PAVILION HILL

An outdoor concert venue

Bachelor's project - Architecture and Engineering 2026

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CONTEXT

This project has its starting point in a competition brief with an acoustical and architectural focus. The assignment was to design a music pavilion for a city orchestra to use during the summer season. Additionally, the venue would also host touring acts, such as pop and rock concerts. The pavilion should be able to accommodate 10 000 people on an open lawn and 3 000 people seated under roof. During orchestra performances it is anticipated 7 500 audience members and for touring acts the number is 13 000.

There were three main focuses in the competition which were:

- natural room acoustics on the stage, enabling on stage hearing,

- reduction of noise levels from a nearby highway and other site noises,

- reduction of noise levels to the nearby residential communities.

Furthermore, the project should include a conceptual solution on how to distribute sound to the audience with the help of electro acoustics.

In the competition brief it was also specified which areas and functions the pavilion should have such as orchestra locker rooms, loading dock, dressing rooms, green room, office spaces, restrooms, storage and mechanical equipment room.

PAVILION HILL

Pavilion Hill is a music pavilion integrated in a rolling landscape, intended to create harmonic experiences. The mounds, buildings and installations are designed to melt into nature but each carry acoustical purposes. The hills come alive with the sound of music.

SITE/LANDSCAPE

The site is located in northern Austria, with its green environment and mild climate. The project aims to reinforce the rolling landscape with large artificial mounds acting as acoustic absorbers. The mounds are irregular in size and geometry, varying between 3 to 6 meters in height, and block any direct sound paths from the highway or to the residences while maximising ground absorption with porous soil under the vegetation.

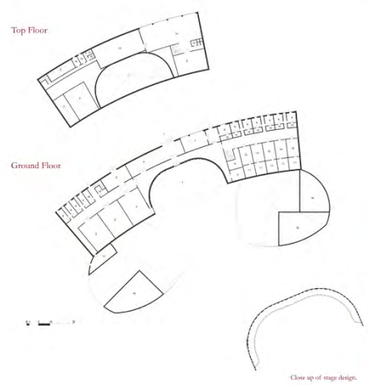
The vegetation includes a network of large native deciduous trees that are spaced to further reinforce the reduction of sound energy along its path in and out of the site. These environmental noise mitigation measures achieve sufficient reduction of the maximum noise level to and from the music pavilion across all frequency bands in accordance with target values that were adapted from the North American Noise Criterion values and commercial daytime outdoor ambient values.

The parking lot is placed on the south side of the site. The distance between the pavilion and traffic was chosen both to avoid noise and to create a nature experience. The walk through the landscape is a transition into a secluded environment both visually and audibly and will be experienced by the visitors when they come to and leave this pretty site.

PAVILION

As the rolling landscape subsides, the pavilion takes over with terraced lawns in different levels. The lawns allow for a standing crowd to have a perfect view while being in a park-environment. In between the elevations are stairs and plantings in a slope, avoiding flat surfaces that reflect sound.

Two sections of under-roof seating are placed on both sides of the pavilion. They are divided into 3 elevated sections each and host 1500 people each.



1. Stage 458 m² - Daytime Commercial Outdoor SPL
2. Storage Rooms 538 m²
3. Loading dock
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6. Technical office 1 6x 4 m²- NC30
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Close up of stage design.

BACK OF HOUSE

One hill in the landscape, placed like a ribbon band on the site, covers the back of house (BOH). The building is one with the hill and includes both the stage and back of house facilities. As well as creating a building close to nature, the structure has the properties of a noise-reducing wall. The access to the roof should be restricted during concerts, however, at other times it is possible for visitors of the park to sit high on the hill.

The back of house building consists of two floors. The first floor is on ground level and accommodates the loading dock with easy access to the stage. The facilities for musicians, including dressing rooms, locker rooms, lounge, rehearsal room and green room are placed on one side of the building with a separate entrance and views of the river. The facilities for other staff, including offices, mechanical equipment room and storage, are placed on the other side with close proximity to the loading dock.

