

SAHARN AFRICA

GROUNDWATER VULNERABILITY IN SUB -

RESOLVING AN ENVIRONMENTAL PROBLEM



H A R I I  
E: T H I N K

BY Dingile Banda  
Studio: RE: ACT

UCA-MA Interior Design-22/23

SDG 6

UNIVERSAL HUMAN RIGHT UN 2030





# About.....

Hi! My name is Dingile Banda and I am a multidisciplinary artist and architect in training under the Zambia Institute of Architects (ZIA). I find joy in creating prints and collages that have emerged during my MA Interior Design course studies at the University for the Creative Arts, Canterbury.

My thesis investigated the extent of groundwater vulnerability within the Sub-Saharan African continent, a problem that is in desperate need for change. Through research and study I found an opportunity to develop and enhance my creativity and problem solving skills by addressing the problem of clean and safe drinking water within the region.

Through ethnographic study and engagement with professionals within the practice of water and sanitation in Zambia, it was found that those living in informal settlements are prone to water borne diseases which account for the high number of deaths, especially amongst children under the age of 5.

Mazyopa compound, an informal settlement in Zambia was chosen as the focus of my investigation as over the years it has and still remains a high risk zone of water borne diseases which have been recorded in the country.

As a result, the thesis is a proposal for a sustainable filtration system that encompasses space and creates an hierarchy within the community. The proposal responds to design for sustainability (DFS) practice by adopting recycling strategies that have a negative impact on the environment by using plastic and the Sustainable development goal (SDG's), number 6, "The right to clean and safe drinking water" (UN, 2023).

The UN has a goal to ensure that everyone has the right to clean and safe water by the year 2030. This project proposal has the potential to ensure that this target is met and safeguards the livelihood of those living in the disparities prone to water-borne diseases.

## Profesional Skills

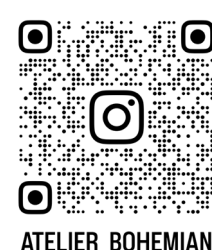
Strong written and verbal communication skills. Fluent (spoken and written) English | Detail-oriented | Analytical and consistent | Creative thinking and art enthusiast | Works well independently or as part of a team | Passion for problem-solving and innovation | High degree of drive and motivation.

### Follow

**WIX** <https://atelierbohemian.wixsite.com/01lb>

**in** <https://www.linkedin.com/in/dingile-banda-2b874092/>

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### Contact

#### Email

latelierbohemian@gmail.com  
dingilebanda94@gmail.com  
2115537@students.ucreative.ac.uk



# Harii

## C O N C E P T   S K E T C H E S

Harii is a native term meaning Gourd or Calabash in Nyanja a local language native to Zambia.

Zambia is located in central southern Africa and is a landlocked country that lies (900 to 1,500 metres] above sea level (Roberts, Hobson and Williams, 2023).

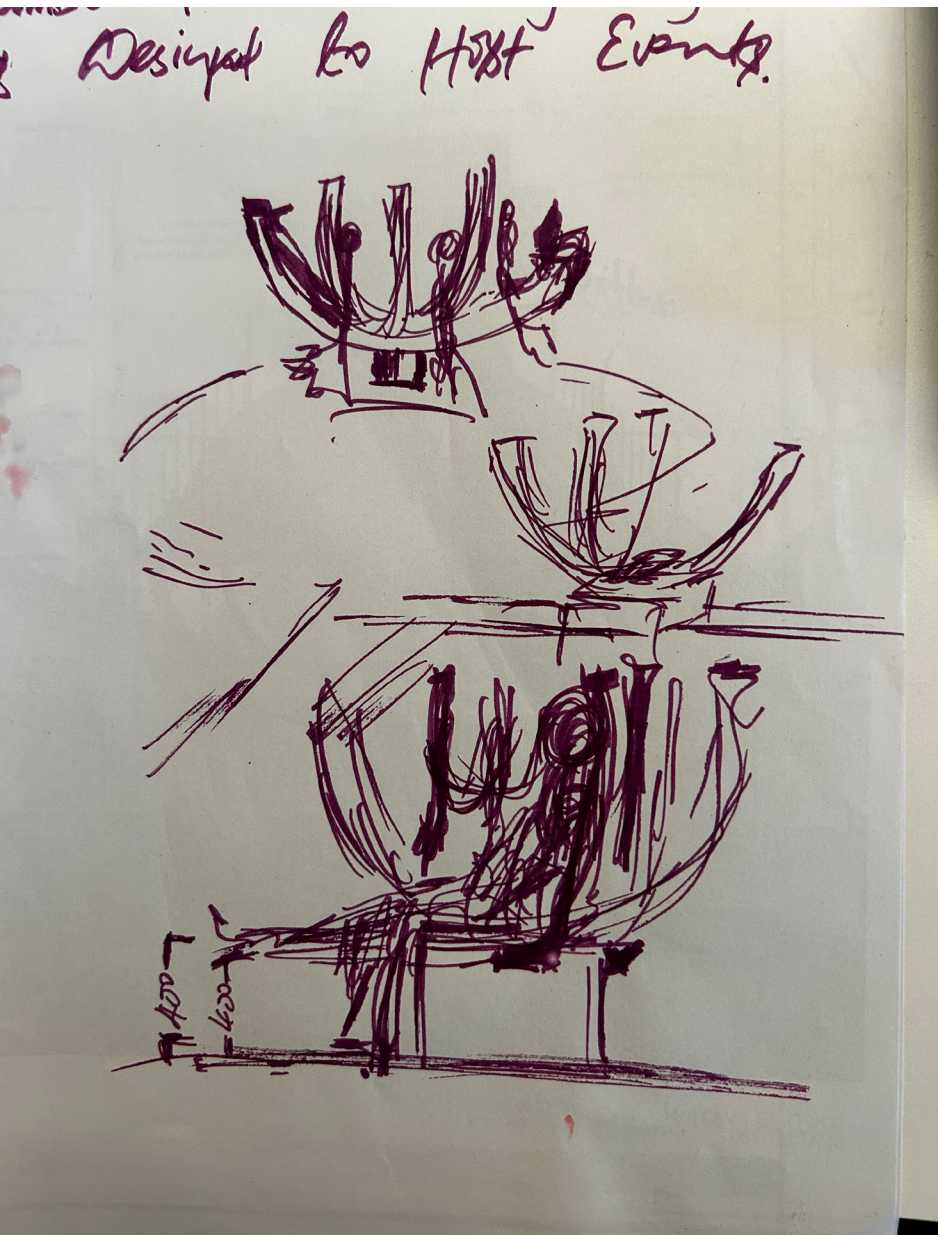
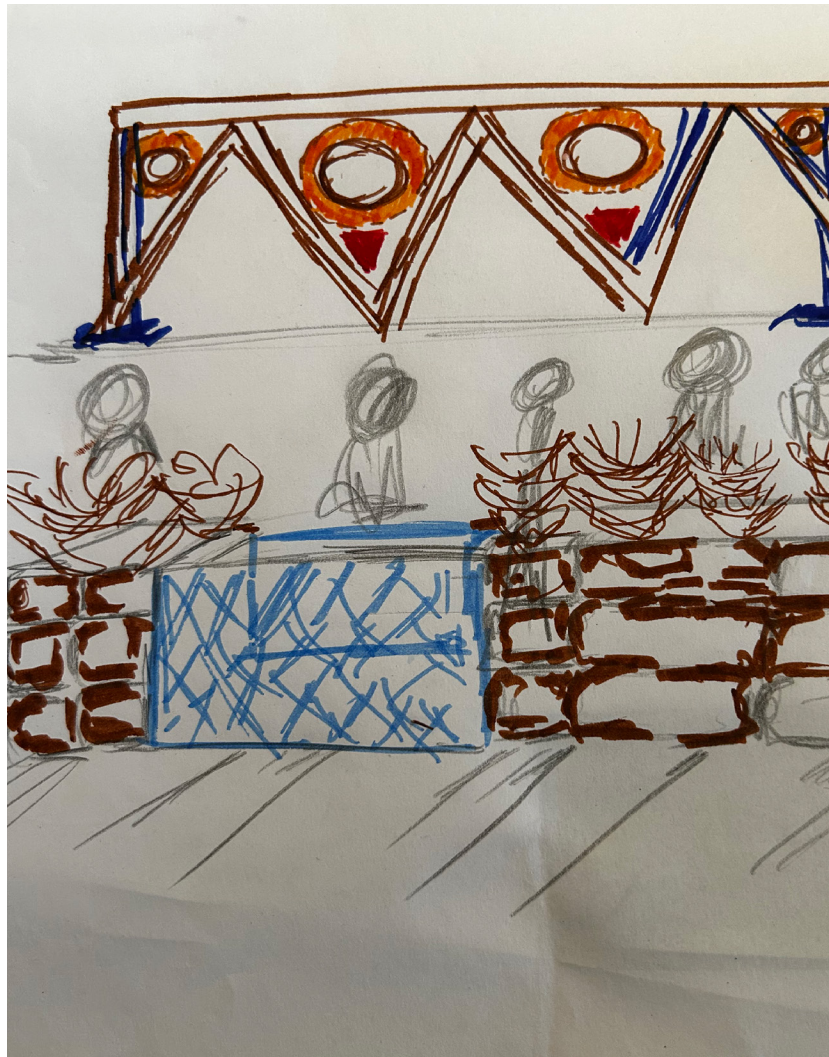
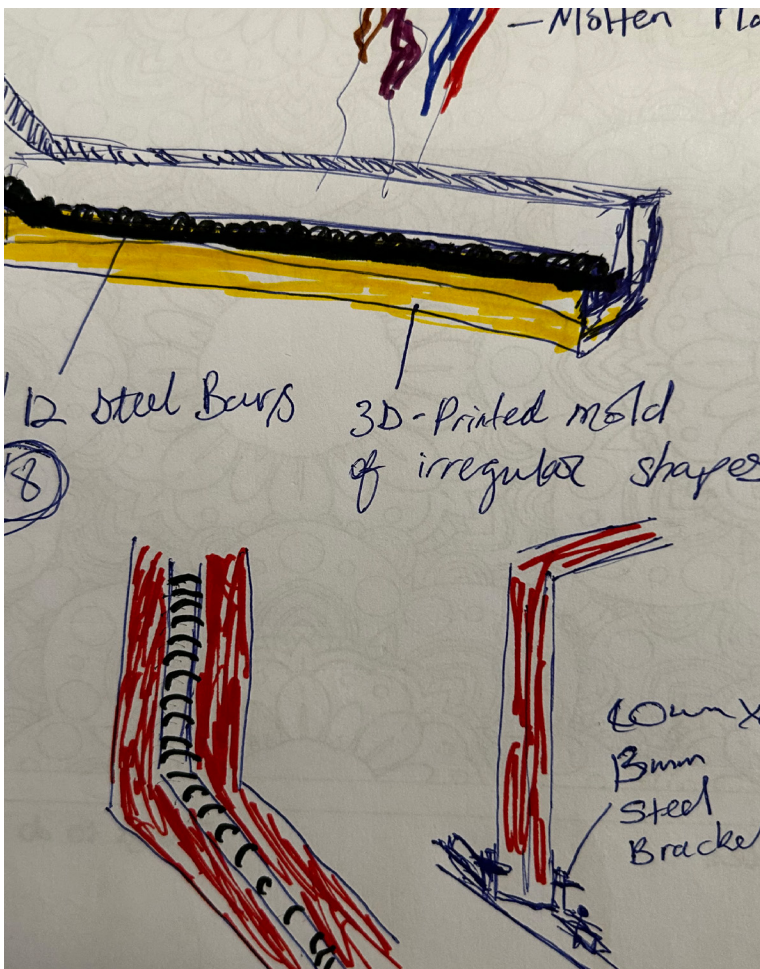
As the country is landlocked most of its drinking water is sourced underground and has over the years been affected by the growing industries, urbanisation and land pollution resulting in ground water contamination.

