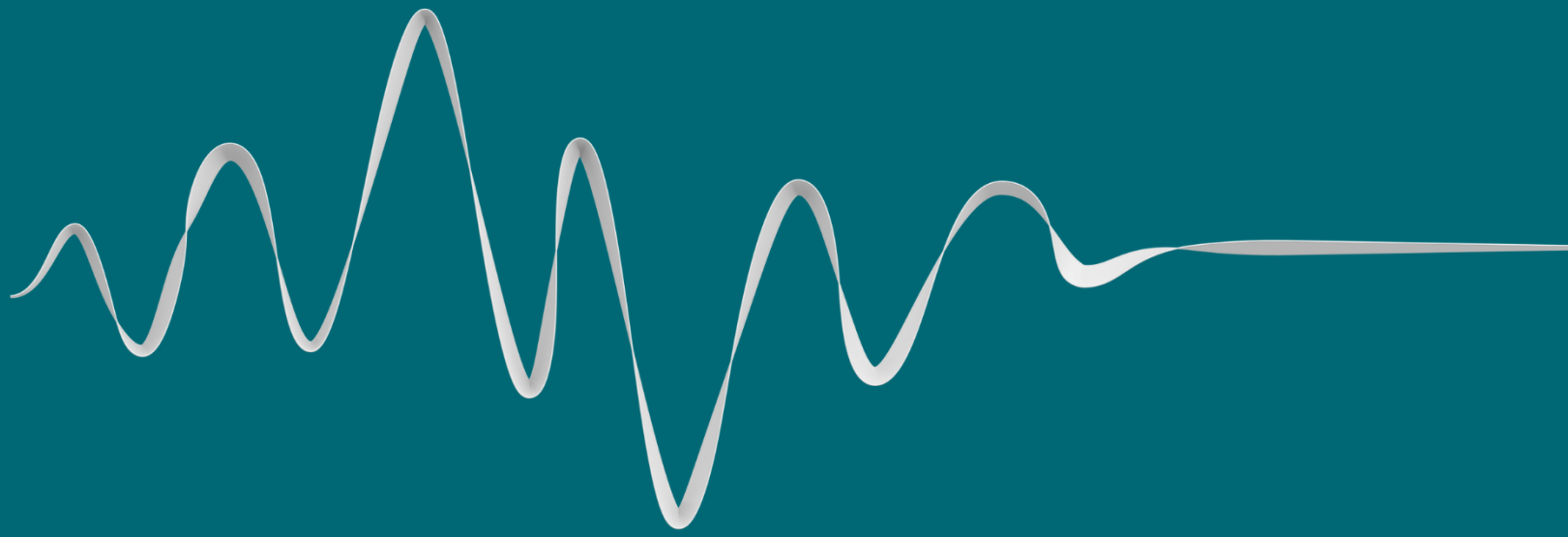
MUSIC IN HERITAGE

THE ACOUSTIC AGORA



MARTIJN VAN DEN BERG - 4183541

PROBLEM STATEMENT

CONTENTS

PROBLEM STATEMENT

In a lot of monuments, the room acoustics are bad due to materialisation and dimensions.

Changing the acoustics with common solutions, could harm the historical and cultural value.

OBJECTIVE

Overall research question

How can the acoustics in monuments be made suitable with unconventional or tailor-made solutions?

Overall design question

How can the Van Gendthallen be a place for music?

