

PORTFOLIO

DISA AHLSTRAND

Contact information

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I am studying Architecture and Engineering at Chalmers University of Technology, a programme combining the creative and aesthetic thinking of architecture with calculations and understandings of the structure and climate of the building. This has given me an understanding of how the engineering and architecture parts work together, an understanding that I use more and more in my projects as my knowledge increases. Apart from the fascination for the possibility to optimise both architecture and structure in relation to each other, I am especially interested in the connections between and people's movements in buildings, rooms and places.

This portfolio contains chosen projects from courses within the programme Architecture and Engineering at Chalmers University of Technology.

Row houses, year 2

Town planning, year 3

Music pavilion, year 3, group project

Swimming hall, year 2, group project

Café, year 1

TASK

The task was to design an outdoor orchestral pavilion for up to 13 000 audience members, out of which 3 000 were to sit under a roof. The stage was going to rely on room acoustics, while the audience was to be supplied with sound using an electro-acoustic system. Along two sides of the site, there were larger roads producing noise that had to be taken into account, and just outside the site there was also a residential area that must not be disturbed by the noise from the performances. Apart from a stage and audience seating area, a back of house with storage, a loading dock, dressing rooms and offices was needed.

The project is a group project with three Architecture and Engineering students as well as two students from the Sound and Vibration programme, functioning as consultants.

FOCUS POINTS & CONCEPT

The idea for this project was to create optimal acoustics for the orchestra on stage, and to give the audience an experience out of the ordinary. To keep the audience close to the stage we wanted them to be seated all around and not just in one direction out from the stage. But the stage could not be open in all directions, since the orchestra needs room acoustics, and for that to work, reflective walls are needed.

Therefore, our concept is a round stage, covered with multi-coloured glass panels. This creates a room with the necessary reverberation time and clarity. The audience cannot clearly see the musicians, but they can hear the music through the electro-acoustic system and they are geographically close to the stage. Glimpses and shadows of the musicians can still be seen, and the multi-coloured glass allows for plays of light and lighting installations.

The site is significantly larger than what is needed for the event area, and we wanted to keep the area open to the public in the form of a park, at the same time as noise reduction was needed. Therefore the park is a hilly landscape with earth berms that absorb and scatter sound, both from the roads and from the performances.

Project carried out spring 2026, year 3
Bachelor project Architecture and Engineering

