

Sound In Motion

- proposal for concert pavilion

Adam Skoglund - Project Portfolio

Bachelor's Project

2026, 15hp

Together with Iain Hermansson and
acoustician Alice Palmgren

Examiner: Mats Ander

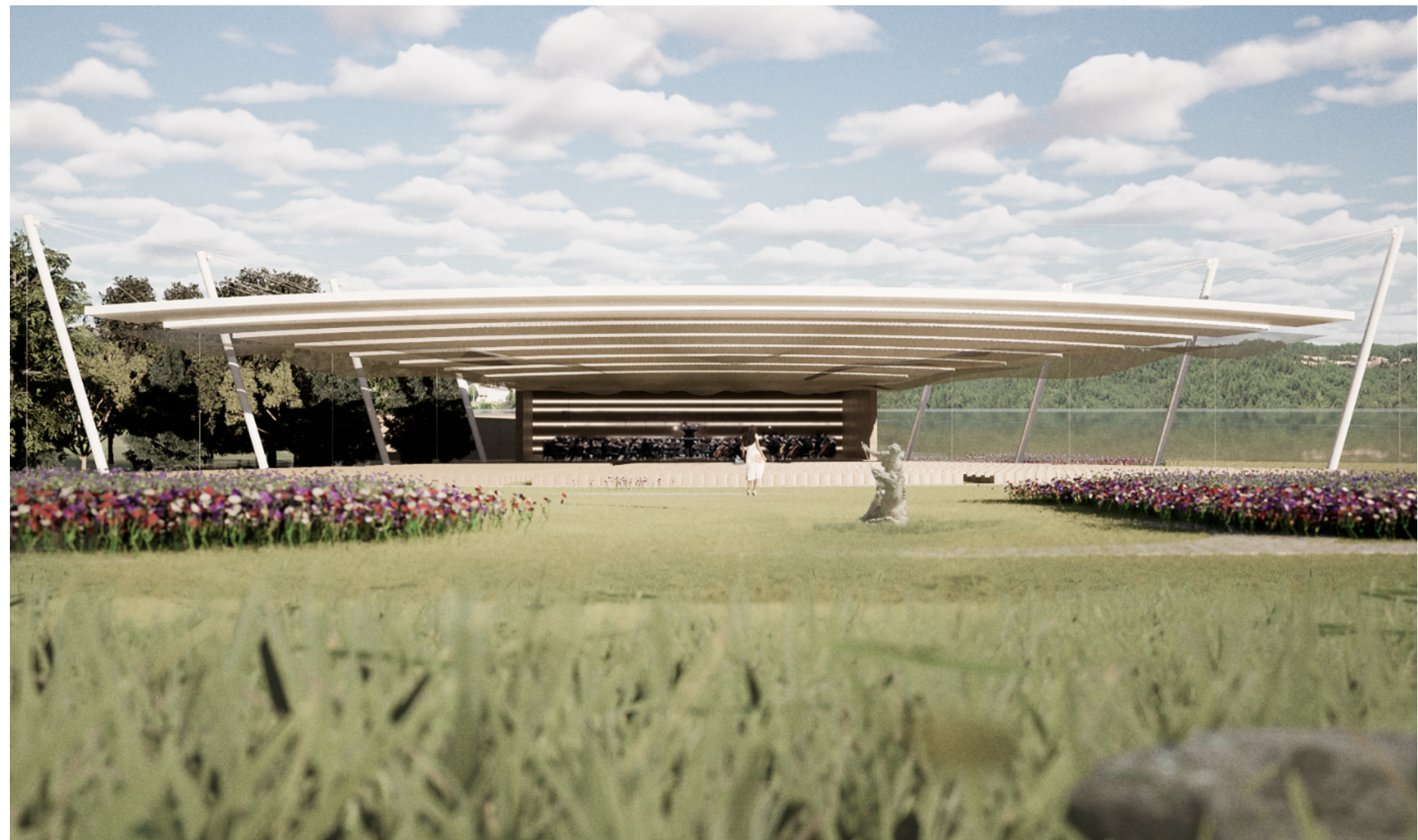
Supervisor: Morten Lund, Peter Christensson,
Lukas Nordström

Commendation Award:

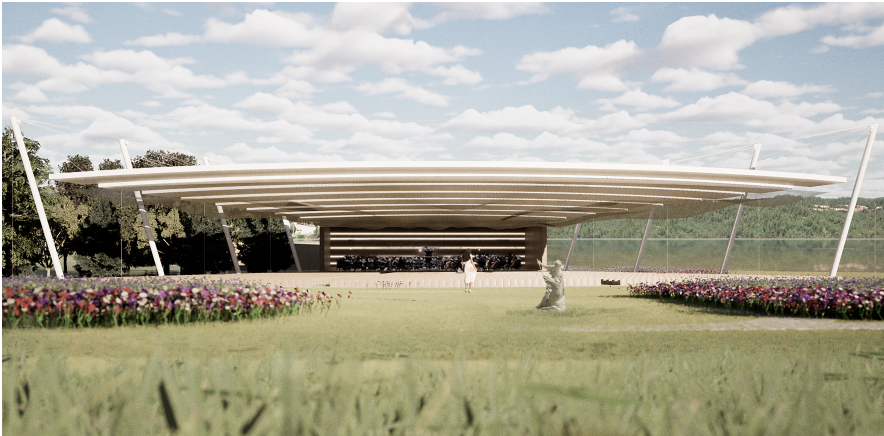
ASA Student Design Competition 2026

The bachelor's project at the Architecture & Engineering program at Chalmers concludes three years of learning and combining architectural studies with engineering methods and principles. The project aims for us to design with performance in mind and to practice collaborating disciplines.

