



KRUNALI SHAH PORTFOLIO

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Portfolio

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About Me

My name is Krunali Shah. I am a recent graduate of the Master in Space Architecture Program at the University of Houston. I have a background in Architecture and User Experience from the New Jersey Institute of Technology.

I have a passion for design and creating spaces that cater to humans. Whether in outer space or on Earth, I want to enhance the human experience.

I have experience in many space projects including developing a lunar base where I designed a multi-module lunar habitat. I was involved in integrating many different systems to show the development of the concept of operations of the base.

I also worked in a team to develop an inflatable communication tower for the lunar surface. This was part of the NASA Big Ideas challenge, and my team and I designed the tower, developed a sequence for inflation, and verified and tested the design. I was directly in charge of designing the structure and working on the tower's concept of operations.

My architecture background allows me to look at projects from a design perspective. My previous professional experience includes project coordination, interior architectural design, construction documentation, and construction management. These skills allowed me to learn the balance of design, project management, client relations, and teamwork.

Design Attributes to Support Astronaut's Psychological Well Being in Long Duration Missions

Background

Masters Thesis Fall 2024

Skills

Habitation Design
Space Systems
Human Performance
Psychological Research
Analog Mission Research
Human Interaction
Long Duration Missions

Programs

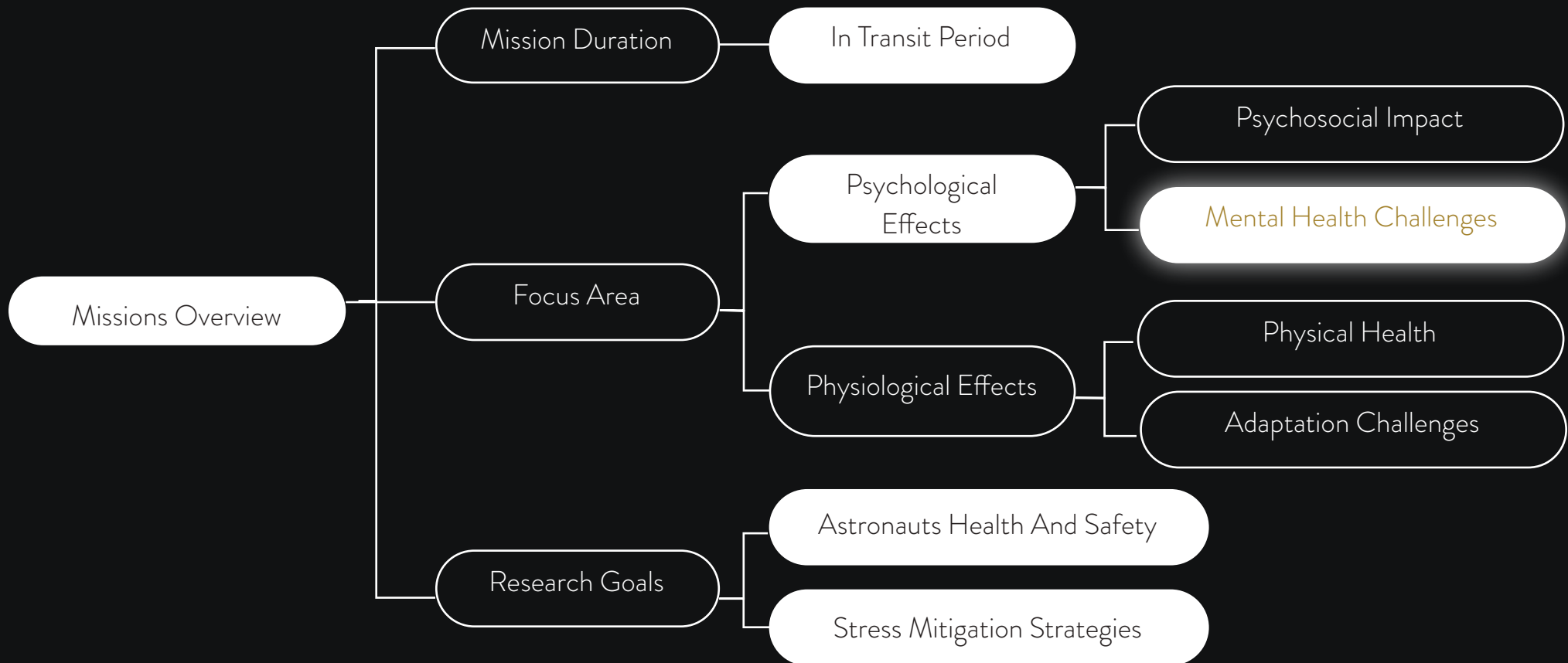
Rhino
Revit
Unreal Engine 5
Photoshop
Illustrator

Description

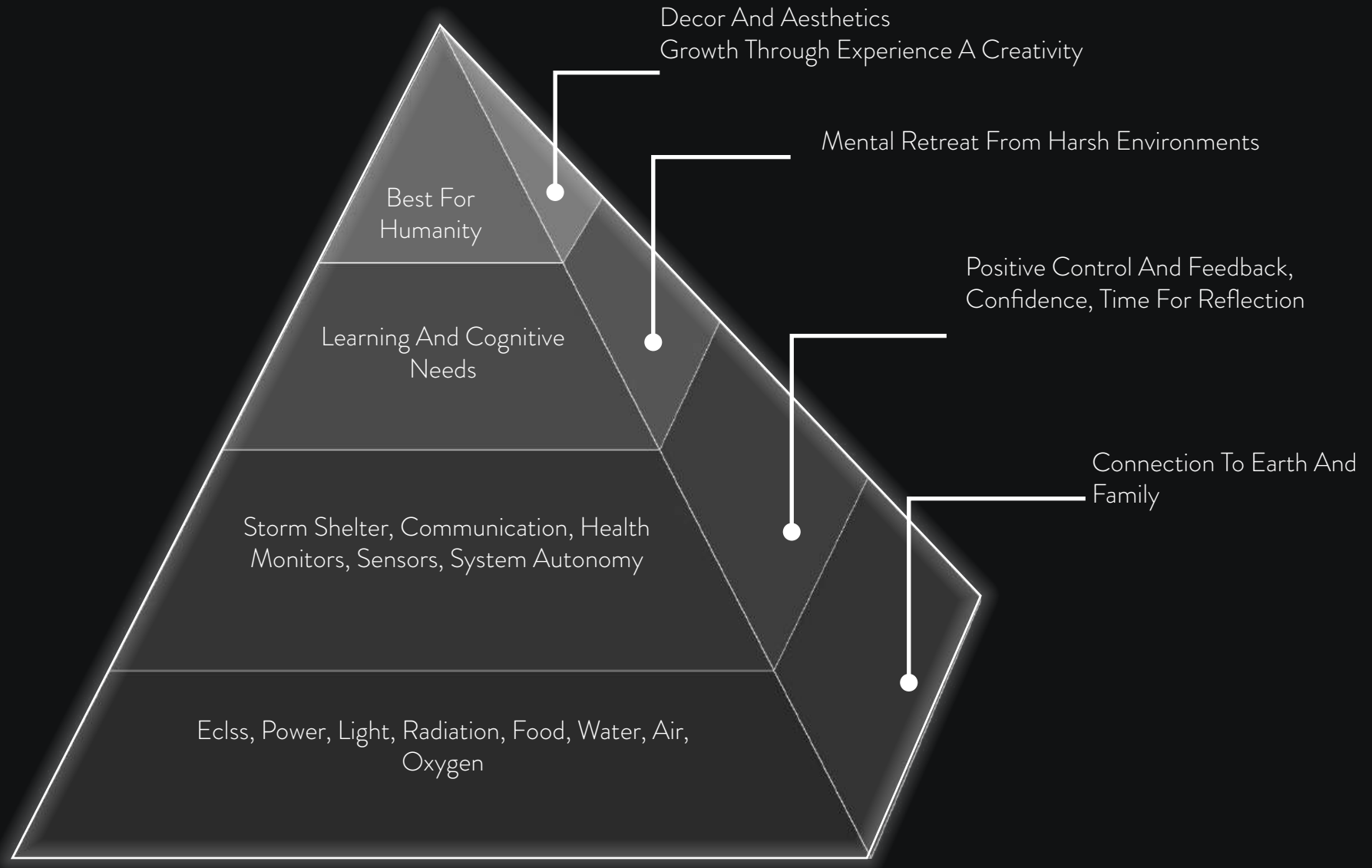
Designing habitation for long duration missions has many challenges including: maintaining physical health, psychological health, operational functions and many more. This thesis is an exploration between the physical habitat design and psychological function of crew members. Its focus is on the visual elements implemented into the spaces, and integration of environmental features that can enhance the mental wellbeing of astronauts. The study examined and analyzed previous research done in analog missions on the effects of long duration missions on humans. While previous research looked at the effects of the mission on humans very little addresses the design of the habitats as a cause for the stressors. This psychological research was synthesized with research done on current transit habitat designs. The focus was on optimizing the transit spaces but often overlooked strategies to minimize psychological stressors.

From the two research studies there are four design attributes that are being proposed to mitigate the psychological stressors in long duration missions. The recommendations aim to improve the quality of life for astronauts by mimicking earth's key conditions needed to regulate the astronaut's mental wellbeing. Lighting, virtual windows and skylights, display screens and open spaces all can be implemented in a variety of mission scenarios. The goal is to ultimately optimize the psychological wellbeing of astronauts in the in-transit period of the long duration of missions to ensure success of their missions.

