EXTEND THE TUNE

Zsa-Zsa Brouwers Public Building Studio Music Marvel P4 4579232

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GRADUATION PRODUCTS

GRADUATION PLAN

Personal information

Name Zsa-Zsa Olivia Idalie Laurence Brouwers

Student number 4579232

Studio

Name / Theme AR3AP100 Public Building “Music Marvel”

Main Mentor Henk Bultstra Architecture

Second Mentor Florian Eckardt Architectural Engineering

Argumentation of choice of the studio

The choice of this studio was determined by its subject, the Music Marvel, which is both architecturally and technologically challenging. Furthermore, designing for multiplicity is what attracted me to this studio, as it is a demanding design within architecture.

Graduation Project

Title of graduation project Tuning the Music Marvel

Location Binckhorst, The Hague, The Netherlands

The posed problem, research questions and design assignment in which these result

Binckhorst, currently an industrial area, is part of the municipality’s new transformation and densification strategy. Binckhorst is to become a mixed residential and working area. To achieve this, a large proportion of the buildings in Binckhorst will be demolished, the reason being twofold, niche mono-functionality and unadaptability. The scrapping will lead to a large-scale waste of structures and their materials. Unfortunate, given the need for the building industry to be more environmentally responsible. To prevent the destruction in Binckhorst from repeating in future, a strategy is needed that allows easier transformation of the area and buildings to meet the demands of future stakeholders. In addition, there ought to be dynamic and diverse functions to make the area more lively to attract more attention and care. Applying the flexible building strategy offers a possible solution, as it aims to extend the life of a building through its adaptability, and adding a public performance space in Binckhorst will broaden the dynamics of the area, by introducing entertainment as a function. However, the use of this strategy in music halls has been limited, as there are special requirements for structure, space and materials in order for these spaces to perform well. Moreover, the overarching characteristic of today’s flexible buildings is that they are nondescript in their architectural appearance. This poses a challenge, as a building must have a certain appeal, to prevent future demolition.

Therefore the question is posed: *“How to design a music venue that is flexible and has a unique identity?”*

Through variable research of the flexible building strategy, a toolbox can be assembled. Combined with the parameters of the site, an iconic and tuneable performance venue can be designed, demonstrating that the flexible building strategy can perform with a demanding function, and still have character.

Process

Method description

The research will be conducted through quantitate and qualitative research of the flexible building strategy. First, the theories of this method will be analysed through variating literary research. Based on the results of this research, a catalogue of the principles of the flexible building will be produced. Hereafter, further literary research will be undertaken on lessons learned from flexible buildings already realised, in order to avoid repeating them. The conclusions of these studies will be compiled. These can be reflected back to the principles catalogue of the strategy. There they will act as a second layer of the principles and form the beginning of a framework for flexible buildings.

The last part of the literary research is conducted to understand how a building with character and identity is created. This will be achieved trough research of different fields of science; social, political and architectural aspects of an iconic building will be examined to learn how an iconic building emerges. From the conclusions of these research analyses, a catalogue will be generated, containing the essential elements to design a building with identity.

Last, a case study research will be performed on music venues with a certain degree of flexibility to gain insight into the current limits of the adaptability of this function. The focus of this study will be on the flexibility principles constructed earlier in the research. By matching the created framework of the flexible building strategy with the lessons learned and the flexible aspects distilled from the case studies, a specific framework for flexible music venues can be developed.

Finally, this framework is combined with the catalogue on creating a characteristic building. Through these different signals of research a toolbox can be prepared from which an iconic and tuneable music venue can be designed. During the design process the site specific demands will be determined through analysis of the conditions and its results will be used in conjunction with the toolbox to develop the flexible and characteristic music marvel of Binckhorst.

Literature and general practical preference

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Case studies
- Muziekgebouw aan 't IJ in Amsterdam, The Netherlands (1997) *by 3XN Architects*
- Ziggo Dome in Amsterdam, The Netherlands (2005) *by Benthem Crouwel Architects*
- Glastonbury Festival in Pilton, England (1970) *by Michael Eavis*
- Fun Palace (never realised) in London, England (1959) *by Cedric Price*

Reflection

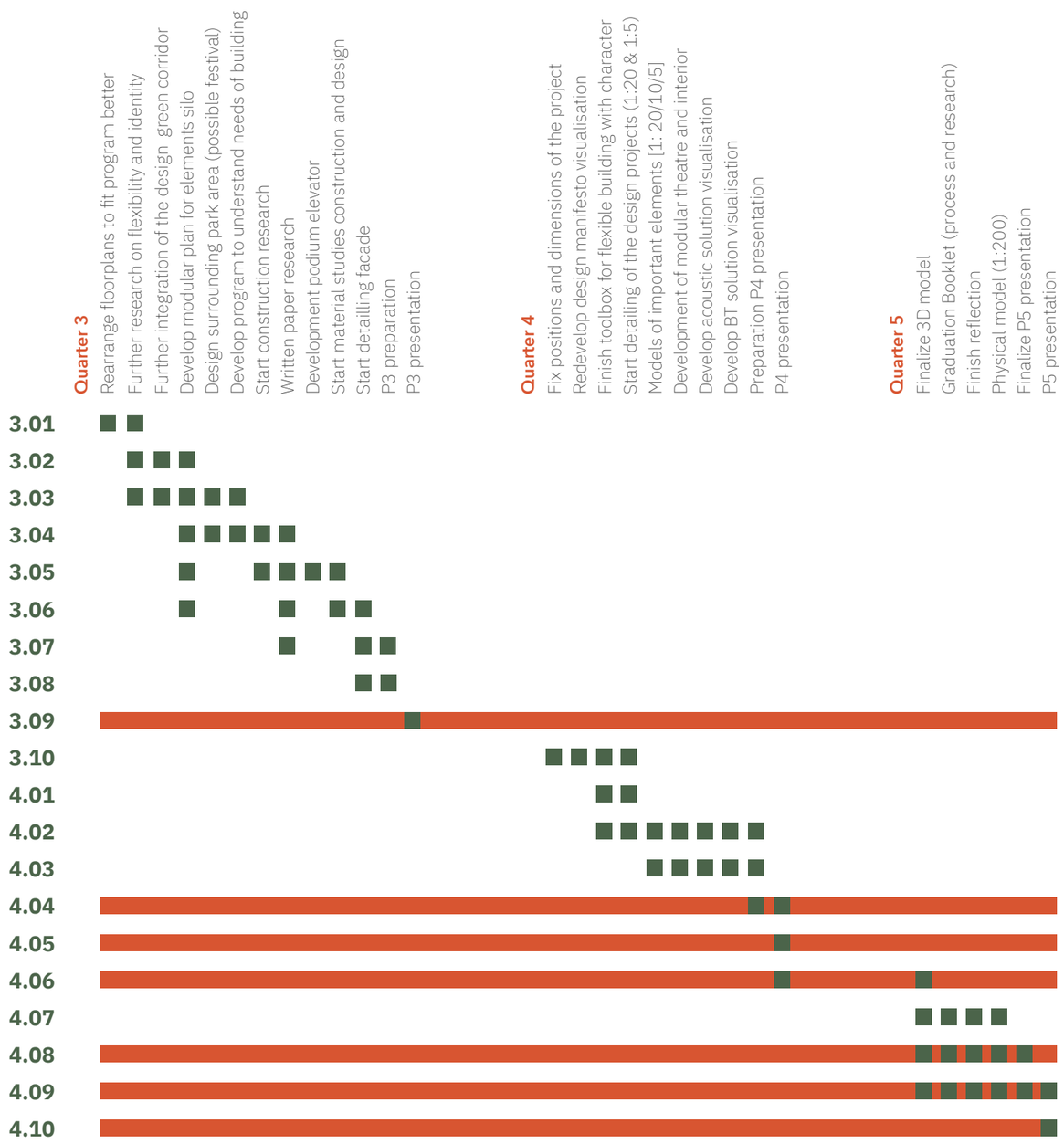
Relation graduation topic and studio

The thesis topic relates to the studio by examining an architectural approach that has little or no application in public buildings with a music function. By examining how this strategy can be applied in an architecturally, technically and structurally demanding function such as a music venue, new information may emerge that can improve and develop this approach within architecture as a future solution.

Relevance in larger scientific framework

This research contributes to the field by examining a current topic within architecture, and the results could contribute to finding a solution for the building industry's need to become more environmentally conscious by reducing their greenhouse gas emissions. A vast amount of research has already been completed on the theory and implementation of flexible buildings. This research contributes to this by creating a framework of the current knowledge to which new information and data can be added in future by other researchers. Through this toolbox, knowledge can be combined to improve the theory and approach of the implementation flexible buildings and increase the chance of developing a strategy that would enhance the role of the built environment in the fight against climate change.

PLANNING



DELINEATION RESEARCH

DEVELOPMENT THEME

Previous program [1]

Binckhorst has functioned as an industrial area for decades. Therefore, there are buildings on this terrain for niche production purposes. The are was developed to be efficient. However, since many companies are now ceasing their activities as a result of the closure of the gasworks in Binckhorst, this area in The Hague has a high vacancy rate. The area is close to the centre of The Hague and it is therefore economically attractive to redevelop this area.

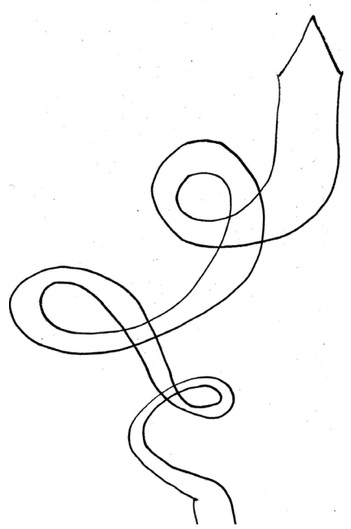
Future plans Binckhorst [2]

The future plans for Binckhorst, as determined by the municipality, are very different from the current Binckhorst. Binckhorst is to become a lively mixed-use area, where working and living are intertwined. High-rise buildings will be built in the district, due to the housing shortage in The Hague, and there are plans to connect Binckhorst to the rest of the city through green infrastructure. However, for this vision to become reality, a considerable amount of real estate is currently being demolished in Binckhorst. As a result, many viable buildings and their materials are being wasted. This is a discredit, because the building sector needs to become more sustainable.

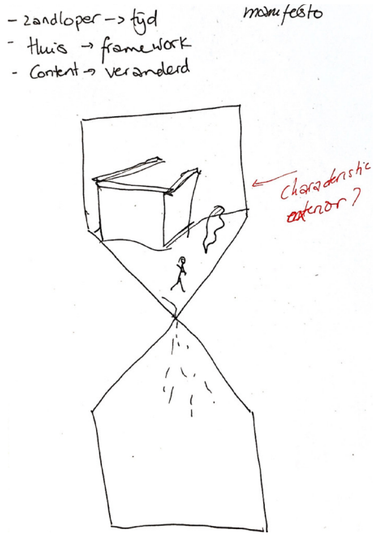
Current state Binckhorst [3]

This waste can be prevented both by introducing adaptability within the building, so that other future functions can easily be realised, and by defining the building's own character, ensuring that it does not suffer from nondescriptness. Combined, these values can ensure that the mass destruction of Binckhorst will not be repeated in the future. This idea will be visualised in the manifesto.

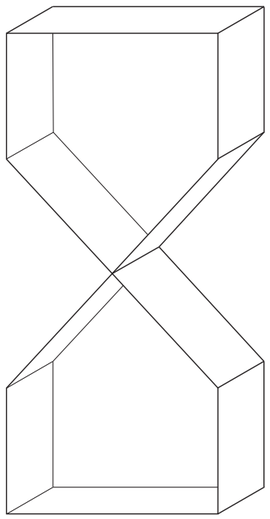
DEVELOPMENT MANIFESTO



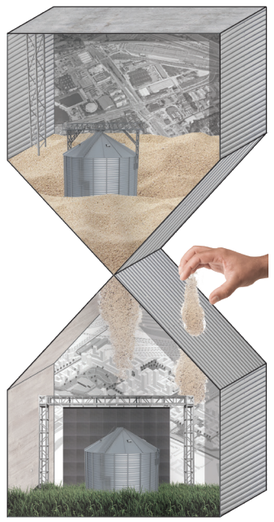
First sketch for manifesto



Idea of hourglass manifesto

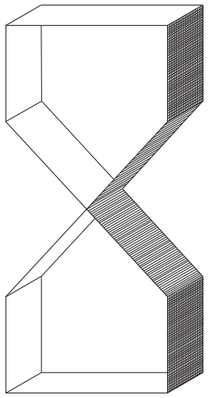


Framework of the hourglass



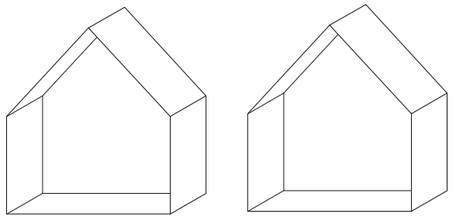
First attempt of manifesto

MANIFESTO EXPLANATION



Framework of the hourglass

The hourglass represents time, it shows the present situation at the top and the future situation at the bottom. When rotating the hourglass the present will disappear and a new future is introduced, this can be repeated infinite times. The hourglass encompasses the reuse of form with a changing substance

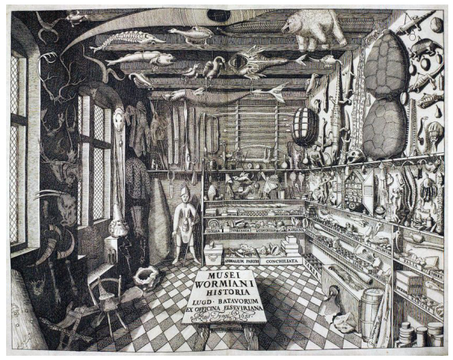


One building

Furthermore, the shape of the hourglass represents one building with a distinct character in terms of its shape. Within this building, the aforementioned situation is the function of the building that is changing over time. The frame of the building however remains unchanged.

Sand [4]

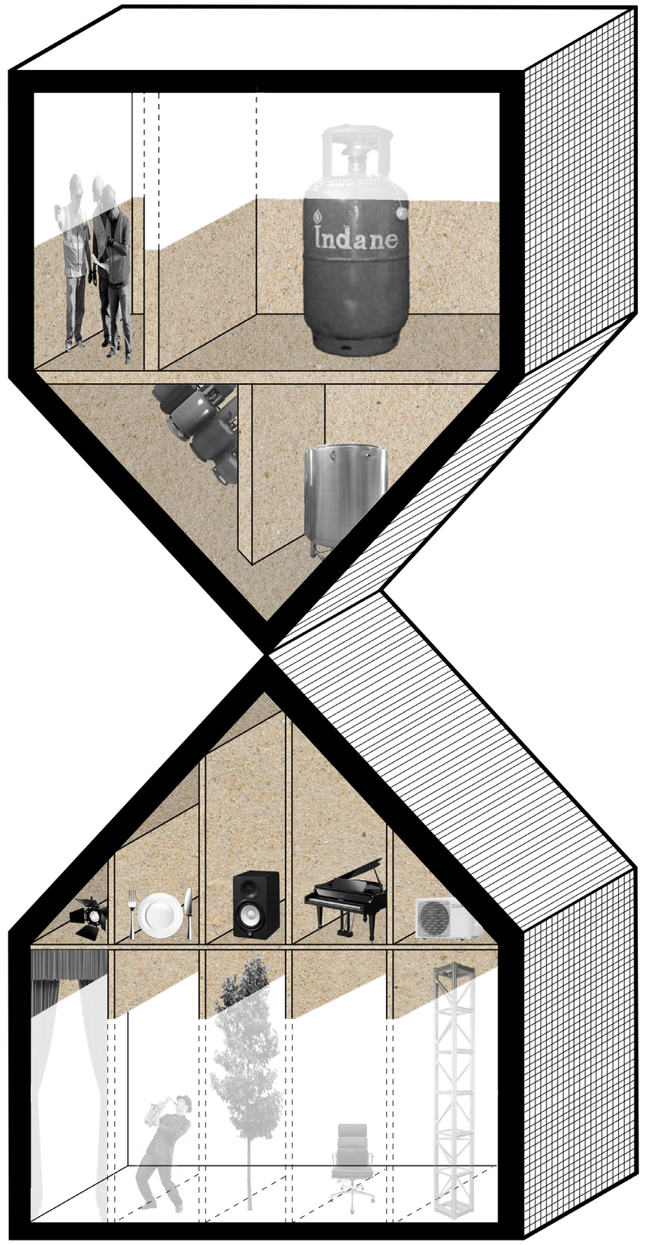
Like a traditional hourglass, it contains sand. In this manifesto the sand represents the flexible elements of the building, which can change over time to accomodate a new function. The sand is all that is needed to realise different future scenarios. The sand consists of modular interior structure, services and furnishings.



Cabinets des curiosités [5]

Two clear grids emerge from the sand, representing cabinets of curiosities. This symbolises the three-dimensional division of space and its construction, which can accomodate a new function with its corresponding curiosities each time.

MANIFESTO



THEORY RESEARCH

EMPATHY DIAGRAM

Individual

During the first visit to Binckhorst, we were asked to keep four questions in mind. What do I like about the area, what do I want for the area, what do I wonder about the area and what if I could change something. These questions focused on our own ideas, without taking into account the plans already under development for the area. The first thing that struck me about the area was the contrast between raw nature and industrial terrain, this contrast represents the area at the moment and it is interesting to experience the duality. The next striking aspect of the area was the variety of smells, which is related to the duality of the area. In some places in Binckhorst it smells like waste and filth, while in other places it smells like fresh nature. It would have been nice to be able to collect this duality in scents, unfortunately this was not possible. I was also very curious as to whether the current residents, by which I mean the business owners of the area, would want to change the area, as there is a certain unattractive atmosphere for outsiders. Do they like the notion that not everyone feels welcome? And finally, I wondered if this area could be used as a festival site, as the current demolition makes the area feel empty, almost turning it into an empty festival site.

I like...	I wish...	I wonder...	What if...
...the **contrast** between **construction** and **nature**	...I could sample the variating **smells**	...if the current "**residents**" would like to **change** the area	...this whole area will be **transformed** into a **festival** terrain

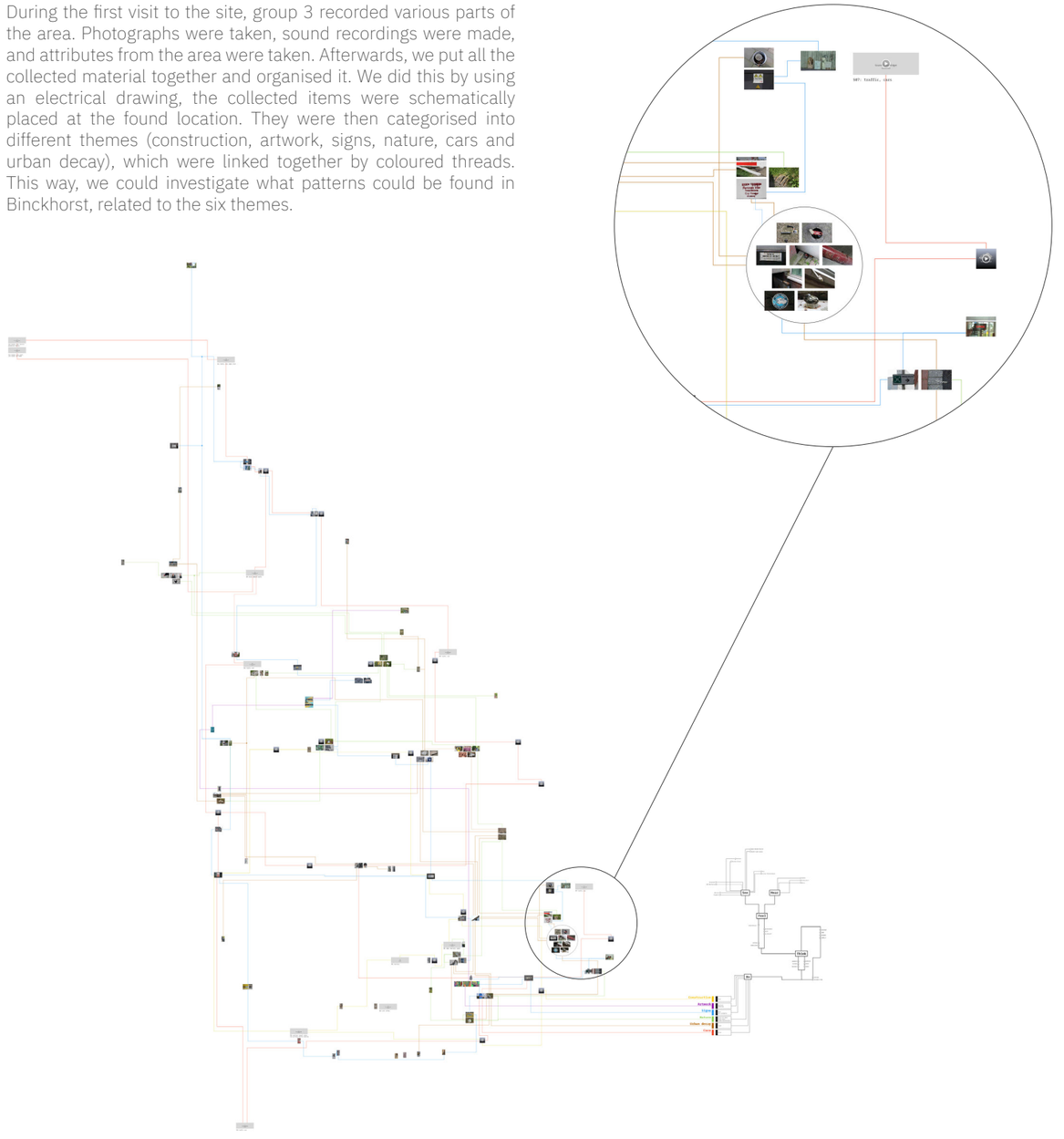
Group

After everyone in Group 3 had developed their own ideas about the area, and had answered the four questions themselves, we put the answers side by side. For every question, each person told us the first thing that came to mind, then we talked about our experience together and came to a common conclusion for each question. Starting with what we liked about the area, surprisingly we all had a slightly different version of the same answer. We all noticed the contrast, between city and this area and between nature and factory. Whether this contrast was beneficial for the development of the area, we were not sure. Then we also agreed that we wanted more dynamics in the area, since currently there are only two things present; industrial terrain and wild nature. We concluded that Binckhorst is currently an island within The Hague, and wondered if the qualities of an island could be retained if you made connections with the mainland, would it still be an island? The idea of the island also raised the question of the festival grounds, which can be seen as an island. We wondered what would happen to the area if we were to consider all of Binckhorst as a festival site. Would the area improve then, or would it cause even more isolation and neglect in the future?

We like...	We wish...	We wonder...	What if...
...the **contrast** within area (**industry** & **nature**) and the contrast between city and area	...there was a more **dynamic range** of offered **sensations**, coupled with **pitstops** for appreciation	...what kind of an **island** it is when **connected** [if it still is one?]	...Binckhorst was **proclaimed** a **festival area**

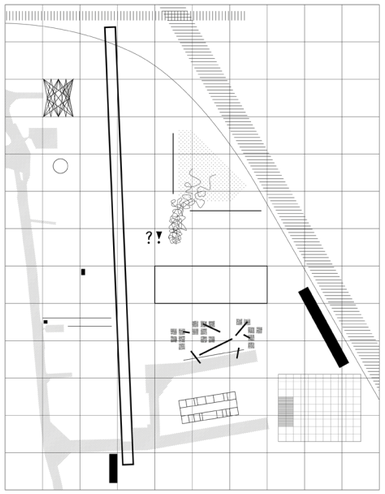
SAMPLING

During the first visit to the site, group 3 recorded various parts of the area. Photographs were taken, sound recordings were made, and attributes from the area were taken. Afterwards, we put all the collected material together and organised it. We did this by using an electrical drawing, the collected items were schematically placed at the found location. They were then categorised into different themes (construction, artwork, signs, nature, cars and urban decay), which were linked together by coloured threads. This way, we could investigate what patterns could be found in Binckhorst, related to the six themes.

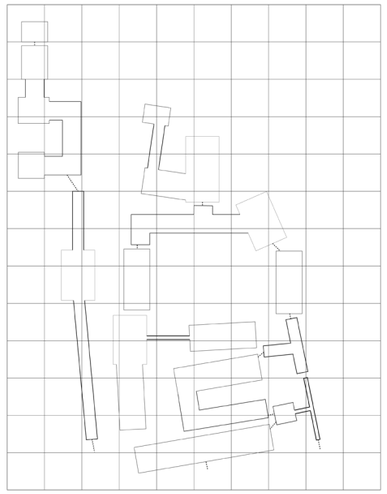


NOTATION

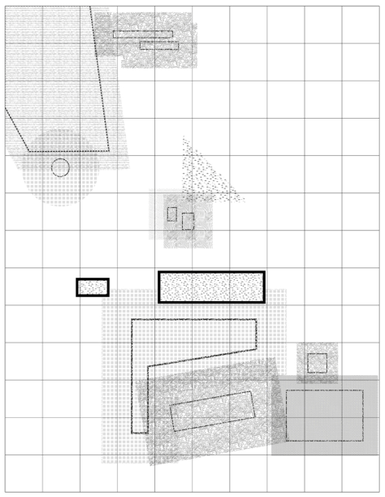
Before preparing a personal research plan, a group abstract was produced. Group 3, consisting of Chris Huisman, Edgars Jane, Phat Ho and Zsa-Zsa Brouwers, chose the amplifier as their overarching theme. An amplifier is a device from which a weak signal is transformed into a strong signal, in form it is equal to that of the weak. But after amplification, the magnified signal can be transformed in any desired manner. Group 3 presents an amplified compilation of 'research signals', enlarged to be discovered as an alternative methodology of space production and a strengthening of a new framework for enveloping music performance space in Binckhorst. Below are the various signals. Personally, I have examined the flexibility of the site.



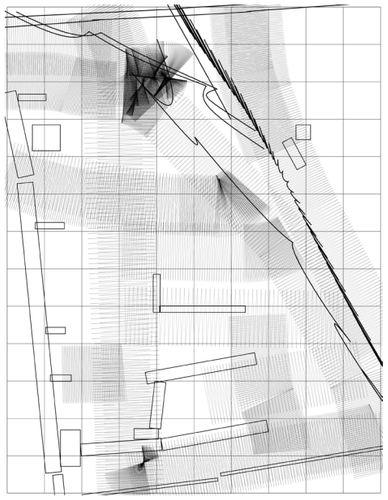
Form



Flexibility



Flow

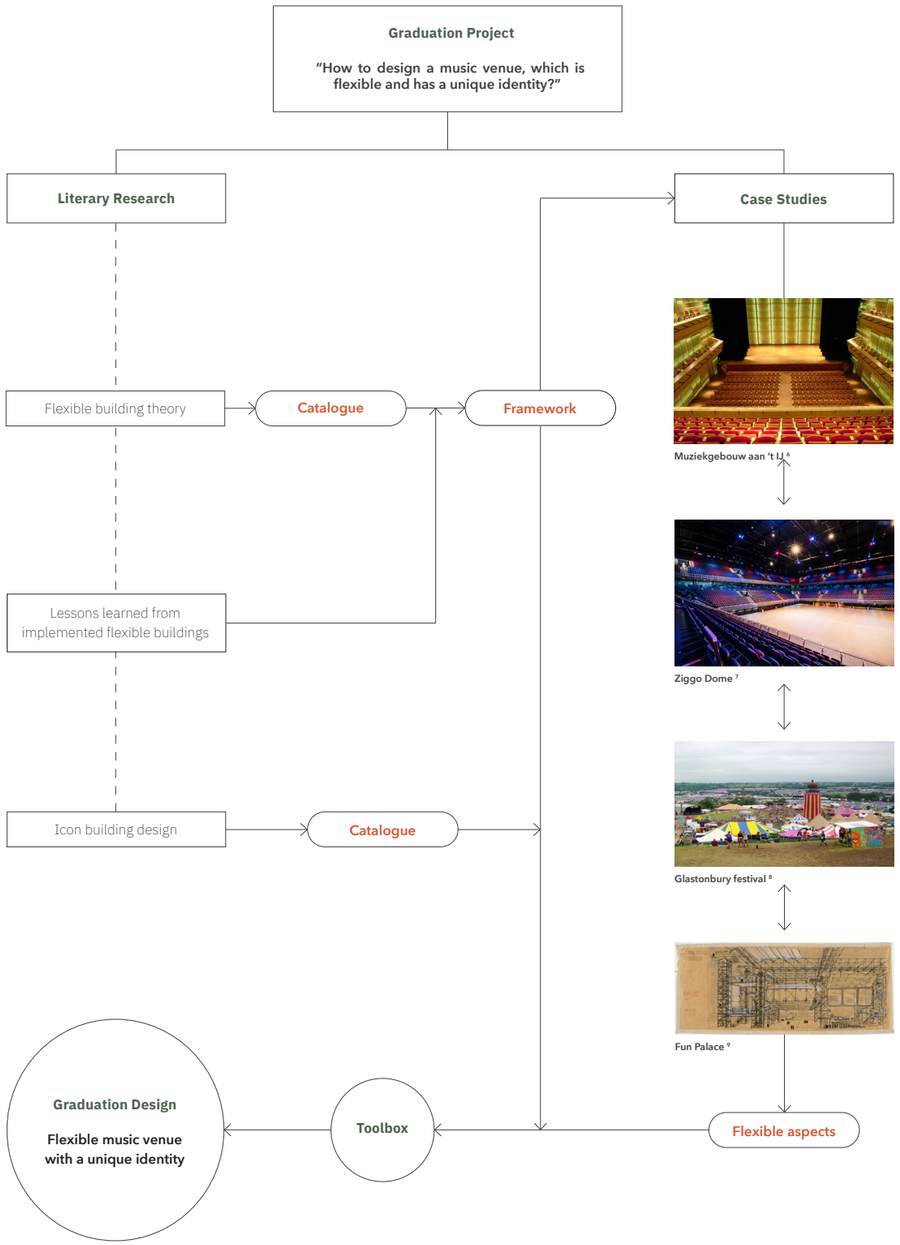


Frontiers

We superimposed the four research themes to find a possible location to place the Music Marvel. By doing research for my project, I discovered that next to flexibility, identity (form) is very important to make a durable flexible building. Also, I wanted the building to not have too many frontiers, to make it most approachable. Because of these limits, I was introduced to the location where the green dot is. In terms of flexibility, a considerable amount is possible at this location, since a large part of it has no clear destination and a lot of it is being demolished. There are two very interesting forms present at this location and the frontiers are not dominant. Furthermore the municipalities's vision regarding this area are also promising.

Superimposition

PROJECT ABSTRACT



The municipality of The Hague is currently redeveloping Binckhorst from industrial area to a high-rise mixed function area. The drastic redevelopment of this area is causing the loss of numerous reuseable materials and buildings. This is worrisome, given the need to improve the sustainability of the building sector. To prevent the destruction in Binckhorst from repeating in future, a strategy is needed that allows easier transformation of the area and buildings to meet the demands of future stakeholders. In addition, there ought to be dynamic and diverse functions to make the area more lively to attract more attention and care. Applying the flexible building strategy offers a possible solution, as it aims to extend the life of a building through its adaptability, and adding a public performance space in Binckhorst will broaden the dynamics of the area, by introducing entertainment as a function. However, the use of this strategy in music halls has been limited, as there are special requirements for structure, space and materials in order for these spaces to perform well. Moreover, the overarching characteristic of today's flexible buildings is that they are nondescript in their architectural appearance and usage. This poses a challenge, as a building must have a certain appeal, to prevent future demolition.

Therefore the question is posed: *"How to design a music venue that is flexible and has a unique identity?"*

This project will research the current implementation of the strategy and its flaws, from this a toolbox will be created. Research from different fields of science is conducted to understand the design principles of an iconic building. Last, flexibility of the music function is analysed through case studies. These three researches combined will form the parameters to design an iconic and tuneable performance venue, demonstrating that the flexible building strategy can perform with a demanding function, and still have character.

DESIGN BRIEF

PROGRAM VISION

Music hall [10]

The vision for the music hall of the music marvel is to design a space that can serve multiple functions. Different kinds of music, theatre, symposiums and conferences can use this room as a stage. This function forms the heart of the building and the other functions have a supporting role in elevating this function. In addition, the hall is intended to offer a unique experience in terms of sound due to its round shape, allowing unique performances.

Surrounding offices [11]

Various new buildings and functions will rise around the gasholder, most of them housing and offices. The music building should become a public building where the surrounding functions can go to take a break from the ordinary day. They can go to the venue for lunch with live music playing in the background. Furthermore, the building can function as a conference hall for these offices and, in the evening, company outings can take place in the theatre.

Cultural park [12]

In future the municipality will introduce a cultural park next to the silo. This park could house the occasional festival, where the silo would function as the main stage. Furthermore this park can be used to connect to the city centre, as there is a green corridor from this park to Scheveningen. Furthermore, this park gives a unique opportunity to make the music marvel more public than the average music building.

Introducing a foodcourt [13]

The introduction of the food halls as a secondary function of the music building creates more motives for visiting this building. People in the park can get something to eat and drink during a festival or day at the park. The same applies to the surrounding offices during their lunch break. The building itself is now equipped with its own catering, meaning that the aforementioned events do not have to arrange their own.

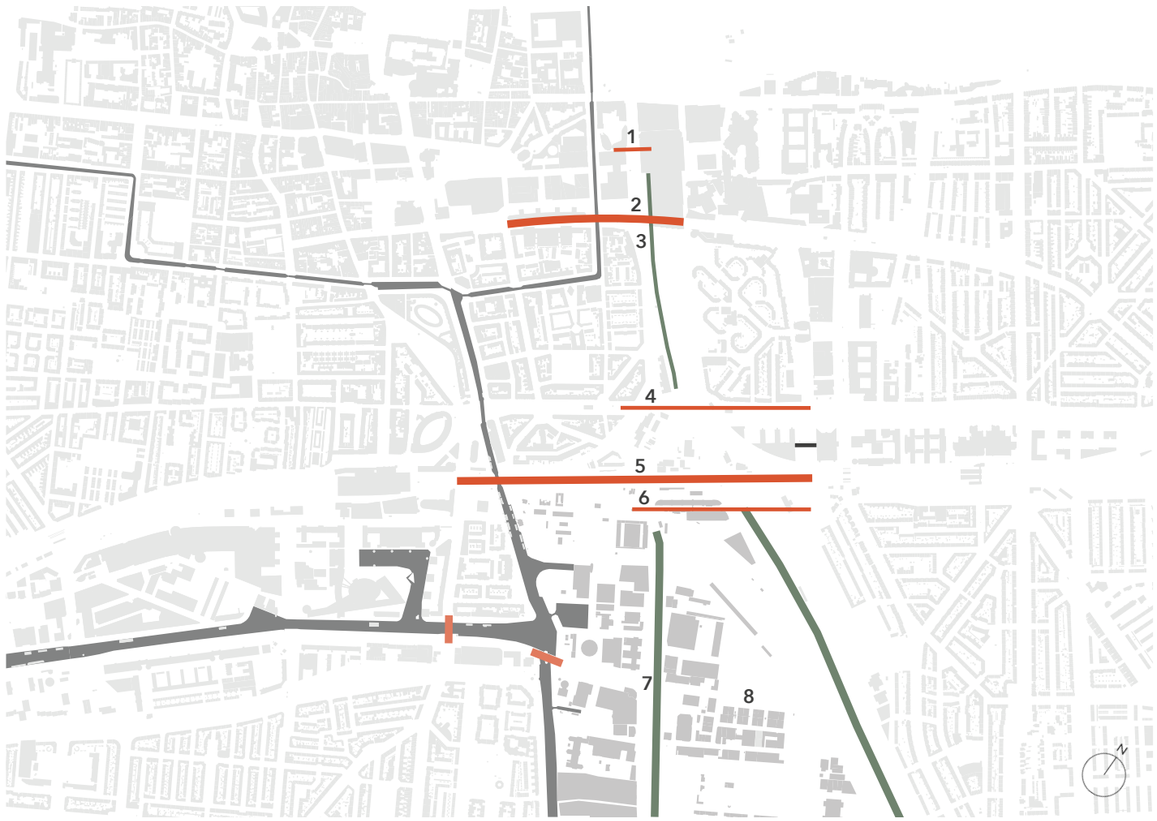
PROGRAM BRIEF

Functions	Nett m²	Nett Area	Gross Area	Height
Concert Space (1200p)				
Stage	80 m²	2,5%	1,7%	18,00 m
Backstage (logistics)	140 m²	4,2%	3,0%	6,80 m
Seating	780 m²	23,7%	16,6%	18,00 m
Crew area	40 m²	1,3%	0,9%	3,20 m
First aid	30 m²	0,9%	0,6%	3,20 m
Artist				
Dressingroom (medium)	60 m²	1,8%	1,3%	3,20 m
Dressingroom (private)	45 m²	1,4%	1,0%	4,50 m
Backstage (artist)	80 m²	2,5%	1,7%	3,20 m
Audience				
Entrance / Foyer	520 m²	16,0%	11,0%	6,80 m
Wardrobe / Cassier	40 m²	1,2%	0,9%	3,40 m
Restrooms (24)	80 m²	2,5%	1,7%	4,20 m
Bars	40 m²	1,2%	0,9%	3,20 m
Foodcourt (800p)				
Restaurants (16)	390 m²	12,0%	8,3%	3,40 m
Sitting area	545 m²	16,7%	11,6%	9,00 m
Restrooms (8)	50 m²	1,5%	1,1%	3,40 m
Support				
Loading dock	1 truck			9,00 m
Storage	50 m²	1,5%	4,6%	5,00 m
Technical space	150 m²	4,6%	3,2%	5,00 m
Total	**3260 m²**	**100%**	**69,7%**	**31,00 m**

BINCKHORST RESEARCH

BOUNDARIES

The research conducted in period 1 mainly revealed that Binckhorst is an island in The Hague. Both mentally and physically, there are many barriers between The Hague city centre and Binckhorst, even though they are very close to each other. This is one of the principles that I want to improve in Binckhorst. To ensure that the music building and the area itself have a better connection with the rest of The Hague. That's why the road connections need to be improved. This applies especially to cycling and walking routes, which are hardly present in Binckhorst at the moment. The current cycle route from Central Station to Binckhorst is described in images. As can be seen from the images, there are eight major barriers that create a physical, but especially a mental barrier between Binckhorst and the rest of The Hague. It begins at The Hague Central Station, where, on leaving the station, you immediately come across the first bridge. Then the train tracks and several other bridges block the way to Binckhorst. When you get close to Binckhorst itself, there is a huge road that has to be crossed, only to find yourself on a half-abandoned factory site, where it feels like you don't belong. This will have to be addressed in the redevelopment of the area, with a new atmosphere that has a connection to the rest of The Hague. Moreover, alternative walking and cycling connections will have to be made, with as few barriers as possible, to improve the mental and physical connections between Binckhorst and the rest of The Hague.



Current mental barriers *1:20.000*

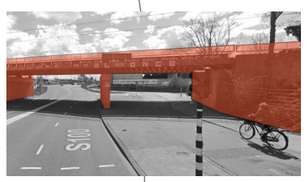
1. Overpass

2. Overpass

3. Railroad

4. Overpass

5. Overpass



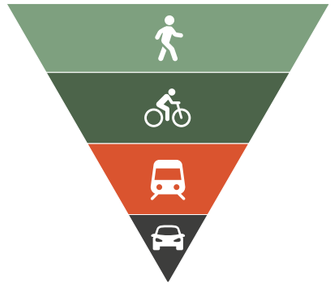
6. Overpass

7. Road

8. Appearance and function

VISION MOBILITY

The vision for mobility is to give priority to pedestrians and cyclists within the existing roads of the Binckhorst. The roads will be redesigned for pedestrians, cyclists and public transport. The car will partly disappear from the street, where this is impossible there will be a 30 km/h limit. There will also be new bicycle connections to Binckhorst and the city centre. There will be new public transport connections for long distances to promote this mode of transport. A new bicycle and walking route will be constructed along the Trekvliet, which will run from Binckhorst to The Hague city centre. This new road will improve the accessibility of the area, locating the music venue there would be great for the connection of the venue itself.

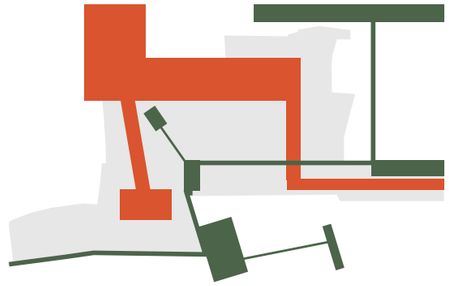


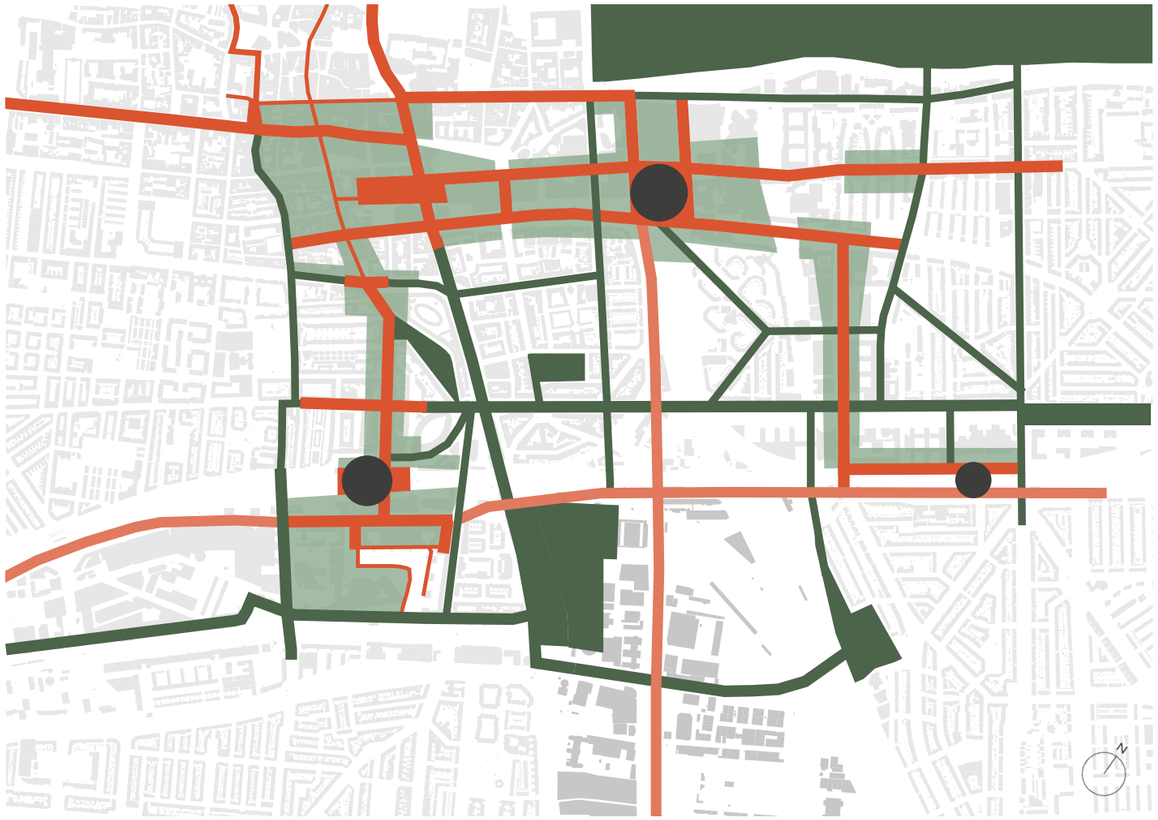
Vision mobility *1:20.000*

Walk
Bike
Public
Car

VISION PUBLIC SPACE

The current residential areas in The Hague's Central Innovation District will be connected by green and blue residential streets to the Binckhorst and various parks. In addition, excellent logistics will be available in Binckhorst along the main road, and many new high-rise buildings will be built along this route, where offices and homes will be located. Both these forms of public space will connect to other forms of public space in CID. There will be a high level of liveliness in the plinth and various functions such as offices, shops and housing will converge here. Important meeting places in this area are the 3 stations, The Hague Central, The Hague Holland Spoor and The Hague Laan van NOI. Connection with the music building to these places is important.



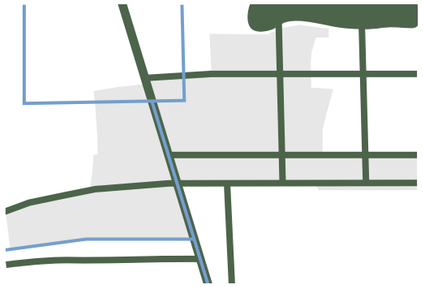


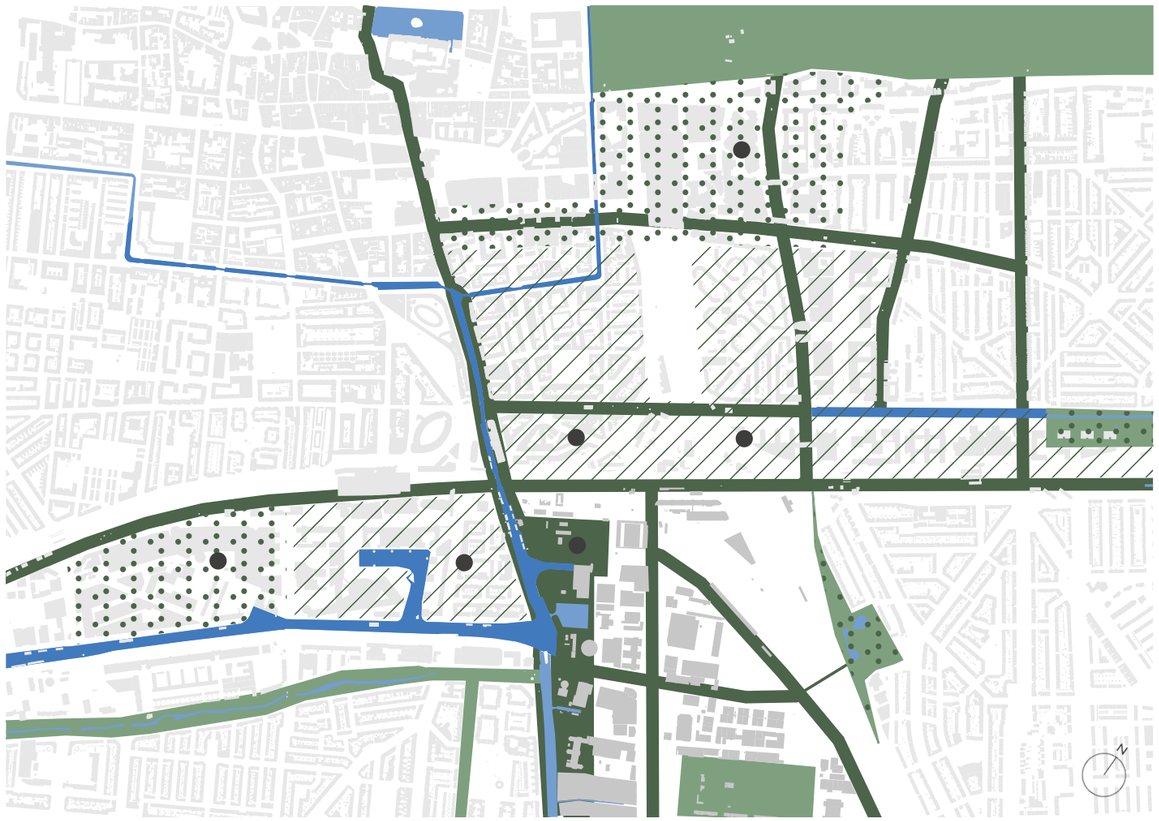
Vision public space *1:20.000*

Excellent logistics, large buildings
High degree of liveliness, offices, commerce
Lively plinth for meeting up, non-residence
Green corridors, parks and residential streets
Important meeting place

VISION GREENERY

In the new vision of the municipality, both water and greenery are deployed as part of the pedestrian infrastructure to connect the Central Innovation District with the centre of The Hague, Scheveningen and the Binckhorst. Small neighbourhood parks will be created along this green connection. This is an excellent opportunity to connect the music building to the rest of The Hague. Moreover, the introduction of the green corridor and the parks will contribute to the development of the Binckhorst's public space and public buildings. In addition, placing a music building in a park is attractive in order to establish a better connection with the public space. This park could also function as a festival area, where the music building could serve as the main stage.





Vision public green & water *1:20.000*

Current water
Use surface water
Current green
Enhance / implement green
Climate adaptive area development
Climate adaptive neighbourhood
Neighbourhood green / park

VISION NEW PARKS

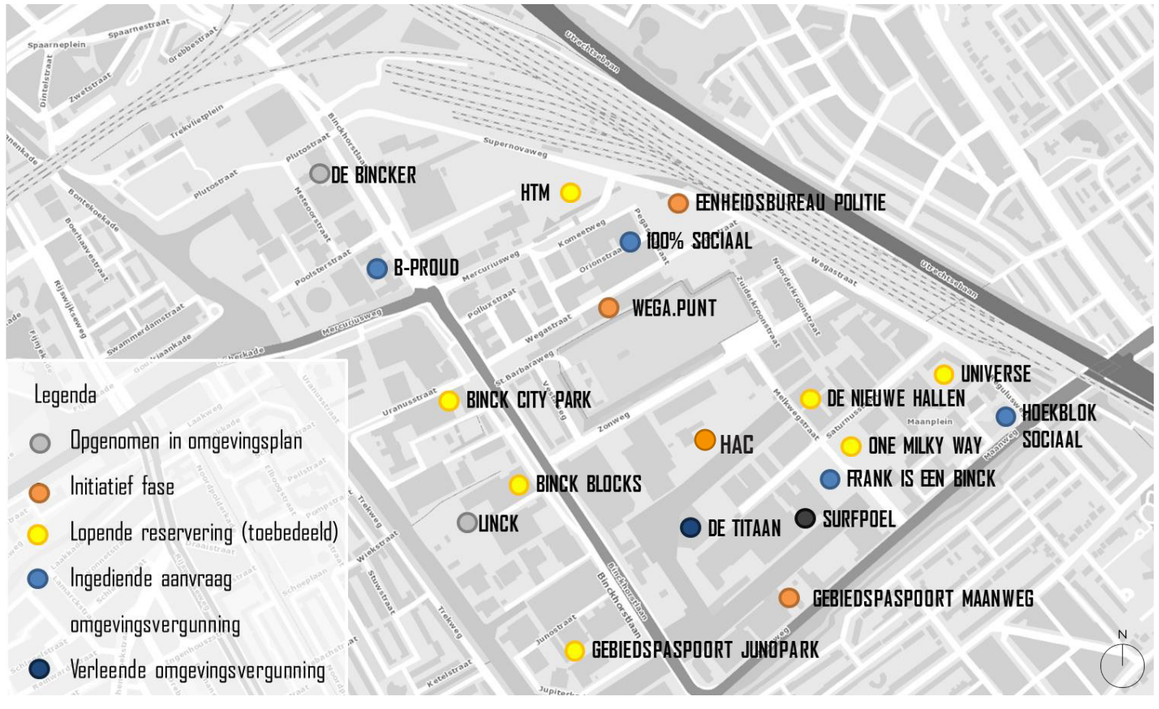
The map below shows the vision plan for the Binckhorst waterfront park by OKRA architects. Here it becomes clear that if you want to make a connection with the rest of The Hague, a place by the water is the best option, because that is where most of the connections are. These drawings also show that the park that will be introduced near the waste processing plant and the silo is an interesting place to build a music building, because at this spot you have both the green connection with the city and at the same time an enormous public outdoor space from which the music building can benefit. The park will in fact function as a cultural park, where creative initiatives are appreciated. A music building is therefore the perfect addition to this part of Binckhorst.

Vision waterfrontpark [14]

Vision new parks [15]

NEW BUILDING PROJECTS

There are currently many new construction projects in Binckhorst. As you can see on the map below, they are scattered throughout the area. At various places, buildings will be removed to make way for new high-rise buildings. The reason for the demolition is not entirely clear. There are a few rundown buildings, of which it is only logical that they will be demolished. But many office buildings from the 1970s are also being demolished, while their reuse would be possible. This is a waste of all the materials that are lost. Several new construction projects are planned next to the silo. But the biggest one so far is the B-Proud tower by OZ archticten. This tower is 150 metres high. The building has various functions, but will mainly house housing and offices. The building has a lively plinth, which could perhaps make a connection with the silo. Two other buildings along the Trekvliet are Binck City Park and Linck, both of which will serve entirely as housing, for different target groups. HTM will also consist of over 300 social housing units. Frank is a Binck is the only one with a redevelopment plan. Here, part of the existing buildings on the site will be reused, and extra square metres will be built on top of them. The ground floor will mainly accommodate hospitality, while the other floors will be used for living and working. From the look of the renders on the right, it can be concluded that Binckhorst will be a modern high-rise area with international allure. It is also striking that square and rectangular shapes are mainly used in these buildings. A round and smaller music building would therefore stand out among all the high-rise rectangular buildings.