The project follows the program of the 2026, ASA Student Design Competition, a international architectural acoustics competiton. The task is to create a 13 000 seats music pavilion with covered and lawn audiences for a summer venue. The venue should accomodate a variety of acts, from touring acts to orchestra performances.

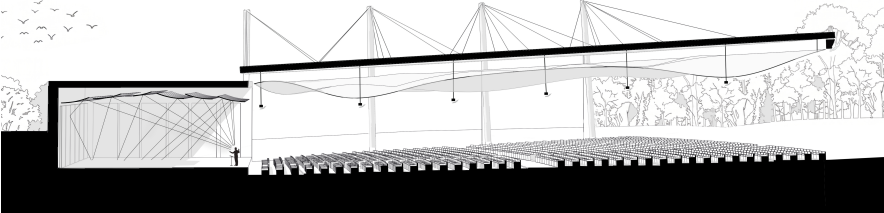


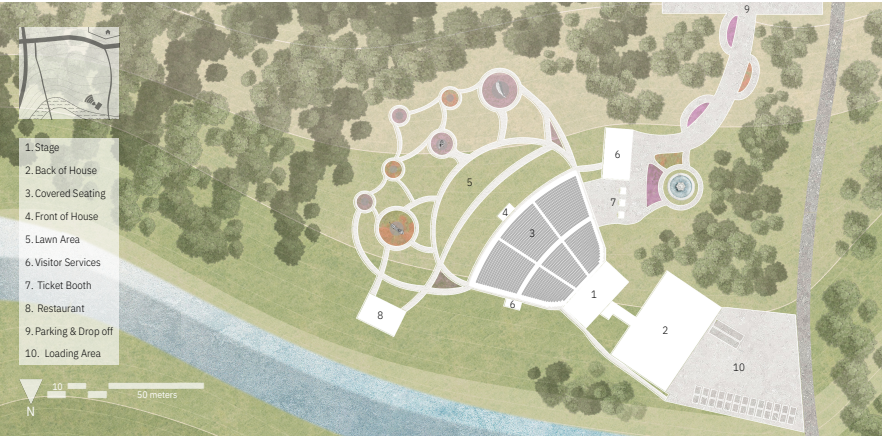
Competition Posters



SOUND IN MOTION

A project by Iain Hermansson, Alice Palmgren, Adam Skoglund
Chalmers University of Technology, Gothenburg





Concept

The motion of music, a sense of flow, is articulated within the pavilion by a canopy of drapes above the seated area.

By offering distinct experiences under the roof and on the lawn, alongside a versatile stage design, the venue adapts to a diverse range of performances and visitors.

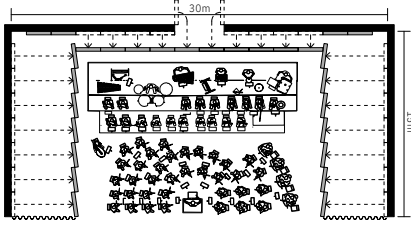
Site Context

The pavilion is situated in the northwest corner of the site in a clearing amid a dense, mature forest. The clearing opens towards the calm river, setting pavilion and lawn close to nature.

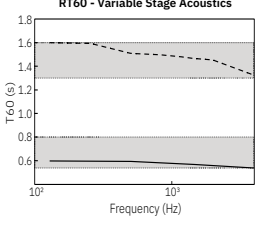
Visitors approach the venue via a promenade through the trees leading to the entrance. Entering, the view reveals the flowing fabric set against a backdrop of the river and lush forest. The towering height of the old trees creates a sense of envelopment within the lawn, harmonizing with the drapes over the seating area.

The lawn is divided into smaller areas by paths, encouraging a free-flowing movement across the site. Sculptures and floral arrangements let visitors decide where to enjoy the music, either on the open grounds near the orchestra, or strolling around in the tranquil sculpture garden.

A restaurant building by the river offers a meal with scenic surroundings before a memorable listening experience.



RT60 - Variable Stage Acoustics



Structure

The pavilion canopy features a slender slab suspended from eight structural steel masts. This bridge-inspired, cable-stayed system utilizes load-bearing and stiffening cables to achieve a large, rigid span, sheltering the 3000-seat audience area. By distributing weight across multiple support points, the roof remains remarkably thin and visually light.

This structural transparency seamlessly integrates the surrounding landscape into the pavilion, providing light weather protection while preserving the airy ambiance required for a summer orchestra.

Stage

The stage is designed for the natural unamplified acoustics to fulfill the hearing among musicians. The walls are made up of lightly structured panels that angle in toward the stage. The widths of the panels are varied throughout the stage, and the angles are optimized to contain sound energy.

Additional panels are suspended from the ceiling, reducing the first sound reflection to 5 meters thereby fulfilling the Initial Time Delay Gap (ITDG) requirement of 20 ms.

Tiered rear risers placed at the back of stage optimize direct sound paths and sightlines, minimizing acoustic masking for essential ensemble support.

Adaptability

The stage is designed to accommodate three different types of concerts.

250-member ensemble - the stage is used in its largest configuration.

