

**ACEX15 BACHELOR'S PROJECT  
ARCHITECTURE AND ENGINEERING  
LUDVIG BORGENTAM**

# THE HATCH OPERA

## INCLUSION THROUGH INTERACTION

PROJECT TYPE: BACHELOR'S PROJECT & COMPETITION ENTRY

COURSE: ACEX15 BACHELOR'S PROJECT IN ARCHITECTURE AND ENGINEERING

LOCATION: WOODLAWN, CHICAGO

YEAR: 2024

The Hatch Opera is our proposal for a new opera venue offering an interactive and empowering experience for visitors. Conceptually, the proposal centers around three ideas - transparency, inclusion, and empowerment. Transparency through our choice of material, inclusion and empowerment through interaction.



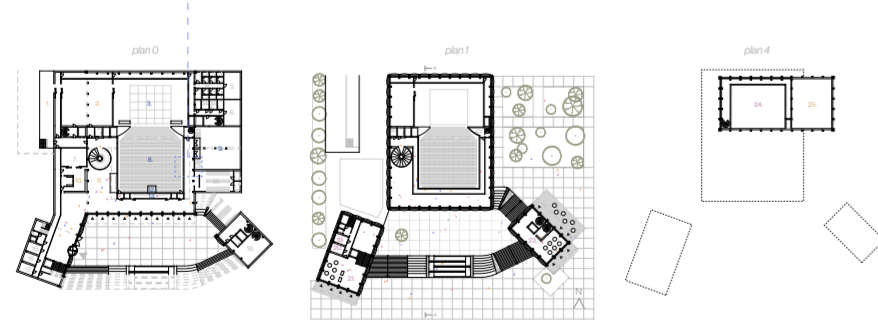
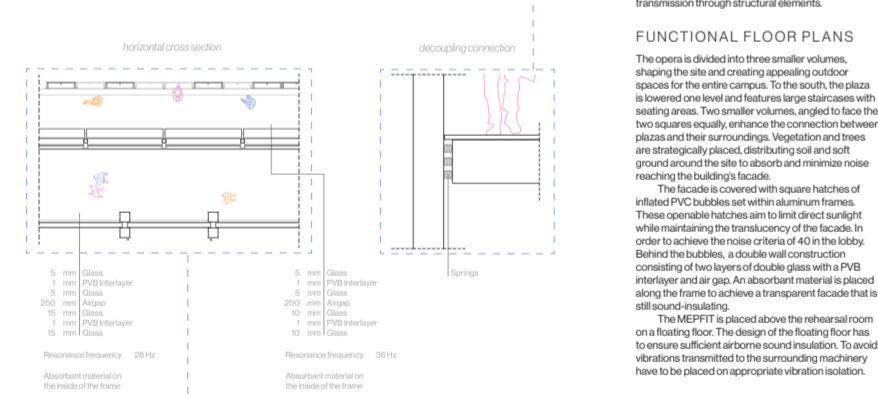
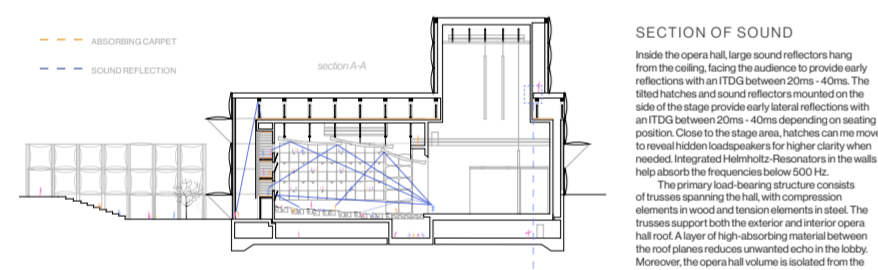
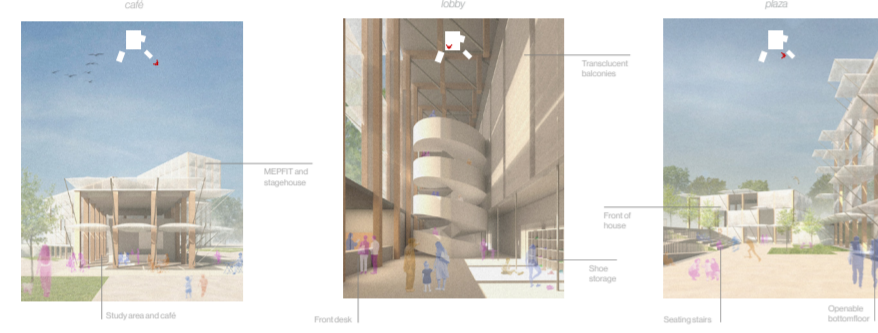
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# THE HATCH OPERA

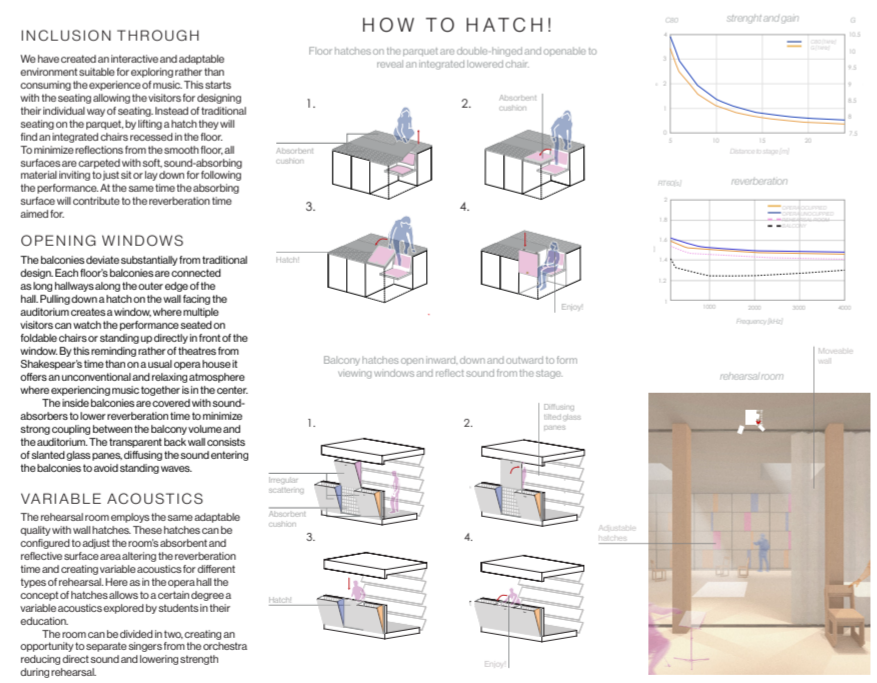
**(4)** The Hatch Opera is our proposal for a new opera venue offering an interactive and empowering experience for visitors. Conceptually, the proposal centers around three ideas: transparency, inclusion, and flexibility. Transparency through our choice of material, inclusion through interaction, and flexibility through adaptability.

The dynamic facade, featuring noise-reducing double windows and inflatable, openable bubble hatches, adapts to the opera's activities. The double window design is expected to handle the traffic noise around the opera having a sufficiently deep and damped air gap as well two panels with different thickness. A café splits the site in front of the opera into two plazas and the option to open the lower floors allows seamless flow between indoors and outdoors. Inside, a sculptural staircase defines the lobby, where visitors must remove their shoes before entering the auditorium.



**(10)**

1. LOBBY	20	40	20	10	20	10	20
2. REHEARSAL ROOM	20	40	20	10	20	10	20
3. AUDITORIUM	20	40	20	10	20	10	20
4. PLAZA	20	40	20	10	20	10	20
5. STAIRCASE	20	40	20	10	20	10	20
6. OFFICE	20	40	20	10	20	10	20
7. RECEPTION	20	40	20	10	20	10	20
8. LABORATORY	20	40	20	10	20	10	20
9. ROBEHOUSE	20	40	20	10	20	10	20
10. MECHANICAL ROOM	20	40	20	10	20	10	20



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(5) We imagine that the opera will be located next to the University of Chicago, south of Midway Plaisance Park. By being mindful of the context of the site, we aim to create functional public spaces for the whole campus and the local community of Woodlawn.

(6) Inside the opera hall, large sound reflectors hang from the ceiling, facing the audience to provide early reflections with an ITDG between 20ms - 40ms. The tilted hatches and sound reflectors mounted on the side of the stage provide early lateral reflections with an ITDG between 20ms - 40ms depending on seating position. Close to the stage area, hatches can move to reveal hidden loudspeakers for higher clarity when needed. Integrated Helmholtz-Resonators in the walls help absorb the frequencies below 500 Hz.

The primary load-bearing structure consists of trusses spanning the hall, with compression elements in wood and tension elements in steel. The trusses support both the exterior and interior opera hall roof. A layer of high-absorbing material between the roof planes reduces unwanted echo in the lobby. Moreover, the opera hall volume is isolated from the rest of the structure, utilizing springs to mitigate noise transmission through structural elements.

(7) The opera is divided into three smaller volumes, shaping the site and creating appealing outdoor spaces for the entire campus. To the south, the plaza is lowered one level and features large staircases with seating areas. Two smaller volumes, angled to face the two squares equally, enhance the connection between plazas and their surroundings. Vegetation and trees are strategically placed, distributing soil and soft ground around the site to absorb and minimize noise reaching the building's facade.

