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# PORTFOLIO.

*tatiana estrina*

*Internship Application Portfolio*  
*Selected Works 2016 - 2021*



# UPROOT

## ONCE A MINE, NOW A GARDEN

In anticipation of the closure of several northern Ontario's mines, UPROOT provides a structure with an alternative use for these areas. The intervention calls for the redevelopment of open-pit mines into stepping community farmland, offering new possibilities for its use after closure as a suspended hub for agricultural and social activities.

2018



CONTEXT LOCATION SOFTWARE

ACSA/AISC Steel Design Competition

Timmins, Ontario

Rhino, Grasshopper, Illustrator, Photoshop



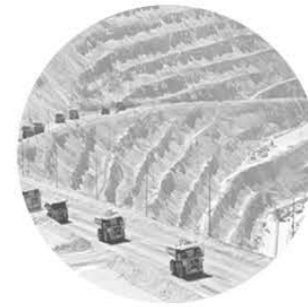
Open Category (ACSA/AISC)



Semi-Finalist (CTBUH)



Ontario Region Scholarship



### CREATION OF A MINE

Initiated by the gold rush in the early 1900s, mining sites in Canada were erected along the various remote sites, including around Porcupine Lake in Timmins, Ontario.



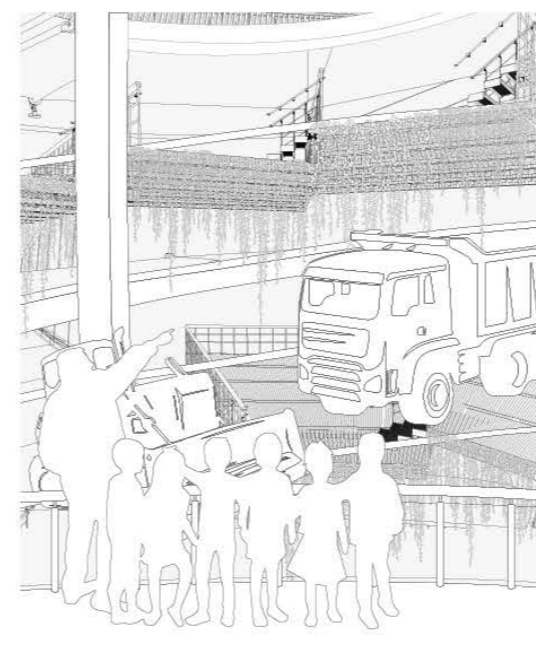
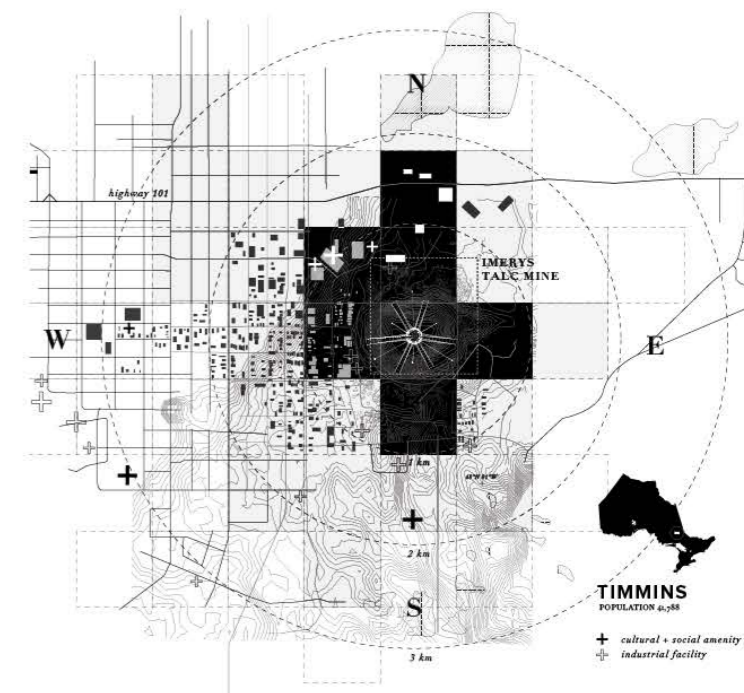
### GATHERING OF A TOWN

Large communities sprung up around mining sites to service the families of those working in the industry. Today, many mines are on the verge of closing down due to a shortage of minerals.



### RETIREMENT

By Ontario law, mining companies are given 5 years to re-vegetate the areas of closed mines. After this period of time, the land is often left unkempt and unusable.



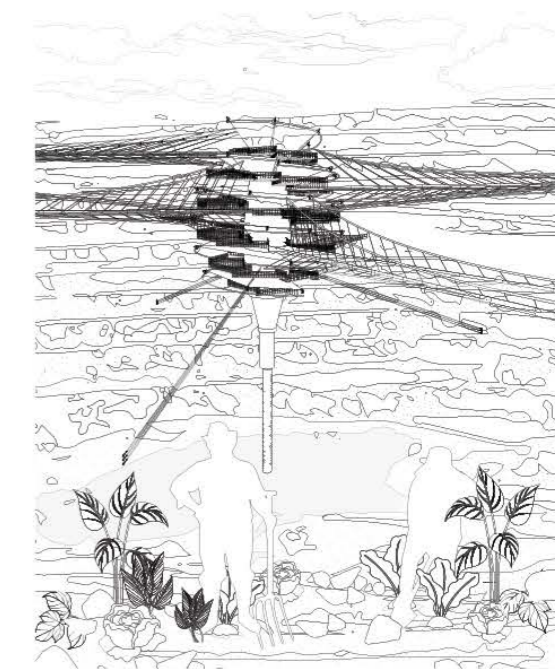
### EDUCATION + RESEARCH

A hub for research and farming advancement, the suspended pod contains museum and auditorium spaces to educate the community about mining history.



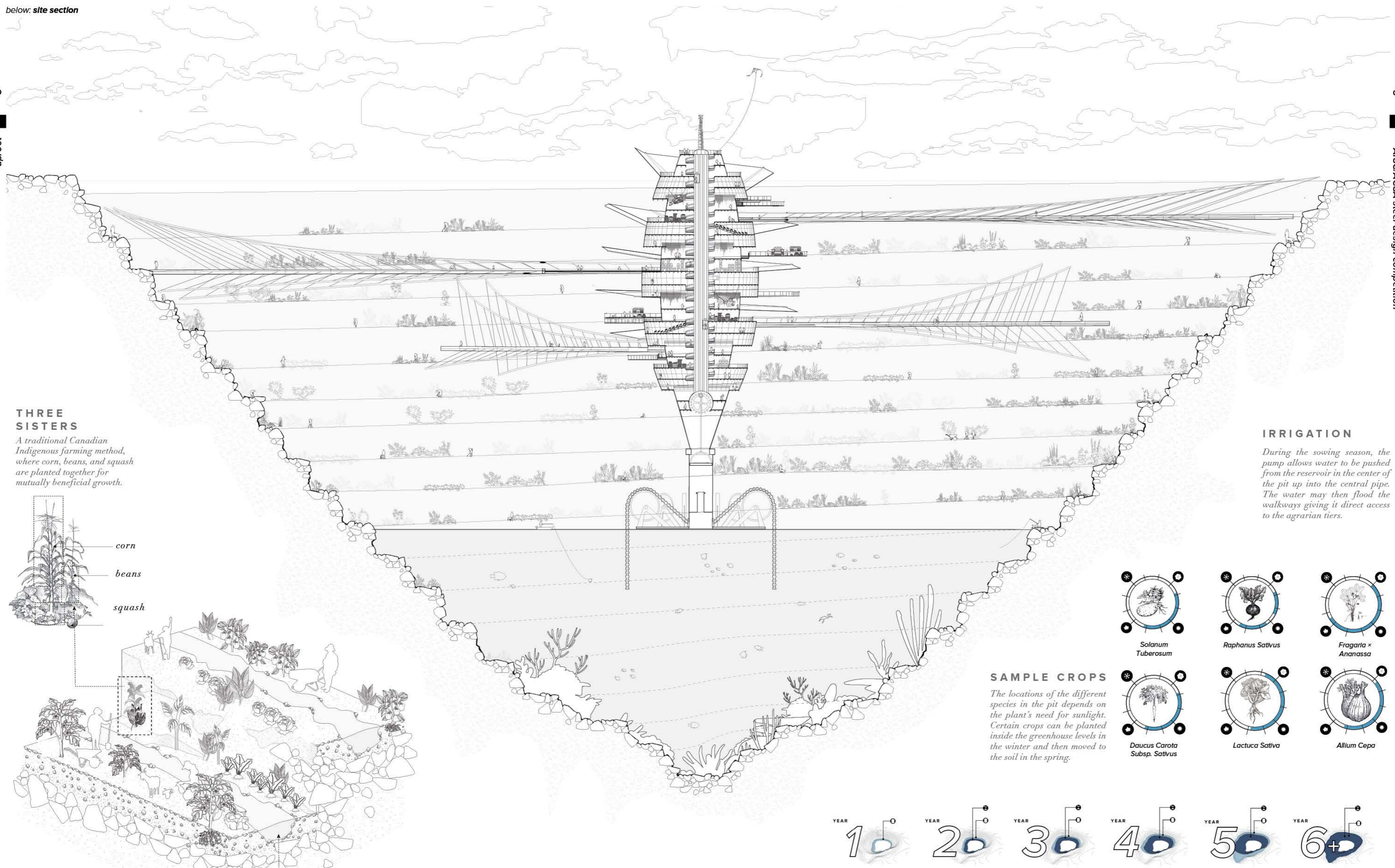
### CULTURE

Serving as a gathering place, the hub provides ample room for social and cultural activities including conference rooms as well as sites for farmer's markets and festivals.



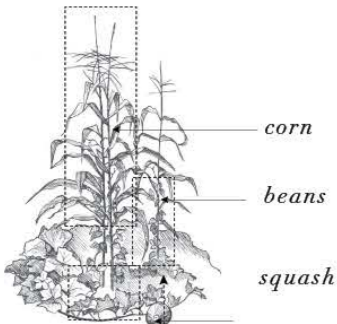
### AGRICULTURE

The levels of the mine are used for agricultural uses, providing residents with land to grow fresh produce, for their own consumption and as a source of income.



### THREE SISTERS

A traditional Canadian Indigenous farming method, where corn, beans, and squash are planted together for mutually beneficial growth.

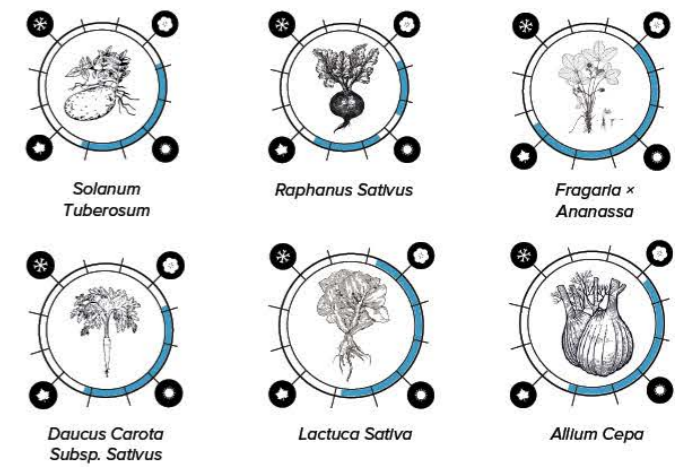


### IRRIGATION CHANNEL

In the sowing season, water is pumped from the pit to fill these canals for crop irrigation.

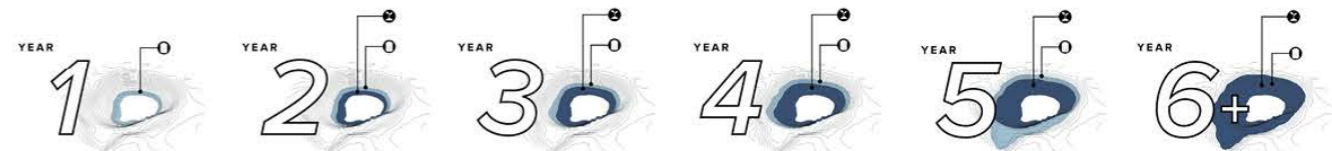
### IRRIGATION

During the sowing season, the pump allows water to be pushed from the reservoir in the center of the pit up into the central pipe. The water may then flood the walkways giving it direct access to the agrarian tiers.



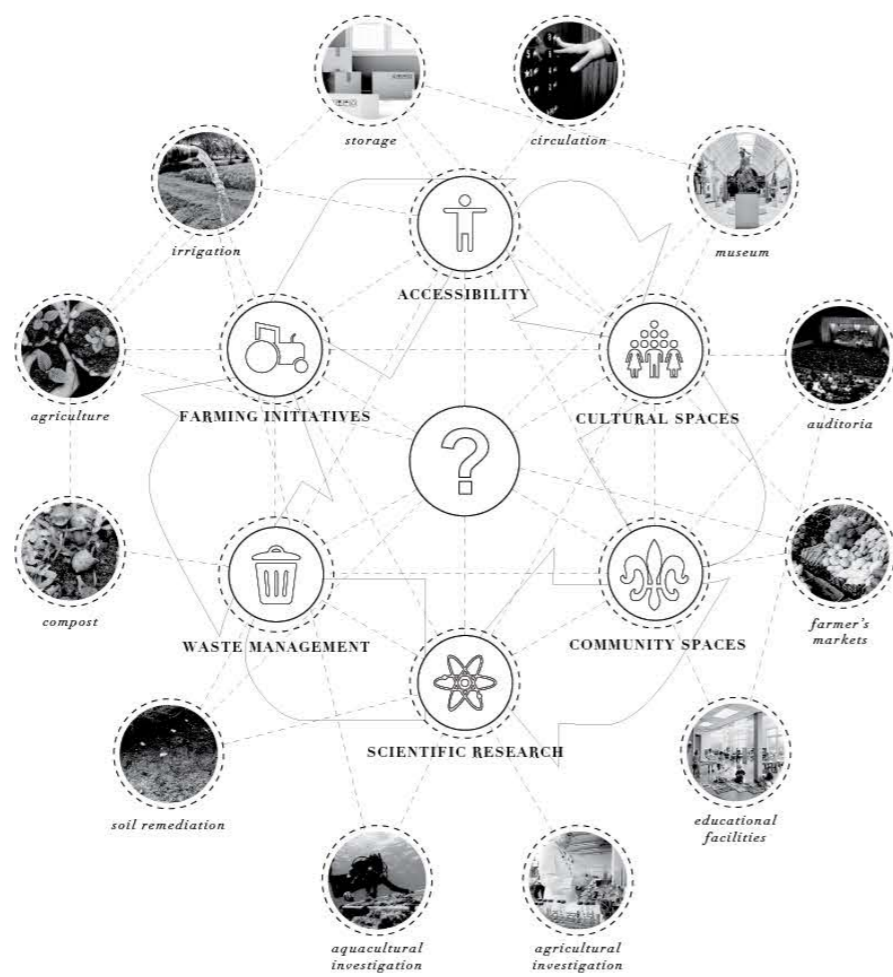
### SAMPLE CROPS

The locations of the different species in the pit depends on the plant's need for sunlight. Certain crops can be planted inside the greenhouse levels in the winter and then moved to the soil in the spring.



### 5 YEAR START-UP PLAN

Compost from the town is used to generate fertilized soil for the growing of crops, as the years go by more of the mine's existing infrastructure is added to the project.



below: detailed sectional perspective

# 1 CANOPY

- [1] Fine Steel Mesh
- [2] Steel Mullion Panel
- [3] HSS Pipe
- [4] Bolts
- [5] Steel Cuff

# A

- [6] Joining Plate
- [7] Rod Anchor
- [8] Cap
- [9] HSS Pipe
- [10] Rod Anchor
- [11] Steel Cable

# 2 STAIRS

- [1] HSS Pipe
- [2] AESS Pipe 100mm dia.
- [3] Steel Cuff
- [4] Bolts
- [5] Rectangular HSS 100 x 100
- [6] Bolts
- [7] Steel Plate

# C

- [8] Steel Grate
- [9] L-Channel Welded Frame
- [10] Steel Bracket
- [11] Bolts

# 3 PLATFORM

- [1] AESS Pipe 100mm dia.
- [2] Steel Cables 5mm dia.

# D

- [3] Welded Casing
- [4] Steel Cables 5mm dia.
- [5] Bolts

# 4 SUPPORTS

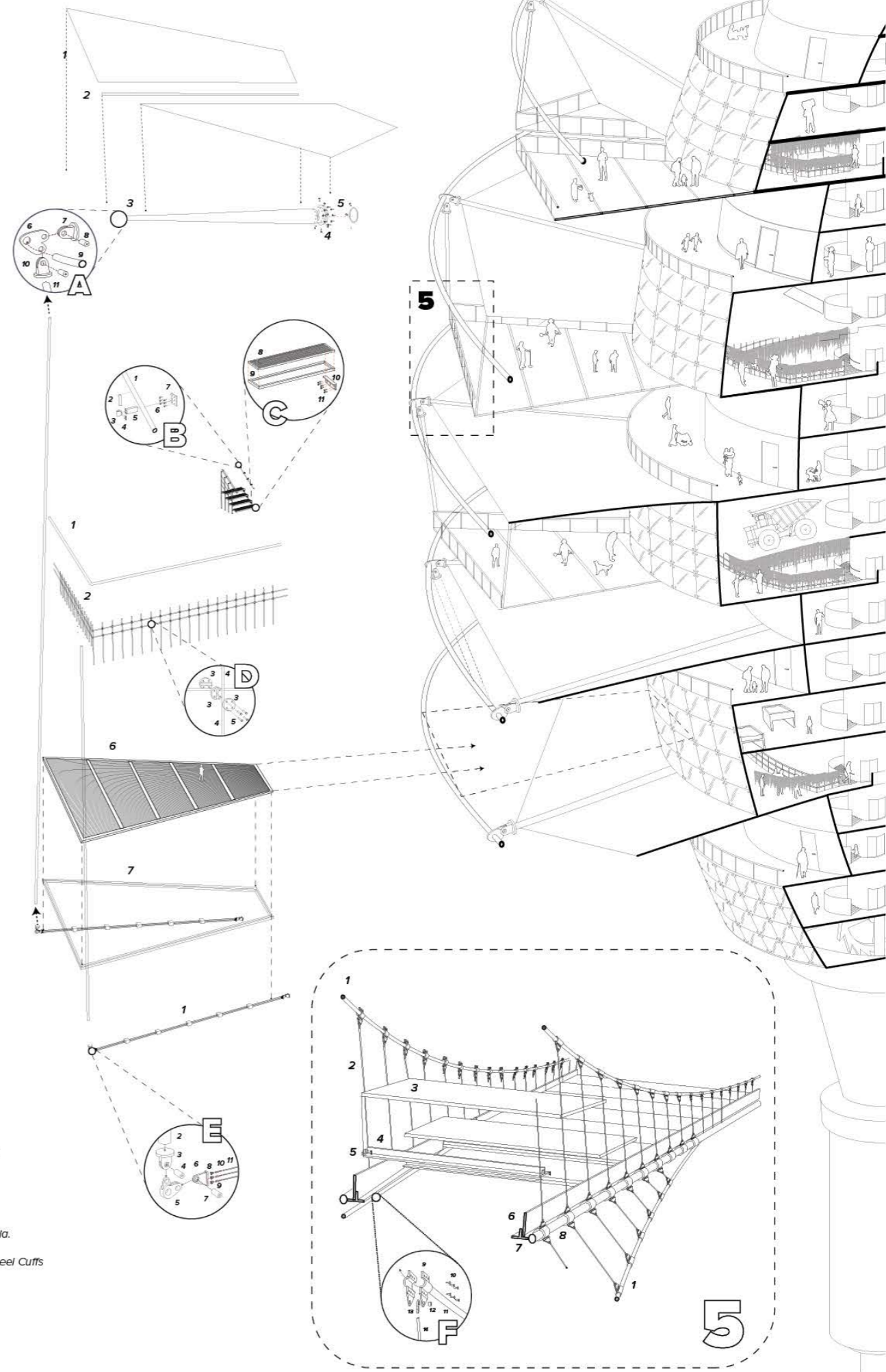
- [1] Welded Casings
- [2] Steel Cable 30mm dia.
- [3] Rod Anchor
- [4] Cap
- [5] Joining Plate
- [6] Rod Anchor
- [7] Cap
- [8] Joining Plate Welded
- [9] Rod Anchor
- [10] Cover Sleeve
- [11] Steel Cable 10mm dia.

# E

- [1] Steel Tension Cable
- [2] Steel Tension Rods 4mm dia.
- [3] Steel Tread Plate
- [4] Steel T-Channel
- [5] Bolts
- [6] Steel Plate, Welded
- [7] Steel T Channel, Welded
- [8] HSS Pipe, Welded 150mm dia.

# F

- [9] Joining Plate Welded with Steel Cuffs
- [10] Bolts
- [11] Steel Tension Cable
- [12] Cap
- [13] Rod Anchor
- [14] Tension Rod 4mm rad.



# HOUSE FOR J.S. BACH

## A FRAGMENTED RESIDENCE

A residence for the famous composer and organist explores the fugal music structure through an architectural lens as an organizational approach to the architecture through play with fragmentation. Fragmentation of realities and cadences emerge from subdivision of spaces, fenestration, and light as well as from the segmentation of planes and materials.

2020



<b>CONTEXT</b>	<b>LOCATION</b>	<b>SOFTWARE</b>	<b>SUPERVISOR</b>
Academic Project ARC 920: Advanced Architecture Studio	Island on Lake Konigesse, Germany	Rhinoceros3D, Grasshopper, Illustrator, Photoshop, 3ds Max, Corona Render	Dr. John Cirka



**PLATO'S CAVE**

Plato theorized that humans view mere shadows of the reality, only by emerging and viewing the light do they view factual forms.



**RELIGIOUS CAVE**

Within religion, light acts as an apparition or religious revelation. In order to reconnect with the light, many monks retreated into solitude of deserts or caves.



**BACH'S CAVE**

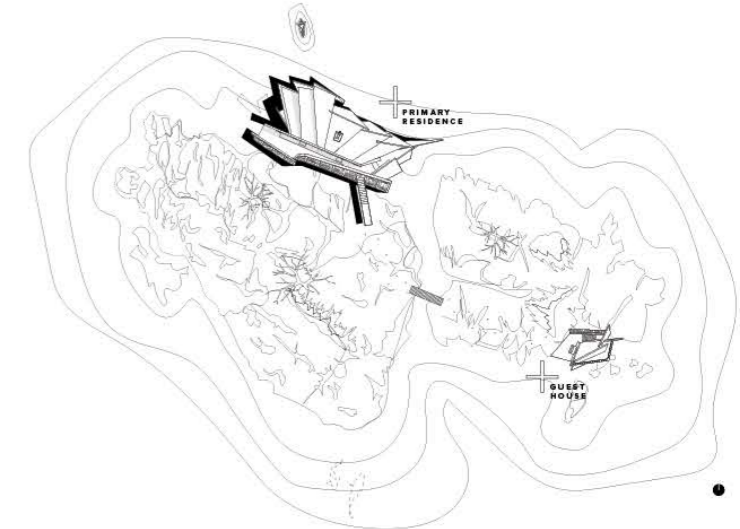
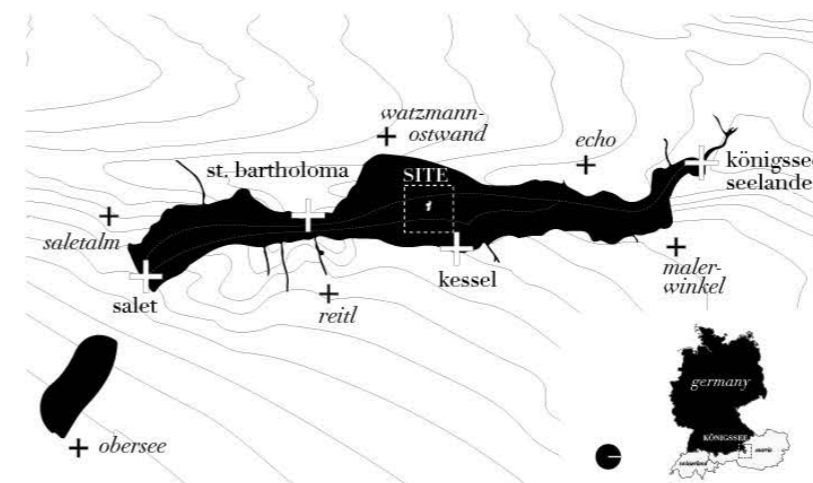
The house becomes a place for religious edification through the fragmentation and submergence into a primal environment.



**FUGAL STRUCTURE**

Bach is well known for his Fugue compositions, musical pieces created using overlapping voices. As the organ instrument provides the organist with multiple manuals, the fugal structure capitalizes on this multiplicity

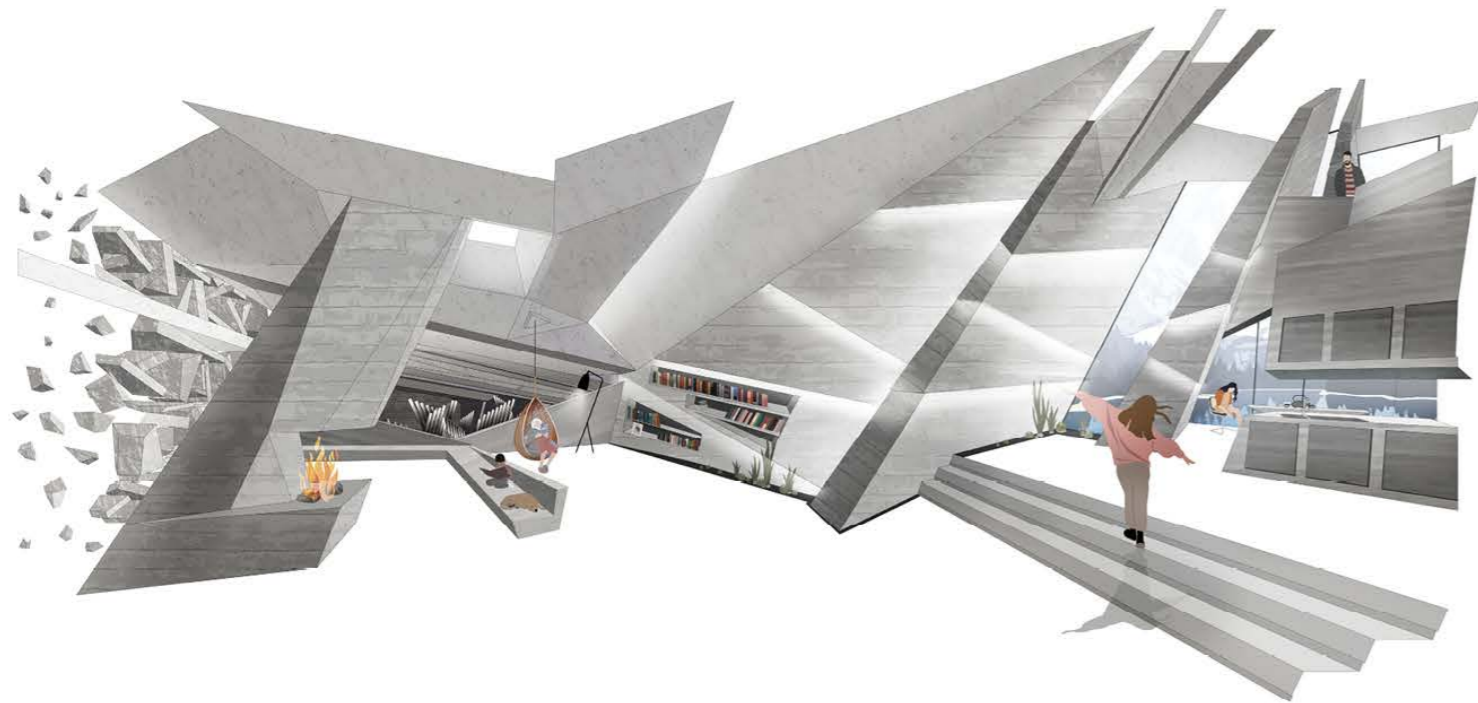
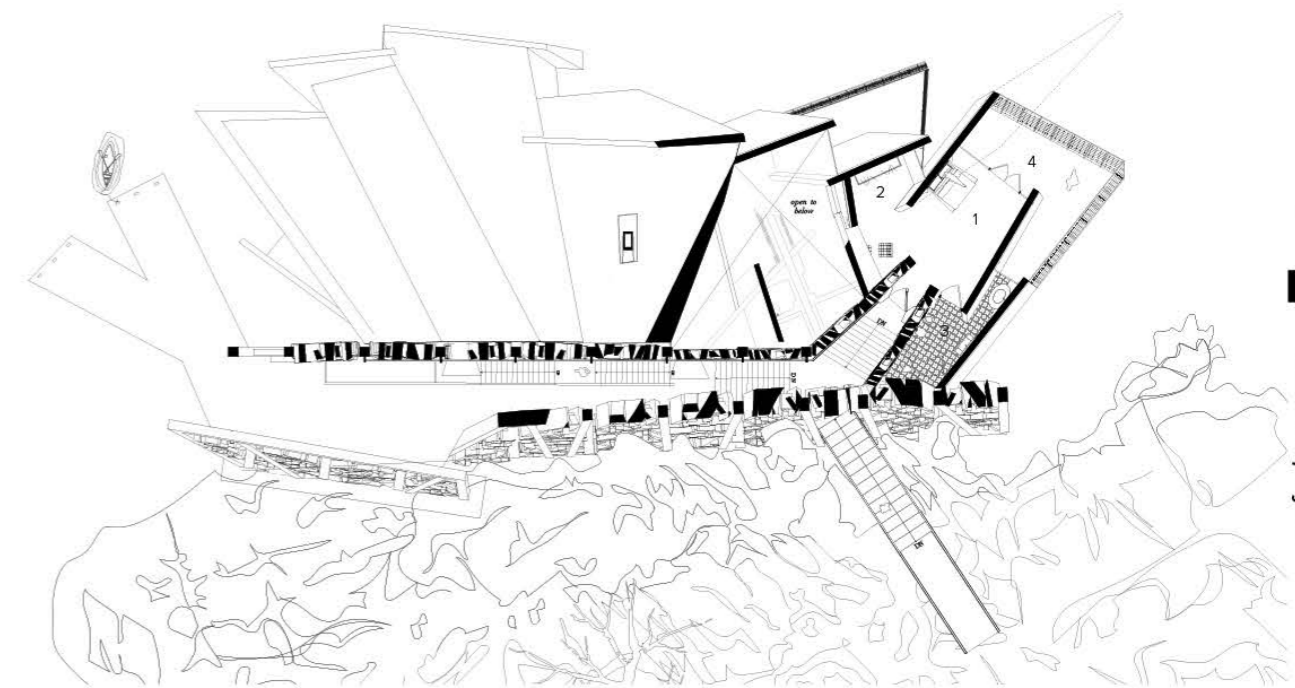
by overlaying repeating melodies in different keys, thereby generating counterpoint. This music structure is explored as an organizational approach for the architecture through play with fragmentation.