100-member orchestra - the walls are pushed forward, reducing the stage volume by 700 cbm.

Touring acts - the walls are rotated, exposing the absorptive backside. The reverberation time shown in the graph is calculated with all panels rotated.

By customizing the number of panels rotated, the reverberation time can be adjusted.

Fabric

Hanging fabric drapes cover the seating area. The fabric is suspended from wires using silent winches. These winches regulate the fabric's height throughout the space, creating a sense of flow that mirrors the music.

Light fixtures installed above the drapes highlight the material, further enhancing the listening and visual experience.

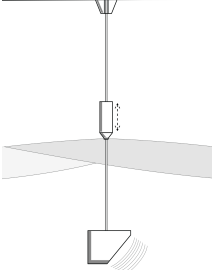
Acoustically, the drapes act as partial absorbers. Their changing heights and distances to the roof vary the absorbed frequencies down to 60 Hz, effectively avoiding acoustically dead zones.

Seated Area

At the seating area, the feeling of envelopment is intensified by an electroacoustic enhancement system. Smaller speakers are mounted in the rigging for the drapes, where the even spread of active point sources creates the artificial reverberation time that surrounds the listener.

These speakers are placed with a maximum distance of 12 meter spacing, allowing for adequate delays in relation to the direct sound.

Main loudspeakers and subwoofers are installed at the stage. By placing them on springs while anchoring the heavy concrete floor of the stage to the ground, the structure-borne vibrations are minimized to ensure acoustic clarity and protect microphone pickup.



Lawn Area

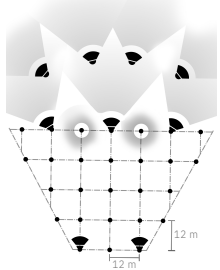
The lawn offers an informal alternative to covered seating, providing a leisurely outdoor concert where visitors can picnic or stroll the sculpture garden.

While the seated area's loudspeakers simulate reflections and create the spatial impression of a hall, the lawn is supplied by strongly directed loudspeaker arrays placed at the roof's edge and integrated delay towers in the sculpture garden. This setup enforces directionality from the stage and creates a park-concert feel.

Vibration Control

To minimize vibrations between the stage and Back of House (BOH), the two buildings are physically separated. A corridor with insulating springs connects the parts, effectively reducing transmissions between parts. BOH is constructed with decoupled double-stud walls with an air gap as well as resilient channels to reduce noise between rehearsal rooms, maintaining a rating of 60 STC.

These measures are critical to ensure that the acoustically sensitive spaces, as dressing rooms and stage achieve the wanted noise criteria. Furthermore, the corridors are designed with corners and may be closed off with doors to minimize sound propagation. In the corridors, ducts are routed, minimizing the noise propagating through ductwork between neighboring rooms.

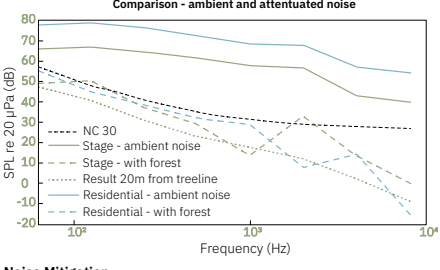


Back of House

The dressing rooms are designed to match stage RT, with drapes installed to enable adjustable reverberation as desired of the practice rooms.

Room placement keeps logistics and performers separated, benefiting efficiency and creating natural flow through BOH. This layout provides clear corridors and ensures high-noise areas, such as the loading dock and MEP, are positioned far from quiet, acoustically sensitive dressing rooms.

To facilitate the seamless loading and transport, the route from the loading dock to the stage is a direct, level path without height differences.



Noise Mitigation

To reduce noise levels in the clearing, the noise-mitigating properties of the surrounding forest are optimized. By planting additional trees in sparse areas and incorporating shrubs, the forest becomes significantly denser. This increased density of greenery, combined with extending the tree trunk area to 3% of the forest and diversifying the vegetation, enhances both the reflection and absorption of sound.

After more than 300-meter distance, the forest can be seen as an acoustically effective barrier. The forest's height of 30 meters ultimately gives the insertion loss shown in the graph.

Ambient noise levels are calculated based on propagation over distance and air absorption. The values calculated at the stage do not account for reflections or absorption from the roof and audience, suggesting that actual noise levels may be slightly lower than predicted.