Group project with Thea Forsell and Vidar Lindberg
DISA AHLSTRAND

IL FIORE

FOCUS ON THE MUSIC

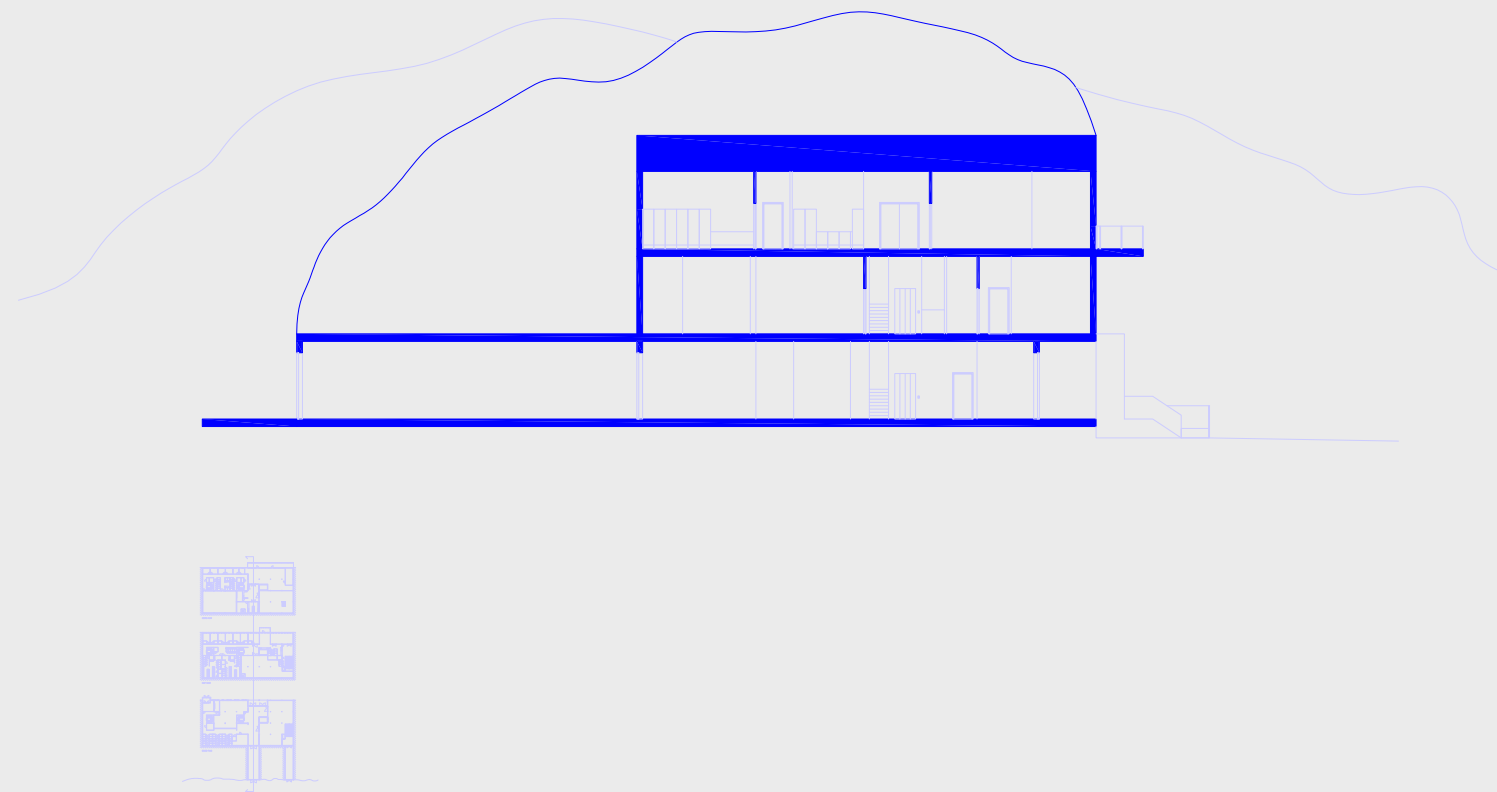


PROCESS & CHOICES - BACK OF HOUSE

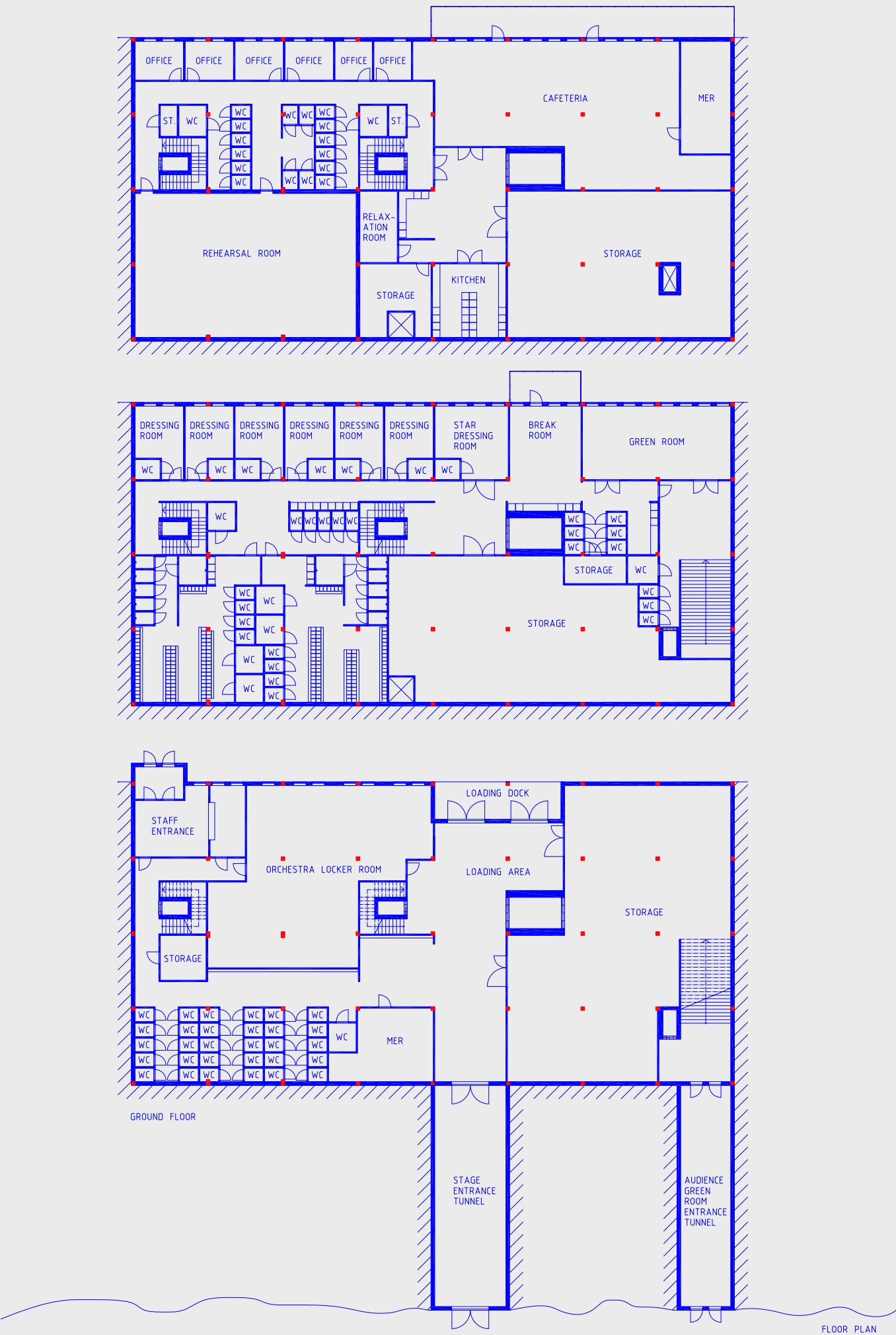
The back of house is located within a hill behind the stage, and thus not visible from the stage nor the audience seating area. Since much of the building is covered by soil, the focus has been to make a well-functioning, practical and structurally simple building. The starting point was a wide straight communication path connecting the loading dock, storage and stage, to enable easy loading and unloading. Around this, the rest of the ground floor grew with orchestra instrument storage and toilets for the performers close to the stage. A bit further from the stage, on the first floor, the orchestra changing rooms and solo dressing rooms are located, as well as a green room for meet and greets. For the safety of the performers and valuable instruments stored in the back of house, the green room has a separate entrance that is not connected to the rest of the back of house, making it difficult for intruders to enter unnoticed. The second floor holds offices, a rehearsal room and a cafeteria, functions that do not need to be close to the stage.

A central goal in drawing up the plan was to make it simple, to make the production more streamlined and to make it easy to find one’s way around. The music pavilion hosts many visiting touring acts, often with a lot of performers, crew and equipment, meaning a building that is easy to understand greatly helps reduce confusion and stress. A large industrial lift is located close to the storage room on all floors, the loading dock and the kitchen and cafeteria, where catering is delivered. A straight corridor runs through the first floor, connecting the two staircases and the green room, and from this corridor, all other rooms can be reached. For simplicity, this is mirrored on the second floor, although shorter and moved towards the facade, to accomodate the different functions.

