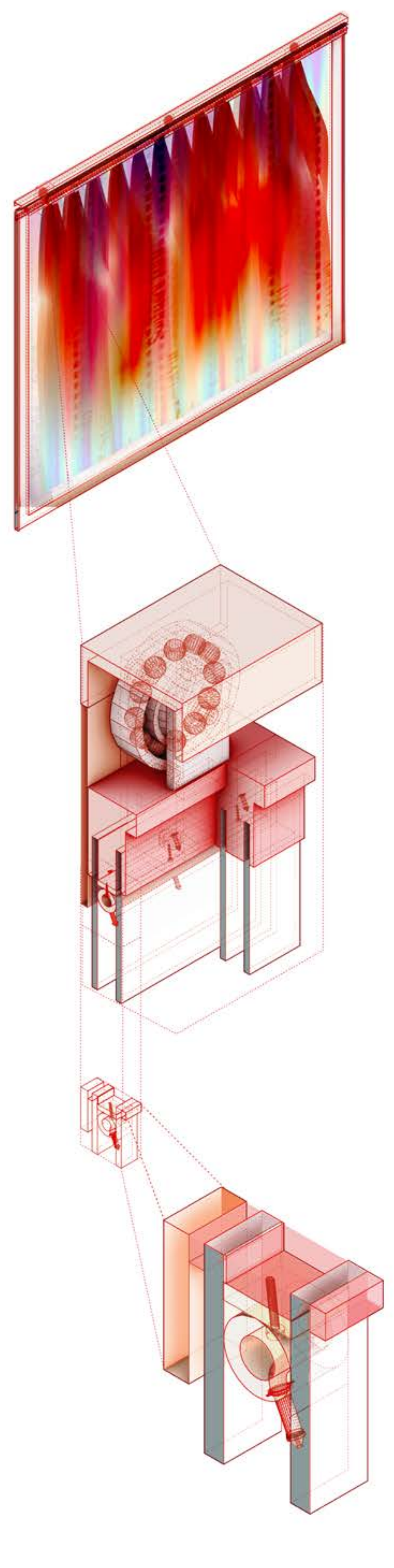
CHROMATIC MIXER

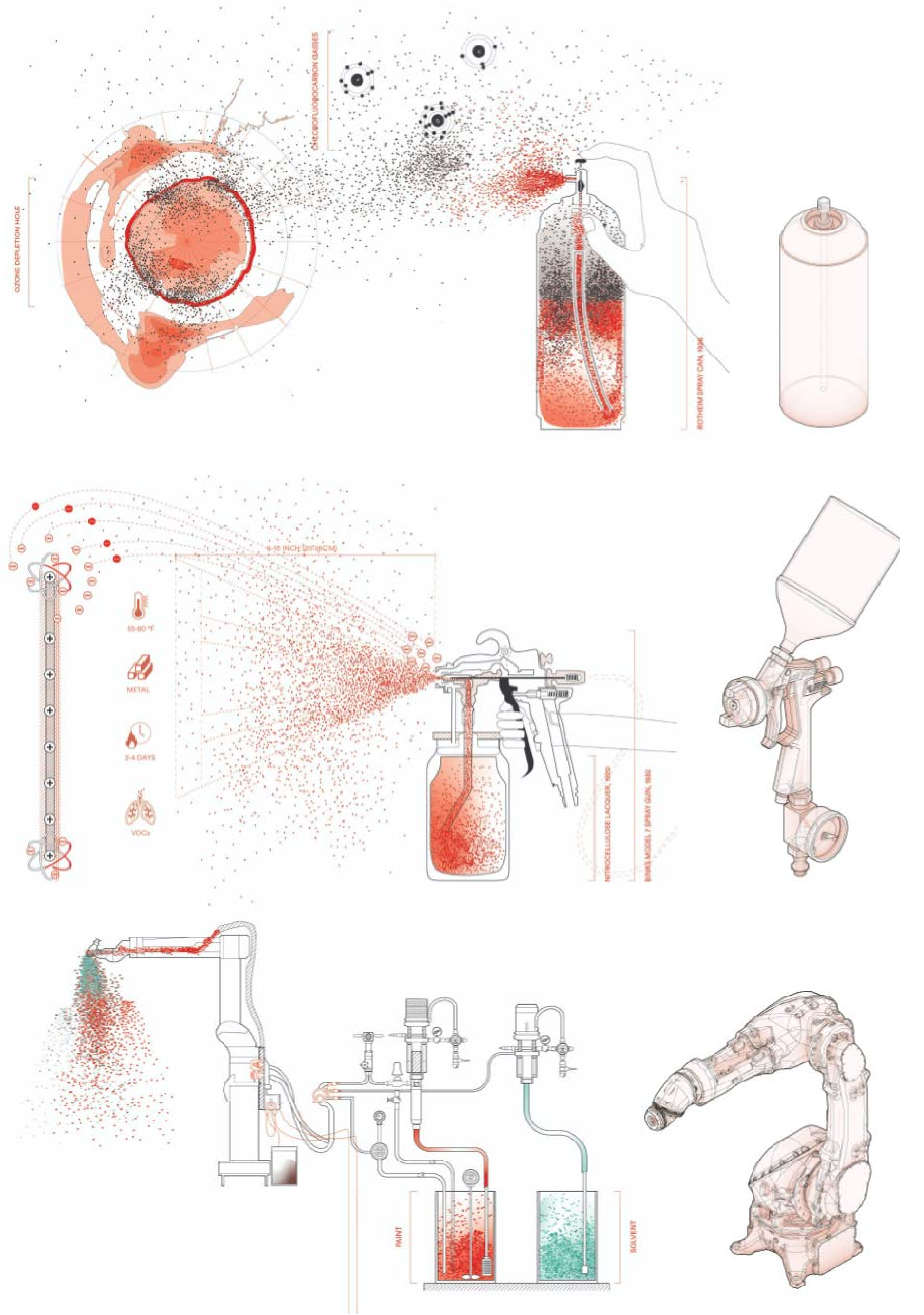
PLAN & PROJECTED ELEVATIONS

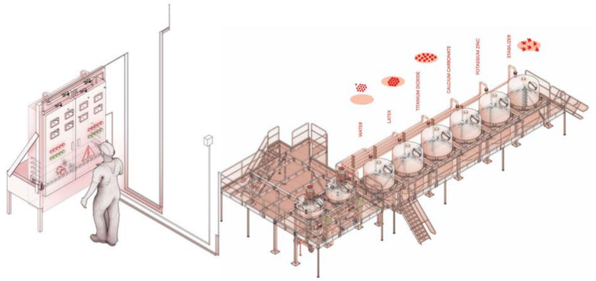


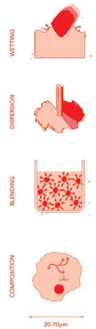

EXISTING OUTER WALL DETAIL
BATHROOM PLUMBING DETAIL
POOL PUMP DETAIL

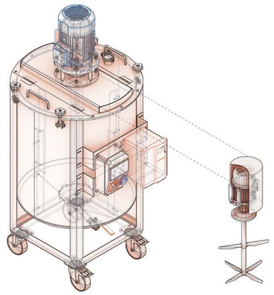


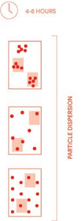


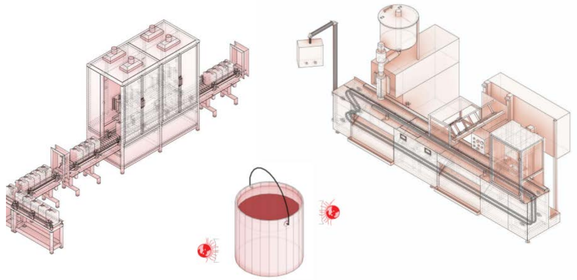


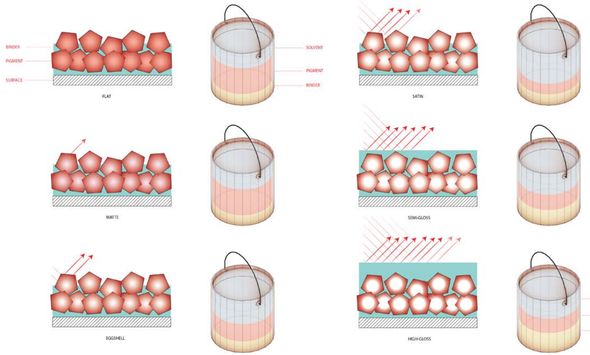


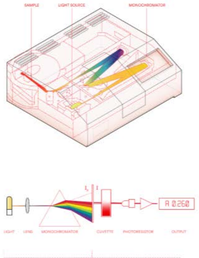


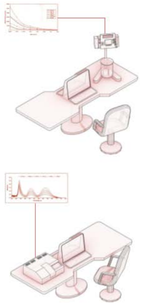


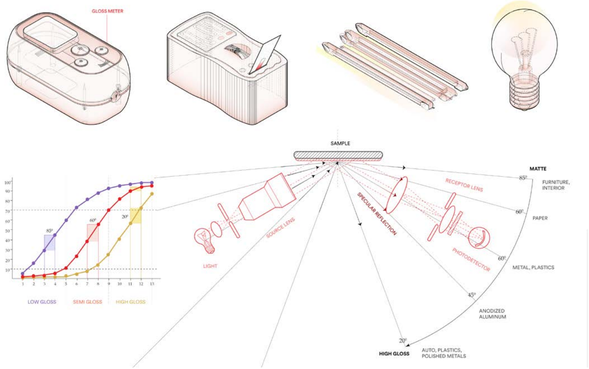


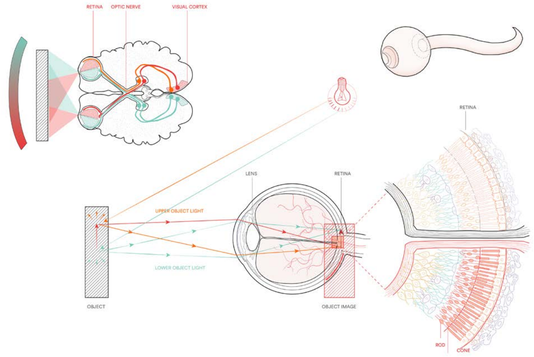


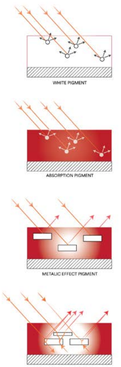




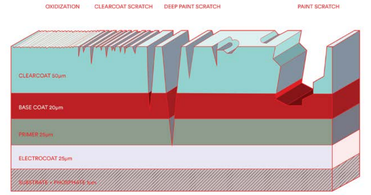






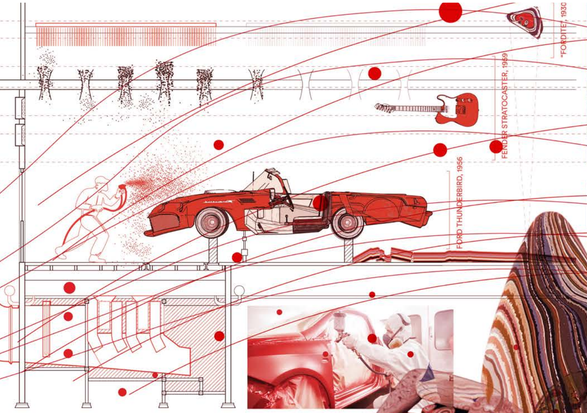


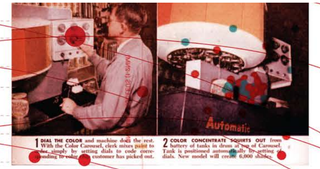
AVERAGE THICKNESS OF COMMON MATERIALS	MILS (1/1000)	MICRON (10⁻⁶ METER)
ALUMINUM FOIL (STANDARD WEIGHT)	0.6	15.2
INDUSTRIAL PRIMER (PER COAT)	1.0	25.4
INDUSTRIAL ENAMEL (PER COAT)	2.0	50.8
CAR FINISH (PRIMER, BASE, CLEAR COAT)	2.3-7.0	58-178
CELLULOSIC PAINT (PER COAT)	7.1-9.3	179-259
POLYURETHANE PAINT (PER COAT)	6.5-13.5	167-344
COPY PAPER (20LBS)	3.5	96.5




PANTONE
Solid Coated
PANTONE
FORMULA GUIDE
Solid Uncoated
PANTONE
PASTELS & NEONS
Solid Coated & Uncoated
PANTONE
METALLICS
Solid Coated

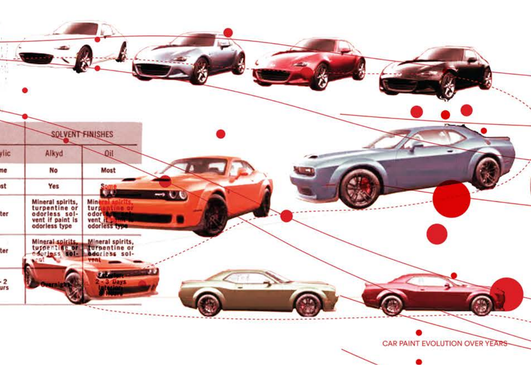

Brighten Up Your Home
Colors Give Fir Plywood Costly Look
Oil Stain
Stain Wax
Paint
Stain Glaze
Dye
Spatter
Parchment
Jewel Tone


FORD THUNDERBIRD, 1956
FENDER STRATOCASTER, 1956
PONTIAC, 1936

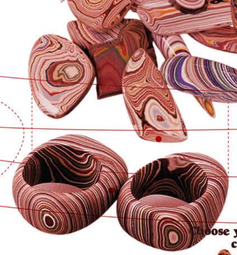

1 DIAL THE COLOR and machine does the rest. With the Color Carousel, clerk mixes paint to the sample by turning dials he reads across. Assuming he has picked out
2 COLOR CONCENTRATE SQUIRTS OUT from
Automatic

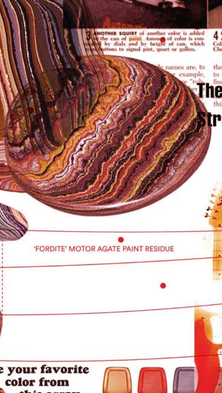

3 ANOTHER SQUIRT of another color is added
4 PERFECT MATCH is shown by test strip. Now
the other. To get the right

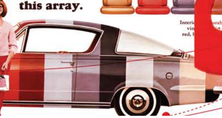

GRAIN WAX



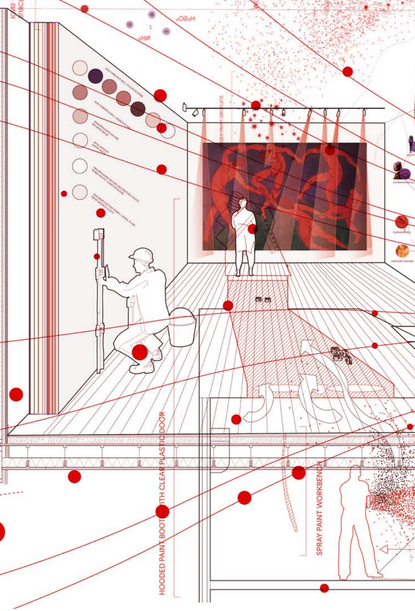
Brighten Up Your Home
New Paints Give You Pro's Skill
HERE'S THE SCORE ON THE NEW PAINTS
EMULSION FINISHES
SOLVENT FINISHES
Rubber
Vinyl
Rubber-Vinyl
Acrylic
Alkyd
Oil
EXTERIOR
INTERIOR
THIN WITH
CLEAN UP WITH
DRYING TIME (Time between coats)

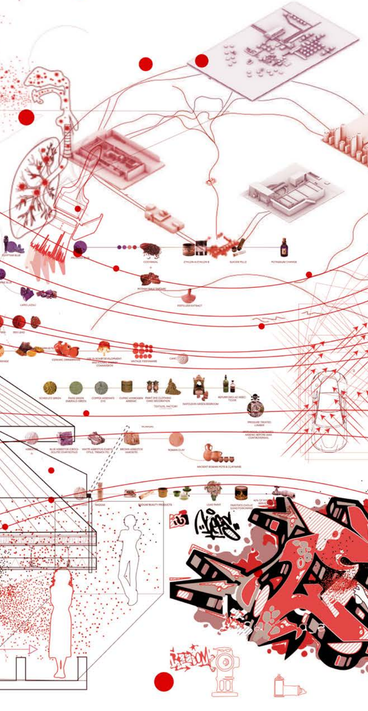






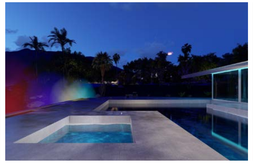

The Hank Marvin Signature
Stratocaster by Fender
labor? Only £499


HOODED PAINT BOOTH CLEARS AUTOMOBILE
SPRAY PAINT WORKBENCH



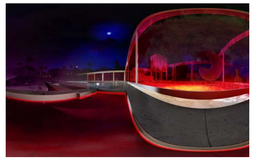
AEROSOL SPRAYU, 1931

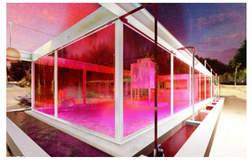
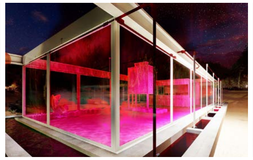
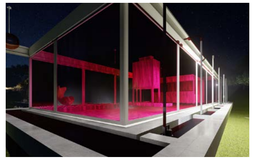