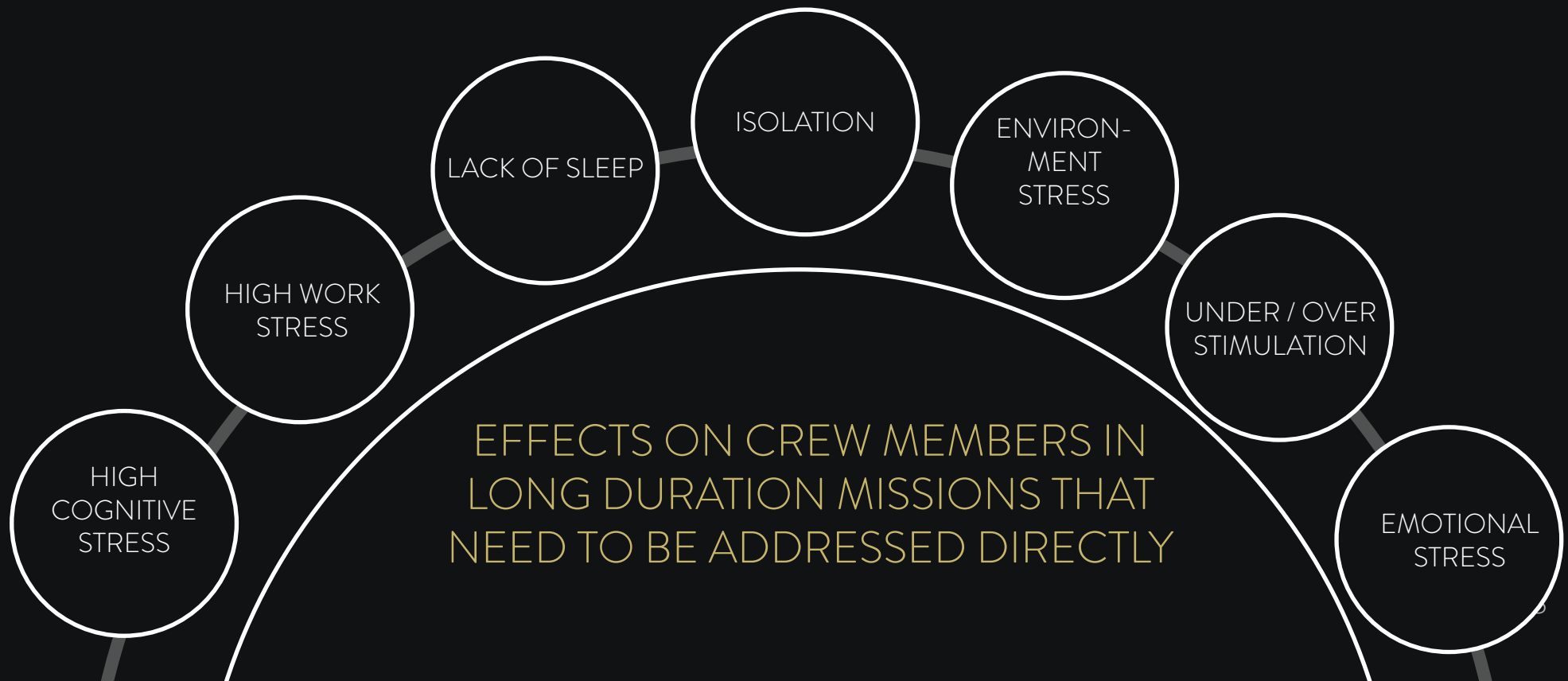
PROJECT SCOPE



RE-IMAGINING MASLOW'S HIERARCHY OF NEEDS FOR SPACE



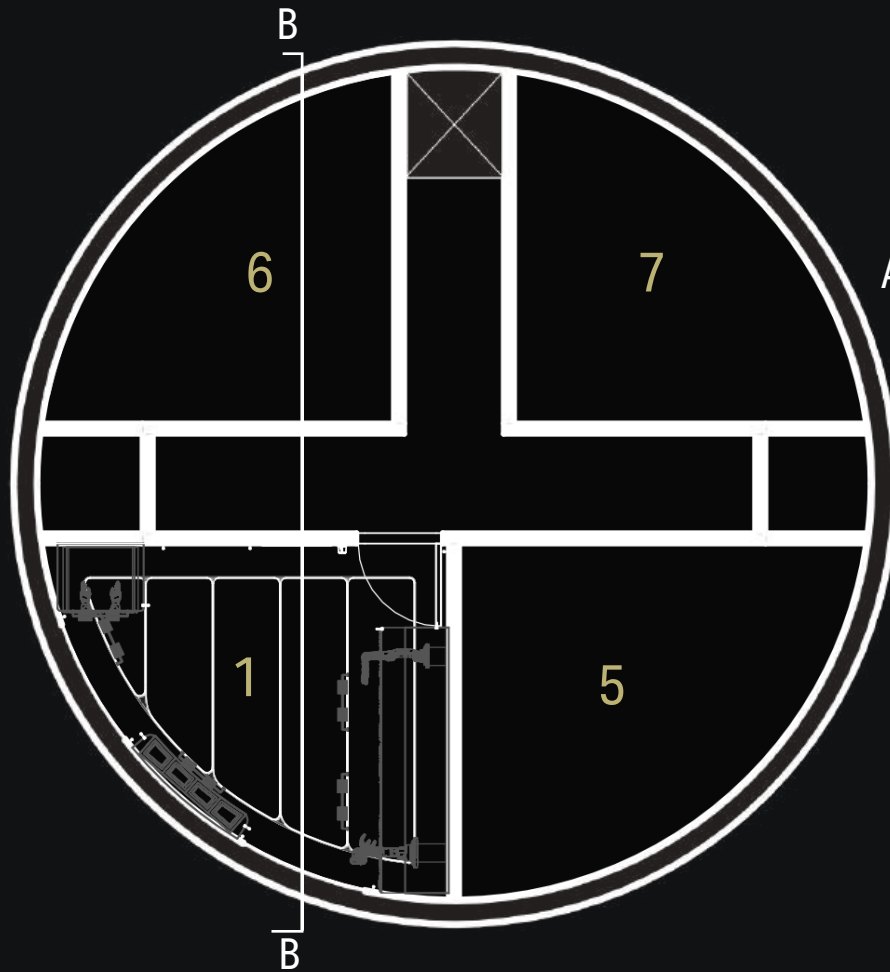
HABITATION DESIGN NEEDS TO HAVE
A MORE HOLISTICALLY APPROACH IN
MITIGATING STRESSORS DIRECTLY.



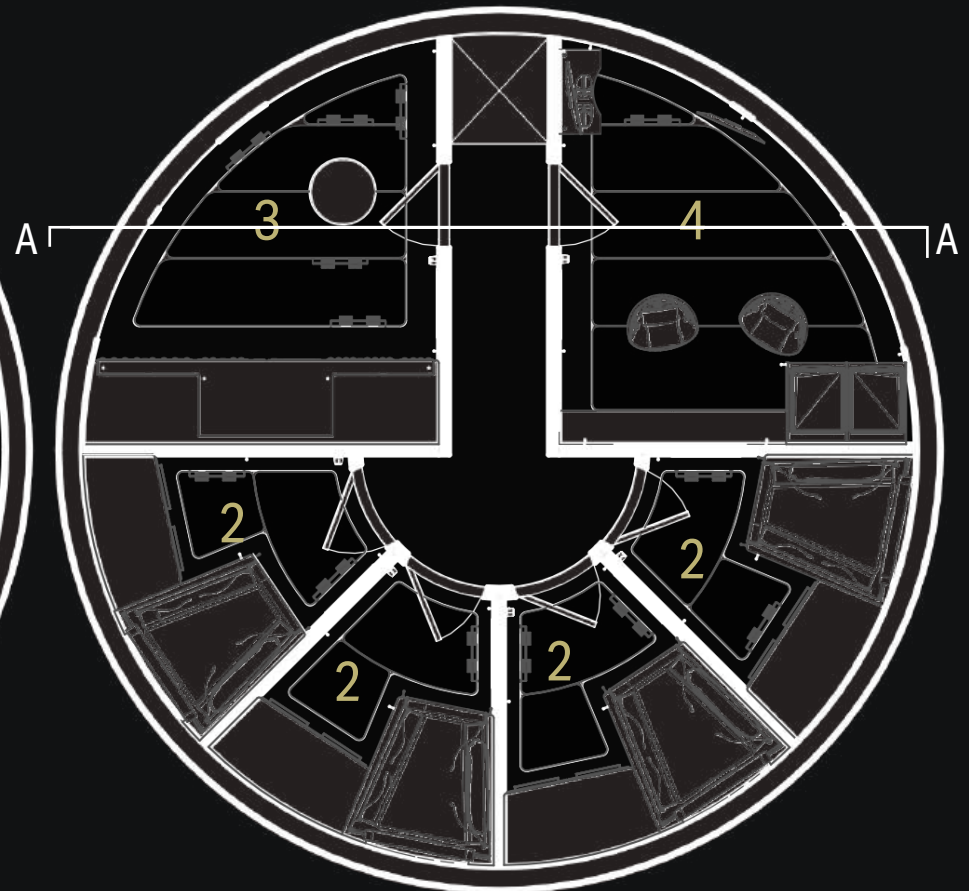
BASE HABITATION LAYOUT

KEY

- | | | | |
|---|--------------------|---|---------------------------|
| 1 | LABORATORY SPACE | 5 | EXCERSICE |
| 2 | CREW QUARTERS | 6 | WORKSTATION |
| 3 | GALLEY | 7 | MEDICAL BAY/ HYGIENE AREA |
| 4 | RECREATIONAL SPACE | 8 | STOWAGE SPACE |



