

Selected Works for Columbia GSAPP
for M.S. Advanced Architectural Design

ZHANHAO FAN

M.S. Advanced Architectural Design

Columbia University

Portfolio 2022

C O N T E N T S

01 THE NEW/OLD AINA

A GROWING LAND FOR DECOLONIZATION

02 THE LUNG

ISLAND FACING AIR CATASTROPHE

04 TOWARDS A FEARLESS BIRTH

REDESIGNING THE BIRTHING BED



01 The New/Old Aina

A Growing Land For Decolonization

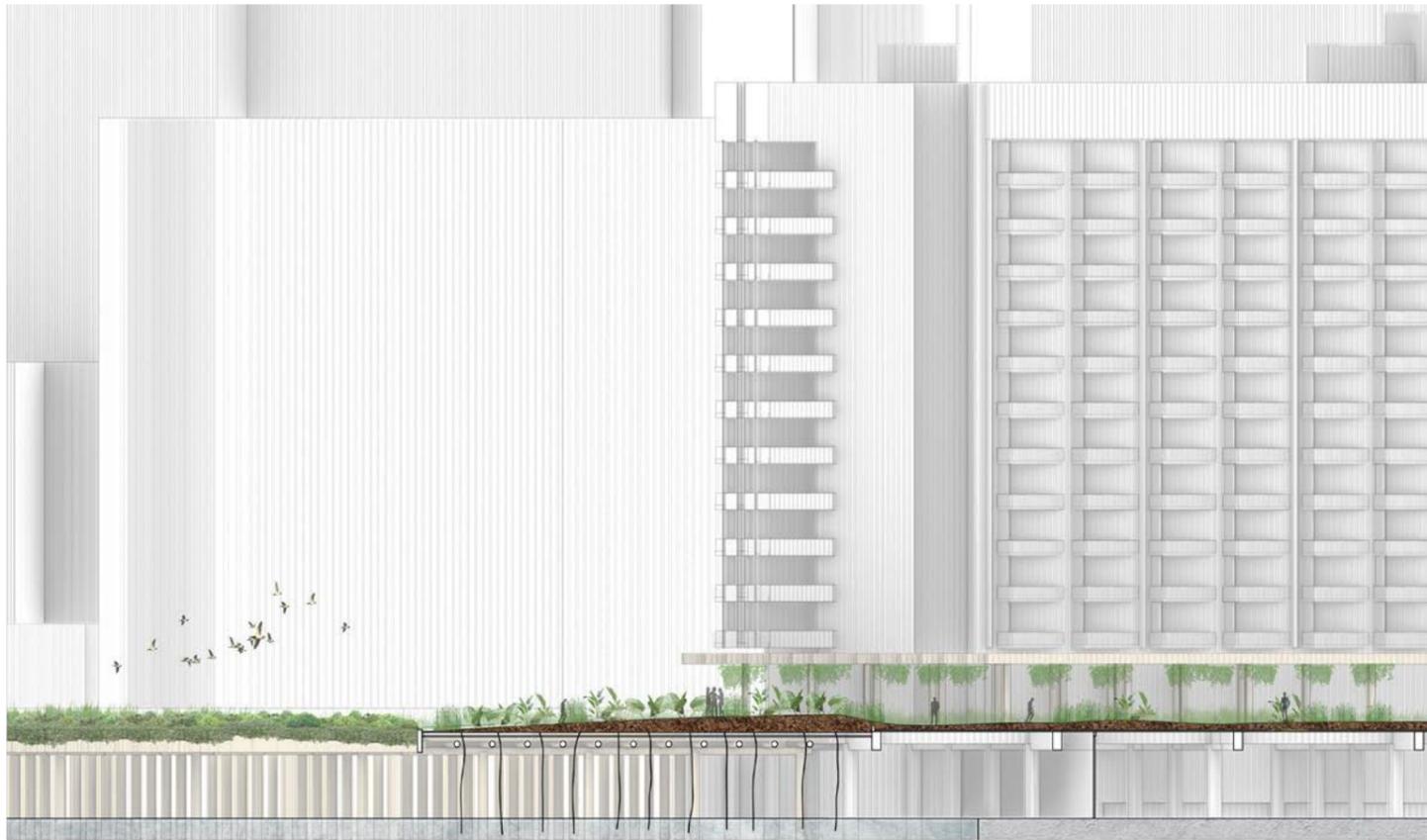
Spring 2022, Advanced Design Studio, Individual Work

Instructor: Mario Gooden

Columbia University

The New/Old Aina is a design project set towards a decolonizing future of Ahupua Waikiki in Hawaii through overlapping the colonial history and the present development condition. It is a growing land floating above Fort Derussy. It grows into the urban texture, while gradually restoring the wet lands system underneath. It also alters the roads for water resilience, creating pervious surfaces and safe evacuation routes during floods. It will keep growing in the future, penetrating and altering the tourism and military programs it touches. Eventually, in 100 years, it will serve as the new aina facing the possible flood or sea level rises.

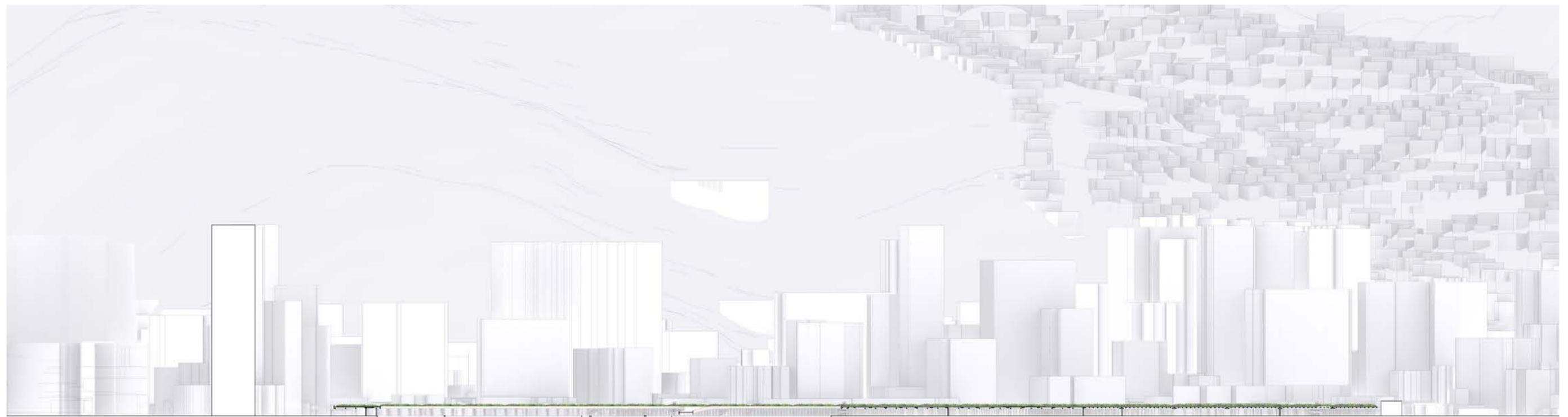
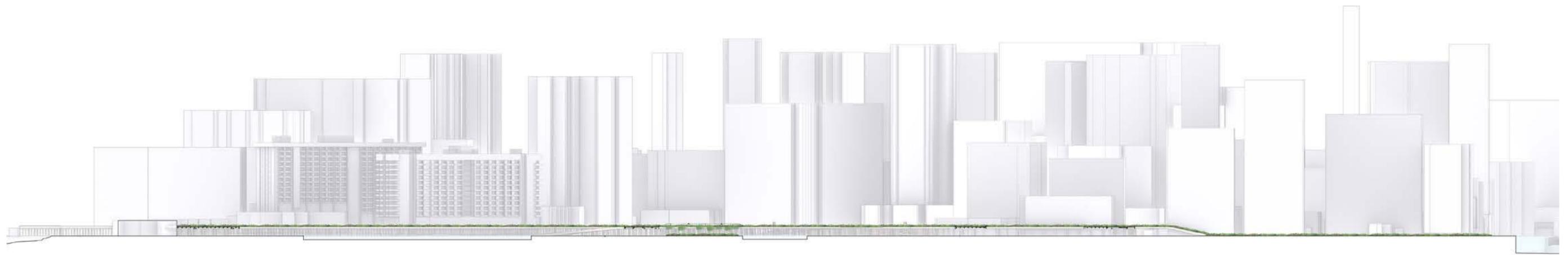




The New/Old Aina starts with the available lands on Fort Derussy right now, and then grows into the urban texture, while gradually restoring the wet lands system underneath.



It also alters the roads for water resilience, creating pervious surfaces and safe evacuation route during floods.







