

GLASGOW DRAMA CENTER

An acoustic landmark

Kandidatarbete i Arkitektur och teknik

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CHALMERS TEKNISKA HÖGSKOLA
Göteborg, Sverige
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Glasgow Drama Center is the bachelor's thesis project concluding three years of studies in the Architecture and Engineering programme. It is a project in architecture, but also in acoustics, as its framework is based on an international student competition announced by the Acoustical Society of America. The project was carried out in collaboration with Malte Frey, also a student in Architecture and Engineering, and Gustav Johansson, a student in the master's programme Sound and Vibration at Chalmers University of Technology.

PROJECT FRAMEWORK

The competition brief for the 2025 edition called for the design of a theatre in connection with a university, intended to host both theatrical and musical performances with amplified and unamplified sound. A central focus was therefore to create a high-quality acoustic environment within the theatre hall, as well as to ensure robust acoustic insulation. Another key element was the design of a rehearsal space under similar acoustic conditions as the main hall.

The brief provided only acoustic parameters for the site, but no specific geographic location. The context was described as having high levels of surrounding noise—i.e., an urban environment. For our project, we chose to place the building on an undeveloped site in central Glasgow, currently used as a parking lot.

The detailed competition brief was released in January 2025, and the work was carried out intensively during March and April, leading up to the final critique on April 25, 2025. The review was conducted by two senior architects from Herzog & de Meuron.

REFLECTION ON DESIGNING FOR COMPETITION

I had never participated in a competition before, but it was a valuable learning experience to work within such specific requirements. Putting effort into ensuring that technical—in this case, acoustic—details were met, and carefully developing solutions to fulfil those requirements, was both challenging and rewarding.

The competition brief included strict guidelines for format and font size. Illustrative drawings, renderings, and acoustic diagrams were all used to communicate the architectural and acoustic qualities of the proposal.

REFLECTION ON THE INTEGRATION OF TECHNICAL DISCIPLINES

To achieve a final result that met the required standard, a broad and holistic approach was necessary. Not only were the architectural qualities explored, but also technical aspects were given significant attention. Through collaboration with Gustav Johansson, a student in the master's programme Sound and Vibration, I gained valuable insight into how to implement acoustic solutions. Just before the start of the thesis course, I had also completed a course in acoustics, which provided me with the foundational knowledge needed to understand what makes a room acoustically successful.

In parallel with the thesis project, I also took a course in indoor environment and building service systems, which deepened my understanding of the technical requirements within a building. Knowing where mechanical spaces should be located, and how they influence other aspects—such as acoustics—helped ground the project in real-world feasibility and made the design process more credible.



GLASGOW DRAMA CENTER

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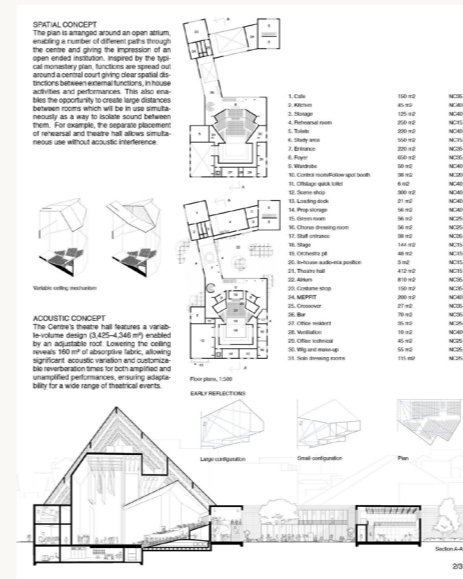
Site axonometric view

SITE
The Glasgow Drama Centre takes the plot of an old car park and transforms it to create a focus point on the south border of Merchant City. The centre extends itself over a large area and is approachable from three different sides - inviting visitors and students from the university not only to the theatre but to the café and study areas integrated in an extension of the competition program.



View from park side

Final posters for the competition, according to the rules of the format and font size.



