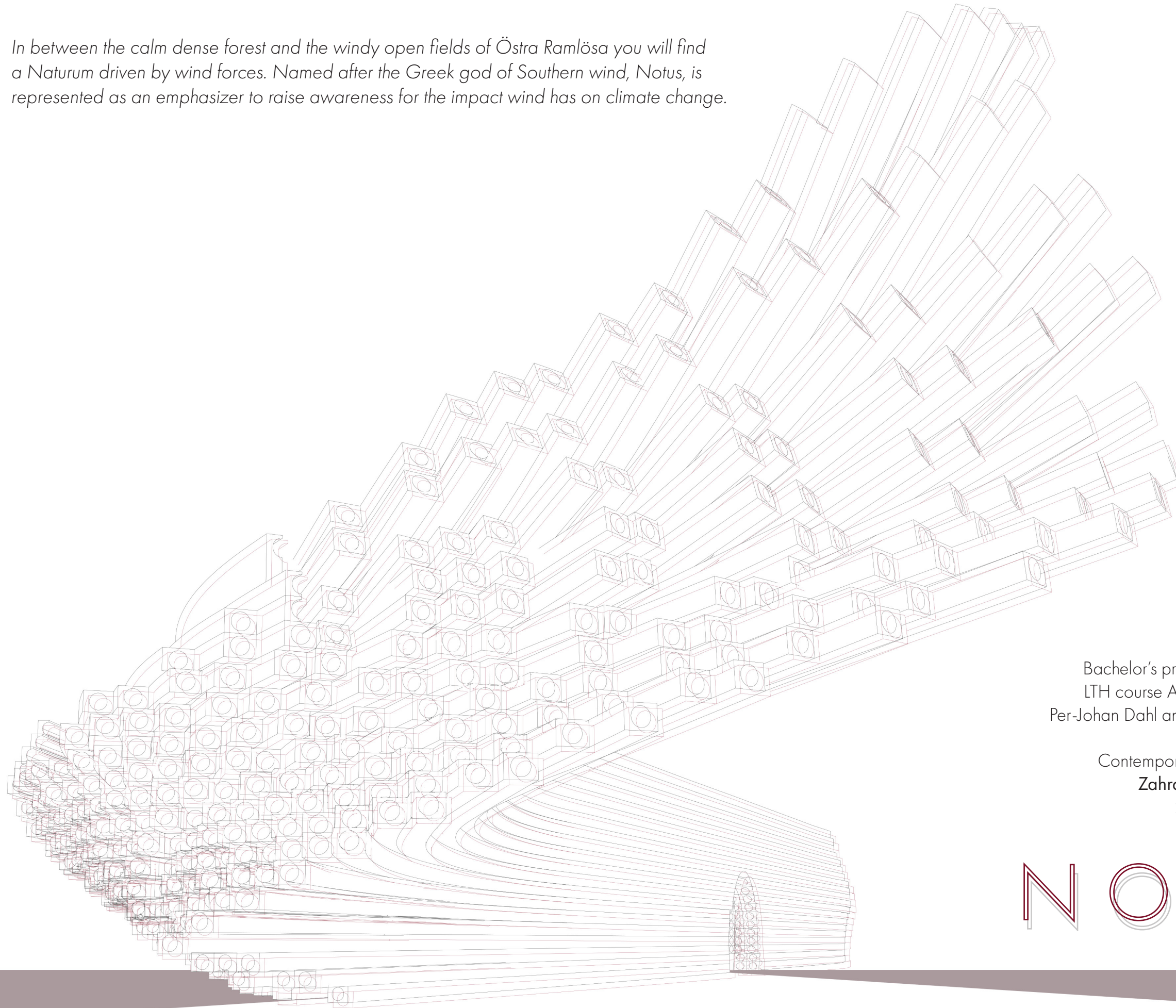


*In between the calm dense forest and the windy open fields of Östra Ramlösa you will find a Naturum driven by wind forces. Named after the Greek god of Southern wind, Notus, is represented as an emphasize to raise awareness for the impact wind has on climate change.*



Bachelor's project made during  
LTH course AAHF30, taught by  
Per-Johan Dahl and Gediminas Kirdeikis.

Contemporary Naturum by  
**Zahra Aldasoki**  
2022

NOTUS





*Dry grass reformed after being wind swept over time.*

## CONCEPT

The concept behind Notus emerged through careful analysis of the site and its nature. From the initial site visit, I was captivated by the expansive flat terrain with the strong and irresistible wind which was almost too windy to walk and enjoy the nature on site. However, what particularly struck my interest was the enduring impact the wind had on the site over time. The vast haystacks of dry grass had adapted to the relentless forces of the wind, leaving an intriguing and durable pattern behind.

After my first visit, I knew I wanted to explore and expand on wind, sound, and patterns concerning climate change. The minimum information I knew about wind and its connection to climate change sparked my curiosity to learn and explore more about it as an element for an architectural space in nature.

From the patterns left behind, we can learn more about how nature is adapting and transforming to the outcomes of climate change. These studies could later be the main research for future projects and solutions. For this specific project, I decided to raise awareness to the problem of climate change and wind rather than solving it. By letting the visitor experience and feel beyond the significance of the wind forces on the site.



*Overview map of the site located in Östra Ramlösa, Helsingborg. Building located in red dot.*



*3D view of site and protection zone where building will be located.*



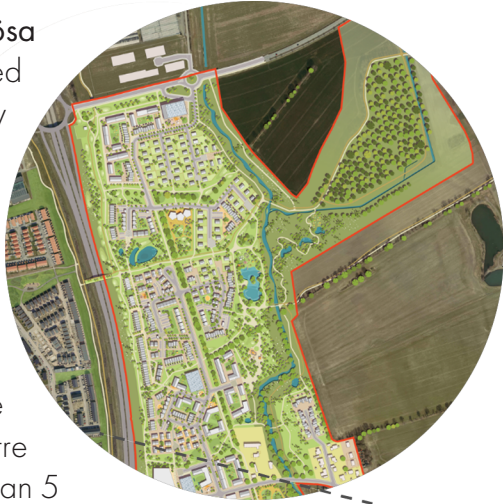
# Site Analysis



Östra Ramlösa,  
Helsingborg, Sweden  
56.037882, 12.772007

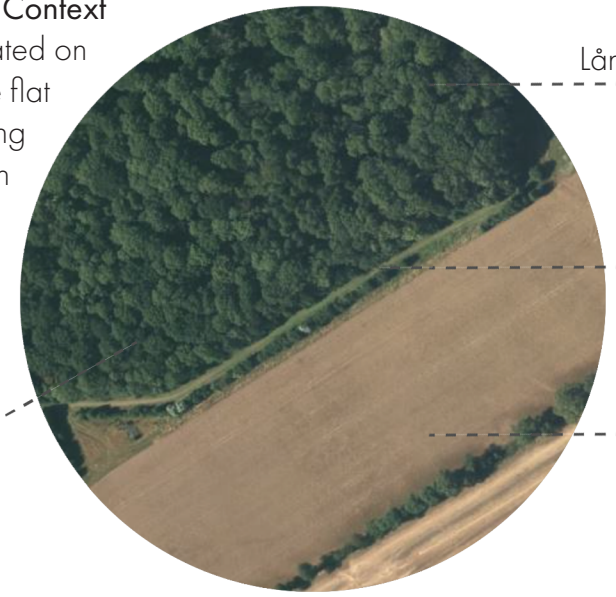
## 1. Östra Ramlösa

Is a rising nature enriched industrial area in the city of Helsingborg with plans for expansion of accommodation, local stores, nature trails, parks, schools, and social settings. It is an attractive site for future plans due to its centre green location with less than 5 kilometres to the nearest sea.



## 2. Context

The Naturum is located on an 8.5-meter-wide flat protection zone, being the contrast between a dense coniferous forest and the wide-open fields.



Långeberga forest

Protection zone

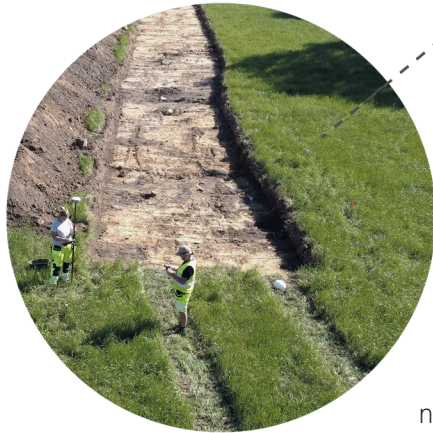
Open fields

Climate change is caused by human activities and is threatening the way we live and the future of our planet. By addressing climate change, we can build a sustainable world for everyone.



## 3. Sustainability

Climate warming has produced stronger winds along some coasts, a result of growing differences in temperature and pressure between land and sea. These winds cause cold nutrient-rich seawater to rise to the surface, affecting climate and fuelling marine productivity.



## 4. Hydrology

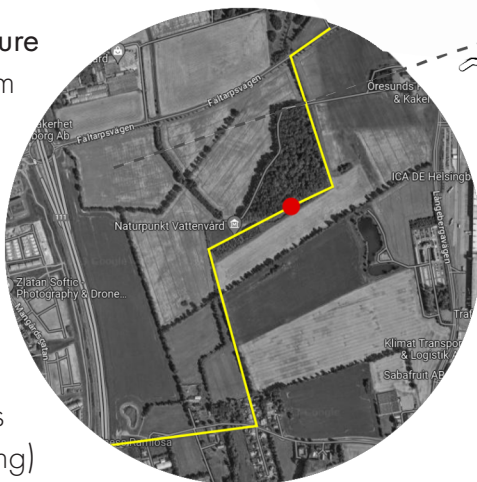
Only a fraction of nature's own purification works in the form of water courses and wetlands remain in Östra Ramlösa today. The nearest water course is on the site and a larger pond is 200 meters away.



## 5. Infrastructure

Ca. 1 km away from nearest bus station (15 min walking) (3-5 min biking from nearest road)

Grocery stores and other essentials (ca 15 min walking)



## 6. Topography

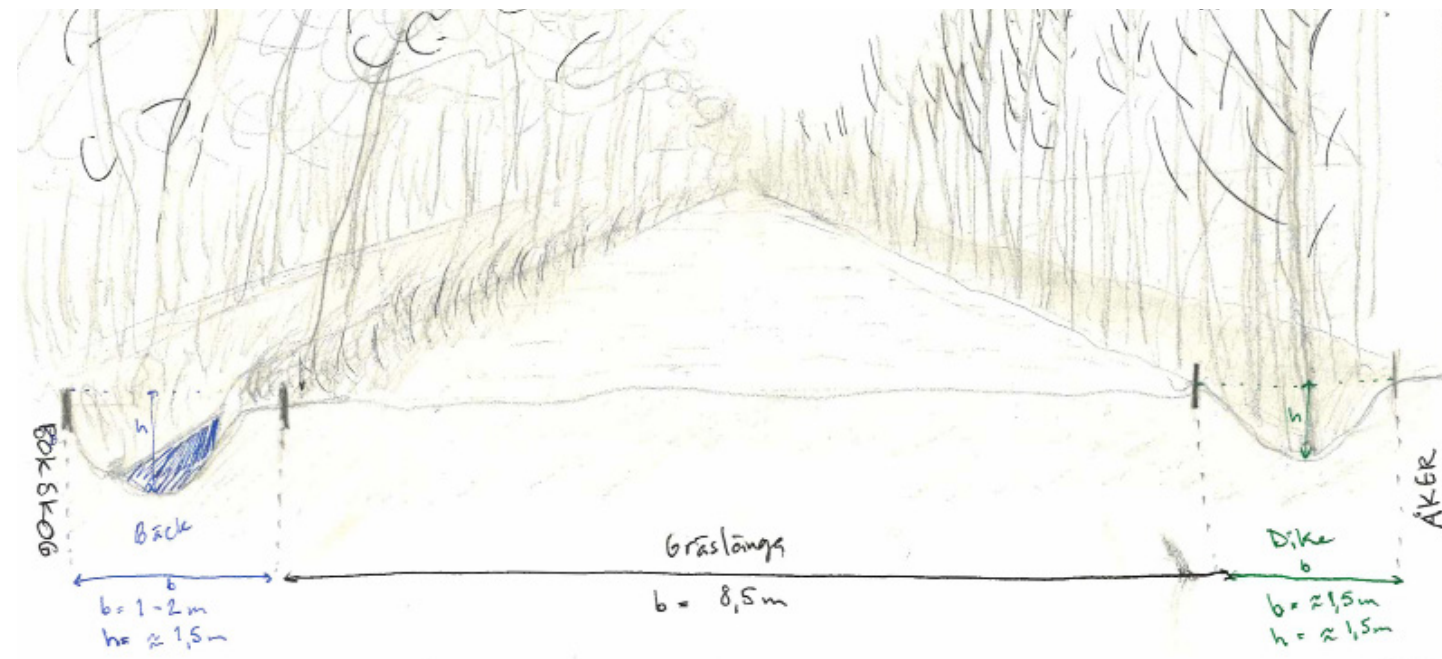
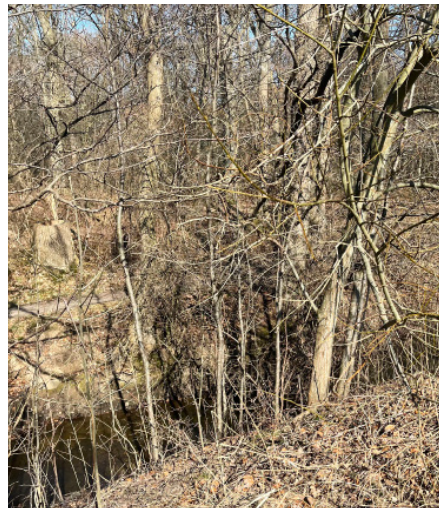
The topography and landform of the site is mainly flat and wide open with a stretched view over the landscape. The fields of hays and dry grass are clearly affected and reformed by the wind forces.





## LOCATION

In the northern part of Östra Ramlösa you can find a dense coniferous forest with clear margins. By one of the edges there is a narrow 220-meter-long strip of grass area stretching from one end of the forest to another. To the left of the grass lawn, you will find the forest with a water stream in-between approximately 1,5 meters below. To the right of the grass lawn lays a shorter trench also 1,5 meters deep. This specific long lawn happened to be extra windy on our site visit which made it a relevant isolated yet accessible location to design with.



Viewpoints from chosen site



1

2

3

4

5





Kinetic sculpture by Anthony Howe



Kinetic facade by Ned Kahn

## INSPIRATION

I was quick to find myself researching the obvious and brilliant kinetic works, which combines movement with wind to successfully showcase and make the invisible element visible. Works such as kinetic sculptures by Anthony Howe and kinetic facade by Ned Kahn showcase movement while works such as the "Singing Ringing Tree" by Mike Tonkin and Anna Liu and Aeolus by Luke Jerram showcase sound generated by the wind. (see pictures to the left).