The walls of the back of house are dimensioned to achieve the desired noise level criteria. The stage, rehearsal room, dressing rooms and mechanical rooms are thicker with air gaps for greater noise insulation. An open plan solution was avoided to reduce noise. Furthermore, the stage and rehearsal room have more ceiling height to ensure a balance between strength and reverberation. The mechanical room and some of the storage rooms also have higher ceiling height but for the purpose of accommodating bigger storage and

STAGE DESIGN

The stage is rounded in shape, and approximately 15 meters deep and 34 meters wide. Along the wall are wooden panels, irregular in width and depth with a convex surface to distribute the sound while minimising the risk of creating focal points. The wooden panels can be moved on rails to create a smaller stage to be used in the absence of a choir, or during smaller concerts to create an acoustical environment suitable to the size of the orchestra.

The lateral reflection behaviour is targeted in particular with this design, so that an ideal initial time delay gap (ITDG) of 15 to 25 ms can be maintained to achieve a balance between intimacy and a sense of space with ensemble support in all stage scenarios. Wood was chosen as the material for these panels for their desirable reflective properties while maintaining harmony with the stage architecture.

Similarly, the ceiling panels are also wooden and convex and are hung 7 meters high. These are especially important when the full stage size is used to maintain the strength of early reflections due to its width. The ceiling panels also aim to direct the reflected sound towards the orchestra members to strengthen the ensemble perception without sacrifice to clarity. With this system of adjustable walls and ceiling panels, the desired balance of acoustic parameters such as reverberation time, strength and clarity can be obtained despite changing stage conditions.

TARGET VALUES

Reverberation Time: 1.8 sec

Clarity C80: -4 dB to -1 dB

Sound Strength G: 5

AUDIENCE ALTERNATIVES

Different seating and stage plans for different types of concerts and audience size.

ELECTROACOUSTICS

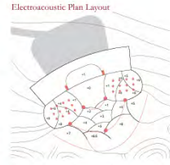
The electroacoustic design for the venue consists of a combination of several solutions to fulfil different functions according to the audience zone they serve. Independent design principles were chosen for each zone to ensure the systems are unobtrusive to the architectural objectives while providing a variety of audience experiences.

The sound in the front zone is reinforced by cross firing clusters that are positioned on each side of the stage, fixed into the walls discretely. This flanking speaker configuration was chosen to preserve the source image in the centre over a wide stage width without cluttering the inner space of the stage and detracting from the performance.

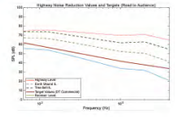
The two seated zones are reinforced via an overhead grid distribution of loudspeakers fixed into the ceiling. This configuration was chosen to fulfil the function of preserving the stage source for the audience in the back through a delay system, while also adding artificial reverberation to adjust the sense of space depending on performance through an inline active reverb system with processed signal output.

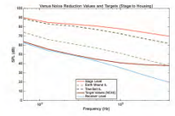
The lawn area is reinforced by five line array positions, two for the middle zone, and three for the back zone. These zones were assigned based on their time delay ranges. A simple and conventional layout was chosen for the larger space to minimise visual obstruction for the audience and promote the open air feel of the layered terraces and natural environment. The two for the middle zone are incorporated into the beams for the seated area and the three for the back zone are hidden amongst trees, both aiming to blend in with the visual environment. This configuration provides sufficient coverage throughout the audience to ensure the strength and image source is maintained.

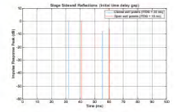
Electroacoustic Plan Layout

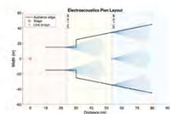


Cross firing clusters (front zone), overhead distribution grid (seated zones), midline array positions (middle and back zones)









SITE PLAN WITH SAMPLE LOCATIONS

Broadband SPL sample points along noise path (unweighted, with noise mitigation measures)

The posters for the final critique.