CONTEXT

the Drama Centre is thought to be located in central Glasgow, next to the River Clyde. Glasgow went through a dramatic urban and economic transformation during the 20th century. It is a city that reflects a wider European condition, where cities must reckon with the decline of industrial glory, and is an extreme example of post-industrial Europe. In recent years, there has been a cultural renaissance in Glasgow, especially in art and music, and the city is looking for strategies for giving traction to these grass route revivals at an architectural and urban scale. We propose a new Drama Centre for the Royal Conservatoire of Scotland contributing to Glasgow's cultural and urban regeneration



Context is here shown through an axonometrical site view. The concept of a landmark is clearly visible.

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The site was found with google earth



The site can be seen from the perspective above. The materiality of the drama center is smoothly fitting in to the built environment around.

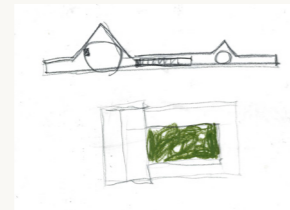
FROM CONCEPT TO SPATIAL DESIGN

1. The first phase of the process began with a classic brainstorming session, during which various concepts were explored. Below are some of the words that resonated with us, a few of which we chose to investigate further.

2. Two concepts we decided to develop were a green, vibrant atrium, inspired by the classic monastery plan of st Gallen, and a strong architectural profile defined by distinct, angular rooflines.

3. Through further refinement, the fully enclosed atrium evolved into a more open configuration, with a building volume that creates a series of more intimate surrounding spaces.

4. Photographing the digital model and coloring it by hand were a method used for fulfilling the aimed relationship of openness to the atrium.



REFLECTION ON ARTISTIC METHODOLOGIES

In addition to the steps outlined above, the process involved iteration on multiple levels. Some early concepts were explored but ultimately not pursued further. Regular critique sessions—so-called “gallery reviews”—were held with instructors and fellow students from both the acoustics and architecture departments. These moments offered opportunities for discussion around both the architectural and acoustic aspects of the project.

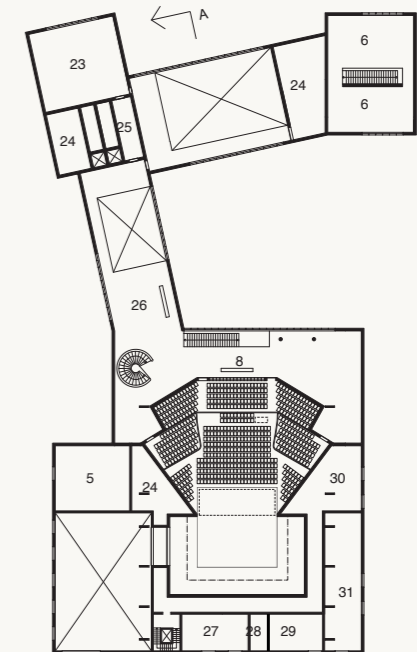
We tested and re-tested, improvised when we didn't have clear answers, followed our instincts, and stayed true to what inspired us. Our method was rooted in being just confident enough in a few ideas to move forward, but never so certain that we couldn't adapt and improve along the way.

SPATIAL ORGANISATION

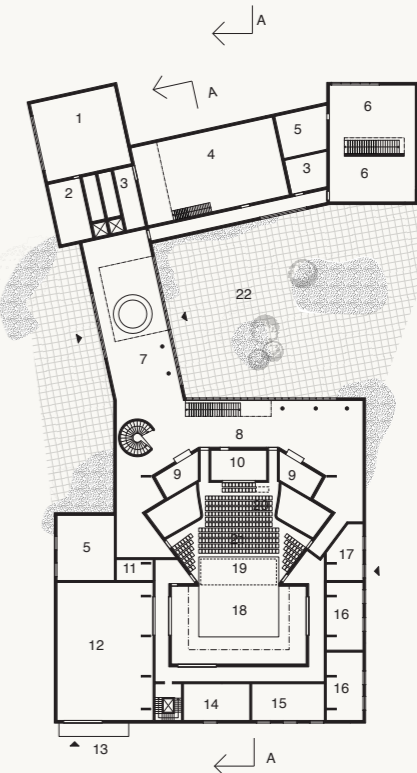
The iterative phase led to that the plan is arranged around an open atrium, enabling a number of different paths through the centre and giving the impression of an open ended institution. Inspired by the typical monastery plan, functions are spread out around a central court giving clear spatial distinctions between external functions, in house activities and performances. This also enables the opportunity to create large distances between rooms which will be in use simultaneously as a way to isolate sound between them. For example, the separate placement of rehearsal and theatre hall allows simultaneous use without acoustic interference.

