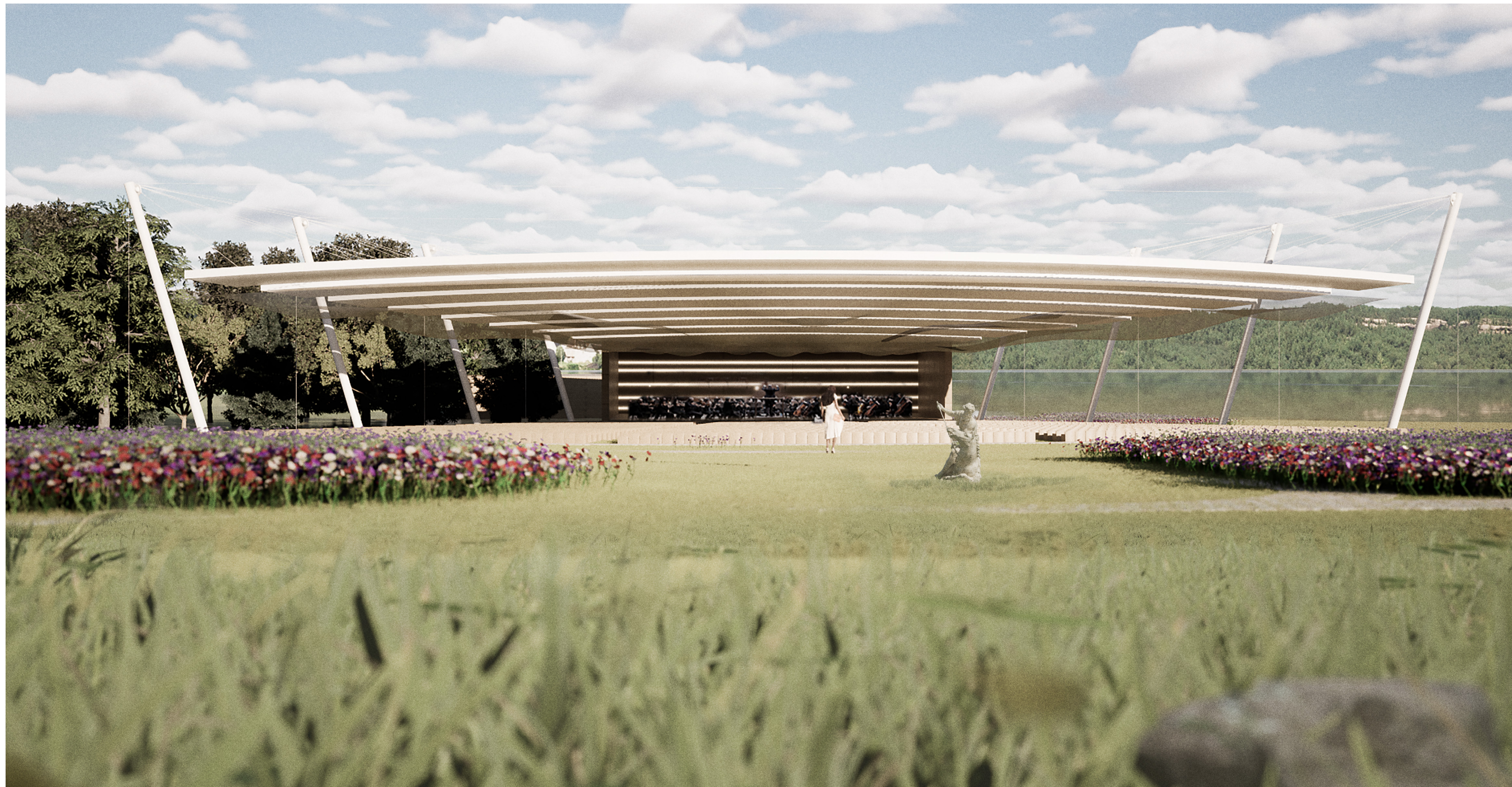
