ANDREA WAN PORTFOLIO

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WAN.ANDREA@GMAIL.COM

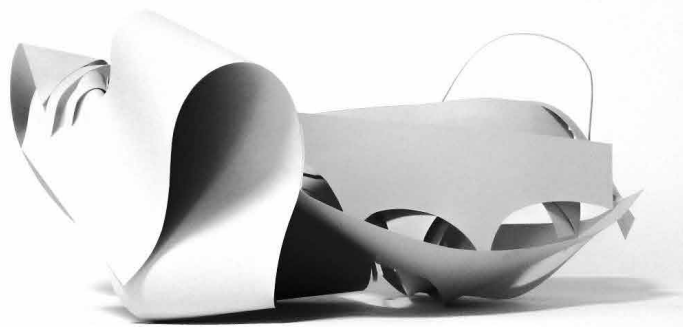## CARNEGIE MELLON

-

YEAR 5

CONTENTS

ANDREA WAN

+15102036513 • andreawa@andrew.cmu.edu • https://www.linkedin.com/in/wan-andrea/ • Pittsburgh, PA

Experience

Carnegie Mellon University — Pittsburgh, PA
Teaching Assistant – Fundamentals of Computational Design — 01/2025 – Present
- Led recitations and office hours
- Assisted with grading

Promantus — Remote
Data Analyst, Intern — 05/2022 – 08 /2022
- Worked with the WELL Building Standard backend team
- Designed a working prototype of a data visualization pipeline, starting from data cleaning, wrangling, and querying to live, interactive dashboard display
- Utilized knowledge of SQL, Python, HTML, CSS, and Javascript
- Used pandas, Altair, Vegas-Lite.js, Vega.js, and D3.js libraries
- Created interactive and web-embeddable charts and graphs

Carnegie Mellon University — Pittsburgh, PA
Outreach Instructor — 02/2022 – 05/2022
- Created and delivered curriculums for K-12 Saturday programs, working with children of various ages to introduce architectural concepts through fun crafts and activities

Williams + Paddon — Roseville, CA
Architecture Intern — 10/2019 – 12/2019
- Made revisions to specifications for building materials, construction materials and other project details in Revit and AutoCAD
- Assisted in 3D modelling, texturing and interior design and visualization tasks in Sketchup and Enscape

Education

Carnegie Mellon University — Pittsburgh, PA
Bachelor of Architecture (B.Arch) — 08/2020 – Expected 2025
- **Fundamentals of Programming**, a computer science course centered on Python
- **Principles of Imperative Computation**, a computer science course using C
- **Introduction to Machine Learning in Design**, an architecture course centered on ML algorithms for generative approaches
- **Data Visualization**, a data science course using Python libraries and Esri GIS software for mapping and interactive visualizations
- **Generative Modelling and Advanced Scripting**, courses centered on the use of Grasshopper and Python to implement computational design approaches

Architectural Association — London, UK
Spring Visiting School Programme — 01/2024 – 05/2024

University College London — London, UK
Summer School – Contemporary Urbanism, Culture, and Space — 07/2023 – 08/2023

Projects

Carnegie Mellon — Pittsburgh, PA
Independent Study — 05/2024 – 08 /2024
- Used Python, sci-kit learn and PyTorch machine learning libraries in conjunction with Rhino 3D to create a training dataset and develop an ML model to predict line weights in 2D CAD drawings from normal map images

Carnegie Mellon — Pittsburgh, PA
STEAM Center of Learning — 05/2024 – 08 /2024
- Building systems integration studio – utilized Rhino and Grasshopper for 3D modelling, including an innovative responsive façade; ClimateStudio and Grasshopper for environmental simulations; 3D model of MEP systems using ArchiCAD; rendering using VRay

Skills

AutoCAD • D3.js • Fusion • Maya • Pandas • Python • Revit • Rhinoceros 3D • SQL • V-ray • Grasshopper • JavaScript • Twinmotion • Revit • 3ds Max • SketchUp • ArchiCAD MEP
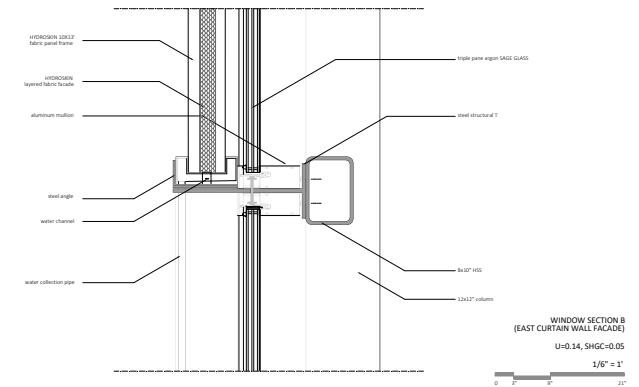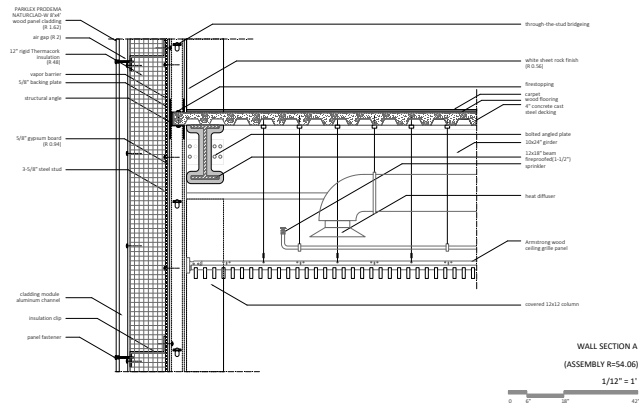
STEAM CENTRE OF LEARNING
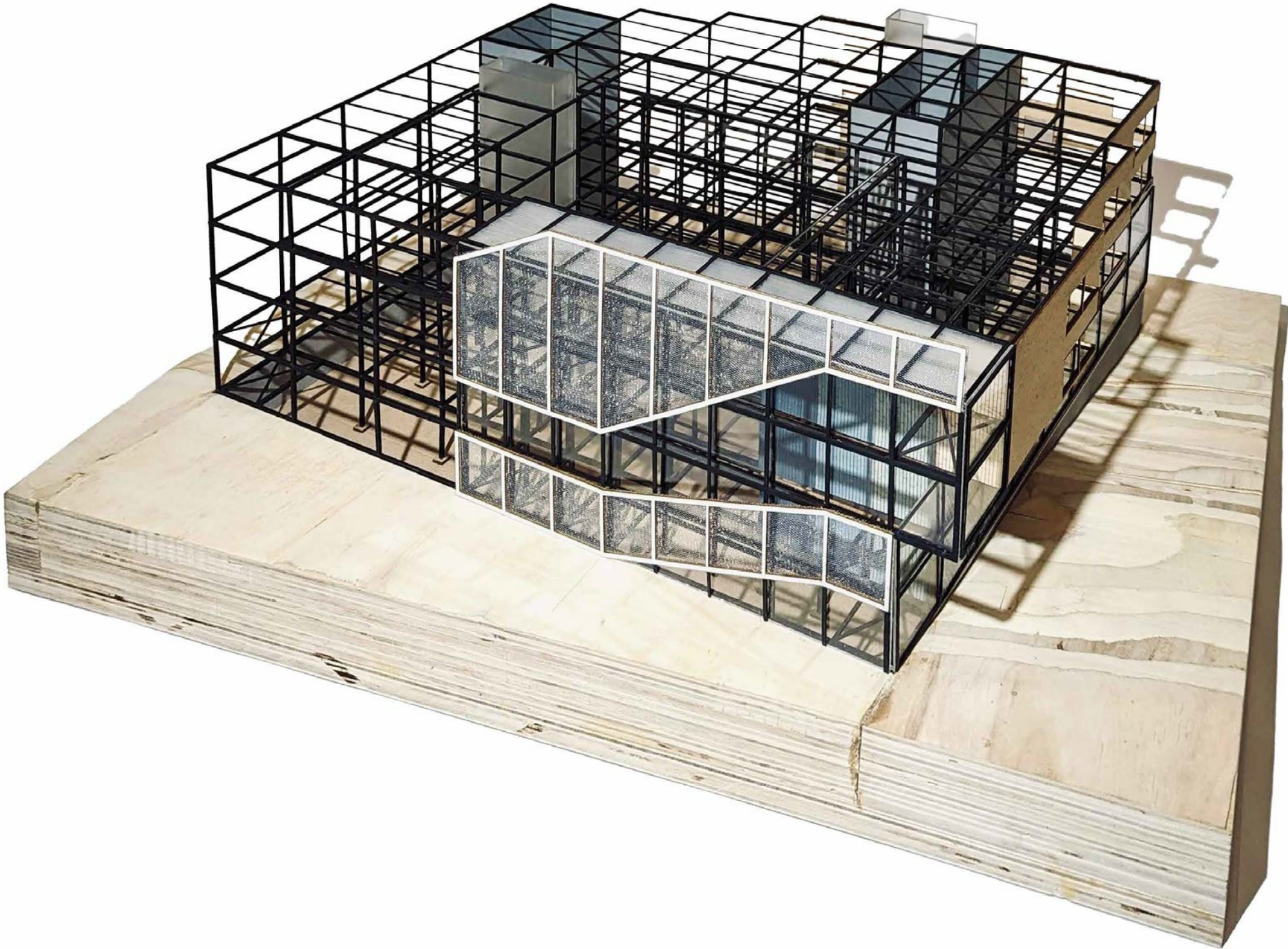
STEAM CENT OF LEARNING

K-5 public school in
Homewood, Pittsburgh, PA

The Homewood STEAM Centre of Learning is
a K-5 school promoting science, technology,
engineering, arts, and mathematics
located in a predominantly black neighbourhood
in Pittsburgh, PA. Previous schools were
closed down in the area due to unsatisfactory
performance.

We focused on developing a project which
explores the idea of building as a teaching tool,
and utilises design integration centred around
the theme of water as a way of demonstrating
the applicability of STEAM skills in designing and
running a building, as well as in our daily lives.

Year	Group members	Location
2023	Andrea Wan, Alexandra Wang, Keanu Dong, Eric Feng	Pittsburgh, PA

WALL SECTION B
(ASSEMBLY R = 50.96)
1/24" = 1'

WALL SECTION A
(ASSEMBLY R=54.06)
1/12" = 1'

ROOF SECTION B
(GREEN ROOF)
1/24" = 1'

WINDOW SECTION B
(EAST CURTAIN WALL FACADE)
U=0.14, SHGC=0.05
1/6" = 1'

K-5 School

Homewood STEAM Center of Learning

Year
2024

Group members
Andrea Wan, Alexandra Wang,
Keanu Dong, Eric Feng

By combining our theme of water with the vehicle of imagination - thinking about different times, places, and ways of being - we are able to integrate the STEAM philosophy of outside-the-box thinking and interface between technological and phenomenological realities.

The building program consists of public program space as private classroom space.This includes the gym, auditorium, and market (which contains the kitchen and cafeteria), as well as regular classrooms and specialty classrooms - such as the sensory room, biology lab, and music room.

The site is located in the Homewood neighborhood of Pittsburgh, in close proximity to the Westinghouse High School, as well as the YWCA. It is also right next to Silver Lake, which was an iconic postcard-worthy hangout spot from the 1890s to 1947 where families were known to enjoy swimming, fishing, boating, picnicking, and ice skating. The lake was eventually filled in due to excessive pollution, and became a drive-in theater in 1949; today it is a car wash.

Our concept hearkens back to this memory

of place and seeks to establish a new culture of water for the community. This includes landscaping developments such as the greenhouse, as well as space for public programs such the market, gym, and auditorium, which are accessible on the lower floors of our building. These programs are central to the plan, and classrooms are organized around.

Building as a teaching tool: innovative facade system

The project features an innovative water-collection facade system, adapting the HydroSKIN fabric facade proposed by the University of Stuttgart. Comprehensive energy analysis and environmental simulations were conducted to evaluate the building's performance against LEED and WELL building standards. This cutting-edge facade not only serves as a sustainable design element, but inspires play and curiosity through functional and aesthetic design.
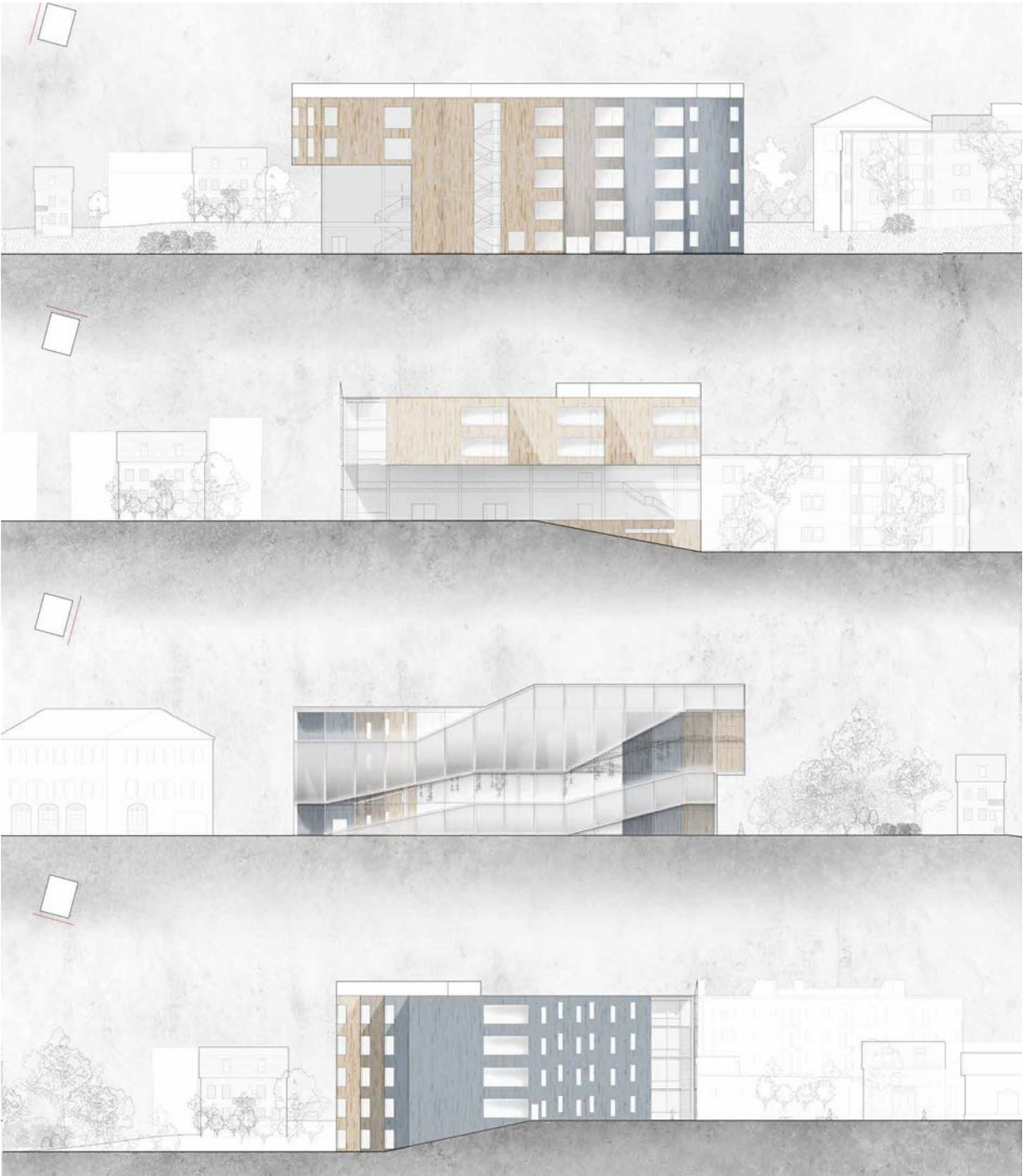
In addition to the water collection facade (which relies on a dedicated track system that collects water from the saturated fabric panels), the gradient of the wood cladding introduces students to the beauty and variability that wood can offer.

Building for community: public program

In addition to typical facilities—such as classrooms and labs—the design features multifunctional spaces serving both students and the community. These include a green roof doubling as a community garden, an outdoor amphitheater and playground facilitating outdoor activities, and a cafeteria transforming into an indoor market and food hall where locals can purchase on-site grown produce. We envision the school as a community resource, that addresses a critical lack of free public gathering spaces for residents.

In addition to other amenities on site, such as electric vehicle charging stations in the carpark (powered by on-site solar panels), the building is designed so that it can also serve as a storm shelter and warming shelter in dire weather conditions. On weekends, the school is available for community activities such as nurse clinics which can facilitate public health initiatives.

Green Roof

Homewood as a neighborhood practices a culture of care towards vacant lots and abandoned properties by planting gardens in their place. We wanted to embody this culture by creating a green roof at the heart of the building.

Gymnasium

We introduced a multi-purpose gymnasium space at the center of the building, which would be glazed and offer lighting to penetrate the corridors and the classrooms. This embodies the transparency a public school should offer.


Structure

The structure of the building exists on a regular steel grid. This is an economical solution for a public school project.

Daylighting

In order to address issues of natural daylighting, the classrooms are stepped in a way to allow for corner windows that wrap around two sides of the classroom walls.