LEVEL 01 PLAN

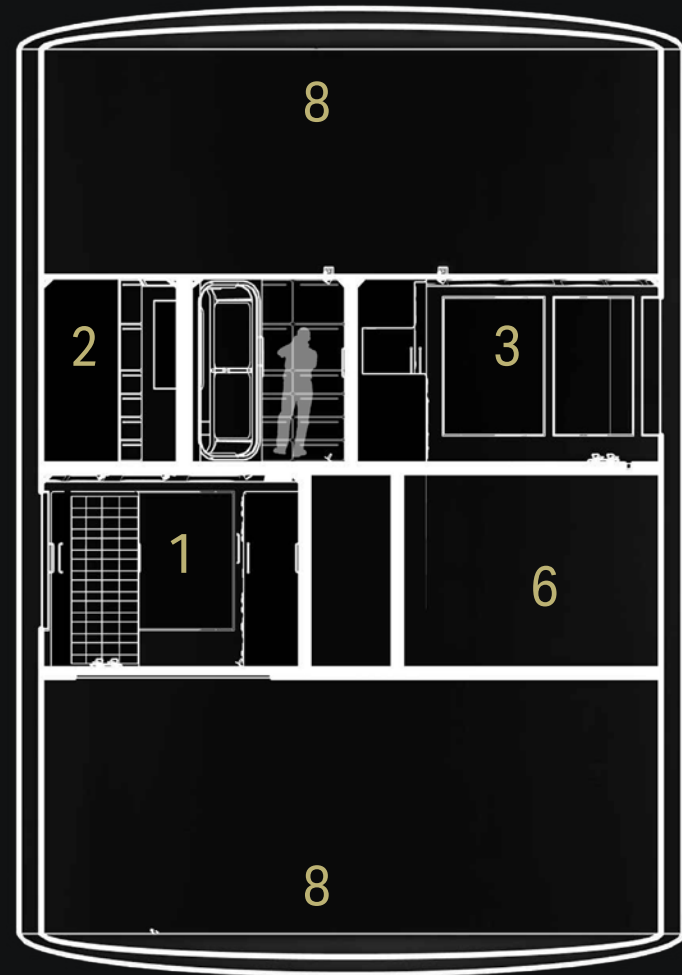


LEVEL 02 PLAN

BASE HABITATION LAYOUT



SECTION A-A



SECTION B-B

KEY

- | | | | |
|---|--------------------|---|---------------------------|
| 1 | LABORATORY SPACE | 5 | EXCERSICE |
| 2 | CREW QUARTERS | 6 | WORKSTATION |
| 3 | GALLEY | 7 | MEDICAL BAY/ HYGIENE AREA |
| 4 | RECREATIONAL SPACE | 8 | STOWAGE SPACE |



CREW QUARTERS INTERIOR



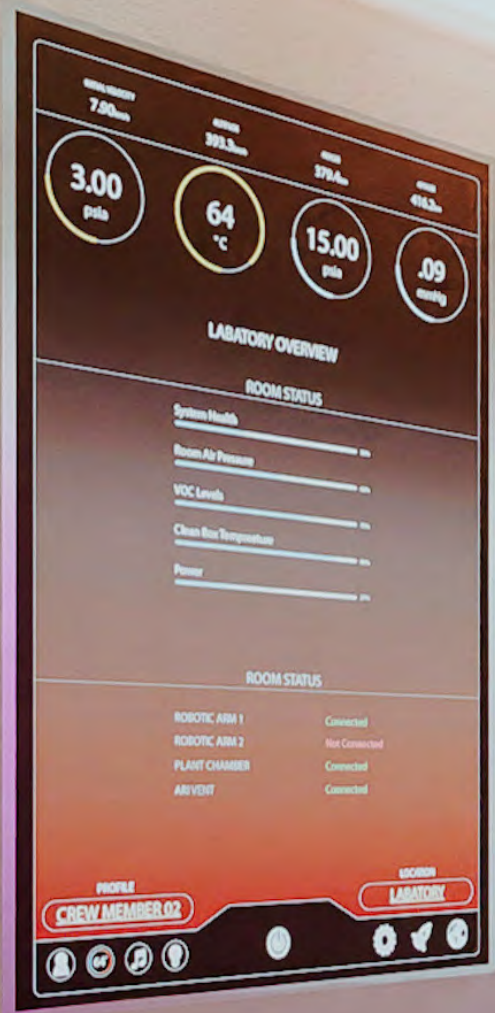
CREW QUARTER INTERIOR



GALLEY INTERIOR



LAB SPACE INTERIOR



LAB SPACE INTERIOR



RECREATIONAL SPACE INTERIOR



RECREATIONAL SPACE INTERIOR

Lunar Propellant Production Base

Background

Space Architecture Studio
Fall 2023

Skills

Mission Architecture
Concept of Operations
Habitat Design
Spacecraft Design
Infrastructure Logistics
Lunar Architecture

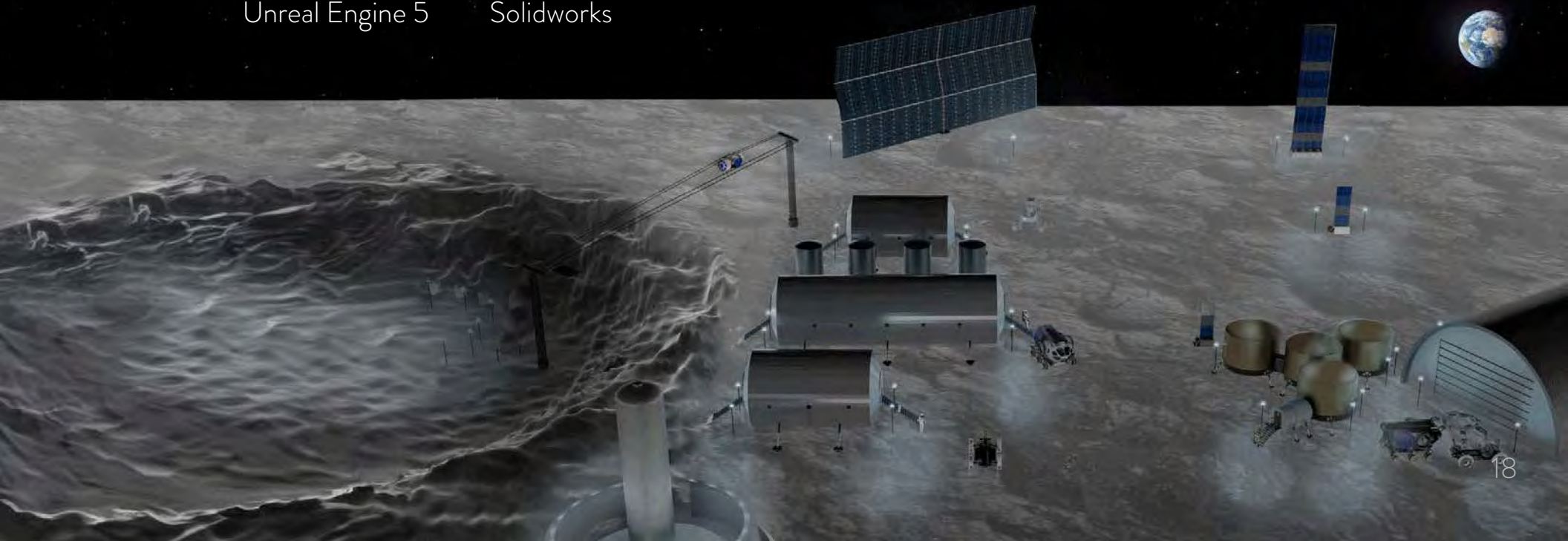
Programs

Rhino
Revit
Unreal Engine 5

Description

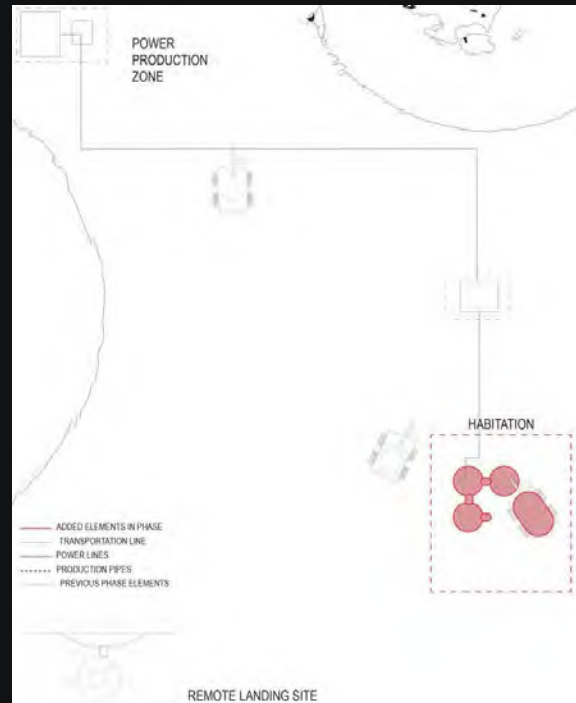
The extraction of lunar resources will not only catalyze the growth of commercial enterprises on the moon, such as mining, processing, and transportation, but will also be crucial to sustaining a long-term human presence. The base will provide commercial partners with the operational support to develop on the Moon, and their development will facilitate increased Earth investment. Creating a Sustainable Lunar Base: A lunar base will be dependent on Earth resupply particularly through the first phases of the project where resource independence will be unattainable. This means a sustained human presence on the moon must be driven by its economic sustainability. The creation of a stable lunar economy will be driven by production of lunar resources and partnerships with Earth-based industries.