1. Cafe	150 m2	NC35
2. Kitchen	45 m2	NC40
3. Storage	125 m2	NC40
4. Rehearsal room	250 m2	NC15
5. Toilets	220 m2	NC40
6. Study area	550 m2	NC15
7. Entrance	220 m2	NC35
8. Foyer	650 m2	NC35
9. Wardrobe	50 m2	NC40
10. Control room/Follow spot booth	38 m2	NC20
11. Offstage quick toilet	6 m2	NC40
12. Scene shop	300 m2	NC40
13. Loading dock	21 m2	NC40
14. Prop storage	56 m2	NC40
15. Green room	56 m2	NC25
16. Chorus dressing room	56 m2	NC25
17. Staff entrance	38 m2	NC35
18. Stage	144 m2	NC15
19. Orchestra pit	48 m2	NC15
20. In-house audio-mix position	3 m2	NC15
21. Theatre hall	412 m2	NC15
22. Atrium	810 m2	NC35
23. Costume shop	150 m2	NC35
24. MEPFIT	200 m2	NC40
25. Crossover	27 m2	NC35
26. Bar	70 m2	NC35
27. Office resident	35 m2	NC25
28. Ventilation	10 m2	NC40
29. Office technical	45 m2	NC25
30. Wig and make-up	55 m2	NC25
31. Solo dressing rooms	115 m2	NC25

Floor plan 2



Floor plan 1

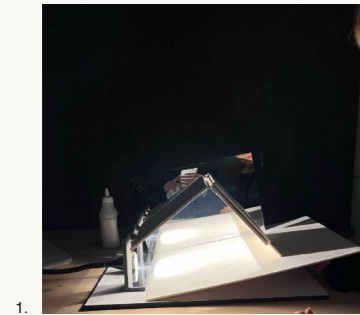


FROM IDEA TO ACOUSTIC DESIGN

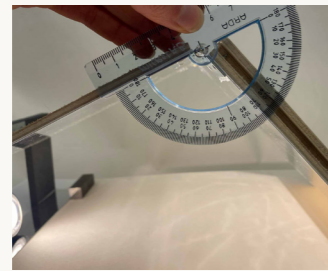
1. Based on the chosen form and its distinct roof angle, we developed a concept that investigated the acoustic implications of such a geometry. We explored how the angled ceiling could be optimized to enhance the room's acoustic performance. To analyze this, we built a ray tracing model using mirrors to visualize how sound reflections would propagate within the space.

2. Another key challenge was managing ground-borne vibrations from heavy traffic, which can transmit through the structure and cause acoustic disturbances. We conducted hammer tests on various materials to evaluate their effectiveness as vibration isolators. This hands-on experimentation proved valuable, and we concluded that mounting the theatre hall on rigid acoustic springs would provide the most effective solution.

3. To enable quick evaluation of iterative theatre hall models, we developed a custom Grasshopper component that calculates key acoustic parameters such as reverberation time, D50, and clarity.



1.



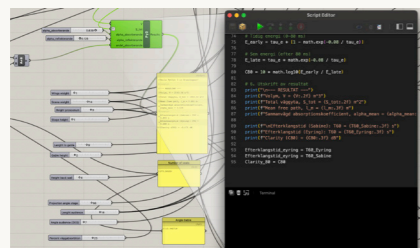
1.



2.



2.



