

SURO TEATER

En teater av kork i Barcelona

Kandidatarbete i Arkitektur och teknik
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Målet med projektet var att göra en teater där arkitektur och akustik samverkar. Vårt fokus har varit att jobba med materialet kork för både arkitekturen och akustiken. För oss var också valet av platsen Barcelona viktigt att jobba utifrån.

Genom en iterativ designprocess har vi successivt utvecklat projektet, där varje steg inneburit att vi utvärderat och omprövat våra val för att säkerställa att resultatet förmedlar den avsedda upplevelsen.



Planscher



SURO

Theater Suro explores the use of suro, the cork tree native to Spain, as both a sustainable and acoustically effective material. Cork and wood panels shape a variety of acoustic settings that together with light and colour define the character of the theatre.

Cork is the main material, chosen for its sound-absorbing qualities and environmental benefits. Layered over wooden panels, it forms composite elements that alternate with exposed wood to balance sound absorption and reflection. These panels, made from recycled wine corks, also appear on the facade where they offer sun shading and weather protection. This way, the design makes full use of cork's natural insulation and durability.

BARCELONA

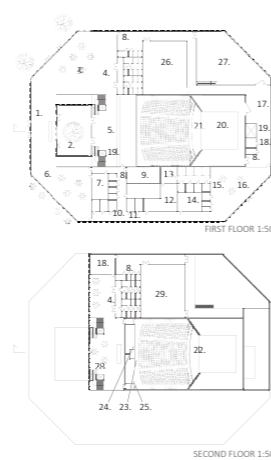
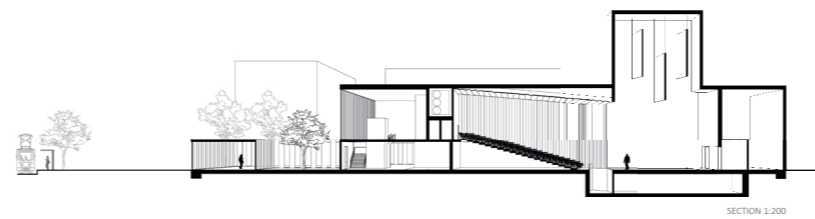
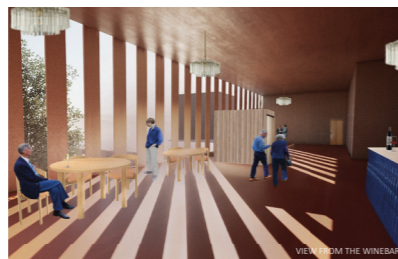
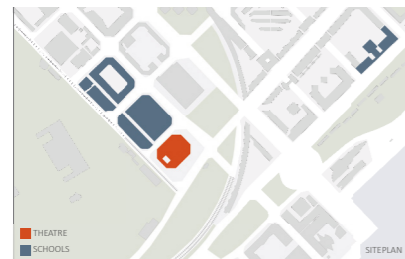
We imagine the location for the theatre to be Barcelona. The site in the theatre district was chosen for its close proximity to theatre and business schools, allowing it to serve as a link between academia and the arts. With tram and metro stops adjacent to the plot, a constant flow of people contributes to the area's liveliness. At the same time, this also presents acoustic challenges.

To respond to the surrounding park's low-rise scale, the theatre starts with a single story facing the green space and steps up in height toward the denser built side. This creates a natural transition that helps the theatre integrate into its urban context.

MEDITERRANEAN WARMTH

Barcelona is known for its vibrant and colourful character, where colour not only decorates buildings and artworks but also tells the story of the city's history and identity. Colour has been a central theme in this project, drawing inspiration from the Mediterranean palette. Warm, bold tones bring life into the building, helping to create a theatre that feels full of energy and vitality.

The floors are covered in colour that interacts with the sunlight seeping into the building. As the light bounces off the surfaces, it reflects onto walls and ceilings, flooding the space with colour.



- | | | | |
|------------------------------|-------|------------------------|-------|
| 1. Lobby | NC-30 | 16. Break Area | NC-35 |
| 2. Atrium | NC-30 | 17. Loading Dock | NC-30 |
| 3. Study Area | NC-25 | 18. Storage | NC-35 |
| 4. Public Restrooms | NC-20 | 19. Elevator | NC-35 |
| 5. Wardrobe | NC-20 | 20. Scene | NC-15 |
| 6. Cafe | NC-30 | 21. Orchestra Pit | NC-15 |
| 7. Kitchen | NC-30 | 22. Auditorium | NC-15 |
| 8. Staff Restrooms | NC-20 | 23. In-House Audio Mix | NC-20 |
| 9. Chorus Dressing Rooms | NC-35 | 24. Follow Spot Booth | NC-20 |
| 10. Technical Staff Offices | NC-25 | 25. Control room | NC-20 |
| 11. Resident Company Offices | NC-25 | 26. Rehearsal Room | NC-15 |
| 12. Costume Shop | NC-35 | 27. Scene Shop | NC-40 |
| 13. Wig and Makeup | NC-35 | 28. Bar/Lounge | NC-35 |
| 14. Green Room | NC-30 | 29. MEFFIT | NC-40 |
| 15. Solo Dressing Rooms | NC-20 | | |

SEQUENCE OF THE THEATRE

The building welcomes visitors with an open and accessible layout that reflects its varied functions. The central lobby connects different areas and serves as a meeting point for studying, working, attending events, or relaxing in the café or atrium.

