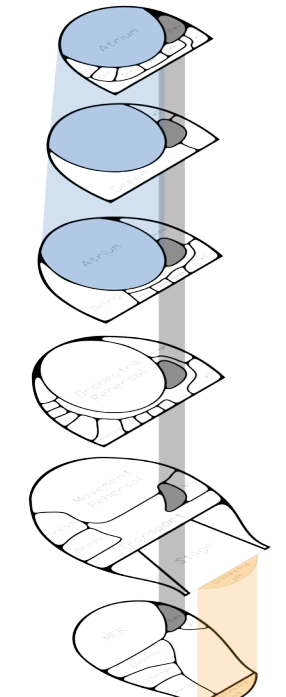


Section
At the site all of the different functions of the pavilion are connected. The backstage area is situated under the roof which covers the seating that are built upon the parking space which in turn provides the ground material used to build up the surrounding hills.

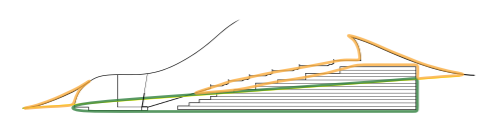
Seatings
The seatings can be divided into different sections depending on the activity of the pavilion. For the orchestra, the sitting area and first level of the standing platforms will offer enough space for the audience. For opera and theater the second layer of the platforms can be added. Pop and rock concert's will demand the usage of all the platforms, except for the last one which can be used as a cabaret area or to spread out the audience further.

Transport
From the parking space the audience get to the pavilion by several elevators. To simplify public transport and alternatives like biking they have a direct connection to the seating entrances by a separate road.

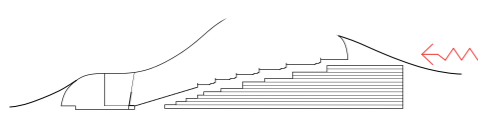


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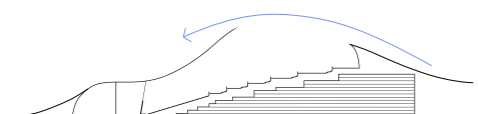
The Backstage areas have been placed behind the stage and are covered by the same roof as the audience. To provide light, an atrium is placed in the middle of the building. The atrium could also function as extra rehearsal space for the orchestra. It has acoustics more similar to the conditions on the stage and could also make it possible for a smaller audience to listen. With a shorter reverberation time the smaller rehearsal room is ideal for musicians to clearly hear themselves while playing. Access to the stage has been made easy by adding a road through the building that goes directly behind the stage.



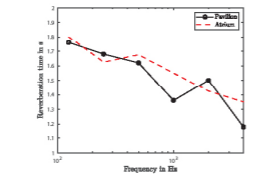
The dug up ground to make place for the parking area and the building is used to create the slopes surrounding the pavilion.



Due to the wind hills surrounding the pavilion, noise from the outside is entirely absorbed.



The enclosing roof and surrounding hills catches the wind to pass over the audience rather than through it and creates a draft free climate for the audience. Since the stage is well protected the pavilion could be functional even during colder temperatures.

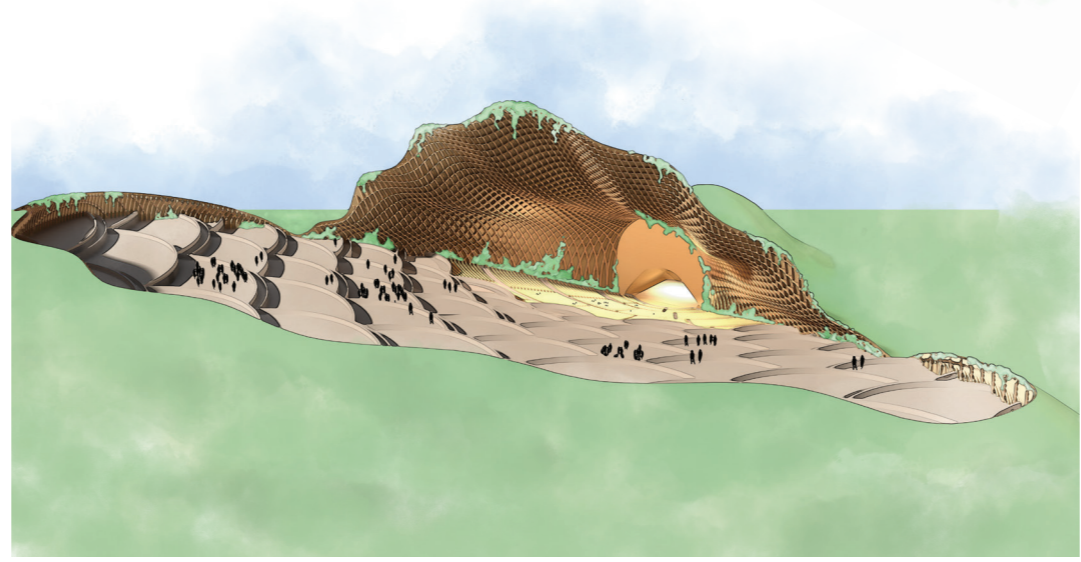


Sound of Nature

When approaching you notice an increasing steepness of the terrain but not much else signifies that this is the place of a concert hall. However, walking through the hill a massive arena rises up from underneath the ground.