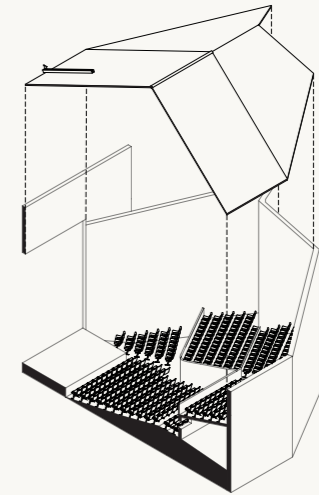
3.



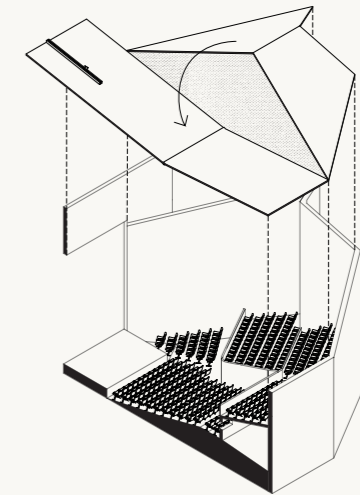
2.

ACOUSTIC DESIGN SOLUTIONS

The building's single-angled form informed the development of an acoustic concept in which the theatre hall features a variable-volume design (3,425–4,346 m³), made possible by an adjustable ceiling where the single angle is varying. When lowered, the ceiling reveals 160 m² of absorptive fabric, enabling significant acoustic variation and customizable reverberation times for both amplified and unamplified performances. This ensures flexibility and optimal acoustic conditions for a wide range of theatrical events



1. Large configuration



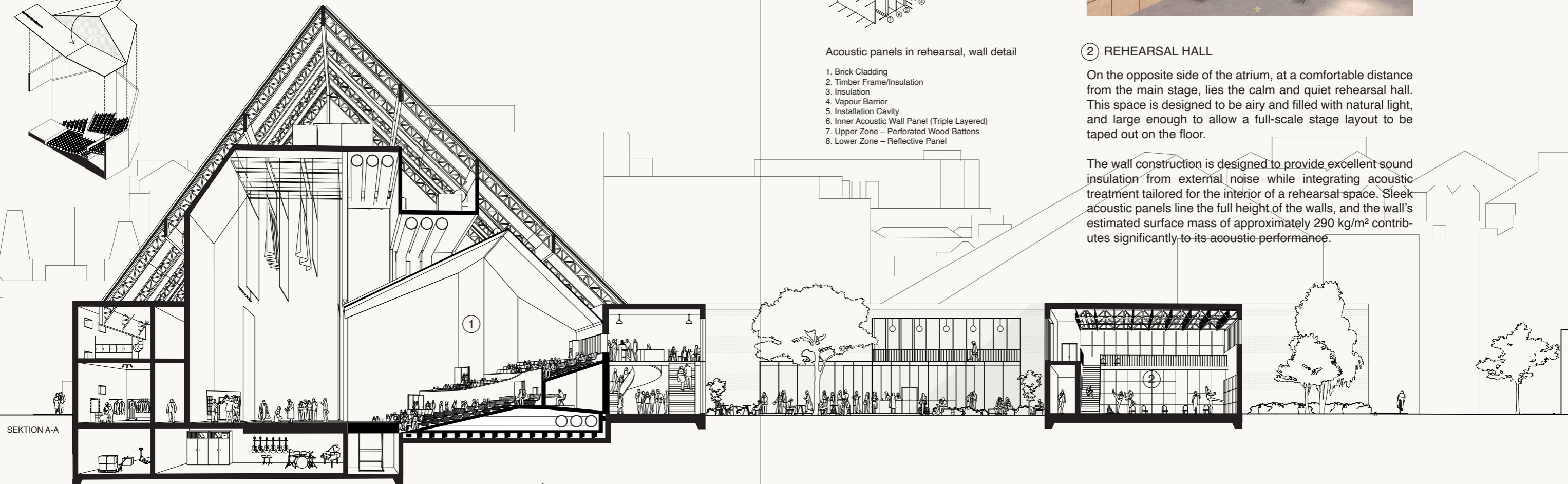
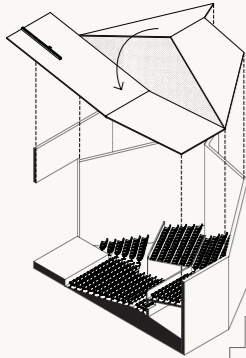
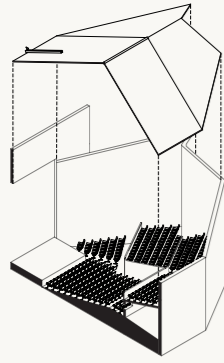
2. Small configuration