In most Sub-Saharan communities Drinking water is collected from a hand pump which usually lies in a central location and is accessible to all. Through research , the hand pump has been discovered to increase the amount of bacteria from the ground-water being collected as it provides a large surface area for bacteria to accumulate and spread.

The notion of RE:THINK developed and initial concept sketches centred around water filtration and the hand pump began the process of Harii.

MIT researchers have discovered that xylem from pine trees has the capacity to to eliminate pollutants like rota-virus and E. coli, which are frequently the cause of diarrhoeal illnesses. Xylem filtration is not only sustainable but also has a treatment level that complies with the World Health Organization’ s “two-star comprehensive protection” standard was achieved by the treated filters, which eliminated more than 99% of both pollutants (Chu, 2021).

Concept sketches developed from the idea of groundwater traversing through a series of xylem and carbon.





# ARTIST STATEMENT

As a mixed media artist I explore the use of watercolors, charcoal and collage. My work is a mixture of abstraction through a relationship of form and themed colours inspired by the principles of the Bauhaus, Basquiat, and Eduardo Paolozzi.

My objective is to create a sense of complexity by infusing my African herirage within my work and to invite viewers to look beneath the surface and embrace my problem solving approach through visual media that evokes a sense of wonder and awe.

My work is inspired by my own experiences through travel, visits to art galleries and my work experiences within the architectural practice.

Nigerian contemporary artist, Chike Obeagu is recognised for his playful use of large lips within his work. Over the years his work has introduced me to the aspect of speculation within art as his work focuses on real time issues that affect many African countries.



JEAN-MICHEL BASQUIAT-Notary, 1983  
Source: *AMERICAN SUBURB*, 2013



Collage, 1953, Eduardo Paolozzi  
Photography by Antonia Reeve  
© Trustees of the Paolozzi Foundation. Licensed by DACS, London 2022.

Source: *National Galleries of Scotland, 2022*



Chike Obeagu- National Cake, 2009  
Source: *Artnet*, 2023







# THEMES

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Harii has developed from a variety of themes. The themes identified relate to the context of the site and the water culture within the Sub-Saharan African context. Geometric shapes and colour have been identified through the study of African motifs which play a significant role in the identity of the African culture. Basket weaving, a role which is synonymous amongst women in Africa has been one of the design drivers that Harii developed from. Sustainable practice through the reuse of plastic material and local materials correlates to my established practice that promotes innovative sustainable ideologies.

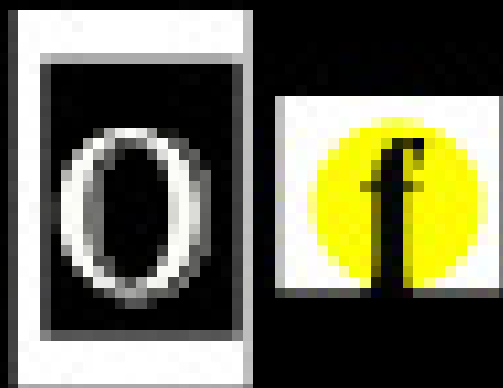
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C R E A T I N G  
A

HIERARCHY



COMMUNAL SPACE

H A R I I

RE:THINK  
A FILTRATION SYSTEM

CLEAN & SAFE WATER SDG- 6



BASKET WEAVING



AFRICAN MOTIFS



SOURCE: MR. WOLF, CINDY2013,2023

SUSTAINABLE DESIGN PRACTICE

SUB SAHARAN WATER CULTURE



CALABASH - H A R I I

Source: B.W. Media Libraries, 1974  
Source: People, 2023  
Source: Penn Museum, 1914  
Source: Shutterstock, 2018  
Source: Designboom, 2018  
Source: Daily Mail Online, 2014 Edited  
by 2114427



VISUALISATION  
AND  
REALISATION

PHYSICAL REPRESENTATION



DIGITAL REPRESENTATION

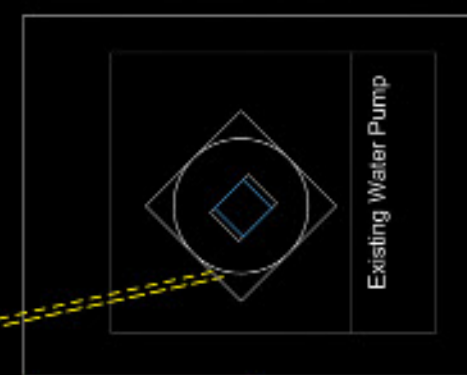
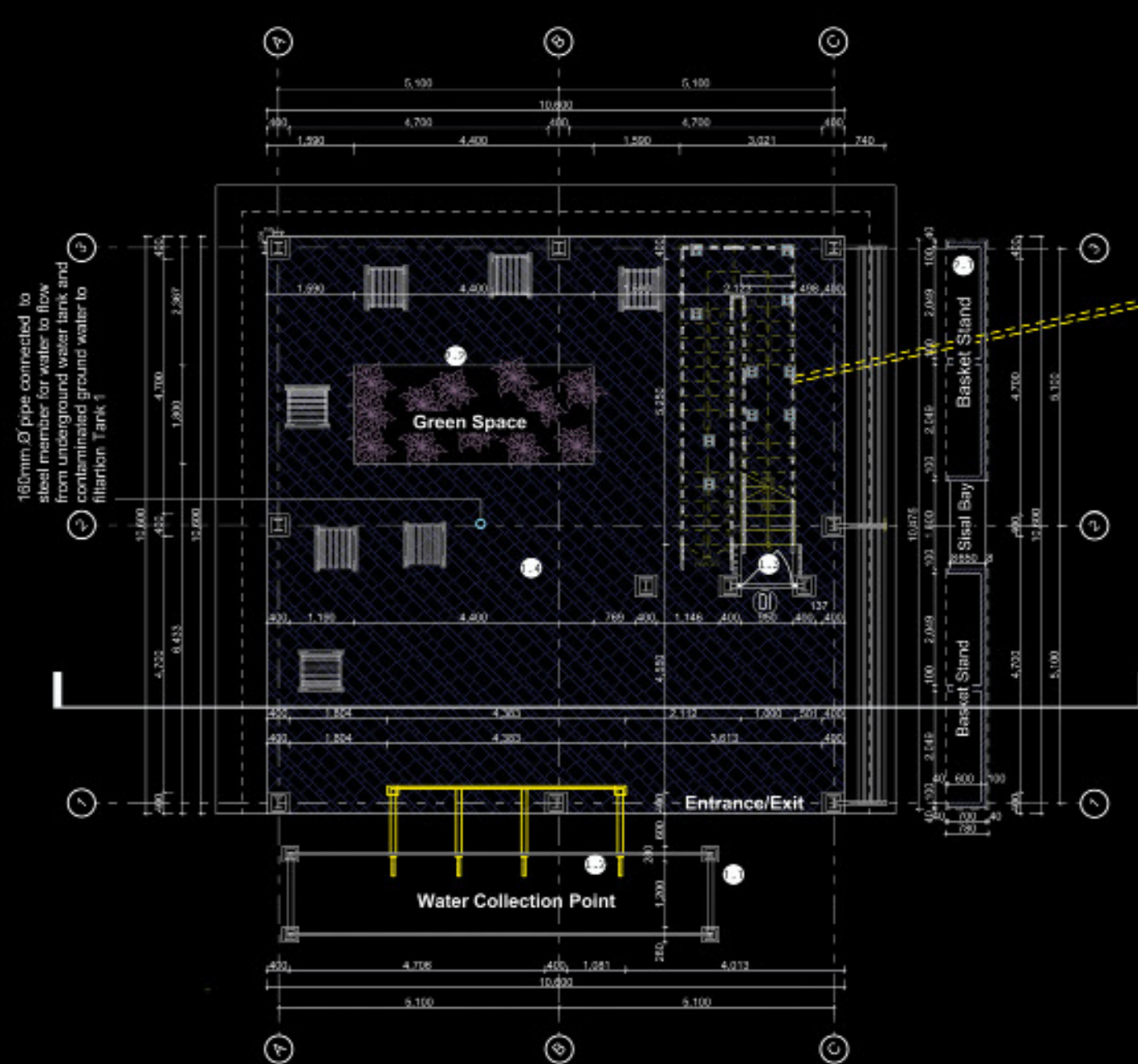
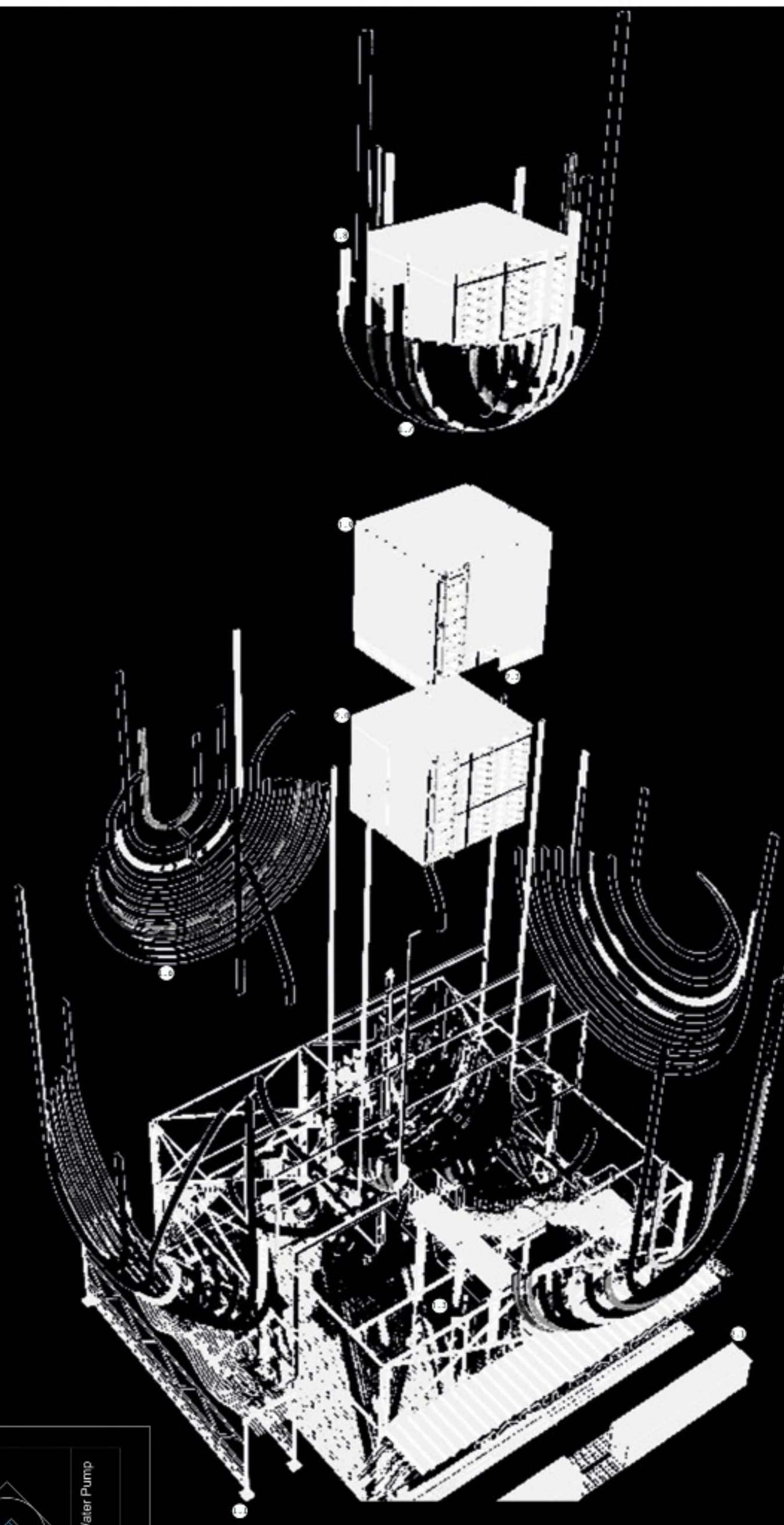
Source: MA Work, CIND7013.2023