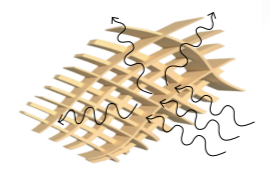
By manipulating the site and vegetation the concert hall is shaped for both acoustical benefits and to create a unique nature experience. The pavilion is framed by two wooden shell-structures, the roof and the ribbon surrounding the stands. Both these structures are shaped with flowing organic shapes to create the illusion that the ground have simply been lifted for the pavilion to fit underneath.

Under the roof the sitting audience is protected from the weather and can enjoy the natural acoustics. Behind them, rounded organically shaped balconies holds the standing audience. Here you can experience both the vibrant crowd of a rock concert or enjoy a picnic to the soft tones of a symphony orchestra.

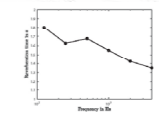
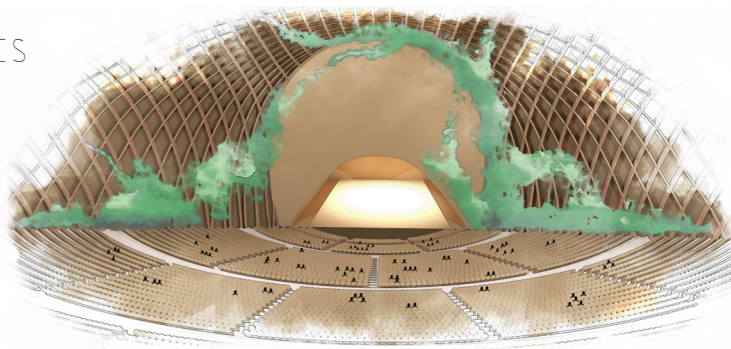


Natural acoustics

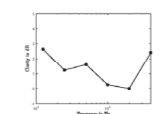
The area under the pavilion's roof is applicable for performances either with or without the sound reinforcement system. When only natural acoustics is used, optimal stage and roof design supports sound propagation. If more sound support is needed, two line arrays directed close to the stage can be used. In this area, the acoustic is designed to enhance an open air feeling, which is provided by the diffusive ceiling. Under the roof there is a portion of the standing audience that will have a mix of both natural and reinforced acoustics. The sound support is provided by the two line arrays that should operate when natural and reinforced acoustics are used.



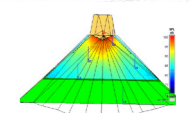
The grid shell is designed to act as a diffuser. The diffusive ceiling creates soft reflections, more even distribution in low domain and reduced echo. Different sizes of grid elements and distances between them provides effective diffusion in wide frequency range.



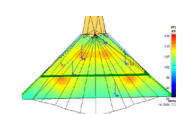
The non adjustable roof structure provides a reverberation time that is well to be applicable for wide range of performances.



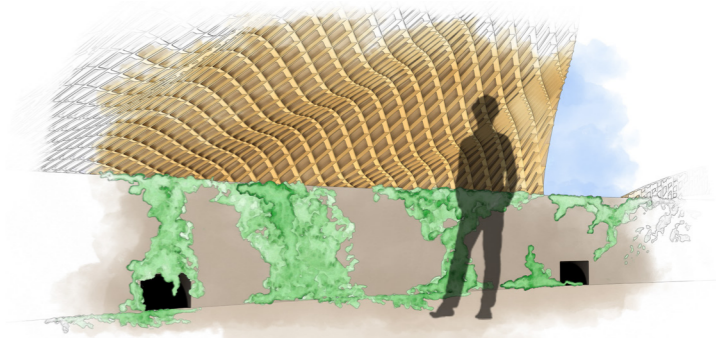
Positive values of the average clarity show that early reflections dominate late ones, which indicates good speech intelligibility.



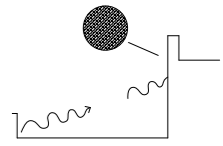
With natural acoustics, sound level differs by about 10 dB. For the rest of the audience it is reduced by no more than 10 dB. These values are enough for outdoor concerts, but for some applications, i.e. theater performances, sound reinforcement system is needed. Sound energy distribution with reinforcement system is shown in the second map for the whole audience area, sound level differ by no more than 10 dB.