Singing Ringing Tree by Mike Tonkin and Anna Liu



Aeolus by Luke Jerram

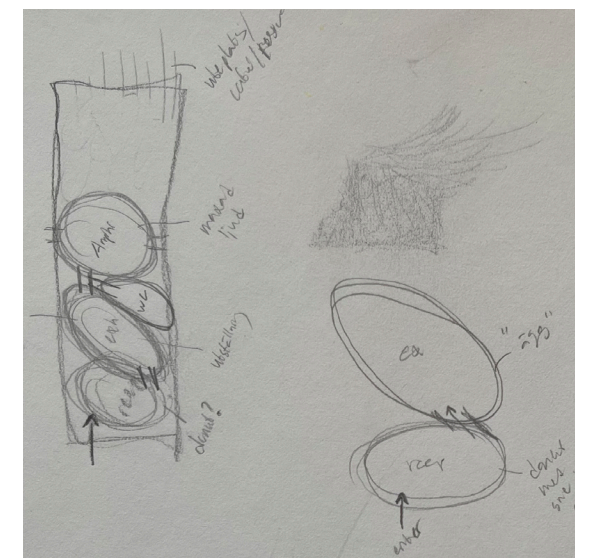
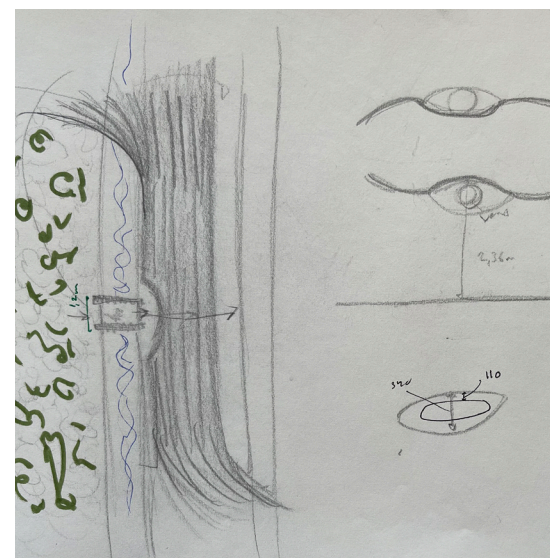
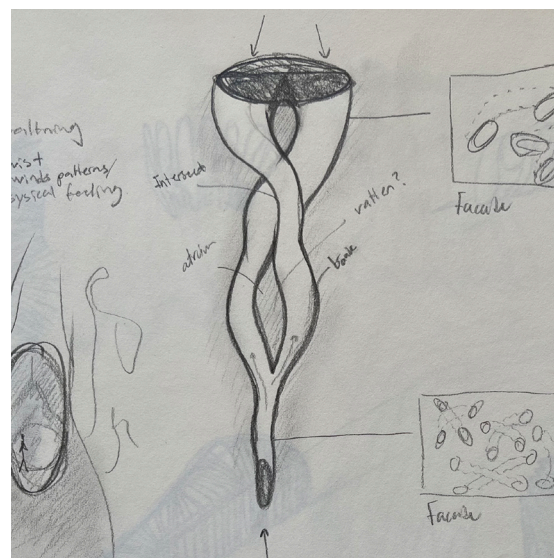
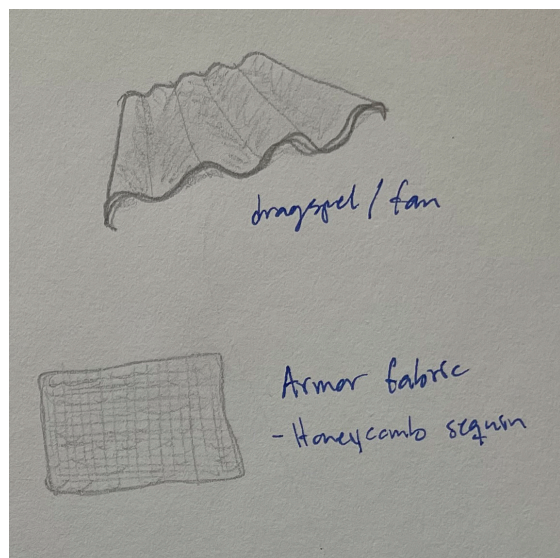
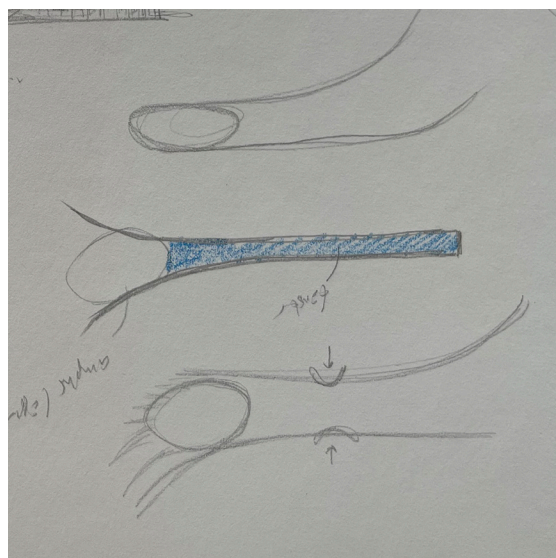
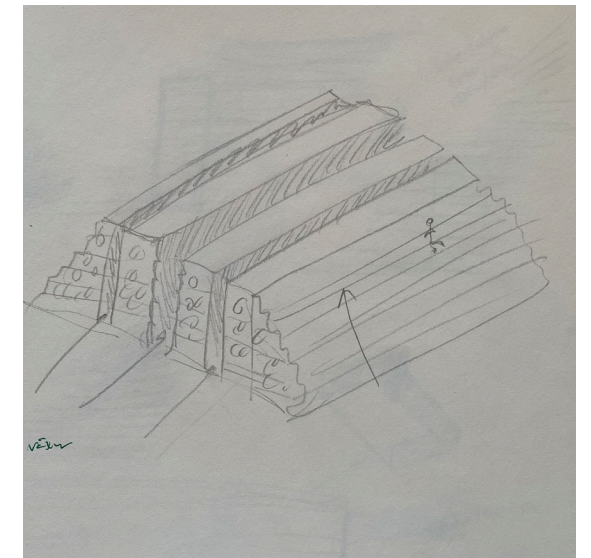
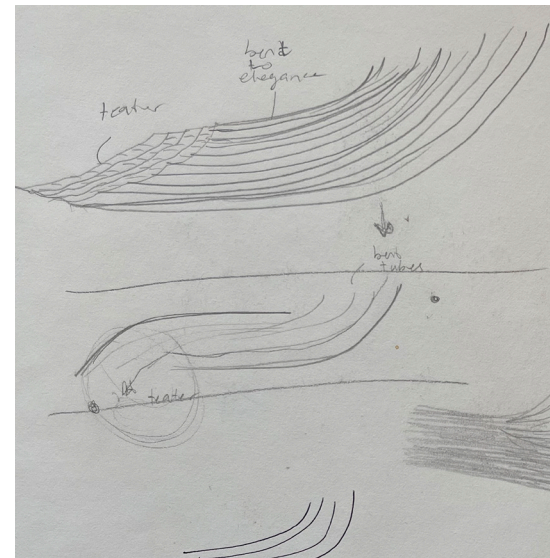
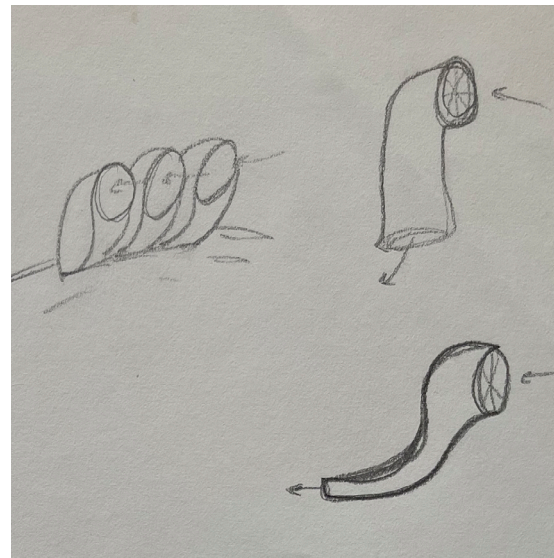
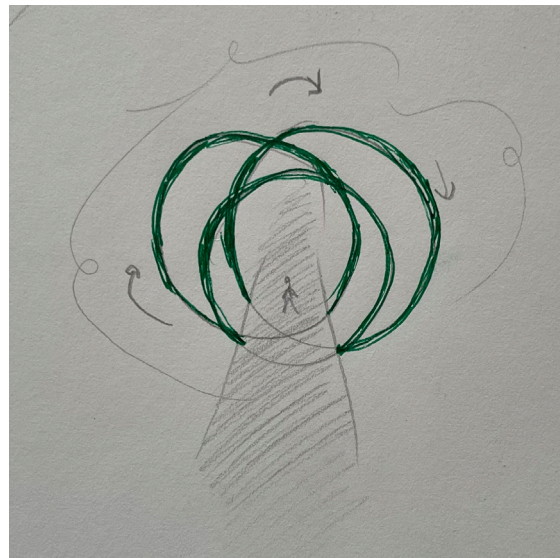
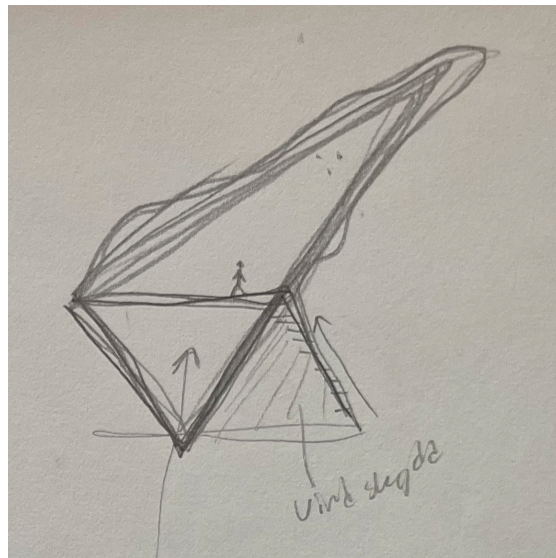
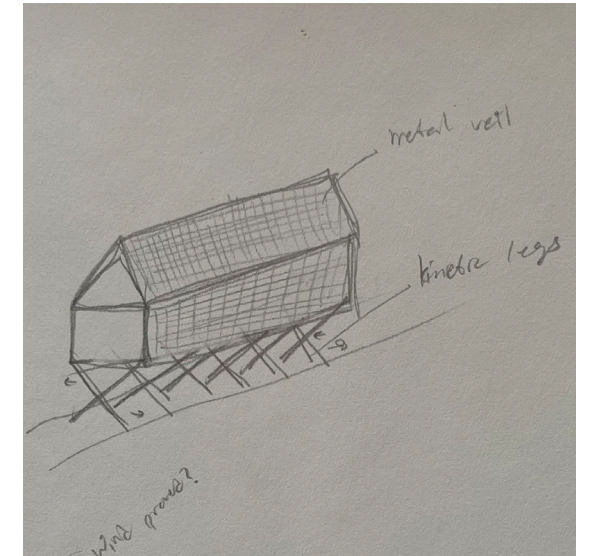
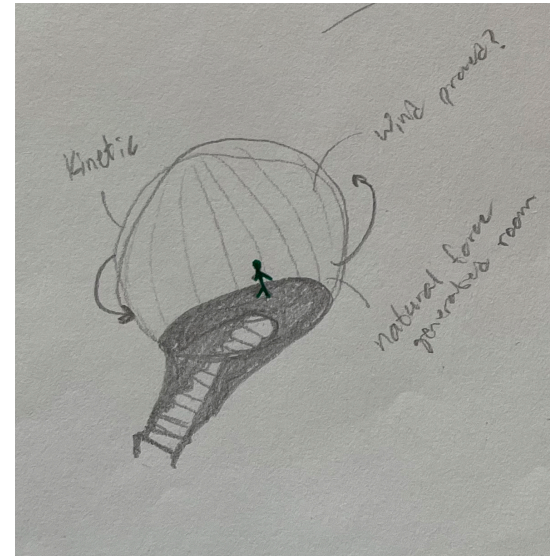
Due to the strong winds from various directions on the site, I chose to focus on the sound generation as inspiration for the buildings form. Inevitably creating something that represents the phenomenon of how form and matter can change over time due to the weather. A few examples of such phenomenon are stone being naturally reshaped due to the pressure of water drops and aqueducts losing detail due to the pouring water. What differs wind from other elements such as water and fire, is how untouchable and invisible it is.



## PROCESS

A few of my requirements for the Naturum was to create a sustainable space one could enjoy both on the outside and inside. Ultimately a room for the public, almost emerging from earth itself. The form of the Naturum had to be diverse and flexible for any activities to be held at or around the space.

With these constraints in mind, my early sketches leaned towards the experiment of combining movement and sound generated by the wind. Most kinetic works focus on one of the above, either generating movement or sound but rarely both at the same time. I started to sketch on a form that could rotate or reform itself after the wind, but the task was too complicated to achieve a form functional and sustainable enough for the project at hand.



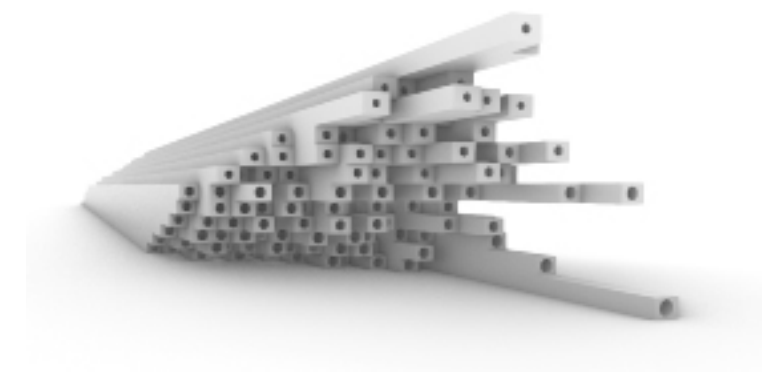
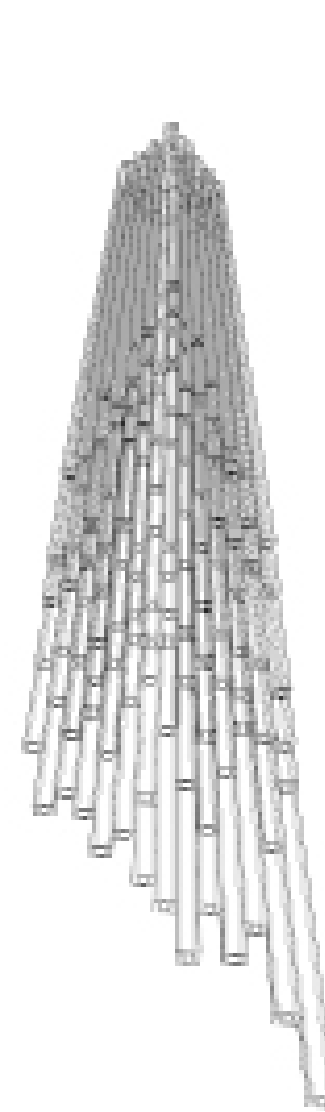
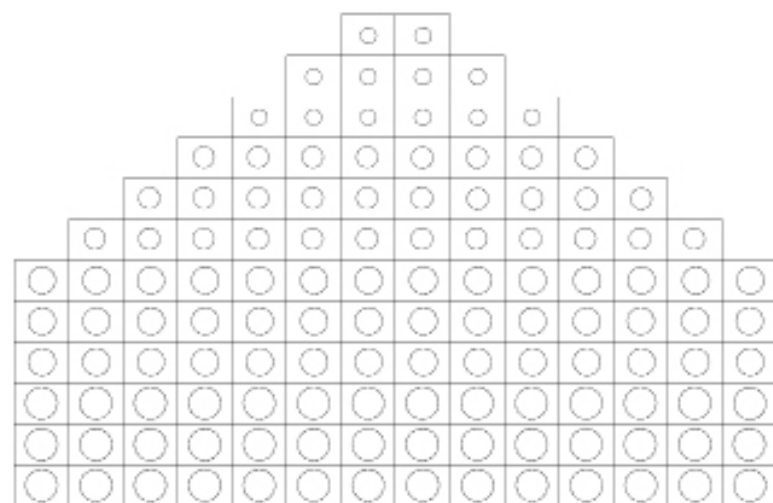
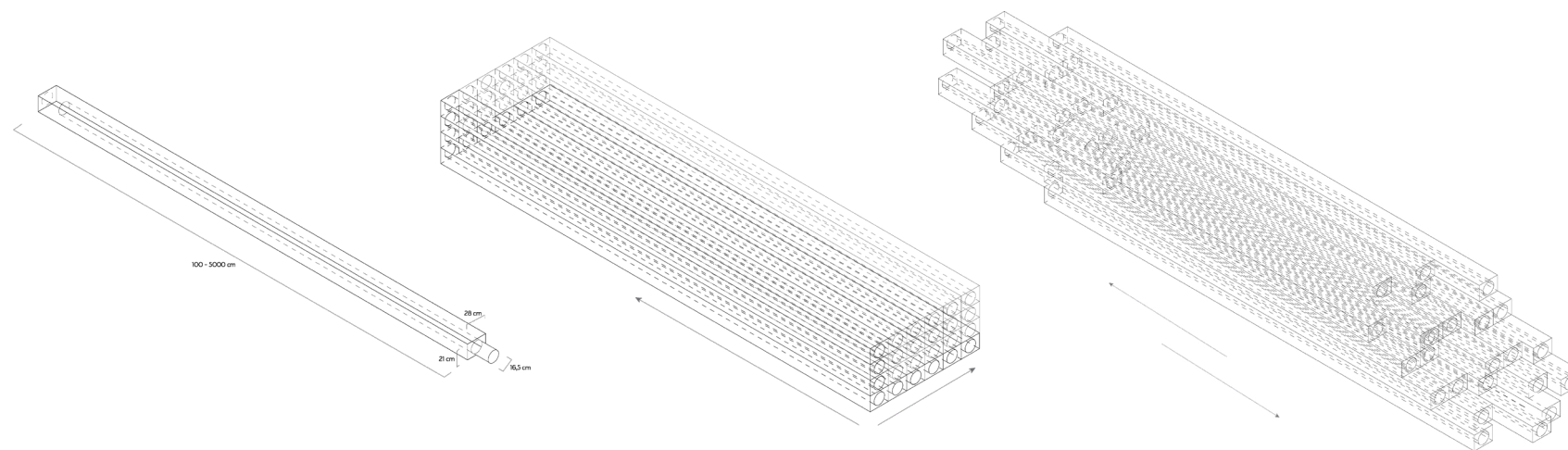


