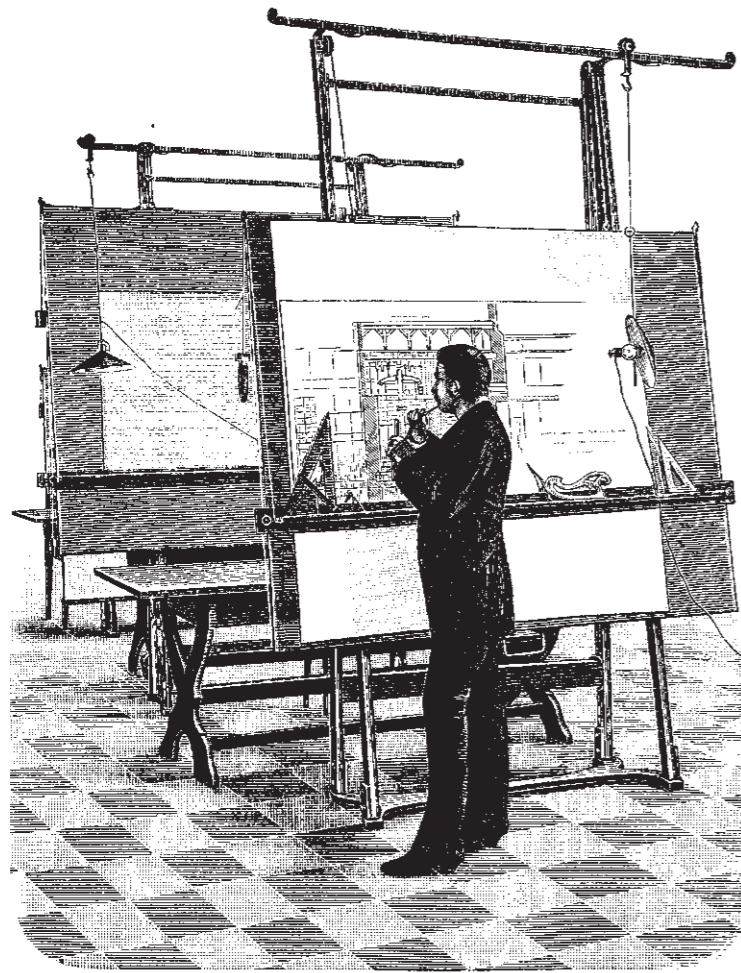


Portfolio

Jonas Svedäng

Architecture & Engineering, Chalmers





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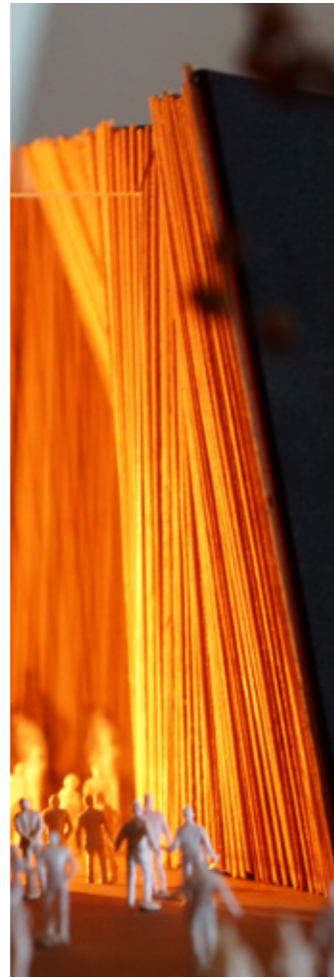
Dear Reader

My name is Jonas Svedäng and this is a portfolio of my work in Architecture and Engineering at Chalmers University of technology in Gothenburg, Sweden.

It is an education that combines architecture and structural knowledge. In June am I finished with my third year and would very much like to do an internship at Snöhetta.

In our school projects we learn engineering knowledge to use in the architectural design. Examples are energy consumptions estimates for row-houses, acoustics calculations and principles for opera hall and structural principles and calculations for bridges, demanding constructions.

I work lot in models, both in the design process and for final presentations. I try to use my technical knowledge in a poetic way. I wish you a enjoyable time reading.



The Treasure 1



Tension 12



The lock's Rust 16



Bastilion Bridge 20

Bachelor project

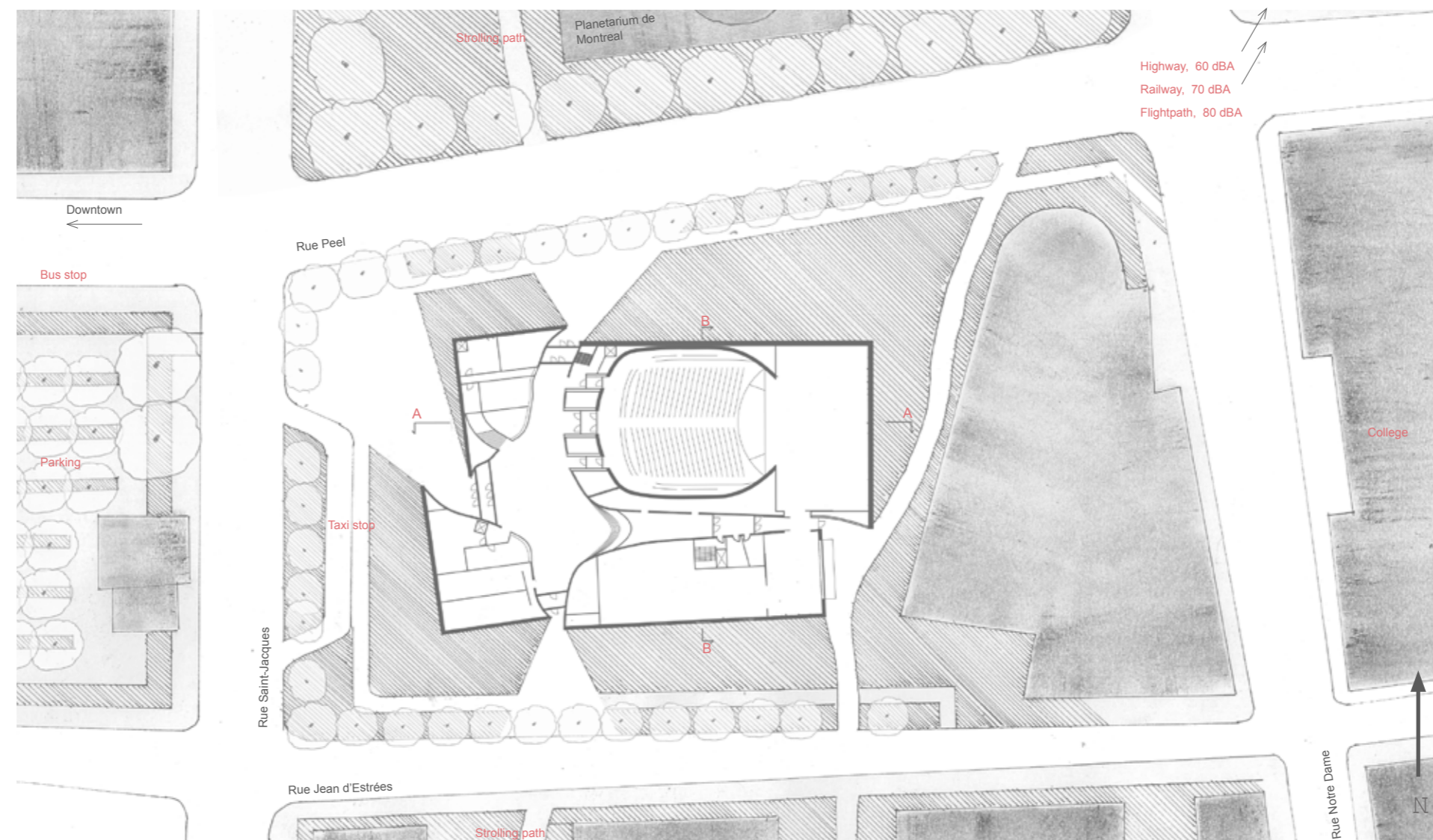
Assignment: to compete in American Acoustic society's student competition, with this year was to make a proposal for an Opera for 1200 visitors to a college in Montreal, Canada.

Nominated

This proposal was one of the three nominated from Chalmers university (19 was made). Each university has a limit of sending three proposals. The winners is decided in June.

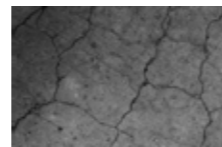
The Treasure

The Treasure is a story of a black stone that breaks apart and reveals a hidden inner secret. It is the story of how a college got an Opera House on a noisy lot in downtown Montreal.