INTERACTIVE SPACE

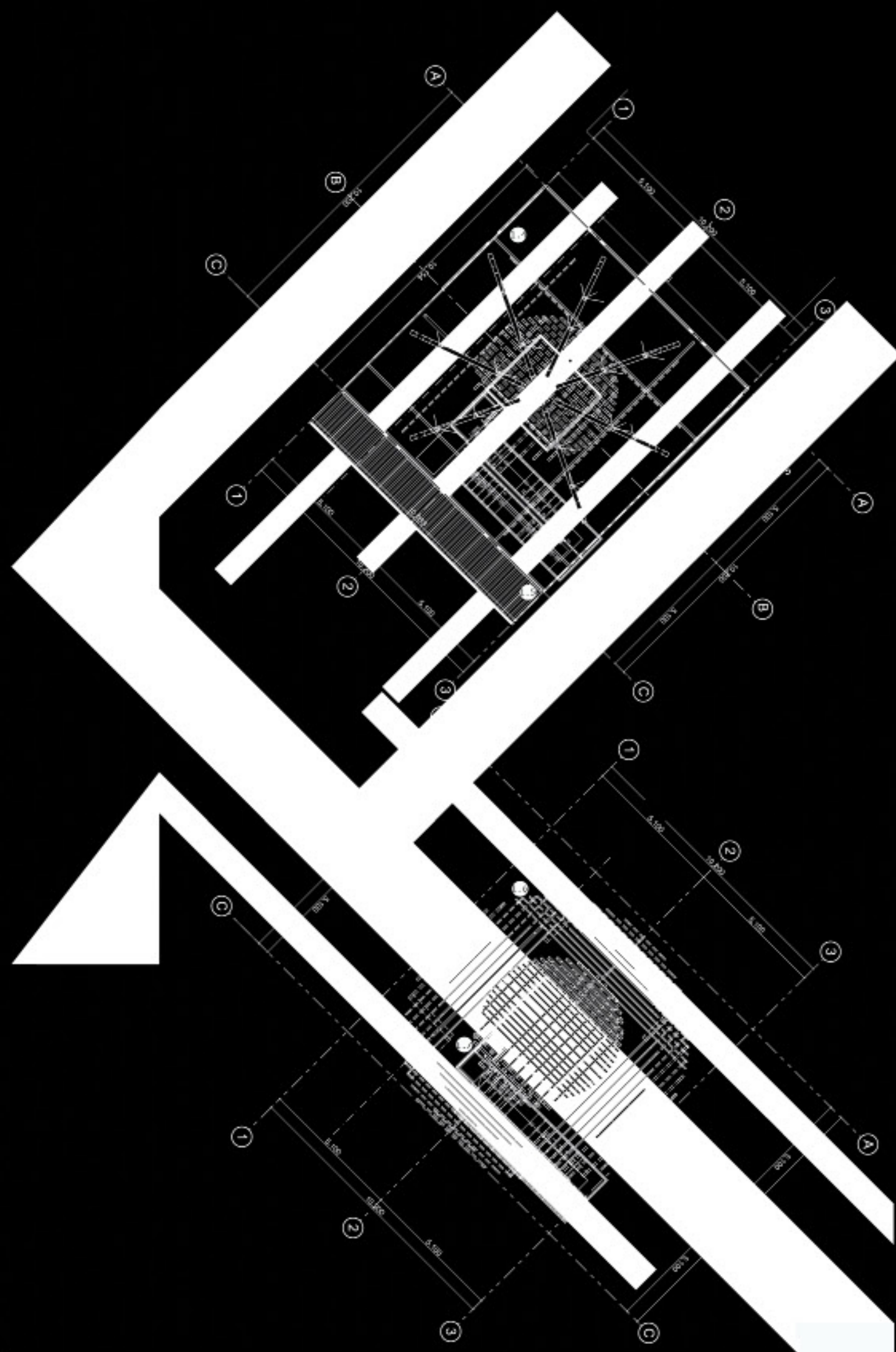
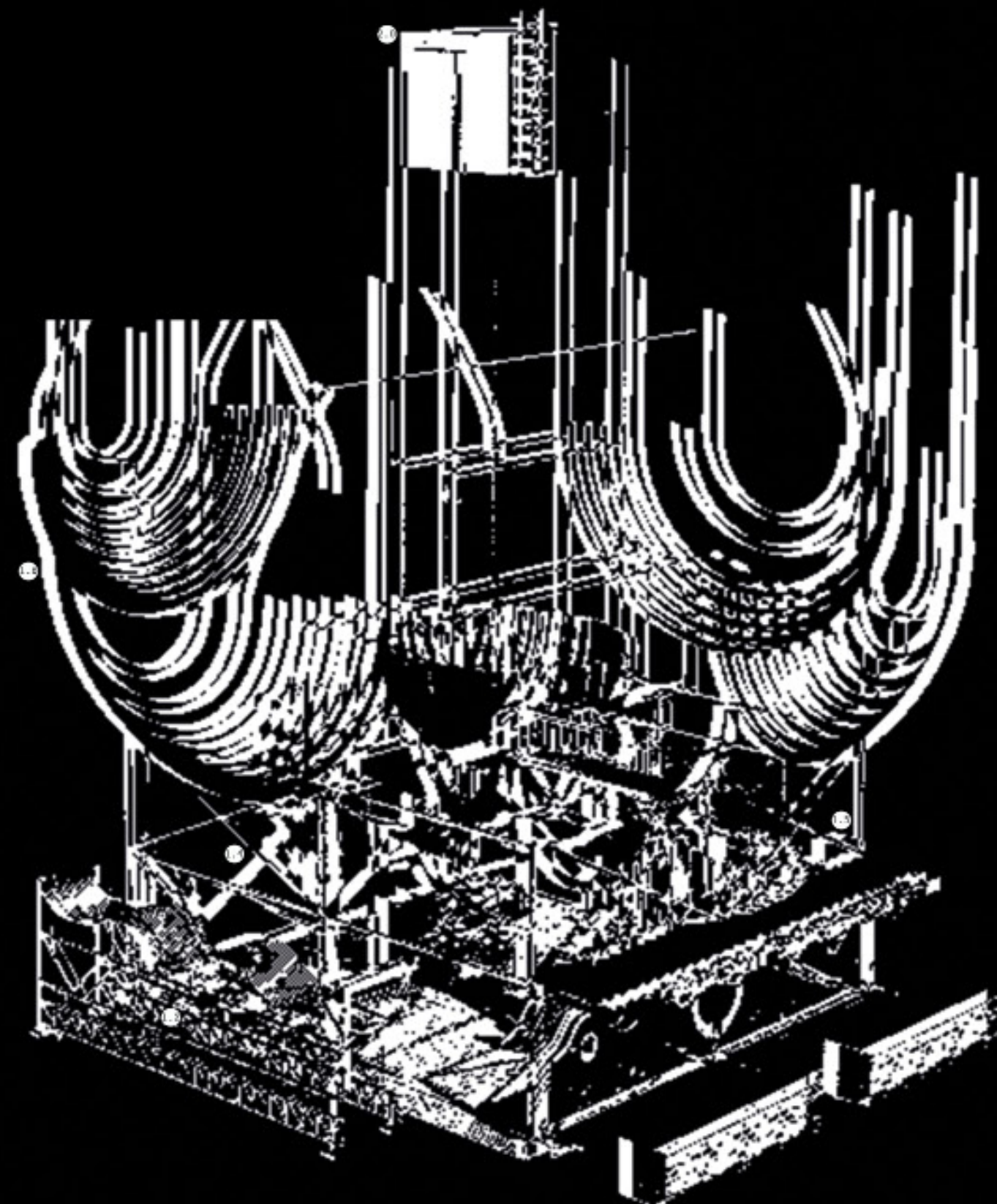
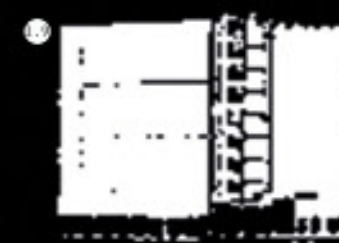