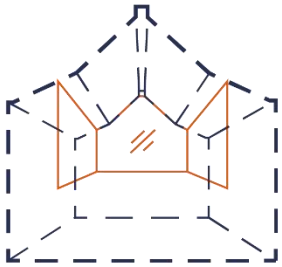
RESEARCH

RESEARCH METHODOLOGY

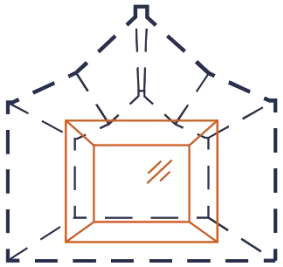
RESEARCH METHODOLOGY

Predecessors

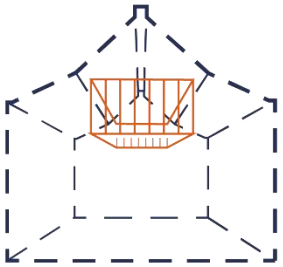
Nieuwe Kerk Den Haag
Glass curtain



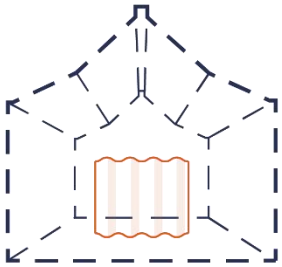
Beurs van Berlage
Glass box



Rijksmuseum
Difussing chandelier

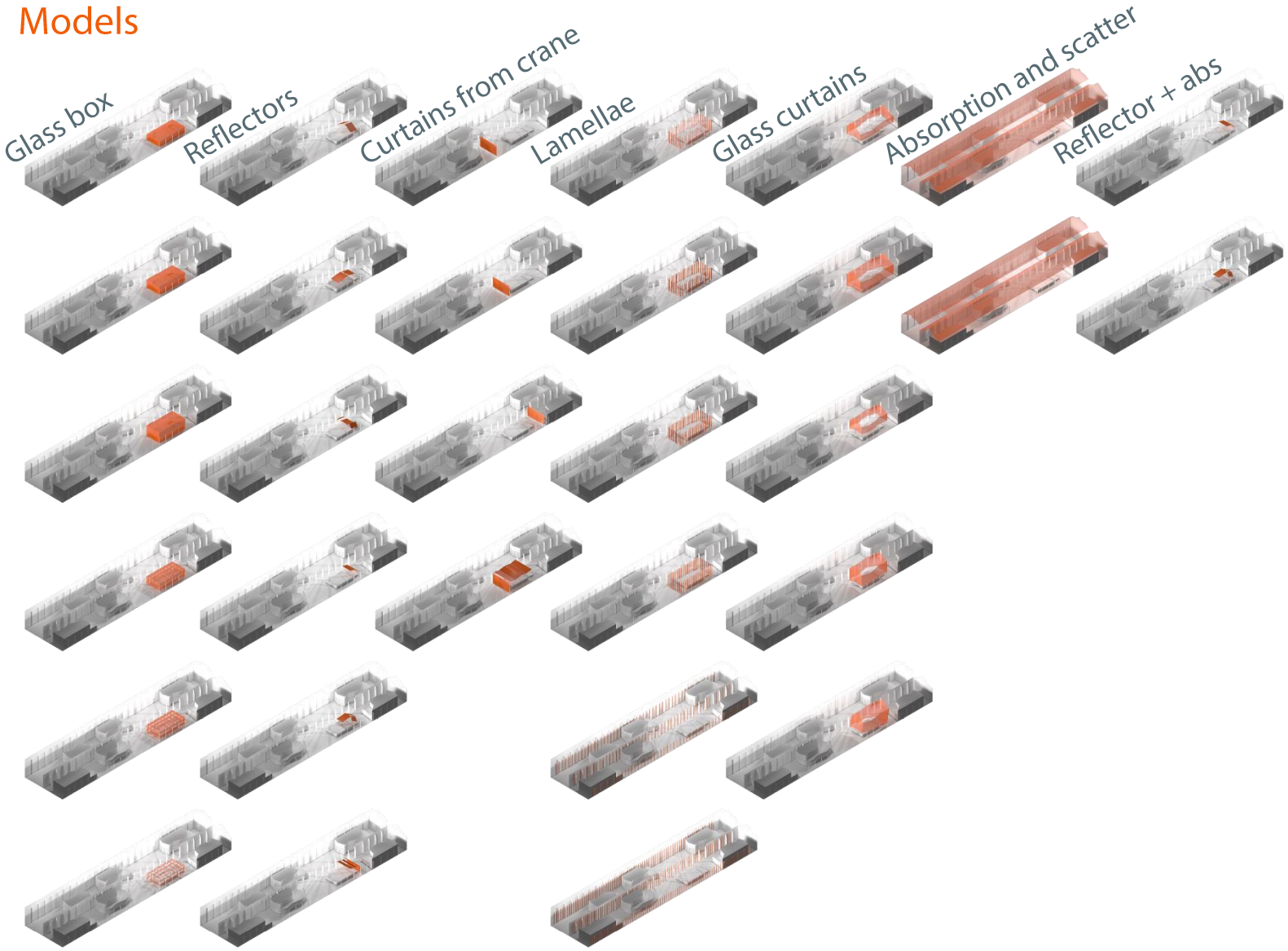


Casa di Musica
Corrugated glass