## METHOD

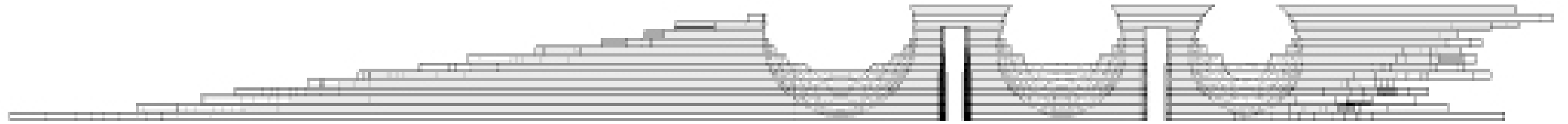
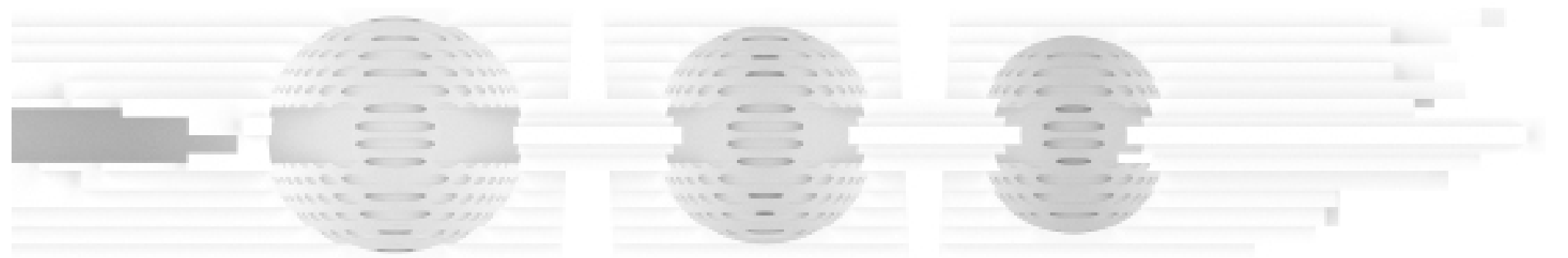
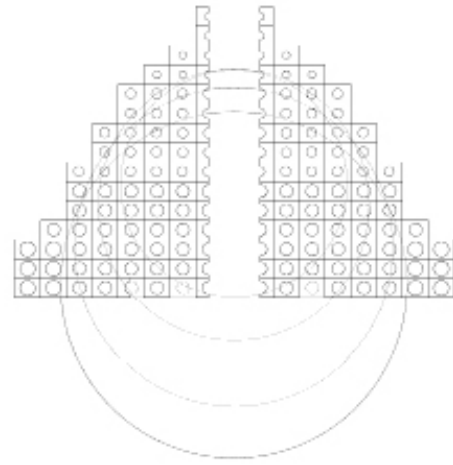
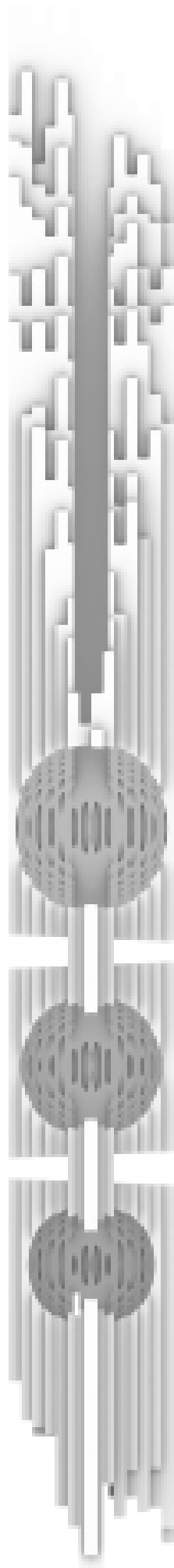
Instead of making the building move, I settled on creating a flowing form that represented change so that I could focus more on the sound generation aspect. Combining inspiration from kinetic works such as the Singing Ringing Tree with my own requirements led my process to focus on beams as stairs.

I wanted to incorporate the physics of pipes with wind and sound into a more functional form. My idea was that a space providing a free seat and a view over the landscape seemed to be only right for my site. Experimenting with some options in width, height and length, the result became a simple beam with a hole in the middle for the wind to pass through.

With the simple concept of using beams as stairs, I started to play around with shifting the beams front and back, resulting in two different ends of the building (example shown to the right). Not only did this method create dynamic in each end but also made the building more diverse and interesting to explore from all directions. The beams function as stairs and as sound emphasizeers throughout the building.





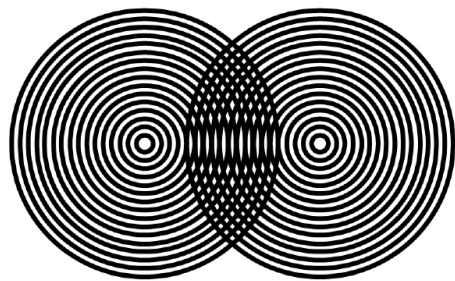
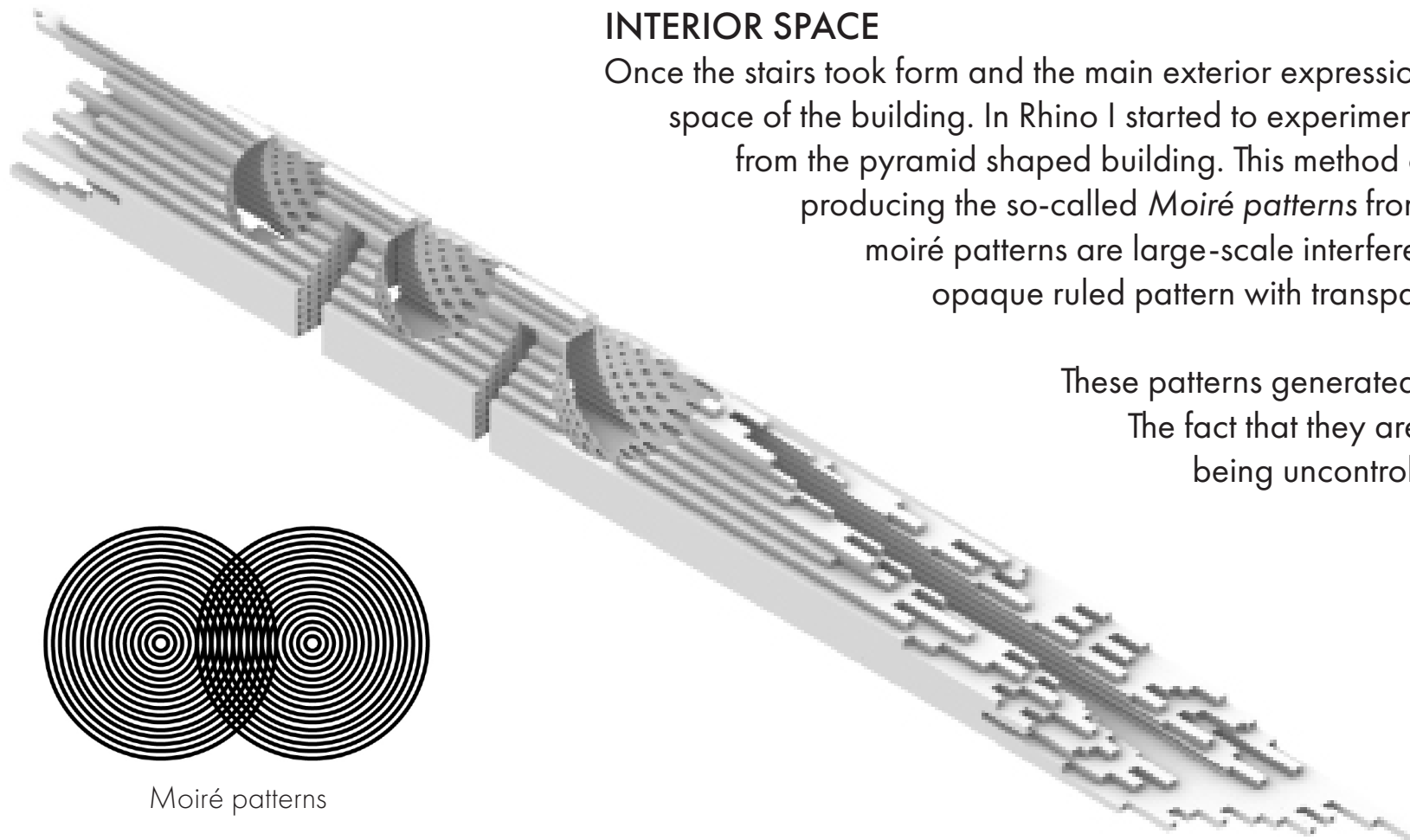


Three different sized spheres carved out of pipe geometry to create moiré patterns inside

### INTERIOR SPACE

Once the stairs took form and the main exterior expression was decided, it was time to explore the interior space of the building. In Rhino I started to experiment with Boolean difference or carving out spheres from the pyramid shaped building. This method opened up a new aspect to the building by producing the so-called *Moiré patterns* from the holed beams. In mathematics, physics, and art, moiré patterns are large-scale interference patterns that can be produced when a partially opaque ruled pattern with transparent gaps is overlaid on another similar pattern.

These patterns generated character and expression to the building's interior. The fact that they are randomized also relates to the concept of wind, being uncontrollable and beautiful at the same time.



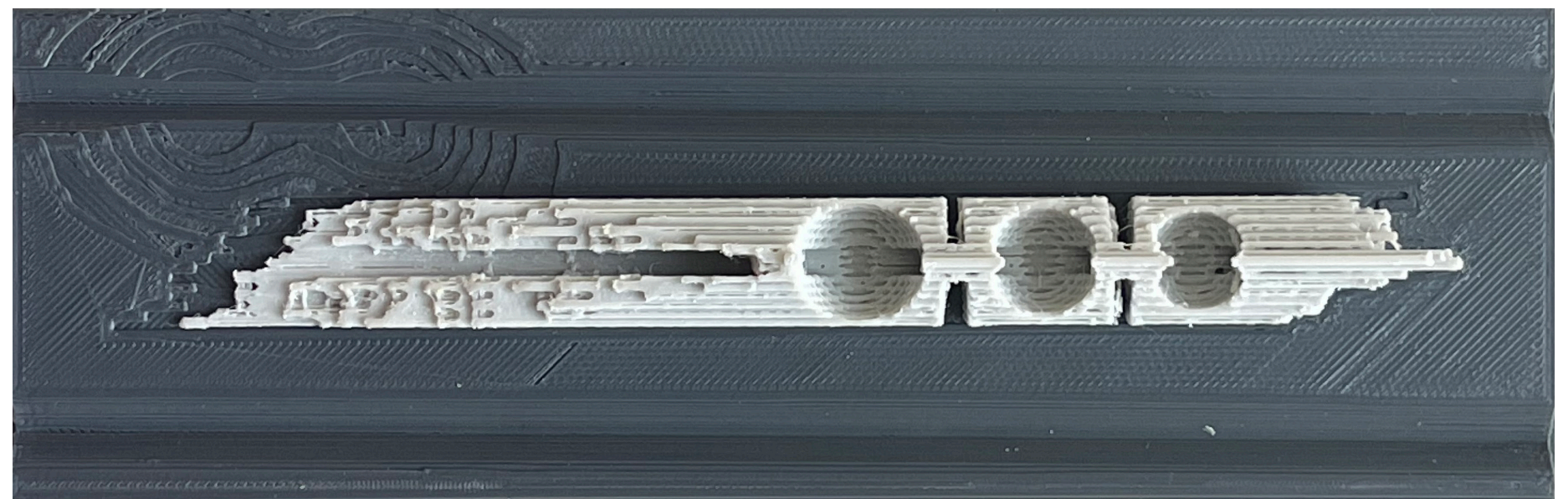
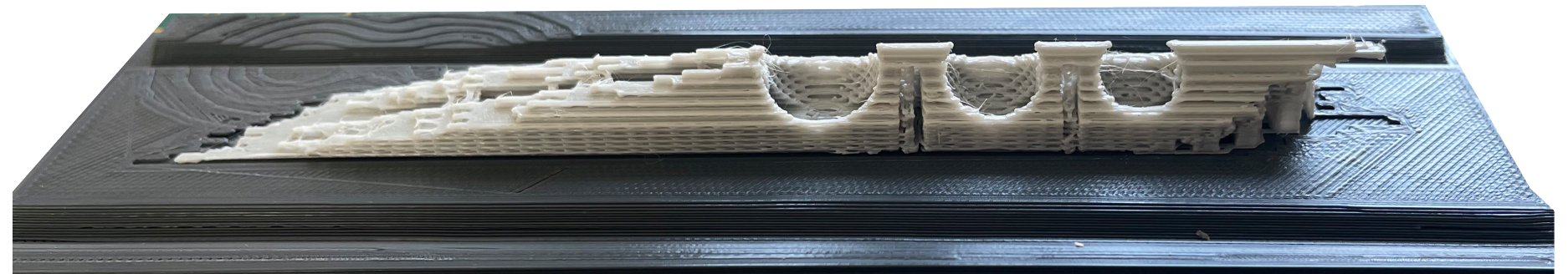
Moiré patterns