The facade is covered with square hatches of inflated PVC bubbles set within aluminum frames. These openable hatches aim to limit direct sunlight while maintaining the translucency of the facade. In order to achieve the noise criteria of 40 in the lobby. Behind the bubbles, a double wall construction consisting of two layers of double glass with a PVB interlayer and air gap. An absorbent material is placed along the frame to achieve a transparent facade that is still sound-insulating.

The MEPFIT is placed above the rehearsal room on a floating floor. The design of the floating floor has to ensure sufficient airborne sound insulation. To avoid vibrations transmitted to the surrounding machinery have to be placed on appropriate vibration isolation.

(8) We have created an interactive and adaptable environment suitable for exploring rather than consuming the experience of music. This starts with the seating allowing the visitors for designing their individual way of seating. Instead of traditional seating on the parquet, by lifting a hatch they will find an integrated chair recessed in the floor. To minimize reflections from the smooth floor, all surfaces are carpeted with soft, sound-absorbing material inviting to just sit or lay down for following the performance. At the same time the absorbing surface will contribute to the reverberation time aimed for.

(9) The balconies deviate substantially from traditional design. Each floor's balconies are connected as long hallways along the outer edge of the hall. Pulling down a hatch on the wall facing the auditorium creates a window, where multiple visitors can watch the performance seated on foldable chairs or standing up directly in front of the window. By this reminding rather of theatres from Shakespeare's time than on a usual opera house it offers an unconventional and relaxing atmosphere where experiencing music together is in the center.

The inside balconies are covered with sound-absorbers to lower reverberation time to minimize strong coupling between the balcony volume and the auditorium. The transparent back wall consists of slanted glass panes, diffusing the sound entering the balconies to avoid standing waves.

(10) The rehearsal room employs the same adaptable quality with wall hatches. These hatches can be configured to adjust the room's absorbent and reflective surface area altering the reverberation time and creating variable acoustics for different types of rehearsal. Here as in the opera hall the concept of hatches allows to a certain degree a variable acoustics explored by students in their education.

The room can be divided in two, creating an opportunity to separate singers from the orchestra reducing direct sound and lowering strength during rehearsal.

*"A college with a very strong music and vocal program intends to construct a new 1,200-seat performance hall primarily for opera. Although the main purpose of the hall is to support their opera program, the hall will also be used for speaking engagements by the school's president and other invited speakers. The hall should engage the public and strive to contribute to the campus as a whole, while also being functional as an interactive and adaptable learning environment for the school's opera program. Furthermore, the building and site should strive to be inclusive and welcoming to the surrounding area."*

(1)

The design methodology for the Hatch Opera emphasizes transparency, inclusion, and flexibility, creating a dynamic and community-focused venue. Transparency is achieved through the use of double windows and inflatable bubble hatches, allowing natural light and views while managing noise. Inclusion is prioritized with open, inviting spaces like a café and plazas, promoting seamless indoor-outdoor transitions and fostering community engagement.

Flexibility is integral to the design, featuring customizable seating where visitors can lift hatches to reveal integrated chairs or sit on carpeted, sound-absorbing surfaces. An innovative balcony design, with long hallway-style balconies and with openable wall hatches, offers an open and communal viewing experience reminiscent of historical theaters.

Strategically located next to the University of Chicago and Midway Plaisance Park, the opera serves both the campus and the Woodlawn community, creating functional and appealing public spaces. Acoustic optimization is a key focus, with sound reflectors and adjustable hatches providing early reflections, and Helmholtz-Resonators and movable hatches in the rehearsal room enabling tailored acoustic settings.

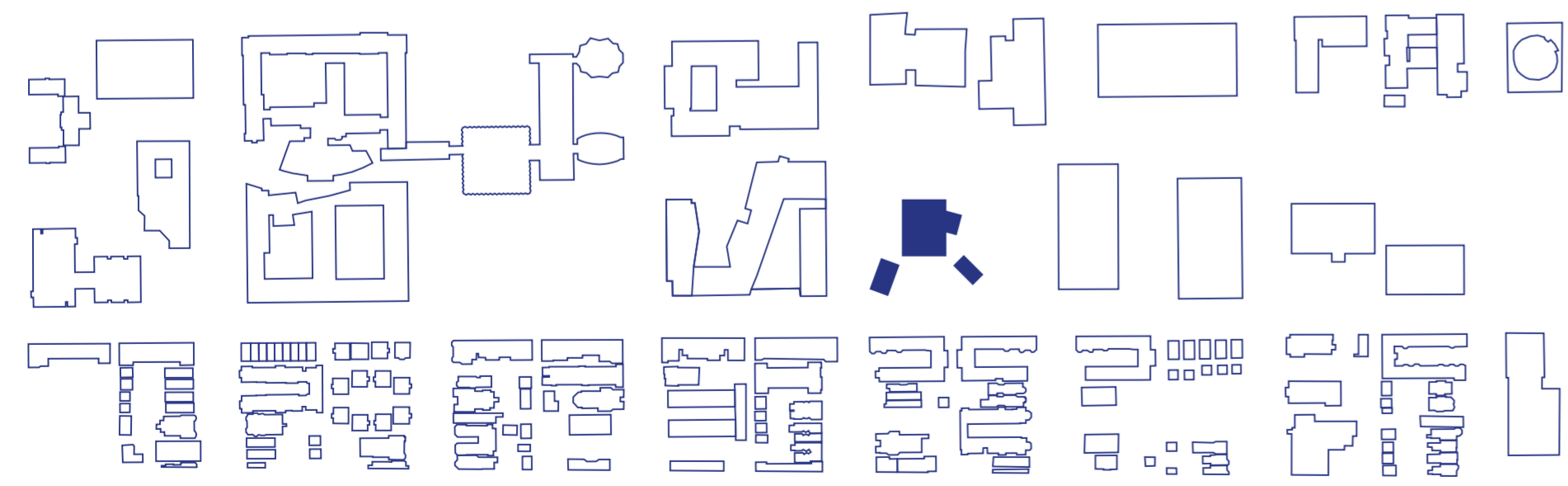
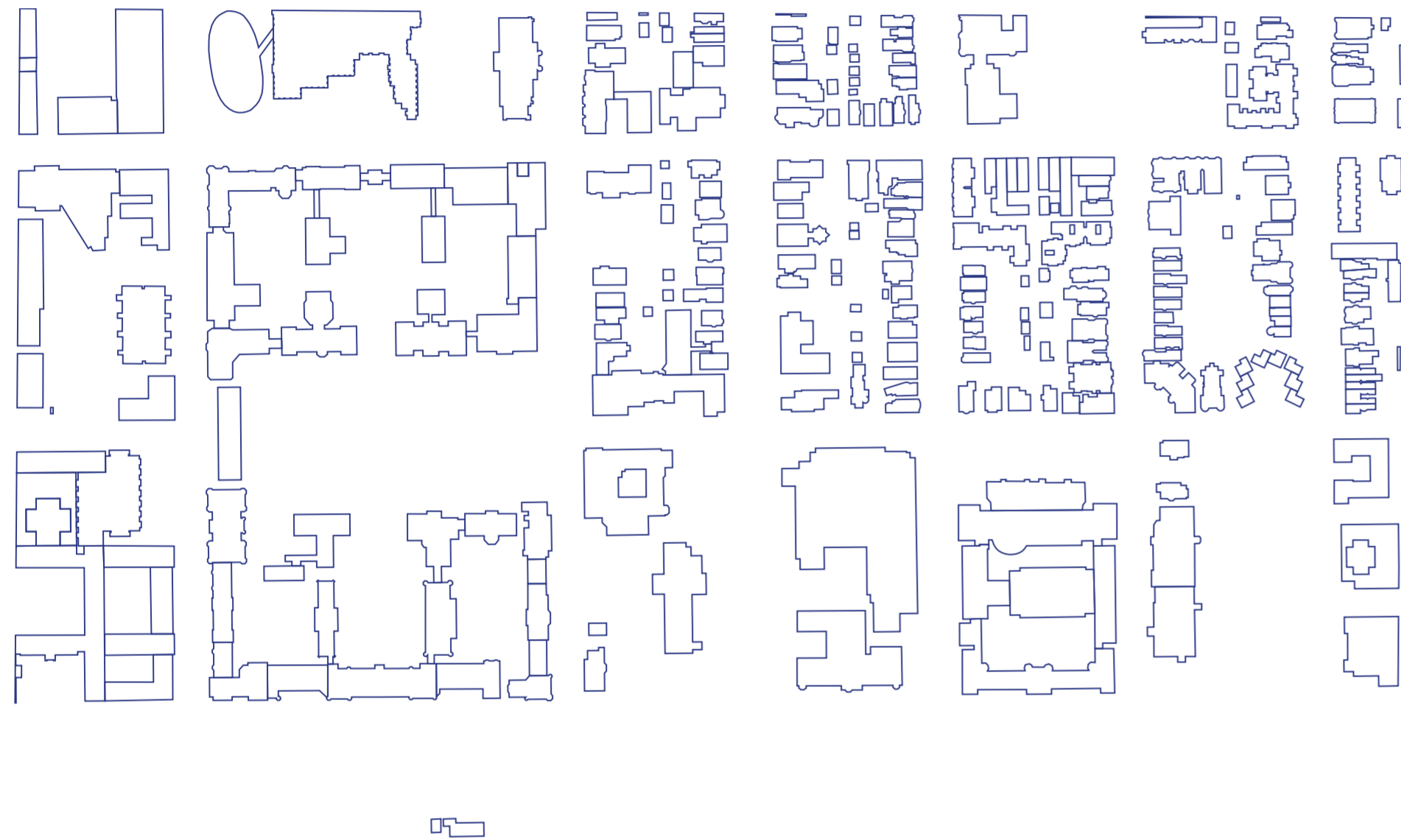
Overall, the design methodology for the Hatch Opera results in a versatile and inviting venue that enhances the musical experience and serves as a vibrant community space for performance, learning, and social interaction.