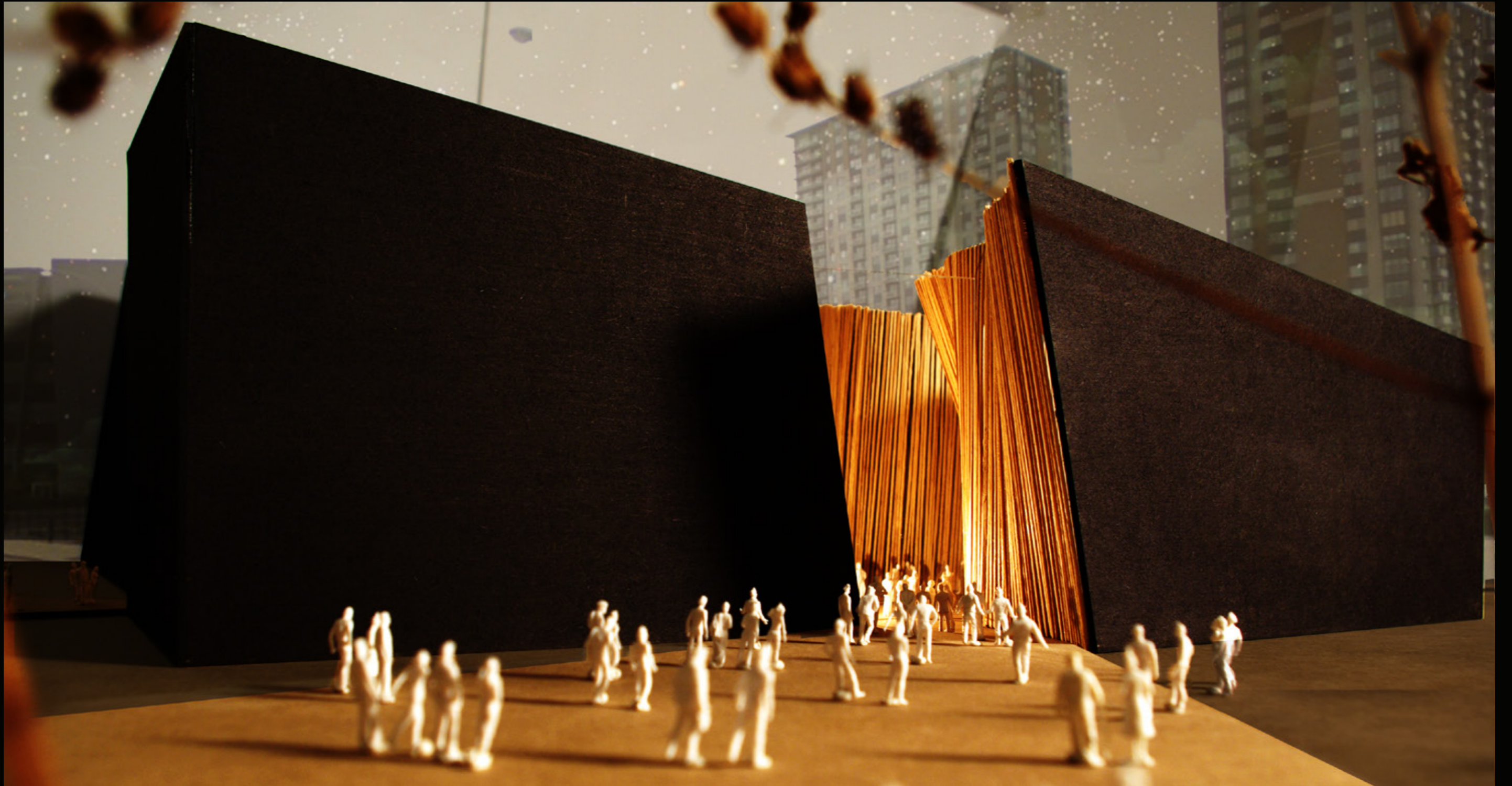
Outside

The story begins on an empty lot in downtown Montreal. A central site in southern Montreal characterized by a noisy environment. To protect the opera from the noisy surroundings the Opera House starts out as a black box, the stone, with thick isolating concrete walls.



Concrete

The outside of the opera building is made of black concrete. Concrete is a high density material which makes it suitable for isolating the opera from low to high frequency noise.



Main entrance

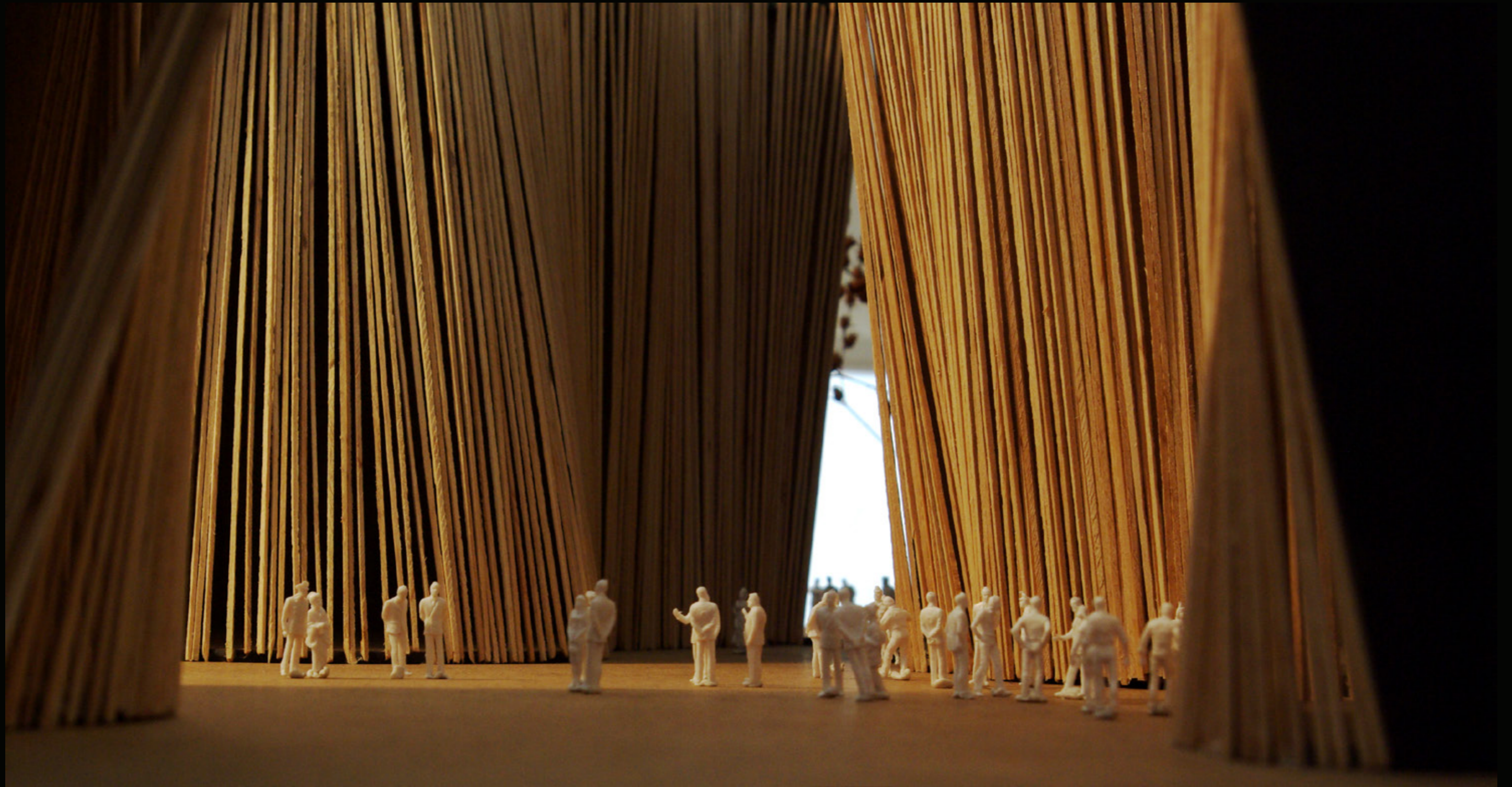
In between

The second chapter of the story is about how the stone breaks apart welcoming the city into its warm glowing inside. It is also about how the stone transform into a functional building with separate functions acoustically isolated from each other.



Pine

The warm inside of the building is made of wooden lattice from Canadian pine, rising from floor to the ceiling to give a strong vertical feeling to the room. The distances between the wooden slits are varied to form natural openings for visual contact between the lobby and its surrounding rooms.



View inside of the Lobby

Inside

The end of the story is about the secret of the stone, the sparkling treasure, hidden in one of the stone pieces. It is how a pile of circular bands is shaped to form an intimate performance hall with early reflections and a highly diffuse sound field.