### 3D SKETCH MODEL

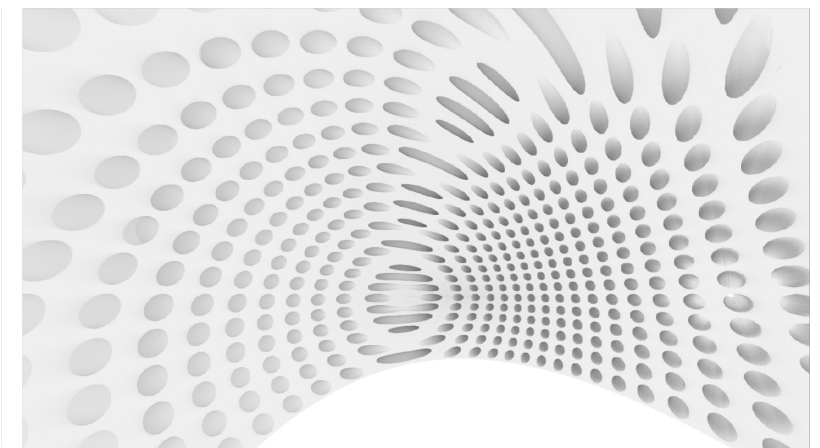
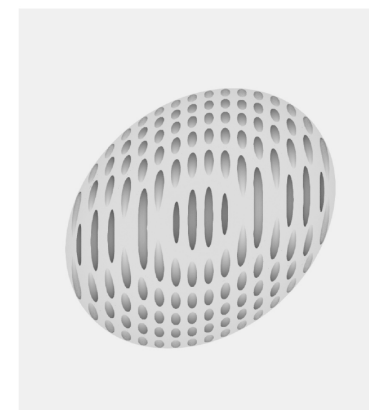
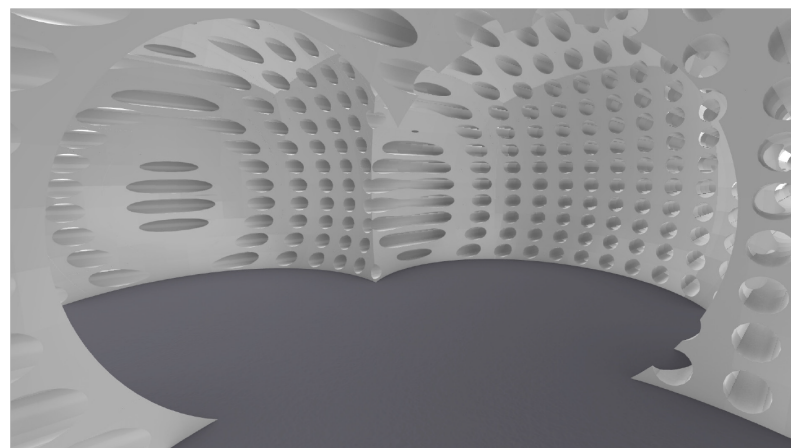
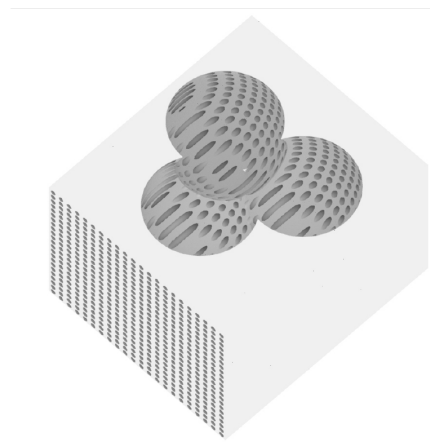
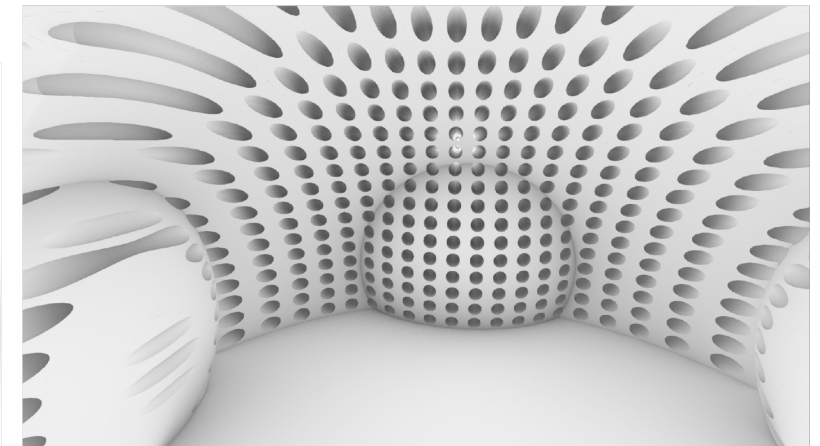
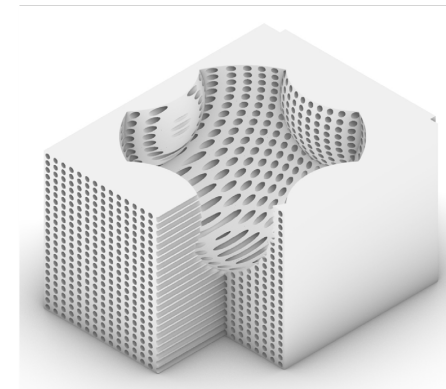
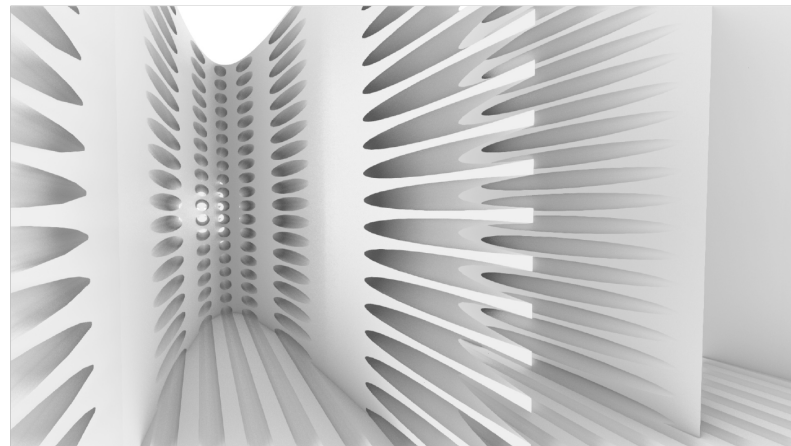
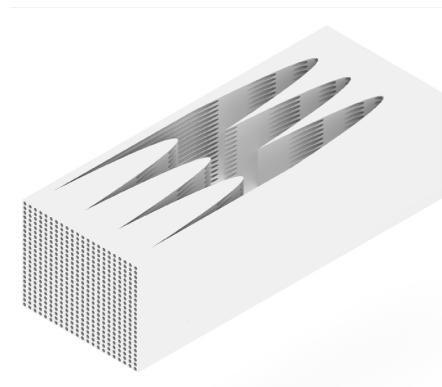
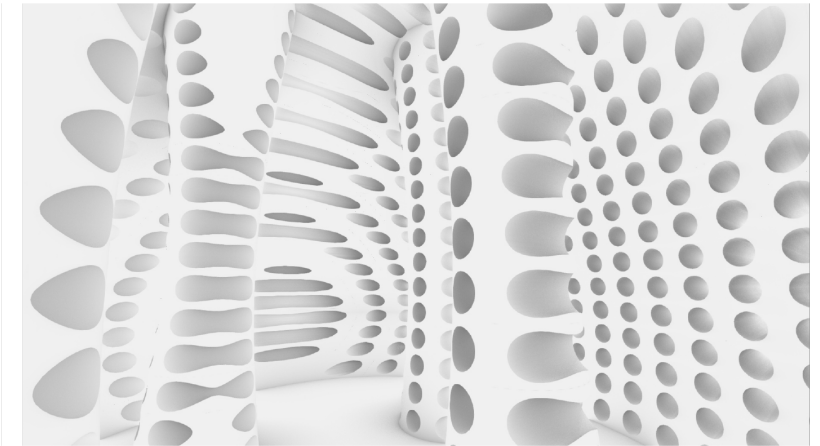
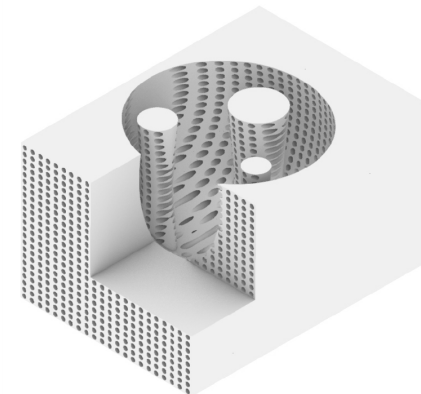
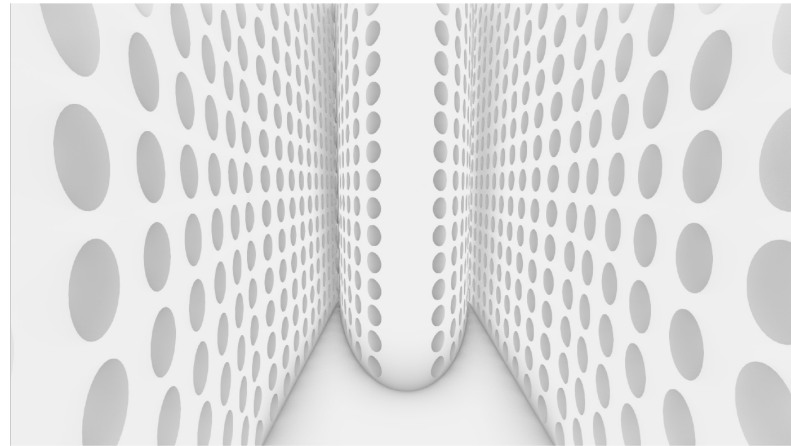
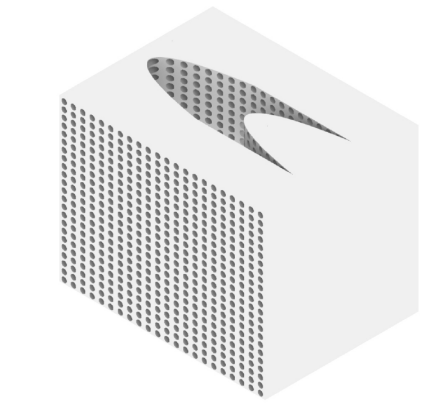
An important part of the project was to examine and practice with 3D model printing. This method of modelmaking was relevant to my building since it has many complex elements and tricky details. The moiré patterns and stair placements would have been unbearable to recreate by hand which is why 3D printing allowed for model making to begin with.



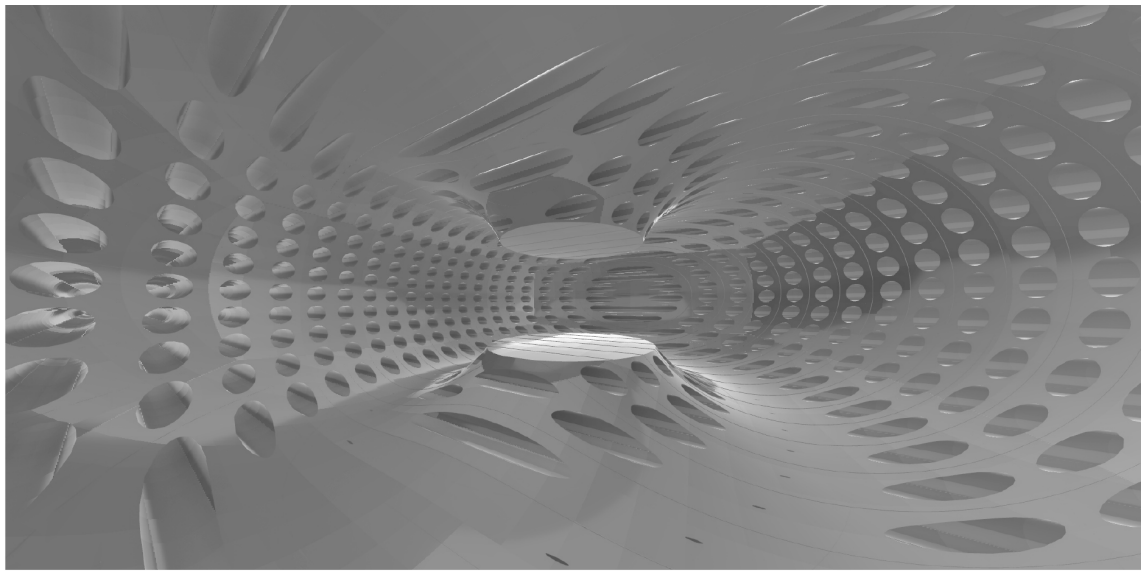


## RHINO PROCESS

Other shapes I experienced with carving out spaces with were domes, oval, anchors, and cylinders which gave different impressions and special experiences, as seen in the examples bellow.

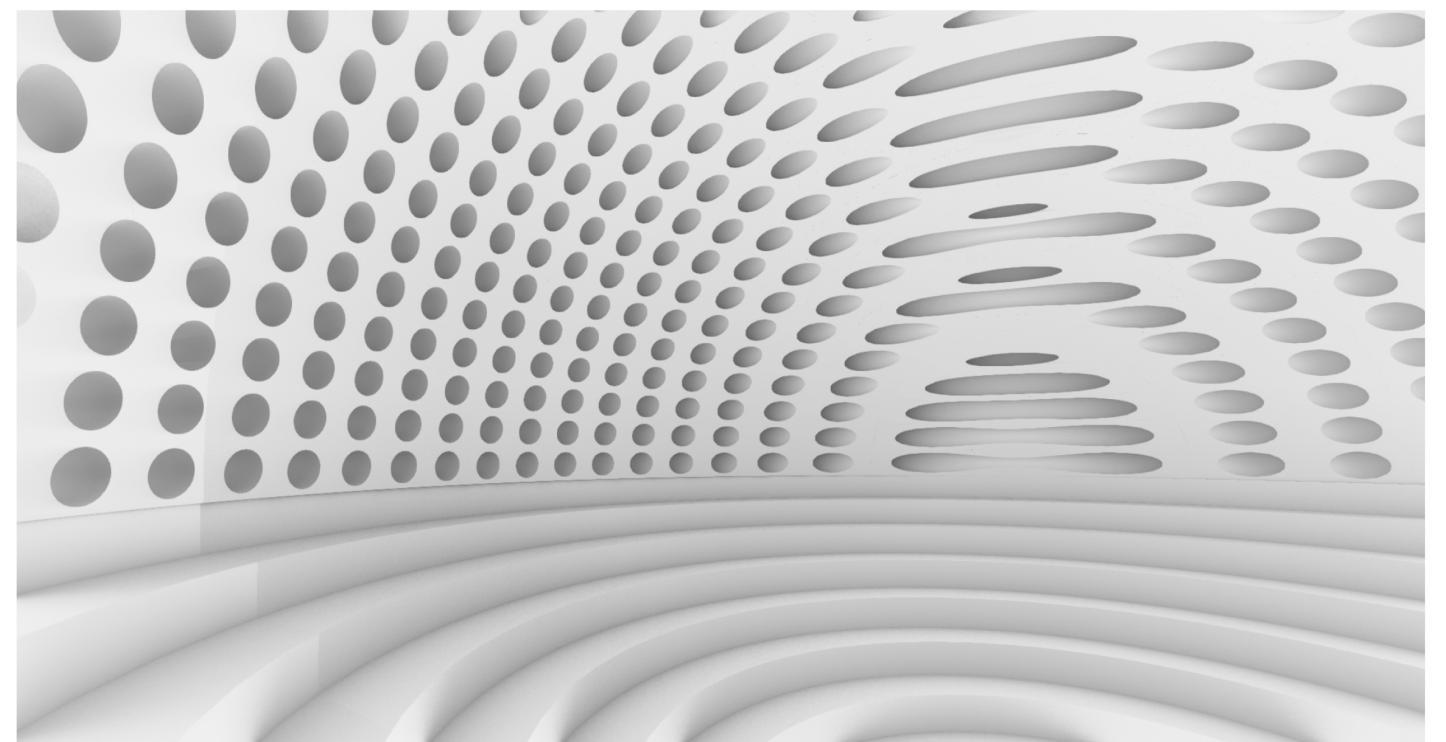
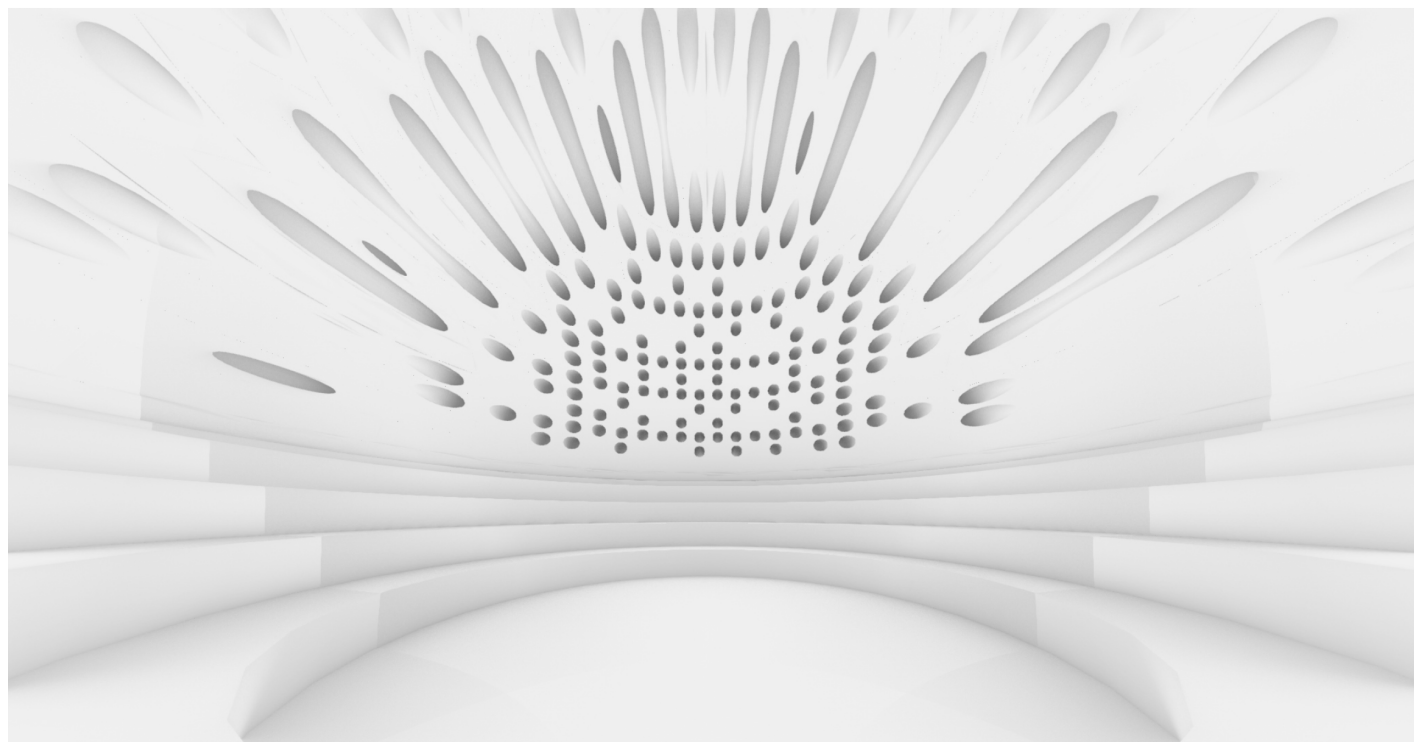
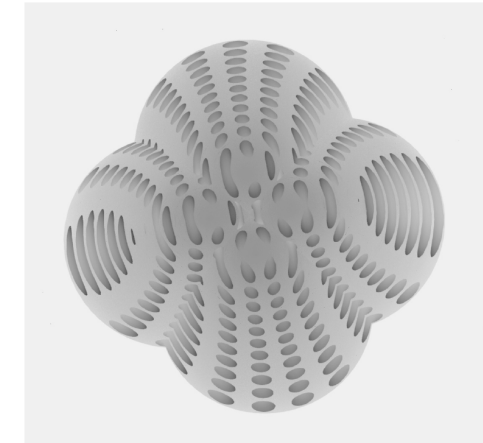
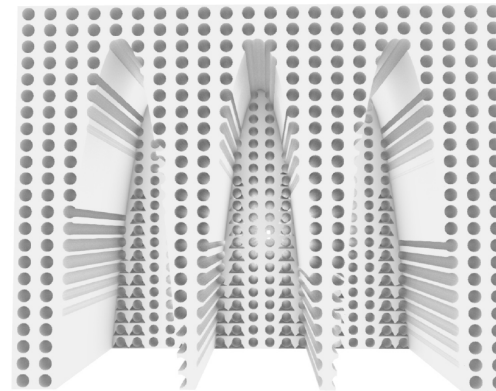
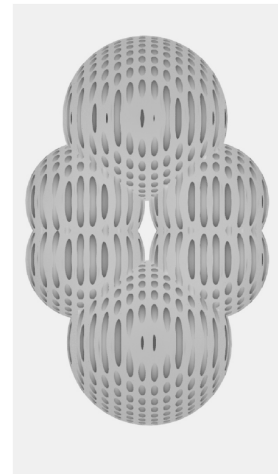
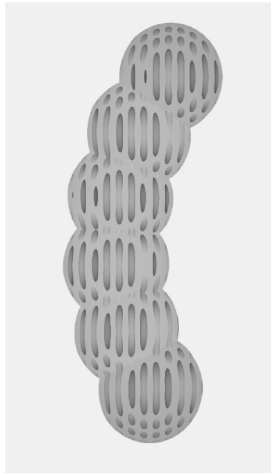