(2)

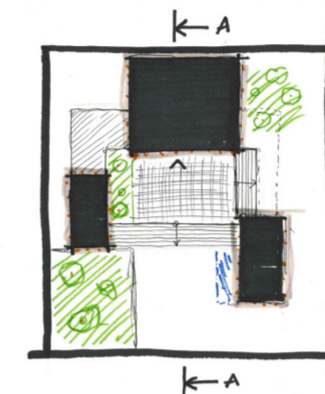
# CONCEPT



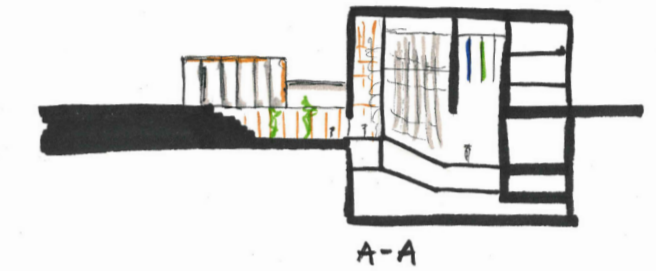
# INCLUSIVITY TRANSPARENCY EMPOWERMENT



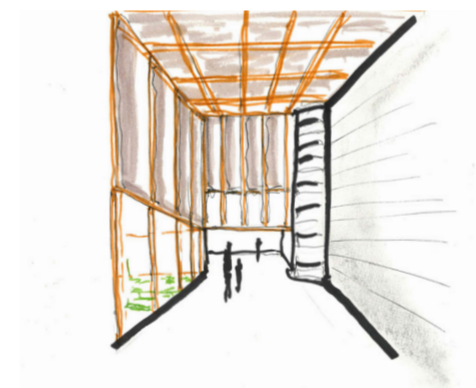
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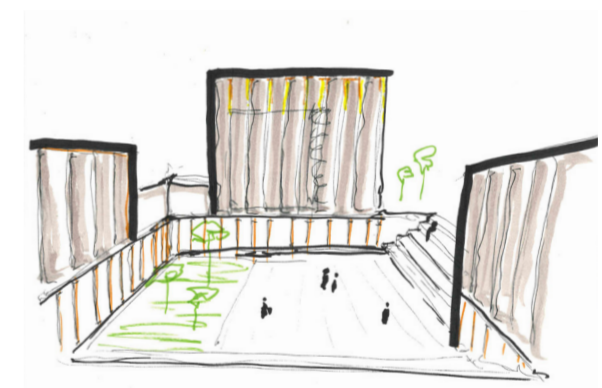
(2) Enriching the site and creating a central plaza enveloped by the opera to provide attractive outdoor spaces for the entire campus.



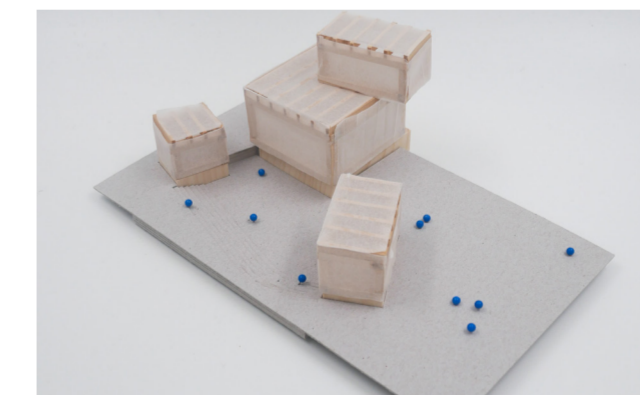
(3) Lowering the plaza by the entrance both to match the height of the lowered opera hall and to create a sheltered outdoor space.



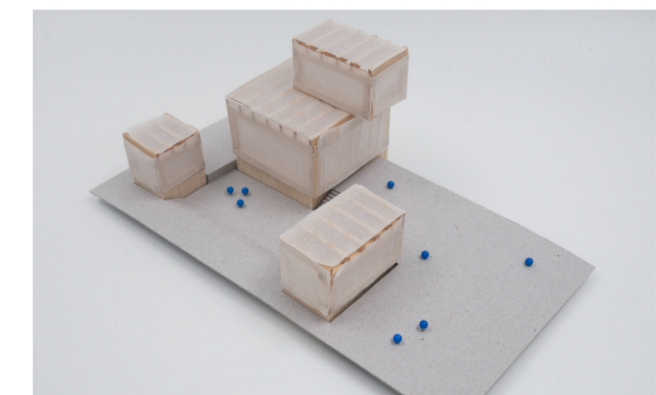
(4) For the lobby room, we knew early in the process that we wanted both to have a visible construction and a tall, slender room.



(5) The lowered plaza. It was essential throughout the design process that the plaza felt both intimate and sheltered but also inviting and public.



(6) We carefully considered the placement of the different volumes. We decided on an angled approach, where the volumes open up the plaza and more clearly define a second plaza to the left.



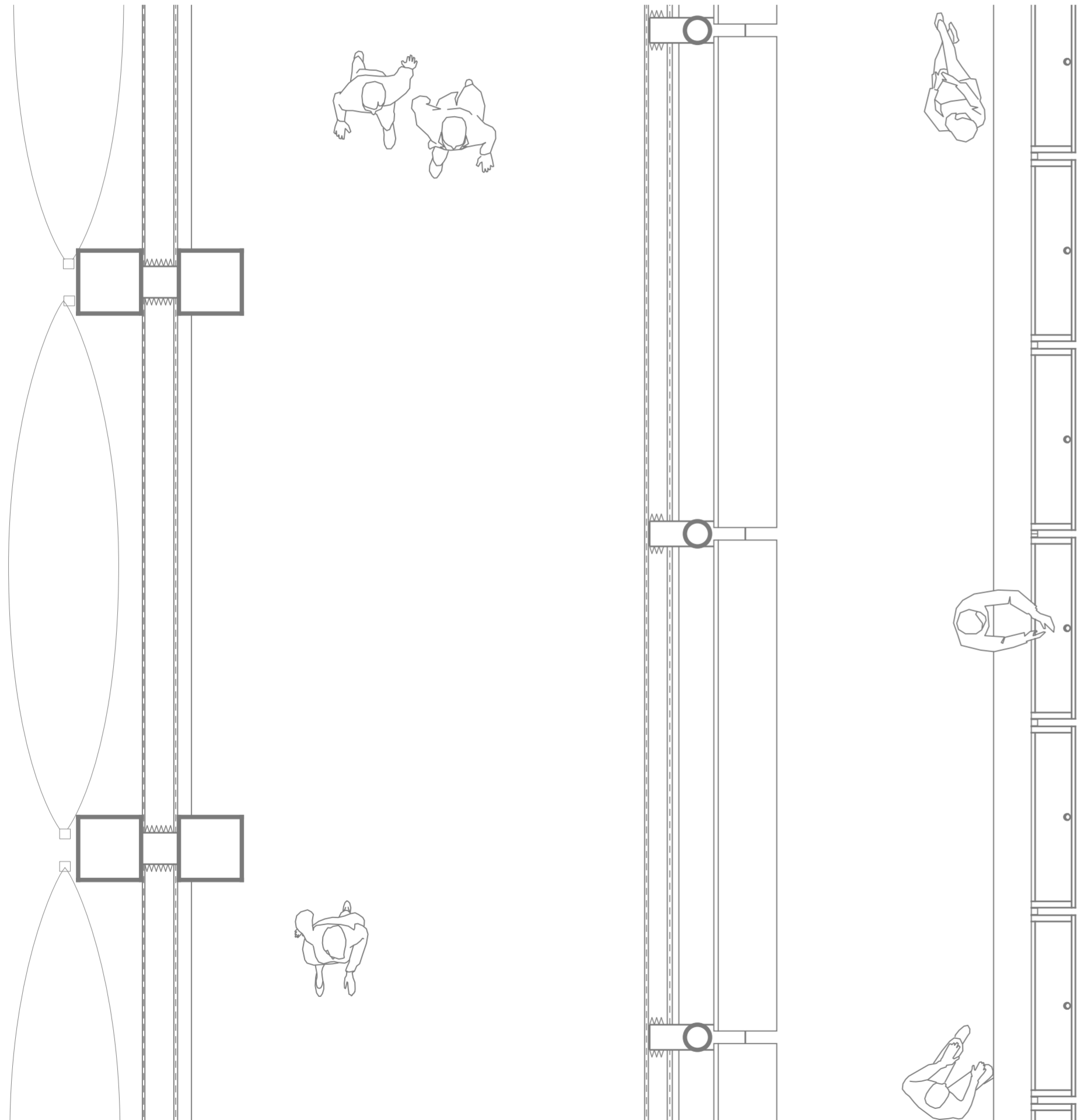
(7) The orthogonal approach. We decided against it in favor of creating something more playful and visually intriguing.