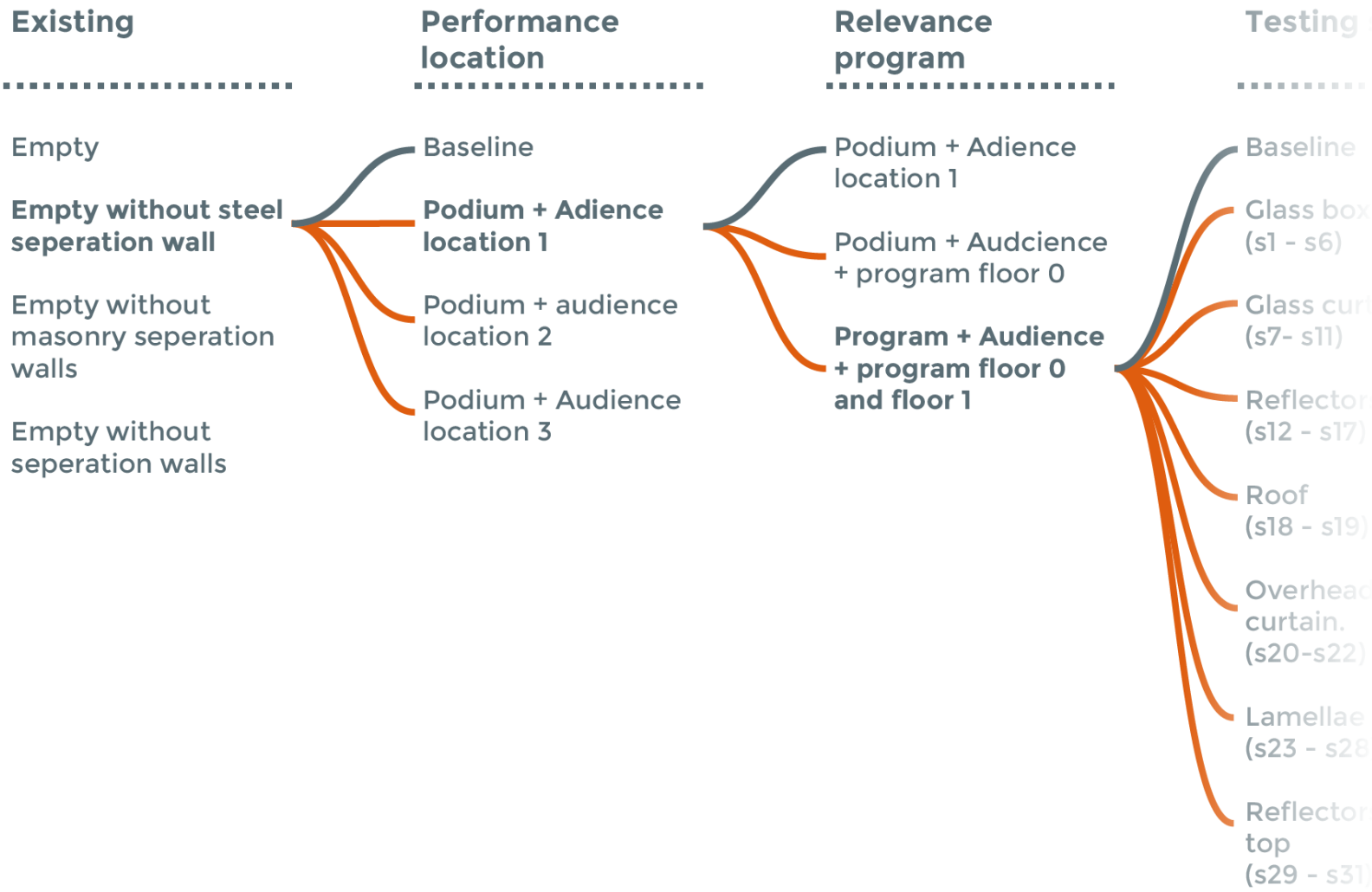
RESEARCH METHODOLOGY

Models



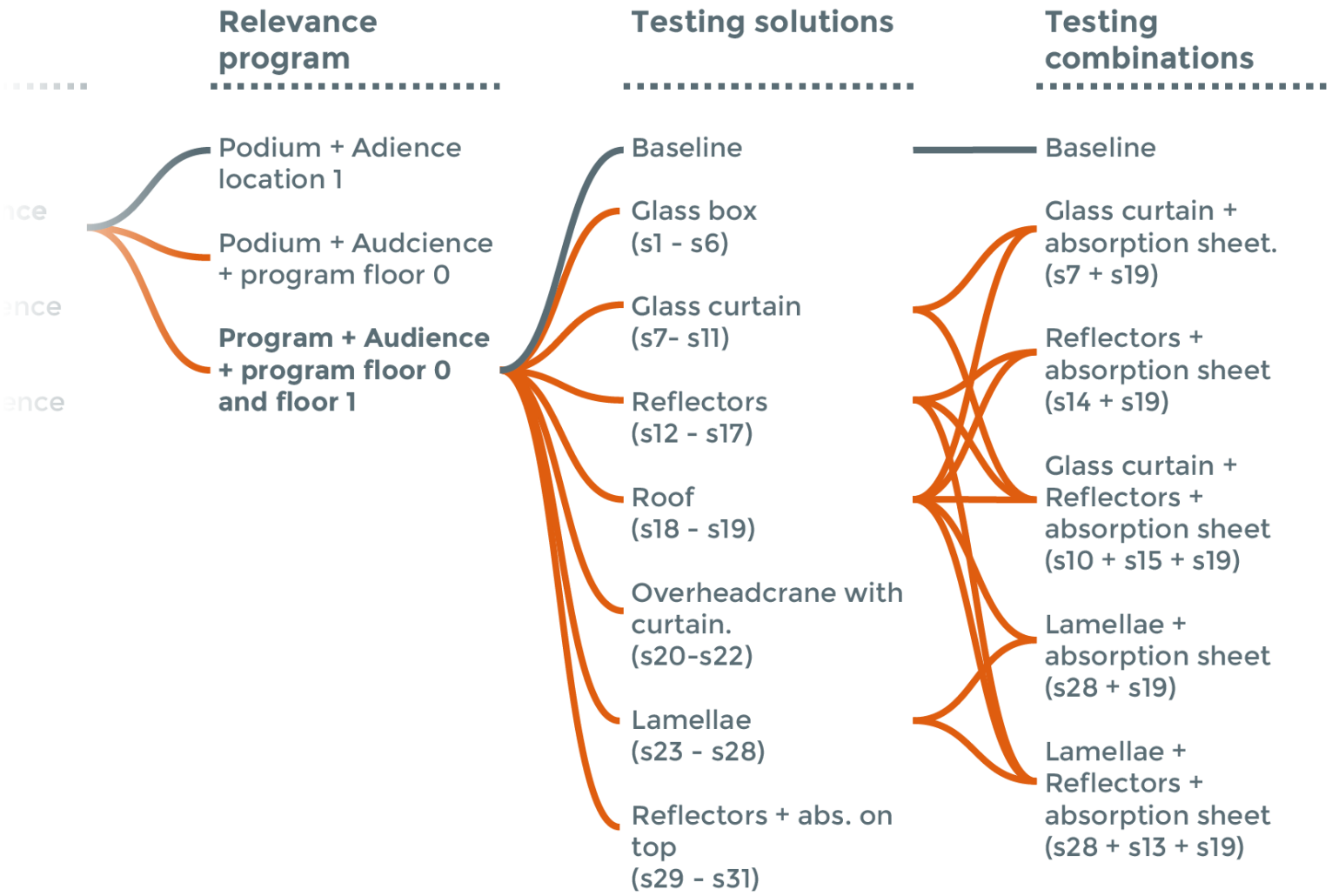
RESEARCH METHODOLOGY

Simulation roadmap



RESEARCH METHODOLOGY

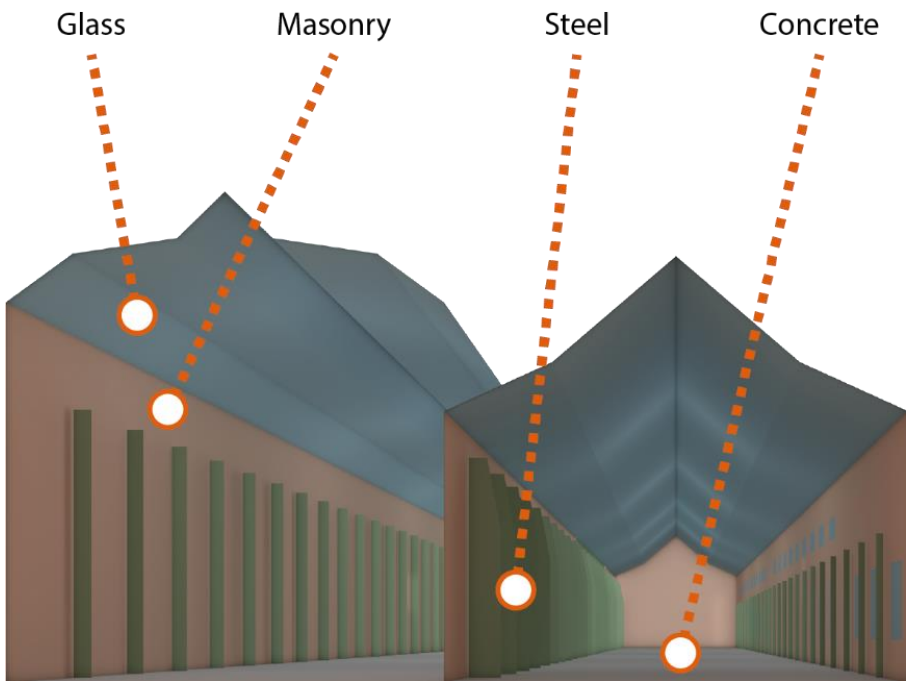
Simulation roadmap



RESEARCH METHODOLOGY

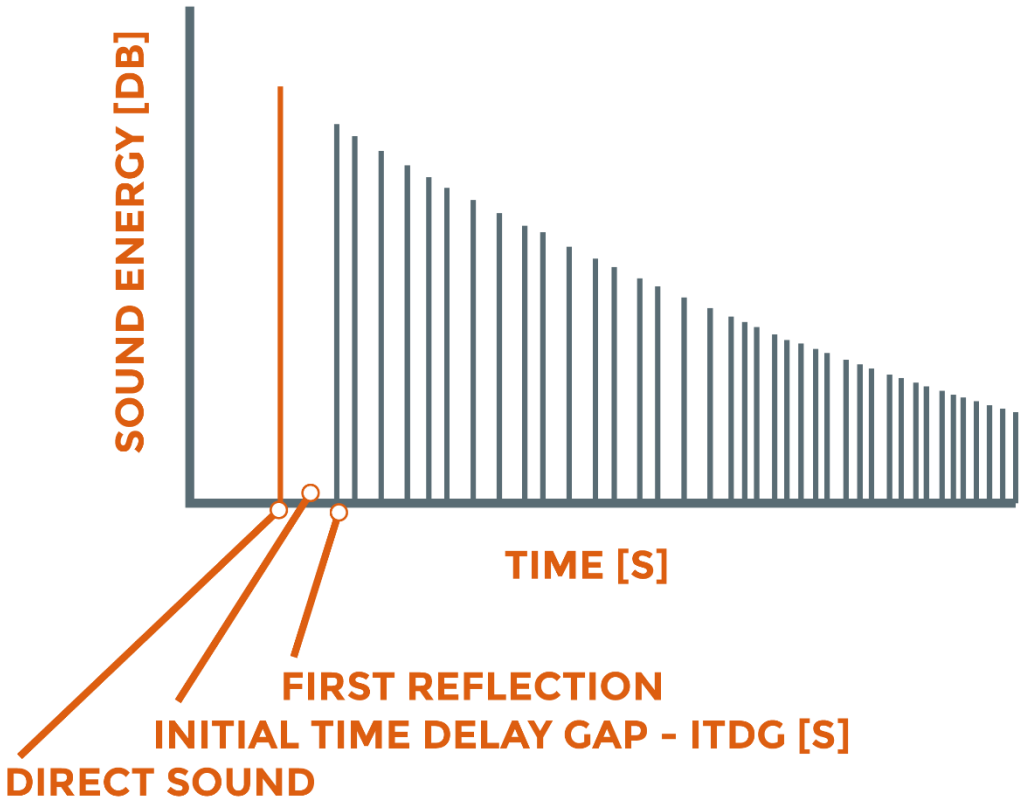
Simulation with CATT Acoustic

- Simulation of a room, based on a ray-tracing method.
- Calculating of objective parameters.
- Auralization.