Current redevelopment [16]

NEW BUILDING PROJECTS

B-Proud [17]

B-Proud [18]

Binck City Park [19]

Linck [20]

HTM [21]

Frank is een Binck [22]

GASHOLDER RESEARCH

GASFACTORY BINCKHORST

In 1907, the second municipal gasworks was opened at Trekvlietplein in Binckhorst. At the time, this gasworks was the largest industrial complex in The Hague and nicknamed “the stockroom” of The Hague. The factory was designed to produce flammable gas made of coal, intended to produce light for the city (Havelaar et al., 2013). For the storage of the city gas, two 53-metre high gas holders were built, which were prominent in the skyline of The Hague, as the photograph demonstrates. These above ground guide-framed gas holders were manufactured by Pletterij Enthoven (metal and iron smithy) (K. Havelaar, 2021b). These gas holders consisted of cast iron basins, columns, and sealing wells. The iron basins, which were the actual reservoirs, were made of plates with cast-on flanges. On the cast iron bottom, 14 superimposed rings of iron plates were built. Around the basins stood the cage guide, in which the tank could be pushed straight up when filled (Enthoven et al., 1996).

The factory expanded over the years and during the 1950s refinery gas, residual gases from the Shell refinery in Pernis, was brought in by “crack pipe” and processed directly on site into usable town gas. For the refinery gas, a special spiral guided gas holder was built in 1955, manufactured by the same firm that designed the earlier gas holders (K. Havelaar, 2021b). The spiral guided gas holder was constructed out of a concrete tub, which was lined on the inside with steel plates that were electrically welded (for the water inside the gas holder). The tanks, too, were made of metal plates varying in thickness from 19 mm (bottom) to 7 mm (top). The gas holder had a diameter of almost 50 metres and when filled to capacity it would reach a height of 50 metres, allowing a capacity of 60,000m³ of gas to be stored. The photograph shows the three gas holders at Trekvliet in full operation, the one in front being the spiral-guided holder (K. Havelaar, 2021a).

In 1959, natural gas was discovered in Slochteren, which meant the end of all town gas companies in the Netherlands, including the second gas plant in The Hague. In June 1967, the conversion from city gas to natural gas was completed, which also meant that the gasworks had produced its last gas and was officially closed. Many buildings lost their function and stood empty for a long time. However, the spiral guided that had recently been built was soon given a new function. The gas holder was cleaned, then the extendable parts of the silo were removed and converted into a water storage for drinking water. The spiral guided holder has fulfilled this function for longer than what it was built for. The other gas holders at the Trekvliet site, however, did not survive the bankruptcy. These silos were demolished, just like many others in the rest of the Netherlands and the world, as can be seen in the picture below. Due to this massive demolition of gas holders, part of the city gas industry history has been lost, fortunately there are still a few silos in the world completely intact. Alas, there are no complete silo’s left in Binckhorst. With the demise of the gasworks, other businesses in the area also largely disappeared (Havelaar et al., 2013).

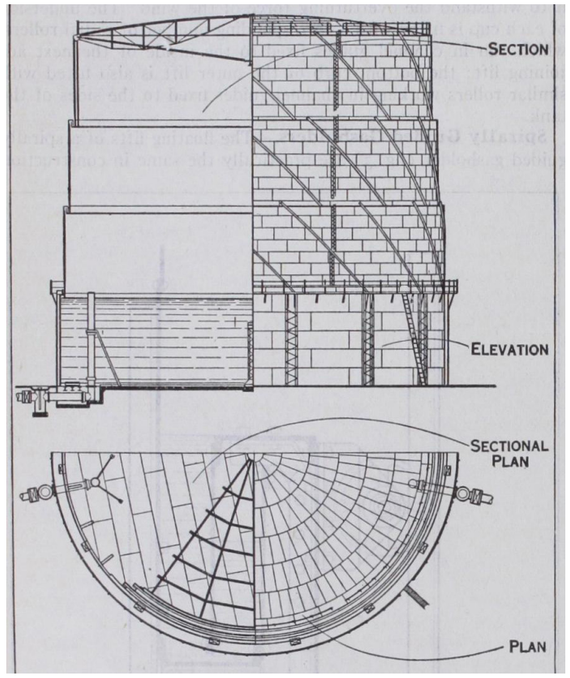
Second municipal gas factory (1930) [23]

Municipal gas factory with spiral guided gasholder (1955) [24]

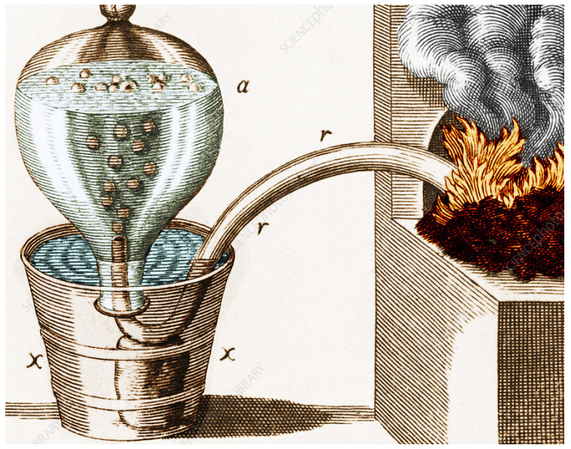
Dismantled gasholder Trekvliet (1989) [25]

SPIRAL GUIDED GASHOLDER

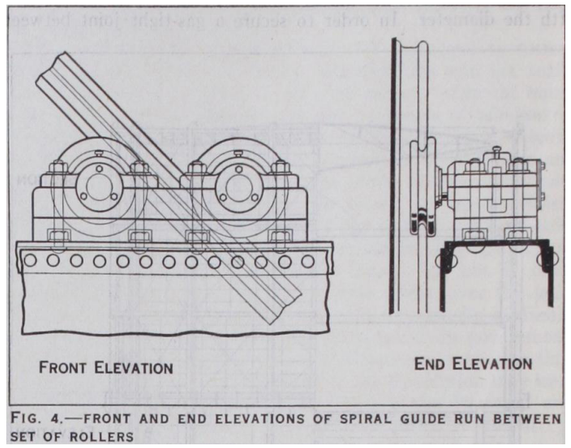
The shape of the gas holder originates back to the development of pneumatic chemistry (Thomas, 2014a). Pneumatic chemistry researches the physical properties of gases in relation to chemical reactions. One of the highlights of this research, was the invention of the pneumatic through, which collects gases. The trough allowed gases to be collected in an inverted glass vessel filled with water, which was placed in a reservoir containing water (Donovan, n.d.). This system is showcased in the picture below. The first gasholders were over-dimensioned rectangular pumps, made of iron with a heavy wooden frame, with a capacity of about 14 m3 gas. Then the gasholder tank was used to condense the tar from the gas, and to purify the sulphur from the gas by adding chalk to the water in the tank. This type was built until 1815, after which several cylindrical variants followed, of which the spiral guided gasholder was one of the later designs. The cylindrical gas holders could be built bigger and therefore had a greater capacity than the rectangular tanks, so they were more effective (Thomas, 2014b). The spiral guided gasholder differs in looks from other gas holders, because it didn’t need an exterior frame to guide the expansion of gas storage. Due to the new system fast expansion of storage capacity and low costs of construction was enabled (Li, 2020). On the right side is a drawing of the spiral guided gasholder system. The spiral-guided gas holder’s floating lifts have a construction with rails at an angle of 45° with double flanges attached at equal distances around the perimeter to the side plating of each lift. The spiral guides run between a matching number of sets of rollers mounted in movable skids, attached to the dips of the holder (shown at lower right) and the upper stand of the tank. The action of the holder in raising or lowering is similar to the action of a coarse threaded screw, and the spiral motion thereby imparted to the floating craft is sufficient to keep the holder level, and enables it to resist the wind-induced rotational force (VinDaj Inc., 2011).



Construction spiral guided gasholder [27]



Early pneumatic trough (1727) [26]



Rails construction spiral guided gasholder [28]

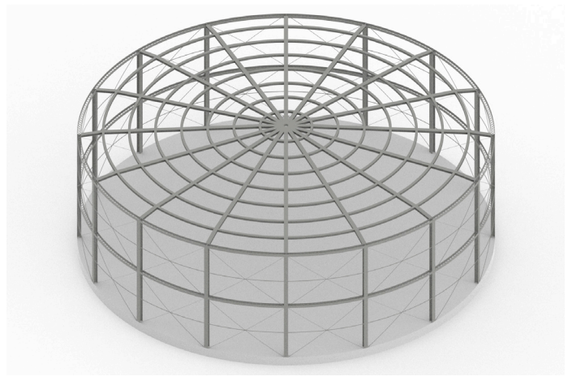
CURRENT GASHOLDER

Spiral guided gasholder Binckhorst (1960) [29]

As mentioned above, 1960 was the last year in which the silo functioned as a gas holder. The accompanying picture provides a closer look at what the gasholder once was. The photograph portrays the spiral guided gasholder in its extreme position. This means that it is about 50 metres high in the picture. The image also reveals that the gasholder was designed and manufactured by Pletterij Enthoven, as the company name is marked on the gasholder in large letters. Furthermore, the rails of the spiral guided gasholder are prominently marked in this image. The position of the rails caused the silo to enlarge in a counter-clockwise vertical direction. The plates that vary in thickness are visible in this image as well, the plates remain the same size per layer, but differ in thickness. It also seems as if the silo is closer to the Trekvliet than it is at the moment, which is true, soil was taken from the Trekvliet for more land in later years.

Watertank Binckhorst (2022)

Today, the gasholder serves as a drinking water storage facility. As mentioned above, the extendable parts of the gasholder were removed when the building changed function, only the bottom layer remained. Because of this change, the building currently lacks dynamics and connection to the outside world. Furthermore, the silo is currently completely shielded from the outside world by the placement of fences around the building. Because of the lack of maintenance within the grounds, the building also looks like it is in disrepair. Outside the fences of the silo, there is a lot of rubbish, as well as newer industrial buildings, which look as if they might collapse at any moment. Because the former context of this gasholder has been almost completely destroyed and a poorer context has taken its place, the architectural and historical value of the silo itself has declined enormously.



Construction watertank (2022)

As mentioned earlier in this report, the silo is made of a steel structure and a concrete foundation. The construction of the silo changed when the gas holder was transformed into a water tank. Unfortunately, no drawings of this are available, so I cannot determine with certainty the inner construction of the silo. But by using drawings of a standard spiral guided gasholder and photos of the roof construction, several students in the group that investigated the silo could determine that the columns are HEA800 with a size of 300x800mm. The roof construction enabled us to determine that there were 16 columns. After this, the rest of the construction was determined based on a standard spiral guided gasholder. This construction ensures that the space inside is completely unobstructed, which is ideal for a flexible building and a music hall. This will therefore certainly be included in the redesign of this round building. Furthermore, the height and openness of this space is characteristic and interesting to include.

COMPARING GASHOLDERS

In the world, several gasholders have been transformed into music buildings without modifying the building too much. This also applies to the Westergasfabriek in Amsterdam, where the gasholder is used as an event hall for between 1100 and 3500 people. This hall is 60 square metres and is located next to several buildings that date back to the gasworks era. The same scenario could, in theory, be applied to the gasholder in Binckhorst. However, adjustments will have to be made to transform this gasholder into a flourishing music venue. In Binckhorst, the surroundings do not contribute to the atmosphere in the area, whereas in the Westergasfabriek the surrounding buildings add value to the gasholder. In addition, the gasholder in Binckhorst was built more cheaply, so the appearance of the building is less significant; the same applies to the inside of the gasholder. It can therefore be concluded that the gasholder in its current state is not suitable as a monumental public music building.

Exterior gasholder Westergasfabriek [30]

Exterior gasholder Binckhorst [33]

Interior gasholder Westergasfabriek [31]

Roof gasholder Binckhorst[34]

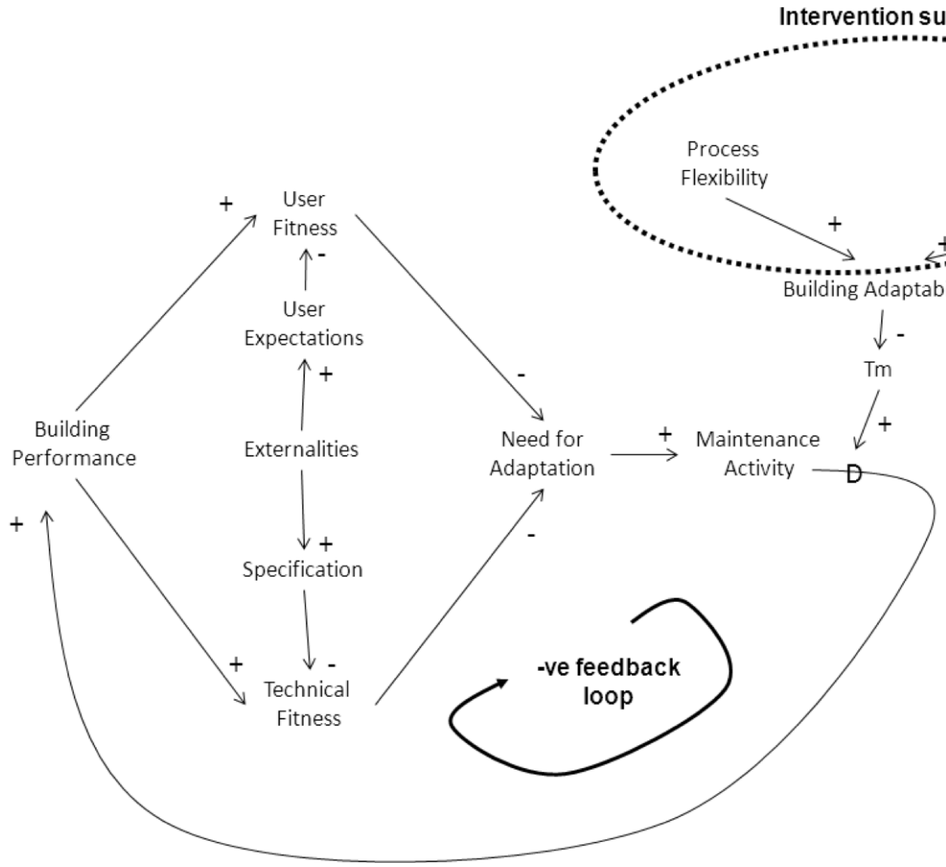
Surroundings gasholder Westergasfabriek [32]

Surroundings gasholder Binckhorst [35]

FLEXIBILITY RESEARCH

FLEXIBILITY FOR SYSTEMS

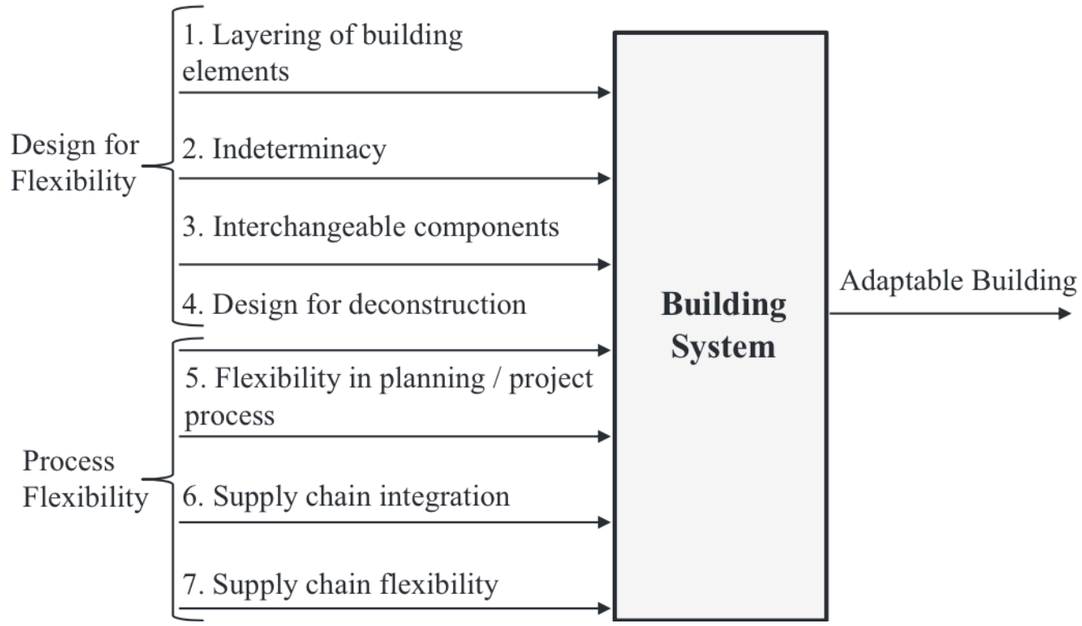
The diagram below illustrates the building adaptation system. It is designed to visualise the different influences that cause a building's need to adapt. In the flexible building strategy, there are two types of "adaptable" buildings. Buildings that are technically adaptable and buildings that are adaptable to the user. Currently, a significant problem with the flexible building strategy is that it focuses primarily on user suitability. In other words, how do you make a building that is easily adaptable for the user, without building in flexibility in the technical needs for these different types of functions. This diagram shows that both the user-friendliness and the technical usability of a flexible building are important to achieve full adaptability. It can be concluded from this study that it is important that the technical aspects of a flexible building are easily accessible to the adaptor. Then transformation will be achieved easier and therefore more efficient and cheaper (Gosling et al., 2008b).



Building adaptation system [36]

FLEXIBILITY SYSTEM

The flexibility system can be described as designing a system for change, that is what designing for flexibility entails. However, there is a second layer in the flexibility strategy, this is process flexibility. This can be defined as the ability of the designed flexibility to be changed. If both the design for flexibility and the process flexibility are in order, the result is an adaptable building, which can be seen in the illustration below. The design for flexibility consists of 4 elements. Layering of the building elements, i.e. decoupling of the building layers as in Stuart Brand's diagram. If all layers are detached, change can be realised more easily and without damage. In the second diagram you can see the different layers of a building and their lifespan. Indeterminacy can be defined as the omission of certain elements, so that the user can decide for himself what to do with the space. Or, for example, the overdimensioning of a building due to indeterminacy of its function in the future. Interchangeability requires a certain kind of modular grid or system of the building. Finally, design for destruction, which ensures that if the building does not function properly in the future, at least the materials can be reused. Process flexibility is a system designed to maintain flexibility within the building and improve it in future. This is very difficult to design as you are designing a system for the future, which is unknown (Gosling et al., 2013a).



Input–output diagram for an adaptable building system [37]

Category	Description	Life	Typical examples
1	Replaceable	Shorter life than the building life and replacement can be envisaged at design stage	Most floor finishes and service installation components
2	Maintainable	Will last, with periodic treatment, for the life of the building	Most external cladding, doors and windows
3	Lifelong	Will last for the life of the building	Foundations and main structural elements

Guide to durability of buildings and building elements, products and components [38]

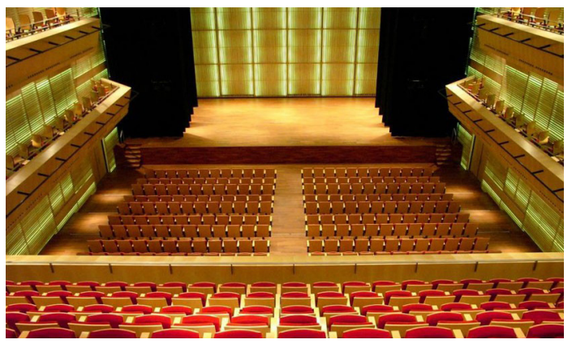
CASE STUDIES
RESEARCH

MUZIEKGEBOUW AAN ‘T IJ

Muziekgebouw aan ‘t IJ is a hybrid music venue in Amsterdam. The venue is known for classical and contempory programming. All parts of the building are used to host events. This means that Muziekgebouw aan ‘t IJ has implemented indetermenancy, one of the flexible design aspects. They use the circulation spacas in the building as indetermenancy spots, they have achieved this by making these spaces slightly larger than nessecary Furthermore the grand hall is designed for different functions regarding stages. In the pictures below the same hall is shown each suited to the event in place. The different stages are achieved by the ability to remove the stage floor. This allows for room for a catwalk, or dance recital between the audience. From this initial study into the flexibility of a music venue, it can be concluded that interdeterminancy can be used in a music venue within a certain cadaster. Furthermore adaptability of music hall through interchangable components is also possible. However this flexibility is still limited to a public (music) building. Next to space adaptation there is no sign of any other adaptability, of services for example. Therefore we need to research further in the other music building case studies, to understand their interpretation of flexibility.

Big hall diner show [39]

Big hall lecture[40]

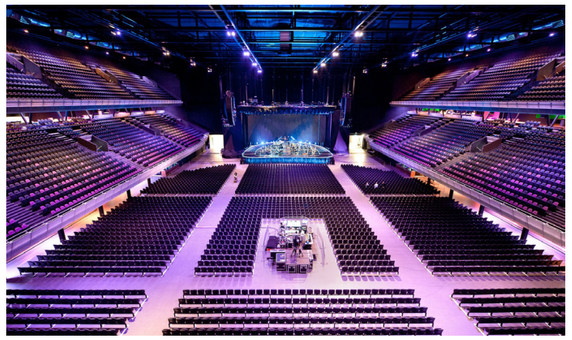


Big hall classic [41]

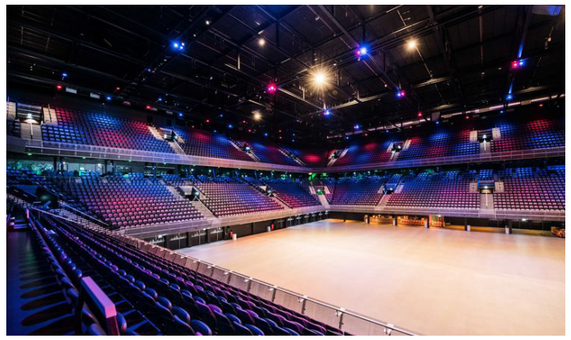
Big hall catwalk [42]

ZIGGO DOME

“Ziggo Dome Amsterdam was built for a single purpose: a venue for popmusic of the highest acoustical quality. The Ziggo dome has a rectangular ground plan with two levels of tribunes. It can accomodate an audience of 17.000 people. The acoustic concept is based on the idela of an outdoor situation without any reflections that disturb the sound quality.” (Peutz, 2012) “Single purpose design, multi-use’ became the overall leading term. This concert venue should also be able to host other events where no concessions had to be made in the premises of the auditorium. Everything had to serve two audiences: the fan and the artist with his or her management. For these two groups, the keyword was: optimum experience. The concert venue had to breathe music. All 17.000 visitors would get the perfect live experience in the Music Dome – as the original name was at the time. “Inspired By Live Music” was the ultimate pay off. Live music always entails three elements: a supporting act, the main act, and an after party. Three phases in which the building and all its facilities would have to excel” (Ziggo dome, n.d.). Because of the leading term, the Ziggo dome has a near empthy music hall design to maximize the multi-usage.



Ziggo dome concert hall [43]



Empty concert hall [44]

Concert in Ziggo dome [45]

Trucks at Ziggodome [46]

PERMANENT DESIGN RESEARCH

CRITERIA FOR MONUMENTS

When one considers building for permanence, one of the earliest examples that come to mind are the architectural monuments of the world, such as the Colosseum in Italy, Abu Simbel in Egypt or, more related to music, the Sydney Opera House in Australia. These buildings all have a place on the UNESCO World Heritage List, a globally recognised list that includes 897 cultural properties, the aim of this list is to recognise properties worth preserving. According to Riegl(1903): “A monument in its oldest and most original sense is a human creation, erected for the specific purpose of keeping single human deeds or events [...] alive in the mind of future generations”. In other words, a monument represents history preserved in a property (Bellentani & Panico, 2016, p. 41). Protection of these structures is, therefore, part of the essence of monuments, for without conservation most would not stand the test of time. Conservation is not simple to implement; it requires both money and organisation (Navrud & Ready, 2002, pp. 3). Therefore the property and its architecture have to be worth the time and effort to preserve. But how to judge whether it is worth the effort and expense? The World Heritage Committee defined that World Heritage Sites should be of “Outstanding Universal Value”. A potential monument is of “Outstanding Universal Value” if at least one of the ten criteria of UNESCO applies to a property and is therefore eligible for inscription in the World Heritage List. These criteria were created in 1972 by UNESCO’s World Heritage Committee (UNESCO World Heritage Centre, 2020). To understand the criteria of UNESCO and to research the contribution of architecture within, it is of significance to first analyse the definition of “Outstanding Universal Value”. In the Operational Guidelines for the Implementation of the World Heritage Convention it is interpreted as (UNESCO, 2019): “Outstanding Universal Value means cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. As such, the permanent protection of this heritage is of the highest importance to the international community as a whole. The Committee defines the criteria for the inscription of properties on the World Heritage List.”
UNESCO has established criteria for natural and cultural monuments, whereby criteria I to VI are cultural criteria and criteria VII to X are natural criteria (UNESCO World Heritage Centre, 2020d). The criteria created by the committee state that a monument has to at least meet one of the following criteria (UNESCO World Heritage Centre, 2020):

I. To represent a masterpiece of human creative genius

II. To exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape

III. to bear a unique or at least exceptional testimony to a cultural tradition or to a civilisation which is living or which has disappeared

IV. to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history

V. to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change

VI. to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria)

VII. to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance
VIII. to be outstanding examples representing major stages of earth’s history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features

IX. to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals

X. to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation

It can be concluded that if criteria VII to X applies to a World Heritage Site, architecture plays no role in the selection process of the monument, as it is no man-made structure. Upon review of the cultural criteria, criteria II and IV specifically mention architecture, however, it is mentioned together with technology; the monument should excel in technology, architecture or both, this means the design needs to be unique and characteristic. In criterion II the architecture should exhibit an important interchange of human values. The criterion does not specify which aspect of the architecture is important to exhibit that in. Criterion IV is specifically focussed on historic buildings, a new building with a non-political function does not meet this criterion. In criteria, I, III, V and VI architecture isn’t directly mentioned, however it still implies that architecture has a role in the selection of monuments. As the words; a masterpiece, a testimony of cultural tradition, a human settlement and tangibly associated with an event can be linked to architecture. However, the cultural criteria do not determine which aspect of the monument’s architecture is important; it only has to be of outstanding concept and design to qualify for the World Heritage List, and thus worth preserving.

Personal research of MSc2

CONSTRUCTION RESEARCH

CONSTRUCTION CALCULATION

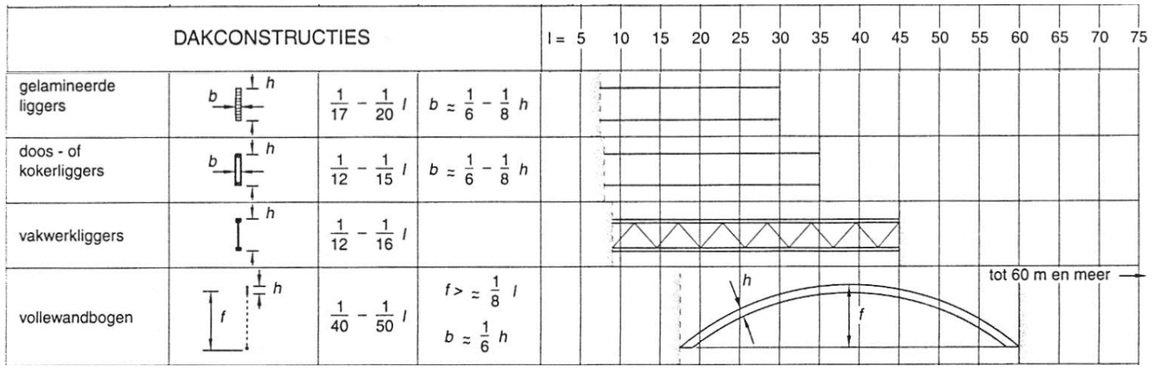
	hout		staal	beton	
	gezaagd	gelamineerd	IPE / HE	t.pl. gestort	prefab
$h_{dakliggers}$	$\frac{1}{20}\ell$	$\frac{1}{20}\ell$	$\frac{1}{30}\ell$	$\frac{1}{20}\ell$	$\frac{1}{20}\ell$
$h_{vloerliggers}$	$\frac{1}{20}\ell$	$\frac{1}{12}\ell$	$\frac{1}{16}\ell$ tot $\frac{1}{20}\ell$	$\frac{1}{10}\ell$	$\frac{1}{20}\ell$

Rules of thumb for beams (CLT) [47]

To calculate the spans in the building I use the chart above. These rules of thumb are for straight beams, in the project flying buttresses and knee beams are used to construct the large spans. These are stronger structures than laminated straight beams, so if these rules of thumb are sufficient, then the structure of the flying buttresses and the knee beams will also be sufficient. From the calculations it can be concluded that in either case, the structure will be adequate for the minimum height of the beams.

h= height of beams
l=center to center distance span length

Roof beams laminated wood= 1/20*17200= 860mm **(1100mm min.)**
Floor beams laminated wood= 1/12*14400= 1200mm **(1200mm min.)**

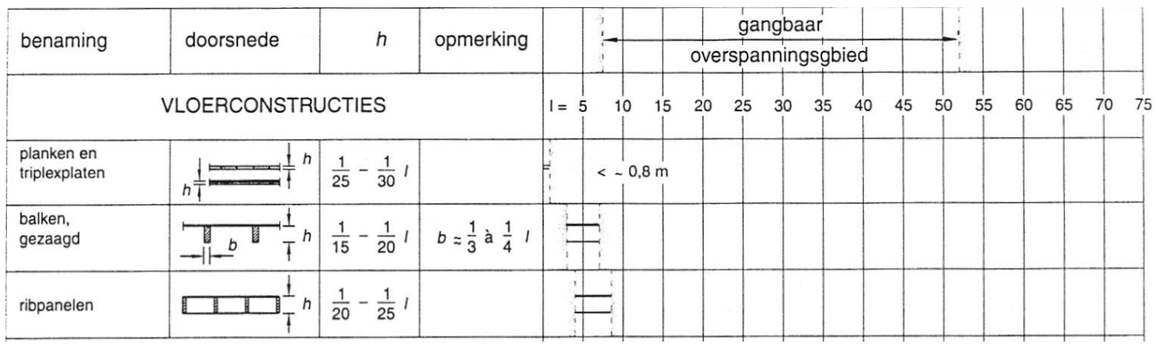


Roof construction parallel arcs (CLT) [48]

As the roof construction is more specific than the standard rule of thumb for roof beams, the wall arch roof construction will be used to calculate the flying buttresses using the graph above. Thus, a slightly more specific rule of thumb can be used to make the calculation. The calculations show that the minimum height of the flying buttresses of CLT is sufficient. The height of the arch itself at the highest point is also more than sufficient.

l=span length
h=beam height
f=arc height

l=40800mm
h=1/40*40800=1020mm **(1100mm min.)**
f=1/8*40800=5100mm **(13000mm)**



Floor construction of 1st floor (CLT) [49]

The table above shows the rules of thumb for calculating the structure of the floor in the building. The material used, cross laminated timber, is not listed, so I based the calculation on rib panels. CLT is stronger than rib panels, therefore the dimensions of the calculations will definitely suffice. For the span length I used the largest distance, as the round shape of the building makes this length decrease the more towards the centre of the building. The calculation below shows that 284mm should be sufficient for the span. Because I want to make the building future proof, the floor will be over-dimensioned to be able to accommodate other functions in the future without structural alterations. Therefore the CLT floor will be 320mm thick.

l=span length
h=floor thickness

l=5676,11mm
h=1/20*5676,11=283,81mm **(320mm)**

	hout		staal		beton	
	gezaagd	gelamineerd	HE	buis	t.pl. gestort	prefab
$b_{kolommen}$	$\frac{1}{20}\ell_c$	$\frac{1}{20}\ell_c$	$\frac{1}{15}\ell_c$	$\frac{1}{25}\ell_c$	$\frac{1}{10}\ell_c$	$\frac{1}{10}\ell_c$

Rules of thumb for columns (CLT) [50]

The design includes two different columns, the existing steel columns of the gasholder and newly added columns made of cross laminated timber. In the calculations, the longest columns in the building were chosen to determine whether the chosen column thickness would suffice. For the steel column, the existing dimensions were used; this calculation is only done to determine whether the structure still meets current requirements. For the calculation of the CLT columns, the maximum knee length is used to determine the thickness of the column. The columns in the building are long, but by using the flying buttresses and stability elements, the buckling length is reduced to a length where no buckling will occur. Furthermore The columns are connected to the flying buttresses by steel plates placed in the columns,This allows the connection to the existing column to be made conveniently.

l= length of column
b= column thickness

b= columns laminated wood= 1/20*12097= 604,85mm **(800mm)**
b= columns steel= 1/25*14528= 581,12mm **(800mm)**

SYSTEMS RESEARCH

VENTILATION CALCULATIONS

In the music building, ventilation type D will be used during major events, a heat recovery system (in dutch WTW) will be installed in the building as well, to prevent useful heat from getting lost. Furthermore it is possible to ventilate the building naturally by opening the facade, if there are no major events occurring.

To calculate the size of the ventilation pipes to meet the minimum requirement of ventilation and quality of air of the Dutch Building Regulations, the floor area of a room is normally used as a basis. However, according to the Dutch Building Regulations, the ventilation requirement in non-residential buildings is calculated according to the quantity of people in the building. In a utilitarian building ventilation requirements are 4 dm^3/s per person (Bouwbesluit, 2012). First I will calculate the total ventilation need in the building and then per room per floor. This music venue has a maximum capacity of 2000 people in this building.

Supply and exhaust ventilation= 4 *2000=8000 dm^3/s

To calculate the diameter of the main ducts, the speed of the air in the ducts must be taken into account. For main ducts this speed may be 5 m/s, for branch ducts 3m/s (Rezaie, 2022).

Pipeline surface= 8000/1000/5=1,6m^2
1,6m^2=1.600.000mm^2
Radius of pipe= √(1.600.000/π) =713,64mm
Diameter of one main pipe= 713,64*2=1427,3mm
Diameter of 4 main pipes=1427,3/4=354,82mm **(355mm)**

From the calculations it can be concluded that for the main ducts, 355 mm spiropipes can be used, which are placed in the hollow system columns next to the space for the systems. To calculate what the diameter of the branch ducts have to be for the flexible area and music hall the amount of people per room will be used to calculate the necessary ventilation. In the music hall a maximum of 1200 people can be seated, in the flexible space 800 people are allowed in.

Music hall supply and exhaust ventilation= 4 *1200=4800 dm^3/s.
Music hall pipeline surface= 4800/1000/3=1,6m^2
Diameter of 4 branch pipes= 713,64/2=354,82mm **(355mm)**

Flexible area supply and exhaust ventilation= 4*800=2400dm^3/s
Flexible area pipeline surface= 2400/1000/3=0,8m^2
Flexible area radius of pipe= √(800.000/π) =504,63mm
Flexible area diameter =504,63*2/4=252,32mm **(315mm)**

To calculate the branch pipes of the kitchens of the foodcourt, toilets, storage and backstage rooms I will use the floor area to calculate the necessary ventilation. According to the Dutch Buildings Decree, there must be a minimum air exchange facility of 0,9 dm^3/s per m^2 of floor area with a minimum of 7 dm^3/s and 0,7 dm^3/s per m^2 of floor area with a minimum of 7 dm^3/s in a residential area. The kitchen must have a supply of at least 21 dm^3/s, the toilet a minimum of 7 dm^3/s (Rijksoverheid, 2012).

00 area from 1 main pipe supply and exhaust ventilation= 0,9*128,88=115,992dm^3/s
00 area pipeline surface= 115,992/1000/3=0,0378m^2
00 area radius of pipe= √(37766,4/π) =109,64mm
00 area diameter=109,64*2=219,28mm **(250mm)**

Kitchen from 1 branch pipe supply and exhaust ventilation= 0,7*42,96=30,072dm^3/s
Kitchen pipeline surface= 30,072/1000/3=0,010024m^2
Kitchen radius of pipe= √(10024/π) =56,50mm
Kitchen diameter of branch pipe=56,50*2=213,001mm **(250mm)**

Toilet / storage from 1 branch pipe supply and exhaust ventilation = 0,7*21,48=15,036dm^3/s
Toilet / storage pipeline surface= 15,036/1000/3=0,005012m^2
Kitchen radius of pipe= √(5012/π) =39,94mm
Ground floor area diameter =39,94*2=79,88mm **(80mm)**

Moving on the first floor, there are toilets, storage, backstage and dressing rooms. For 1 main pipe the area will be calculated, this will include backstage, crew area, toilet and bar.

01 area from 1 main pipe supply and exhaust ventilation = 0,9*197,093=177,3837dm^3/s
01 area pipeline surface= 177,3837/1000/3=0,0591279m^2
01 area radius of pipe= √(59.127,9/π) =137,1896mm
01 area diameter of branch pipe=137,1896*2=274,379mm **(315mm)**

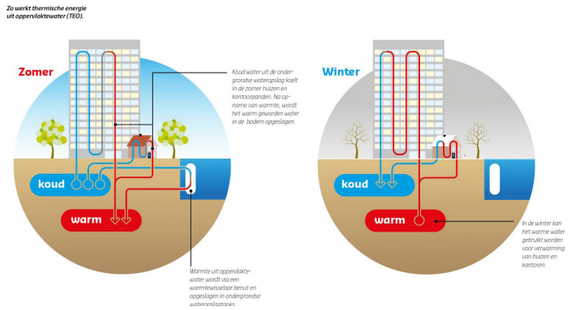
Backstage supply and exhaust ventilation = 0,7*51,578= 36,1046 dm^3/s
Backstage pipeline surface= 36,1046/1000/3=0,0120349m^2
Backstage radius of pipe= √(12034,9/π) =61,89mm
Backstage diameter of branch pipe=61,89*2=123,79 mm **(125mm)**

Crew area / toilet / bar supply and exhaust ventilation = 0,7*48,505=33,9535dm^3/s
Crew area pipeline surface= 33,9535/1000/3=0,01131783m^2
Crew area radius of pipe= √(11317,83/π) =60,02mm
Crew area diameter of branch pipe=61,89*2=120,049mm **(125mm)**

OTHER SYSTEMS

Aquathermal heating and cooling

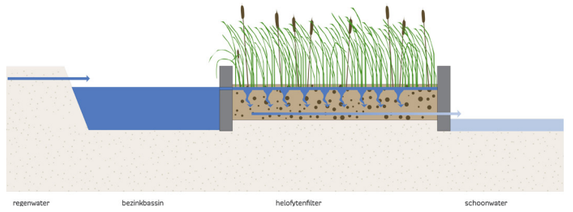
The building will make use of the surrounding water of the park in various ways. The surface water of the park will be used to heat the building in winter and cool it in summer. In the drawing on the right, the system is shown schematically. In the summer, a heat exchanger will extract heat from the surface water and store it in a heat recovery system, this heat will be used in the winter. In the winter the cooled down water from the building will be stored and used in the summer to cool te building (Deltares, 2022b).



Aquathermal heating and cooling [51]

Greywater helophyte filter

Next to aquathermy, the building will use the surrounding waterpark to filter greywater to use for the toilets. The waterpark will collect rainwater, in a bassin and filter it trough a helophyte filter. A helophyte filter is used for the purification of water with the help of helophytes, reed for example. Helophyte filters serve to purify polluted rainwater and can also purify wastewater (Rainproof, n.d.). In the picture below, the helophyte system is shown.



Greywater helophyte filter [52]

Sprinklers

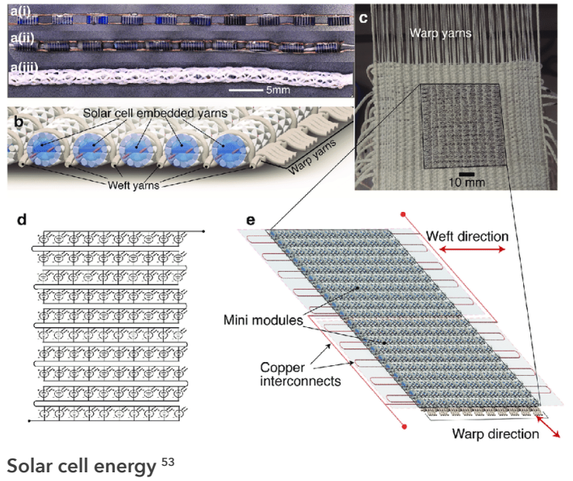
A sprinkler system will be used in the building, which will be integrated in the construction of the systems. The sprinkler system will be used in this building because there are no fire compartments due to the open floor plan. As a result, the fire cannot be contained within a room. Sprinklers can act immediately upon detection of an incipient fire, limiting water damage to a small area (van Nielsburg, 2022). The sprinkler system limits the release of toxic fumes and the fire is often already extinguished when the fire brigade arrives (SPIE, n.d.).

Diameters of water pipes

For the diameter of water pipes, there are target sizes for different functions that are utilised. There are inlet sizes and outlet sizes. The main water pipe is 22mm and the branch pipes are 15mm. The drainage for a toilet is 110mm, for a sink 50mm, a collector pipe is 75mm and a ground pipe 125mm (Praxis, 2012). The pipes of the floor heating systems have a standard size of 18mm (Sylvie, 2021). The sprinkler pipes have a diameter of 50mm (CCV, 2009).

Solar cell energy

A new technique is used to produce the energy needed in the building. The solar cells that collect energy are woven into fabric. At the moment they are still developing the product, but there are already promising results. The average output is 9677 $J/m^2/h$. There are 4496.73m^2 of solar cells. This means that per year 9677*4496.73*8765.81=3.8*10^11 J is produced (Zhang et al., 2020). If this product will be as successful as it is during research energy storage is necessary in the building, which can be placed in the buttresses of the system construction. The diameter of the electricity pipes are 19mm, in which a maximum of 5 threads can be placed (123GroepenKast, 2013).



Solar cell energy [53]

ACOUSTIC RESEARCH

ACOUSTICS IN ROUND SHAPE

Functional mixing and hybrid spaces within the built environment require acoustics that are highly adaptable to function well as an environment (BKTUDelft, 2020). Inside the gasholder, there is a functional mix within a spacious open area, which reinforces the importance of incorporating the aforementioned into the design of the new music venue. Especially since each event type requires a different reverberation time. In addition, the integration of the acoustic design into the building's design is crucial in this circular ga holder, as a curved shape produces the most problems acoustically. Most common problems within a round shaped room is sound-focusing, echo-disturbances and the whispering-gallery effect (Takatsuh et al., 2002). Integrating these factors within the design together with the flexible Tsub values per different event type could be possible both in the new roof and the implemented and the flexible foodcourt construction. At the TU Delft they are currently researching how to include these requirements into a geometric acoustic panel which can be designed to different acoustical preferences (Setaki et al., 2014). The disadvantage of this system however, is once it is designed for the building, change within the panel itself is not possible. Therefore I want to disconnect both the elements and implement them separately.

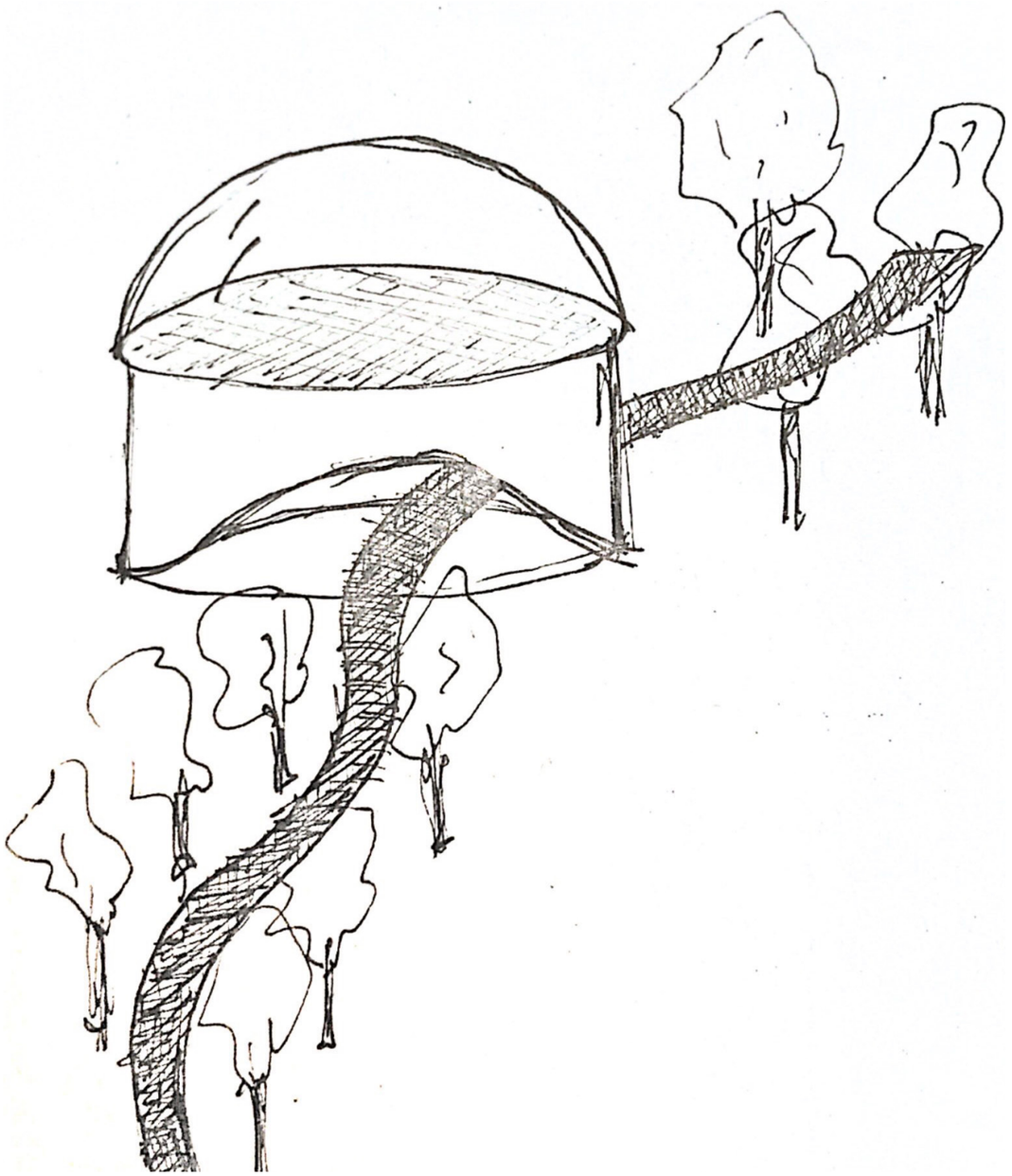
T_{sub} values for each event type

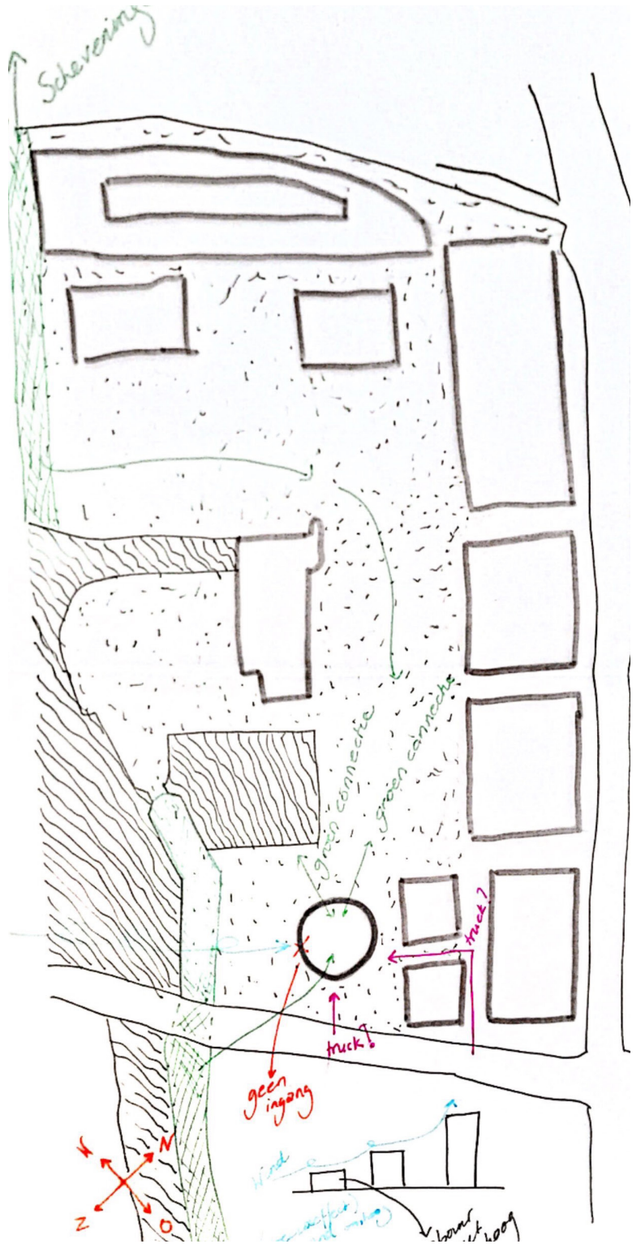
Event	T_{sub} (s)
Concert of acoustic sound (slow tempo)	2·0
Concert of acoustic sound (quick tempo)	1·5
Speech, dramatic performance	0·7
Fashion show, cinema (with electric sound system)	0·7
Exhibition, party	0·7

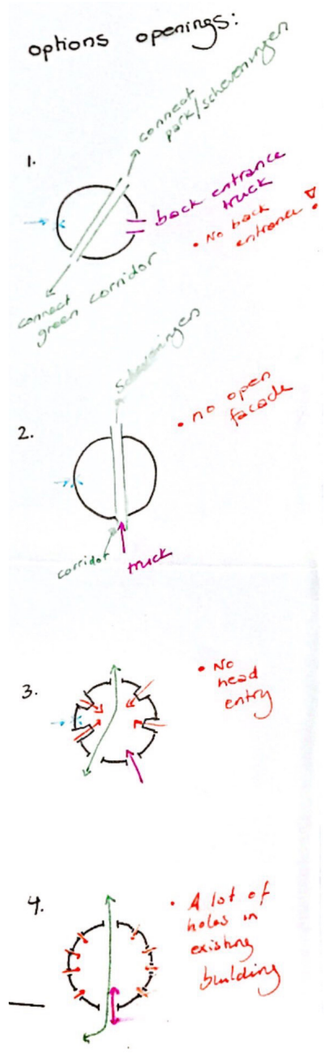
Tsub value for each event type [54]

DESIGN JOURNAL

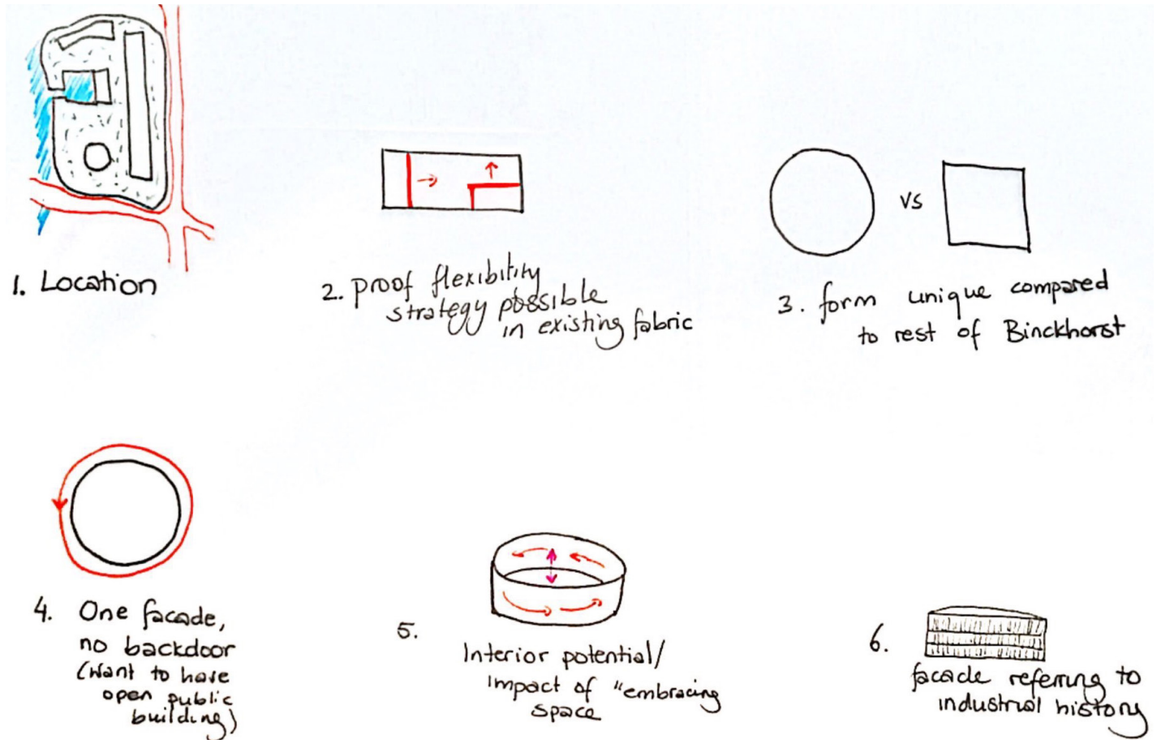
Q2 - SITE



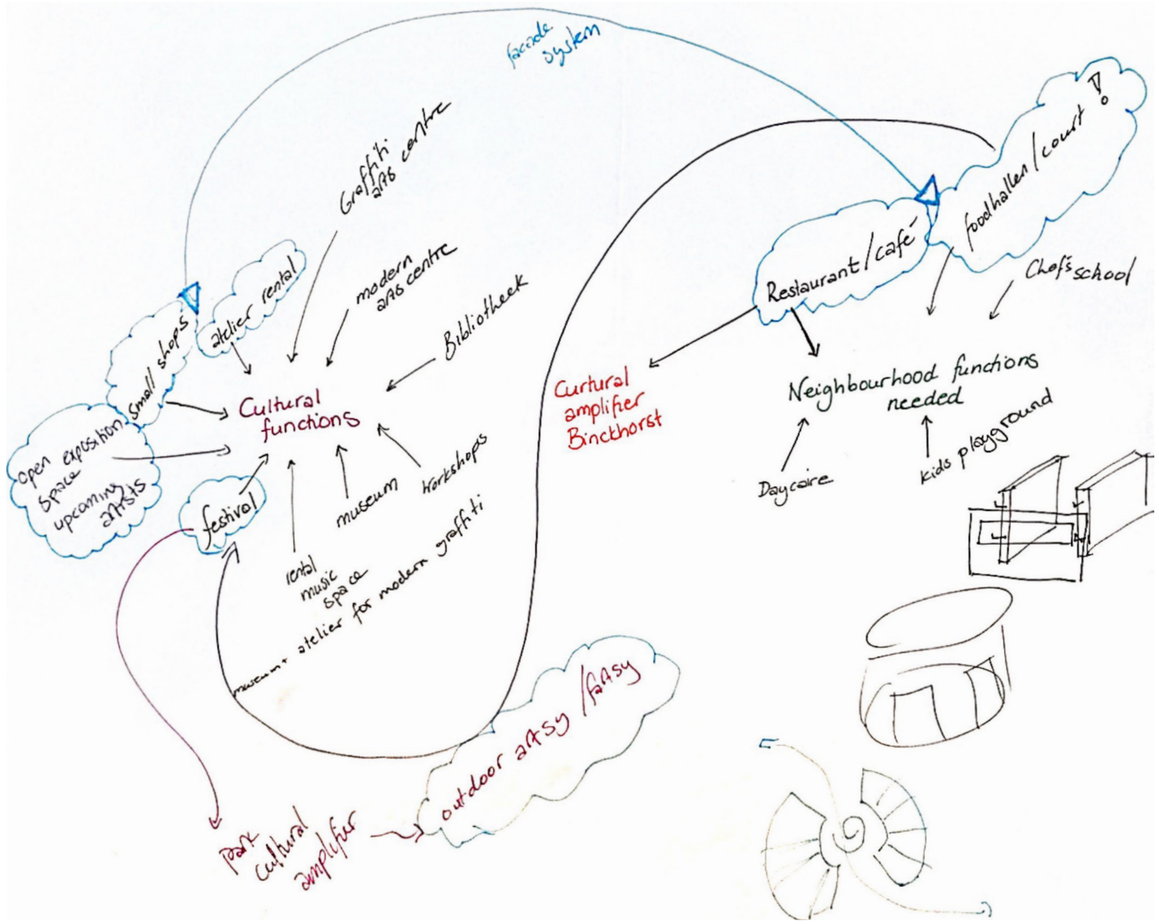

Schevening
green connectie
truck
geen ingang
N
O
Z


options openings:
1.
connect park/schevening
back entrance truck
• No back entrance
connect green corridor
2.
Schevening
• no open facade
corridor
truck
3.
• No need entry
4.
• A lot of holes in existing building