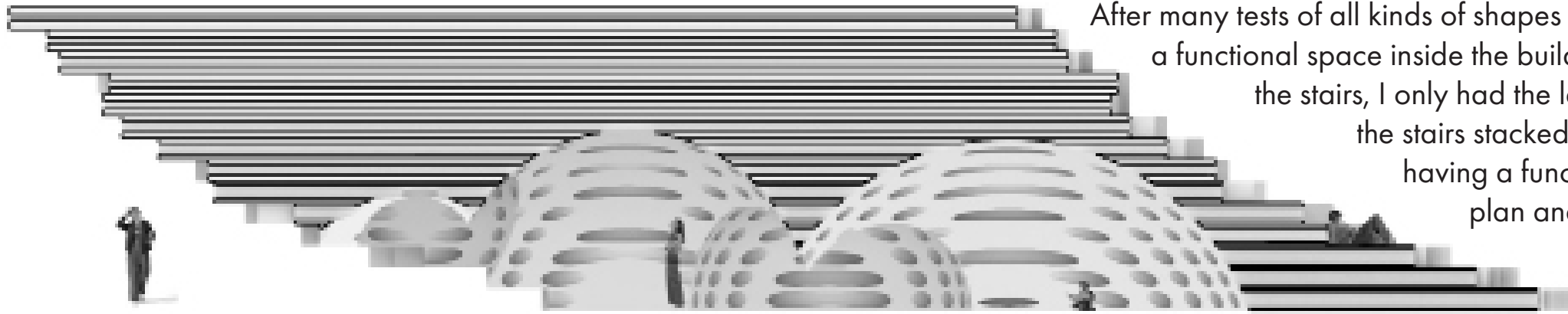


## COMBINING SHAPES

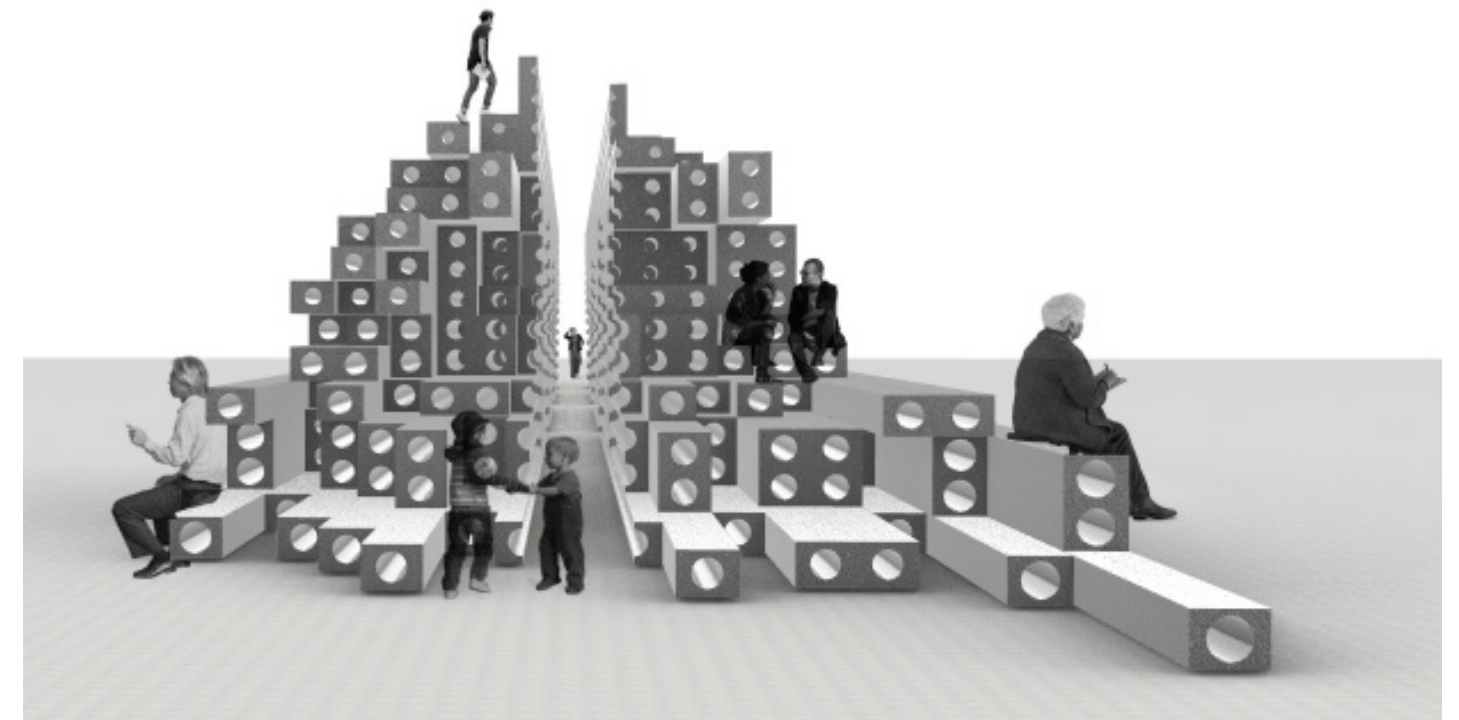
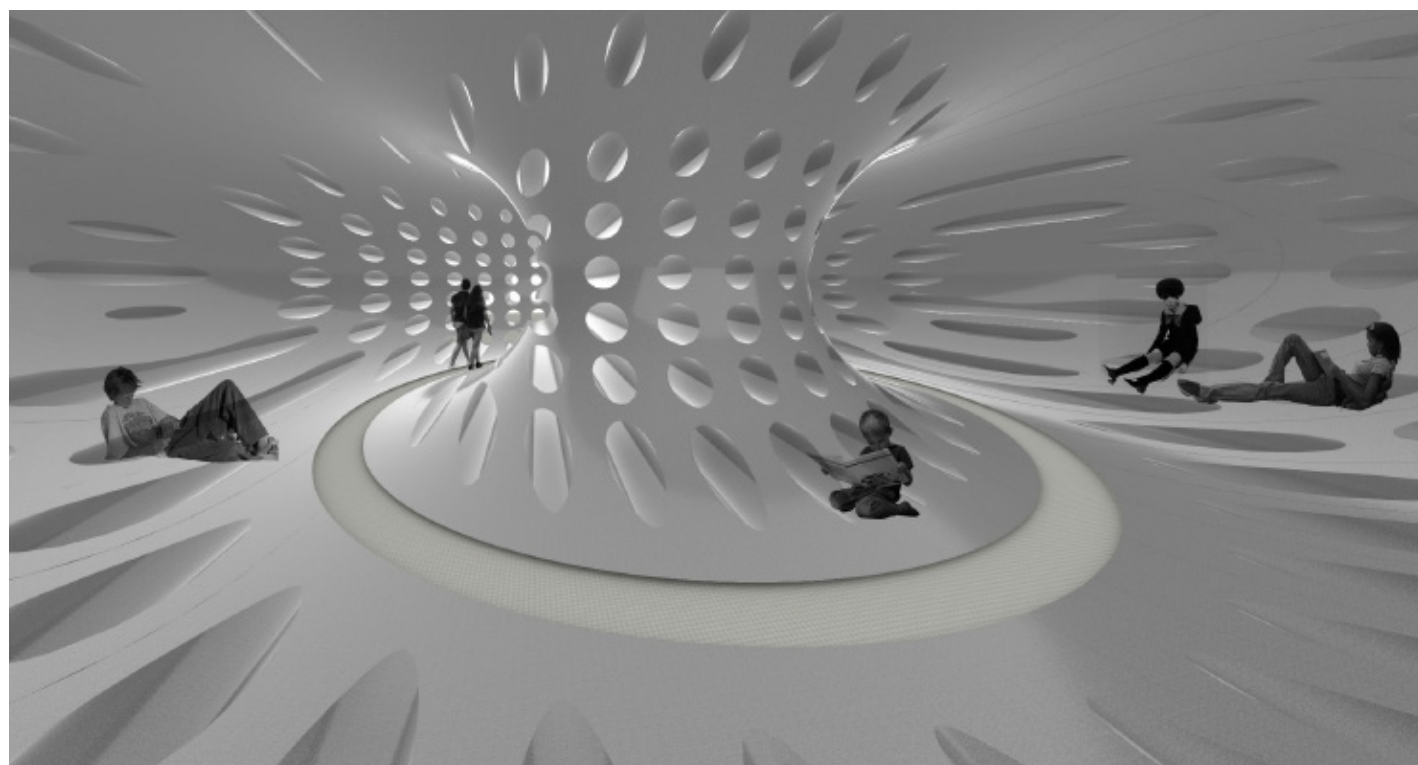
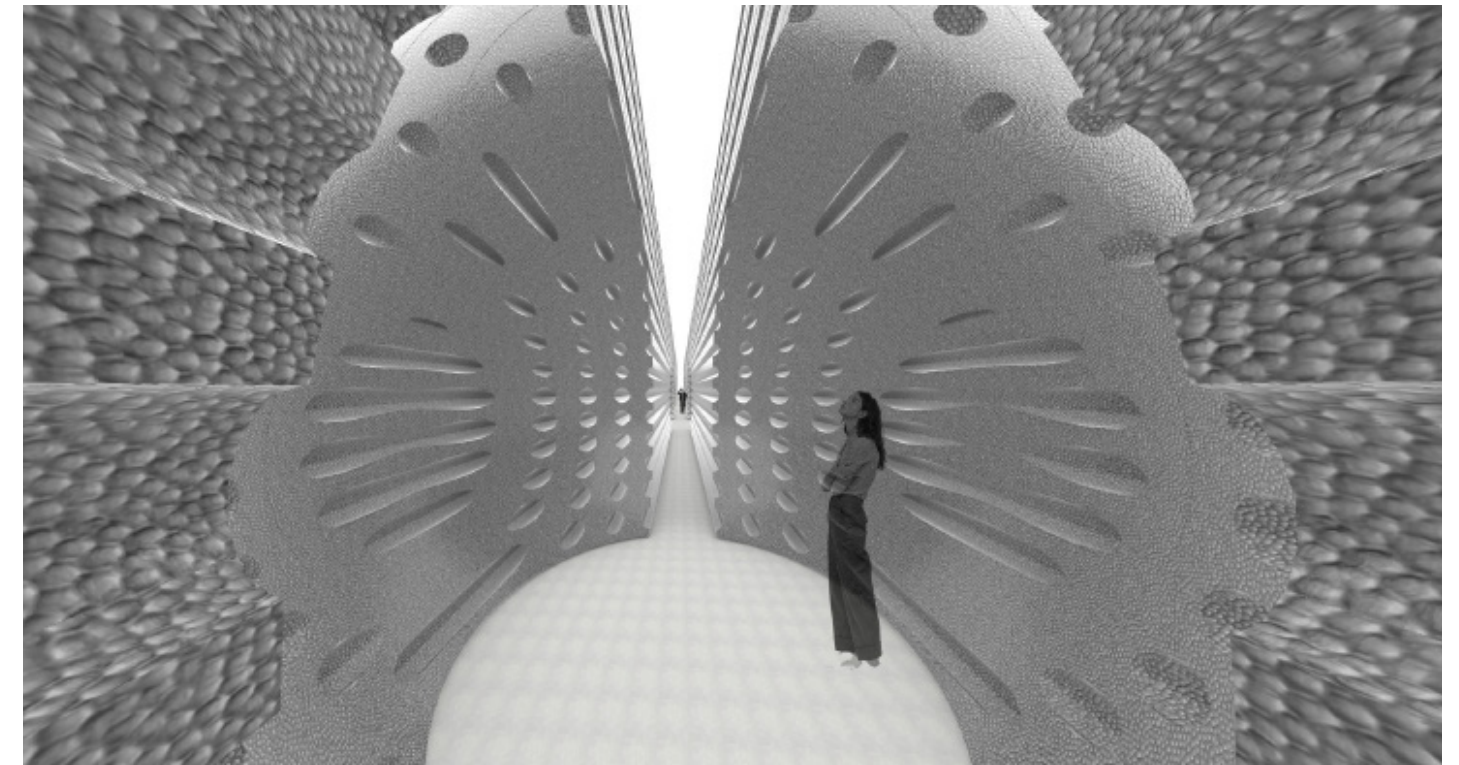
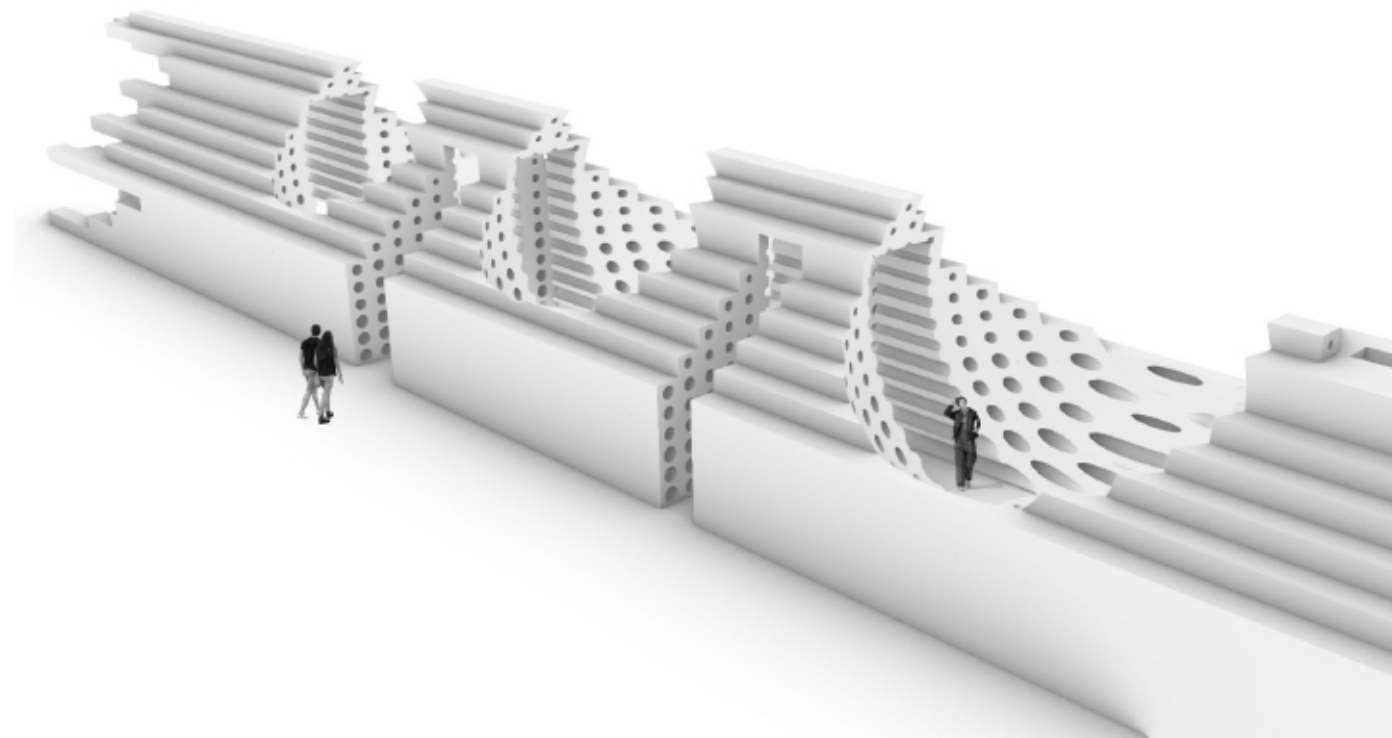
I kept on developing the idea of using different shapes to carve out the interior space and this time testing to combine shapes to see the outcome. The results were even more mesmerising than before and the interior space is now projecting art by itself. This method of combining shapes to carve out space made it easier to plan rooms and their function. Hallways, discreet getaways, space for storage and bathroom were now possible to design.