Next to the Business School, the Study Hall offers a quiet space for focused work, while the restaurant on the opposite side adds a more social atmosphere. Together, they create a flexible public zone. Multiple entrances offer easy access, and the single-floor design allows natural light to fill the atrium with outdoor seating. A glass-lined corridor leads past the atrium and up a staircase overlooking the outside. At the top, a bar offers a pause before guests continue into the theatre, where they are met by a direct view of the stage and walk down a staircase framed by cork and wood panels.

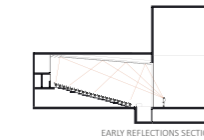
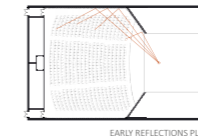
Back-of-house areas are located toward the back and sides of the building, including staff areas, rehearsal rooms, and production spaces. A wing behind the stage enables smooth circulation, while the orchestra pit connects to a corridor with storage and an elevator to the ground floor.

VARIABLE PANELS

Each step along the side walls of the auditorium features two independent panels, designed to be both movable and rotatable. This allows for flexible acoustic adjustment based on the type of performance, enabling fine-tuning of the reflection and absorption areas within the space.

Behind the panels, the base wall is constructed from wood, with a layer of cork panels placed in front, followed by a layer of wooden panels. These wooden panels can be slid to cover the cork, creating a fully wooden surface for longer reverberation times.

Alternatively, the cork can remain exposed, resulting in a combined wood and cork surface that shortens the reverberation time. In the ceiling, wooden panels are adjustable to control reflections from above, optimizing acoustics for the audience.

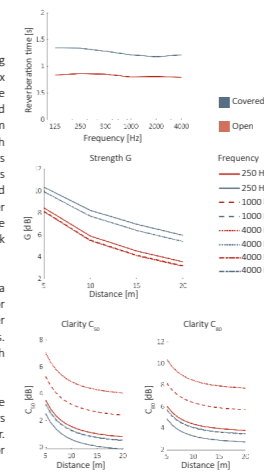


COMPACT SPACES

The theatre with a volume of 3500 m³ has a seating capacity of 700 and is constructed using a "box in a box" design which effectively isolates the space acoustically. The ceiling is double layered wall design, preventing external noise from entering. The floor is built as a floating floor with cork as elastic interlayer. Additionally, the cork is used as floor coverage to dampen the footsteps within the theatre, ensuring a quiet and focused environment. The rear wall is covered with a layer of cork to supply sufficient absorption even in the case the wooden panels are fully covering the cork panels.

The theatre is designed to be compact with a relatively small volume, which is beneficial for acoustic performance. This allows for better control of the direct sound and early reflections. These features lead to the theatre suited for both musical performances and spoken word events.

To make the reverberation time shorter for the lower frequencies, some helmholtz resonators have been placed in the back wall of the theater. The resonators have been tuned specifically for frequencies 125-500.



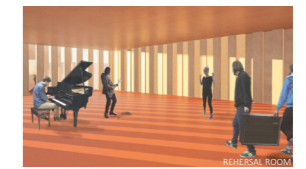
SOUND CONTROL

The orchestra pit includes a wall with tuned absorptive material to control sound levels and create an acoustically balanced environment. It's designed to absorb problematic low frequencies without over-absorbing, preserving enough reflections for sound projection and musician communication. Excessive absorption could lead musicians to play louder, counteracting the intended effect. The stage house will have an absorptive material with an absorption coefficient of 0.5 on all four walls.

REHEARSAL ROOM

With a similar approach to the one used in the theatre hall, the rehearsal room features adjustable acoustics through the use of sliding cork panels along the walls. Cork is also used as elastic interlayer to create a floating floor in the MEFFIT room where the walls are covered with an acoustic lining consisting of cork backed by gypsum board.

The panels allow adaption of the reverberation time between 0.9 and 1.1 seconds to tailor to different types of activities, ensuring optimal sound conditions whether for musical rehearsal, meetings, or presentations.



Text från planscher

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Barcelona

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Mediterranean warmth

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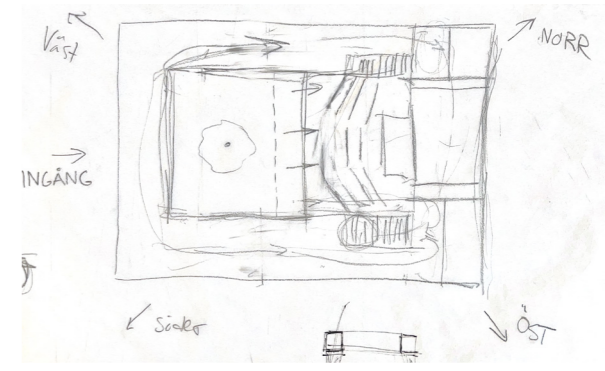
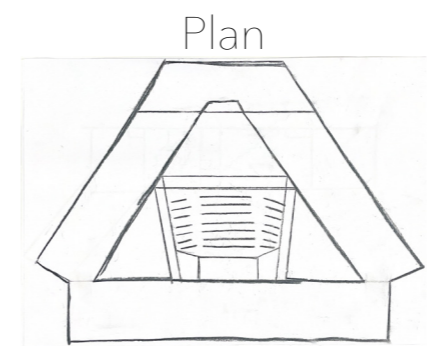
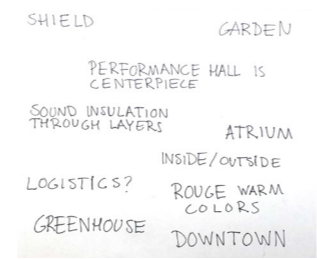
Processen

I samarbete med Linn El Haddad och Tilma Thorén. Det första vi gjorde var att ta fram tre stycken koncept för akustikerna. Sedan fick vi välja ett av dem att gå vidare med. Vi valde att gå vidare med konceptet "sammansatta rum" tillsammans med vår akustiker. Vi insåg att färger och särskilt medelhavs färger var något vi drogs till och ville jobba med. Sedan tyckte vi det var kul att jobba med ett hållbart material och vi fäste oss vid materialet kork.