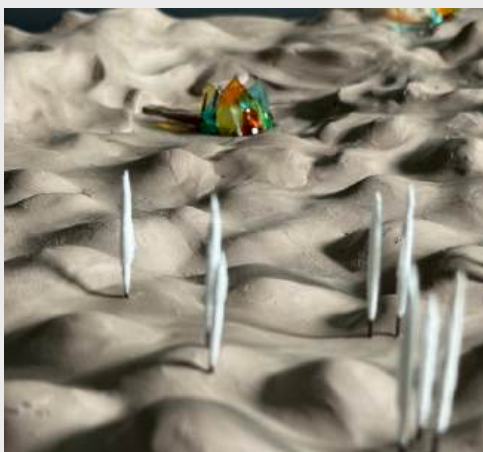
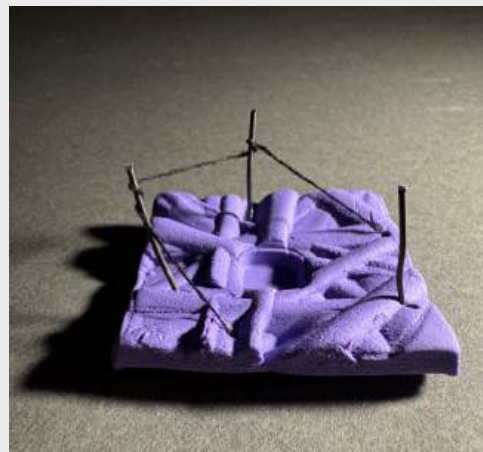
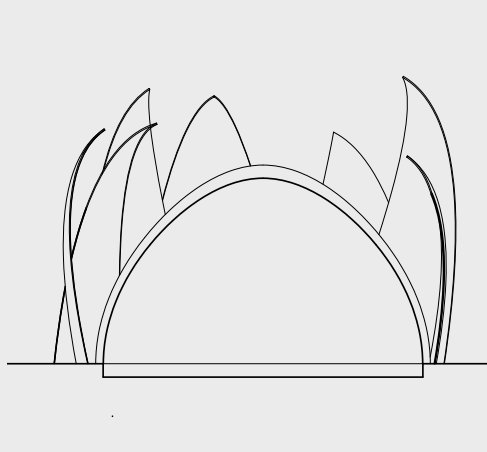
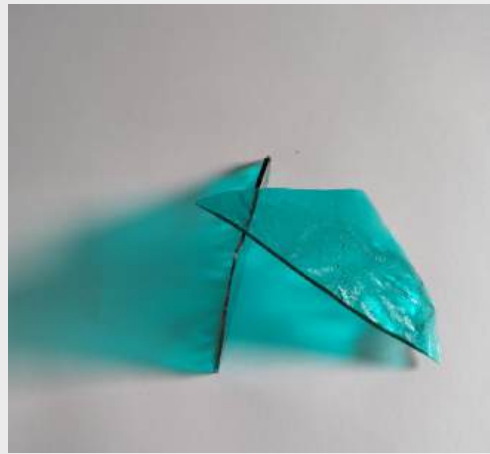
A large amount of soil will be covering the building and therefore it needs to have a well-functioning structural system. To make the building easy to build, this is solved by a 6x6m grid of pillars taking care of all the loads and allowing the plan to vary as needed without any load-bearing walls. A problem with the grid system was the rehearsal room on the second floor, which needs to be open for all of the orchestra members to see and hear each other. Therefore, one pillar has to be removed and the width of the neighbouring pillars increased on all floors.



SECTION THROUGH BACK OF HOUSE 1:400
DISA AHLSTRAND



FLOOR PLAN, SECOND FIRST AND GROUND FLOOR 1:400



REFLECTION

This project was explorative and tested how far a concept can be driven. The glass panels covering the stage are supposed to stand without a large structure and function as reflective, but controlled acoustic panels, but this has not been calculated. It is uncertain whether realising this project would be possible, even after extensive alterations.

The chosen concept, focus on the music, is not the reason behind but rather the consequence of the glass-covered stage. The orchestra being invisible or blurry as seen from the audience is in theory interesting, since the art portayed is the music. But as the project has been presented to architects and professionals from the Gothenburg Symphony Orchestra, the discussion has turned to what the orchestra bring to the performance in addition to the music. I now believe that the visible communication between the orchestra and the audience is an important part of a performance. Thus, this stage concept is missing an integral part of the experience and the audience may feel as though they just as well could have listened to a recording.