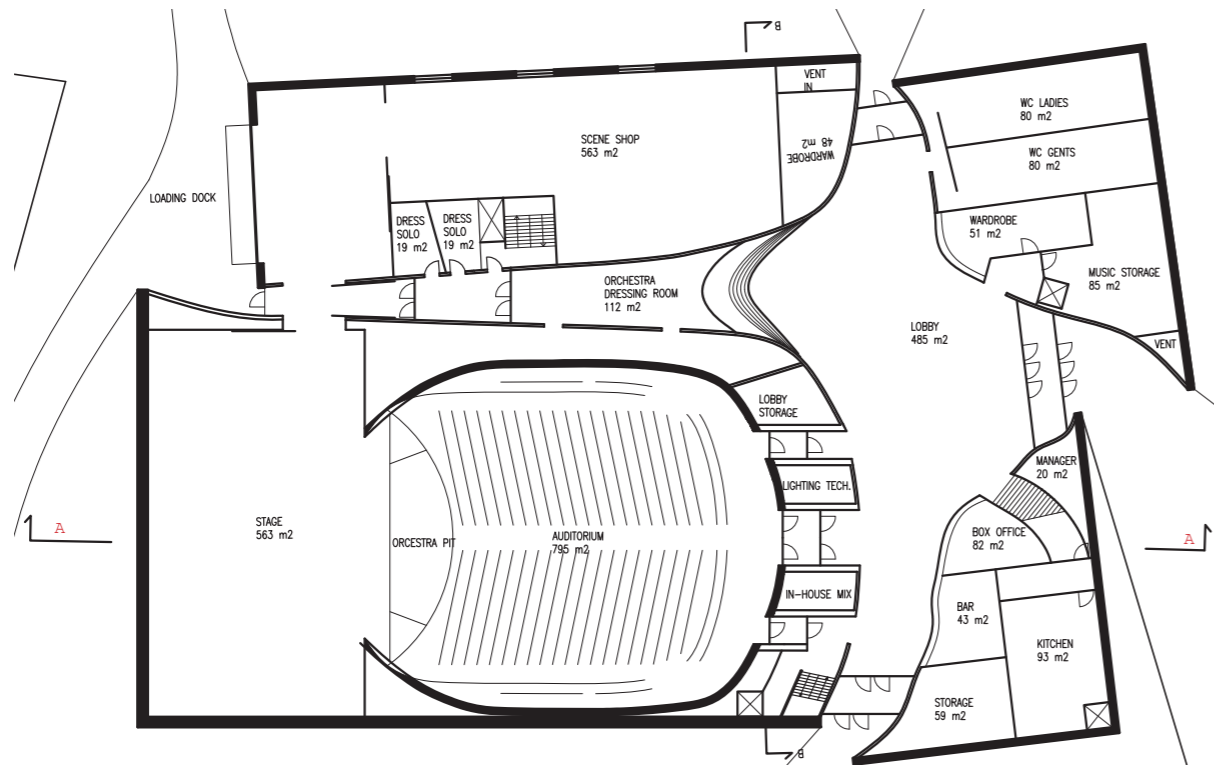


Copper

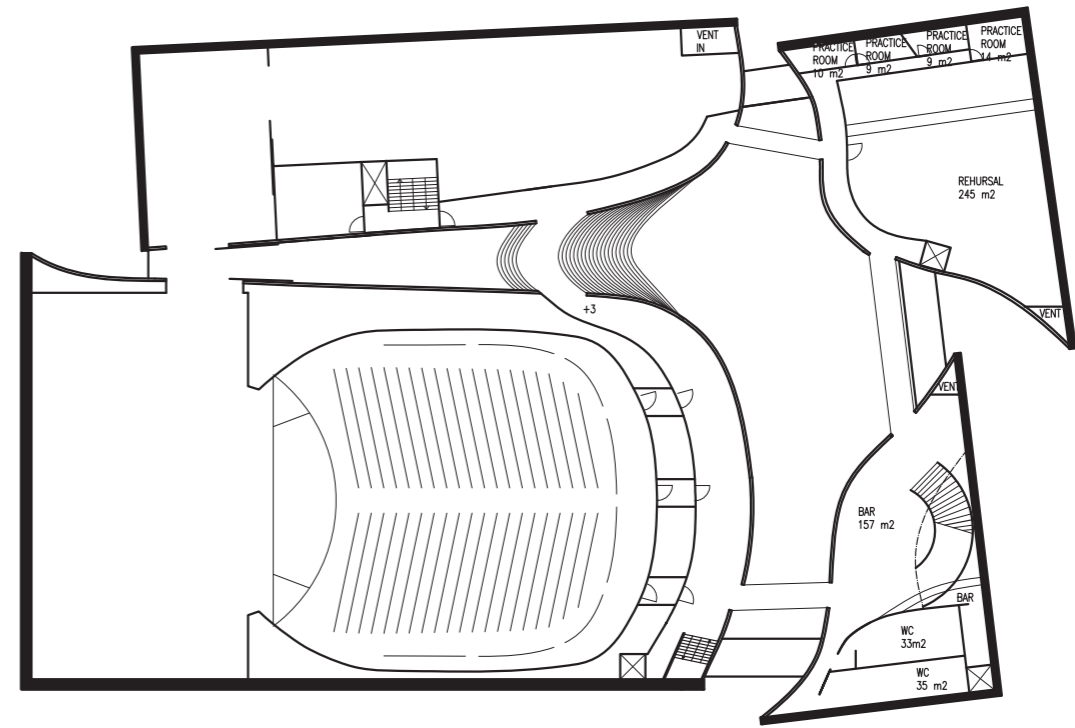
The thin copper bands that define the auditorium are attached to an asphalt board to prevent them from unwanted vibrations. The copper has a very low absorption coefficient, which creates highly reflective walls and balcony fronts as desired.