02 The Lung

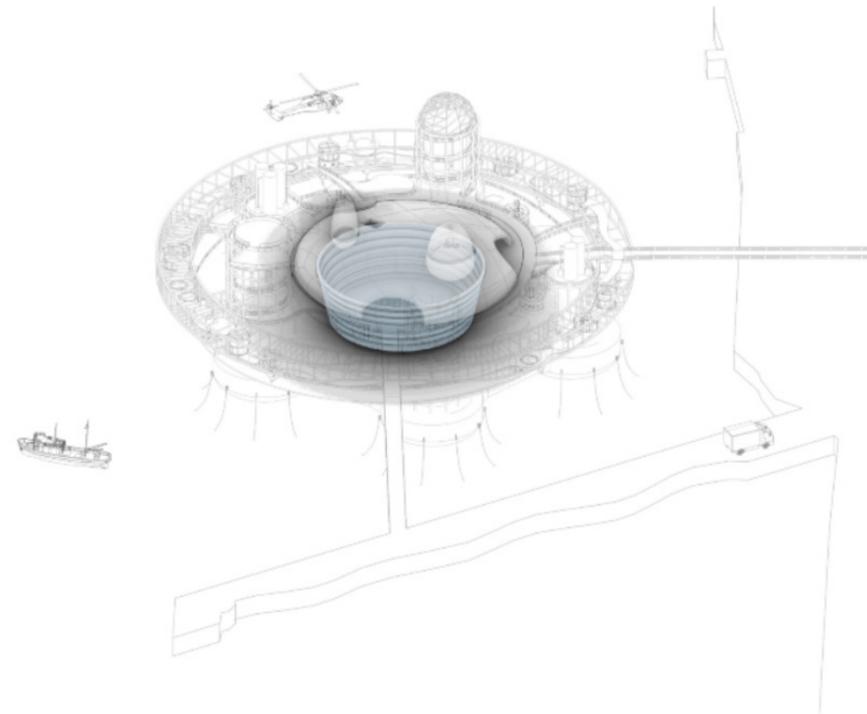
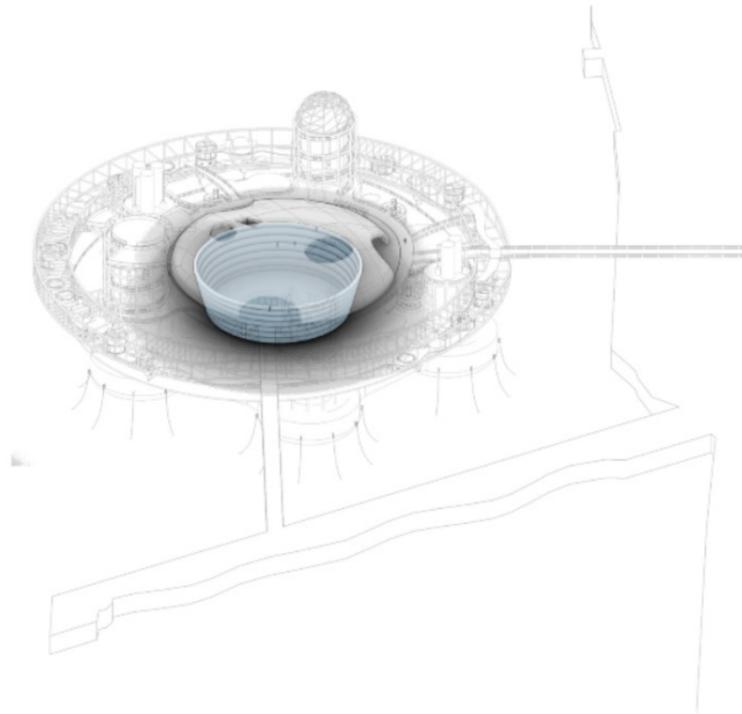
Island Facing Air Catastrophe

Fall 2021, Advanced Design Studio, Group Work

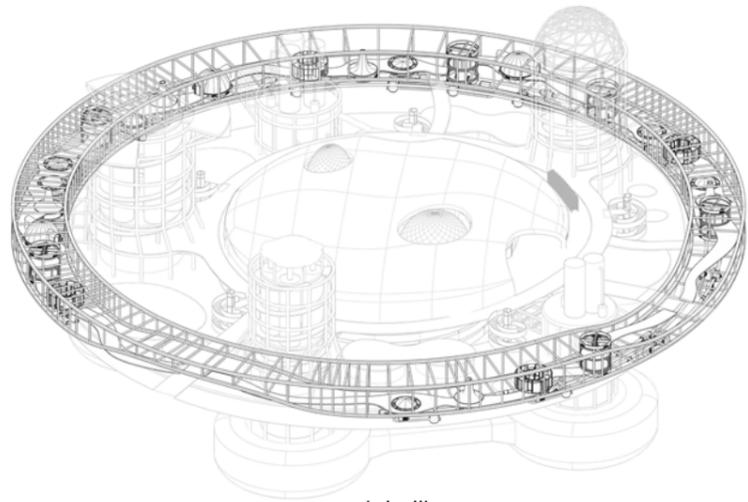
Instructor: Bernard Tschumi

Team Member: Zhanhao Fan, Ece Cetin, Han Kuo
Columbia University

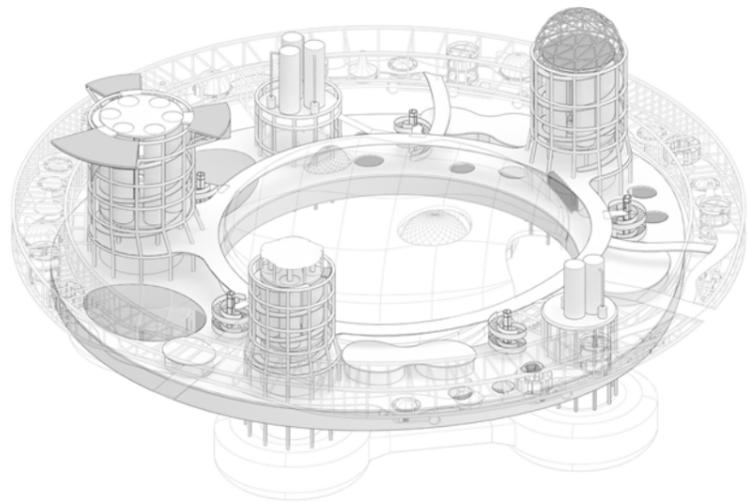
The Lung is a factory, museum, and purifier of air. Facing various underlying urban disasters, The Lung prepares the city for potential air catastrophes while healing the damage. Spatializing natural and technological processes, the museum demonstrates the cleaning and making of 'air.' The visitor is invited to obtain sensitivity to the so-called 'void' or 'invisible' through the air. The island prioritizes the invisible as the most crucial and blends the infrastructure abstraction to everyday experience.



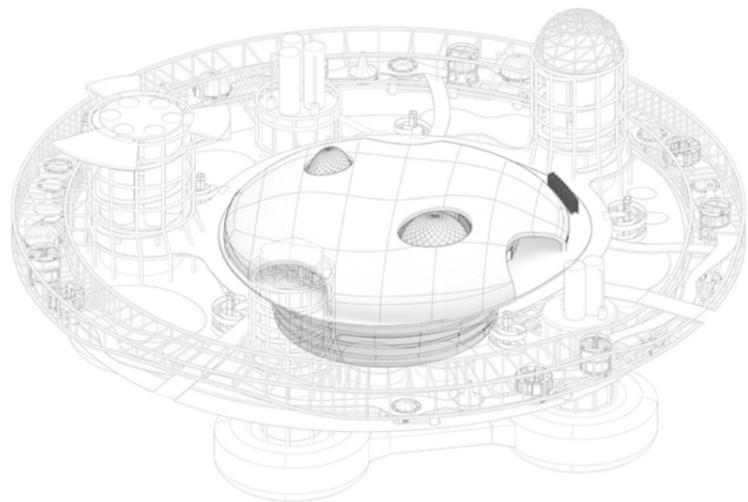
The age of airborne infections and air pollution grew hyper sensitivity around breathable air. An essential but overlooked part of life. The lung responds to this need for sensitivity and action towards unbreathable air, acting as a factory for oxygen pre catastrophe and as an oxygen distribution center during catastrophe time.