## SECTIONAL AXONOMETRIC

- 1.1 Entrance to Water Collection Point
- 1.2 Taps -Releasing filtered water
- 1.3 Entrance to Services
- 1.4 Interactive Space
- 1.5 Solar Battery enclosed in water tight service cabinet
- 1.6 Base Level of weaving with recycled plastic
- 1.7 Apex Level of weaving with recycled plastic
- 1.8 Flocculation & Coagulation Tank-A
  - Xylem and Carbon Filtration
- 1.9 Solar Water Disinfection-SODIS Tank-B
- 2.0 Distribution Tank-C
- 2.1 Solar pump booster & Inverter
- 2.2 Underground Storage Tank-D
- 2.3 Photovoltaic Panels



RE:THINK-HANDPUMP





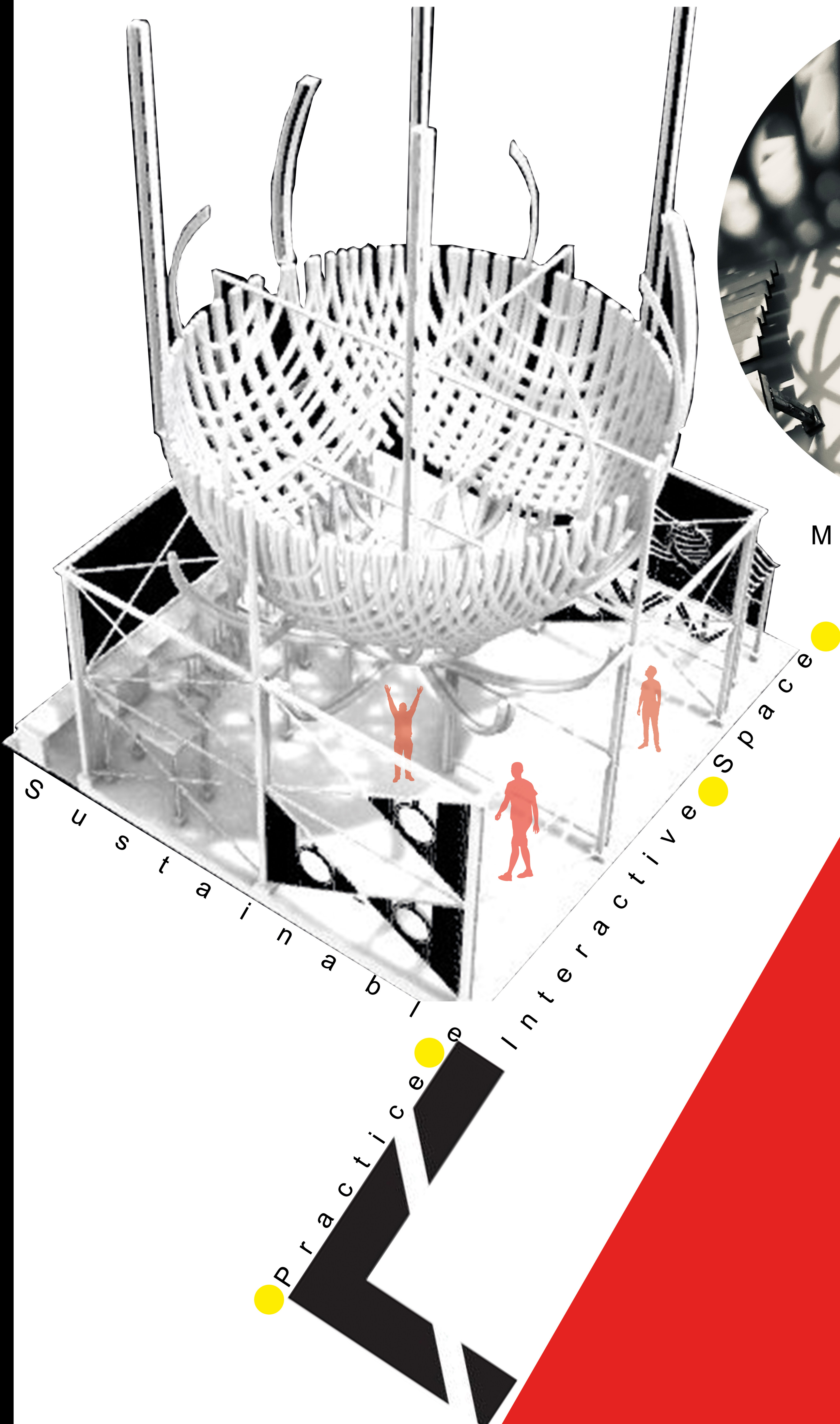
Kéré  
Architecture



Interior of the reception hall of the Gando School Library. Photo by Kéré Architecture  
Source: Kéré Architecture, 2010