RESEARCH METHODOLOGY

CATT Acoustic



RESEARCH METHODOLOGY

Quantification

- Reverberation time [T-30]
- Early decay time [EDT]
- G-Strength [G]
- Clarity [C-80]

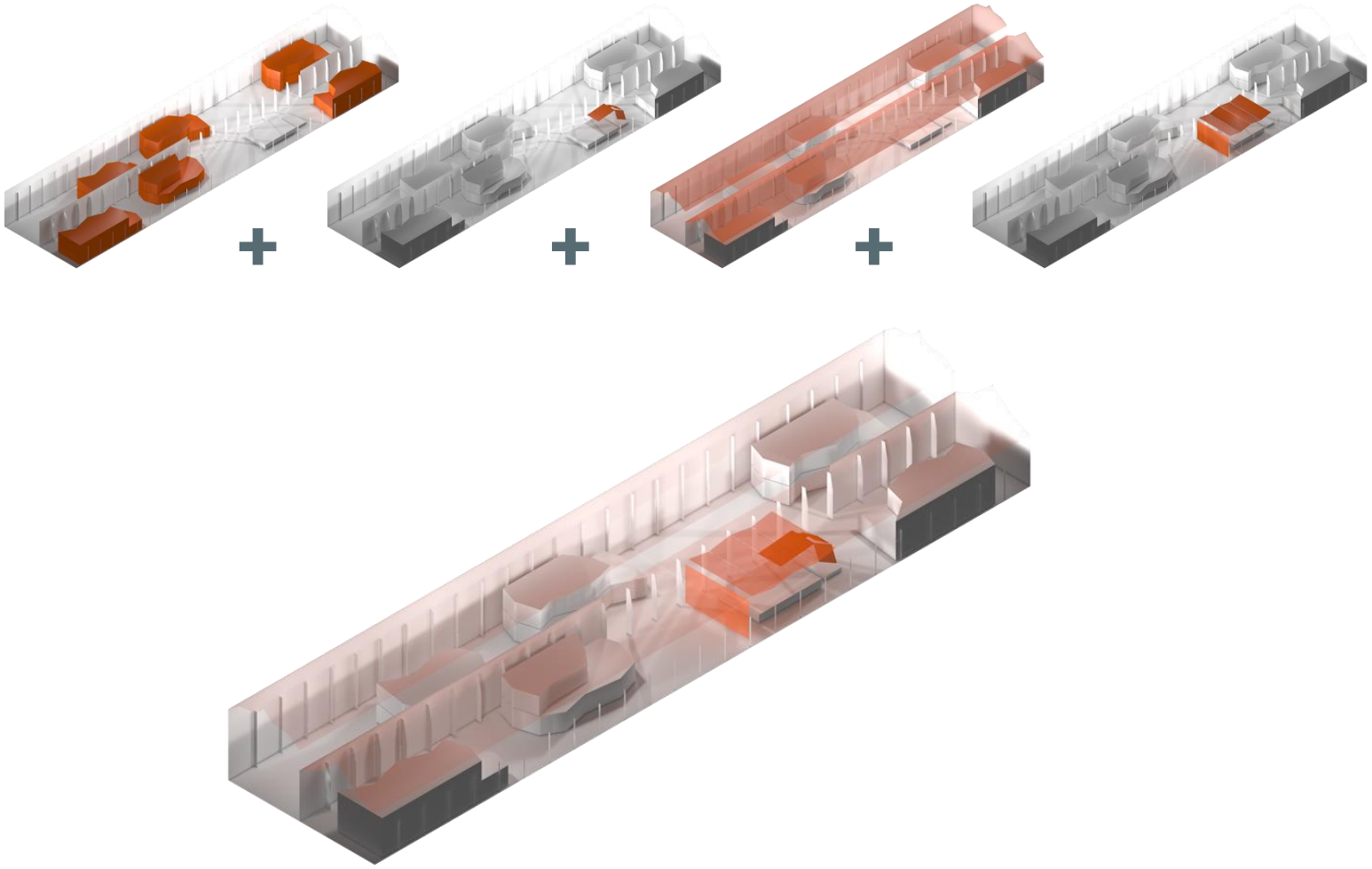
RESEARCH METHODOLOGY

Preliminary demands

RT30 <350 Hz	RT30 >350 Hz	G	C80	EDT
1.7-2.0	1.4-1.7	10-12	6-10	1.3-1.6

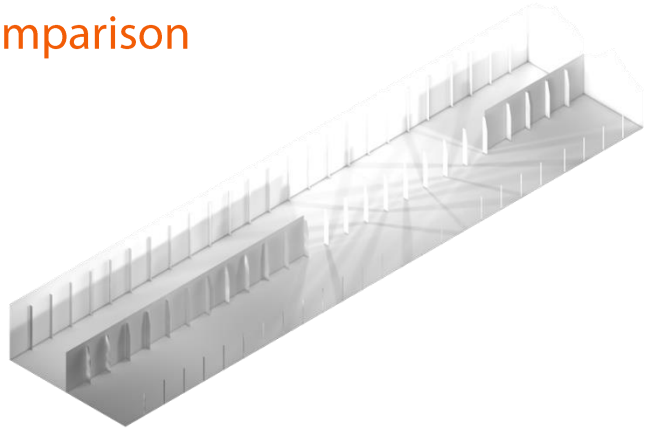
CONCLUSION

Combinations are necessary

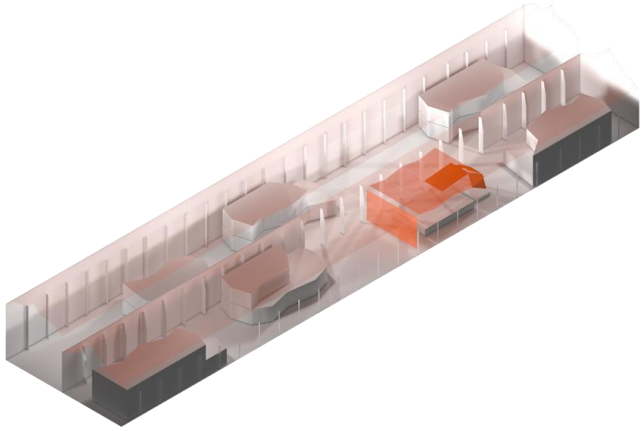


COMBINATION

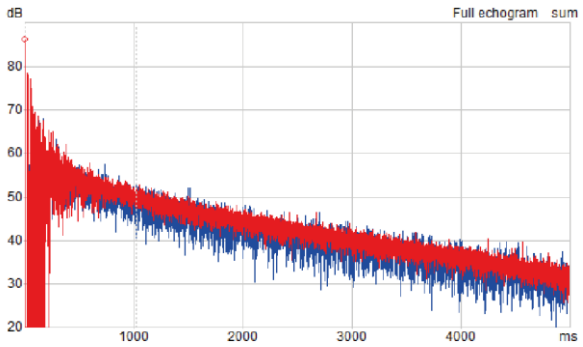
Comparison

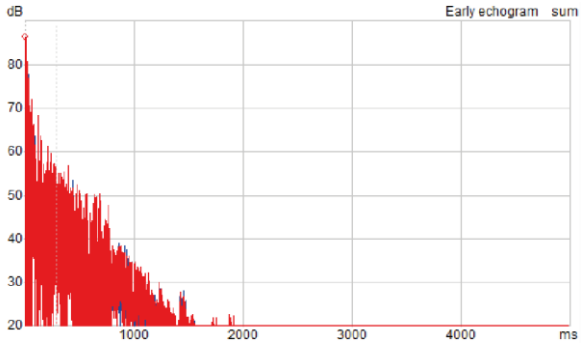


Empty hall



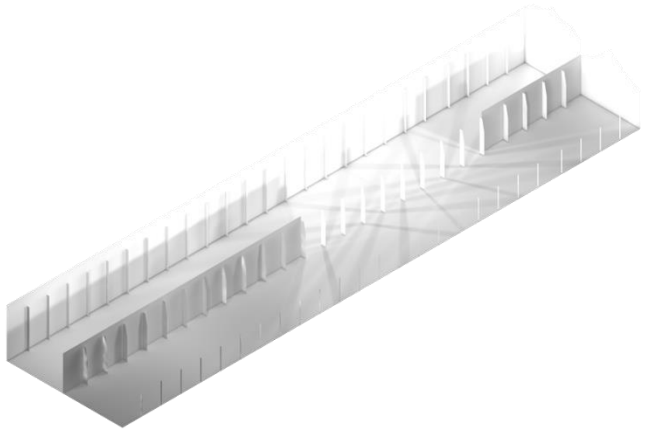
Combination