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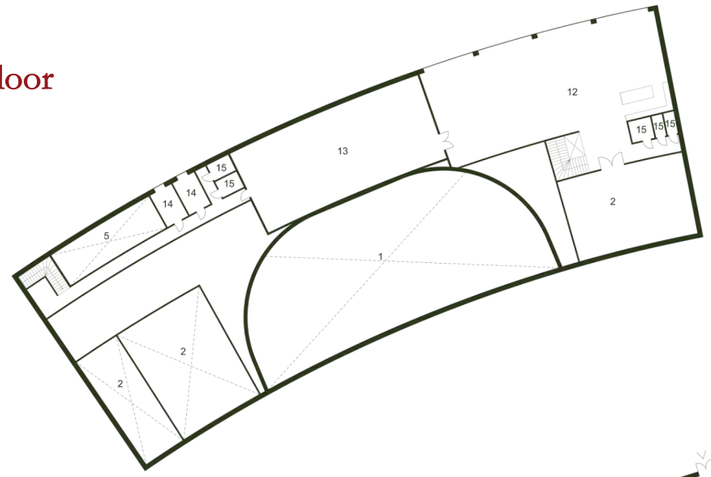
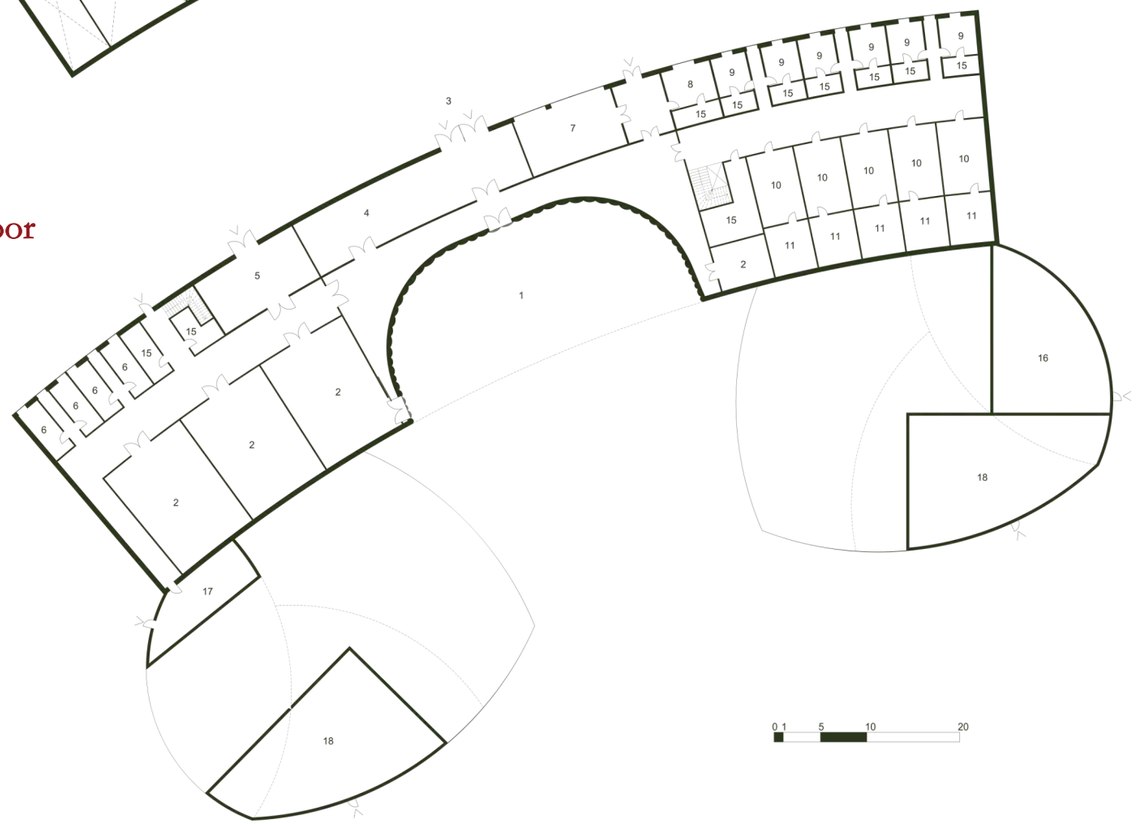