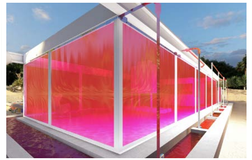



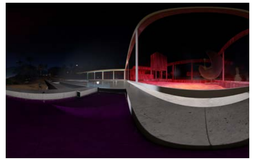
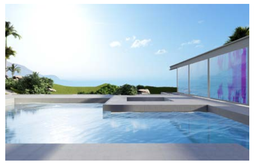
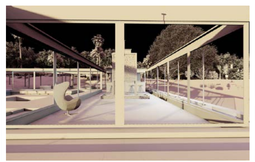
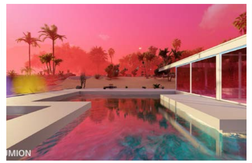




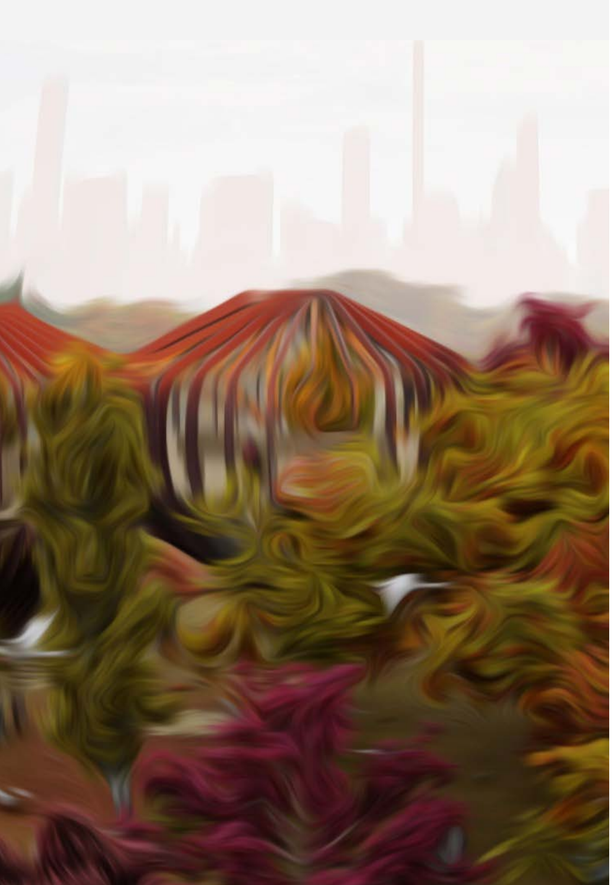






HABIT/HABITAT/HABITUS
CENTRAL PARK CO-LIVING FUTURES

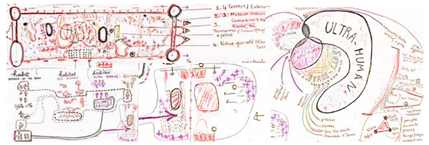
ADV V STUDIO COLUMBIA GSAPP
INSTRUCTOR: MABEL O. WILSON, FA21
PARTNER: MEISSANE AUDE KOUASSI

Central Park is a landmark of urban wildlife, tourists, migrating birds, and unseen dwellers. Unearthing its historical and geopolitical layers reveals a plantation logic characterized by dispossession, alteration, and control of land in the name of the public good. The Conservancy, private park management entity, benefits from commodifying landscape elements & receiving income from real estate developments priced based on their adjacency and view towards the park.

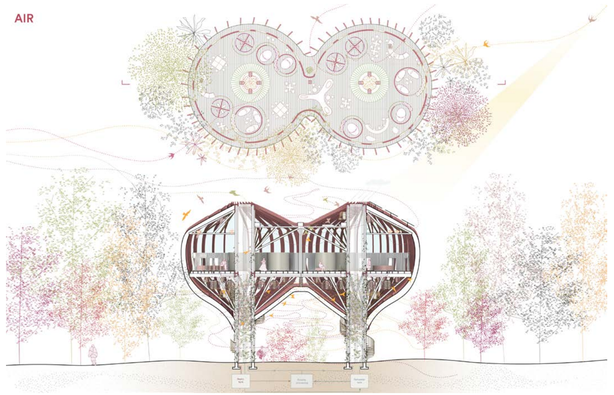
This project proposes a disruptive policy of public park stewardship with a park-view tax, removing the need for private management and freeing up the land back to the public—

a post-plantation future of deterritorialization, symbiosis, and utter blending between the humans and non-humans of Central Park. Ecological propositions are drawn in a novel tapestry of pollinators, birds, amphibians, mammals, humans, soil, water, and air.

The co-living futures are designed for ecosystems occupying spaces dominated by humans, allowing unique imaginaries of caretaking models. A hundred years from now, when boundaries dissolve and roadways become obsolete, one can imagine a sustainable city where fauna, flora, and humans live in an adaptive entanglement of habit, habitat, habitus.

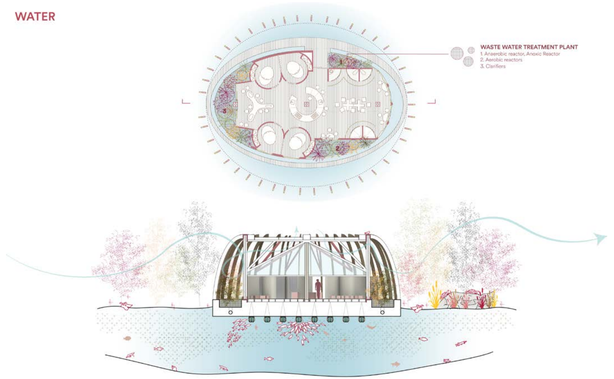


AIR



EARTH

WATER



EIA STEVENS
SENECA MEMORIAL
ARTHUR STEVENS
MARY O'STEVENS
MARY ROCKFORT
JOHN W. ANDREWS
MARIE W. ANDREWS
EDWARD ANDREWS
CATHERINE VAUGHN
JOHN P. PAULSON
MARGARET PAULSON
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CLARA PAULSON
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WILLIAM DALEY
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DALIA HAFF
ROBERT HAFF
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EDWARDS HAFF
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ELIZABETH WILLIAMS
JEREMIAH WILLIAMS
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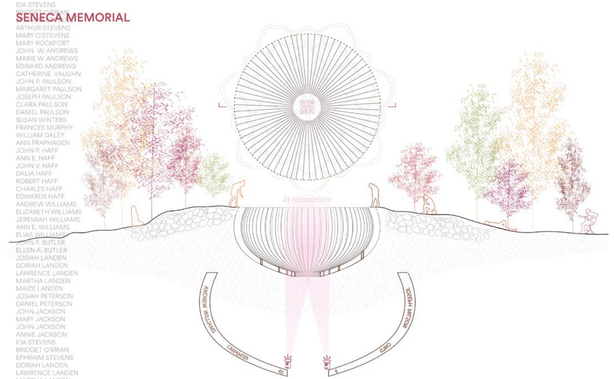
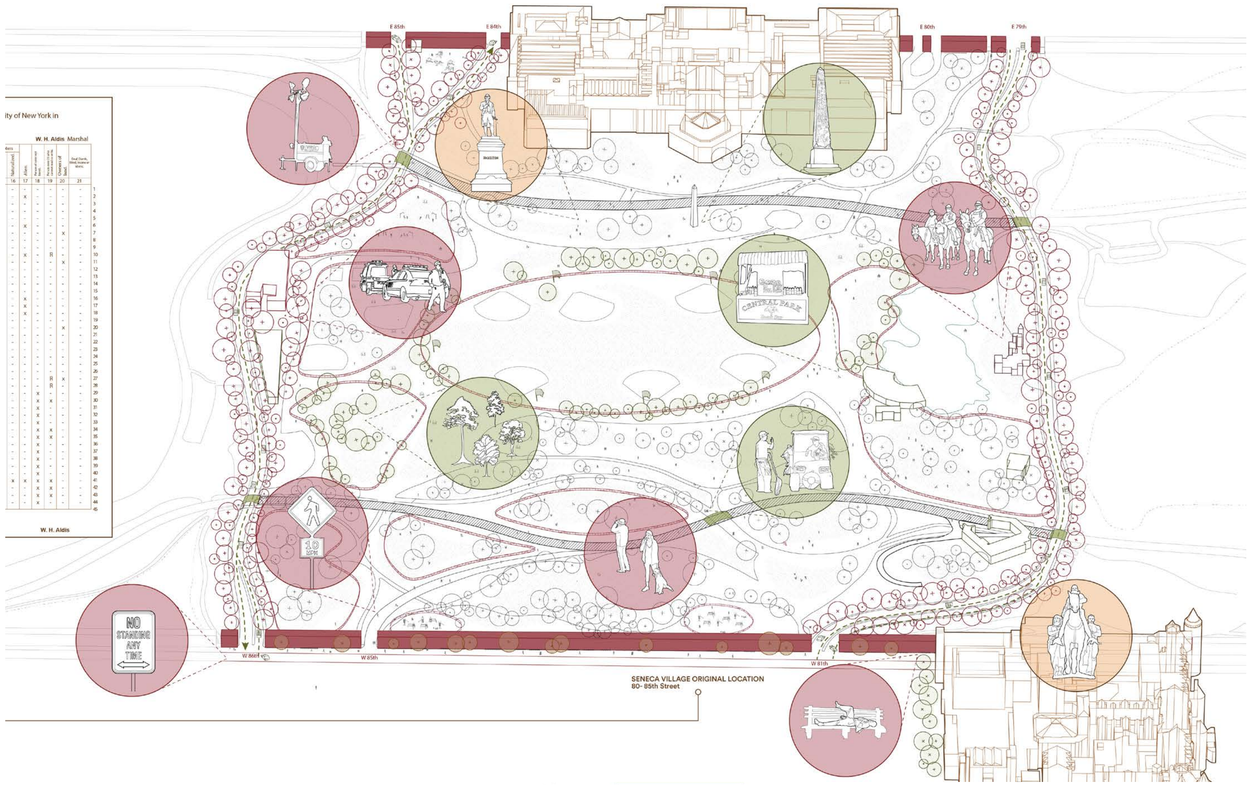
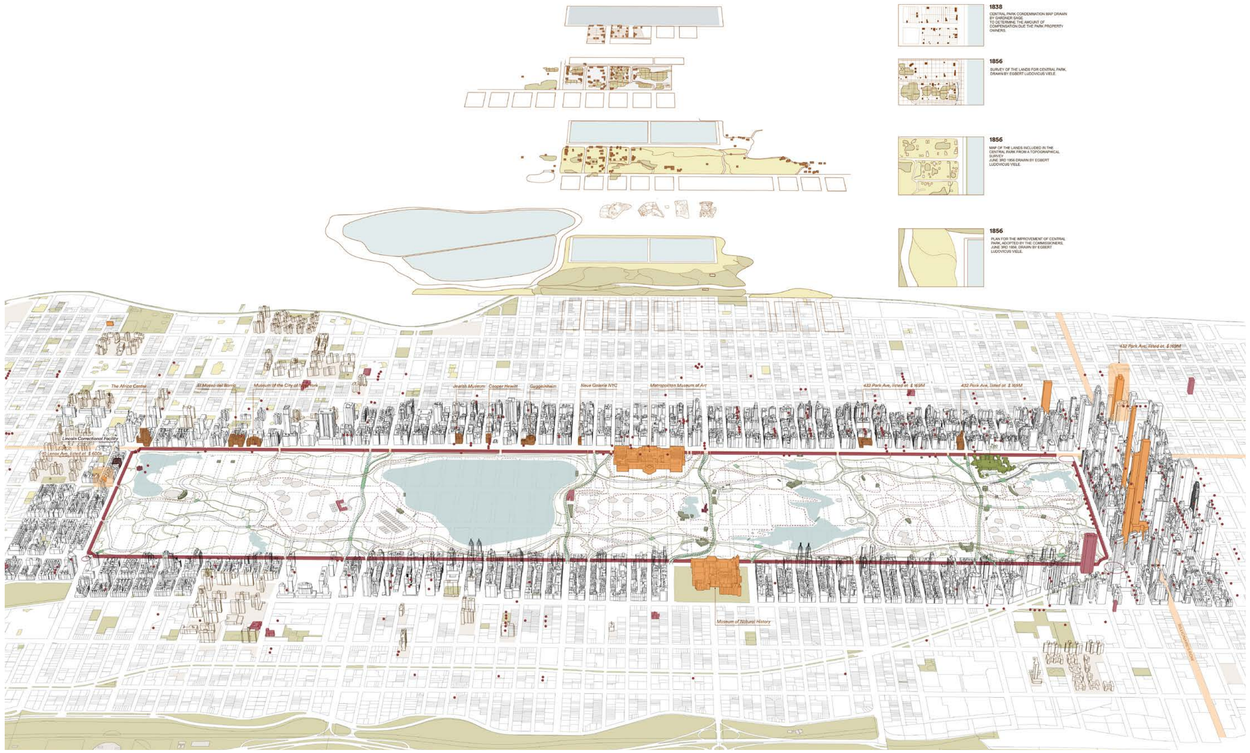
ELIZA E. BUTLER
ELLEN A. BUTLER
JOSIAH LANDEN
DORIAH LANDEN
LAWRENCE LANDEN
MARTHA LANDEN
MAIZE LANDEN
JOSIAH PETERSON
DANIEL PETERSON
JOHN JACKSON
MARY JACKSON
JOHN JACKSON
ANNIE JACKSON
EIA STEVENS
BRIDGET O'BRIAN
EPHRAIM STEVENS
DORIAH LANDEN
LAWRENCE LANDEN
MARTHA LANDEN



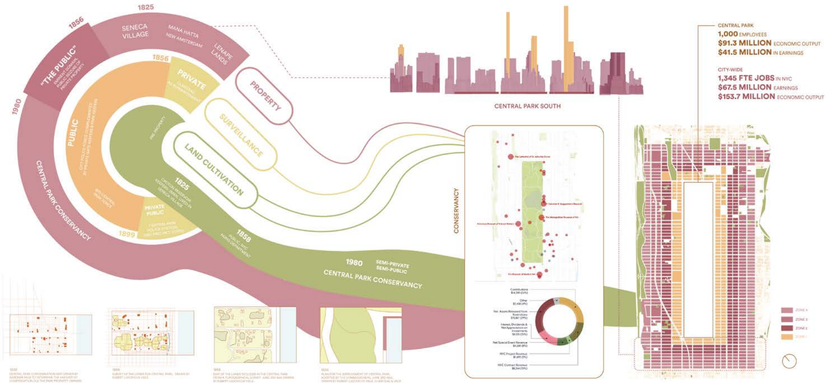
UPPER WEST SIDE STUDY

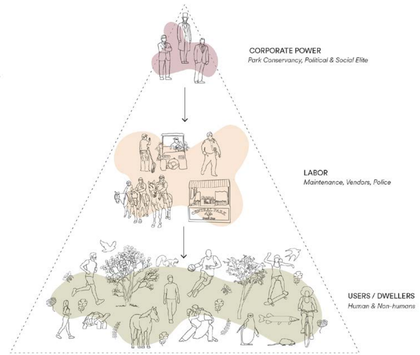


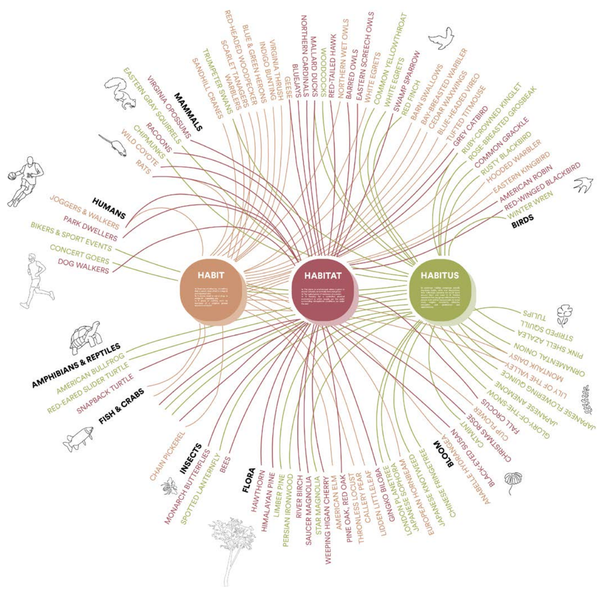
CENTRAL PARK PLANTATION HISTORIES & PRESENT

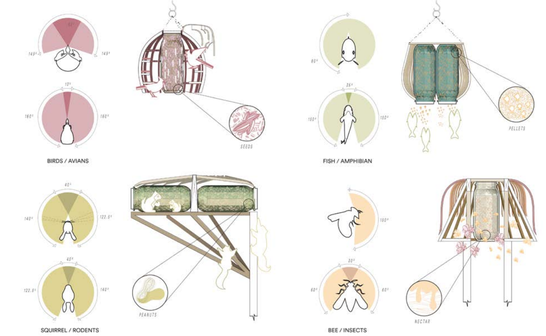


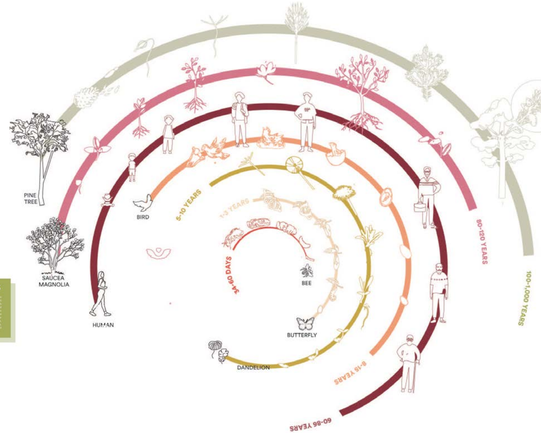
HIDDEN PARK AGENTS DIAGRAM: CORPORATE POWER, FAUNA, FLORA





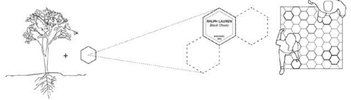






CENTRAL PARK CONSERVANCY | Welcome to your 843 acres backyard !