COMBINATION

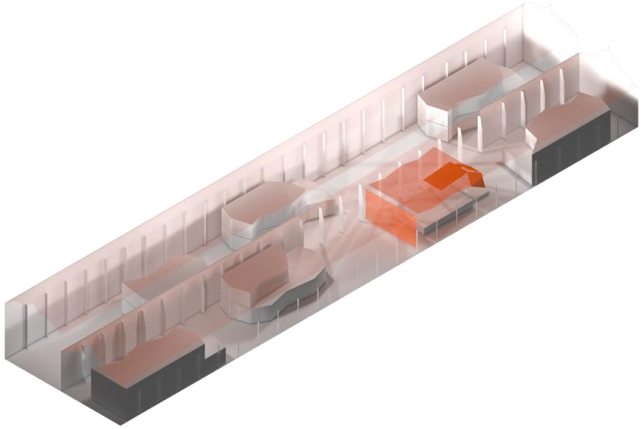
Auralization



Empty hall

COMBINATION

Auralization



Combination

RESEARCH CONCLUSION

- Final program has significant influence on the room acoustics.
- The different solutions can be combined very well.

ARCHITECTURE

CONTEXT

Van Gendthallen - Location

CONTEXT

Van Gendthallen - Values

- Beautiful existing construction

CONTEXT

Van Gendthallen - Values

- Closed façade

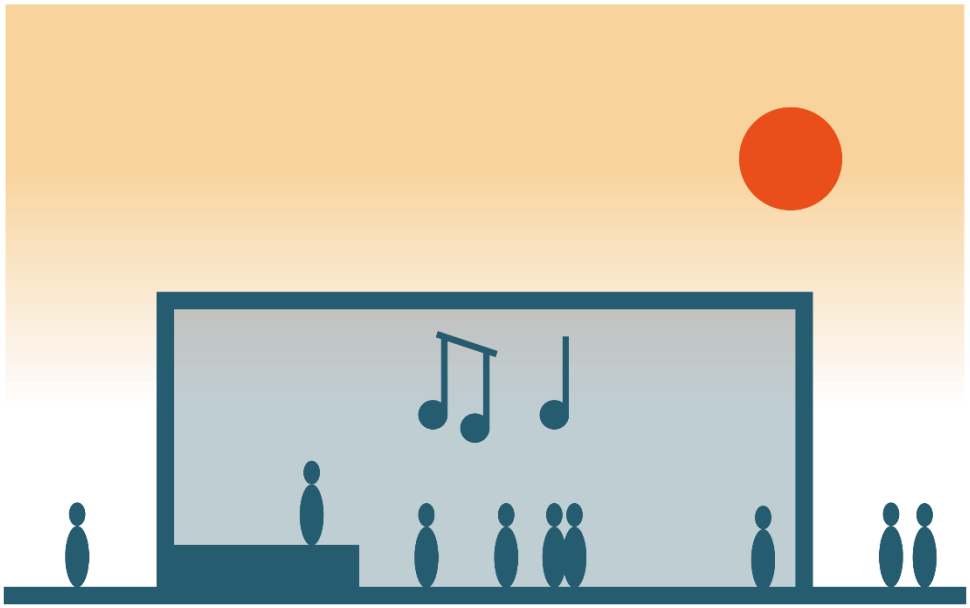
CONTEXT

Program 'Acoustic Agora'

- Rehearsal rooms & studios
- Workplaces & meeting rooms
- Hotel restaurant, coffee corner
- KeyMusic shop
- Music halls