Photoshop
Blender
Illustrator
Solidworks



4 STAGE CONCEPT OF OPERATIONS

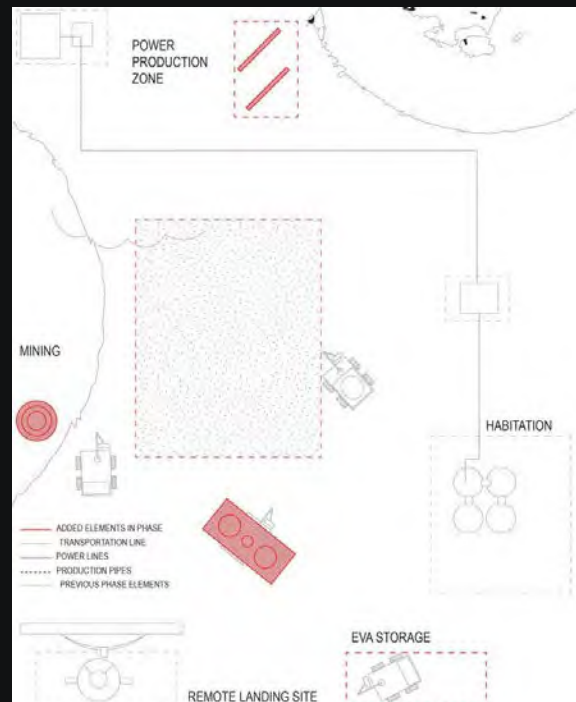
Stage 01



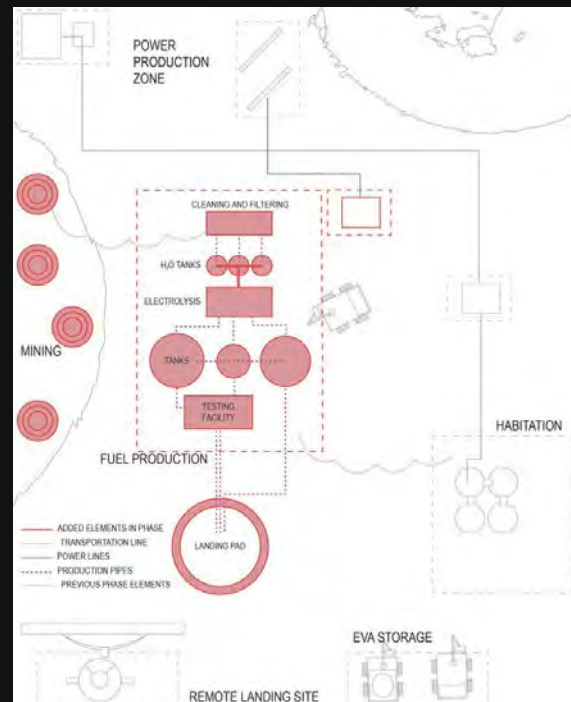
Stage 02



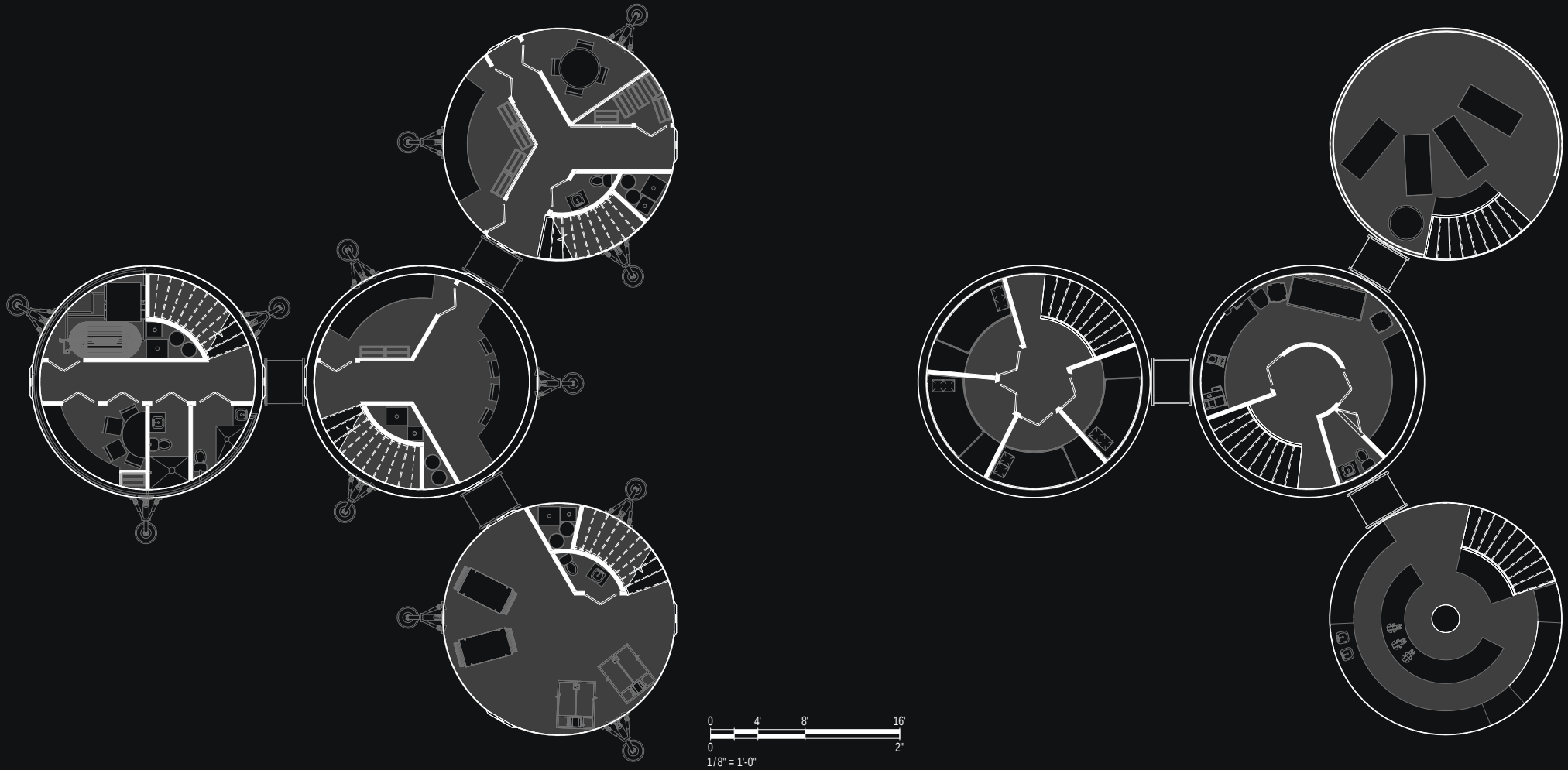
Stage 03



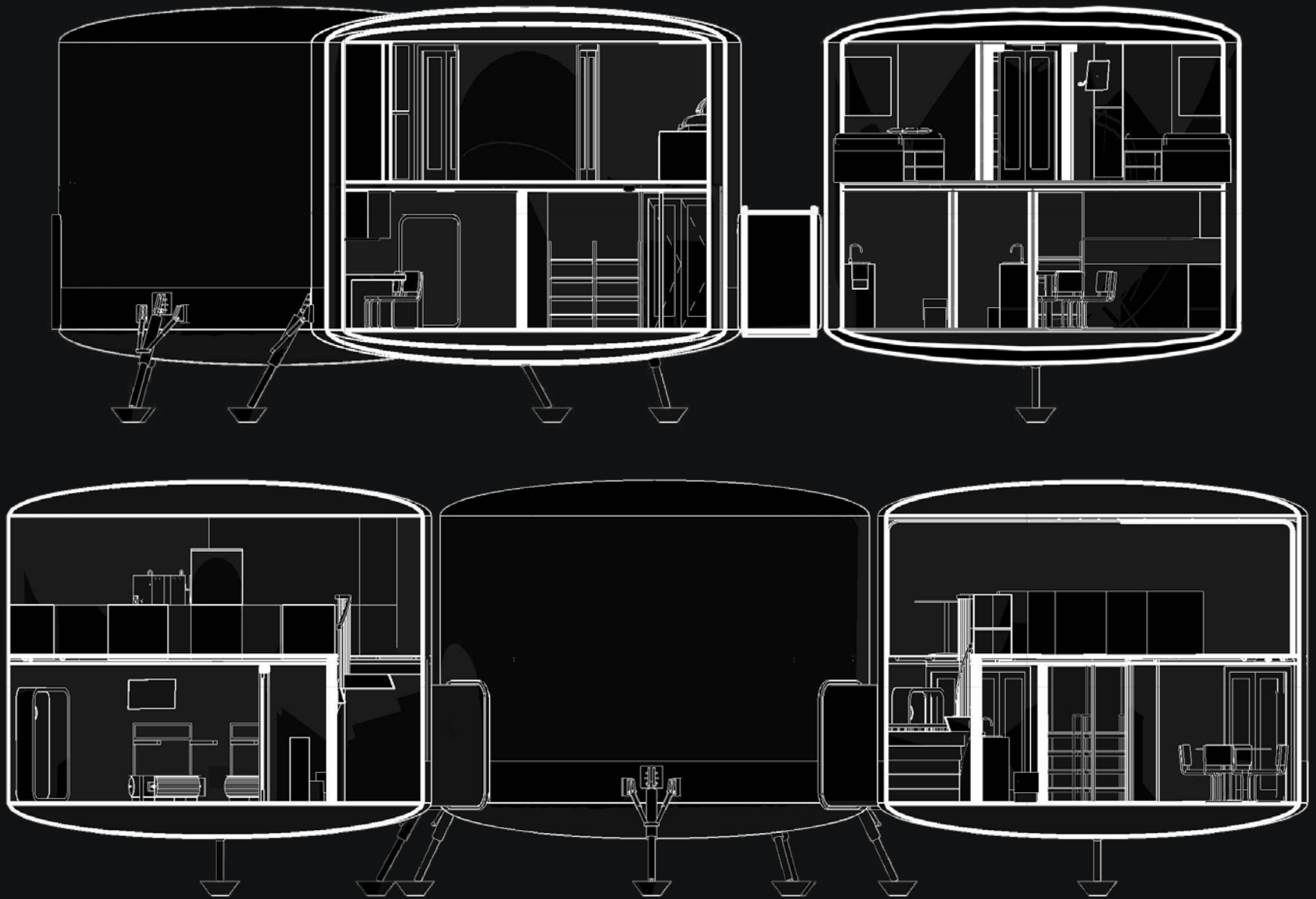
Stage 04



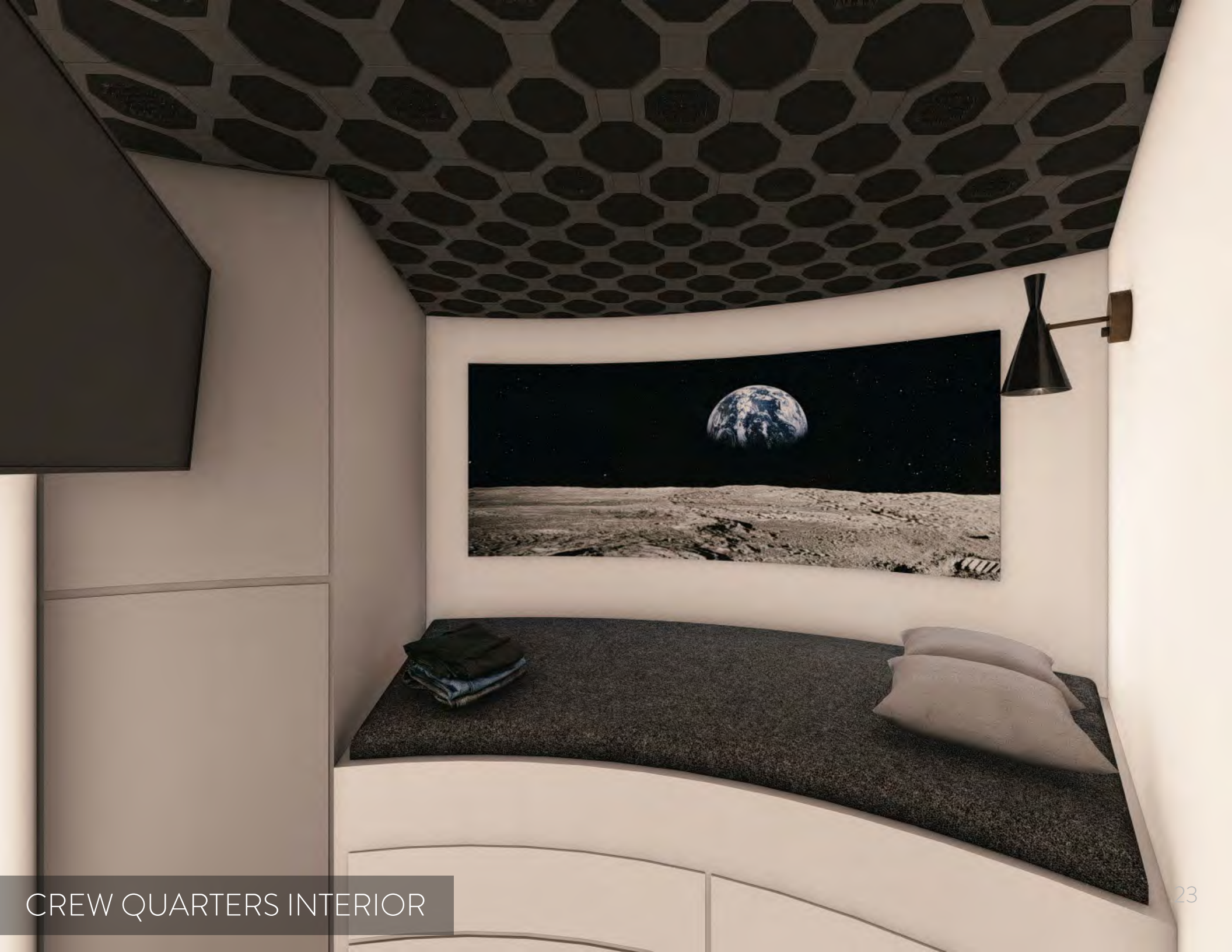
HABITATION DESIGN LAYOUT



HABITATION DESIGN LAYOUT







CREW QUARTERS INTERIOR







MEDICAL INTERIOR

Four Freedoms Museum

Background

Architecture Studio
Spring 2023

Skills

Facade Design, Interpreting
Building and Accessibility
Codes
Program Planning
Schematic Design
Design Development
Construction Details
LCA
Mechanical Systems
Structural Systems

Description

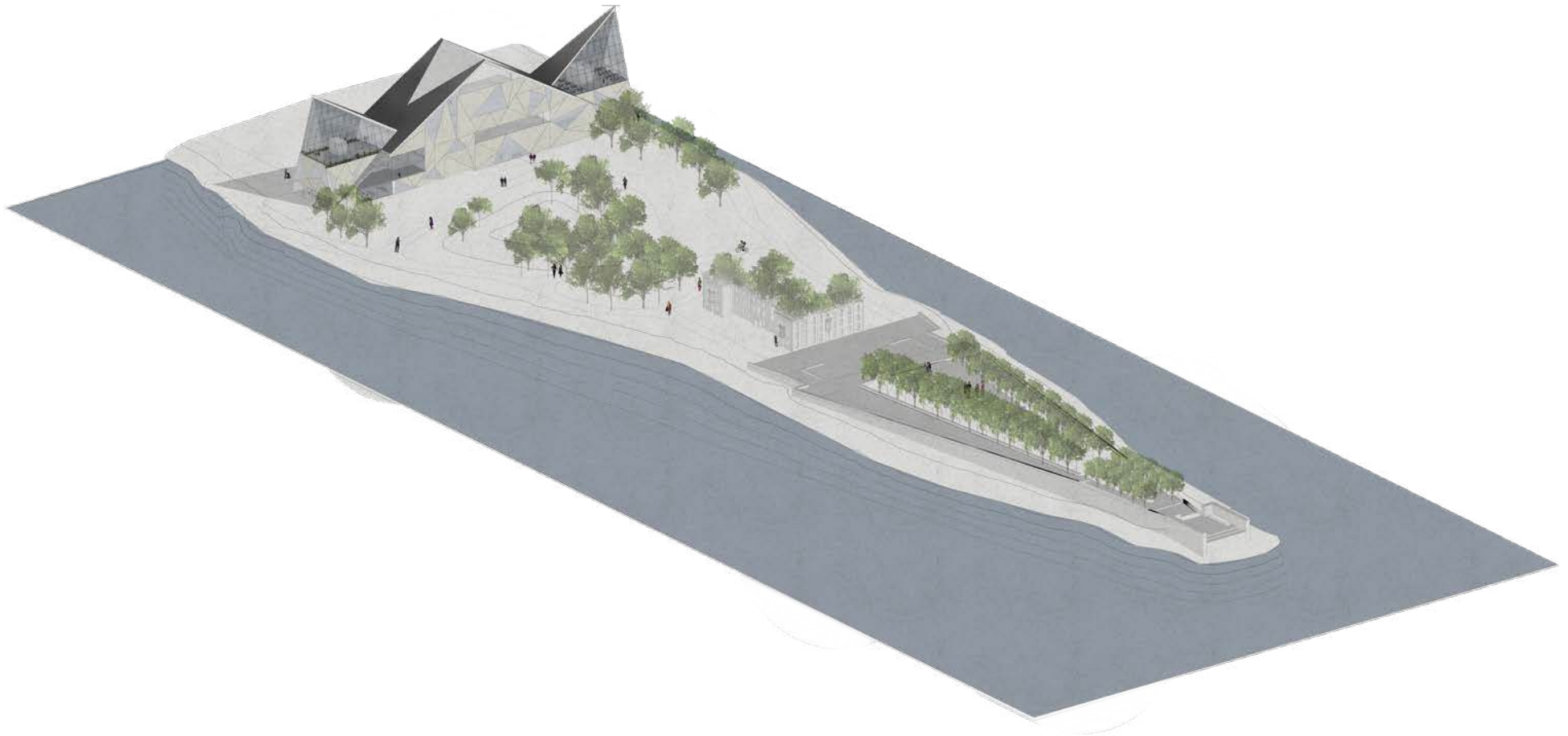
The primary concept of this building is to embody a harmonious fusion of form, function and sustainability. It is a testament to the values embodied by President Roosevelt's Four Freedoms freedom of speech and expression, freedom of worship, freedom from want, and freedom from fear. The buildings striking form characterized its peaks allows for the valley in the building to feel like a protected space. The building's unique design, paired with its functional Spaces, creates a display that inspires creativity, encourages innovation and sets a new standard for its surroundings. The spaces are meant to encourage collaboration and creativity. Following Roosevelt's vision of a world free from Desire this building allows the occupants to look inward and outward and appreciate the space around them. In short, this building represents a modern interpretation of Roosevelt's Four Freedoms speech pointing towards an age of comfort and protection.