Working in a larger group consisting of both architecture and engineering students and sound and vibration students has been a new and instructive challenge. The two disciplines had different ways of working, where we architecture and engineering students had a more continuous but explorative approach whereas the sound and vibration students followed a document and answered questions based on that. The different ways of working made collaboration harder. A closer cooperation would have enabled testing ideas architecturally and acoustically simultaneously, which would decrease the amount of time spent working on ideas that turned out to not work in the other discipline. It would also minimise the solutions that came up solving problems that could have been avoided.

As the project was iterated, the concept evolved. In hindsight, it did not develop in the best way possible. From the beginning, the concept was a slopy terrain with a stage visible from many directions, but for each iteration a new concept was added, meaning that the project lacked a strong concept that could be altered and improved. The project is still in phase one, explorative with many parallel concepts, and has yet to decide on one to develop.

TEXT FROM THE POSTERS

IL FIORE

In the middle of Italy, amongst bushes and trees, we find ourselves walking through a sculpture park. Somewhere in the distance we hear the soft tones of an orchestral concert, intensifying as we follow the meandering slopes down towards the river. As we come around a hill, a large glass flower appears before us, seemingly the source of the music.

The concert hall is located in a bowl-shaped sculpture park, with the audience seated at different levels across a varied, sloping terrain. Roof-covered seating areas, with roofs made of glass to mirror the aesthetics of the stage, are mixed with informal lawn seating. By designing the omnidirectional loud-speakers as Roman pillars they relate to the Italian site as well as supply the audience with sound. These are strategically placed around the seating area, and smaller loud-speakers are hung from the ceiling of the covered areas. The loud-speakers are delayed 20-40 ms relative to the main loudspeakers at the stage to simulate distance perception and reflections from for example the glass ceiling. 3,000 audience members are accommodated in the roof-covered seating area, while the lawn accommodates an additional 10,000. The informal seating areas absorb sound, making it anechoic.

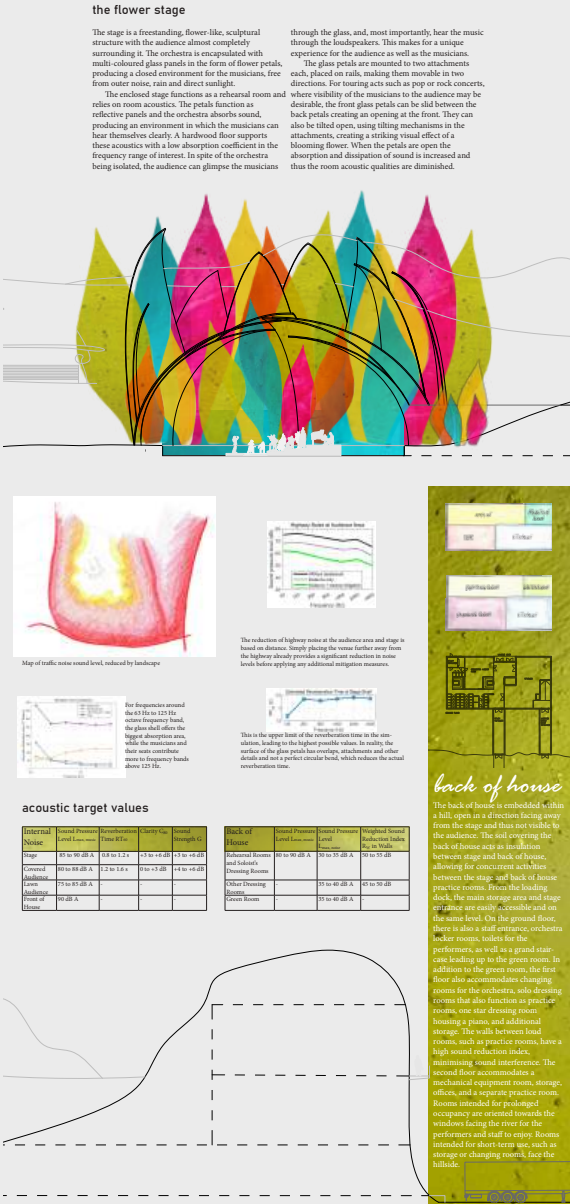
The surrounding park has a hilly, varied landscape with earth berms, tree buffers, and sculpturally designed Helmholtz resonators of different sizes that absorb and scatter traffic noise. Noise propagation is further reduced by the bowl-shaped terrain, which also protects the residential area from noise of performances. Apart from the stage and immediate surrounding area, the sculpture park is open to the public. If needed, a temporary fence may be raised to separate the audience area from the public park. Along the edges of the seating area, as well as by the car parks located at the outer bounds of the landscape, toilets and refreshment booths can be found.