Q2 - SILO AS LOCATION



Q2 - PROGRAM



Q2 - PROGRAM

BG Semi-outdoor market:
- foodcourt with foodtrucks (Foodhallen) (rental)
- Open exposition space upcoming artists (rental)
- Small artist shops (rental)
- Green pathway through building

1962,5m² (16 market places, toilets, Dining room, foyer, cassier, green corridor)

+01
- (Music) hall for 1200 man/women + logistics

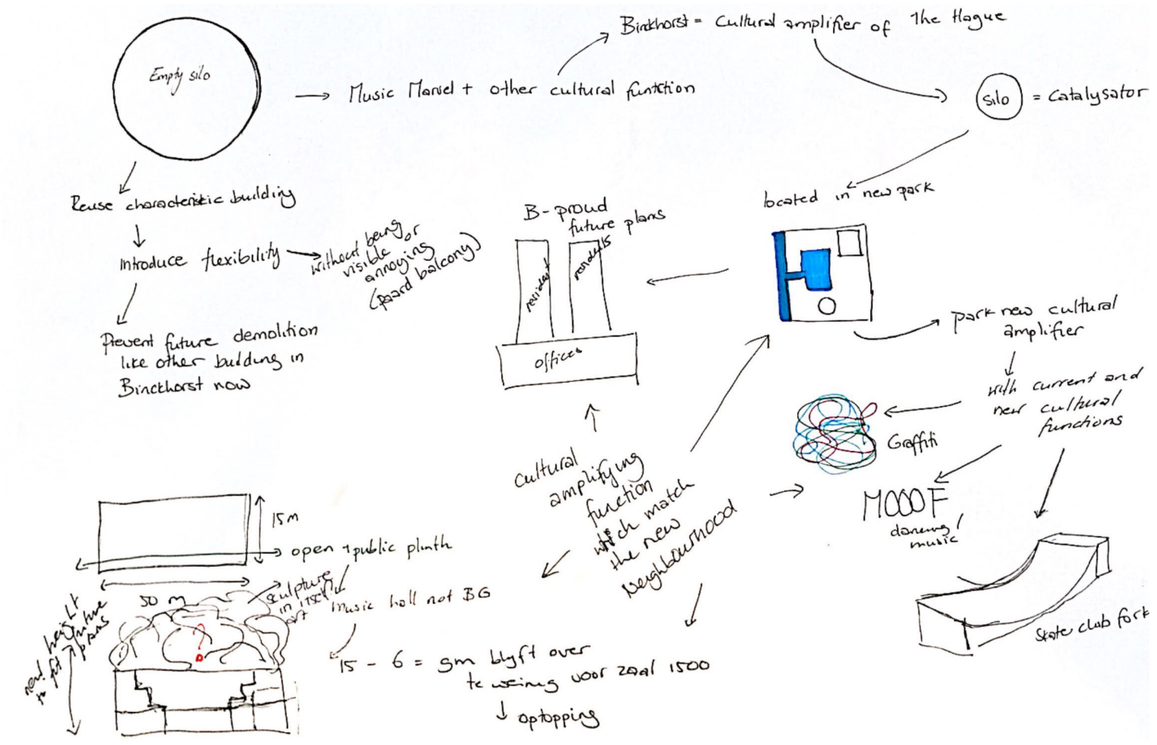
+02
- (Music) hall for 1200 man/women +logistics (1500)

1962,5 m² x 2

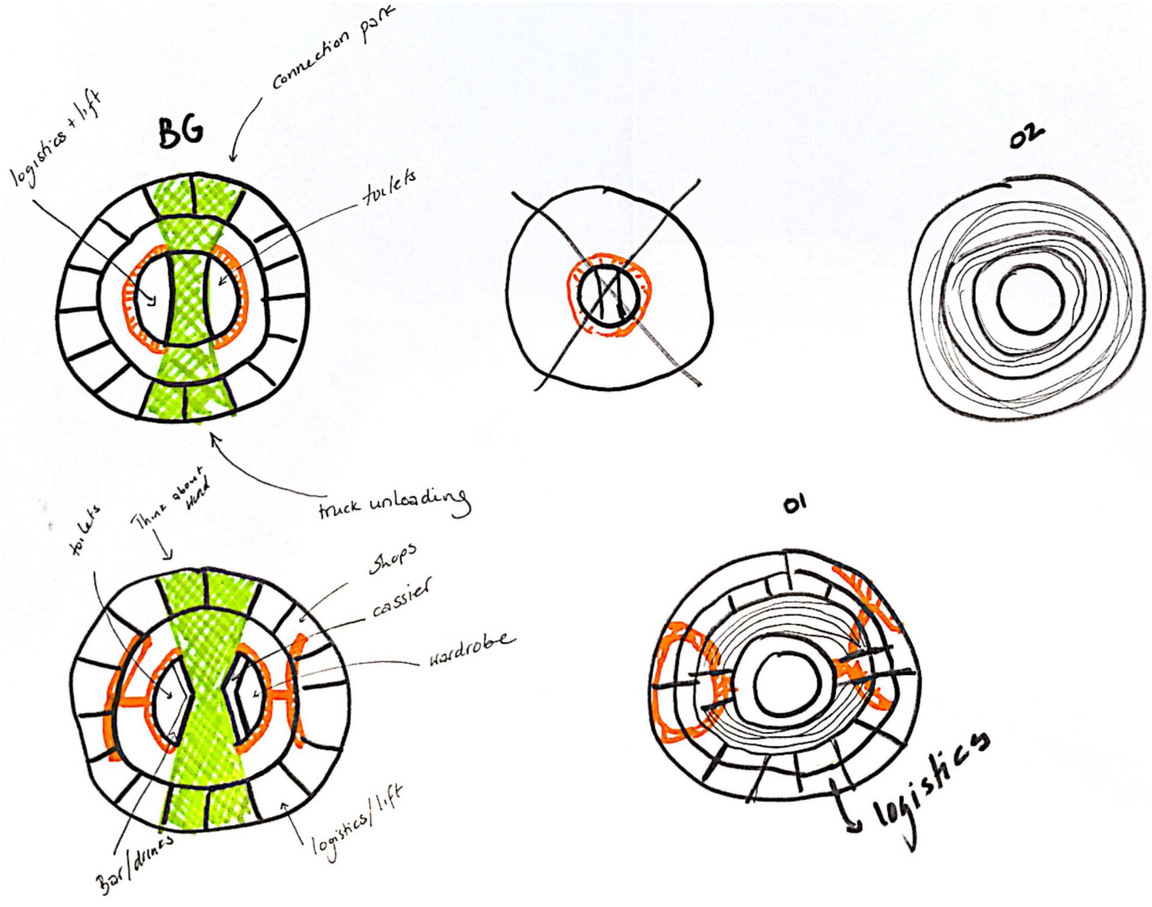
* Stage: 110 m² h=gm
Round stage 15m ∅
* 2x private dressing room (15m²)
* 2x medium dressingroom (40m²)
* Concerthall total → 1000m²
* bar
* balcony
* Crew area 30m² (toilet + shower)
* Stage director's room
* Foyer
* Waiting line
* Wardrobe 50m²
* Cassier
* artists entrance
* First aid room (15m²)
* office space (200m²)
* Loading area (1 truck)
* Storage 50m²
* parking cars (100)
* bycicles (400, 500m²)
* Technical spaces (100m²)

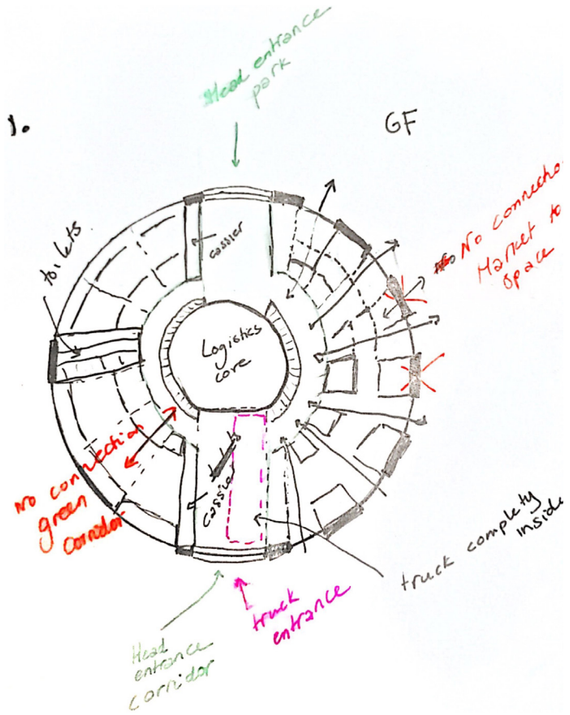
Outdoor
- Festival park
- Green corridor to Scheveningen
- Terrace
- Podia

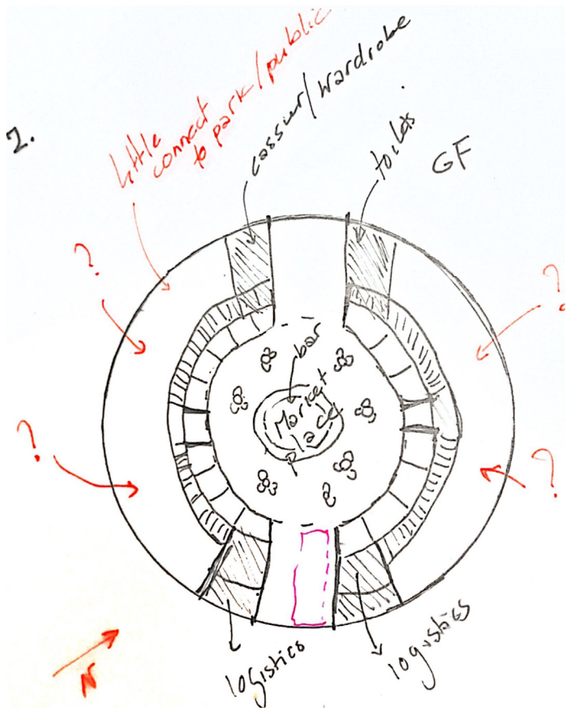
Q2 - FIRST DESIGN PARAMETERS

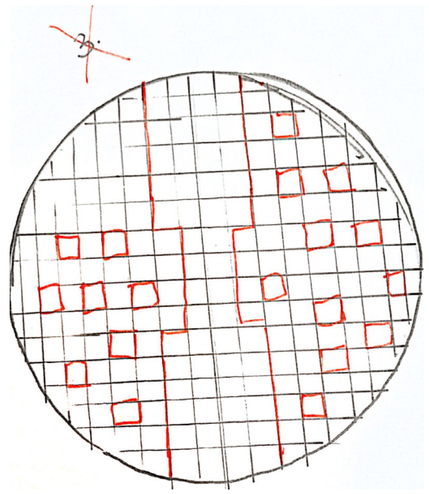


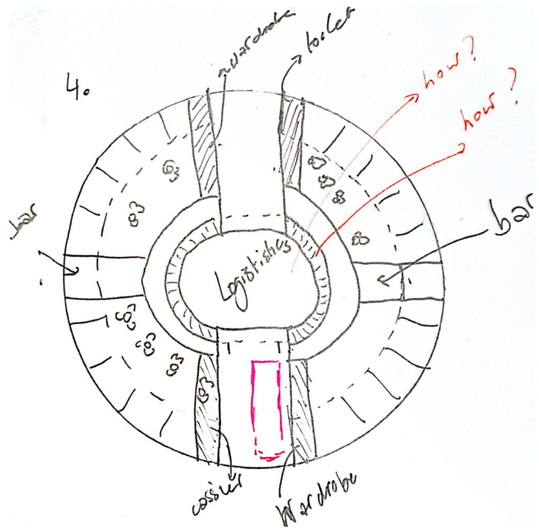
Q2 - PLANS


BG
logistics + lift
connection park
toilets
truck unloading
toilets
Thin about wall
shops
cassier
wardrobe
Bar/drinks
logistics/lift
01
logistics
02

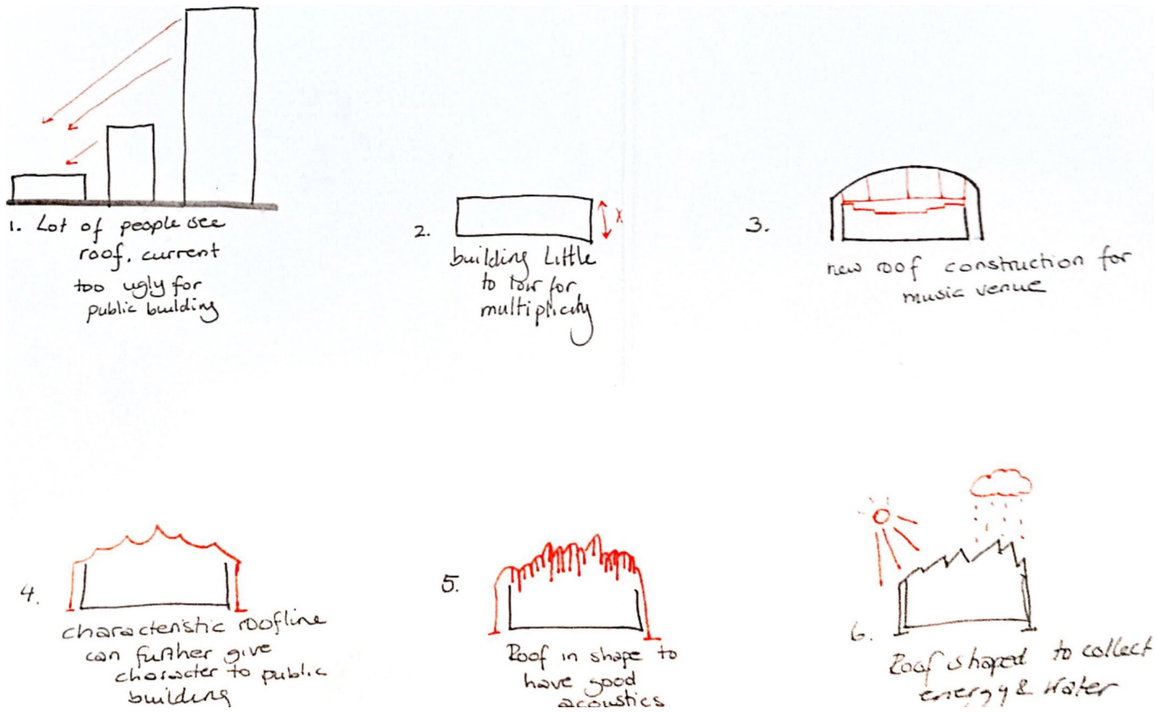

1.
GF
Head entrance park
toilets
cassier
Logistics core
No connection to park
No connection Market to Space
truck entrance
truck completly inside
Head entrance corridor


2.
Little connect to park/public
cassier/wardrobe
toilets
GF
bar
Market place
logistics
logistics

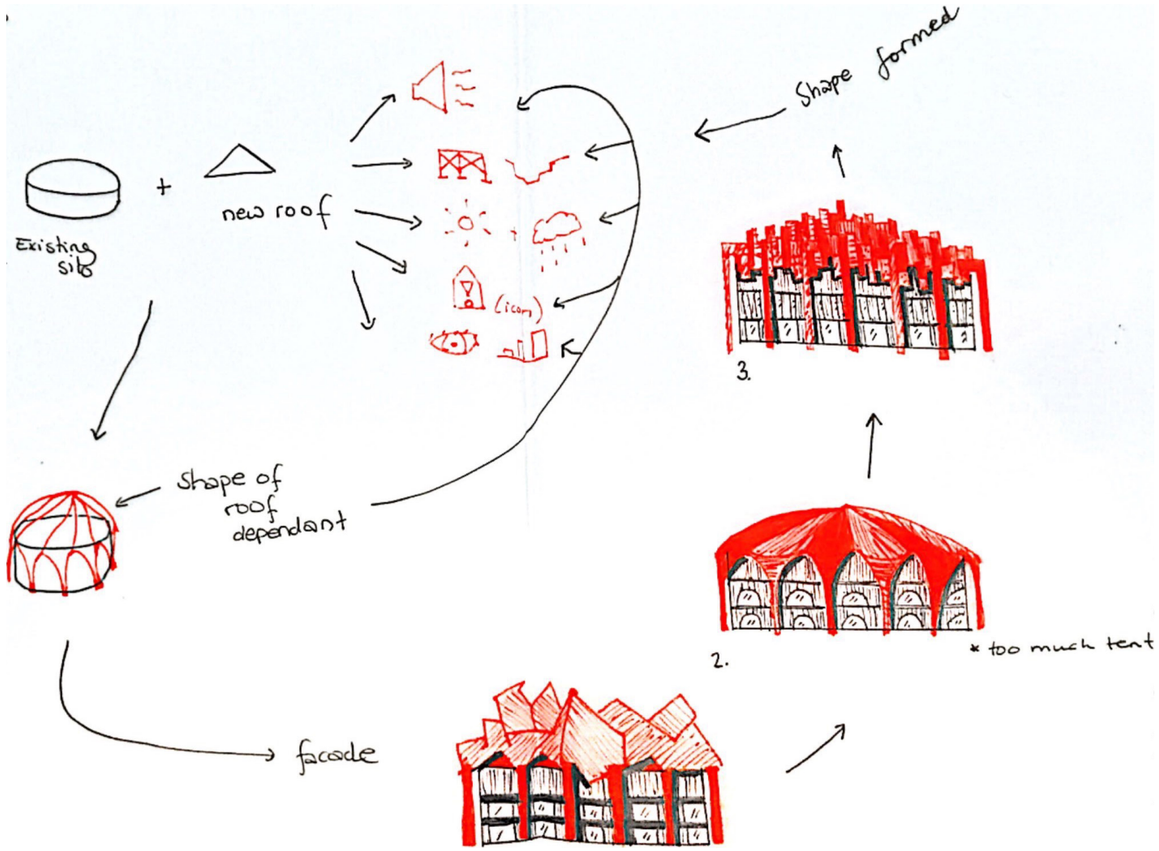

3.


4.
wardrobe
toilet
how?
how?
bar
bar
Logistics
cassier
Wardrobe

Q2 - NEW ROOF

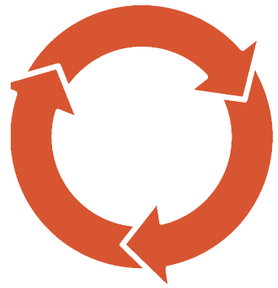


Q2 - WHY NEW ROOF?



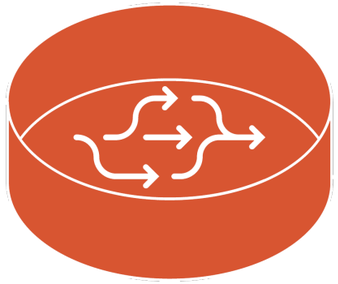
P2 - SILO TO MUSIC VENUE

P2 - WHY SILO



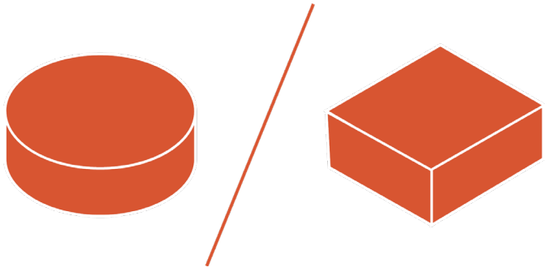
Reuse existing building

Right size for music venue



Open for flexibility

Industrial identity

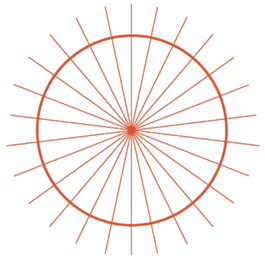


Unique shape

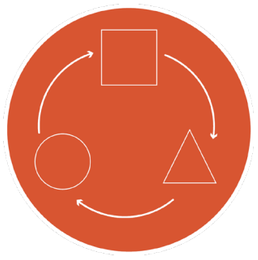
History of place

P2 - DESIGN PRINCIPLES

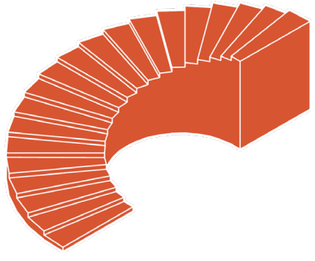
Balance between flexible and iconic building to design future proof building



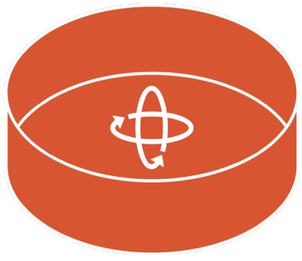
Divide in modular elements



Multiple usage for spaces

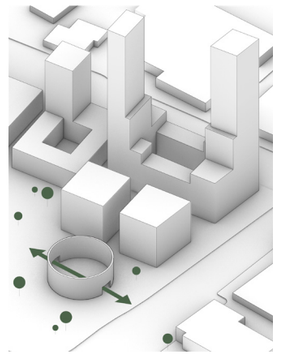


Stairs as architectural feature

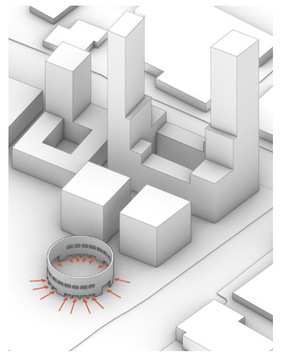


360° spacial experience

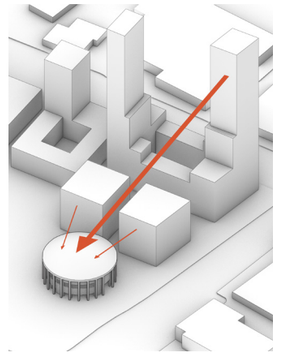
P2 - VISION SITE



Green corridor



Multiple entrances



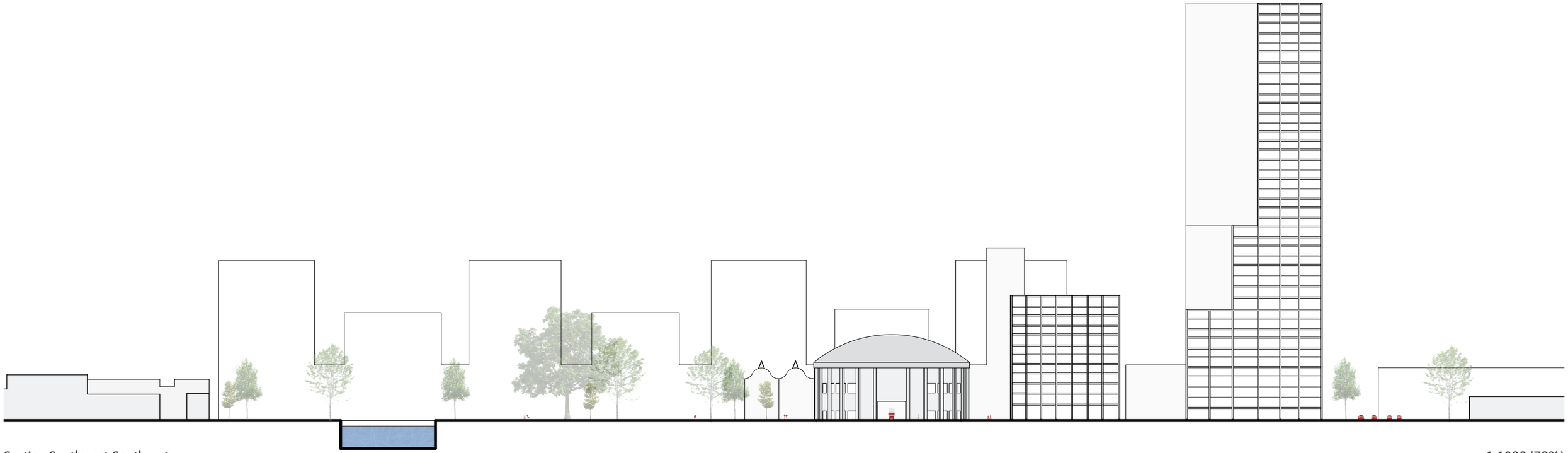
New roof

P2 - SITE PLAN

Site plan Binckhorst

1:1000 (72%)

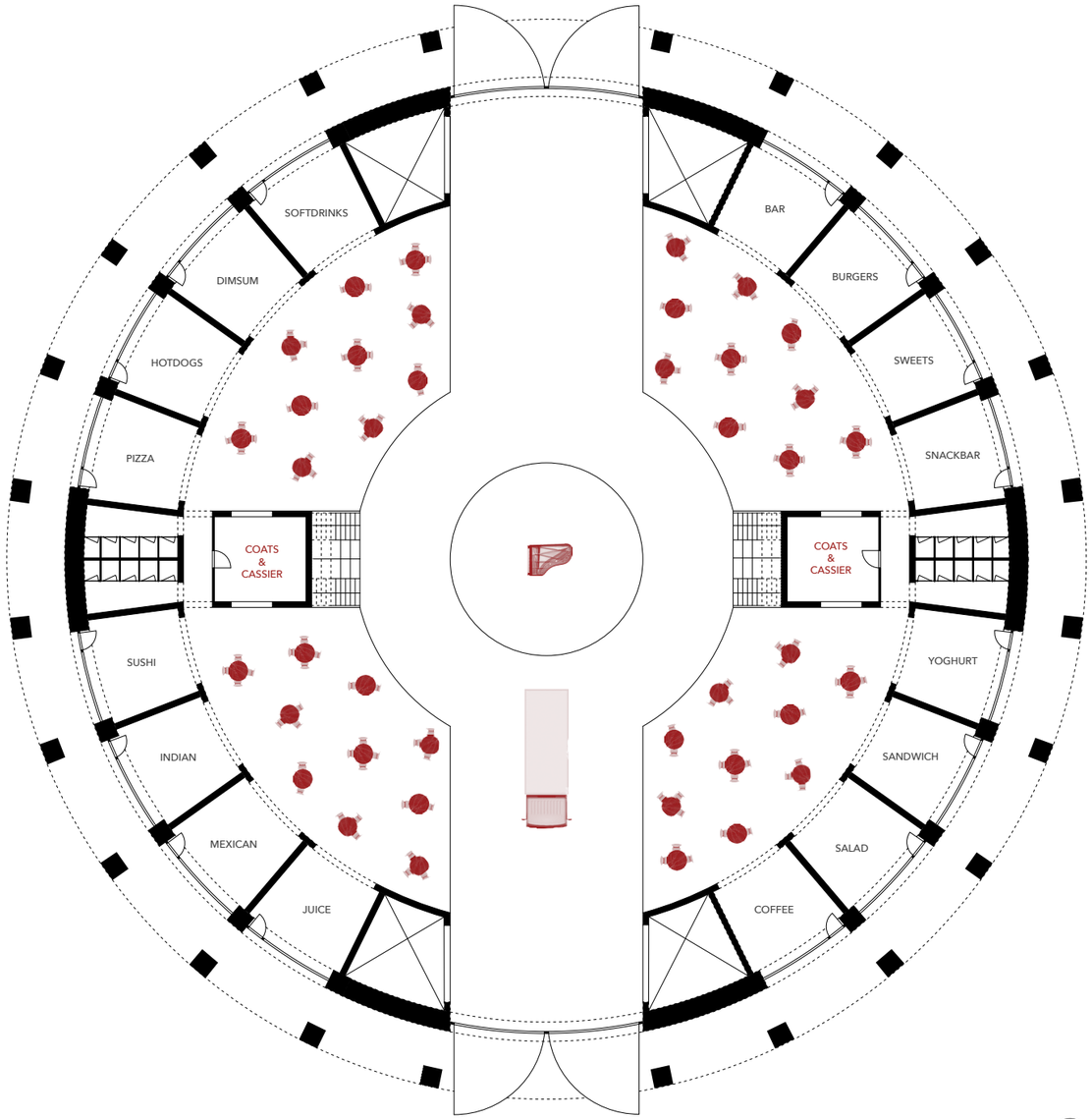
P2 - SITE SECTION



Section Southwest-Southeast

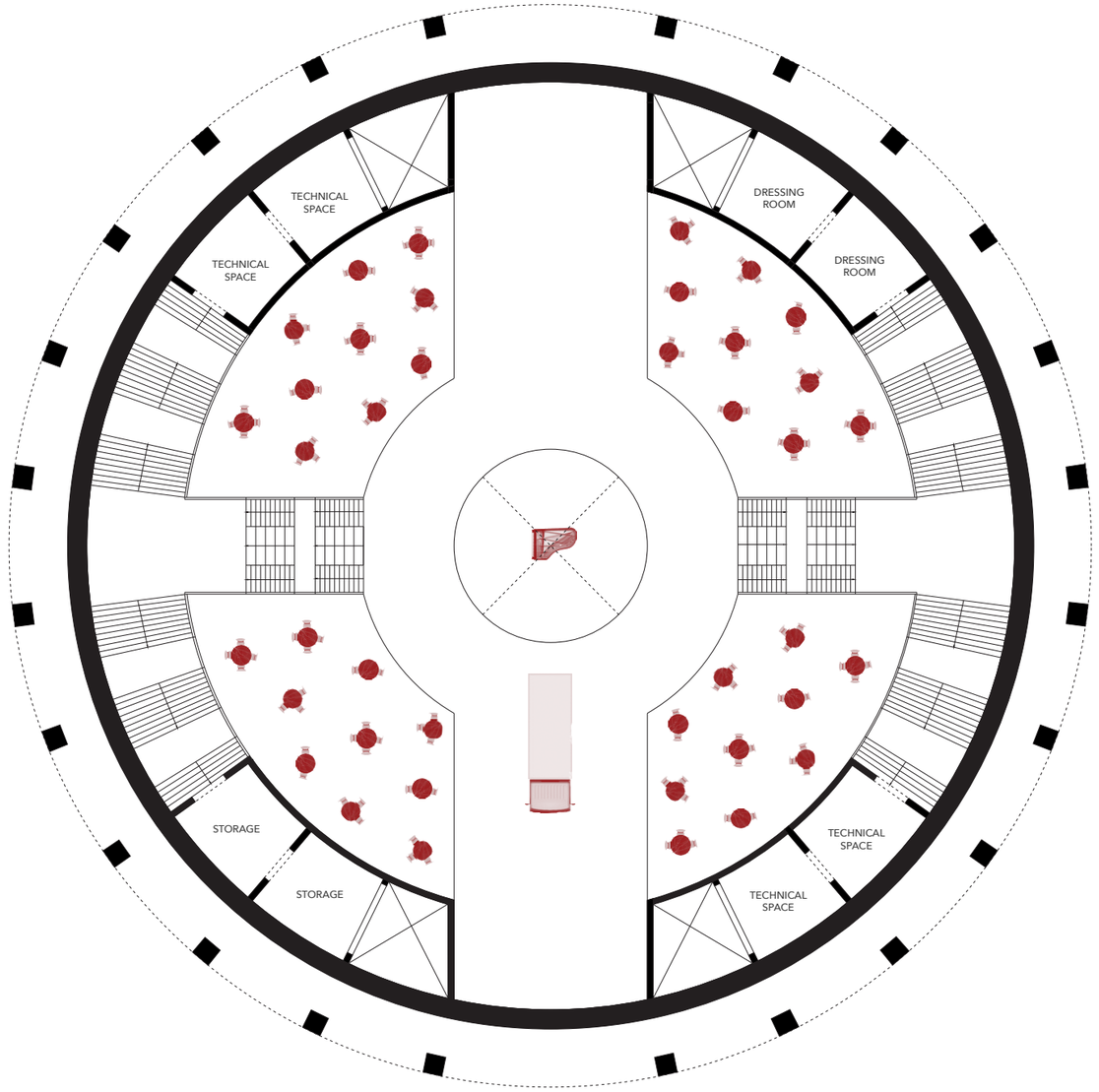
1:1000 (72%)

P2 - PLAN 00



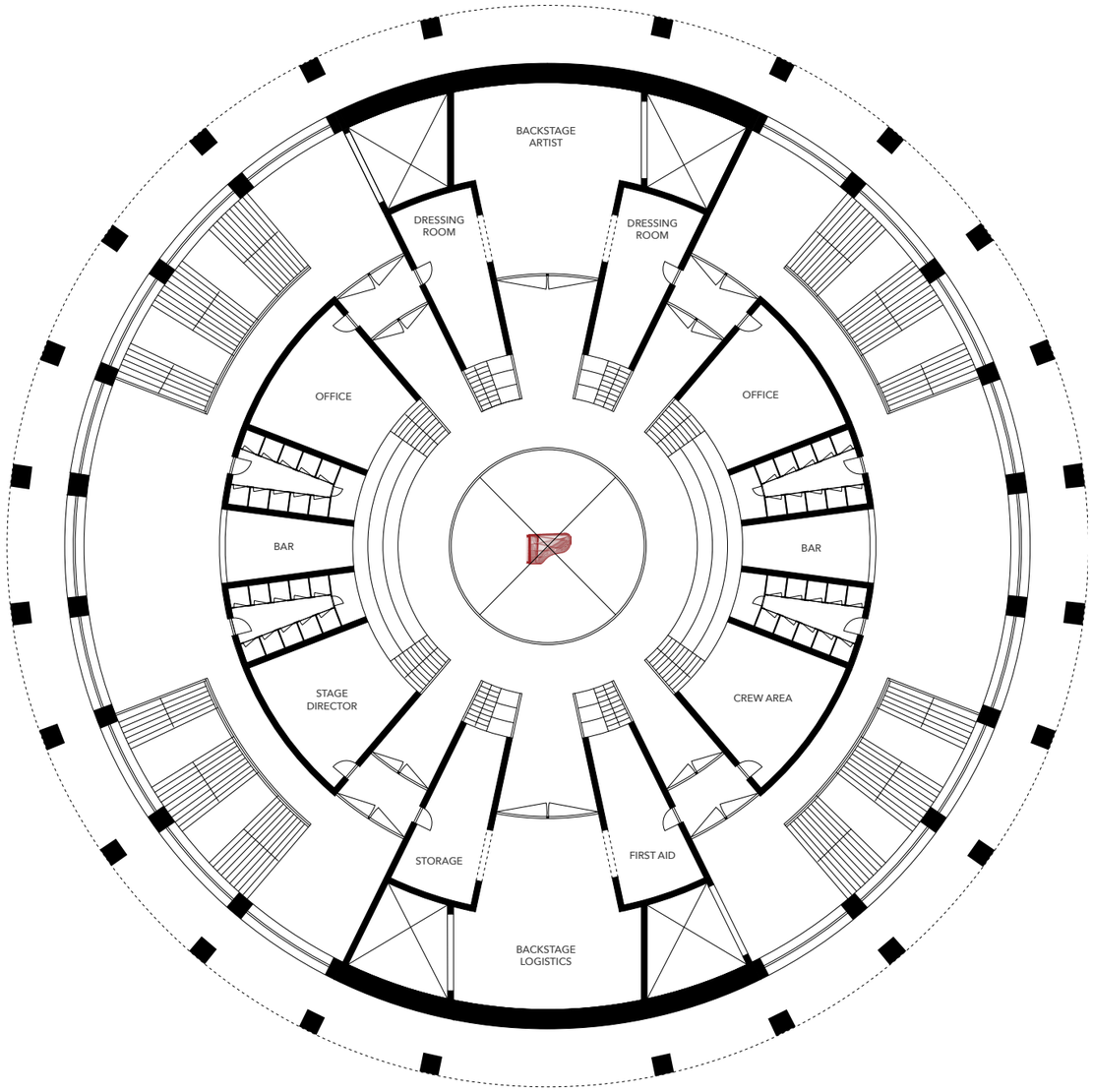
1:500 (160%)

P2 - PLAN 00+



1:500 (160%)

P2 - PLAN 01



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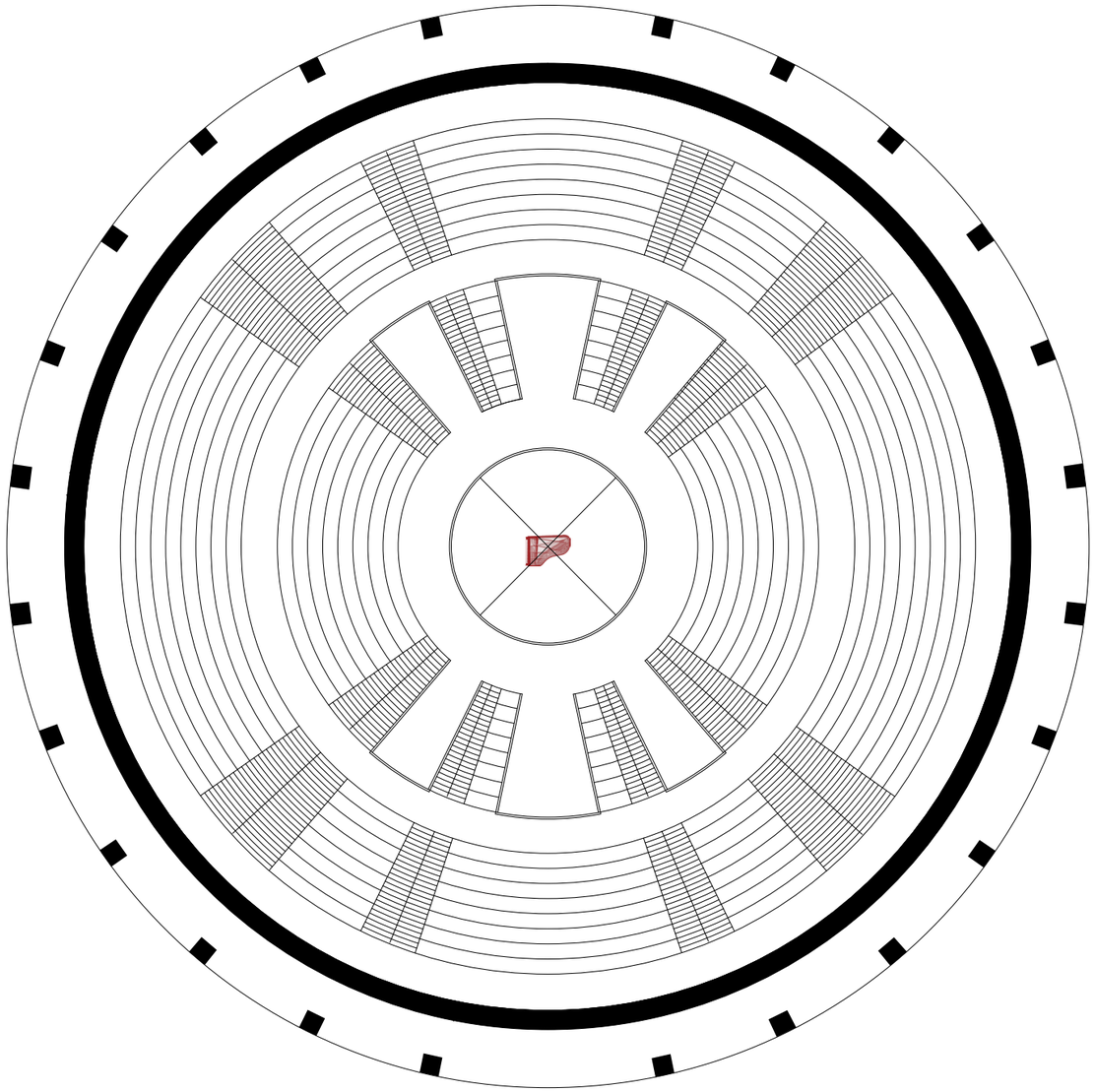
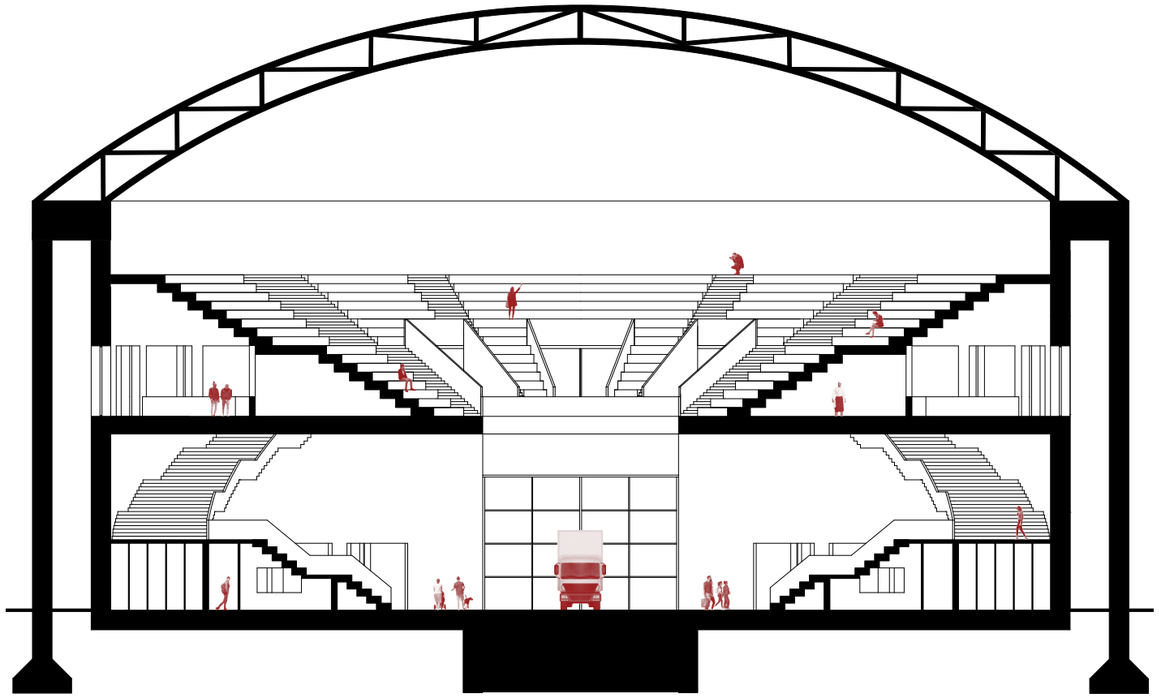
P2 - PLAN 01+



1:500 (160%)

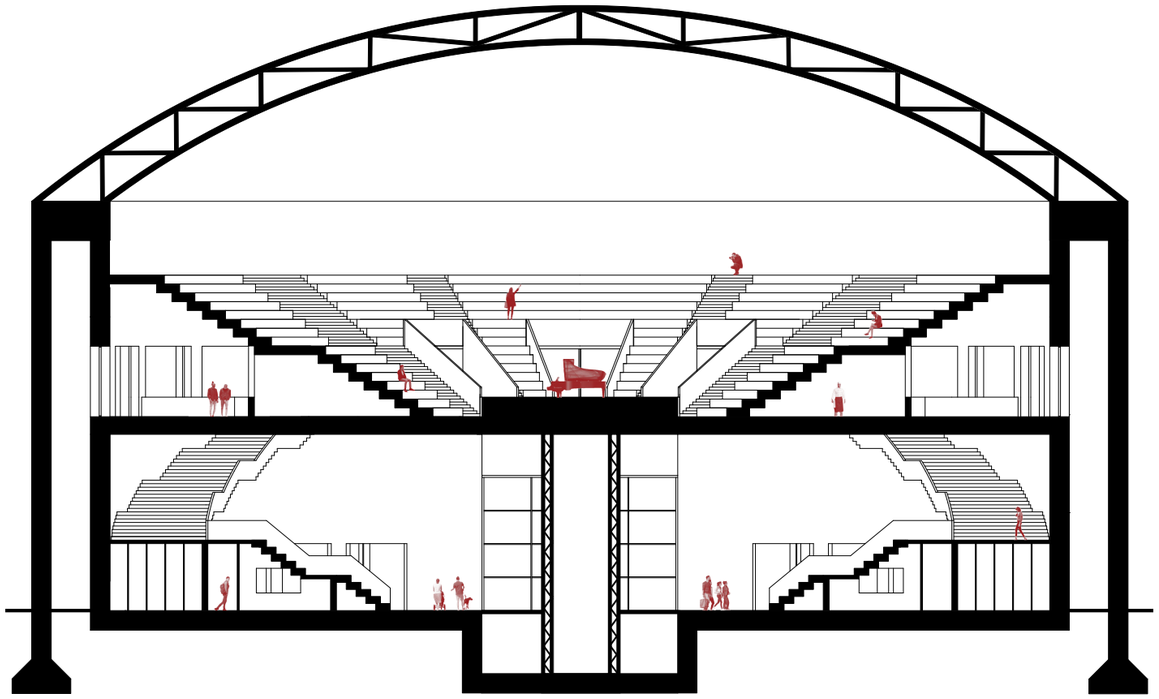
P2 - SECTION OPEN VOID



1:500 (160%)

Southwest-Northeast

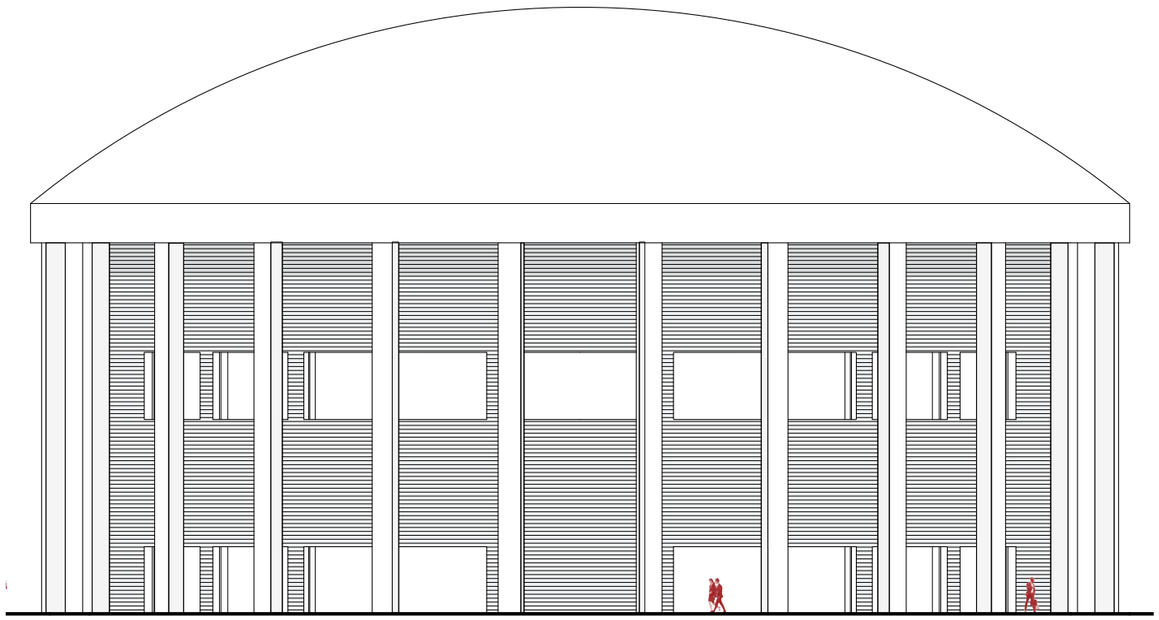
P2 - SECTION CLOSED VOID



1:500 (160%)

Southwest-Northeast

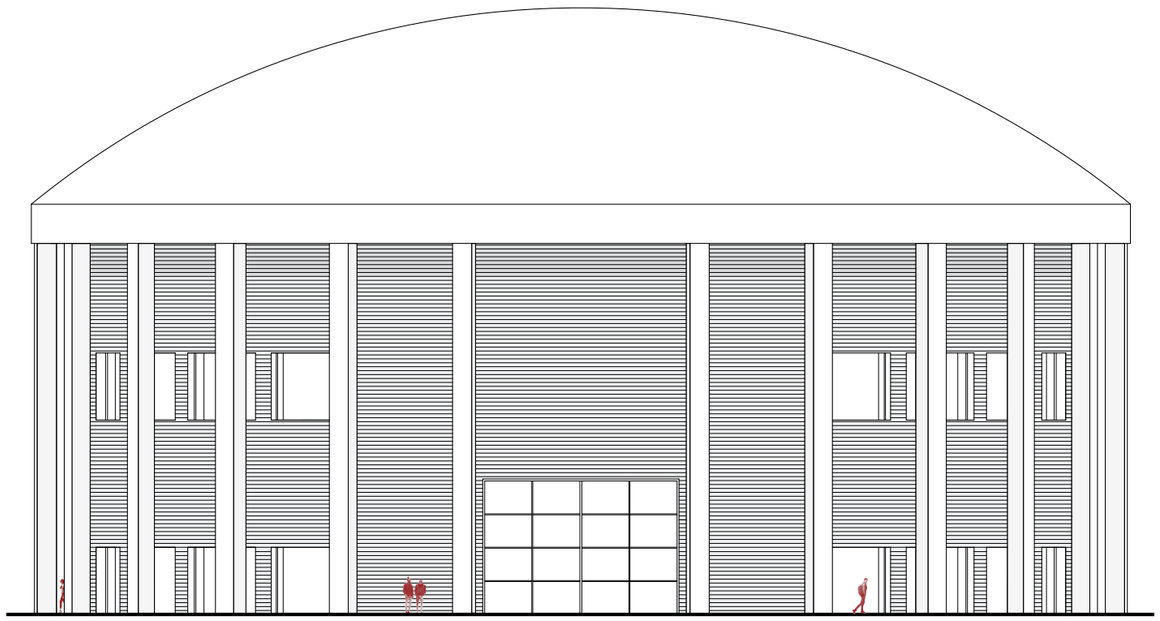
P2 - FACADE 1



1:500 (160%)

Southeast

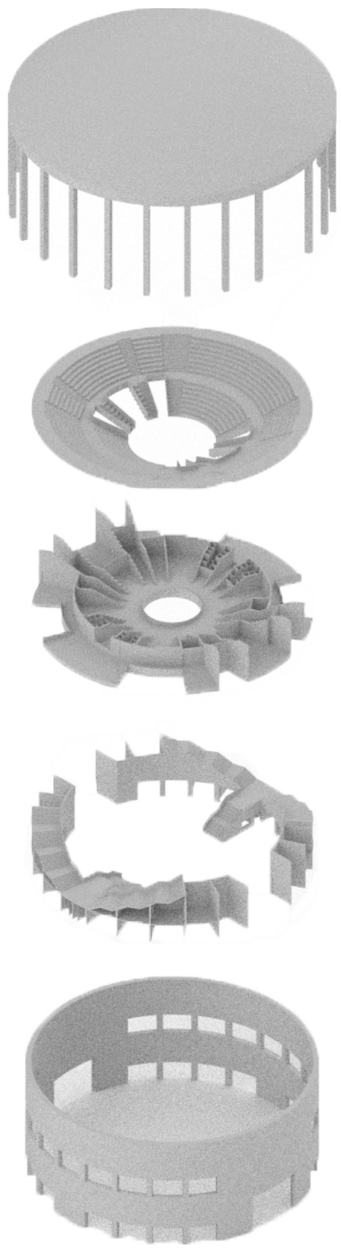
P2 - FACADE 2



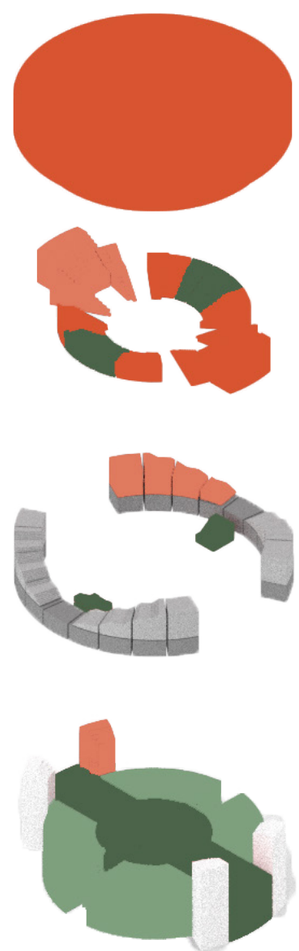
1:500 (160%)

Southwest

P2 - CONSTRUCTION



P2 - PROGRAM



Concert space

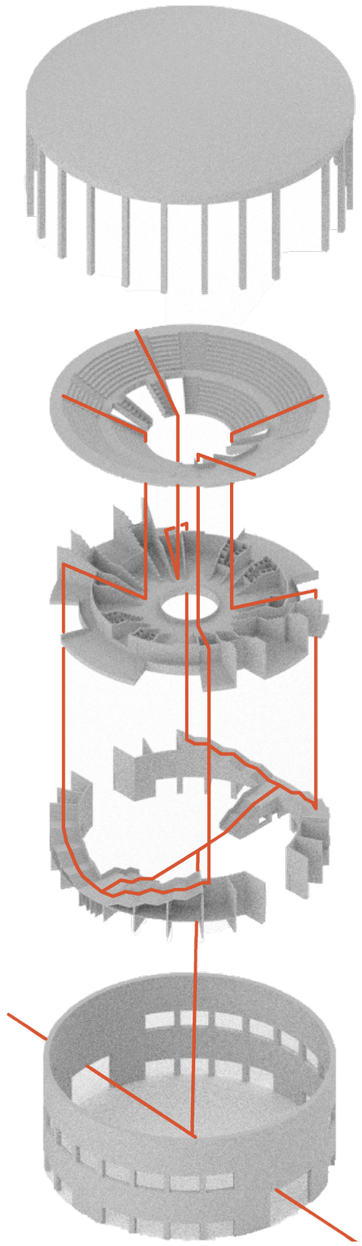
Artist

Audience

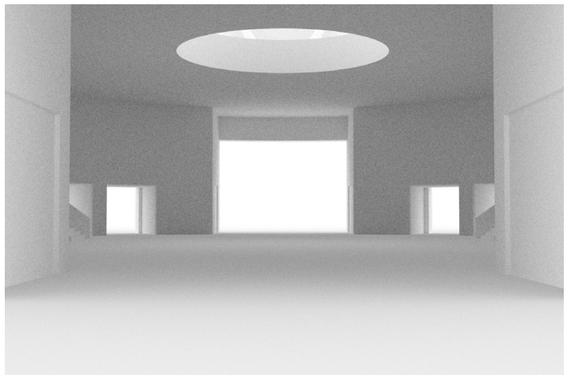
Foodcourt

Support

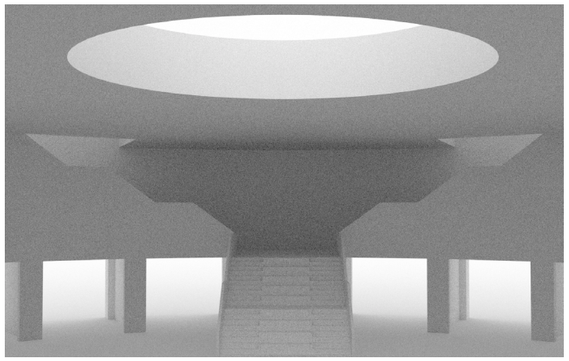
P2 - CIRCULATION



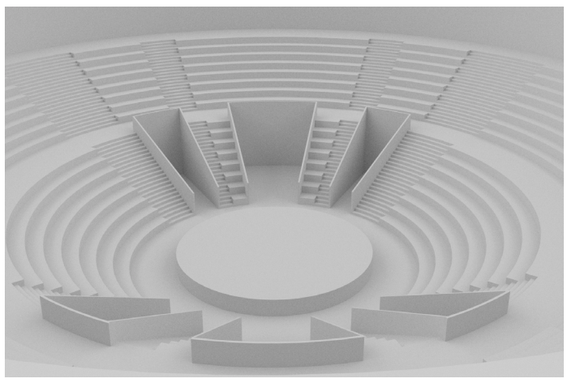
P2 - INTERIOR RENDERS



Entrance

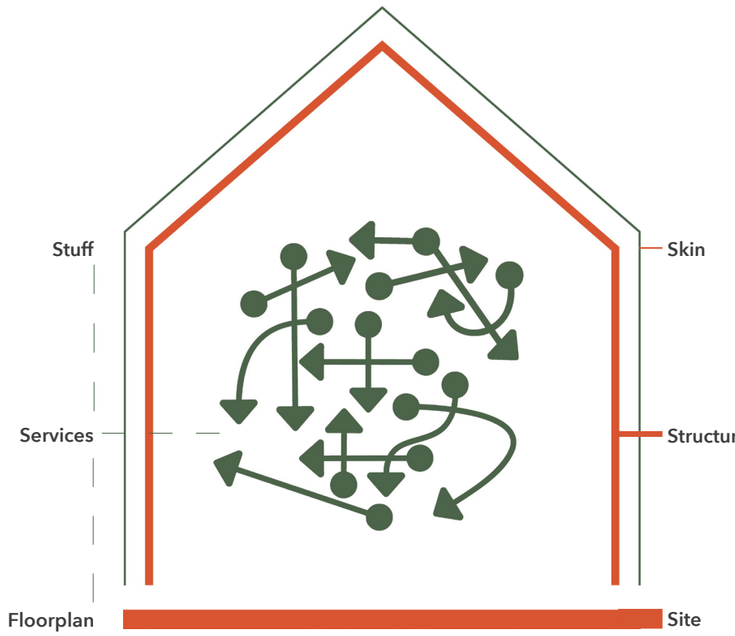


Stairs



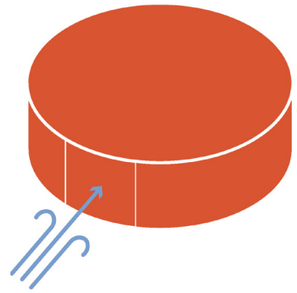
Music hall

P2 - CIRCULARITY

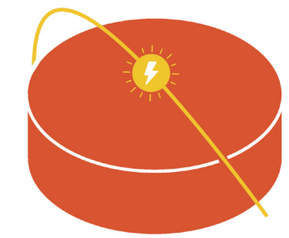


Circularity in of great importance in this graduation project, as the theme is flexibility. In the Stuart Brand diagram, the life span of materials in a building is normally illustrated. However, in the diagram below the Stuart Brand diagram is pictured in a slightly different manner. In this diagram the first three layers are disconnected for flexibility. The other three layers need to become more flexible. This means that even though materials wear out, these layers can extend their lifespan because they can be continuously adapted.