Building as a teaching tool

The school utilises a dropped ceiling solution consisting of prefabricated fins made of natural wood, which provide acoustic benefits and softens artificial lighting whilst also allowing views to the crucial mechanical ventilation systems and fire sprinklers that make the building habitable. This is just one of many ways that the building embodies its role as a teaching tool.
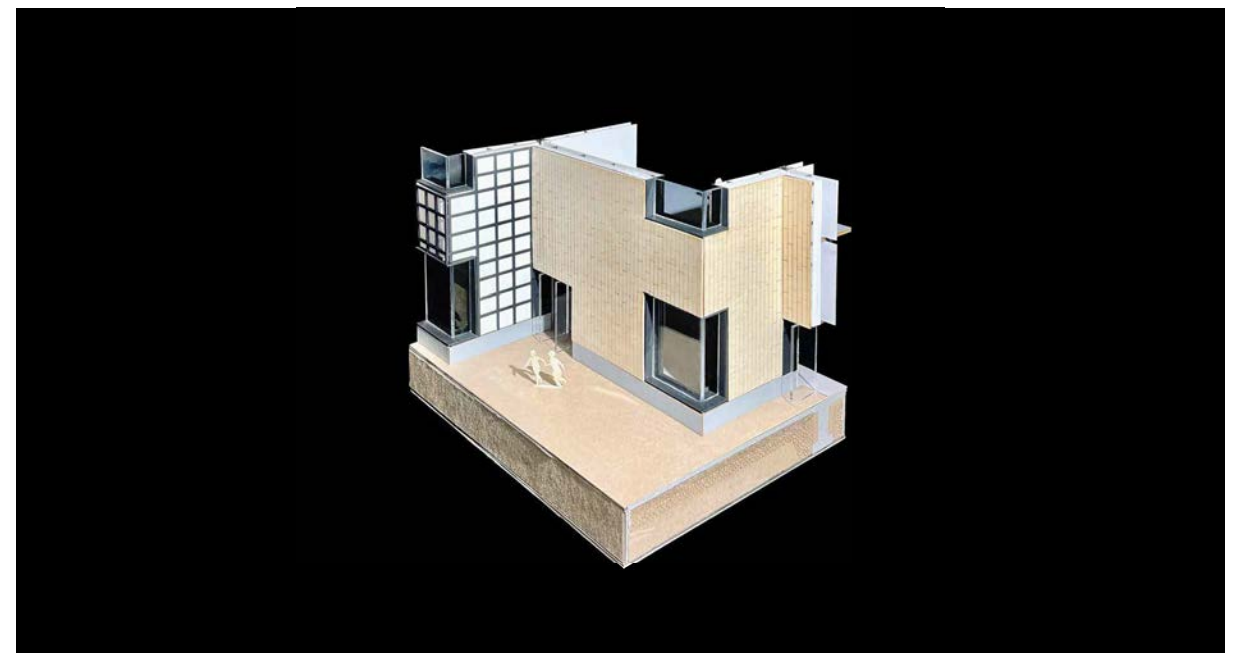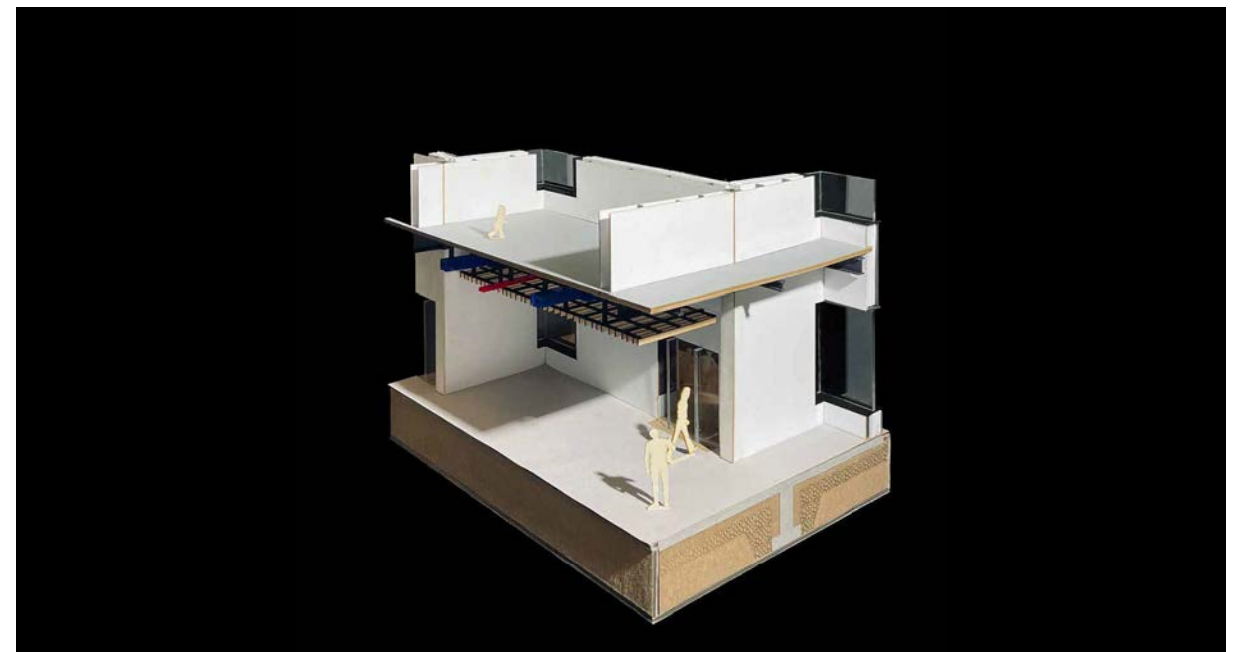
Although the wood is treated, the wood facade is offset from the ground to mitigate water damage concerns. Instead, we choose to reveal concrete materials, which helps students to understand the logic of materiality in building construction.
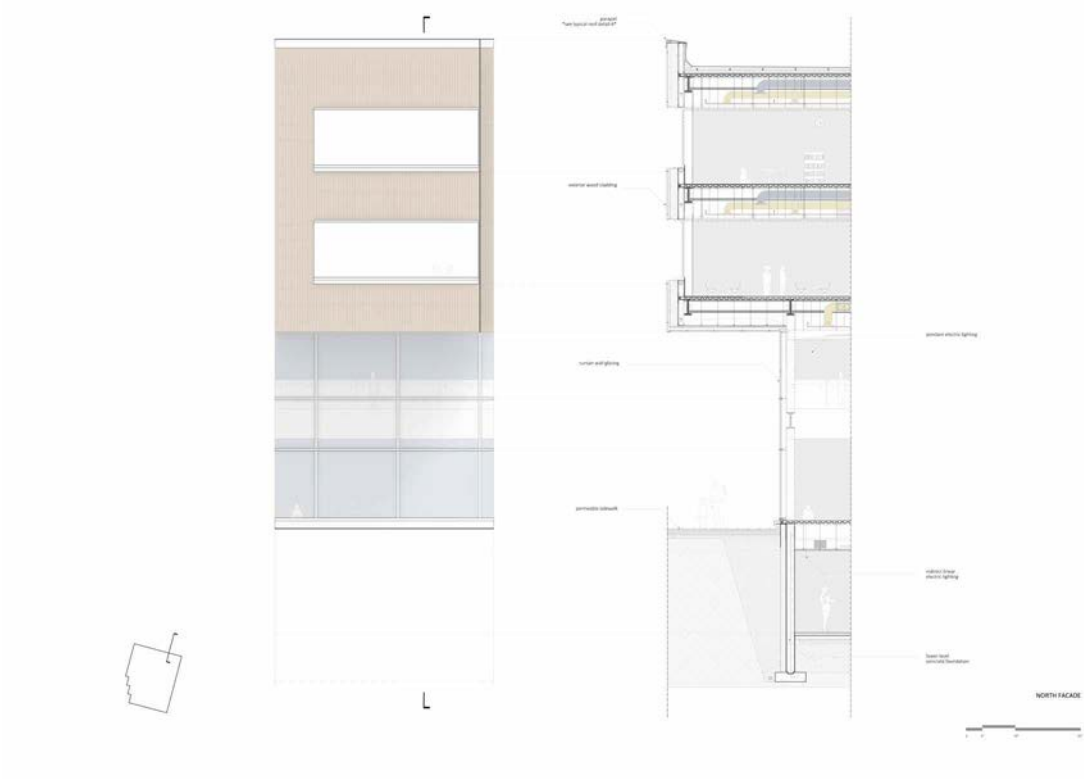
Facade and enclosure - water collection

We propose an active double-skin facade which is rigorous and unconventional. It is comprised of two types of panels supported by a combination of a point-fixed curtain wall system which uses spider fittings: glass, and hydroskin, which is an innovative multi-layered textile that acts as both a collector and evaporator, allowing for rainwater harvesting and evaporative cooling to occur.

Facade and enclosure - Wall

The other three sides of the building utilise a prefabricated wood panel with adequate insulation and other envelope strategies to ensure a water-tight barrier between the interior and exterior of the building , such that thermal bridging does not occur. Low-e glazing is selected for normal windows; Kalwall is used for the gymnasium. This provides a nice balance of natural daylighting without compromising heating and cooling problems.

The interaction of transparency and translucency, as well as the "crack" pattern is central to the design, as it allows the exterior of the building to act as a teaching tool by demonstrating water sustainability practices. This space allows students to get up close and personal with the water system that supplies the water for their toilets, so they have a better understanding of the water cycle and sustainable living practices.

The more conventional wall type is used for classroom spaces. As seen in the section, mechanical ventilation systems and fire sprinklers are hung from the roof. Plumbing resides predominantly in the wall cavity.
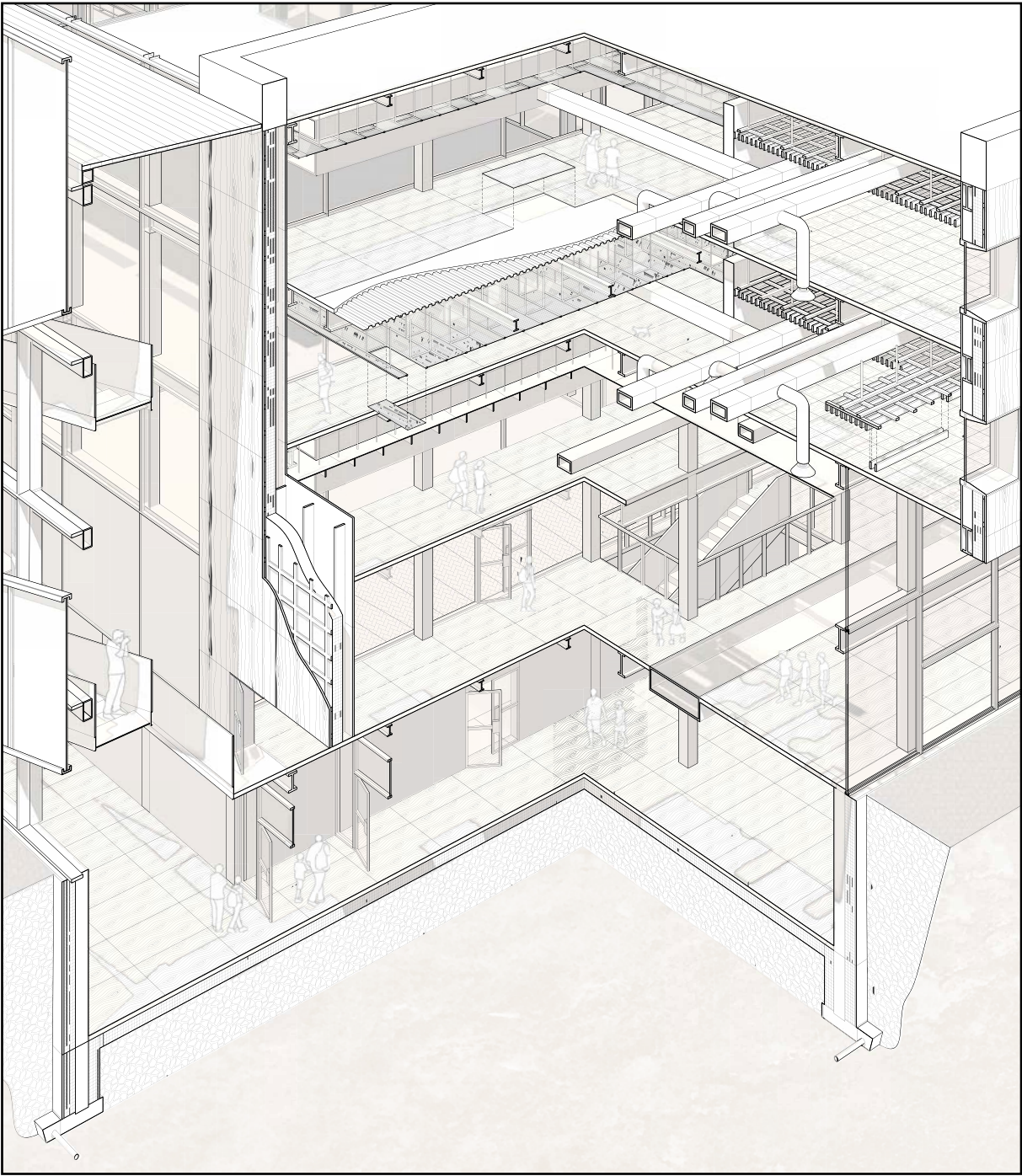
STRUCTURE

LEGEND

A. STEEL COLUMN JOINT
A1. TERTIARY BEAM
A2. PRIMARY BEAM
A3. SECONDARY BEAM
A4. BOLTED CONNECTION
A5. 12" x 12" STEEL COLUMN

B. STEEL COLUMN & FOUNDATION
B1. 12" x 12" STEEL COLUMN
B2. BASE PLATE
B3. 45" x 45" x 13.5" FOOTING

C. HYDRO-SKIN FACADE
C1. HYDROSKIN FABRIC PANELS
C2. TRIPLE-GLAZED CURTAIN WALL
C3. MULLIONS
C4. STEEL STRUCTURAL "T"

A. STEEL COLUMN JOINT

B. HYDRO-SKIN FACADE

B. STEEL COLUMN & FOUNDATION

Structural Strategies

The building utilizes a conventional steel framing system on a regularised grid to mitigate construction and material costs. This is an economical and affordable solution for public schools.
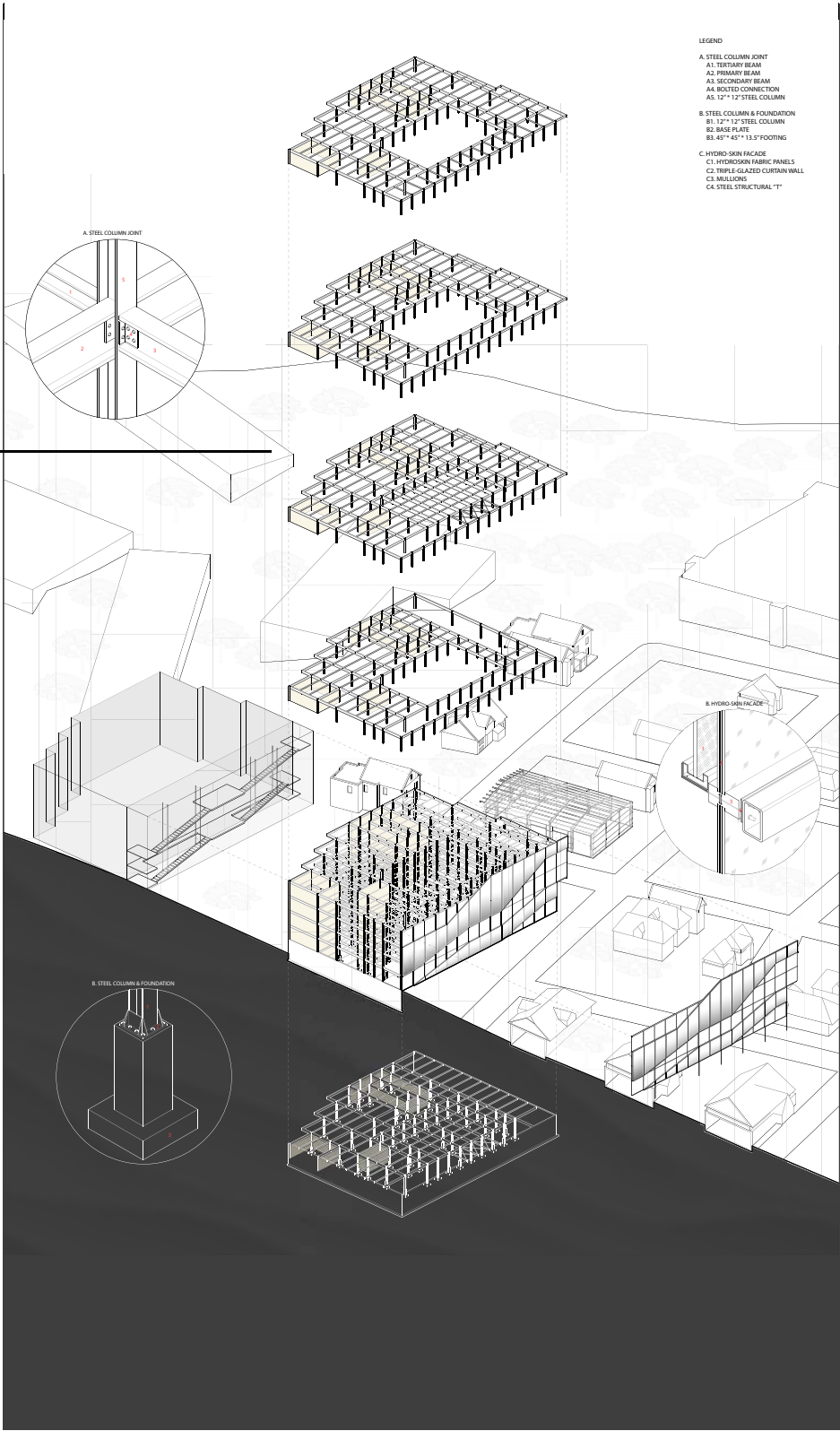
Software

AutoCAD MEP, ArchiCAD, Rhinoceros 3D, Grasshopper, Revit, Climate Studio, V-Ray, Enscape

Structure and MEP

The building is designed so that the mechanical ventilation systems, the electrical systems, and the plumbing systems do not interfere with each other (or the fire sprinkler or data systems). Additional ceiling height is allotted so that necessary systems can be hung from the ceiling.

This cutaway section reveals the logic of the structural system that supports the MEP systems of the building.

MEP

HVAC SYSTEM

PLUMBING & WATER SYSTEM

MEP

MEP coordination becomes a 3-dimensional spatial problem that I modelled out in order to solve. In our case, there was also a fire sprinkler system, as well as the non-potable water from the water collection facade which needed to be addressed separately from the potable water in the drinking fountains and faucets. The decision was made to store the water collected from the facade in underground tanks.
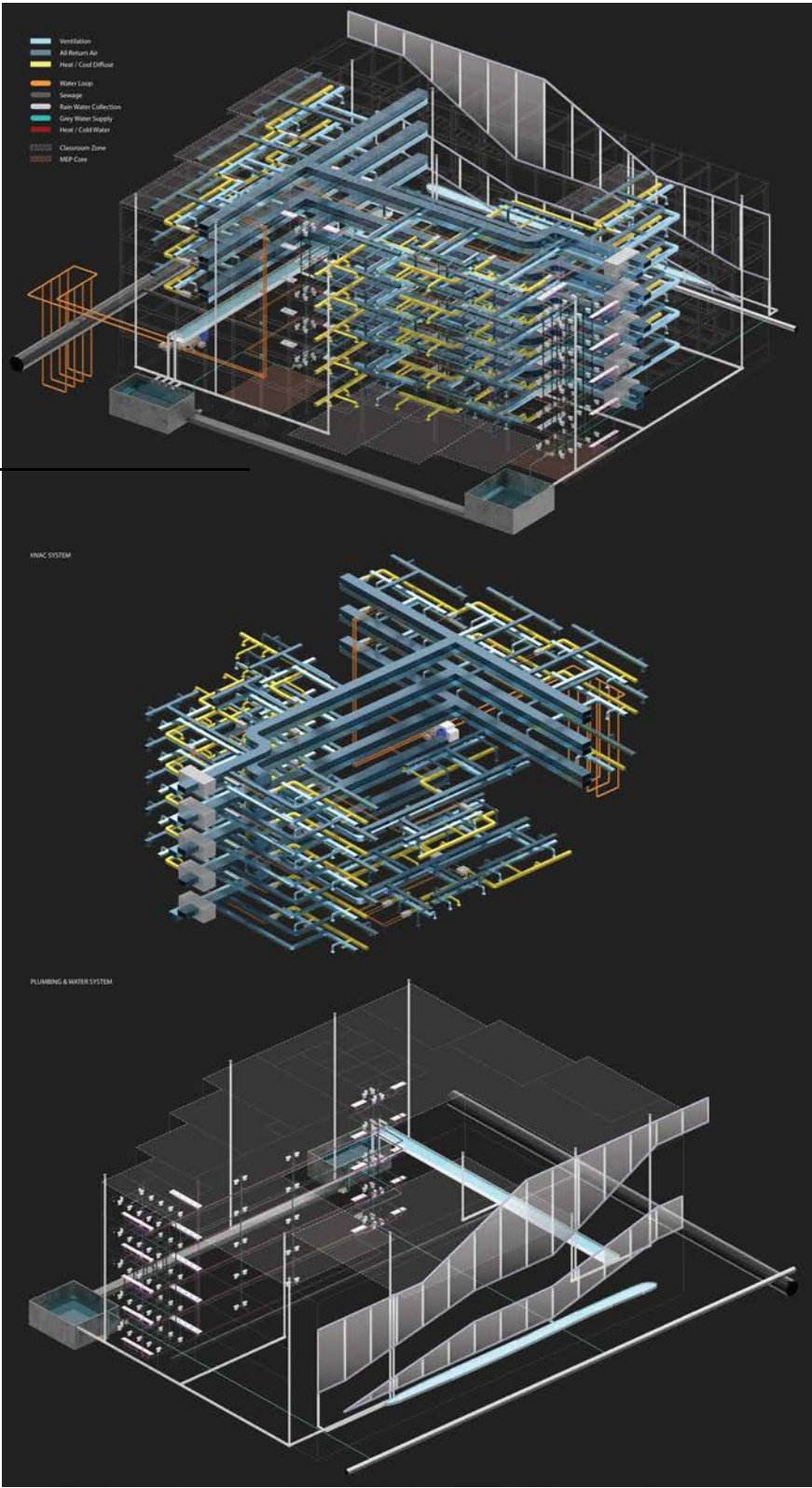
Software

AutoCAD MEP, ArchiCAD, Rhinoceros 3D, Grasshopper, Revit, Climate Studio, V-Ray, Enscape

Solar Renewable Energy - PV Simulation

The array of 160 PV panels are placed at a 23.5-degree tilt, facing south. They altogether produce 55,319 kWh annually, which accounts for 9.32 percent of the total energy use. The energy produced operates the pumps for the stormwater recycling system, which uses greywater to flush toilets.