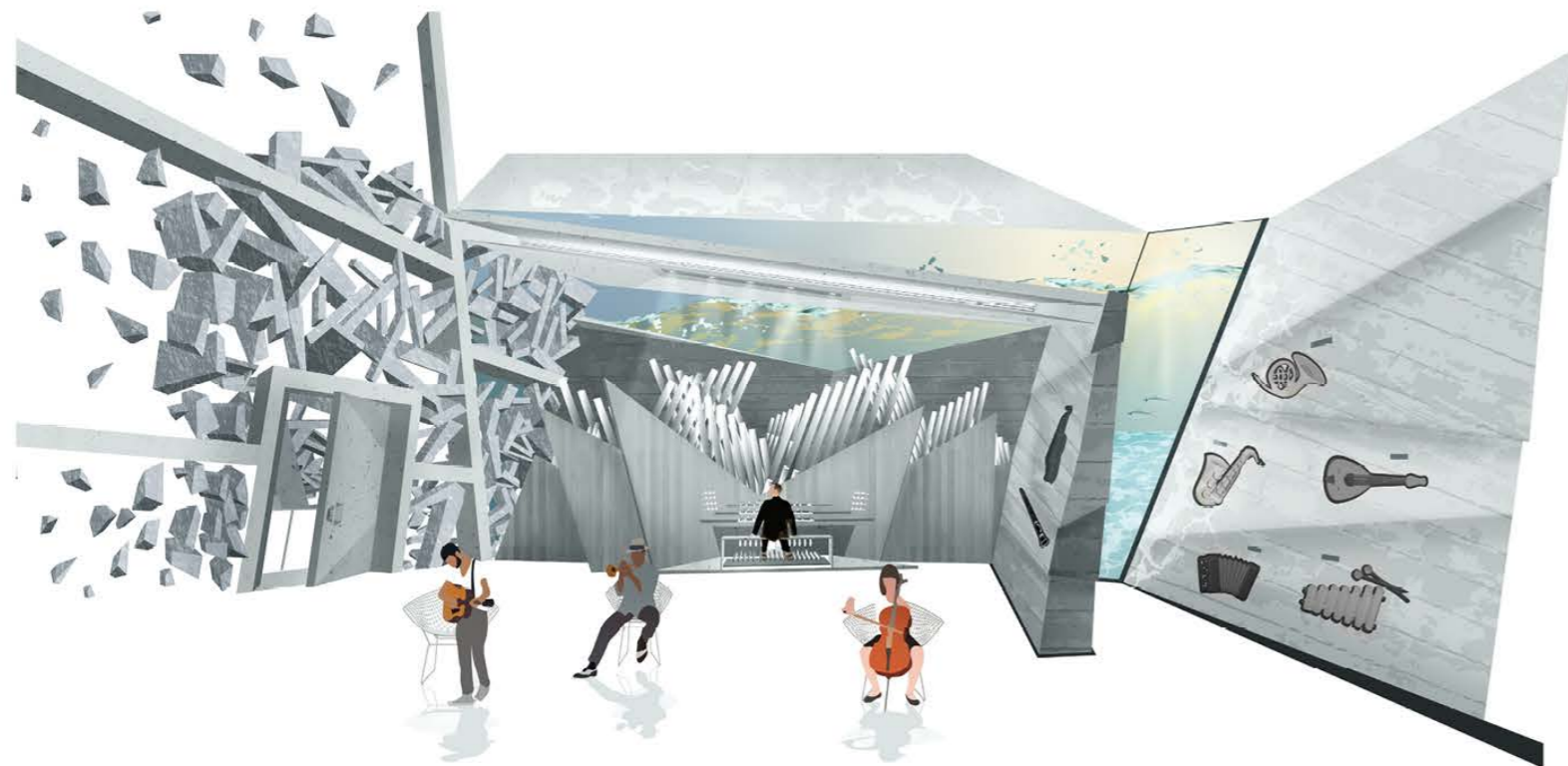
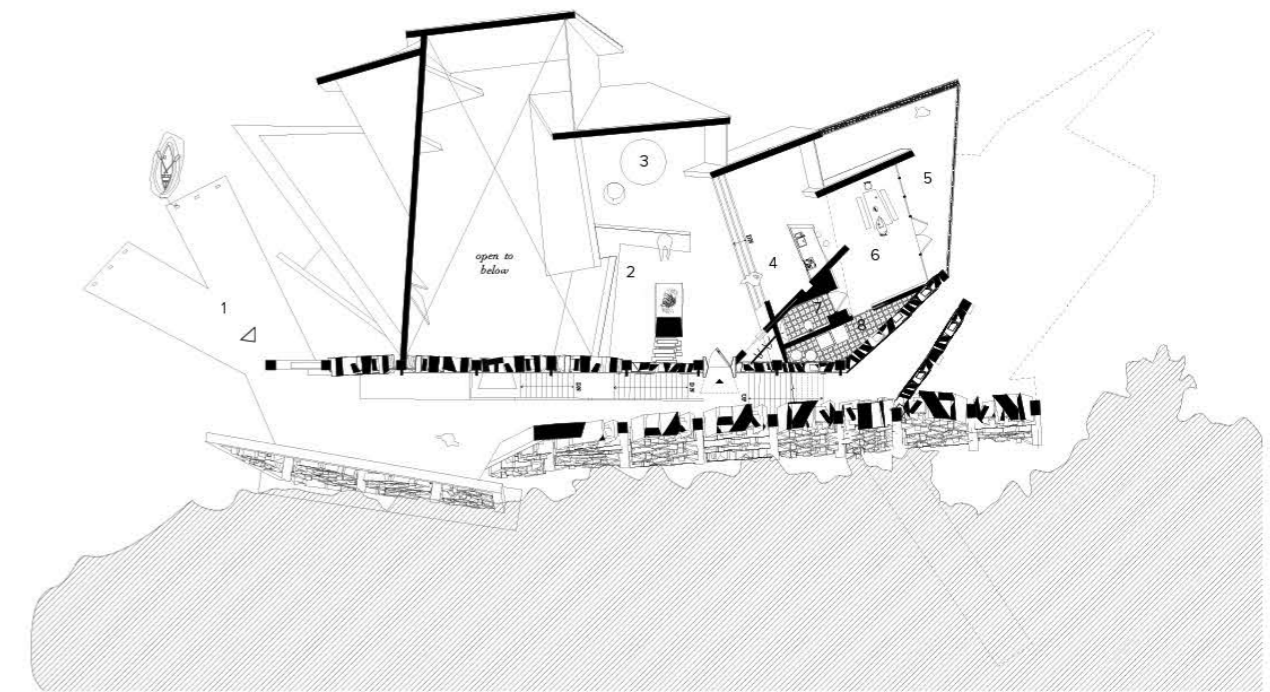
left: **bedroom perspective**  
 right: **private spaces plan**  
 + 4m above water level

- [1] **bedroom** - resting
- [2] **closet** - dressing
- [3] **bathroom** - grooming
- [4] **balcony** - observing



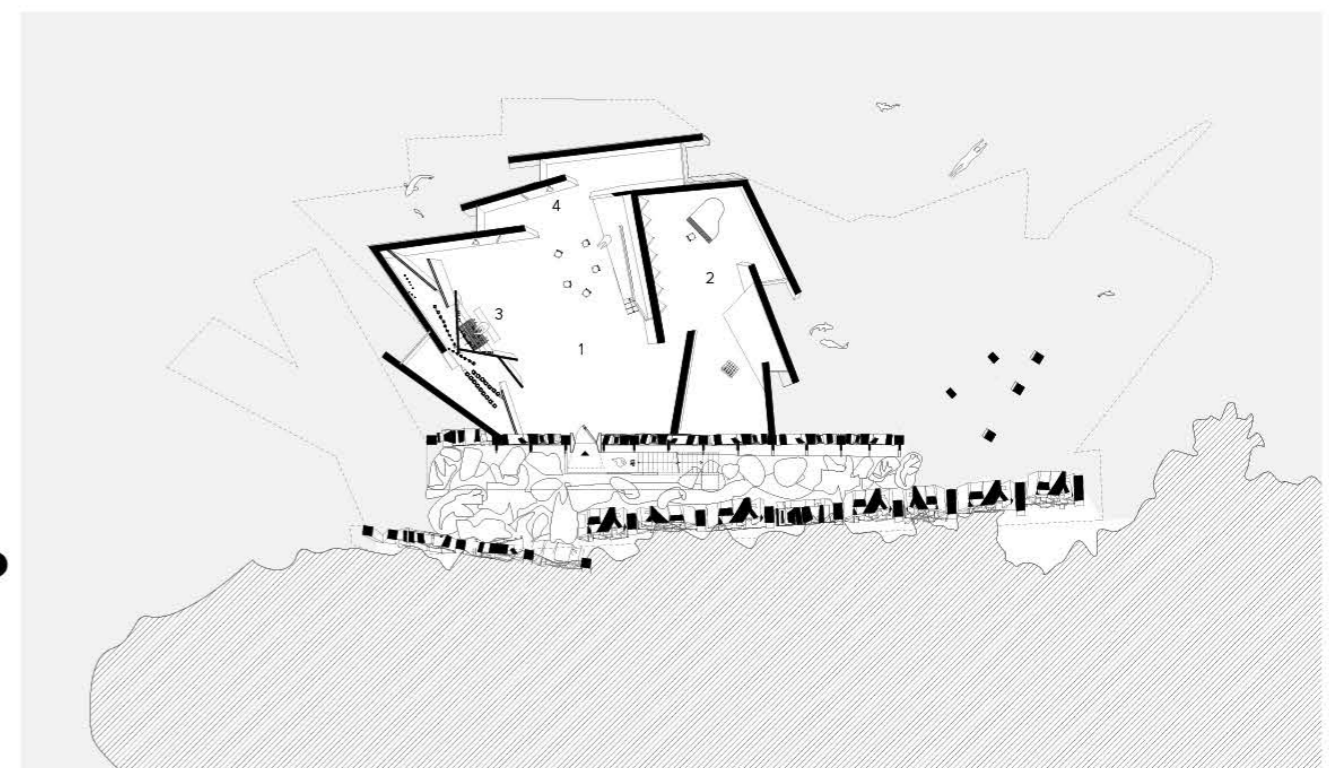
left: **living room perspective**  
 right: **living room plan**  
 + 1m above water level

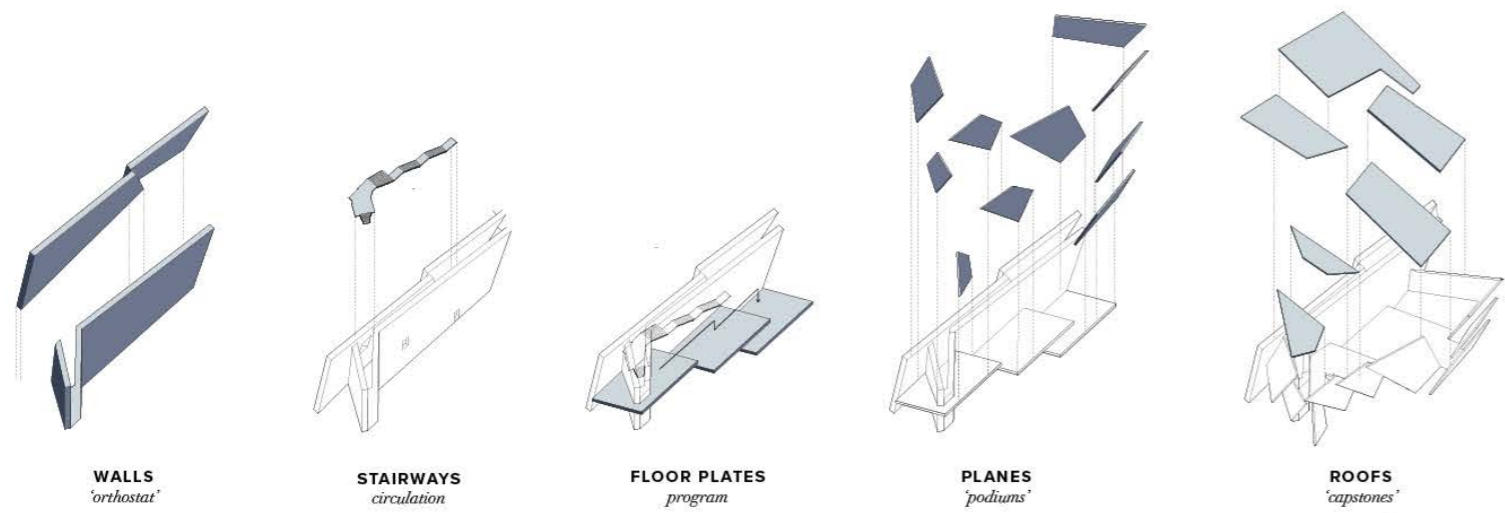
- [1] **dock** - arriving
- [2] **living room** - socializing
- [3] **library** - reading
- [4] **balcony** - observing
- [5] **kitchen** - cooking
- [6] **dining room** - eating
- [7] **water closet** - grooming
- [8] **mechanical** - supporting



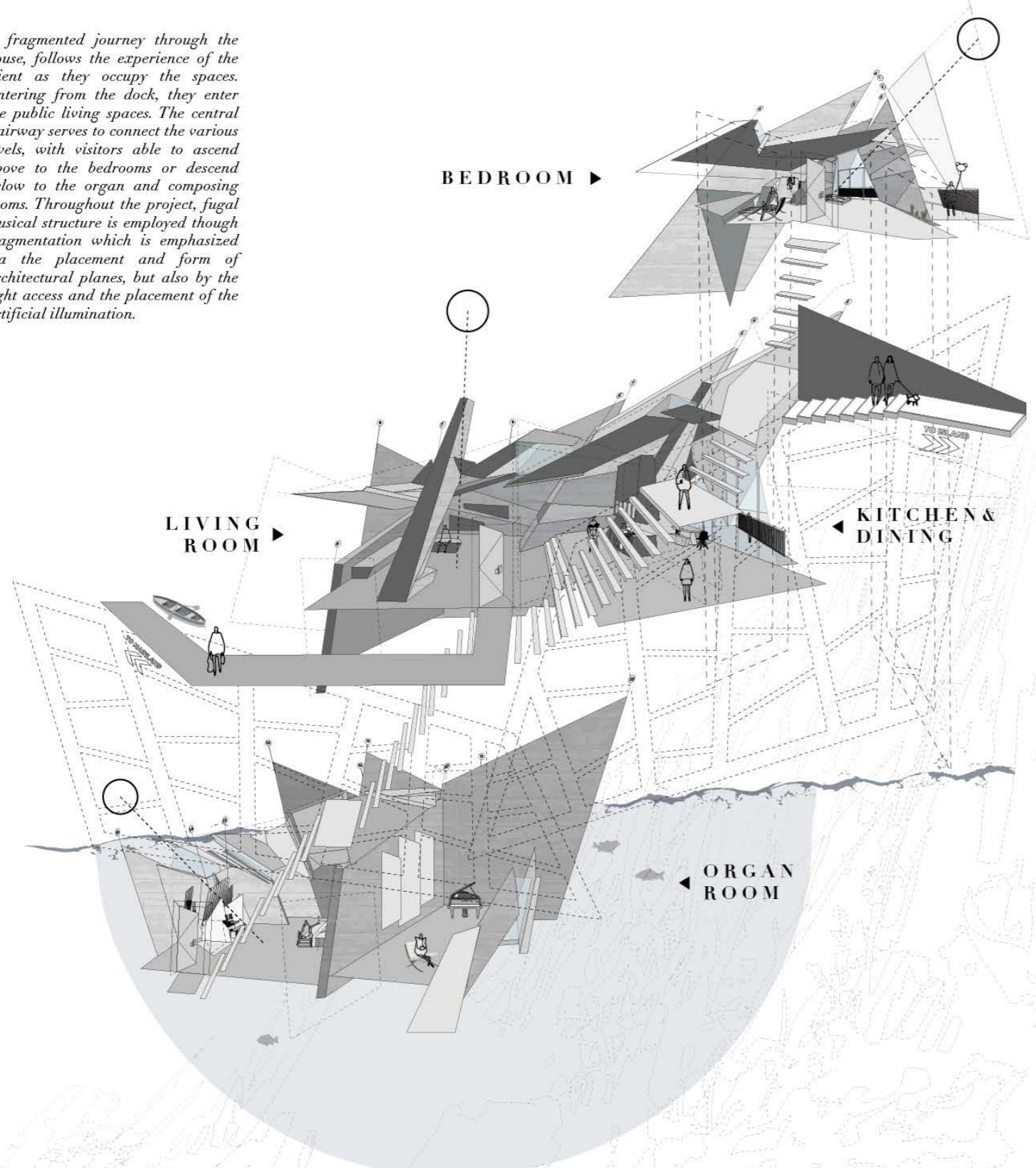
left: **music room perspective**  
 right: **music spaces plan**  
 - 4m below water level

- [1] **music room** - playing
- [2] **writing room** - composing
- [3] **organ** - playing
- [4] **instrument walls** - storage

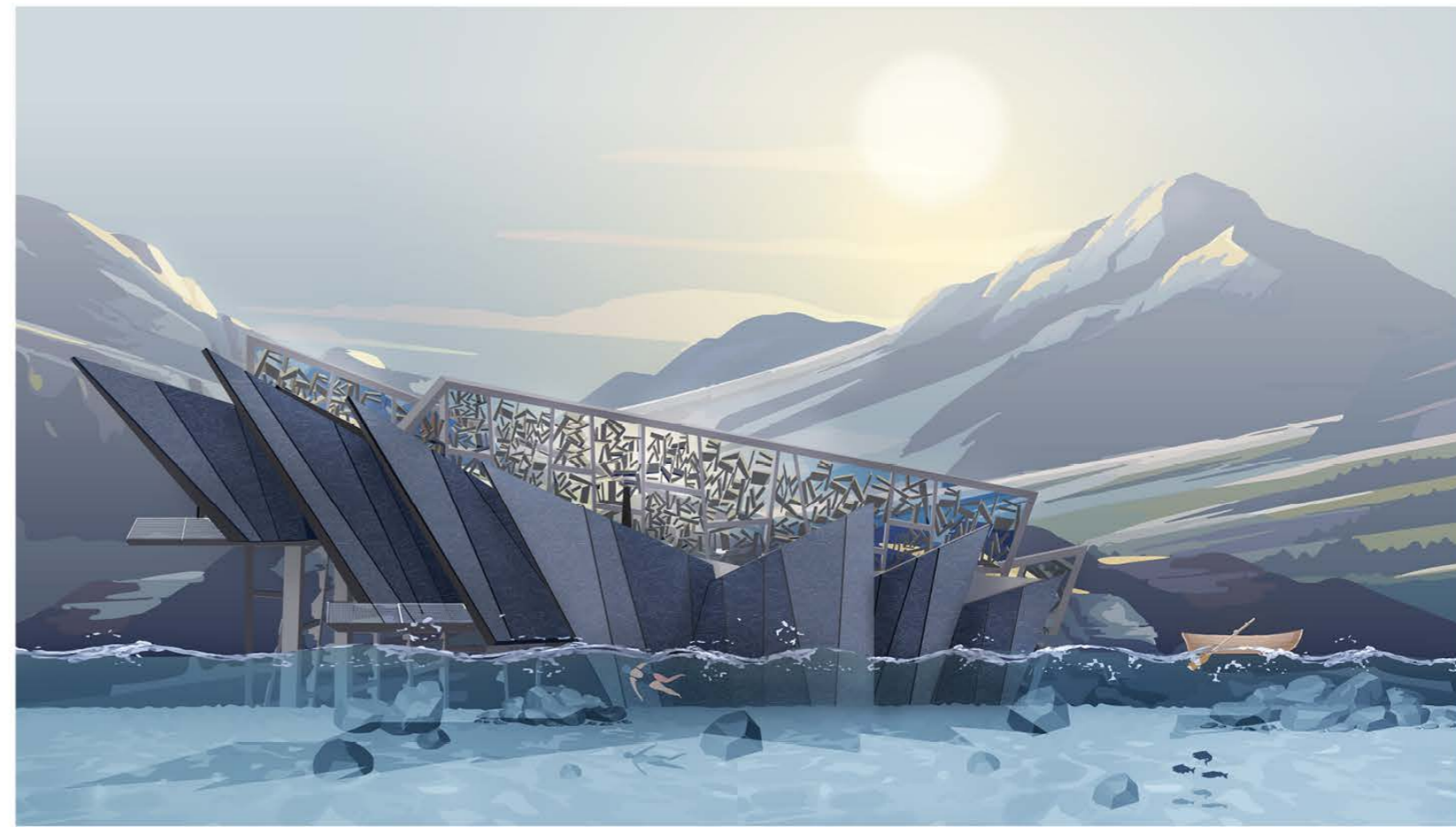
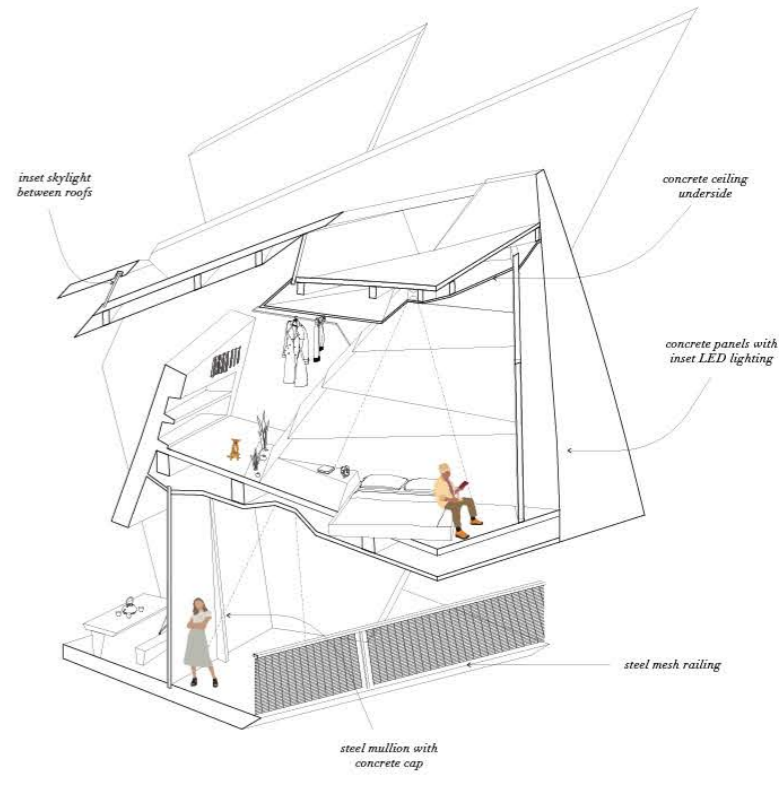
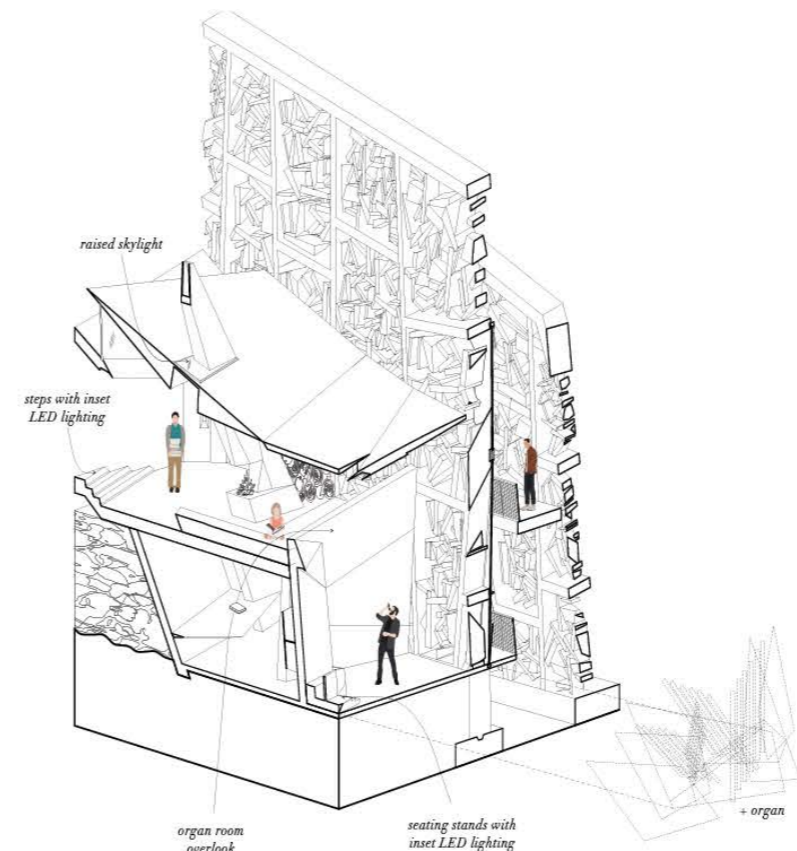




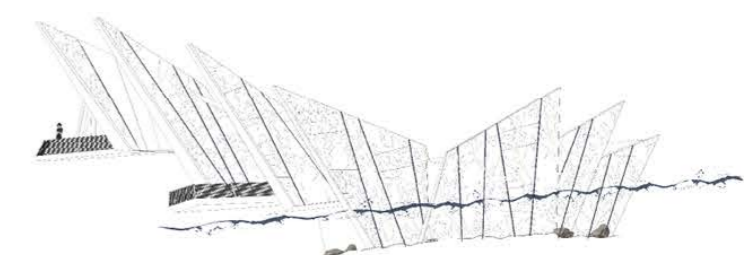
A fragmented journey through the house, follows the experience of the client as they occupy the spaces. Entering from the dock, they enter the public living spaces. The central stairway serves to connect the various levels, with visitors able to ascend above to the bedrooms or descend below to the organ and composing rooms. Throughout the project, fugal musical structure is employed through fragmentation which is emphasized via the placement and form of architectural planes, but also by the light access and the placement of the artificial illumination.



below left: living room cut-off isometric  
below right: bedroom cut-off isometric



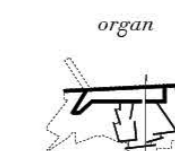
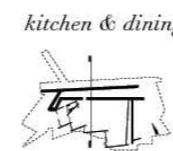
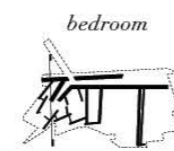
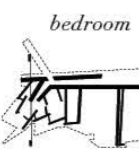
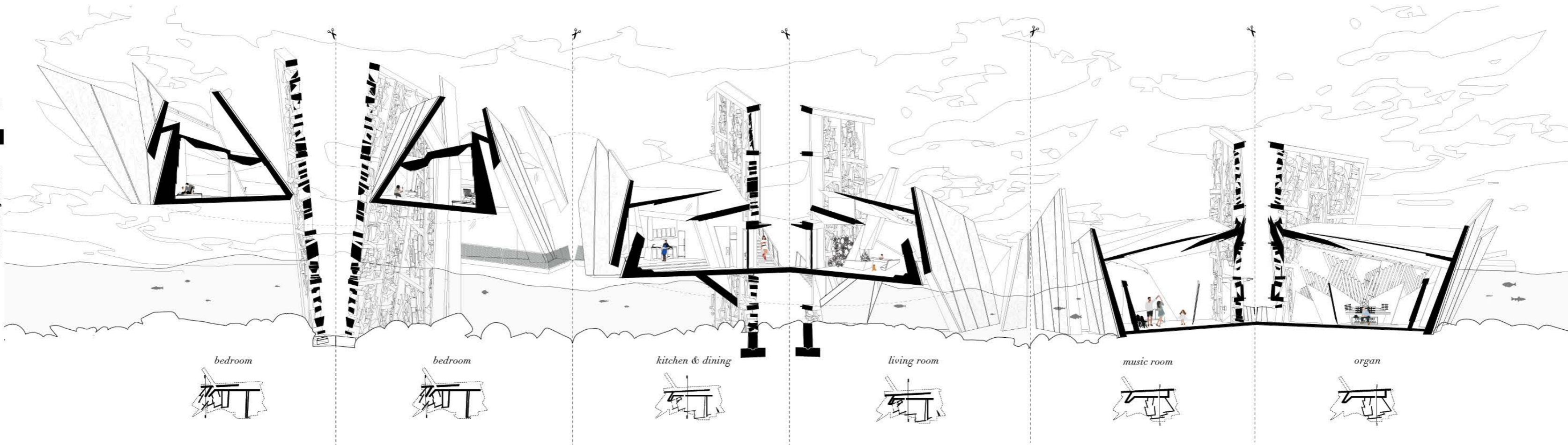
**CIRCULATION**  
The stairway between the orthostat walls connects the various programmatic levels to the two access points into the building, the first from the water through the dock and the second from the island itself.



**FACADE**  
This facade most prominently embodies the ideas found in the fugal structure, with the two wall typologies serving as an overlay onto one another while retaining a similar architectural language.

above: experiential journey through the house





*The morning light washes the interior of the bedroom and dining spaces.*



*Light enters through the skylight around the fireplace near mid-day.*



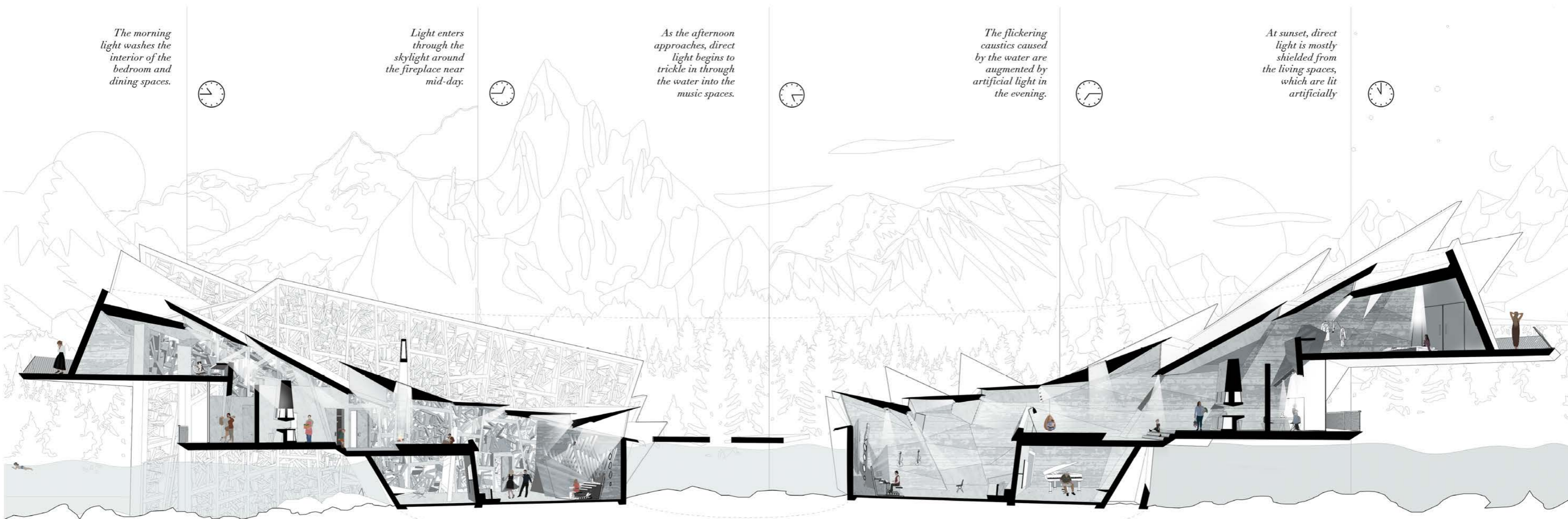
*As the afternoon approaches, direct light begins to trickle in through the water into the music spaces.*



*The flickering caustics caused by the water are augmented by artificial light in the evening.*



*At sunset, direct light is mostly shielded from the living spaces, which are lit artificially.*



above: accordion unfolded section  
temporal unfolded sectional perspective

# TRIPIX

## ICEBREAKERS FESTIVAL

This design brings the idea of the ocularcentric experience of architecture to light through the faceted reflective interior condition. The viewer experiences the space as a reflection back on themselves, in many different lights and angles while also being intertwined with the reflections of the exterior conditions. It encourages people to interact with it by taking images and looking through the funnel-like apertures to view notable Torontoian landmarks such as the CN Tower, Wave Deck, Lake Ontario, and Rogers Center.

2019



Project Photo Credits: Arash Ghafouri, Gregor Tratnik and Devanshi Jagota



### FRAMING THE CONTEXT

Surrounded by some of Toronto's most famous landmarks, the openings within the panels frame views of the buildings for visitors.