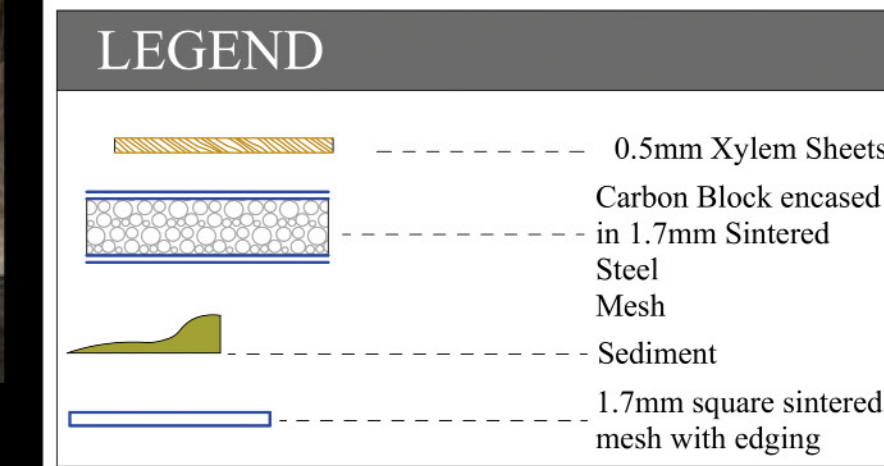
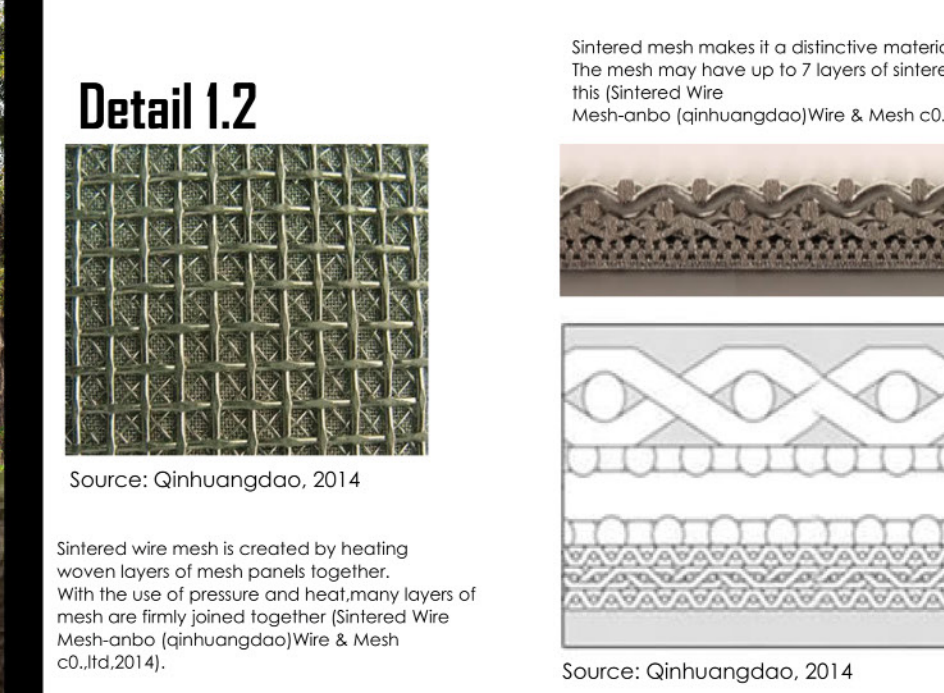
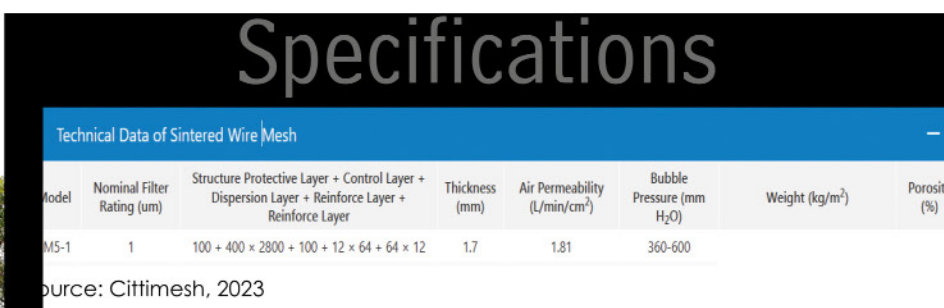
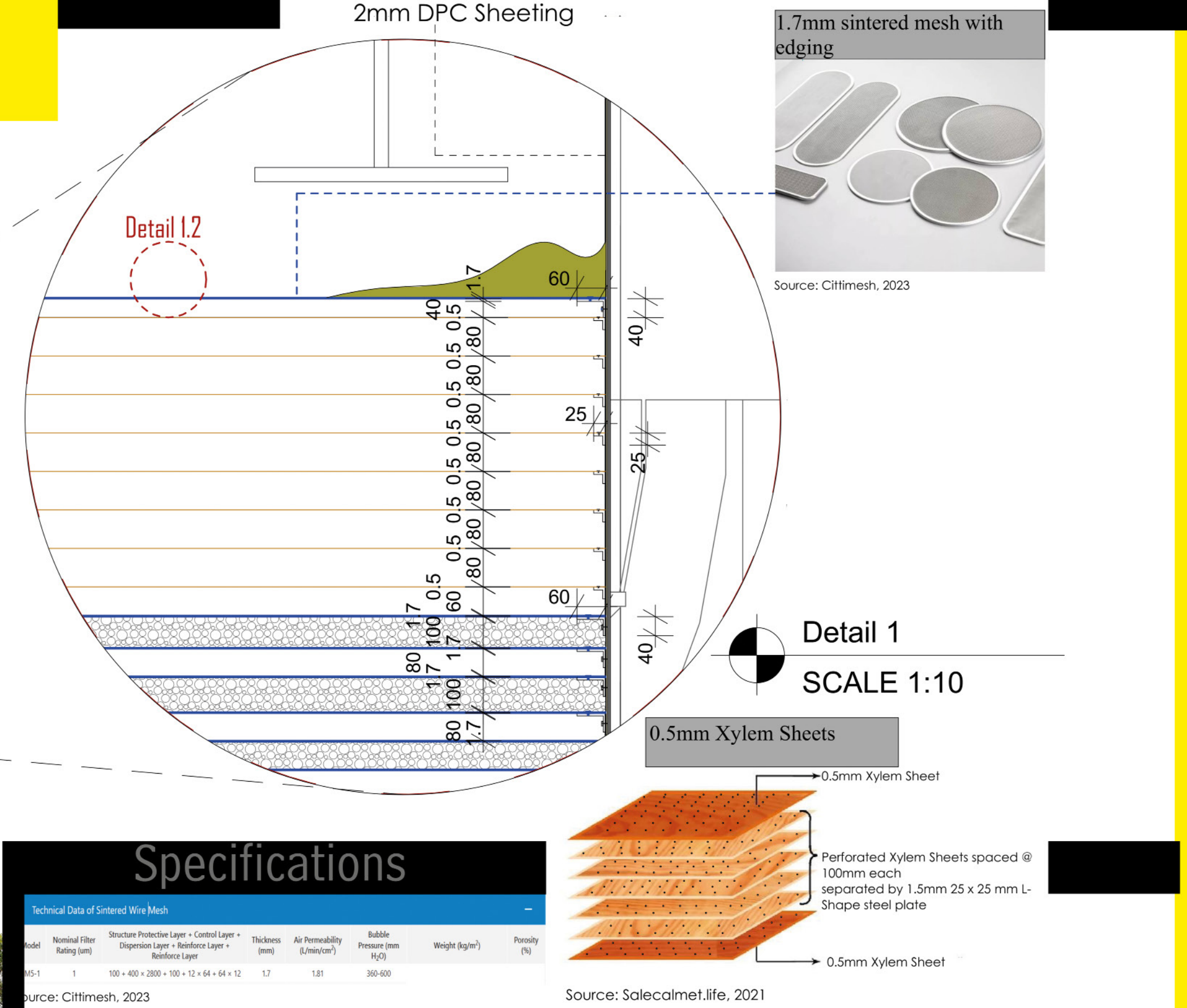
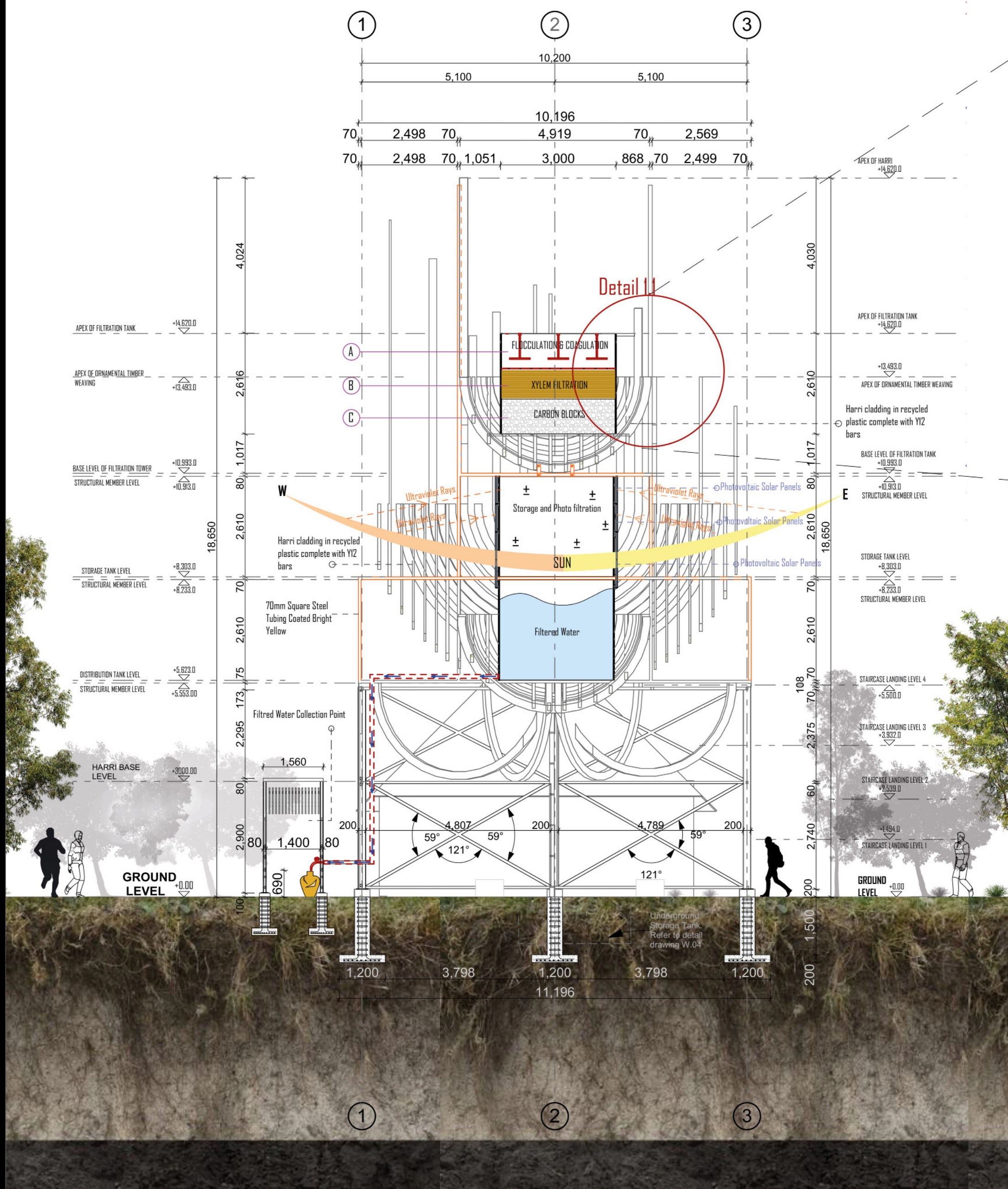
Model making