Ground Floor



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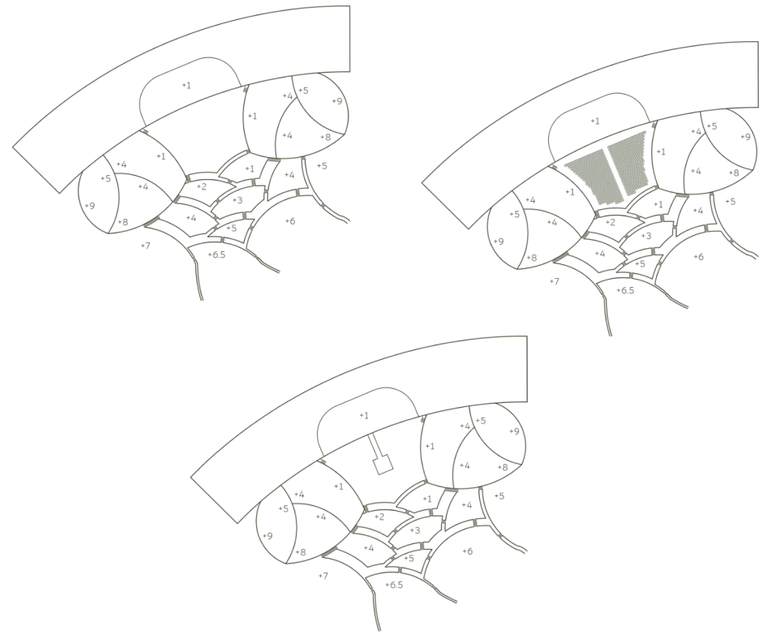

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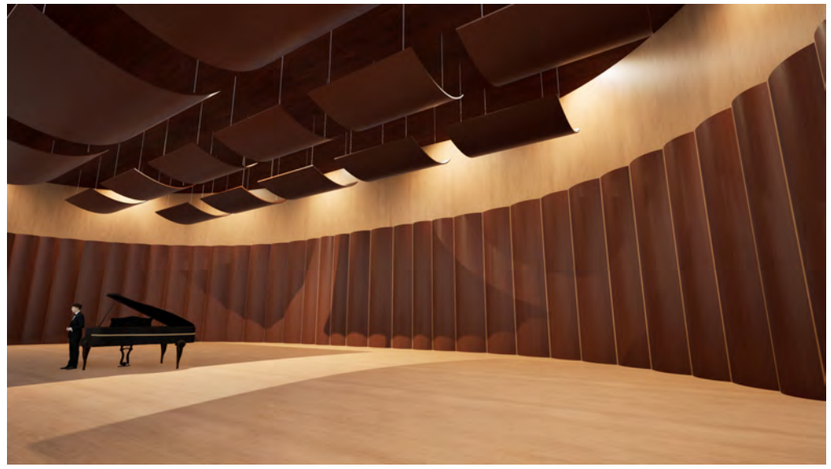
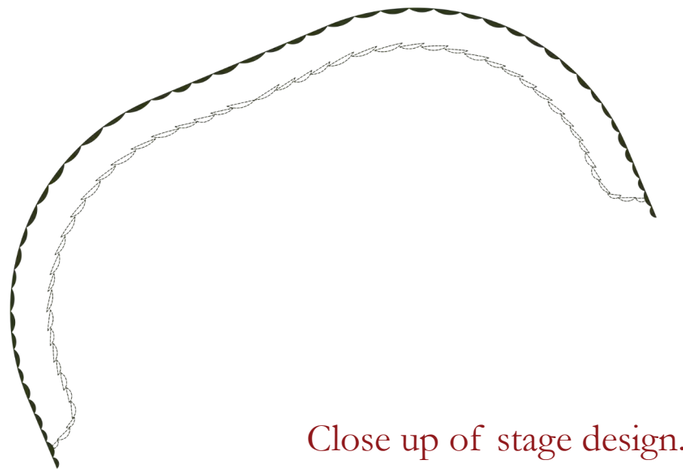
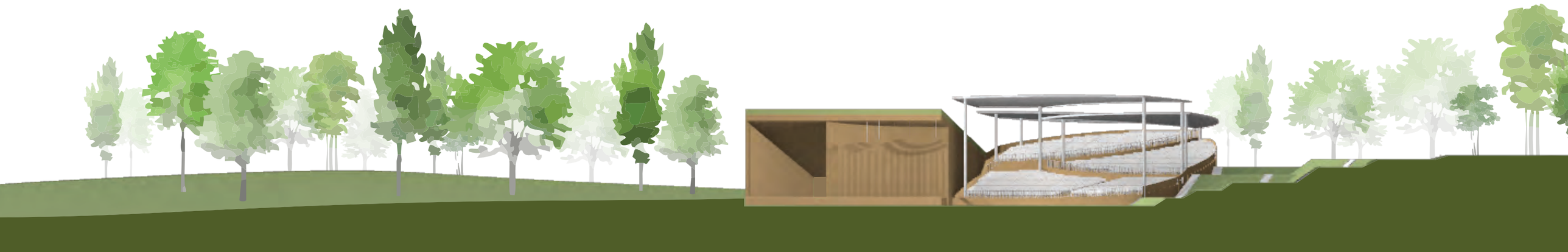