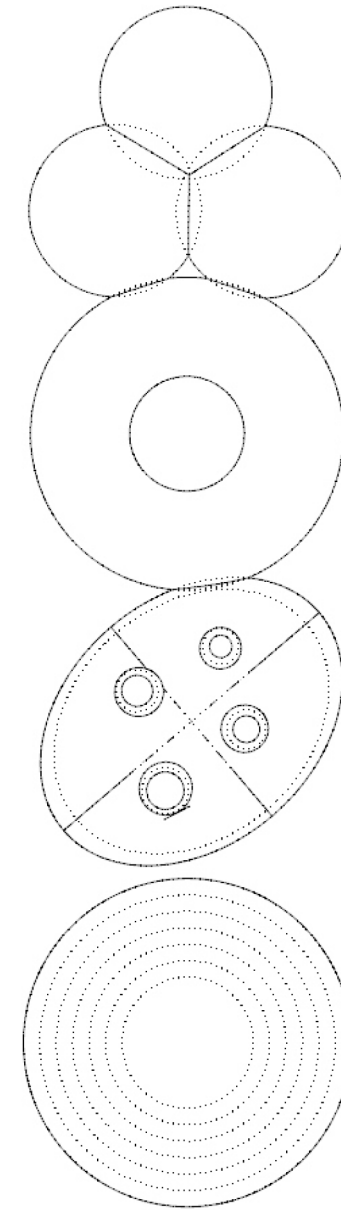
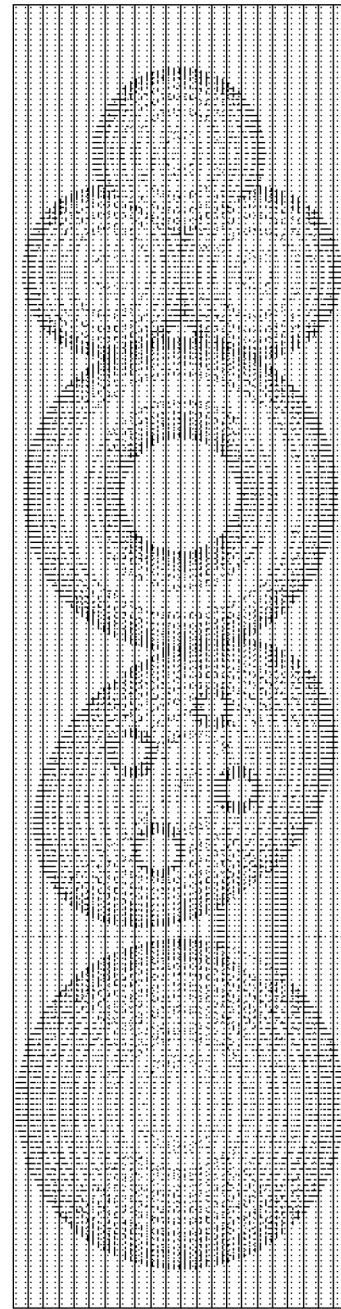
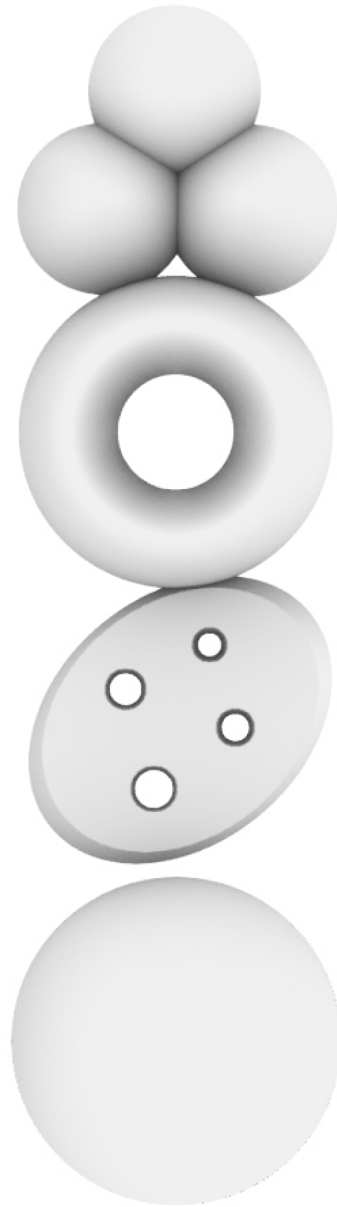
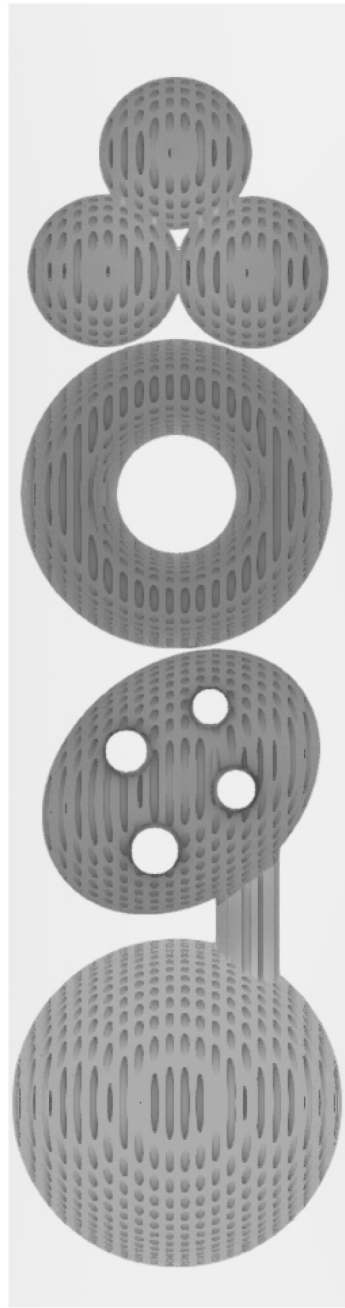




After many tests of all kinds of shapes to Boolean difference with, it was time to actually create a functional space inside the building. Due to the narrow site (8.5 m wide) and the size of the stairs, I only had the length and height of the building to work with. The higher the stairs stacked the more dangerous and steeper they were. The idea of having a functional tunnel between the dome rooms made it easier to plan and design the interior. Spatial visions and examples of life inside and outside the building are as shown.







Desired features are as follows:

**Entrance/Reception**

A torus shaped room with the reception desk in the centre. Easy circulation and access to connected rooms.

**Café**

Room for social interaction and relaxation. Made out of multiple spheres to create niches for couches and kitchen area.

**Exhibition space**

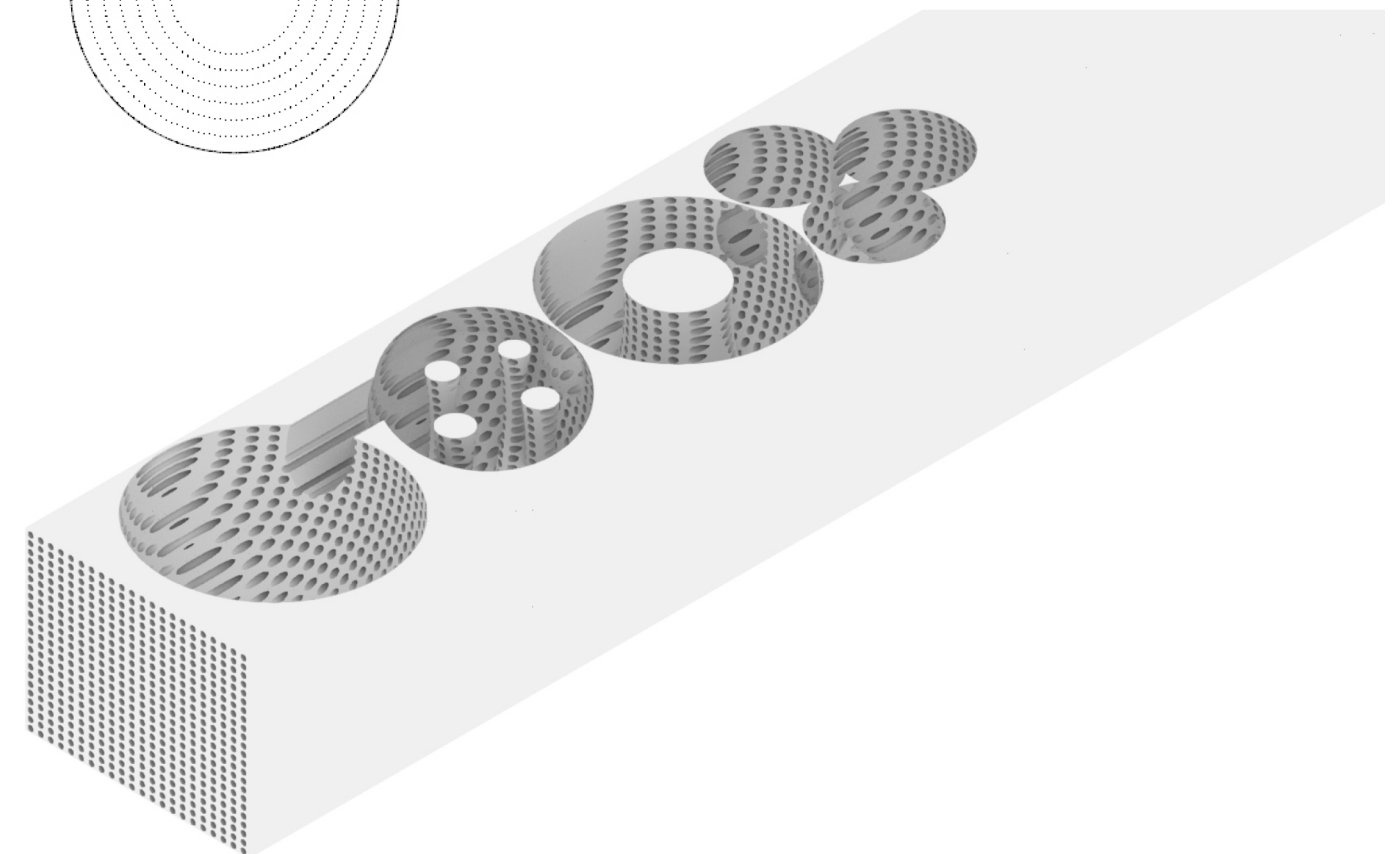
An oval shaped space with multiple pillars to showcase climate change related art.

**Amphitheatre**

Semi open public amphitheatre. An addition to the experiments of sound and wind. Events such as opera performance, and poetry reading can be held with the interesting factor of it being heard throughout the building through the beams.