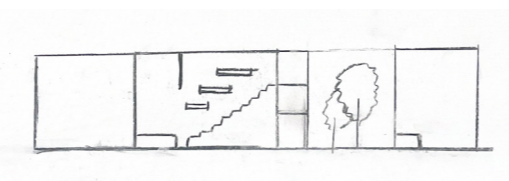
När vi bestämde oss för att jobba med kork och medelhavs färger var det naturligt för oss att välja platsen Barcelona. För platsen gjorde vi en arbetsmodell för att ta fram en bra volym. I den tidiga iterationen fastnade vi också för en panelstruktur för akustiken och fasaden.

I och med att vi jobbade i en iterativ process fanns det alltid chans att reflektera över vad man kommit fram till. Detta var mycket givande då man dels lär sig att presentera sitt material men man får också mycket bra feedback.

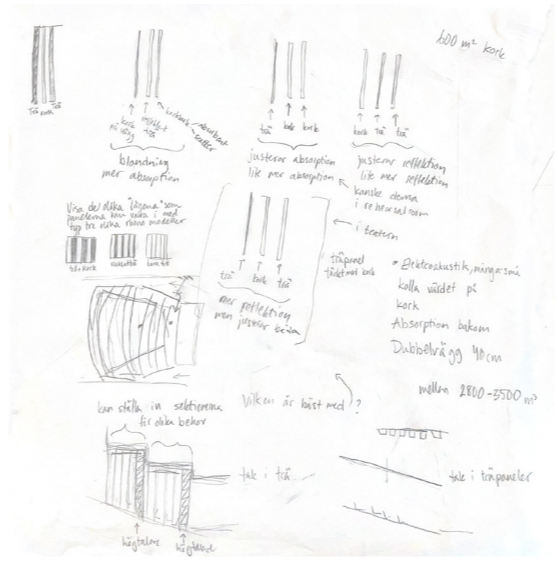
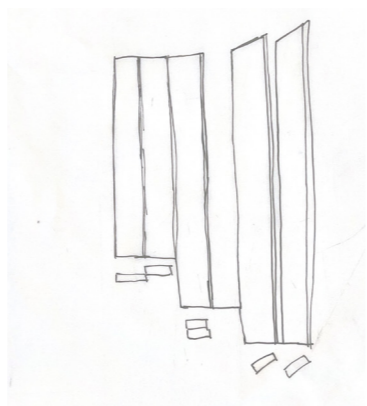
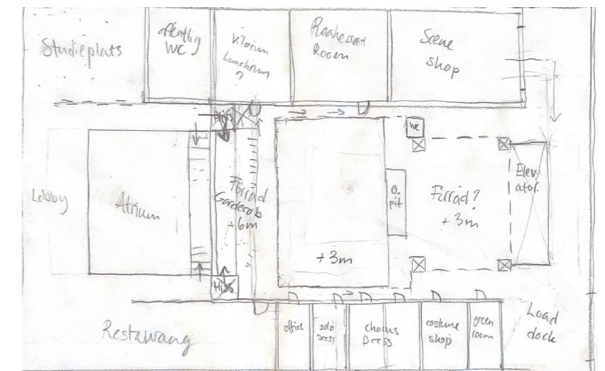
EMBEDDED ROOM