Close up of stage design.



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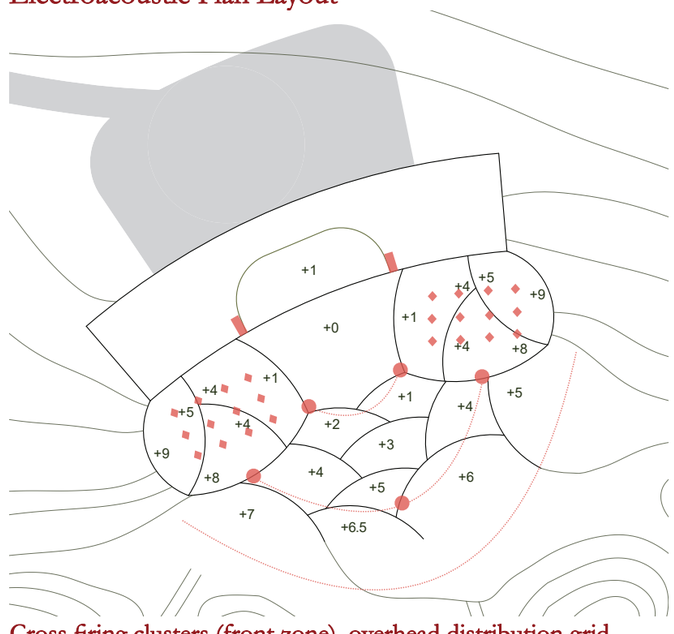