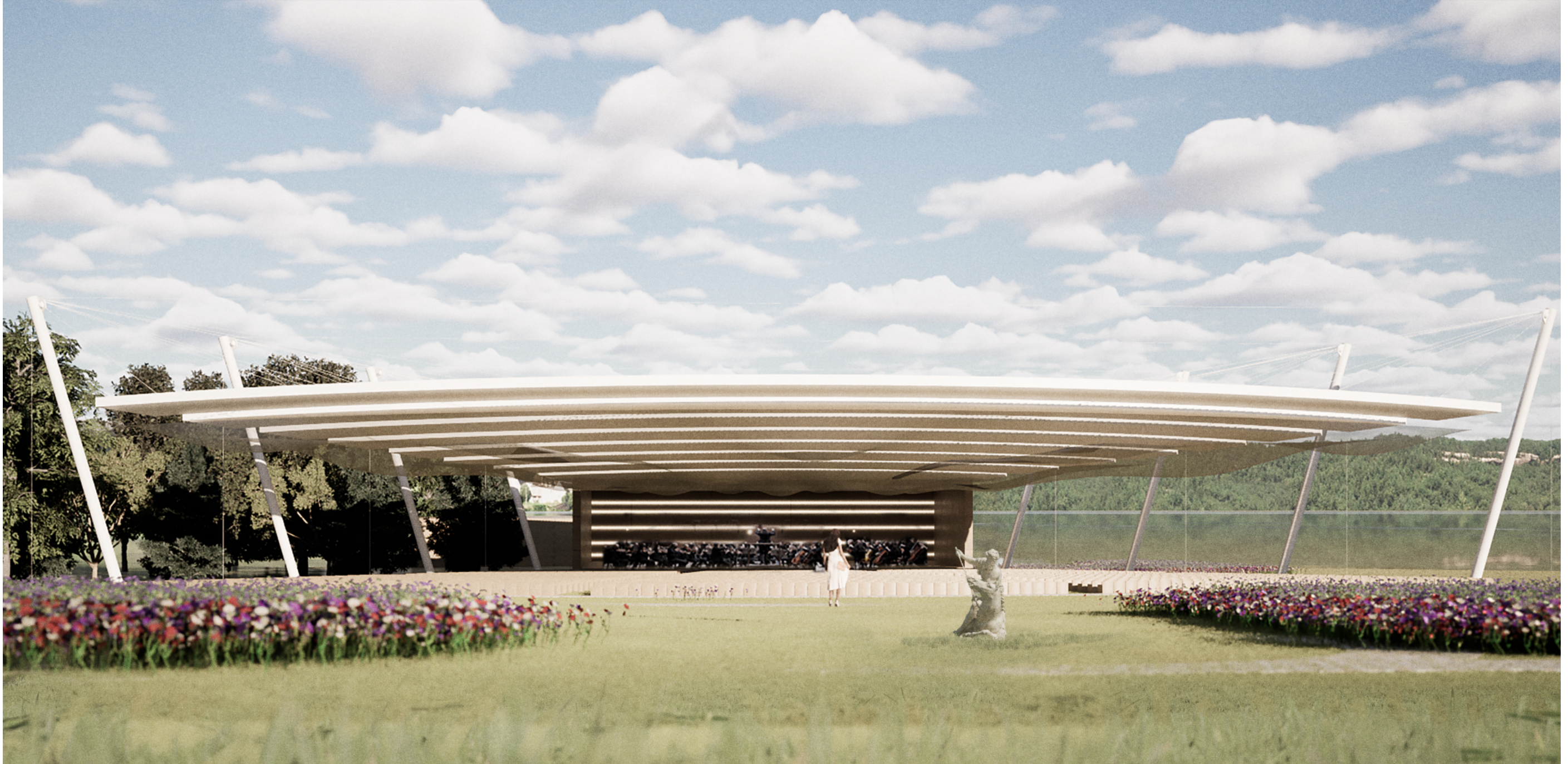
On the lawn, 20 meters from the treeline, the noise level shows a more significant reduction due to its proximity to the tall trees. Furthermore, as windy conditions can lead to the downward propagation of noise, an acoustic screen is positioned within the forest, approximately 30 meters from the clearing.

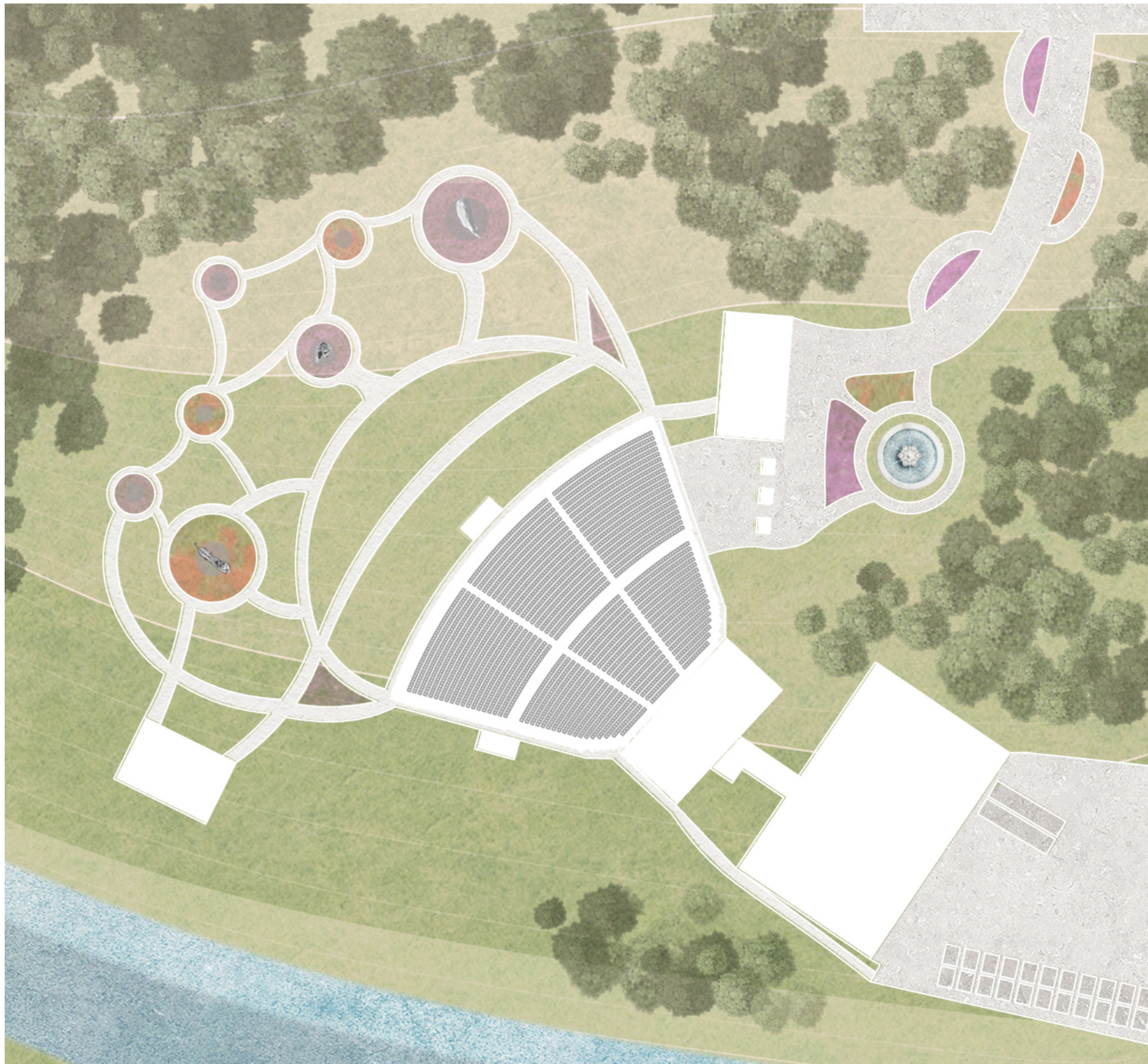
For the residential area the same principle as the forest is used. As the noise levels from the concerts are significantly higher than that from the road, and the placement of parking in between the venue and residential reducing forest space, an extra screen with height 3 meters is added beside the road reducing the noise further. Enabling NC30 at the residential housing.