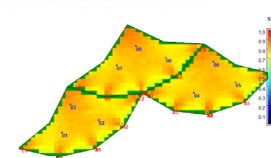
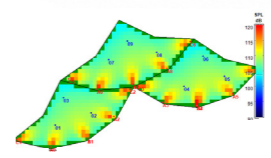
Electro reinforced acoustics



On the balconies, electro reinforcement system is provided. Each balcony has its own sound system, built with five full range monitors and one subwoofer for low frequencies. Monitors are distributed evenly on the balcony barriers to create a feeling of being surrounded with sound. The back wall of every balcony is covered with absorptive material, wood wool, to avoid reflections. To reduce the subwoofer's visibility, they are hidden in the barriers. Separate sound system for each balcony makes it possible to create different acoustical zones, for example quiet zone for families.



Absorptive material at the end of the balcony to avoid reflections.

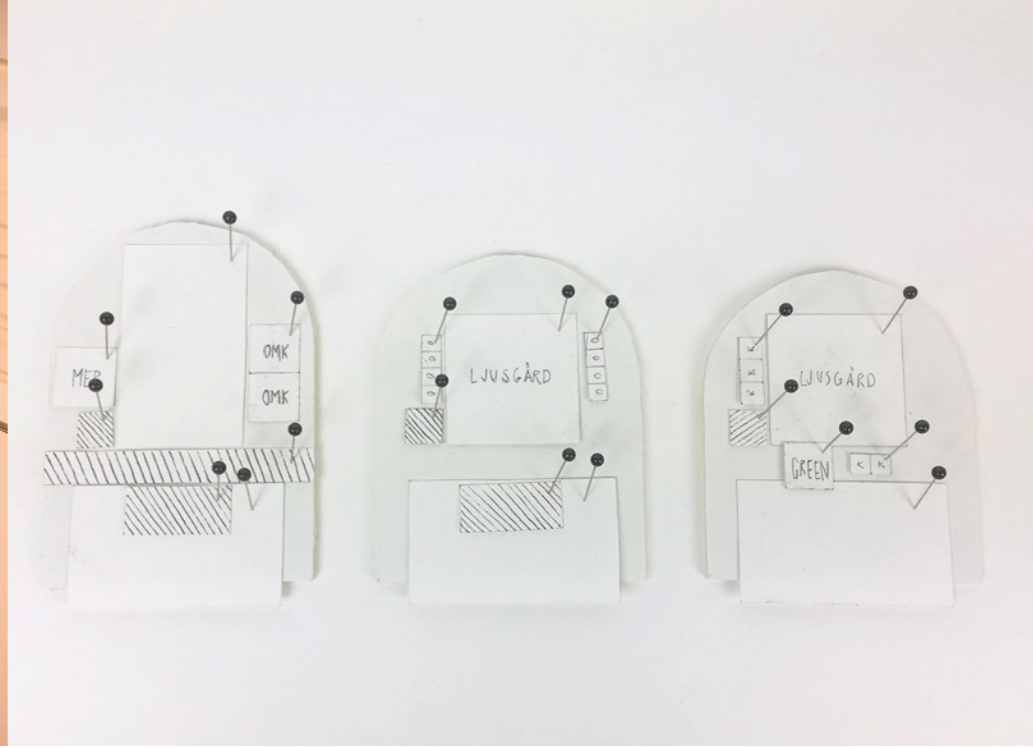
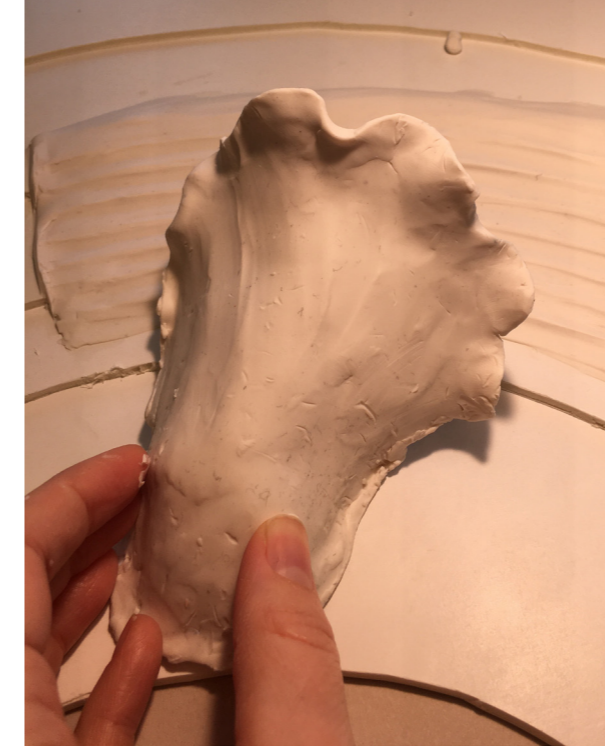
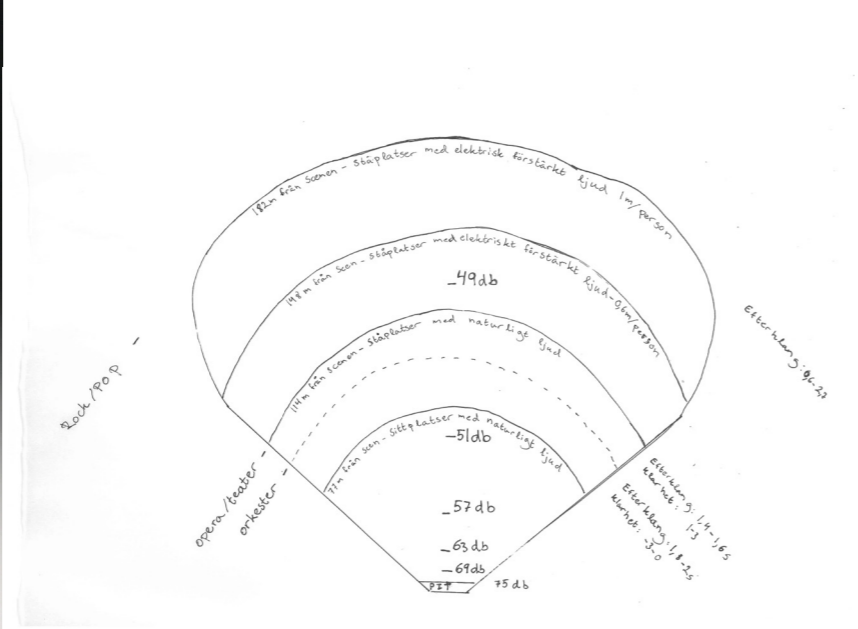