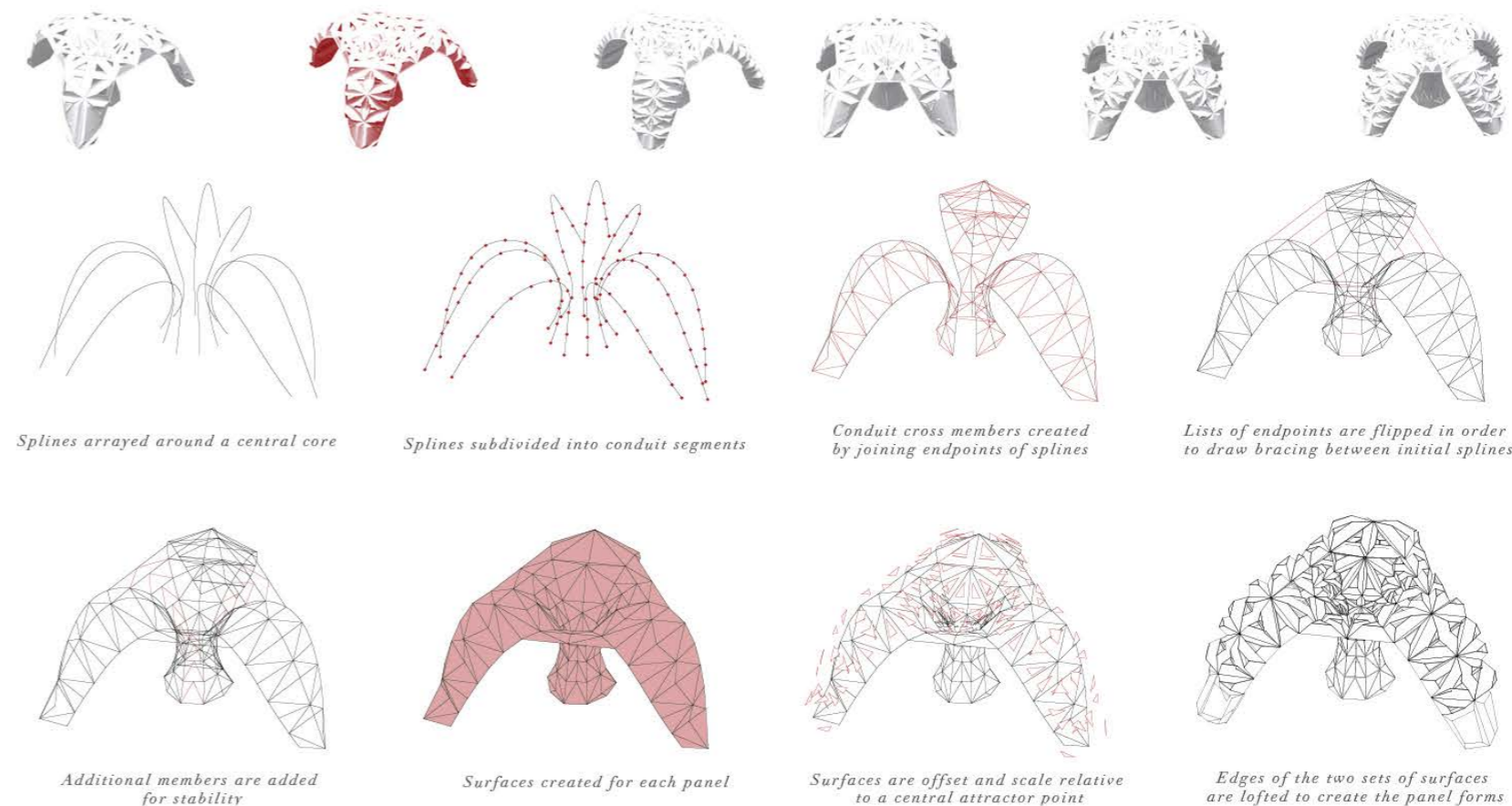
### STRADDLING THE PATH

Located at a fork in HTO park, the three wings straddle the path, creating a sense of place for a location that is otherwise a method of transit.



### OCULARCENTRISM

Reflectivity and form allow for photography of oneself superimposed over context landmarks and the pavilion's form.

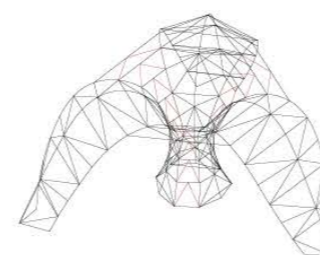


Splines arrayed around a central core

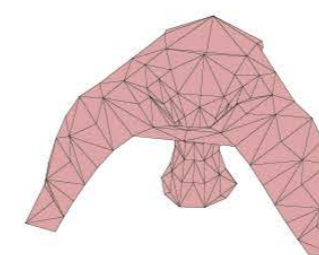
Splines subdivided into conduit segments

Conduit cross members created by joining endpoints of splines

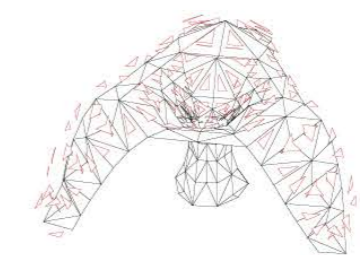
Lists of endpoints are flipped in order to draw bracing between initial splines



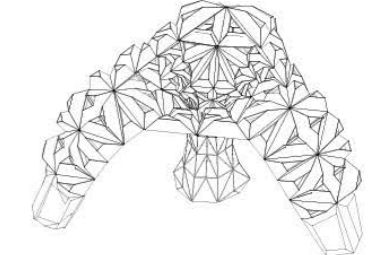
Additional members are added for stability



Surfaces created for each panel



Surfaces are offset and scale relative to a central attractor point



Edges of the two sets of surfaces are lofted to create the panel forms

All drawings produced by the applicant

### CONTEXT

Icebreakers 2019 + CelebrateTO Festival

### LOCATION

HTO Park East, Toronto + Nathan Phillips Square, Toronto

### SOFTWARE

Rhino, Grasshopper, RhinoCAM, Rhino Nest, CNC Router

### COLLABORATORS

Gloria Zhou, Thomas Gomez, Vivian Kinuthia, Florencio IV Tameta, Zeenah Mohamed Ali

### ROLES

Design iterations, testing materials, parametric modeling with Grasshopper, fabrication files, fabrication, installation, project coordination and management

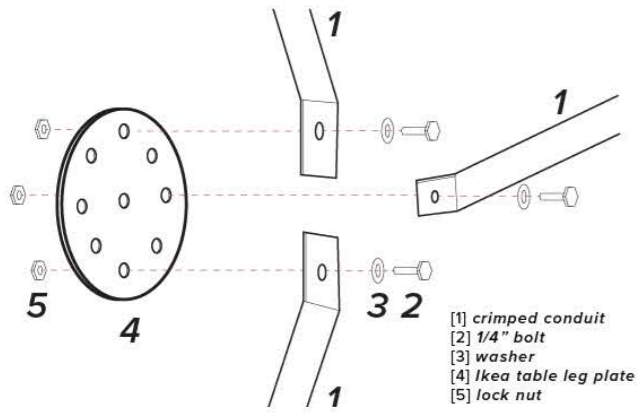
above: formal iterations scripting process

below: materials palette  
assembly phases  
fabrication process



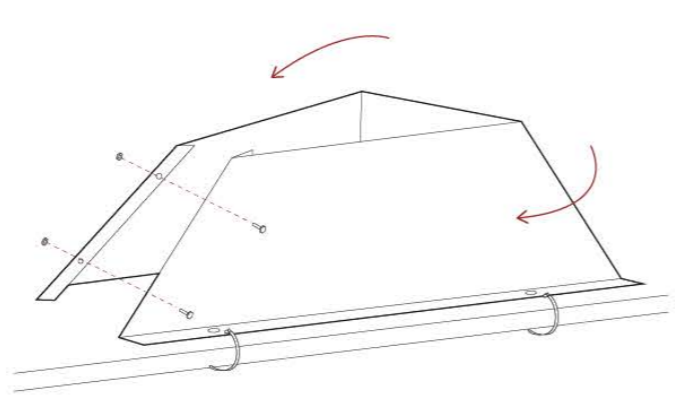
12  
tripix

12  
Icebreakers 2019



**CONDUIT**

Galvanized steel conduit was selected as the primary structure due to its fridity in extreme weather conditions. The conduit was fastened with bolts to table leg circular plates where multiple members joined.



**ALUMINUM**

Aluminum and foam sandwich sheets were CNC'd to create the various panels which provides weather-resistant finishes and notches for bending when milled. These panels were fastened to the conduit using zip tie connections.



**ACRYLIC**

Mirrored acrylic inside of the flange panels add reflectivity, allowing for ocular-centric experiences.



**FABRICATION**

Conduit was cut to specified lengths, crimped and then drilled.

**ASSEMBLY**

Bolts were used to attach the various pieces of conduit together and to the steel plates.

**ERECTION**

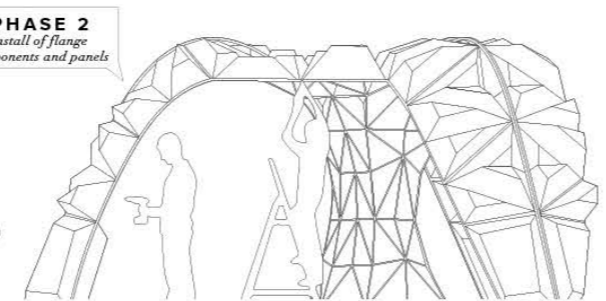
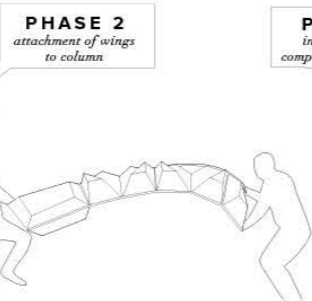
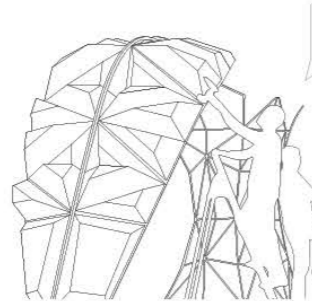
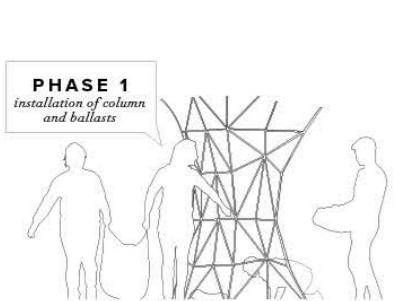
The main components (wings and column) were pre-assembled to create frame.

**PANELIZATION**

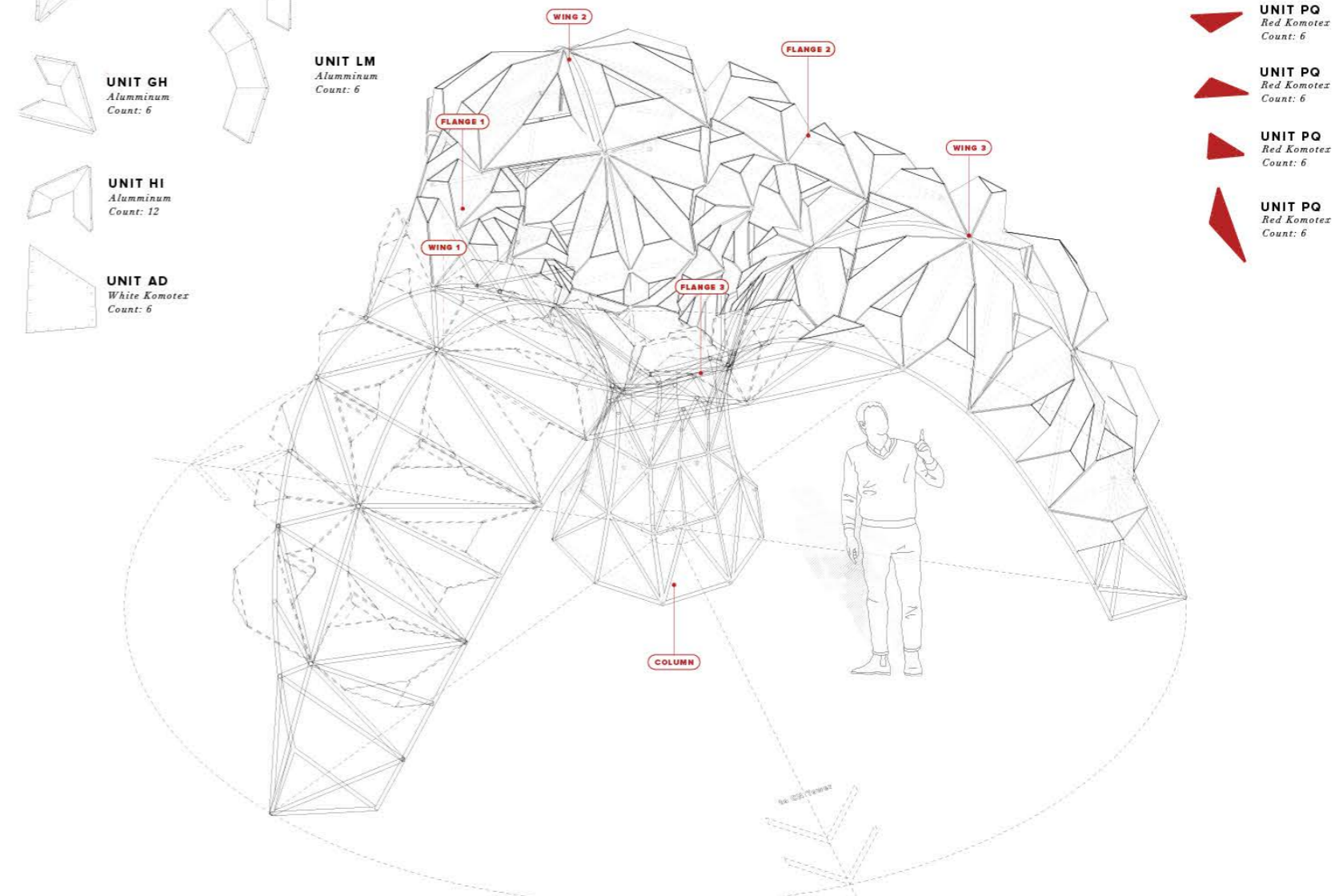
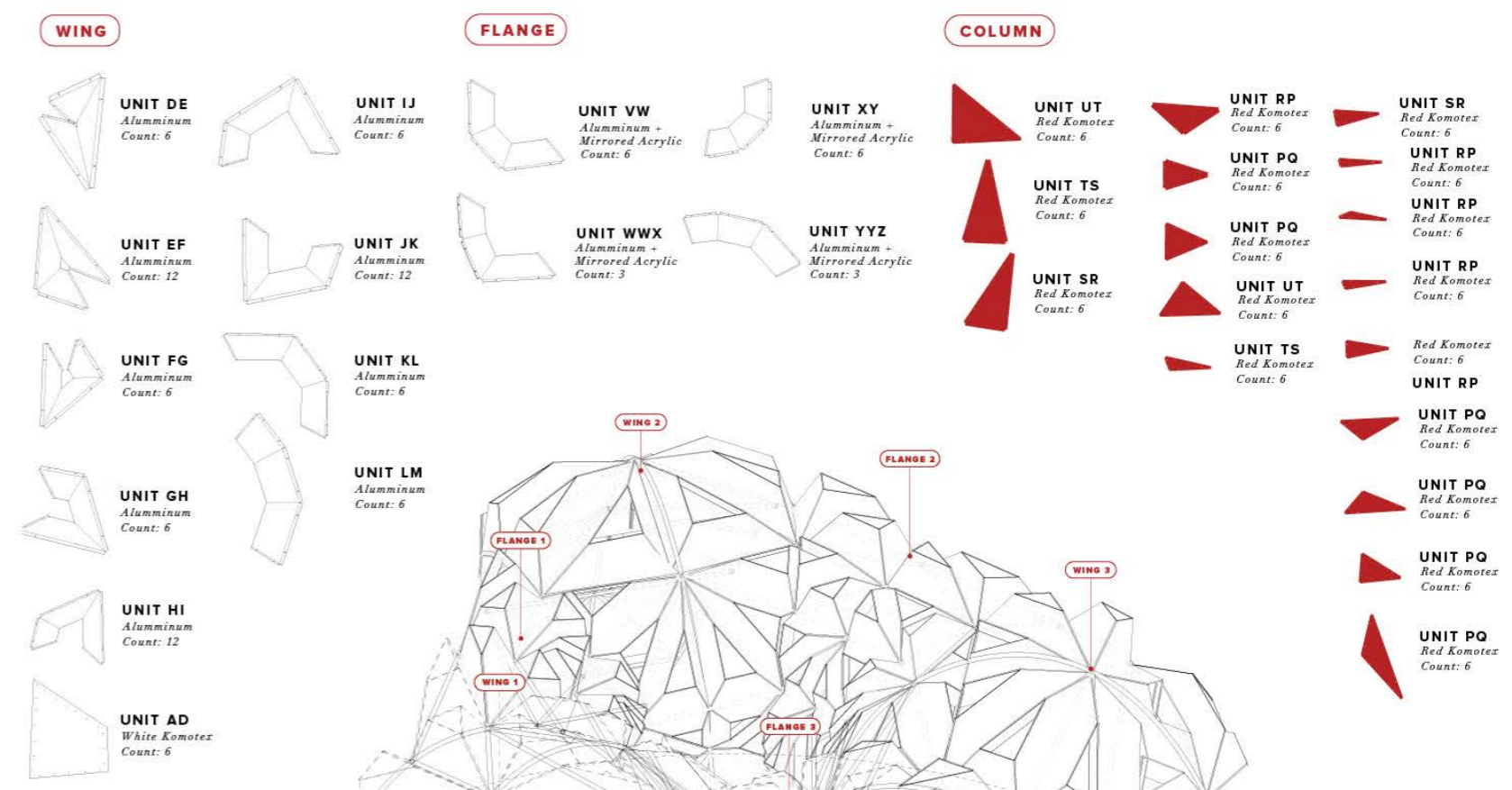
Panels were inserted within conduit frame using zip-tie connections to secure them.

**SITE INSTALL**

The four main components were transported to the site for final assembly.



All drawings produced by applicant



above: assembly diagram

# HART ISLAND OSSUARY

## FORGOTTEN MILLION, NOW REMEMBERED

Being a large city, New York not only has a large impoverished population, but also frequently experiences waves of disease. In order to deal with the death toll, the city began to bury bodies on Hart Island, a small isle on Long Island Sound. Hart Island Ossuary offers a proposal for an open-air visitors center, memorial and observation tower allowing guests to get panoramic views of the massive grave site while also taking the millions of dead out of anonymity.

2020



CONTEXT

AISC/ACSA Steel Design Competition

LOCATION

Hart Island, New York

SOFTWARE

Rhino, Grasshopper, Illustrator, Photoshop



Open Category (ACSA/AISC Competition)

**1870**  
During the yellow fever pandemic, Hart Island was used as a quarantine station.

**1865**  
Island used as a prisoner of war camp, with no of the dead soldiers becoming the first to be buried in the city cemetery.

**1900**  
Became a boys' workhouse and penitentiary, what would later become Rikers Correctional Center.

**1970**  
Nike defense missiles installed on Hart Island. They were later dismantled in 1970.

**1977**  
Arson destroyed the records of those buried on Hart Island.

**1960**  
Infants and stillborns begin to be buried separate from adults. These account for 2/3 of those buried as hospitals are able to deliver "city burial" as an option for parents.

**1950**  
The Phoenix House, a sanatorium for those with tuberculosis opened on the island. They hosted events with up to 20,00 attendees who would arrive by ferry.

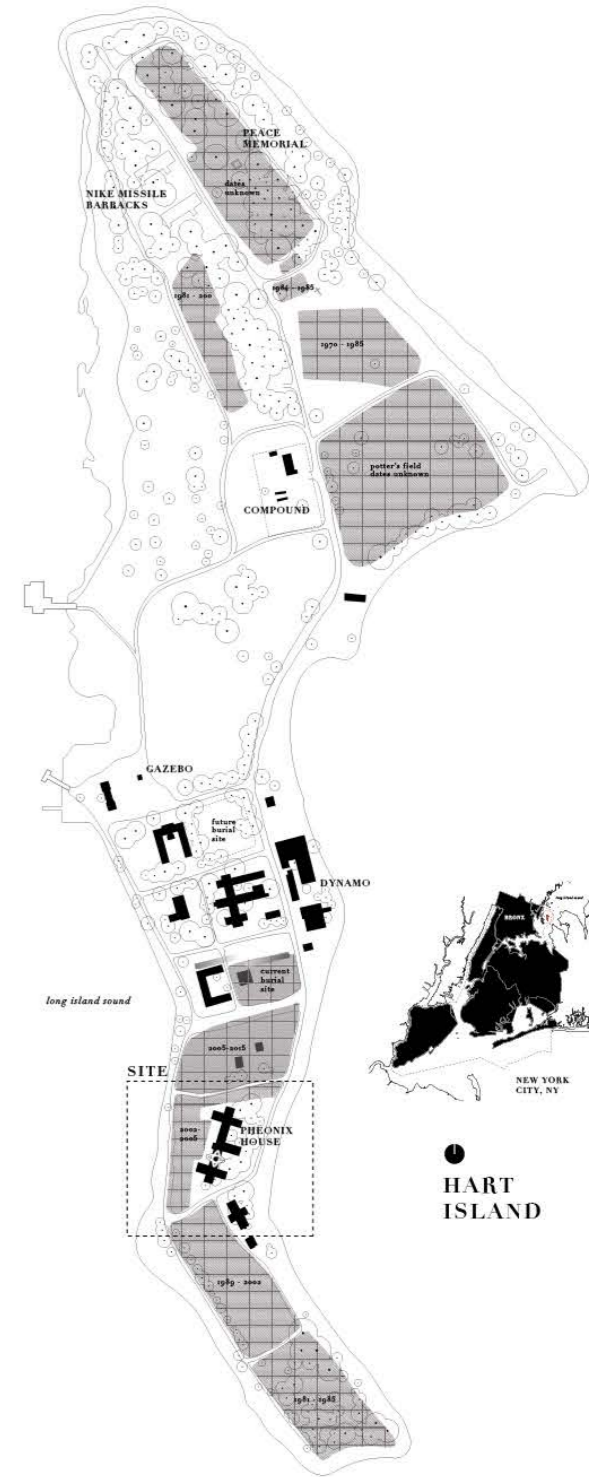
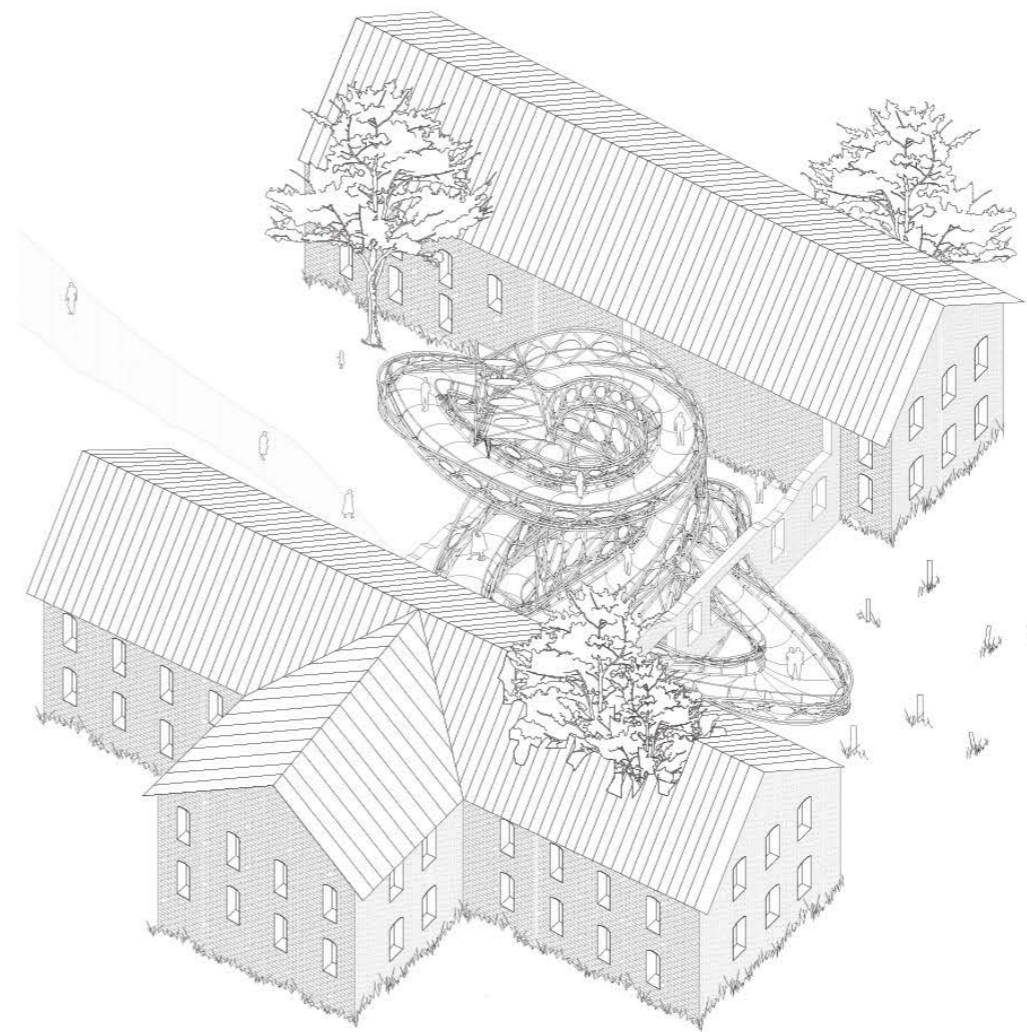
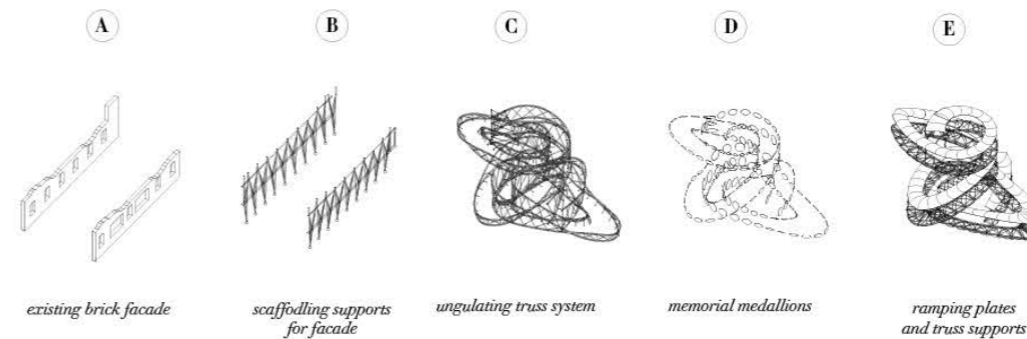
**1918**  
The Spanish Flu pandemic caused many impoverished to be laid to rest in the Potter's field.

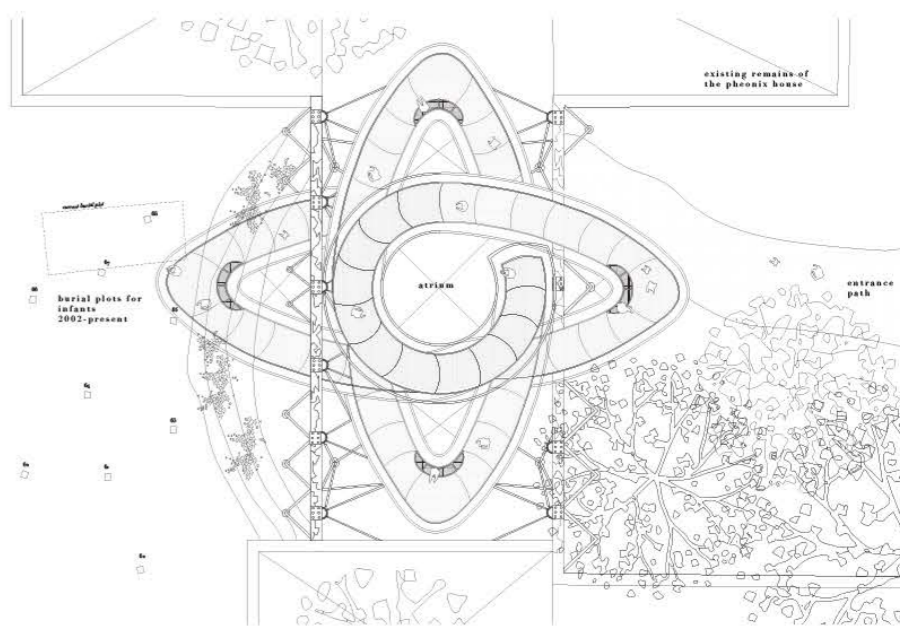
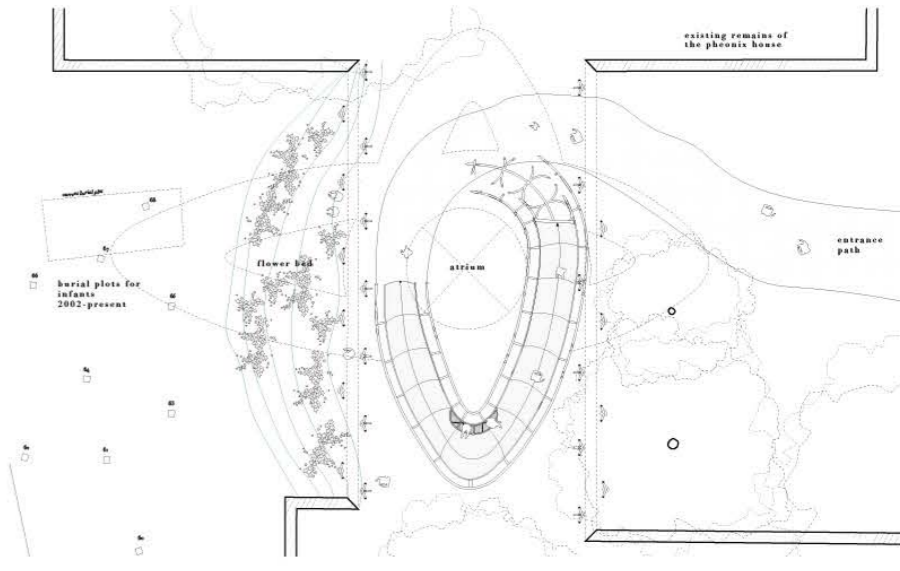
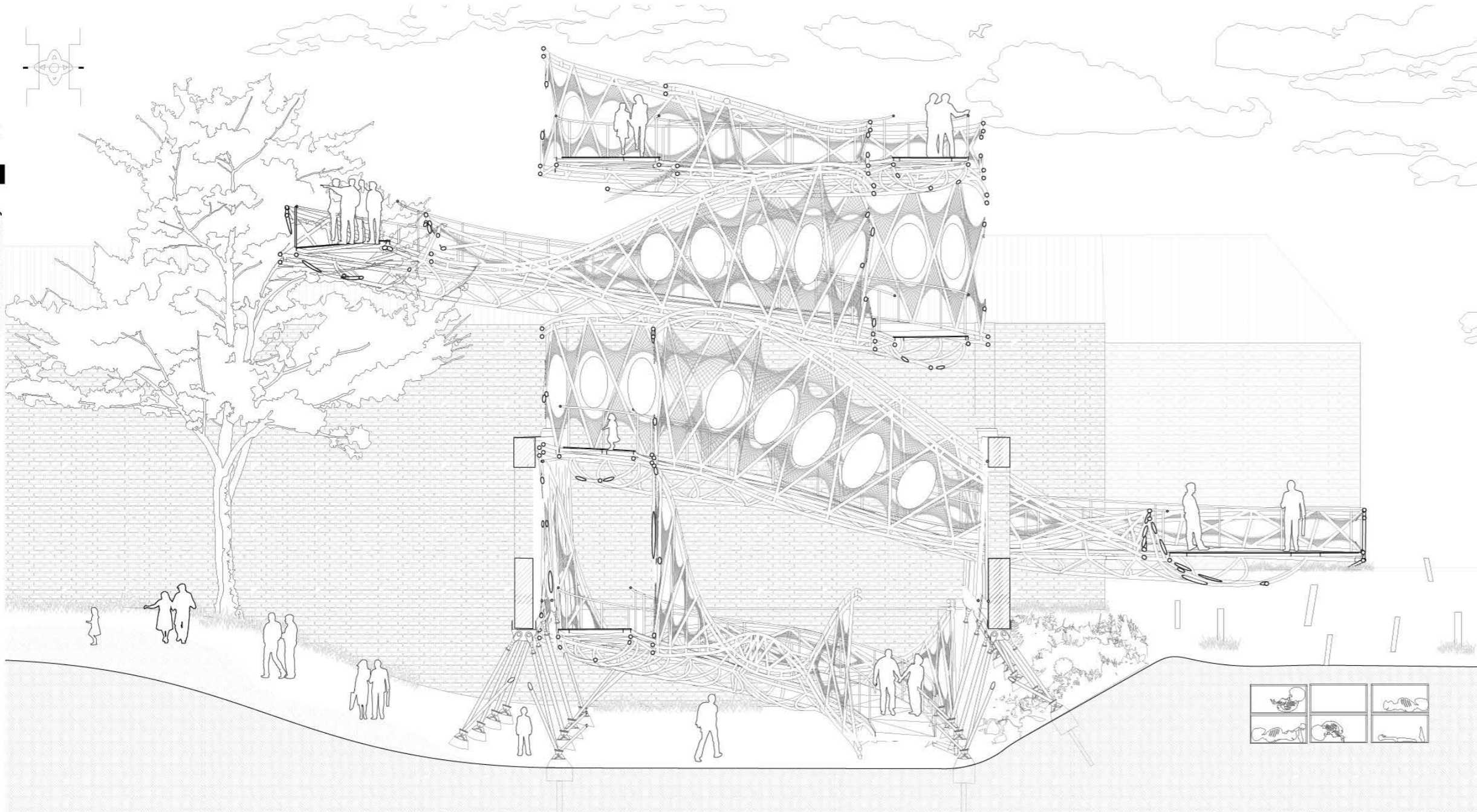
**1980**  
The first AIDS victim buried on the island is also the only named grave. Throughout the epidemic, many were buried on Hart Island due to funeral homes refusing to bury them because of the stigma.