Panel 0, Panel 1, Panel 2, Panel 3, Panel 4, Panel 5, Panel 6, Panel 7, Panel 8, Panel 9, Panel 10, Panel 11, Panel 12, Panel 13, Panel 14, Panel 15, Panel 16, Panel 17, Panel 18, Panel 19, Panel 20, Panel 21, Panel 22
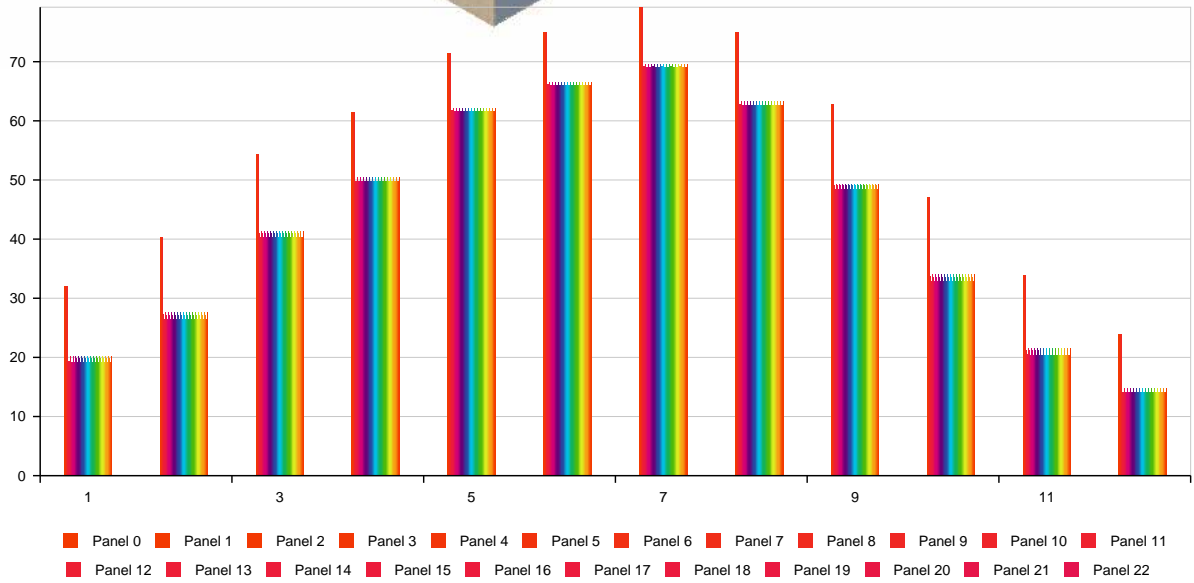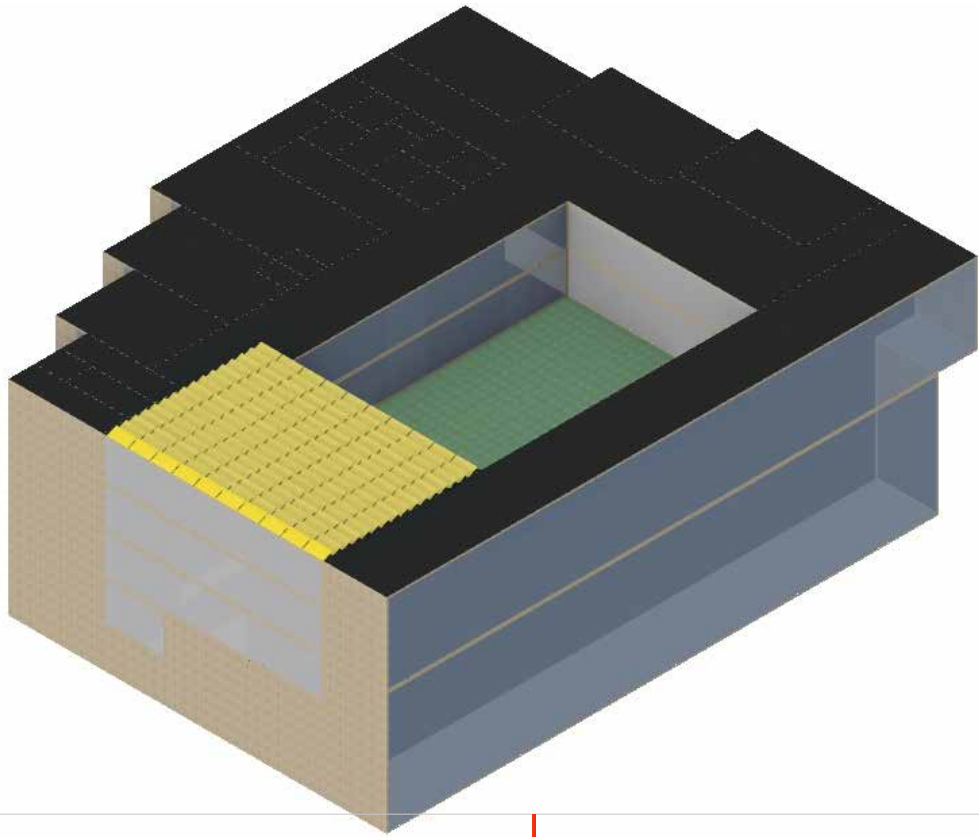
DAYLIGHTING

Baseline

The baseline assumes floor-to-ceiling single-pane glazing, frosted single-pane glazing, and bronze-tinted single-pane glazing assemblies, as well as white painted room walls and white floors.

With the exception of a few classrooms, many spaces suffer from extreme daylighting.
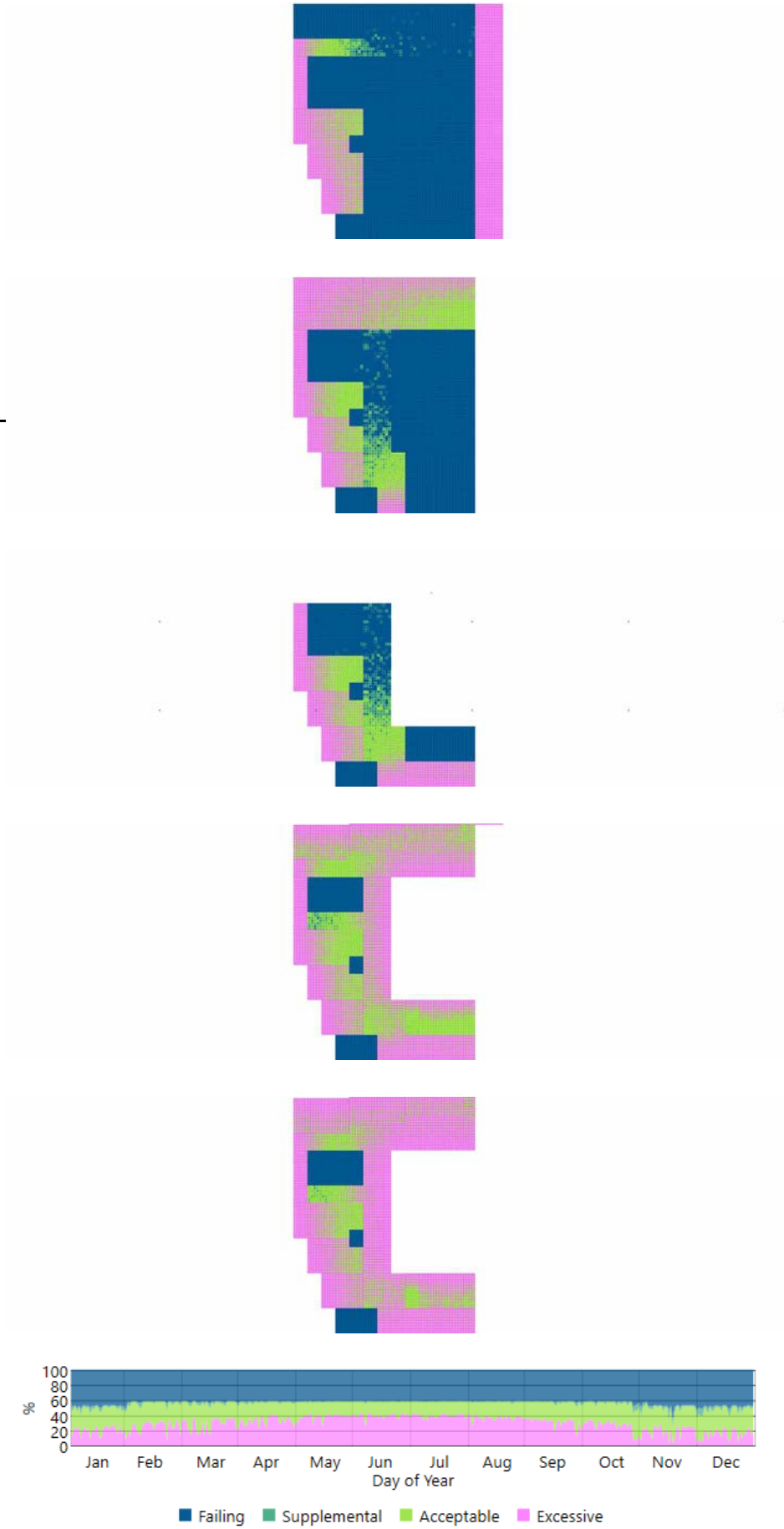
DAYLIGHTING

Final

The second iteration features resized windows, better glazing assemblies with low-e options and Kallwall.

There is no longer excessive glare in any part of the building. The market, classrooms on all floors, and corridors on floors above the gym all receive acceptable daylight.
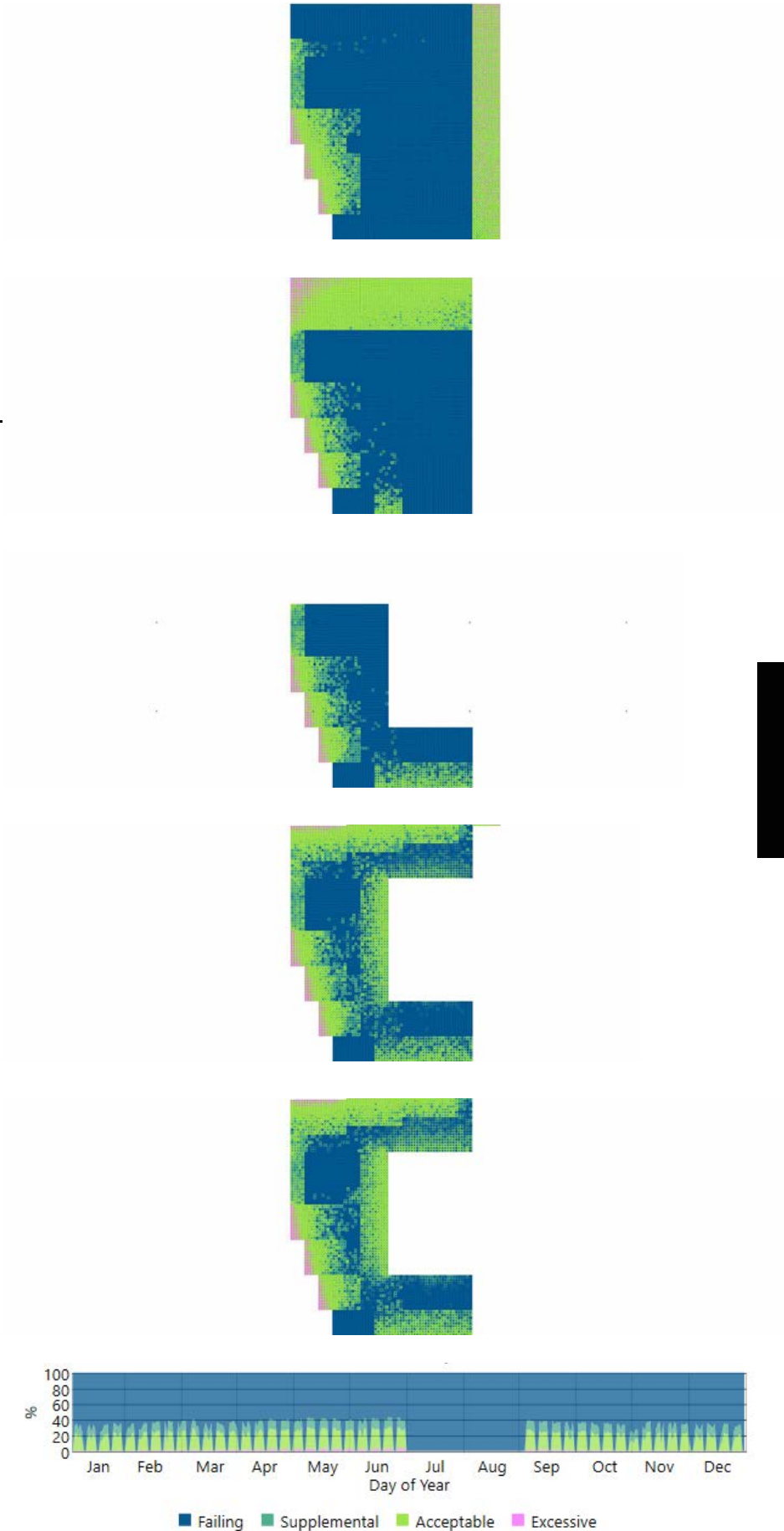
Energy Analysis - Baseline

The baseline has a EUI of 43 KBTU/ft^2 per year. In both cases, we can see the majority of the energy use comes from heating loads in the winter months, which is why insulation is so important.
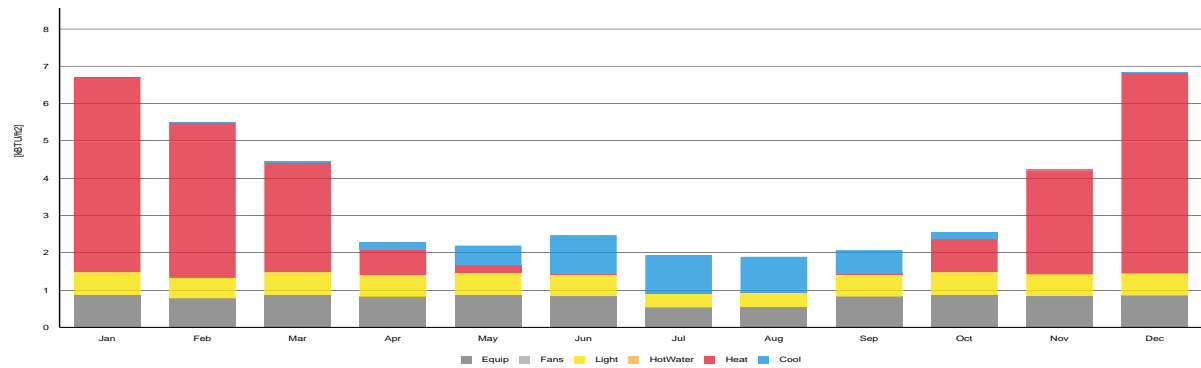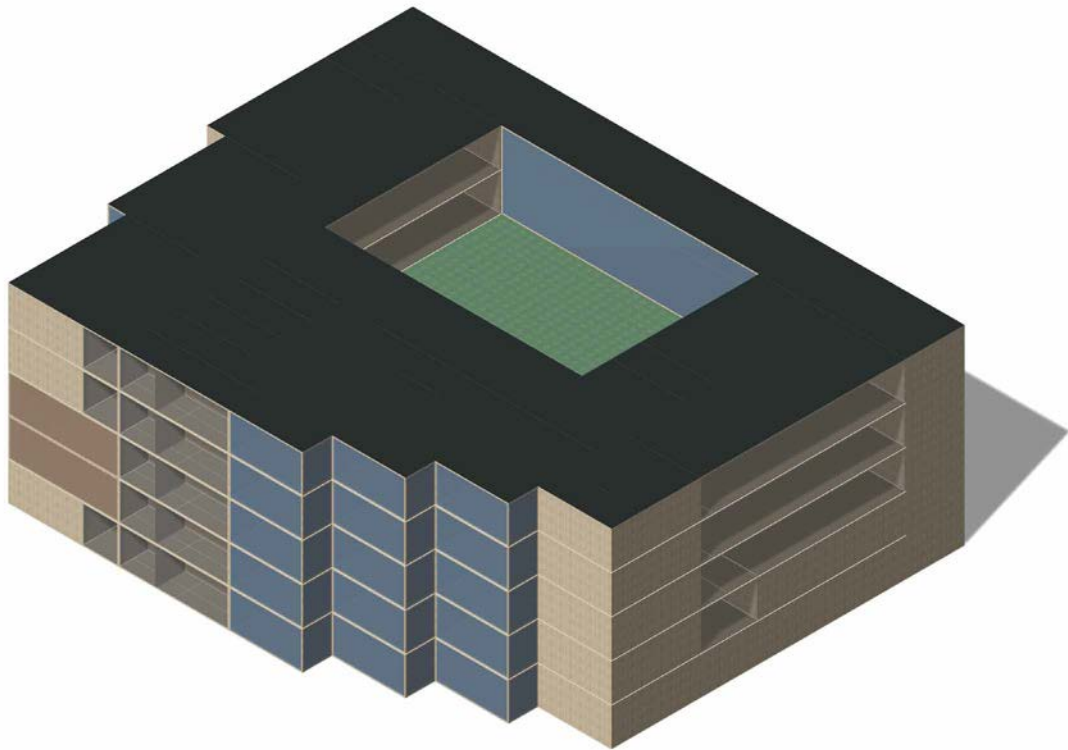
Energy Analysis - Final