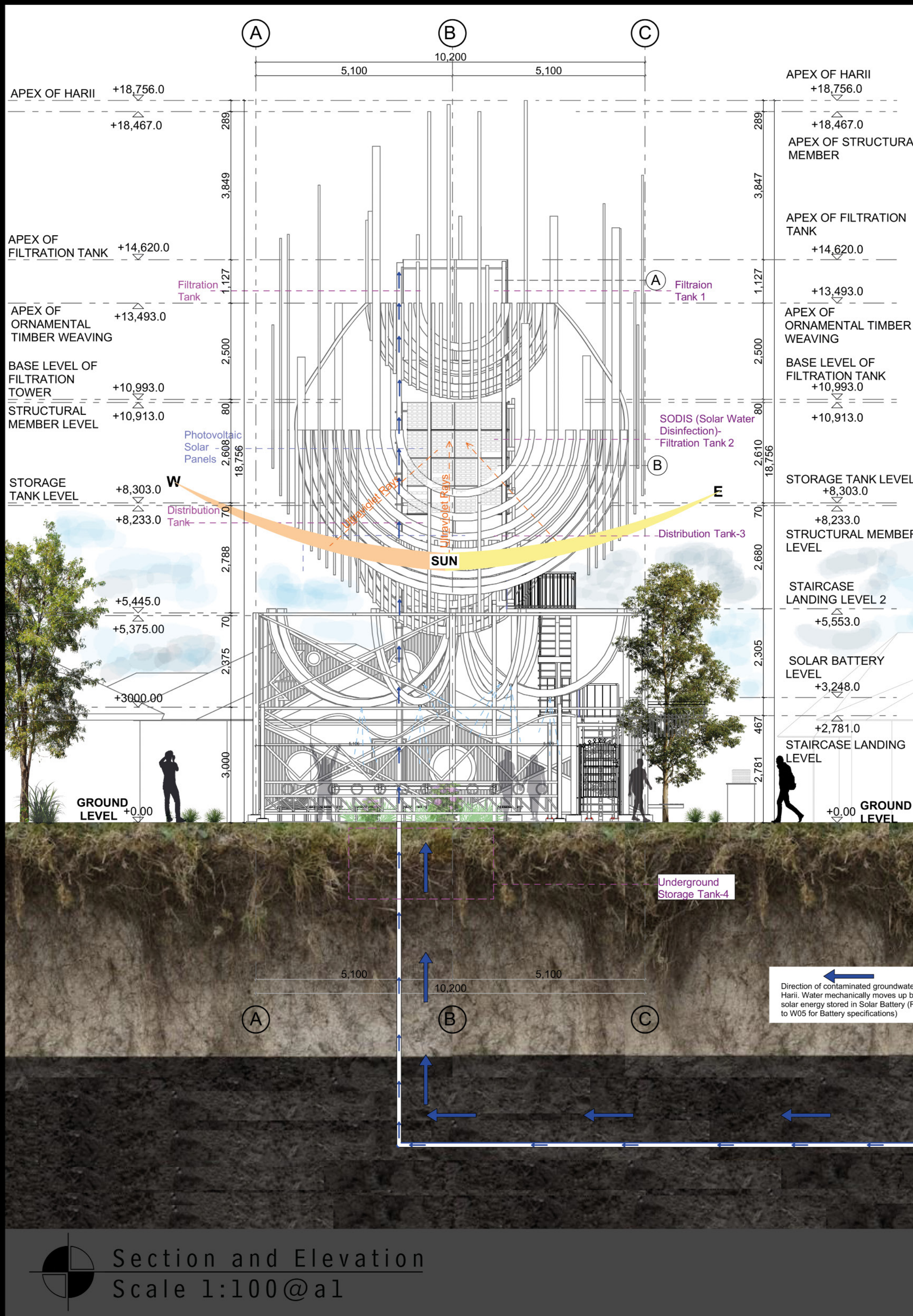
L I G H T & S H A D O W



# SECTION AND ELEVATION

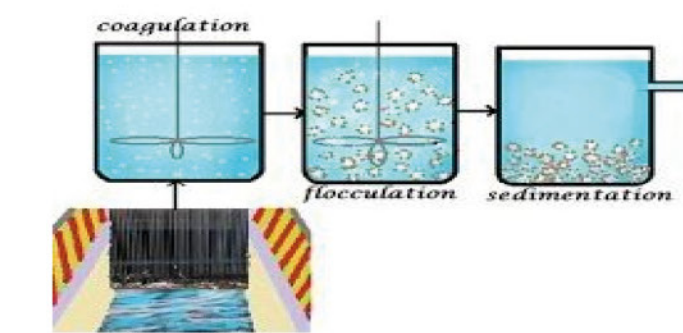


RE:THINK ● ADDING VALUE



## A FLOCCULATION & COAGULATION

Coagulation and flocculation occurs in successive steps, allowing particle collision and growth of floc. This is then followed by sedimentation. If coagulation is incomplete, the flocculation step will be unsuccessful, and if flocculation is incomplete, sedimentation will be unsuccessful. This reduces turbidity of water (Coagulation and Flocculation in Water Treatment, 2018)



## A XYLEM FILTRATION

New xylem filters that can filter out pathogens such as *E. coli* and rotavirus in lab tests, and have shown that the filter can remove bacteria from contaminated spring, tap, and groundwater (SciTechDaily, 2021)

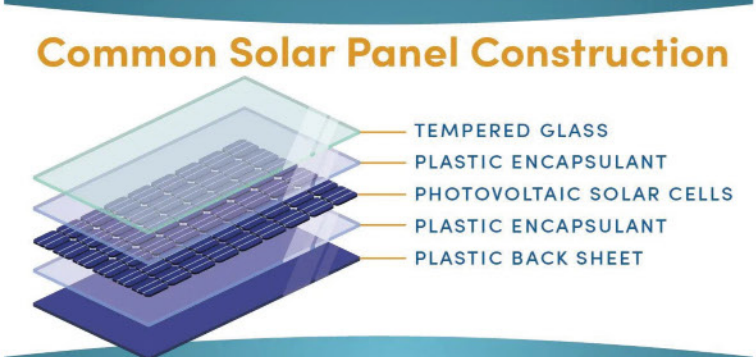


## A ACTIVATED CARBON FILTRATION

In general, carbon filters remove at least 81 chemicals and are effective at reducing another 52. According to the EPA, activated carbon is the only filtering material that removes all 12 identified herbicides and 14 pesticides, along with all 32 identified organic contaminants (Tech, 2018).



## B PHOTOVOLTAIC PANELS



Source: Americas's Plastic Makers, 2022

One household water treatment that is now becoming widely used is solar disinfection, more commonly known as SODIS. The technique is very simple. Ordinary transparent bottles are filled with the available (contaminated) water. These bottles are then placed in direct sunshine for a minimum of 6 hours, after which time themicrobial pathogens are killed (Inga Vesper for SciDev and part of the Guardian development network, 2016).