Inclusivity through the architecture and the utilization of the site was a guiding concept throughout the design process. Since the opera is located on a collage campus, a context we as students are very familiar with, we felt it to be very important to create functional spaces for all students. Both inside and outside. Furthermore, we wanted to challenge the historically elitist nature of opera and create an opera experience that feels new, inviting and open. This concept of inclusivity is part of our other two guiding themes, but starts here with the utilization of the site.

# CONCEPT

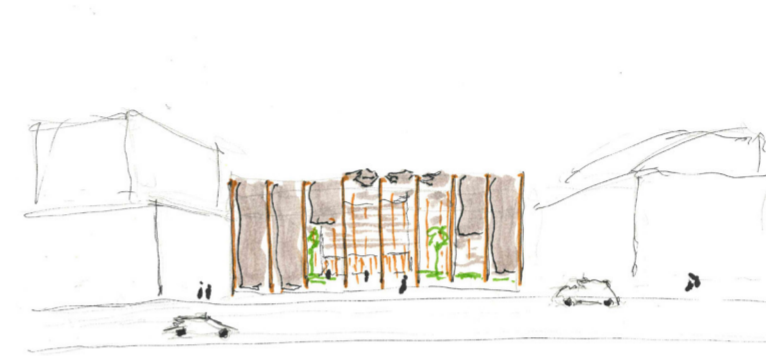


# INCLUSIVITY TRANSPARENCY EMPOWERMENT



(1)

To further challenge the elitist and uninviting atmosphere of opera and in an effort to demistify we decided on utilizing transparency in the architecture to its full extent. By creating translucent and transparent facades we aim to show the outside world what's going on inside the opera and also remind guests that they're not disconnected from the world outside. Opera and concert halls for the most part strive towards creating a closed bubble, of course to enable visitors to be fully immersed in the experience. We wanted to challenge that. What if the opera feels more like a street performance? Something you pass by and enjoy on your own terms?



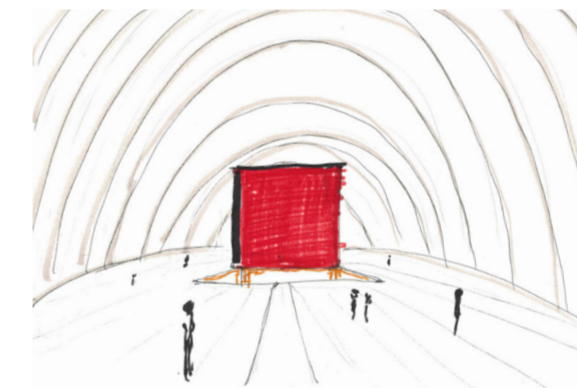
(2)

Hiding the interior volume behind a transparent layer was a conceptual idea that developed early in the process and stayed throughout.



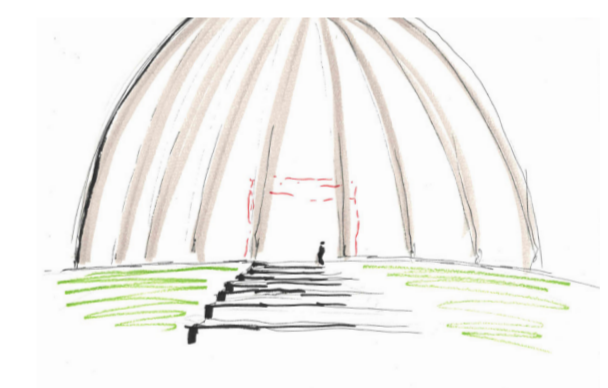
(3)

Creating an architectural journey through the transparent layers when entering the opera, both being able to glimpse in but also out.



(4)

Creating a visually striking inside that shines through the shell was a part of the transparent concept that we eventually decided to abandon.



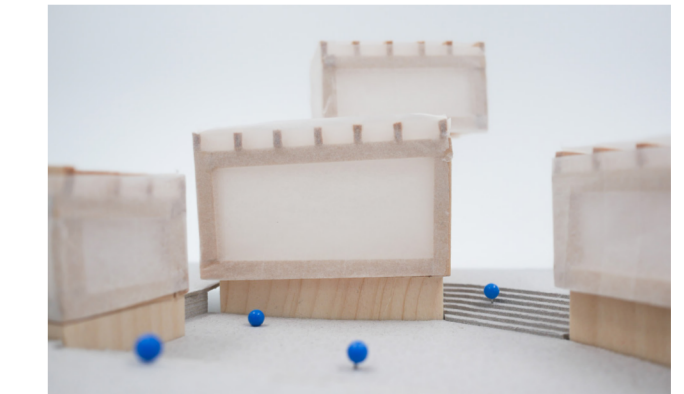
(5)

Glimpsing the inside volume from the outside.



(6)

The balcony rooms with transparent backwalls creating a visual connection to the lobby.

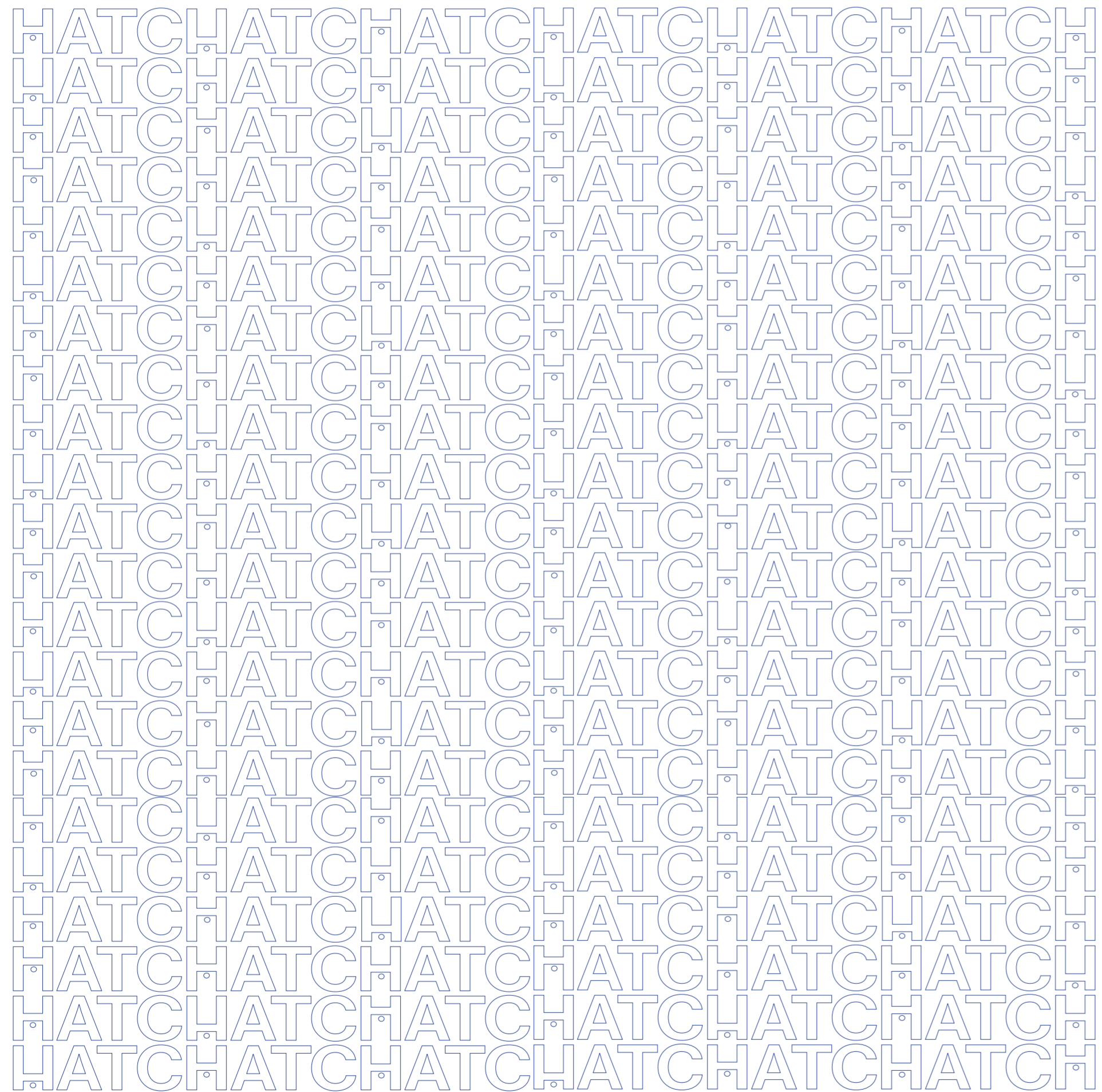


(7)

We found the idea of "transparent boxes" scattered around the site very intriguing.