Programs

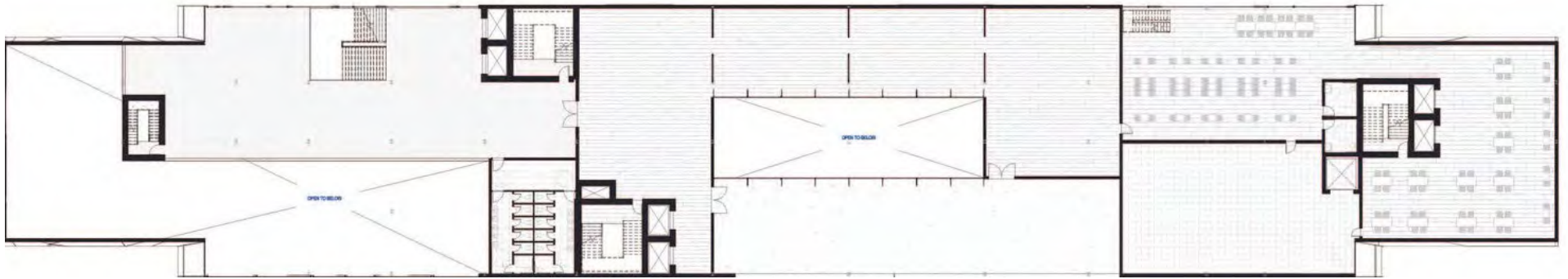
Rhino
Revit

Lumion
Adobe Photoshop
Adobe Illustrator

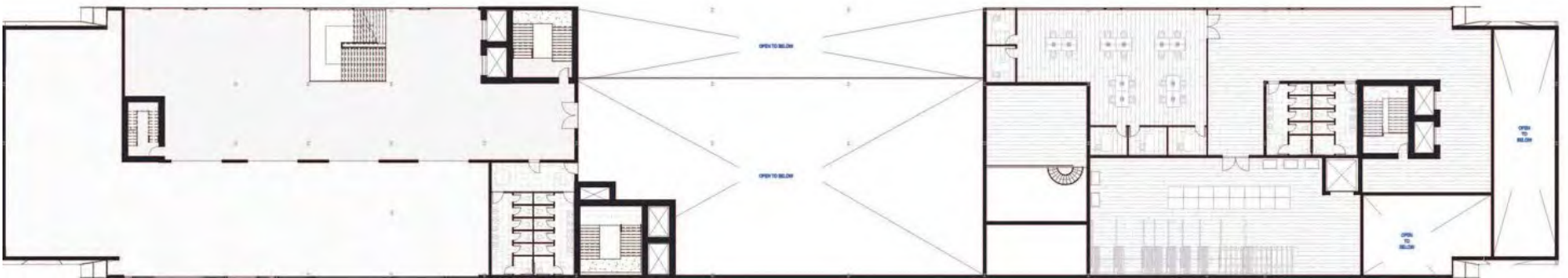
SITE MAP



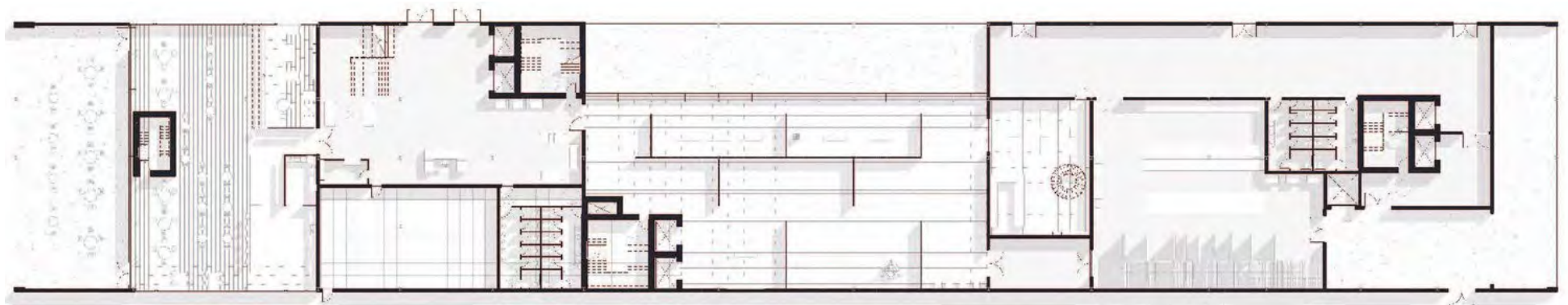
PLANS



LEVEL 03

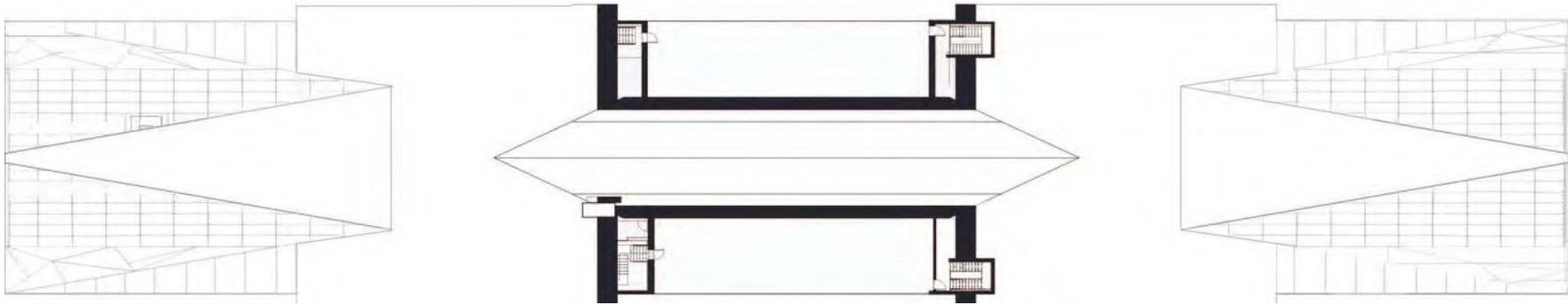


LEVEL 02

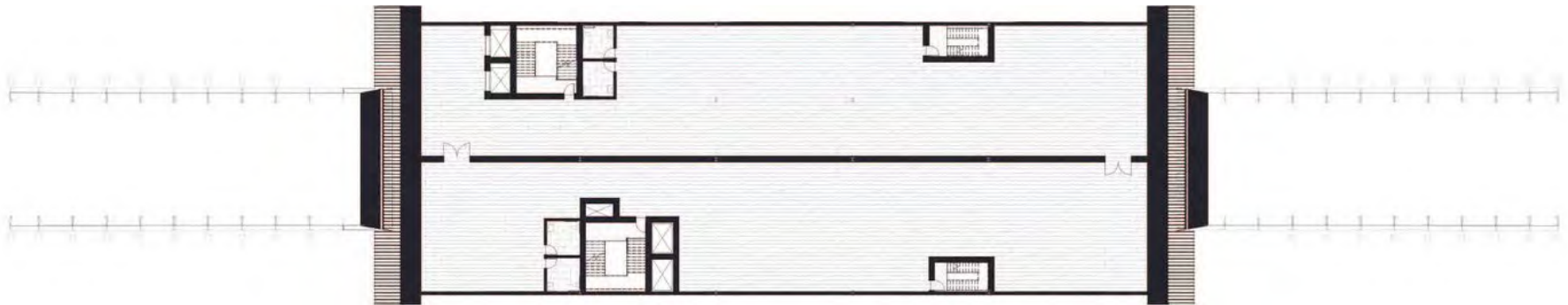


LEVEL 01

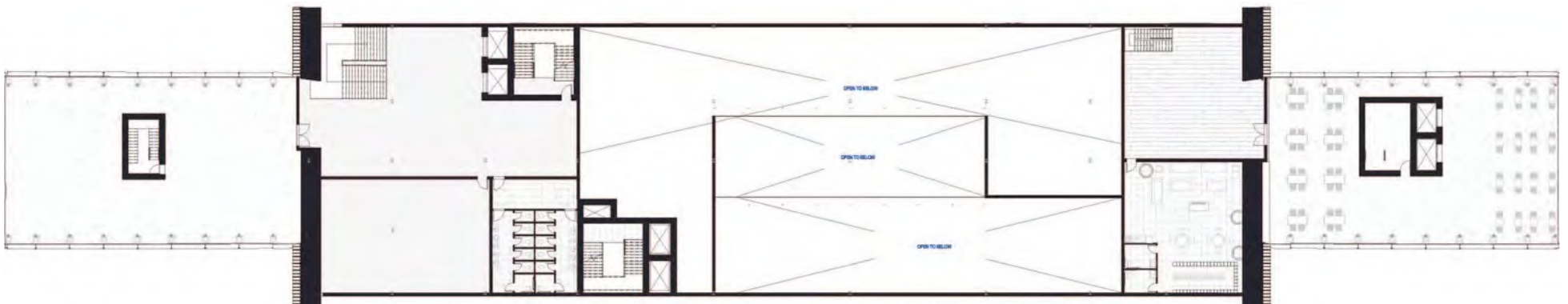
PLANS



LEVEL 06



LEVEL 05

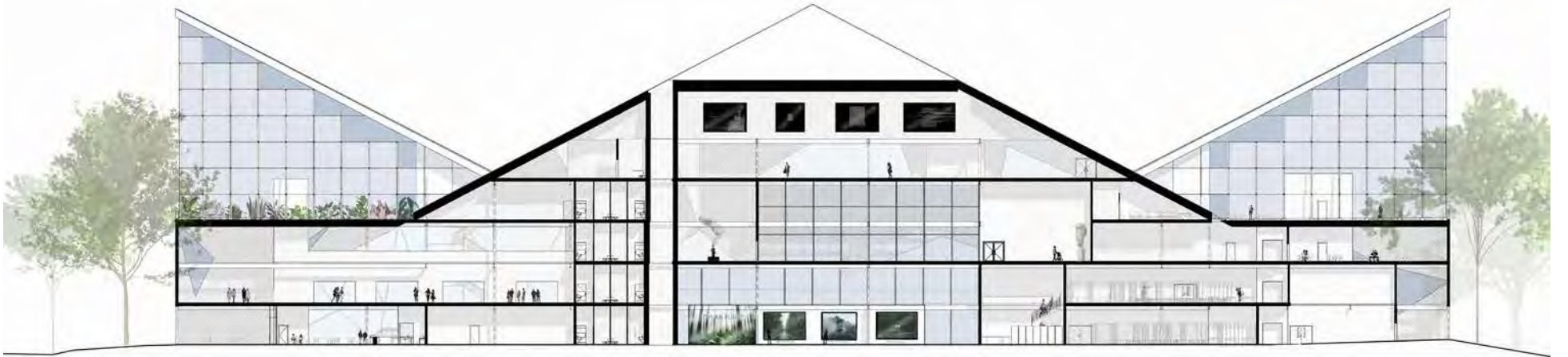


LEVEL 04

SECTIONS



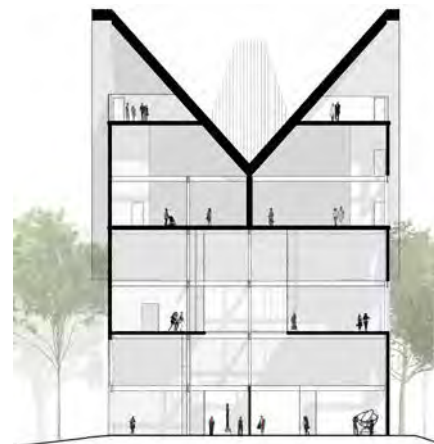
LONGITUDINAL SECTION



LONGITUDINAL SECTION

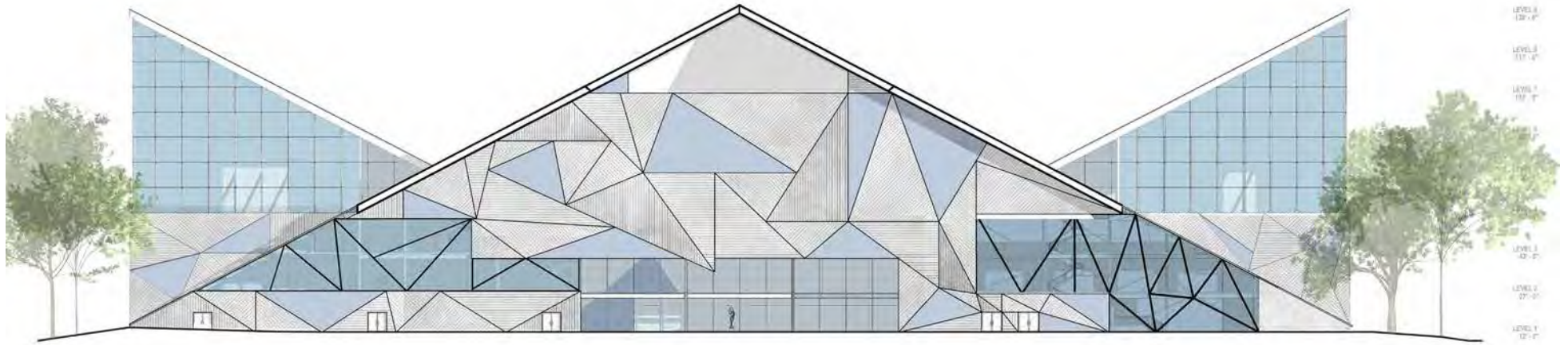


TRANSVERSE SECTION

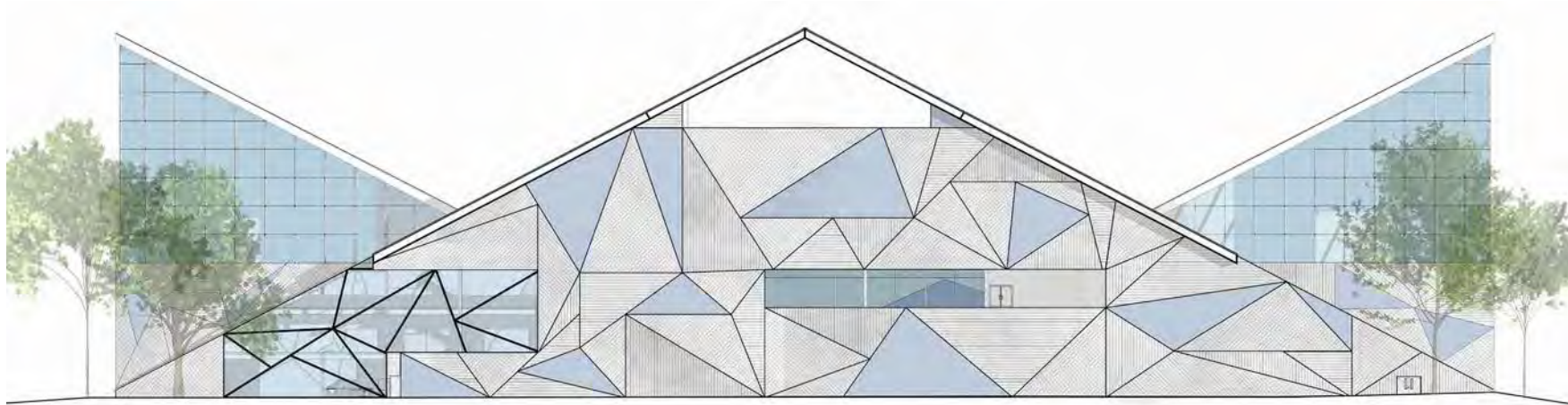


TRANSVERSE SECTION

ELEVATIONS



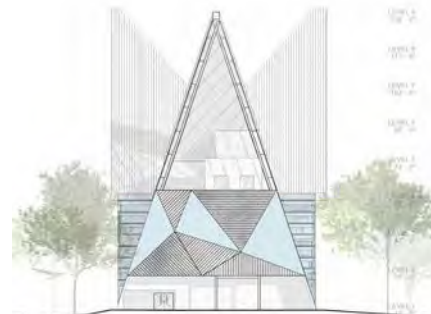
NORTH ELEVATION



SOUTH ELEVATION



WEST ELEVATION



EAST ELEVATION



NORTH EXTERIOR



SOUTH EXTERIOR

The image shows a modern, minimalist interior space with a high, light-colored wooden ceiling and a floor made of wide wooden planks. On the left, a large wall with a geometric, stone-like pattern features the text "ROOSEVELT ISLAND" and "FOUR FREEDOMS GALLERIES" in large, white, illuminated letters. Three small, dark, conical pendant lights hang from the ceiling above this wall. In the center, a long, low, light-colored reception desk is positioned. A person in a dark coat and hat stands near the desk. To the right, a dark-colored sofa is placed against a