The new iteration has a EUI of 25.6 KBTU/ft^2 per per year. The reduction in energy use is the result of neutralizing the envelope and providing better insulation which protects against infiltration.
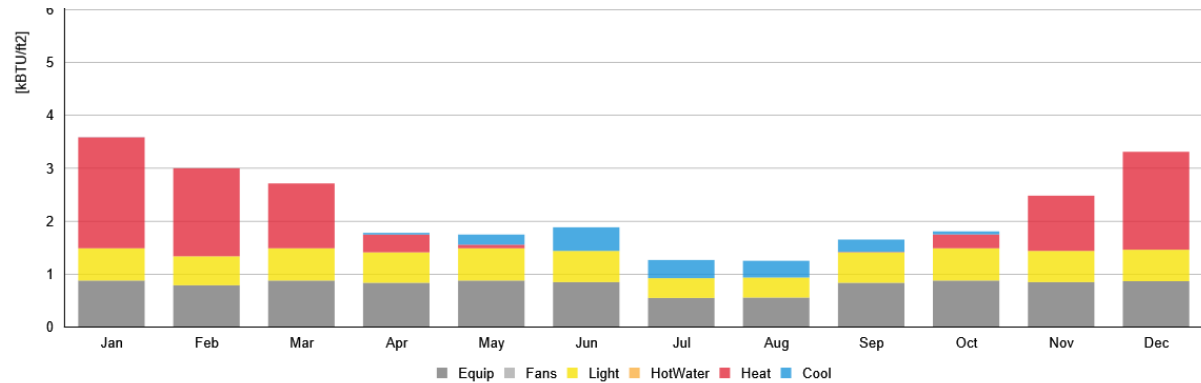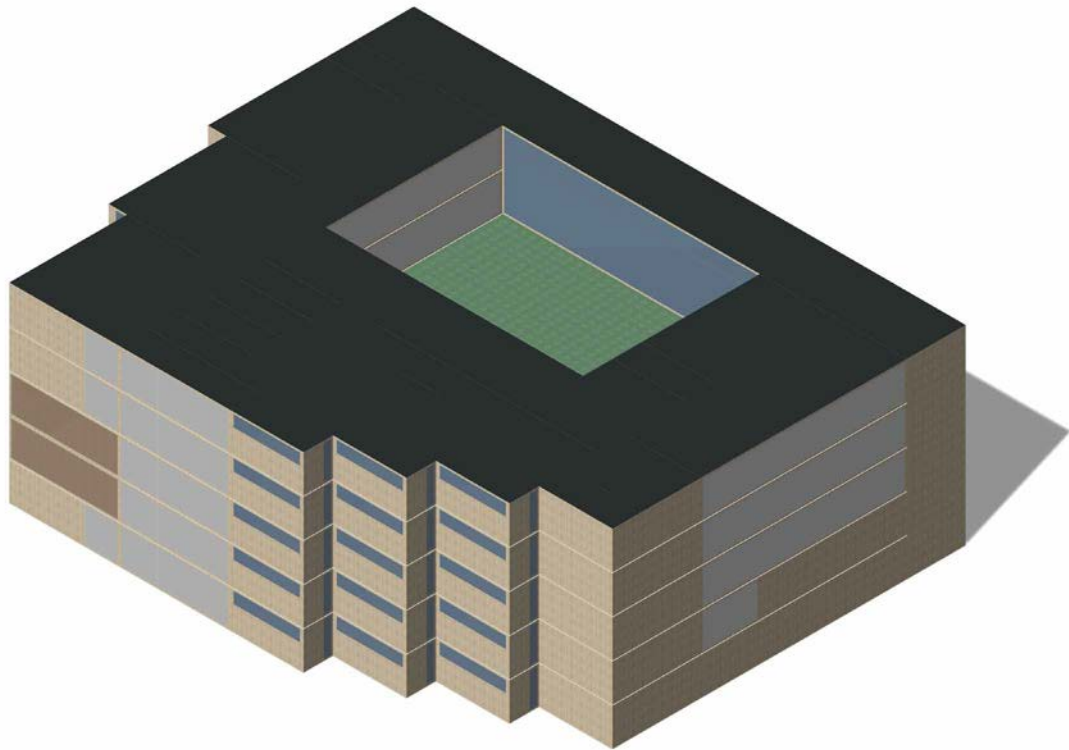
Mean Illuminance - Baseline

According to both LEED 4.1 Schools and WELL Building Standard v3, the recommended lux for primary schools is 300. The baseline iteration suffered greatly from all the glazing and had an average of 4087 lux.
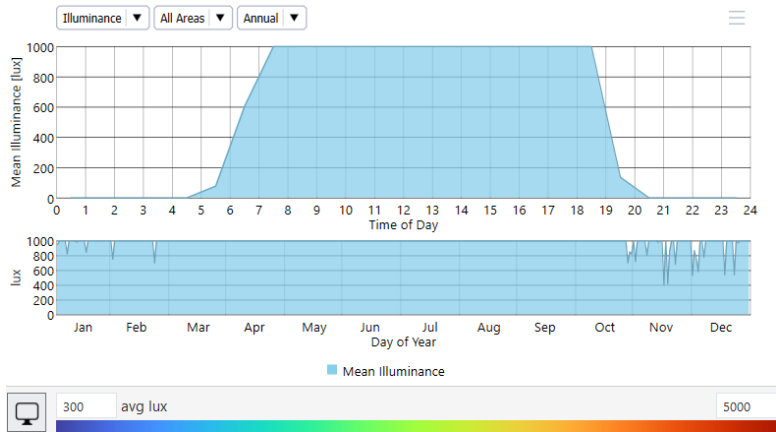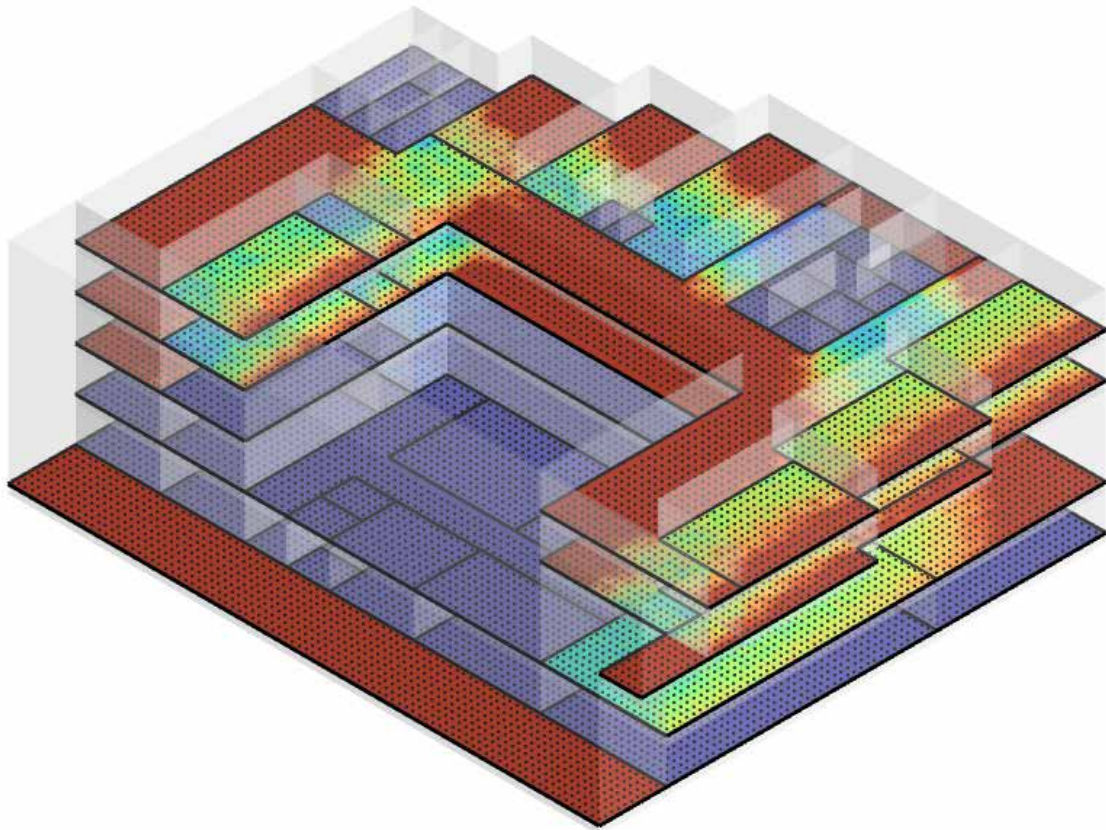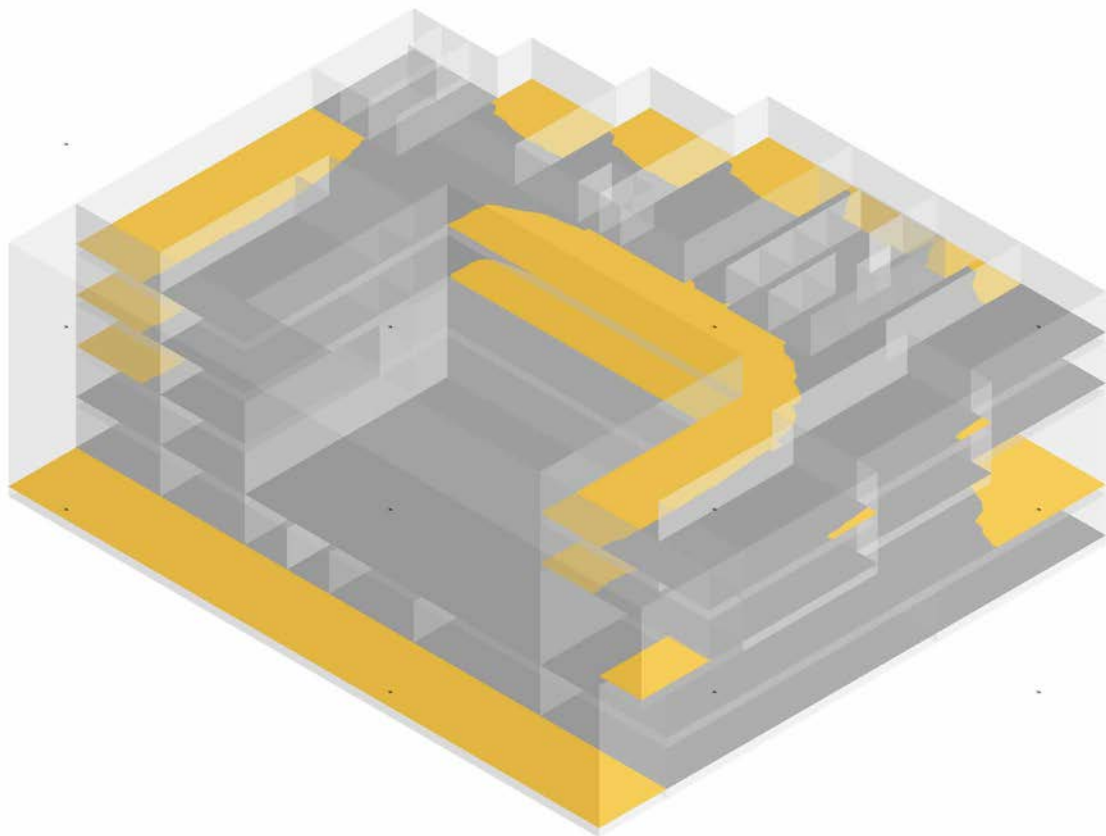

Mean Illuminance - Final

The new iteration has an average of 292 lux. This average is true for over 75% of the occupied area, which in theory would award 3pts in LEED.
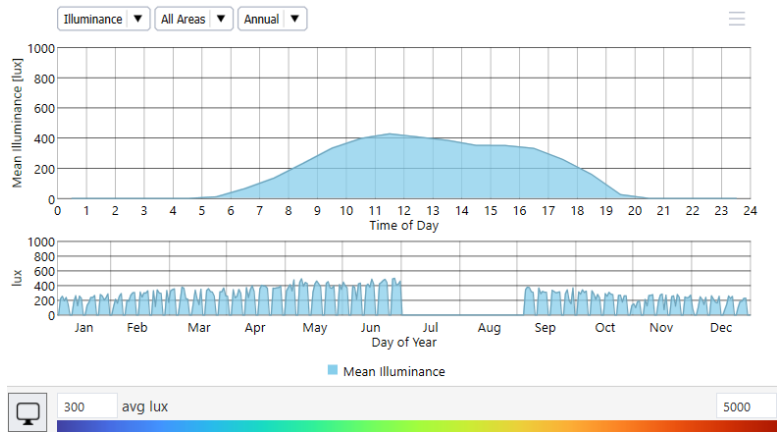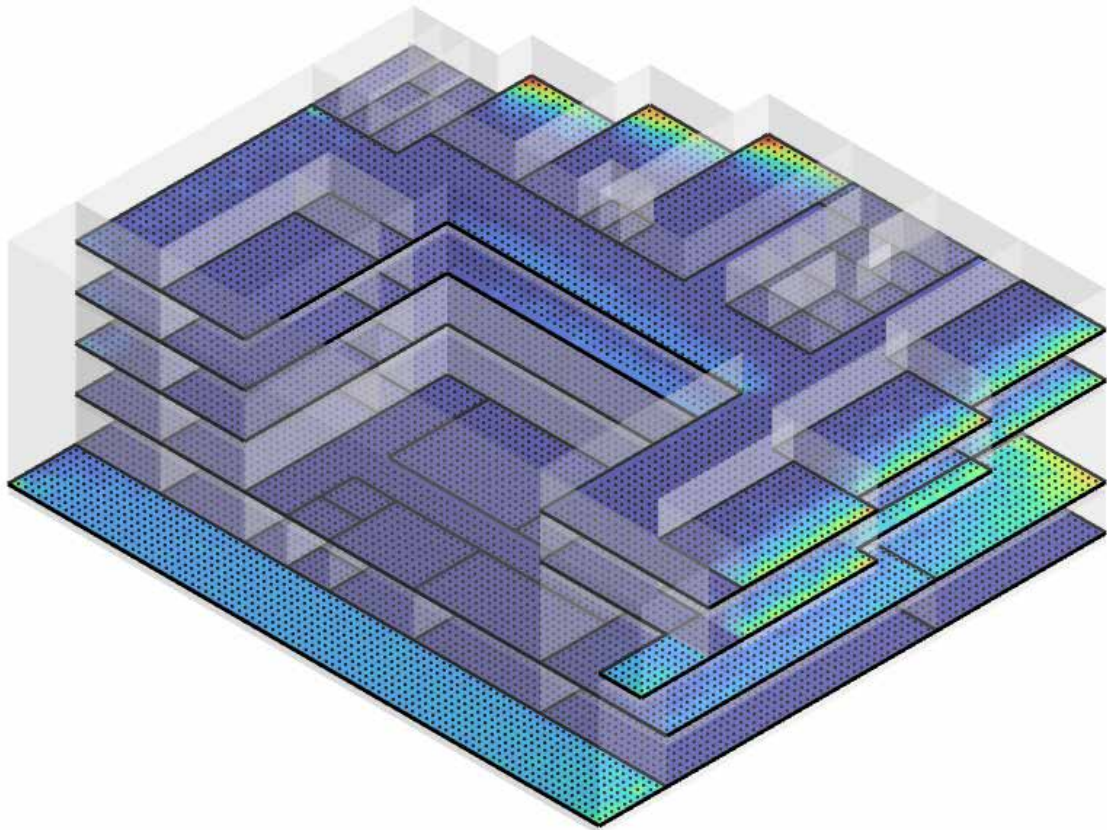
Overlit Sunlight Exposure - Baseline

The baseline had 24.6% of its areas overlit. This is due to the large floor-to-ceiling conventional glazing in the classrooms and corridors.
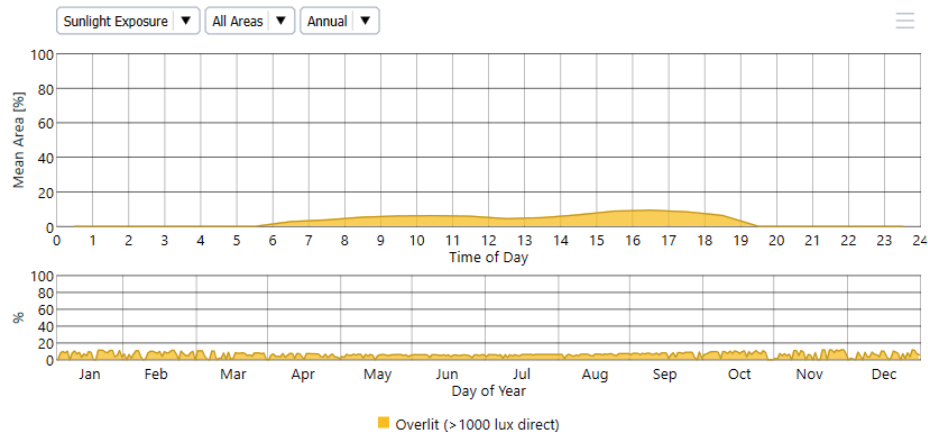
Overlit Sunlight Exposure - Final

The simulation here does not take into account the shadows cast by the stairs or the fabric panels in the front vestibule. The simulation here does not take into account the shadows cast by the stairs or the fabric panels in the front vestibule. The new iteration has only 5.3% of its areas overlit.
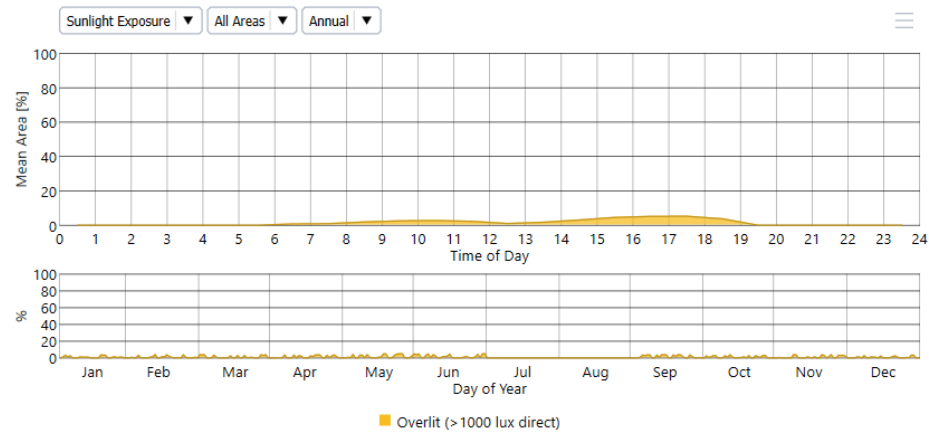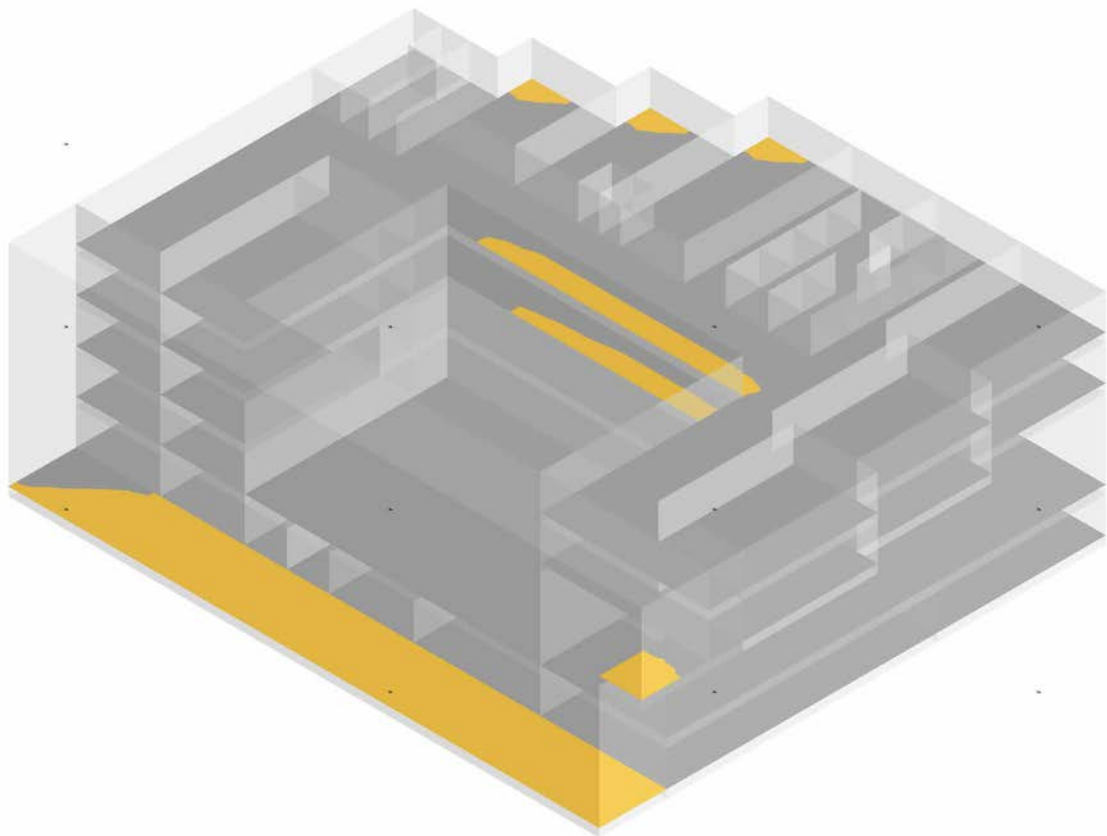
UPHAMS' CORNER LIBRARY

Uphams' Corner Library

A community-oriented library in Boston, MA

The Uphams' Corner library proposes a community-oriented library in Boston, MA which is situated next to the Dorchester North Burying Ground.