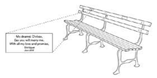
ENDOW A TREE
$5,000 and up



ENDOW A PAVING STONE
$3,500

ENDOW A TULIP
$50 ($1 per bulb)

ADOPT-A-BENCH
$10,000



CORPORATE PROGRAMS
$10,000 and up

Foster team spirit by volunteering to a *Day in the Dirt* Paint benches, plant ground covers, rak leaves etc.

CHOOSE YOUR MEMBERSHIP PACKAGE :

~~$25,000~~ ~~$50,000~~ ~~$100,000~~

Current partners

Bloomberg · Bank of America · MACQUARIE · NYSE · NORDSTROM · WALTER · Anonymous · ANSTEK Foundation, Inc. · citi · Disney · TimeWarner

~~LABORERS~~
CARETAKERS
Environmentalists, Artist, Nature lovers etc.

SYMBIOSIS

FREQUENTER
Human & Non-humans

HABITAT
Any habitat must provide, in sufficient quantity and quality and without undue disturbance, food, water, shelter and space for animals to survive and reproduce.
The three principles of conservation biology are:
1) Ensuring that current habitat areas are protected and managed for the species that depend on them over the long term.

REBELLION

SURVEILLANCE

CAMOUFLAGE
The disguising of an entity to make it appear unnoticeable or undetectable. This is usually to avoid detection by other entities.

MIGRATION
The seasonal movement of animals from one region to another, usually to find food or breeding conditions.

CULTIVATION

PROPERTY

LABOR

HABIT
The habit area of influence is usually small, as an animal's habit is usually the area it can cover in its daily activities. Habitat selection is the process by which animals choose habitats in which to live.

ENTANGLEMENT

DISPOSSESION

COLLISION

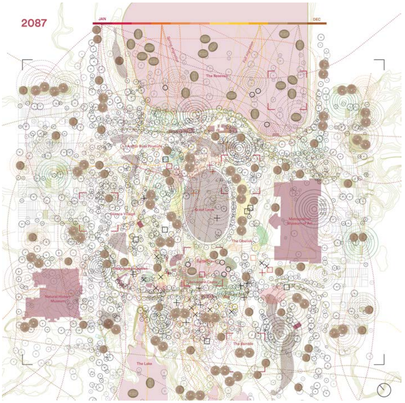
REPARATION

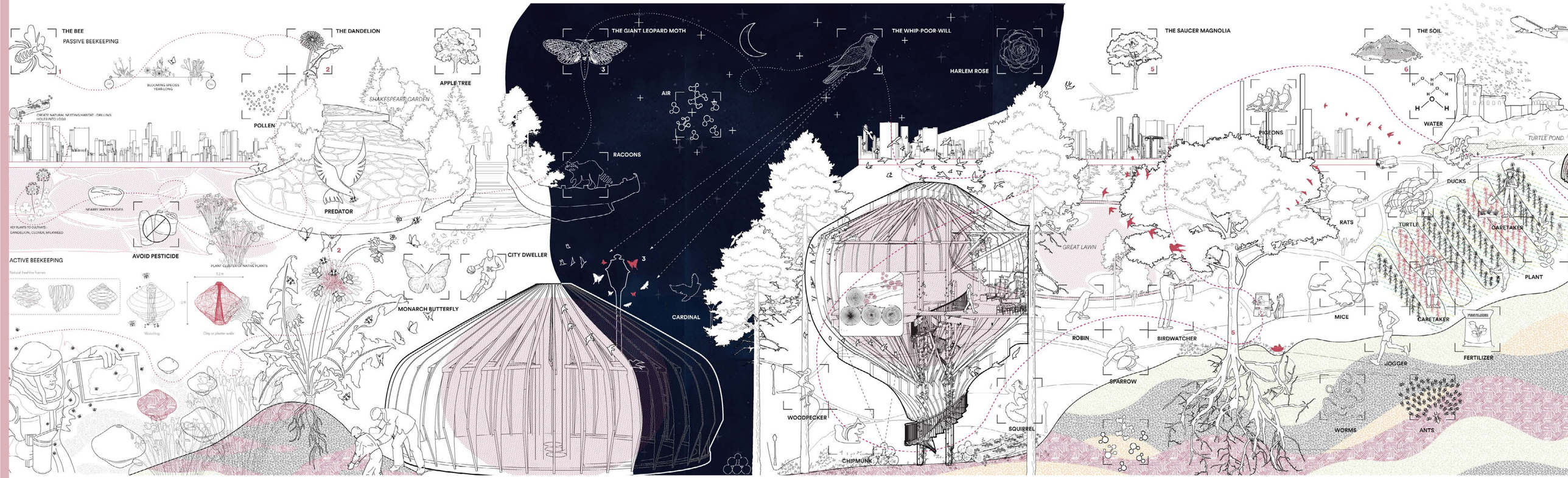
OVERLAP

BLENDING

HABITUS

SECTION THROUGH MET & MUSEUM OF NATURAL HISTORY, PLANS




THE BEE
PASSIVE BEEKEEPING
1
BLOOMING SPECIES YEAR-LONG
CREATE NATURAL NESTING HABITAT - DRILLING HOLES INTO LOGS
THE DANDELION
2
POLLEN
APPLE TREE
SHAKESPEARE GARDEN
NEARBY WATER BODIES
PREDATOR
KEY PLANTS TO CULTIVATE: DANDELION, CLOVER, MILKWEED
AVOID PESTICIDE
PLANT CLUSTER OF NATIVE PLANTS
ACTIVE BEEKEEPING
Natural beehive frames
Woodchip
Clay or planter walls
3.2 ft
CITY DWELLER
MONARCH BUTTERFLY
THE GIANT LEOPARD MOTH
3
AIR
RACOONS
CARDINAL
THE WHIP-POOR-WILL
4
HARLEM ROSE
WOODPECKER
CHIPMUNK
SQUIRREL
THE SAUCER MAGNOLIA
5
GREAT LAWN
PIGEONS
RATS
ROBIN
BIRDWATCHER
SPARROW
MICE
JOGGER
WORMS
THE SOIL
6
WATER
TURTLE POND
DUCKS
TURTLE
CARETAKER
PLANT
CARETAKER
FERTILIZER
ANTS

PUBLIC CONNECTIONS
AFFORDABLE HOUSING IN THE BRONX

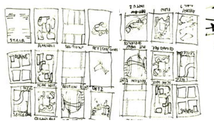
CORE III STUDIO COLUMBIA GSAPP
INSTRUCTOR: BENJAMIN CADENA, FA20

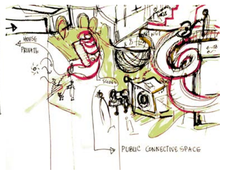
A demographic study of Melrose shows a majority of residents single-parent households earning less than $25K a year. This project proposes to address the needs unmet by the existing codes and agencies for affordable housing, creating a **safe third public space between the house and the school for the children of the Bronx.**

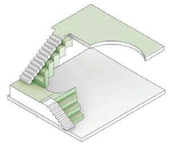
After conducting interviews with children at NYCHA housing in Melrose, the program was extrapolated to create spaces for the kids study outside of the house while the guardian is at work, after school, amenities but also rest spaces for the mothers, and study pods condusive to growth.

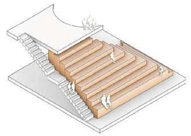
The structural core is the organizational and circulatory element and public plaza that residential units are plugged into. Variations in step levels and platform widths allow a wide range of spatial and light qualities.

The units wrap in an L-Shape around it and occupy a shifted steel frame with balconies. Inner courtyards house sports halls and community garden, serving at the ground level as daycare and afterschool program. With this design, new modes of interconnectivity between families promote modes of co-living and inter-generational growth and rest through affordable housing.



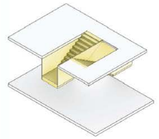


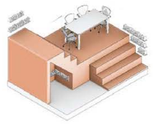


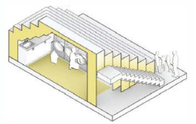


SPACES FOR GATHERING
MULTI-PLATFORMS

AUDITORIUM SEATING



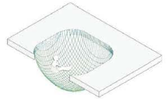


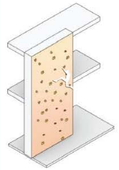


SPACES FOR WORK
PRIVATE WORK PODS

OPEN LIBRARY

LAUNDRY & AMENETIES

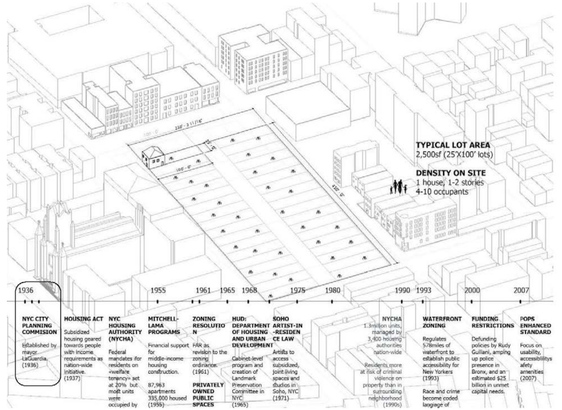


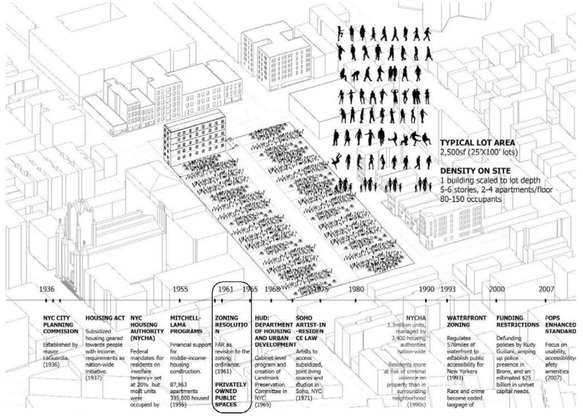


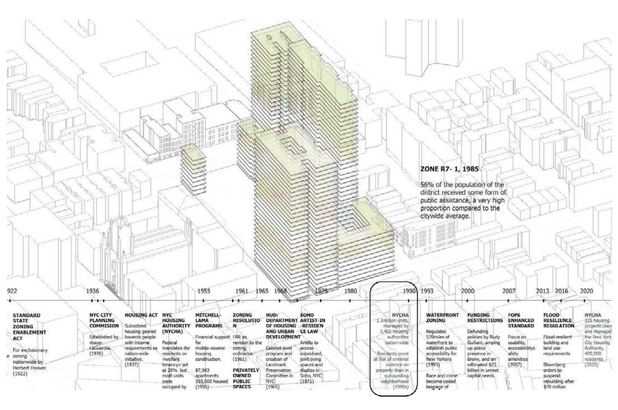
SPACES FOR PLAY
NET

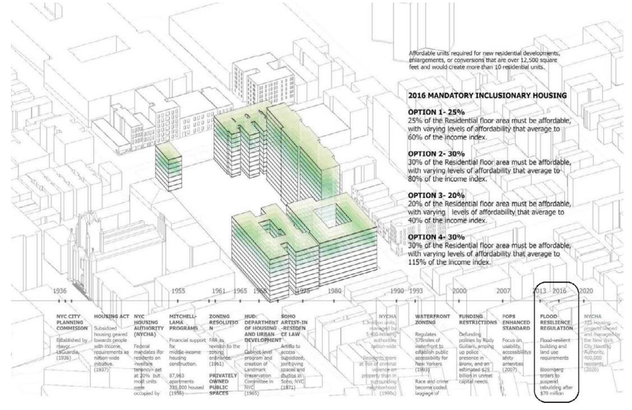
SLIDES

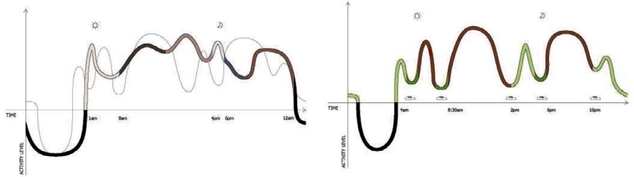
CLIMBING WALL

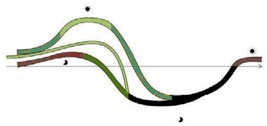






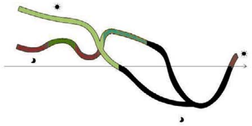






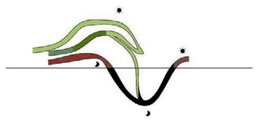
2B 1BA ACTIVITY SPATIAL DISTRIBUTION DIAGRAM

2B 1BA FLOOR PLAN 950SF 1/8"=1'



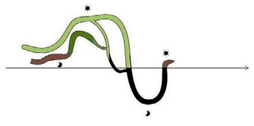
3B 2BA ACTIVITY SPATIAL DISTRIBUTION DIAGRAM

3B 2BA 1,100SF 1/8"=1'



2B 1BA ACTIVITY SPATIAL DISTRIBUTION DIAGRAM

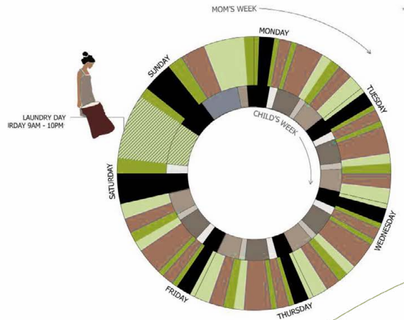
2B 1BA FLOOR PLAN 950SF 1/8"=1'

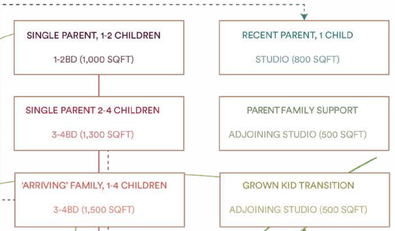


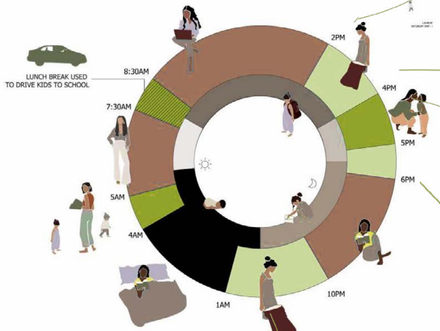
2B 1BA ACTIVITY SPATIAL DISTRIBUTION DIAGRAM

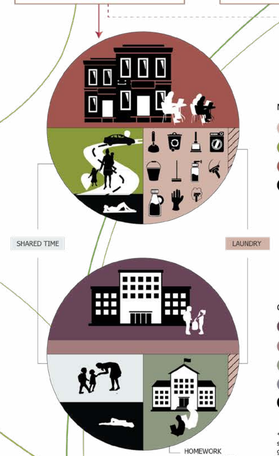
2B 1BA 1,100SF 1/8"=1'

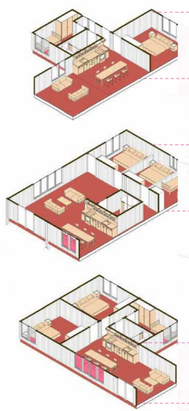
ANALYSIS OF INTERVIEWS WITH NYCHA & SEMIPERM HOUSING RESIDENTS & UNIT TYPOLOGIES