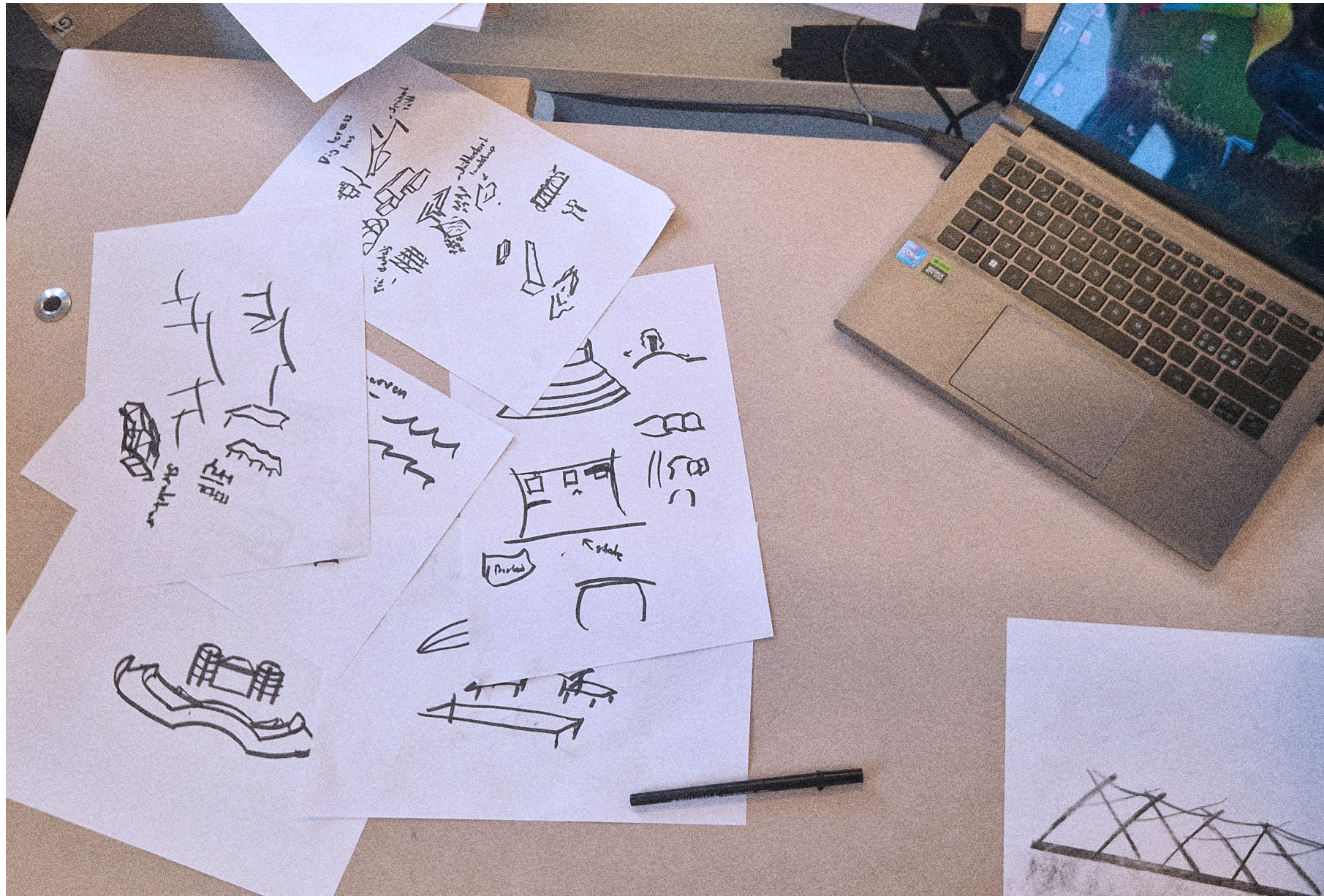