The library's unusual roof, whose form comes from that of an open book, propositions that the library of today must be 'Instagrammable' - it must advertise itself as a physical asset, and place on display the offerings and amenities it has as a makerspace in addition to being a place for storing books.

The library mitigates public and private space by negotiating the collective experience of the city and the meditative experience of the individual.

Year	Individual work	Location
2023	Andrea Wan	Pittsburgh, PA

https://wanandrea.blogspot.com/

Eiusmod tempor incididunt

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

PROGRAM

Program and Massing

The library takes on the unique challenge of negotiating between public and private space to allow both the collective experience of the city and the meditative experience of the cemetery to come through.

The makerspace is placed at the entrance in a public display of the amenities that the library has to offer. Bookshelves are splayed as in the pages of an open book, welcoming people in. The second floor has private offices and study spaces, and a view to the cemetery trees.

Software

Rhinoceros 3D, Photoshop, Illustrator, Maya, V-Ray

A Library for Everyone

The library celebrates the context which it is in by offering views to both the street and the cemetery. The environmental sustainability goals of these design decisions are negotiated through the use of a robust roof system, which has formal and aesthetic significance, but also serves the function of providing shade and cooling, to improve both lighting and thermal conditions of the building.
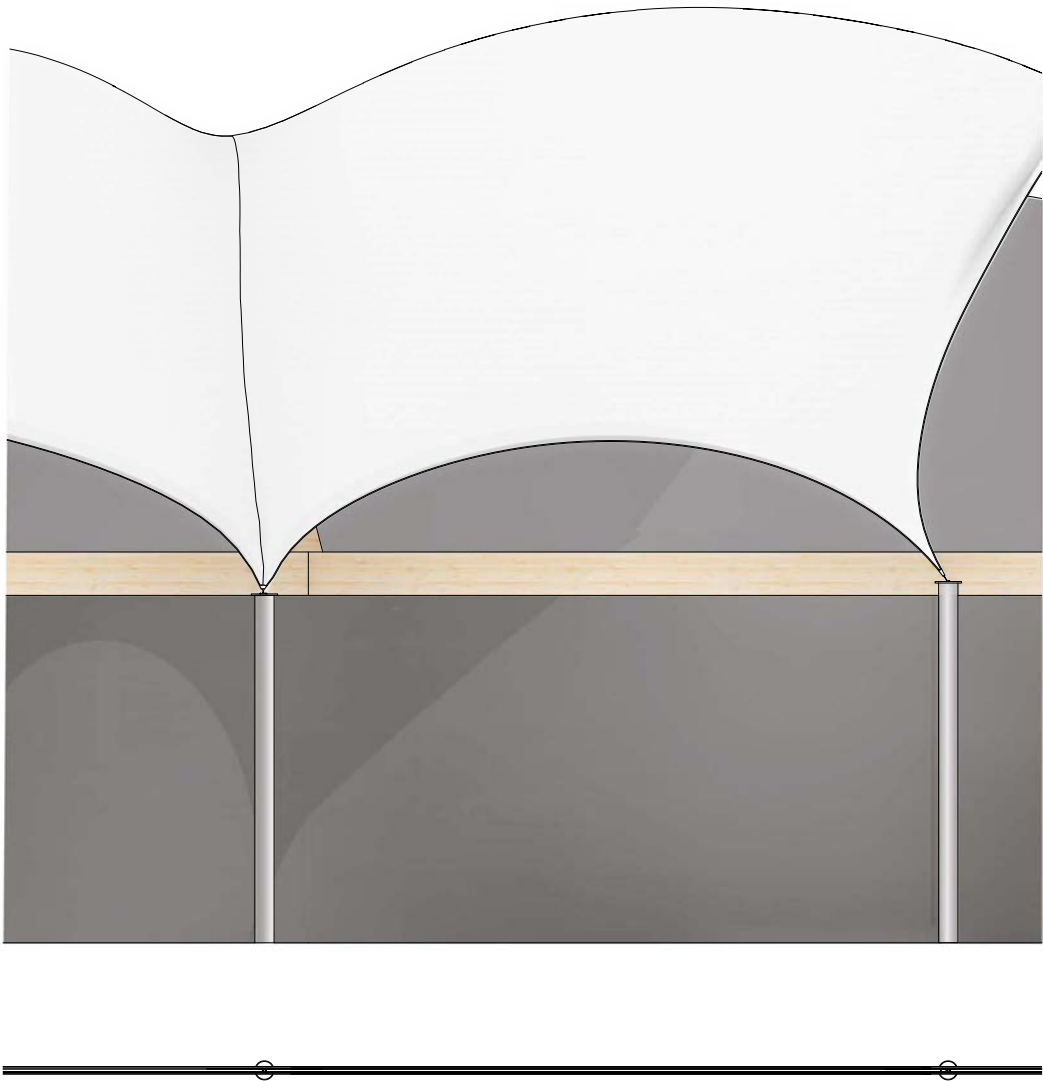
The first floor is more street-facing, whereas the second floor includes a balcony space where one can be among the canopy of the trees.
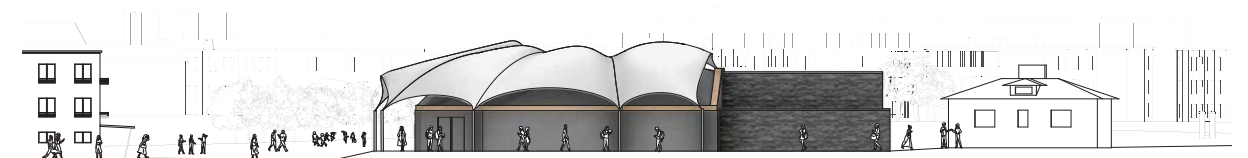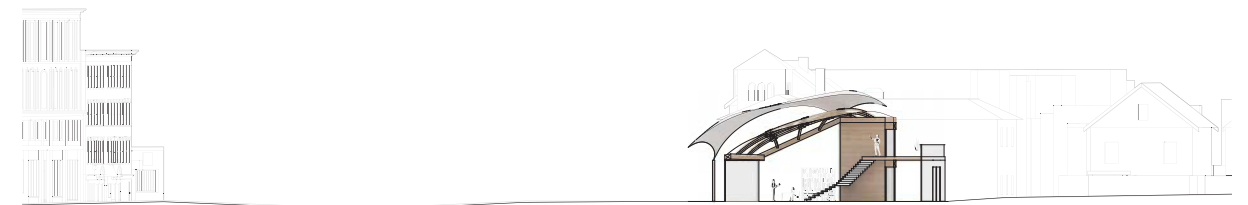
The glazed facade offers transparency into the main parts of the library, while the slate siding works in dialogue with the cemetery behind and offers needed privacy into the children's area.

Envelope Strategies

The library emphasises transparency of knowledge and access of its services through materiality. The glazing, the PTFE roof, the thinness of the steel columns which create the otherworldly effect of the floating roof, all contribute to the welcoming feeling that the library embodies.

Details of Construction

In order to achieve the effect of the roof, an innovative mass timber design is proposed. The beams are regularized to allow glazing panels to be installed within the grid. A series of steel columns are utilised in conjunction with a custom anchoring detail to allow the PTFE roof to stretch over a steel skeleton, much like an umbrella.

A detailed look at the glazing.
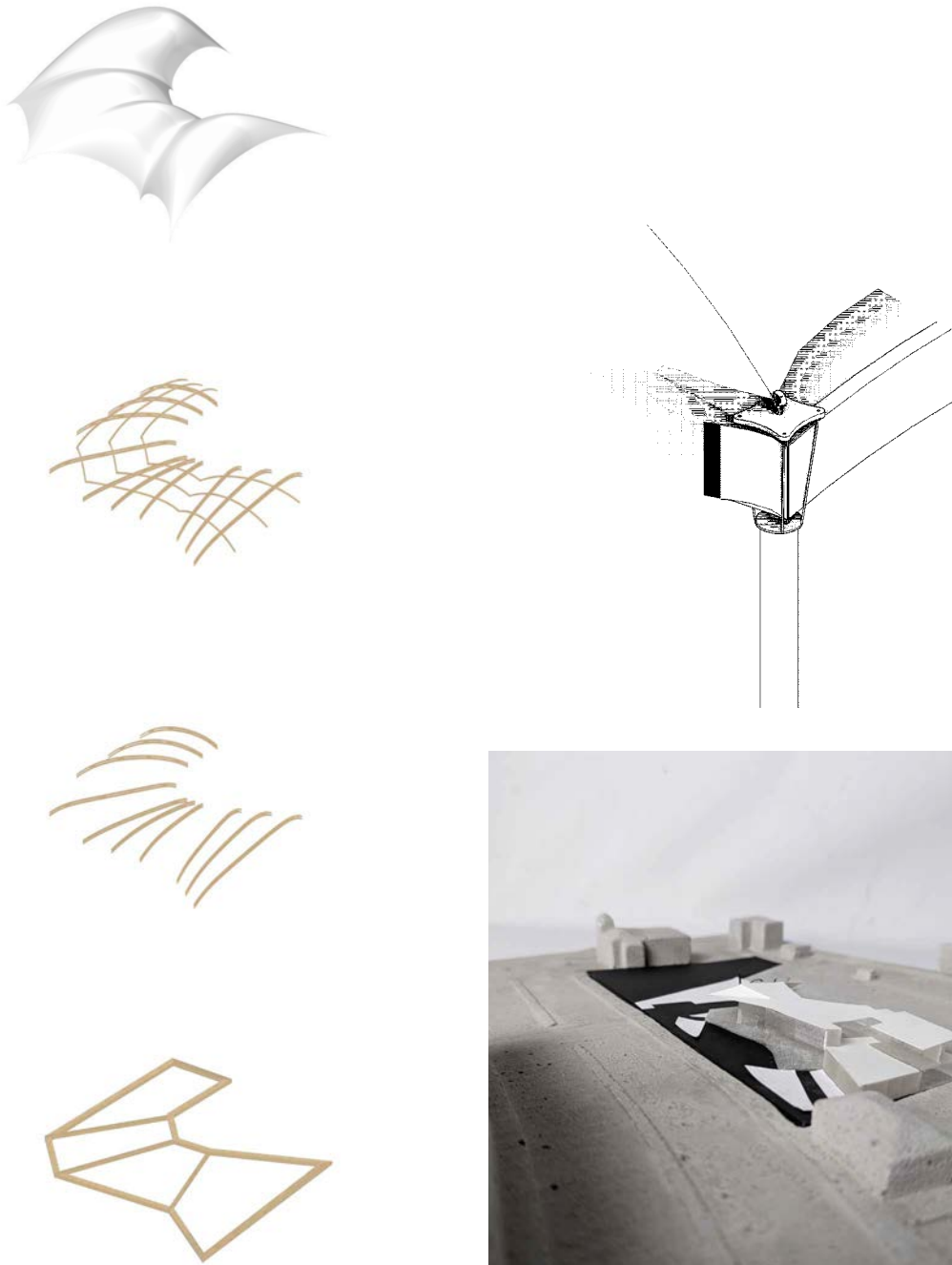
The various layers of the roof are shown.

The detail allows the idea of thinness and transparency to be maintained.

Building Interior

The building design allows for two entrances (one from each side), as well as outdoor buffer space where pedestrians can look into the library, or take photos in front of it as they wish. By clustering the service spaces together, we are able to create an open plan, and lay the bookshelves in a way that directs the circulation between adult, teen, and children's spaces.

The childrens' space (in the bottom right) is the most private, but allows easy access and ample light from the cemetery side.

Building Performance

One of the main challenges in a building which is glazed on more than one front is the problem of sustainability. A comparison of the baseline simulation, which merely offers a glazed roof and a greenhouse-like condition, and the final, where a robust PTFE roof system is introduced, shows how form can be functional too.
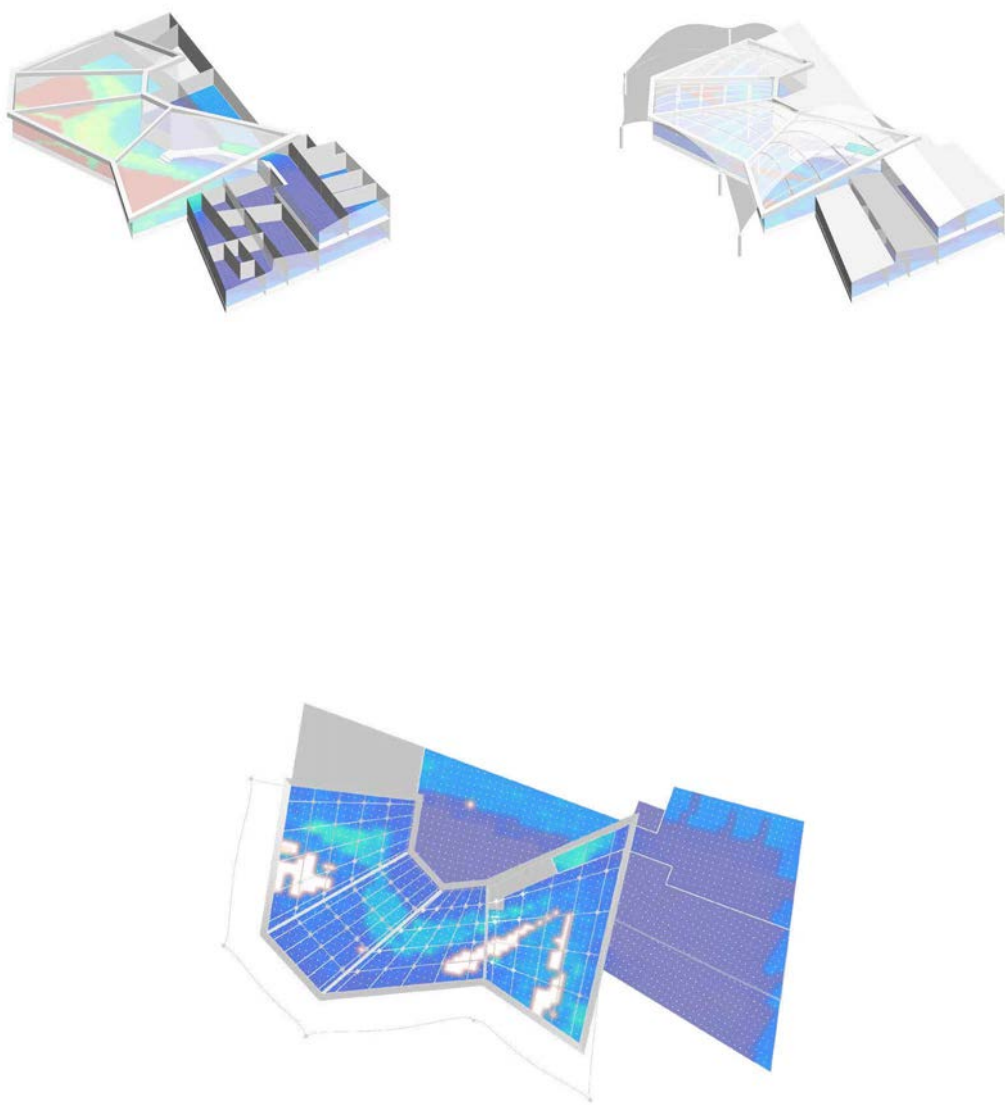
The final iteration of the roof assembly does not exceed more than 500 lux during daytime, which is preferable for library settings.

https://wanandrea.blogspot.com/

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Pittsburgh Steps

Architecture Interface:
Interface Architecture

The studio explored the ambiguities of
architectural tectonics as manifested by the
trending culture of big data and the increasingly
quantifiable universe.

Through collaboration with the Garden Club of
Allegheny County, we studied the city steps of
Pittsburgh, which have a long and storied history
as crucial infrastructure for both steelworkers
and residents across neighborhoods, but have
now fallen into disrepair and are in need of
government funding.

What mediums of representation are effective
for community outreach? How does data
representation affect our message?

| Year	Group members	Location
2022	Andrea Wan, I Lok U	Pittsburgh, PA

Data and (mis)Representation

The interactions between the user and designer exist as a feedback loop, wherein the medium of transfer is data. Initial design stages are informed by data regarding existing conditions of people and place. Data analyses provide a useful means of abstraction which allows for assumptions to be made. These abstractions retain only the essence of the experience and do not actually exist; real conditions may vary.