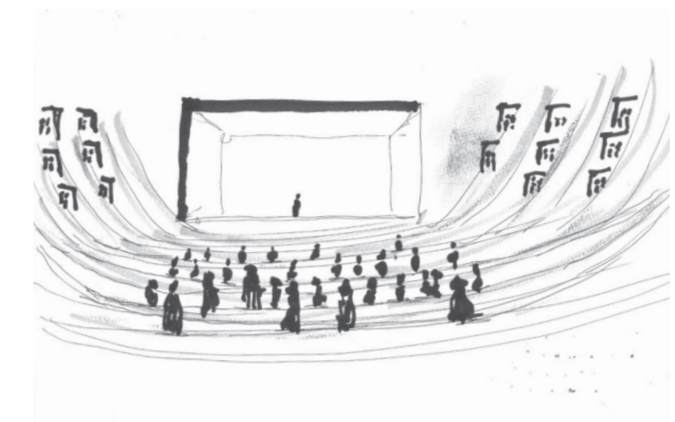
INCLUSIVITY  
TRANSPARENCY  
EMPOWERMENT

CONCEPT 

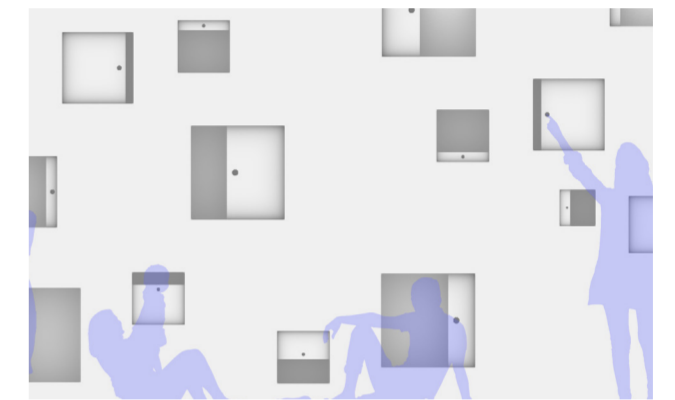


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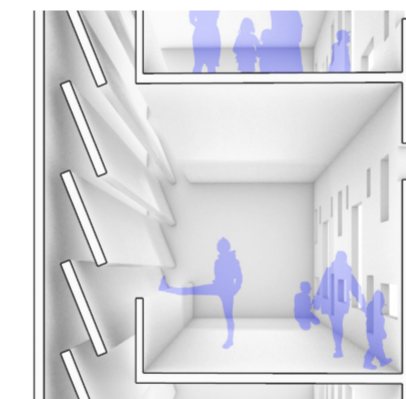
To continue the idea of watching and experiencing the performance on the guests own terms, we knew that we wanted to create an interactive experience for the visitors. Where interaction and play is encouraged. Creating and adaptable space where visitors are given the power to choose. By creating a transparent and interactive space we strive to, in the opera hall itself, create a socially inclusive atmosphere where the elitist nature of opera is muffled and introduce a new and exciting way to experience opera.



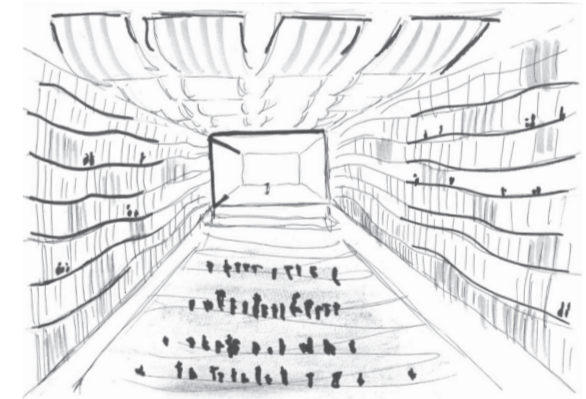
(2) We knew early in the process that we wanted to create an unconventional experience in the hall. At first we were interested in using hanging fabrics spanned between the audience.



(3) The idea of the hatches developed initially only for the balconies, the concept eventually developed into using their adaptability as much as possible.



(4) Early 3D model of the balcony corridors. Creating an open and shared space at both times disconnected and connected to the operahall.



(5) Early sketches of creating an orthogonal hall and lengthwise spanning balcony corridors



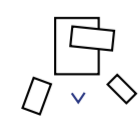
(6) Early physical model of a hatch. Here it is completely integrated into the wall, something we eventually decided against for acoustical reasons.



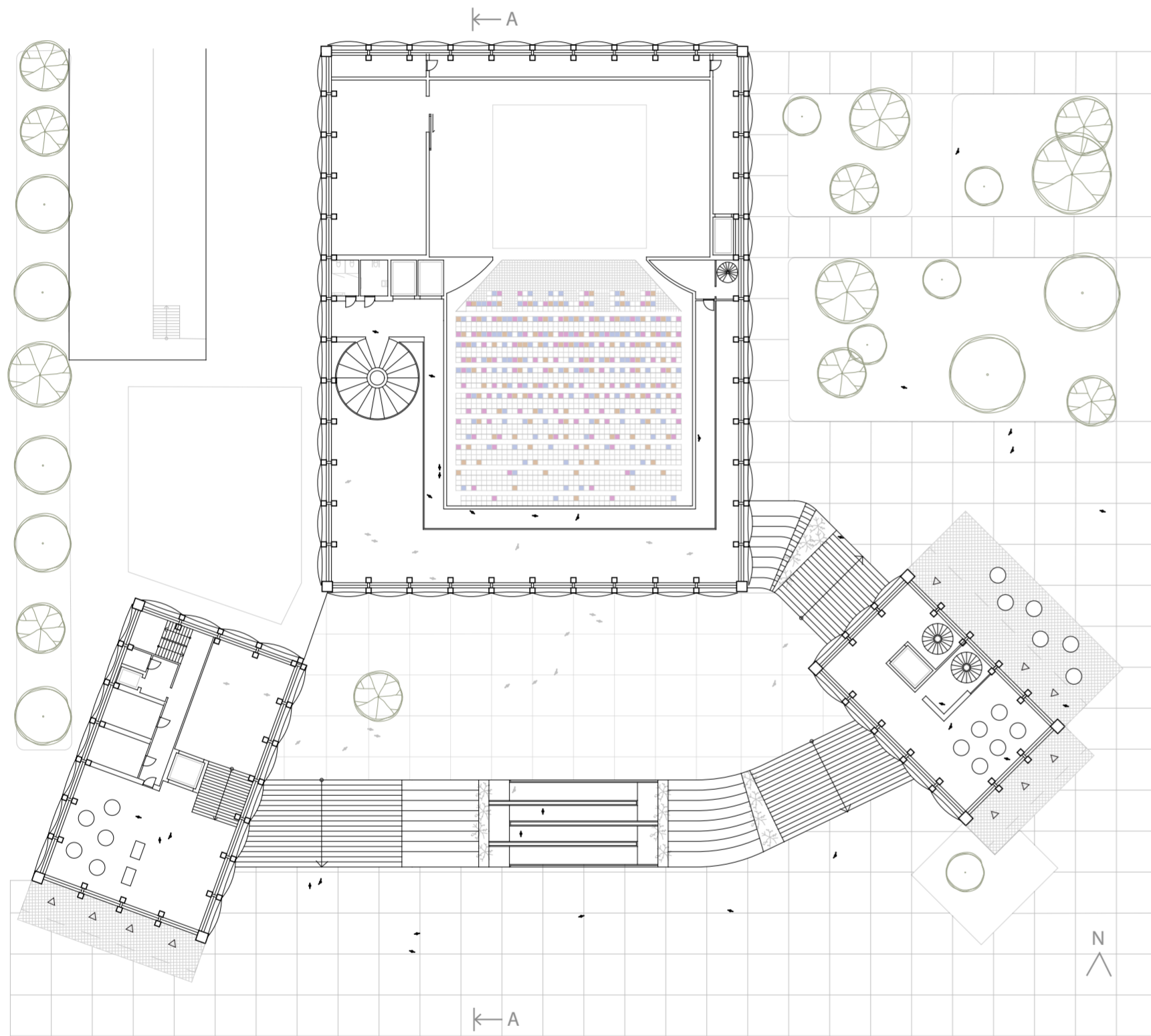
(7) Open hatch, visually it appears as square window. Something that stayed throughout the whole design process.