The maps to the left shows the cover of sound for three balconies. Loudspeakers are distributed in 10 m distance to reduce the time difference between sound generated by distant loudspeaker in a concert position. Time difference above 20 ms can cause an unpleasant echo feeling. However for 10 m distance time difference is short enough to avoid it. Sound distribution over the audience area is even, with an exception for the points closest to the loudspeaker. Distributed sound system ensures very high sound intelligibility, showed as C80 parameter. The C80 values above 0.75 indicate excellent speech intelligibility.

Music pavillion

Bachelor theises

Hanna Eriksson



A documentation of your design process with your point of departure in a crucial decision you made.

In the beginning we wanted to have an environmental focus on our project. Our starting point for the project was one of the models we made in the first assignment. We liked its organic shapes and thought that the connection to nature would work well with the environmental theme of our pavilion. When developing the shape, we shifted our focus completely towards the closeness to nature.

In the model we developed the concept that the pavilion would be a part of the ground. We also experimented with the shape of the stands. First it was shaped like an ordinary amphitheater but then developed a more rounded shape to each balcony that we thought was both more interesting and suited the organic shape of the roof better.

A written reflection of the methodology you applied

Creating such an organic shape, it felt natural to work with a physical model and for it to be in clay. This had both its upside and downside. For me working in clay was a fun and physical way to develop a shape. However, it took a lot of time to make changes which might have hindered the process.

We wrote a schedule for every day which we found very helpful to keep our focus. It also helped us to be on the same page. Something we could have done better is evaluate every shape in more detail. We found the critic from Marta about the shape of the stand to be valid in that we could have thought more about that.

A written reflection of the interdisciplinary collaboration you experienced

The collaboration with our acoustician, Alexandra, worked well. It felt like she had a good understanding of our vision of the project and could come up with her own ideas to improve it. In return, we tried to be open to the suggestion of improvement she had for us. One thing we changed was to lower the roof. We also discussed the possibility of having moss as an absorbent material but found that it didn't have the qualities we needed so we switched to a material that did and added the greenery as an addition instead.

A written reflection of the architectural and acoustical quality you achieved

We wanted to create a unique musical experience with our pavilion where our main concept was to combine nature and music. With the pavilion that rises from the ground and working with wood, organic shapes and a lot of greenery I think we succeeded. The shape also came from solving technical problems like parking where we used the soil from digging out the parking underneath the pavilion to form the ground. Furthermore, the grid shell we used to support the structure also had an acoustical benefit as a diffuser.

