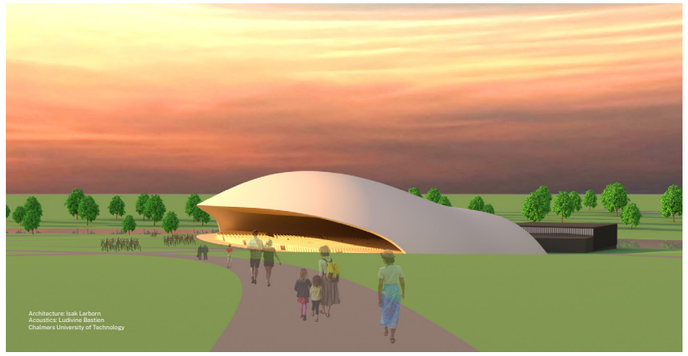
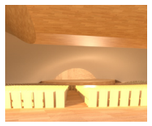
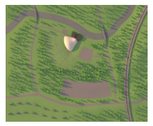


The Venerid Pavilion



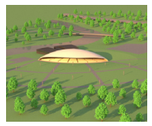
The Programme

A city orchestra wishes to construct a multi-use concert pavilion capable of seating up to 5,000 under a roof with an additional 20,000 outside, with additional backstage facilities.



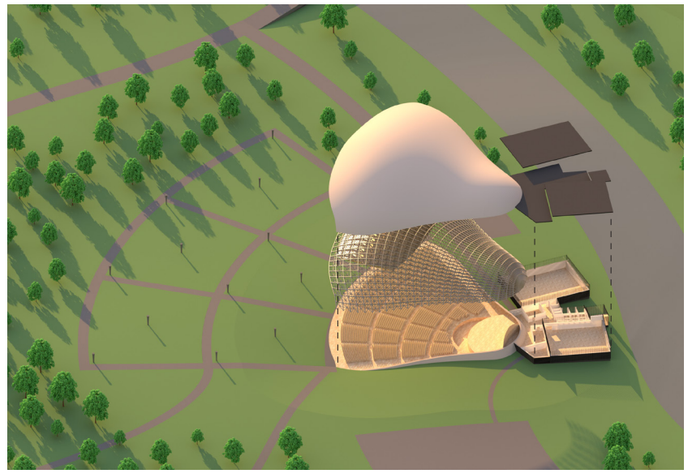
The Location

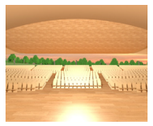
Bordered by roads and a river, with an Interstate highway in close proximity, and a gentle slope, this Pacific Northwest site presents a number of unique opportunities and challenges.



The Solution

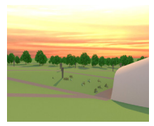
Elegant and beautiful, the Venerid Pavilion simply adresses the issues at hand with a functional and proven layout, a simple and clear design, and a daring but entirely feasible structure.





Natural Interior

The Venerid Pavilion supports itself with no interior columns to detract from the audiovisual experience. Its shape is tailored to create a good acoustical environment for the interior, requiring only simple adjustments, notably a hump inverting the structural dome.

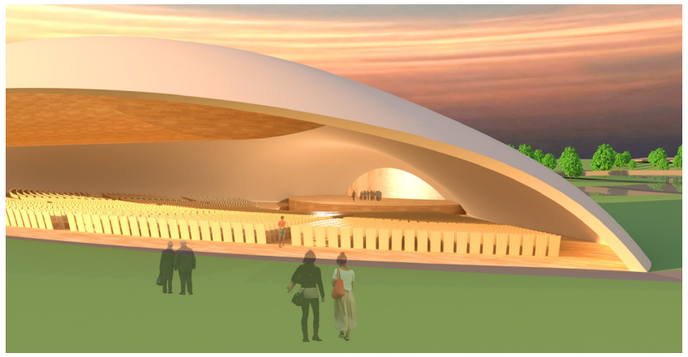


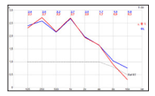
Amplified Exterior

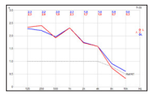
The natural slope and the wide, pillarless opening provide an unobstructed view all the way to the stage. Electronic amplification provided by a quiet but dense network of speaker towers ensures that viewers outside enjoy an excellent auditory experience.