**2020**  
With New York seriously affected by the COVID-19 epidemic, Hart Island has been designated not only as the grave site for the unclaimed but also a space for temporary burial while the city is locked down.

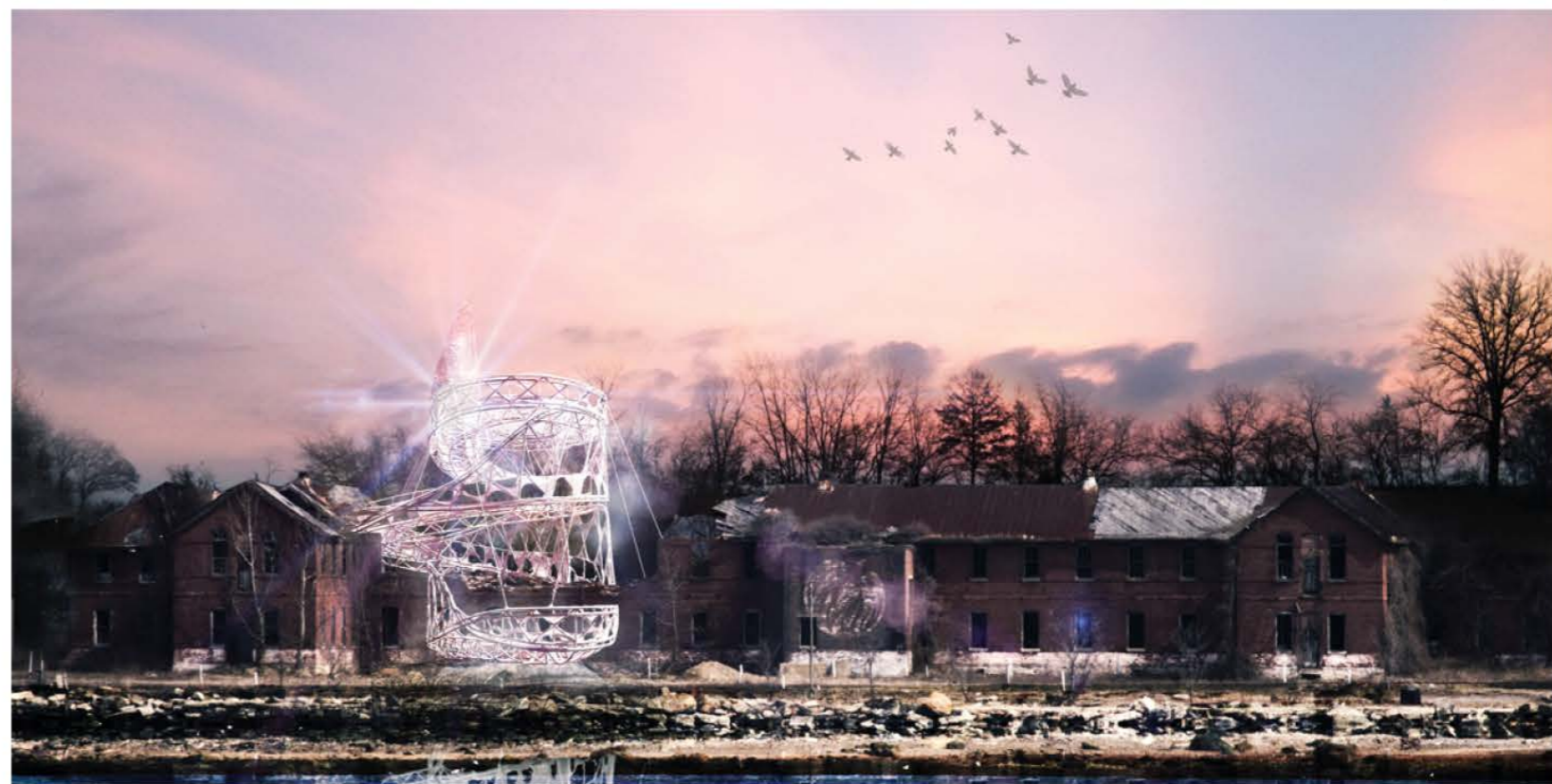
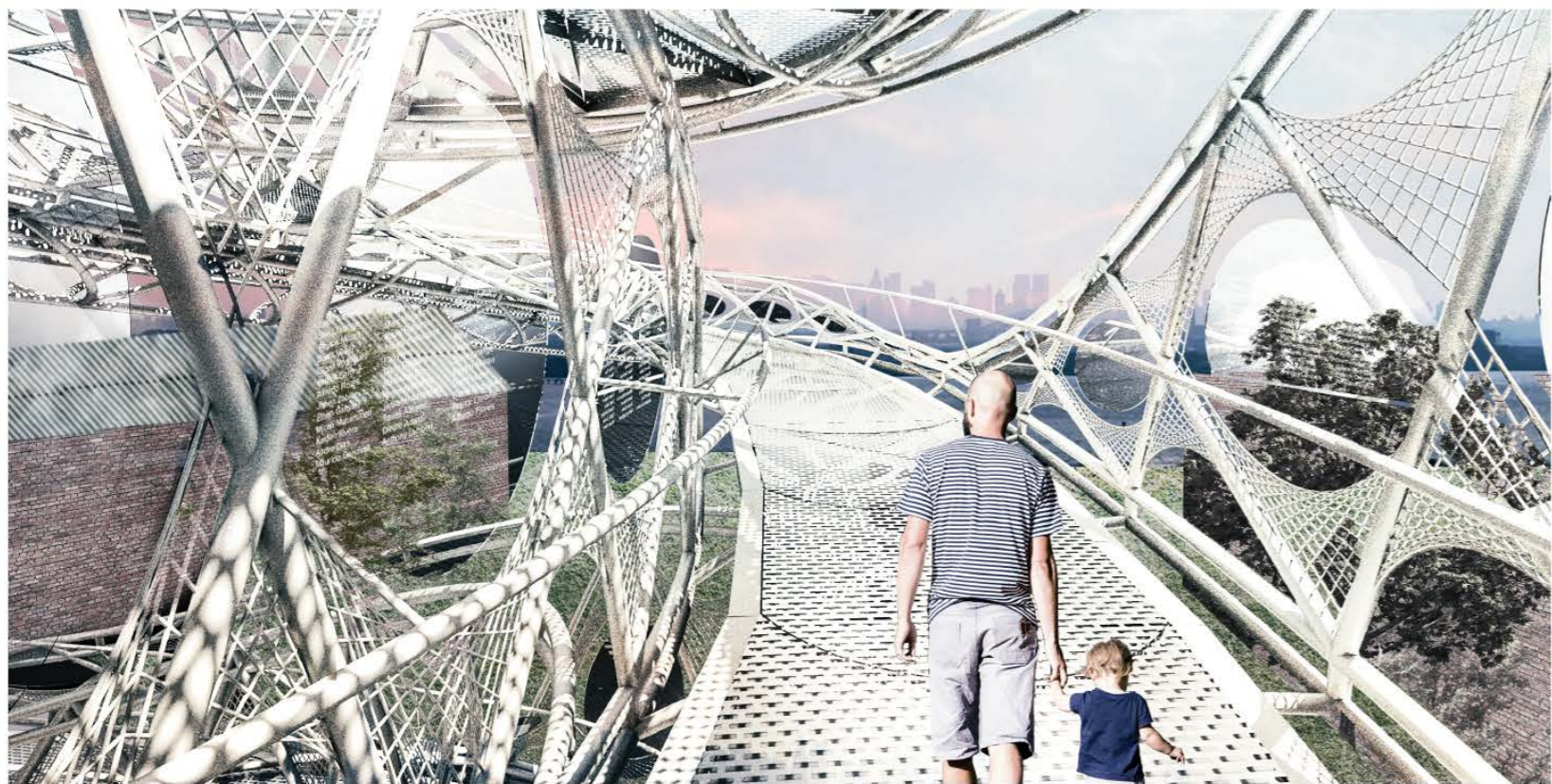
The island sports a collection of dilapidated buildings and fields of enumerated posts, each representing 150 bodies. Until recently, the island was under the jurisdiction of Rikers Correctional Center, with inmates working to bury the dead. In 2019, the island was passed over to the parks department, to create a public and pleasant cemetery space for visitors and tourists alike.

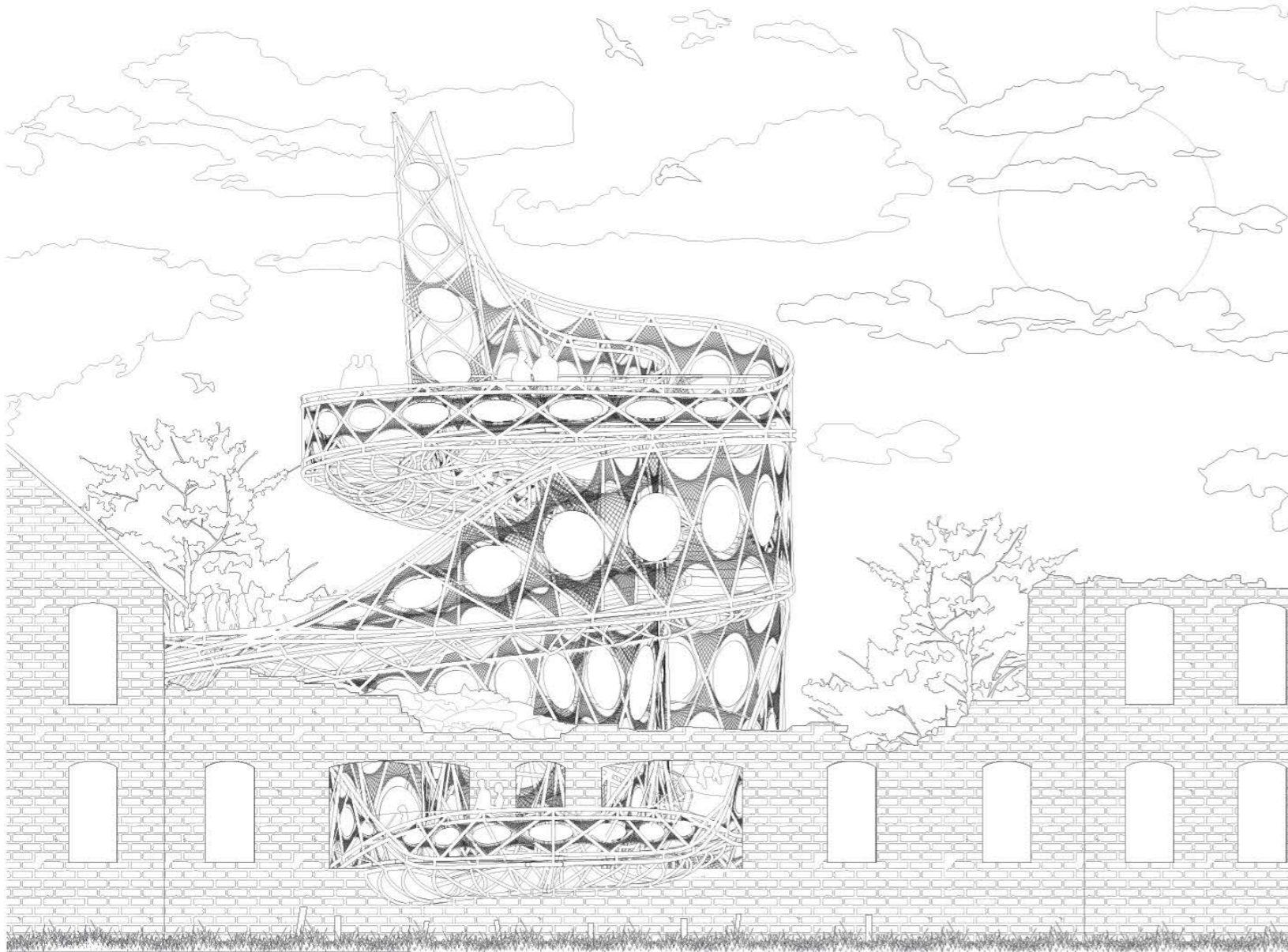
Due to the unmarked graves and the few accessible roads on the island, grave visitors may not be able to reach their loved one's resting place. Taking advantage of the ruins of the former Phoenix House, the ramping structure weaves below, through and above the crumbling brick facade, commemorating not only the dead but also the history of the island.





above: grade floor plan, roof floor plan  
left: sectional perspective

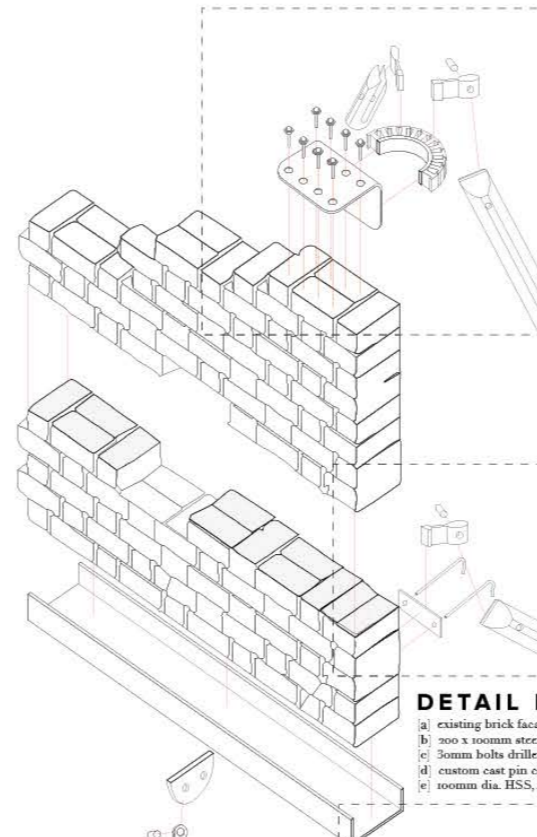




below: east elevation

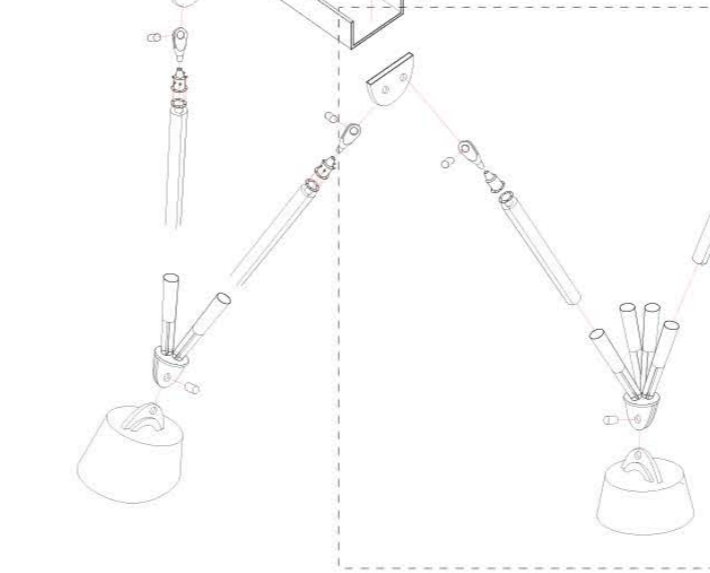
**DETAIL A**

- a) existing brick facade
- b) 300 x 200 x 300mm predrilled steel plate, AESS 1
- c) 76mm bolts drilled into brick, AESS 1
- d) custom spoke receptor welded to plate, AESS C
- e) custom cast pin connection, AESS C
- f) 100mm dia. HSS, AESS 2



**DETAIL B**

- a) existing brick facade
- b) 200 x 100mm steel plate, AESS 1
- c) 30mm bolts drilled into mortar, AESS 1
- d) custom cast pin connection, AESS C
- e) 100mm dia. HSS, AESS 2



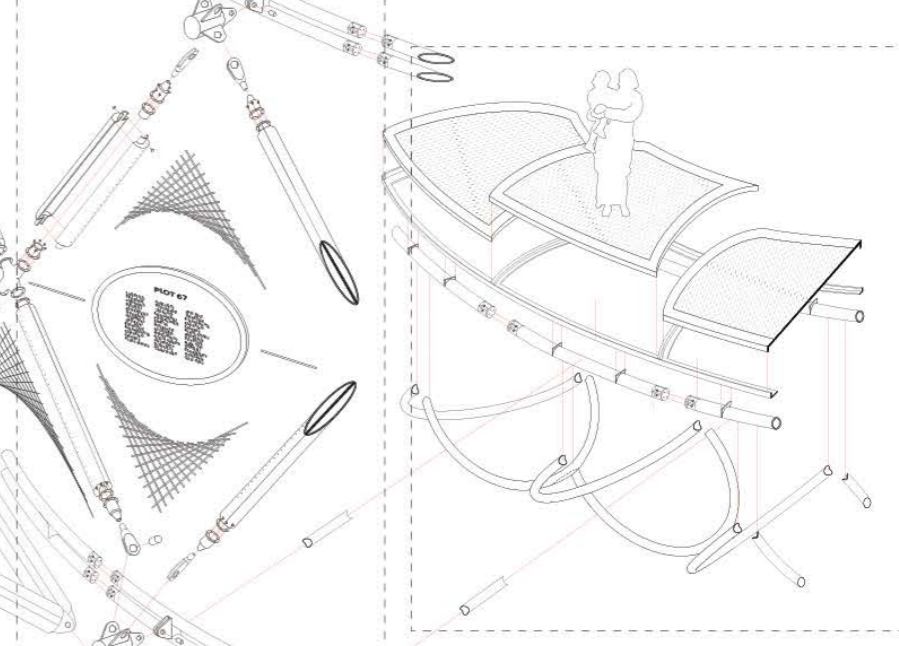
**DETAIL C**

- a) 600mm dia. concrete foundation
- b) 400mm attachment plate, AESS 1
- c) custom pin connection, AESS 4
- d) 400mm dia. plate, AESS 3
- e) 100mm dia. HSS, welded to plate, AESS 3
- f) custom pin connection, bolted to HSS, AESS 3
- g) 600 x 200 x 5mm connection plate, welded, AESS 2
- h) 600 x 300mm C channel, bolted to underside of brick, AESS 1
- i) 76mm bolts drilled into brick, AESS 1
- j) existing heritage brick facade



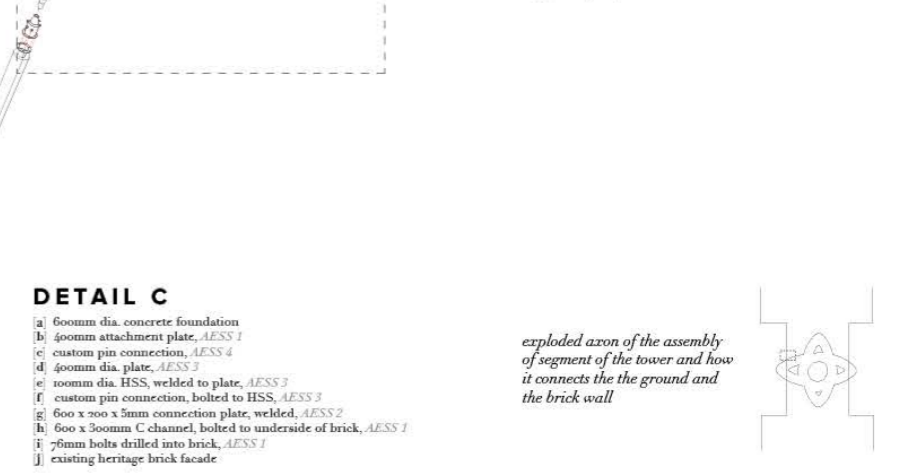
**DETAIL D**

- a) 100mm dia. HSS, bolted to pin connection, AESS 3
- b) custom pin connection, AESS 4
- c) custom cast 7 node pin connection, AESS C
- d) 150mm dia. HSS pipe bolted to surrounding segments, AESS 2
- e) 150mm dia. HSS pipe welded to HSS pipe, AESS 2
- f) custom pin connection, AESS 4
- g) halves of 100mm dia. HSS, bolted to pin connection, AESS 3
- h) custom cast 4-way bolted connection, AESS C
- i) 2000 x 1500mm etched acrylic medallion
- j) steel cables, fastened into HSS
- k) halves of 100mm dia. HSS, bolted to pin connection, AESS 3
- l) custom cast 4 node pin connection, AESS C

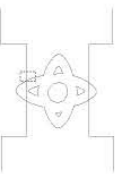


**DETAIL E**

- a) 75mm dia. bent HSS, welded, AESS 2
- b) 150mm dia. HSS pipe bolted to surrounding segments, AESS 2
- c) 70 x 50mm bent L Channel, AESS 1
- d) steel grate, AESS 1



exploded axon of the assembly of segment of the tower and how it connects the ground and the brick wall



# CAVE HOUSE

## HOUSE FOR THE 21ST CENTURY

Frequently overshadowed by the primitive hut, the cave typology has been largely unexplored in architectural discourse due to the lack of architectonic qualities. The Australian town of Coober Pedy, "the opal capital of the world", is also internationally known for its peculiar vernacular housing tradition. The Cave House acts as a dwelling for two NASA scientists, a botanist and an aeronautical engineer, and their children, who are relocating to the outback for research work.

2020



### CONTEXT

Here and Now: House for the 21st Century Competition

### LOCATION

Coober Pedy, Australia

### SOFTWARE

Rhino, Illustrator, Photoshop



### DISCOVERY

Originally founded in 1915 when opal was first discovered by 14-year-old Wille Hutchison, the town's name comes from the indigenous term "kupa piti", meaning "white man in a hole".



### HOUSING DEVELOPMENT

As the early inhabitants were miners, they simply slept in the mines. They soon discovered the benefits of subterranean living in the harsh climate, and the construction style persisted.



### PRESENT DAY

In recent years, Coober Pedy has seen a drop in prospecting activity with less miners on the field. Instead, the town turned to tourism and serves as a major regional center in the Australian outback.



HUT

partitioning



Subdivision of space to set program boundaries

aggregation



Amalgamation of materials to delineate space

visible segregation



Stark contrast of walls to create privacy, with openings for visibility



CAVE

spatial gradient



Continuous space that can be variably occupied

envelopment

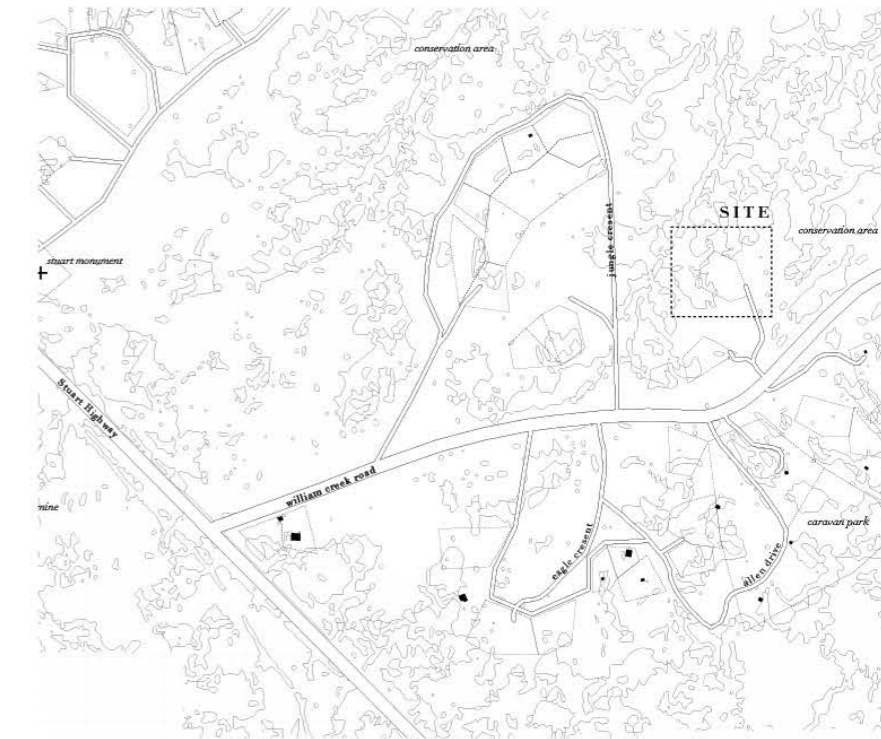


Spatial void that embraces the occupant, similar to a mother's womb

optical eavesdropping



Ability to see and not be seen, from within and to the exterior



above: site plan

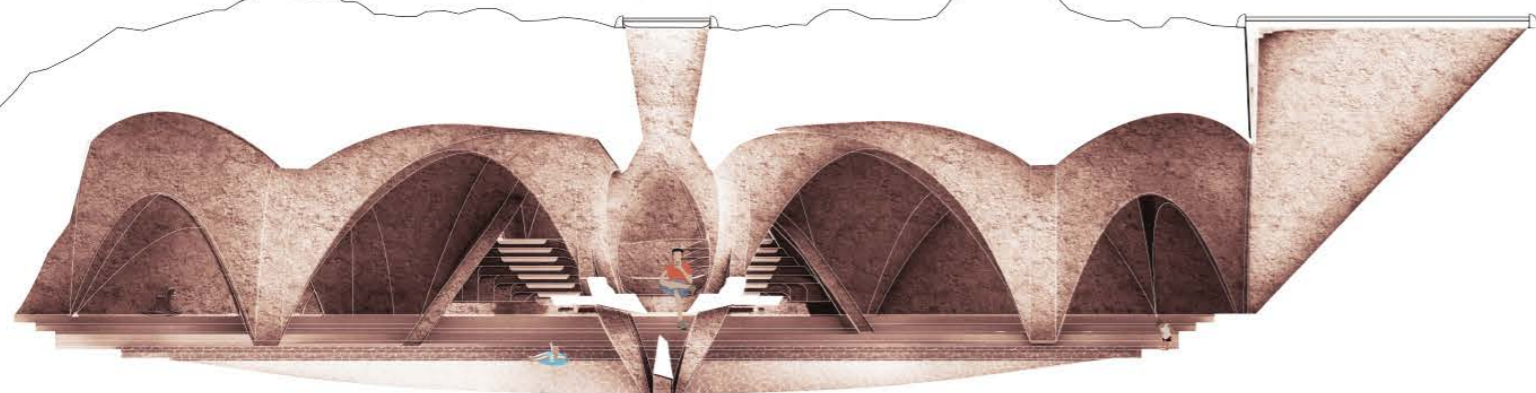
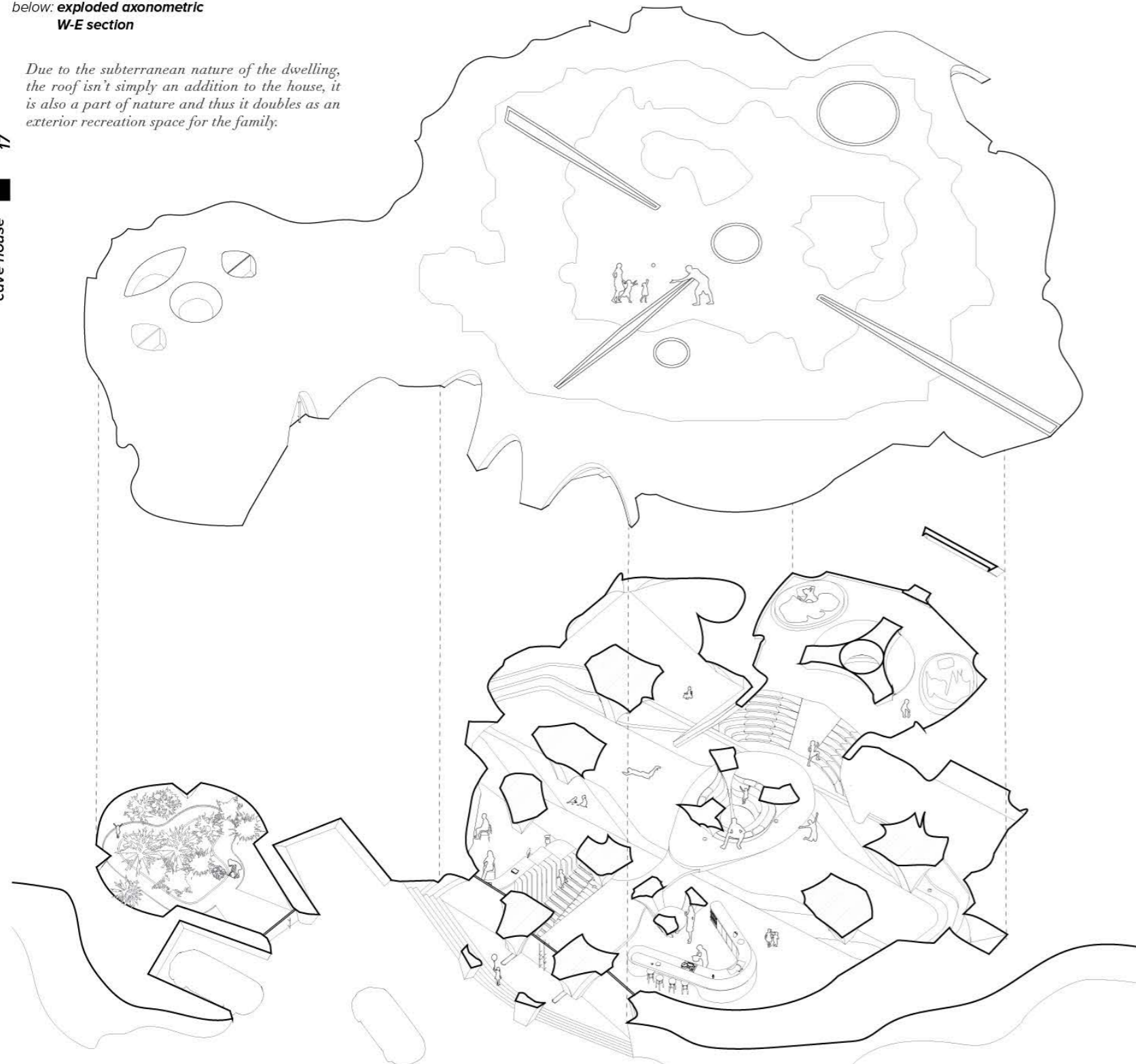
As the majority of buildings are underground they are shown with dashed lines.



COOBER PEDY

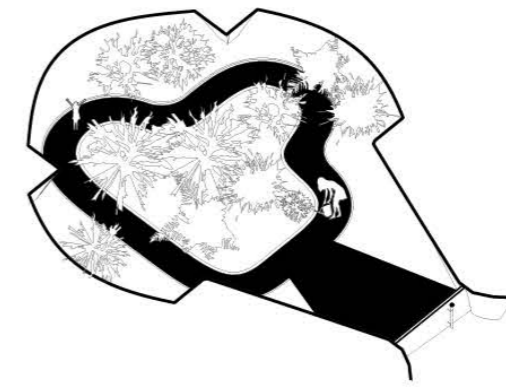


Due to the subterranean nature of the dwelling, the roof isn't simply an addition to the house, it is also a part of nature and thus it doubles as an exterior recreation space for the family.