'Binning' by colour to show disparity between government and satellite data catalouging trees in the Fineview neighbourhood in Pittsburgh

Representation and Advocacy

Virtual reality can be used to bring the conditions of reality to an audience in a different time and place. The model created for this venture does not represent a specific set of steps, but rather represents each of the three step typologies determined based on categorisation of over 600 photos of the steps themselves. By encoding plants and steps data as an immersive experience, can we inspire people to care about the steps?
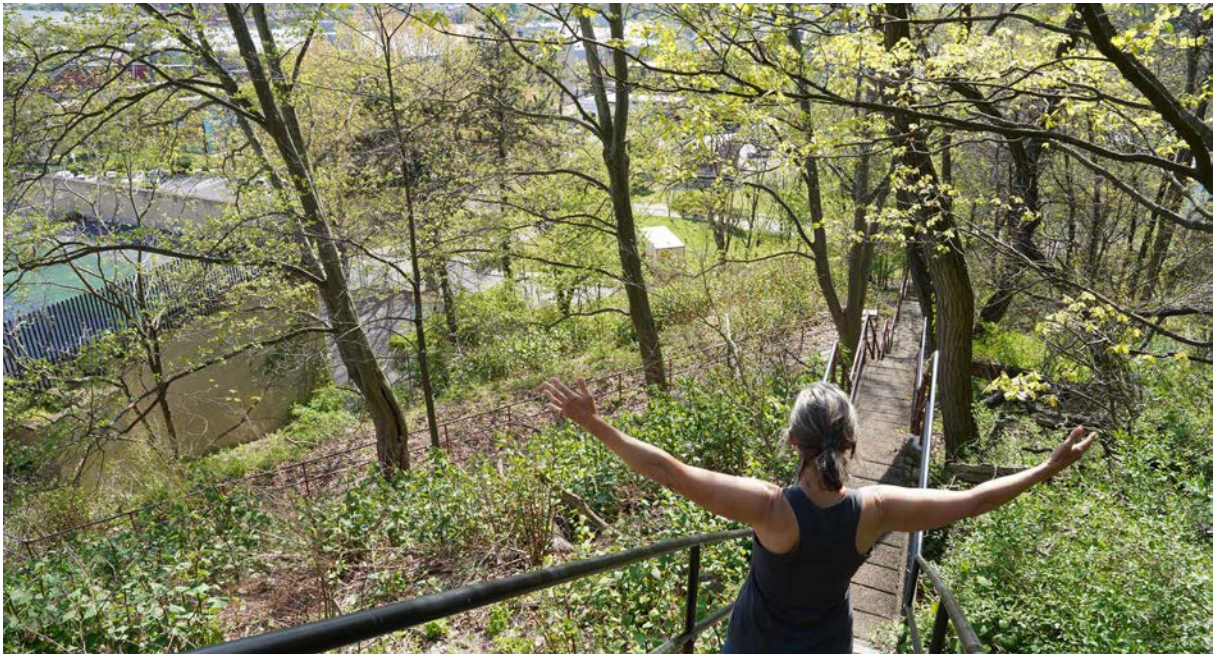
For people who have never experienced the steps before, this VR experience can inspire care and interest in checking out the real thing.

EXHIBITION

Final Exhibition

As life goes on, certain moments in history are lost to time, leaving behind monuments to narratives of past life. The final exhibition aimed to bring new life to Pittsburgh steps through storytelling and advocacy.

We told the story of the steps, drawn from memories of the old and imaginations of the young, looking towards an imagined future where the steps may once again reestablish the steps as the genius loci of the community.

Software

Rhino, SketchUp, Maya, Enscape, Twinmotion

Immersive Experience

When the exhibition was happening, it was still in the early months of spring and we had just come out of the snow. However, what I found most beautiful about the city steps was the way in which they allowed you to walk through the clusters of trees that divided one neighborhood from the next. I chose to focus on recreating and embodying this effect in a VR experience.

One of the garden club members tries out the VR experience. We collaborated with them in terms of fieldwork, so it was exciting for all of us to make the evaluation of how "true" the VR experience was to our own on the real steps!

THE WAY OF WATER

# The Way of Water

A Lanna kitchen in Chiang Mai, Thailand

This reimagined Lanna compound, situated on a formerly flood-prone site that has been infilled, responds to the area's changing dynamics. It addresses river pollution challenges by blending Lanna village wisdom with new technologies, and serves as a hub where people participate in agricultural activities and share cultural practices, adapting traditional knowledge to contemporary conditions. By focusing on culinary traditions rooted in the river-based ecology, "The Way of Water" aims to raise awareness and unite the fragmented community of locals and tourists, fostering a new culture that honors the past while embracing the future.

Year	Group members	Location
2024	Andrea Wan	Chiang Mai, Thailand

https://wanandrea.blogspot.com/

SITE STUDY

Chiang Mai's Way of Water

Early legacies of Chiang Mai highlight the river not only as a source of livelihood, but a spiritual and culturally meaningful lifeline. How do these rituals and traditions persist today? Have they changed?

The first series of explorations centered around this question, seeking to understand where people settled in the past, where they live now, and how their relationship with the river may have changed since the beginning of settlement in the area.
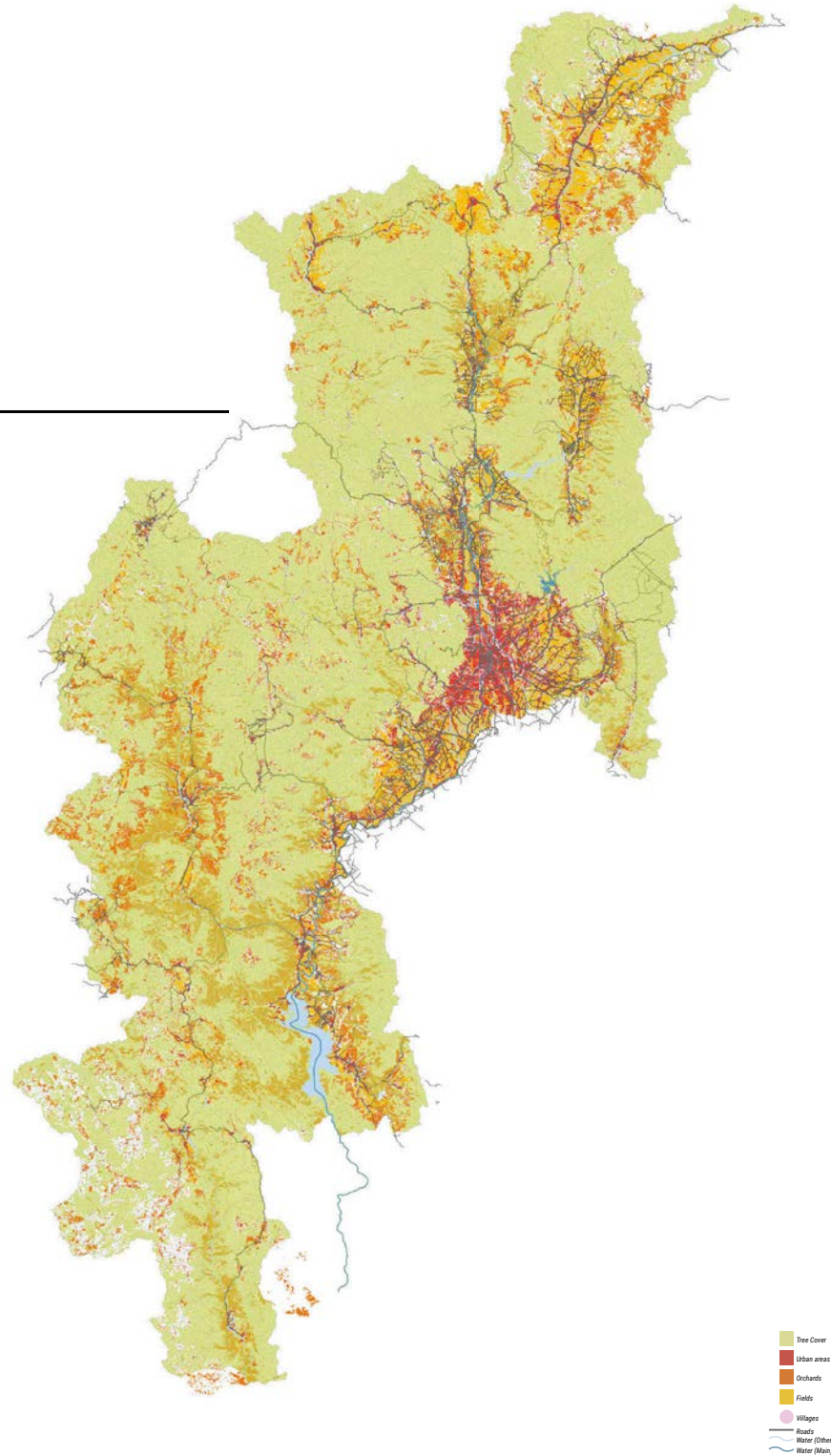
Software

3ds Max, ArcGIS Pro, CityEngine, Rhinoceros 3D, Photoshop, Illustrator, V-Ray, Enscape

The Control of Water

The villages studied still follow some variation of the small-scale muang fai irrigation system. Rice paddies rely on the flow of water from the Kuang River, which is traditionally redirected through the construction of weirs.

Since the 1930s, the Royal Irrigation Department has begun to take over irrigation control projects Local governments have since co-operated with villagers to replace traditional weirs with concrete construction, with the caveat that the control of water now lies in the hands of the government.


There have been anecdotes from villages which described having to pay for water usage for half of the year, as their farming subsidies only cover water usage for half of the time.
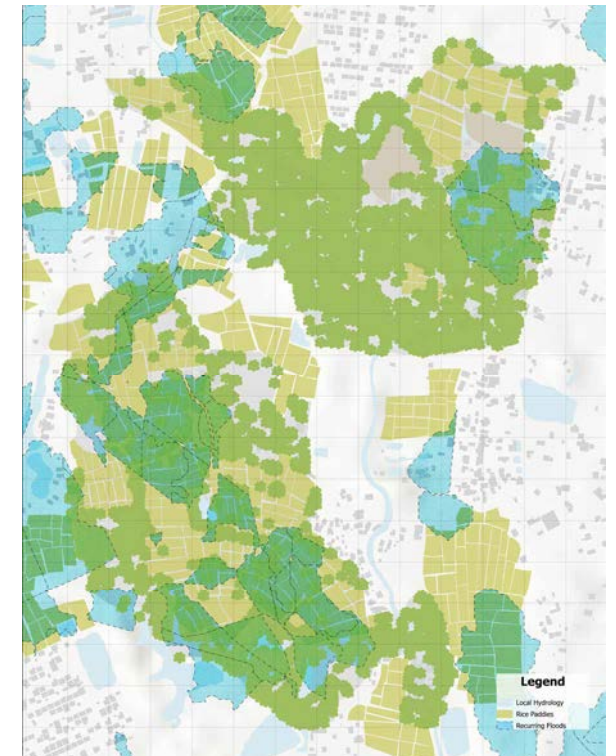
Although newer concrete weirs may have mechanical controls and shutoffs, older weirs are often constructed seasonally and may naturally fall into disrepair or cause inadvertent flooding.

Lanna Wisdom

The project's circular ecosystem integrates Lanna farming wisdom with modern techniques. Rice paddies double as habitats for farmed crabs, crucial for local dishes like crab paste. A banana orchard provides feed for crabs and leaves for cooking. Fish are raised in the pond, adapting to river pollution challenges. Chickens contribute fertilizer for the gardens, which supply fresh ingredients to the kitchen and restaurant. This system not only preserves culinary traditions but also demonstrates sustainable farming practices.
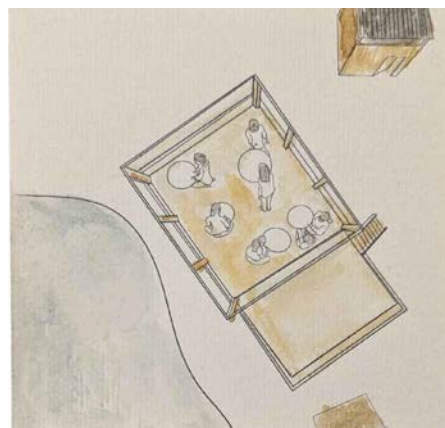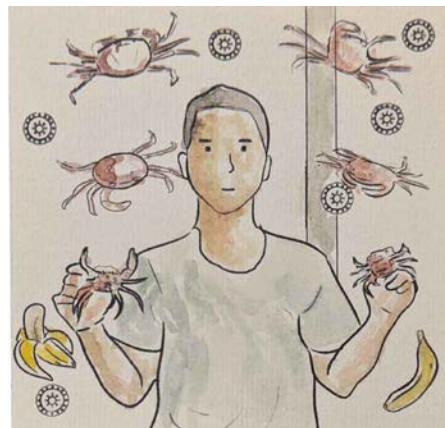
Old and New: Changes at the building and urban scale

As nearby housing developments expand with the ring roads, new gated housing developments create a fragmented landscape where westernised tourist communities and locals do not interact. Although new construction typically uses steel as opposed to the traditional teak wood, study of these details reveals that there are more similarities than differences. How can design be used to mitigate the delicate tension between these two groups?
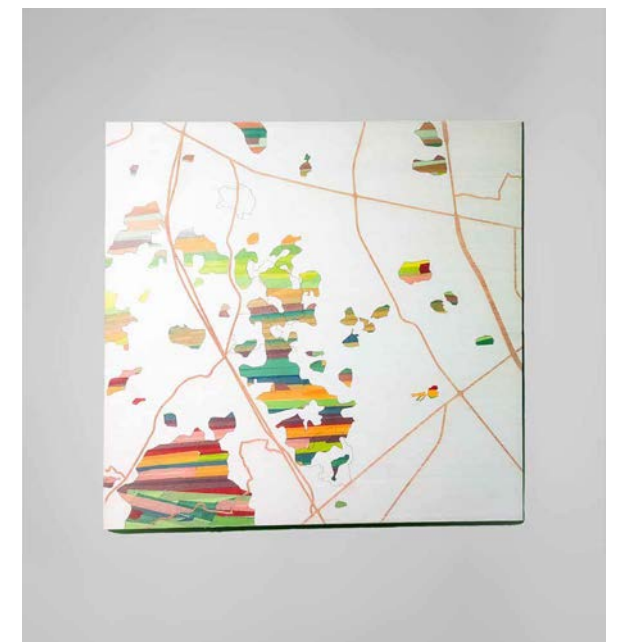
The models of the maps are a way of bringing the GIS data into the physical world through color, texture, and materiality. The map on the left shows the scale of a study site, including the relationsip between gated housing developments (top left), rice paddies (in various shades of green), the river (in blue), and known roads (in grey). The map on the right shows land use which is classified as farm land at the scale of the villages and the ring roads.
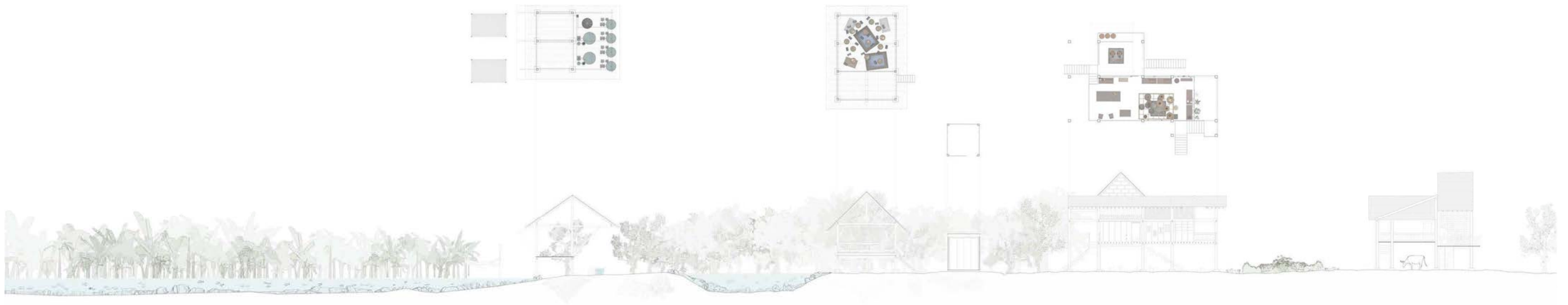
Program

Banana orchard, fishery, restaurant,
toilet, kitchen, vegetable garden,
chicken coop, cow shed, granary

Year
2024

Individual work
Andrea Wan

Location
Chiang Mai, Thailand

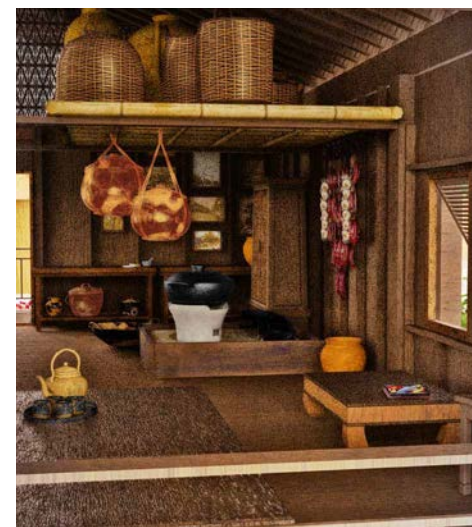## Kitchen

The kitchen is the heart of the project, where food is prepared and stored, and animals roam around.

Year
2024

Individual work
Andrea Wan

Software
3ds Max, Maya,
Rhinoceros 3D,
SketchUp, Arnold,
V-Ray, Photoshop,
Illustrator, Lightroom

COOKING

Cooking Technologies

The open-air kitchen is designed to accommodate the region's warm climate and communal cooking practices. Essential utensils include the mortar and pestle for grinding making chili pastes, and the "Taad Hai," a wooden steamer for cooking sticky rice. A charcoal stove, or "tao," is used for grilling and simmering curries. Bamboo baskets hang from the ceiling to store leftover rice, while large clay pots preserve water and fermented ingredients. Ventilated panels and a special grilling area is provided in the back.

Software

3ds Max, Maya,
Rhinoceros 3D,
SketchUp, Arnold,
V-Ray, Photoshop,
Illustrator, Lightroom

A Place to Eat

The khantoke dinner, a traditional Lanna Thai experience, combines communal dining with cultural performances. An eating pavilion situated beside water offers natural ventilation during hot months, providing comfort for diners. Guests can enjoy views of fish pond while savoring authentic northern Thai dishes served on low tables. The adjacent open space allows for traditional dance and music performances, creating an immersive cultural atmosphere for gatherings and events.
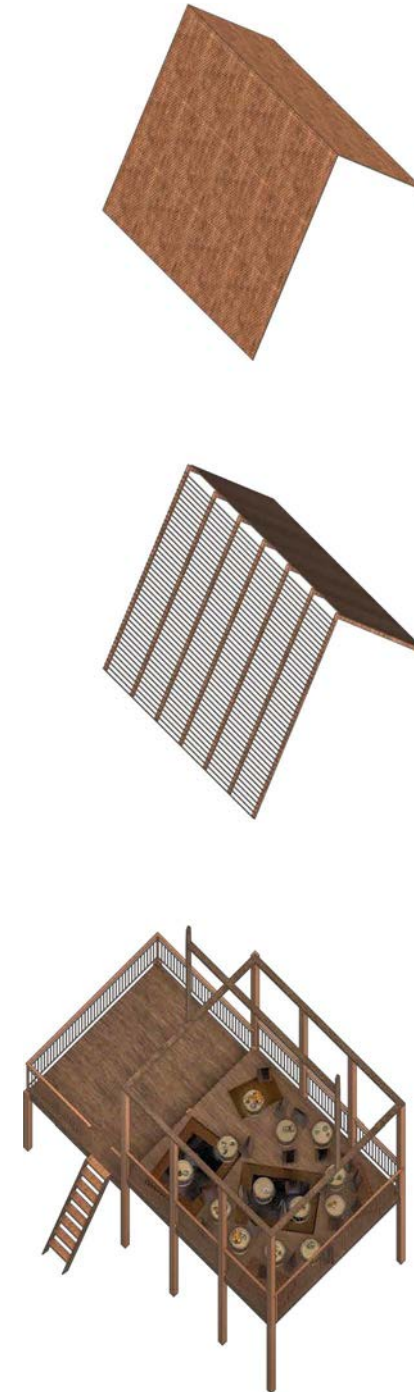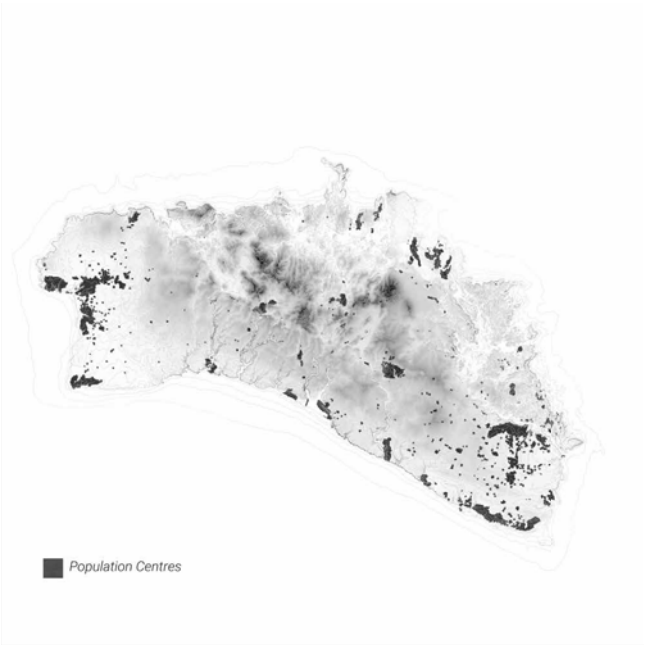
FORNELLS BIRD CONSERVANCY

FORNELLS BIRD CONSERVANCY
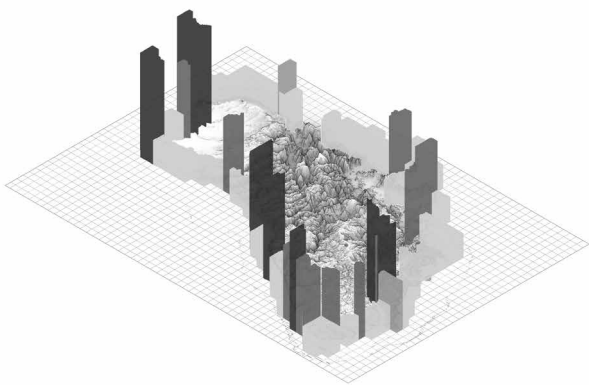Bird park and observatory on the island of Menorca, Spain

The Fornells Bird Conservancy project addresses the delicate balance between tourism and ecological preservation on Menorca's northern coast. Located in Fornells Bay, this initiative responds to the growing pressures of "last-chance tourism" that threatens the area's rich seagrass ecosystem and bird habitats. The design proposes a bird observatory, viewing tower, and seagrass laboratory that serves as both an educational facility and a symbol of conservation, featuring distinctive biomimetic forms that resemble various parts of the cormorant bird skeleton.