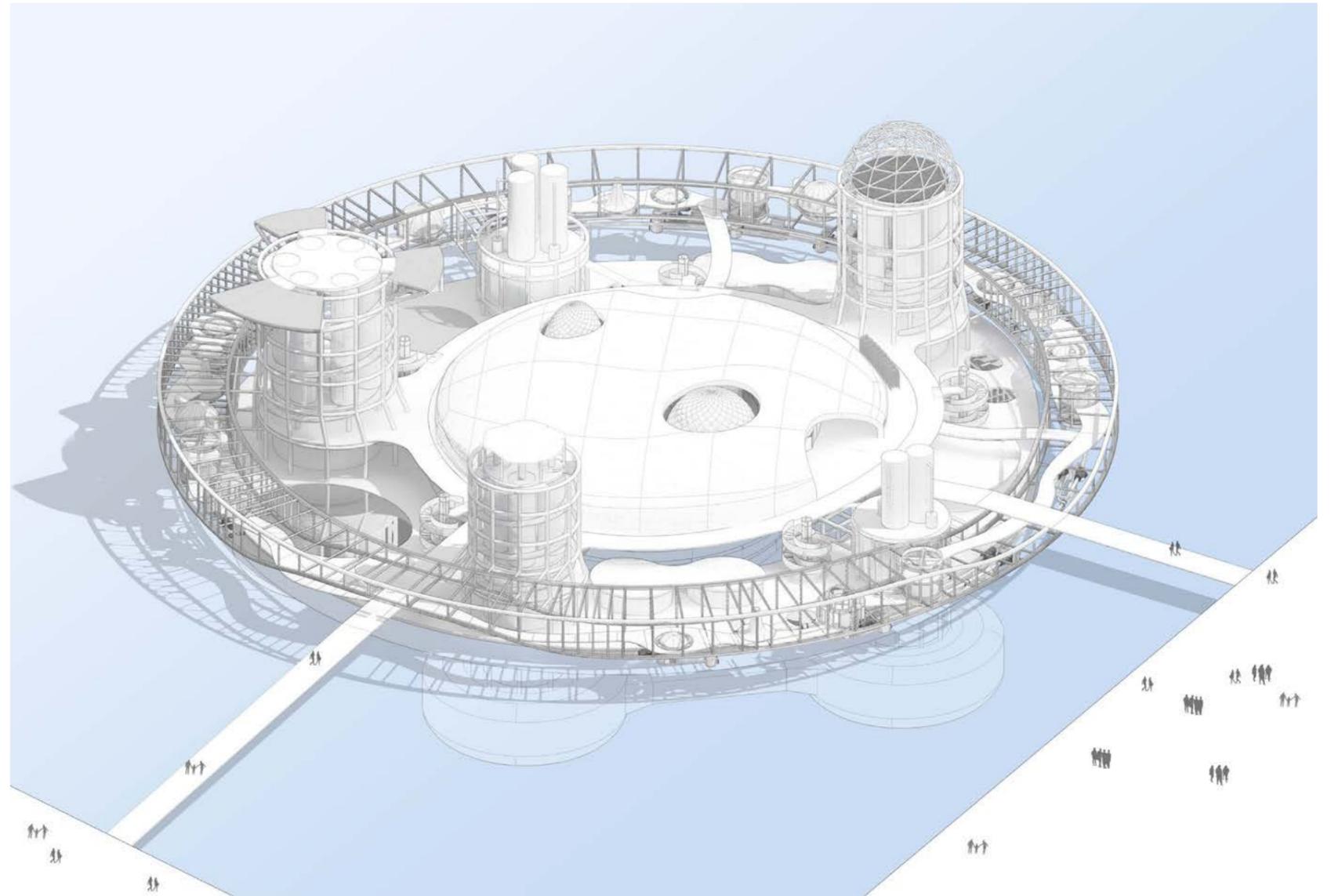
Inhaling



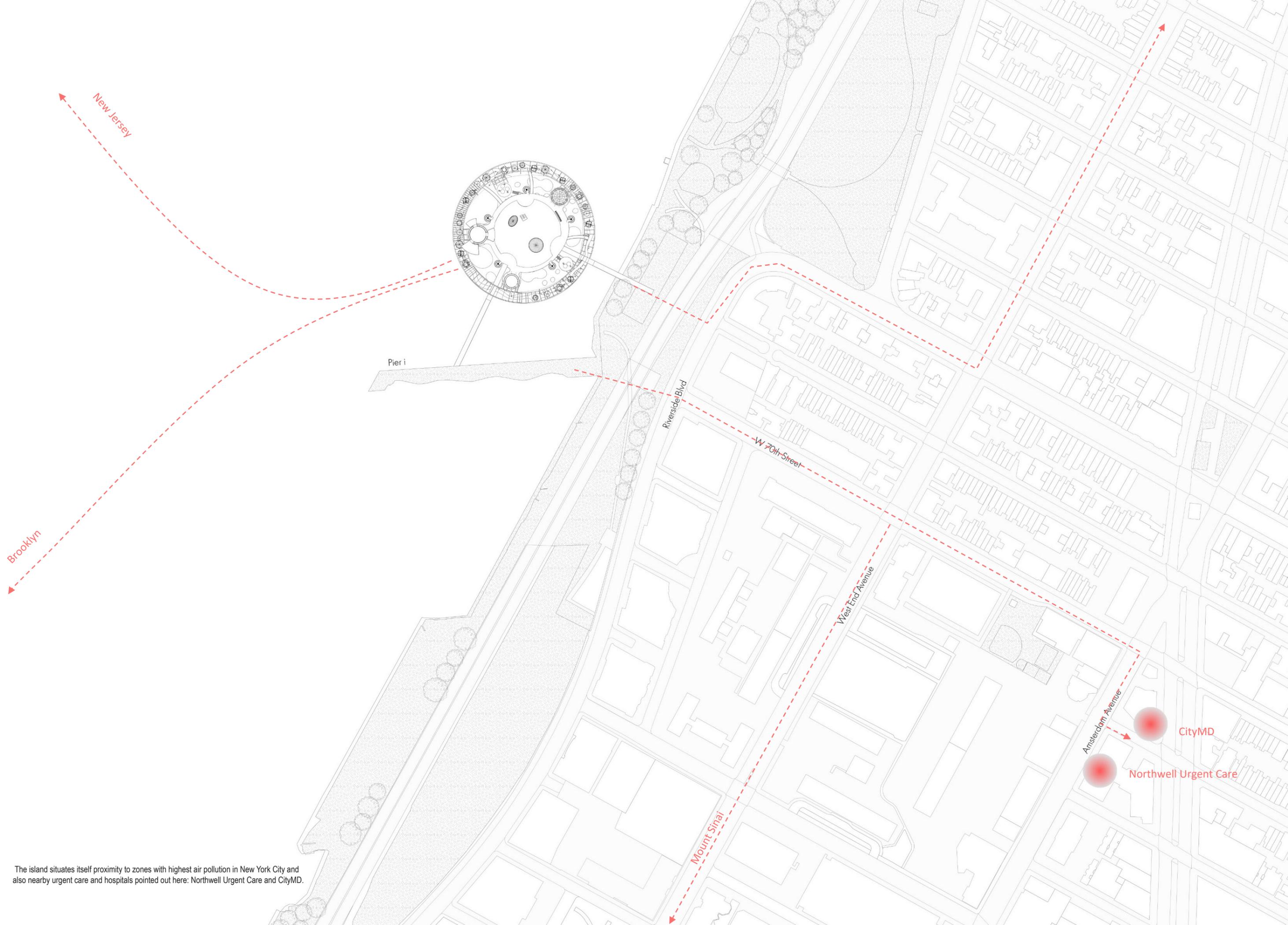
Absorbing



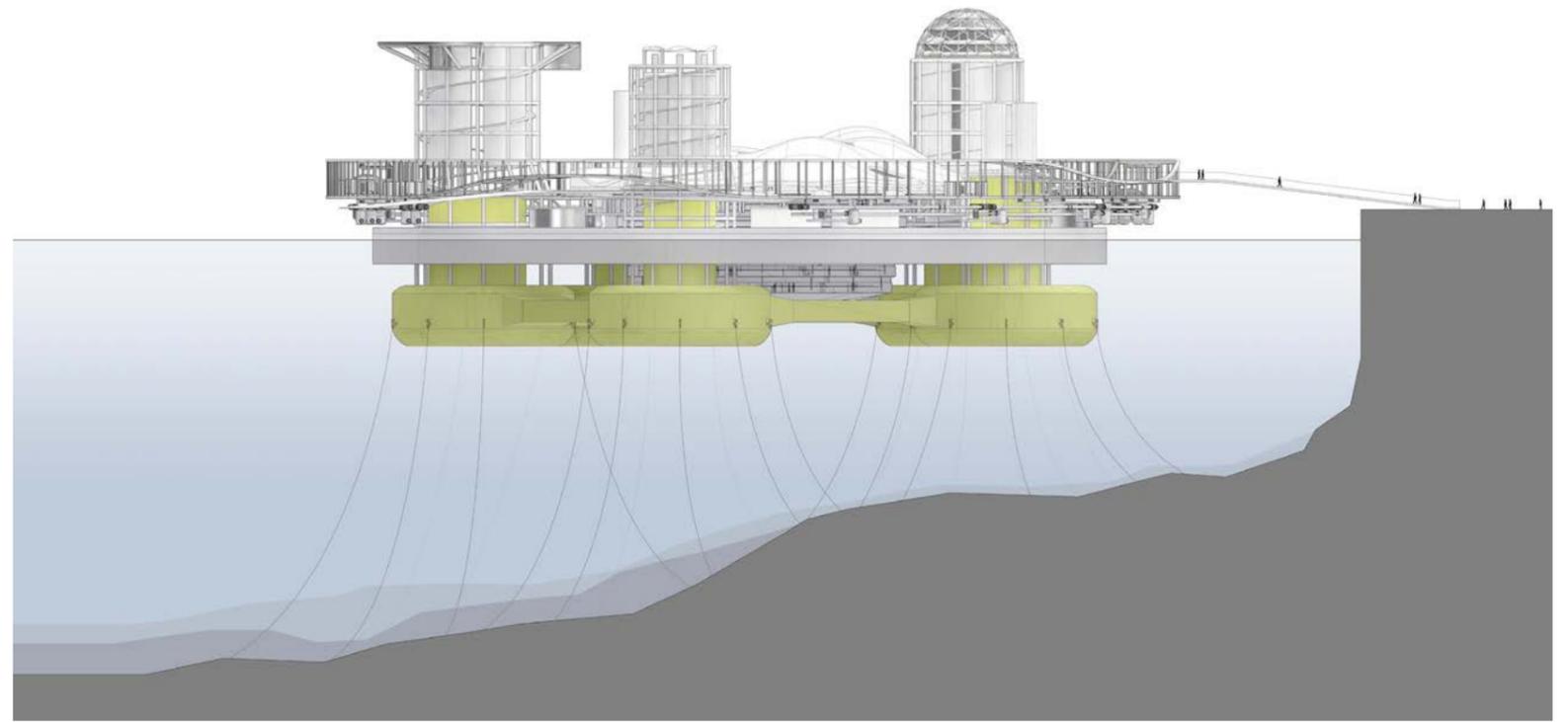
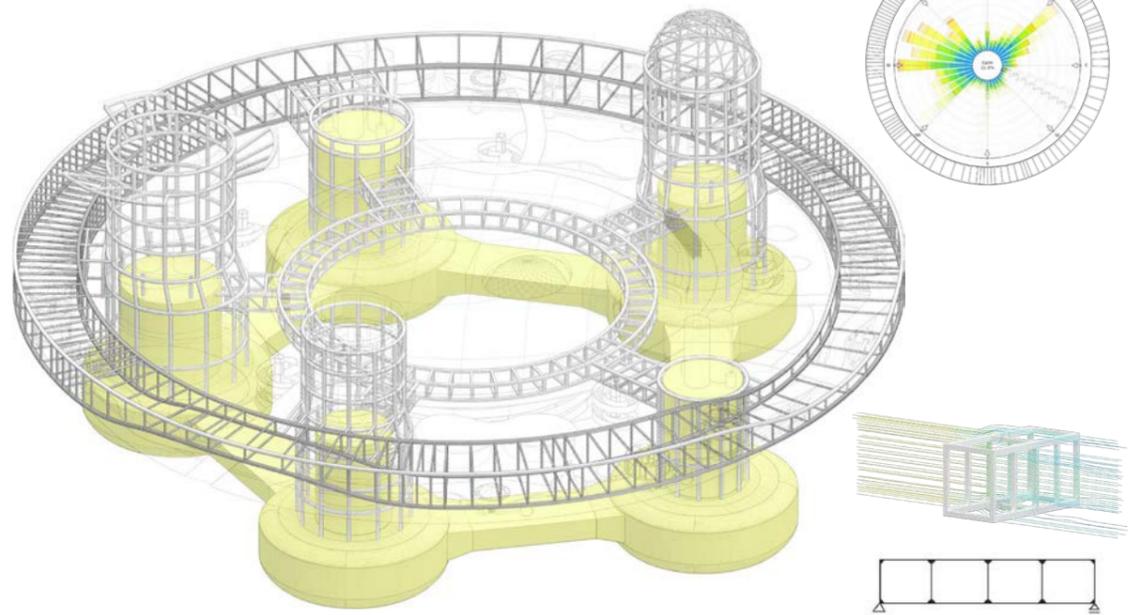
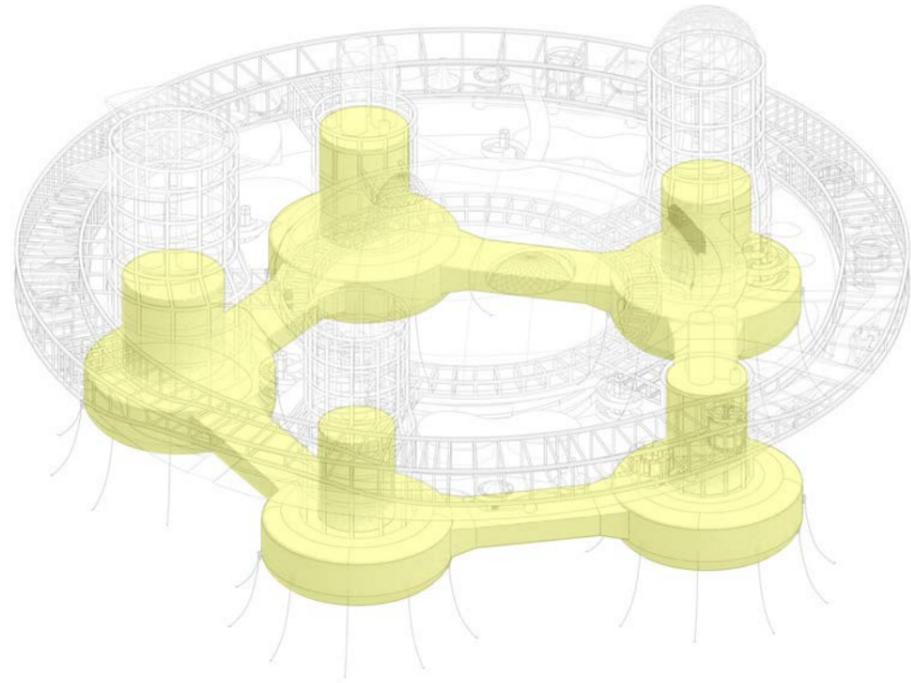
Exhaling