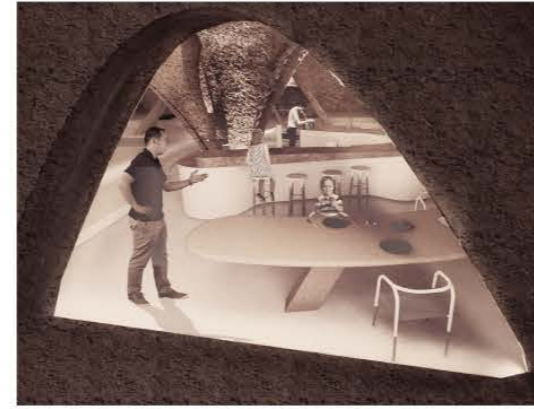
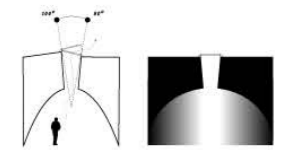


**POOL**

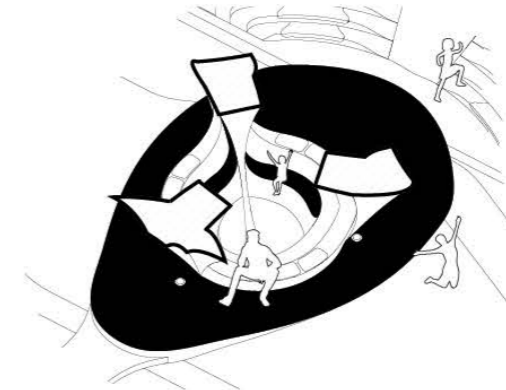
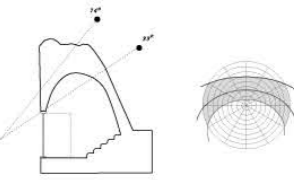
The pool not only provides a reprieve from the desert heat but also serves as a safe playscape. The gradual steps allow for various plateau conditions for play as well as various other family activities.



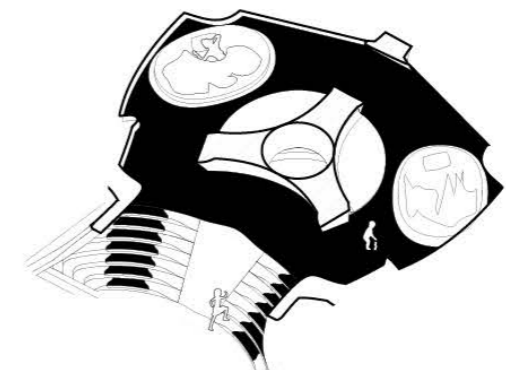
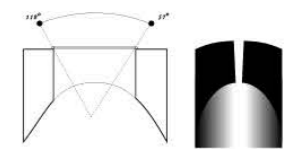
**GARDEN**  
In order to accommodate subterranean planting research, the garden is placed on the exterior of the house proper. This allows for the natural elements to have more of an impact on the plants creating a realistic simulation.



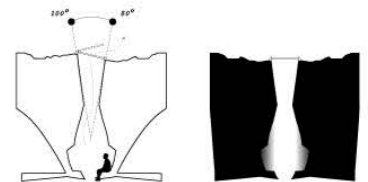
**KITCHEN**  
The kitchen is configured as an island in order to encourage gathering around as a social center. The oculus skylight above the island table provides ventilation and daylight to the space.



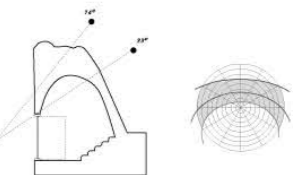
**LIVING SPACE**  
The pool merges with the living space, with the built-in seating featuring out facing padded seats as well as inner facing benches, which allow feet dangling in the water or slipping directly in.



**BEDROOM**  
The central oculus opening guides light to the lower bedroom while also generating a non-definitive obstruction to create a sense of separation between the upper rooms.



**STUDY**  
Working primarily with data and complex technologies, it is crucial for this family to have a large workspace. Incorporated into the adult workspace are stepping desks that allow for the children to participate in academia.





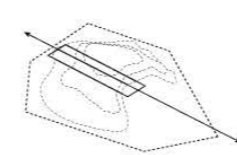
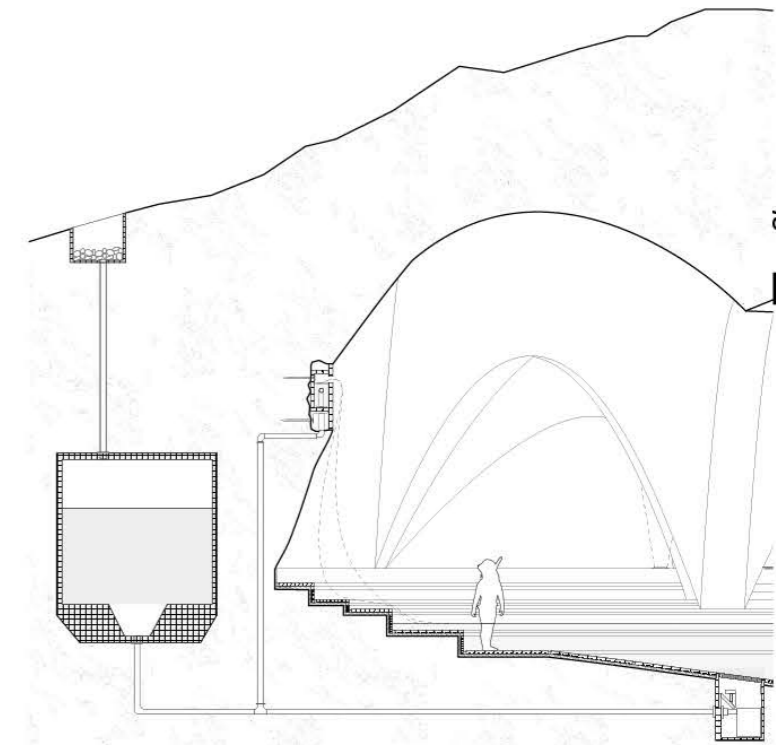
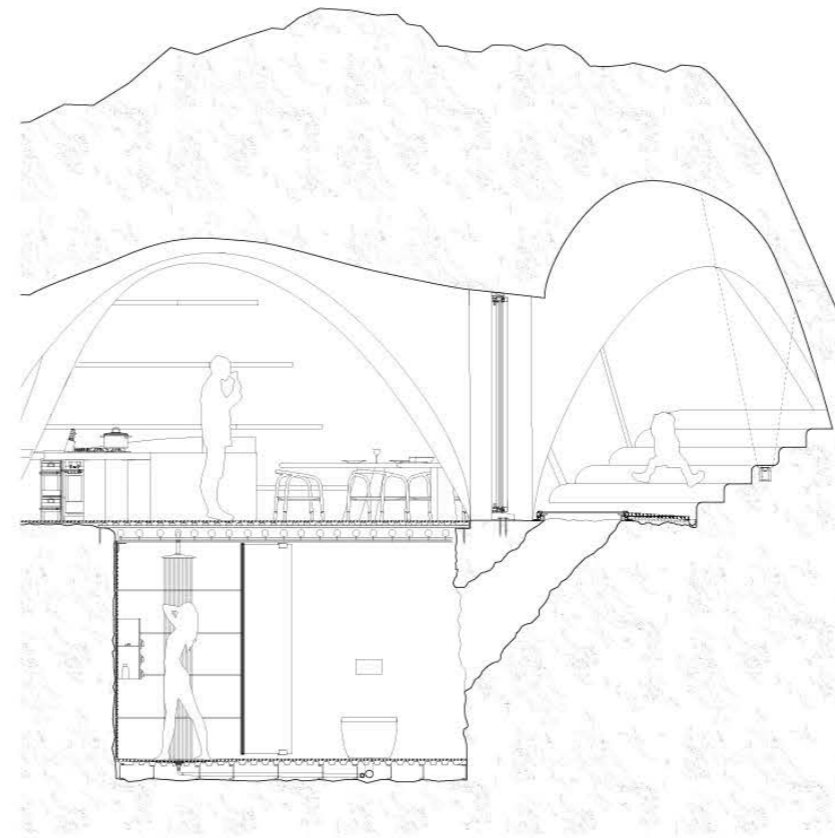
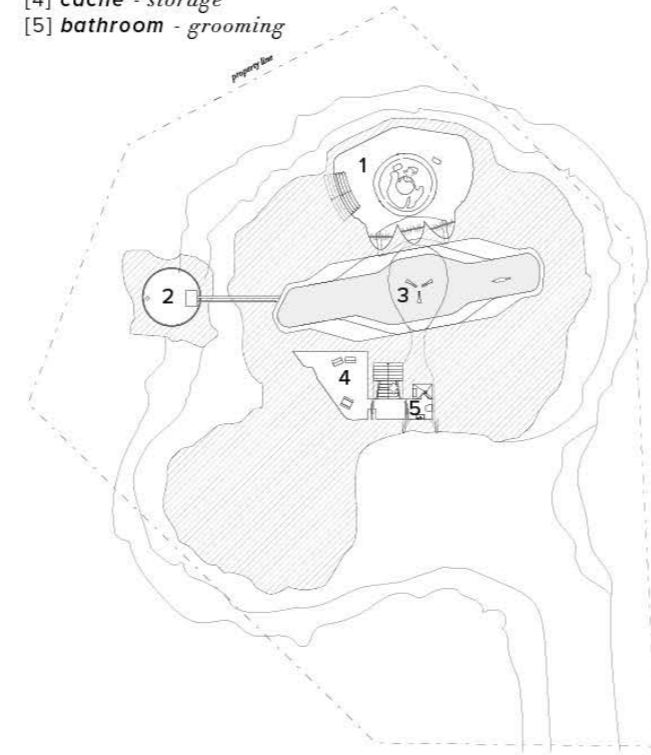


left: **ground floor plan**

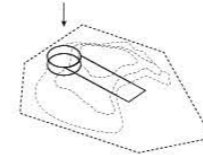
- [1] bedroom - resting
- [2] living room - socializing
- [3] pool - swimming
- [4] study - researching
- [5] foyer - entering
- [6] kitchen - cooking
- [7] dining room - eating
- [8] carport - parking
- [9] garden - growing

below: **basement plan**

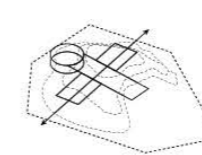
- [1] bedroom - resting
- [2] cistern - harvesting
- [3] pool - swimming
- [4] cache - storage
- [5] bathroom - grooming



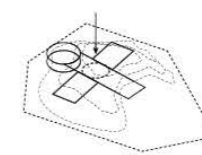
The dominating southern wind provides a central axis, with optimal natural ventilation.



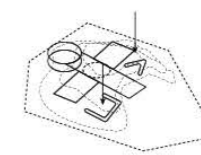
Stacked bedrooms create a journey through the spaces and capitalize on the northern light.



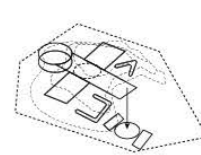
A perpendicular axis emerges in the form of the pool, dividing the public from private spaces and serving as a grounding element in the space.



At the intersection of these two axes, the social and living spaces are placed.

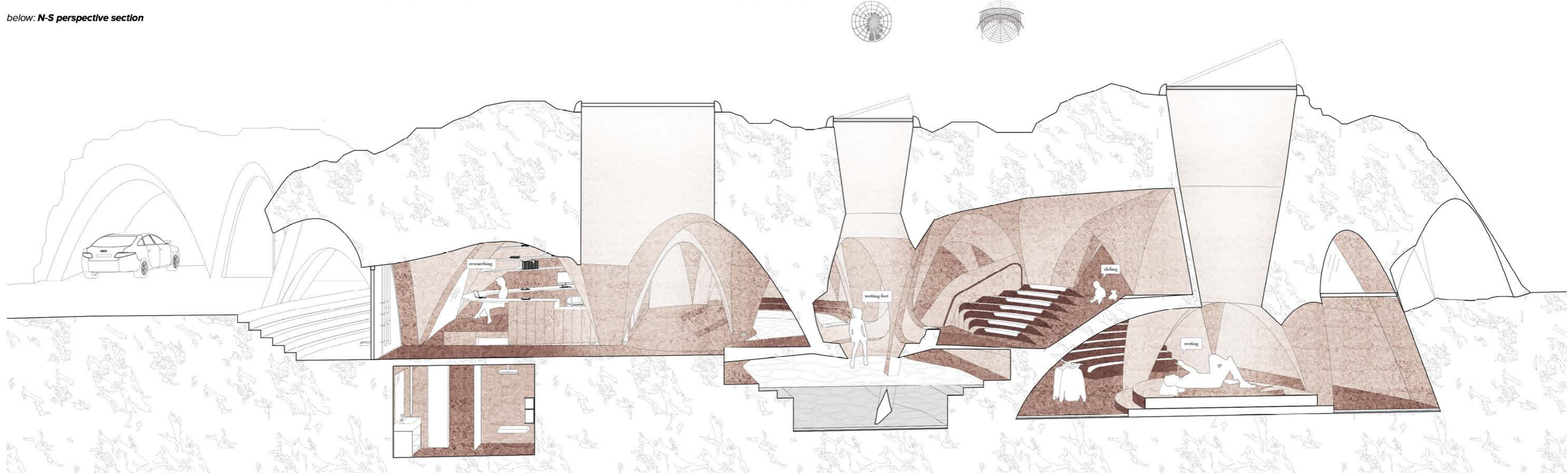


Study, dining and kitchen spaces are placed along the southern facade to maximize daylight.



External spaces, the carpark and garden are placed perpendicular to the entryway, creating an optimal access angle both by foot and by automobile.

below: **N-S perspective section**

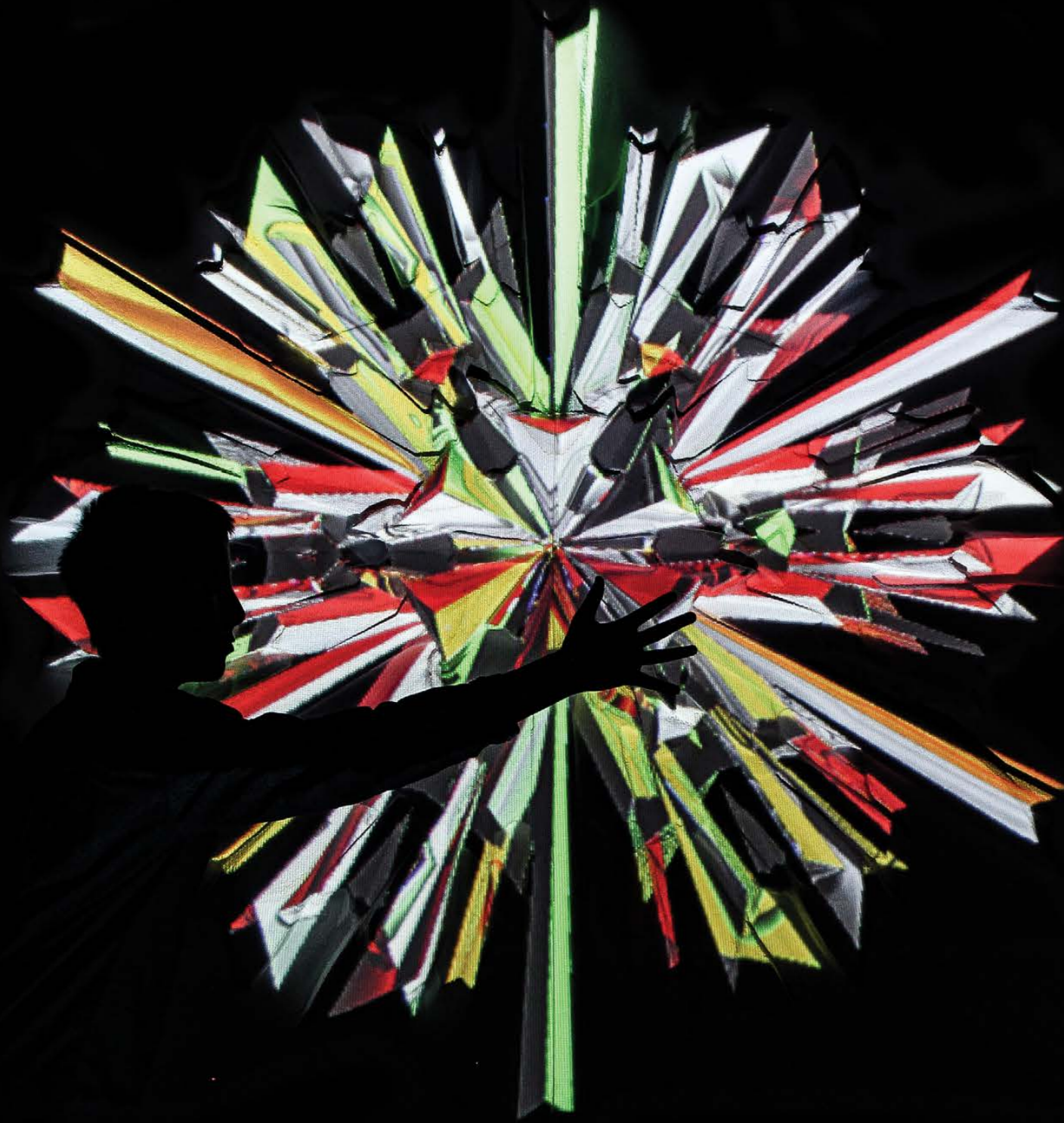


# DISTORTED PROJECTIONS

## DESIGN TO FESTIVAL

As physical and social distancing becomes the 'new normal', people are becoming less connected to spaces they previously occupied. This project aims to build connections between the digital and the physical using projection mapping and motion tracking. The installation undulates and morphs based on the movements of passersby.

2020



### CNC MILLING

The CNC machine carved the geometry from rigid insulation block of material.



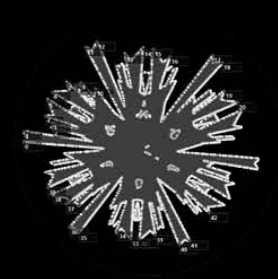
### SANDING

In order to remove any inconsistency, the geometries were sanded.



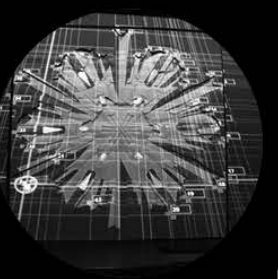
### PAINTING

For optimal reflectivity, the geometries were coated in a layer of primer paint.



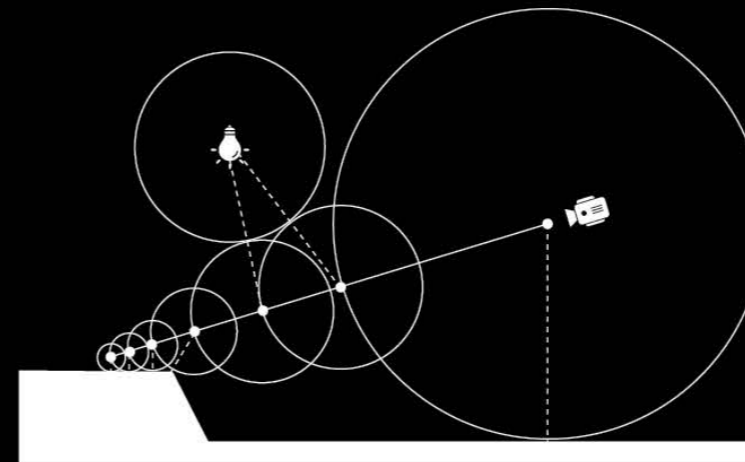
### DIGITAL OUTLINE

Within TouchDesigner, key points are identified on the virtual geometry.



### ALIGNMENT

The projected points are then aligned to the actual coordinates in real life.

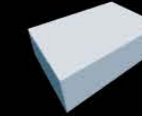


sphere



```
sphere =
length(point)
-radius;
```

rectangular prism



```
vec3 q = abs(point1)
-point2;
box = length(max(q,0.0))
+ min(max(q.x,
max(q.y,q.z)),0.0)
```

torus



```
vec2 q = vec2(length(p.xz)
-t.x,p.y);
torus = length(q)-t.y;
```

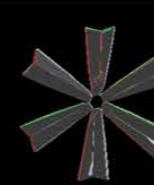
developed by Inigo Quilez

## RAYMARCHING

It is extremely difficult to modify complex geometry in real-time due to the memory and GPU power required. Raymarching, a novel technique used primarily in interactive media design and animation in order to alleviate these issues. It is written in code (GLSL) to dictate to the graphics card directly what color each pixel should be. In this method,

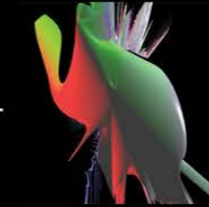
no actual geometry exist instead, everything is generated through mathematical equations. In order to represent the geometry, rays are 'thrown' in a particular direction, and 'marched' or stepped until they either intersect with one of the equation-based geometries or reach the maximum march count, thereby returning nothing.

Input geometry



ring 1

displacement geometry

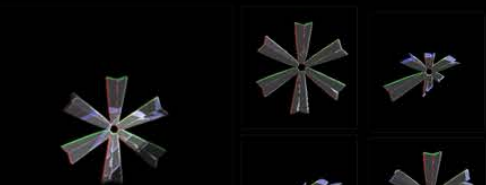


power: 1, phase: 2 Julia-Mandelbulb based on Daniel White & Paul Nylander's equation (2009)

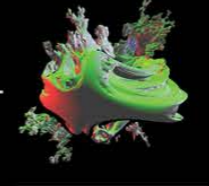
GLSL code for geometry

```
float DE(vec3 pos, int Power) {
pos.z+=0.5;
int Iterations = 12;
int Bailout = abs(10);
vec3 z = pos;
float dr = 4.0;
float r = 0.0;
for (int i = 0; i < Iterations;
i++) {
r = length(z);
if (r>Bailout) break;
float theta = acos(z.z/r);
float phi = atan(z.x,z.y);
dr = pow(r, Power-1.0)
*Power*dr + 1;
float zr = pow(r,Power);
theta = theta*Power+(uTime*PI);
phi = phi*Power;
z = zr*vec3(sin(theta)*cos(phi),
sin(phi+(uTime*PI))*sin(theta),
cos(theta));
z+=pos;
}
return 0.5*log(r)*r/dr*0.6;
```

resultant geometry

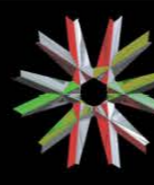
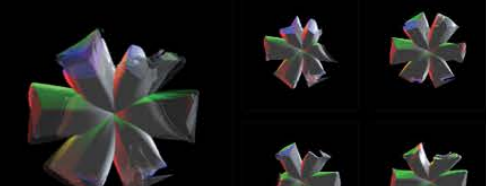


ring 2



power: 3, phase: 2 Julia-Mandelbulb based on Daniel White & Paul Nylander's equation (2009)

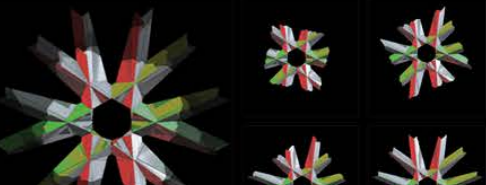
```
float sdOctahedron( vec3 p, float s)
{
p = abs(p);
float m = p.x+p.y+p.z-s;
vec3 q;
if( 3.0*p.x < m ) q = p.xyz;
else if( 3.0*p.y < m ) q = p.yzx;
else if( 3.0*p.z < m ) q = p.zxy;
else return m*0.57735027;
float k = clamp(0.5*(q.z-q.y+s),0.0,s);
return length(vec3(q.x,q.y-
s+k,q.z-k));
}
```



ring 6



size mouseX position, rotation mouseY position, octahedron based on Iquilez's equation



## GEOMETRICAL DERIVATION MATRIX

The projected geometries are animated through the displacement by time or input-animated geometries or using self-dilation based on a user's hand placement in front of the panel. The displacement geometries are plays on more

classic forms, such as the fractal Julia-Mandelbulb or various pure geometries including the sphere, octahedron and more. By combining the static and kinetic equations, the projected geometries are able to come alive and morph.

### CONTEXT

Academic Project + Design TO Festival

### LOCATION

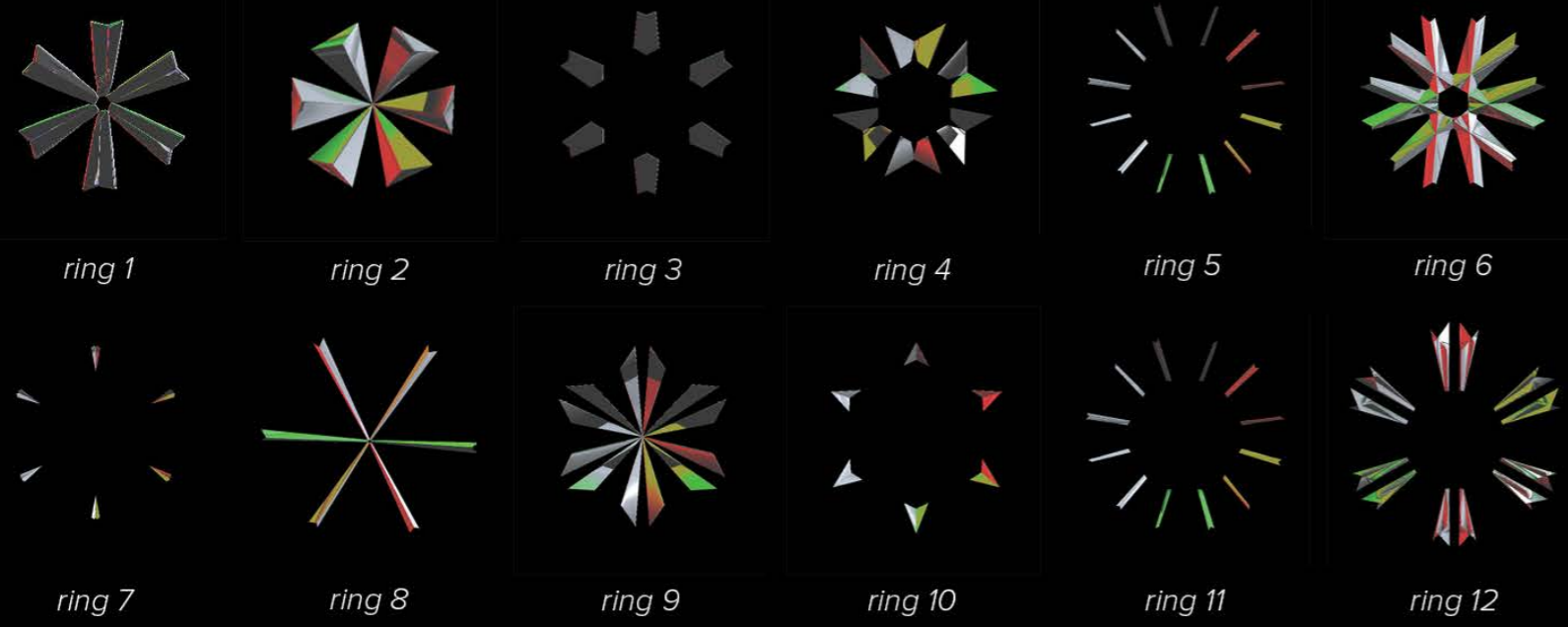
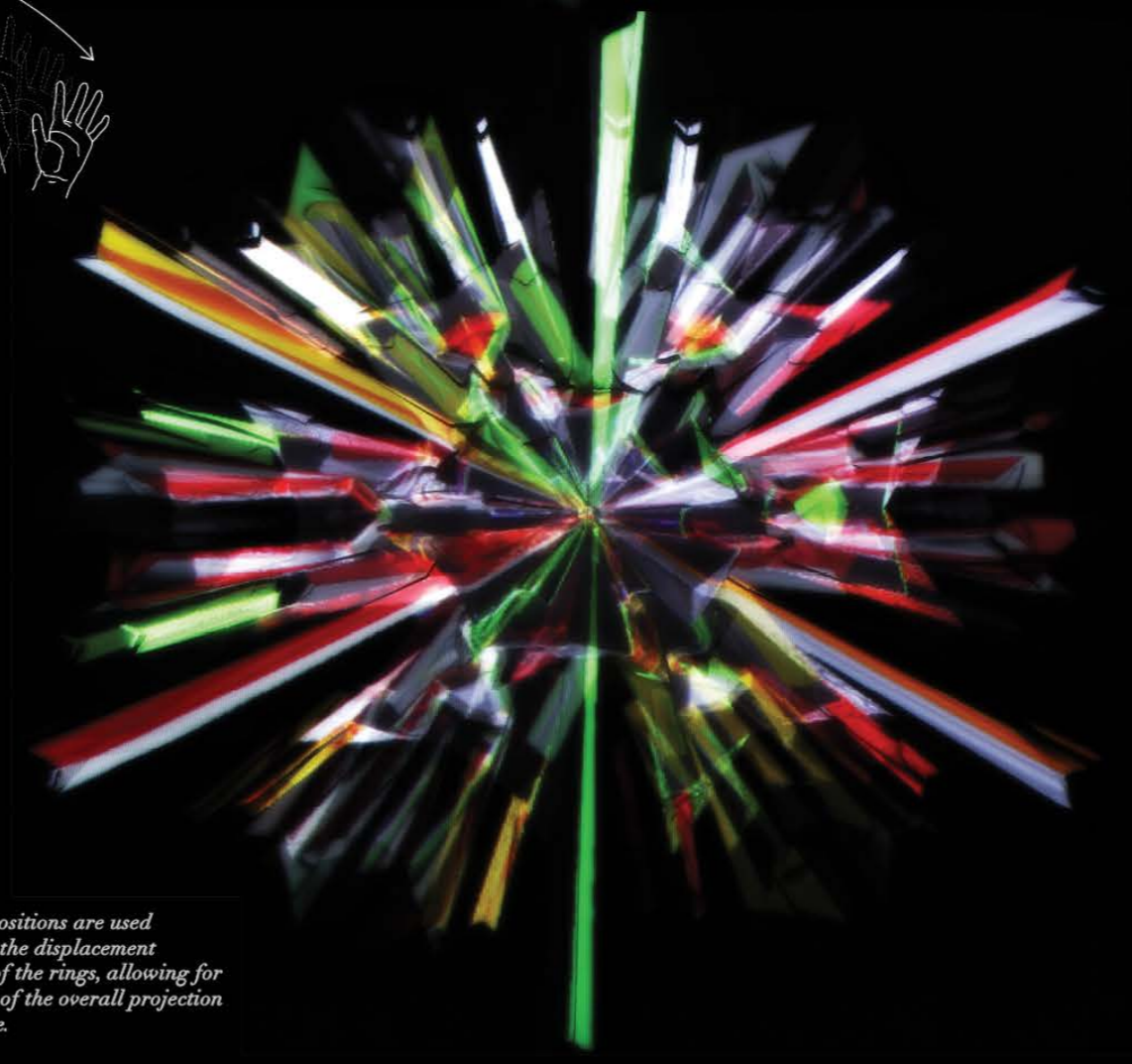
325 Church Street, Toronto

### SOFTWARE

TouchDesigner, GLSL, Rhino 6, Gashopper, CNC milling, Photoshop, Illustrator

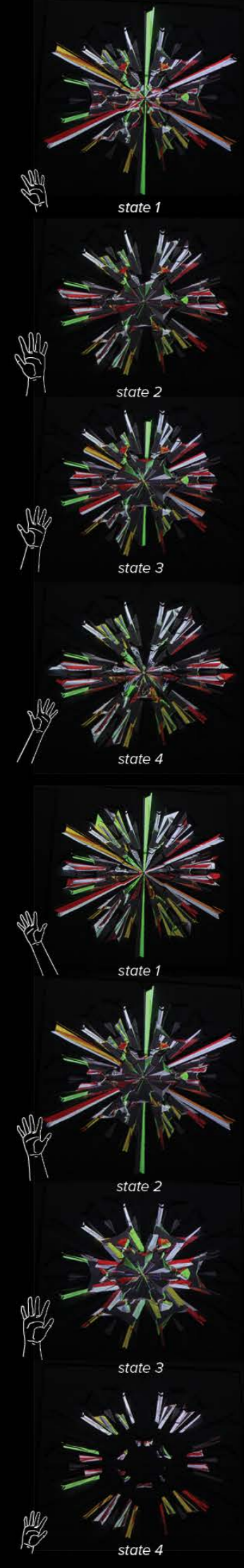
### SUPERVISOR

Prof. Vincent Hui



FORMAL DEVELOPMENT

The base geometry is composed of 13 arrayed 'ring' geometries, each made up of a plethora of 3D quadrilateral and triangular planes. Each ring aligns with a portion of the CNC'd geometry once superimposed.