THE FLOWER STAGE

The stage is a freestanding, flower-like, sculptural structure with the audience almost completely surrounding it. The orchestra is encapsulated with multi-coloured glass panels in the form of flower petals, producing a closed environment for the musicians, free from outer noise, rain and direct sunlight.

The enclosed stage functions as a rehearsal room and relies on room acoustics. The petals function as reflective panels and the orchestra absorbs sound, producing an environment in which the musicians can hear themselves clearly. A hardwood floor supports these acoustics with a low absorption coefficient in the frequency range of interest. In spite of the orchestra being isolated, the audience can glimpse the musicians through the glass, and, most importantly, hear the music through the loudspeakers. This makes for a unique experience for the audience as well as the musicians.

The glass petals are mounted to two attachments each, placed on rails, making them movable in two directions. For touring acts such as pop or rock concerts, where visibility of the musicians to the audience may be desirable, the front glass petals can be slid between the back petals creating an opening at the front. They can also be tilted open, using tilting mechanisms in the attachments, creating a striking visual effect of a blooming flower. When the petals are open the absorption and dissipation of sound is increased and thus the room acoustic qualities are diminished.



ACOUSTIC TARGET VALUES

The reduction of highway noise at the audience area and stage is based on distance. Simply placing the venue further away from the highway already provides a significant reduction in noise levels before applying any additional mitigation measures.

For frequencies around the 63 Hz to 125 Hz octave frequency band, the glass shell offers the biggest absorption area, while the musicians and their seats contribute more to frequency bands above 125 Hz.

This [around 2,4 seconds] is the upper limit of the reverberation time in the simulation, leading to the highest possible values. In reality, the surface of the glass petals has overlaps, attachments and other details and not a perfect circular bend, which reduces the actual reverberation time.

BACK OF HOUSE

The back of house is embedded within a hill, open in a direction facing away from the stage and thus not visible to the audience. The soil covering the back of house acts as insulation between stage and back of house, allowing for concurrent activities between the stage and back of house practice rooms. From the loading dock, the main storage area and stage entrance are easily accessible and on the same level. On the ground floor, there is also a staff entrance, orchestra locker rooms, toilets for the performers, as well as a grand staircase leading up to the green room. In addition to the green room, the first floor also accommodates changing rooms for the orchestra, solo dressing rooms that also function as practice rooms, one star dressing room housing a piano, and additional storage. The walls between loud rooms, such as practice rooms, have a high sound reduction index, minimising sound interference. The second floor accommodates a mechanical equipment room, storage, offices, and a separate practice room. Rooms intended for prolonged occupancy are oriented towards the windows facing the river for the performers and staff to enjoy. Rooms intended for short-term use, such as storage or changing rooms, face the hillside.

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Through these projects and others that I have done both at school and outside, I have learnt about a way of thinking, where creative ideas meet rigid rules. I have learnt to iterate, and to develop my ideas based on my own reflections and in communication with other students or advisors. I have learnt to cooperate, with others and with myself. By cooperating with myself I mean to acknowledge all my ideas and thoughts, and prioritise and combine these into concept and project that I would be proud of. The courses in this programme differ substantially and I have learnt how to adjust my way of working to what functions for me and for the task at hand.