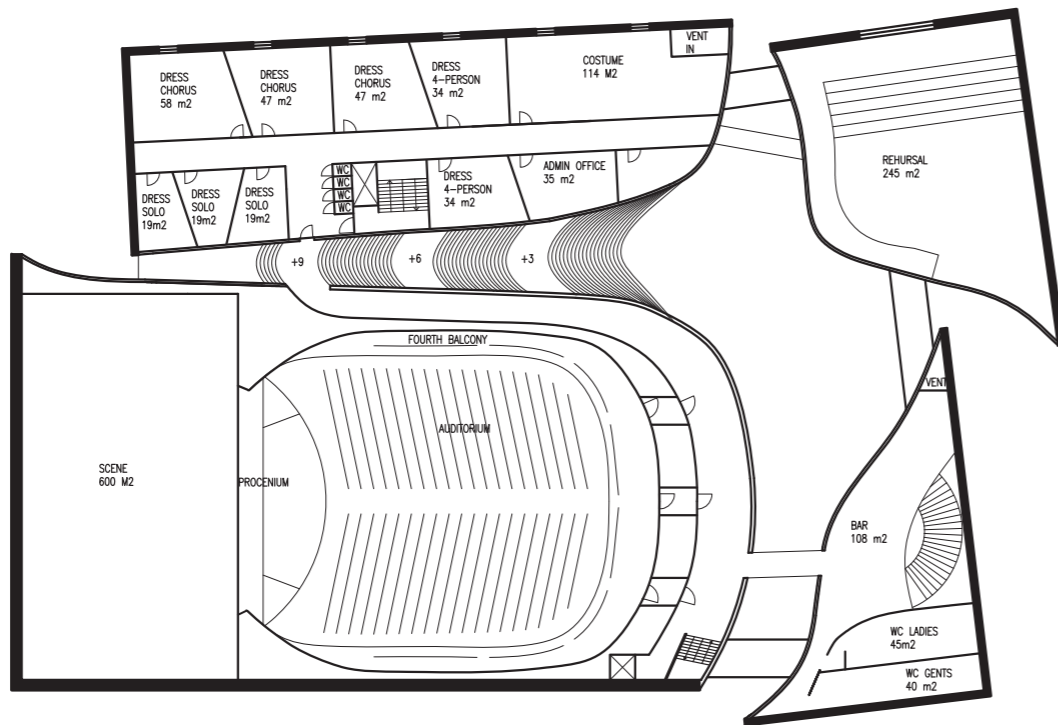
Auditorium



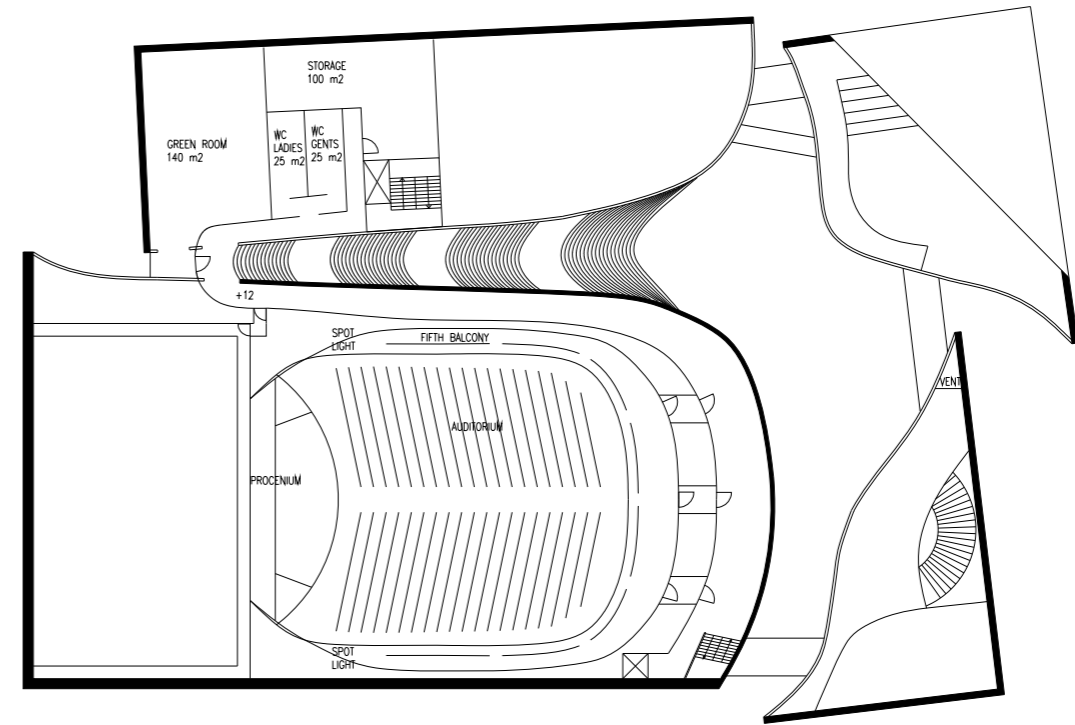
Main floor



+4 Second floor



+10 Fourth floor



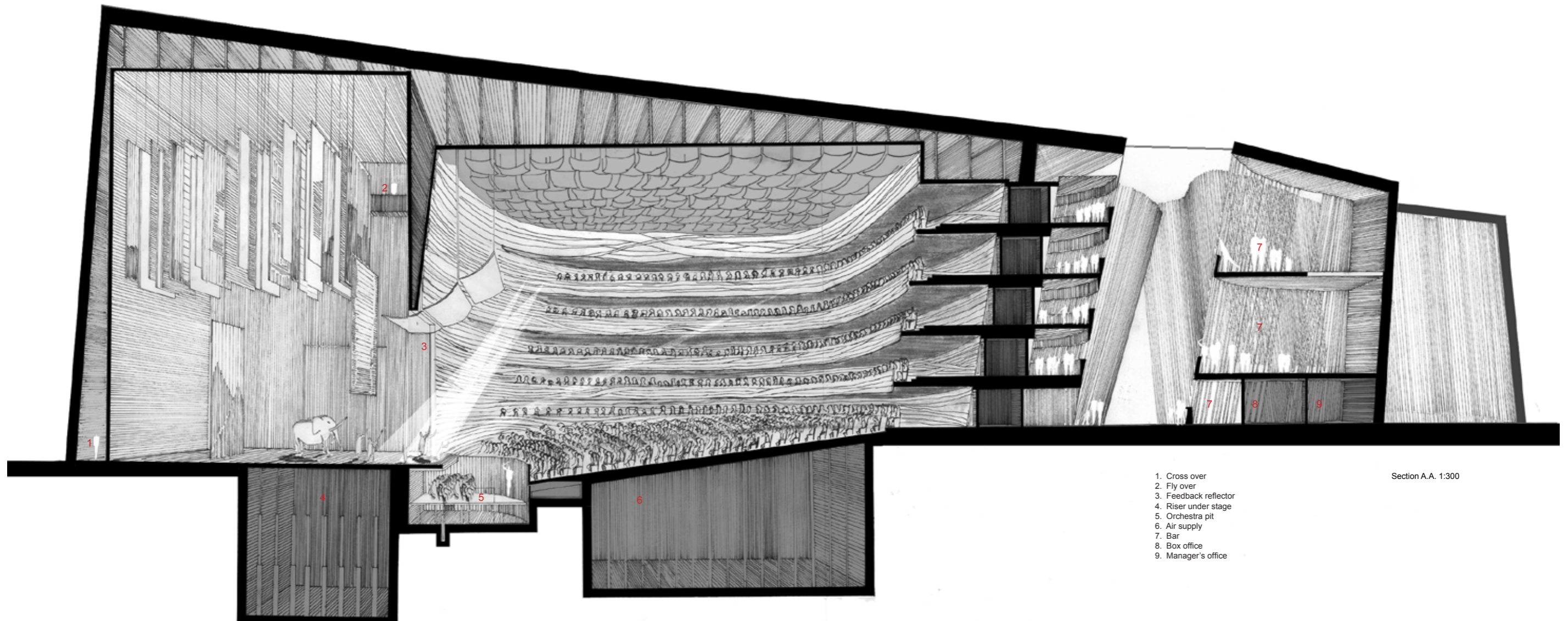
+13 Fifth floor 1:600

Lobby

The lobby is the center of public movement located in the volume that is created when the broken stone pieces are pulled apart. The main vertical communications are distributed by a spectacular stair located between two of the building volumes supported by four elevators, one in each volume. The main stair is also an acoustic isolator that prevents the noise from the path between the stage and the scene shop from leaking out into the lobby.

Green Room

The Green Room has a spectacular location at the end of the main stair at the fifth floor, but also close to the dressing rooms and stage. This intimate room is a space where actors can relax before and after events together with specially invited guests. From the Green Room one will have a good view over the city and at the same time watch people move up and down to the different balconies. The green room provides easy access for wheelchairs from the nearby elevator outside the auditorium.



1. Cross over
2. Fly over
3. Feedback reflector
4. Riser under stage
5. Orchestra pit
6. Air supply
7. Bar
8. Box office
9. Manager's office

Section A.A. 1:300

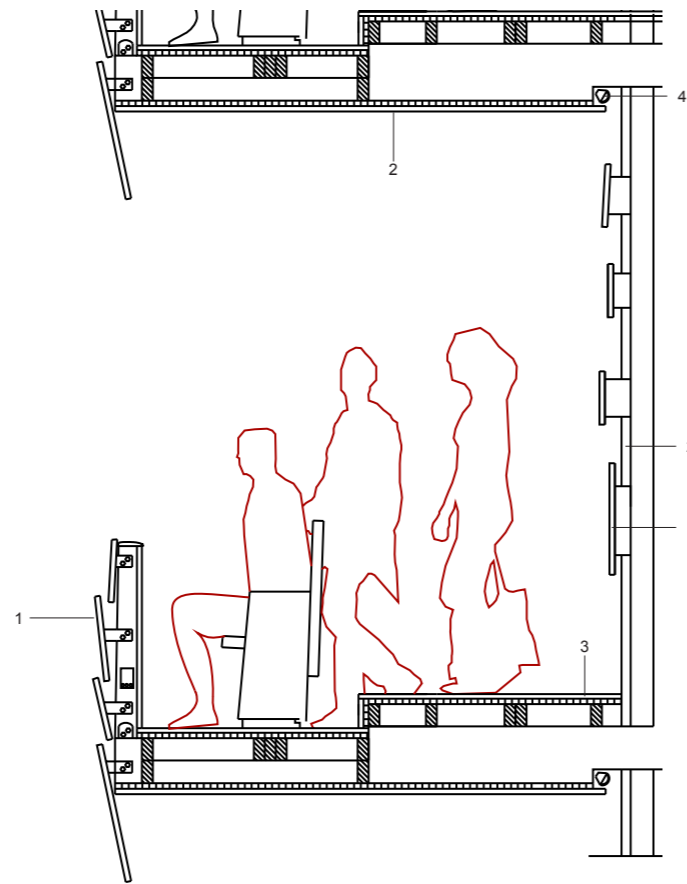
One-row Balconies

In the Treasure it is all about intimacy and good acoustics as an opera should be, not only for those on the orchestra floor but for all in the audience.

The auditorium therefore has five balconies with only one row of seats per balcony, so the audience at the balconies does not have anyone between themselves and the performance, providing everyone a personal contact to the actors.

One-row balconies enable everyone to experience lots of roof reflections, which are important for the acoustic experience. The small balcony openings increase the amount of reflecting planes, giving a high reverberation time and strength.

All of this makes the auditorium a very intimate environment. Truly a treasure for all opera lovers.



Balcony fronts:

The copper bands on the balcony fronts are tilted downwards close to the stage to obtain the desired side wall reflections and upwards in the rear of the auditorium to avoid reflections at the back head.

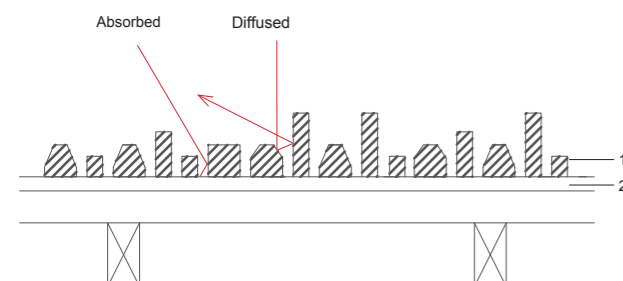
Section of balcony 1:40

1. Diffusive copper bands
2. Acoustic plaster
3. Wooden parquet floor
4. Lamp

Lobby wall - diffuser

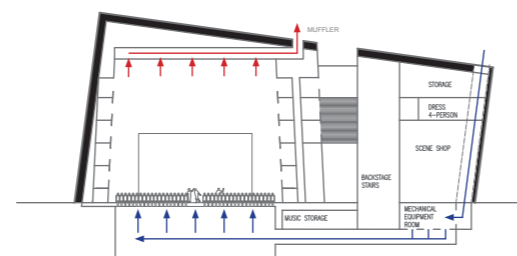
The lobby is dominated by mid frequency sound made from talking people. To diffuse the sound field the walls in the lobby are covered with a wooden panel of various cross sections. The panel is supported by an absorbing fiberboard to lower the reverberation time.

1. Pine of various cross section
2. Absorbing panel



Ventilation

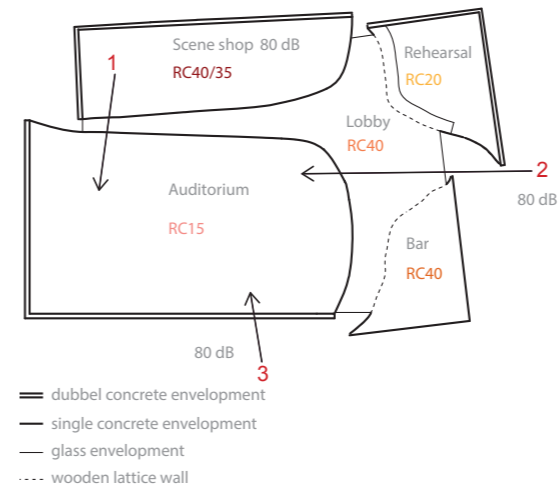
The fresh air is taken in from the roof at level of 20 meters and is let out in a big space under the auditorium. It sips in to the concert hall mainly by vents under the chairs at a speed of 1.5 m/s so that no disturbing noise is created. At the outlet there is a muffler preventing sound from entering the auditorium.



Isolation strategy

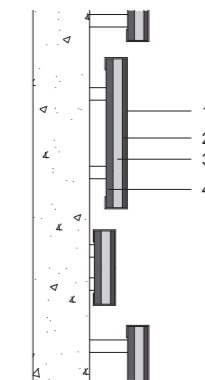
Instead of each room having different noise criterion each volume has one. The volumes are acoustically isolated from each other and are standing on separated ground floors to reduce structure borne sound.

Critical sound paths were identified and shown in details how the noise was reduced.



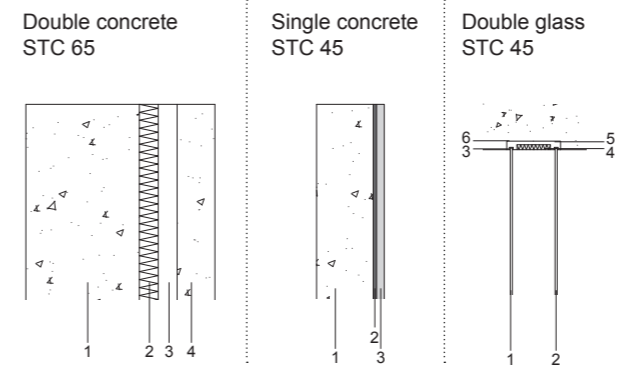
Copper wall

The walls in the auditorium are covered with copper band of various widths to give the auditorium a highly reflective and diffusive surface. The bands are made of a thin layer of copper foil attached to an asphalt board to add mass to the foil and the felt layer transforms the energy into heat.