Room	Area (sqm)	NC
1. Stage	(465 sqm)	NC 25
2. Dressing room	(19 sqm)	NC 30
3. Star Dressing Room	(28 sqm)	NC 35
4. Orchestra Lockerroom	(140 sqm)	NC 35
5. WC	(182 sqm)	NC 35
6. Green Room	(75 sqm)	NC 35
7. Technical Office	(45 sqm)	NC 35
8. Touring Office	(18 sqm)	NC 35
9. Storage	(550 sqm)	NC 35
10. Piano Storage	(14 sqm)	NC 35
11. MEP	(75 sqm)	NC 35

Hallways and Corridors

Audience
Residential





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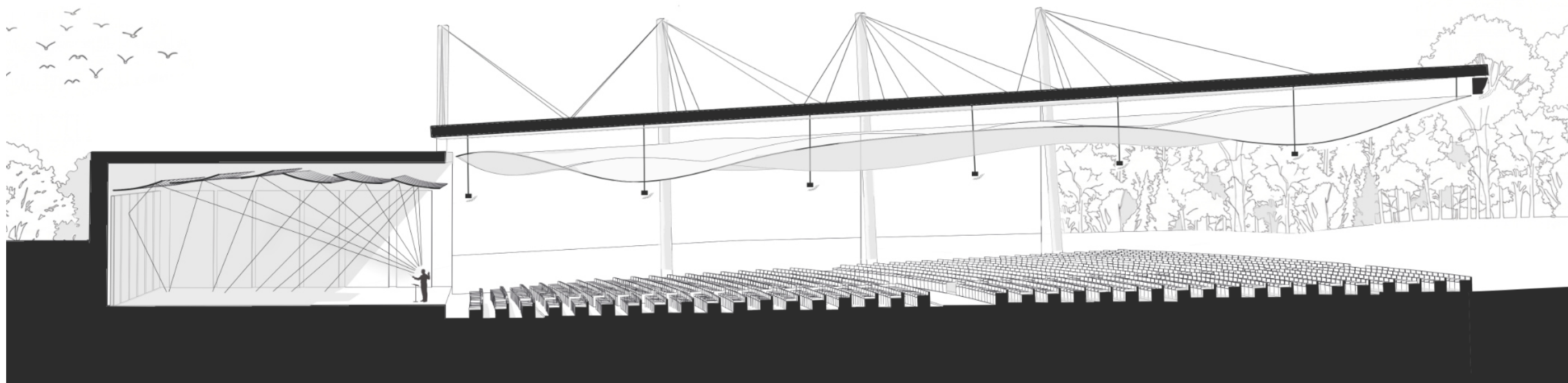
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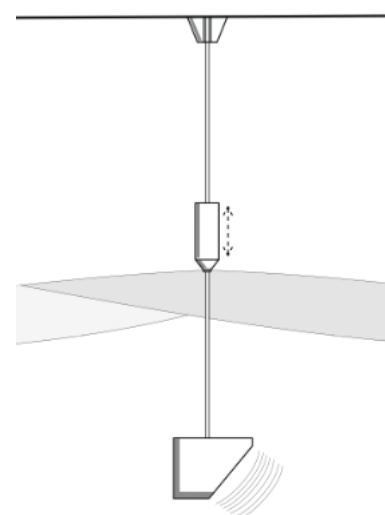
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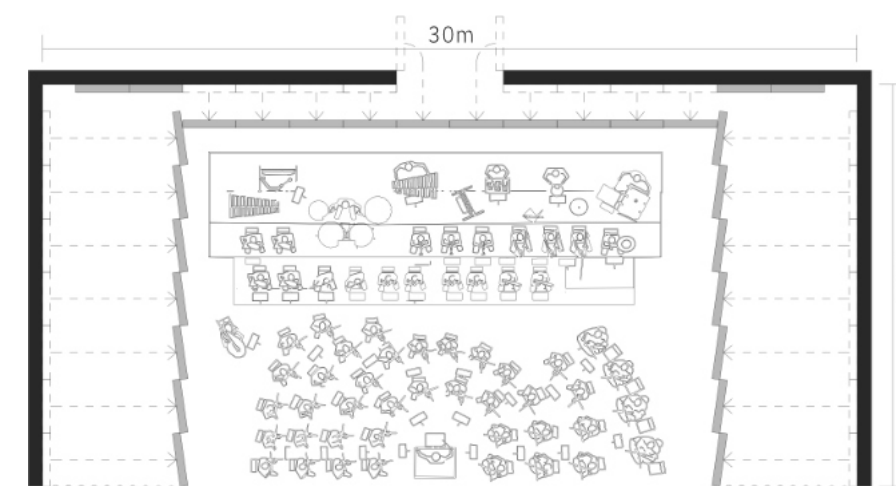
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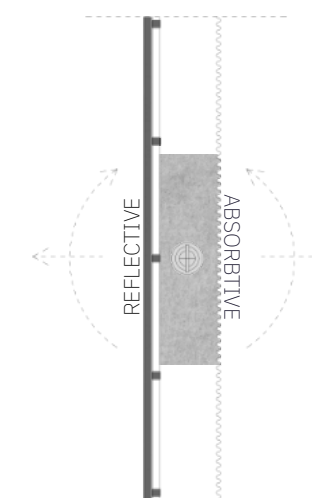
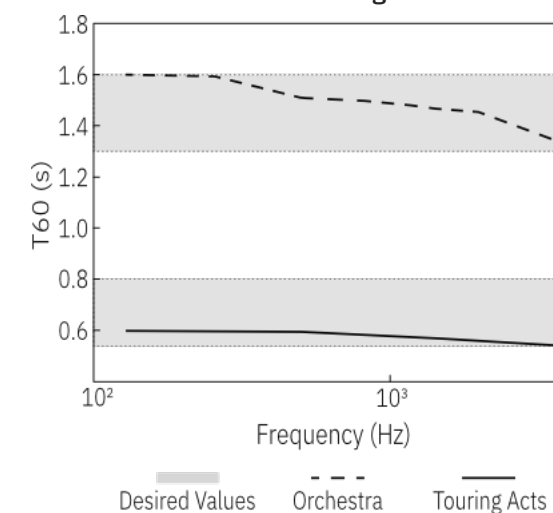
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Absorption Coefficients Fabric
[0.01 0.35 0.68 0.76 0.79 0.8]
1/3-octave bands 125 Hz - 4 kHz
Measured at 150 mm from roof