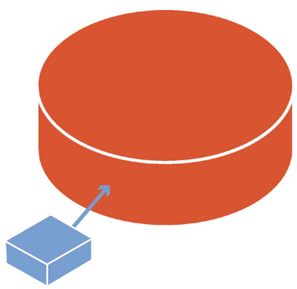
P2 - SITE CONDITIONS



The silo is positioned in relation to other buildings in such a way that the south-west wind runs straight into the silo. This can be both an advantage and a disadvantage for the gas silo. The design currently considers the wind in two ways. There is no opening at ground level perpendicular to the south-west wind to ensure that there is no draught, and the height of the new roof has been designed not to be higher than the other buildings, to allow the wind to be pushed up slowly.

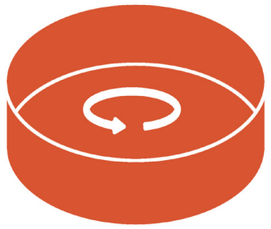


Because only the northeast side of the silo has nearby buildings, the silo has plenty of sunlight all day long. This sunlight can be used as an energy source in the music building. The new roof can be designed to incorporate the solar panels into the architecture.

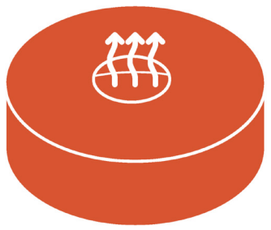


The silo is located on the banks of the Trekvliet. This water could be used in the silo's cooling system if it is not used in too large quantities. This could help make the building passive.

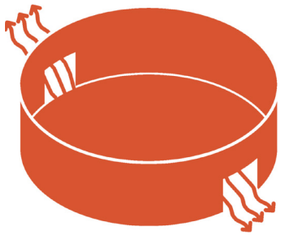
P2 - ENERGY ISSUES



A design principle of the silo is to have a 360 degree experience of the space as a characteristic property. This vision does mean that a very large space needs to be heated in winter. In addition, I want the services to be as flexible as possible in change, perhaps that is where the solution lies.

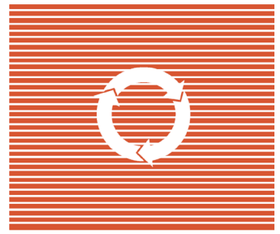


In addition to the large open space, there is also a hole in the ceiling leading to the stage. When there is a performance, the hole is closed, which makes heating the room easier, but most of the time the hole will be open and the theatre will be heated unnecessarily.

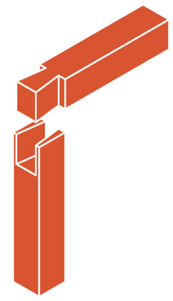


Finally, there will be large open entrances on the ground floor, which will cause a lot of heat to be lost. Because of these problems mentioned above, another solution may be to make it a completely open building, as a kind of pavilion.

P2 - MATERIALITY



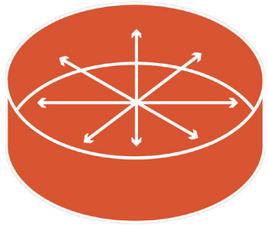
Because the silo is being reused, the materials will also return in the new design. The corrugated sheet façade of the silo, in particular, will be clearly present in the building. The construction of the silo will have to be reinforced because it is now a very light structure.



Because flexibility and adaptability are of great importance in this design project, it is also important to make a structure that can be de-structured. This means that dry connections must be made between elements.

The new structure of the building that will be erected for the theatre must be light because it will be supported by the roof. It will also have to carry the span of the first floor.

P2 - ACOUSTICS



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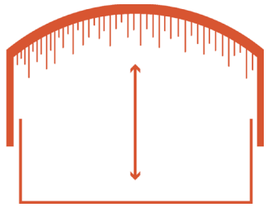
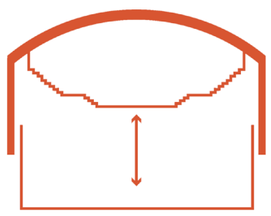


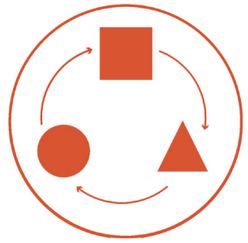
To get the acoustics in the music hall right, different panels will have to be installed. I want to investigate whether it is possible to make acoustic tubes that are flexible in the type of acoustics needed in the building.



The theatre is built with a separate supporting structure. The new roof of the silo will support the theatre. As a result, there are no vibrations in the rest of the building when the stage is closed.

P2 - MULTIPLICITY

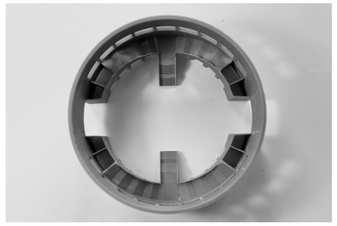
Multiplicity is present in this design in several ways. Firstly, there is a mix of functions within the building. These different functions come together in different spaces.

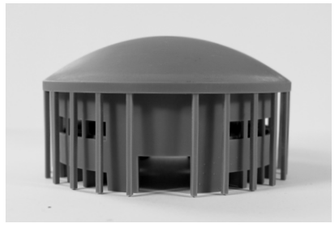


There is also multiplicity in the use of spaces. Different spaces can be used in different ways and for different functions. This allows the building to be used by a larger group of people.

And finally, the silo is also a multiplicity for the future, as the flexible construction strategy allows for various changes to be made.

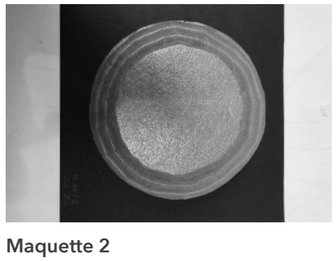
Q3 - MAQUETTES





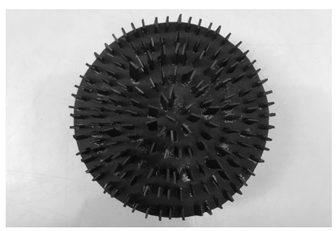
Maquette 1 (P2)

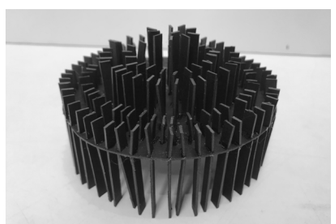
The design for P2 was the refurbishment of the existing gas silo, where the facade was retained and a new interior and roof were added to the design. On the ground floor, the space consisted of a spatial staircase system and on the first floor, a music hall. The roof of the music building has multiple functions; it supports the music hall, is the eye-catcher of the building, and generates energy.



Maquette 2

The second model was made after P2, to separate it from the existing gasholder. However, I had decided to reuse the foundation, so I wanted to keep the shape of the building the same as the gasholder. Here I experimented with a different stair direction, referencing to the layout of the football stadium of Renzo Piano.

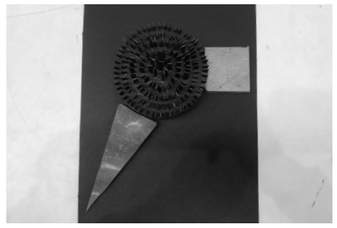
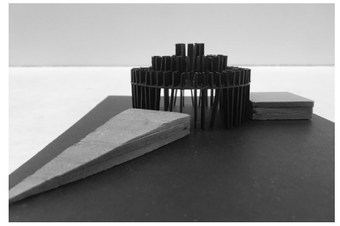
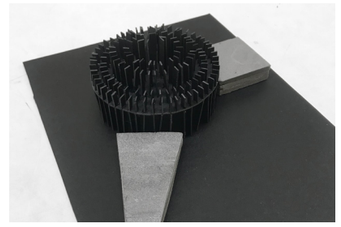




Maquette 3

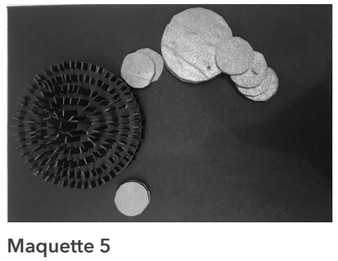
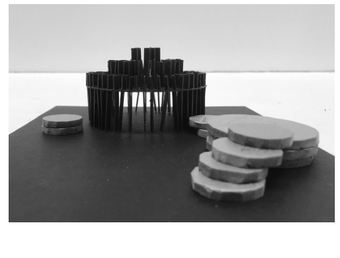
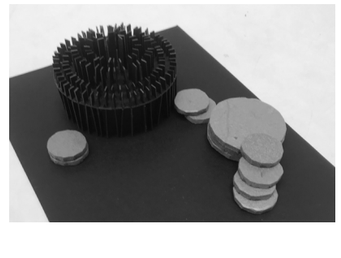
For the third model I was inspired by soundwaves. In this study I used the existing columns in the silo and repeated them to create uniformity, which is one of the strengths of the existing gasholder. This model really appealed to me, as it still contained the essence of the gasholder, but the building had a completely different character, which is more public.

Q3 - MAQUETTES

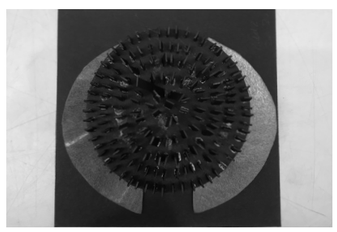
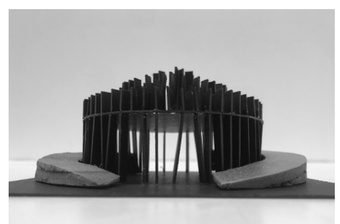
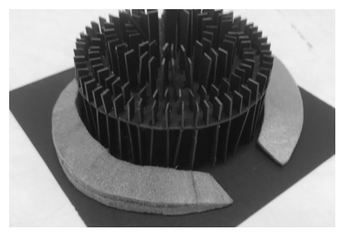
Maquette 4

During tutorials, my teachers commented that I clung too tightly to the round shape, which is exactly what I want to express. But as a study, I looked for different additions to the round shape. In this model, I experimented with the primary forms. But I soon came to the conclusion that this does not work together with the round shape.

Maquette 5

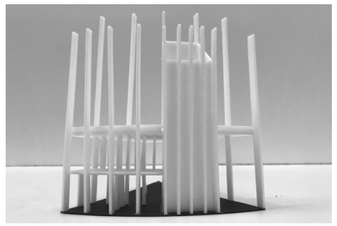
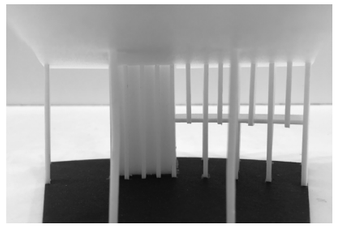
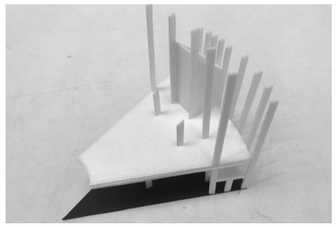
The second variation on the addition of other shapes was to continue the round shape in different scales. Although in my opinion this mixes well in the model, the strong round shape is now lost in its solitude. This is precisely one of the strengths of the building in this area. That is why this variant does not work either.

Maquette 6

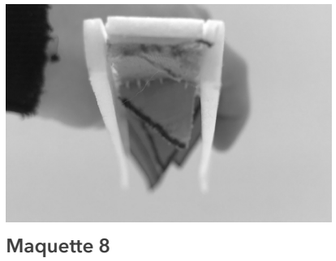
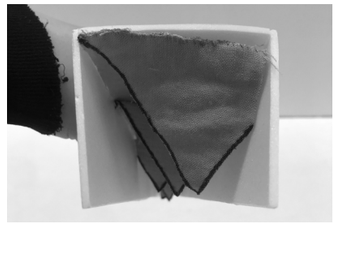
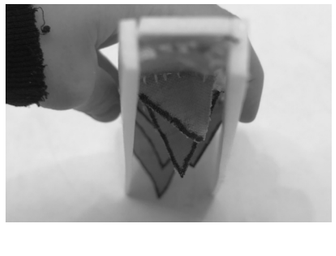
The last variation on the addition of other shapes was simple compared to the other models. In this model, the stairs that were initially positioned on the inside have been pulled outwards. The shape still remains round, but an extra dimension is added to the façade. This variant was used as inspiration for further development of the design.

Q3 - MAQUETTES

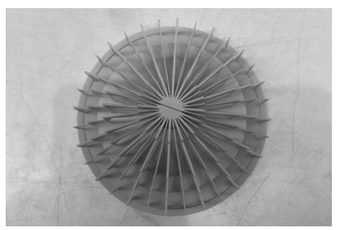
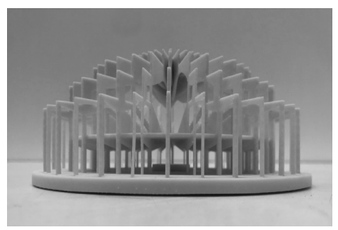
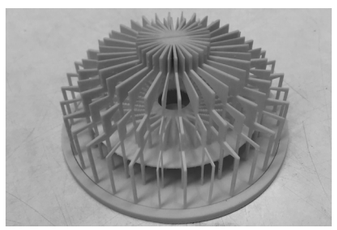
Maquette 7

In any case, it was certain that maquette 3 would be the inspiration for the new music building. This design examines how a column system with various functions would look spatially. The thickness of the columns and the quantity of columns are examined in this maquette. It also examines how the building can be stabilised by means of a core.

Maquette 8

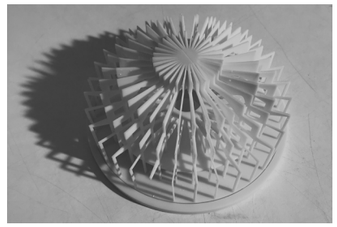
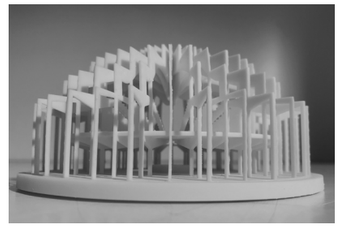
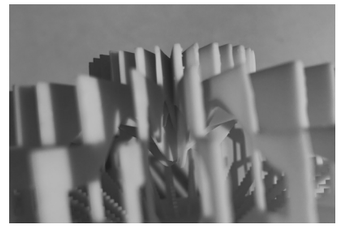
This model shows the acoustic panels between the columns of the building. This model explores how the fabric panels in different patterns would work both acoustically and spatially in a room. The shapes of these panels are inspired by garments made by Iris van Herpen. The materials differ per function of the panel.

Maquette 9 (P3)

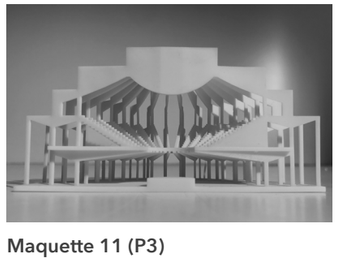
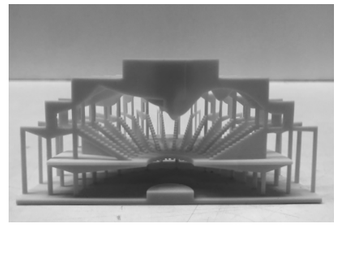
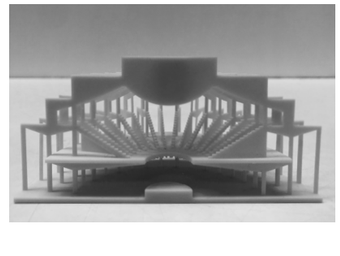
Model nine shows the design as it was at P3. The design still consists not only of columns, but also of flying buttresses and vault ribs. This gives the outside a uniform look, which is an important characteristic of the existing gasholder, while the flying buttresses and vault ribs on the inside form the character of the space.

Q3 - MAQUETTES

Maquette 10 (P3)

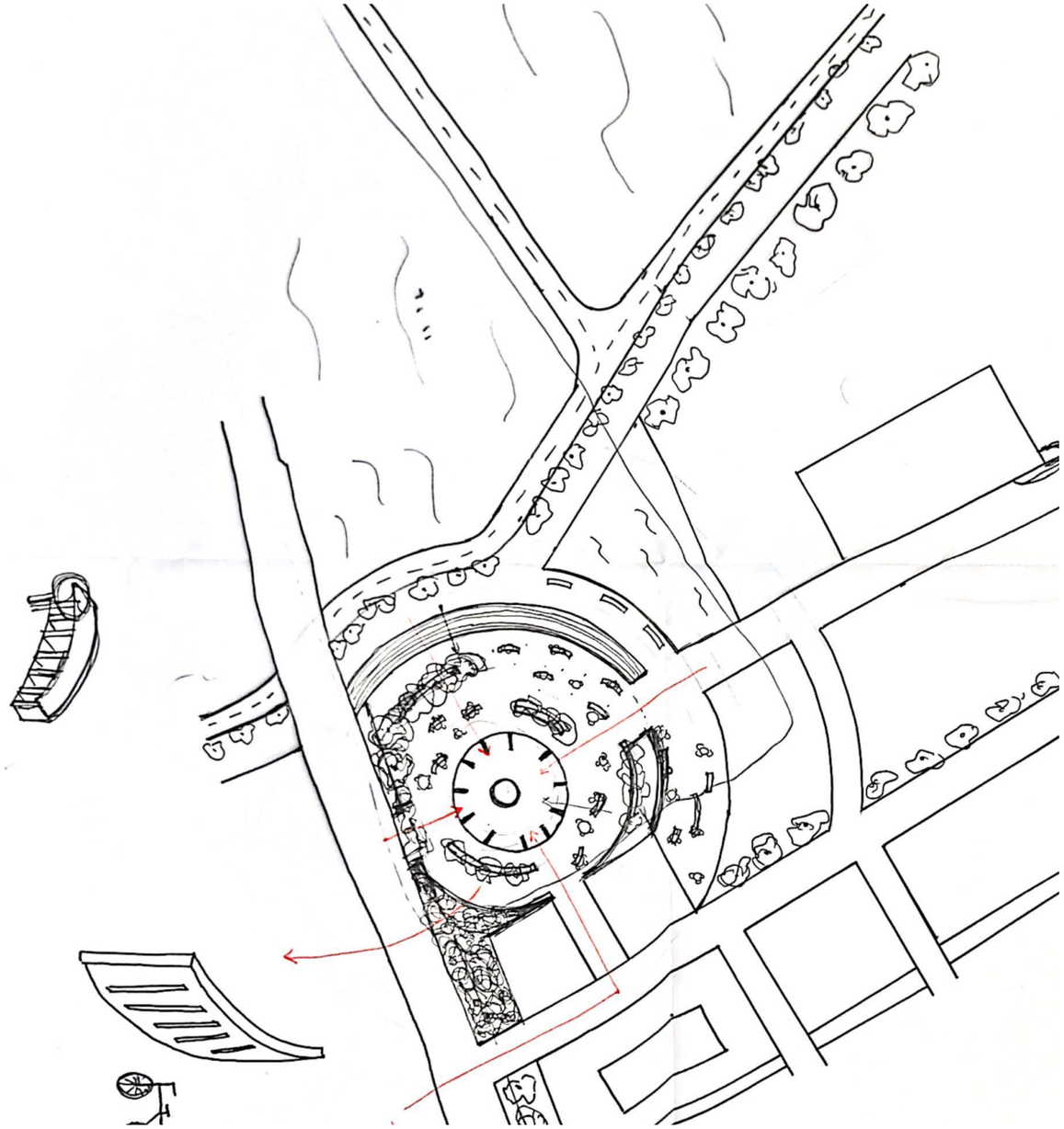
In these pictures you can clearly see the hardness of the building's exterior. Especially in the shadow of the first image, you can see how the columns almost form a musical rhythm. Yet the softness of the inside is already partly visible. Especially the roof of the music hall is already clearly visible while you are still standing outside.

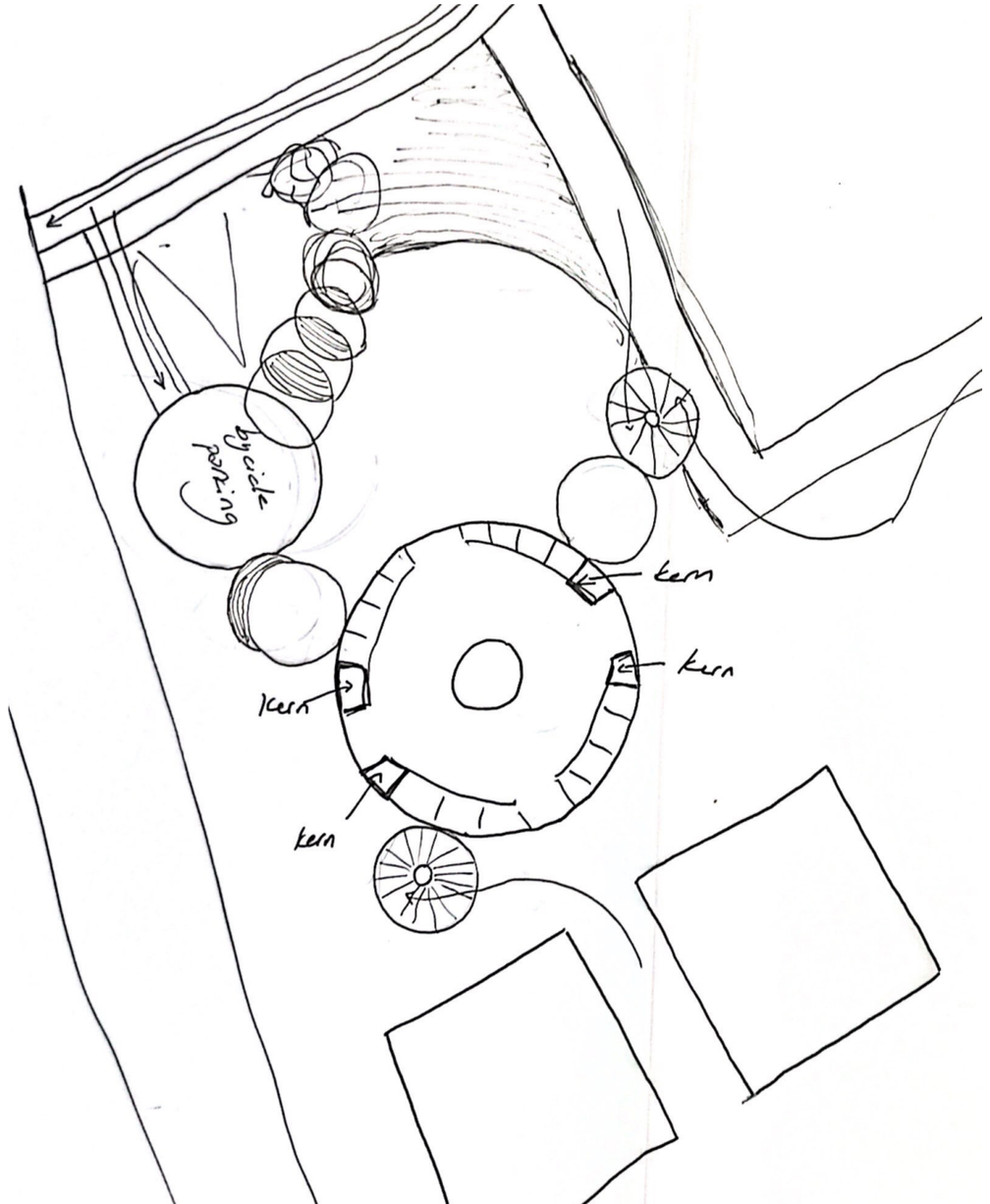
Maquette 11 (P3)

In the section models, the difference between inside and outside is clearly visible. Whereas outside the form is clearly visible, inside there is a stratification of different forms, which is most extreme in the music hall. In the pictures above, different variants of acoustic roofs can be found. The intention being that the music is not reflected back to the artist, but everywhere else.