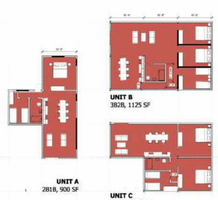






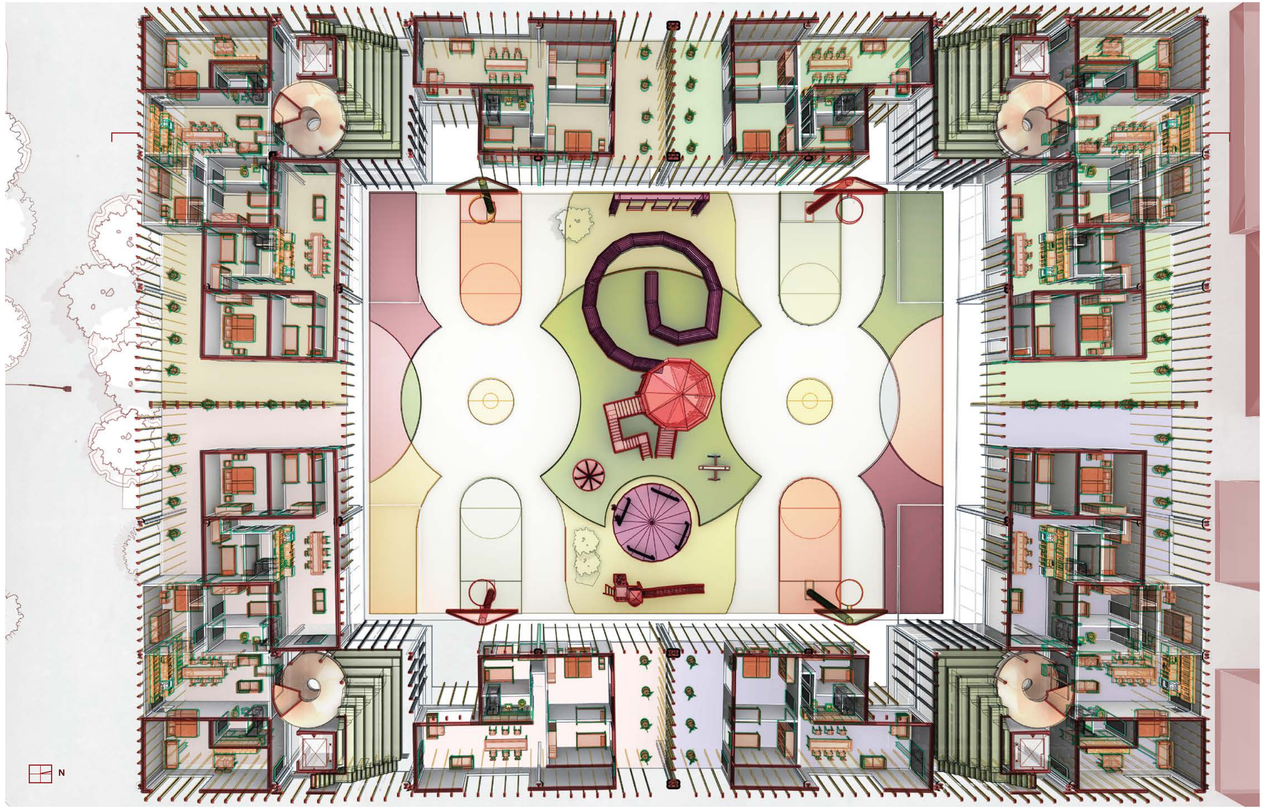




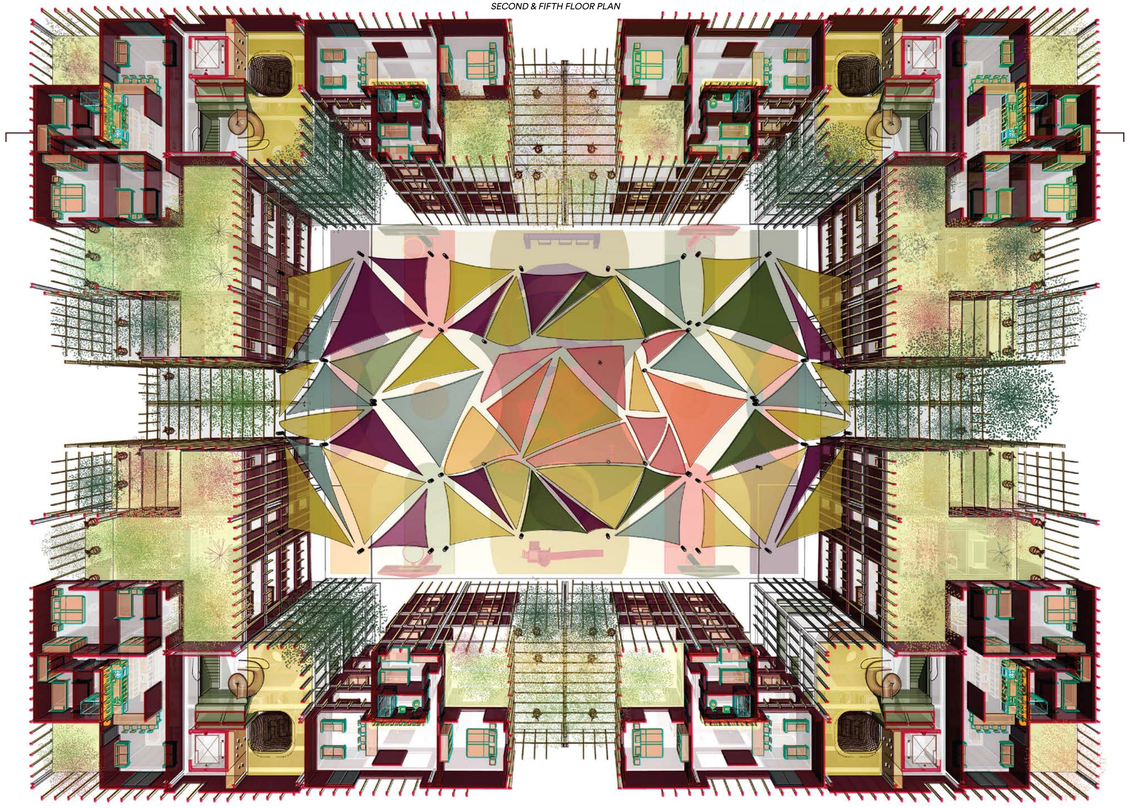


CROSS-SECTION THROUGH DAYCARE

MASSING & UNIT AGGREGATION DIAGRAMS



SECOND & FIFTH FLOOR PLAN



P.S. 64
THE INSIDE OUT SCHOOL

CORE III STUDIO COLUMBIA GSAPP
INSTRUCTOR: CHRISTOPH KUMPUSH, SP20

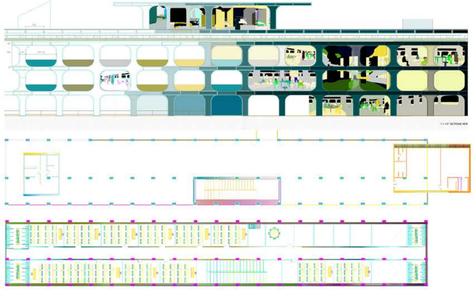
How 'public' can a public school be?

How can a school simultaneously insert itself and spill out of the existing urban fabric? The rehabilitation of P.S. 64 in the East Village presents opportunities to embed systems of modern design into the existing H-shaped Snyder school.

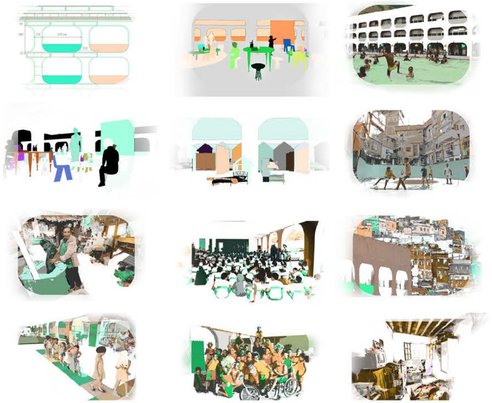
The majority of the building's skin and bones is preserved to minimize material waste. Surgical cuts create spatial interventions for special programs, open classroom and community workshop spaces. An embedded gantry crane in the building slides hipping containers in and out of the city, fulfilling much needed functions of public bathrooms.

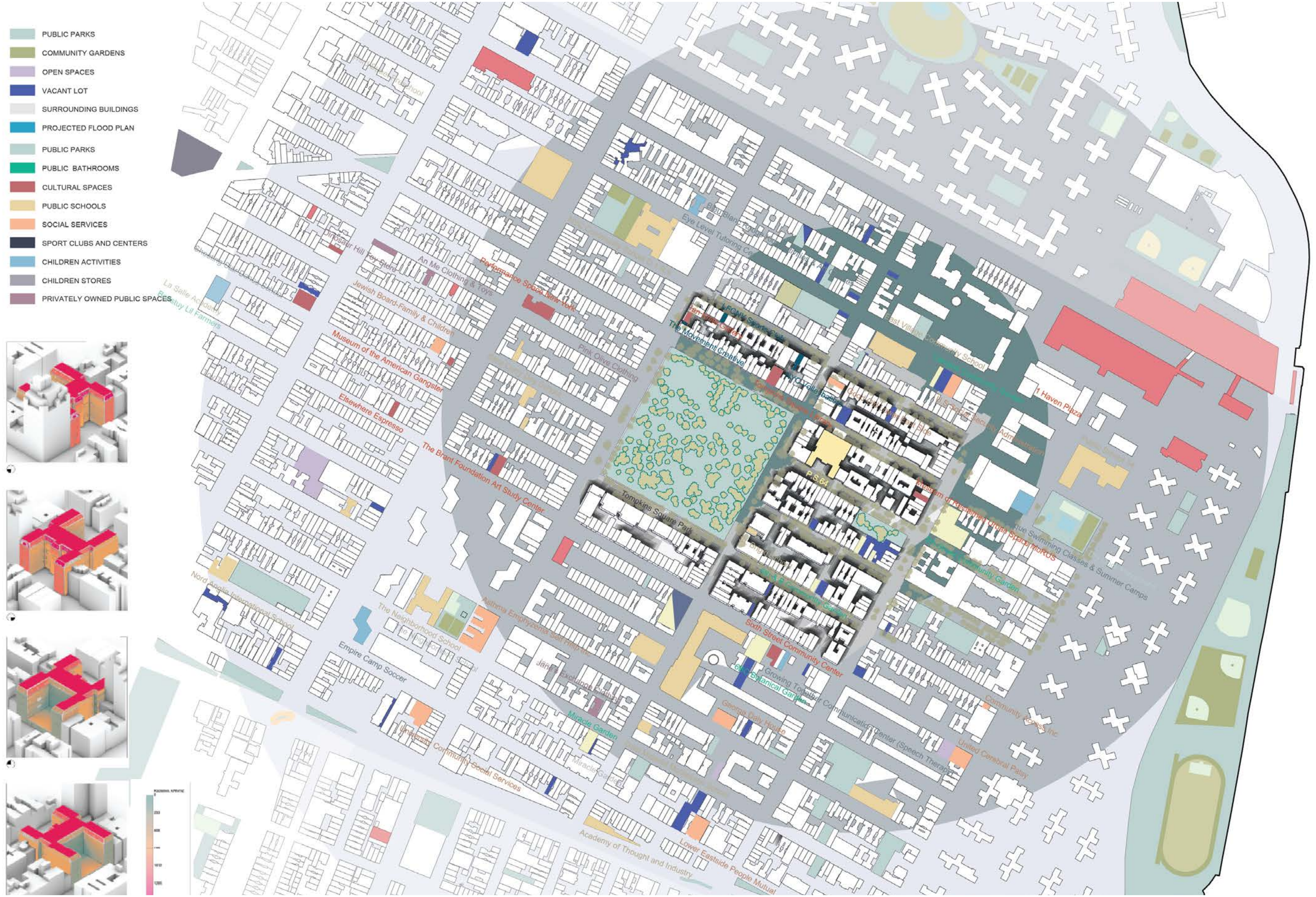
These containers can be placed in Tompkins Square park,as outdoor public library, or science labs after school, floating on a barge in the East River. The surrounding community can come in and be involved in night classes or art workshops integrated in a larger education system and cycle, contributing to new possibilities of learning within the New York Public School system.

Unforeseen future usage and programmatic needs of classrooms is accounted for, physically and socially creating a relationship between the school and the surrounding public and natural spaces. The shipping containers sliding in and out suggest an infinity of possibilities.

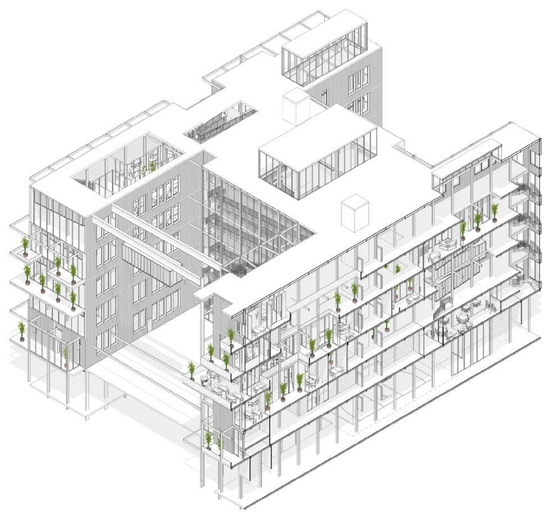


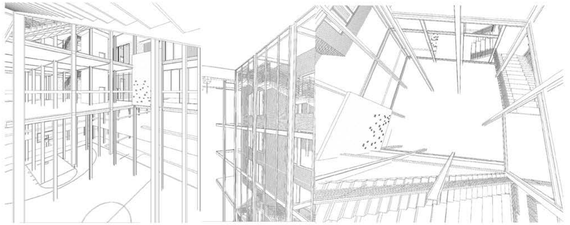
1/64"=1'-0" PLAN VIEWS, GROUND LEVEL AND LEVEL 1

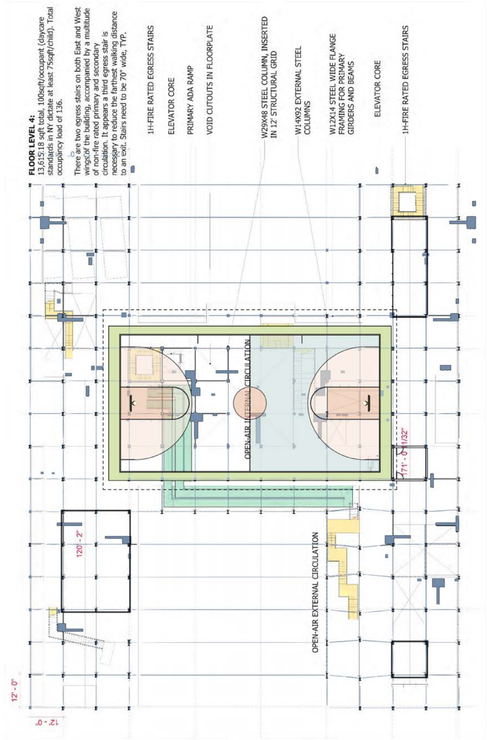


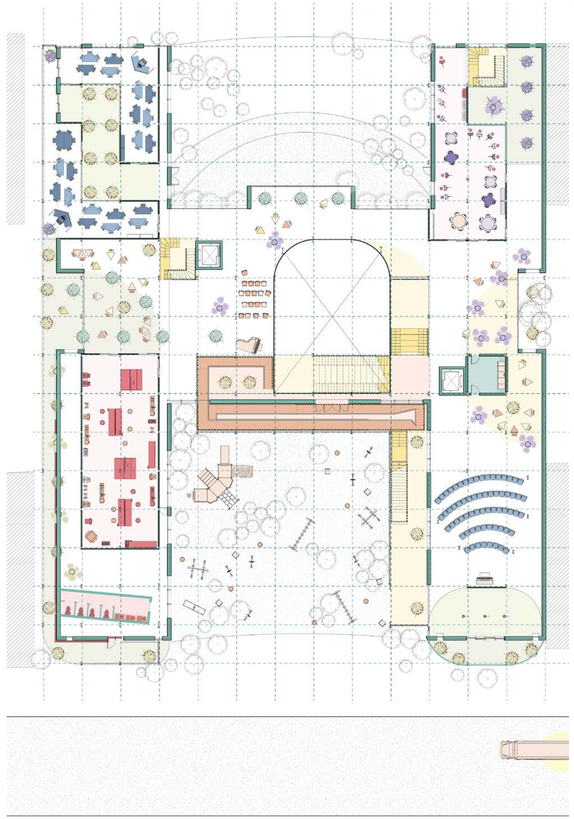


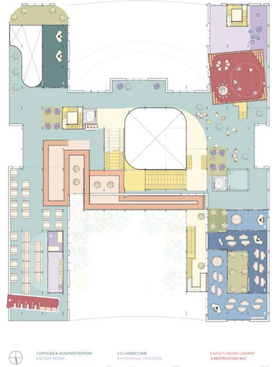
SITE STUDY & SKETCH MODELS



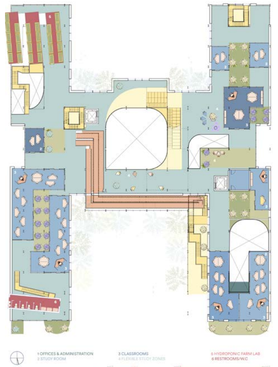


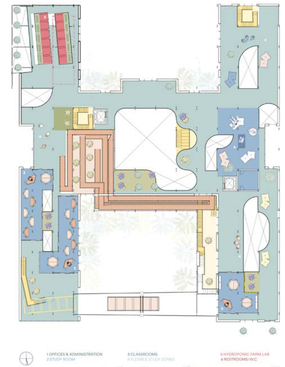

FLOOR LEVEL 4:
13,615.18 sqft total, 106sqft/occupant (daycare standard), 1 exit per floor at least 75sqft/child). Total occupancy load of 128.
There are two egress stairs on both East and West wings of the building, accompanied by a multitude of non-fire rated primary and secondary circulation. These stairs were strategically necessary to reduce the farthest walking distance to an exit. Stairs need to be 70" wide, TYP.
1H-FIRE RATED EGRESS STAIRS
ELEVATOR CORE
PRIMARY ADA RAMP
VOID CUTOUTS IN FLOORPLATE
W28X49 STEEL COLUMN, INSERTED IN 12' STRUCTURAL GRID
W14X92 EXTERNAL STEEL COLUMNS
W12X14 STEEL WIDE FLANGE PURLINS SPACED 4'-0" O.C. BETWEEN GIRDERS AND BEAMS
ELEVATOR CORE
1H-FIRE RATED EGRESS STAIRS
OPEN-AIR INTERNAL CIRCULATION
OPEN-AIR EXTERNAL CIRCULATION
12' - 0"
12' - 0"
120' - 2"
77' - 0" / 102'




1 OFFICES & ADMINISTRATION
2 CLASSROOMS
3 MULTI-MEDIA LIBRARY
4 RESTROOMS/WC
5 STUDY ROOM
6 MULTI-PURPOSE/PERFORMANCE SPACE


1 OFFICES & ADMINISTRATION
2 CLASSROOMS
3 MULTI-MEDIA LIBRARY
4 RESTROOMS/WC
5 STUDY ROOM
6 MULTI-PURPOSE/PERFORMANCE SPACE


1 OFFICES & ADMINISTRATION
2 CLASSROOMS
3 HYDROPONIC FARM LAB
4 RESTROOMS/WC
5 STUDY ROOM
6 FLEXIBLE STUDY ZONES


1 OFFICES & ADMINISTRATION
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4 RESTROOMS/WC
5 STUDY ROOM
6 FLEXIBLE STUDY ZONES

EDIBLE PARK
BUSHWICK URBAN FARMINGV

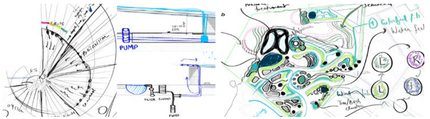
ATV INTEGRATED URBAN DESIGN
INSTRUCTOR: EMILY BAUER
TEAM: JINSEON NEOH, JOHANE CLERMONT, YUMENG LI, YEONGEOB KIM

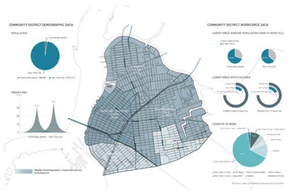
This proposal is for a Bushwick Inlet park around plant-based food designed as an edible landscape.