The hand positions are used as input for the displacement geometries of the rings, allowing for a morphing of the overall projection to take place.

above: long exposure image of morphing geometries based on user hand motions

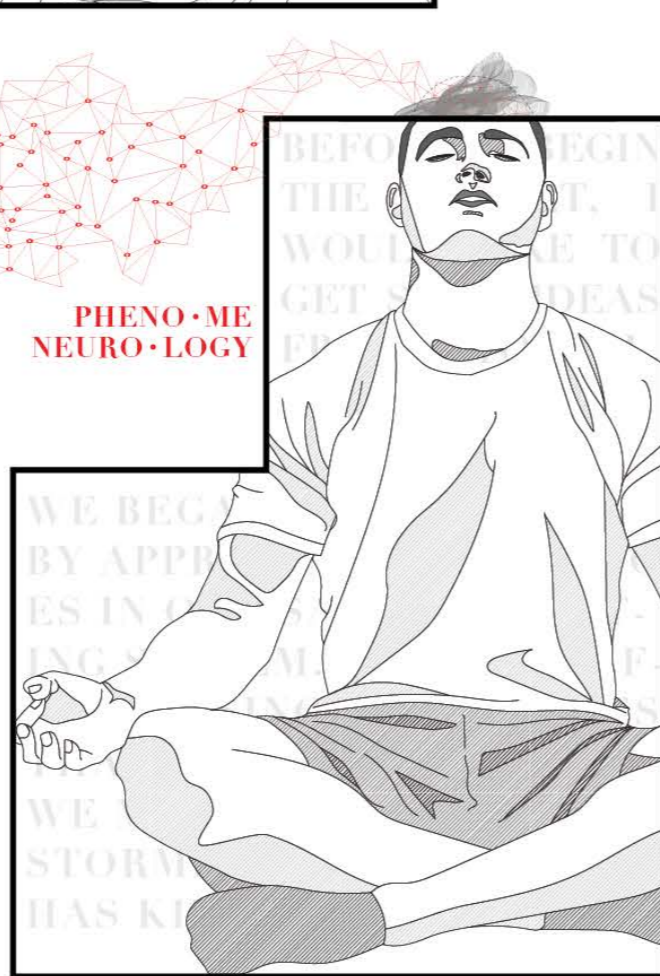
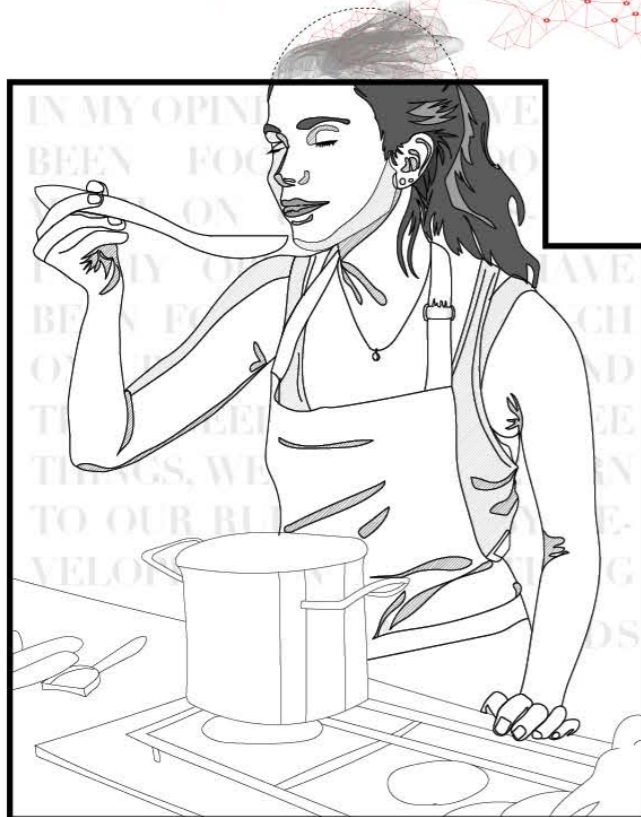
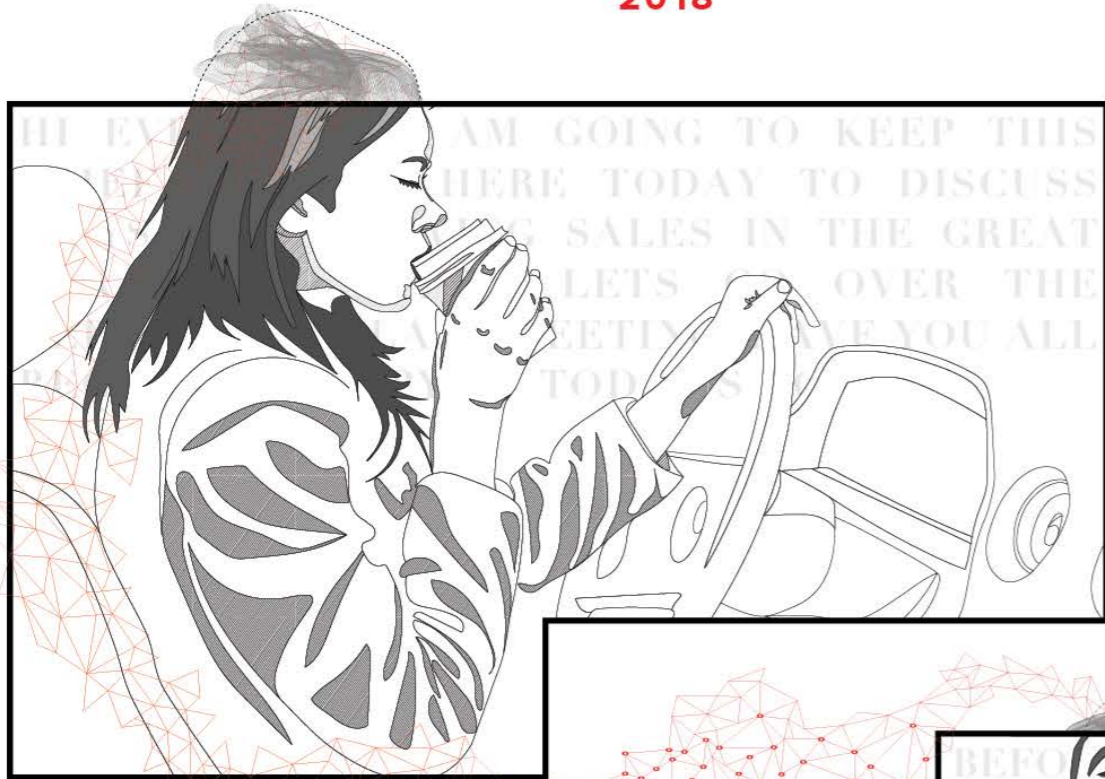
the action of minds coming together to innovate, problem solve and create efficiently.

# PHENOMENEUROLOGY

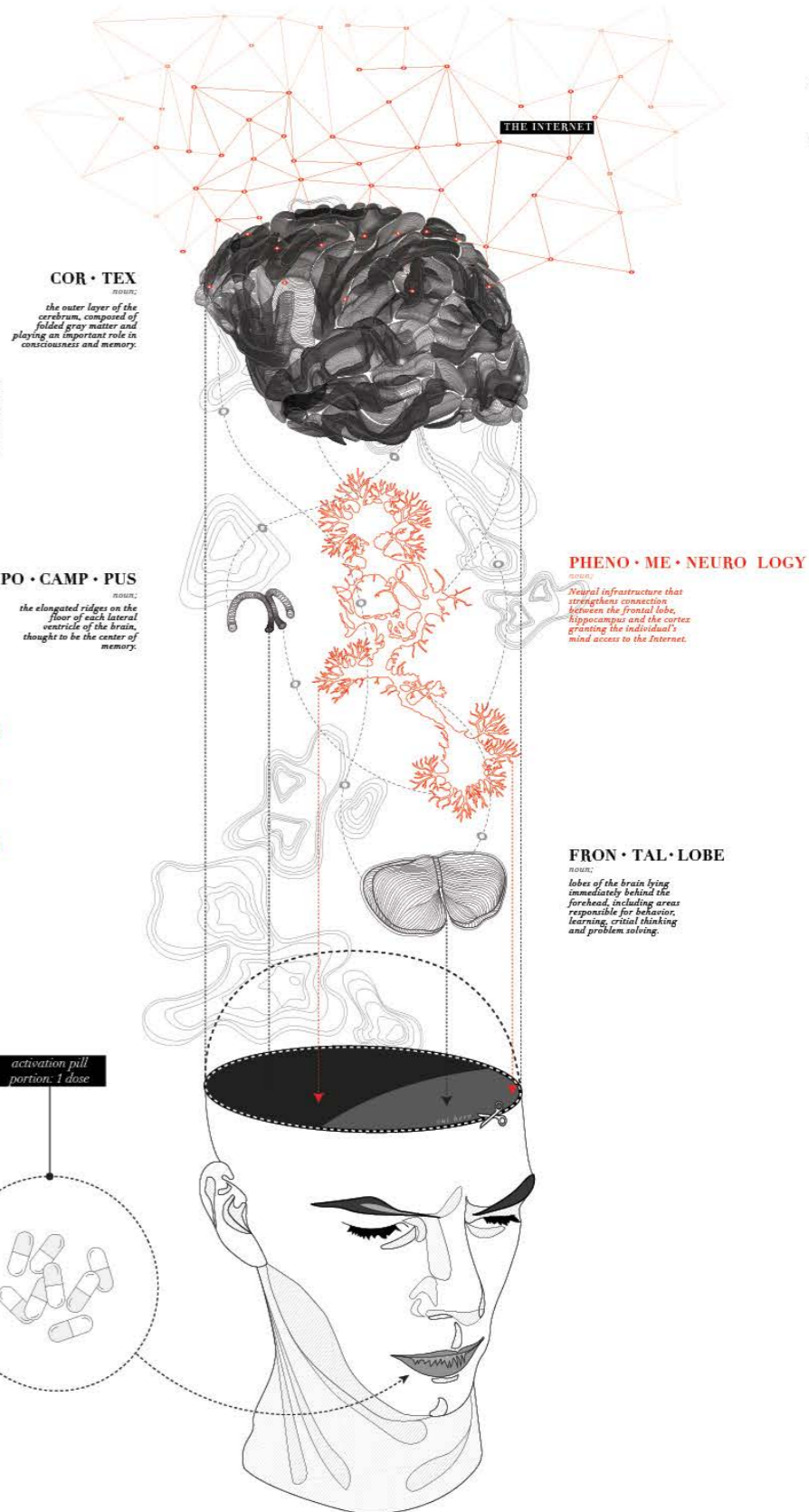
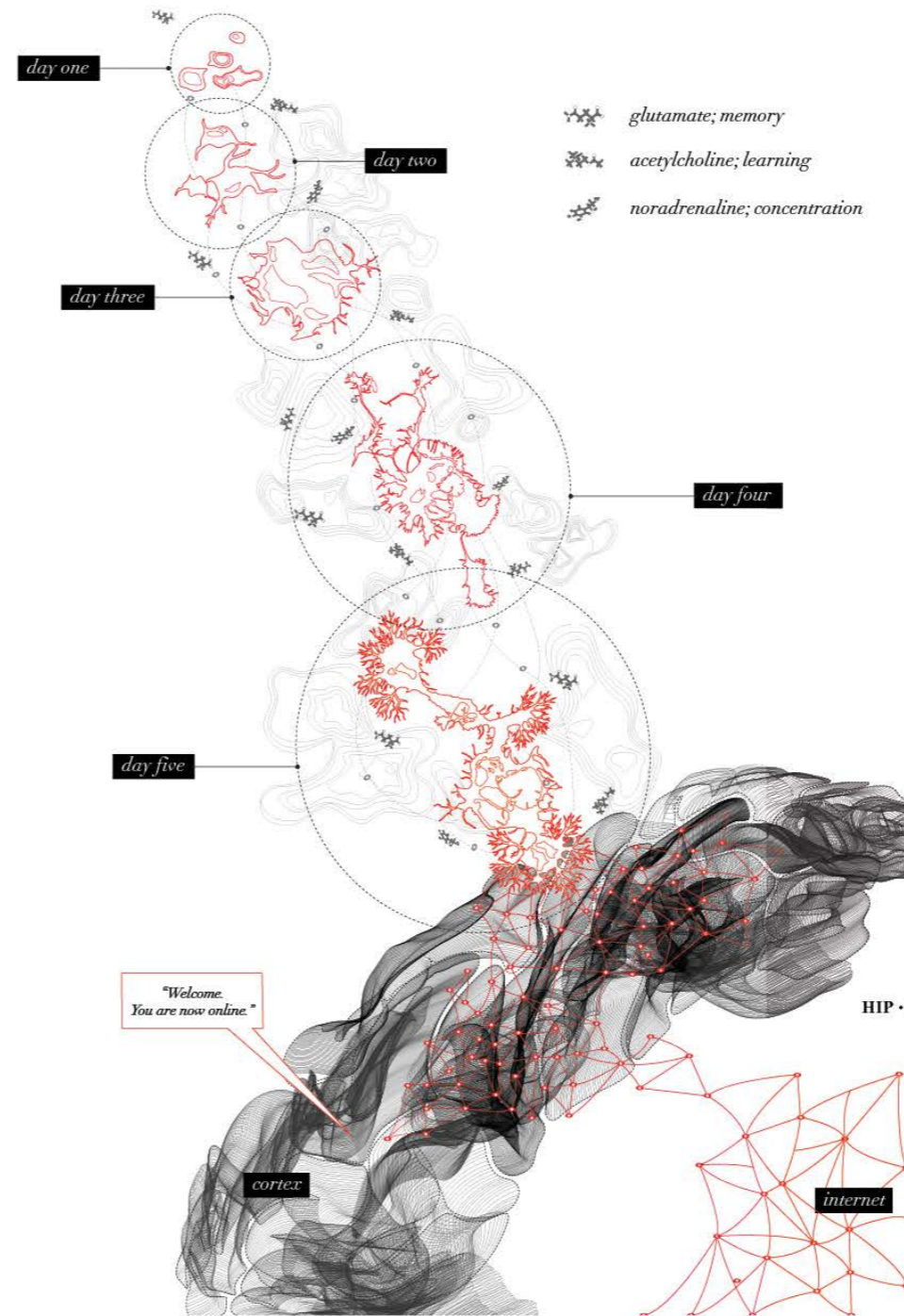
## AN OFFICE WITHIN THE BRAIN

Introducing the revolutionary piece of synthetic neurology. This all-new product allows for 100% productivity, providing you with time to do whatever you wish.

2018



PHENO • ME  
NEURO • LOGY



Here, it will begin to grow into synthetic neuron tissue, which when extended to reach the cortex, will begin to emit radio waves through empty grey matter in the cortex giving your mind access to the Internet.

In the 21st century architects were designing spaces to create sensations. In the 22nd century, we design sensations directly using neural infrastructures. Rather than an office you can inhabit, we have now created an office that inhabits you without the need of transport. This technology allows you to collaborate with your coworkers straight from the comfort of your own home. Get yours today!

**Possible Side Effects:**  
Hallucinations, delusions, vomiting, coma, momentary or permanent paralysis, and/or death. If you experience any of these effects, please stay calm and have faith in technology.

<b>CONTEXT</b> <i>'Thinking' Non-Architecture Competition</i>	<b>LOCATION</b> <i>Human Brain</i>	<b>SOFTWARE</b> <i>Illustrator</i>	<b>COLLABORATORS</b> <i>Routao Wang</i>
--	---------------------------------------	---------------------------------------	--

# OCAD U DESIGN SCHOOL

## AN ANTI-PERFECTIONIST INSTITUTION

This project takes the initial schematic design to the design development with a focus on the main fragment. The project creates a central atrium with steeping studios towards the park, creating a space with a focus on the process rather than the product of design and art.

2019



CONTEXT	LOCATION	SOFTWARE	COLLABORATORS	ROLES	
Academic Project	128 Sterling Road, Toronto	Revit, Rhinoceros3D, Grasshopper, Illustrator, Photoshop, InDesign	Lena Ma	Design, Modeling, Detailing, Rendering, Making orthographics	Craig Race Model Award



### SUNKEN CAFE

The sunken cafe creates a threshold between the studios and the park.



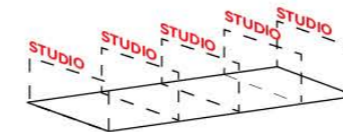
### STUDIOS

The industrial nature of the building is displayed in the studios by inverting the guts of systems and emphasizing them.

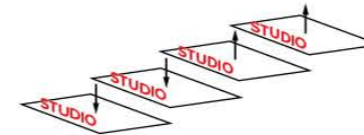


### FACADE

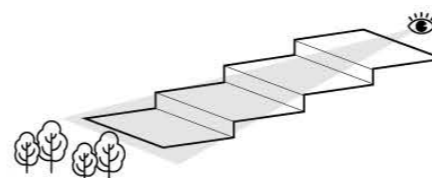
The lowered facade on the south elevation allows for some shading while preserving the views into the park.



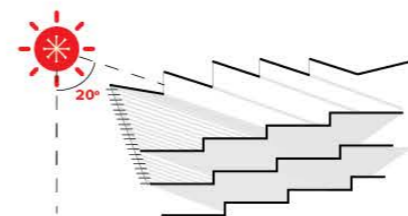
Typical studio configuration



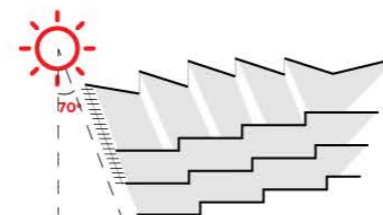
The staggering of studios to allow for the expression of process and progression



The views from the levels expose the park beyond as well as the activities within the studios



The winter sun is able to illuminate the interior spaces



The shading elements are able to protect the interior from summer sun

Diagrams by Lena Ma, edited by applicant

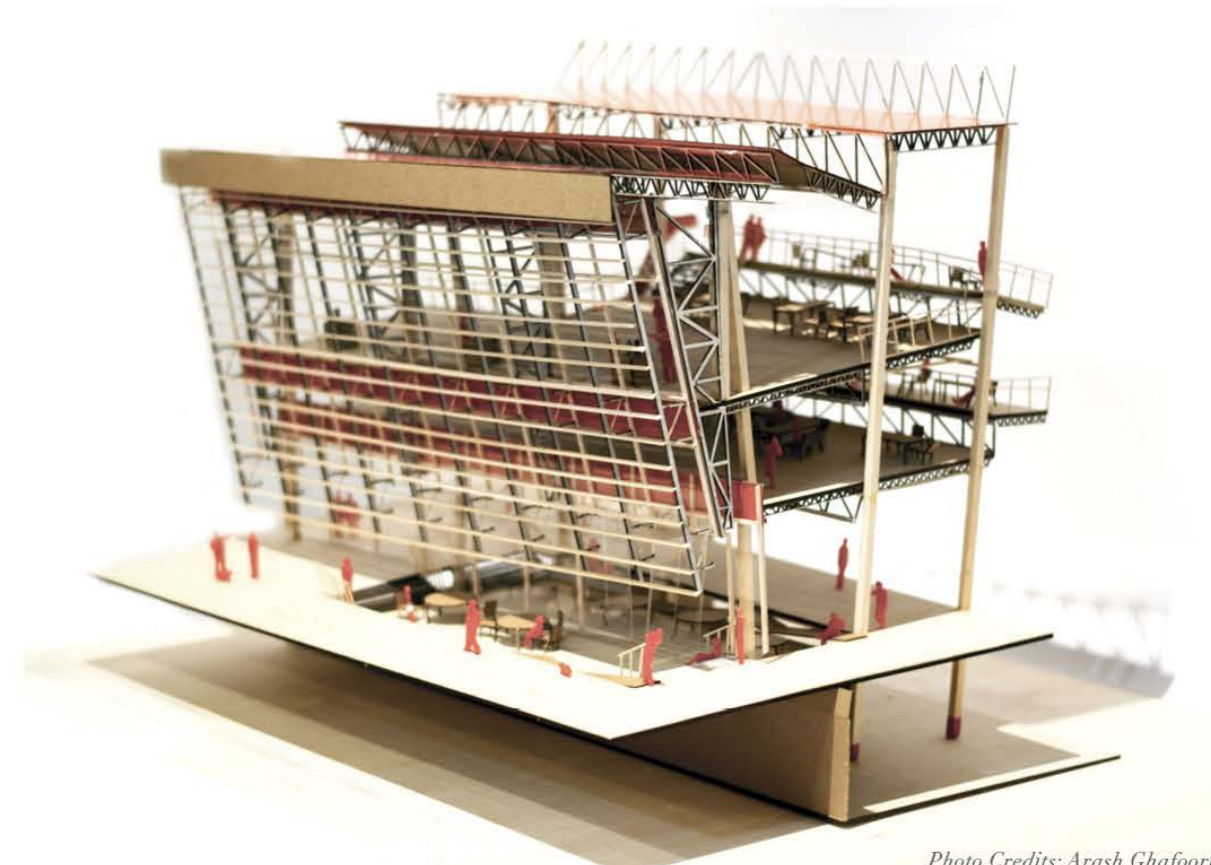
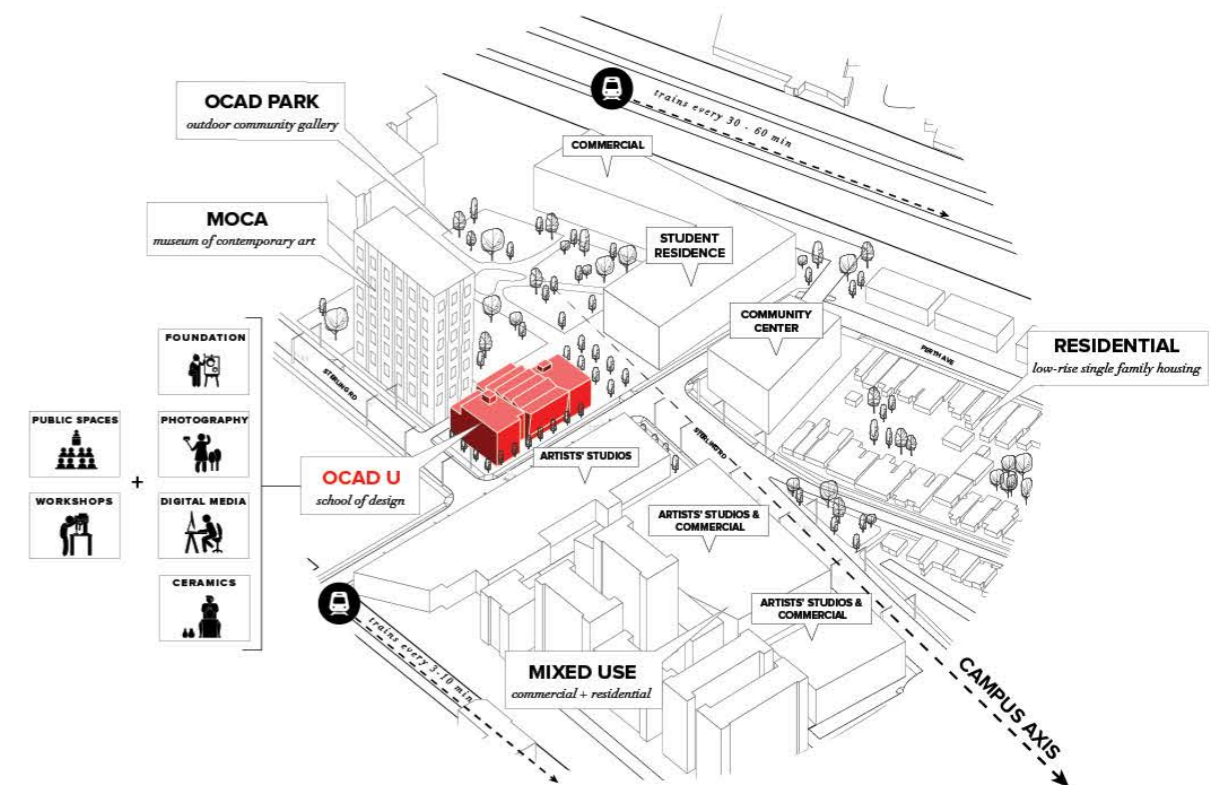
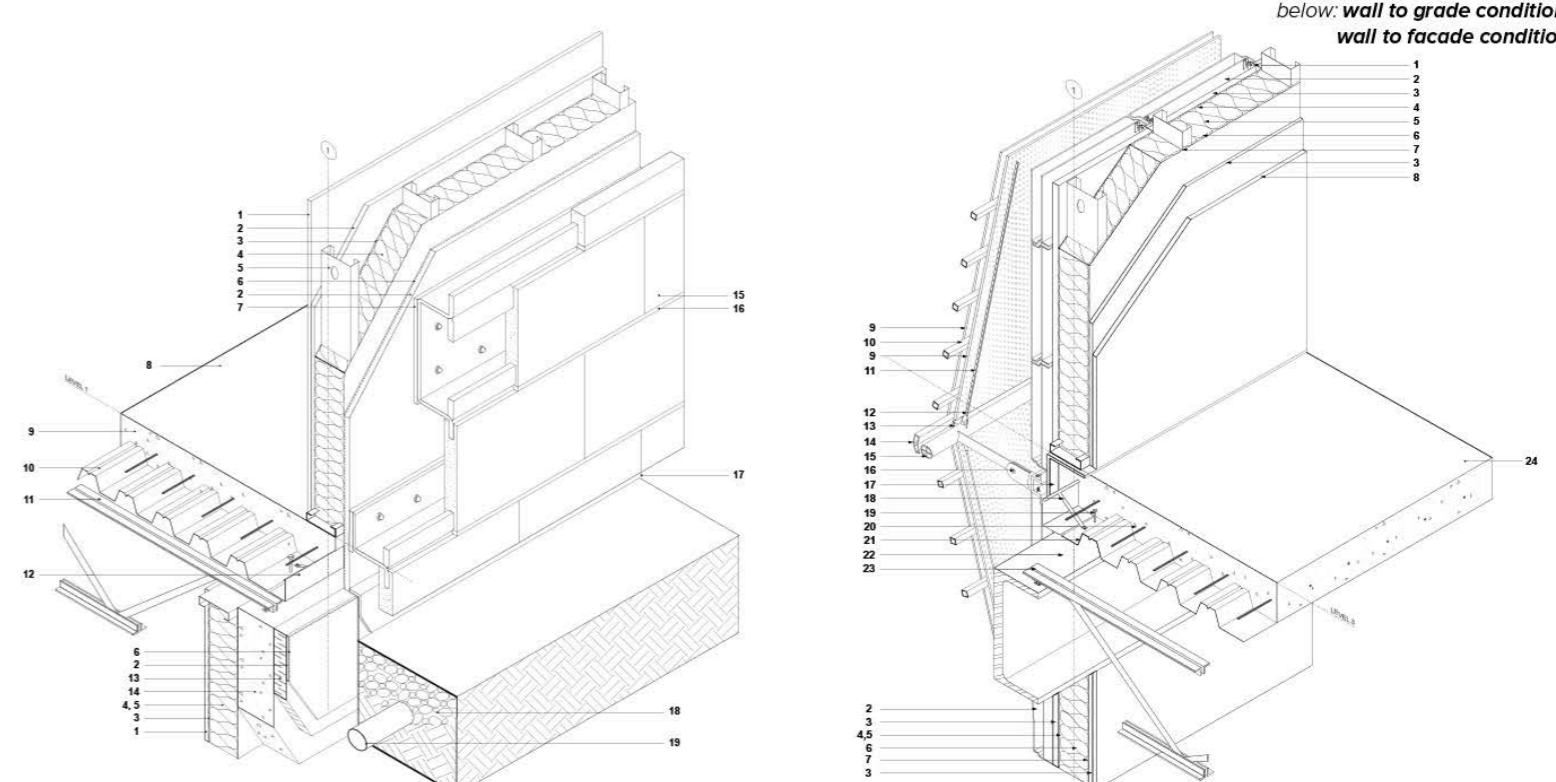
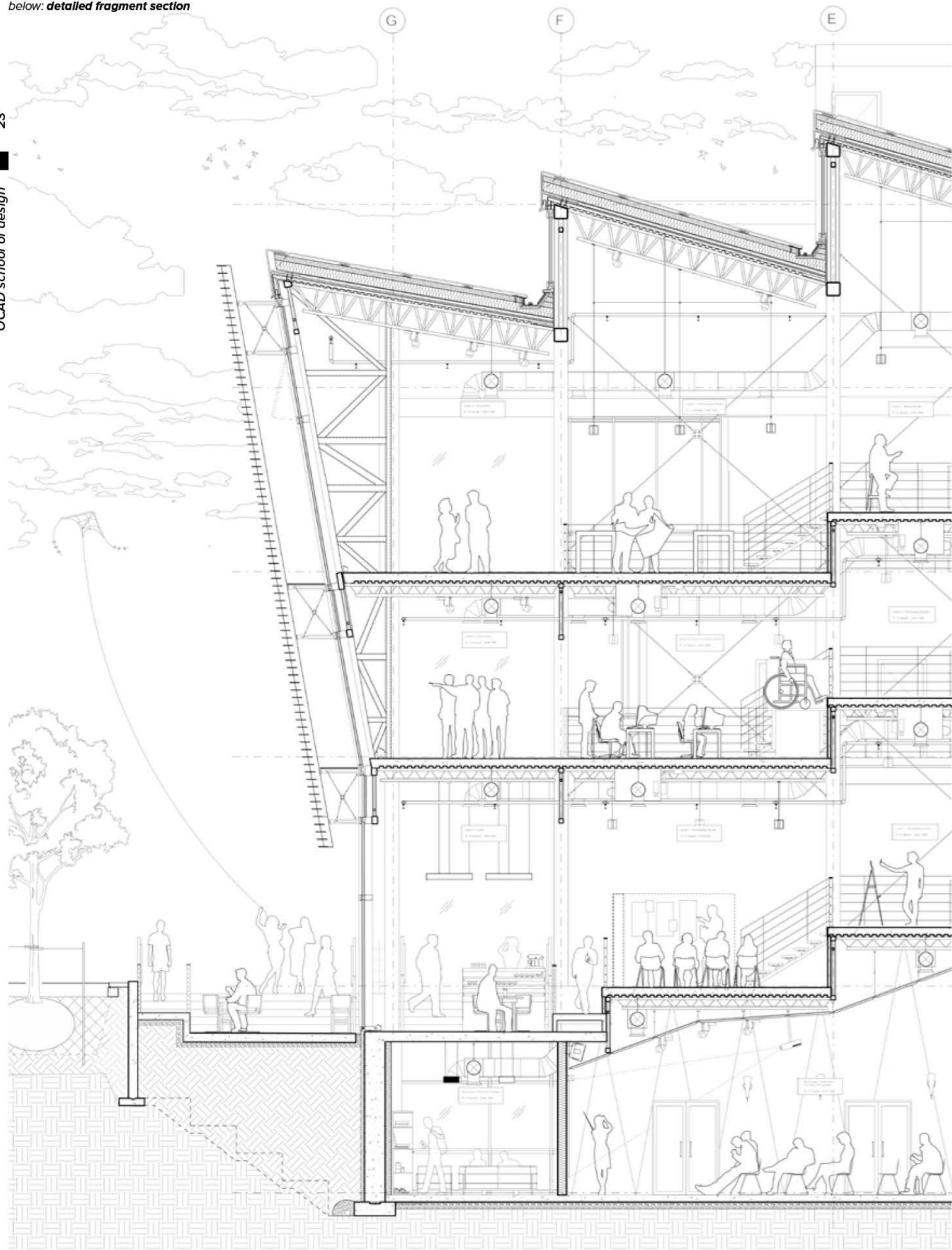


Photo Credits: Arash Ghafoori



- |  |                                |                                   |   |
|--|--------------------------------|-----------------------------------|---|
| [1] gypsum board 12.5mm                  | [11] steel truss wt180 x 22.5  | [1] steel panel attachment        | [13] steel welded connection              |
| [2] osb sheathing 12.5mm                 | [12] steel decking edge trim   | [2] aluminum panel                | [14] steel HSS 100mm x 50mm               |
| [3] vapor barrier                        | [13] rigid insulation 50mm     | [3] osb sheathing 12.5mm          | [15] steel rod 60mm dia.                  |
| [4] mineral wool insulation 150mm        | [14] structural concrete 200mm | [4] vapor barrier                 | [16] steel pinned connection              |
| [5] steel studs 50.8mm x 150mm           | [15] marble panels             | [5] gypsum board 12.5mm           | [17] steel angle 200mm x 150mm            |
| [6] air vapor barrier                    | [16] grout                     | [6] mineral wool insulation 150mm | [18] steel decking edge trim              |
| [7] steel panel attachment               | [17] flashing                  | [7] steel studs 50.8mm x 150mm    | [19] attachment nail                      |
| [8] polished concrete finish             | [18] gravel                    | [8] air vapor barrier             | [20] concrete rebar-reinforced slab 200mm |
| [9] concrete rebar-reinforced slab 200mm | [19] weeping tile              | [9] perforated corten steel skin  | [21] perforated decking 141mm x 78mm      |
| [10] steel decking 141mm x 78mm          |                                | [10] hss framing 50mm x 50mm      | [22] steel c-section beam 400 mm x 150mm  |
|  |                                | [11] tension rod                  | [23] steel truss wt180 x 22.5             |
|  |                                | [12] steel pinned connection      | [24] polished concrete finish             |



# STRATUM

## GROW OP EXHIBITION

Drawing from references such as the Scarborough Bluffs, *Stratum* creates an immersive experience using sculpture and light to examine how humans live within natural forces of gravity, erosion and stratification. Material experimentation was a key element of the project, developing the chemical mixture of quinine and isomalt.