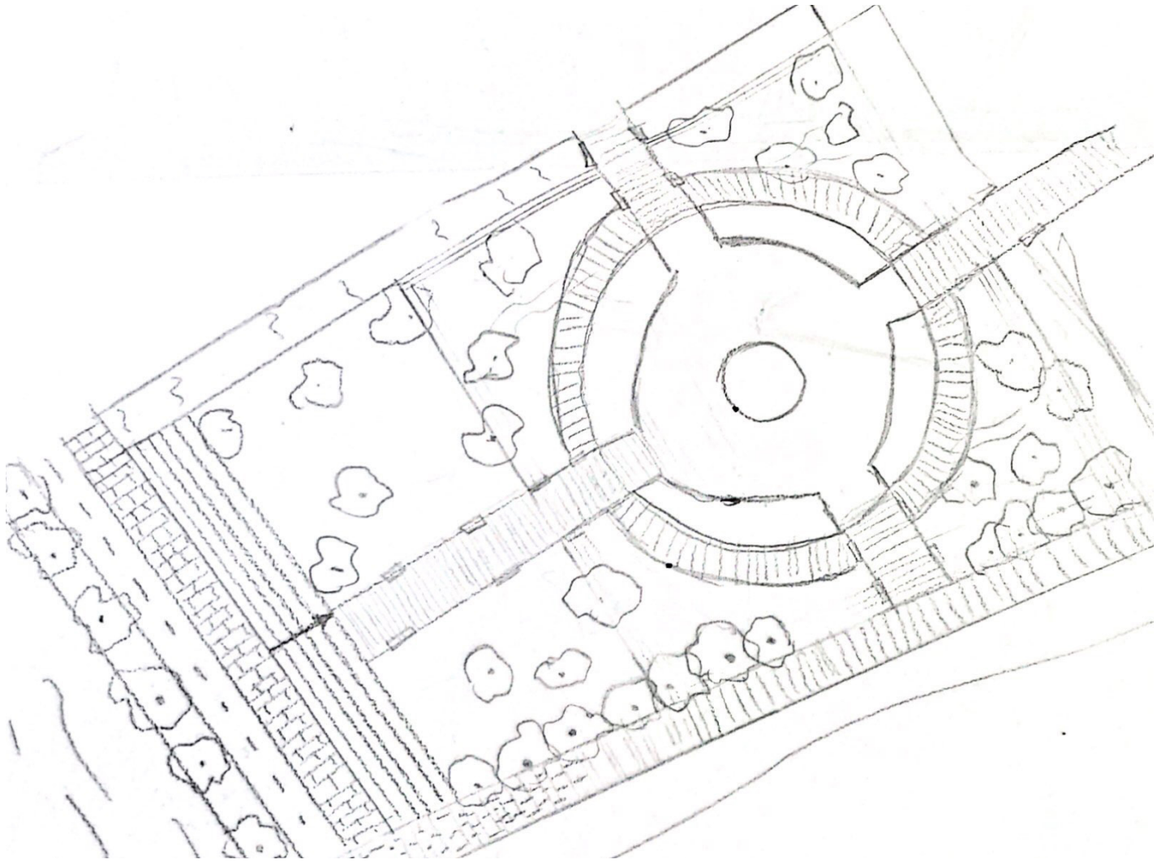
Q3 - SITE



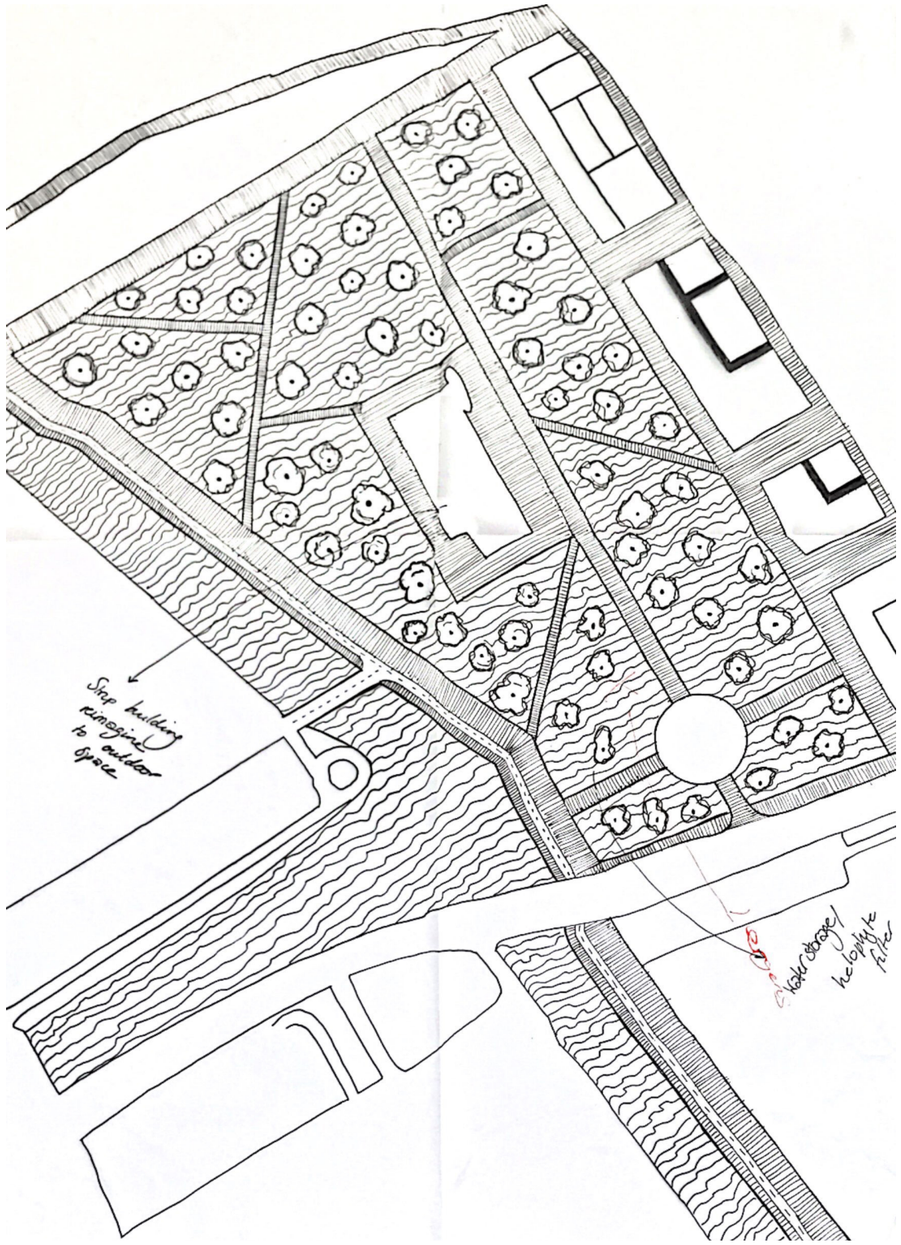
Q3 - SITE



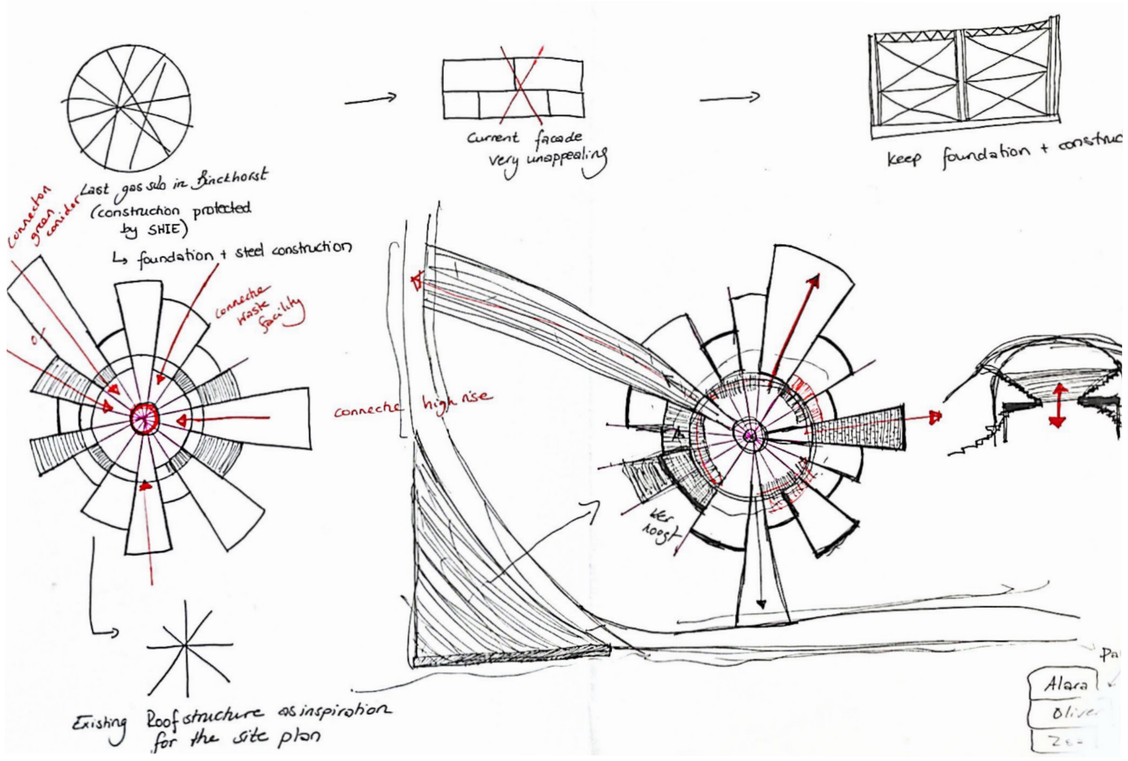
Q3 - SITE



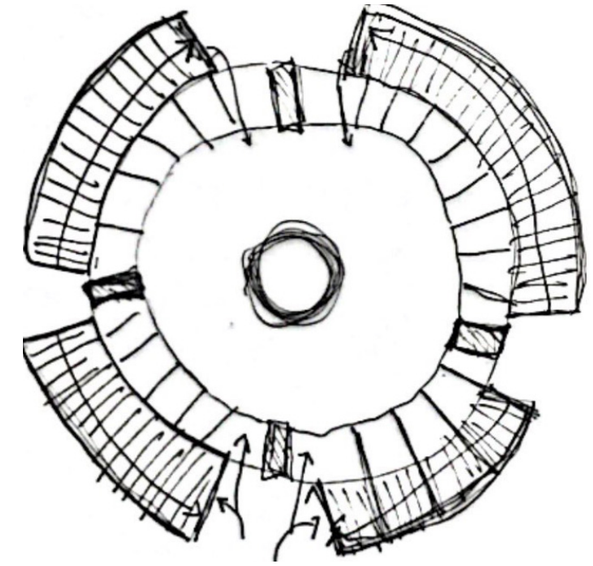
Q3 - SITE

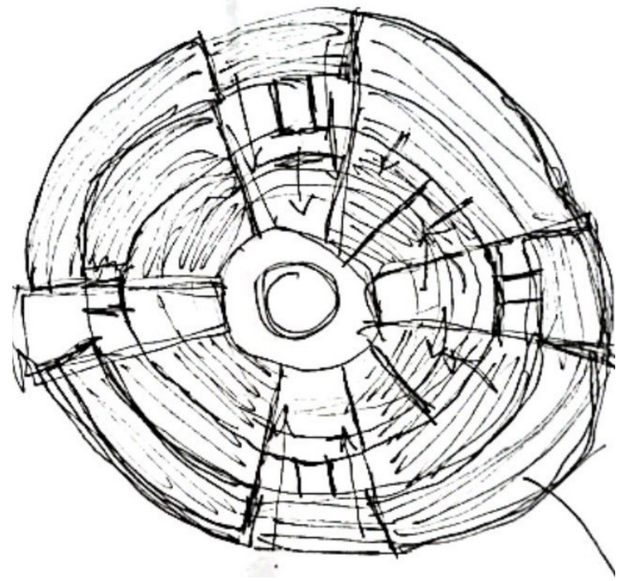


Q3 - VENUE IN PARK

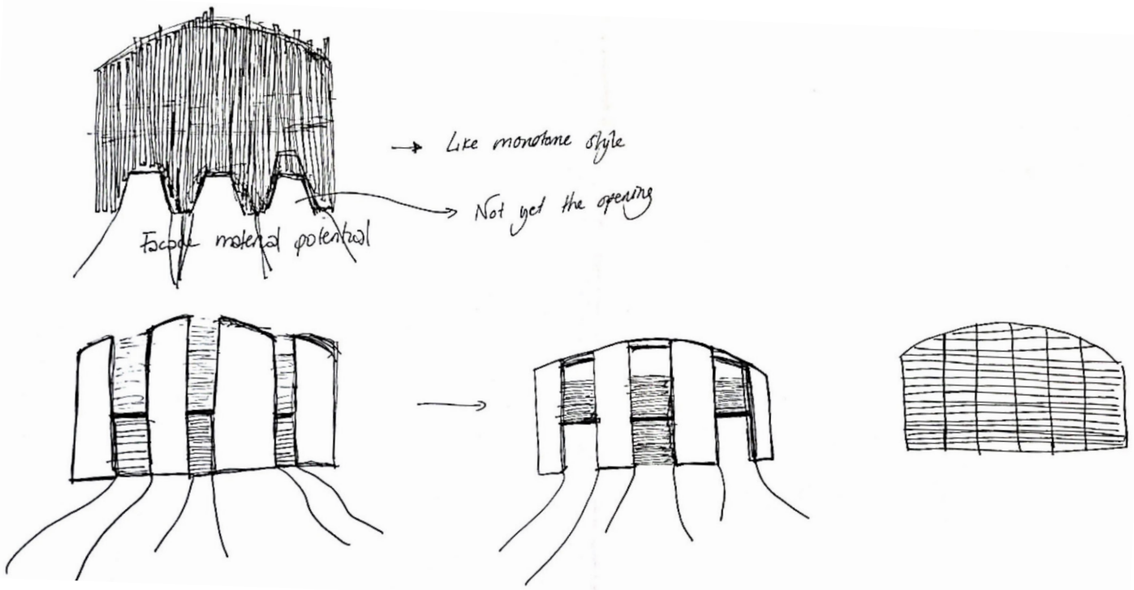


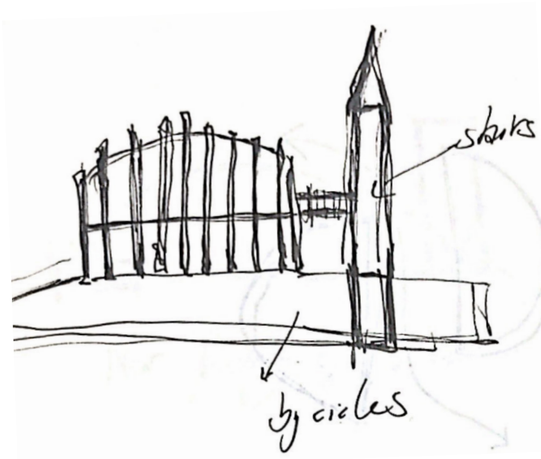
Q3 - STAIRS EXTERIOR

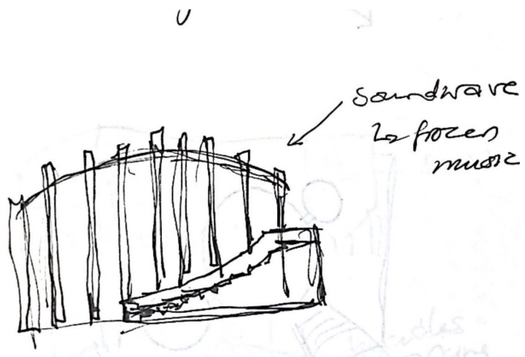




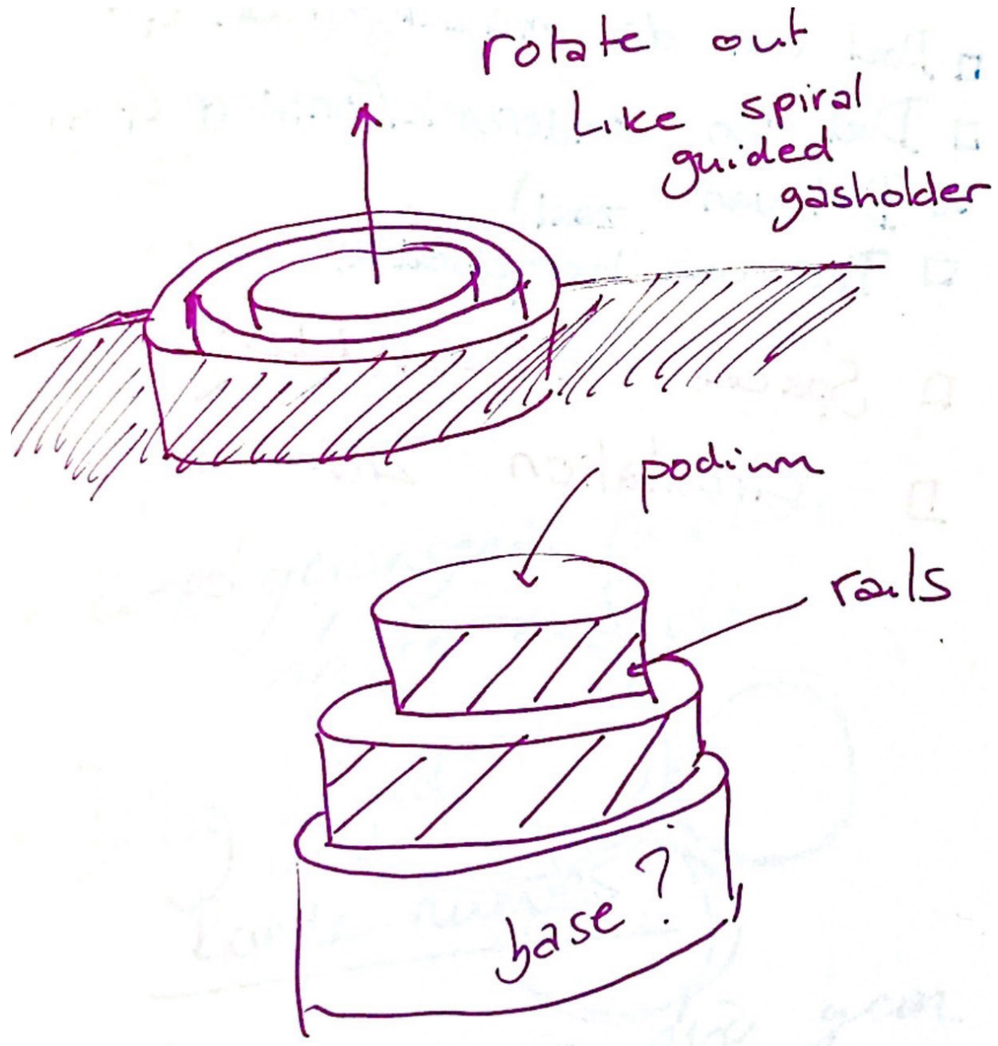
Q3 - MASS SKETCHES



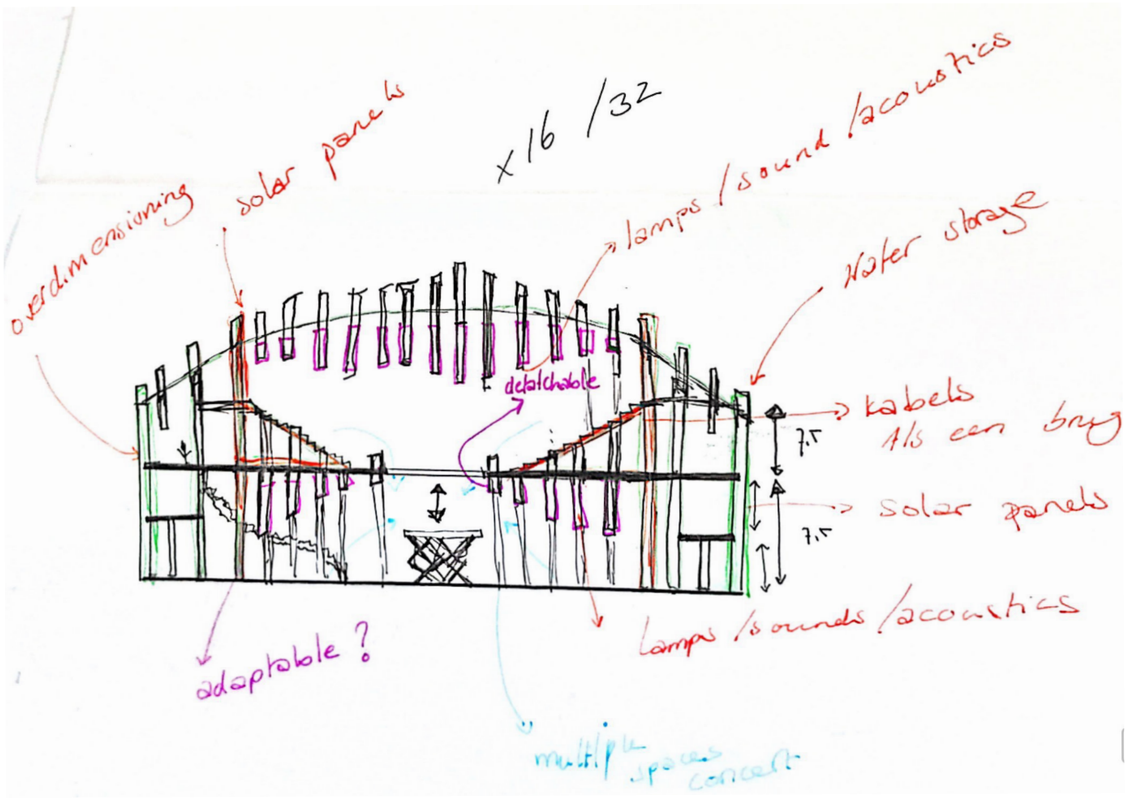


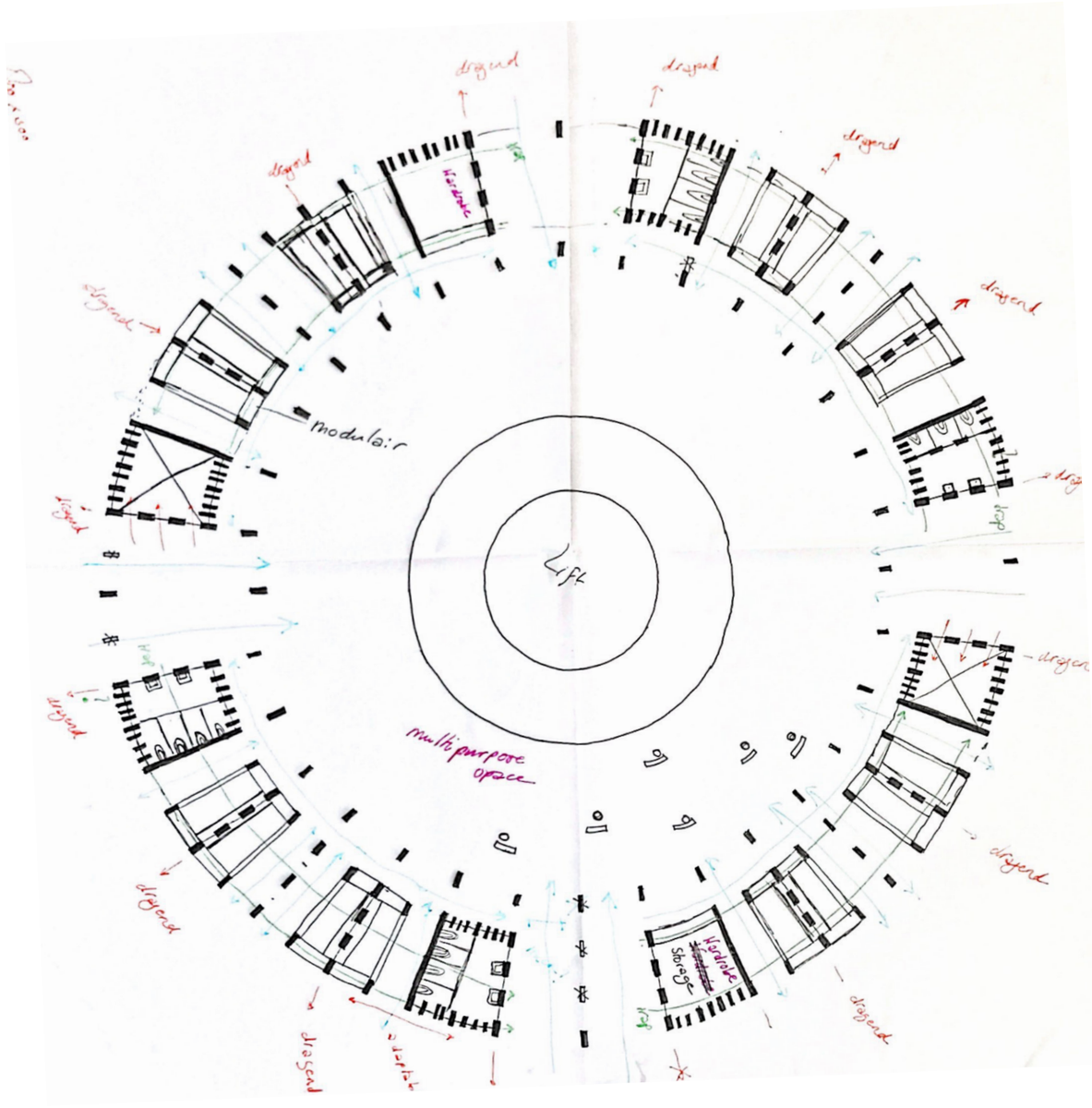


Q3 - MASS SKETCHES

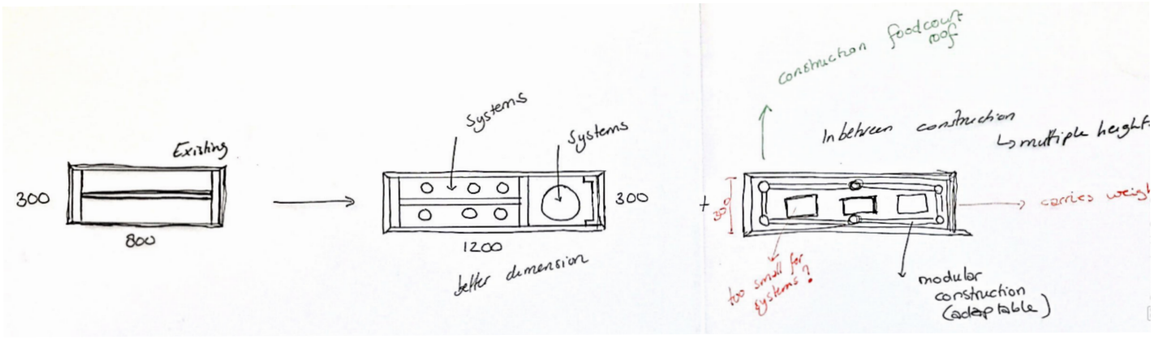


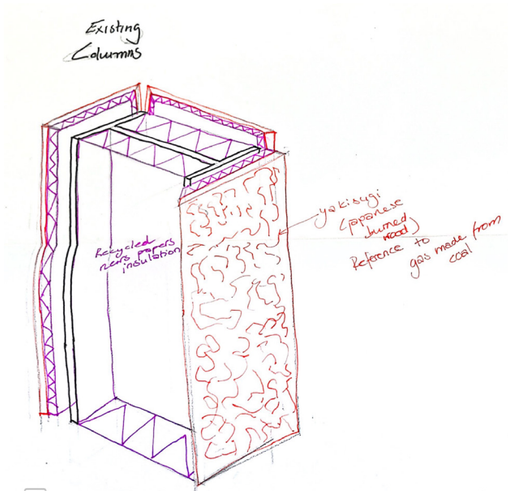
Q3 - FIRST SYSTEM IDEA

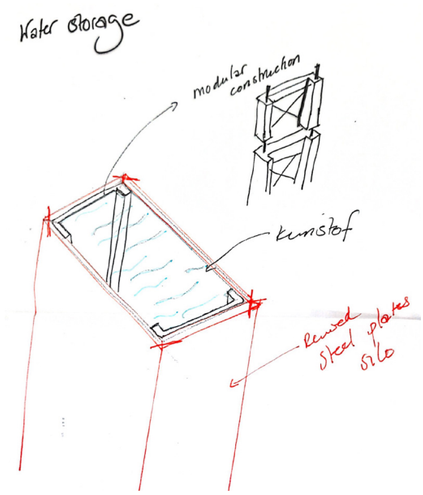


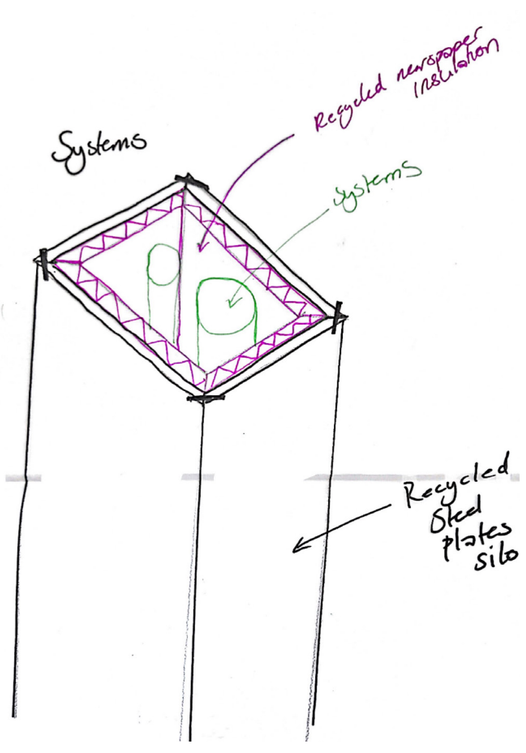


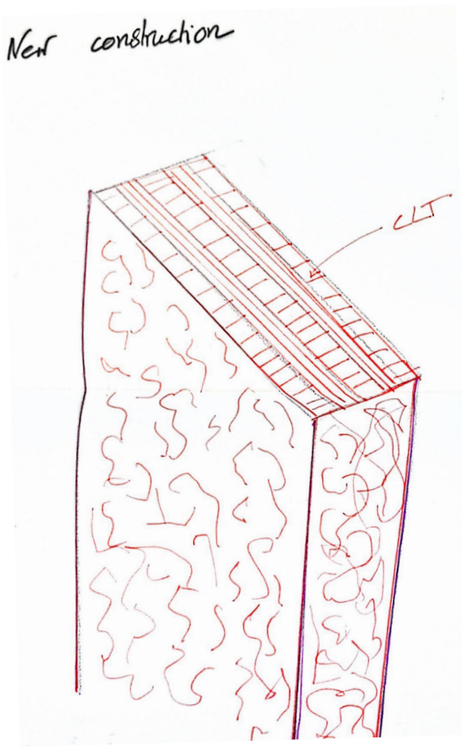
Q3 - SYSTEM ELEMENTS

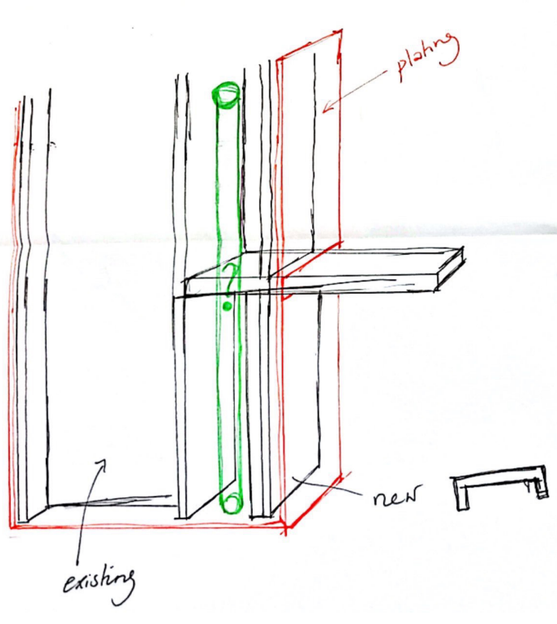


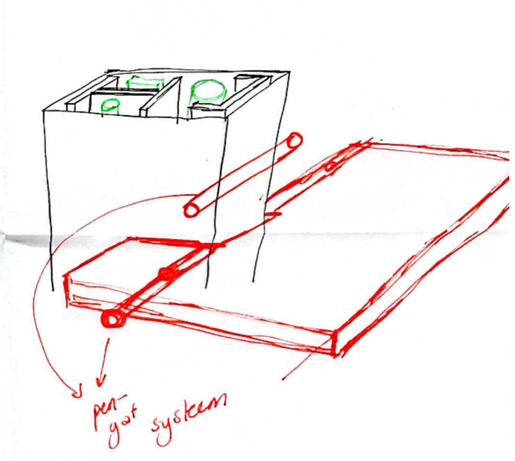




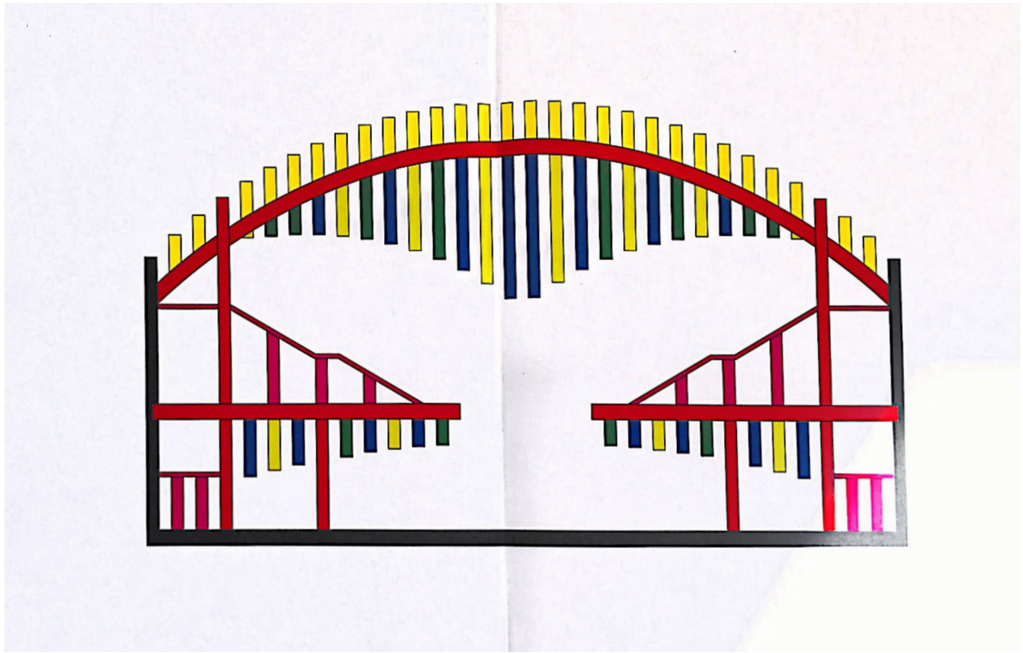




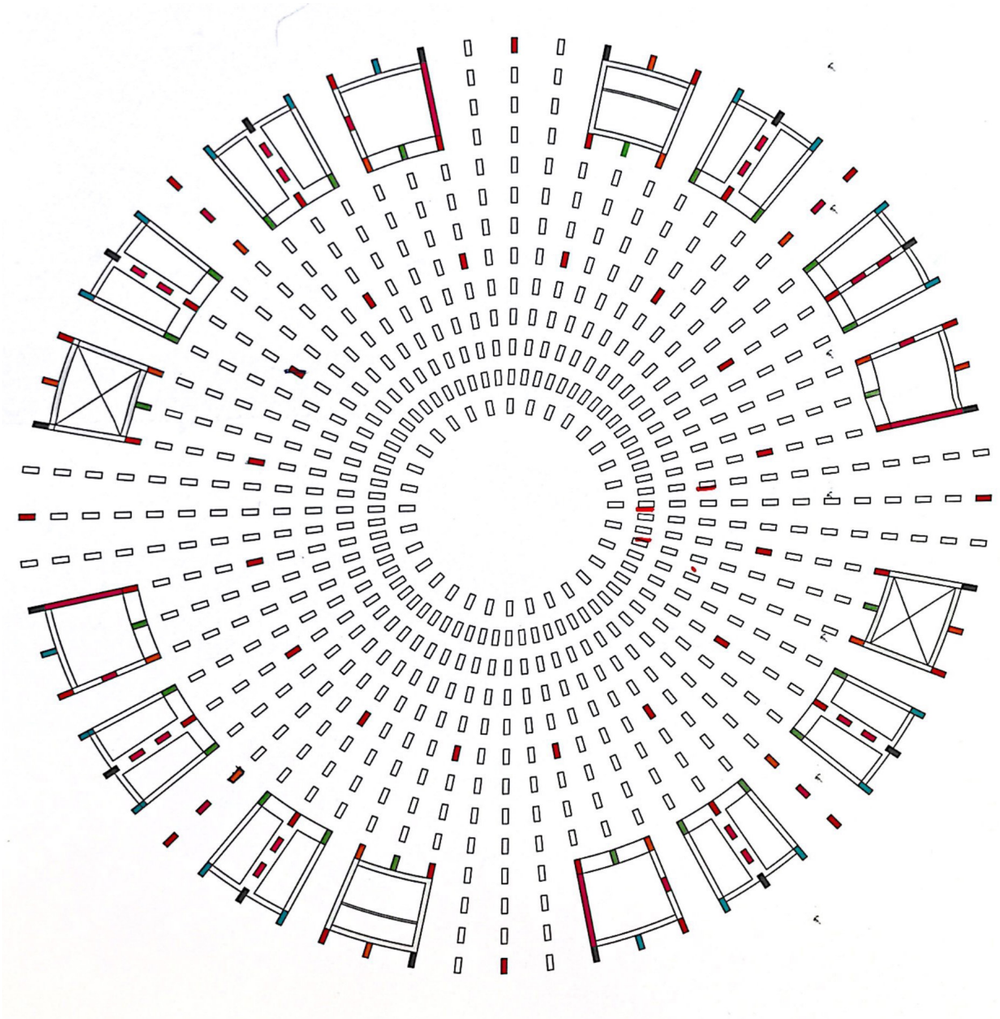




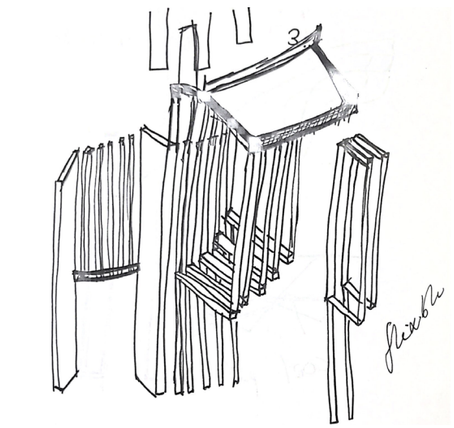
Q3 - SECTION OF ELEMENTS

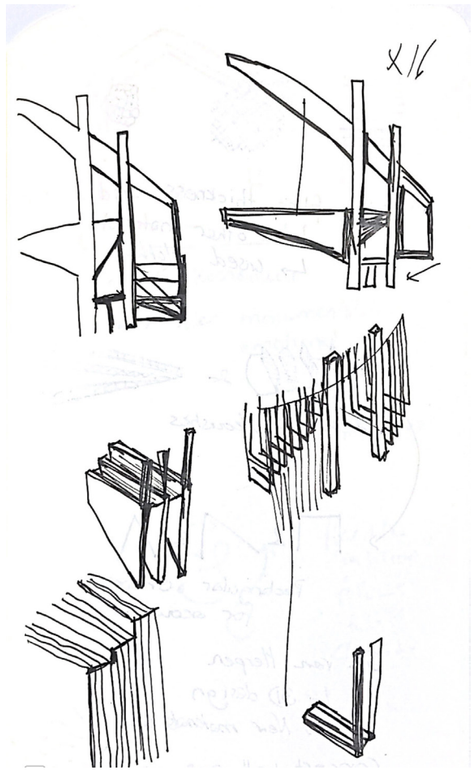


Q3 - PLAN OF ELEMENTS

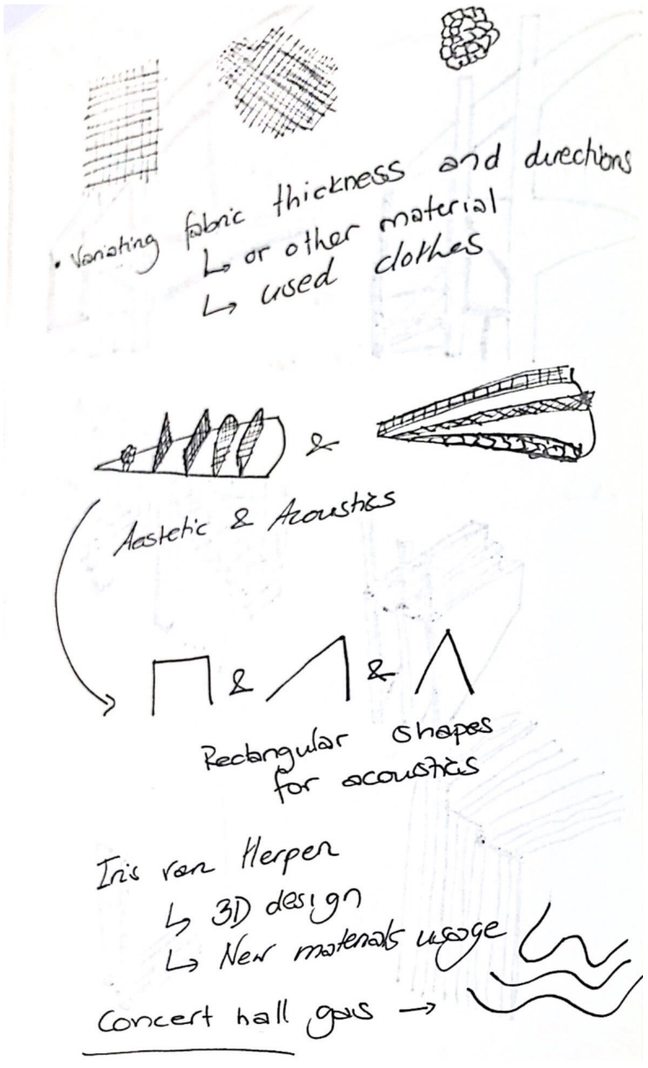


Q3 - FACADE & CONSTRUCTION

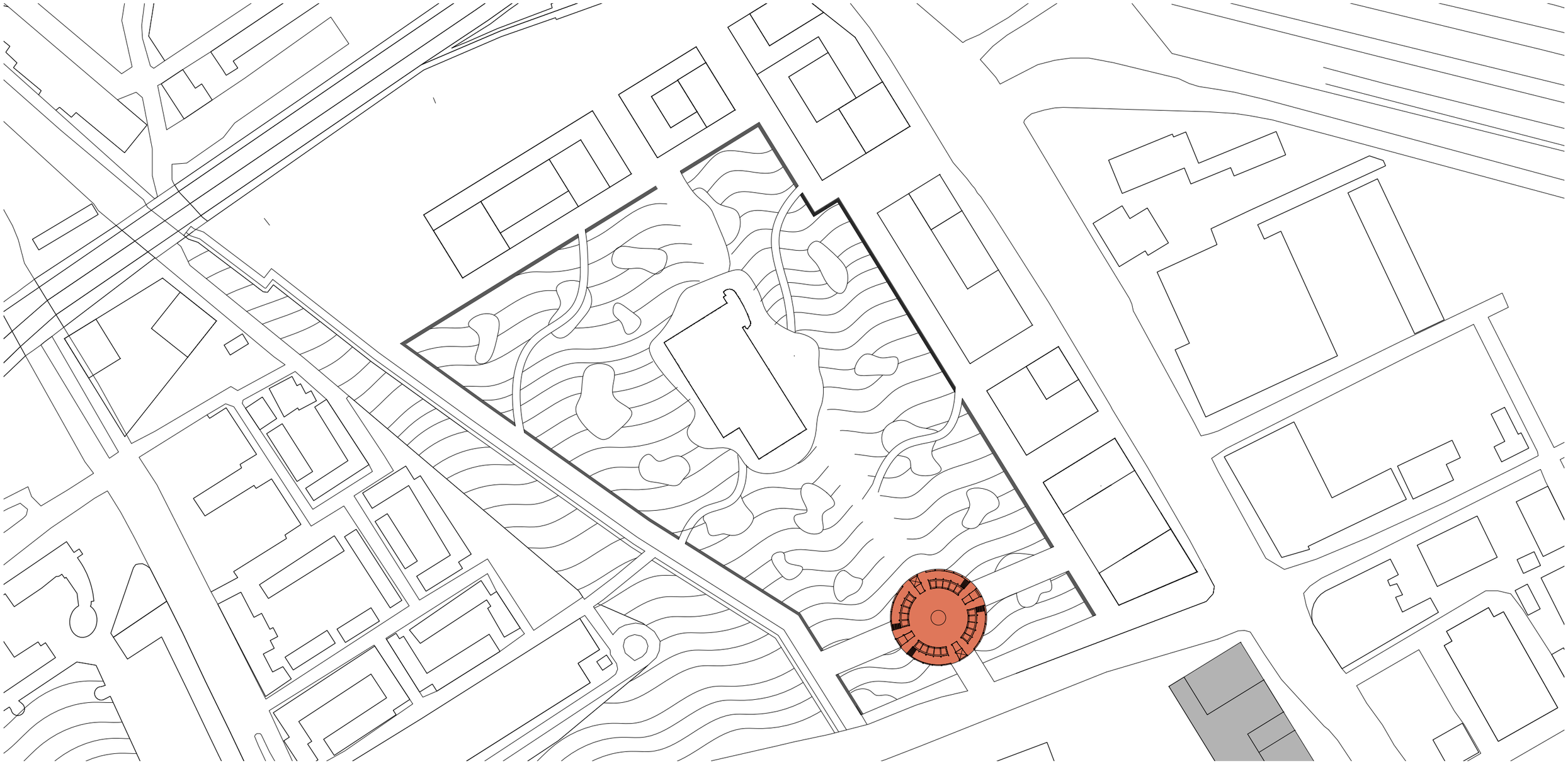




Q3 - ACOUSTICS IDEAS



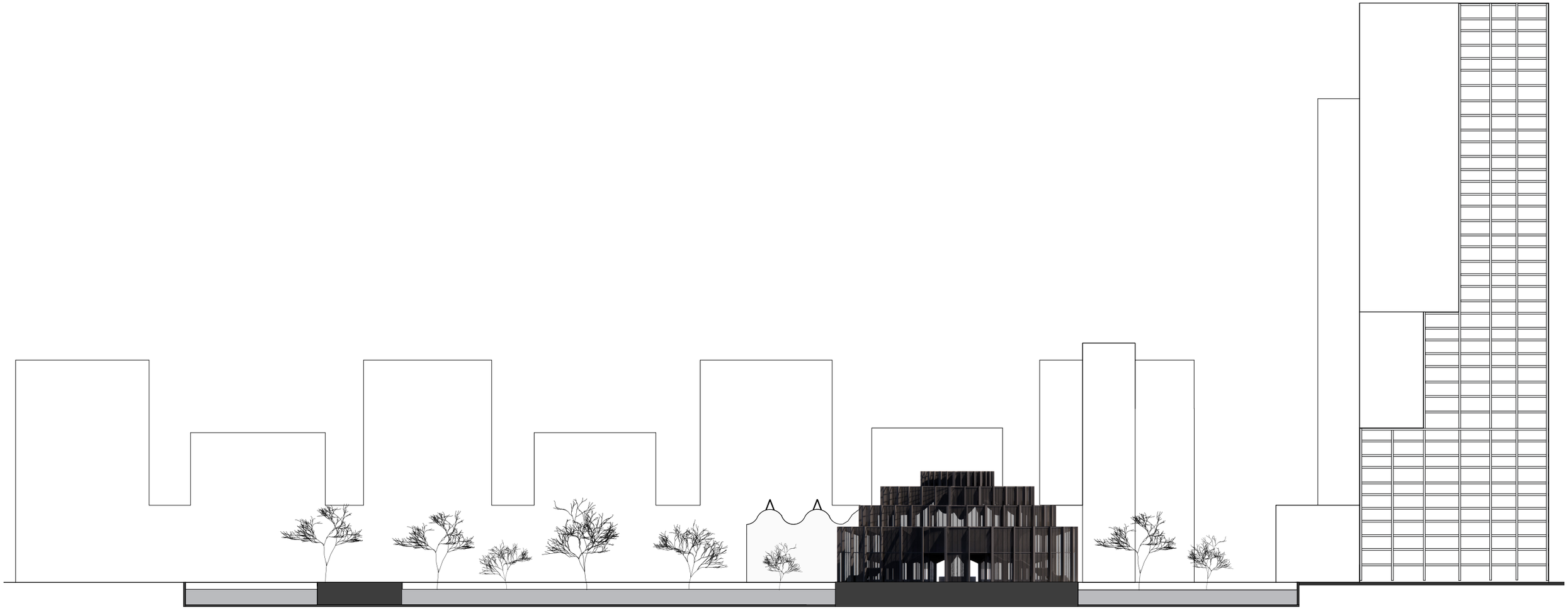
P3 - SITE PLAN



Site plan Binckhorst

1:2500

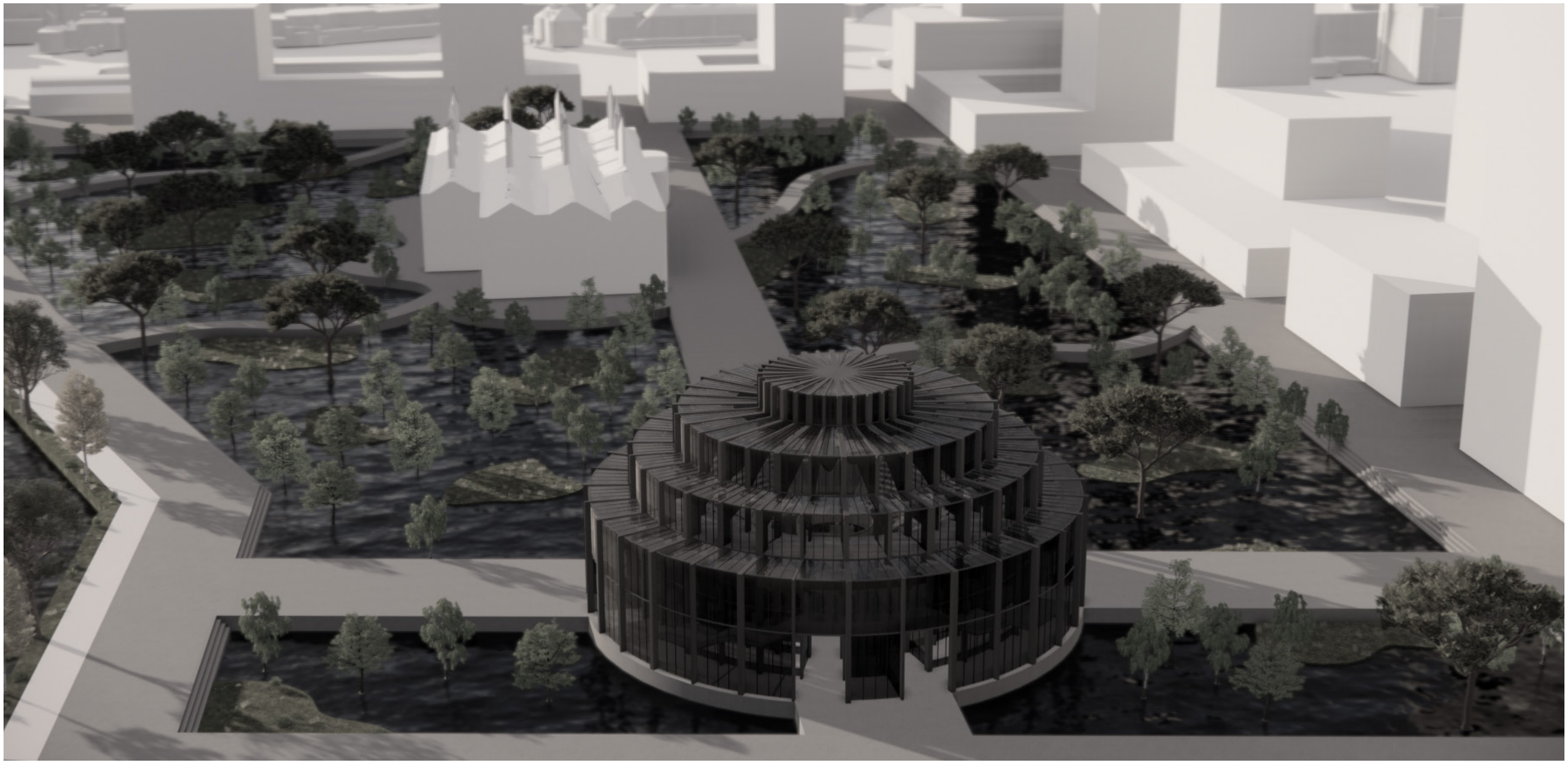
P3 - SITE SECTION



Section Southwest-Southeast

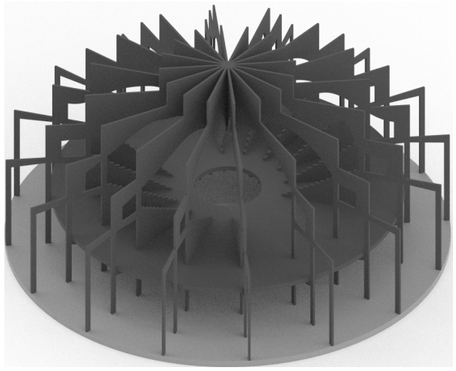
1:1000

P3 - SITE IMPRESSION

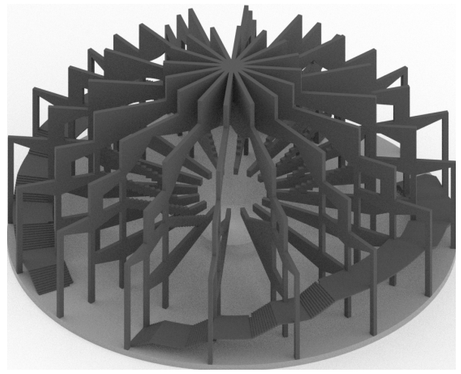


Birdseye entrance music venue in waterfrontpark

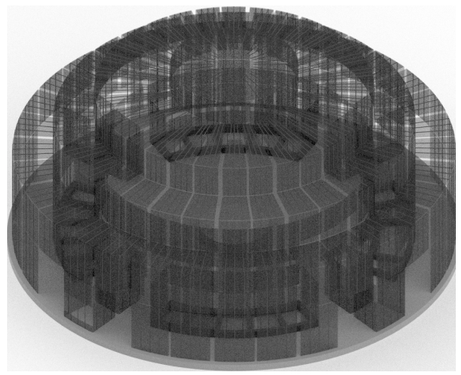
P3 - VISION BUILDING LAYERS



Permanent construction

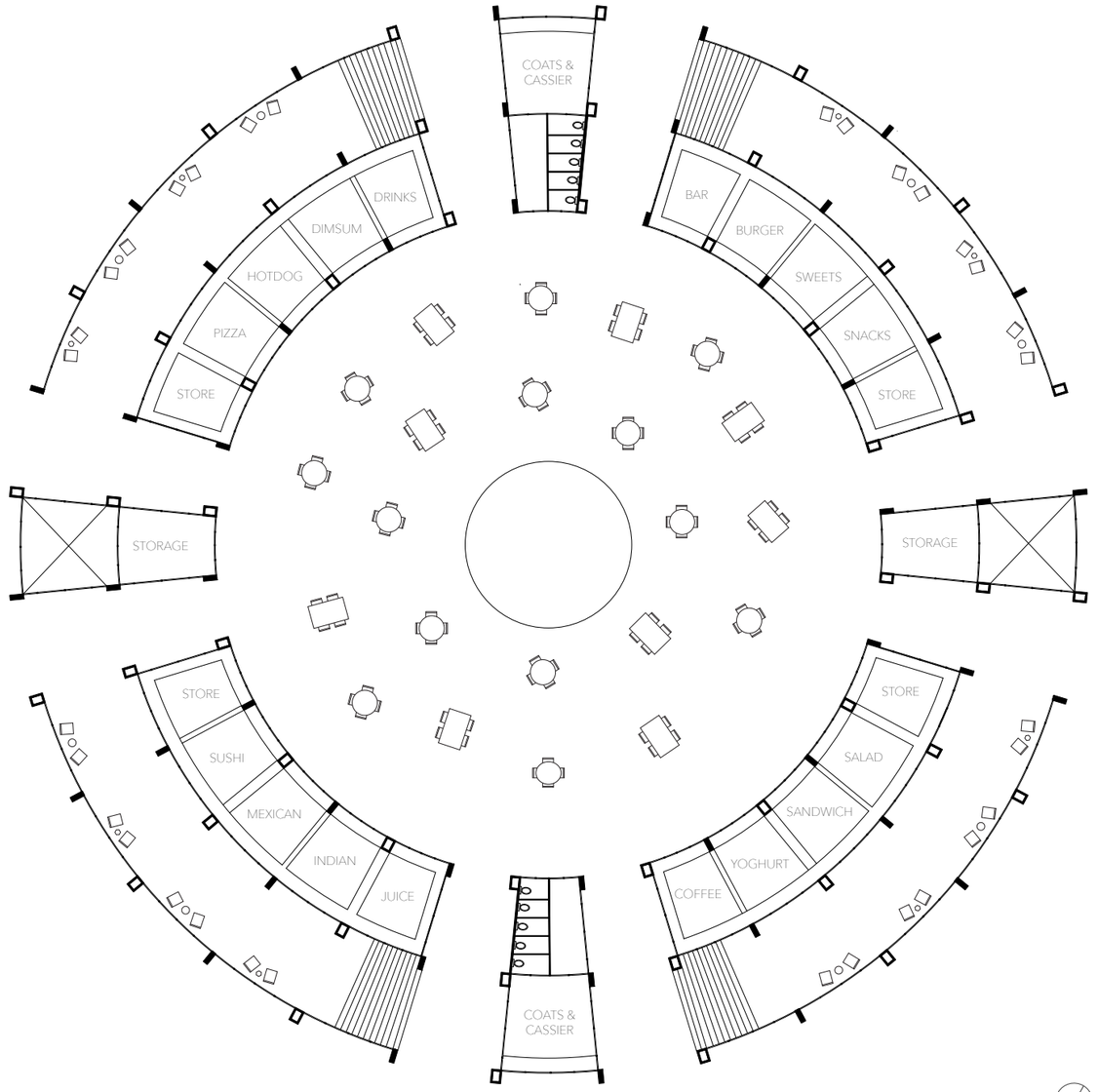


Semi-permanent structure with systems



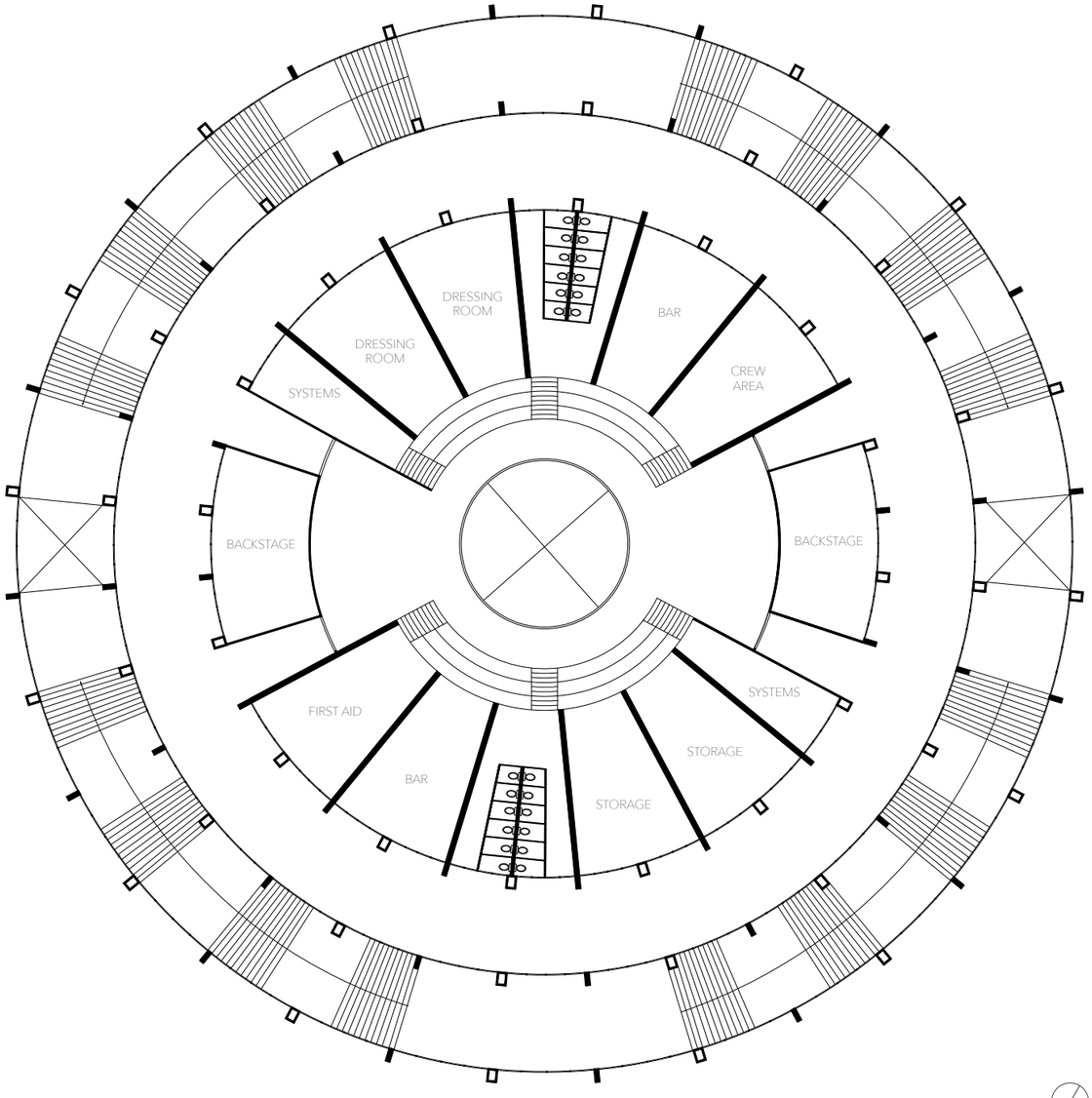
Flexible wall structures through fabric

P3 - PLAN 00



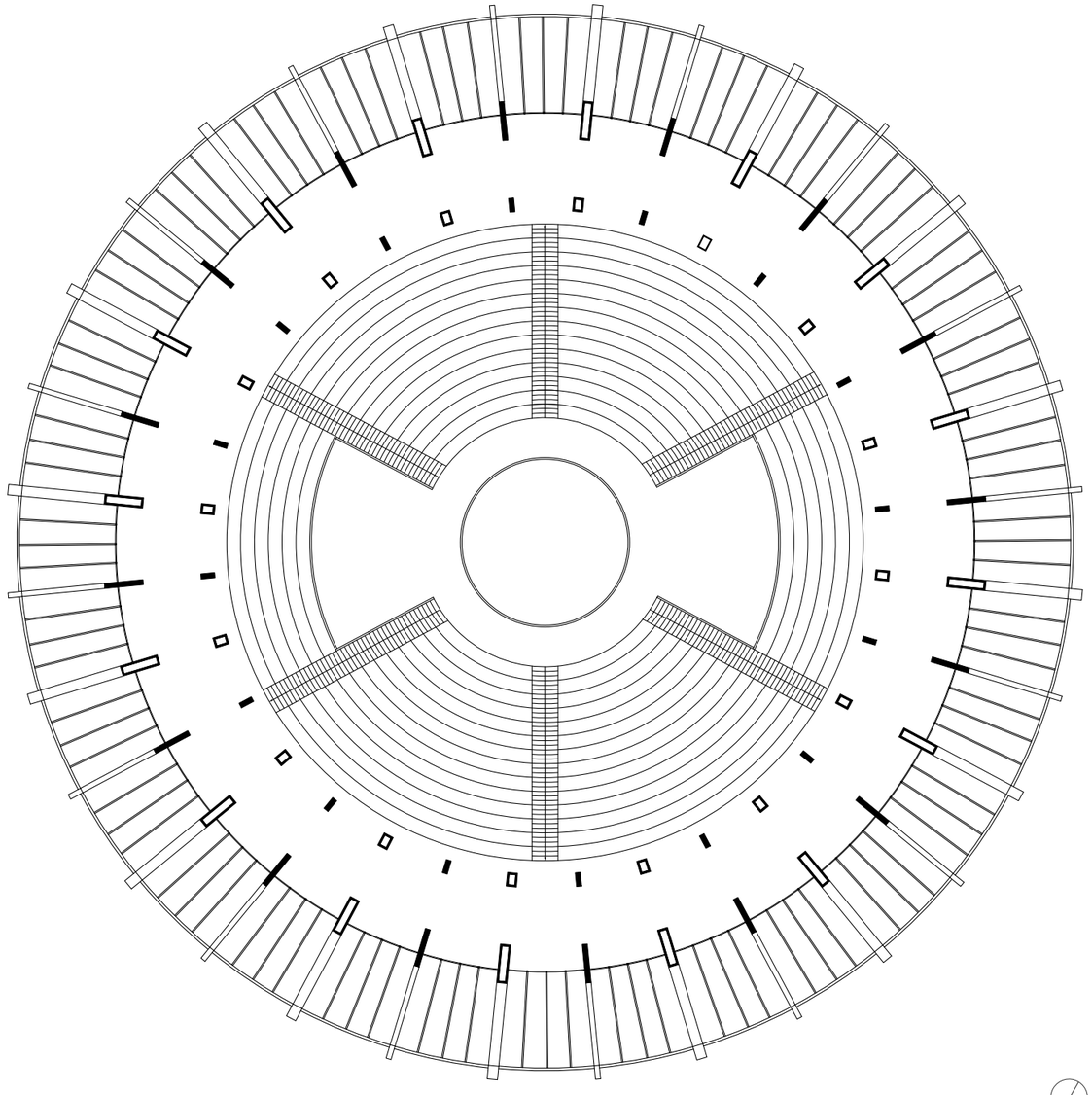
1:500 (145%)

P3 - PLAN 01



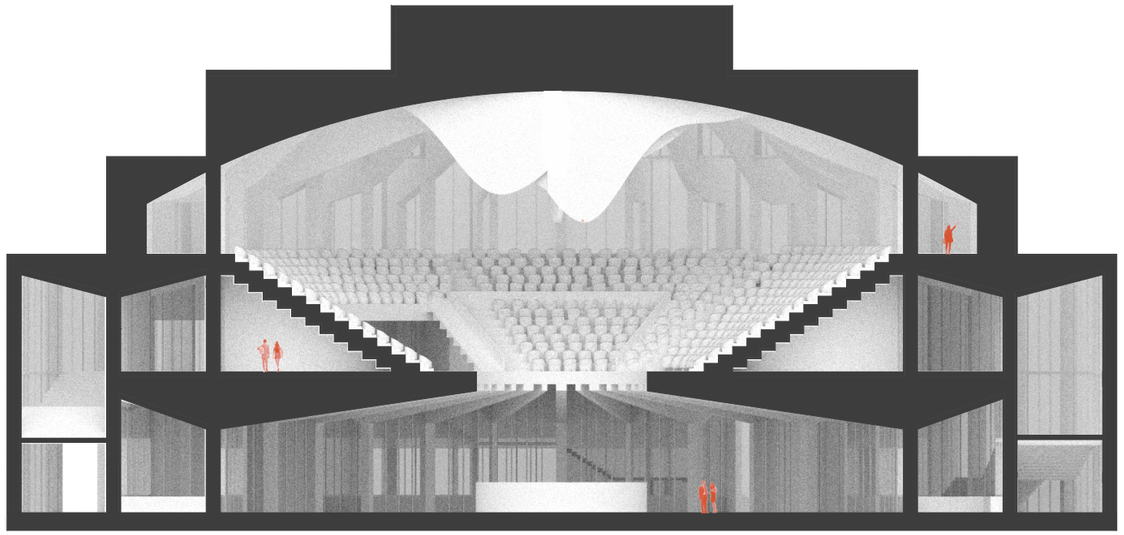
1:500 (145%)

P3 - PLAN 01+



1:500 (145%)

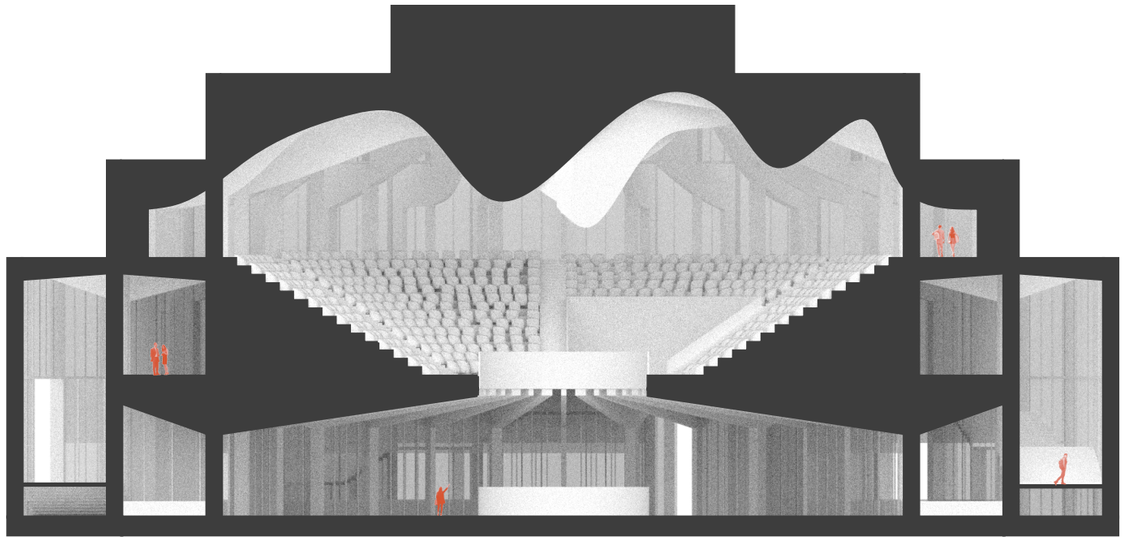
P3 - SECTION 1



1:500 (145%)

Northwest-Southeast

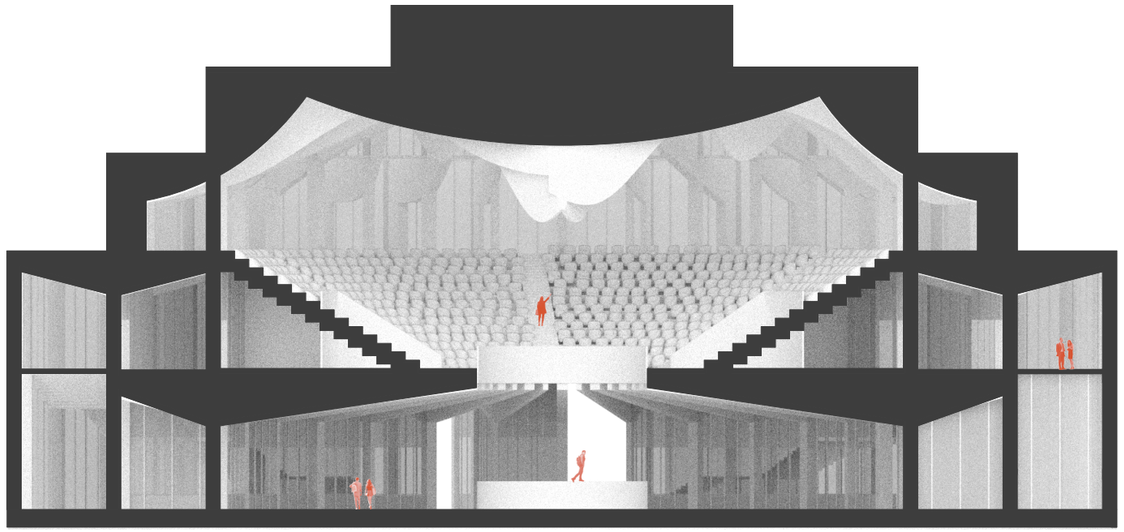
P3 - SECTION 2



1:500 (145%)

North-South

P3 - SECTION 3



1:500 (145%)

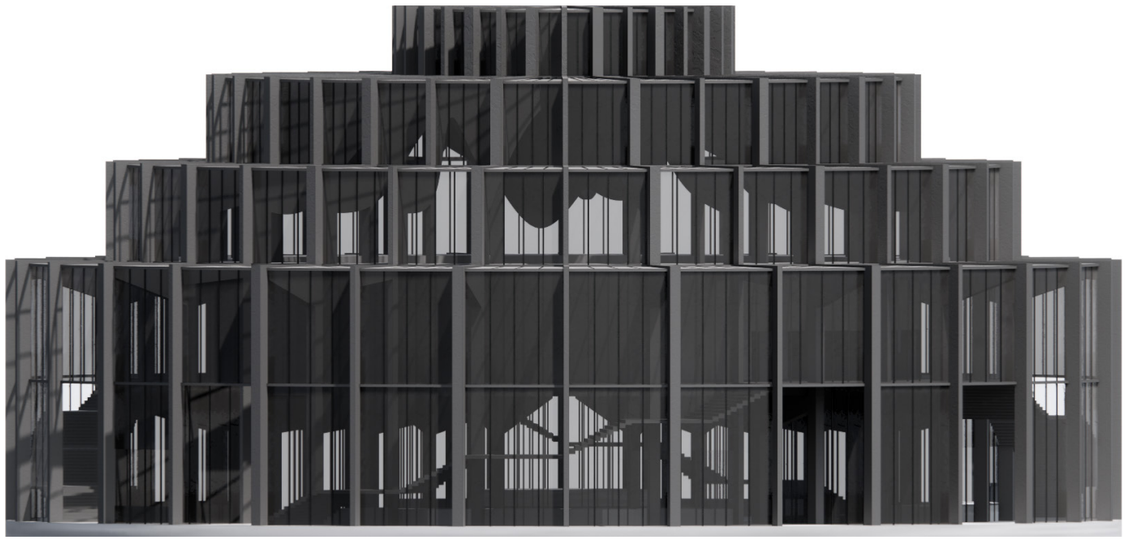
Northeast-Southwest

P3 - FACADE 1

1:500 (145%)

North-west

P3 - FACADE 2



1:500 (145%)