wall. Several people are visible in the background, including a woman in a red top and a man in a dark jacket. Large, bright shadows of architectural elements are cast onto the floor. The overall atmosphere is clean and contemporary.

ROOSEVELT ISLAND FOUR FREEDOMS GALLERIES



CAFE INTERIOR







COURTYARD EXTERIOR



Freedom's

RESTAURANT EXTERIOR



RESTAURANT INTERIOR

Augmented Reality For Emergency Responders

Background

Architecture Studio
Fall 2022

Awards Presentations

NJIT Dana Nox Research
Showcase
NJIT HCAD Design Show
Case

Skills

Sensors
Coding
Augmented Reality
Website Building
Data Collection
Emergency Response
Measures
IoT devices development

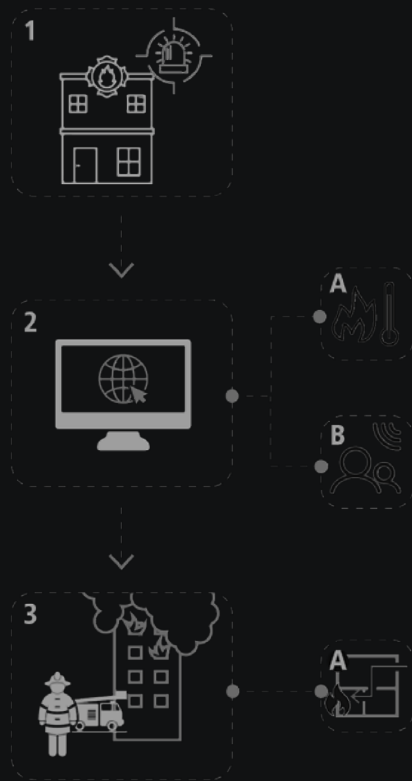
Description

The purpose of this project is to improve the efficiency of emergency responders by using augmented reality (AR) platforms interfaced with the Internet of Things (IoT) devices. By implementing sensors throughout the building, information on occupancy and temperature can be collected. Emergency maps can be placed on each floor as markers to be viewed in 3D using HoloLens/smartphone. These maps will provide information on room temperatures, occupancy, and can highlight egress/emergency paths from the map's location. The goal of this system is to ensure safety and decrease emergency response times. The primary focus will be creating a system to respond to emergency fire incidents.