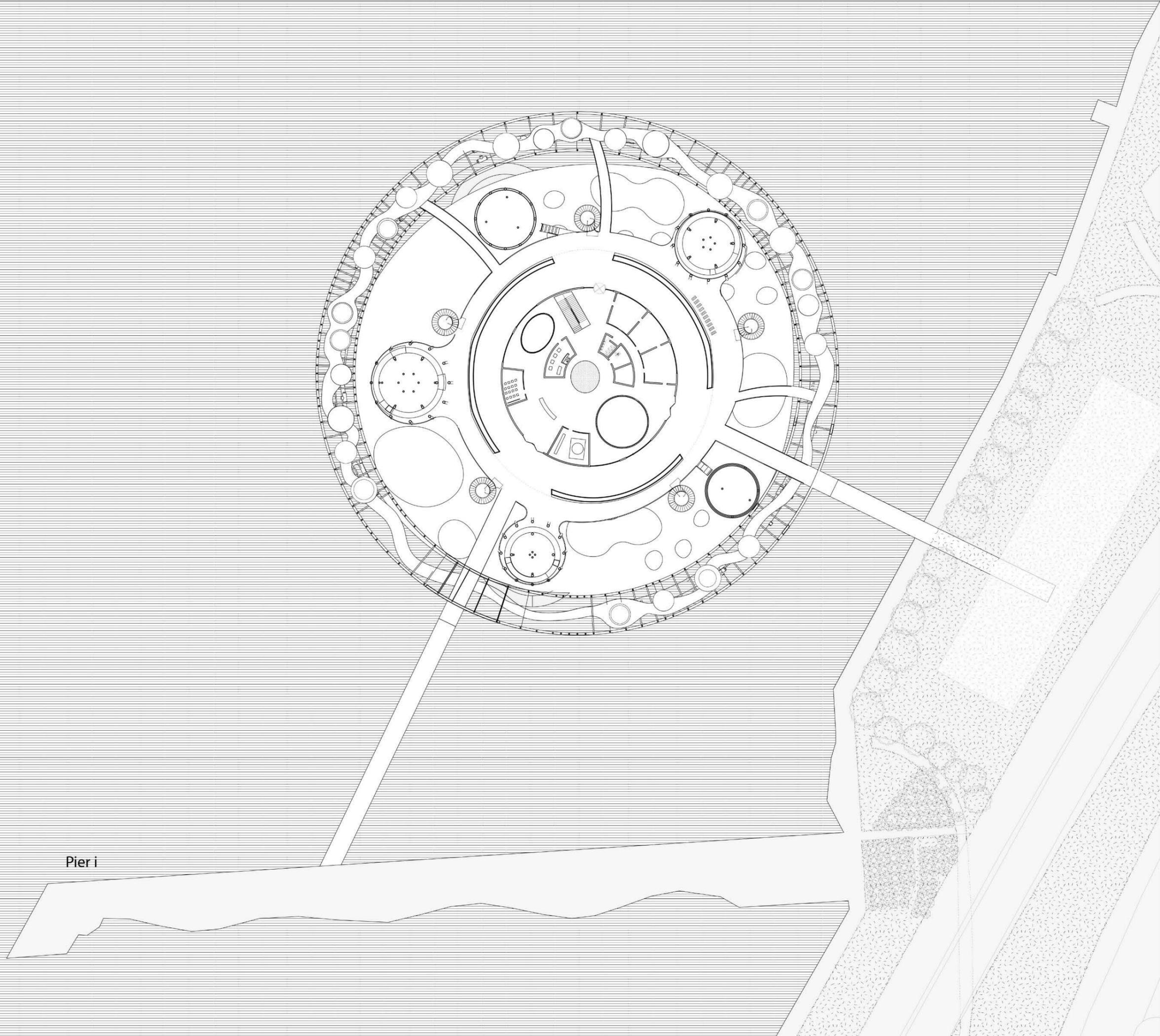
Oscillating between 2 programs, the island is both a factory and a museum. It is accessible through the 2 entry bridges. The lung consists of 3 concentric zones from inhaling, to absorbing, to exhaling. From the outer ring towards the central reservoir the spaces become more concentrated/denser, from collection of air to storage of oxygen.



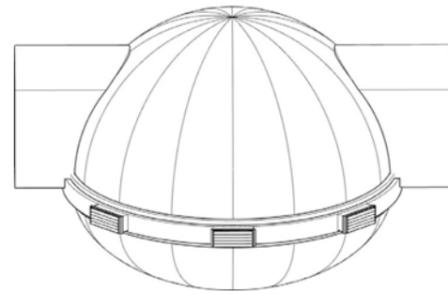
The island situates itself proximity to zones with highest air pollution in New York City and also nearby urgent care and hospitals pointed out here: Northwell Urgent Care and CityMD.



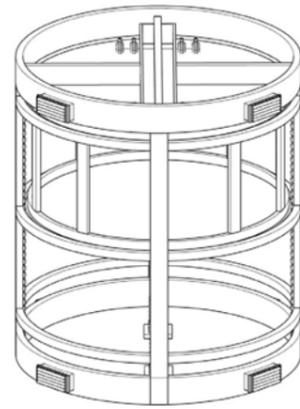
In terms of structure, we're inspired by the semi-submersible platform which is commonly used in the offshore oil industry, enhancing the impression and relation between intangible air and solid structure. Moreover, we analyze the annual windrose diagram of new york. By manipulating the density of truss, the structure can respond to this invisible context of air. Gigantic Floating pontoons support the whole island.