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Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

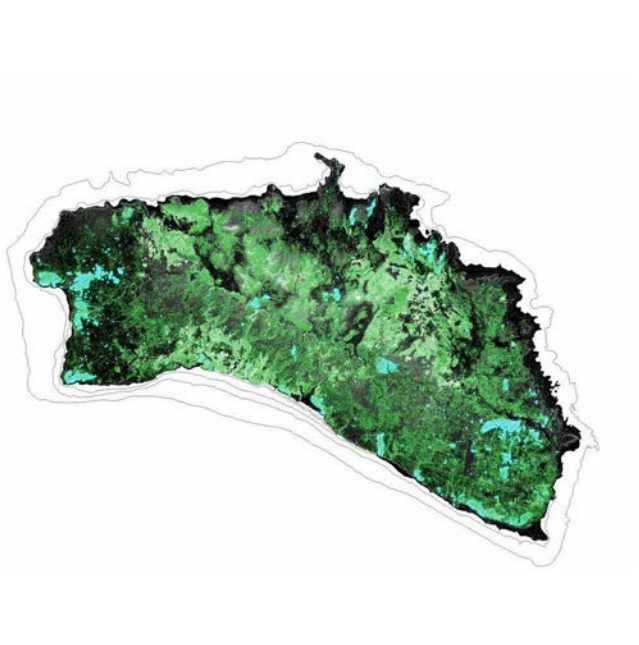| *Year*	*Individual work*	*Location*
2020	Andrea Wan	Menorca, Spain

Population Centres

Human settlements

Initial mapping shows some clustering of human settlements near the Mahon airport area, where most tourists land, and little elsewhere. The Fornells bay to the north appears largely undisturbed.
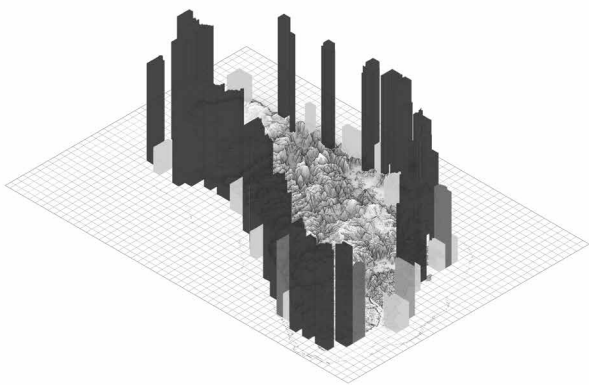

A green island

The island of Menorca is designated as a biosphere reserve by UNESCO. At first glance, LIDAR imagery suggests that it is a "green island," where vegetation is plentiful and undisturbed.


Pressures by urbanisation

Mild

Moderate

Severe

Extremely Severe

Human impact via urbanisation

Although data sources from the Spanish government suggest some mild to moderate impact from urban settlements along the coast of the island, these impacts (primarily measured by garbage collection and water quality) are not as severe as those of beach tourism.

Pressures by beach tourism

Mild

Moderate

Severe

Extremely Severe

Human impact via beach tourism

By contrast, beach tourism creates severe impacts on the ecological system along the coastline of the entire island, including areas which are not densely populated by locals.

The Case of Fornells Bay

The magenta and purple dots in the map below represent hotels and long-stay tourist rentals gathered from Google and Airbnb, respectively. When cross-referenced with data which shows the diversity of seagrass in the area, it becomes clear that the main tourist attraction is the rich ecosystem of the Fornells Bay area, which has remained largely undisturbed since the abandonment of the military site that was erected during British occupation.

Infrastructure/
Amenities

Beach

Swimming/
Diving/
Boating

Wildlife

View
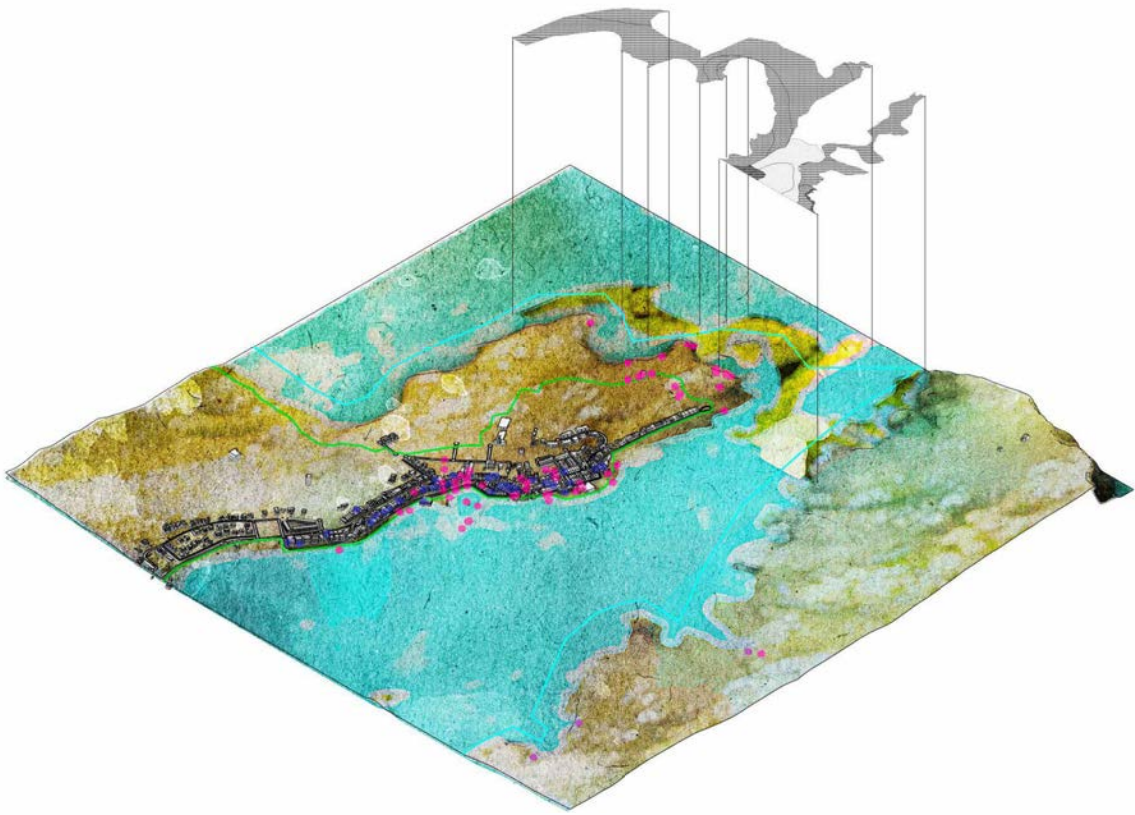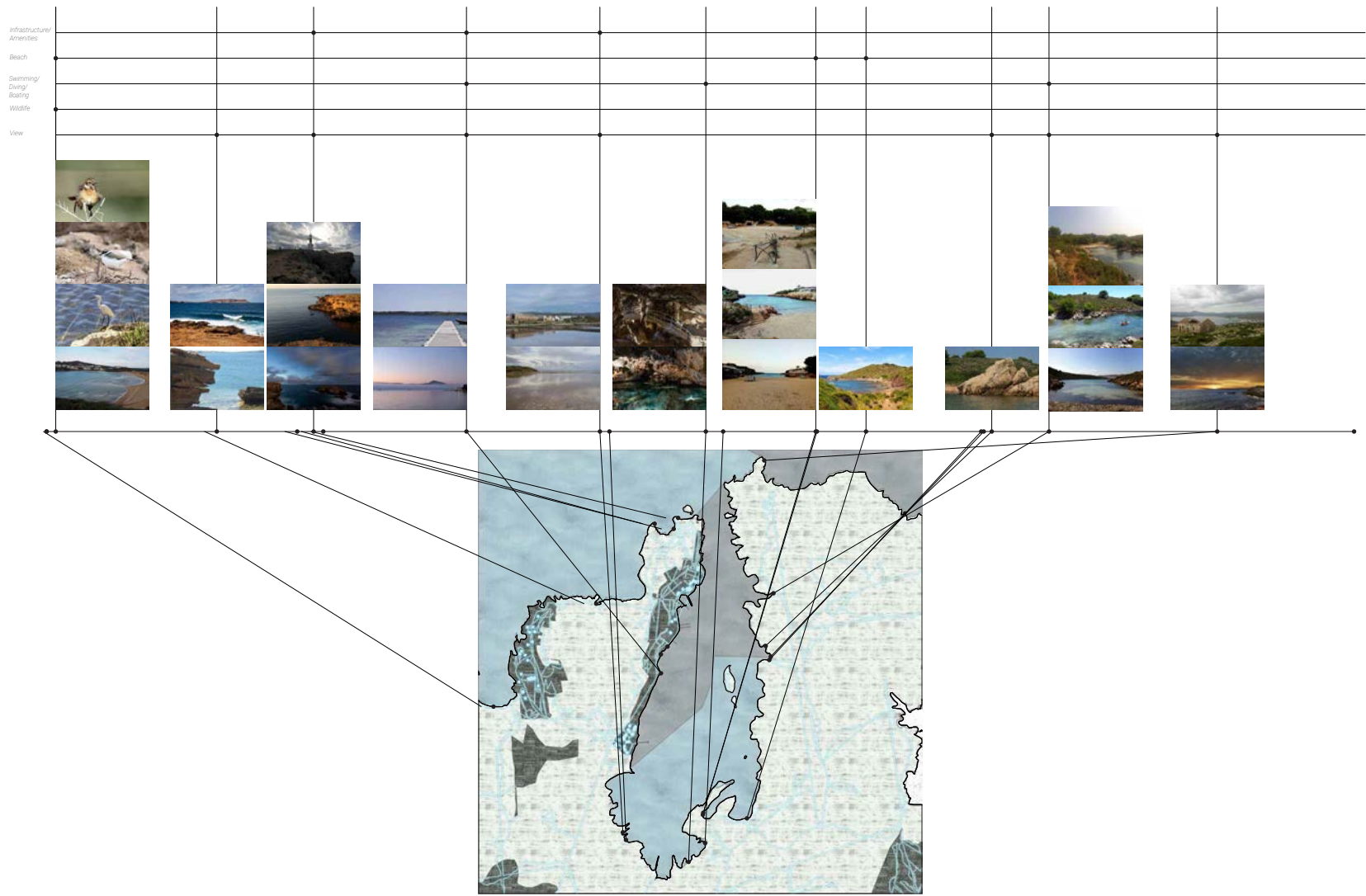
Human and Nature

The Fornells bay is a site of "last-chance tourism," with many coves and beachfront attractions that are unregulated and leave nature at risk.

| Year	Group members	Software
2024	Individual	ArcGIS Pro, Photoshop, Illustrator, Python, Instagram, Midjourney

Seagrass, Cormorants, and Biomimetic Forms

The design emerges from two critical ecological elements of Fornells Bay: seagrass meadows and cormorant populations. From these, formal components such as the seagrass shoots, bone density patterns, and spinal columns could be derived. This biological-architectural synthesis serves a dual purpose - creating an experiential journey through the anatomy of coastal ecosystems while standing as a powerful reminder of their fragility. The observatory becomes both shelter and cautionary tale, its skeletal form simultaneously celebrating and memorializing the delicate balance of Fornells Bay's marine ecology.
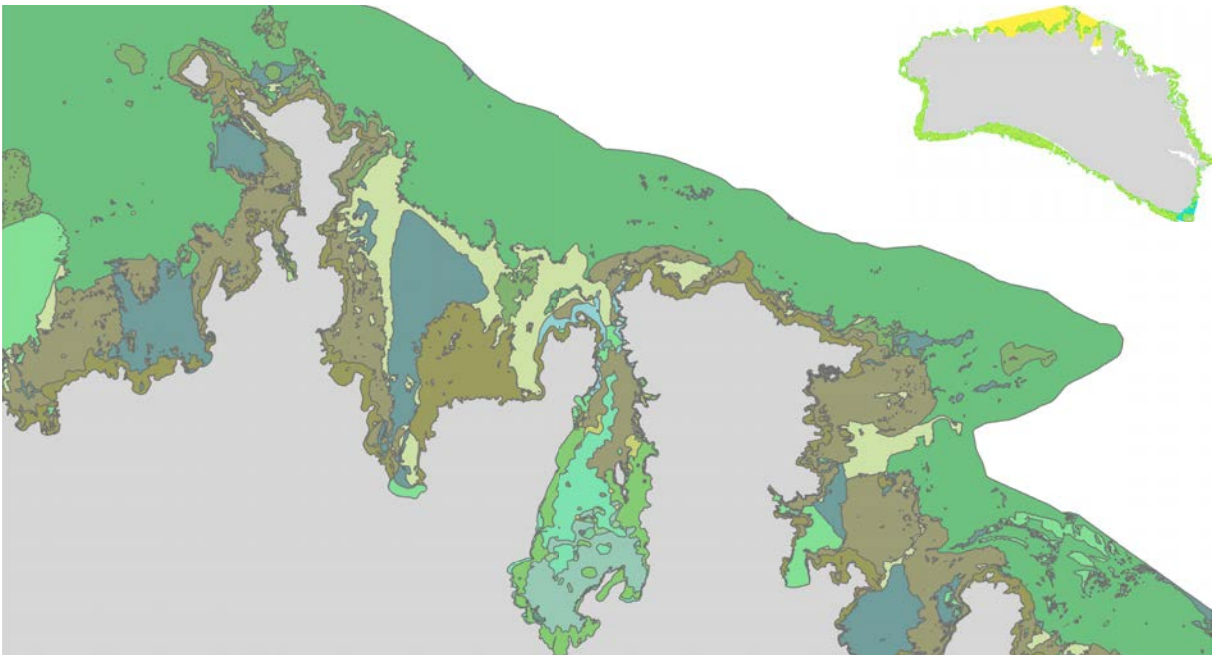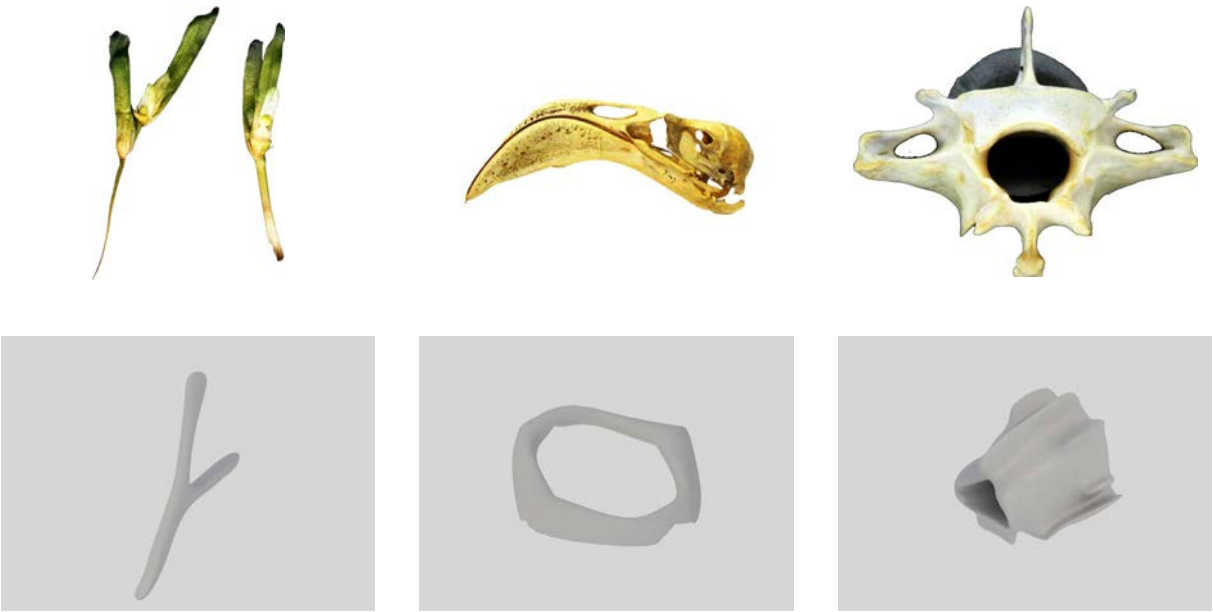
Although seagrass is present along the coast of all of Menorca, Fornells bay is unique because of the extremely high biodiversity its waters have. Some species of seagrass are rare and only found in this region.