2018

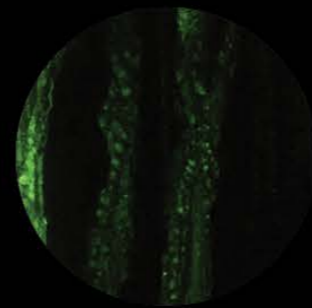


Photo Credits: Gabby Frank, Arash Ghajori, Thomas Gomez



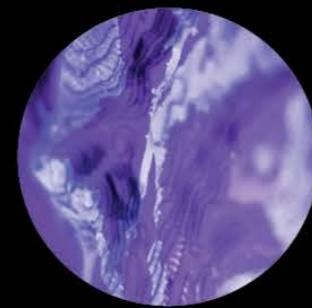
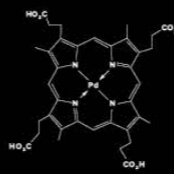
Grow Op Seed Award

**CONTEXT** Gladstone's Annual Grow Op Exhibition  
**LOCATION** Gladstone Hotel, Toronto  
**SOFTWARE** Rhino, Illustrator, Photoshop, CNC Router, Laser Cutter  
**COLLABORATORS** Jiaqi Liu, Thomas Gomez-Ospina, Shengyu Cai  
**ROLES** Design, 3D Modeling, Budgeting, Fabrication, Material Experimentation, Logistics, Detailing



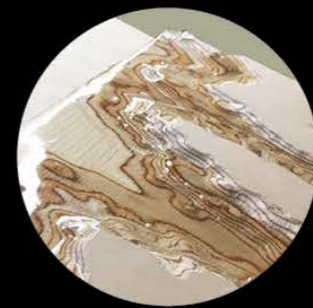
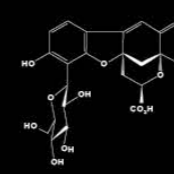
### PHOSPHORESCENCE

Phosphorescent paint, which glows in the dark after being exposed to light, was tested first. It proved to be dim, unreliable and wasn't a smooth application.



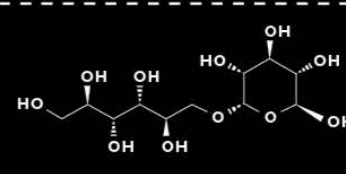
### FLUORESCENCE

Fluorescent paint was tested next, which glows under blacklight. Although it was bright, it was not viscous and had a very 2D appearance.



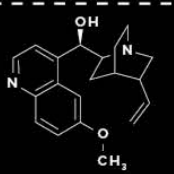
### ISOMALT

A sugar replacement for people with diabetes, isomalt creates a candy-like object when boiled in water. It cooled to be a clear, viscous and solid mixture.



### QUININE

A naturally occurring element found in tonic water, which gives it the ability to glow under blacklight.



Following several rounds of material testing, the combination of isomalt and quinine was selected for the clarity and transparency of the substance in daylight conditions, and the steady glow under black light.



### CNC MILLING

Following the 3D models, plywood was CNC'd to mimic the contour lines of the bluffs based on the heightfield maps.



### CREATING MIXTURE

A heated mixture of tonic water and isomalt was boiled until a clear substance emerged.



### MIXTURE APPLICATION

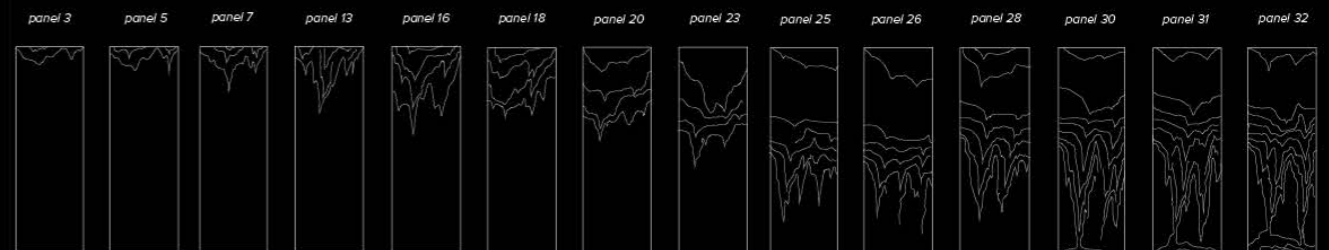
The substance was applied onto 'eroded' area of the panels under black light to ensure visibility.



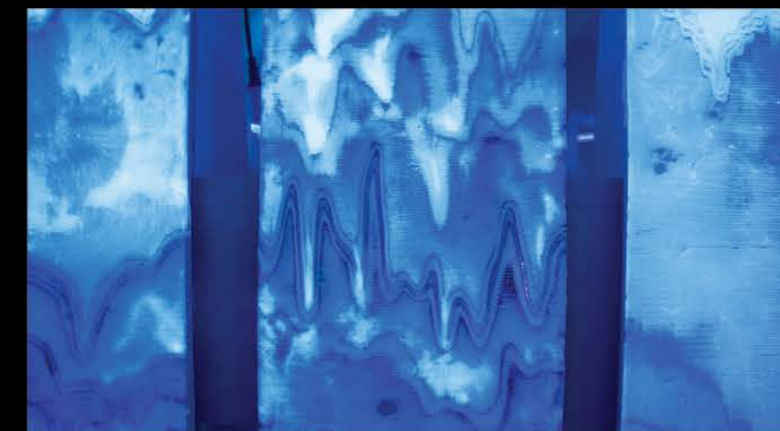
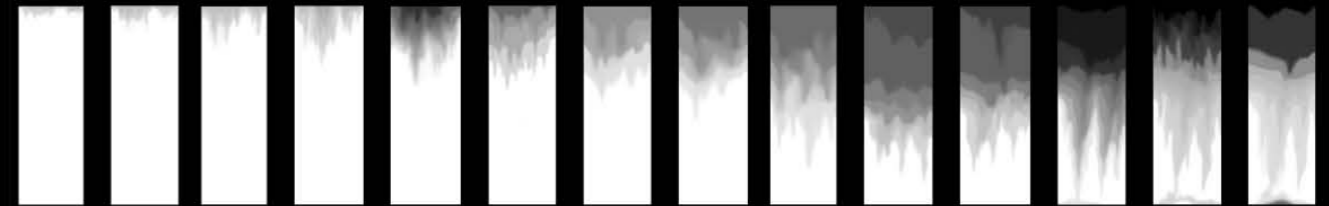
### ON-SITE ERECTION

Finally, the display structure was erected on site, with cleated connections to support the panels.

Panel Outlines based on sketched by Thomas Gomez-Ospina



Heightfield Maps base Imagery for CNC models of the panels



# TRANS-PIER™

## WHERE TRAVEL MEETS ENTERTAINMENT

The Trans - Pier™ turns the cause of Atlantic City's downfall into its greatest asset by creating a transportation hub that becomes a destination in itself. The facility emphasizes the experience of those who transition through the spaces within the transportation hub and allows them to become participants in other traveler's journeys. By combining port transport such as cruises, ferries, and cargo ships with air travel, the hub caters towards a variety of visitors traveling to and from nearby cities.

2019



**CONTEXT**  
ACSA/AISC Steel  
Competition

**LOCATION**  
Atlantic City, New  
Jersey

**SOFTWARE**  
Rhino, Grasshopper,  
Illustrator, Photoshop

2<sup>nd</sup>  
Transportation Hub Category  
(ACSA/AISC Competition)

DAS  
Frank Leva Award

### PLEASURE PIER

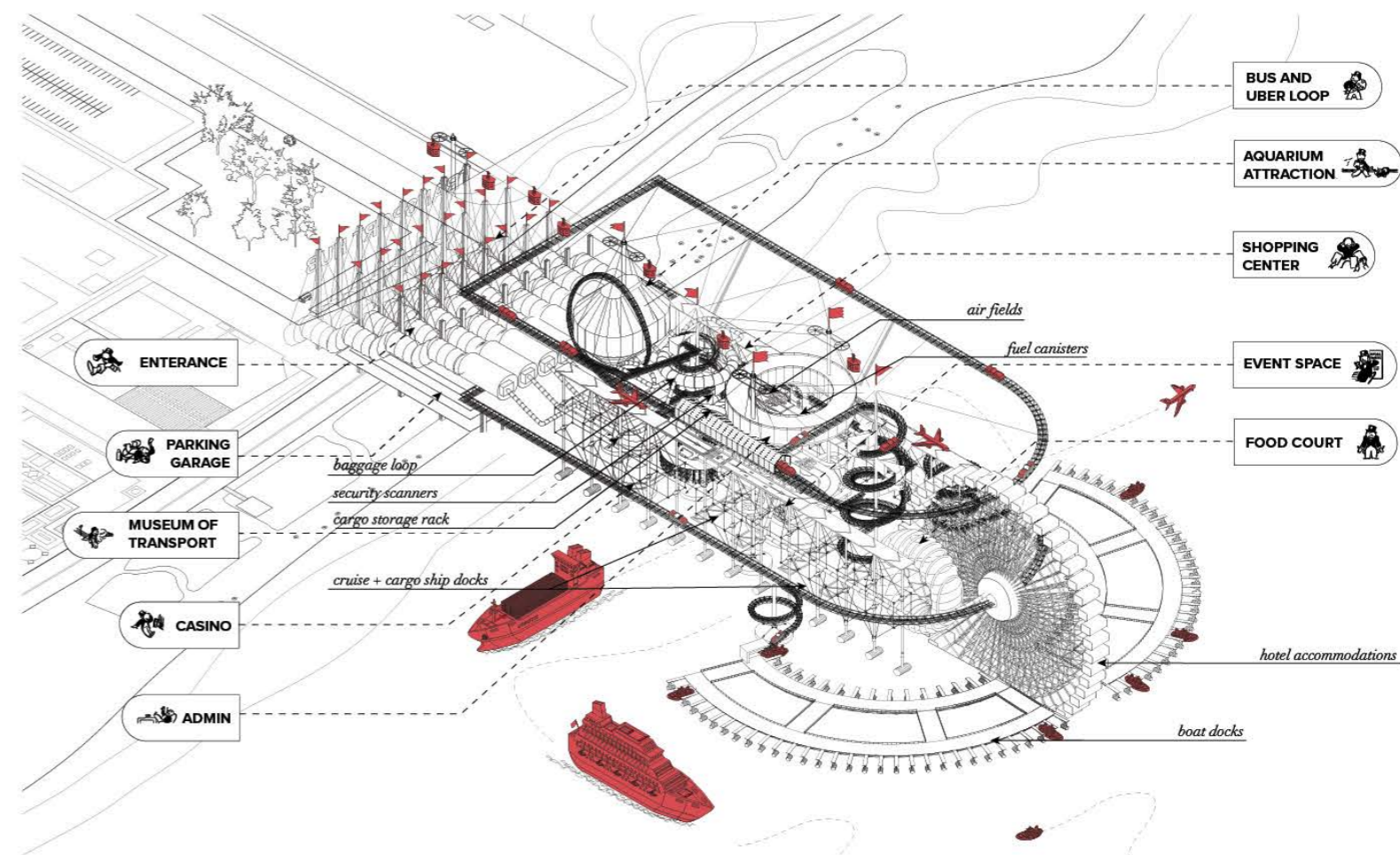
Galveston Island, Texas  
Founded in 1943

### SANTA MONICA PIER

Santa Monica, California  
Founded in 1909

### STEEL PIER

Atlantic City, New Jersey  
Founded in 1898

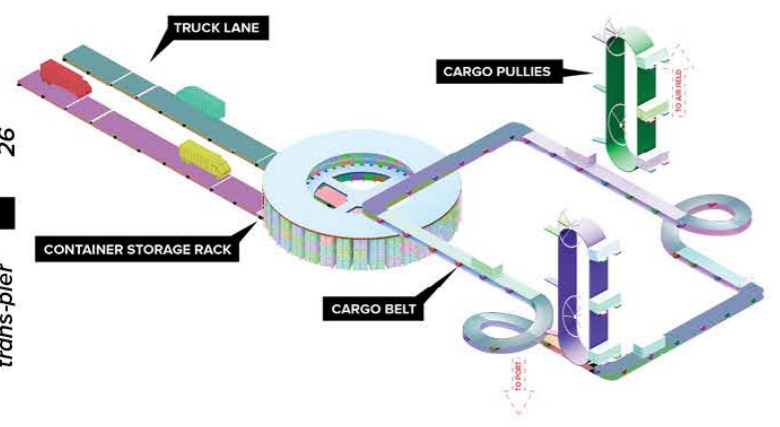


Throughout the United States, the 'pleasure pier' concept has been a popular icon of summer retreats and entertainment since the early 1900s. Built over a body of water near popular summer vacation spots, such piers contain a multitude of rides and games for the tourists enjoying the beach. Such a model serves as a perfect precedent for the Trans-Pier™, catering towards the tourists enjoying the boardwalk as well as those in transit, while also giving a nod to the historical entertainment structures in the area.

above: exploded isometric

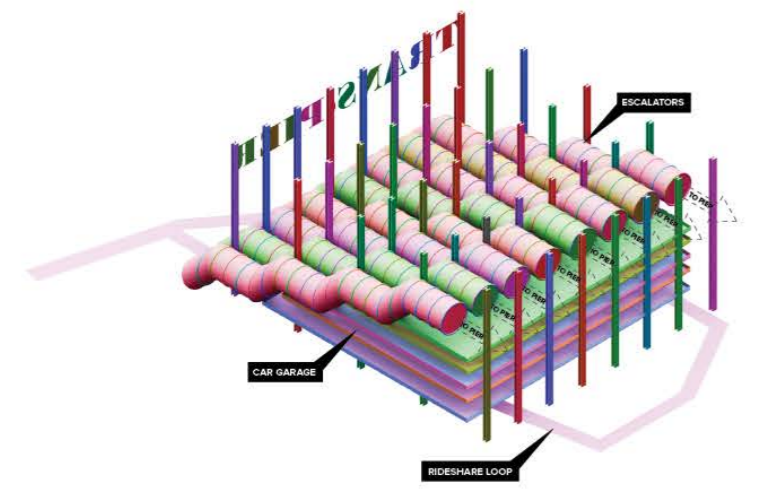
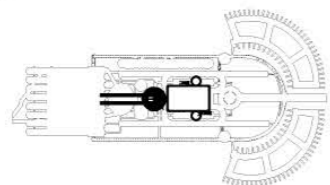






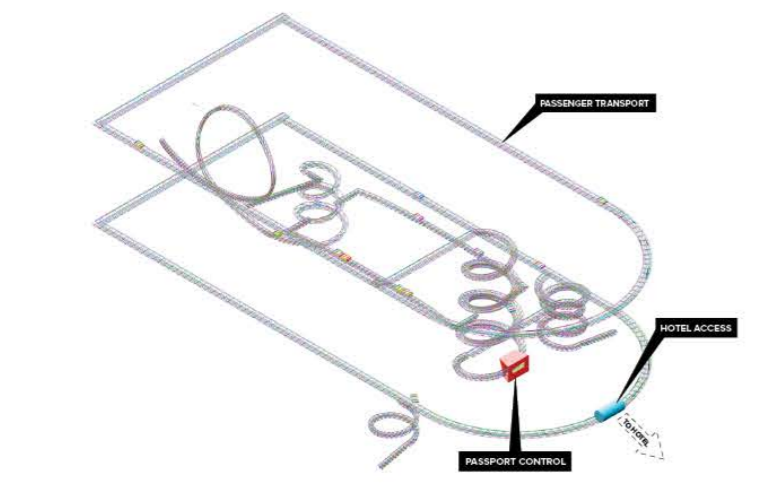
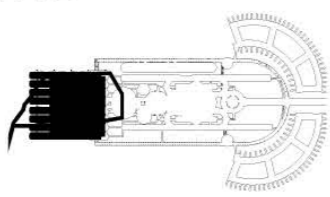
### CARGO

Connecting the boat and the airplane unloading areas, the continuous cargo system allows for goods to be easily delivered by air and sea and placed on trucks, and vice-versa.



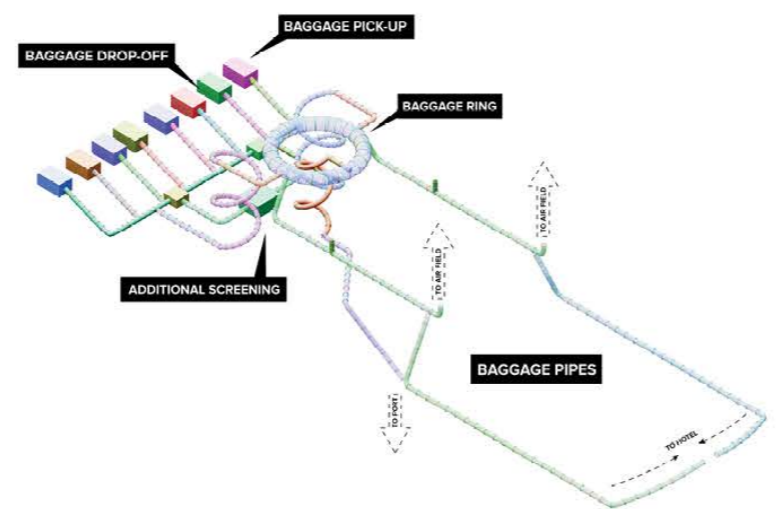
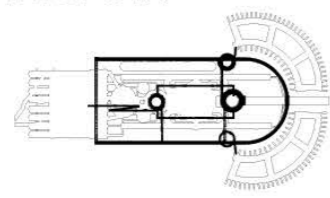
### LAND TRAVEL

The car garage features continuous and exposed floor levels for passengers to leave their vehicles and ascend to the building. As ride sharing transport becomes more prominent, the ride share and bus loop allows for easy entry and exit for vehicles.



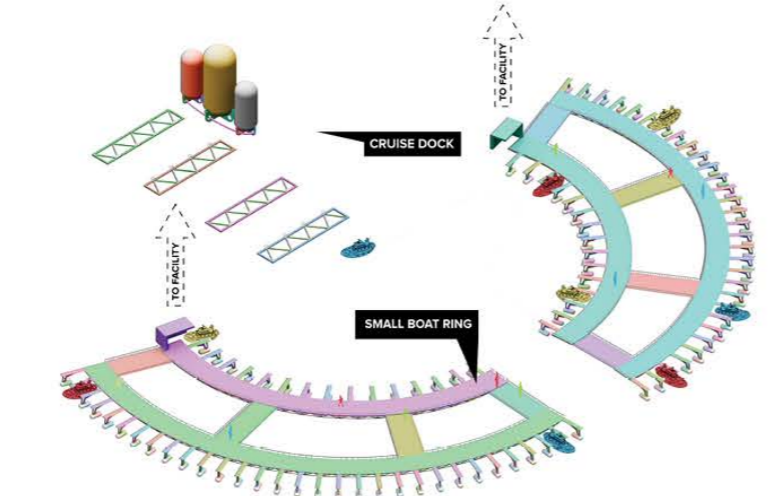
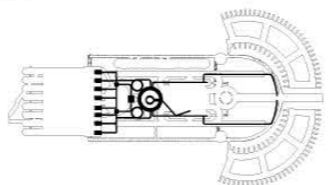
### PASSENGER TRANSPORT

By using continuous looping systems of transportation, the baggage and cargo is able to be transported throughout the facility seamlessly.



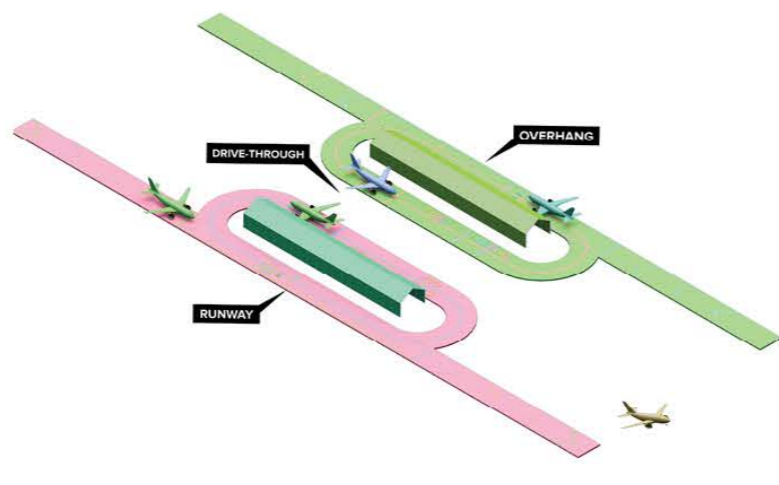
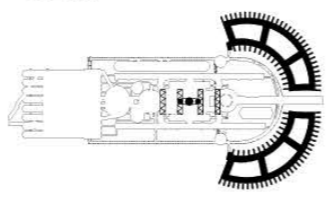
### BAGGAGE

By using continuous looping systems of transportation, the baggage is able to be transported throughout the facility, to the various entry, exit points as well as the hotel, seamlessly.



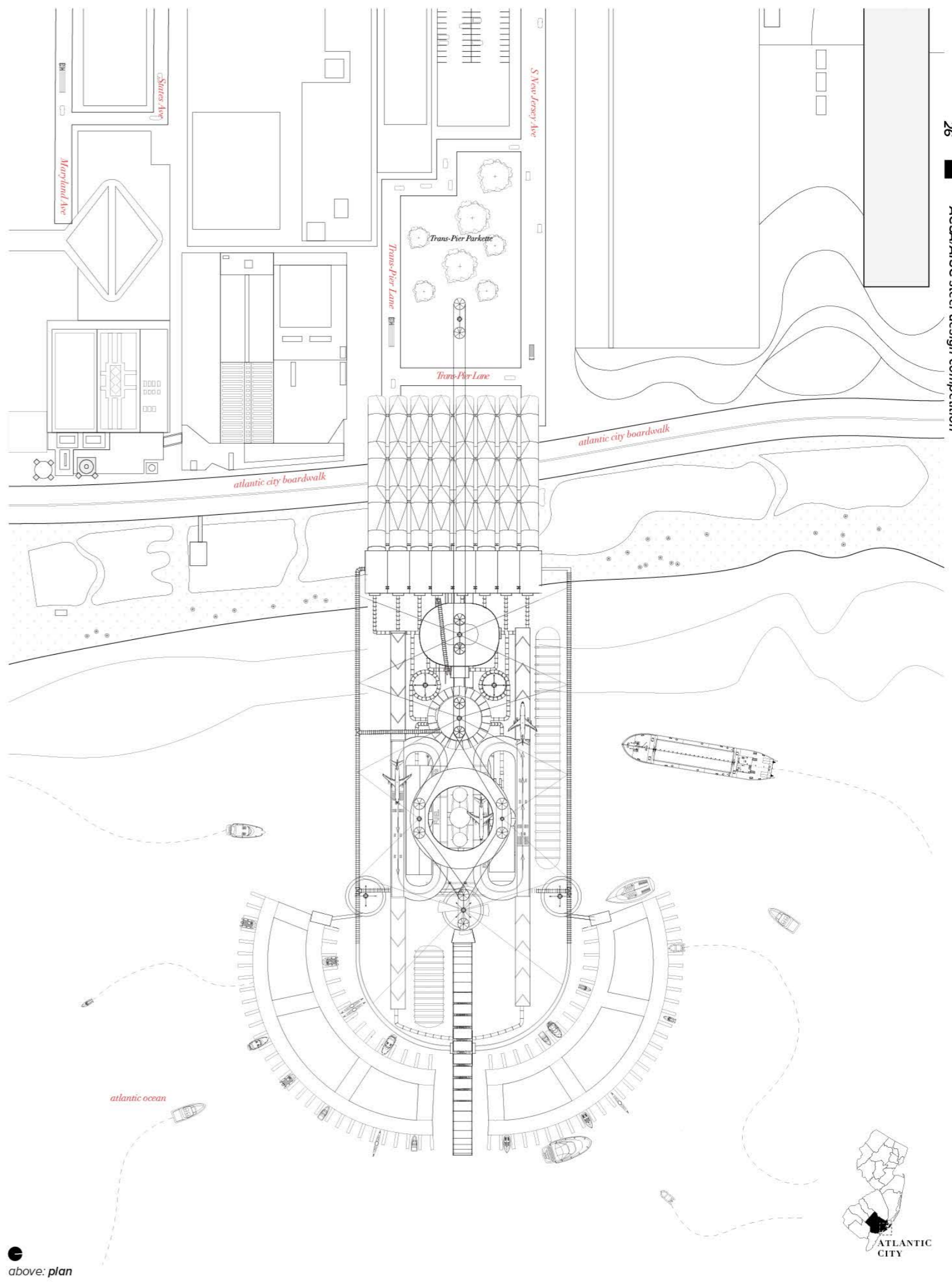
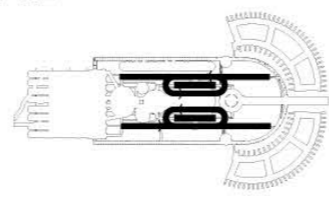
### TRAVEL BY SEA

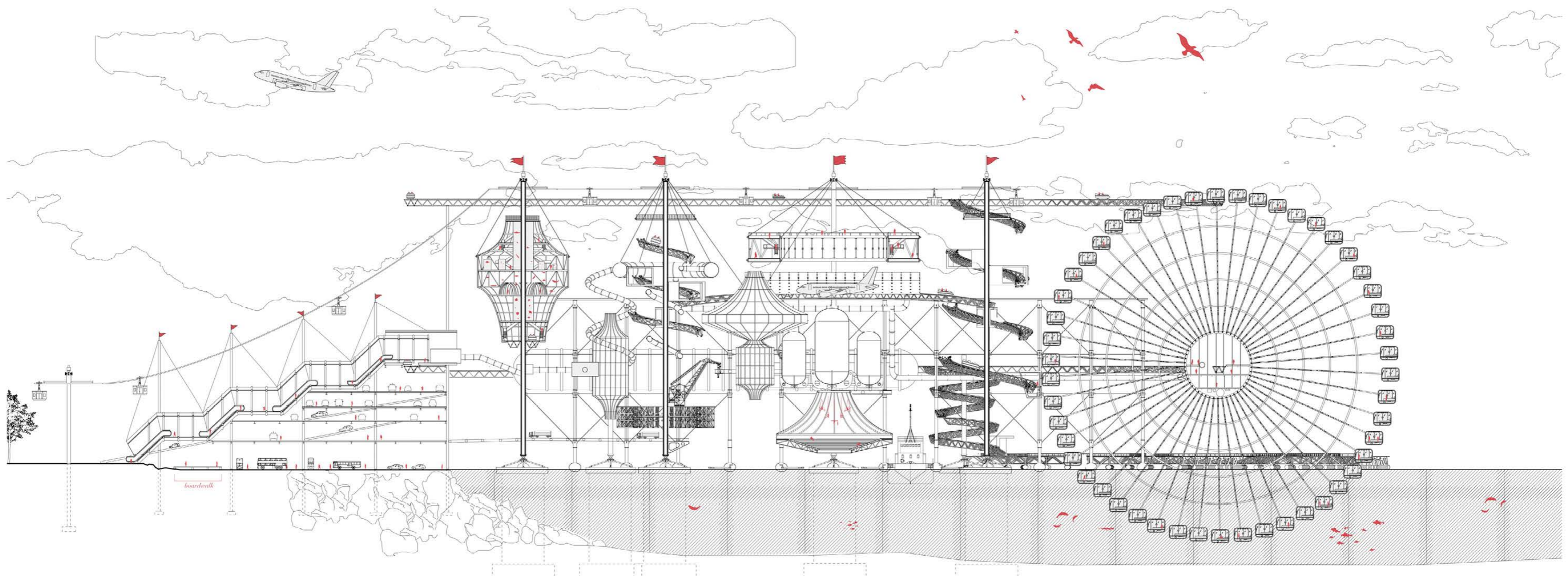
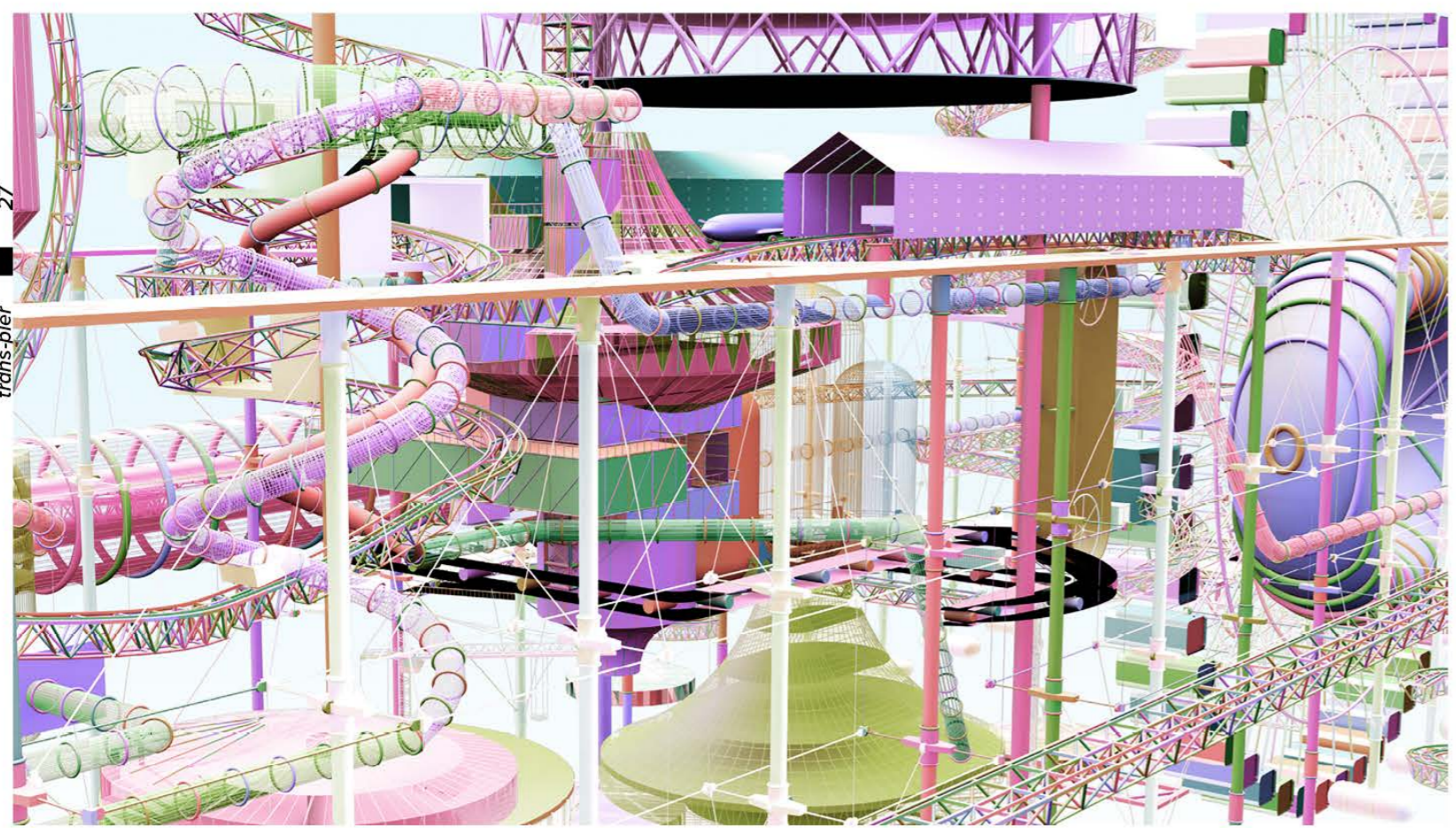
Boating is a very popular activity and method of transportation among the tourists in the city and this facility provides sufficient docking space for those visitors. In addition, the cruise port serves as a destination for incoming ships to dock.