CONCEPT

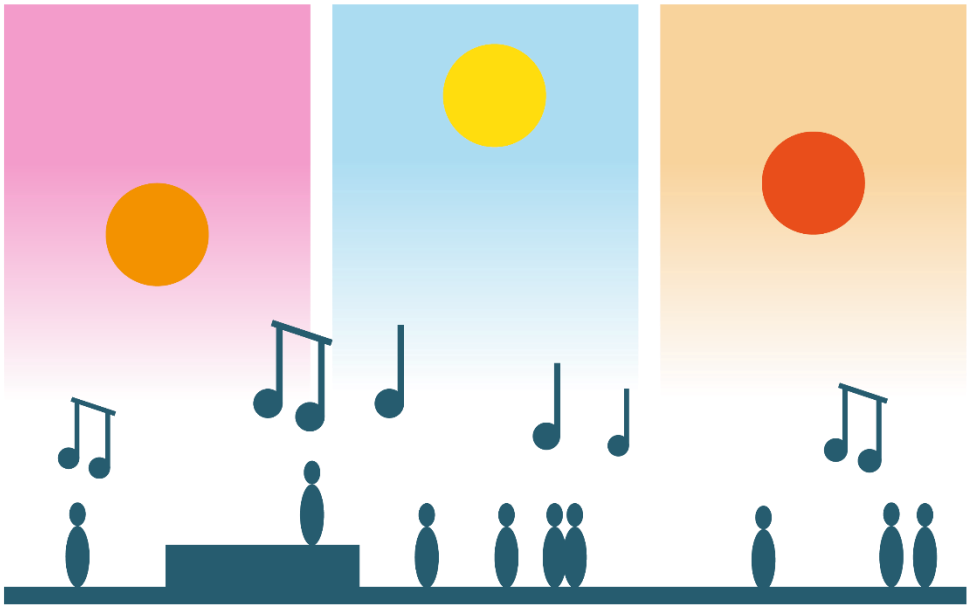
Standard music halls



- Closed, secluded box
- Used a few hours a day

CONCEPT

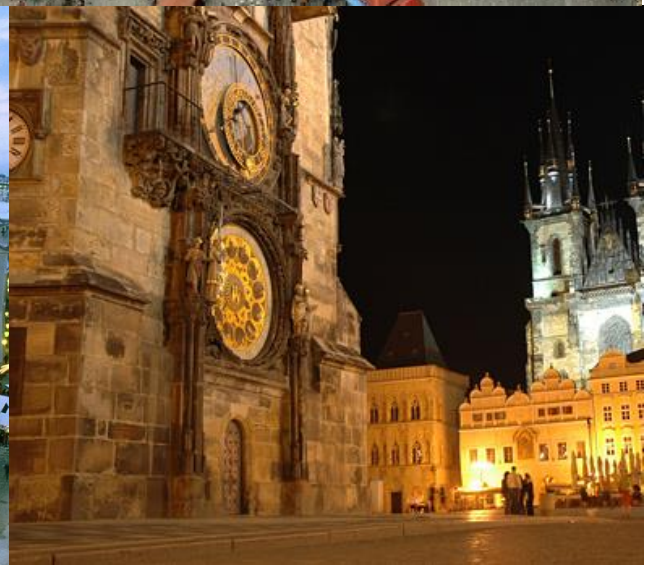
Old city square



- Casual place for singer songwriter / alternative music
- Beautiful existing construction exhibits itself as a roof instead of the sky.