Section



Storyboard



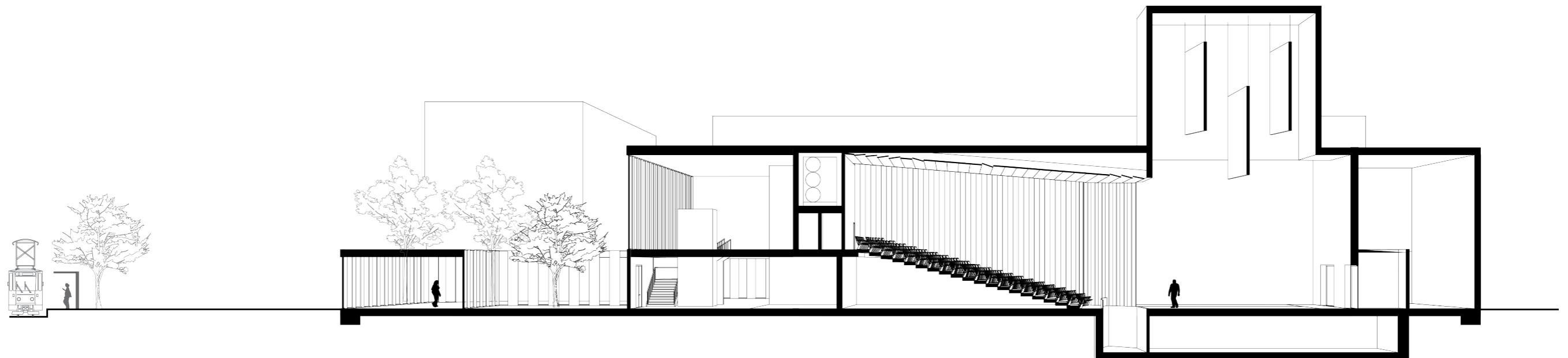
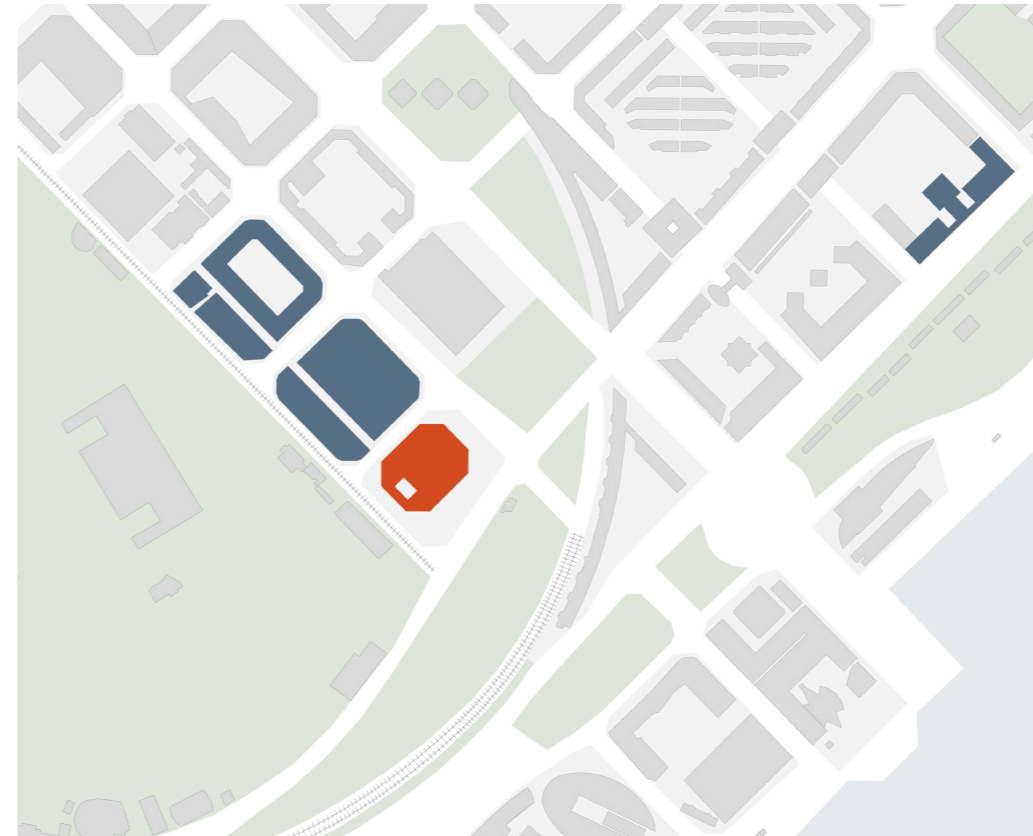
Skisser och modeller från processen

Platsen

Vi valde en plats i södra delen av Barcelona. De blå byggnaderna är skolor som kan dra nytta av den sociala platsen teatern skapar. Det finns en spårvagnshållplats vid huvudingången och en tunnelbanestation på nordöstra sidan.

Vi har också valt att utforma byggnaden liknande byggnadsmönstret i Barcelona med avklippta hörn. Det skapar en trevlig plats mellan byggnaderna.