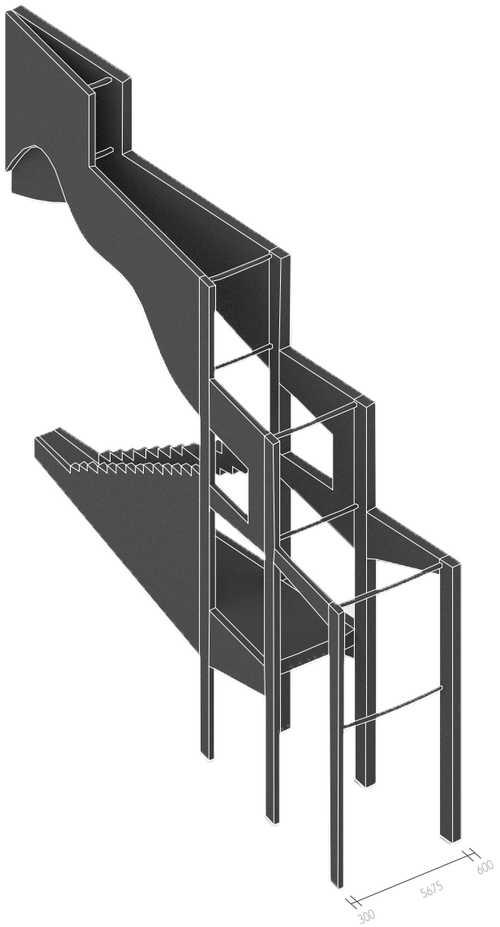
North-west

P3 - FACADE 3

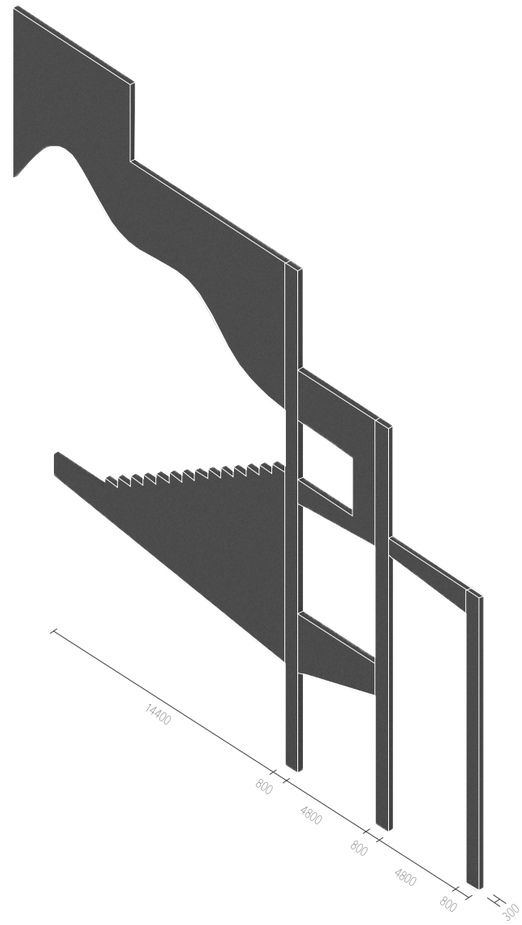
1:500 (145%)

North-west

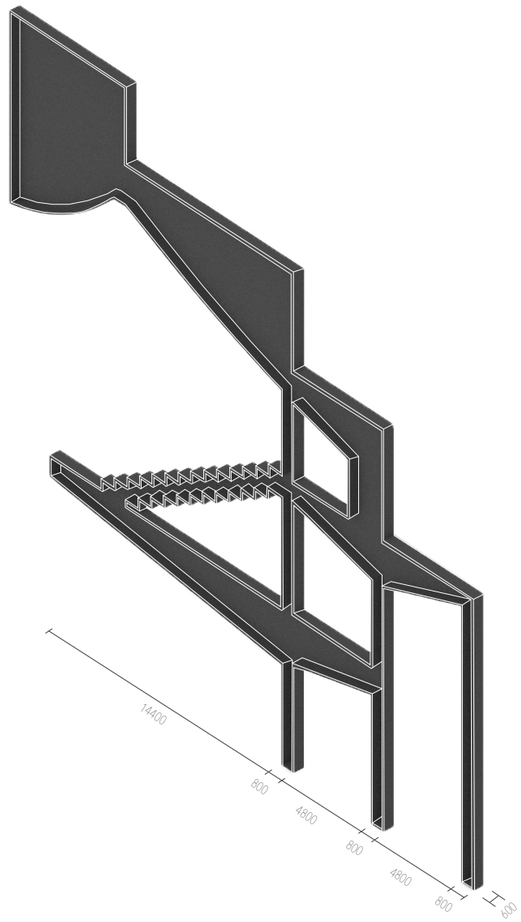
P3 - CONSTRUCTION



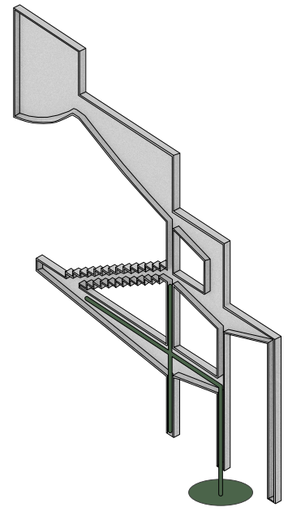
P3 - CONSTRUCTION ELEMENT



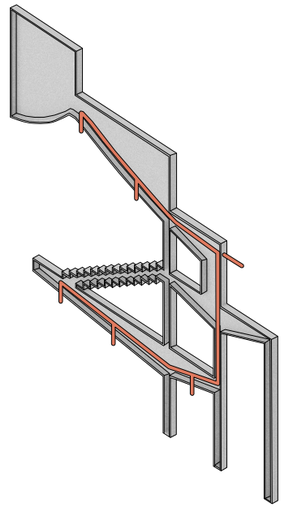
P3 - SYSTEM ELEMENT



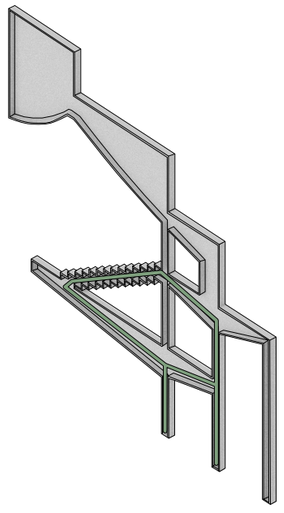
P3 - SYSTEMS



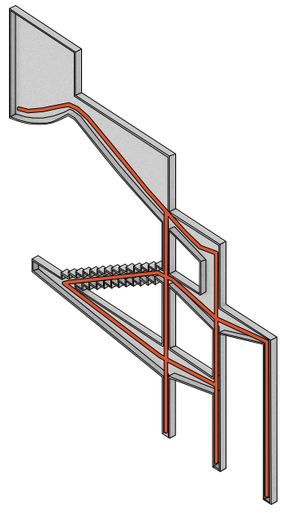
Greywater reuse



Mechanical ventilation input

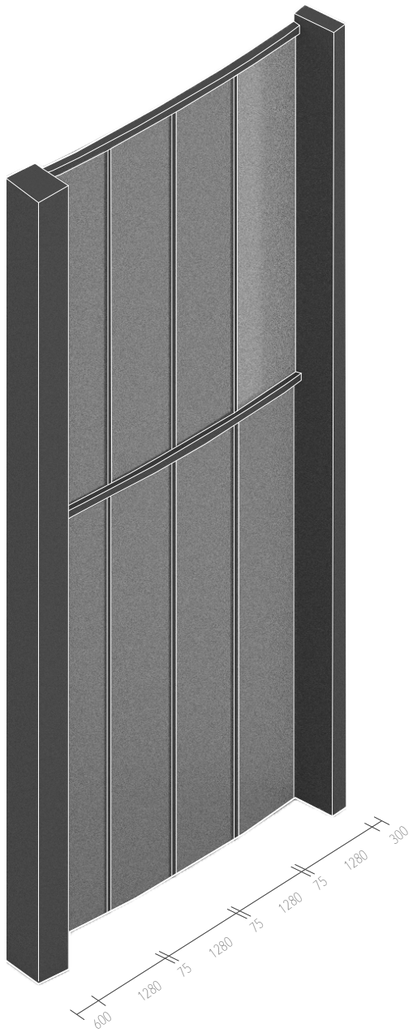


Water

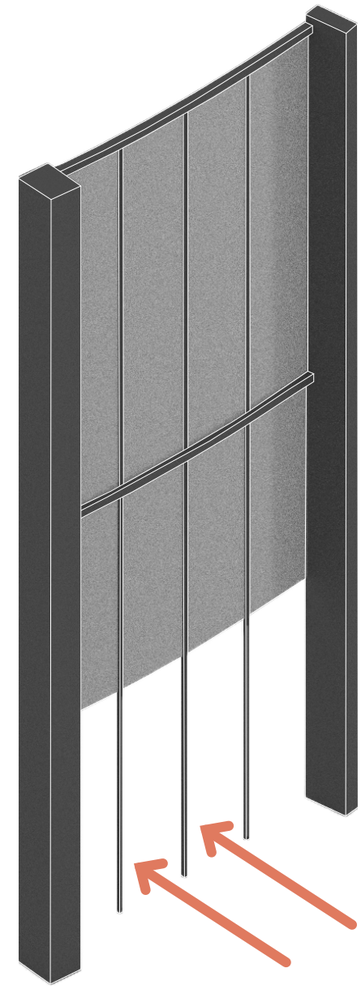


Electricity

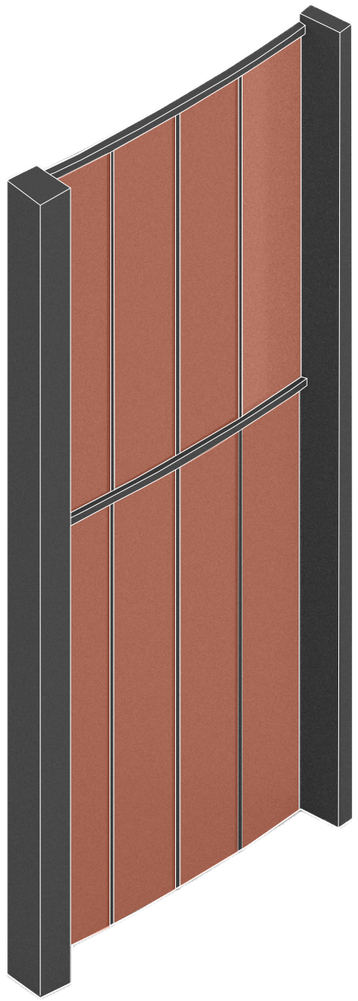
P3 - WALL SYSTEM ETFE



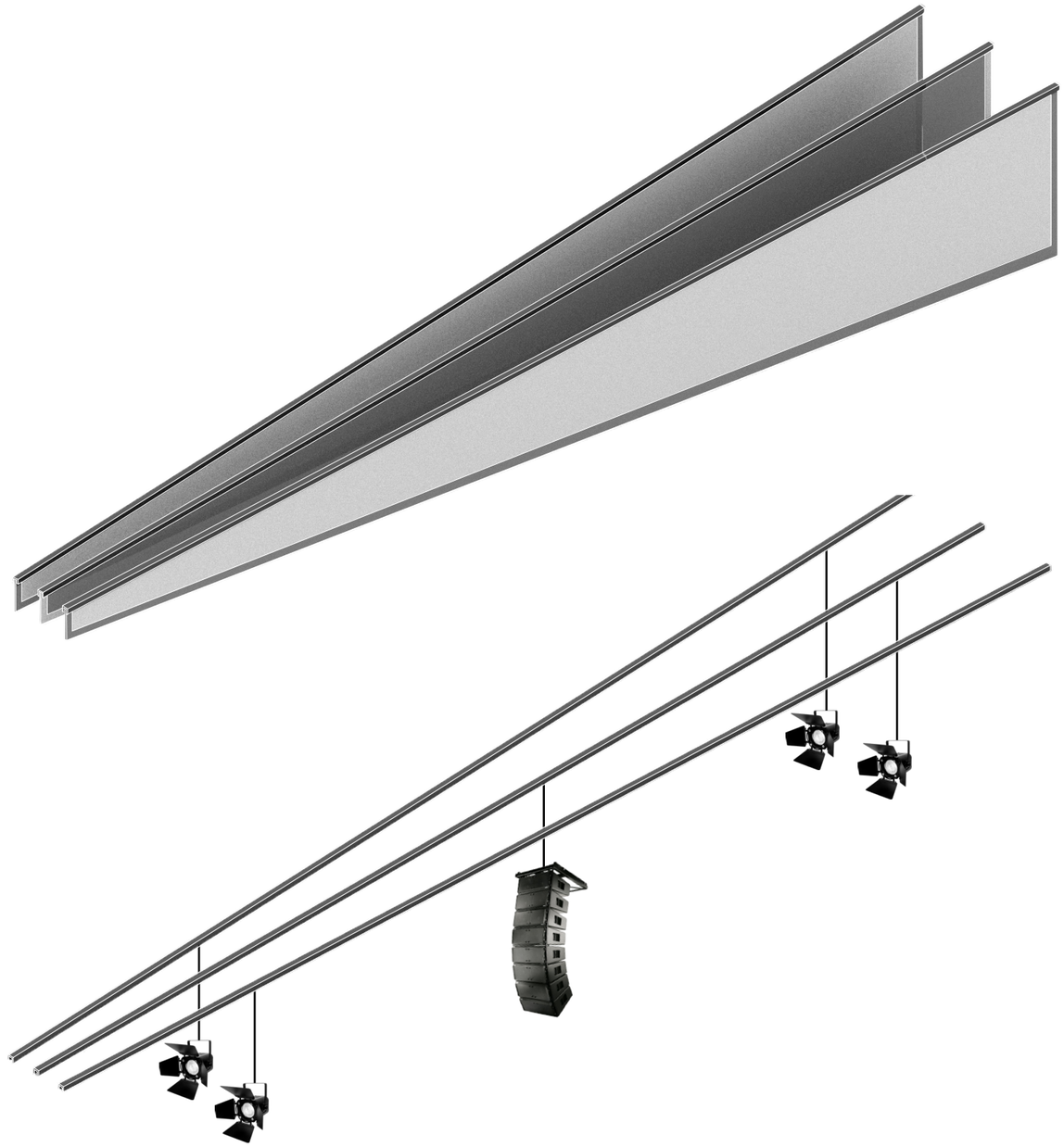
P3 - NATURAL VENTILATION



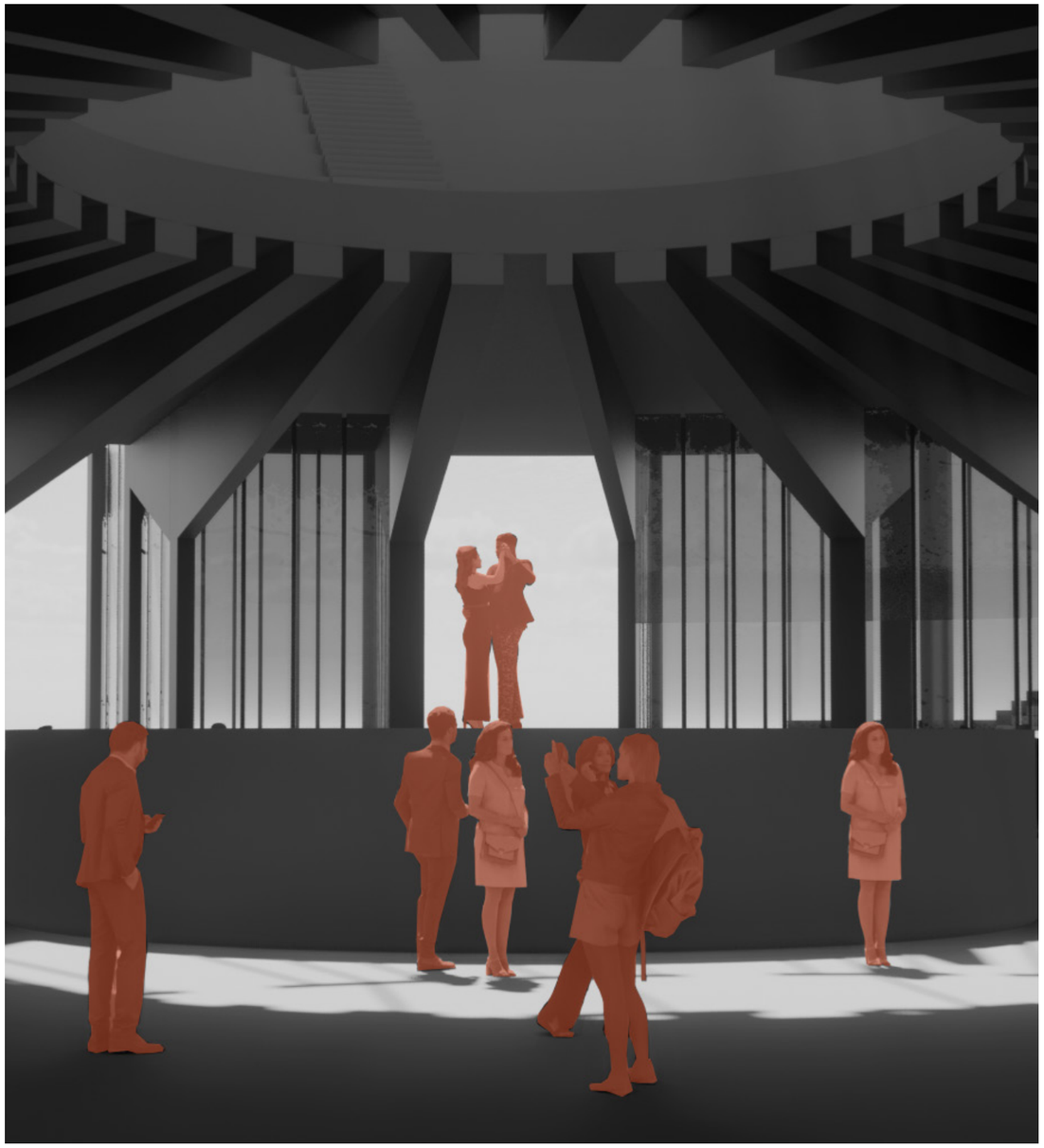
P3 - EFTE SOLAR PANELS



P3 - RAILING FOR MUSIC HALL



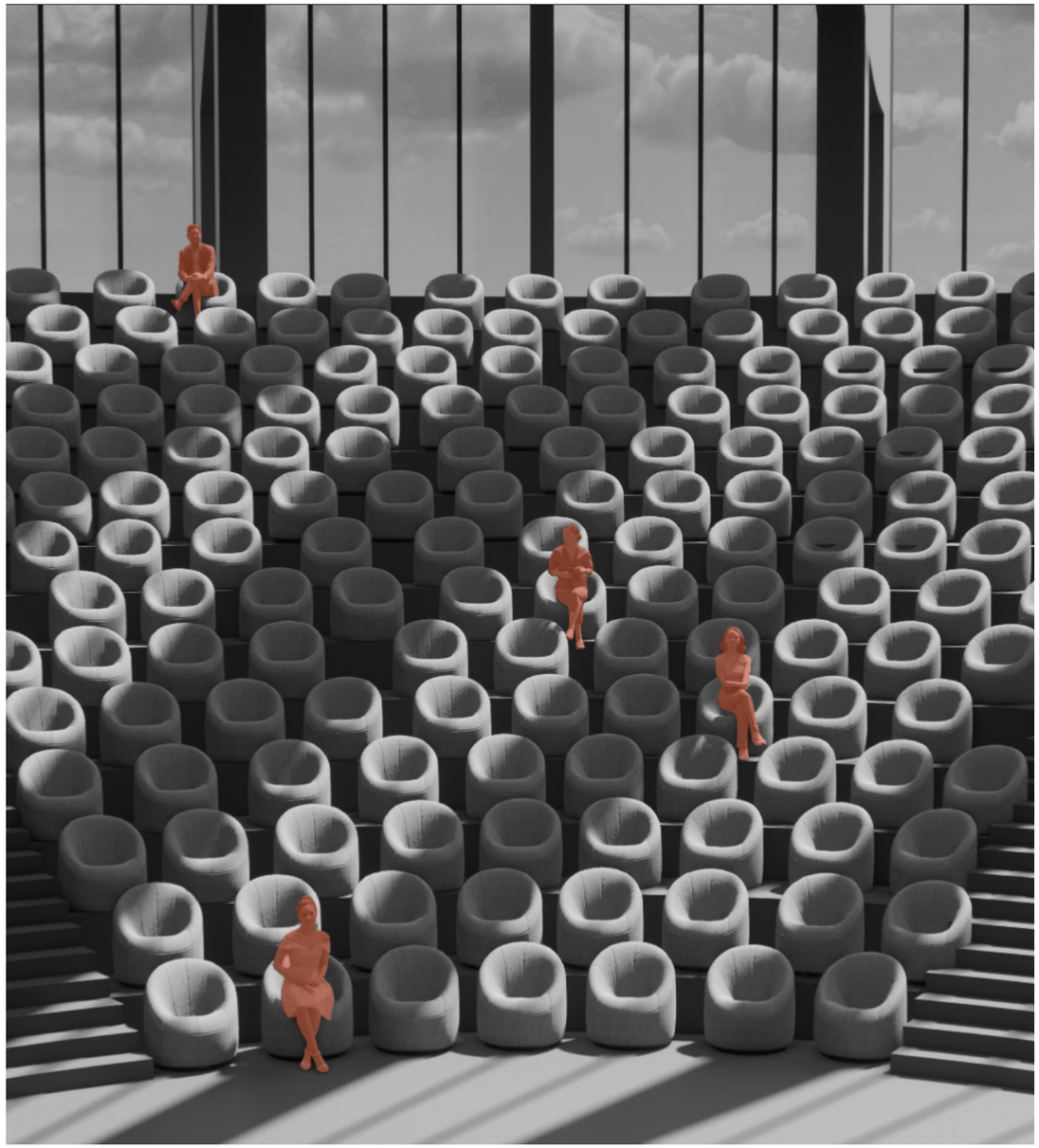
P3 - INTERIOR IMPRESSION



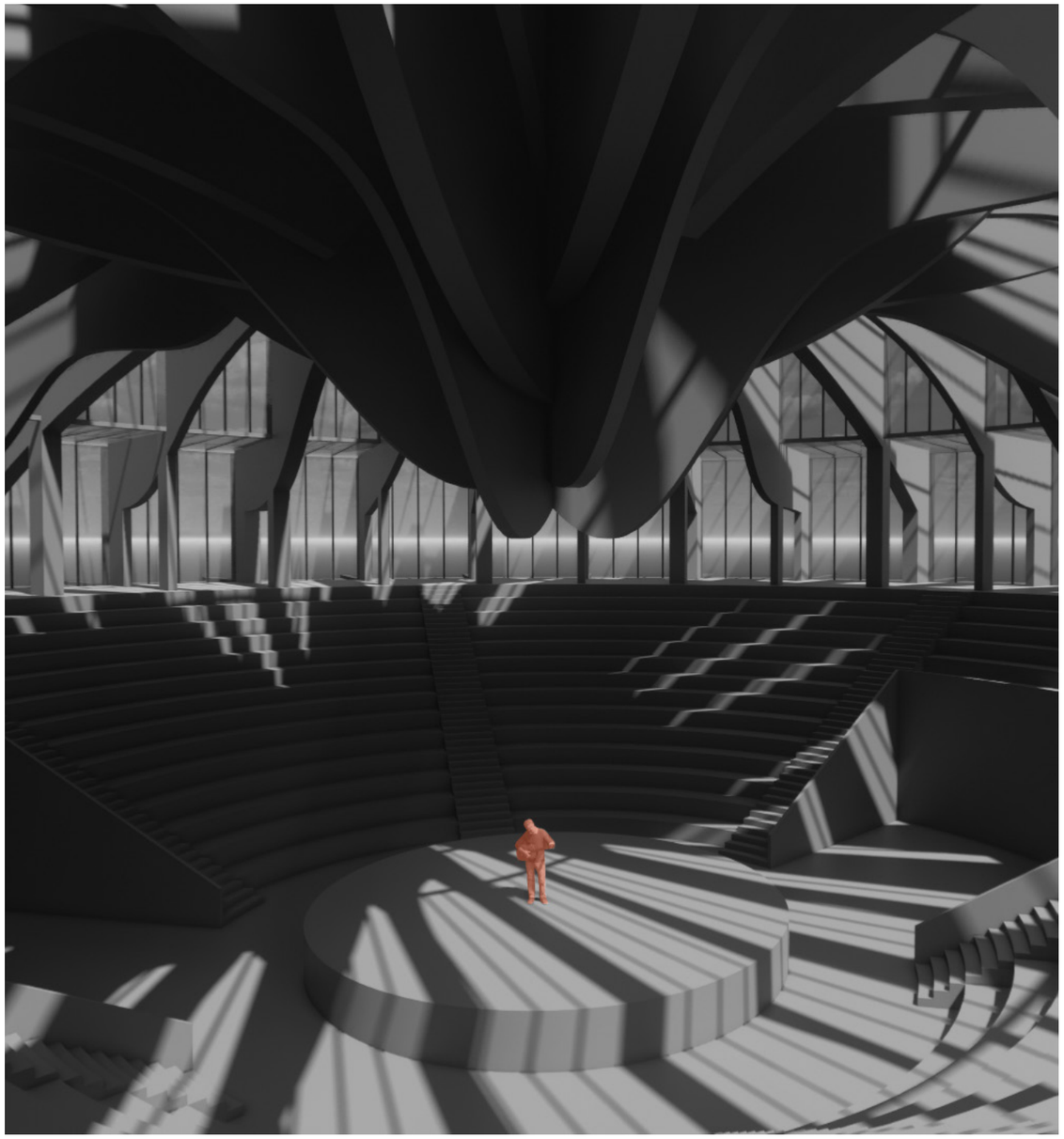
Multifunctional groundfloor space

Stairs to first floor

P3 - INTERIOR IMPRESSION

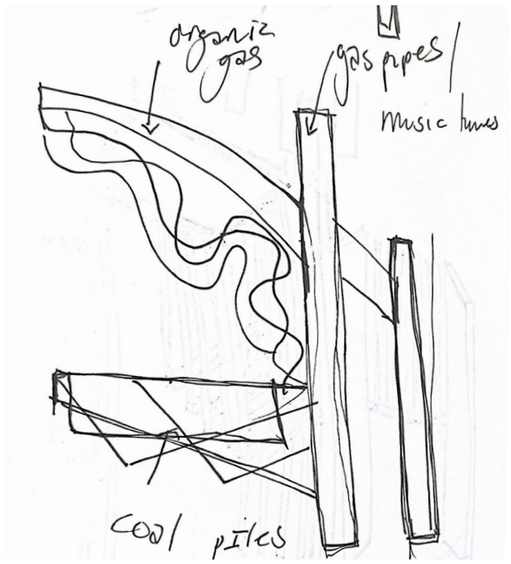


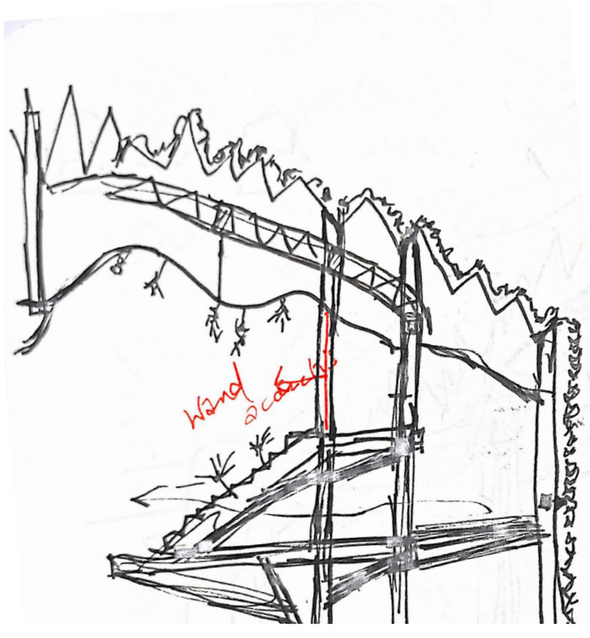
Chairs in music hall



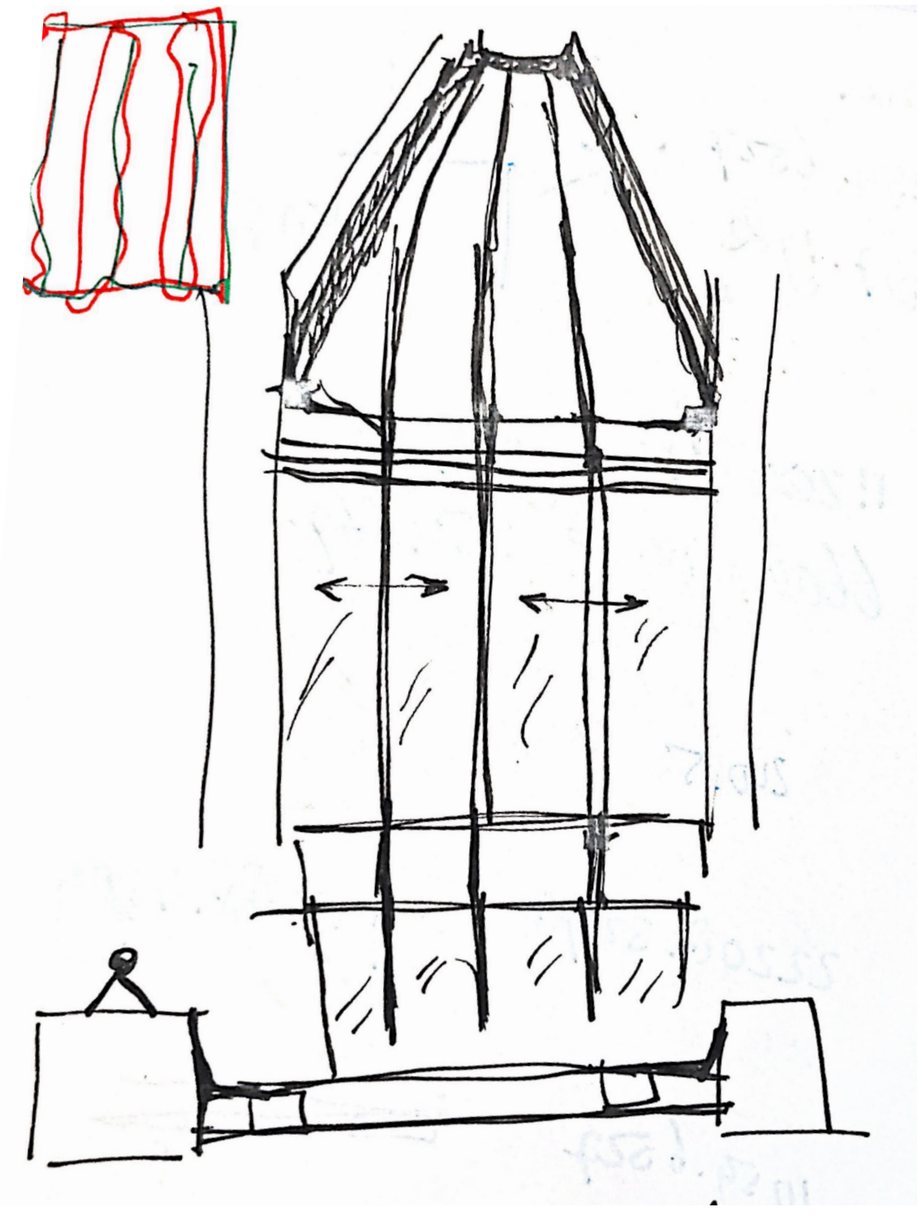
Roof of music hall

Q4 - REDESIGN CONSTRUCTION

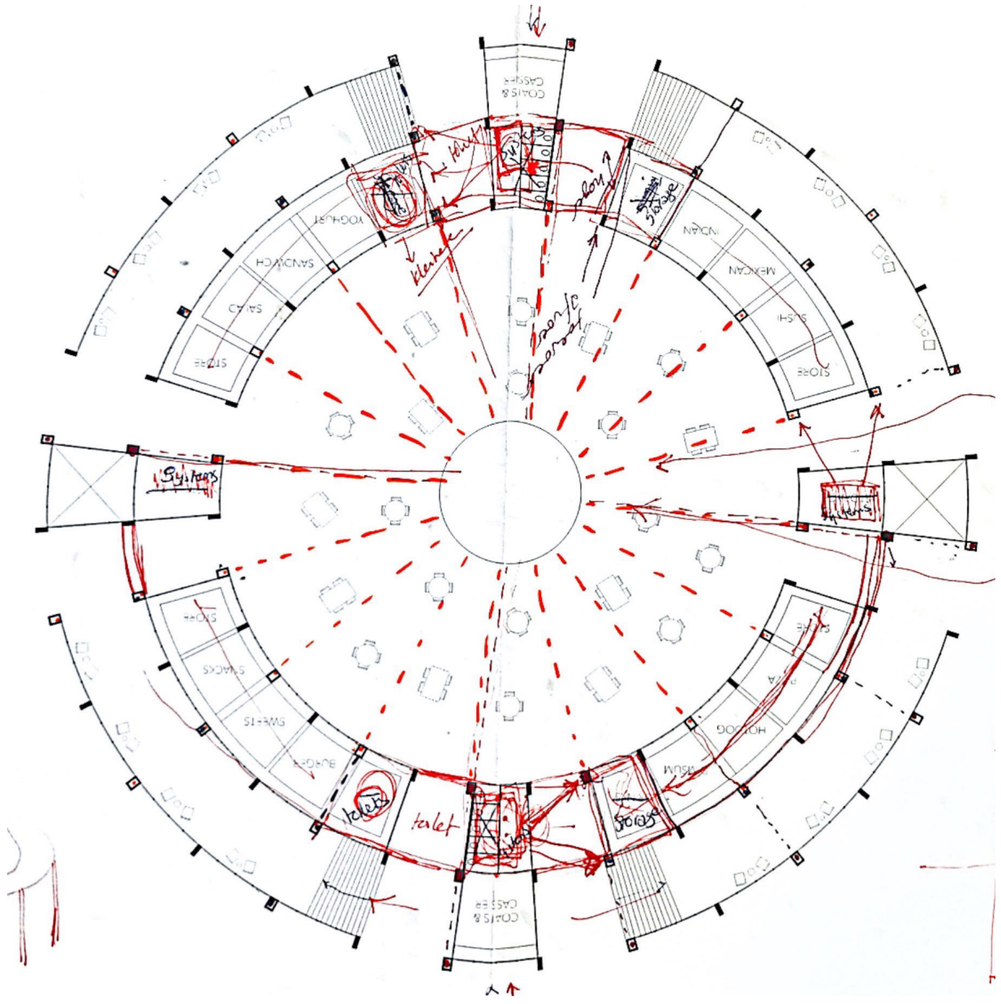




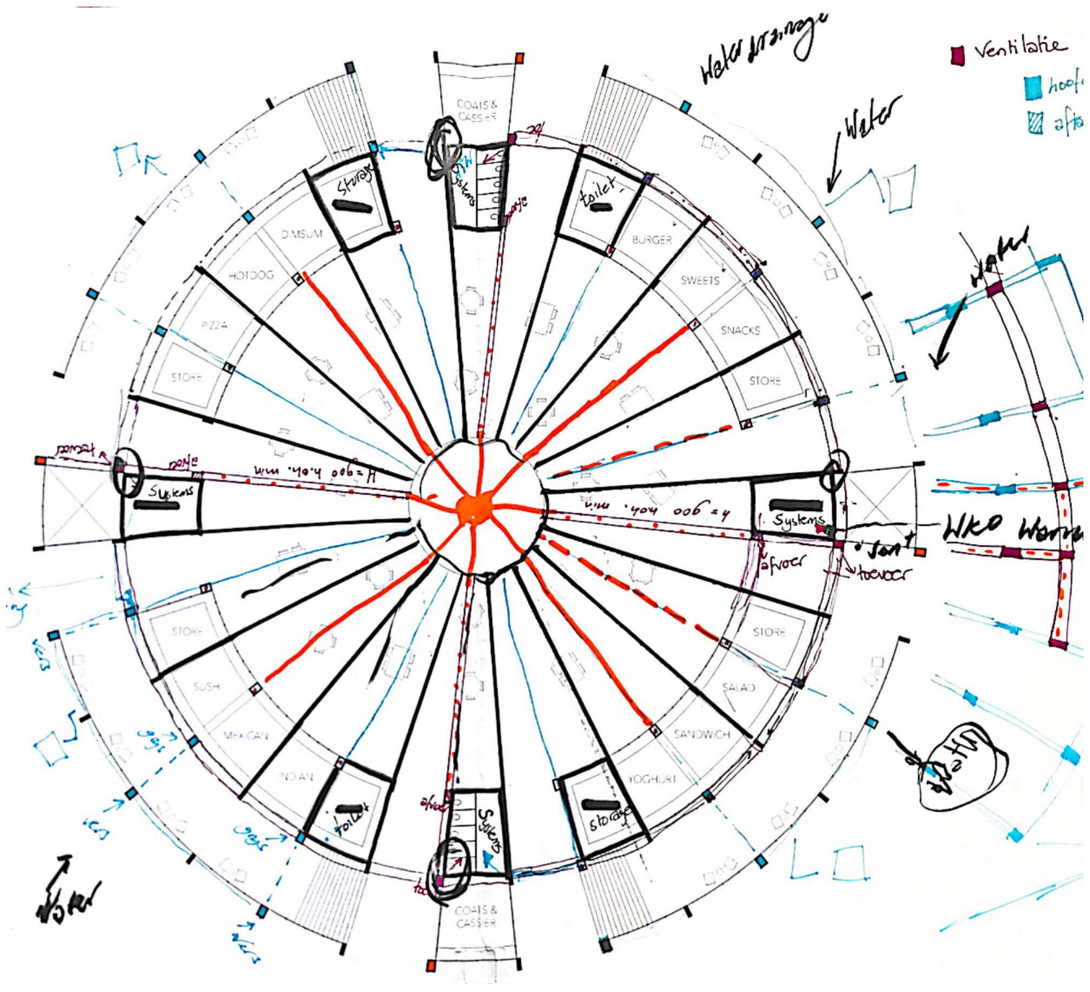
Q4 - FACADE REDESIGN



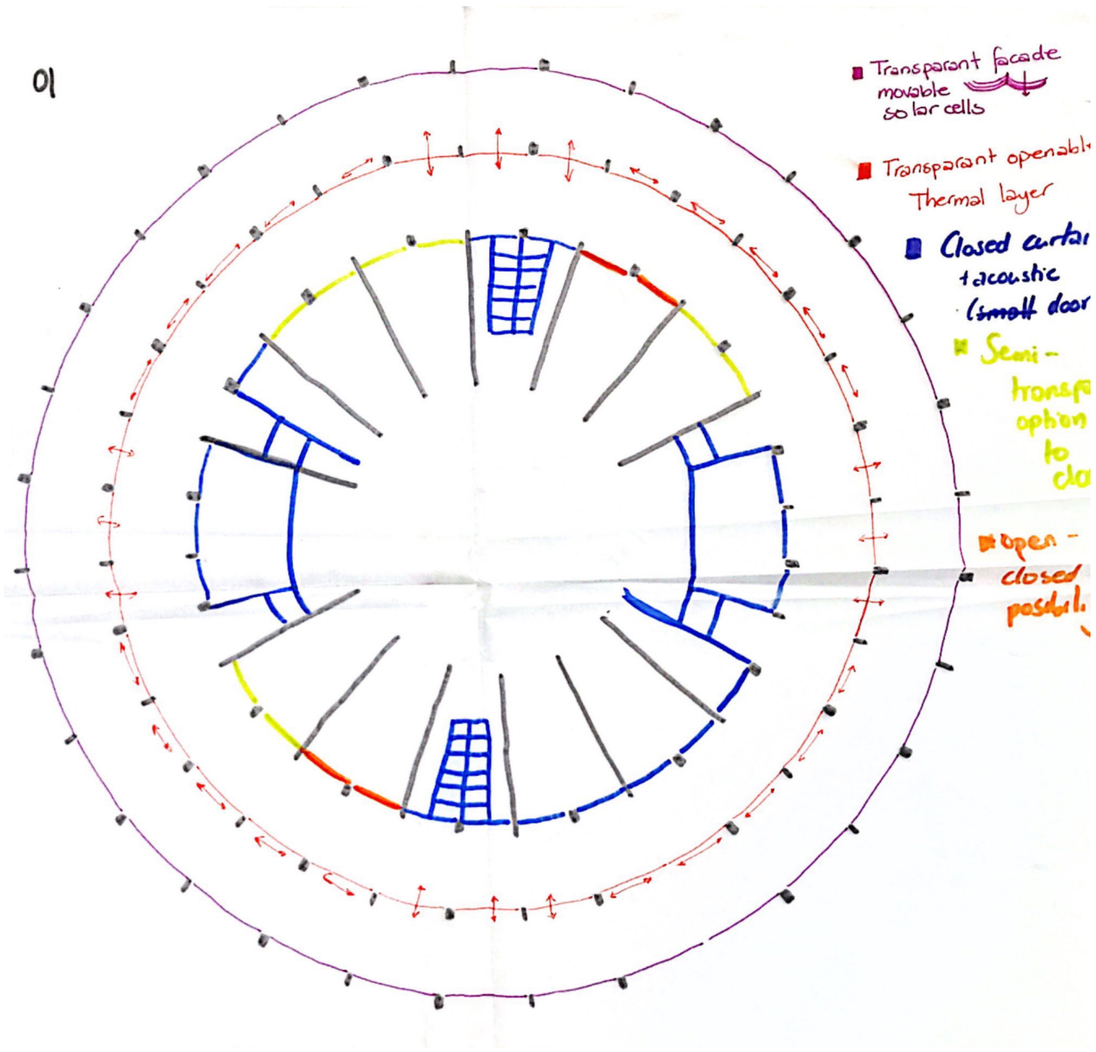
Q4 - VENTILATION



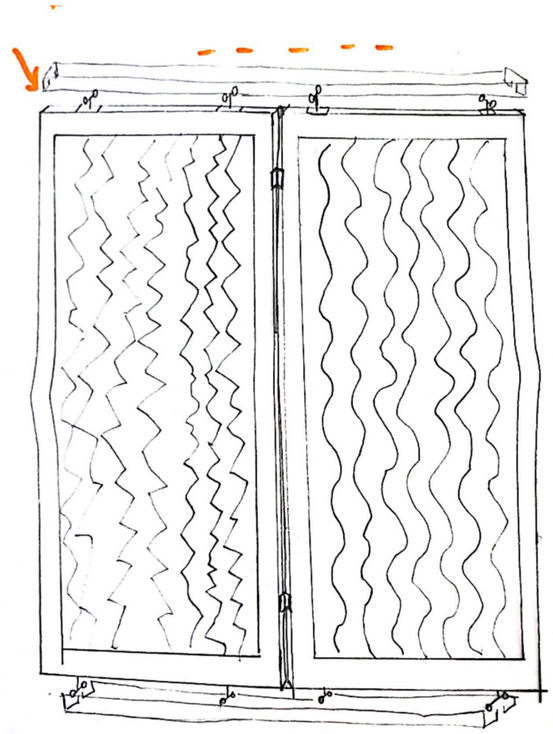
Q4 - SYSTEMS

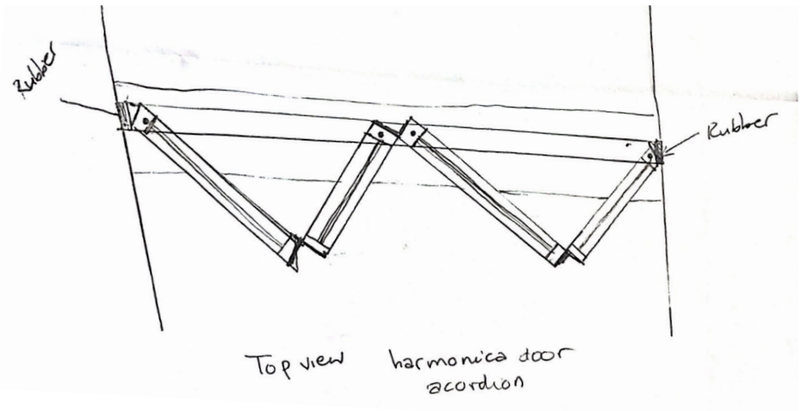


Q4 - HARMONICA DOORS



Q4 - HARMONICA DOORS





FINAL DESIGN

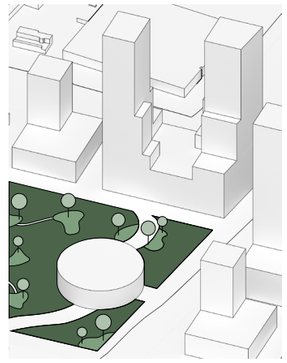
SITE PROBLEMS

Privatised area through fencing

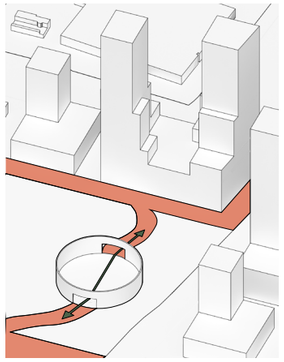
Area designed for car

Buildings disconnected from public space

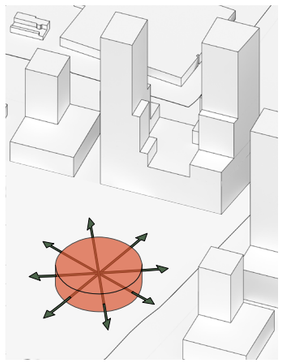
SITE VISION



Music venue as part of public park



Connect music venue to new public space of The Hague



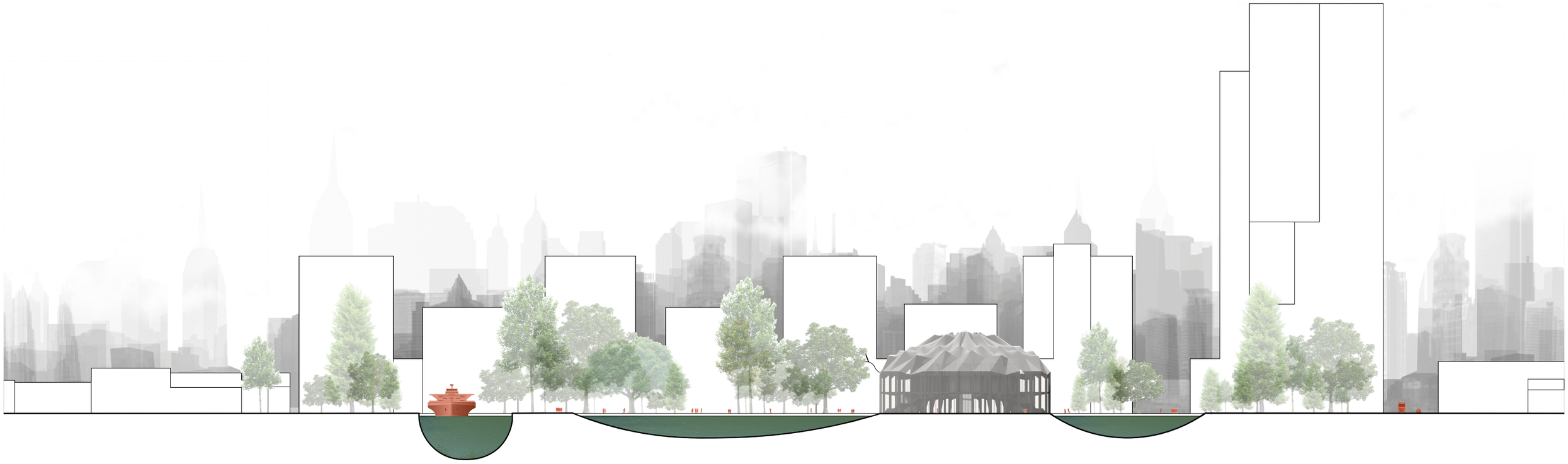
Direct visual connection music venue to surroundings