Sound in motion
Iain och Adam



Kandidatprojektet har varit ett lärorikt projekt som gav oss möjligheten att arbeta på ett nytt sätt. Projektet bestod av många iterationer i flera olika medier, med stort fokus på samarbete. Målet var att skapa en musikpaviljong för 13 000 åskådare.

En viktig del av metodiken var det iterativa arbetssättet. Projektet inleddes med att skapa tre olika iterationer i pastellkrita. Jag var initialt skeptisk till detta medium, men i efterhand upplever jag att det gav större frihet i idéutvecklingen. När man ritat med pastellkritor skapas en utgångspunkt där ritningarna får vara mer barnsliga och fantasifulla. Genom detta kan man utveckla mer kreativa arkitektoniska lösningar som inte nödvändigtvis behöver vara realistiska, men som senare kan ligga till grund för en mer genomarbetad modell.

Arbetet med tre parallella iterationer blev sedan en återkommande metod genom hela projektet. Genom att alltid utveckla flera alternativ kunde vi jämföra idéer, plocka ut de starkaste kvaliteterna och minska risken att fastna i ett spår som inte fungerade.

Att kunna släppa idéer som inte fungerar är enligt mig en viktig del av en arkitektonisk designprocess. Även om mycket tid har lagts på en lösning kan det vara nödvändigt att omvärdera den om den inte bidrar till projektets helhet. Här blev reflektion och kontinuerlig utvärdering centrala delar av metodiken.

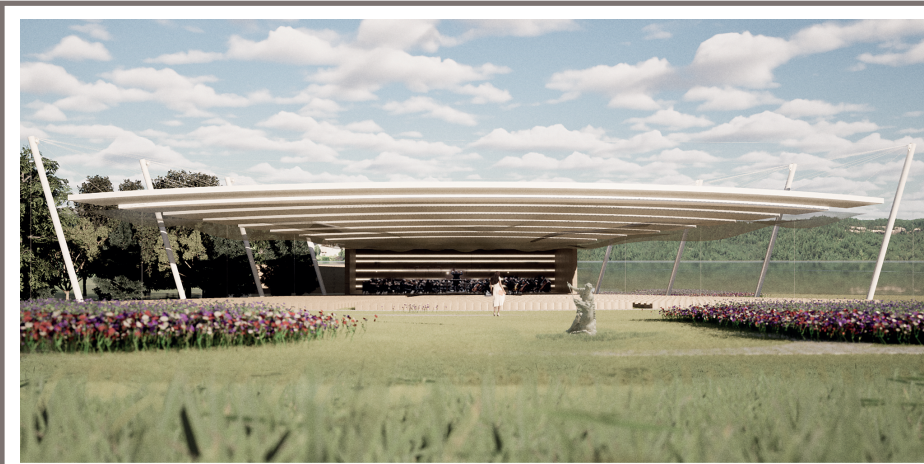


En utmaning i projektet var samarbetet mellan olika kompetenser. Det kan vara svårt att skapa något tillsammans när olika personer har olika uppfattningar om vad som är viktigt eller kvalitativt. Detta blev särskilt tydligt i samarbetet mellan arkitektur och akustik, där projektet ofta handlade om att balansera arkitektoniska kvaliteter mot akustiska krav. I vissa situationer uppstod konflikter kring vad som skulle prioriteras.

Genom att skapa en gemensam målbild lyckades vi dock utveckla ett fungerande samarbete. Tävlingsens kriterier blev här viktiga som gemensamt ramverk och fungerade som stöd vid beslut och prioriteringar. På så sätt kunde vi utvärdera våra förslag utifrån tydliga kriterier i stället för enbart personliga preferenser.

Att arbeta mot en tävling som mål påverkade också designprocessen. Till skillnad från tidigare projekt, där fokus ofta låg på vad man själv uppskattar, handlade detta projekt mer om att skapa något som andra skulle värdera positivt. Det innebar att projektet behövde kommunicera tydligt och skapa en stark helhetsupplevelse. Samtidigt var det viktigt att behålla motivation och personligt engagemang.

Att följa det man gillar skulle jag säga var det viktigaste i vårt projekt. När man hittar det man själv vill göra hittar man också motivation, och med motivation blir resultatet nästan alltid bättre. Det innebar att vi ibland gjorde färgglada illustrationer som fångade känslan i projektet i stället för tekniska ritningar, eller byggde en maskin som visade tygets rörelse i stället för att skriva reflektioner.



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.

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.

RT60 - Variable Stage Acoustics

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.

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.

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.

Comparison - ambient and attenuated noise

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.

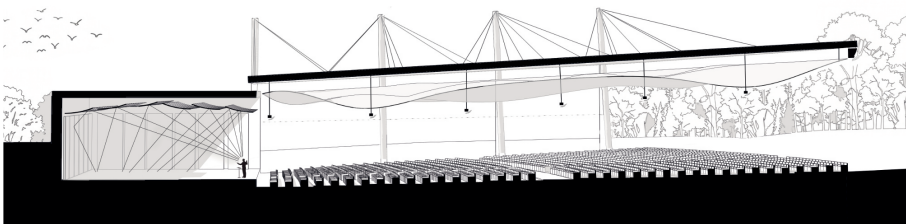
Ambient noise levels are calculated based on propagation over distance and air absorption. The values calculated at the stage do not account for reflections or absorption from the roof and audience, suggesting that actual noise levels may be slightly lower than predicted.