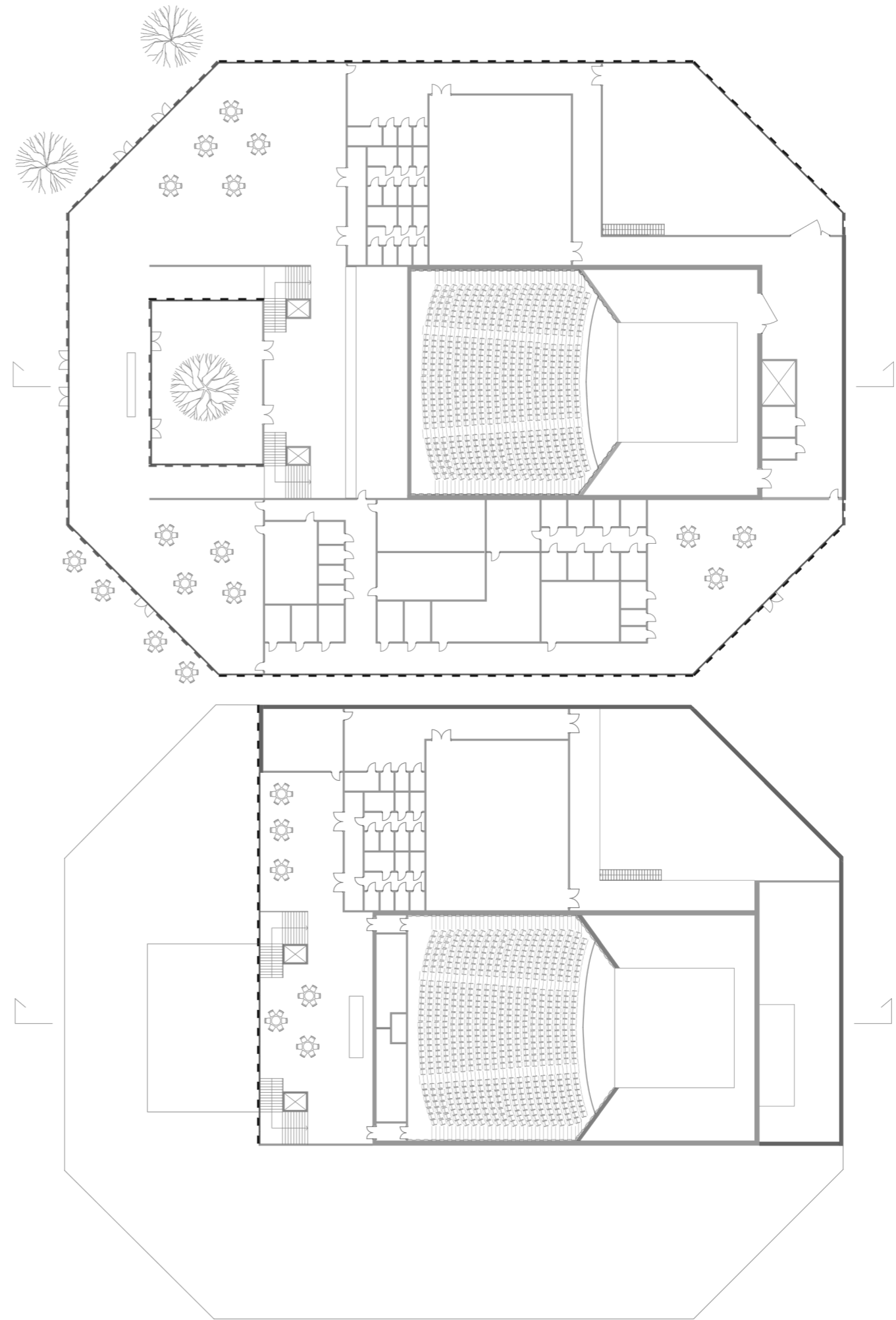
Sektionen visar hur teatern förhåller sig till de omkringliggande byggnaderna och spårvagnshållplatsen.



Planer

Lobbyn är placerad mittemot atriet och i de avklippta hörnen finns ett café och en studieplats. Sedan går man förbi, eller igenom, atriet och uppför trappan. Där möts man av en vinbar med högt i tak och utsikt över atriet och parken. Där ifrån går man in till teaterhallen.

De utrymmen som är till för personal och skådespelare är placerade runt teaterhallen mot långsidorna och baksidan av byggnaden.