SITE PLAN

Site plan Binckhorst

1:2500

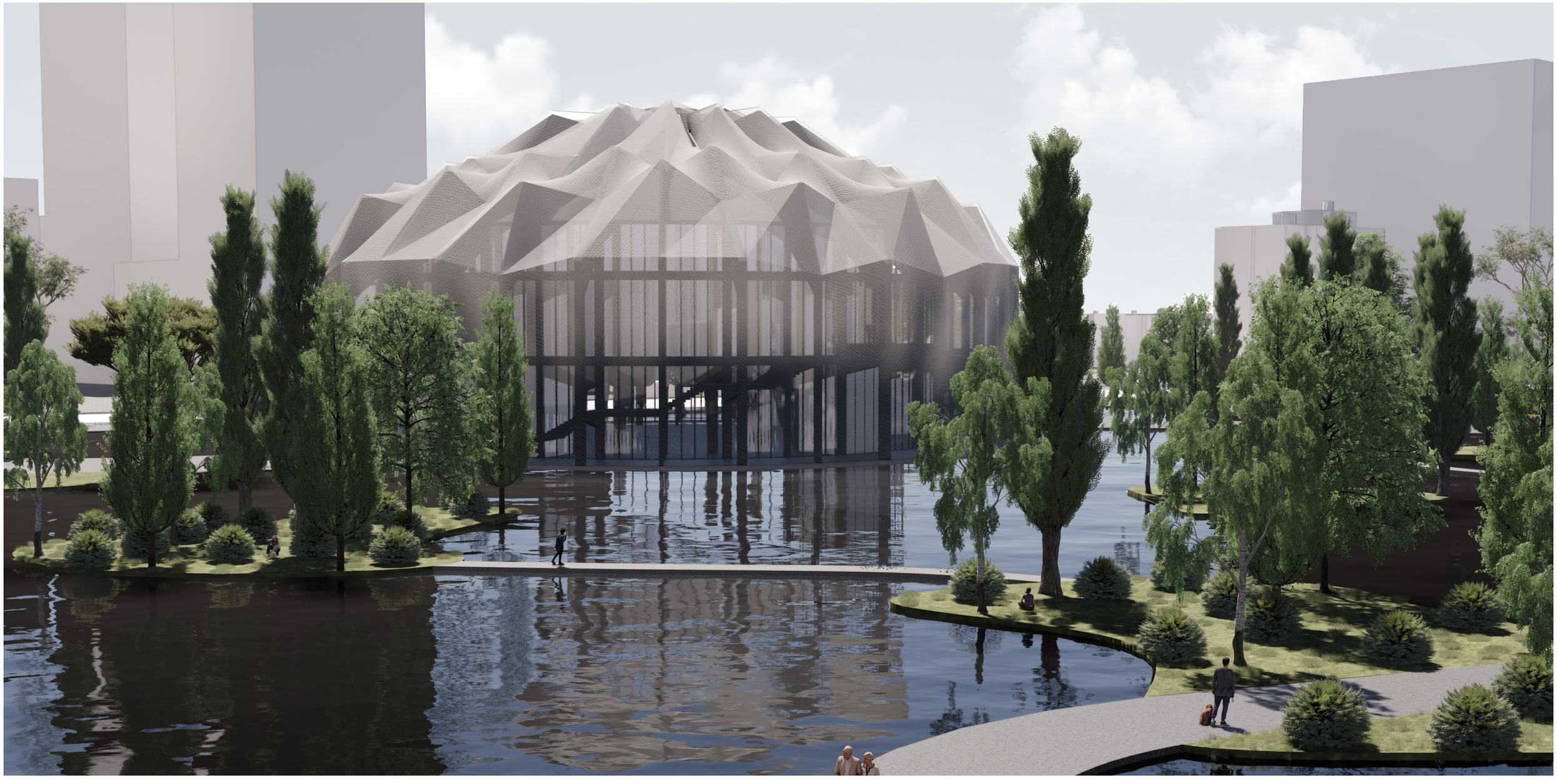
SITE SECTION



Section Southwest-Southeast

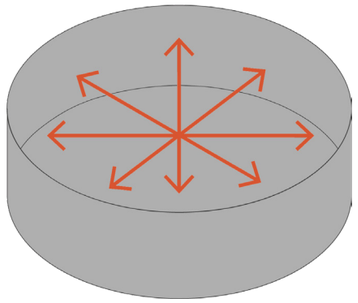
1:1000

RENDER SITE

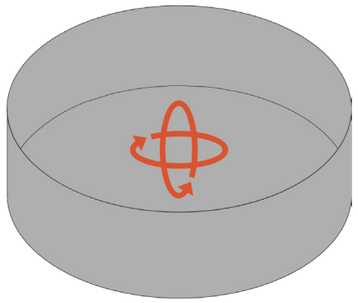


RENDER SITE

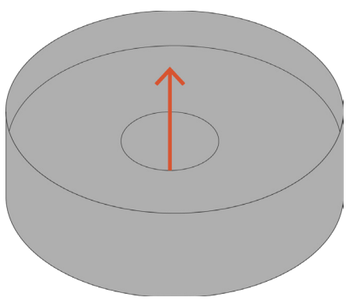
ARCHITECTURAL VISION



Reinterpret minimalistic monotome building

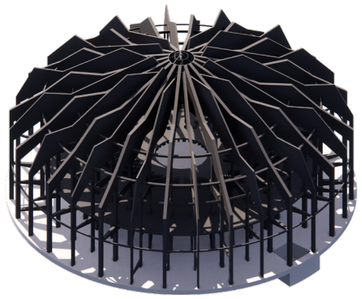


Flexible ground floor



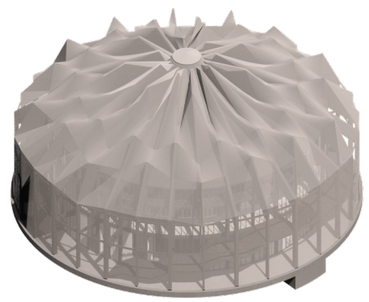
Connect music venue to public

LAYERS OF THE BUILDING



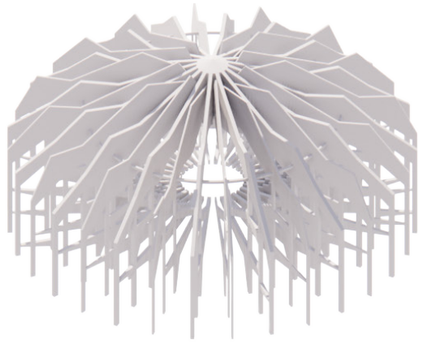
Permanent construction

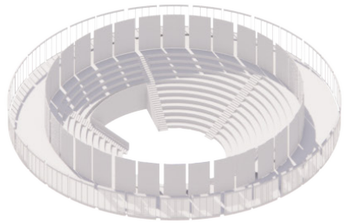
Semi-permanent structure with systems

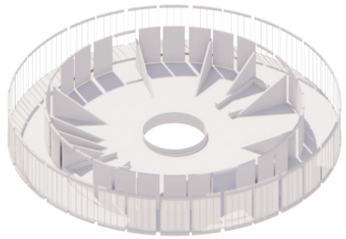


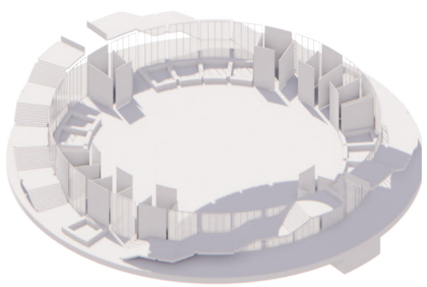
Flexible elements inbetween structure

AXONOMETRY

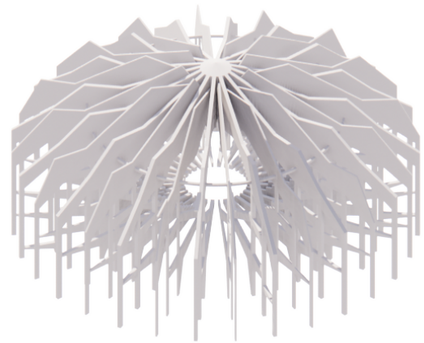


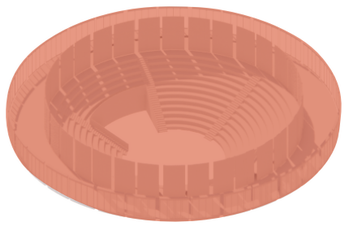




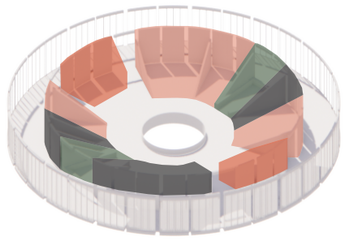


PROGRAM



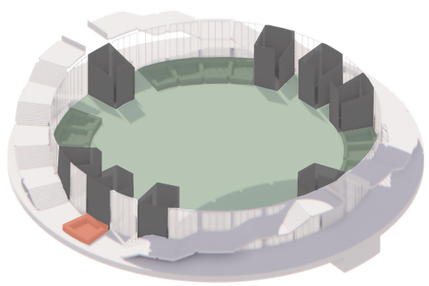


Music venue



Artists and crew

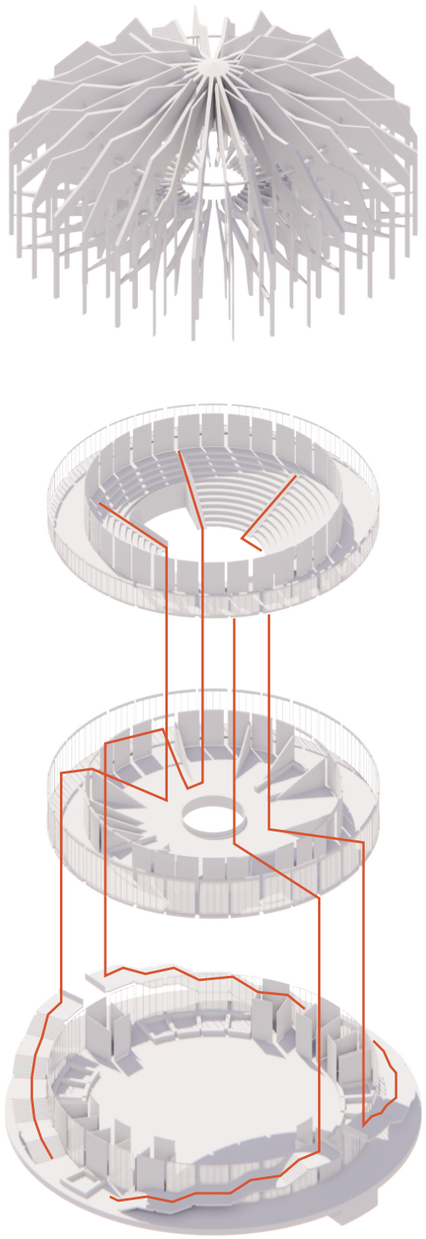
Support



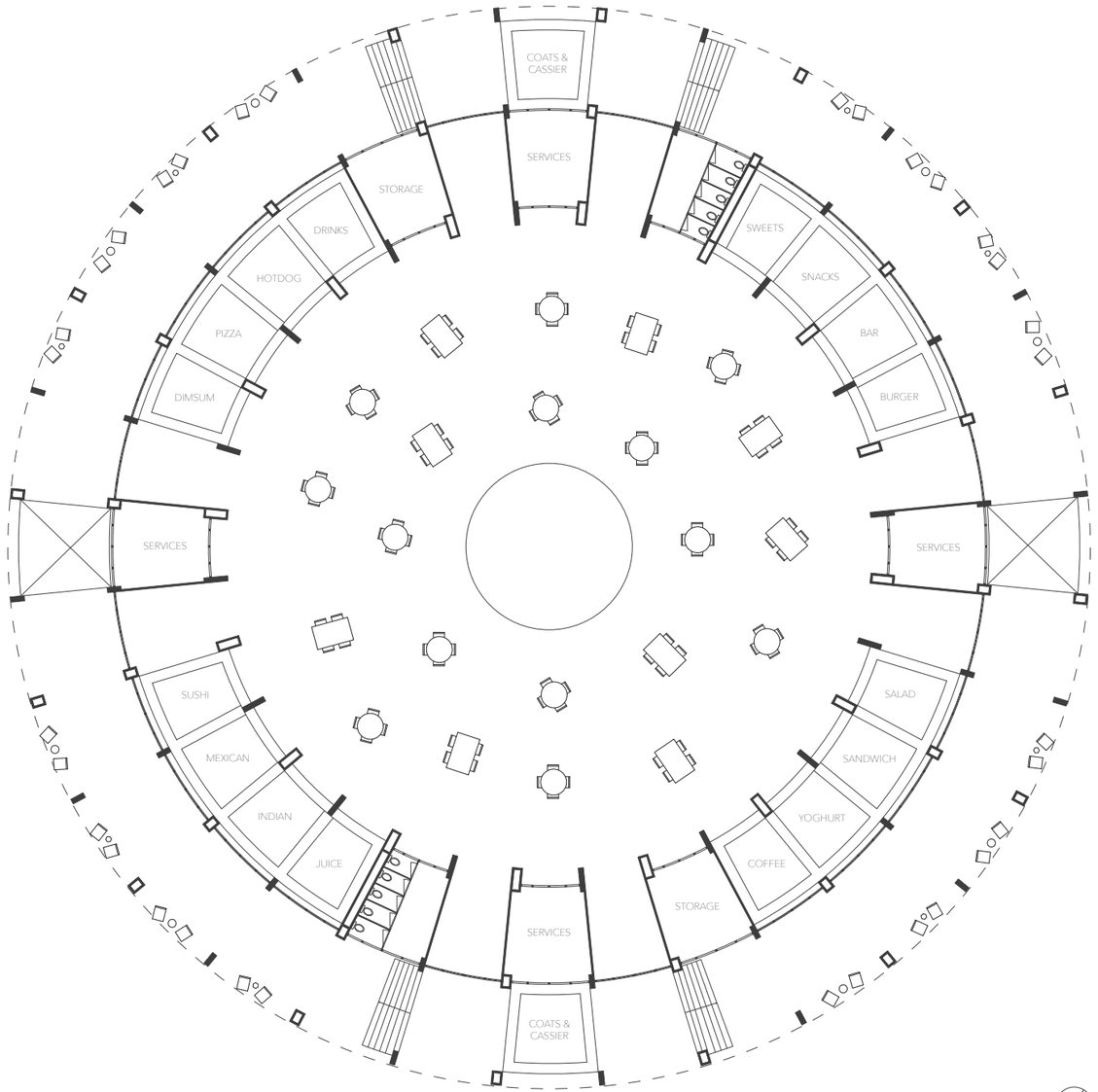
Foodcourt

Multifunctional hall

CIRCULATION

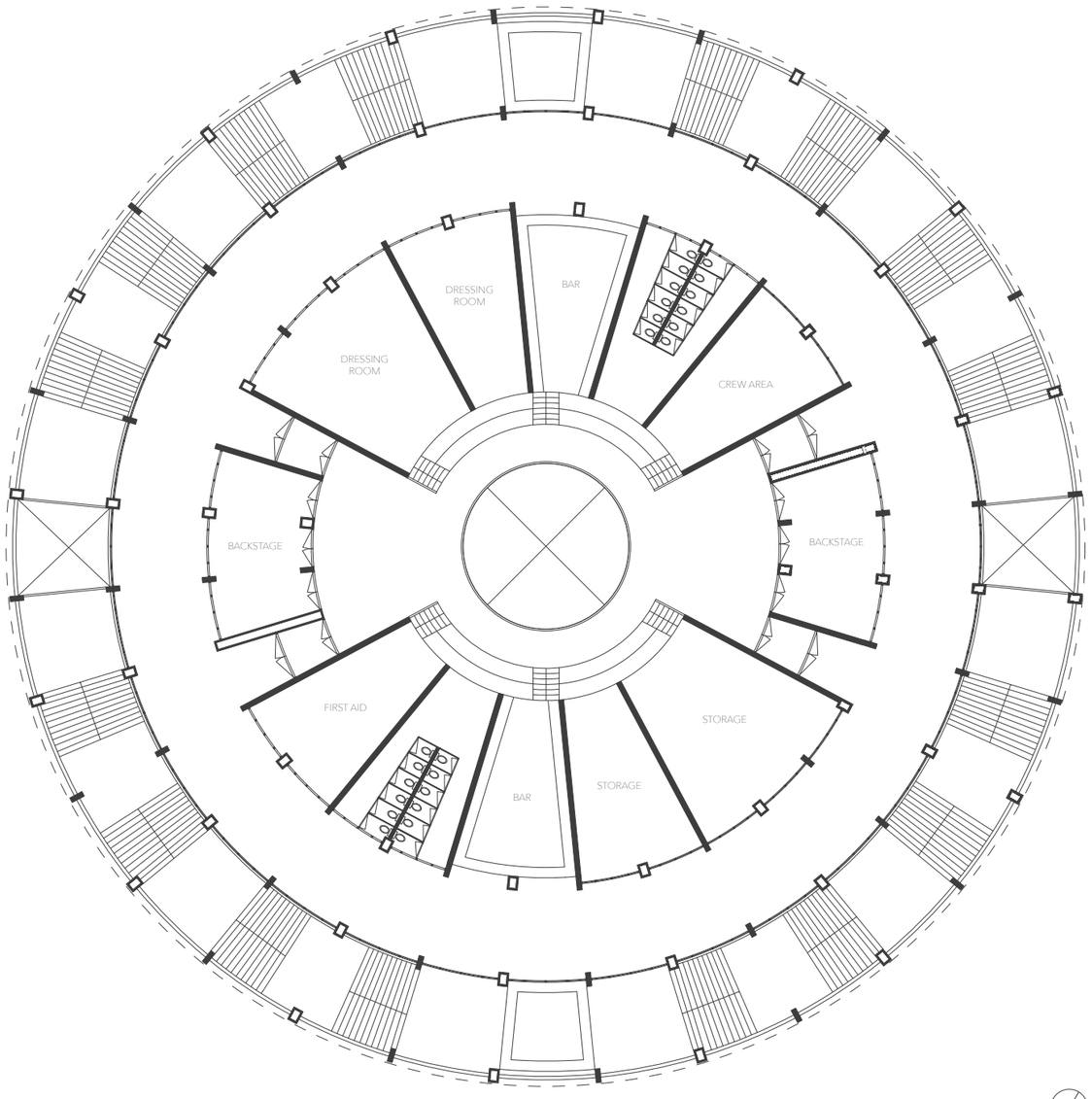


PLAN 00



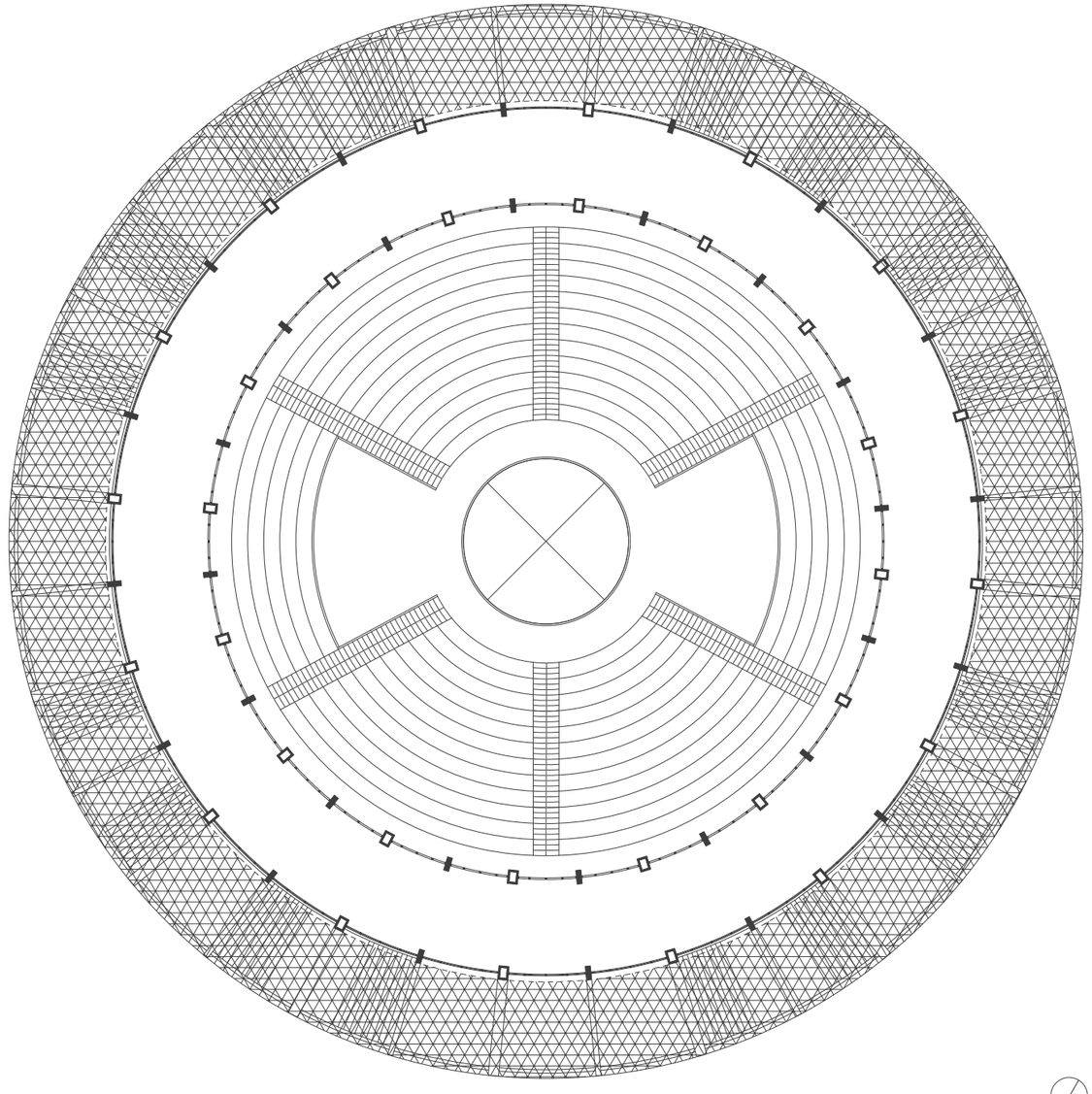
1:500 (145%)

PLAN 01



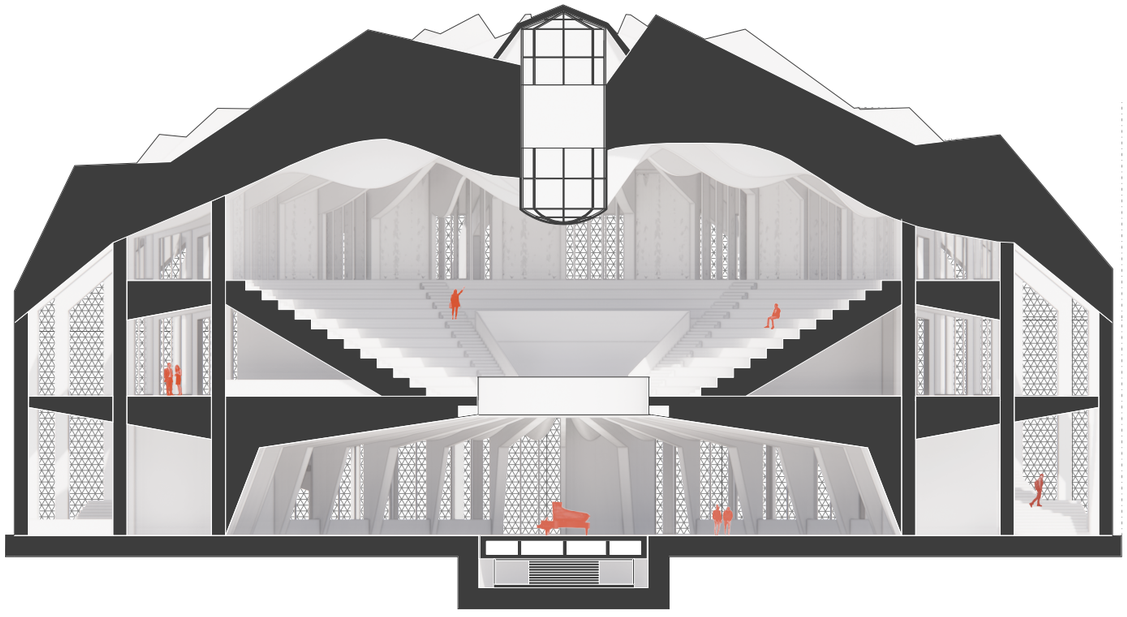
1:500 (145%)

PLAN 01+



1:500 (145%)

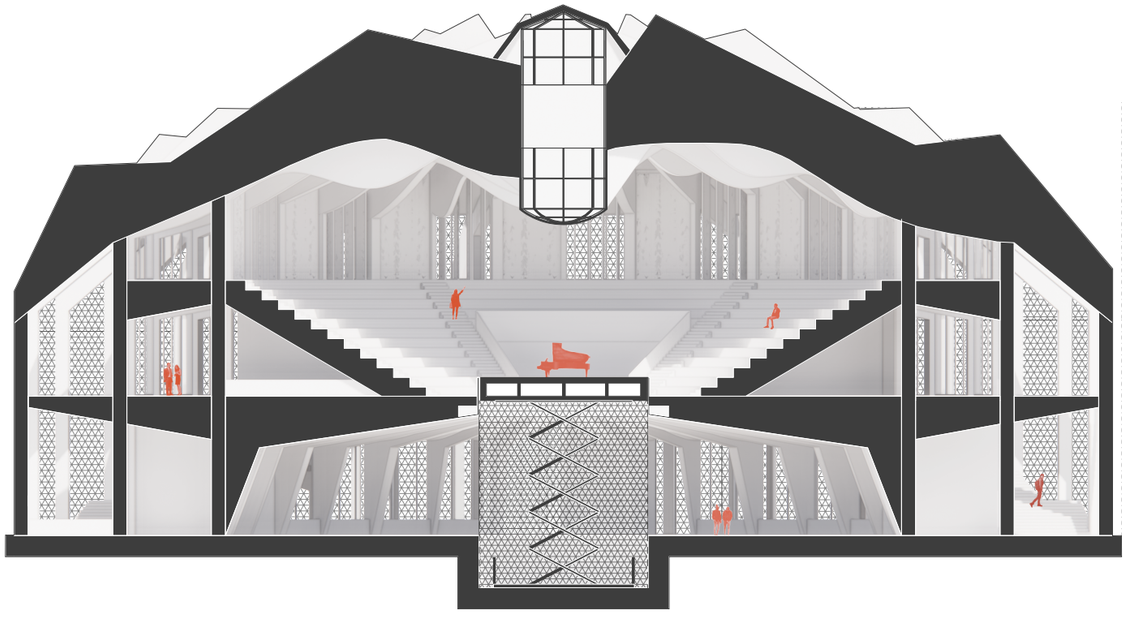
SECTION PODIUM DOWN



1:500 (145%)

Northeast-Southwest

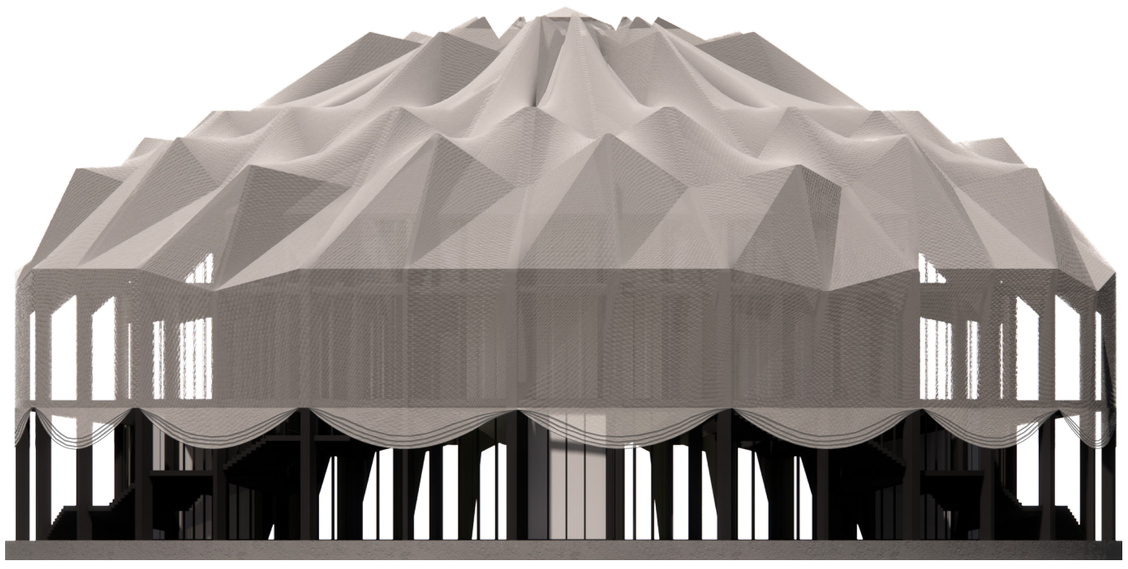
SECTION PODIUM UP



1:500 (145%)

Northeast-Southwest

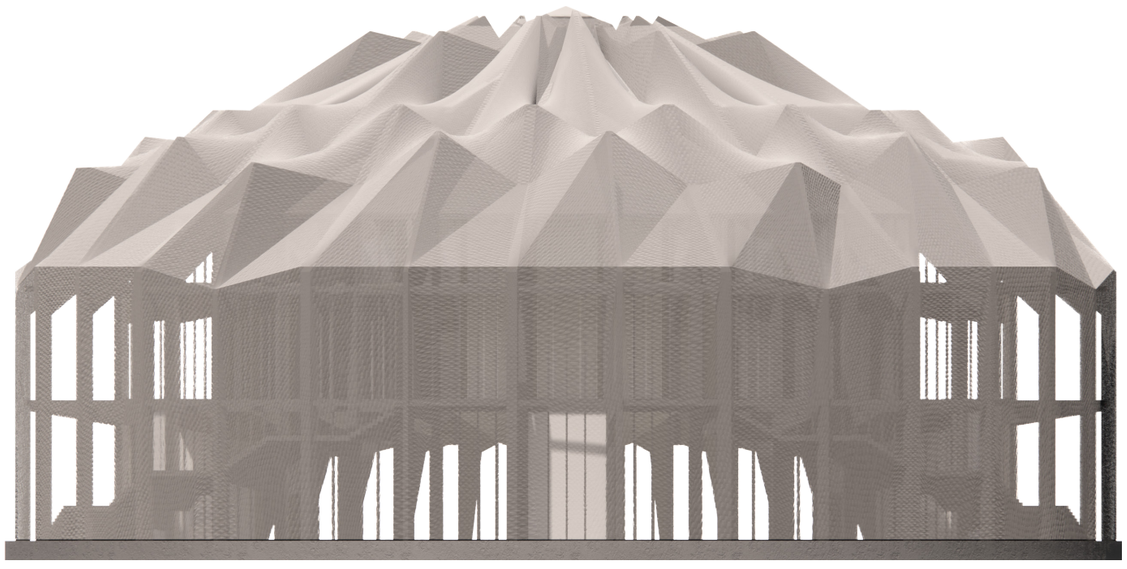
FACADE OPEN



1:500 (145%)

North-west

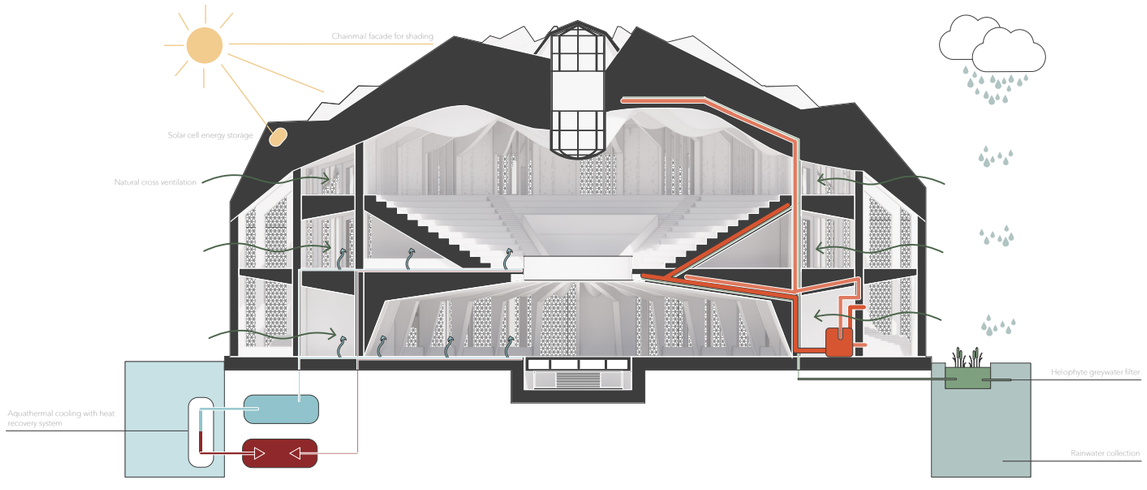
FACADE CLOSED



1:500 (145%)

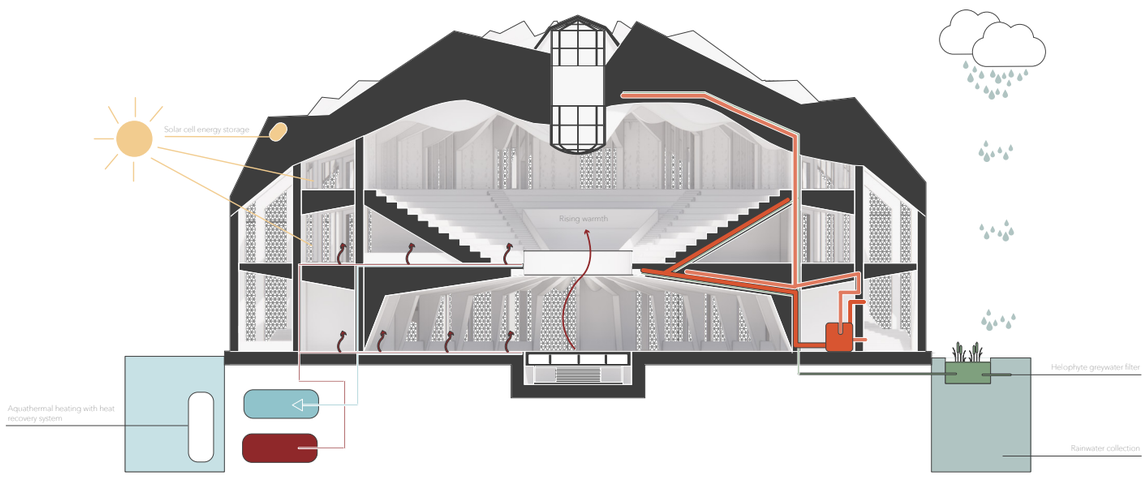
North-west

CLIMATE SCHEME



Summer

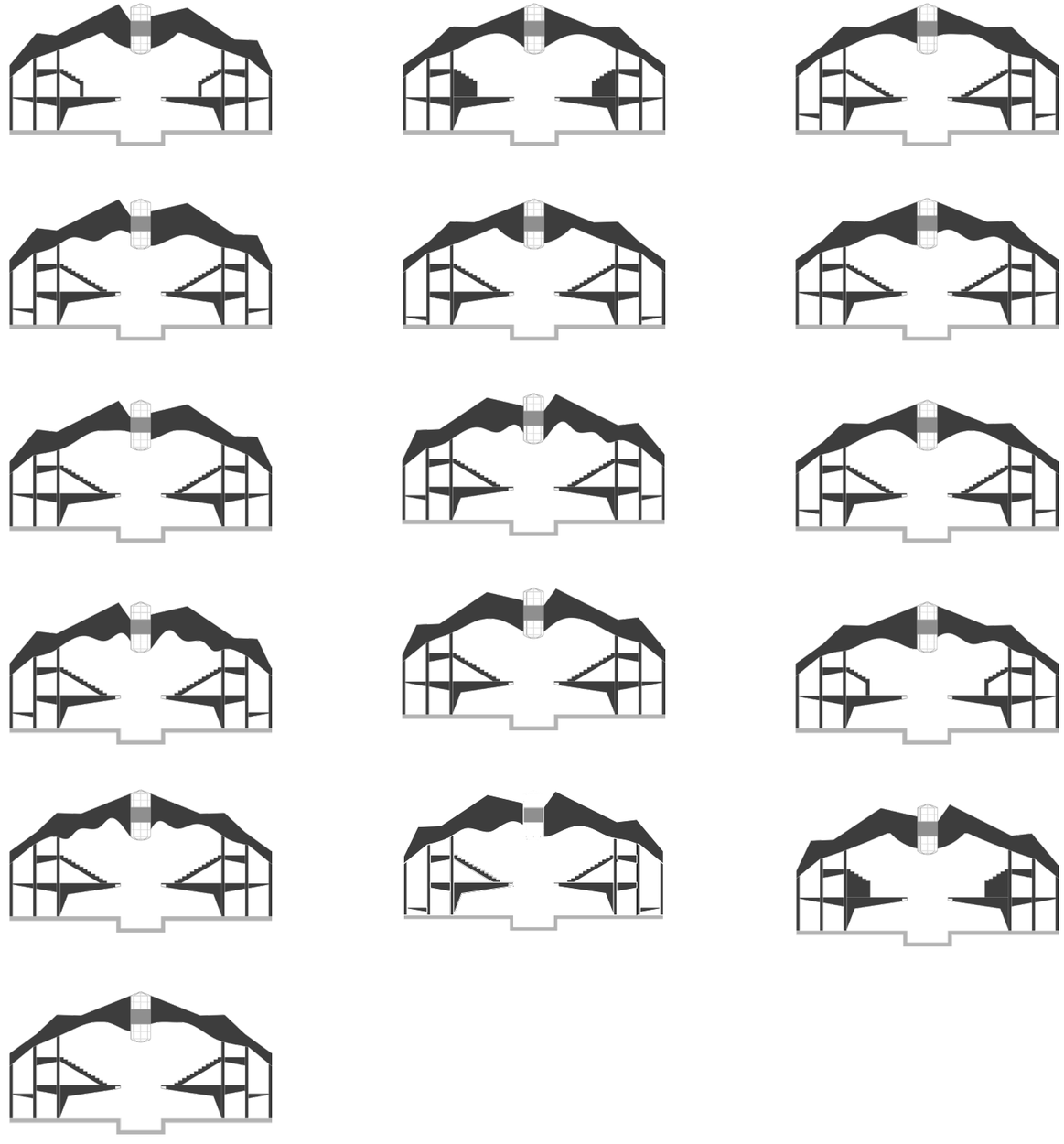
Northeast-Southwest



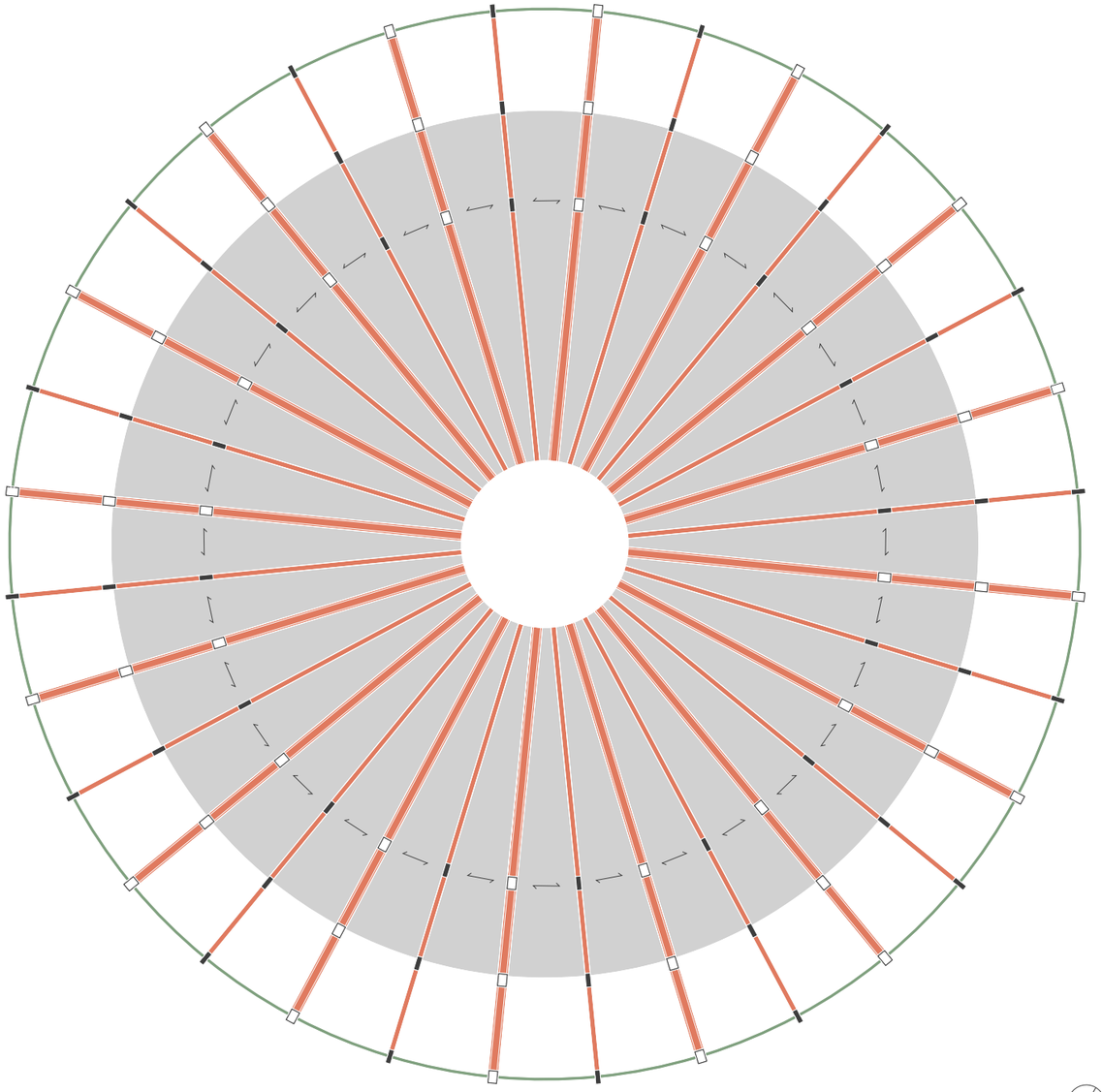
Winter

Northeast-Southwest

CONSTRUCTION SECTIONS



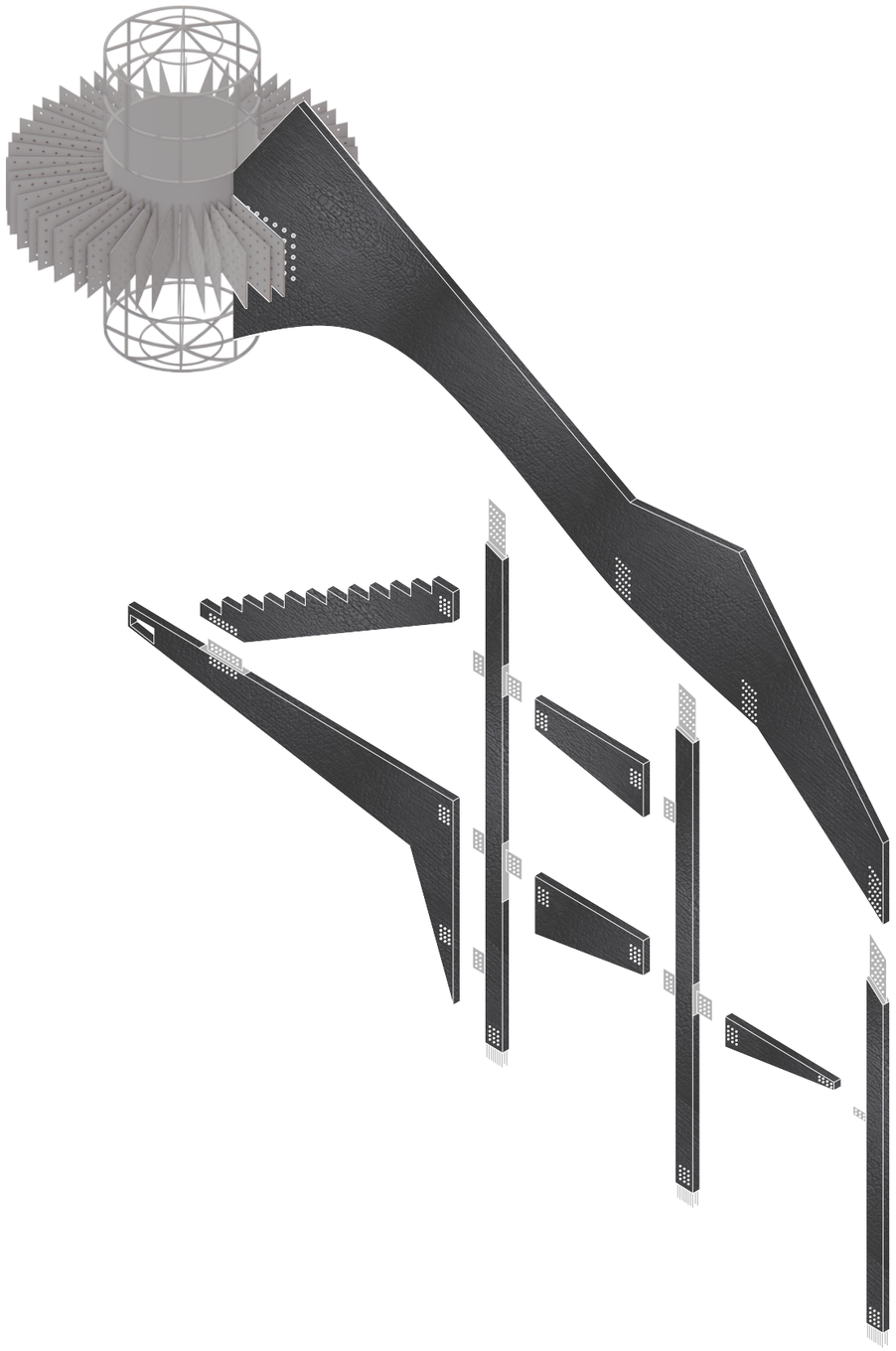
CONSTRUCTION PLAN



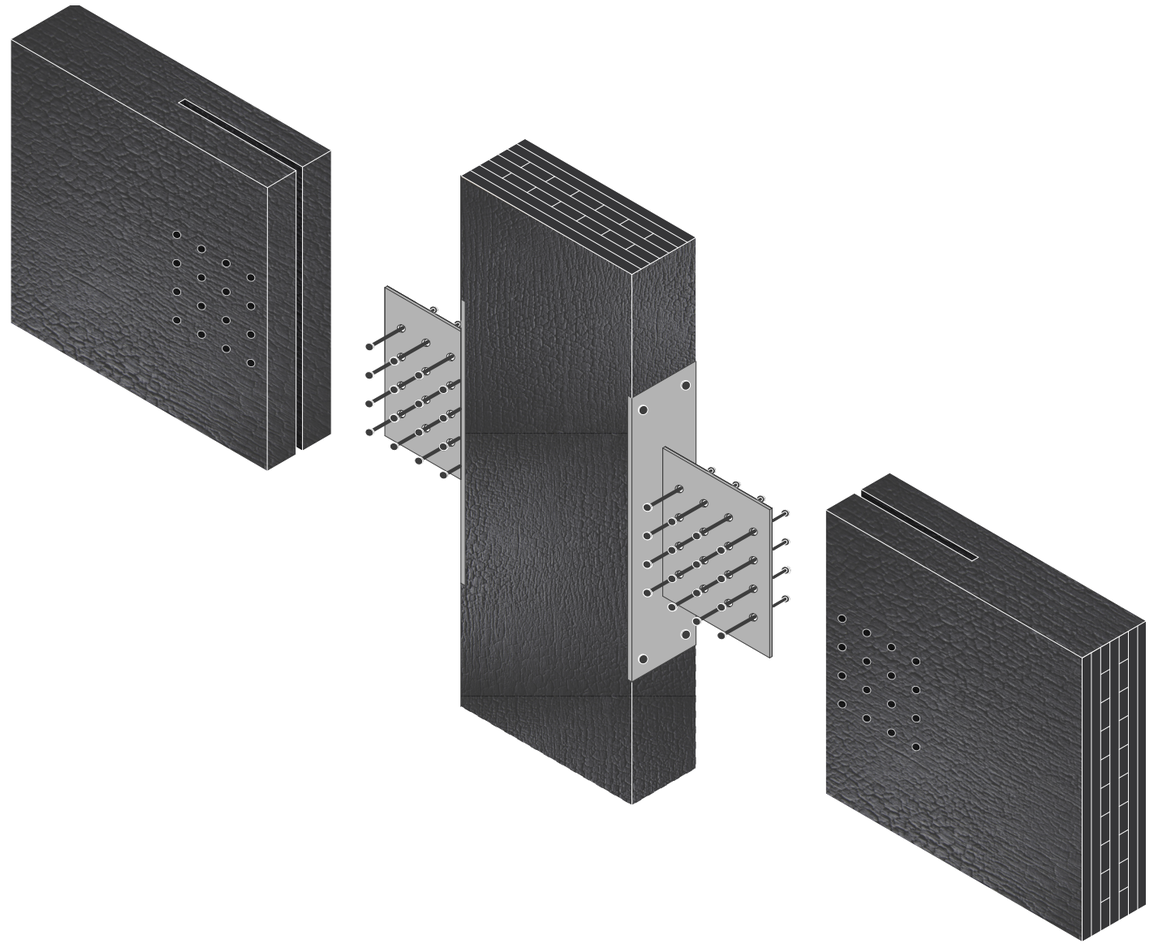
1:500 (145%)

CONSTRUCTION ELEMENT

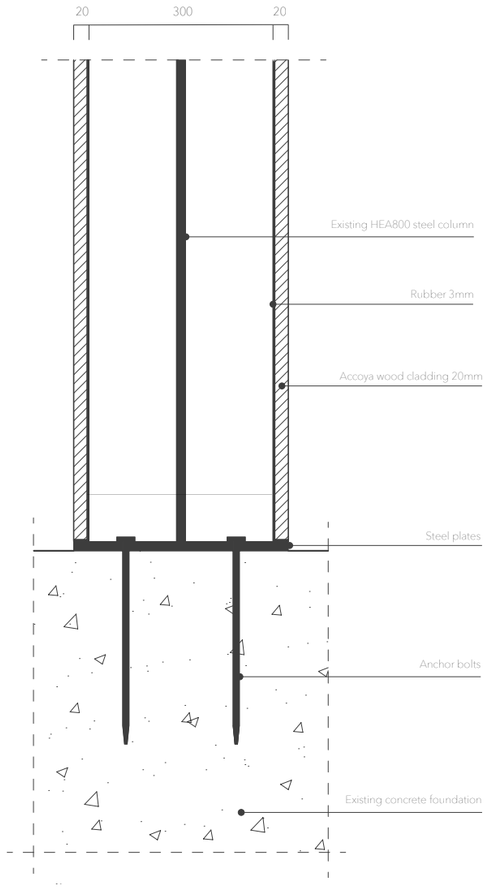
CONSTRUCTION ELEMENT



JOINT PRINCIPLE



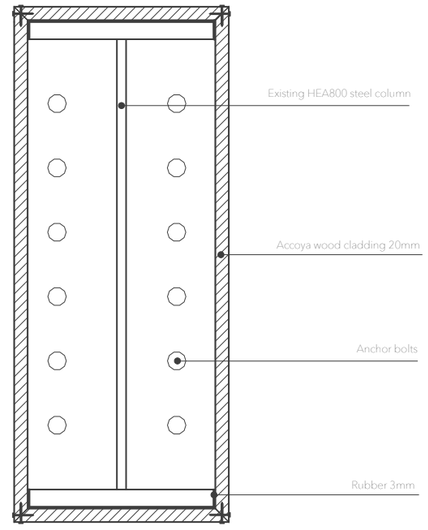
EXISTING CONSTRUCTION



1:5 (50%)

Vertical detail

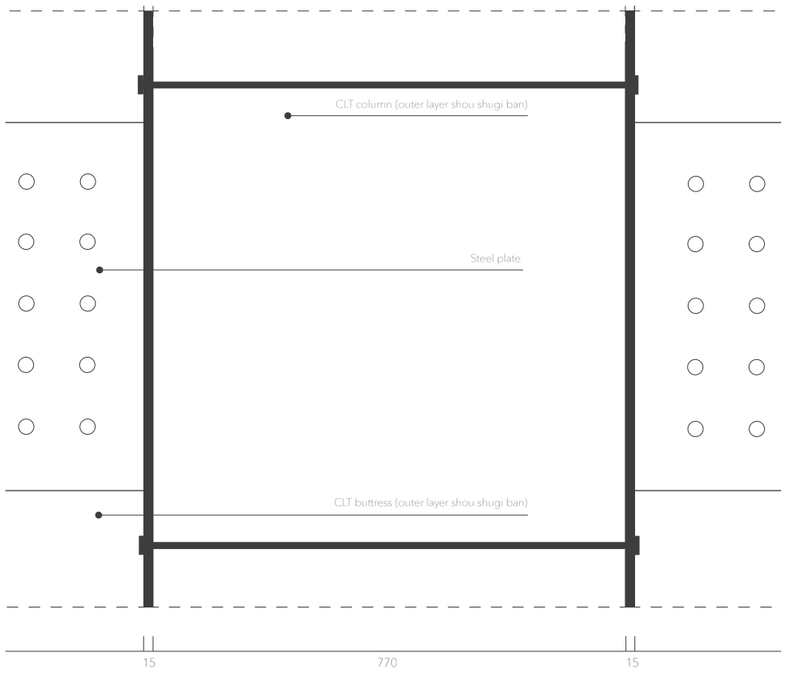
EXISTING CONSTRUCTION



1:5 (50%)