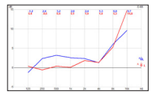
Bright Backstage

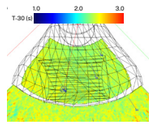
The supporting spaces hide behind the pavilion with their simple shape and dark colour, but the staff and performers will appreciate the natural light provided by the high windows in the rehearsal rooms, and the excellent view shared by the offices and the Green Room.





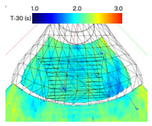






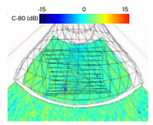
RT without Pit

With the orchestra on the main stage, as it would be during symphonic concerts, the reverberation time varies from 2.2 to 2.5 seconds, which is at the upper end of what is desired for orchestral music.



RT with Pit

When the orchestra pit is used, for example during opera and stage play, the reverberation time drops by approximately 0.3 seconds, achieving a sligtly shorter reverberation as is required for these uses.



Clarity and More

The clarity varies between -2dB and 6dB which is suitable for symphony, opera and electronic music. The sound strength lies between -2 dB and 5 dB. This result shows that the level stays high even further from the stage.

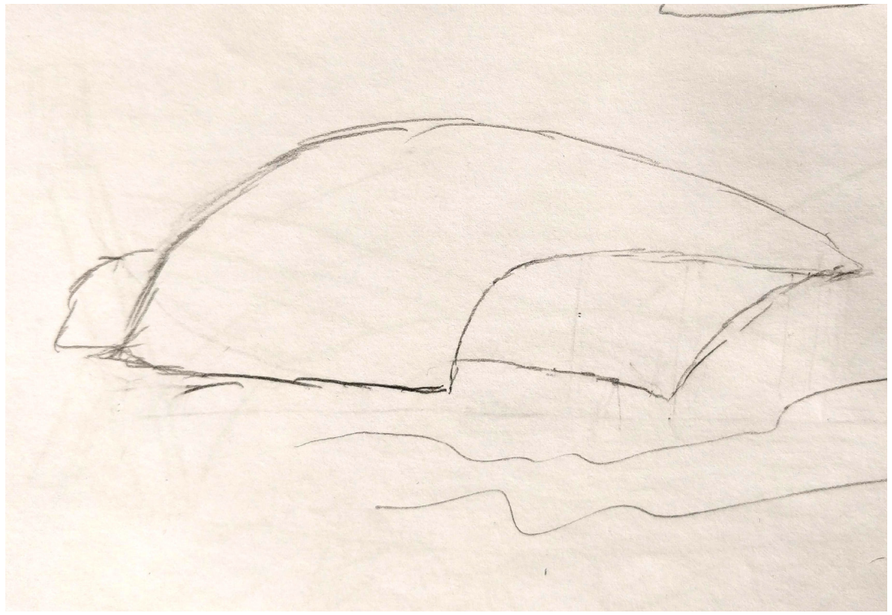
Improving the proven

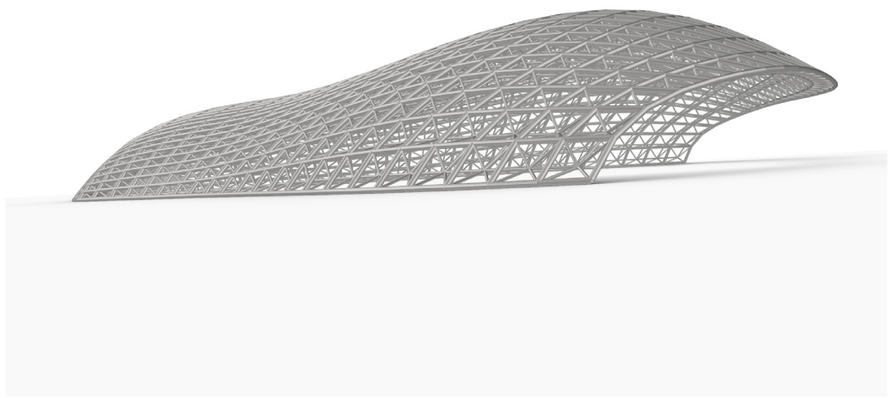
Providing great natural acoustics for 5,000 attendees is no simple task. As architects and engineers we constantly have to ask ourselves: Has this been done before? For semi-outdoor concert venues, the answer is most definitely yes. By studying existing venues, their strengths and weaknesses, in particular the Koussevitzky Music Shed at Tanglewood, I found a good point of departure from which to build something entirely new.

Right from the first sketches my goal was to create a visually pleasing structure that would be able to meet all acoustical demands, give outside viewers an excellent view inside, and be able to support itself with no interior columns. To make this possible, I quickly turned my sketches digital, creating a Grasshopper script that enabled me to make parametric modifications to the surface of the structure. From this I used Karamba3D to test different ways to support this structure: A reinforced concrete shell, a steel gridshell and a space truss. Out of these, the space truss showed the most promise - while the gridshell simply could not support the overhang without too much deflection, the space truss could.

To place additional functions and plan out the building complex, I made a physical model of the site along with a simplified version of the pavilion and building blocks for all additional required functions. The location needed to be such that neither the Interstate highway nor any other roads would be a disturbance, while also enabling a logical access and taking advantage of the natural slope. Once the site was found, I drew up plans for the annex cointaining all additional functions. This needed to be bright and airy for its occupants, while also fading into the background for visitors, not breaking up the silhouette of the pavilion.