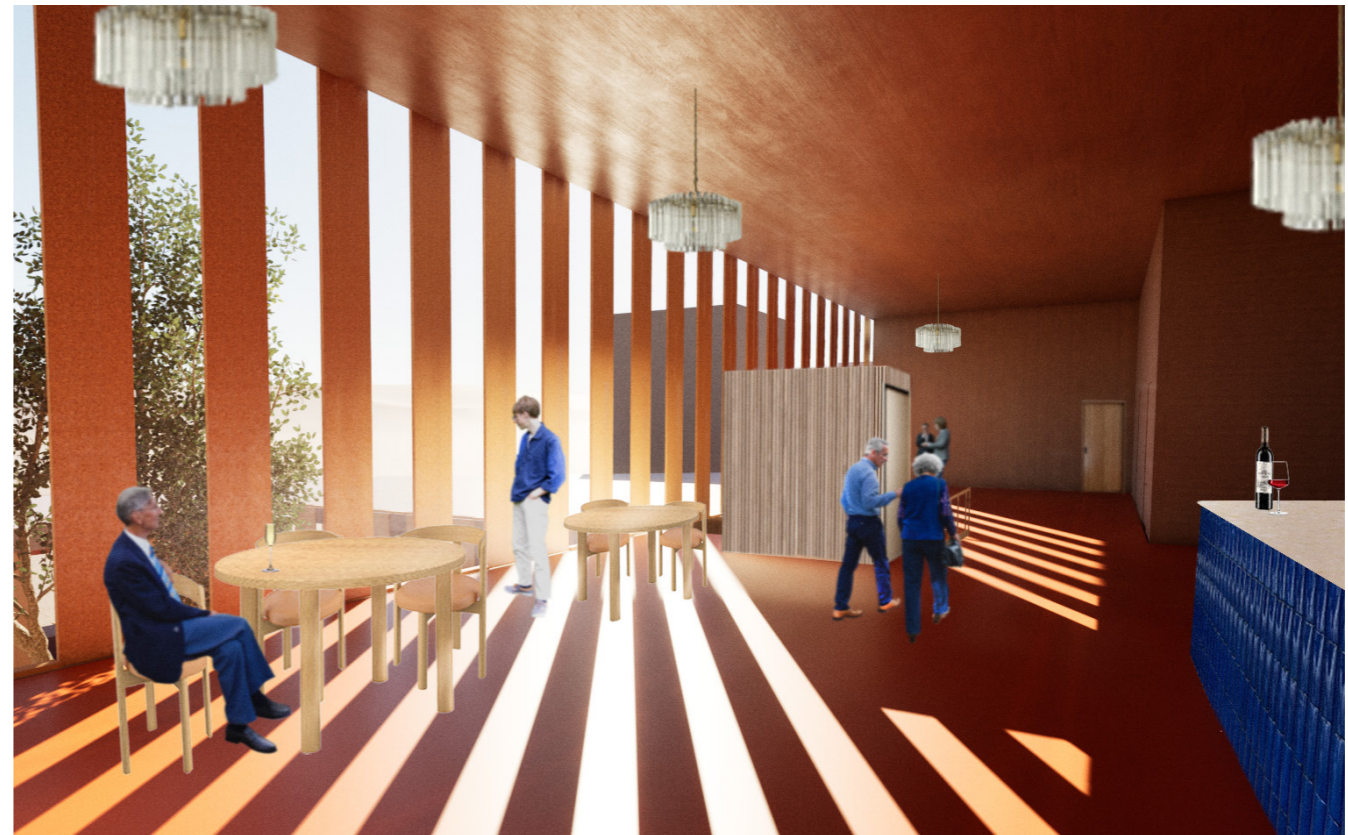


Kork och arkitektur

Vi har valt att använda oss av vinkorkar som smulas ner till fibrer och sedan pressas på träpanel. Dessa korkpaneler finns längs med fasaden på byggnaden. Korkekar växer naturligt runt medelhavet och vi vill med hjälp av arkitekturen belysa korkens bra egenskaper. I atriets har vi också placerat ett korkek för att besökare ska få en bakgrund i vart materialet kommer från.

Materialet är sprött och är mjukt och behagligt att vistas omkring. Tillsammans med korkens naturligt beigea ton har vi valt att lägga en varm orange ton på golvet.

Efter att vi studerat materialet närmre har vi också förstått att korken har en del bra tekniska egenskaper. Bland annat så skapar den ett bra inneklimet.

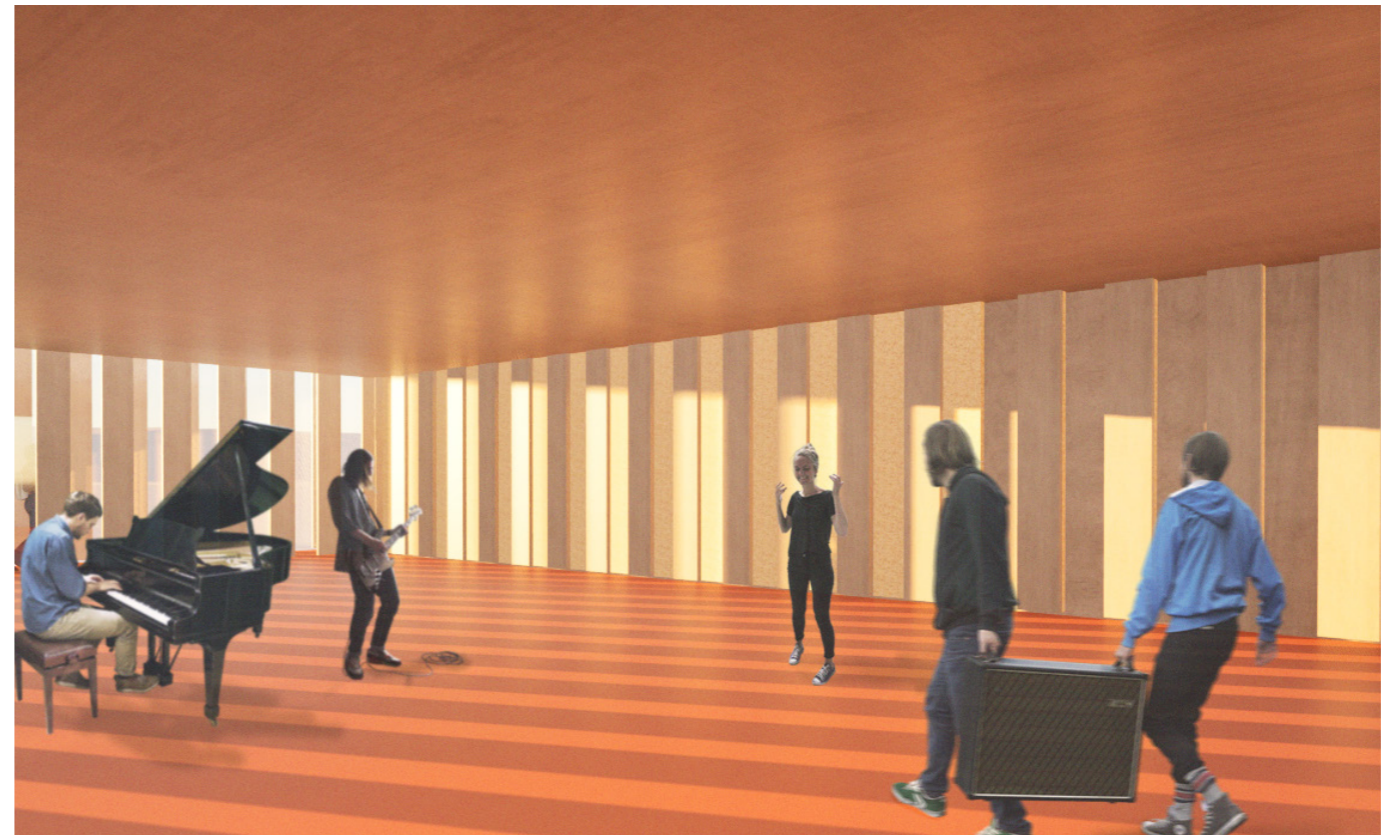


Kork och akustik

Förutom att korken har bra arkitektoniska egenskaper har materialet också akustiska fördelar. På samma vis som med fasadpanelerna gör vi också de akustiska panelerna. Dessa verkar då som absorberande för ljud.