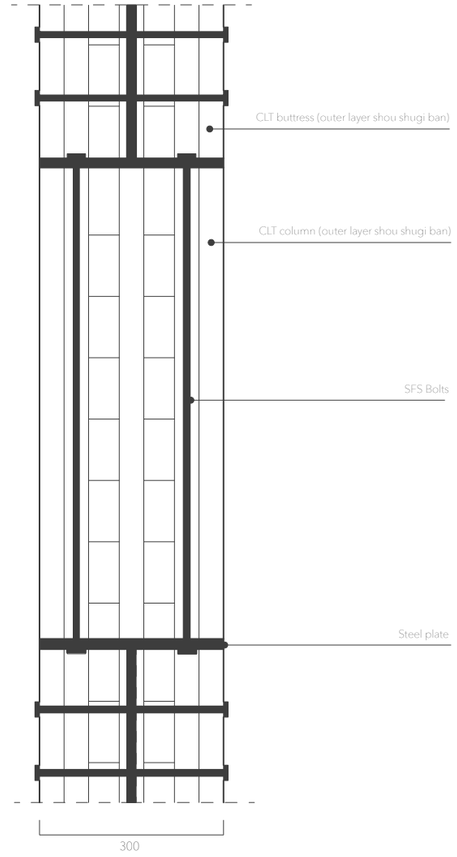
Horizontal detail

COLUMN TO BUTTRESS



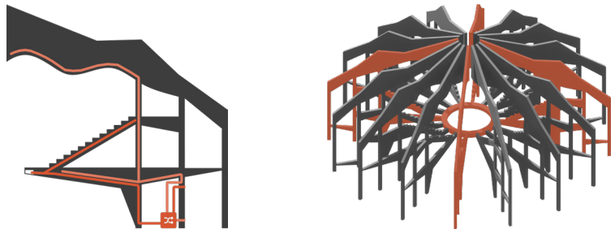
1:5 (50%) **Vertical detail**

COLUMN TO BUTTRESS



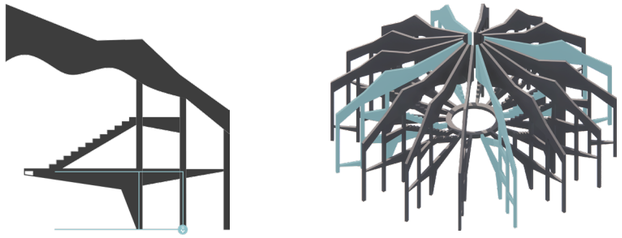
1:5 (50%) **Horizontal detail**

PIPES IN SYSTEMS

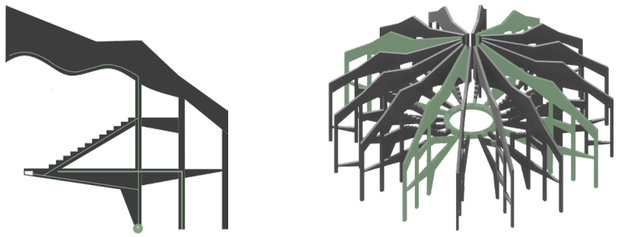


Mechanical ventilation

Solarcell energy

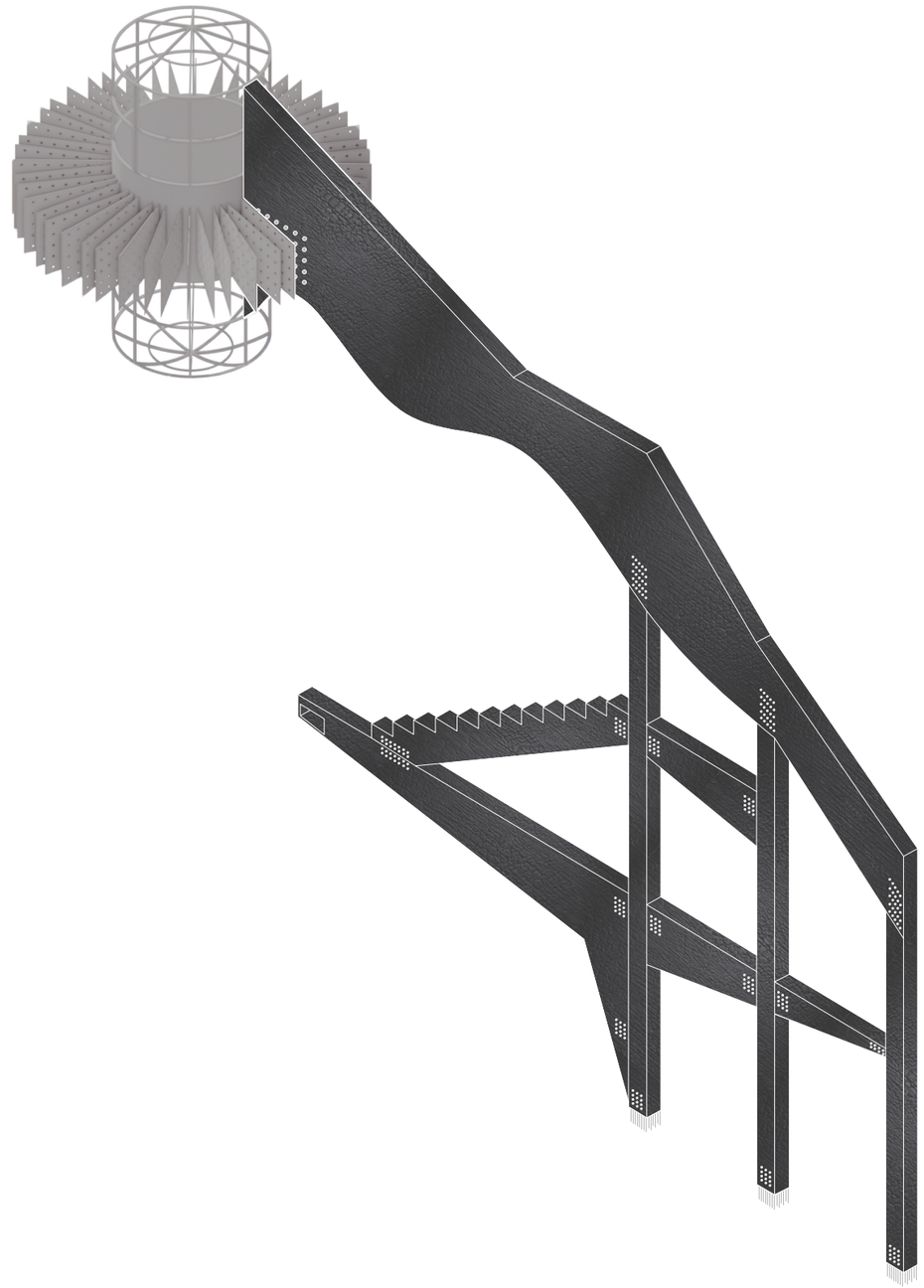


Aquathermal floorheating/cooling

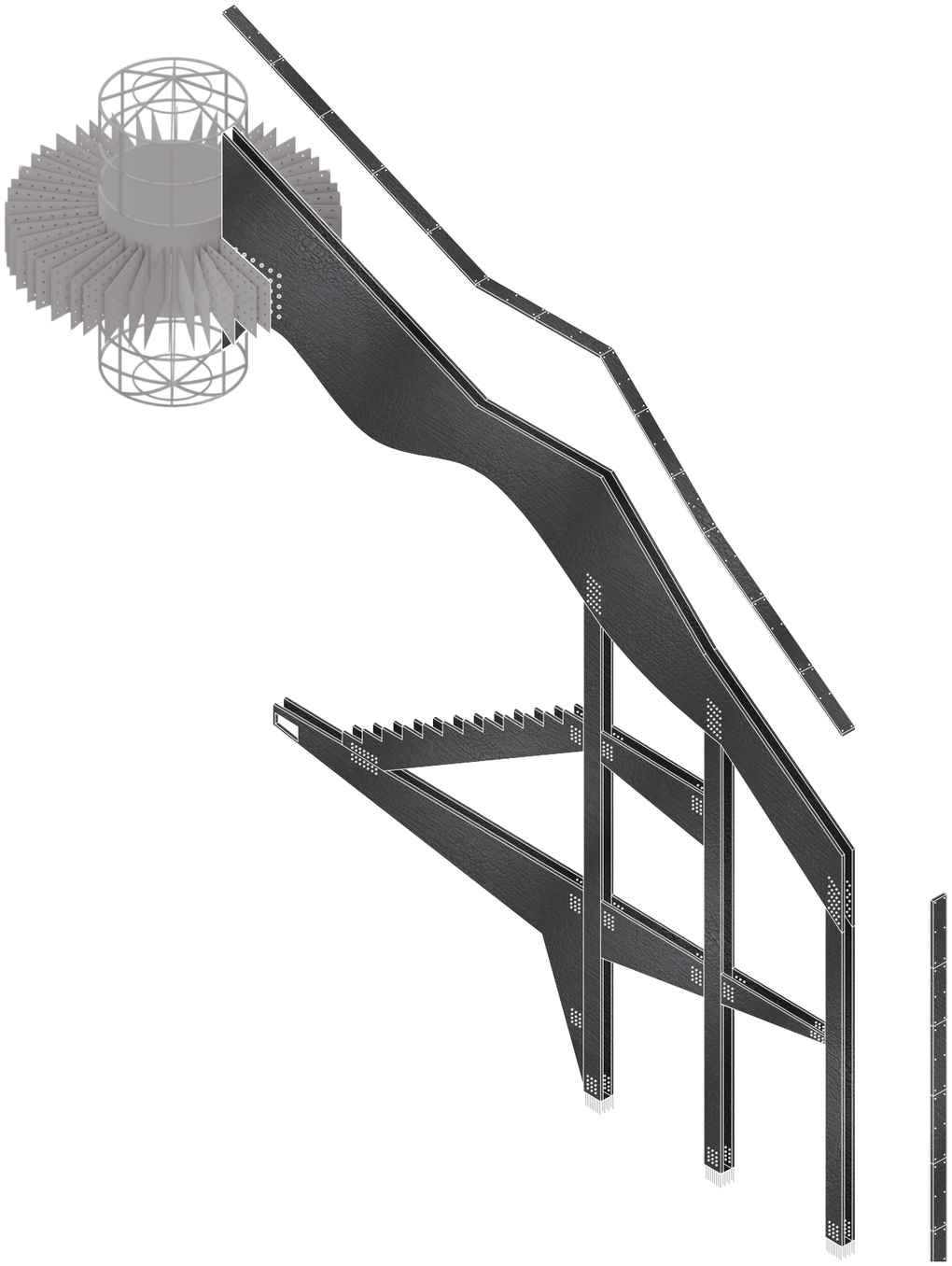


(Grey)water reuse

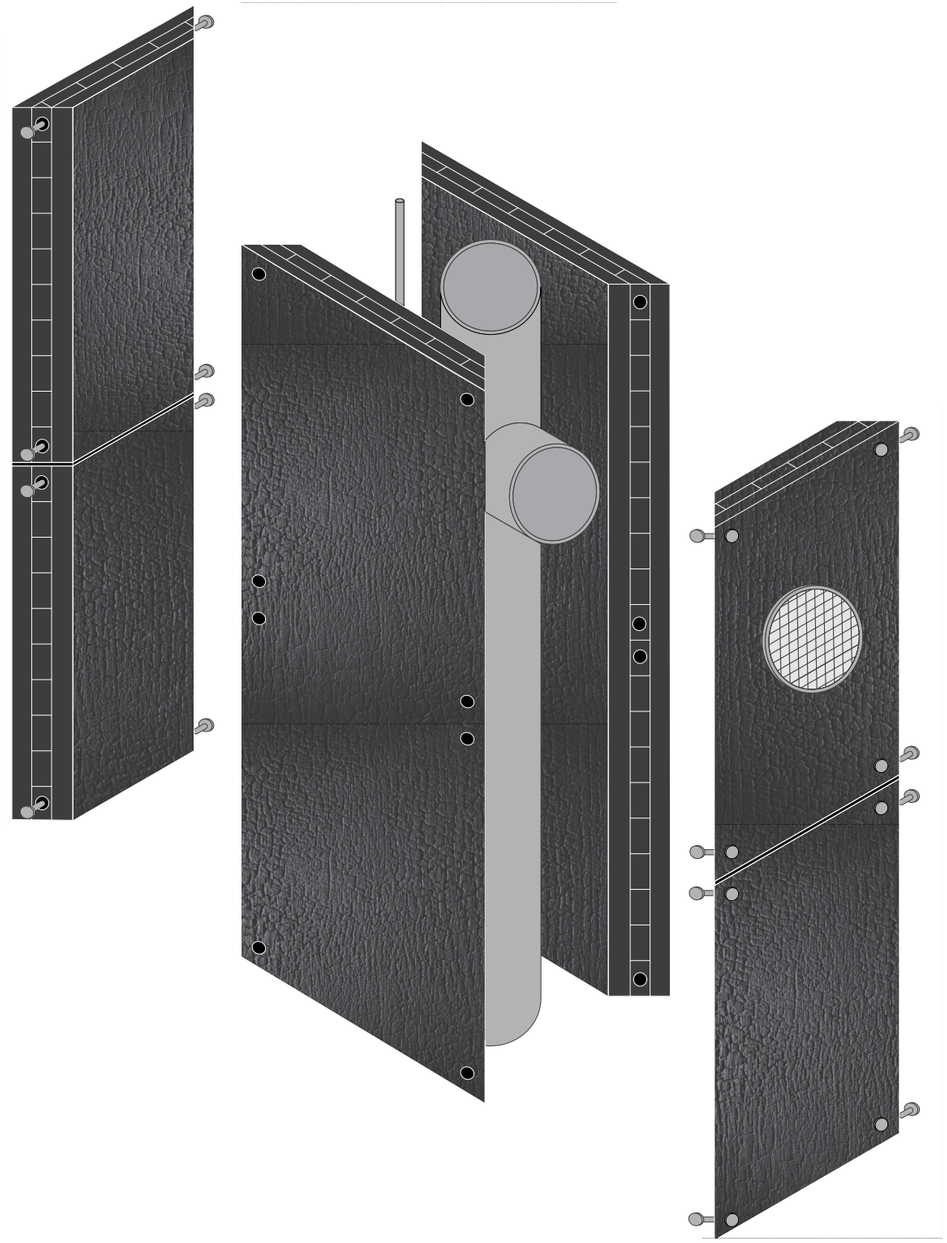
SYSTEM ELEMENT



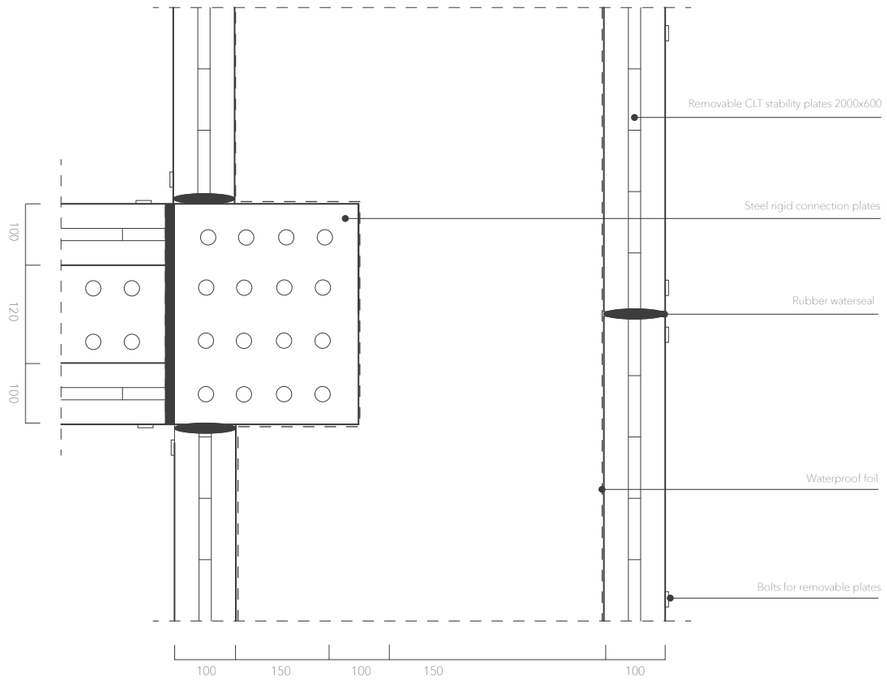
SYSTEM ELEMENT



PANEL PRINCIPLE

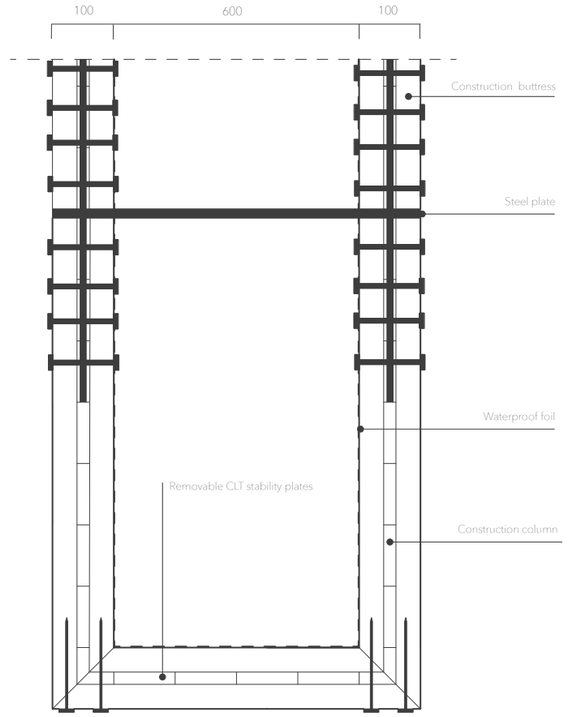


SYSTEM ELEMENT



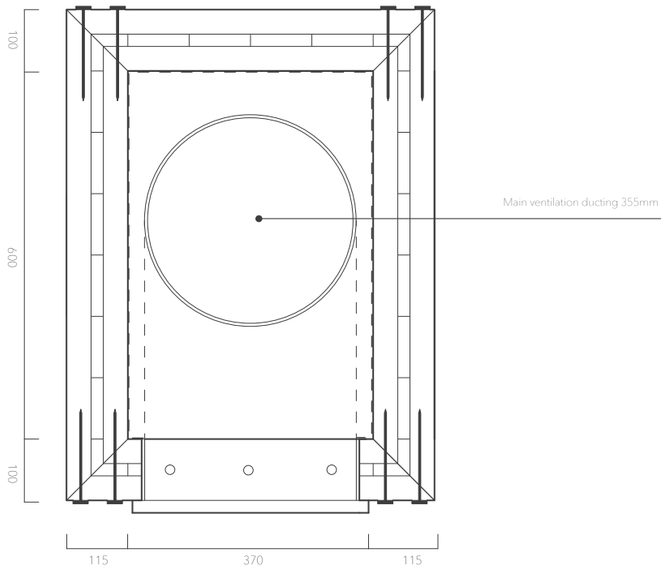
1:5 (50%) **Vertical detail**

SYSTEM ELEMENT



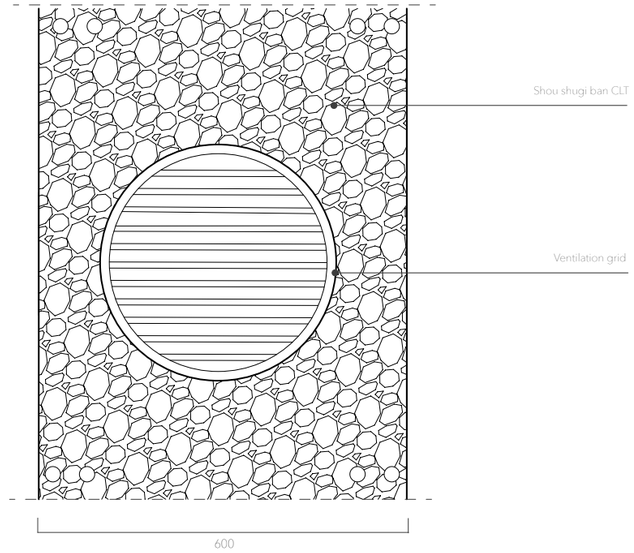
1:5 (50%) **Horizontal detail**

VENTILATION GRID



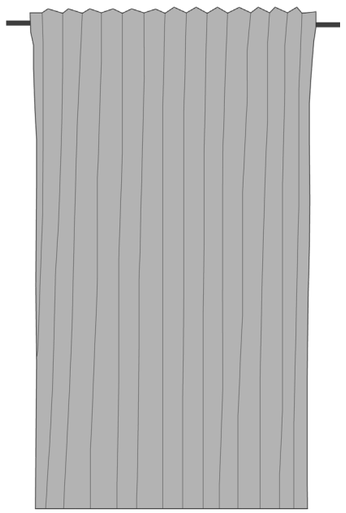
1:5 (50%) **Horizontal detail**

HARMONICA DOORS

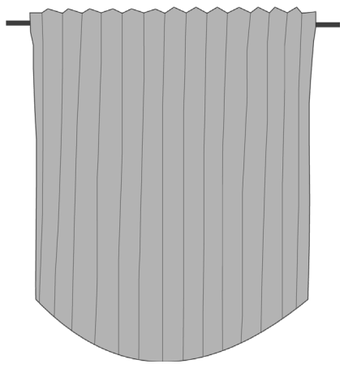


1:5 (50%) **Front view detail**

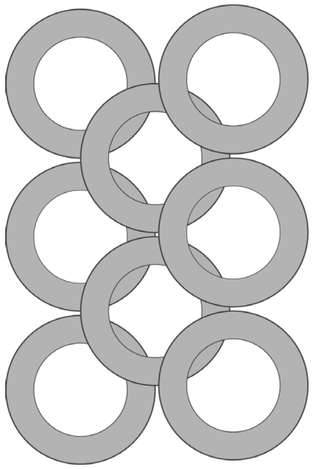
CURTAIN FACADE



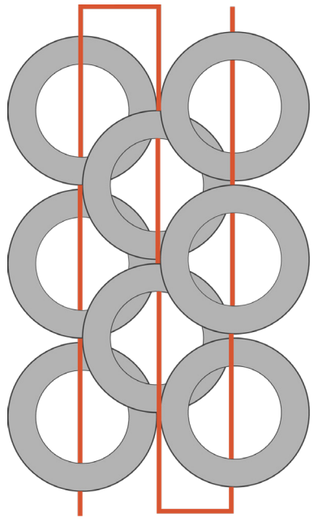
Chainmail facade



Able to open trough catrol system

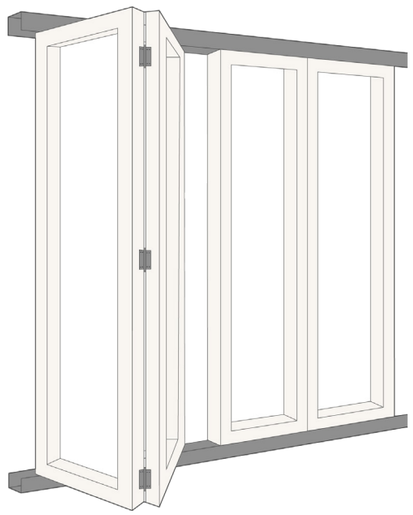


Rings for transparancy



Solar cells interwoven trough chainmail

HARMONICA DOORS



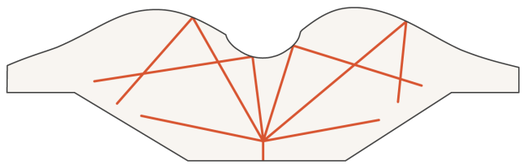
Wooden harmonica frame doors

Harmonica door glass facade

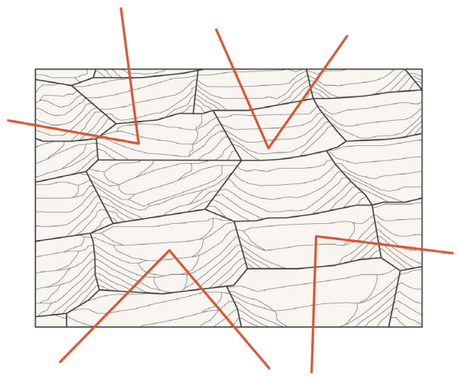
Harmonica door closed wall

Harmonica door acoustic panels

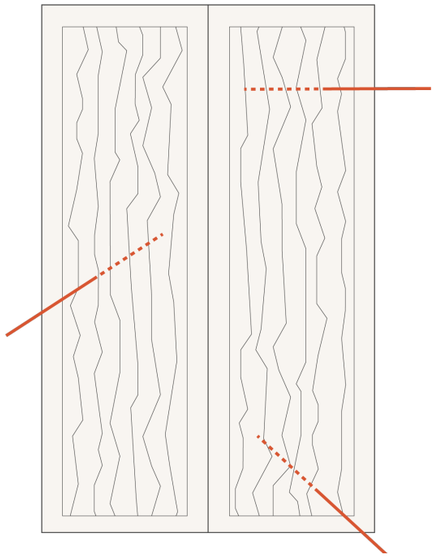
ACOUSTICS



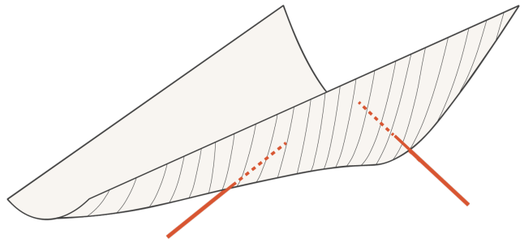
Reflective beams in shape to improve acoustics



Reflective carved gypsum fiber acoustic panels

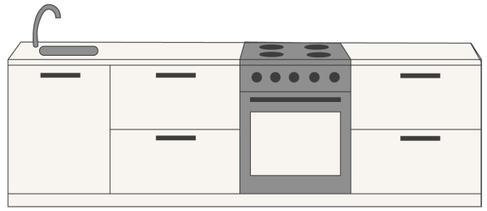


Carved absorbig fabric covered foam panels



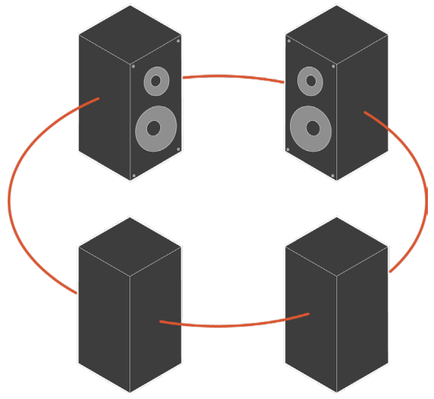
Draped absorbing covered foam panels

FURNISHINGS

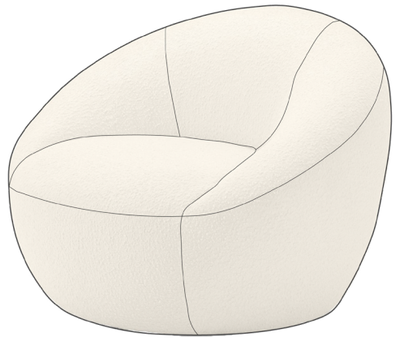


Circular kitchen in foodcourt

Absorbing chairs for foodcourt

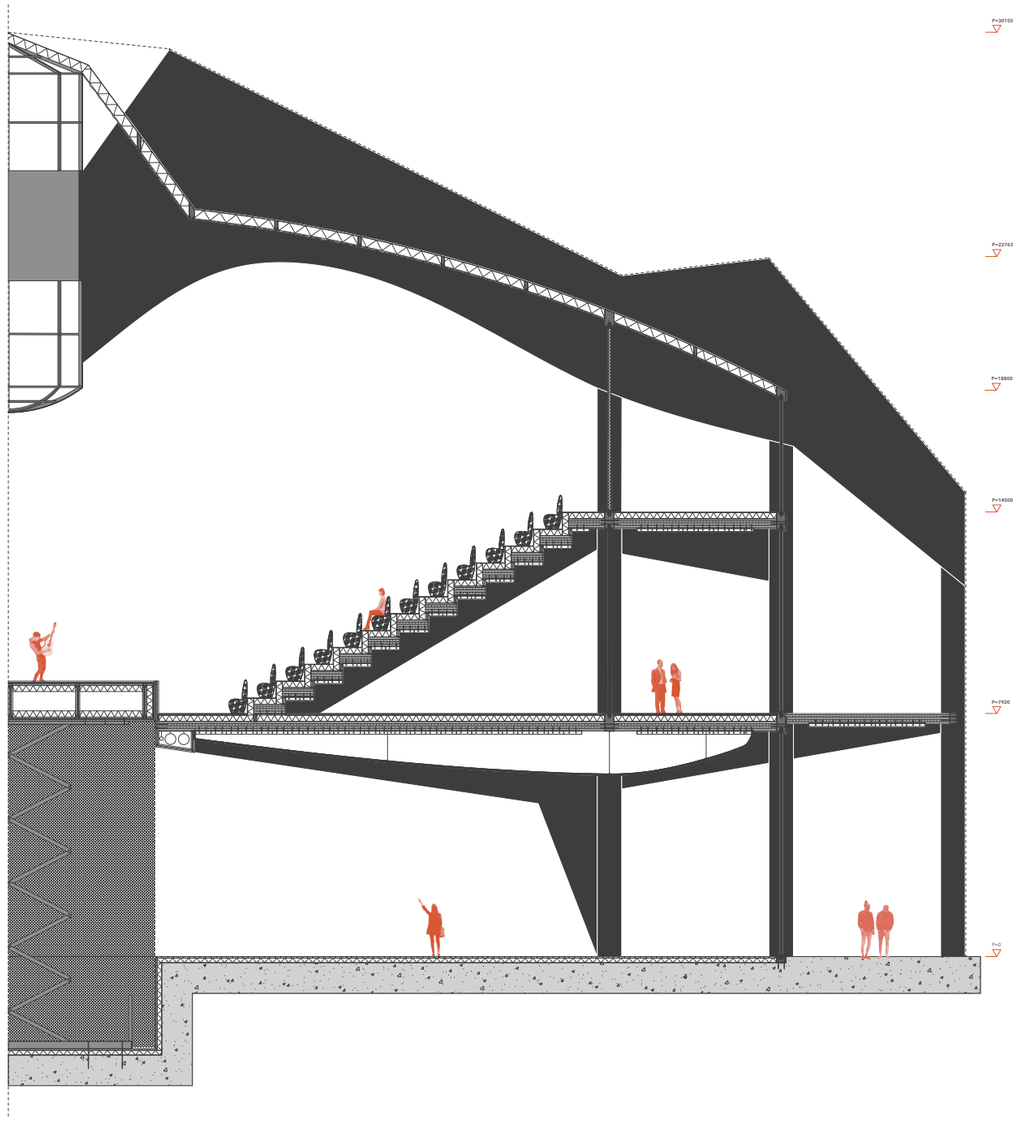


Dolby atmos 360 system



Absorbing chair for music venue

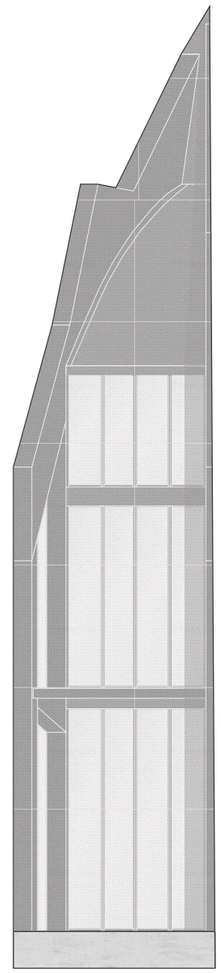
VERTICAL DETAIL



1:50 (25%)

Northwest-Southeast

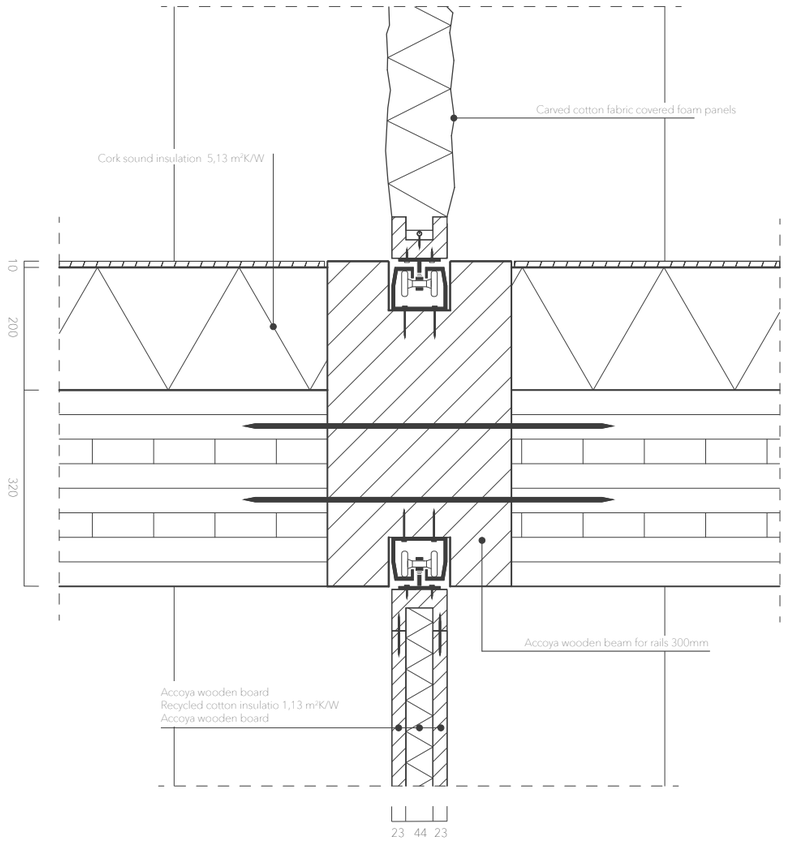
FACADE DETAIL



1:50 (25%)

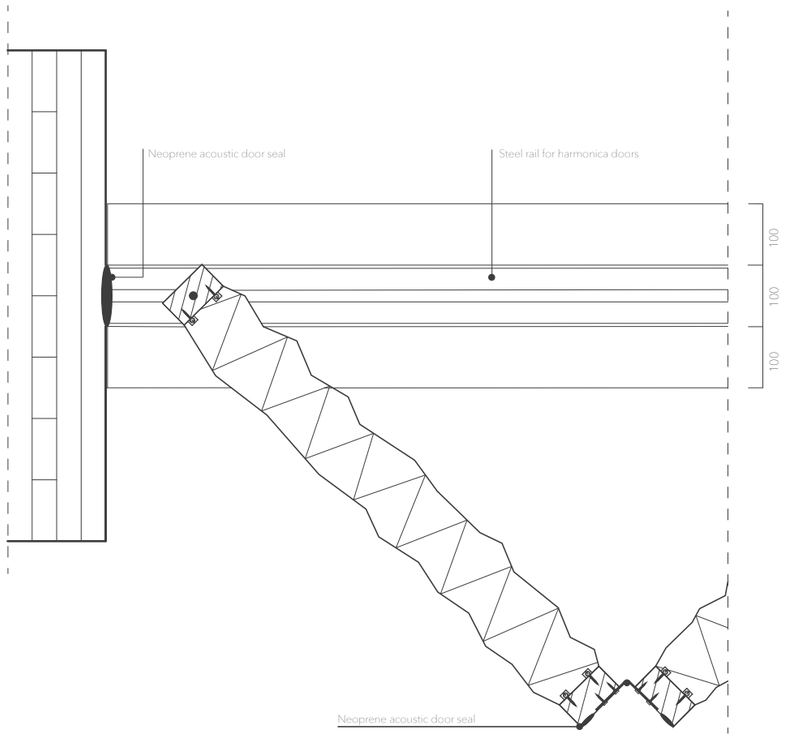
Northwest-Southeast

HARMONICA DOORS



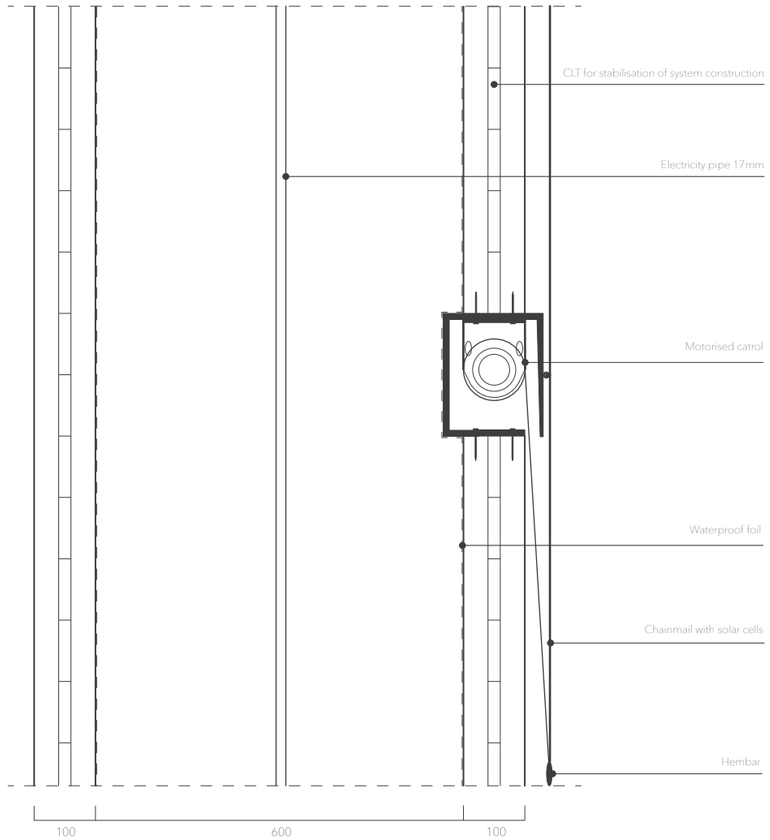
1:5 (50%) **Vertical detail**

HARMONICA DOORS



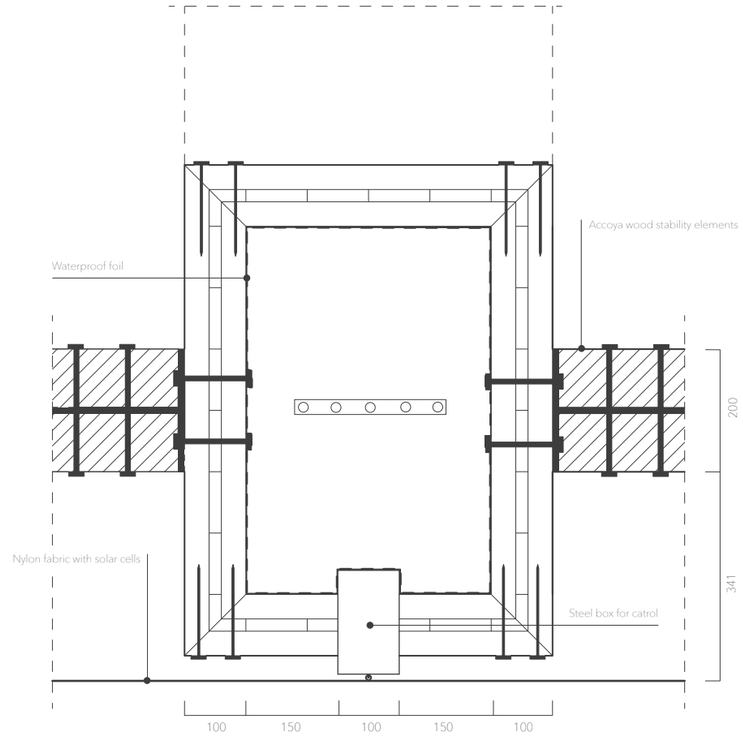
1:5 (50%) **Horizontal detail**

CHAINMAIL FACADE



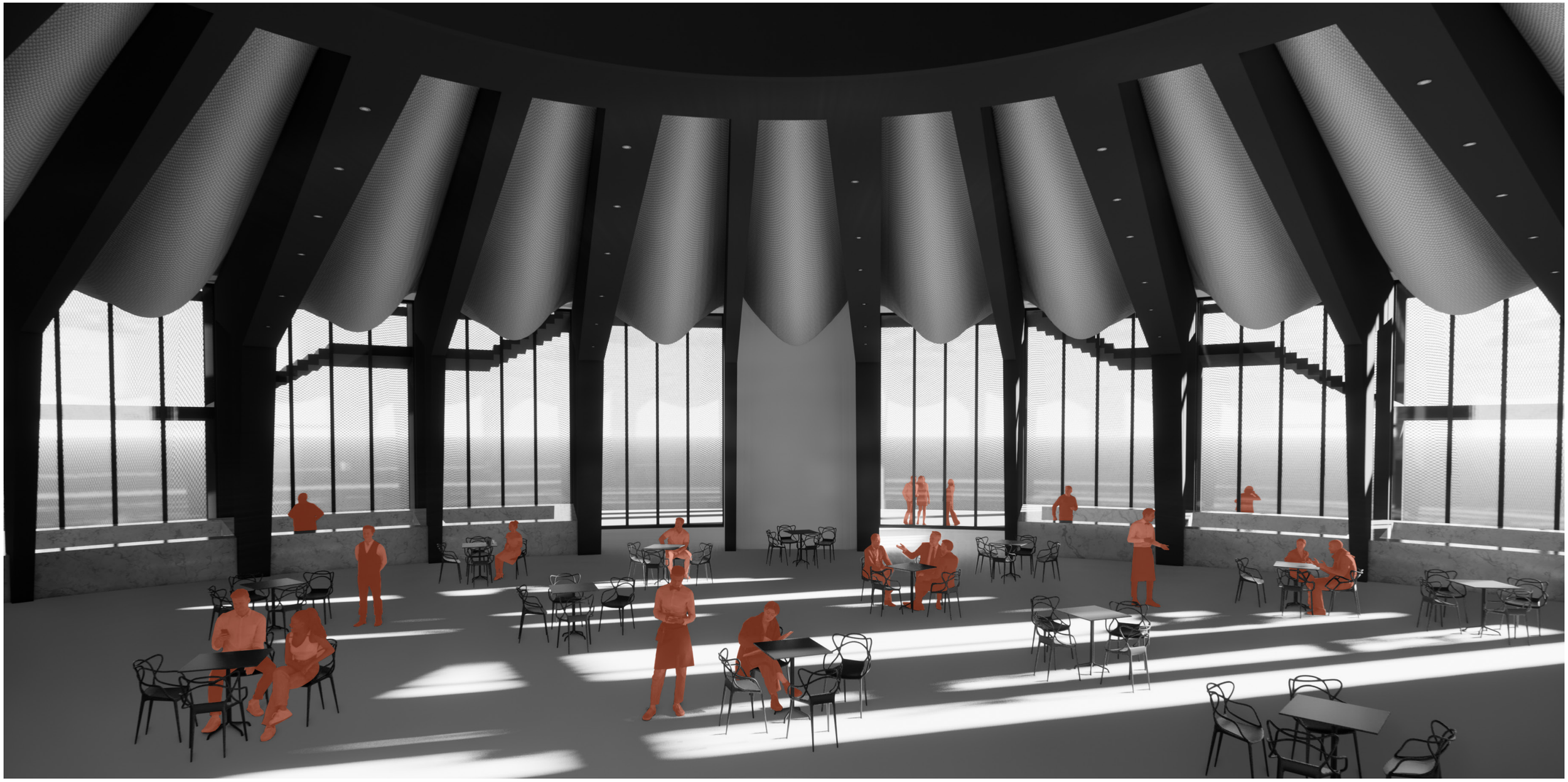
1:5 (50%) **Vertical detail**

CHAINMAIL FACADE



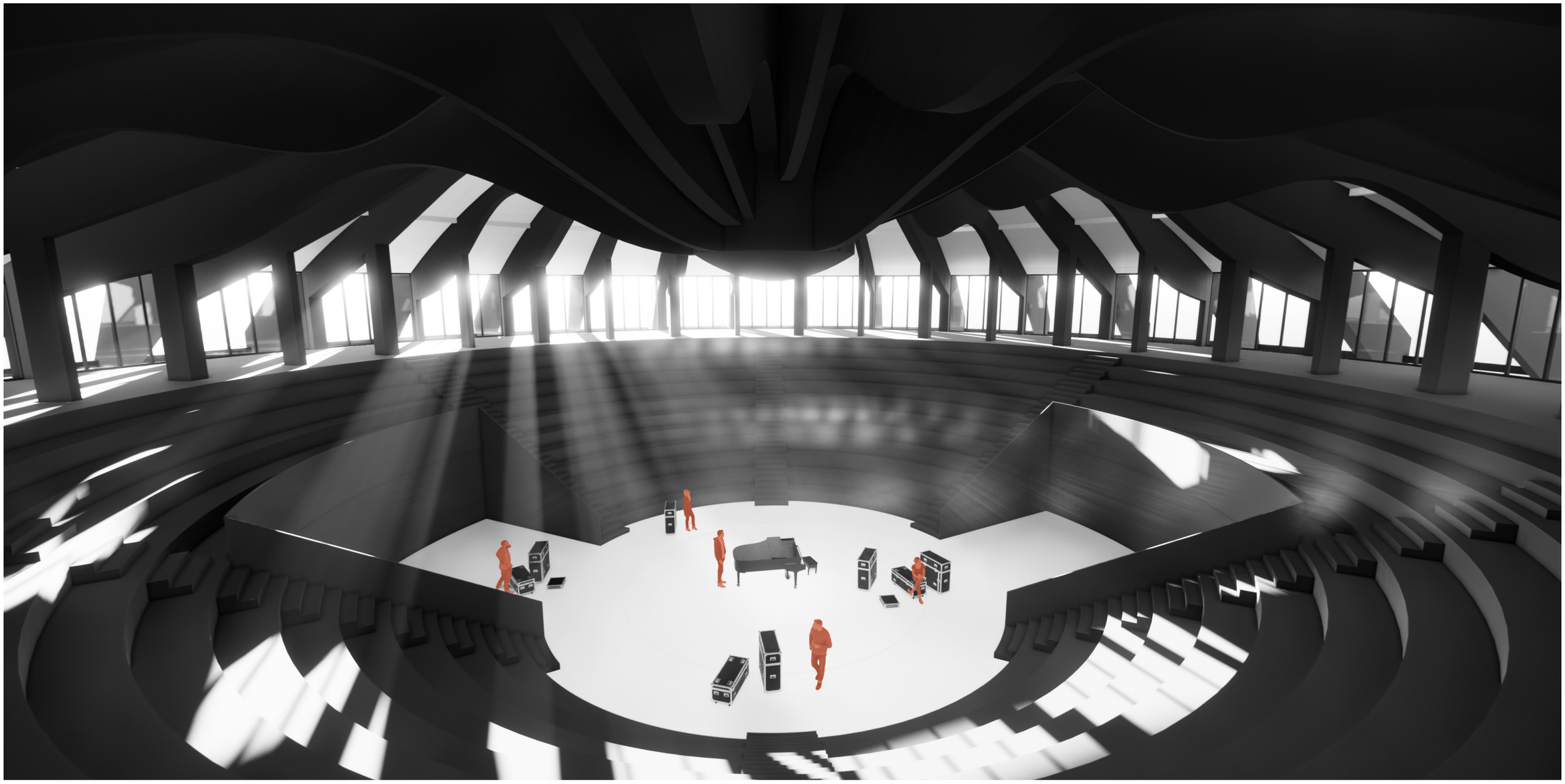
1:5 (50%) **Horizontal detail**

RENDER FOODCOURT

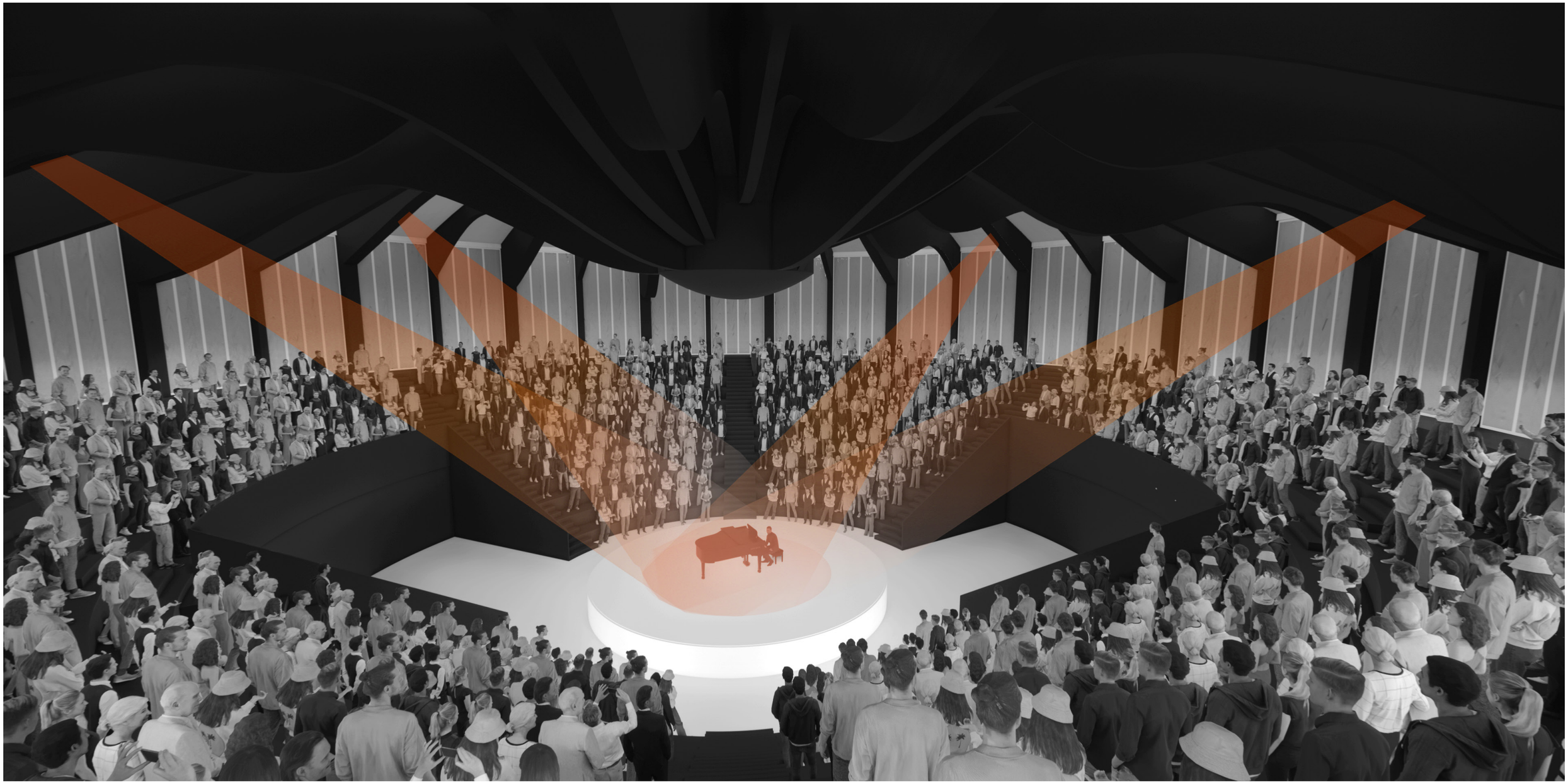


RENDER STAIRS

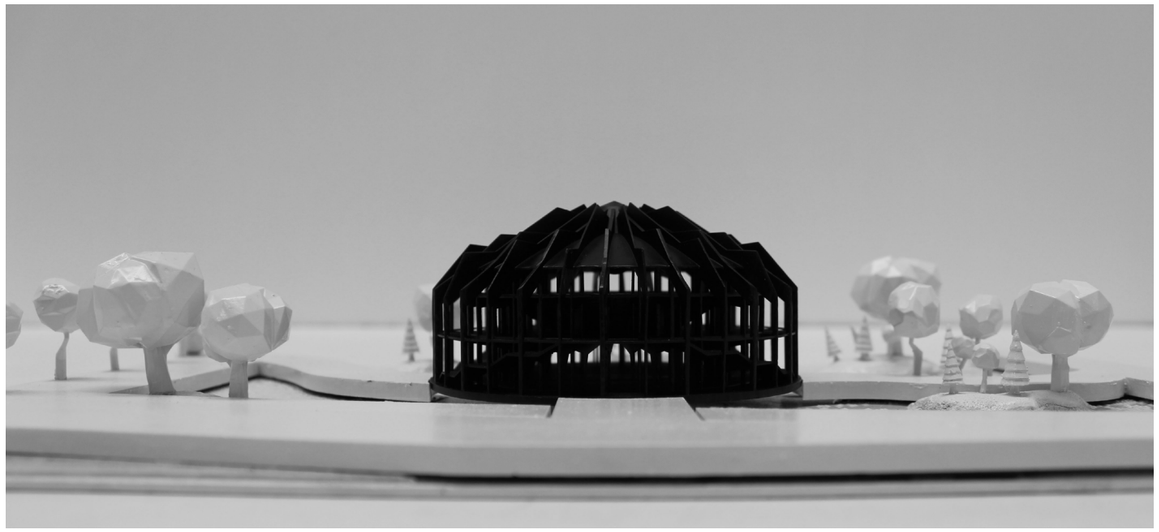
MUSIC HALL DAY

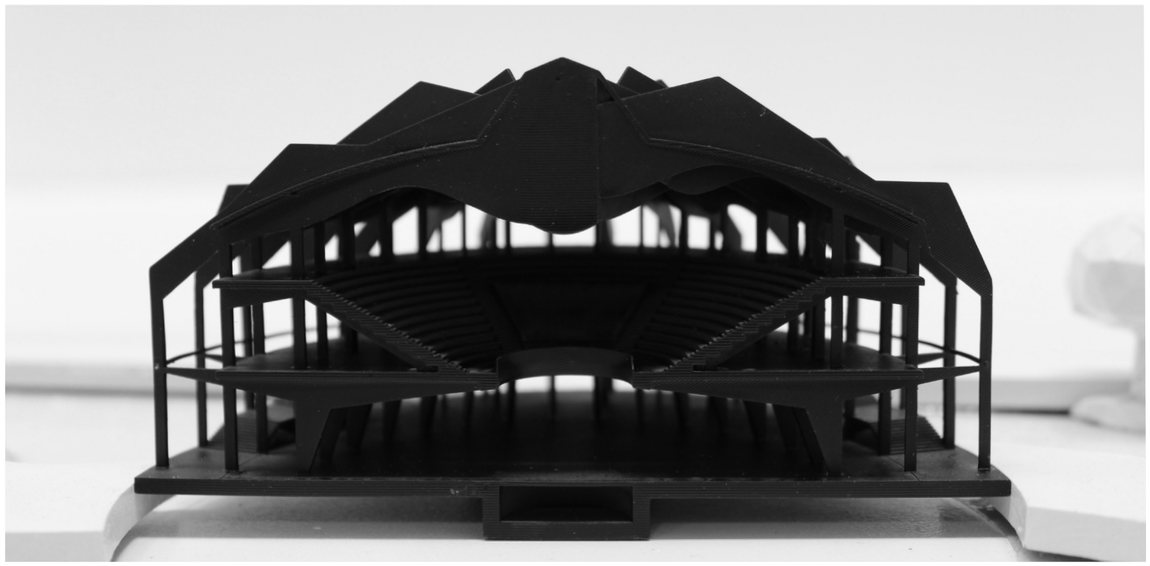


MUSIC HALL CONCERT



MODEL 1:500





MODEL 1:50

REFLECTION

REFLECTION

When I look back at my design, I can see that the relationship between research and design is linear. The concept for the design of this building arose during the first area visit. Binckhorst is mostly being demolished to provide space for a new programme with different requirements, and many buildings and their materials are being wasted in the process. This is a shame, since at present, the built environment has to deal with the current building stock in a conscious manner, as climate change and material scarcity will dictate the current building approach and especially the demolition approach as is currently taking place in Binckhorst, which will no longer be possible in the future. Because of this problem in the area, I decided to conduct research into a design method that could prevent this large-scale demolition in future.

I decided to research the flexible building strategy, which aims to prolong the lifespan of a building by introducing adaptability in the buildings elements to meet the demands of current and future stakeholders. This method of approach also corresponds well to the studio's theme of "Multiplicity", because of the building's adaptability, multiplicity is present by allowing for different usage both present and in future. From research on the flexible building strategy a toolbox of necessary elements was established to design an adaptable building. This toolbox was then used as a guideline for the design of the project. However upon researching this method, it was concluded that the method, is currently lacking on a few aspects. The goal of this method is to prolong the lifespan of a building, however, current implementations lack architectural character, this is due to the pragmatic and modular approach of this method to architecture and design. This pragmatic approach was also visible in the P2 presentation of my design.The lack of character, and therefore the value of a building, endangers its lifespan prospects.

To understand what defines a building's character, I researched the criteria buildings must meet to be declared monuments, as monuments are the most valued form of architecture and the lifespan of most monuments outweighs the lifespan of current flexible buildings. From the research on the criteria of monuments I concluded that the architectural characteristics of monuments widely differ, however, overarching is the uniqueness of the architecture and the translation of the program of the monument into the architecture. I noted that the approach to designing for permanence and designing a flexibility are the opposite, in flexibility you strive for no specific function, yet in permanence it is the strength of the architectural design. However both strive the same goal of prolonging the lifespan of the building. While designing for permanence focuses on designing the ultimate form of the building's architectural design, flexibility focuses on the ultimate form of a building's system. Combining both thinking methods would allow both system and architectural design to be present in the building and therefore the lifespan of the building and its materials can possibly be prolonged. Due to this conclusion I started viewing my design from a different perspective, not only striving for possible change, but introducing the idea of permanence. Thus, the research inspired me to start colouring outside the pragmatic lines, which was one of the criticisms of my P2.

During Q3 and Q4 I started exploring the characteristics of music translated to architecture by making different types of models and sketches. These models and sketches, together with the encouragement of my mentors allowed me to free myself from the restraints of pragmatic flexible building design and allowing character to be introduced into the design. However, after exploring this new approach, I had difficulties, combining it with the adaptability within the design. After exploring several options integrating the two approaches within one system, I concluded that sometimes separating the two approaches within one building would function better. Stuart Brand's diagram inspired me to look at the building in layers, dividing the two approaches between these layers and combining them wherever possible. The most important layer for the character of the building is the construction layer, as is has the longest lifespan, and will not quickly be removed, allowing the character to remain even if the program changes. Whereas the space plan and services are most important for adaptability within the design. Designing through these three different layers allowed systematic flexibility and permanent character to successfully exist alongside each other in the design of my building. And that is what the definition of a Music Marvel is for me, a unique music venue with permanent character that allows variating music, artists and program to interpret the venue through its adaptability.

Reflecting back on this research, I would have liked to have conducted more theoretical research into what determines the character and value of a building, however, by conducting research through design I have developed my own understanding of design. This approach of finding character through design, while using the flexible building strategy toolbox, allowed me to rethink the way I approach building design. Furthermore, I believe this approach could positively influence the flexible building strategy as well, by introducing a way to incorporate character to the building and therefore potential value.

During the final part of the graduation period, I would like to further develop the visualisation of the three building layers, and how they connect to each other. Therefore, I will spend a large portion of the final part of the graduation period to develop a 1:50 maquette of the three building layers in detail. Furthermore, I would love to further explore my material research in remanufacturing and recycling, to further strengthen my concept. Lastly, I will improve the overall visualisation of the design.

SOURCES

SOURCES

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