While slightly domed roof is vital to the structure's ability to support itself, it is very much detrimental to the acoustical quality of the pavilion. Much of acoustician Ludivine's work therefore was counteracting the negative effects of this dome, which was done by inverting it on the inside with a single rounded hump, as simple as the pavilion itself. Apart from that, the usage of an already proven layout made sure that only simple adjustments were required to improve the acoustical quality.





Simple Solutions

Working with acoustician Ludivine on this project has been quite a different experience to working alone, or even in groups with other Architecture and Engineering students, and it must have been quite new to Ludivine as well. At first, Ludivine recommended quite drastic changes, such as flattening the roof, that while good from an acoustic point of view would have been detrimental to the architectural quality of the pavilion. The challenge was knowing when to put my foot down and resist changes, and when to listen and reevaluate. I kept an open mind, but still stayed true to my original concept.

While my architectural design is completely original, sticking to a proven layout definitely made my project one of the less interesting of the works presented for this programme. However this may not necessarily be a bad thing. It helped make my project more convincing and realistic, and immediately understandable to the viewer. One thing can definitely be said - since the acoustical concept was already done, my focus shifted more towards the structural design, perhaps unjustified due to the small role it ended up playing in my final posters. However, i believe it is still important in showing the viability of my concept.

Although Ludivine's early simulations before any enhancements showed too low of a reverberation time, she ended up overshooting her targets quite a bit in the end. Further development to reduce the reverberation time down by a few tenths of a second would be required to make the pavilion more suitable for orchestral music. I believe there is every possibility to do so, by adding absorbent materials and utilising the hollow insides of the space truss structure. The way the reverberation time is naturally lower when the orchestra pit is used is still a very elegant solution that would otherwise require much more complex adaptions.

From start to finish my design stayed true to my original vision of a simple, off-white smooth surface perfectly encapsulating all required functions. But the seashells that inspired it are not quite as smooth. They have patterns and texture. As I in a possible future development work out the details the pavilion's materials, working with different textures and patterns would certainly help create readability and a sense of scale in this building. The simple solution would be to show the currently invisible structure I worked so much on. And this project is all about the simple solutions.