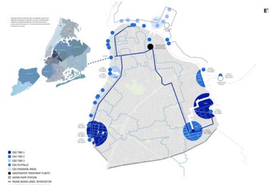
The park is designed to have fungi farms connecting with each other underneath the building, while sunlight-needed crops occupy the roof. Adjacent to the site mix use buildings across the avenue provide residential houses for the farmers from upstate NY. The greenery is categorized into farmland responding to the concept of the edible landscape and besides the pedestrian circulation farmers lanes are pre placed across the park for the farmers to collect crops.

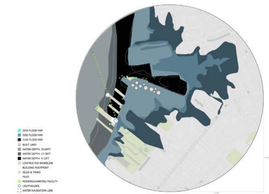
The farming system is based on four introduced categories in a crop rotation between legume leaf roots and fruits cultivated year-round leave a healthier soil and sustainable farming methods. seaweed agriculture on the final hand extending into the East River and finally wetland grass is planted for natural greywater treatment.

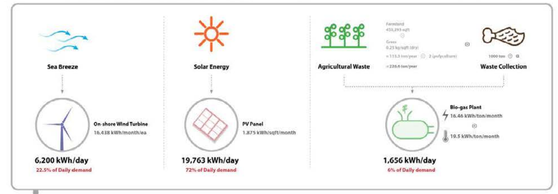
The species introduced create food webs and habitats for different species, transforming the site into a true ecological habitat that serves the fauna and flora of the East River and feeds the people of Bushwick.

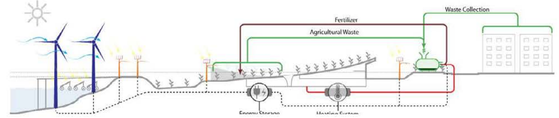


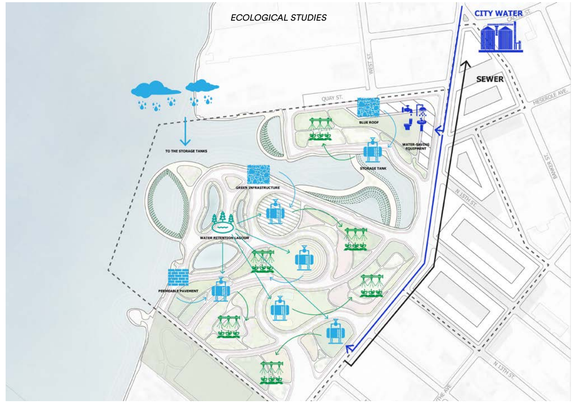


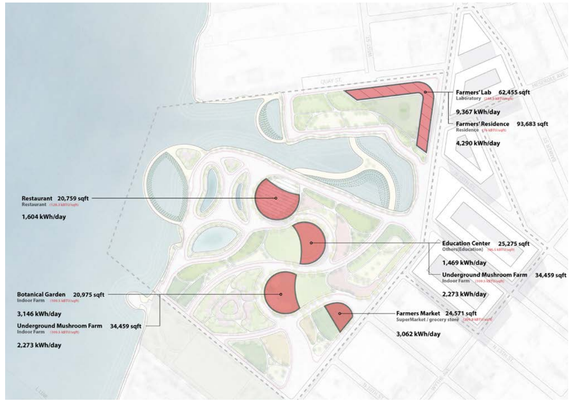


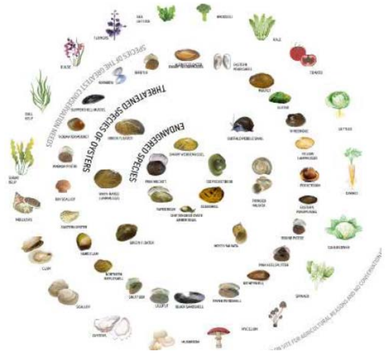


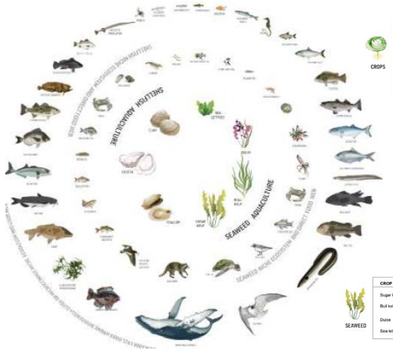












FARMING OUTPUT STUDIES

CROP TYPE	GROWTH TECHNIQUE	AGRICULTURAL INFORMATION
Walnut tree, Apple tree	Add mulch to wet shredded leaves, or back landscape fabric to keep the soil moist	Colorful floweheads placed prominently, highself maintenance especially in summer
Daylily	Lesser-irrigation flower fertilizer fed to plants every 2 to 3 weeks	Bedding plants with high heat and insect and disease tolerance
Wood Sorrel	Harvesting as flowers open several times a week	Most flowers require six hours or more of direct sunlight
Blueberry Bush	Harvesting by plants that require cross-pollination (Bilberry)	Flowers require 2-4 hours of morning sun, shadier selection
Grapes	Harvesting by plants that require cross-pollination (Bilberry)	Compost, slow-release flower fertilizers, raised beds
Turnips	Harvest in morning or evening	Some flowers grow on vines and might require trellis, stakes or support
		Successive planting (fresh seeds every 2-3 weeks) ensures steady seasonal supply

GROWTH TECHNIQUE	CULTURE TECHNIQUE	FUNGICULTURAL INFORMATION
Mushroom Spores turn into hyphae	Tray Culture	Dark, cool and humid environment
Hyphae combine	Wall Culture	75 to 80 °F, away from direct heat
Mycelium forms colonies	Column Culture	Soil-rich or organic matter with plants or animals onto which fungi live
Hyphal Knot	Bag Culture	Mushrooms die if underground temperatures are too high in the summer
Primhead (baby mushroom)	Mound Culture	Recommended growing medium: straw, cardboard logs, wood chips, compost blend
Mushroom	Stump Culture	Oyster/pinguitura & Shiitake (tuners, longer than other mushroom species)
	Log Culture	Different substrate materials and temperature control needs depending on the species

CROP TYPE	GROWTH TECHNIQUE	AGRICULTURAL INFORMATION
Broccoli	3-5 Year Crop Rotation	Water Use Efficiency (WUE) as measure of crop water use, loss, and yield
Carrot, Turnips	Legume (broccoli)	Drip irrigation can reduce water loss by transpiration and photosynthesis.
Lettuce	Root (carrot, turnips)	Drip irrigation can reduce up to 40% water usefe
Kale, Spinach	Leaf (lettuce, greens, herbs, kale)	Water Inputs: Precipitation, Irrigation, Stored soil Water
Cauliflower	Fruit (tomato)	Water Outputs: Transpiration (use) Evaporation, Runoff
Tomato		For healthy planting and confident growth, water saturation or deficiency is prevented by confident flow of

CROP TYPE	GROWTH TECHNIQUE	AGRICULTURAL INFORMATION
Sugar kelp	Seed Production in hatchery	Needs clear & clean water, protection from strong currents
Bull kelp	Rearing of seedlings to greenhouse	Planted in shallow-depth near surface(30cm) for sunlight needs
Dulse	Transplantation of seedlings/tubes into floating net	Water quality: clear, constant motion for continuous nutrient flow. Salinity: 28 (Appl (salty)
Sea lettuce	Kelp production in farm	Growth: Mid-November to Mid-July

ARD / GROUND
THE MOSQUE AS A LANDSCAPE

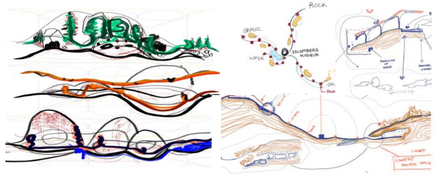
ADV IV STUDIO COLUMBIA GSAPP
INSTRUCTOR: ZIAD JAMALEDDINE, SP21
PARTNER: HAZEL VILLENA

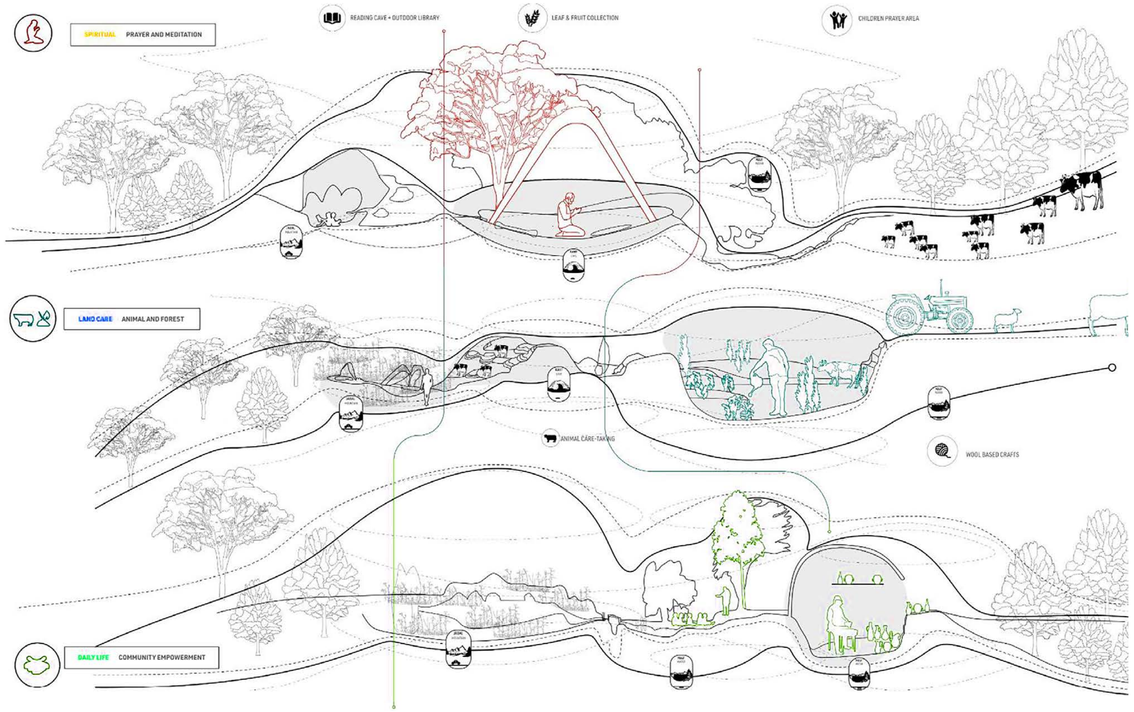
What is a mosque? ARD: ground, earth, or land, proposes to re-imagine the rural mosque of Islamberg as an outdoor landscape that transforms throughout the seasons. The studies of the terrain and the existing unfinished mosque translate into three proposed journeys of a mosque corresponding to geological conditions of the site: jabal (mountain), kahf(cave) and maa(water).

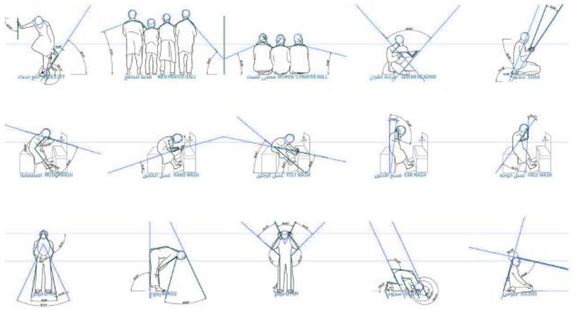
A network of prayer spaces is formed with weaved programs creating twelve typologies through topography manipulation, water redirection, inserted limestone sourced from the local quarry, mudbrick structures and planted landscape features, activating the land through daily use and care.

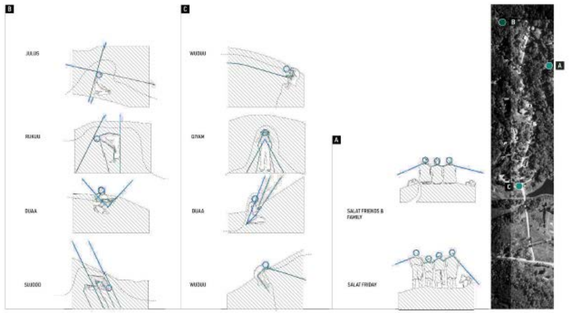
Following Sufi beliefs, this sacred network of interventions re-imagines spiritual mysticism in religious architecture, creates additional interface with the natural environment with land care and community empowerment.

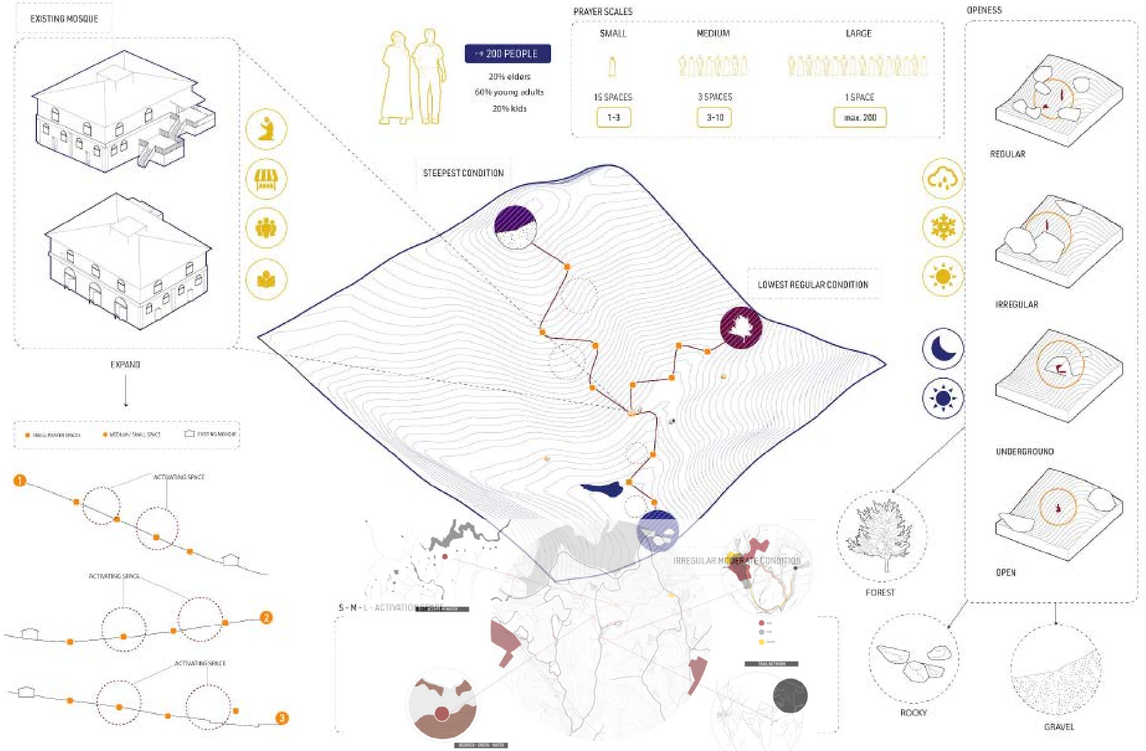
With these interventions, navigating through the landscape becomes a collective experience, deeply connecting to the land and empowering the community. By fragmenting the mosque and dispersing it through the landscape in different scales, land care becomes part of the spiritual journey to reconstruct their natural environment over time and offer new discoveries of sacredness and spirituality