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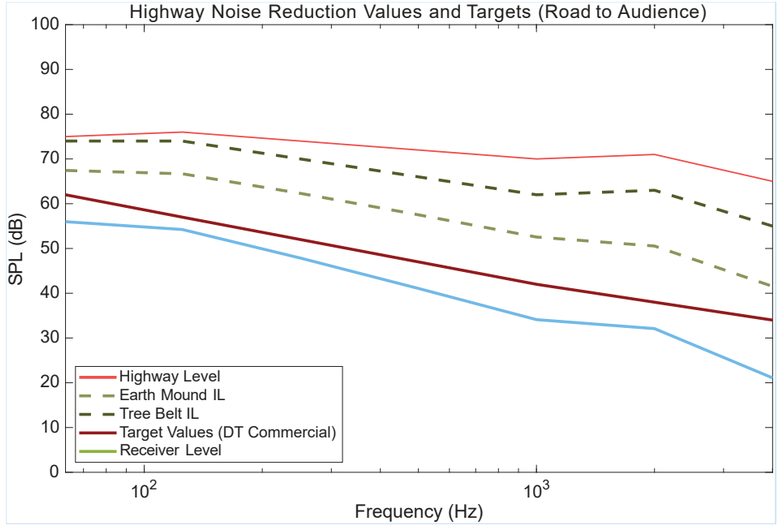
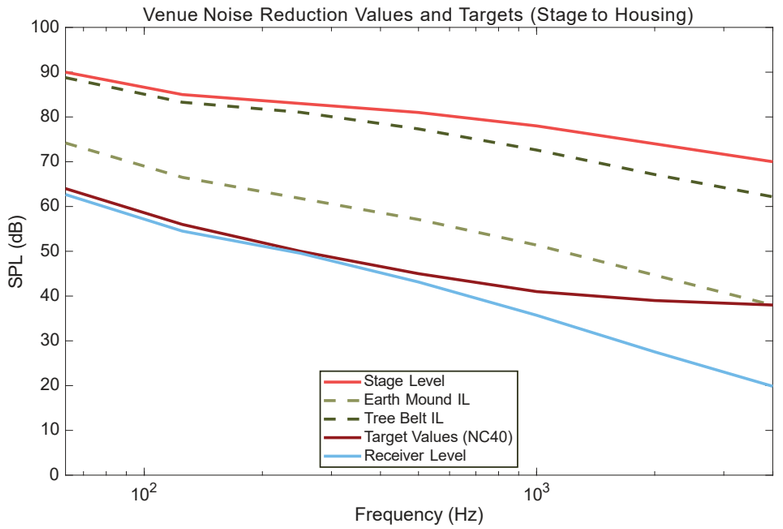
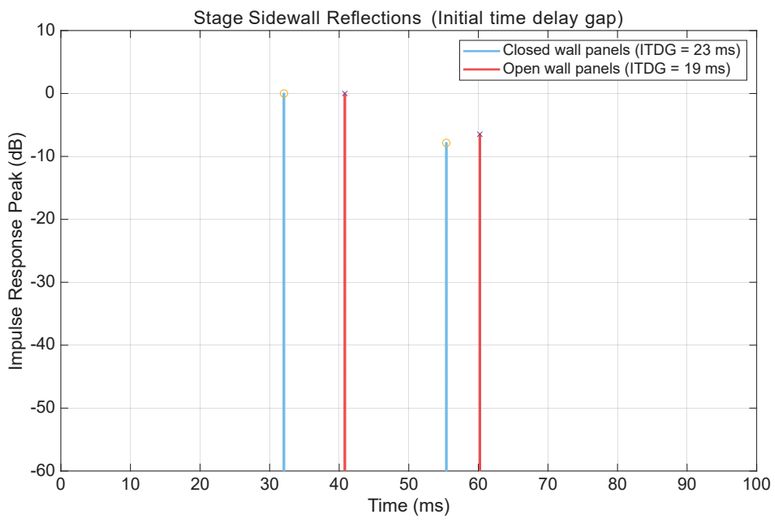