Ecologies of Co-Creation

The viewing tower serves a dual ecological purpose, providing both observation opportunities and nesting habitats for cormorants. The structure's exoskeleton allows seagrass nests to be suspended. After the breeding season (March to July), the fallen seagrass is collected by humans, creating a cyclical relationship. This design responds to the loss of natural nesting sites due to beach tourism, offering an alternative habitat that supports the cormorants' breeding patterns while managing human desire to view the birds.
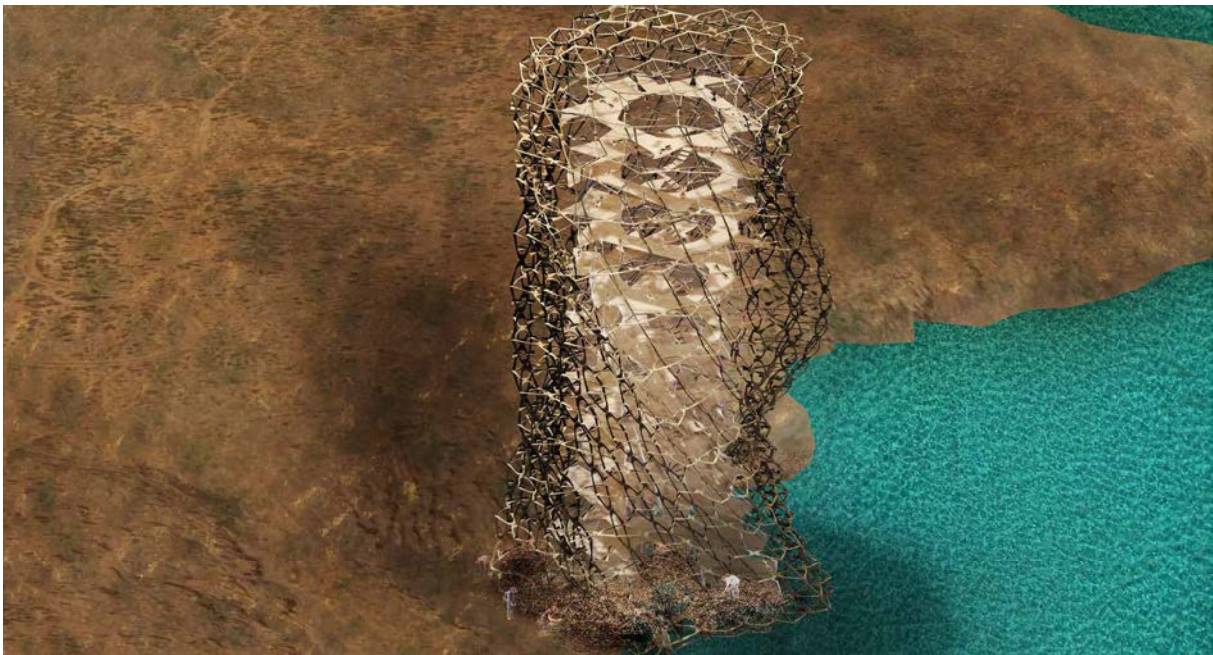
Above: cormorants nesting on the tower; Below: humans collecting the dried seagrass

## VIEWING TOWER
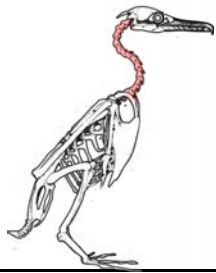
Exoskeleton as Envelope

The viewing tower's design translates cervical vertebrae into architectural form, with each vertebra becoming a distinct viewing platform. The exoskeleton creates a trellis upon which the cormorant can nest. This biomimetic approach allows the tower to function both as shelter and observation point.
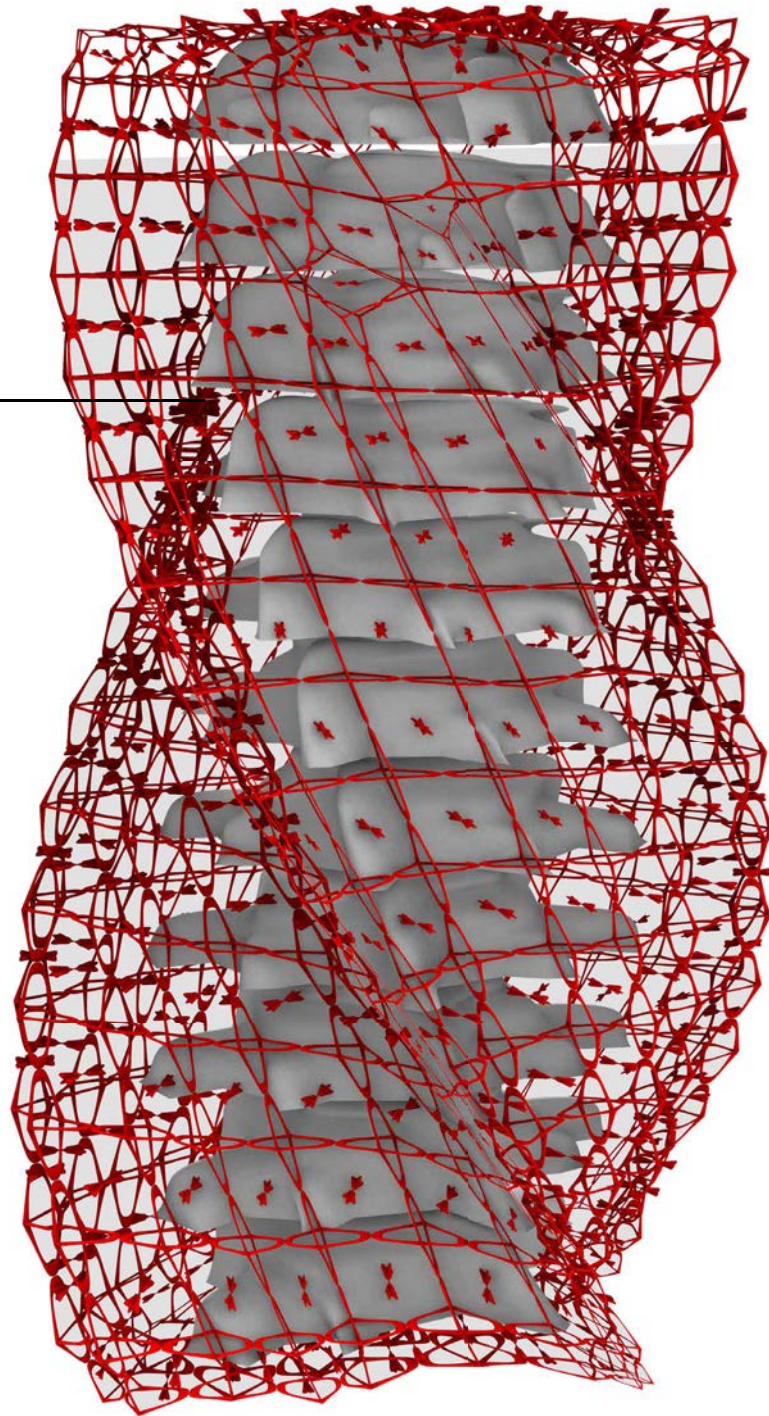
Software

Autodesk Maya, Blender, Photoshop, Illustrator, Premiere Pro, InDesign

Formal Explorations

In order to arrive at the final form, a series of formal explorations using parametric and computational design methods in Rhino Grasshopper, Maya, and Blender were undertaken. Should the spine be circulation?   How might views be obstructed or unobstructed?
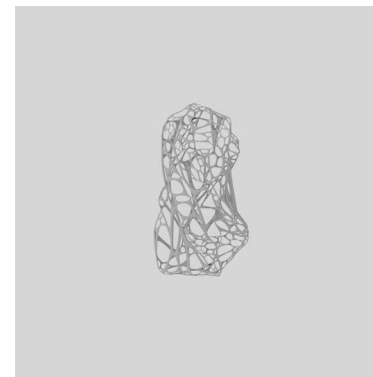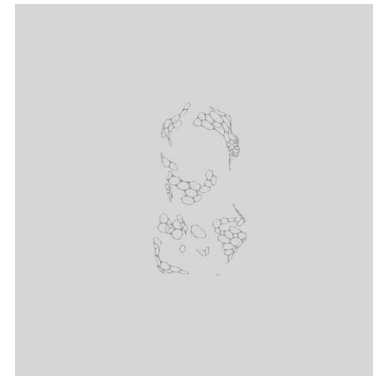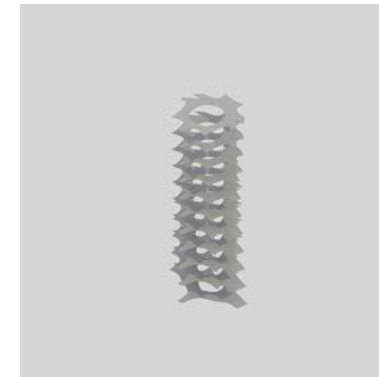
RESEARCH LAB

A Framed View in the Ribcage

The central space in the seagrass laboratory creates a dynamic interplay between architecture and landscape, where seagrass-inspired structural supports frame strategic views of Fornells Bay. The space's central platform offers a vista of the historic military tower, while vertical elements inspired by seagrass shoots provide both structural support and visual rhythm. These biomimetic columns guide the eye through the space, connecting visitors to both the cultural heritage and natural environment of the site.
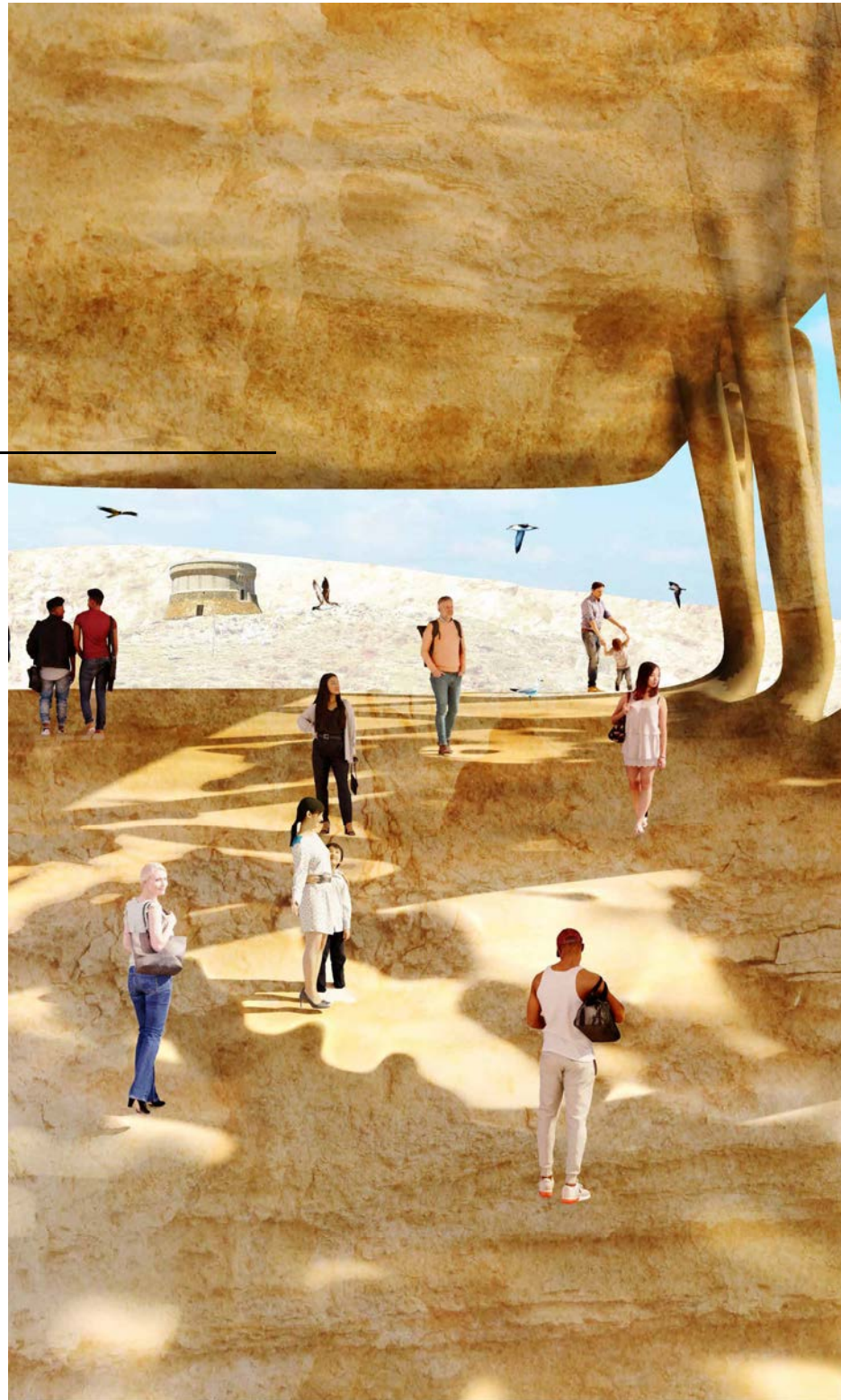
Software

Autodesk Maya,
Rhinoceros 3D,
Photoshop, Illustrator,
Premiere Pro,
InDesign

Program

As shown in the conceptual section, the seagrass laboratory is conducted on the lower level, where a set of staircases can be used for direct access to the ocean. On the upper level is an museum space, where the latest research findings can be shared with the public.
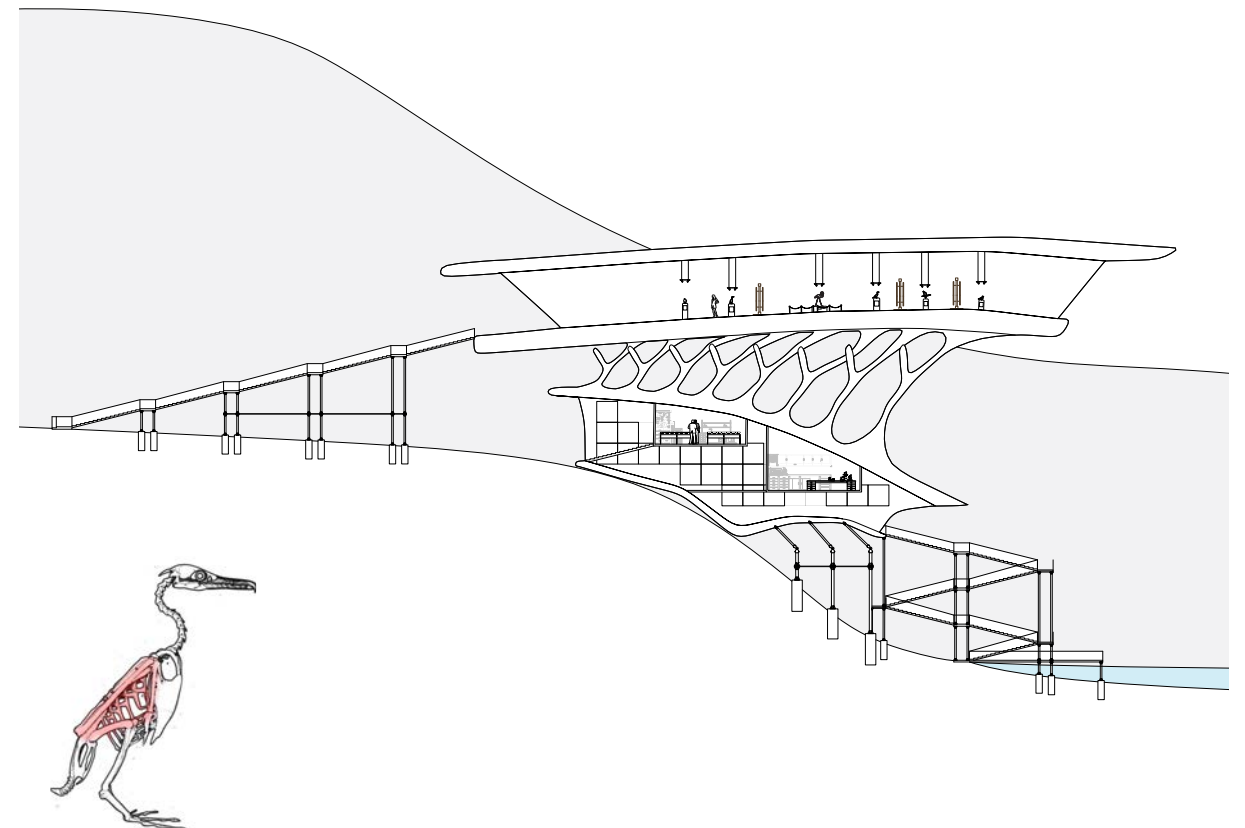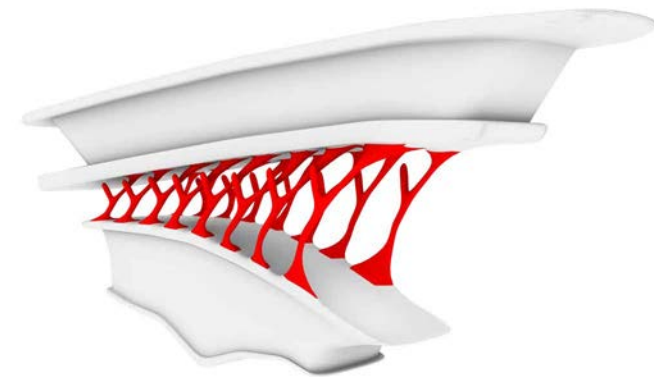
The form of the seagrass laboratory is derived from both the seagrass shoots and the ribcage of the cormorant bird.

VISITOR CENTRE
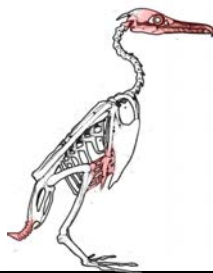
Occupying the Spine

The visitor centre design serves both conservation and educational purposes, with its distinctive skeletal form echoing the beak of the bird. The upper vertebral structures provide protected nesting spaces for the rare Scopoli's shearwaters. These nesting areas have live camera feeds which are shown on screens in the floor below, which humans occupy. Visitors can also observe the diving displays of both bird species through the panoramic windows that extends toward the water.
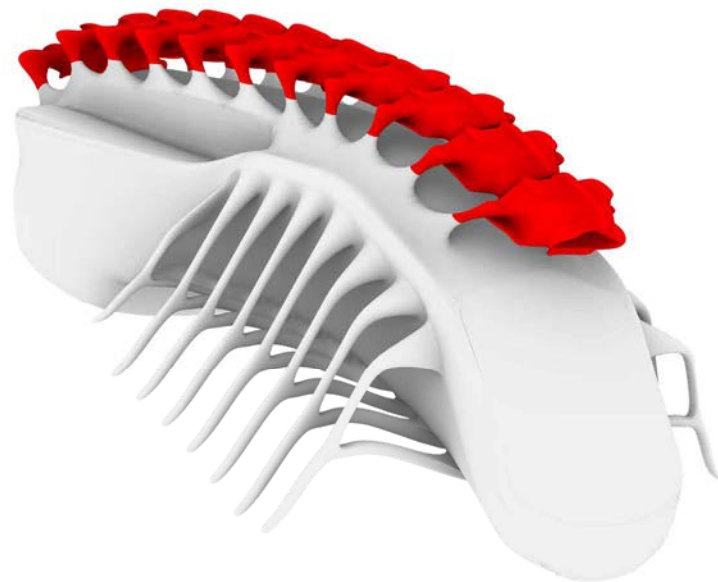
Software

Autodesk Maya,
Rhinoceros 3D,
Photoshop, Illustrator,
Premiere Pro,
InDesign

Design Morphology

A series of formal morphologies was explored before arriving at the final form. At the onset, there is a desire for viewing platforms at a higher altitude, and the perception that the beak is dipping into the water. Structural elements in the shape of the seagrass shooots are introduced to hold the beak up without touching the water, and to maintain an aesthetic consistency across buildings. Finally, the nesting area is introduced.