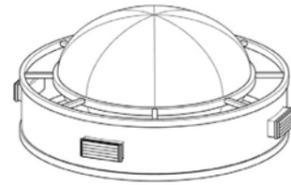
Pier i



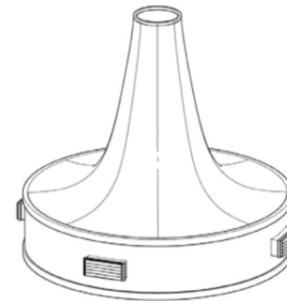
inflatable room



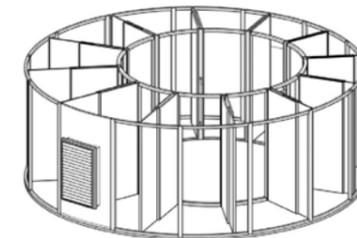
air lift



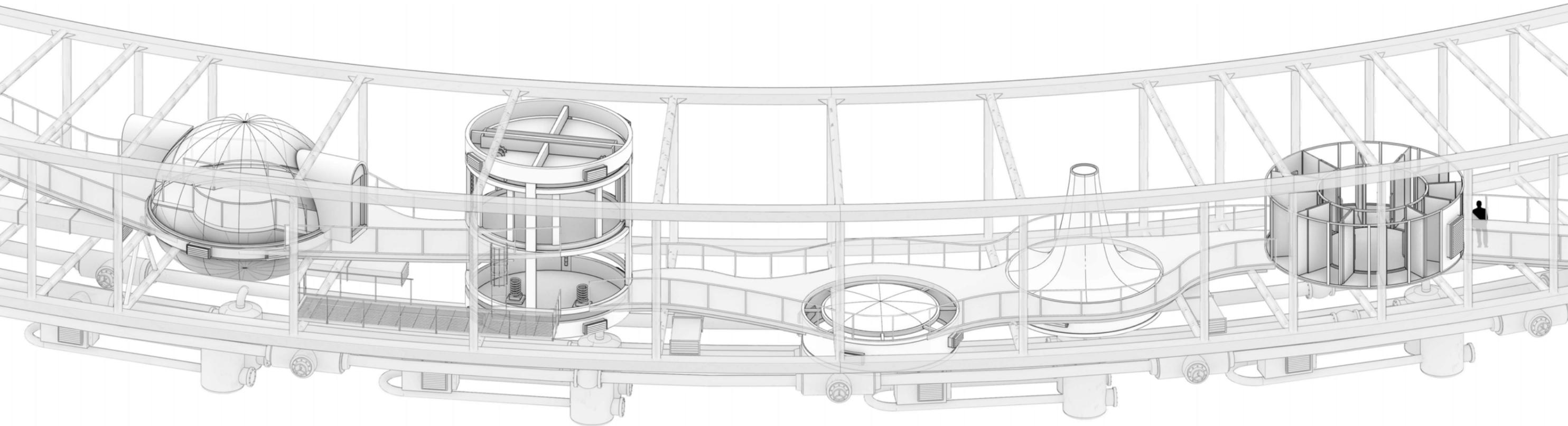
bubble 1



bubble 2

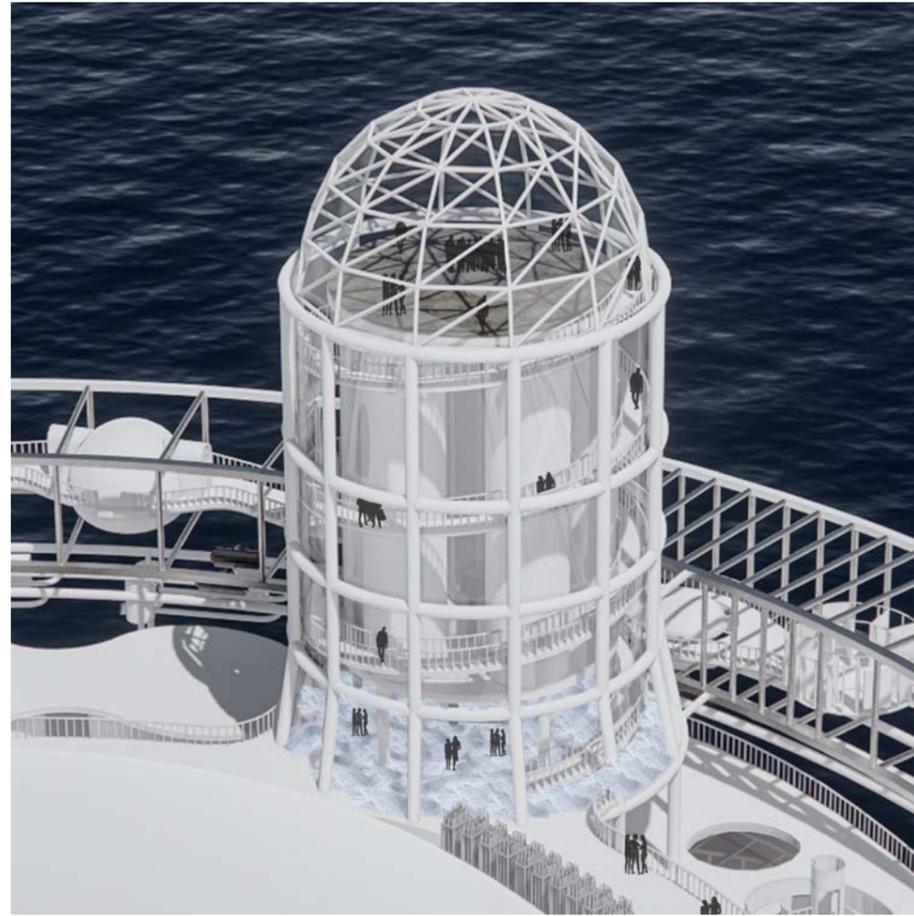
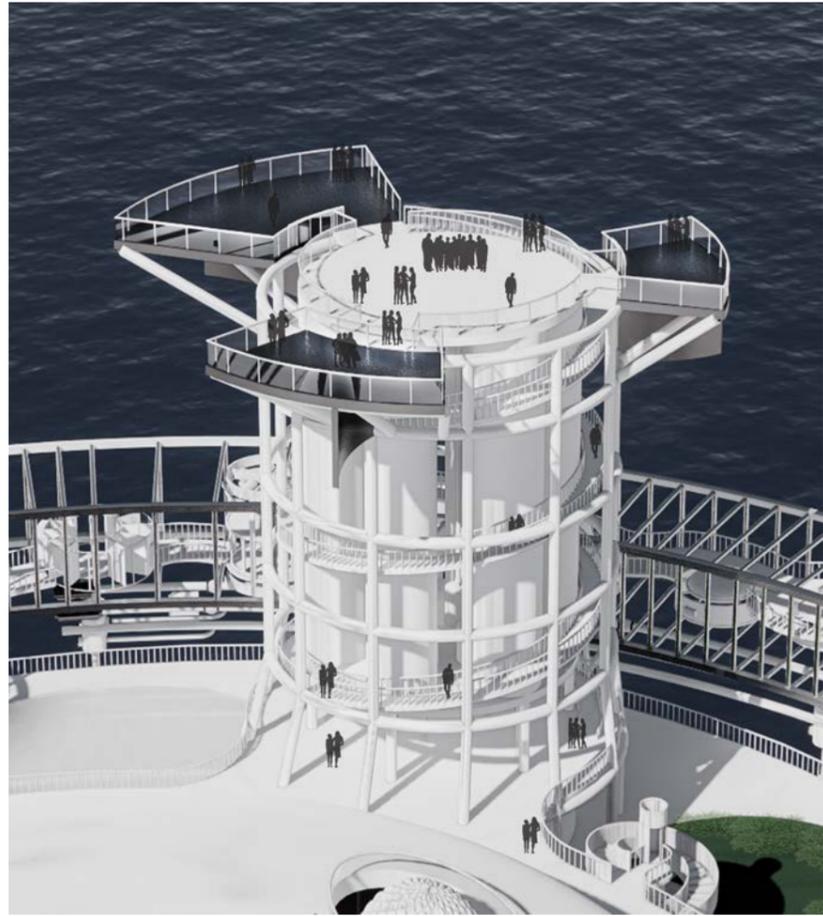


rotary chamber



Instead of following typical compression machinery, we try to visualize the behavior of air compression by introducing 5 various compression episodes. And distribute them around the outer ring, connected by a public pathway. When people walk around it, they experience and interact with the unique compression mechanism of each episode. For the inflatable rooms, visitors are invited to walk in to feel the process of compression. For the air lift, this unit isn't only designed to process air, but also helps to carry people to different levels. For the bubbles, 2 types of units compress the air outside or inside of them. Lastly, visitor can immerse themselves in the rotary chamber before their next destination.