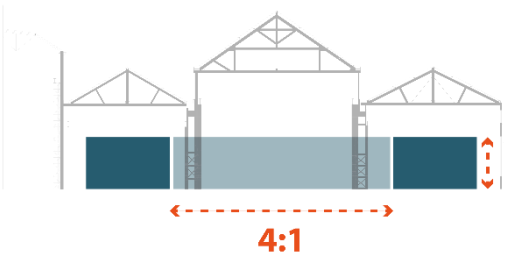
CONCEPT

Old city square

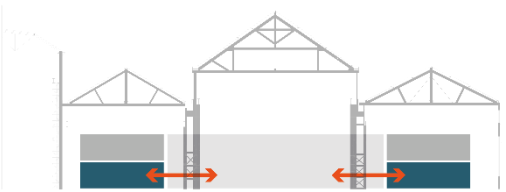


CONCEPT

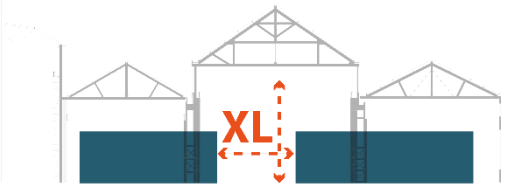
Boundary conditions



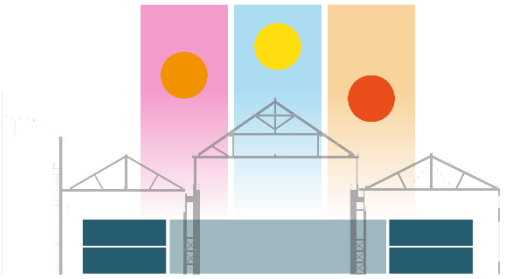
1. Envelop



2. Plinth



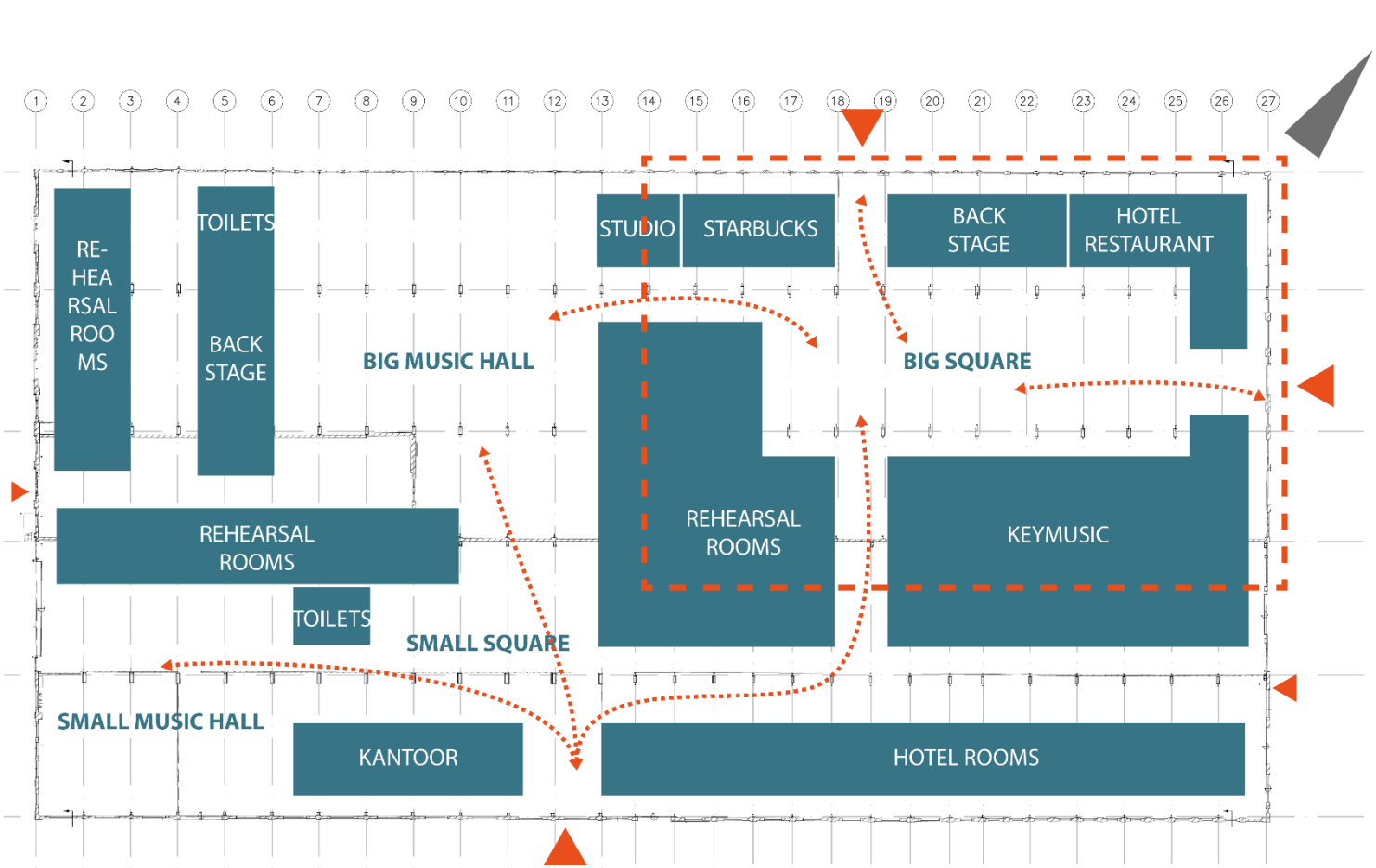
3. Large entrance



4. Dynamic use

DESIGN

SITE



DESIGN

Groundfloor

DESIGN

First floor

DESIGN

Elevation

DESIGN