REFLECTION ON INTERDISCIPLINARY COLLABORATION

The collaboration within the project—especially across disciplines—was driven by curiosity and attentiveness. From an acoustic perspective, there was a strong shared ambition between the two fields to approach the project as a problem-solving task. Together, we developed a working method that allowed us to quickly evaluate which iterations met the required standards. Software such as Grasshopper was used to assign acoustic properties to a simplified digital model, enabling efficient testing and development.

① THE THEATRE HALL

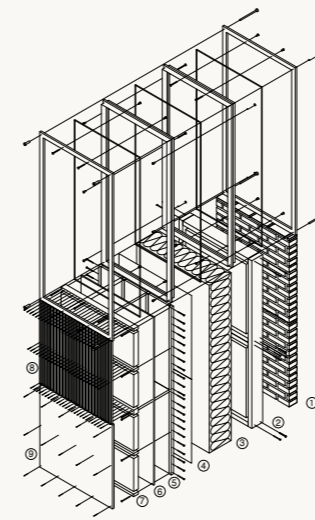
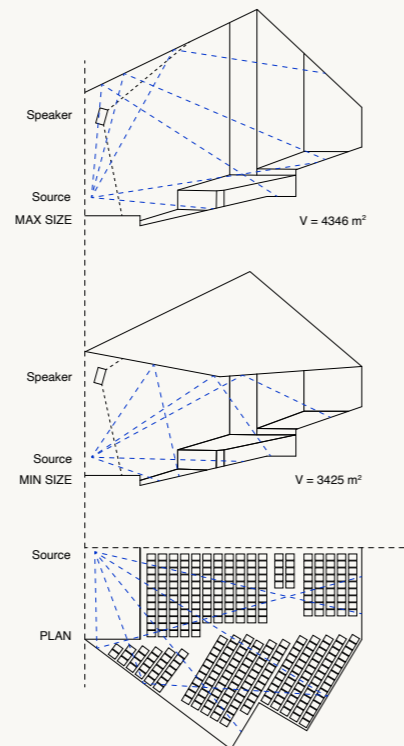
The acoustic concept and the overall form of the building ultimately shaped the theatre hall—the most important space within the project. The distinctive geometry is expressed both inside and out, with the single-angled roof playing a central role in the architectural character. The roof mechanism, visible again to the right, is shown in its raised position in the section below. The theatre hall is closely connected to the atrium, allowing daylight to filter in through the rear windows when they are not covered. Despite this openness, the space remains acoustically shielded from the noise of the city, as the atrium still acts as an effective buffer against the surrounding urban soundscape.



SEKTION A-A

Raytracing

To the right, diagrams show that both room configurations provide evenly distributed sound reflections without critical acoustic flaws. With a maximum depth of 17 meters, the risk of audible echo is eliminated throughout the auditorium.



Acoustic panels in rehearsal, wall detail

1. Brick Cladding
2. Timber Frame/Insulation
3. Insulation
4. Vapour Barrier
5. Installation Cavity
6. Inner Acoustic Wall Panel (Triple Layered)
7. Upper Zone – Perforated Wood Battens
8. Lower Zone – Reflective Panel

② REHEARSAL HALL

On the opposite side of the atrium, at a comfortable distance from the main stage, lies the calm and quiet rehearsal hall. This space is designed to be airy and filled with natural light, and large enough to allow a full-scale stage layout to be taped out on the floor.

The wall construction is designed to provide excellent sound insulation from external noise while integrating acoustic treatment tailored for the interior of a rehearsal space. Sleek acoustic panels line the full height of the walls, and the wall's estimated surface mass of approximately 290 kg/m² contributes significantly to its acoustic performance.