Experiencing Absorbing Towers



Flow of Air

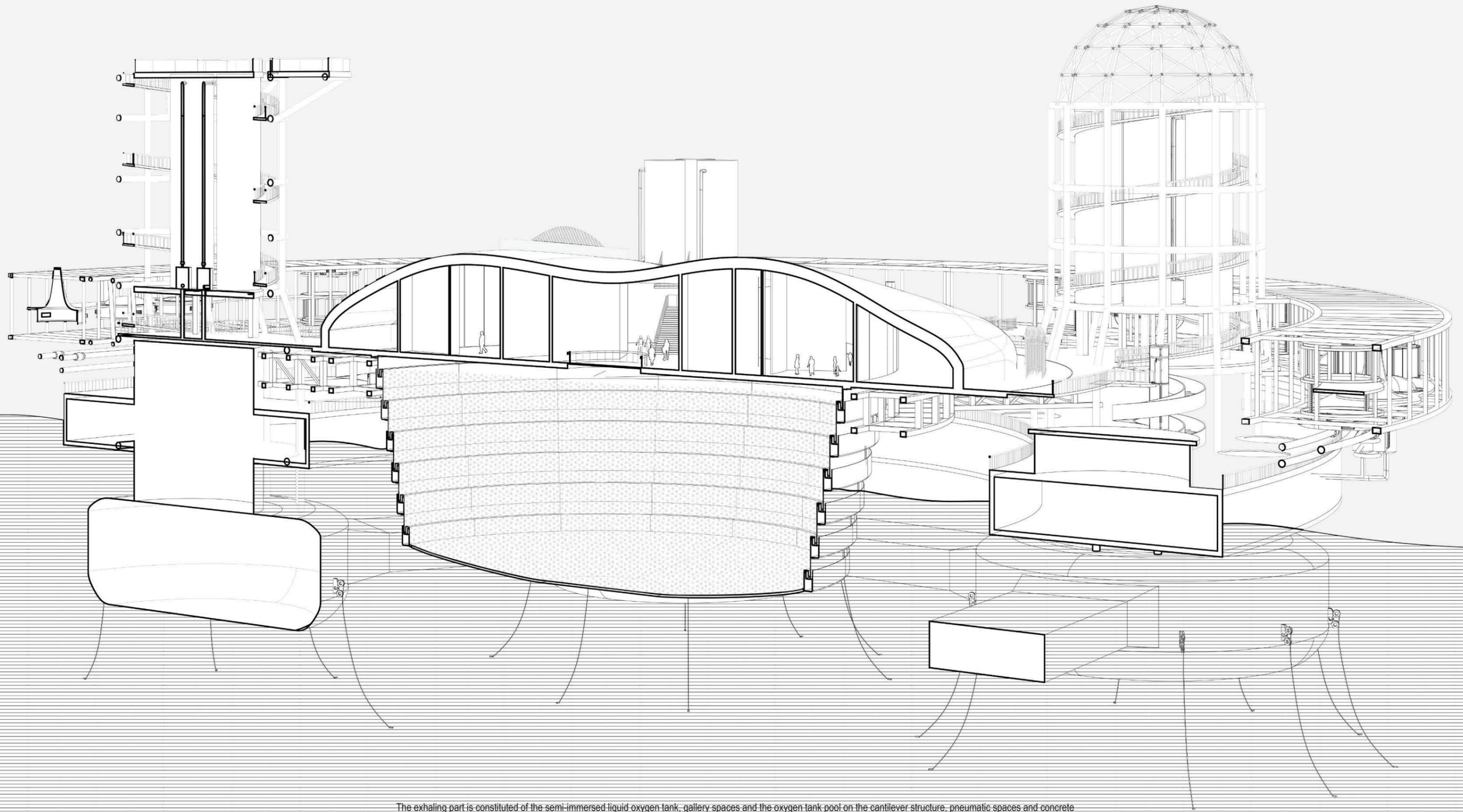


Temperature of Air

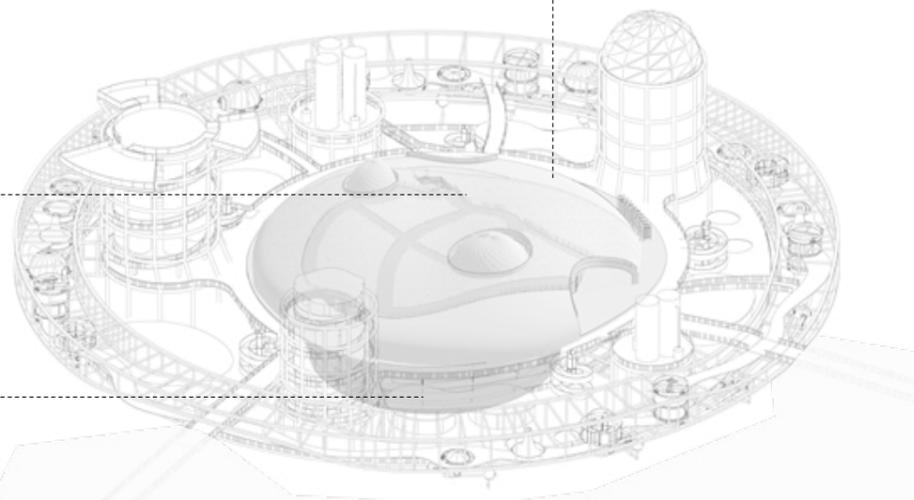


Form of Air

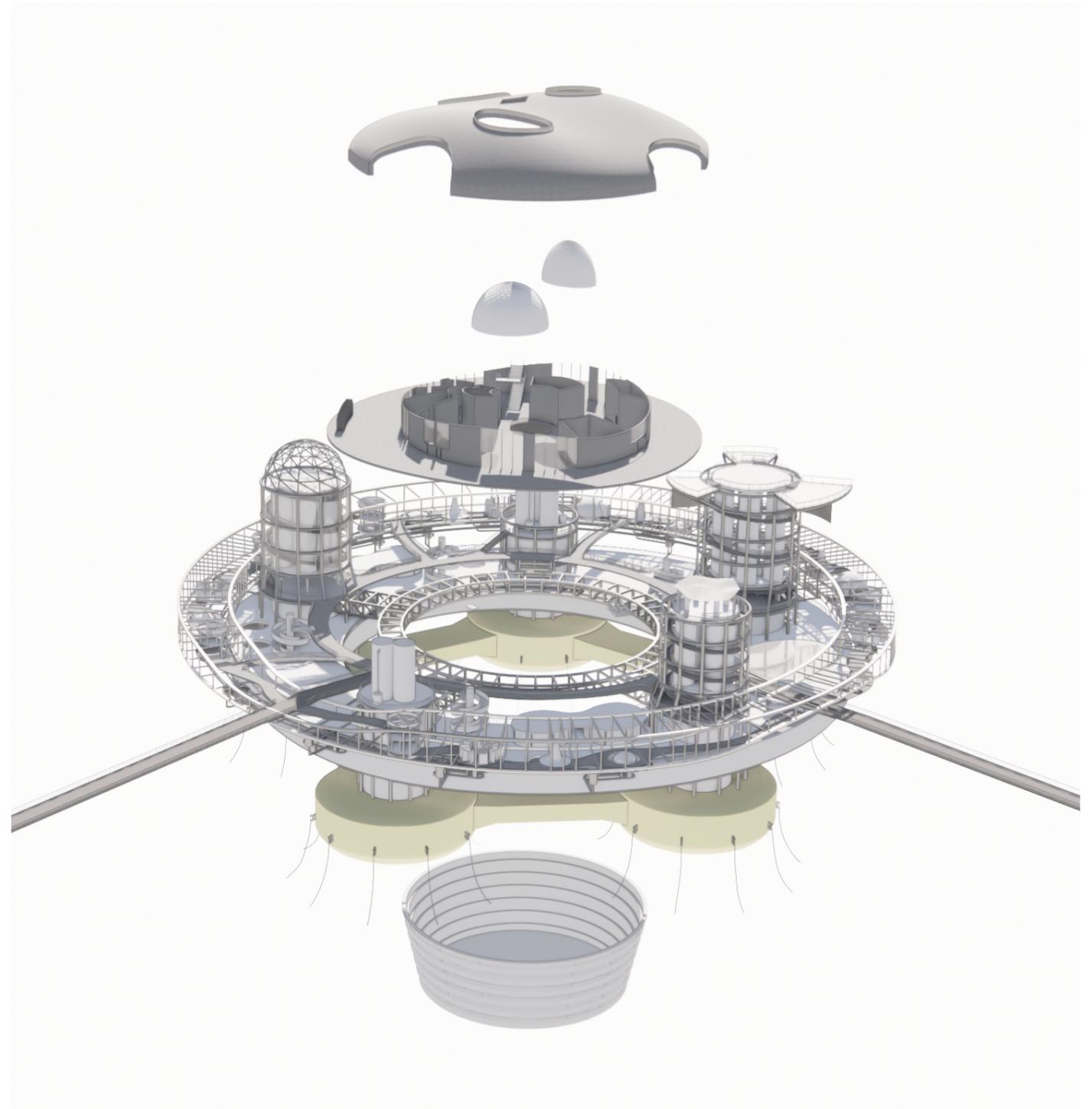




The exhaling part is constituted of the semi-immersed liquid oxygen tank, gallery spaces and the oxygen tank pool on the cantilever structure, pneumatic spaces and concrete landscape shell. Reaching to the central reservoir the visitor sees the expandable semi-immersed liquid oxygen tank. Above the floor inflatable pneumatic gallery rooms react to the production of gas oxygen, using it as a material for its form. Here the visitor is able to experience sounds and volumetric differences associated with the change in form from liquid to gas. The expandable reservoir structure is inspired by the precedents of gas holders from 1950s. But it expands downwards instead of upwards in order to hold liquid oxygen.

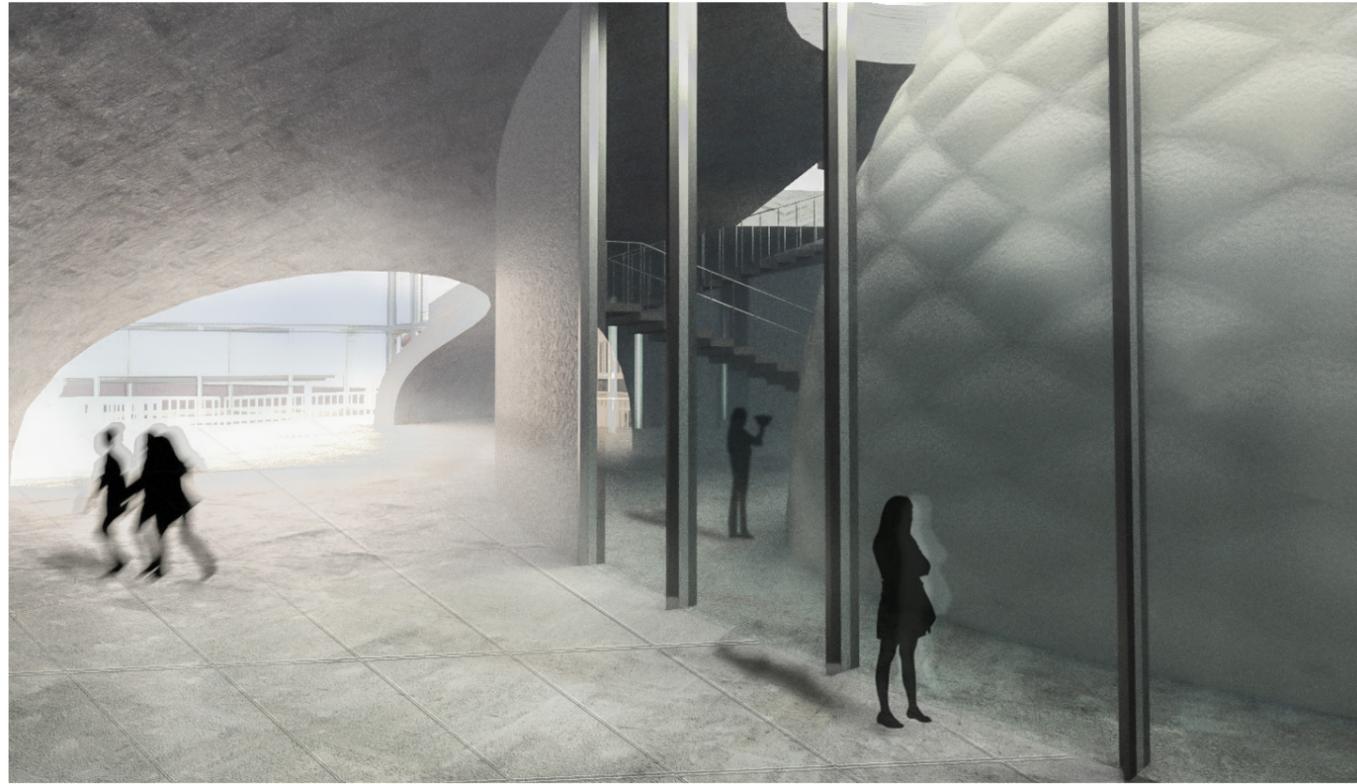


The botanical garden and algae bioreactors on the landscape shell provides more organic oxygen production.













A whole pregnancy company
 The Inflatable Birthing Kit aims to ameliorate the emotional fear caused by unfamiliarity through a redesign of birthing beds by making it into furnitures that that accompanied the pregnant during the whole pregnancy.



A birthing practice kit
 By accommodating a series of liberal birthing position, the Inflatable Birthing Kit actually serves a pedagogical purpose of promoting the liberal position birth knowledge. And with the help of our smart mirror and tablets online, pregnant can easily access pre-birth exercises, birthing simulation trainings with partner, and postpartum recovery exercises.



A furniture set for more than birth
 To really rethink birthing beds as daily life components, all of the furnitures in the Inflatable Birthing Kit is also designed as furnitures that can be used in daily life. Our goal is to help pregnant get as familiar as possible with the furnitures that they will be giving birth in, and sense fear caused by strangeness permanently.