# INHABITATION & INTERACTION



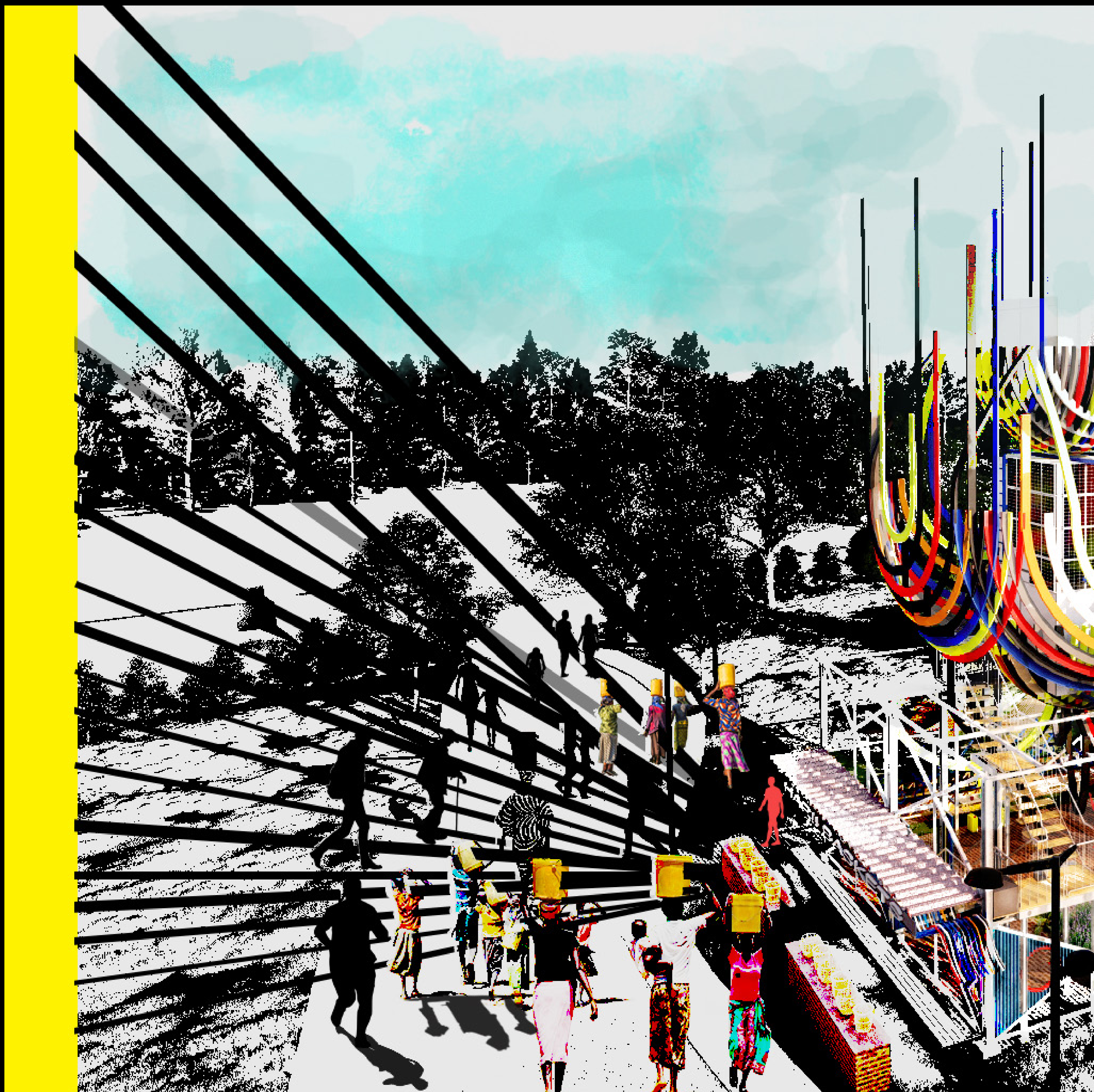


## USER EXPERIENCE- THE AFRICAN RAIN DANCE



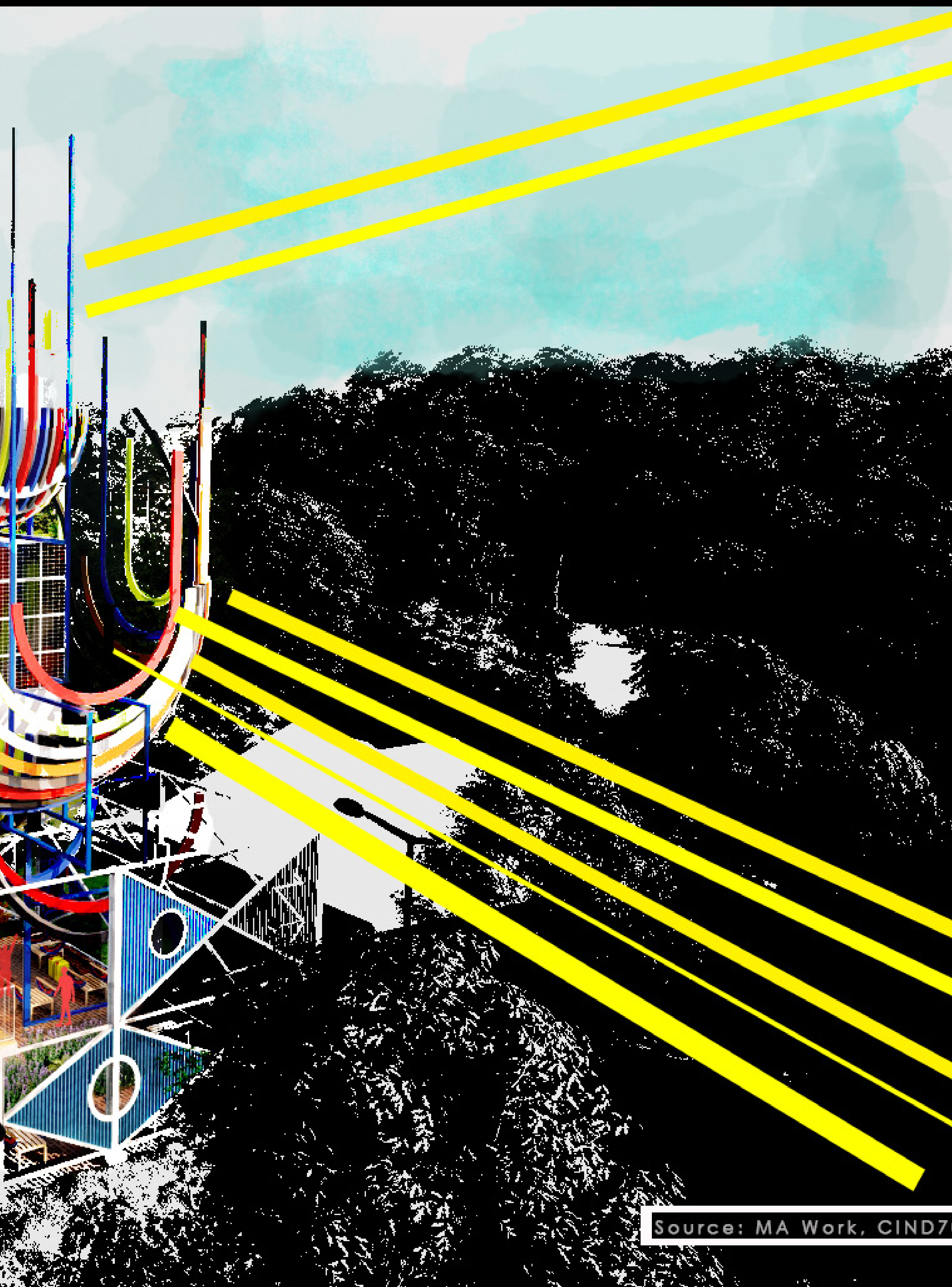


# HARII-A BEACON AND COMMUNITY HUB



H A





Source: MA Work, CIND7013,2

R I I



PERSPECTIVE VIEWS



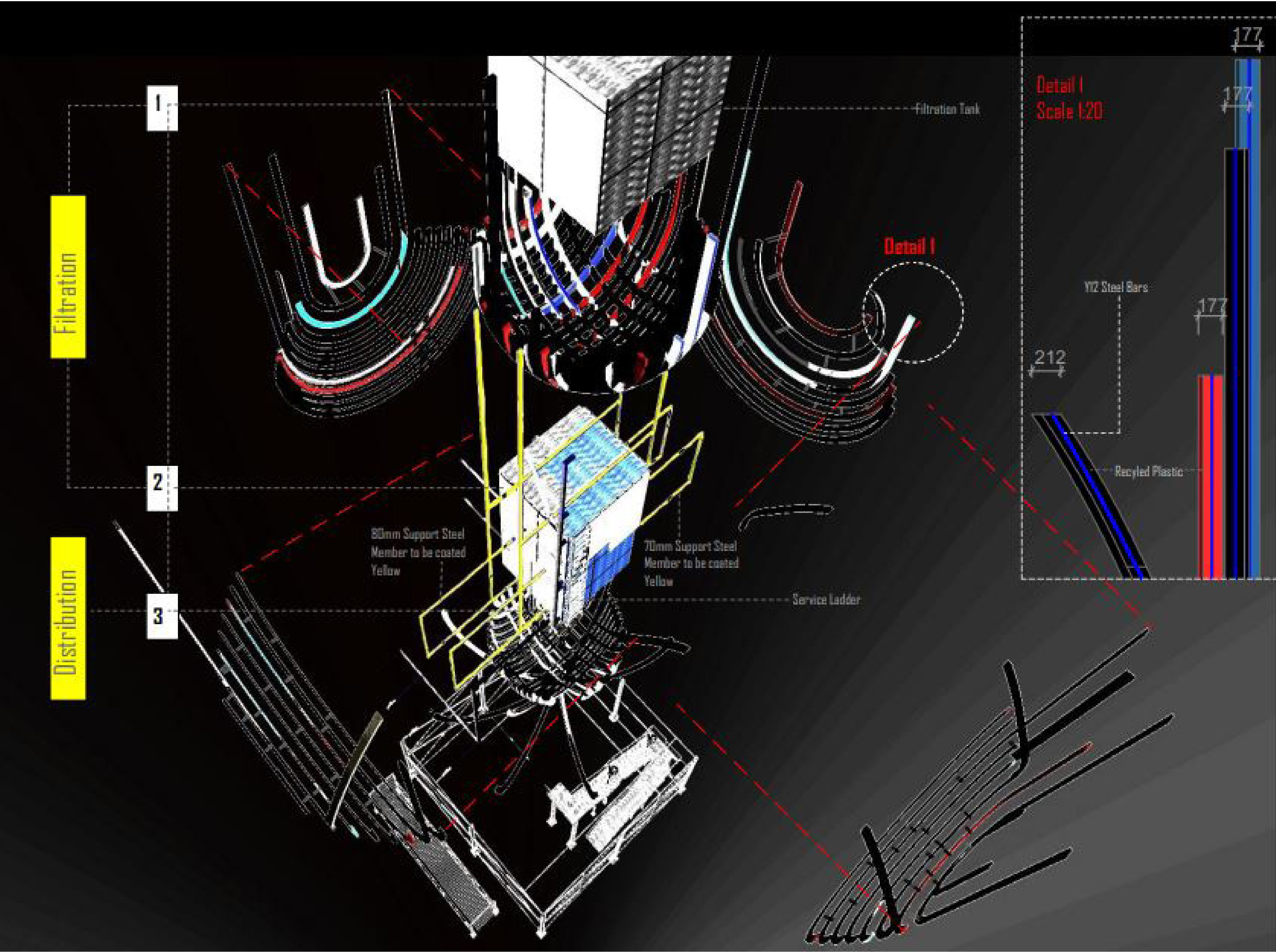


## DAY & NIGHT





# MATERIALS-RECYCLED PLASTIC





## NIGHT & AERIAL VIEW





# COMMUNITY HUB

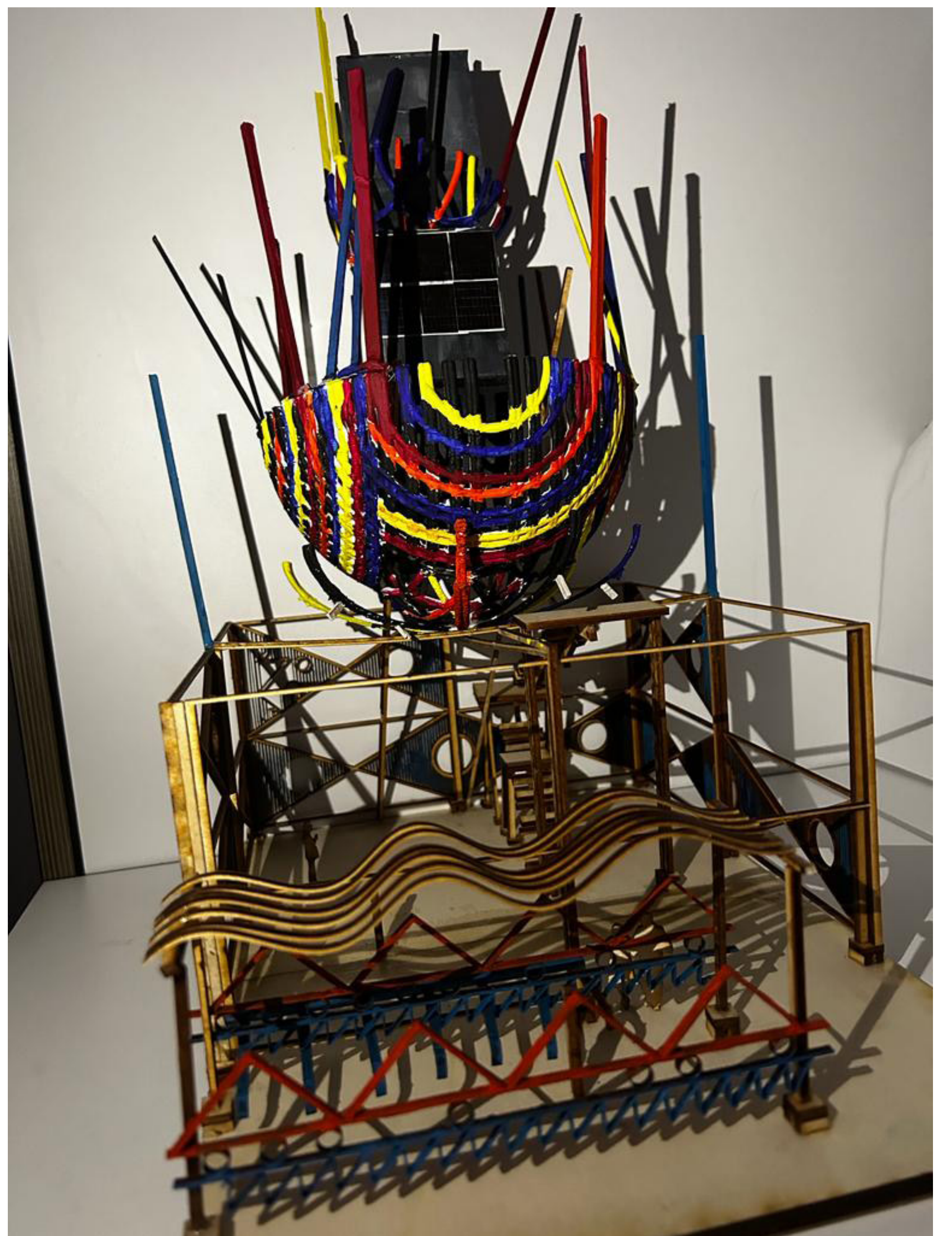
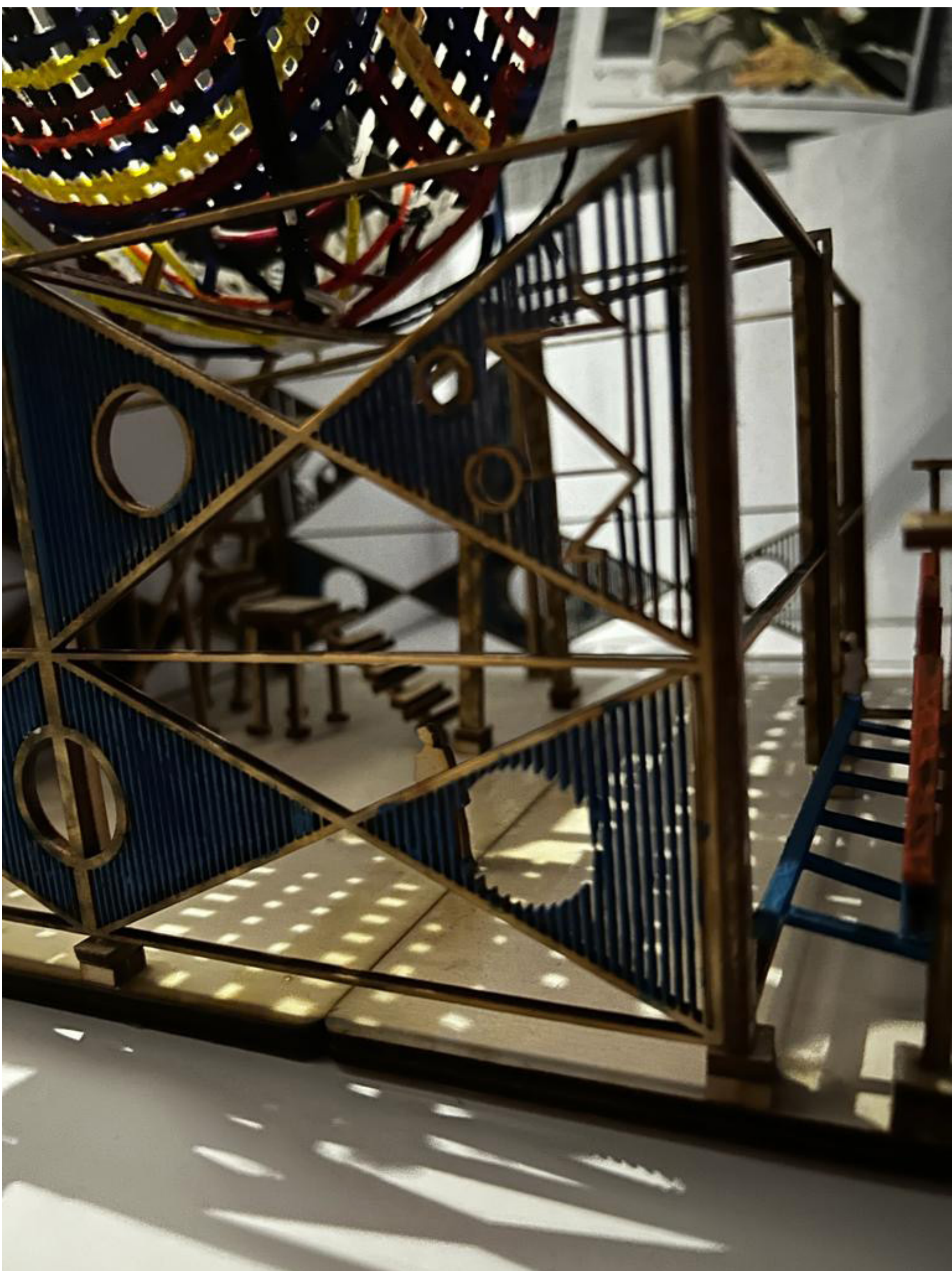