**SPACE AND FUNCTION**

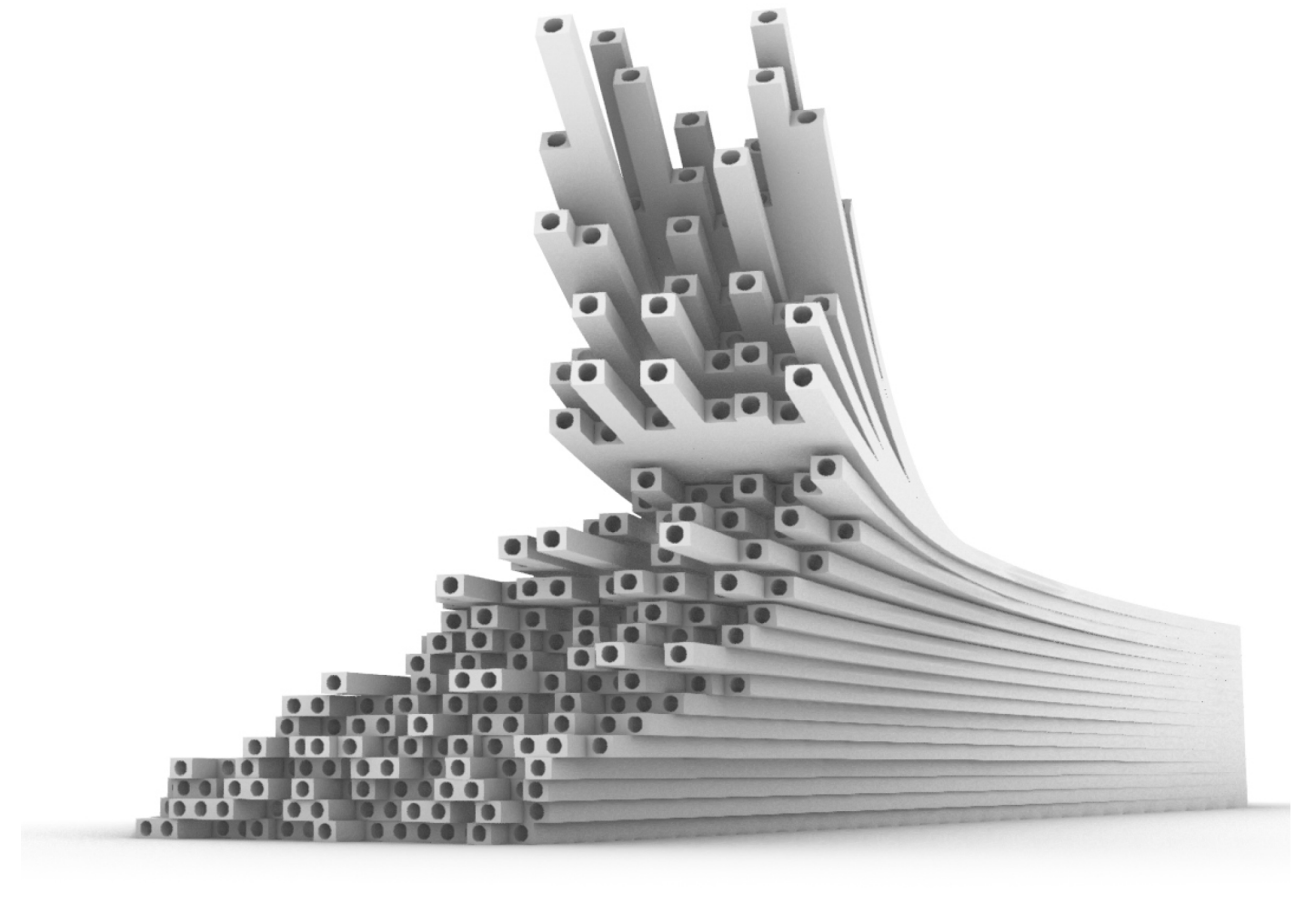
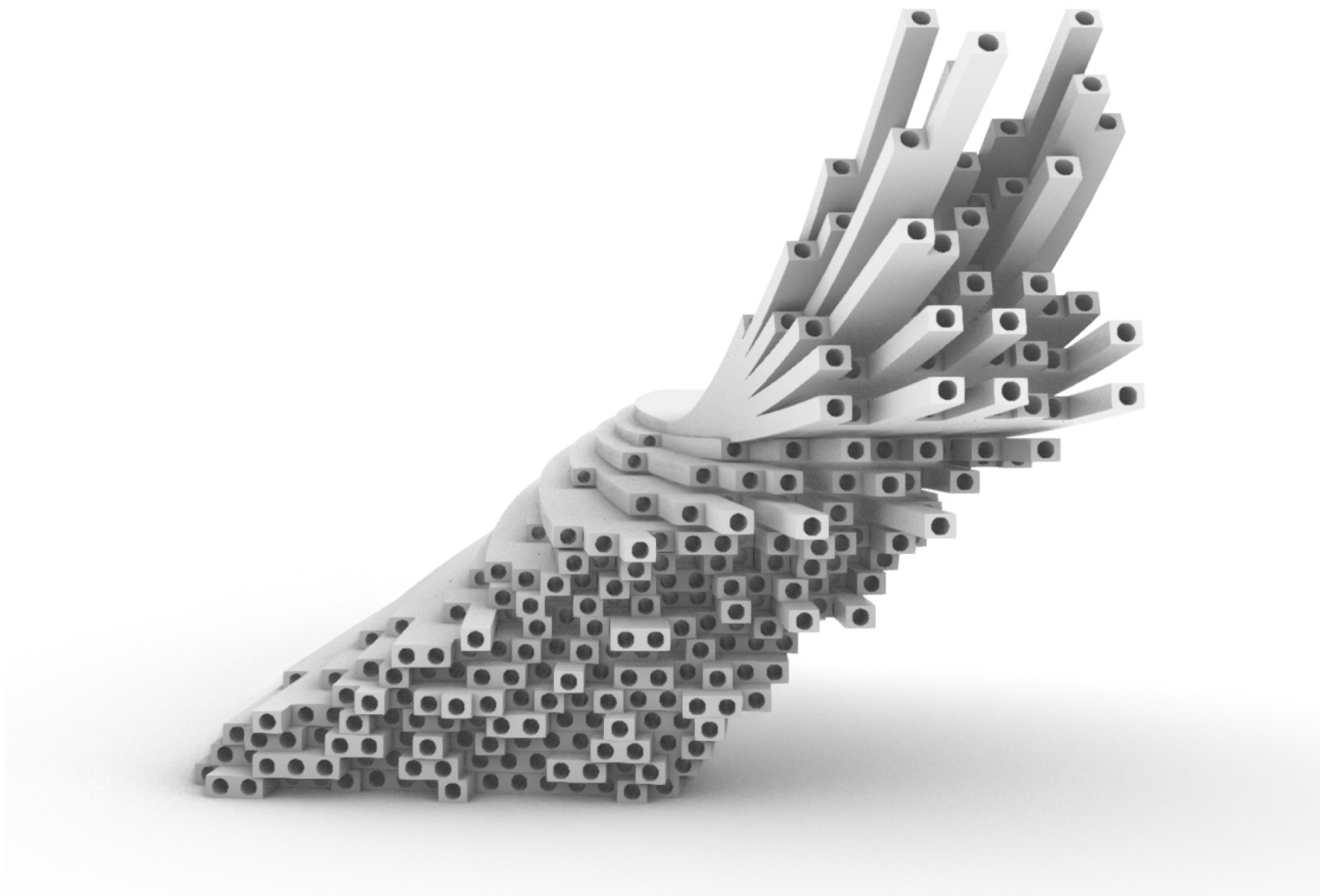
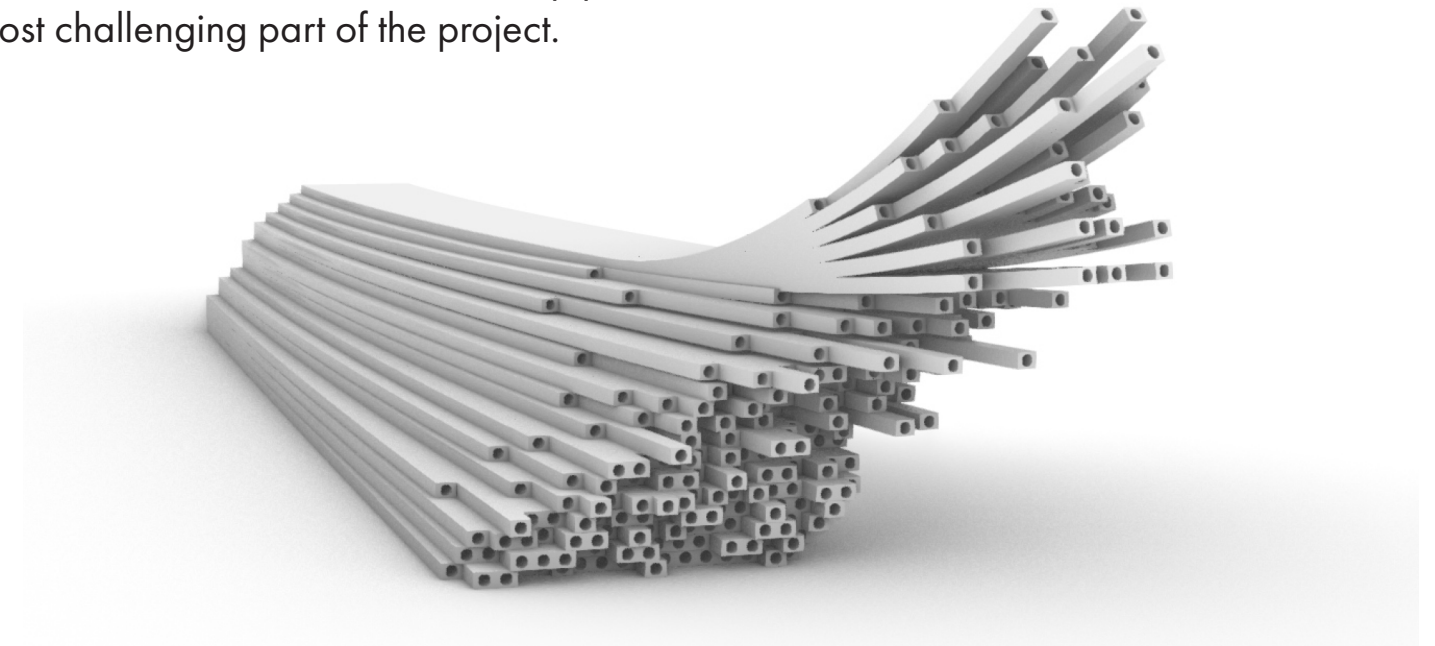
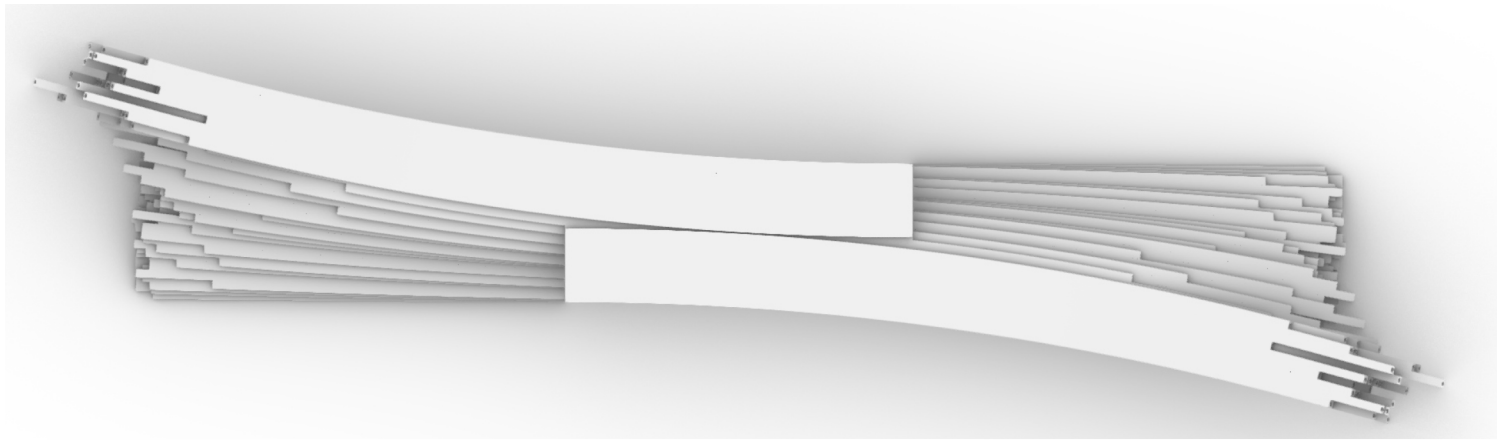
Once I was happy with my experiments and felt like I had enough shapes to work with, it was time to piece it all together. Each shape represents a different room while also being relevant to the rooms function. I settled for circular shapes since they generated the cleanest moiré patterns out of all other shapes. Domes, torus, and combination of both were used to carve out and create a coherent transition between rooms.



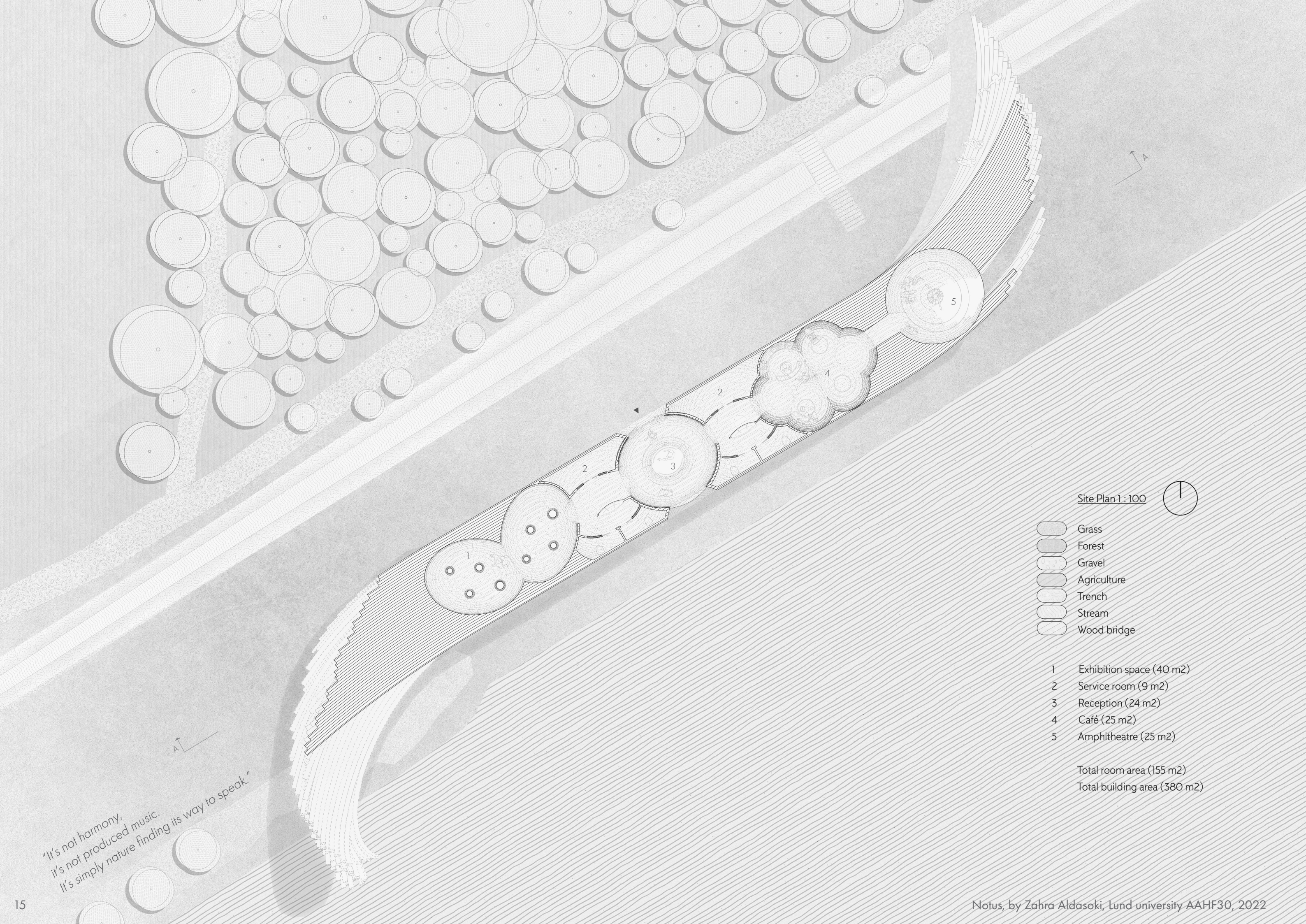


## EXTERIOR EXPRESSION

Coming back to the concept of emphasizing movement generated by wind, I wasn't totally satisfied with the lack of presentation of the wind-swept grass. The interior was set and the exterior still had potential to offer more. An idea of mine was to envision one buildings end literally being blown away, just like the patterns on the grass. This was possible since I could manipulate each stair beam and bend them one by one in order to achieve such expression. The bent beams would then represent the wind forces but also function as pipes with the wind passing through easier from both ends. This method took the longest and was the most challenging part of the project.














Site Plan 1 : 100



-  Grass
-  Forest
-  Gravel
-  Agriculture
-  Trench
-  Stream
-  Wood bridge

- 1 Exhibition space (40 m<sup>2</sup>)
- 2 Service room (9 m<sup>2</sup>)
- 3 Reception (24 m<sup>2</sup>)
- 4 Café (25 m<sup>2</sup>)
- 5 Amphitheatre (25 m<sup>2</sup>)

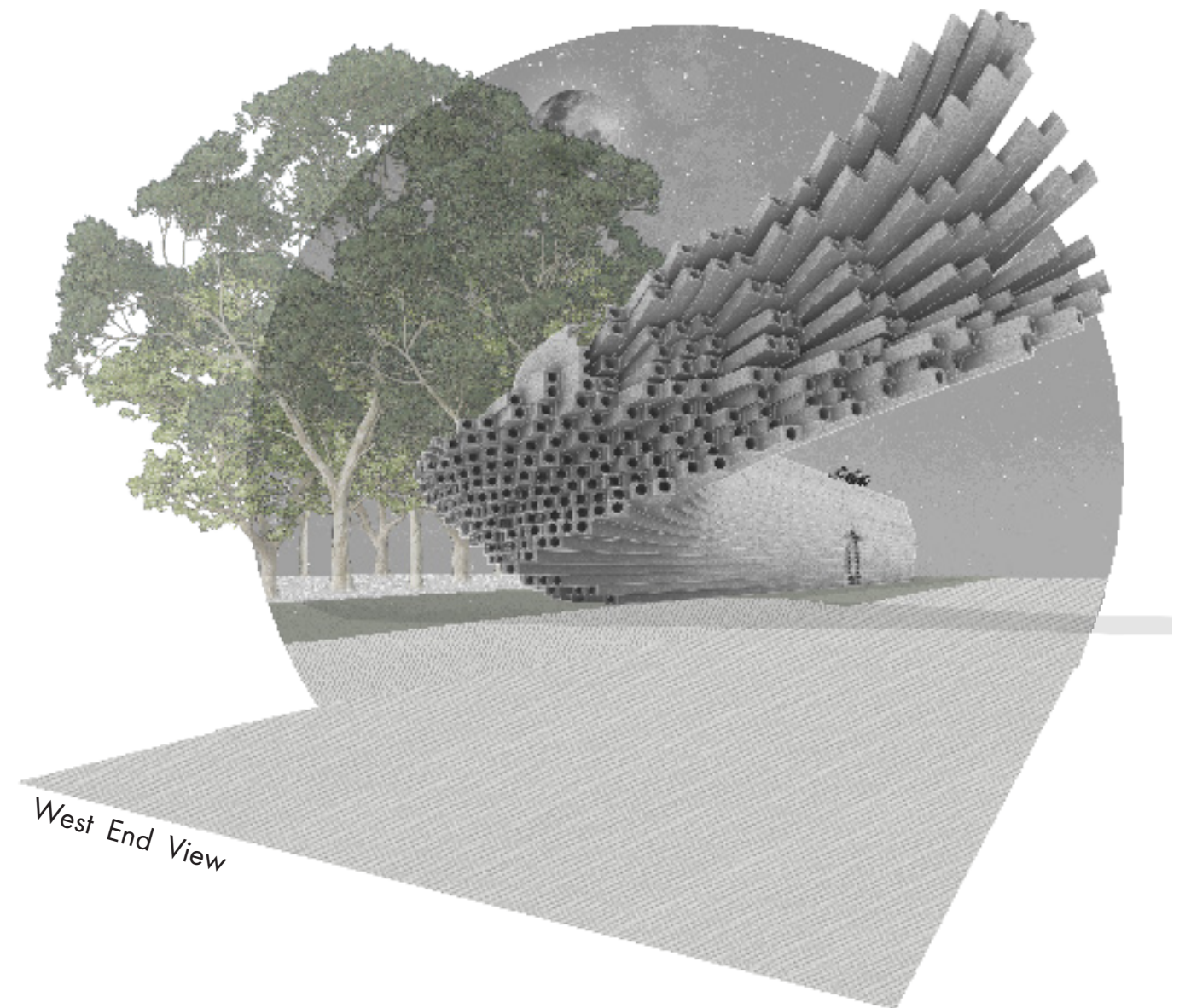
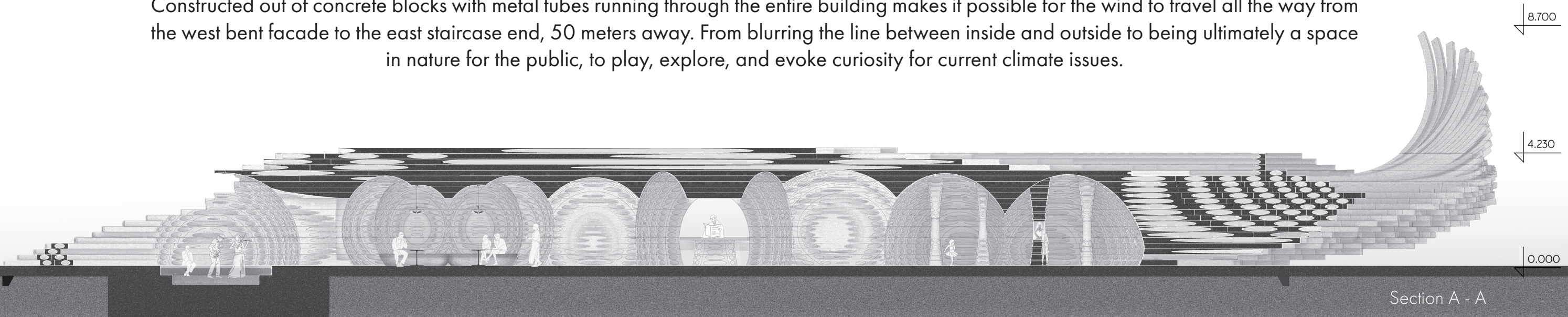
Total room area (155 m<sup>2</sup>)  
 Total building area (380 m<sup>2</sup>)

"It's not harmony,  
 it's not produced music.  
 It's simply nature finding its way to speak."