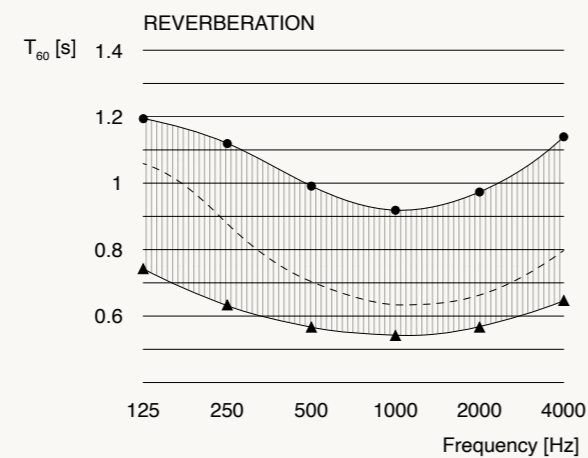
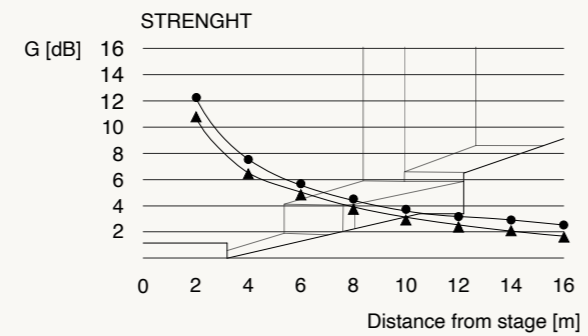
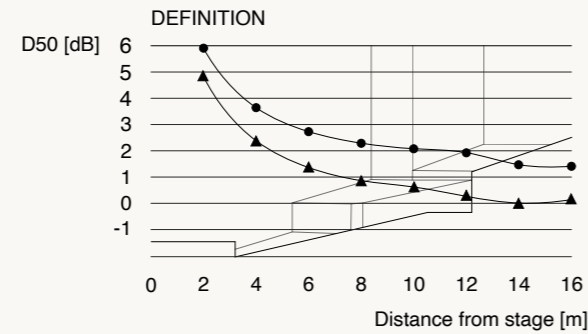


SOUND INSULATION

The theatre hall is mounted on springs tuned to 8 Hz, which reduces vibrations by more than 30 dB at frequencies above 15 Hz. A double-wall construction with staggered studs, dual layers of rigid boards, and mineral wool provides approximately 60 dB of sound insulation between the theatre and adjacent spaces. The floor features a floating system on springs, offering 58 dB airborne sound insulation and 52 dB impact sound insulation. Ventilation ducts are equipped with attenuators that reduce noise by around 45 dB in key frequency ranges, and all wall penetrations are sealed with acoustic collars to prevent sound leakage. Triple-glazed acoustic windows are used throughout the building.

THE ACOUSTIC QUALITIES

Due to its variable acoustics, the theatre hall offers a wide range of acoustic conditions. In the large configuration, it provides excellent sound quality for unamplified performances, with a reverberation time of approximately one second. In the small configuration, it creates a suitable environment for amplified sound, such as in a musical production.



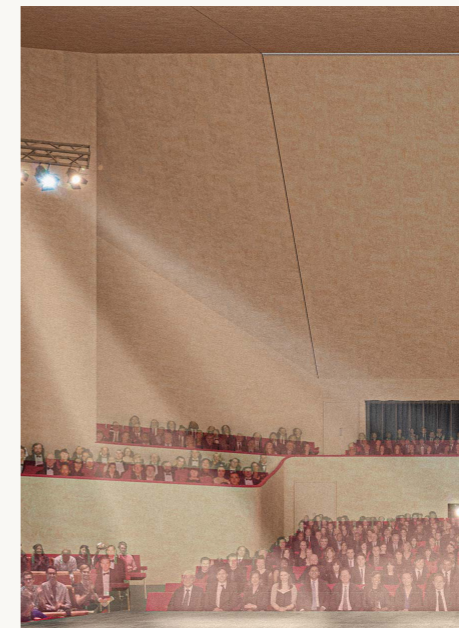
- ▲ Small configuration (V = 3425 m³)
- Large configuration (V = 4346 m³)
- Rehearsal Hall (V = 2184 m³)