I teaterhallen och repetitionslokalen består väggarna av två olika sorters paneler. En rad träpanel och en rad korkpanel. Väggen bakom består av trä. Dessa paneler kan förflyttas och roteras för att förändra de akustiska egenskaperna. Nedan finns en prototyp för detta.

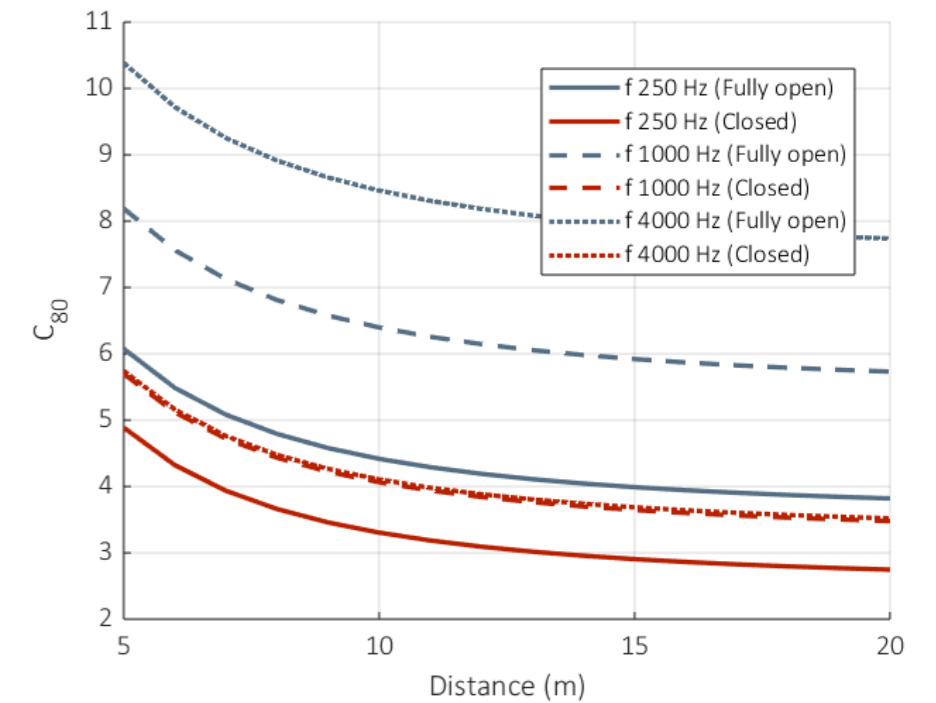
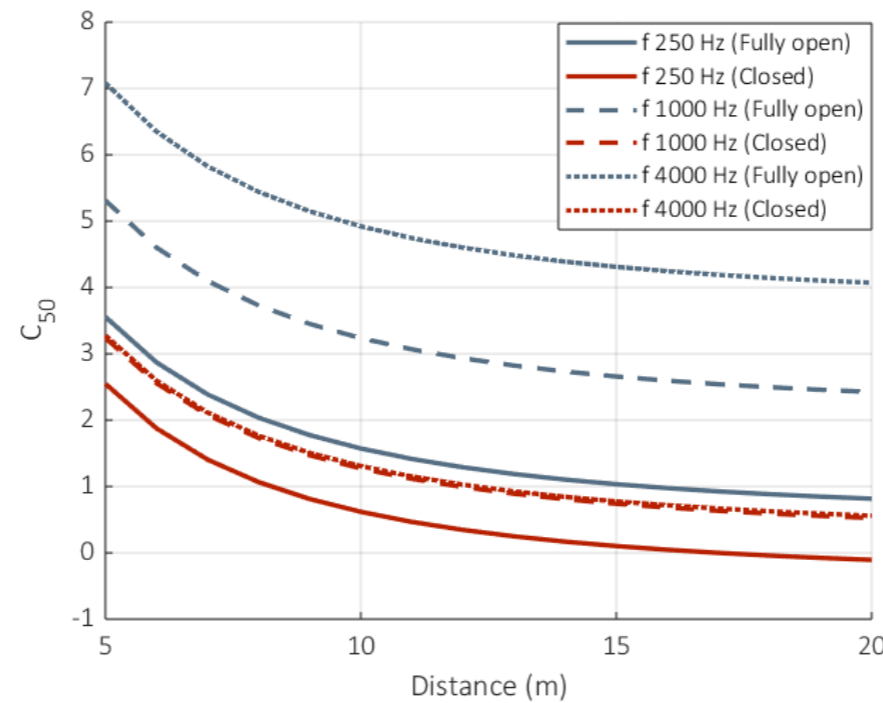
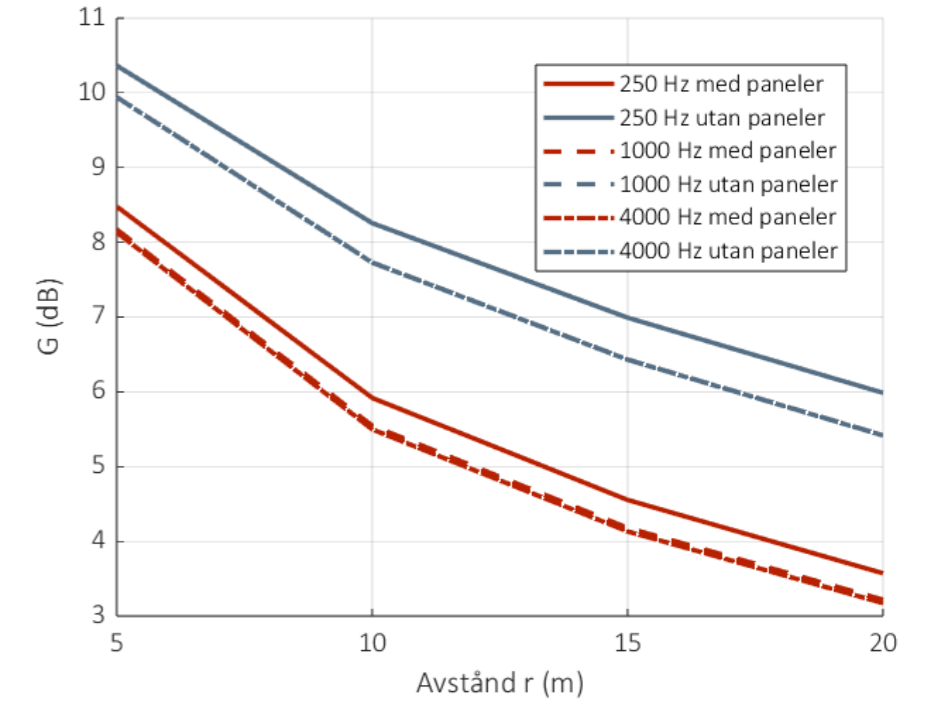
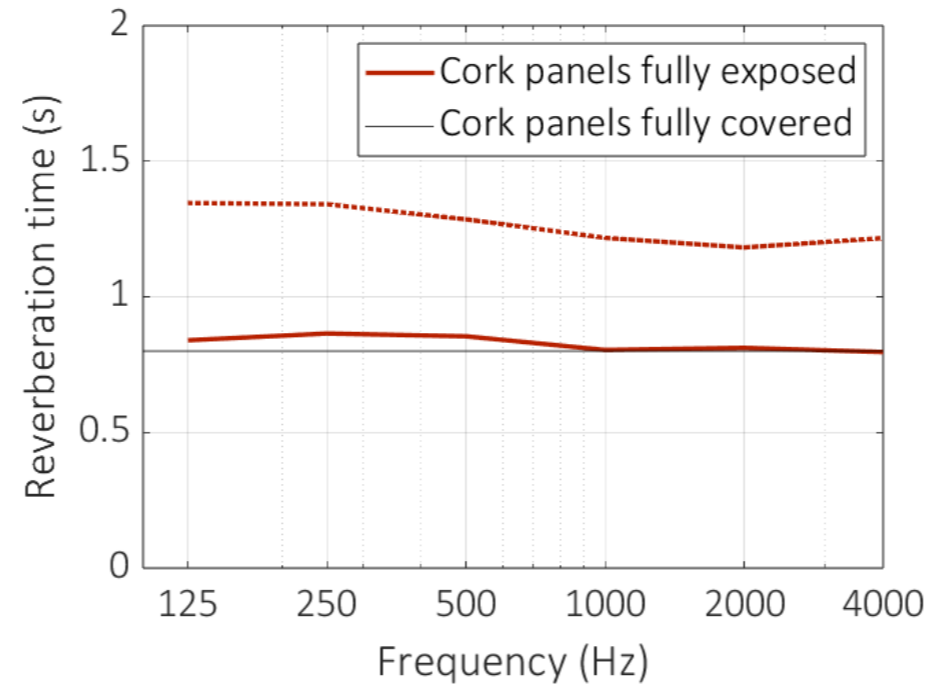
Golvet kommer också beläggas med ett lager kork för att undvika vibrationer.