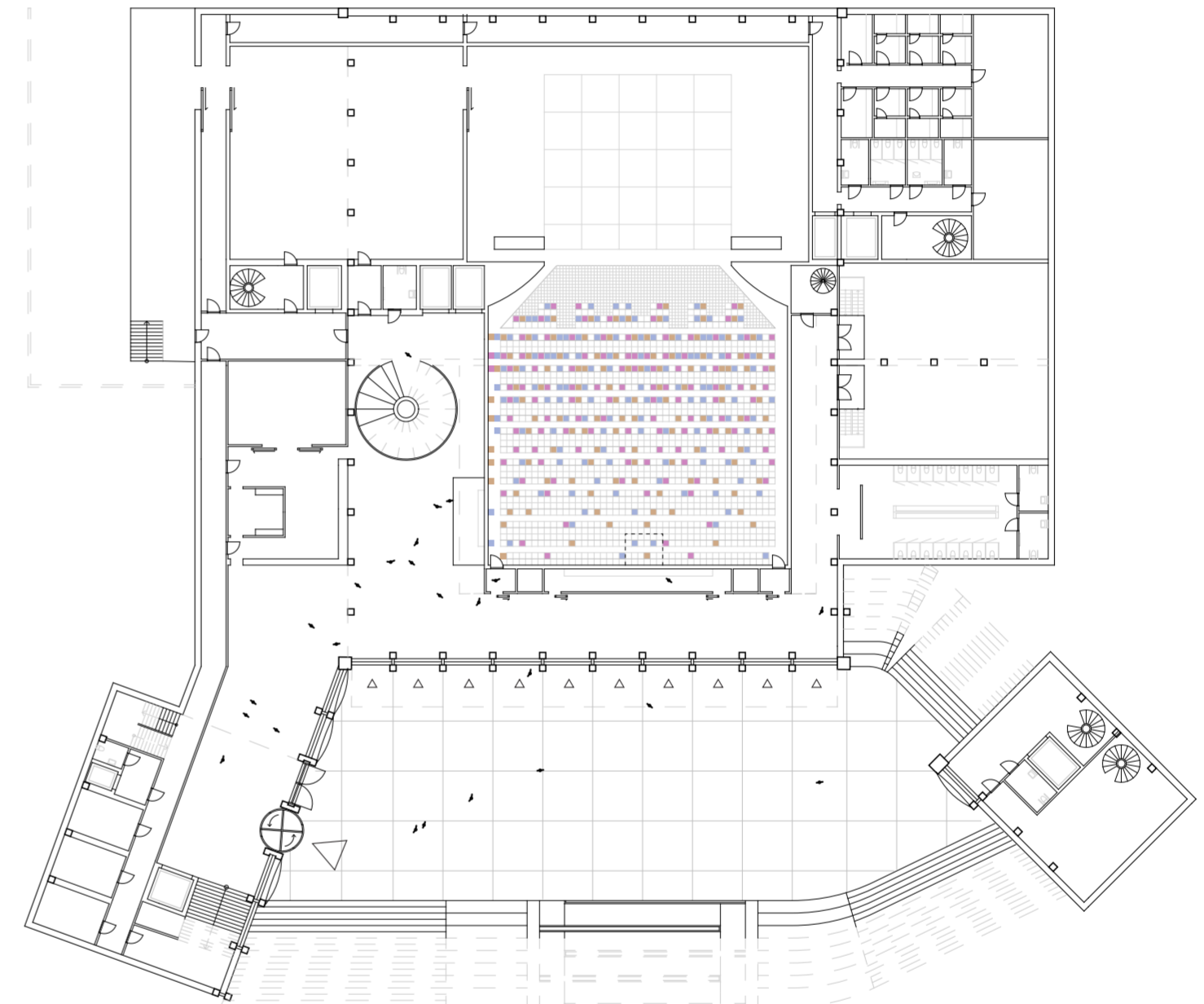
(1)



The transparent façade consisting of inflated bubbles of PVC are individually openable and reveal the innerworkings of the opera. Through the bubbles the opera hall can be glimpsed through the transparent inner facade.



(1)

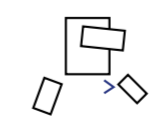


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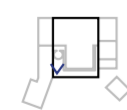
The smallest volume houses a café with places to study. The inflated wall hatches open up and connect the two plazas through the interior. It, together with the front of house volume, act as an entrance building that invites and opens up the opera towards the city.

Image Exterior Café (1)

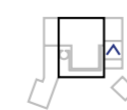


A lowered plaza is placed in front of the main operahall. The lower floor of the bigger volume is openable, integrating the plaza with the lobby and merging inside with outside. The large staircase surrounding the plaza integrate seating and green areas for the whole campus to use.

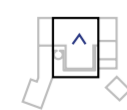
(2) Image Exterior Plaza



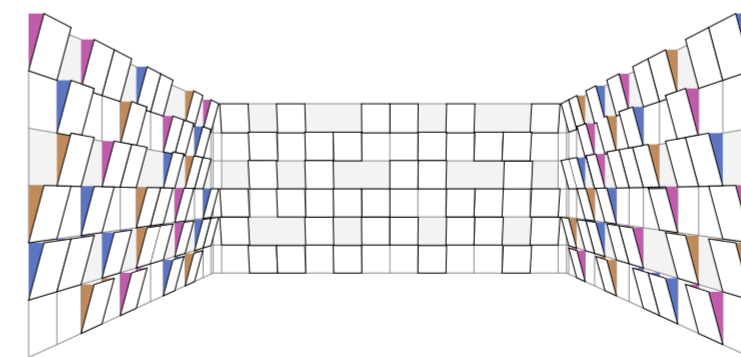
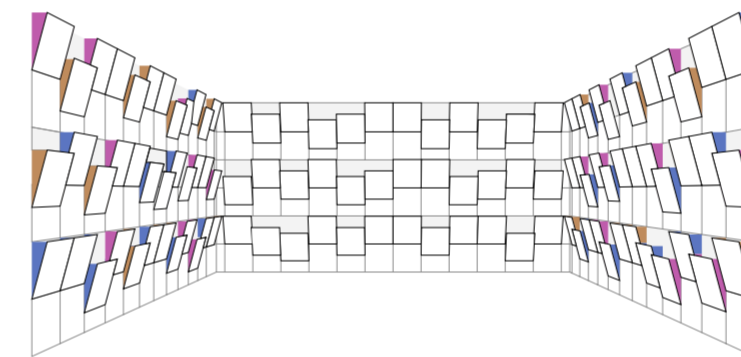
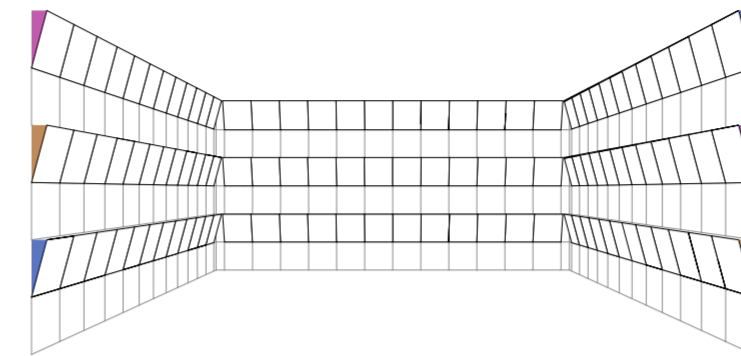
In the lobby room a large sculptural staircase is nestled firmly inbetween the two transparent facadés. The outer facadé, defined by the use of woden pillars and a visually striking wooden truss system in the roof. The inne facadé, defined by the use of steel pillars and a transparent and translucent glass and plastic.



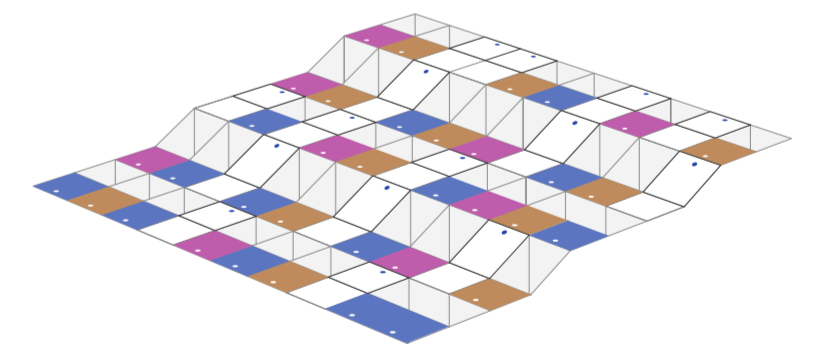
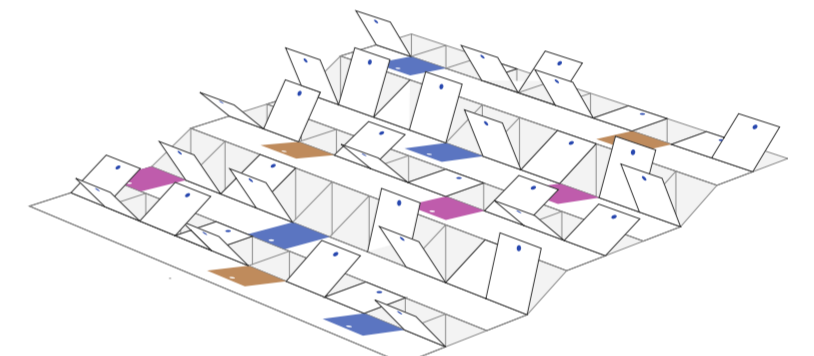
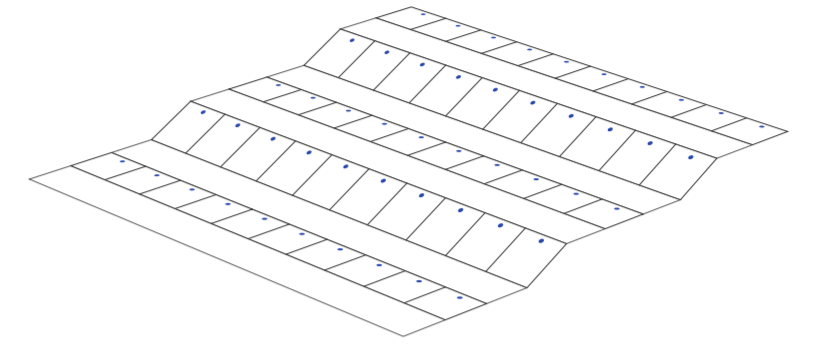
The walls of the rehearsal room are covered with retractable hatches with the ability to change the acoustics of the room depending on the intended use. Furthermore, the same pillars as in the outhter facadé divide the room and a movable wall offer the ability to close of parts of the room for acoustical reasons.