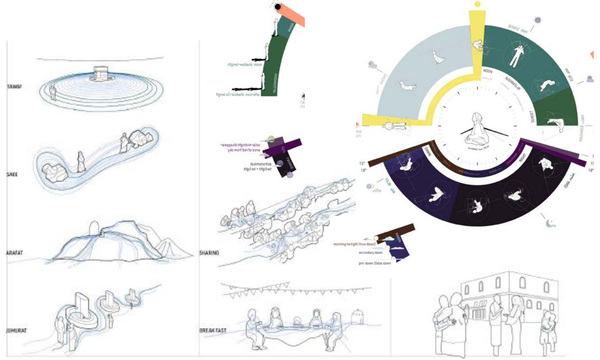


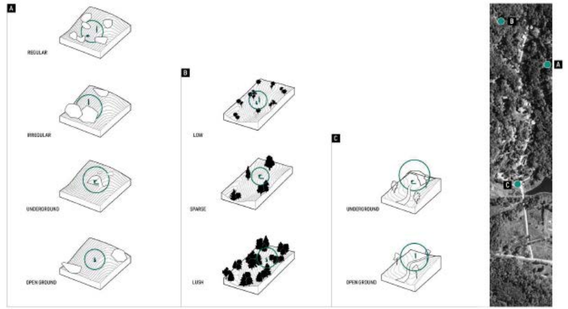


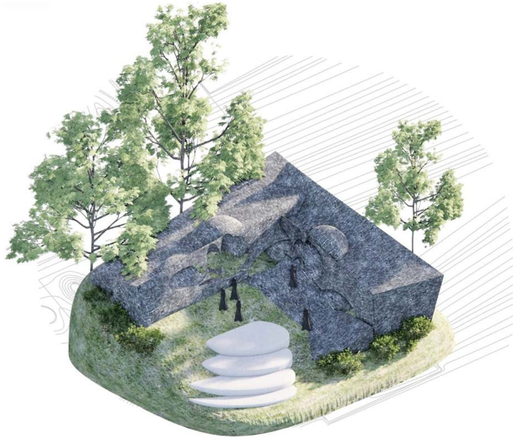


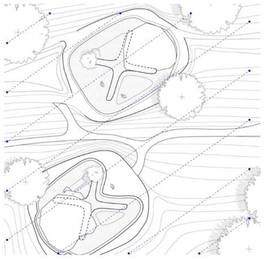

B
C
A
JULUS
RUKUU
DUAA
SUJUUD
WUDUU
QIYAM
DUAA
WUDUU
SALAT FRIENDS & FAMILY
SALAT FRIDAY

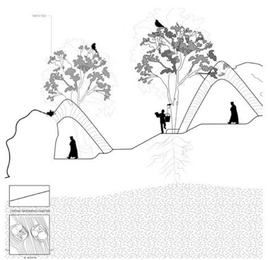

EXISTING MOSQUE
EXPAND
ACTIVATING SPACE
ACTIVATING SPACE
ACTIVATING SPACE
+ 200 PEOPLE
20% elders
60% young adults
20% kids
PRAYER SCALES
SMALL
MEDIUM
LARGE
15 SPACES
1-3
3 SPACES
3-10
1 SPACE
max. 200
STEEPEST CONDITION
LOWEST REGULAR CONDITION
IRREGULAR MODERATE CONDITION
S - M - L - ACTIVATION
FOREST
ROCKY
OPENESS
REGULAR
IRREGULAR
UNDERGROUND
OPEN
GRAVEL

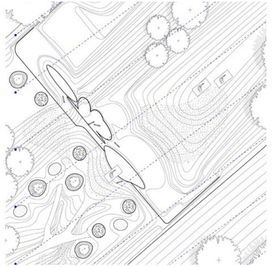

RAMP
SAKE
ARAFAT
JUMURAT
SHARING
BREAKFAST

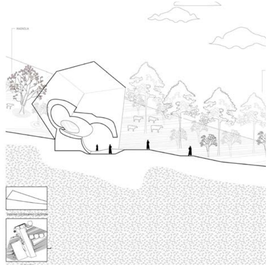

A
REGULAR
IRREGULAR
UNDERGROUND
OPEN GROUND
B
LOW
SPARSE
LUSH
C
UNDERGROUND
OPEN GROUND



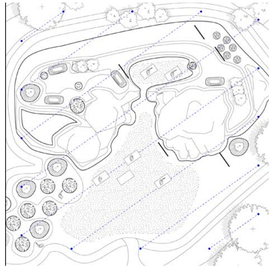


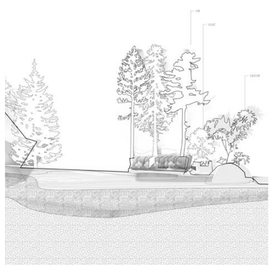






DESIGN





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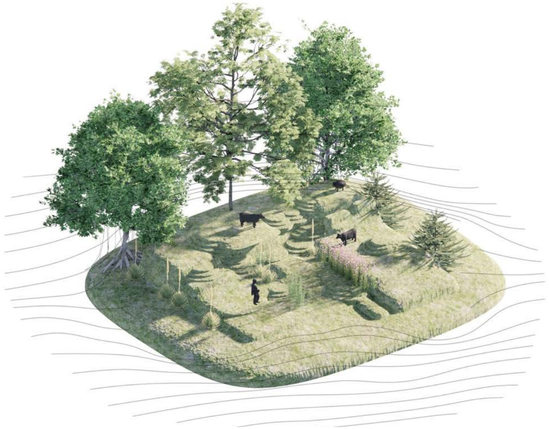
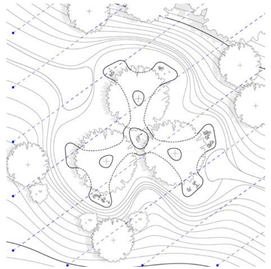
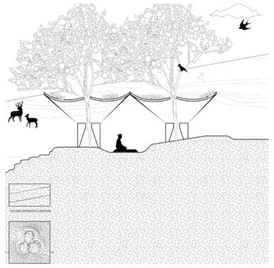
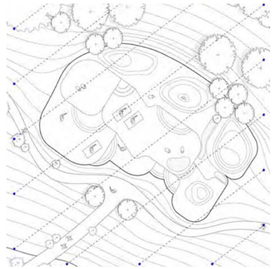
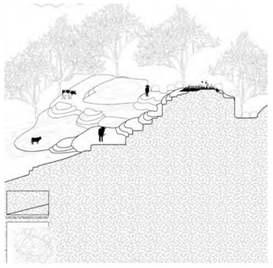


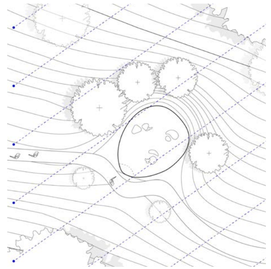


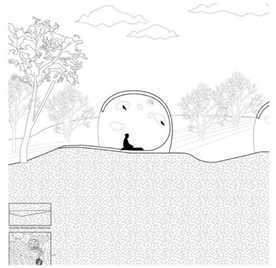


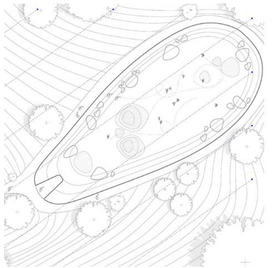


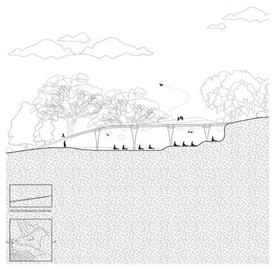


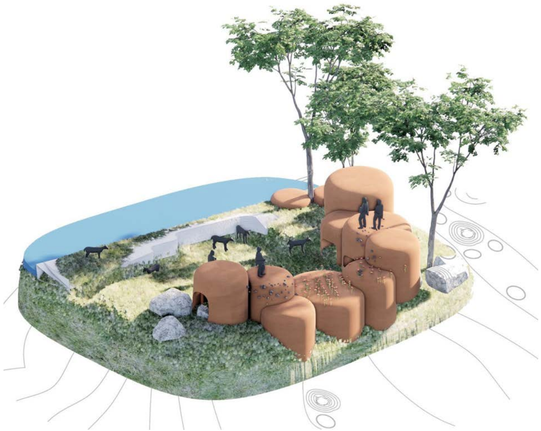
12 PRAYER SPACES: KAHF / CAVE

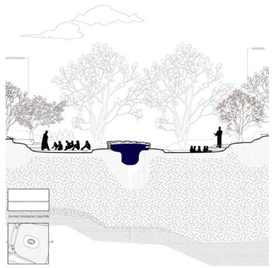


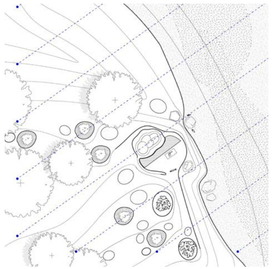


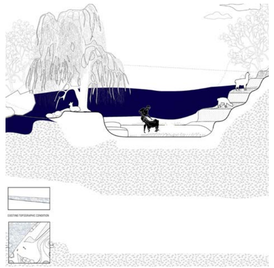




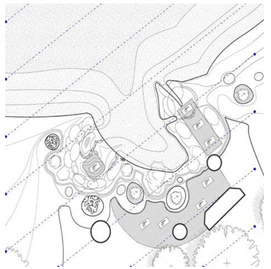


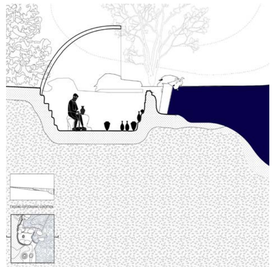


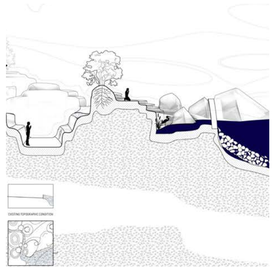


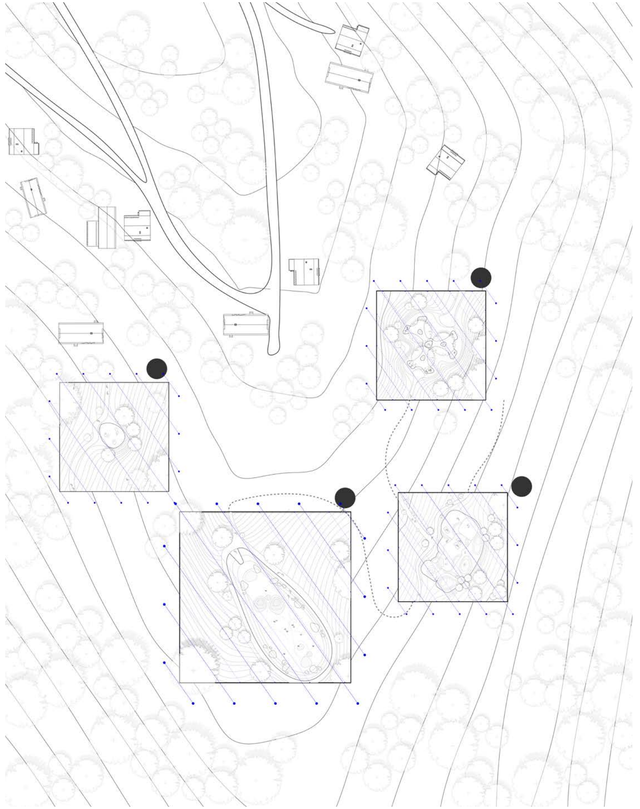


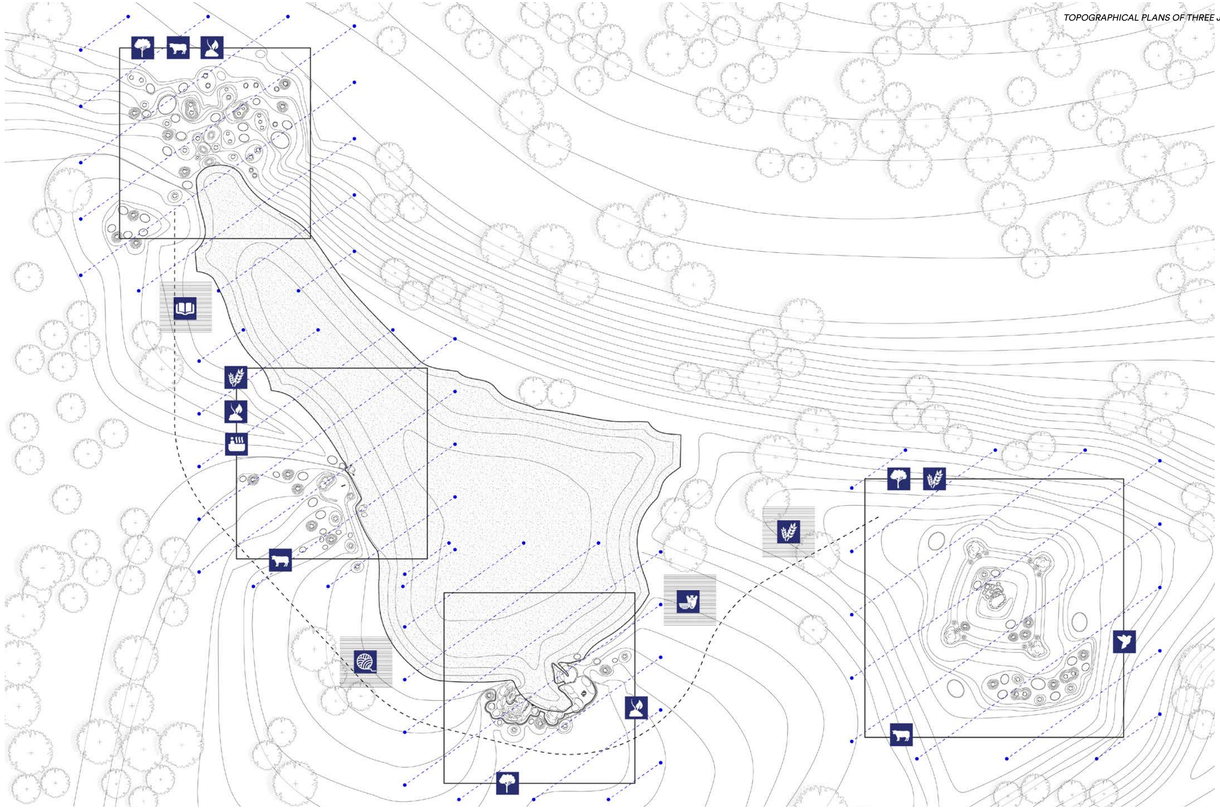
12 PRAYER SPACES: MAA' / WATER

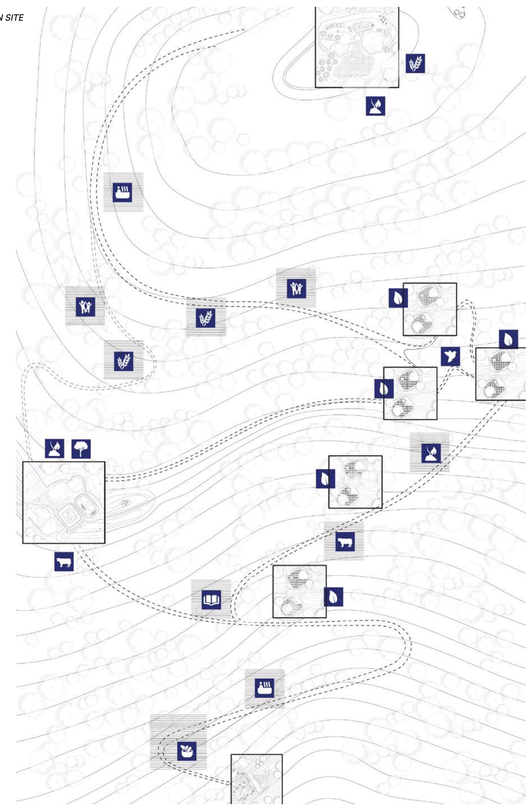






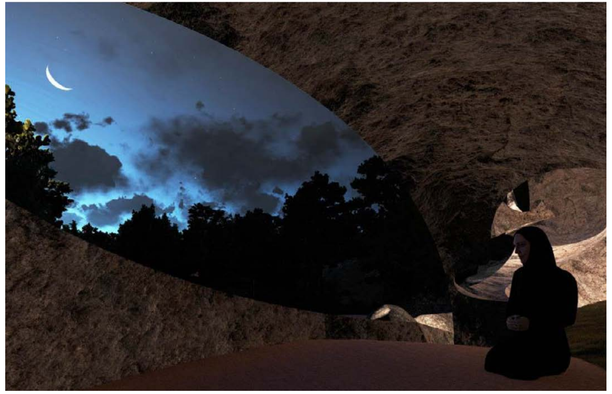






TOPOGRAPHICAL PLANS OF THREE JOURNEYS ON SITE


JABAL
MOUNTAIN
KAHF
CAVE
MAA'
WATER



INTERFAITH LABYRINTH
VASSAR CAMPUS LANDSCAPING

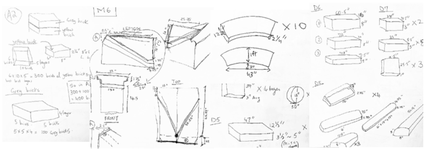
CLIENT: VASSAR COLLEGE, POUGHKEEPSIE
WORK WITH L.E.F.T ARCHITECTS, NEW YORK
(UNDER CONSTRUCTION)

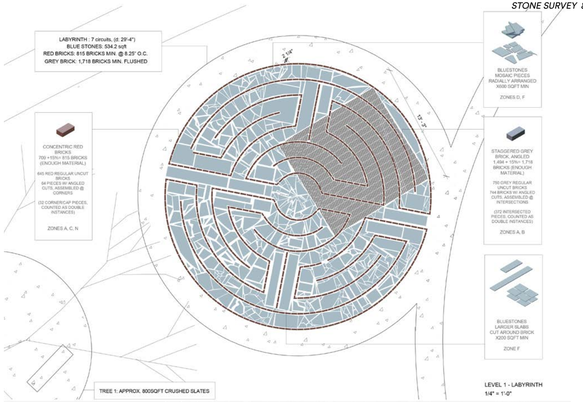
Campus landscaping project completely sourced from discarded building materials. The project started with an extensive survey of the Vassar College campus boneyard and modeling and documenting the different materials to design the landscape and architecture elements of the site.