LARGE CONFIGURATION

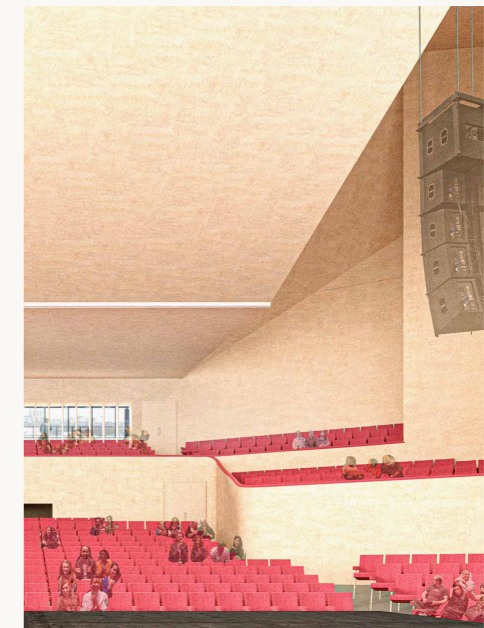
In the large configuration, reverberation times of 1.1 seconds suit unamplified theatre and musical performances, ensuring a rich acoustic environment. Speech clarity (D50) ranges from about 4 dB near the stage to 1 dB at the back, providing good intelligibility.

SMALL CONFIGURATION

In its smaller configuration, the hall achieves a reverberation time of around 0.6 seconds—ideal for amplified performances and presentations. D50 values near the stage increase by up to 5 dB, enhancing speech clarity. Lowering the ceiling reveals heavy fabric panels with an absorption coefficient of about 0.7. Behind them, a plenum filled with porous material adds further acoustic damping.



Large configuration



Small configuration

REFLECTION ON ARCHITECTURAL QUALITIES

There were strong conceptual ideas running throughout the project. The single-angle roof, for example, not only defined the acoustic characteristics of the space but also shaped a room whose adjustability creates a vibrant and dynamic spatial experience. Working solely with the angle of the ceiling in the theatre hall meant it was essential to preserve its clarity in the final design. The angled roof remains fully visible and is further emphasized by the use of smooth panels on its interior. These smooth surfaces extend down onto the walls and railings, where they soften slightly to ensure a comfortable and tactile experience as one moves through the space.

We imagine the Drama Centre to be located in Glasgow, next to the River Clyde. Glasgow went through a dramatic urban and economic transformation during the 20th century. It is a city that reflects a wider European condition, where cities must reckon with the decline of industrial glory, and is an extreme example of post-industrial Europe. In recent years, there has been a cultural renaissance in Glasgow, especially in art and music, and the city is looking for strategies for giving traction to these grass route revivals at an architectural and urban scale. We propose a new Drama Centre for the Royal Conservatoire of Scotland contributing to Glasgow's cultural and urban regeneration.

SITE

The Glasgow Drama Centre takes the plot of an old car park and transforms it to create a focus point on the south border of Merchant City. The centre extends itself over a large area and is approachable from three different sides - inviting visitors and students from the university not only to the theatre but to the café and study areas integrated in an extension of the competition program

SPATIAL CONCEPT

The plan is arranged around an open atrium, enabling a number of different paths through the centre and giving the impression of an open ended institution. Inspired by the typical monastery plan, functions are spread out around a central court giving clear spatial distinctions between external functions, in house activities and performances. This also enables the opportunity to create large distances between rooms which will be in use simultaneously as a way to isolate sound between them. For example, the separate placement of rehearsal and theatre hall allows simultaneous use without acoustic interference.