### AIR TRAVEL

By making the runway a continuous loop, the air field is able to use a drive-through system which minimizes the time that the plane spends on the ground.





above: transverse section

# VELA

## RESTAURANT INTERIOR

The Vela Restaurant and Bar space emerges from the interplay between stars, constellations, and sky and boat-making techniques of the past. The ceiling form emanates a sky-like veil, altering its lighting and appearance based on the time of day. The motion of 'carving' and 'shaping' guides the grounded elements such as the bars, inspired by the ships and voyageurs. Such a space curves around its inhabitants and envelops the visitors in a warm and cave-like interior.

2020



CONTEXT	LOCATION	SOFTWARE	PHASES	CORE TEAM	ROLES
PARTISANS Internship (12 months)	601 King Street East, Unit 6, Toronto	Rhino, Grasshopper, Revit, Illustrator, 3D printing, Python	SD, DD, CD, Construction	Jonathan Friedman (partner), Ivan Vasilyv (senior designer)	Design iterations, construction documentation (IFC, Revisions, Patio approvals), fabrication rationalization



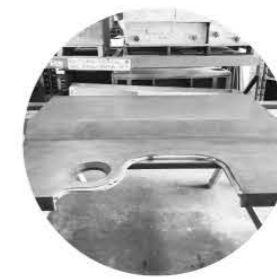
**STUD FRAMING**  
Complex 3D stud framing was required on the ground wall and ceiling planes.



**DRYWALL**  
Drywall is a primary element in the bulkheads as well as entry walls.



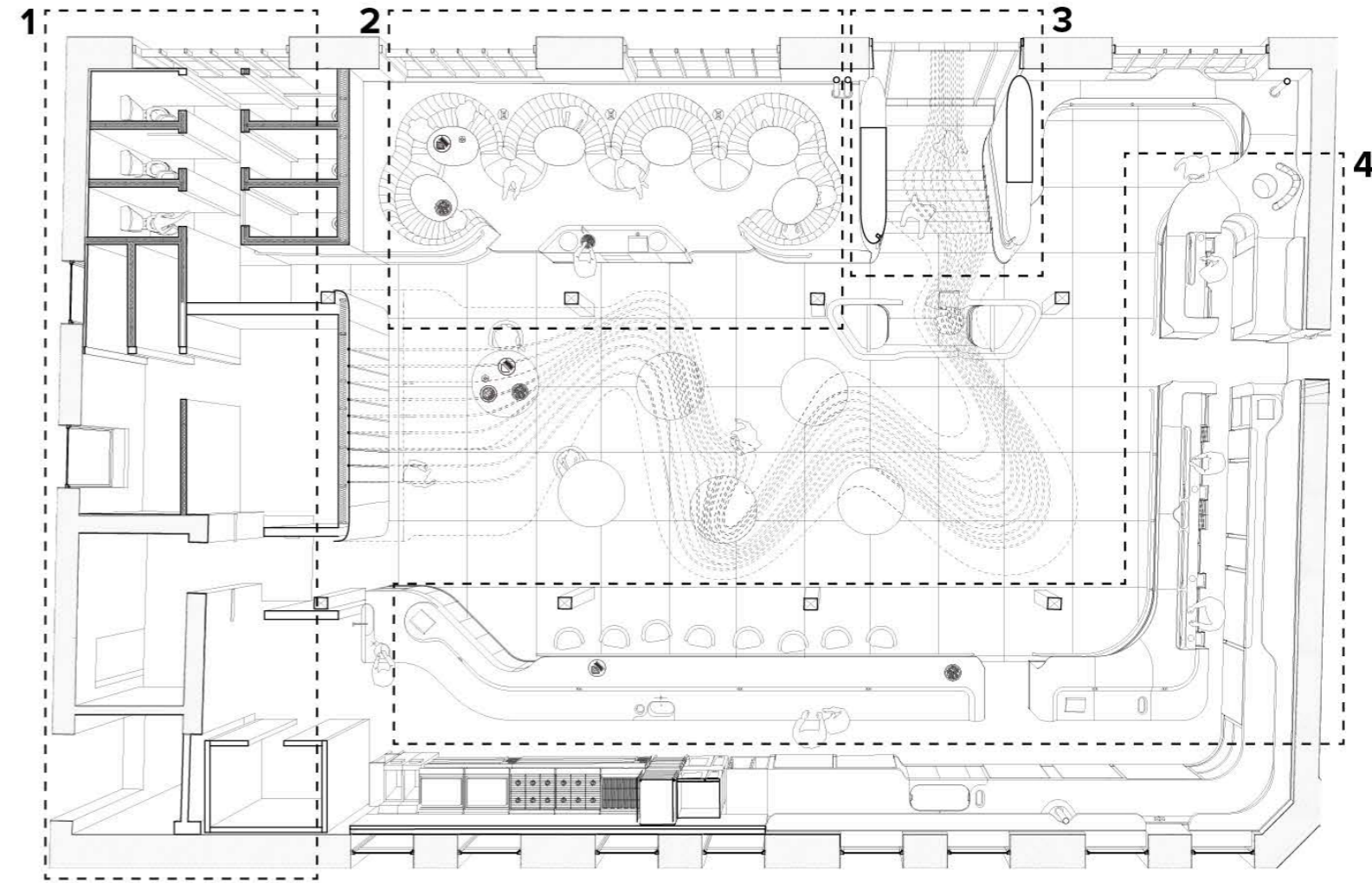
**CEILING**  
The GFRG sculptural ceiling extends throughout the space, acting as the sky.



**COUNTER TOPS**  
The concrete and leather counters act as the erosion elements.



**MILLWORK**  
Millwork elements serve to direct clients through the space.



**1 BACK OF HOUSE AREAS** Contributions: plan framing layouts, modeling, detailing

**2 DINING AREAS** Contributions: plan layouts, iterative design + models, detailing

**3 ENTRY AREAS** Contributions: iterative design + models, mock-ups, detailing

**4 BAR AREAS** Contributions: iterative models of bars, drip tray design, detailing

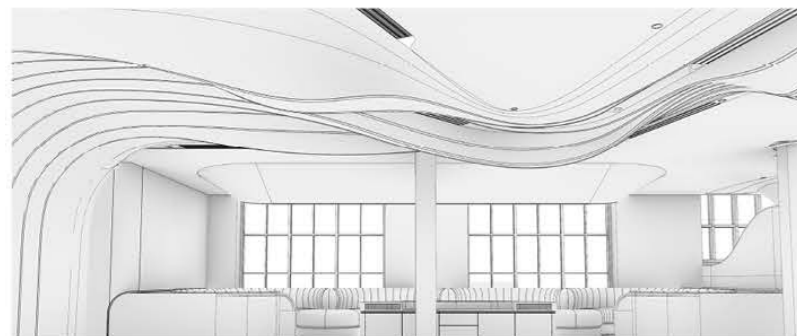
above: perspective floor plan



all images courtesy of PARTISANS

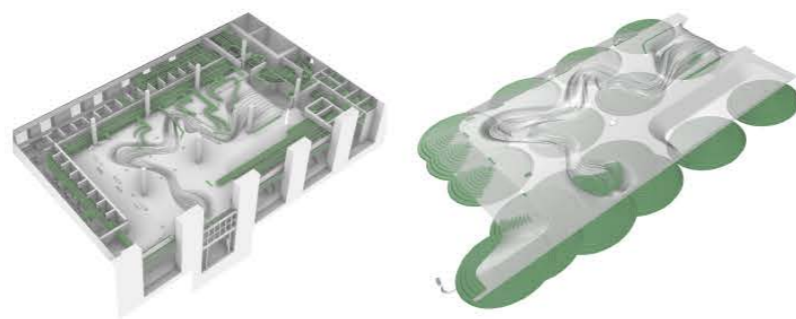


photography and renderings by PARTISANS, all others created by the applicant

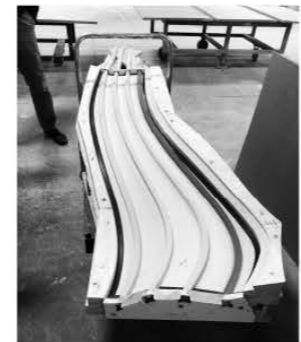
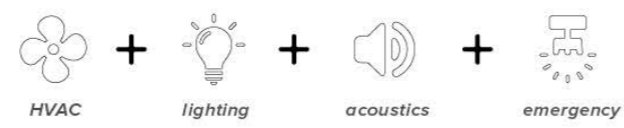


SYSTEMS INTEGRATION

The sculptural ceiling serves as not only the centerpiece of the project but also a keeper of all the functional ceiling elements, such as the lighting, sprinklers, speakers, emergency signage, and HVAC. I was tasked with developing RCP and reconciling ceiling geometries with various systems.



HVAC integration      sprinkler coverage



HARD MOLD

Mold is CNC'd from wood with silicon strips for the lighting grooves.



PUTTY APPLICATION

Gypsum putty and fiberglass meshes are applied within the mold.



HOOK INSERTION

Before the putty fully dries, hanging hooks are inserted into key structural areas.



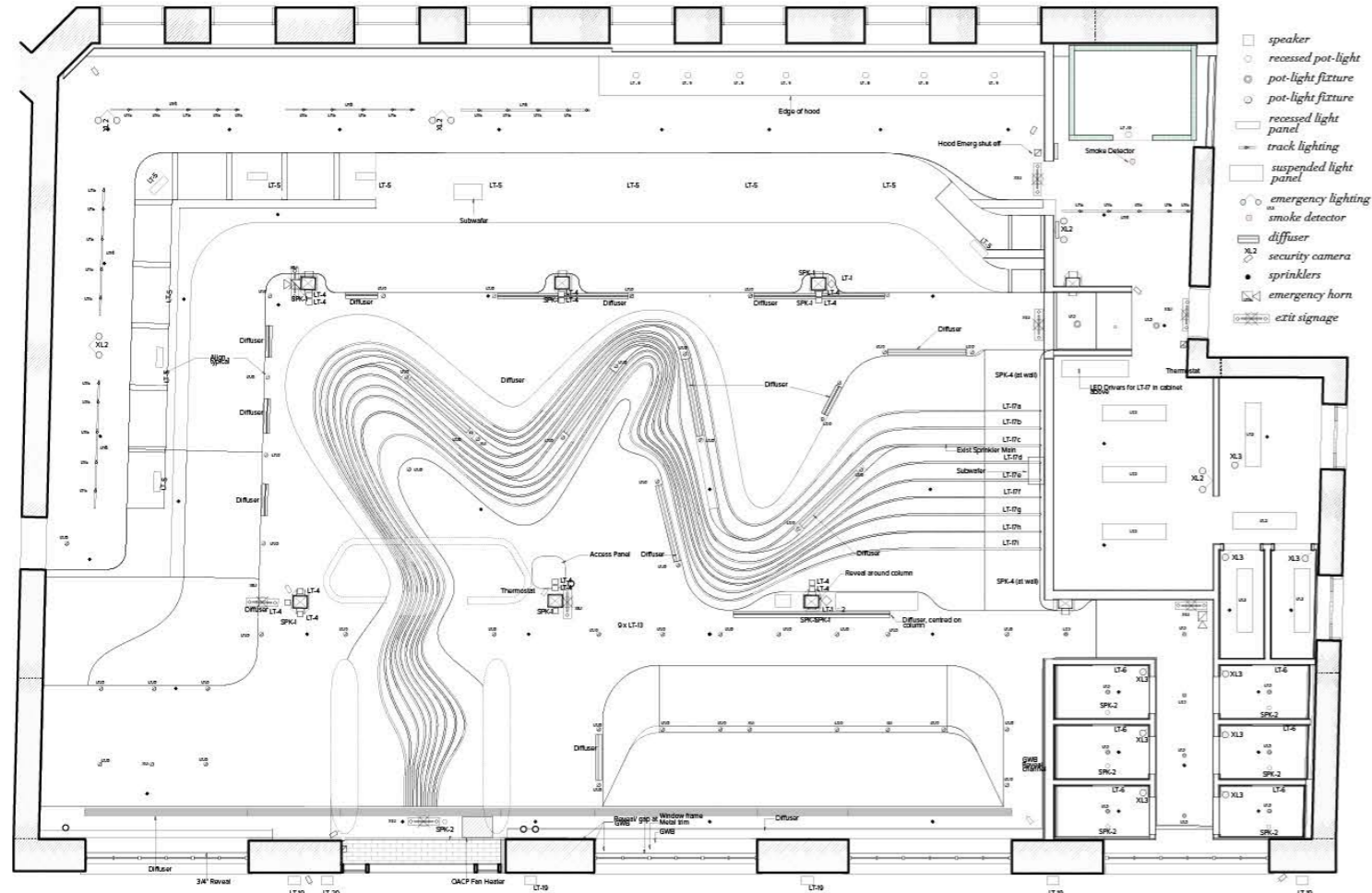
SITE INSTALL

Lights are placed within the grooves and connected via drilled holes.

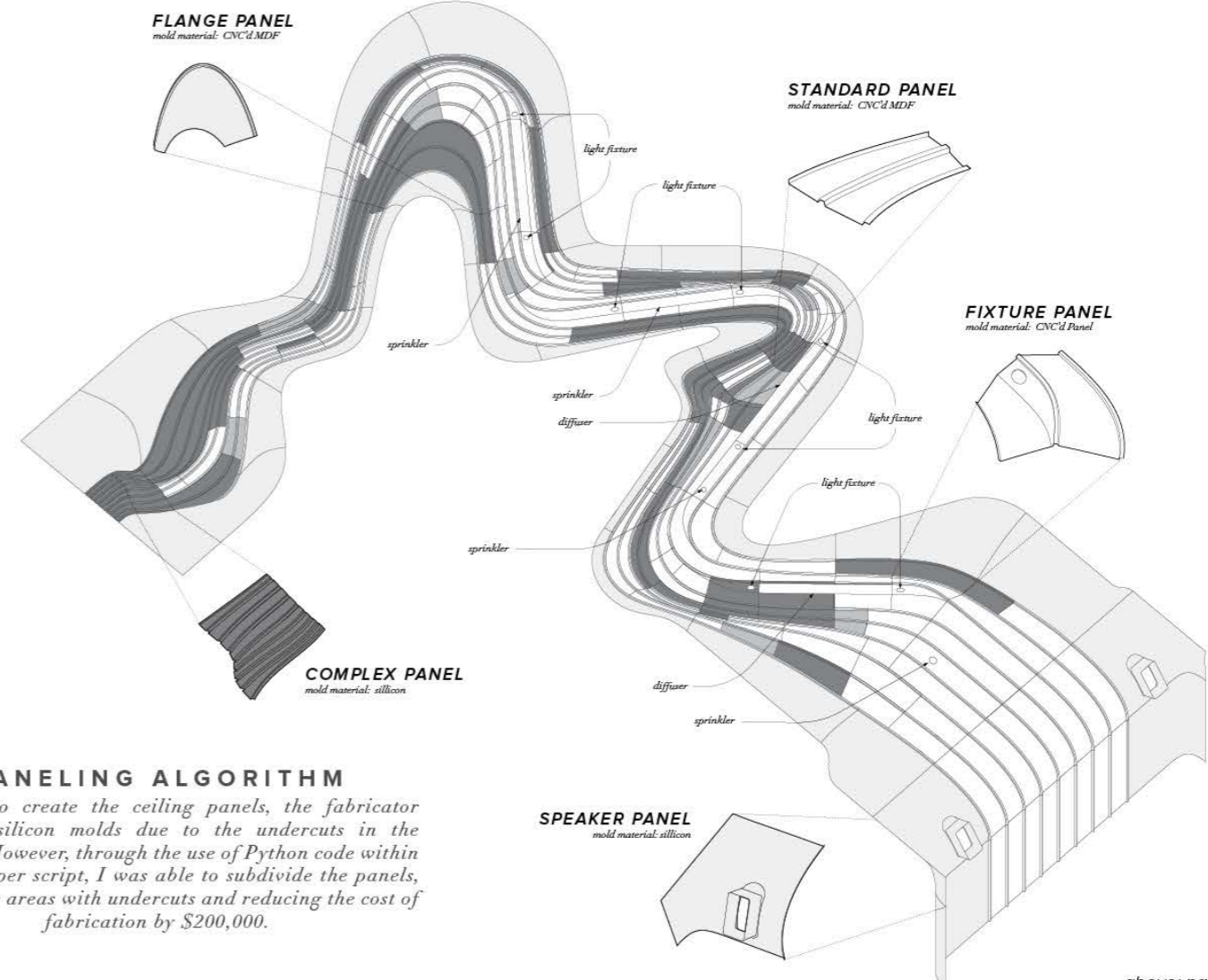


MUDDING

Finally, panels are hung onto stud substructure and mudded to drywall.



- speaker
- recessed pot-light
- pot-light fixture
- pot-light fixture
- recessed light panel
- track lighting
- suspended light panel
- emergency lighting
- smoke detector
- diffuser
- security camera
- sprinklers
- emergency horn
- exit signage



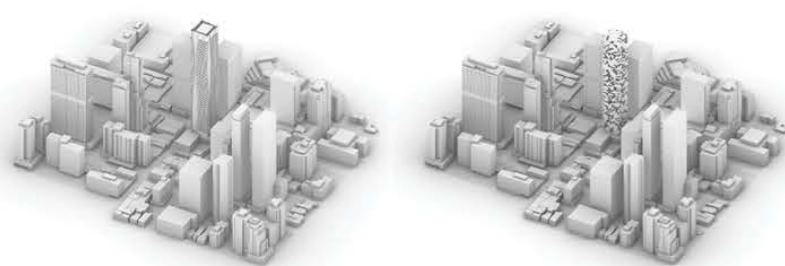
PANELING ALGORITHM

In order to create the ceiling panels, the fabricator suggested silicon molds due to the undercuts in the geometry. However, through the use of Python code within a grasshopper script, I was able to subdivide the panels, limiting the areas with undercuts and reducing the cost of fabrication by \$200,000.



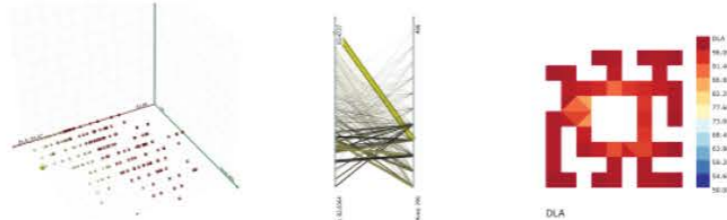
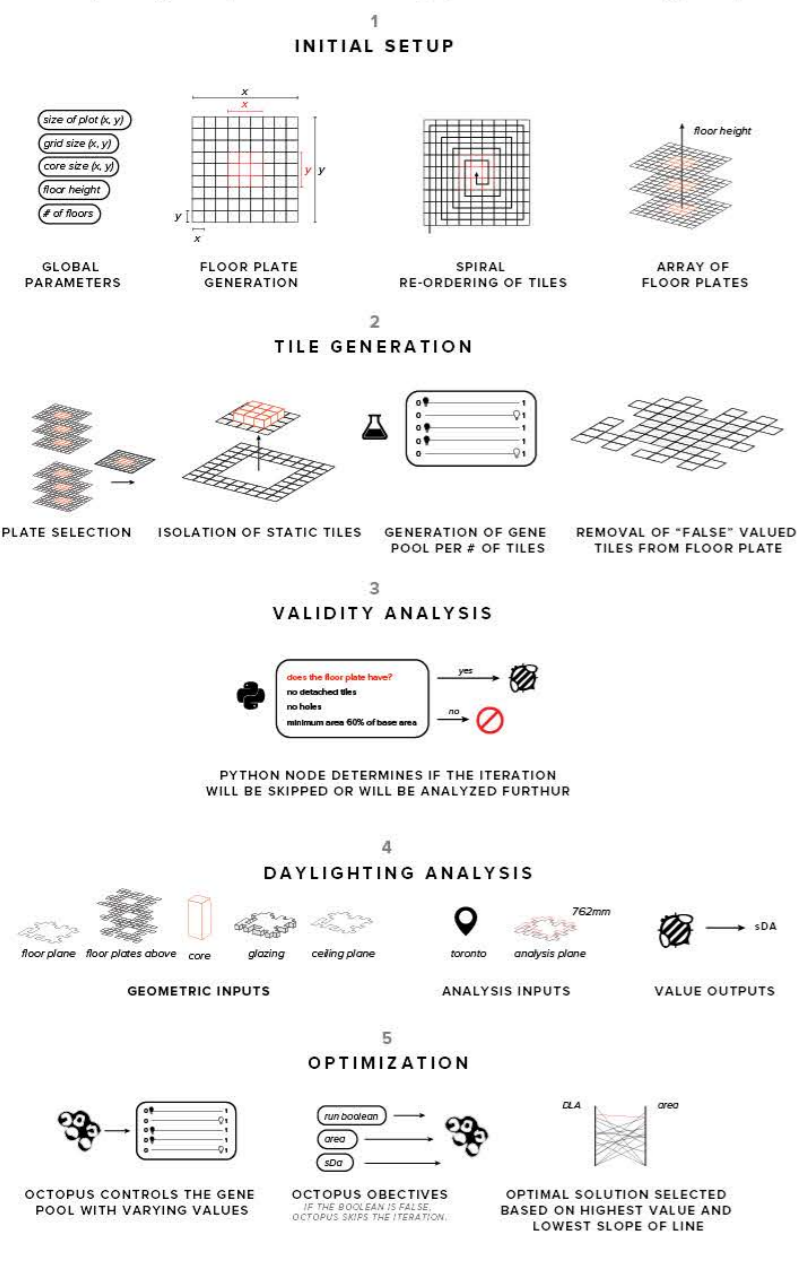
**MULTI-OBJECTIVE OPTIMIZATION FOR DAYLIGHT IN MURBS: DEVELOPING A NEW DESIGN WORKFLOW**

Research to be published in a conference paper and a journal article

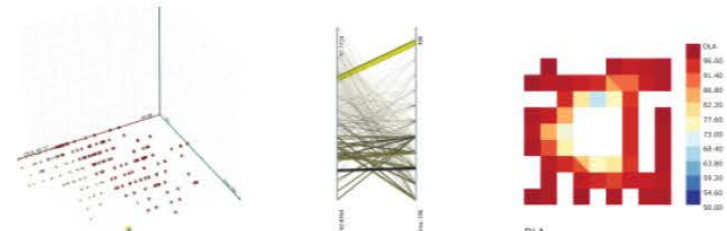


Expanding on previous research conducted by Prof. Terri Peters, I was offered the challenge of re-examining the previously designed workflow to generate residential building geometries based on daylight optimization. Where the previous iteration of the script used Galapagos, the results were variable and many contained disconnected floor plates. I substituted the approach in favor for multi-object optimization, in order to account for various factors, such as daylight, area, energy efficiency and most importantly a boolean value for validity, which eliminated invalid floor plate configurations. The script also featured python nodes, which helped with the iterative decision making within the script itself.

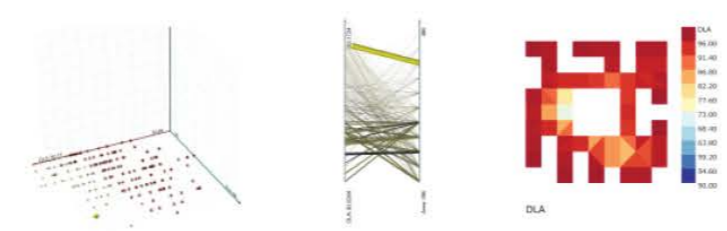
This workflow was tested on Hariri Pontarini Architects' Bloor One Towers in Toronto, yielding an improvement in DLA of up to 30% on the building floor plates.



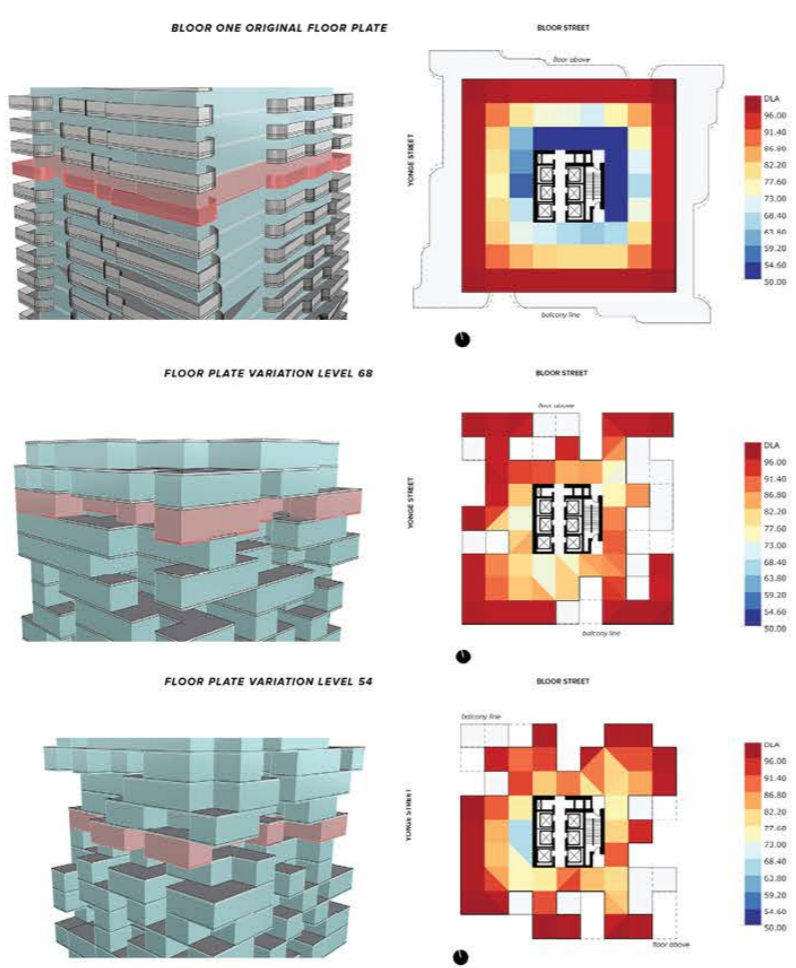
Solution with Highest DLA Performance



Solution with Greatest Floor Area



Most Optimized Solution



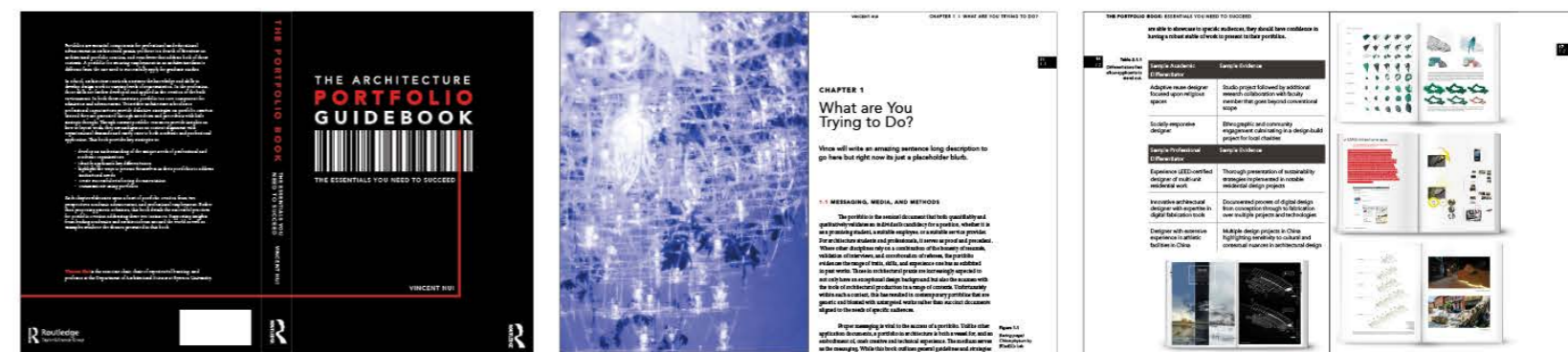
**CONTEXT** Research Assistantship  
**LOCATION** Ryerson University, Toronto  
**SOFTWARE** Rhinoceros3D, Grasshopper, Honeybee, Ladybug, DIVA, Illustrator, Octopus, Python  
**SUPERVISOR** Dr. Terri Peters

**THE ARCHITECTURE PORTFOLIO GUIDEBOOK**

By Vincent Hui, Published by Routledge Taylor Francis Group in 2019

As a research assistant, I had the opportunity to aid professor Vincent Hui with his first book. I was tasked with collecting imagery from students and alumni within and outside of Ryerson University; generating the diagrams and tables, discussing contents with the professor, cover jacket design, and typesetting layouts. As the book contained several interviews from architects and academics, I worked on the transcription and editing of the interview text.

In addition, I provided the imagery and text for the appendix, which provided examples of various drawing representation types with suggestions for students.

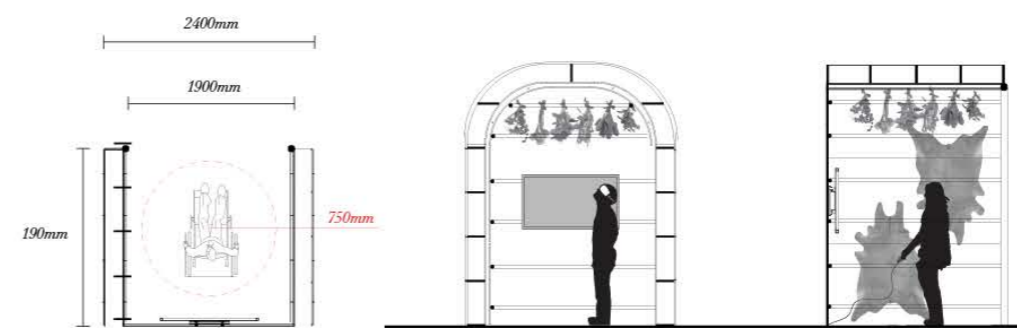
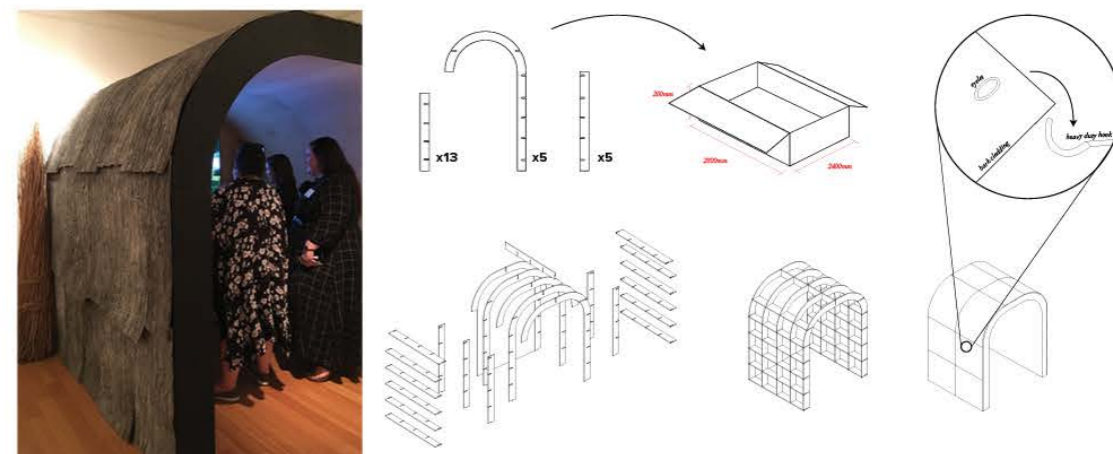


**ARCHEOLOGY ALIVE EXHIBIT AT THE WHITCHURCH-STOUFFVILLE MUSEUM**

Awarded the Ontario Museum Association Award of Excellence in Exhibitions

Led by professor William Michael Carter as a inter-disciplinary, inter-institutional endeavor to create a multi-sensory virtual experience for the Whitchurch-Stouffville museum as a part of their "Archeology Alive" Exhibit. The collaboration, involving professors, researchers, and students from Architecture, Archeology, Animation, and Sound Design, aimed to reconstruct a digital model of a traditional Huron-Wendat longhouse, alongside an enclosure that would enhance the virtual experience to a multi-sensory one.

I was charged with the design of the physical enclosure, so I was able to take part in site visits, examine indigenous architecture, research traditional materials, and develop fabrication techniques for the enclosure.



**CONTEXT** Research Assistantship  
**LOCATION** Ryerson University, Toronto  
**SOFTWARE** InDesign, Illustrator, Photoshop, Rhinoceros Enscape, Twinmotion, Oculus, Unity, Unreal  
**SUPERVISOR** Prof. Vincent Hui

*thank you!*

**Tatiana Estrina**  
LEED Green Associate

✉ [testrina@ryerson.ca](mailto:testrina@ryerson.ca)

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