Akustiska egenskaper

Diagram för efterklangstiden, styrkan G och klarheten C_{50} och C_{80} . Vi hade en relativt liten volym på cirka 3500 m³ och ett avstånd från scen till bakre raden på cirka 20 m. Dessa egenskaper gör att värdena på styrkan och klarheten förbättras.

För att kunna variera efterklangstiden så kan panelerna förflyttas och roteras beroende på vad teaterhallen ska användas för. Den kan varieras mellan ungefär 1.4-0.8 s.



Reflektion

Jag känner mig väldigt nöjd med vårt projekt och jag har lärt mig mycket om hur man arbetar i ett större projekt. Om det hade funnits mer tid så hade vi gärna jobbat ännu mer med materialet kork och ge det större utrymme på planscherna.

Det har varit spännande att få fokusera på ett koncept under hela projektet, något som vi under tidigare projekt inte gjort. Speciellt att få välja ett koncept som intresserar en. För oss var det hållbara material, platsen Barcelona och färger.

Under utbildningen och främst under arbete med projekt så har det bara funnits ett slutinlämningsdatum. Det jag tycker har varit bra i den här kursen är att man får lämna in kontinuerligt men också presentera sitt projekt flera gånger. Den iterativa processen har hjälpt en att hela tiden granska det man har gjort och detta är något jag verkligen kommer att ta med mig i framtiden.