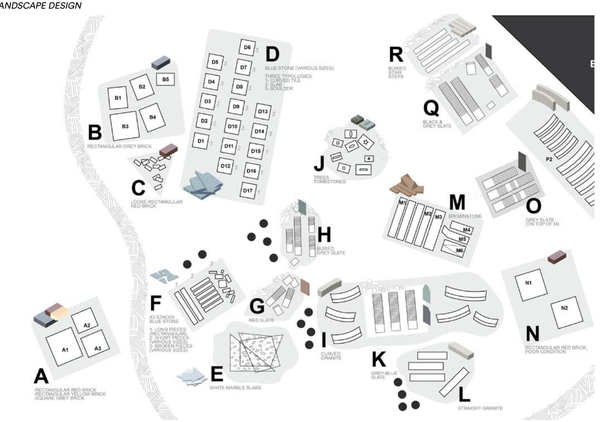
Seven rings are completed by an eighth circle path surrounding the Interfaith Center, with a water tank tower connected to an exterior ablution space and fresh water pump with rerouted drainage from the Center's roof. Bricks, bluestones, granites, slates, marble and special graduation tree tombstones compose the site with planted trees over crushed slates with gradients, surrounded by granite benches, creating accessible seating of different levels and heights.

The labyrinth is oriented towards Jerusalem, Mecca and the East, for spiritual recognitions of religious student groups. Bluestones arranged in a radial pattern towards the center, with hand-selected pieces for a central rosace-inspired pattern, draws from existing campus traditions. The radial bluestones are then cut and inlayed with alterning red and grey bricks in a circular design of seven rings.

Multiple quantification methods were used for material takeoff schedule and estimate of square volume to work with. The design process was very much reversed: starting with the material, quantifying it and measuring dimensions, designing the possibilities including it and working closely with the university mason to supervise construction.

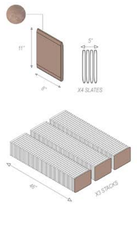






G

G - RED SLATE = 117 PIECES



G:

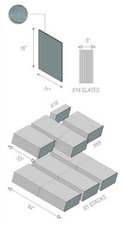
RED SLATE X 117

SURFACE AREA:
8 X 11 X 117 = 10,296 SQ INCH OR 71.5 SQ FOOT

TOTAL VOLUME:
9,238 CUBIC INCH OR 5.9 CUBIC FOOT

H

H - GREY SLATE = 787 PIECES



H:

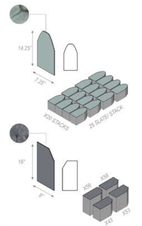
GREY SLATE X 787

SURFACE AREA:
11 X 16 X 787 = 138,512 SQ INCH OR 962 SQ FOOT

TOTAL VOLUME:
41,553 CUBIC INCH OR 24 CUBIC FOOT

K

K - GREY+BLUE SLATE = 712 PIECES



K:

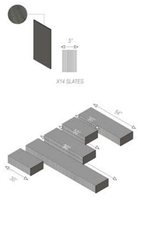
BLUE GREY SLATE X 500
DARK GREY SLATE X 212

SURFACE AREA:
8 X 15 X 712 = 85,440 SQ INCH OR 593 SQ FOOT

TOTAL VOLUME:
15,687 CUBIC INCH OR 9 CUBIC FOOT

O

O - BLACK SLATE = 700 PIECES

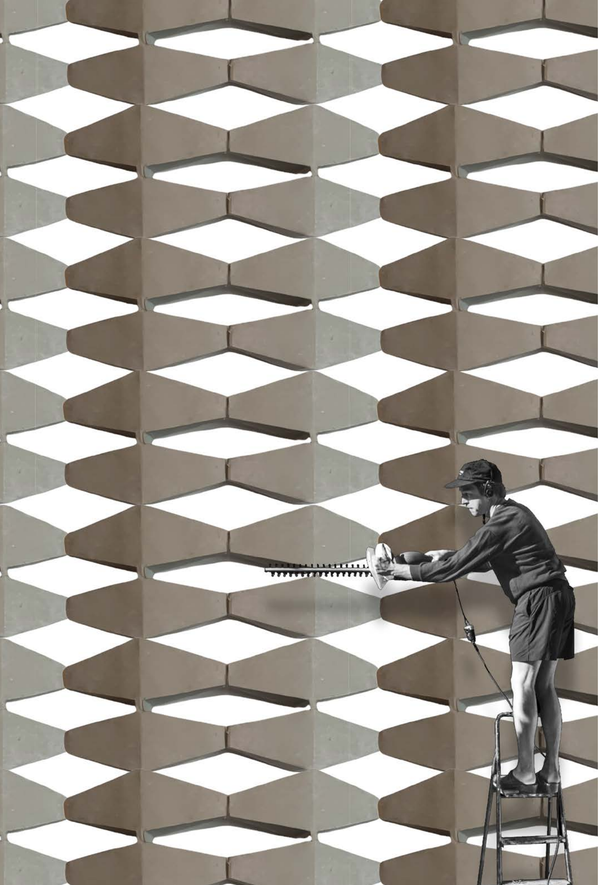


O:

BLACK SLATE X 700

SURFACE AREA:
8 X 15 X 700 = 84,000 SQ INCH OR 583 SQ FOOT

TOTAL VOLUME:
22,400 CUBIC INCH OR 13 CUBIC FOOT



INFINITE GEOMETRIES
CAST MODELS, COMPOSITE MATERIALS

VISUAL STUDIES SEMINAR, COLUMBIA GSAPP
INSTRUCTOR: JOSH JORDAN, FA21

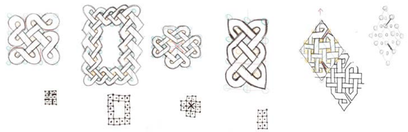
Inspired by Celtic Knots and the Penrose Patterning systems, this tile explores multiple fabrication methods from 3D printing combined with laser-cutting and clay sculpting.

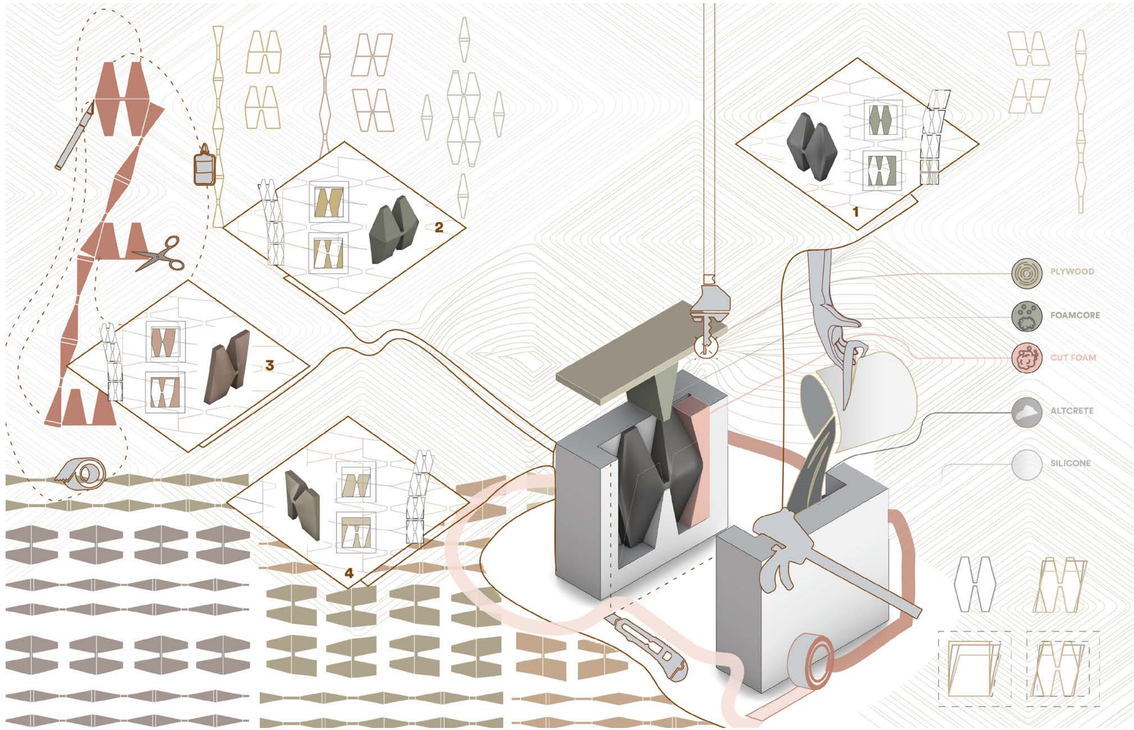
The tiles explore a wide range of modelling, design and form-finding techniques, made with rockite and bio-material composites recycled from waste.

The first iteration of the tile was made doing a positive with knots, made with clay-filled balloons and sealed with oil-based clay. The knot was fitted into a 6"x6" foamcore rhombus to tile in a Penrose-pattern.

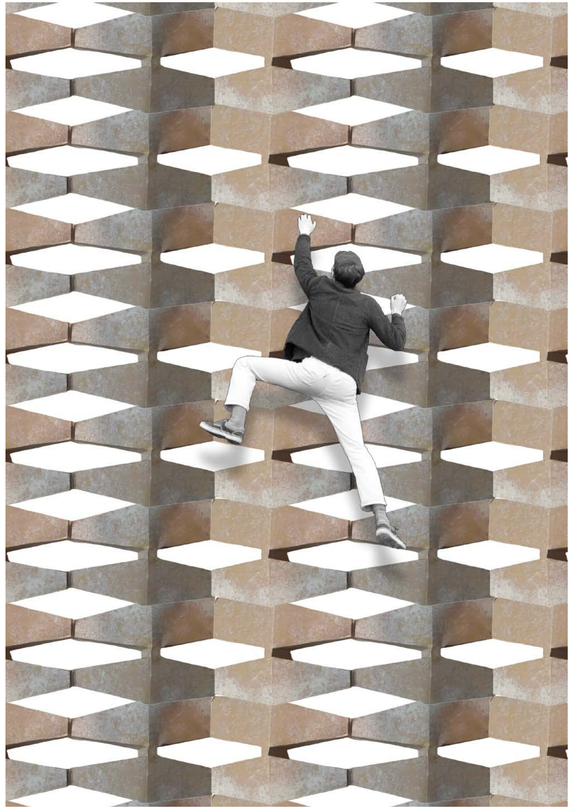
The second iteration was with milled wood and formed by a two-part silicone mould with three pour-spouts for leveling.

The third iteration is 3Dprinted using PLA and cast with experimental material based on waste upcycling techniques.





PROCESS & STUDY MODELS



BIOMATERIALS
BIOWASTE AS BUILDING MATERIAL

RESEARCH PROJECT
CARLETON ENGINEERING LAB, 2022-PRESENT

This project consisted in developing a range of materials testing them, 3D printing, and designing wall assemblies for locally-sourced soil and seaweed mixtures. The materials started with clay as a base and explored cob, light-straw clay and different soil types for different fabrication techniques. The materials developed were tested in a cyclical feedback loop of testing that covers a range from thermal mass to insulation.

The project started with expansive research on existing methods and materials in additive manufacturing, artistic achievements using computational design, and most recent scientific discoveries.

Recipes were initially replicated then customized and developed based on different parameters, changing one at a time and evaluating the total carbon impact of the material, from cradle to grave.

The forms printed explore a wide variety of mixture ranges that can be achieved with soil, ranging from intensive clay thermal walls to light straw insulative infills, but all dissolvable in water and completely biodegradable and reusable. The forms were designed using a custom grasshopper slicer for FDM printing as a start, and later on coded using G-Code language for customized print settings per material.

3D PRINTED EARTH

3DPRINTING METHODS: SOIL & BIOMATERIALS

RESEARCH PROJECT, PRINCIPAL INVESTIGATOR
NATURAL MATERIALS LAB, CARLETON ENGINEERING LAB, 2021

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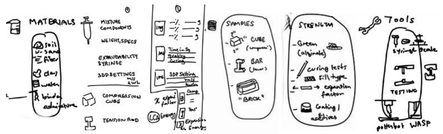
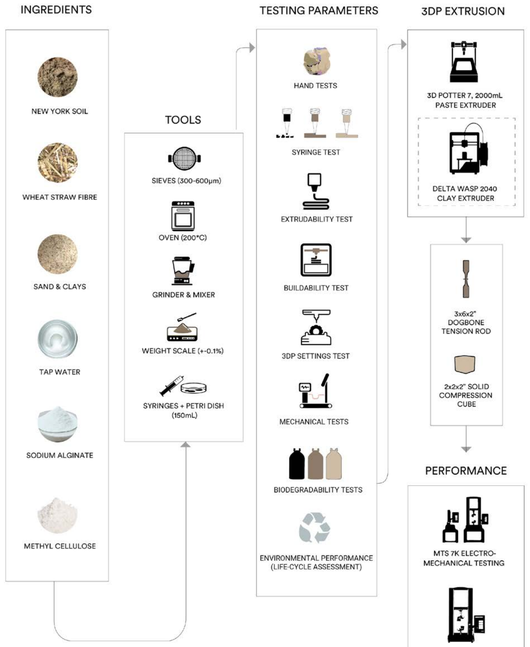




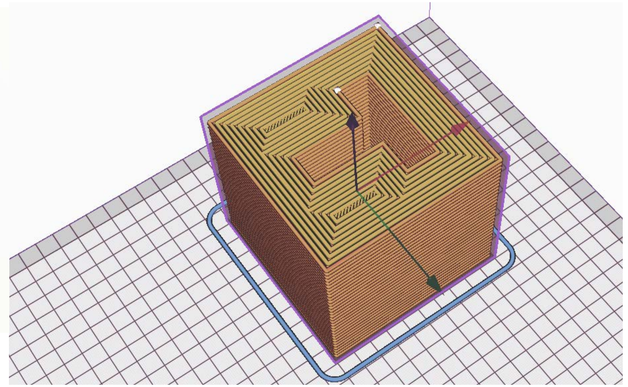
	SUBSOIL	SAND	FIBRE	WATER	ADMIXTURE	RESULT
1	50.03g	25.01g	2.03g	23.10g	none	NOT EXTRUDABLE
2	50.01g	25.31g	2.01g	25.19g	0.55g	POTENTIAL
3	55.17g	25.11g	2.05g	23.05g	0.55g	NOT EXTRUDABLE
	RED CLAY	**SAND**	**FIBRE**	**ADMIXTURE**	**WATER**	**RESULT**
4	25.13g	75.01g	2.02g	0.58g	75.02g dry 24.7	POTENTIAL slft sand finer
5	25.02g	75.01g	2.08g	0.66 c	74.99g dry 24.4	TOO MUCH WATER
6	18.31g	54.83g	1.99g	3.76g	23.10g	TOO DRY
7	18.31g	54.83g	1.99g	3.76g	25.31g	TOO ELASTIC
8	17.16g	53.67g	2.08g	2.17g	25.50g	CONTAMINATED
9	17.16g	53.67g	2.08g	2.20g	25.5g	POTENTIAL
10	17.15g	53.64g	2.01g	2.19g	25.1g	NON EXTRUDABLE.
	WHITE CLAY					
11	17.13g	53.60g	2.05g	2.02g	25.42g distilled	High potential
	SUBSOIL	**SAND**	**FIBRE**	**ADMIXTURE**	**WATER**	**RESULT**
13	47g	23g	2g	2-3g	25g	ALMOST EXTRUDABLE Too sandy - somewhat ectruding
14	50g	20g	2g	2-3g	25g	ALMOST EXTRUDABLE Still v fiberous/sandy need more clay
15	48g	24g	1g	2g	2g 24g	NON EXTRUDABLE might need other additive
16	32g	39g	2g	1.5g	25g	Mixture order changed. Mixture extremely watery and not blinded enough LOW POTENTIAL
17	33g	40g	2g	1.5g	22g	Water and cellulose mixed together first. + less water content. POTENTIAL. Ingredients mixed separately then added
18	33g	40g	2g	1.5g	22g	NON EXTRUDABLE