1. Copper foil 0.8 mm
2. Asphalt 10 mm
3. Felt 25 mm
4. MDF - board 18 mm

Sound isolating envelopments



- Double concrete 1:20**
1. Concrete 250 mm
 2. Low density fibreglass 50 mm
 3. Air 50 mm
 4. Concrete 100 mm

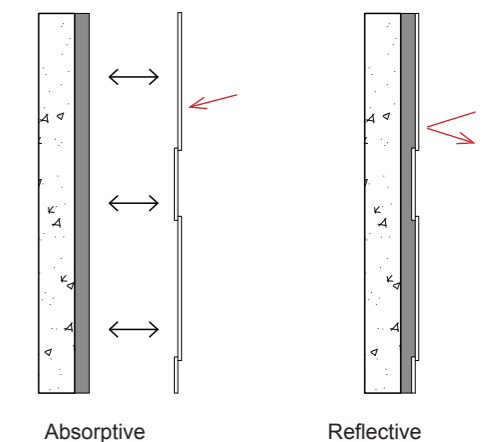
- Single concrete 1:20**
1. Concrete 150
 2. Gypsum 9 mm
 3. Fiberboard 9 mm

- Double glass 1:20**
1. Laminated glass 10 mm
 2. Laminated glass 7 mm
 3. Neoprene foam
 4. Cloth wrapped fibreglass
 5. Wood window frame
 6. Mastic sealant

To get the glass roof absorptive, a third layer of 0.2 mm plexiglass, with micro perforated holes will be installed at a distance of 600 mm. This will increase the absorption and give a lower reverberation time in the lobby.

Low frequency

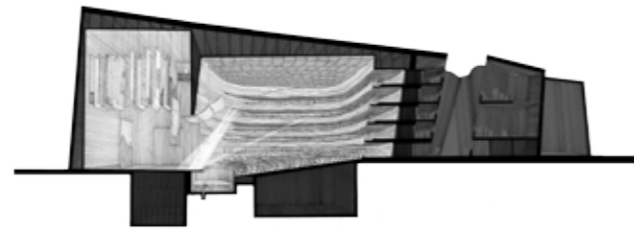
To reduce the reverberation time for speech, variable absorbers are installed in the walls close to the stage. The heavy absorbing wall behind the copper bands is pulled away to let the bands work as a membrane absorber for undesired low frequency sound waves around 125 Hz.



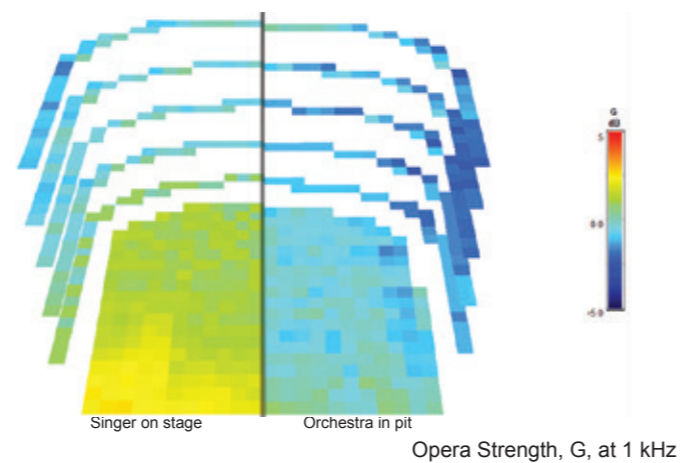
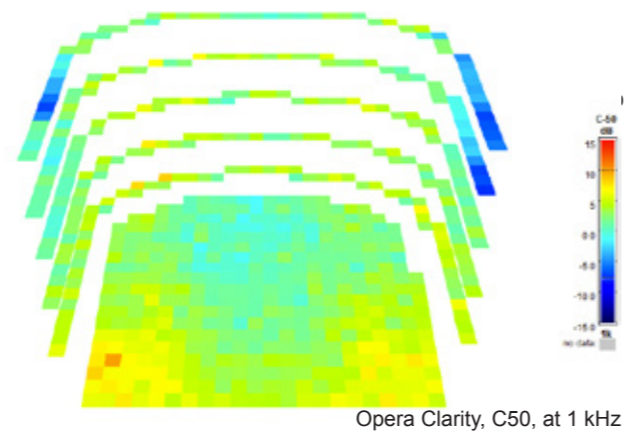
Acoustics

The college's opera hall needed variable acoustics to support all from lectures to classical concerts. This variable acoustics is shown in these graphs. Calculations were made in catcoustics from a sketchup model.

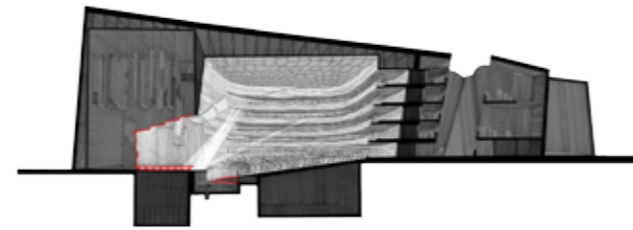
Opera



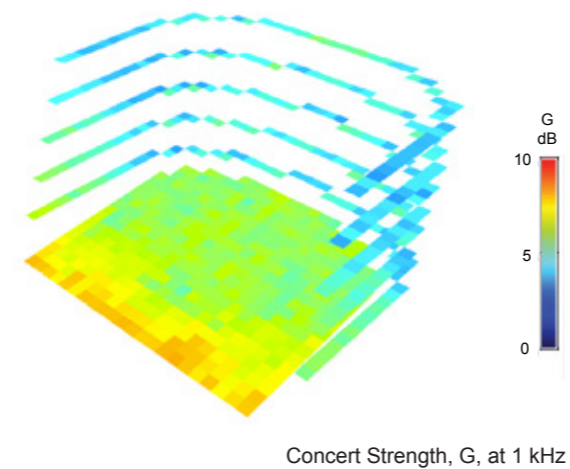
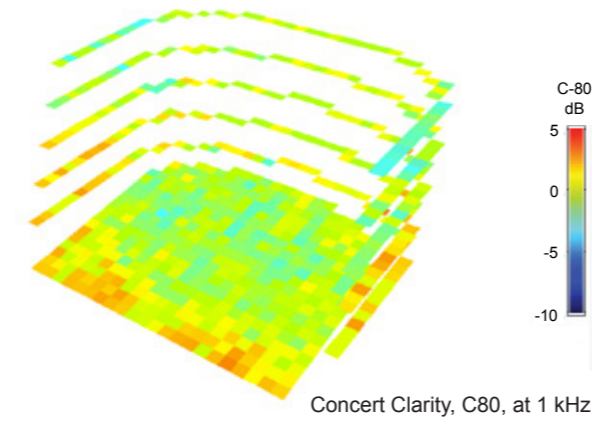
The ceiling height is 19 m above the audience floor. Convex reflectors are installed below the ceiling with adjustable height. Opera pit has an adjustable pit ceiling size and floor level for easy balance adjustments between the singer on the stage and orchestra in the pit. The mean balance between singers and the orchestra is 3 dB. Reverberation time is 1.5 seconds.



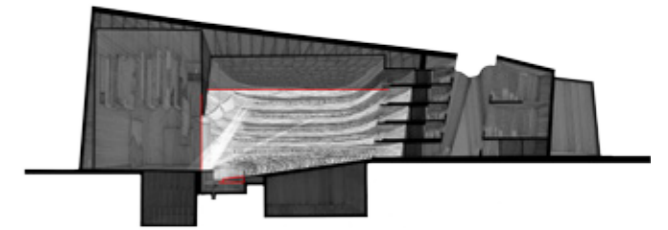
Concert



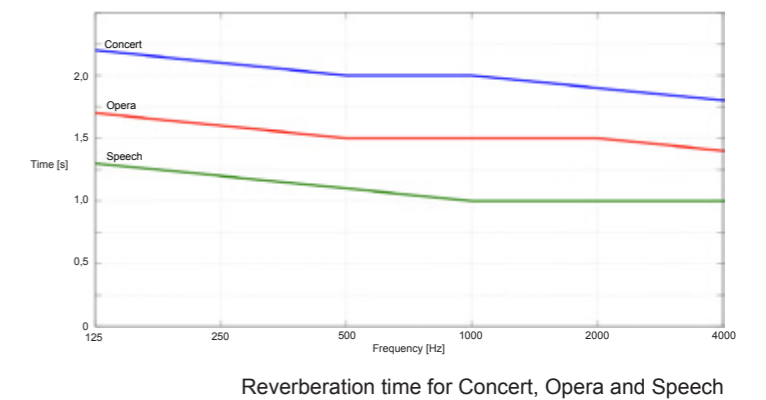
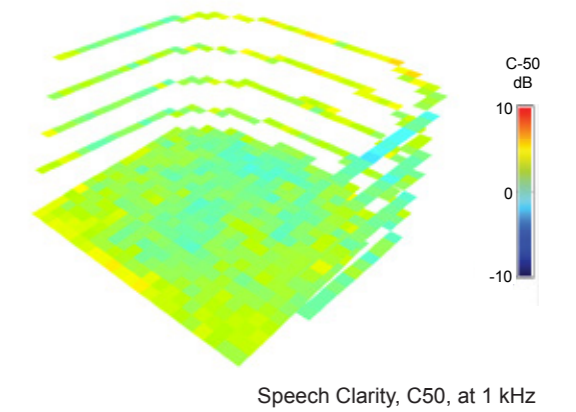
Ceiling and reflectors heights are kept the same as in the opera mode. The orchestra is placed on the stage where the stage shell is installed. By removing the pit railing, extra seats can be added in the orchestra pit for audience. Reverberation time is 2.0 seconds.



Speech



A heavy curtain is pulled out just below the fifth balcony to act as a lower ceiling at a height of 14 meters above the audience floor. The reflector panels closest to the stage are lowered to a position below the new ceiling. The front wall acts as a low frequency absorber as in the detail. The reflecting fire curtain will close the proscenium and supports the speaker. Reverberation time is 1.0 seconds.