Programs

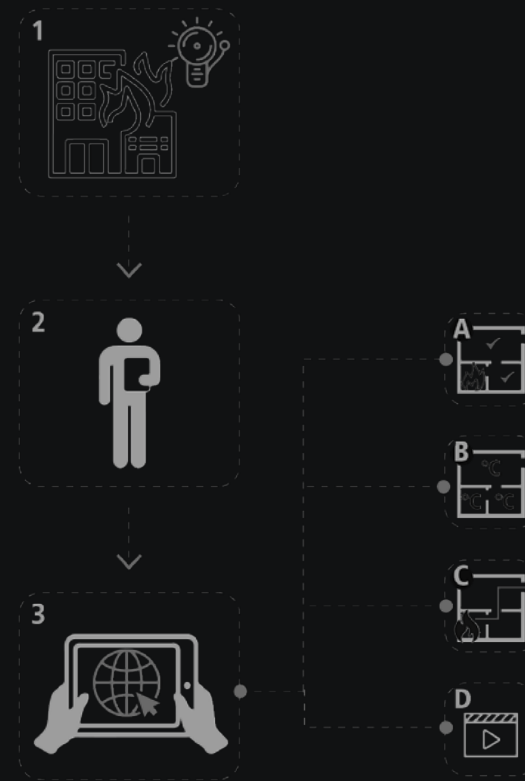
Rhino
Revit
Lumion
Adobe Photoshop
Adobe Illustrator
PHP
Java
MySQL
HTML
C++
Python
Arduino

EXAMPLE USE CASE SCENARIOS



1. A fire alarm will go off in the building
2. The building occupant can use the website to find their location within the building
3. The website will aid in navigation safely out of the building

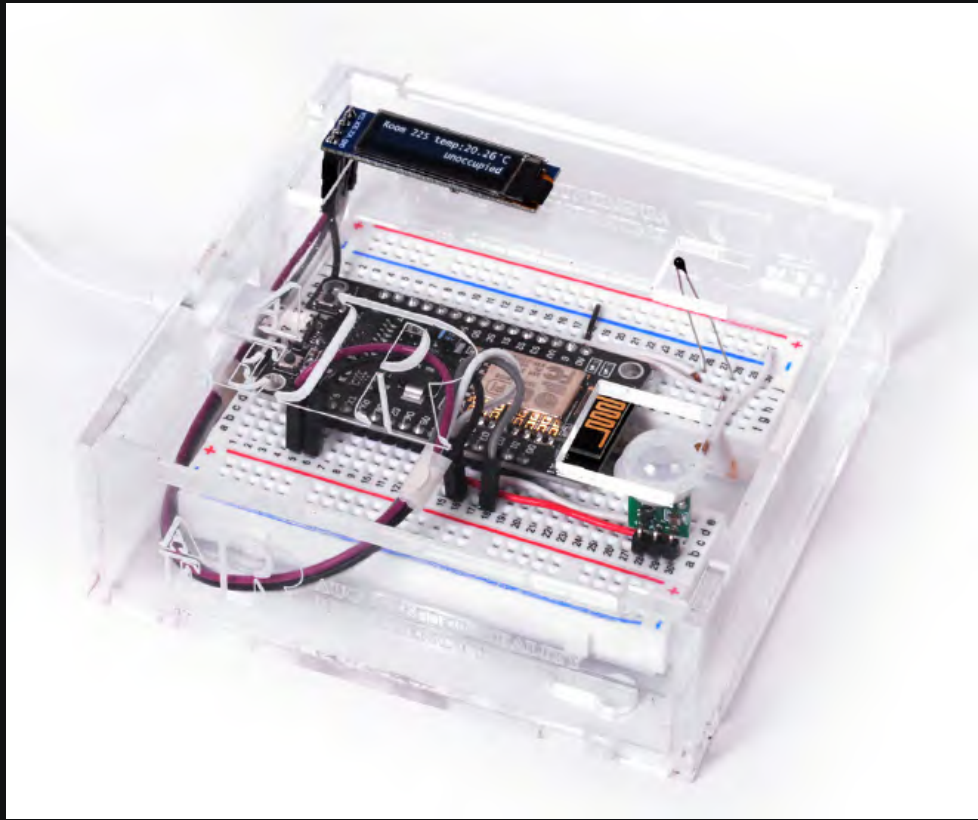
Safe versus unsafe rooms can be detected
Room temperatures can be viewed
The most efficient egress path will be displayed
A video walkthrough of the egress path will be displayed as well as a 3D model



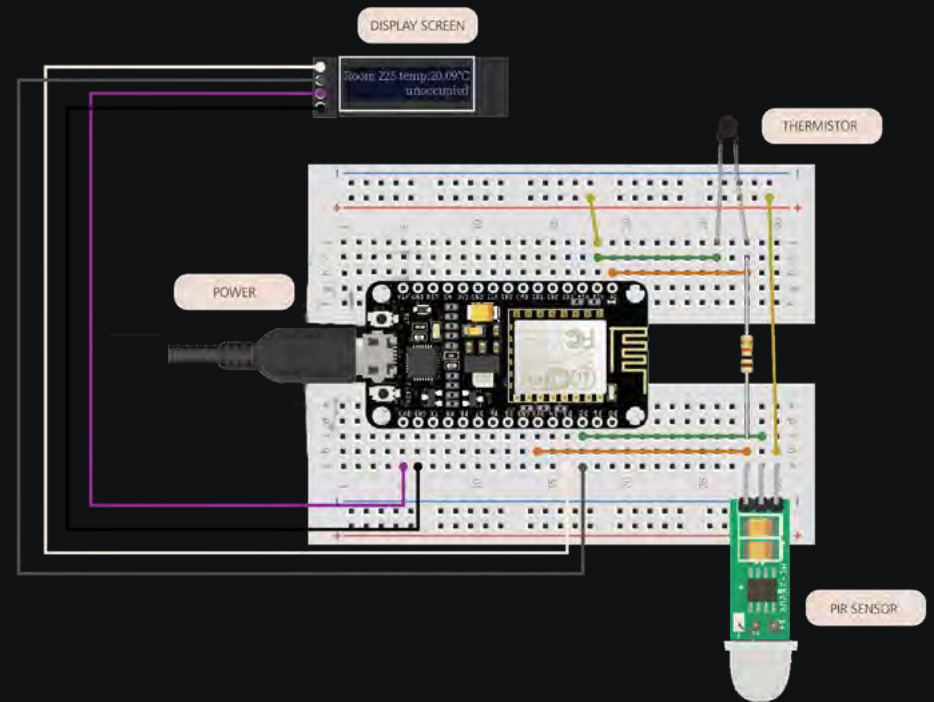
1. A fire alarm will go off in the building
2. The building occupant can use the website to find their location within the building
3. The website will aid in navigation safely out of the building

Safe versus unsafe rooms can be detected
Room temperatures can be viewed
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A video walkthrough of the egress path will be displayed as well as a 3D model

SENSOR LAYOUT

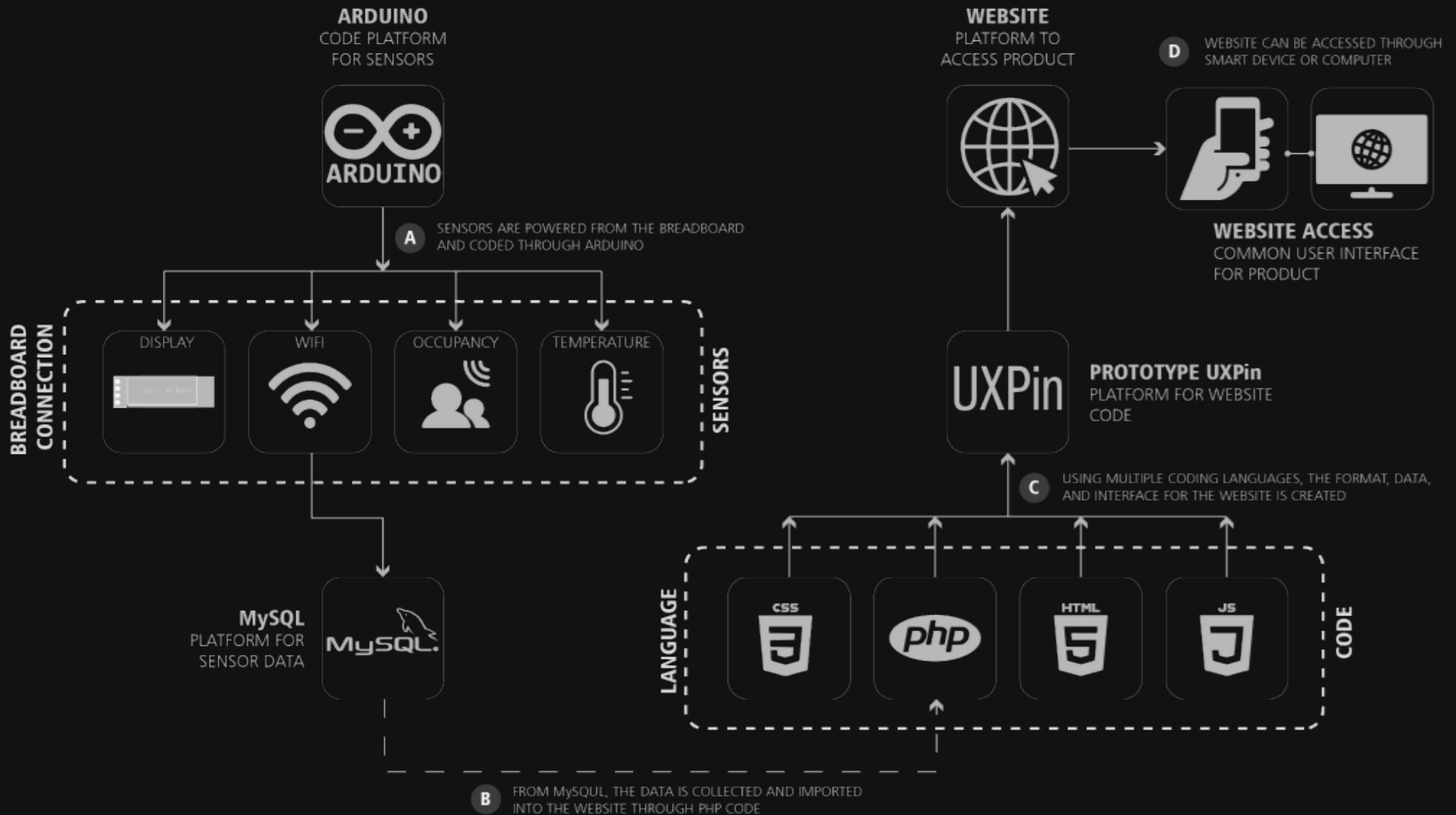


Prototype



Breadboard

WORKFLOW DIAGRAM





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