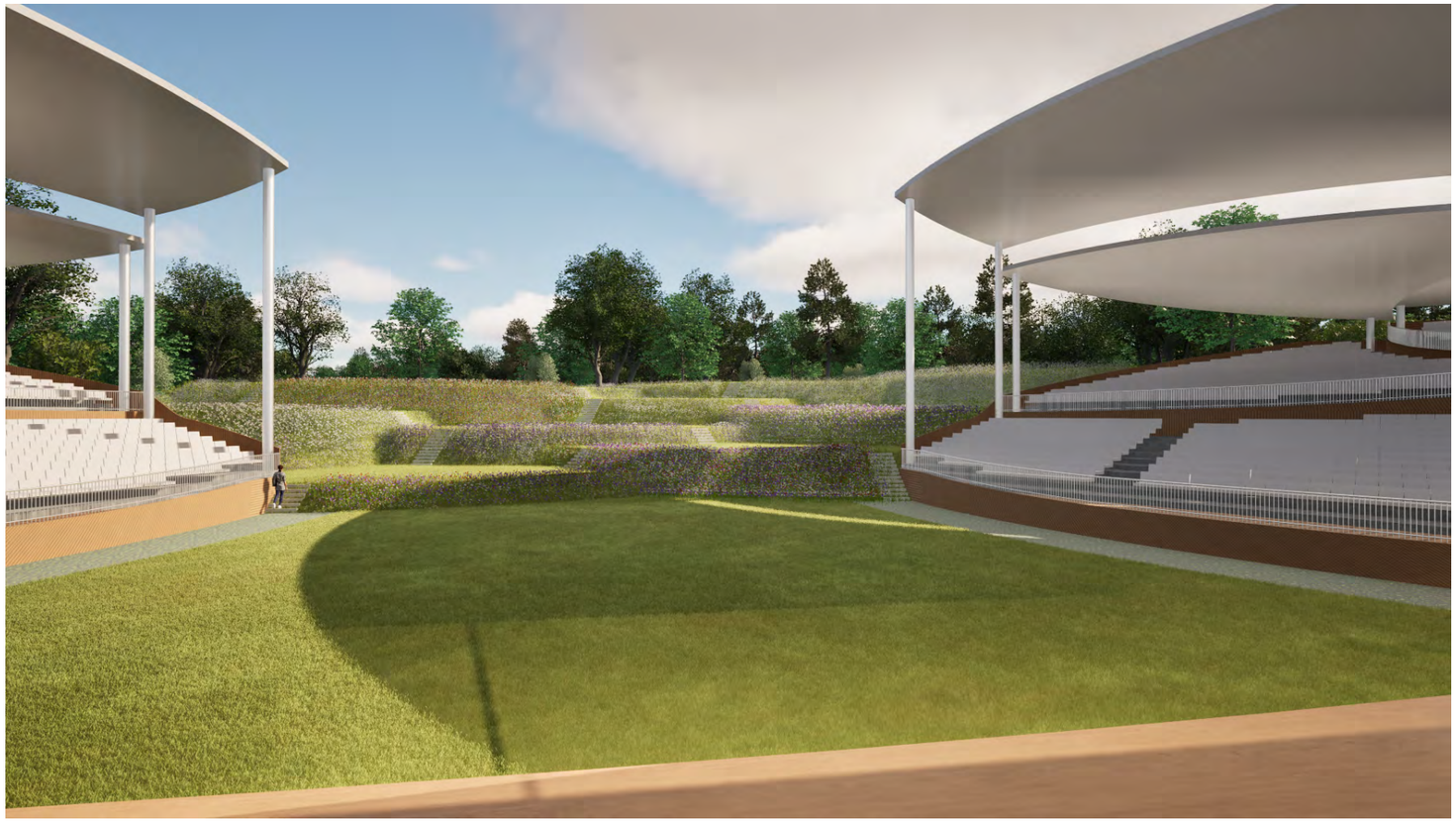
REFLECTIONS

DESIGN PROCESS AND METHODOLOGY

The design process and methodology for this project was to start big and conceptual before narrowing the idea and working more in detail. The first assignment was to draw three concepts in a big scale. After that, one of them was chosen to further work on with the possibility to integrate some thoughts from the other concepts, which we did. An important idea for our project was to use the site and landscape to reduce the noise levels, which was explored with a clay model. This way, we could get a better overview of how the pavilion would be placed in the landscape, and how the number and the height of the hills would affect the experience.

For us, it was important to own the process, to not get stuck in decisions but rather decide something to explore and, if needed, try something else later. To make decisions easier, a method we used was to formulate our ideas and visions in key words, and to have a theme for our project. When we were further in the design process, our method was to get started with different things that needed to be done and then work parallel with those things. That way it was easier to dispose the time and to see problems earlier, for example if the idea in plan looks the way we wanted in 3D.

Lastly, our methodology has also been to do performance driven design in accordance with what our acoustician has said to be best for the acoustics. An example of that is the stage design where the geometry at first was a semicircle. We learned that it was bad for the acoustics and we decided to do a rectangle with rounded corners instead and also add convex panels on the walls.



ARCHITECTURAL QUALITIES

The architectural qualities we aimed for in this project were largely based on the landscape at the site. Early in the project, we knew that we wanted to keep the site natural and integrate the venue into the landscape. We wanted that to be imprinted in the experience as a whole, from arriving at the site, to being at a concert. The visitors should be close to nature, and close to the music at the venue simultaneously. We also wanted the standing audience to have a good sight of the stage.

The result was a hilly landscape around the venue. That way, we were able to create noise barriers while still avoiding a design that interrupts nature. The noise barrier became an architectural experience as the visitors can walk through and be welcomed into the venue area.

The venue was integrated into the landscape through the terraces we designed for the lawn audience. During concerts, the audience can see the stage both from the seated and standing area, even from the back thanks to the terraced landscape.

In order to integrate the stage and back of house into the nature, the building we created has a roof with vegetation. The building blends into the landscape through a sloping roof, and the vegetation on the roof joins with the vegetation of the site. The hill-building is slightly curved to allow for better sight. The back of house was planned to accommodate musicians, transports and other staff side by side. To provide each with good space, the back of house was designed with multiple entrances leading to different sides of the building so that musicians and loading dock staff can use the facilities without interrupting each other.