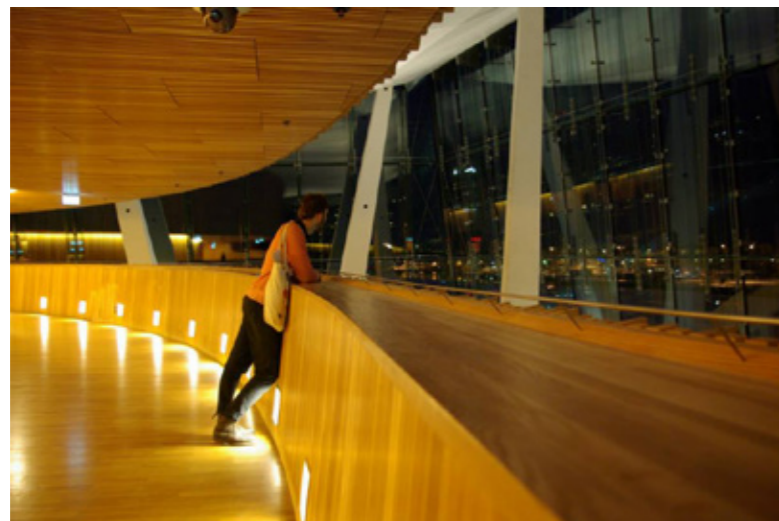




entré



på taket



blickar ut över lobbyn

Inspiration

Allt började med en resa till Oslo

Under de första introduktionsdagarna av kursen bestämde jag och Niklas oss för att åka på en studieresa till den prisbelönta oslo operan av Snöhetta.

Det gav ett starkt arkitektoniskt intryck och ökade förståelsen för operaverksamheten.

Några andra starka inspirationskällor var Kristiansands konserthus och den klassiska operan i Milano, la Scala, operan som bland annat Puccini skrev till.

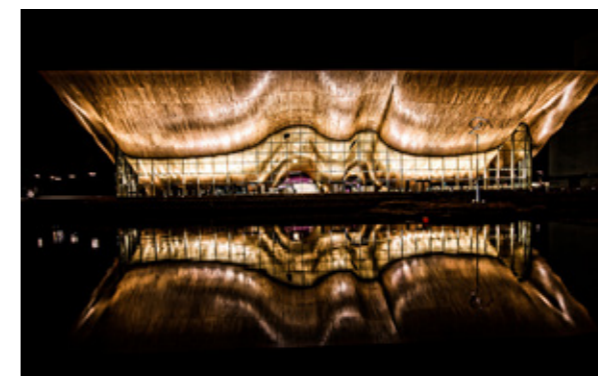
Efter inspirationsfasen gjordes en analys över platsen i den mån som var möjligt. Det innefattade samlande av klimatdata, kulturellinformation och ett bildgallerie av googlestreetviews.

Efter analysen tog skissprocessen fart med en tydlig fokus på konceptmodeller. Först producerades allt fritt i stora mängder efter hand började vi såla ut idéer och undersöka dem vidare.

Det var idéén om en delad enhetlig volym som hängde kvar. Från början tänkt som en offentligt torg emellan med spontana uppträdanden runt omkring.

Vi gick vidare med idéén och började undersöka i foam. kontrasten mellan den hårda yttre geometriskt bestämda ytan och den inre skulpturala oförutsägbara ytan var något som lockade oss väldigt starkt.

Senare undersöka vi vidare lobby, entre m.m. genom handritade perspektiv för att förstå rummet som vi ville skapa ytterligare.



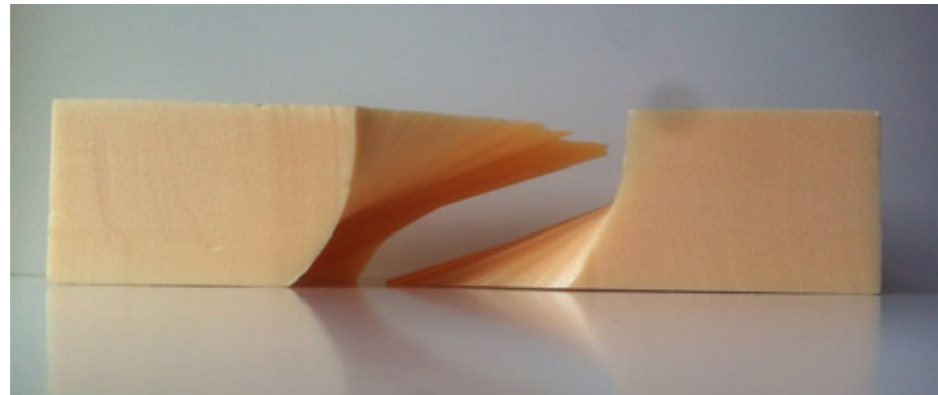
kristiansands konserthus



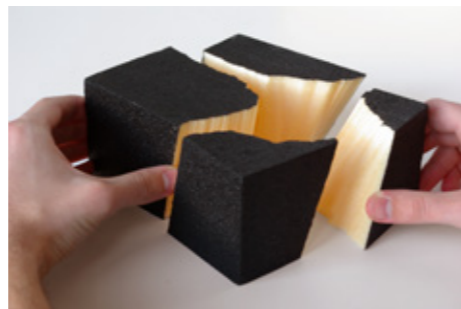
La Scala



Första konceptmodellen



Vidare undersökning av konceptet i foam



Sludgiltigt koncept



Perspektiv

Skissprocess

Ett arbete med konceptmodeller som grund

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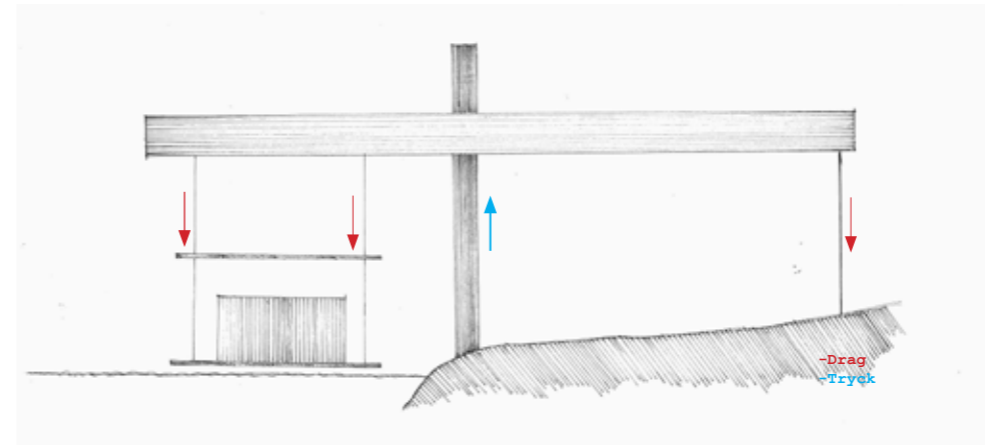
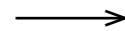
Tension

Course: Building & structure

Assignment: to make a structure in kungsparken that would have a café, public toilets and make it possible to be in the park in a new way longer part of the year.



The tree branch and its reflection

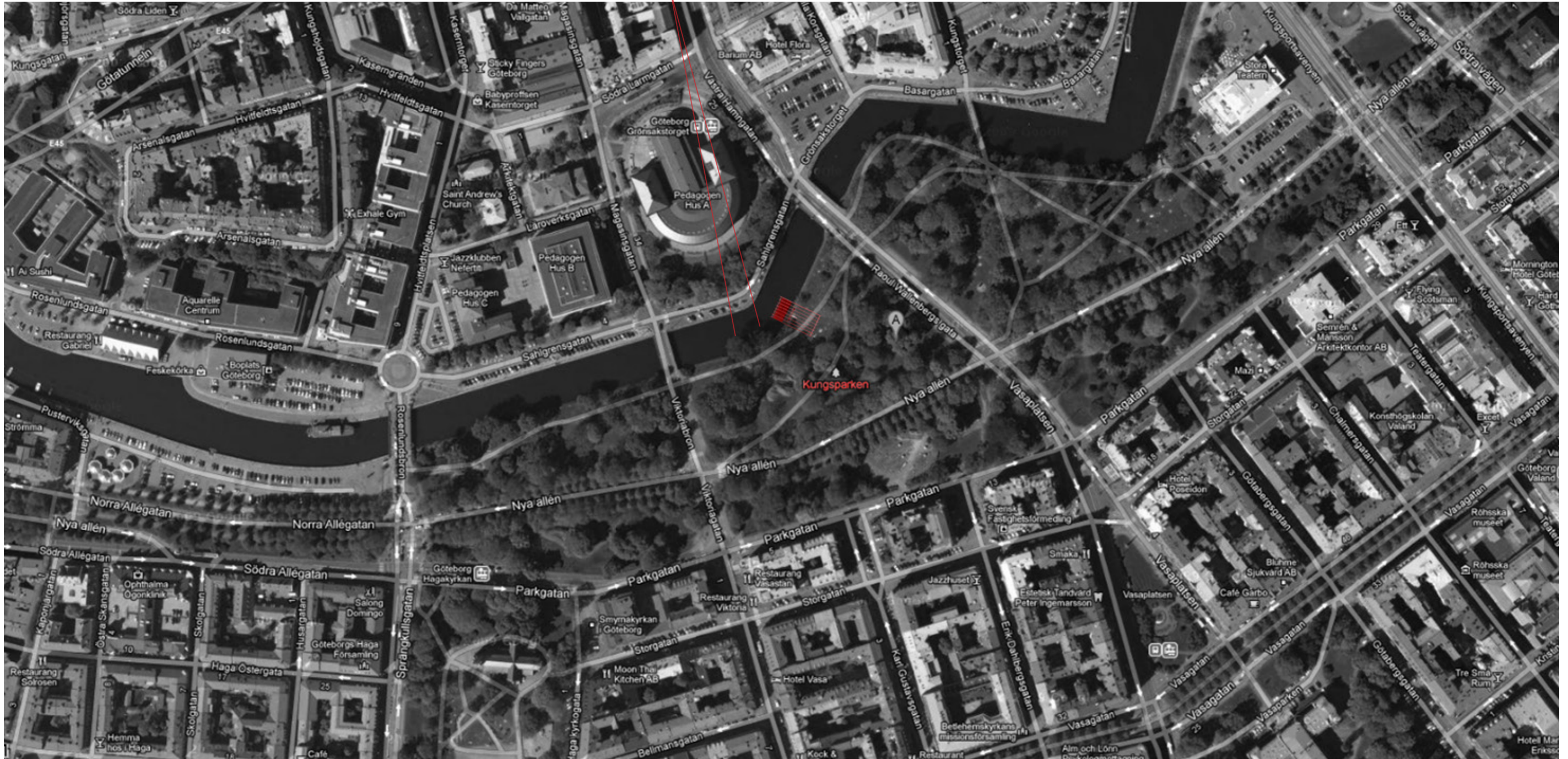


the balancing act

The inspiration to the project came from the trees in the park that reaches out over the moat and let its branches hang right over water surface, in the same way does the structure elevate precisely over the surface.