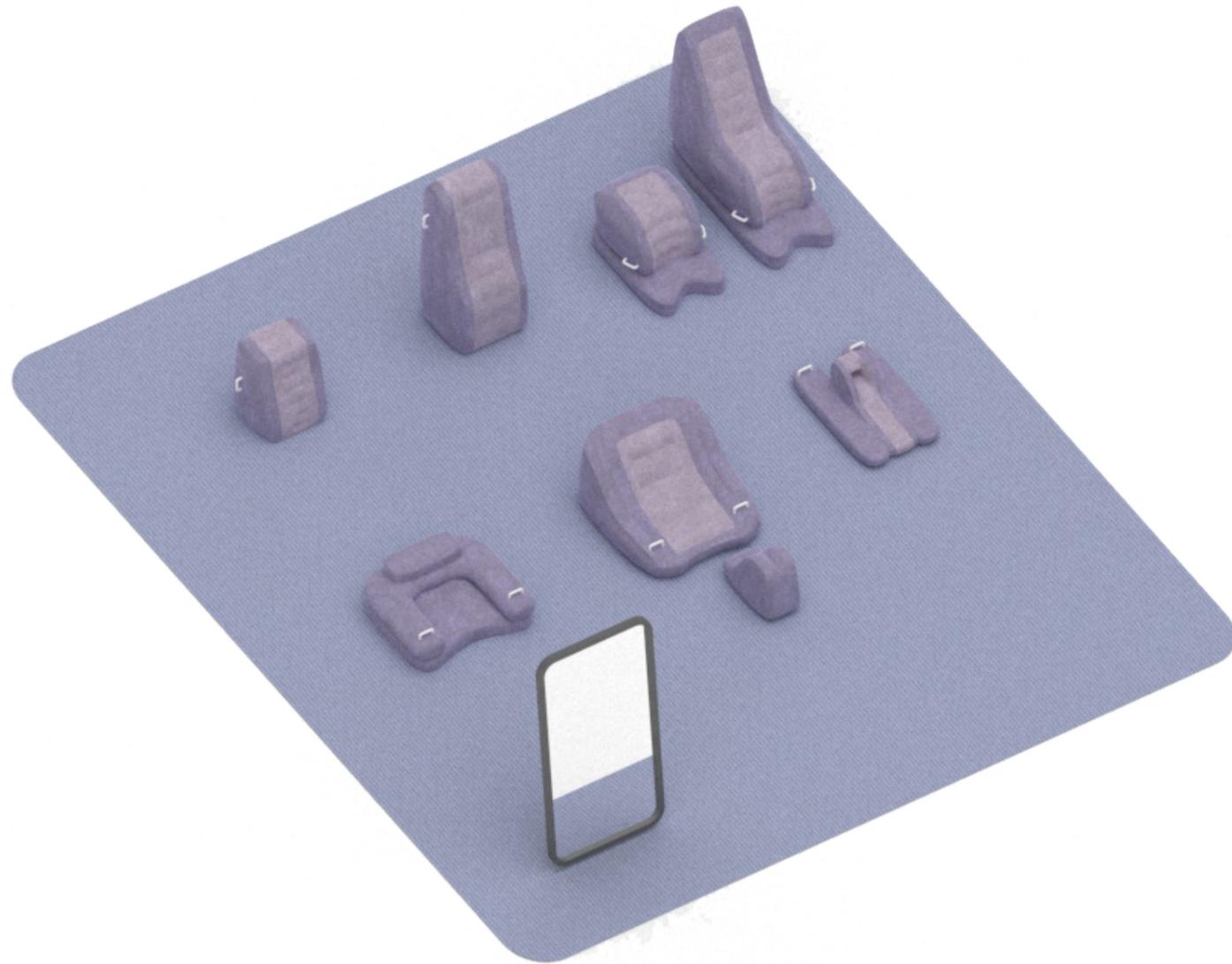


03 Towards A Fearless Birth

REDESIGNING THE BIRTHING BED

Summer 2021, Advanced Design Studio, Individual Work
 Instructor: Anne Liu
 Columbia University

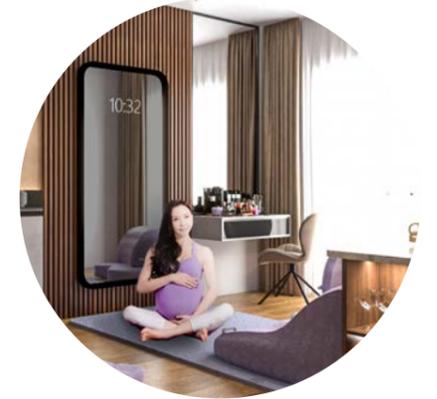
This project is developed in the Advanced Architecture Design studio, "Feminist Technoscience", which focuses on how technology can contribute to a better future for reproduction, motherhood, and gender equity. Using inflatable furnitures as vehicle, this project aims to ameliorate the emotional fear caused by unfamiliarity through a redesign of birthing bed, by making it into furnitures that that accompanied the pregnant during the whole pregnancy.



DESIGNED TOWARDS A FEARLESS BIRTH

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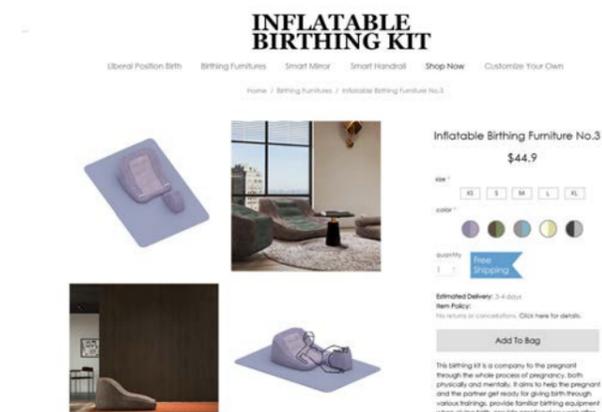


DESIGNED FOR LIBERAL POSITION BIRTH



What is liberal position birth?

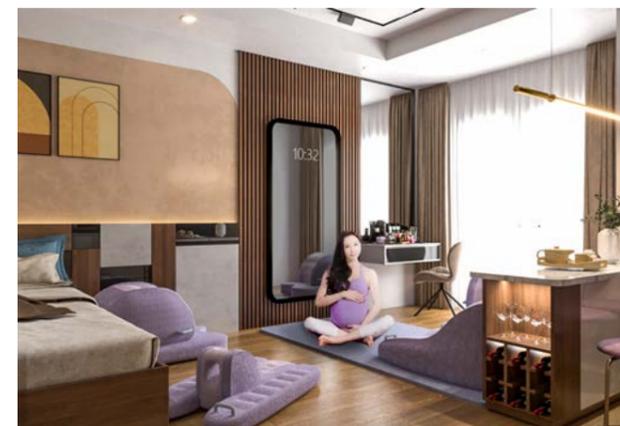
Liberal position birth refers to that the pregnant is in a comfortable position, such as lying down, walking, standing, sitting, kneeling, lying on her back, squatting, etc., instead of the traditional lithotomy position. As promoting vaginal birth becomes a consensus among the Chinese medical field, liberal position birth has proven several distinguish advantages. The fetus and the mother's pelvis is easier adapt to each other, making it easier to enter the pelvis and the pregnant mother's uterine opening will dilate faster. And the pressure of the uterus on the mother's blood vessels can also be reduced. In addition, the fetus will be able to receive more adequate oxygen, reducing the risk of hypoxia.



Step 1 Purchase/Customize online
The Inflatable Birthing Furnitures come in all sizes and a wide range of colors. You can choose your favourite ones, submit the order, or even customize your own in advance, and leave the rest to us!

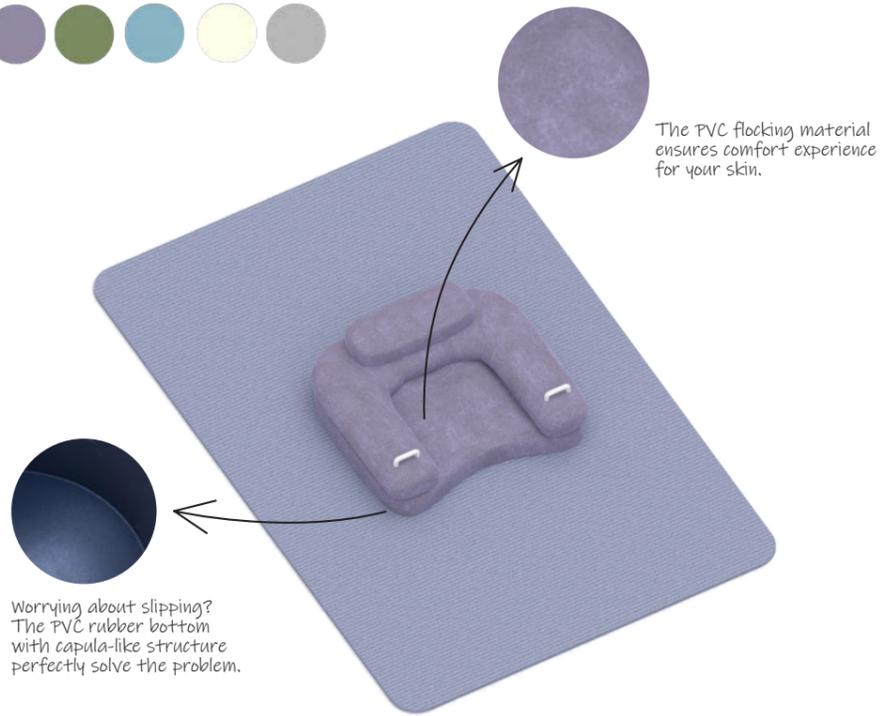
Step 2 Get familiar at home

After receiving your Inflatable Birthing Kit, you can follow our instructions and install all the items with the complimentary tools including an automatic air pump that saves you the effort to inflate with your own strength. Then, use them in your giving birth practices, or even just use them as normal furnitures! The only goal is to get used to their company!



Step 3 Use your own at the hospital

When the baby comes, you and your partner can easily deflate the whole set and bring them to the hospital with you. The hospital will inflate and sanitize them to get ready for your birth. No more fear from unfamiliarity, you are giving birth on the very familiar furnitures that have accompanied you through the last months. After birth, if you had chosen our smart handrail, you will even get your own souvenir of this epic journey of giving birth to life.



The PVC flocking material ensures comfort experience for your skin.

Worrying about slipping? The PVC rubber bottom with capula-like structure perfectly solve the problem.

¥219 \$32.9

Inflatable Furniture No.1

This item is designed to facilitate recumbent birth position, and is also a comfortable sofa that you can rest on whenever you like.



RECUMBENT



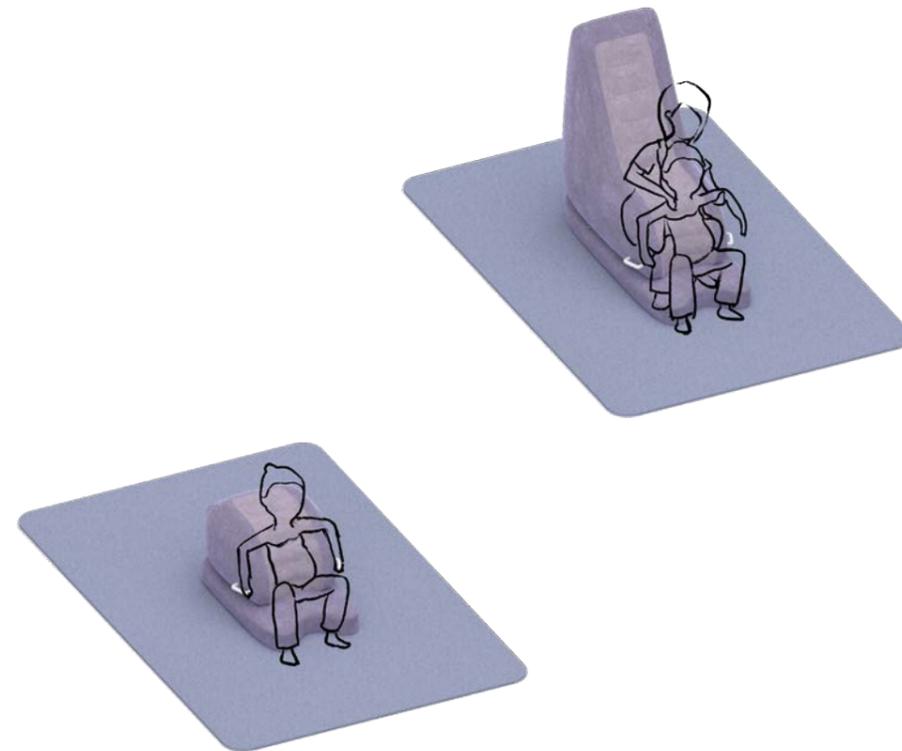
The pad serves both as a cushion for birth and foot pad for normal use.