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.

SOUND IN MOTION

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



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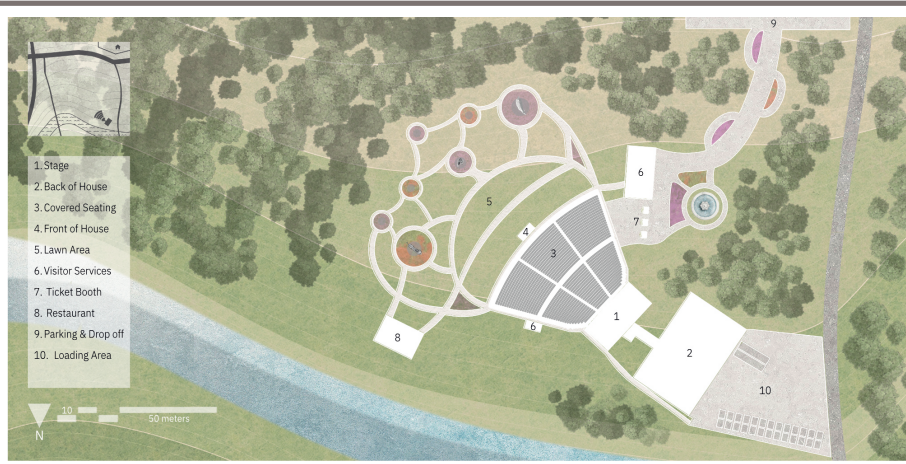
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Back of House

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.

Comparison - ambient and attenuated noise

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Slutkritik

Iain och Adam

Den slutliga paviljongen är ett projekt som fångar rörelsen i musiken. Genom ett medvetet arbete med platsen och dess stigar formas en nästan magisk upplevelse för besökarna.

Resan börjar redan vid parkeringen, en bit ifrån paviljongen. Härifrån leds besökarna in i skogen längs en rak och en slingrande stig kantad av blommor och skulpturer. Den slingrande stigen inbjuder till rörelse runt den raka. Stigen kröker sig allt mer tills den plötsligt öppnar siktlinjen mot scenen och mynnar ut på ett litet torg som fungerar som förplats till platsen. Här välkomnas besökaren av platsens atmosfär, en fontän att slå sig ner vid, en shop att kliva in i. När man väl passerar biljettkontrollen står man direkt bland sittplatserna.

Härifrån kan man välja sin egen rytm. Antingen sätter man sig och inväntar musiken, eller så fortsätter man längs stigen ut i skulpturparken. Parken är gestaltad så att åskådaren ska kunna lyssna i rörelse, vandra mellan skulpturer medan en klassisk konsert klingar genom trädkronorna, kanske slå sig ner på en bänk och måla med musiken som bakgrund. Att inte enbart erbjuda platser där man aktivt måste lyssna öppnar för längre evenemang där besökaren får växla mellan stillhet och vandring. För den som söker en lugnare stund slingrar sig en sidostig vidare ner till restaurangen vid floden.

I väntan på att konserten ska börja sänks ett stort tygstycke långsamt från taket. Det hänger spänt och förväntansfullt i luften. När de första tonerna ljuder börjar tyget röra sig i takt med musiken och skapar en djupt inlevelsefull upplevelse. Eftersom tyget blir platsens självklara centrum delas rummet i två: de som rör sig bredvid tyget, och de som befinner sig under det. De som är bredvid lyssnar på musiken. De som är under är i den.

Också planen för back of house bär på arkitektoniska kvaliteter. Byggnaden är uppdelad i två flöden: det tekniska och det för uppträdarna vilket skapar behagliga ljudnivåer genom hela huset och hindrar de två flödena från att störa varandra. Rummen har därtill rena, tydliga former och är placerade utifrån sin funktion. Scenen är inte heller direkt kopplad till byggnaden utan separerad med en korridor för att minska ljudöverföringen.