The two inspiring trees



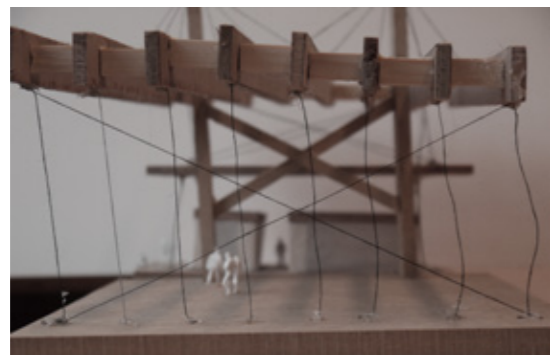
Situation 1:3000

The beam system is hanged from the pillars. From the beams is the café suspended on one side and is held back by on the other side by wires attached to the ground.

The Café brings life to the park and by pushing a glass wall around the deck the life can continue in on colder seasons. To walk under the hanged beams through the park is new experience but speak the same language as the crown of the trees.



Facade



Vajerkräys



Hängandet av balksystemet

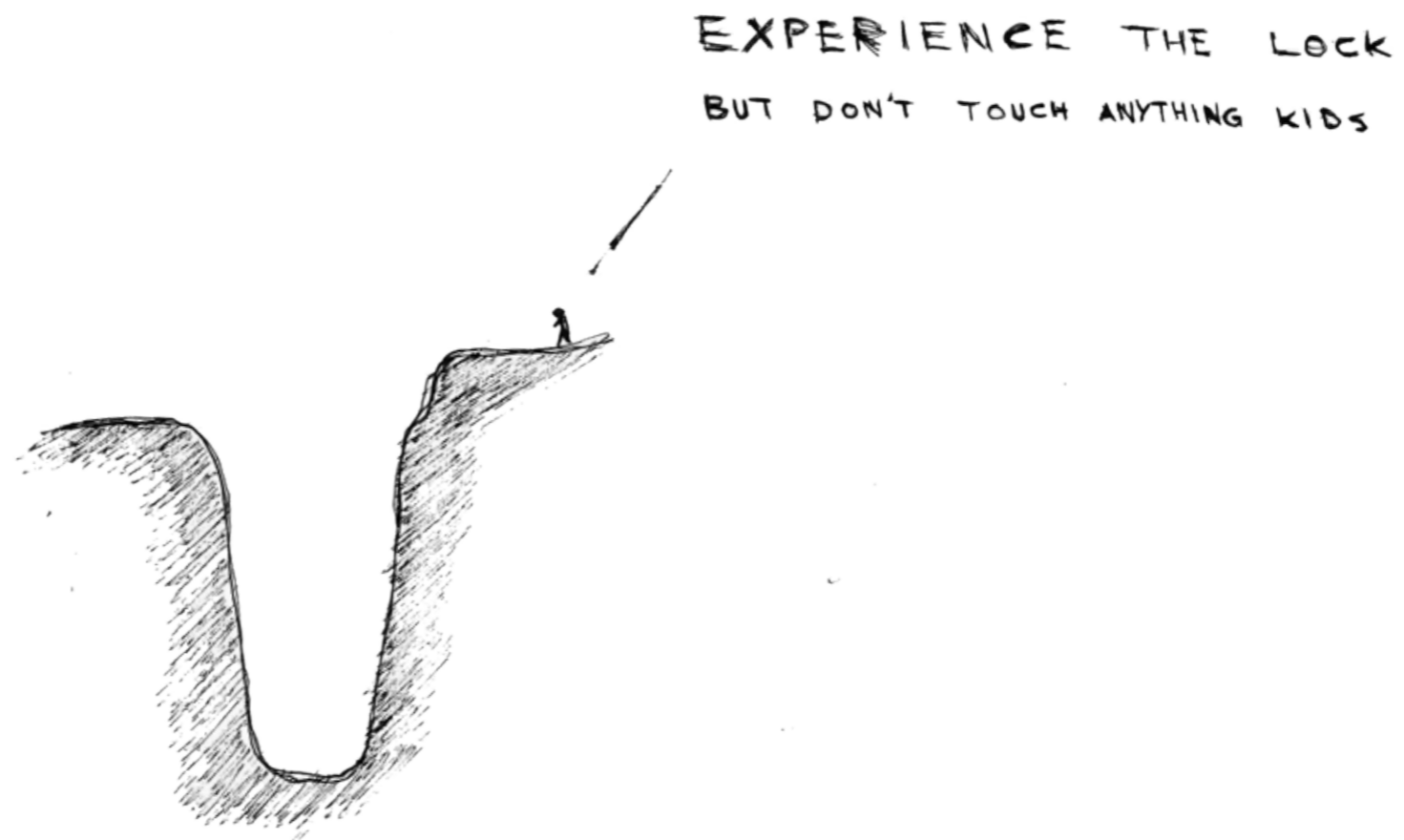


Häng på Däck

The Lock's Rust

Course: Optimized structures

Assignment: to make a visitors centre to Trollhättans lock district, placed at the dam up lock from the year 1800. The centre was to give the visitors away to experience space of the lock and get an overview of the whole district.



In the abandoned lock from 1800, one time Sweden's link to the sea and the start of the industrial revolution, hangs a rusty family of volumes left in the air, resisting gravity.

It guides travellers on their journey through the district and rappel them down to the bottom of the lock.



Façade towards west



Principle 1: If the angle between the both wires and the pillar are the same, the pillar is working only in pure pressure. This is accomplished by a torque free joint.

Principle 2: Six wires is needed to secure a body in space (three for a dot).



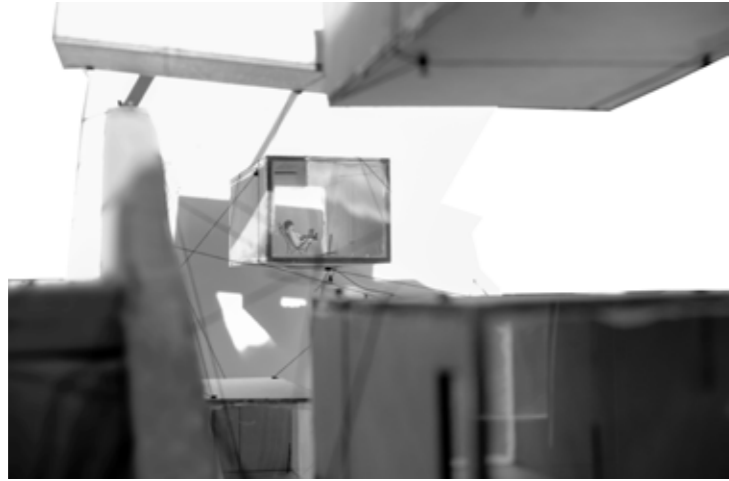
Situation over Trollhätans 1:4000

The walk

The visitor centre informs and shows the lock different parts. A elevator that is suspended from the pillar takes you down to the bottom of the slues, where you continue on foot. Stairs of corten are placed at every level of the lock so that it is possible to continue the walk through the district. In this way the centre becomes a part of the landscape and its footpaths.