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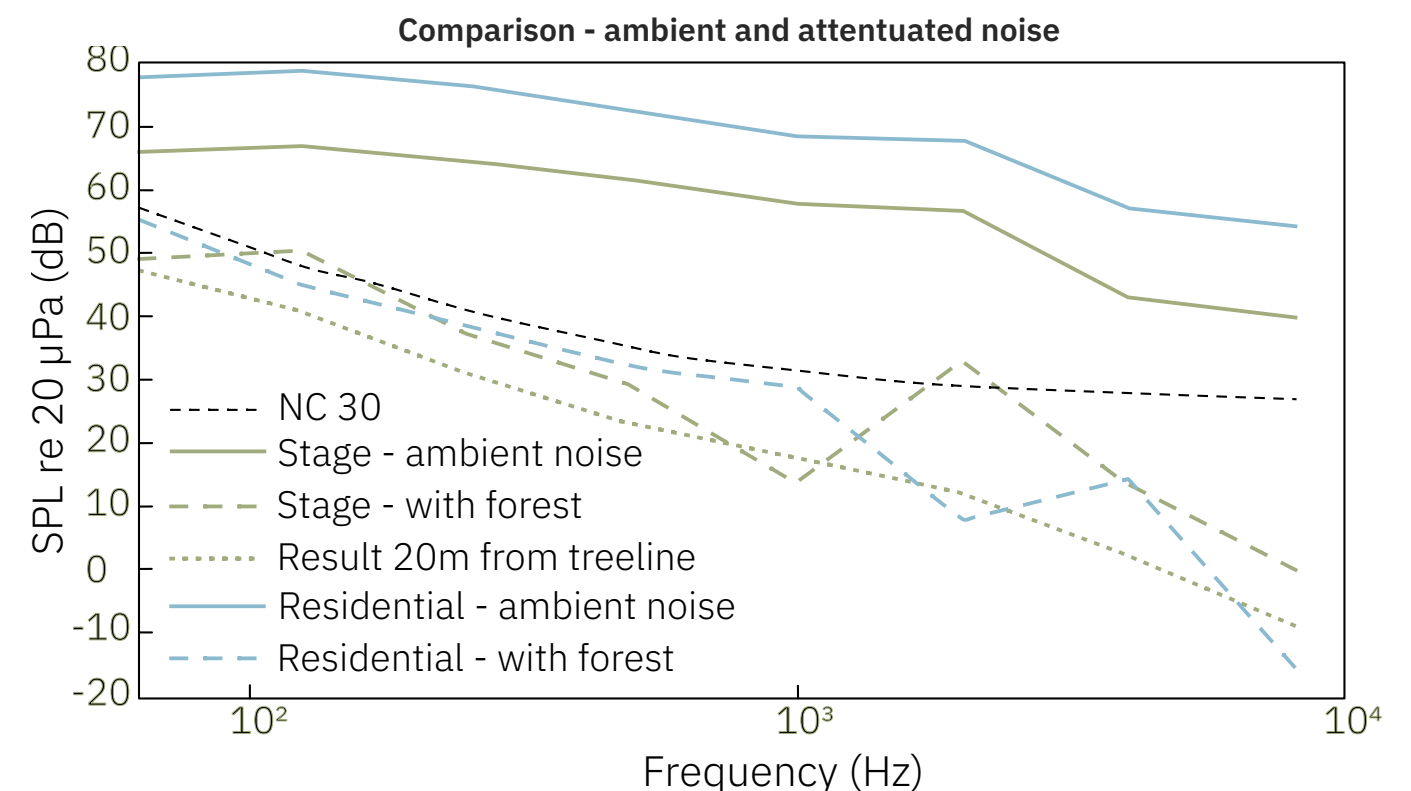
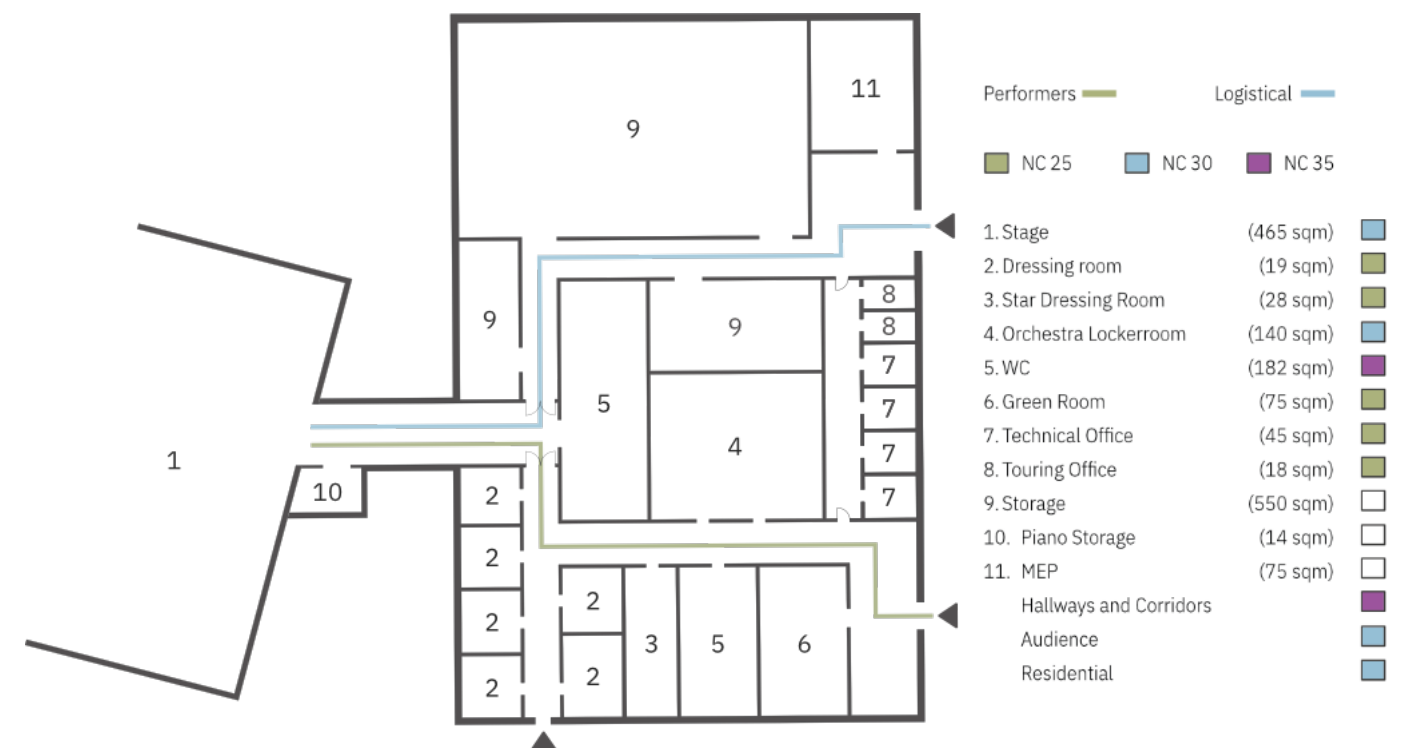
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Process

During our project we followed an iterative process where we during each stage assessed ideas, concepts, drawings and text for their strength and weaknesses.

We started in a conceptual stage, thinking about an overall theme and a focal point for the project, sketching and building three conceptual models. We were determined to find something interesting to explore during the project.