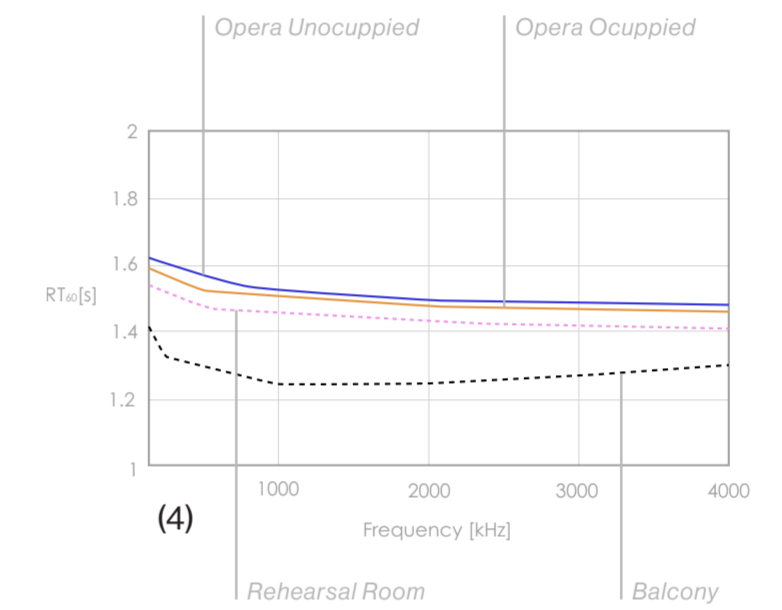
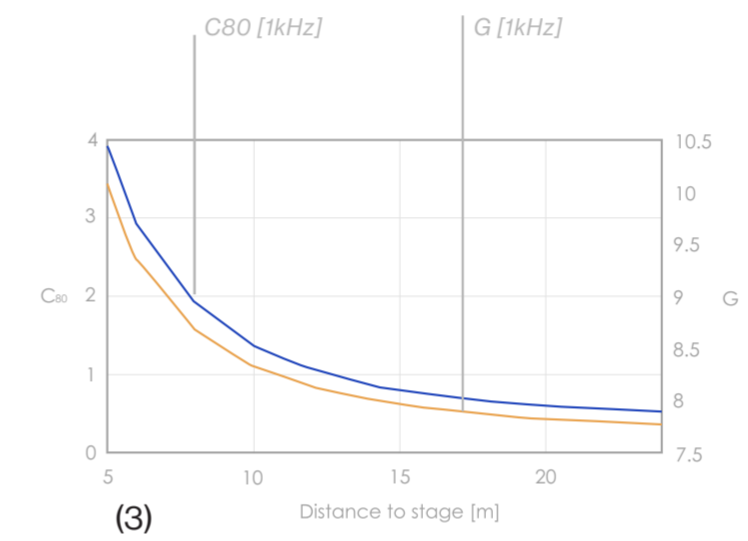
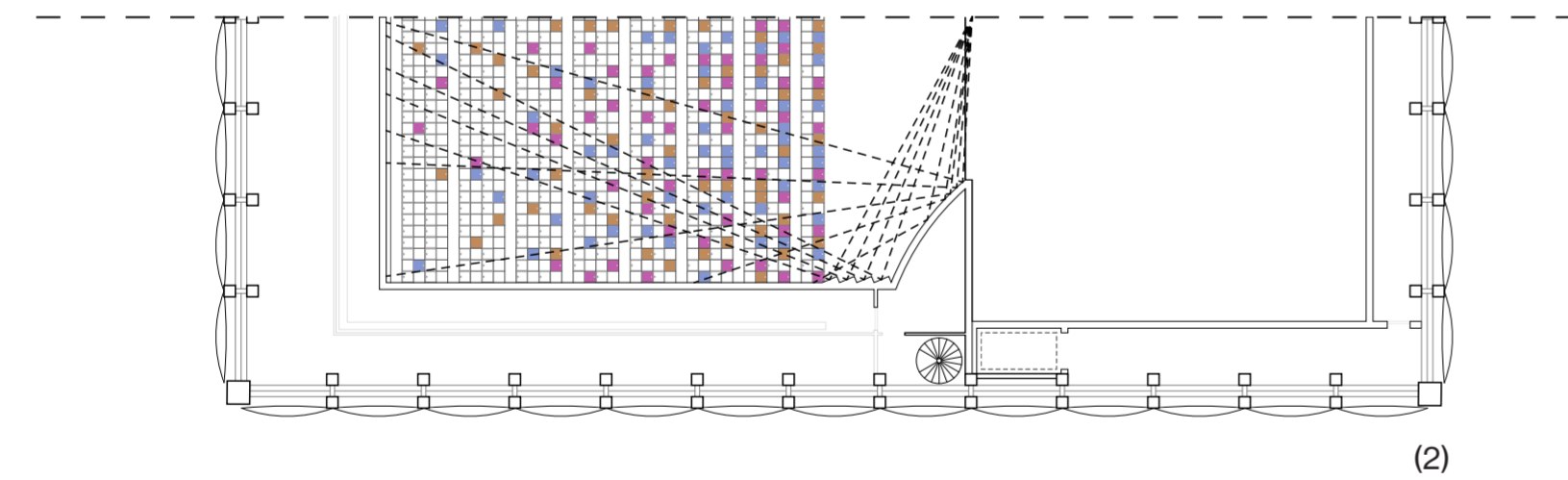
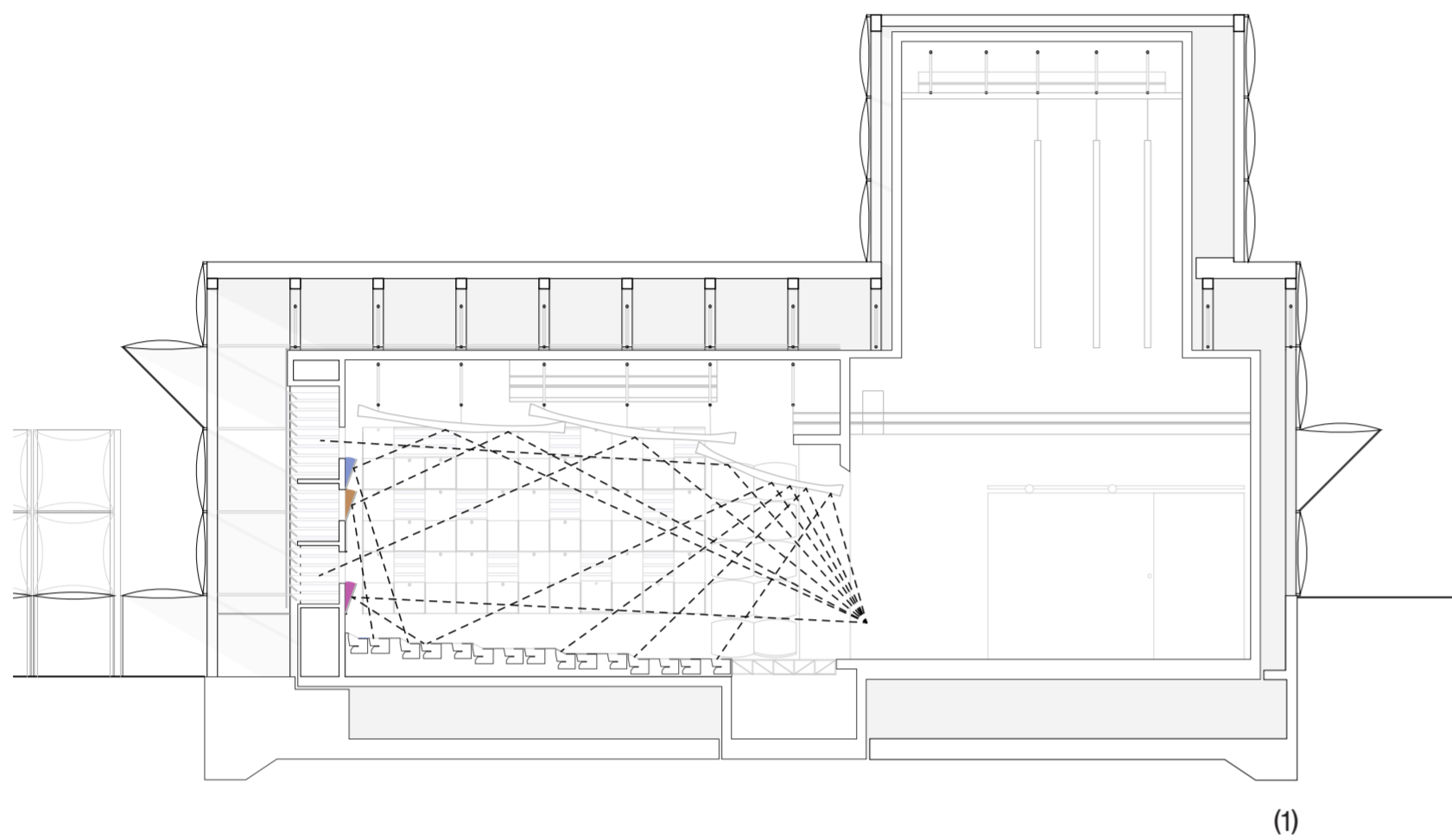
Instead of traditional seating on the parquet, visitors are encourage to lift a hatch in the floor where they will find an integrated chair. On the balcony corridors visitors pull down a hatch to open a view window. This changes the hall both acoustically and visually as guests enter and take thier seats.



(2)



(3)



Inside the opera hall, large sound reflectors hang from the ceiling, facing the audience to provide early reflections with an ITDG between 20ms - 40ms. The tilted hatches and sound reflectors mounted on the side of the stage provide early lateral reflections with an ITDG between 20ms - 40ms depending on seating position. Integrated Helmholtz-Resonators in the walls help absorb the frequencies below 500 Hz.