Section along the lock 1:500



Office



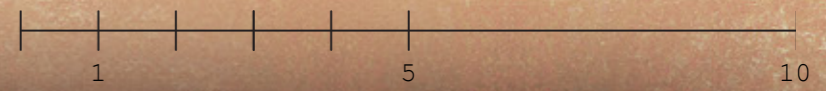
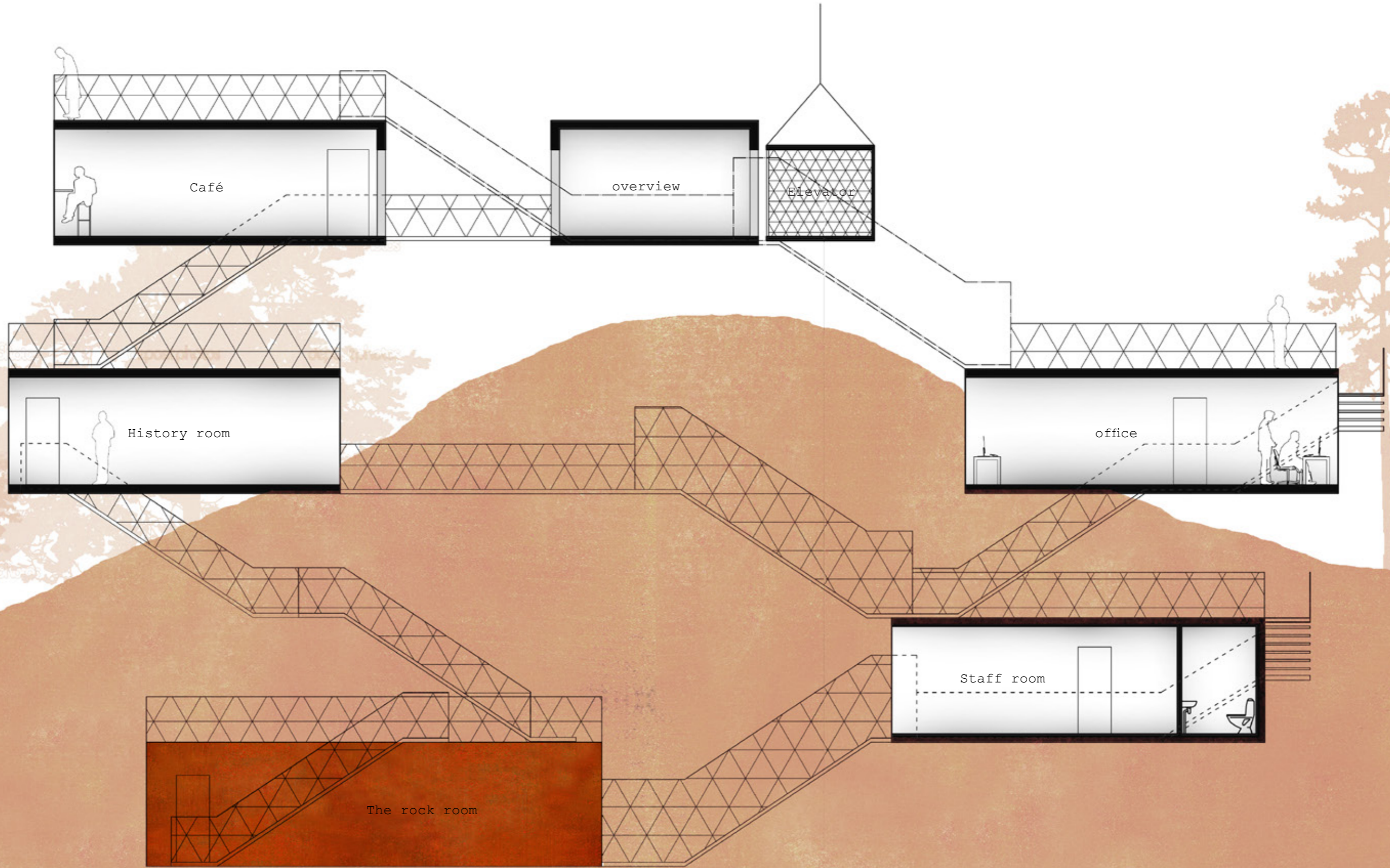
Reception

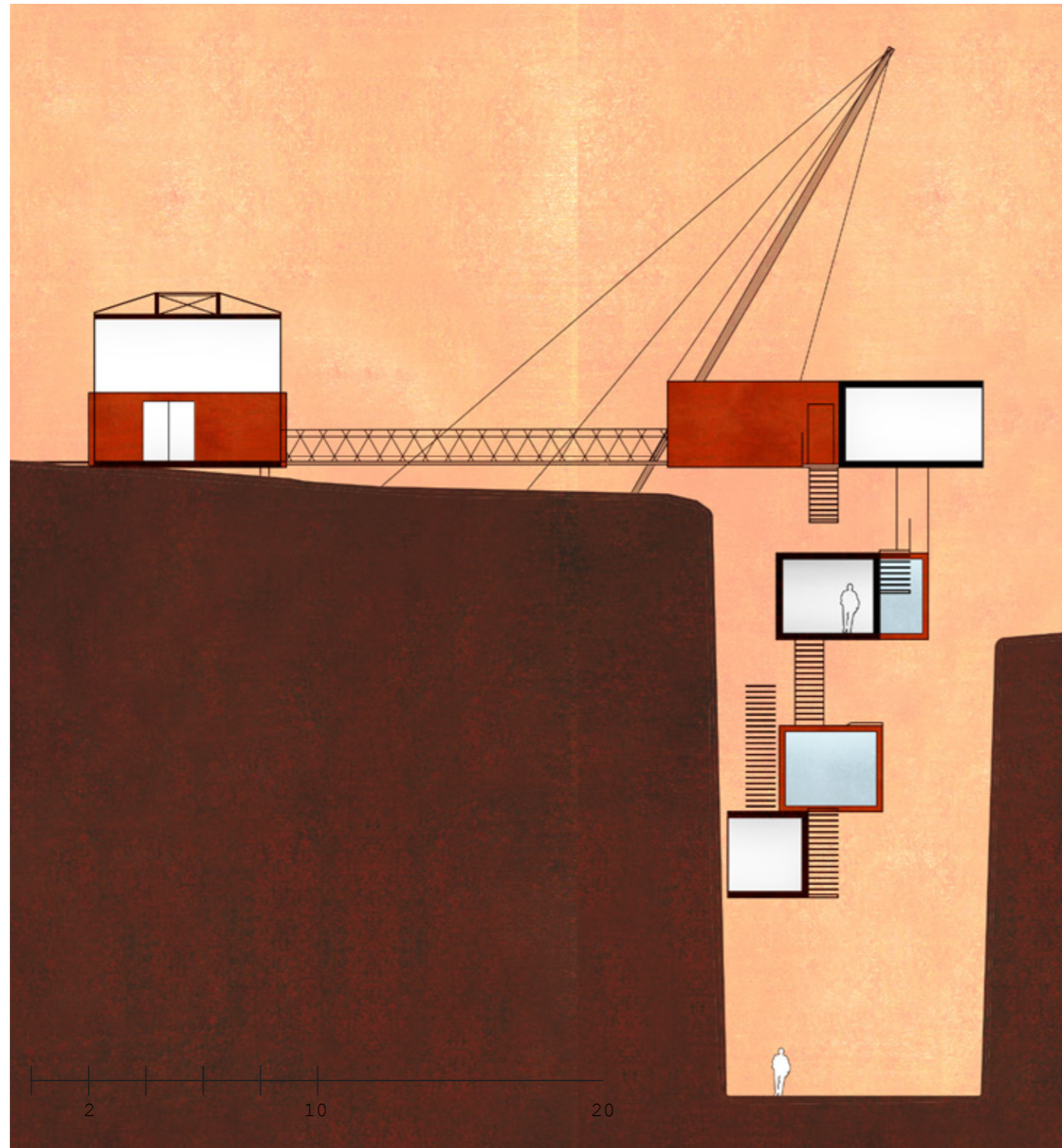


History room



Fasade towards north





B.B. Section towards East 1:200



View from the bottom

The visitor centre

Instead of opening a door and walking in to the next room you take a stair to the next. Each of the volumes focus on different parts of the lock.

Bastiliion Bridge

Extra course, focus models

Assignment: to construct a temporary footbridge in wood over Gothenburg's moat, without using supports in the water, resulting in a span of 50 meters.



Salubron is a wooden lightweight bridge that is gentle against the historical and fragile supports and with a strong connection to the water.

Adaptable

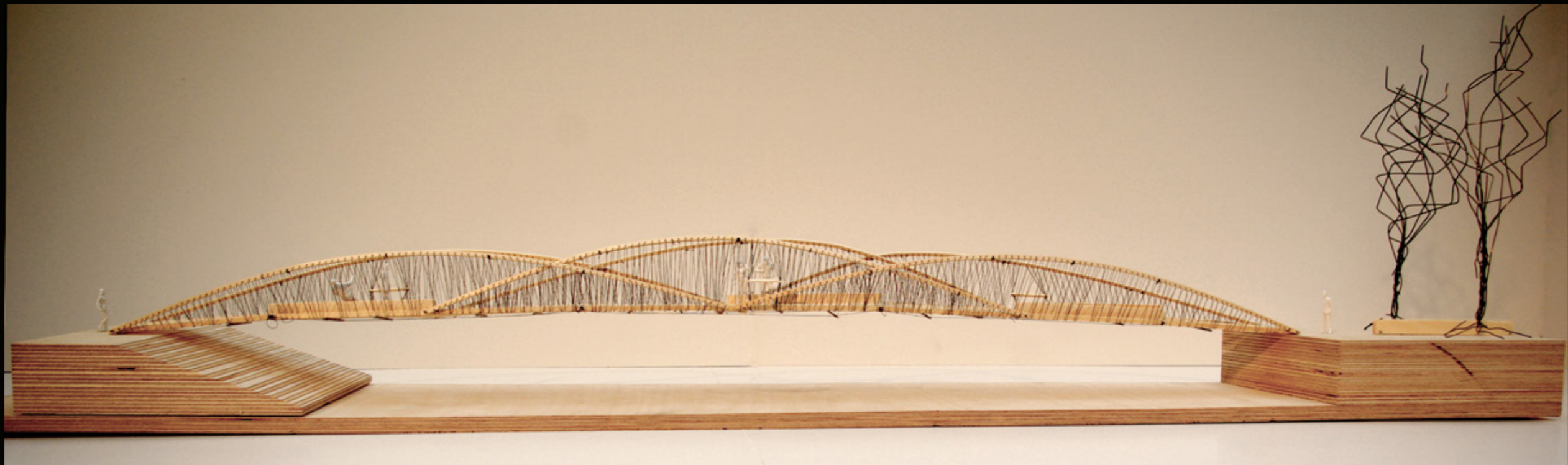
A temporary bridge constructed of modules easy linked together, making it possible to move to many places, building it shorter or longer.

Lightweight

All material is part of the load bearing system, even the benches and the rail, making it very light. The lightness and that the bridge works as a beam makes a gentle impact on the fragile supports.

City life

Salubron connects Milleniumtorget and Kungstorget, activating both places with pedestrians. The moat and the channels has an important role in giving Gothenburg its character and therefore wanted we our bridge to have a strong connection to the water.



Thank you for your time

I hope you enjoyed reading

Yours Faithfully

Jonas Svedäng