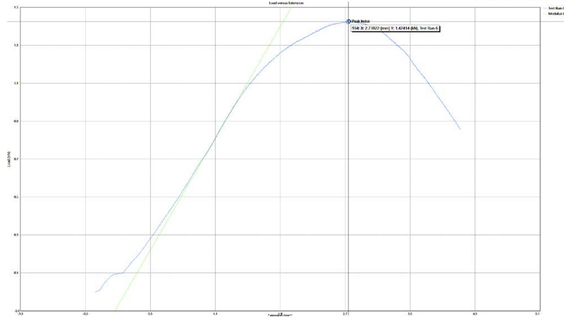


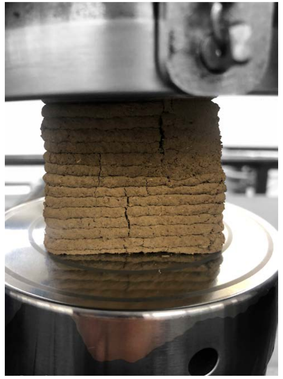


DIGITAL FABRICATION & ASSEMBLY

STRENGTH TESTING (MTS6K) PROCESSES & RESULTS





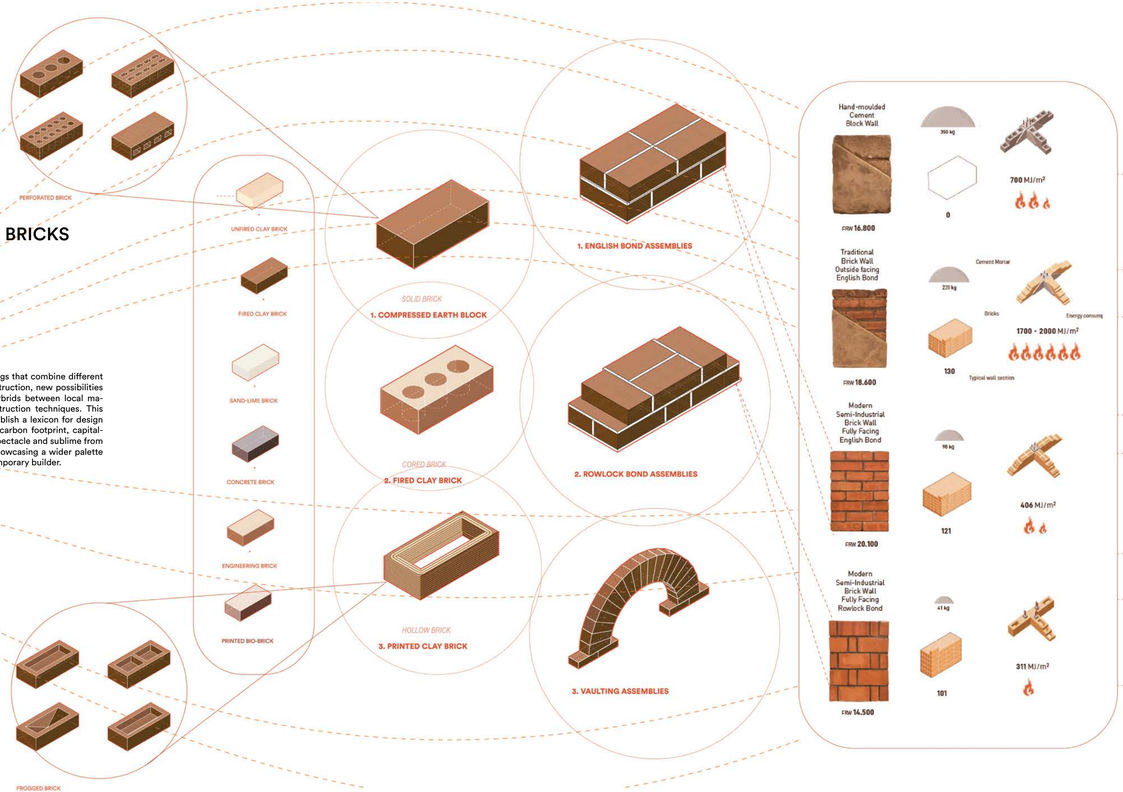
SPECTACULAR CLAY

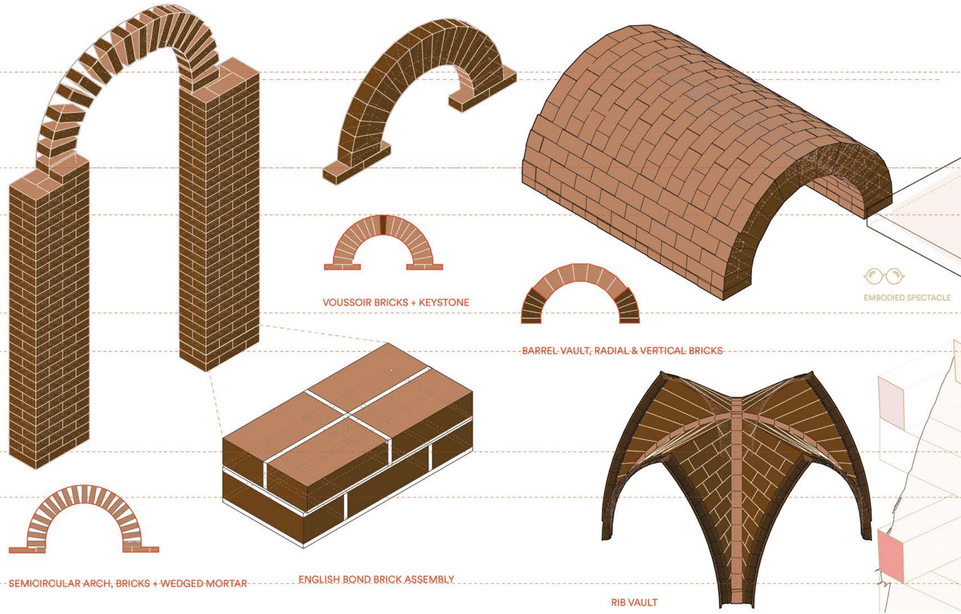
EMBODIED SPECTACLE IN EARTHEN BRICKS

INDEPENDENT STUDY, SP22
ADVISOR: DAVID BENJAMIN

Earthen construction in the Global South has been slowly regaining popularity as cities grow and urbanize, the potential to develop a highly functioning infrastructure and climate-conscious construction system becomes more appealing. From kiln-fired clay bricks to air-dried adobe & compressed blocks, the environmental, economic and health benefits combined with local availability of the material and existing use have allowed new imaginaries of experimentation with clay bricks.

Studying earthen buildings that combine different local crafts in their construction, new possibilities emerge to prototype hybrids between local material and modern construction techniques. This project proposes to establish a lexicon for design strategies with minimal carbon footprint, capitalizing on the embodied spectacle and sublime from structural assemblies, showcasing a wider palette of choices for the contemporary builder.



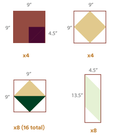


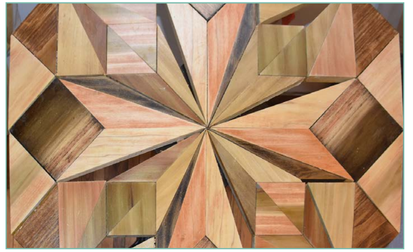
POPLAR WOOD
UPCYCLED TABLE

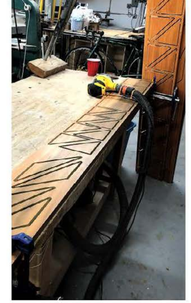
MAKING SEMINAR, FA21
INSTRUCTORS: ADA TOLLA, GUISEPPE LIGNANO

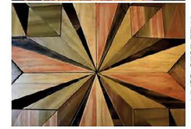
Poplar wood is unique in its green hue and saturation, and this table pays hommage to that. It's based on delicate cut-outs radially arranged in triangular sections to fit on damaged pieces of wood planks previously used for a bookshelf. This table was an experiment in creating high-end handmade furniture completely sourced from waste.

The pieces are CNC milled with each triangle's rotation following the grain angle of the wood piece it's being cut on for the radial middle point of the table. The pieces are attached underneath with brass brackets. All the pieces are ombre-stained by hand to emphasize the gradient of natural colors and hues present in the wood.







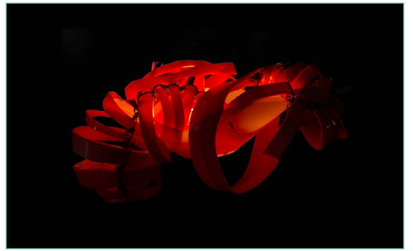


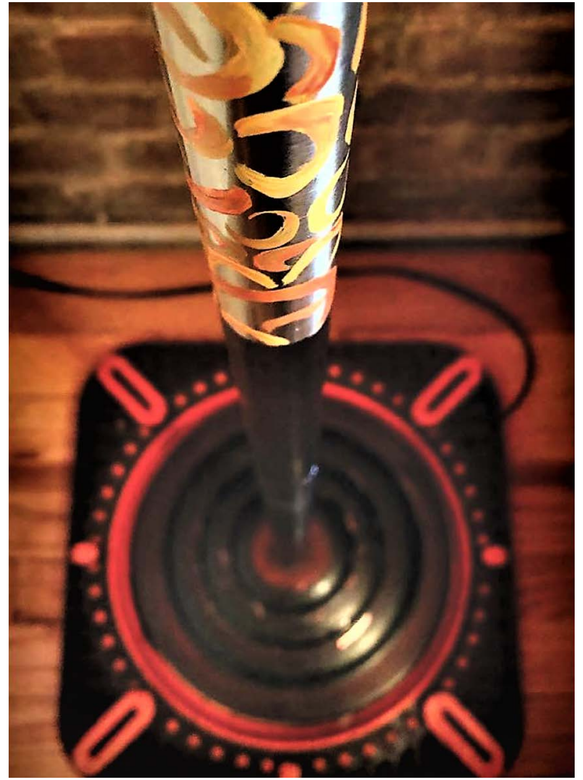
TRAFFIC CONE
UPCYCLED LAMPSHADE

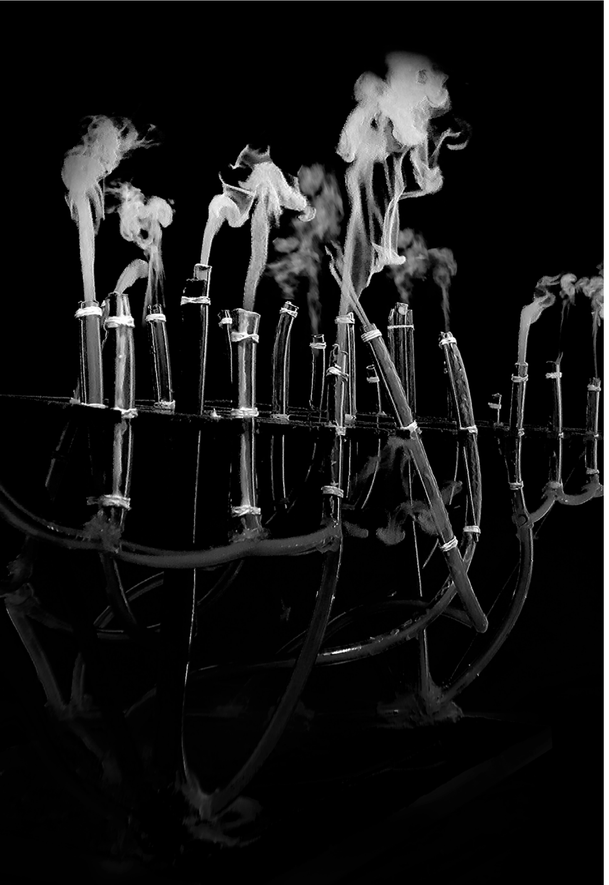
MAKING SEMINAR, FA21
INSTRUCTORS: ADA TOLLA, GUISEPPE LIGNANO

This lamp is sourced from a traffic cone found on the street, it's a unique light fixture that completely reverses the properties of the original found object. Construction cones were a simple 1940s invention to precent cars from going on wet paint, offering smarter alternatives to existing wood barriers at the time. Soon enough, the cone became the star of the construction market, with 1 million a year stolen in the U.S. and 140million produced.

This piece is an inversion of the cone, made by slicing it into 25x1inch circular strips dissassembled and tied together into a three-dimentional peeled strip. A sphere on top of a stick, the variations of reflective and opaque material creates different readings of the object in different modes of lighting and daytime or night time, utilizing all aspects of visibility as the urban marker, and creating another hommage to the cone.

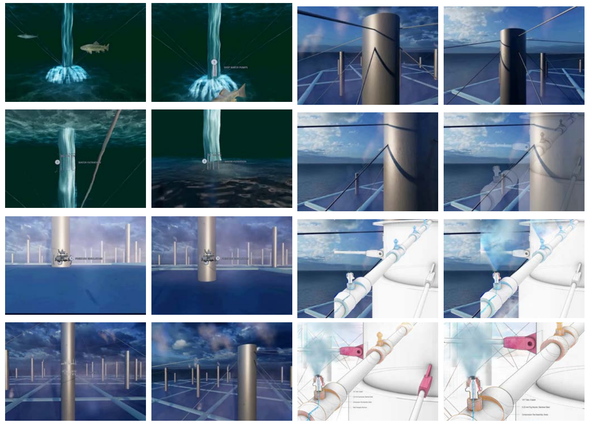


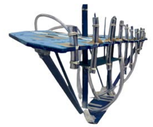


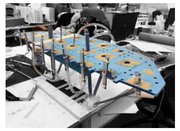


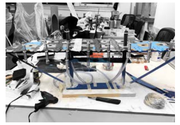
BLUR
A SMOKING MODEL

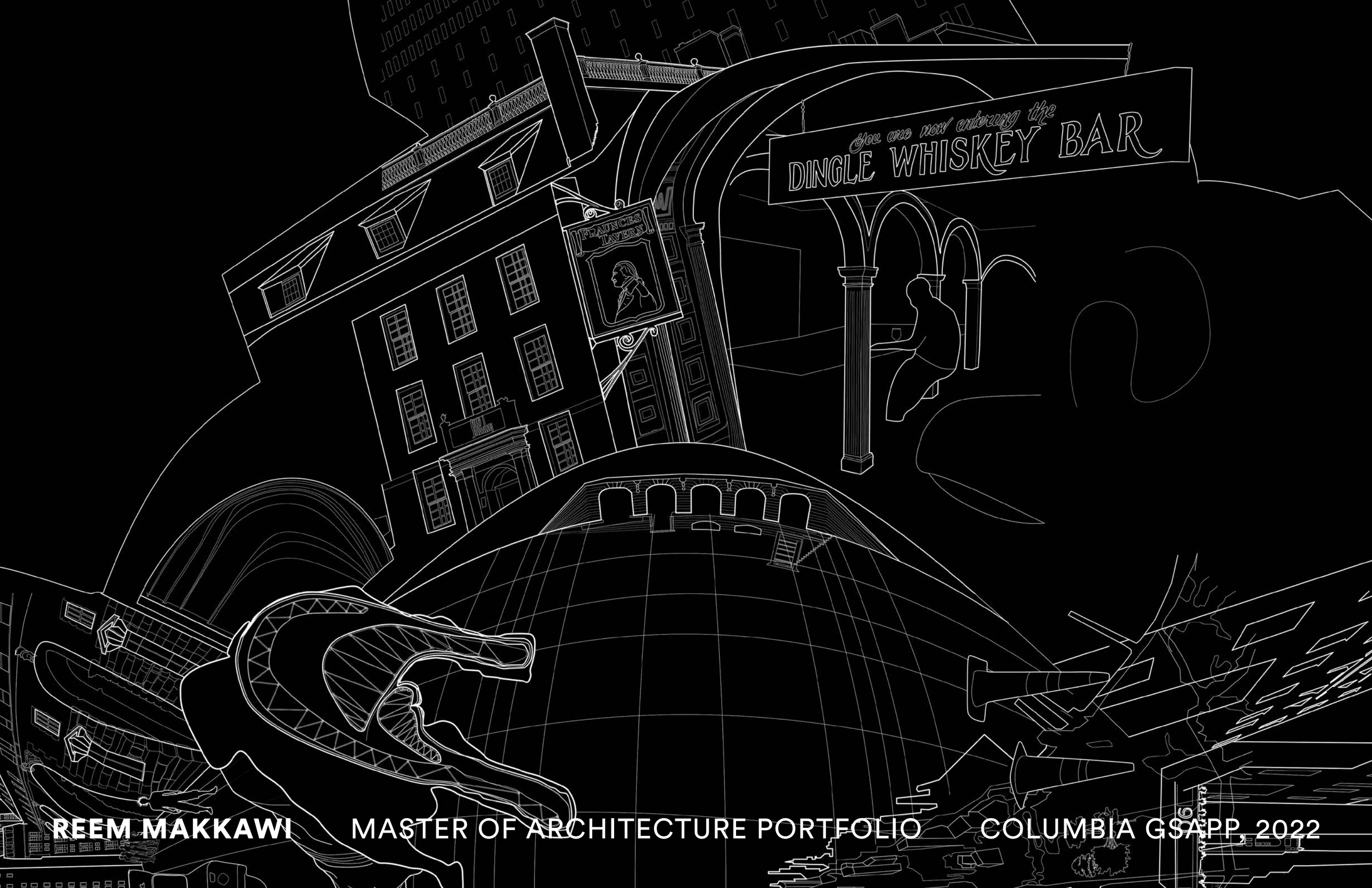
ARCHITECTURAL DRAWING AND REPRESENTATION I, FA19
INSTRUCTOR: ZACHARY WHITE
PRECEDENT: BLUR, DILLER SCOFIDIO + RENFRO











REEM MAKKAWI MASTER OF ARCHITECTURE PORTFOLIO COLUMBIA GSAPP, 2022