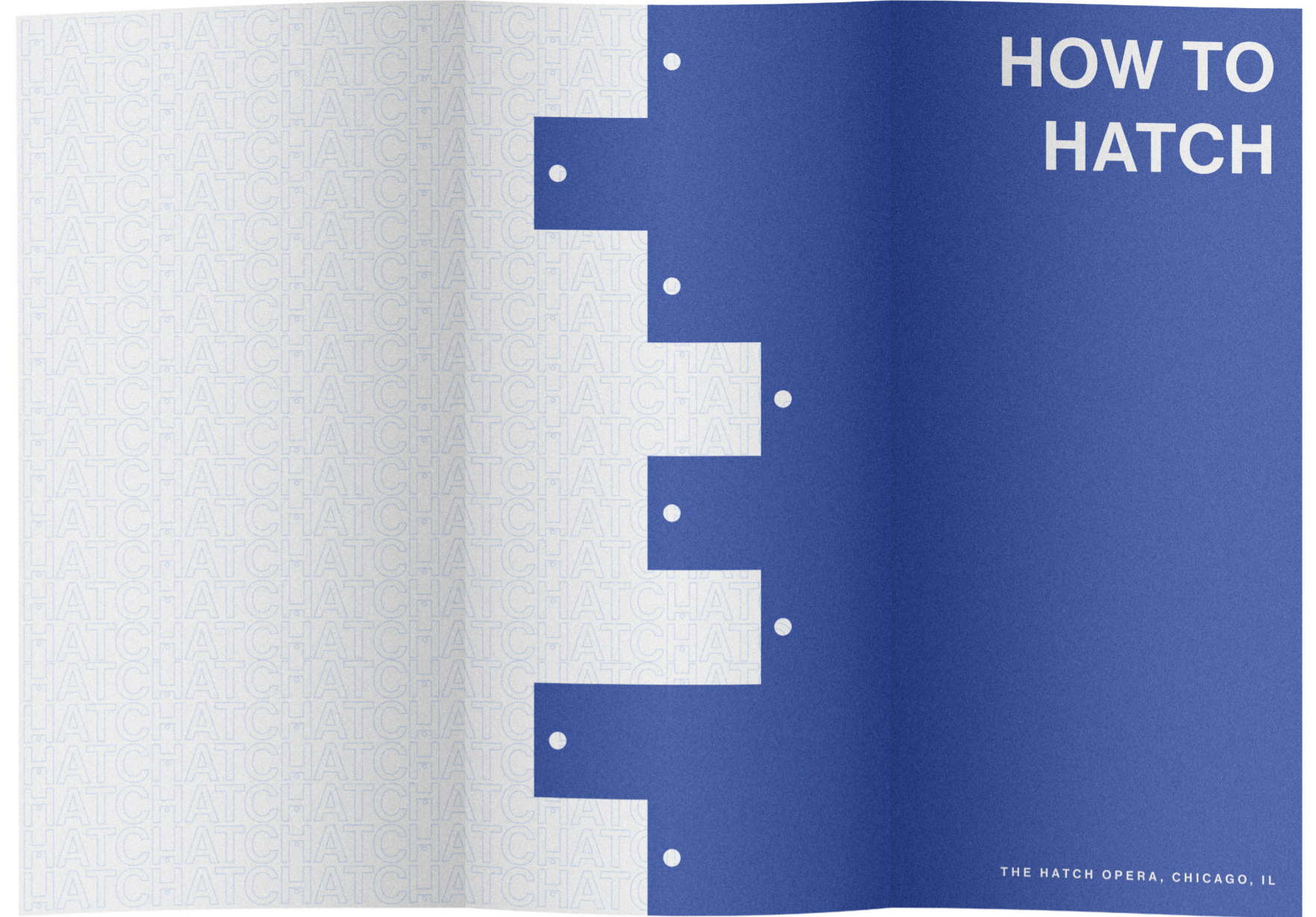
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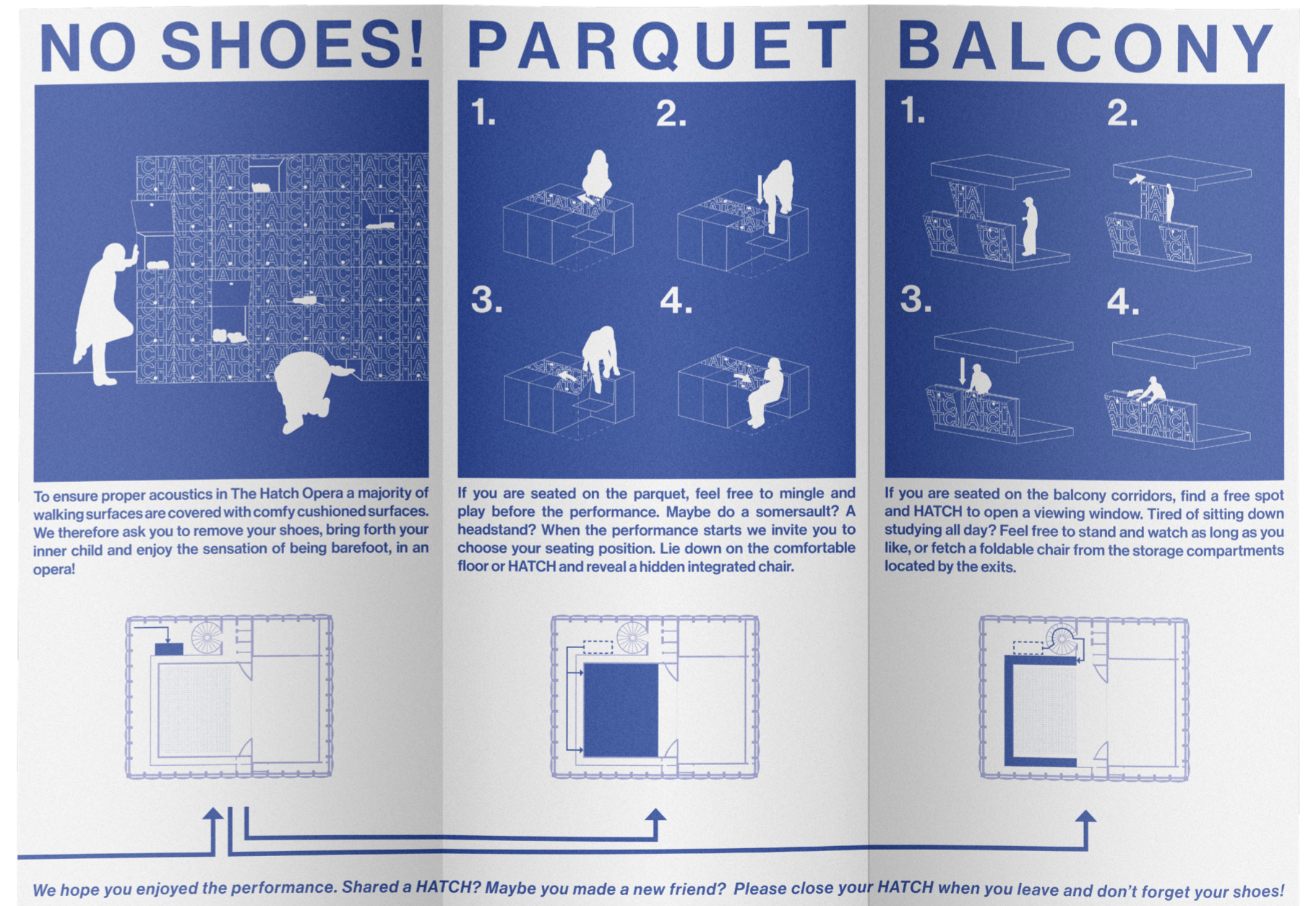


(2)



The unconventional seating arrangement on the parquet and balconies requests the visitor to interact with the architecture itself. To be able to do this the interactive process must be easy, almost self explanatory while also being fun and intriguing.

The instructional pamphlet shows in a clear way how visitors should interact with the hall. The tight graphical profile aims to be playful and encourage the interaction while at the same time being clear and easy to follow.



(3)

The structure of the course and assignments leading up to the final design assignment encouraged a very iterative and fast-paced process. We embraced this approach and decided early on to adopt a playful and explorative design process where no idea was dismissed outright. Instead, we always tried an idea and then evaluated its potential. This led to a playful and unconventional project where norms were questioned in favor of creativity and exploration.

Early on, we conceptualized three very different, broad initial ideas using quick hand sketches with charcoal and colored pencils. These ideas eventually evolved into an overarching concept centered on inclusivity and interaction, something unique for an opera hall. We created a large number of physical models, with the site model proving particularly valuable in our design process. Rapidly iterating the placement of the different volumes was instrumental in developing the final design.

The idea of hatches emerged surprisingly late in the design process and conceptually worked as a tool for promoting inclusivity and interaction. Throughout the process, we often found ourselves leaning heavily into the concept of the hatches, sometimes perhaps too much. This was partly because it was a comfortable design approach and partly to push the concept as far as we could. We even created branding and graphical design directives for the operation of the opera to further envision the reality of the concept.

Overall, I am very satisfied with this project in its entirety. The explorative and playful process stimulated creativity and was by far the most important quality.

(1)