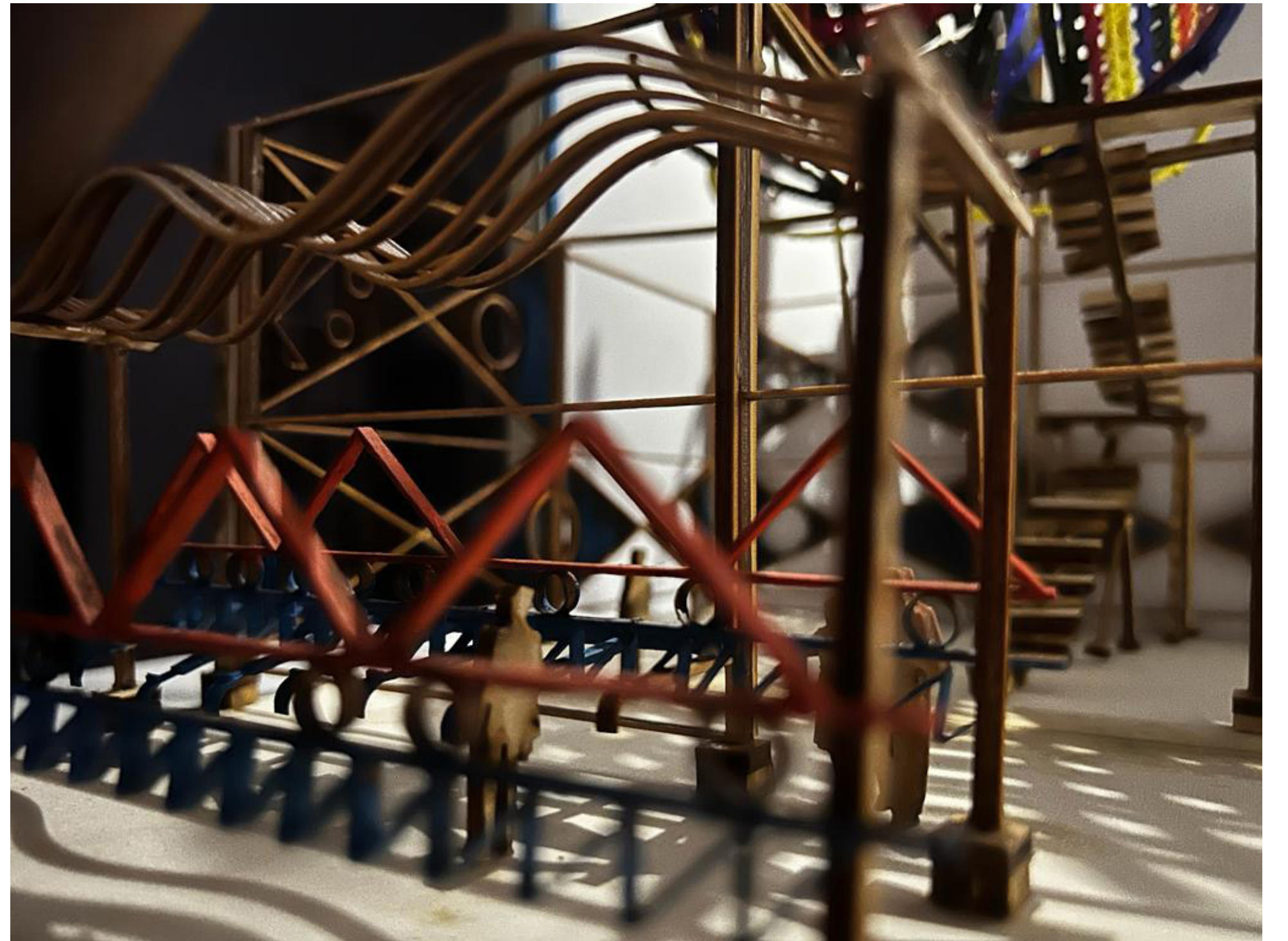




## FINAL MODEL

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MODEL FINISHES: 3D PRINTING, 3MM  
BIRCHWOOD PLY, ACRYLIC PAINT  
SCALE: 1:50





# ANIMATION

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C l i c k   l i n k   t o   v i e w



**Film Link 02/08/2023**

[https://youtu.be/n7d\\_PRKui2A](https://youtu.be/n7d_PRKui2A) [https://youtu.be/n7d\\_PRKui2A](https://youtu.be/n7d_PRKui2A)



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