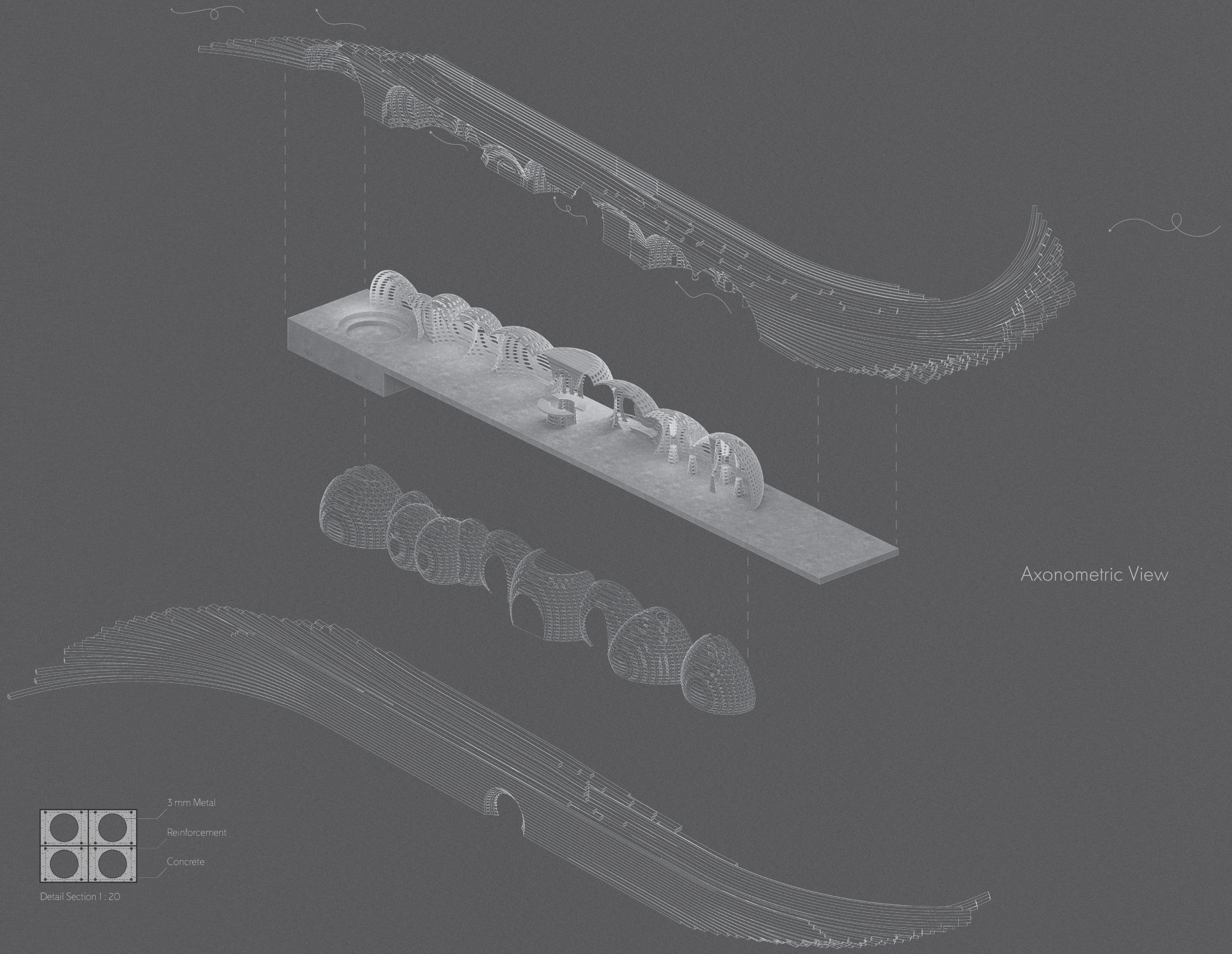


## THE BUILDING

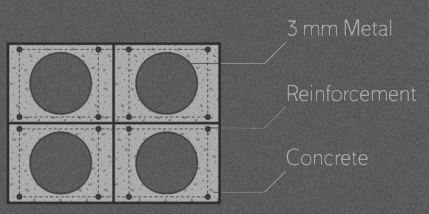
Constructed out of concrete blocks with metal tubes running through the entire building makes it possible for the wind to travel all the way from the west bent facade to the east staircase end, 50 meters away. From blurring the line between inside and outside to being ultimately a space in nature for the public, to play, explore, and evoke curiosity for current climate issues.







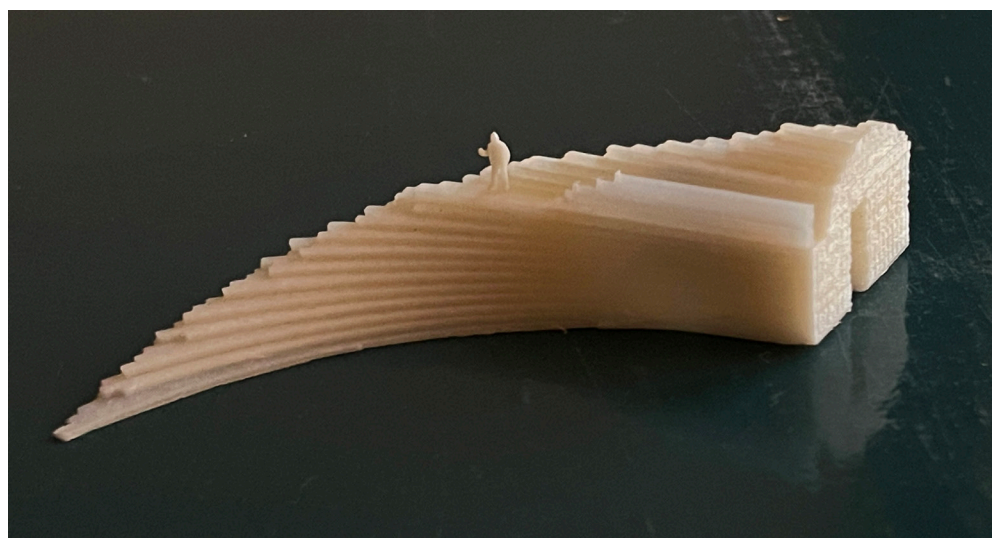
Axonometric View



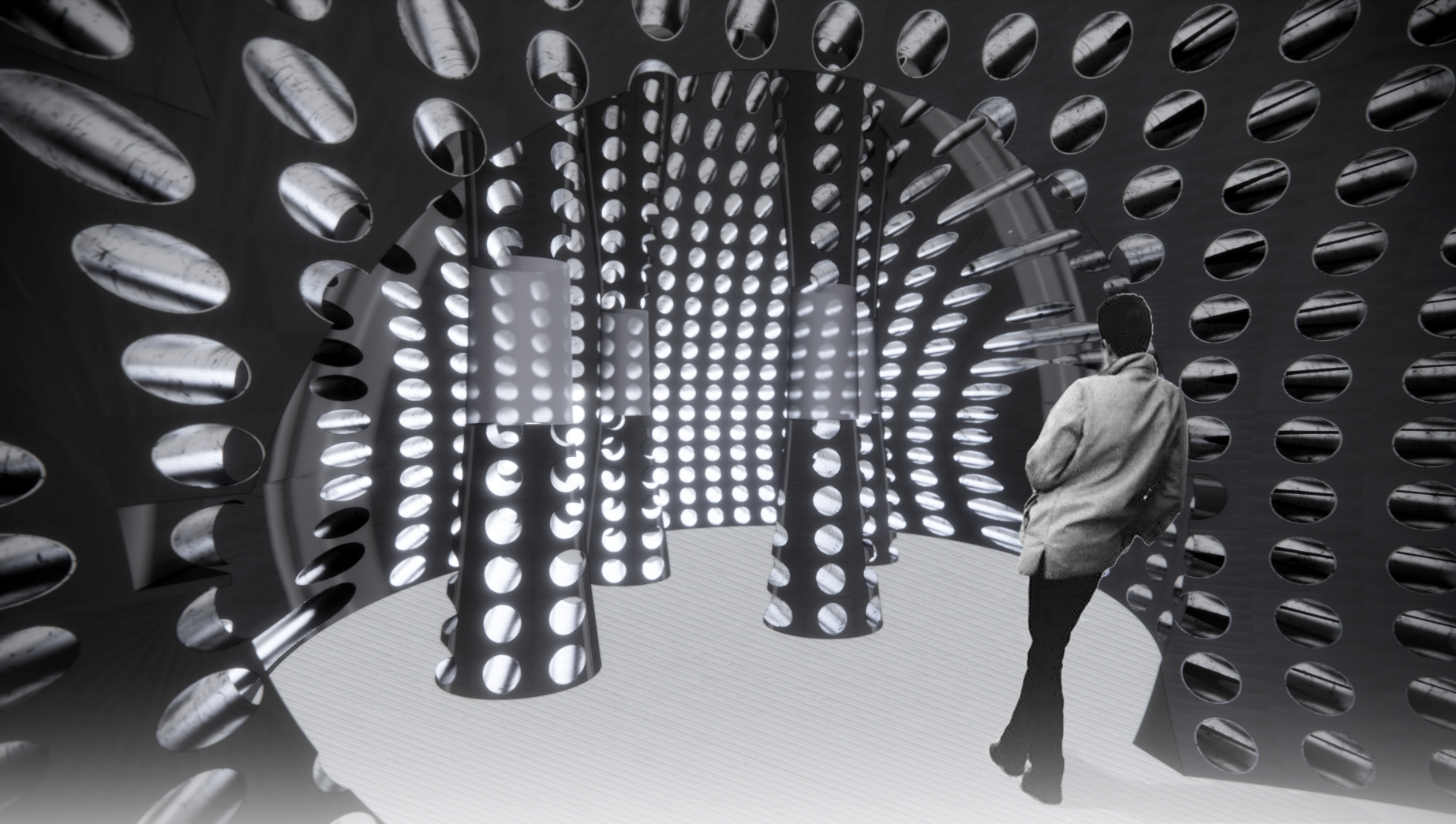
Detail Section 1 : 20



FINAL  
3D  
MODEL

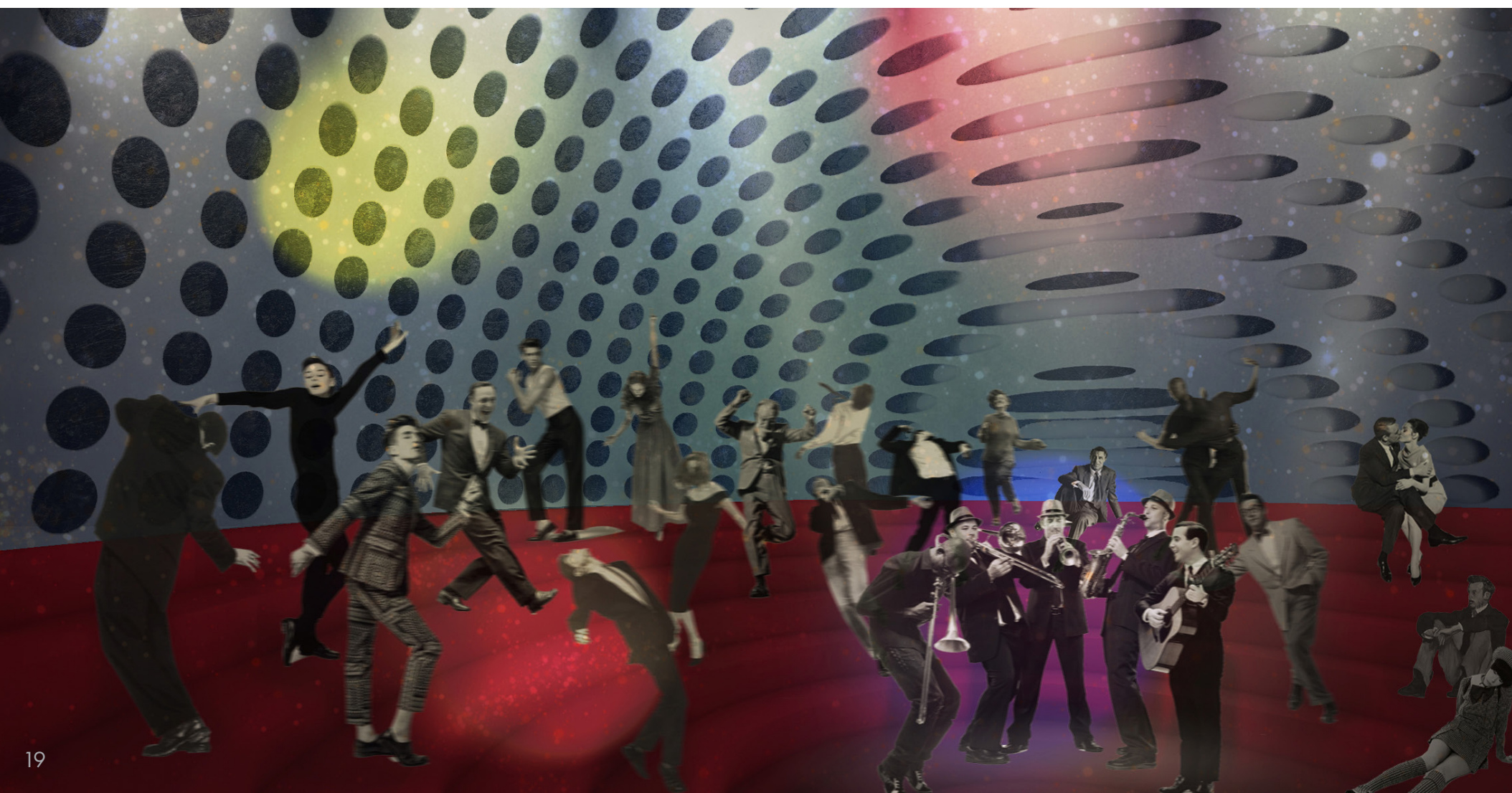






Above: Illustration of exhibition rooms.

Below: Illustration of the inside of the amphitheater.



## REFLECTION

The project as a whole has developed in a consistent pace and presented itself with surprises but also some challenges. Deciding on a clear concept early in the design stage has helped and favoured the guidance through the process. The location of the project was also decided at an early stage, which created reasonably clear margins that I could be flexible in. If I hadn't done that, there would be too many locations and floating limitations to work with, although sketching for other alternatives at the beginning.

Experimenting with moiré patterns and 3D printing was the most rewarding and fun part of the design process, giving me a different view on digital pattern making. The main concept for the course is to experiment with digital design processes aimed at developing novel spatial and structural typologies. Using 3D programs such as Rhino and plug in Grasshopper made it possible to test out all sorts of intriguing and complicated patterns. Yet for my project, I kept it simple and practical to experiment further by using the Boolean difference method. Additional plug ins were also tested out but were not much more different than doing it manually.

As noted earlier in the report, the bent west end of the building and the curved east end were the most challenging segments of the design process and which

I should have used a plug in. Due to the manual method of bending and curving each stair beam or stair level, resulted the completion to take longer than expected. Non the less, the desired results were achieved but unfortunately not in the time frame for the course final review. One strategy that could have prevented delay would be to get to know the 3D programs plug ins better to get an advantage with bending and curving effectively.

A different critique to the project is the size of the rooms. The building has a width of 6 meters and a ceiling height of approximately 3 meters which limits the rooms to be as spacious as their function would require. The rooms can be compared to a big living room in an accommodation. This quality is neither positive nor negative but most likely unrealistic for the function of the rooms if it was to be built.

One thing I wish I had more time for is testing out the actual sound behaviour of the building since until now it's only in theory. Also measuring and analysing how the wind forces go through the building would have further strengthened the concept and it's purpose.