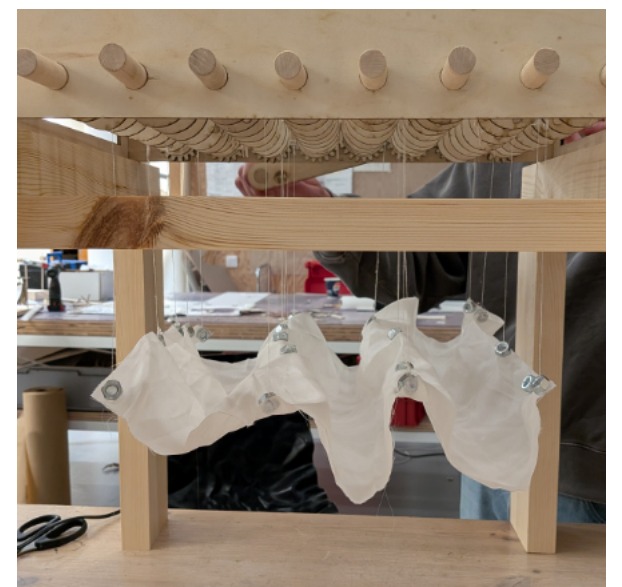
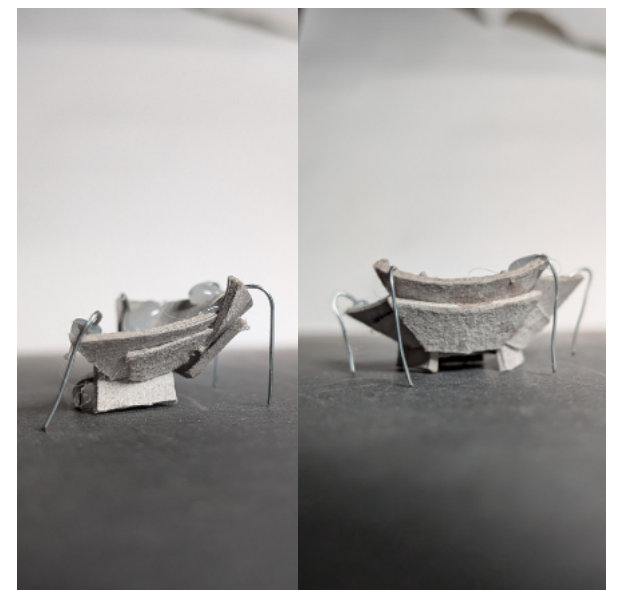
Simultaneously we also read and analysed the program to understand the task. Since the competition is yearly, we could also analyse projects and judging forms to understand the competition and judging.

We continued to iterate over the conceptual themes and sketches, discussing and analysing what each idea could bring to our pavilion. This ultimately led to a pavilion where the three concepts and ideas have been merged, dissected and redone to fit our program and project.

Working together with our acoustician we sought ways of using our architectural ideas in an acoustically efficient manner. A critical point being the moveable structure, which we wanted suspended over the audience. By using a lightweight fabric, which heightens and lowers in a flowing motion above the audience, we can assure that no frequencies will be absorbed continuously. This ensured that we could use movement without sacrificing sound quality.

During the later stages we iterated over details, assessing their contribution towards the program and competition brief. Being able to let go of ideas became critical when we were limited in poster space and time, therefore having to work only with ideas that brought something to our project as a whole.

During the last part of the project we wanted to explore the moving fabric more in detail, this was done by building a machine. The machine was built using laser cut parts and iterating over different parts, different setups to finally create the moving flow of the fabric.



Reflection

The project has been a great learning opportunity for me, having to test and apply what i have learnt during my three years of studying Architecture and Engineering.

Overall i believe that we managed to accomplish not only a good competition proposal, but also a bachelors project with architectural qualities which performs well acoustically.

Our pavilion and back of house are well thought out and planned. The lawn can accomodate a wide arrange of performances and visitors. Back of house is well planned, with clear paths and logical spaces catering to the logistical problems of serving the stage with equipment and performers.

Although motion became an integral part of our project, both with the moving fabric and audiences ability to roam the sculpture park i would like to have further emphasized this in the competition material. Due to time, we were not able to convey the feeling invoked by flowing fabric in the pavilion, only later could we show it using the machine.

I would also like to further explore the roof structure. This was also something that we had to forsee in the project due to time and space. I believe that suspending the roof above the audience is an integral part of the pavilion. The roof interacts with the hanging fabric and lets nature into the pavilion while keeping unpleasant elements out, critical for a summer pavilion.

Working toghether with an acoustician gave great insight into real world collaboration. Having different knowledges and perspectives could sometimes be a problem. But by having a clear communication and expectations we could discuss and analyse problems, therefore in the end enhanching the outcome. To be able to understand other professions and their view is something i will bring with me.

The methodology induced by the course scheme was for me a great learning opportunity. By coming up with concepts and ideas, sometimes not connected to the task gave us an opportunity to sketch unhindered and without to much thought. It was only later where we analysed the ideas to the brief and from a more logical standpoint. This gave us greater freedom in our exploration of acousticsa and architectural concepts.

My time at the program Architecture and Engineering is something that I am incredibly grateful for. The combination of studies, both artistic, architectural and engineering courses has opened my eyes to a new world. It has given me a understanding and a greater interest in the built enviroment.

The studies have given me a great reference bank, both of historical projects, projects and places visited during study trips, projects done by my peers and projects done by myself. By studying and trying to understand these projects, i have learnt a lot.

Studying both professions at once has at times been hard, procrastination has not helped. But i believe that I have also learnt to become rather efficient during my studies. I have learnt to learn.

For me this would not have been the same if it were not for the teachers and classmates. Learning has been done not for the tests, but to understand. After three years of studies, what i have learnt the most is that there is so much more to learn.