THEATRE SOUND INSULATION

The theatre hall is mounted on springs tuned to 8 Hz, reducing vibrations by over 30 dB above 15 Hz. Double-wall construction with staggered studs, dual rigid boards, and mineral wool provides around 60 dB sound insulation between the theatre and adjacent spaces. The floor features a floating system on springs, offering 58 dB airborne and 52 dB impact sound insulation. Air ducts include attenuators that cut noise by about 45 dB in key frequency ranges, while acoustic collars seal all wall penetrations to prevent sound leakage.

OUTERWALL SOUND INSULATION

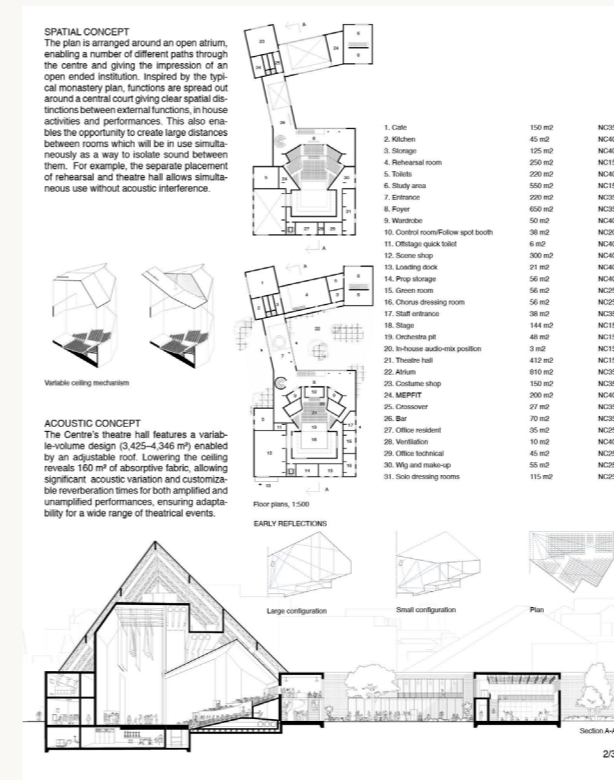
The wall assembly is designed to provide excellent sound insulation against external noise while integrating acoustic treatment tailored for the interior of a rehearsal space. The wall has an estimated surface mass of approximately 290 kg/m², contributing significantly to its acoustic performance. Triple-glazed acoustic windows are used throughout the building.

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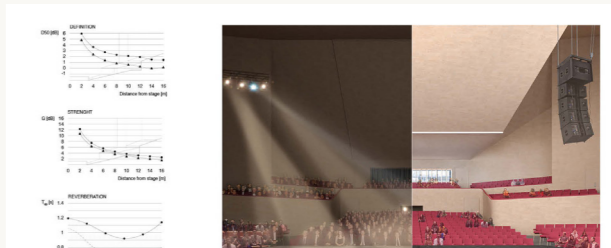


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REFLECTION ON ARCHITECTURAL QUALITIES

The monastery-like atrium plays the most important role in creating a calm core—one that the building can embrace, with each part connecting to it in its own way. Both the foyer and the rehearsal hall lie directly adjacent to the atrium and receive its soft, filtered light through large windows. From the staircase in the foyer, one can move along the large window bands, and the entrance itself is almost dissolving into the outside. The atrium forms a secluded world, separated from the urban exterior—both spatially and acoustically.



view of atrium

REFLECTION ON THREE YEARS OF STUDIES

Throughout the programme, which is deeply rooted in the intersection of architecture and engineering, I have developed strong problem-solving skills and learned how to manage complex, large-scale projects from concept to completion. I have also come to understand the importance of clear and accessible communication—ensuring that ideas and solutions are conveyed effectively, regardless of the audience.

Along the way, I've gained confidence—both artistically and scientifically—and I've learned to genuinely be inspired by the talent and perspectives of others during collaboration. It has always felt natural to ask for help, just as it has felt natural to offer it. The work has been so engaging and meaningful that it's been easy to commit fully. Moments that, on the surface, should have felt difficult or exhausting have often turned out to be the most rewarding—because they've driven the most growth.

All the hours I've poured into my work stay with me warmly. They have helped shape something unique: a space at the intersection of art, architecture, science, and human behaviour.