¥289 \$43.5

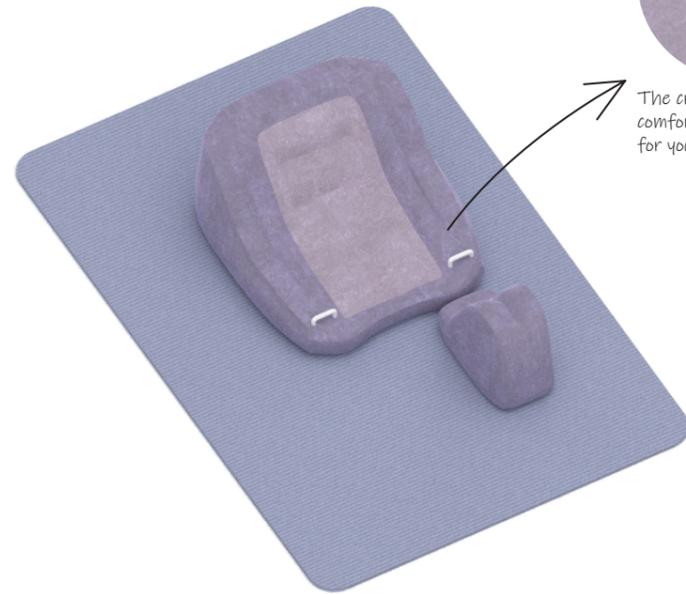
¥249 \$37.9

Inflatable Furniture No.2

This set is designed for the squatting birth position. In addition, they both serves as a nice chair in your daily life.



SQUATTING



The crease on both side provide comfortable and secure fixation for your arms.

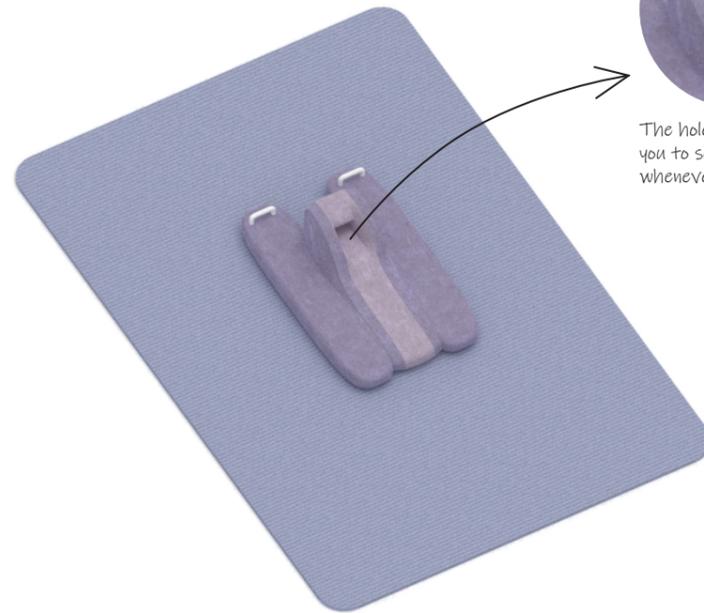
¥ 299 \$ 44.9

Inflatable Furniture No.3

This item comes with a stool that can hold your leg when giving birth in lateral recumbent position. It also is designed to be a cozy sofa.



LATERAL RECUMBENT

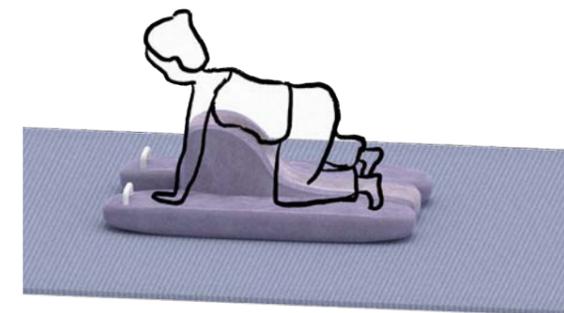


The hole in the middle allows you to see the birthing situation whenever you want to.

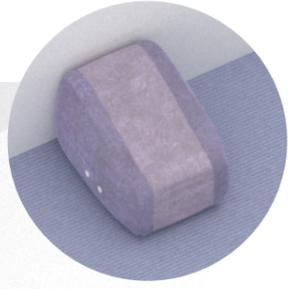
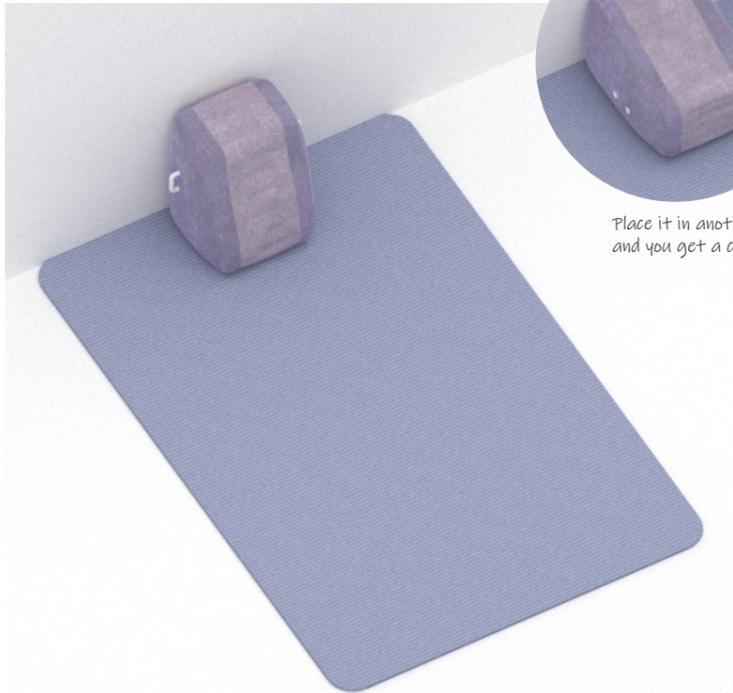
¥ 249 \$ 37.9

Inflatable Furniture No.4

This item is a kneeling pad with breast support, aiming to provide a stable and effortless kneeling position birth. It also serves as a sitting pad and the support in the middle can hold your head comfortably.



KNEELING



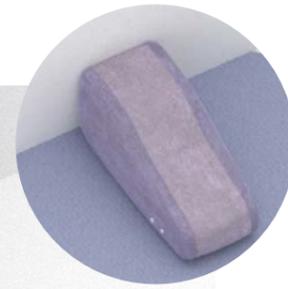
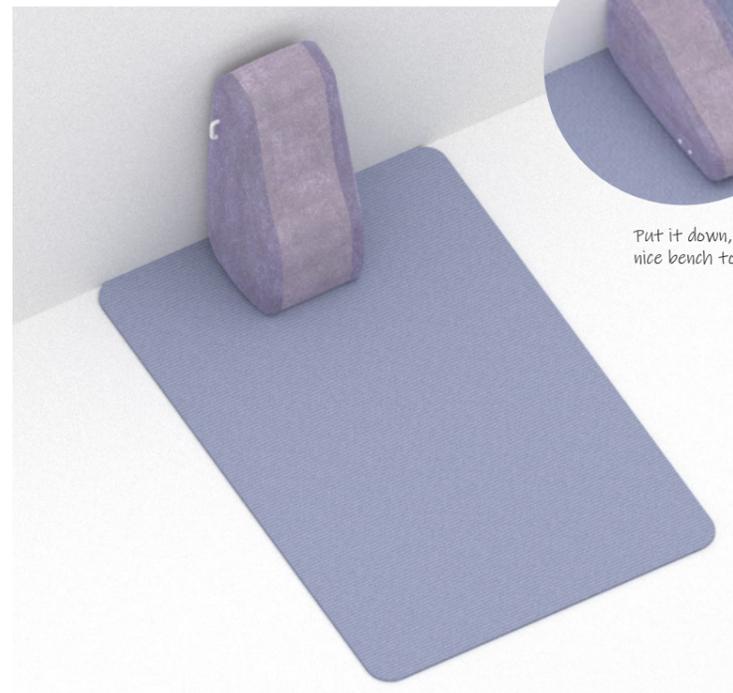
Place it in another direction,
and you get a cozy stool!

¥ 179 \$ 22.5

Inflation Furniture No.5
This item can support squatting and leaning birth position.
Besides, it also can be a cozy stool during your pregnancy.



SQUATTING AND LEANING



Put it down, it becomes a
nice bench to lie on.

¥ 239 \$ 35.9

Inflation Furniture No.6
Though similar to No.5, this item is designed specifically to
support standing birth position. It provides strong support
to the upper body and is a comfortable company to lean
on. When put down, it becomes a bench.



STANDING AND LEANING



**A COMPANY
THAT ERASES FEAR**



Always there for you

The goal of the Inflation Birthing Kit is to let birthing furnitures be around you from the very beginning of pregnancy to even after the born of a new life. It has multiple identities. It is a set of tools that leads you through pregnancy and is a set of daily furnitures that is a part of your pregnancy life, and after giving birth, it shifts form to become a souvenir that celebrate this memorable journey.

SOCIAL AND ENVIRONMENTAL FRIENDLY



Available in both rural and urban area

The low cost of manufacturing and transportation makes it affordable to all class. Anyone can order it online! The relatively expensive smart mirror can be substitute by group lesson, and the tech-based relatively expensive smart mirror can be substitute by group lessons in the local hospitals in rural areas, and the smart handrail is optional. And it brings opportunity to promote vaginal birth in rural areas by promoting liberal position birth.