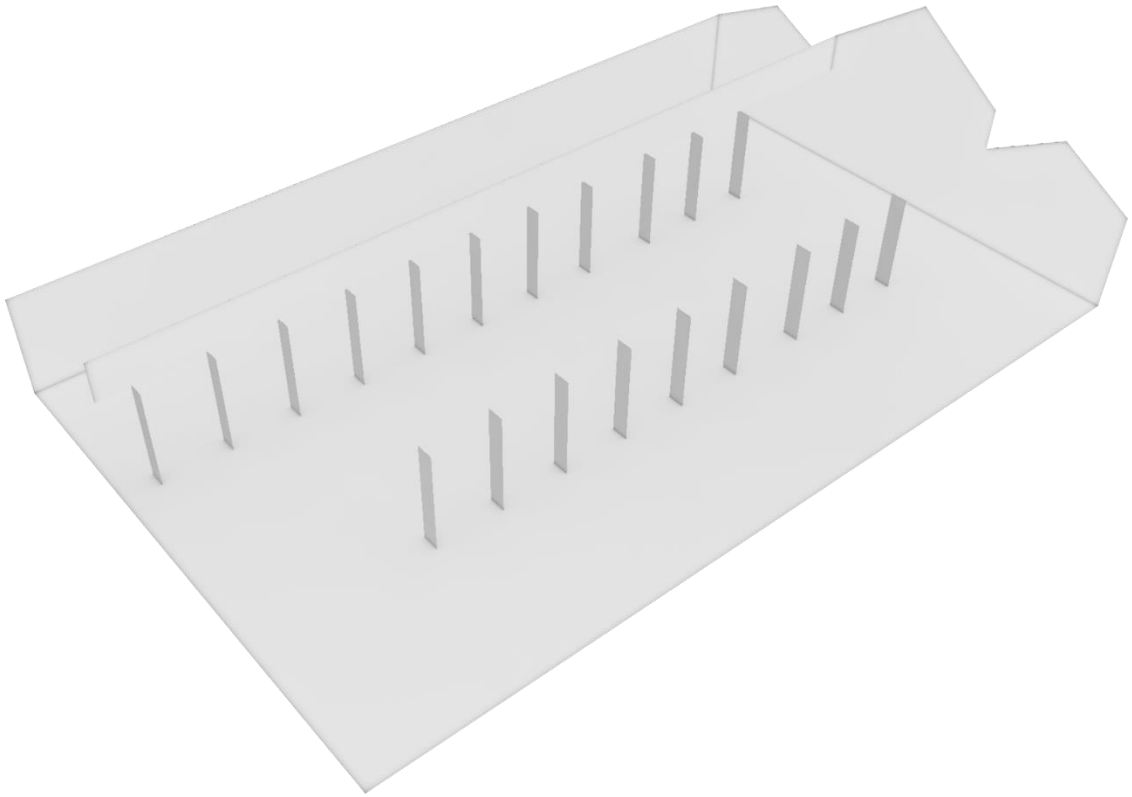
Longtitudinal section

ATMOSPHERES


THE
ACOUSTIC
AGORA

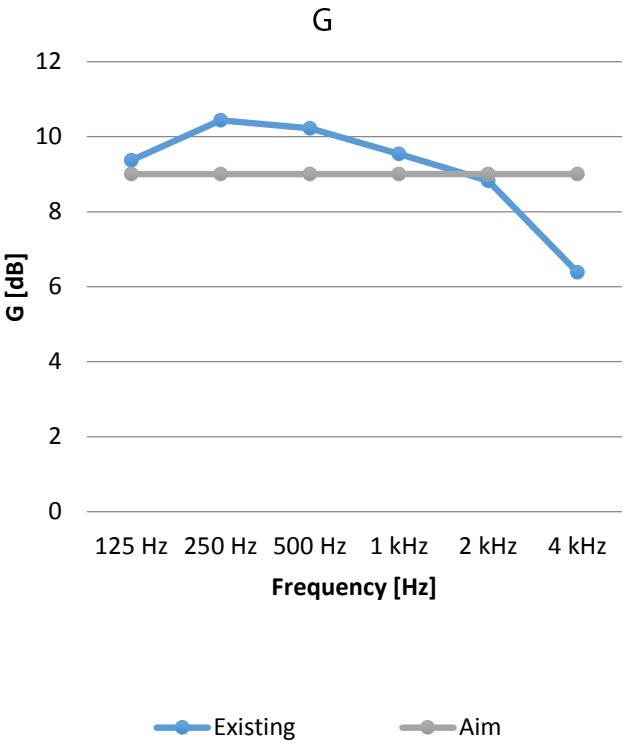
ACOUSTICS

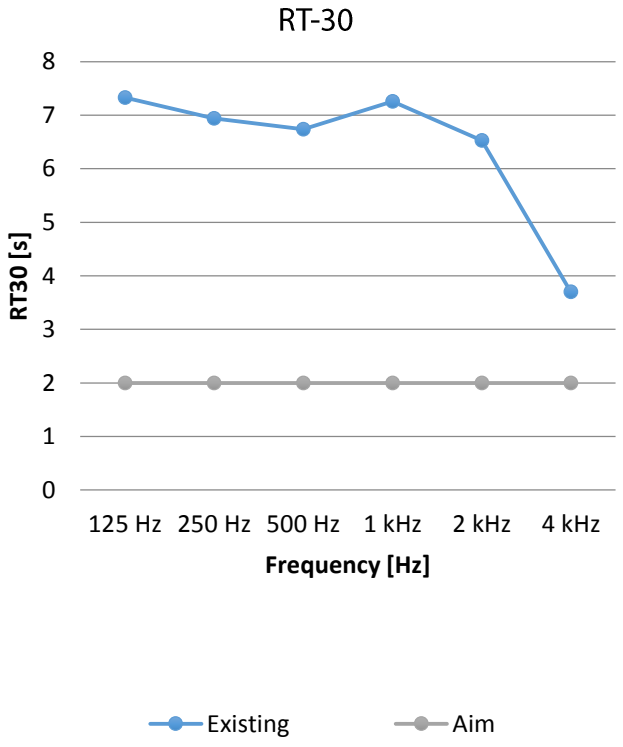
EXISTING SITUATION



EXISTING SITUATION

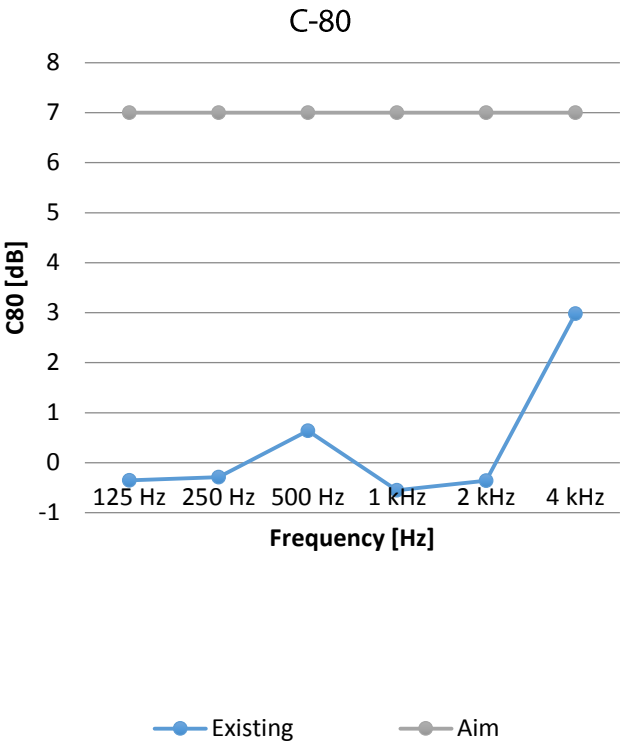
Simulation

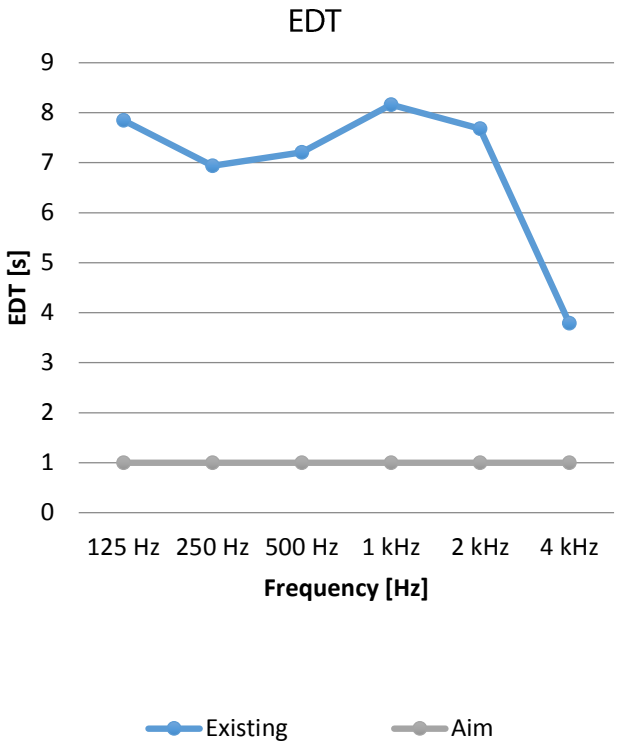




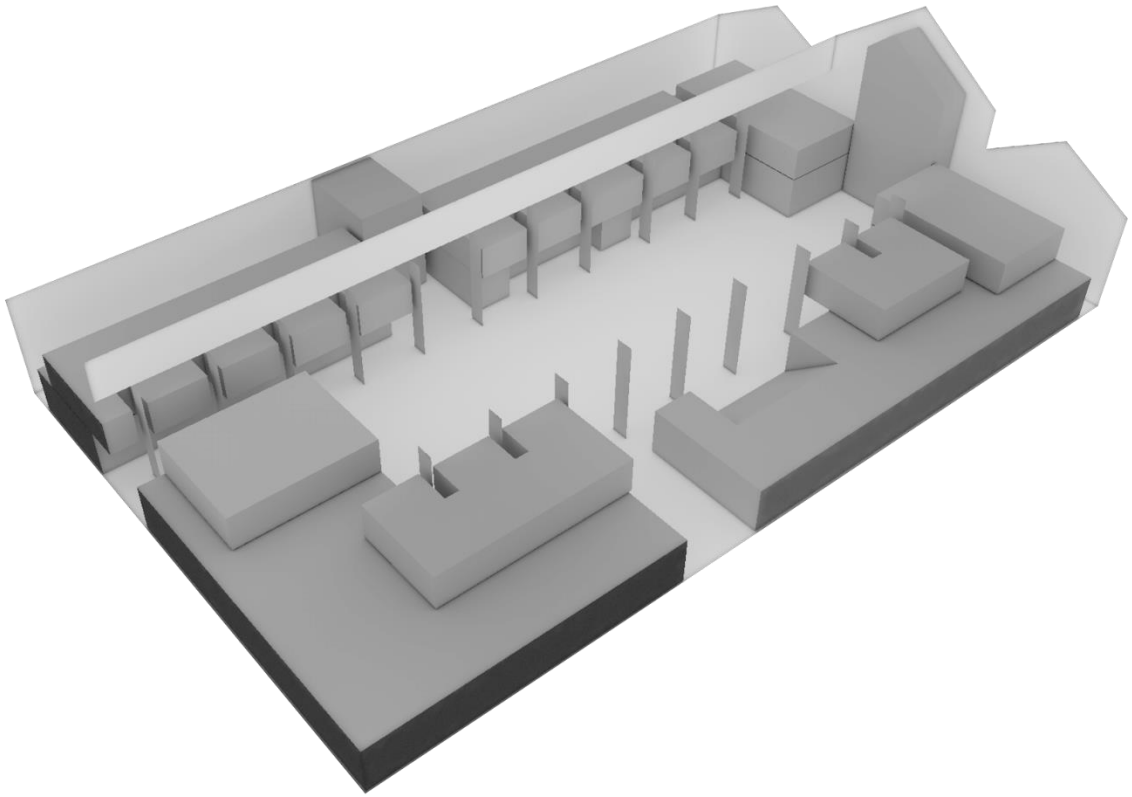
EXISTING SITUATION

Simulation





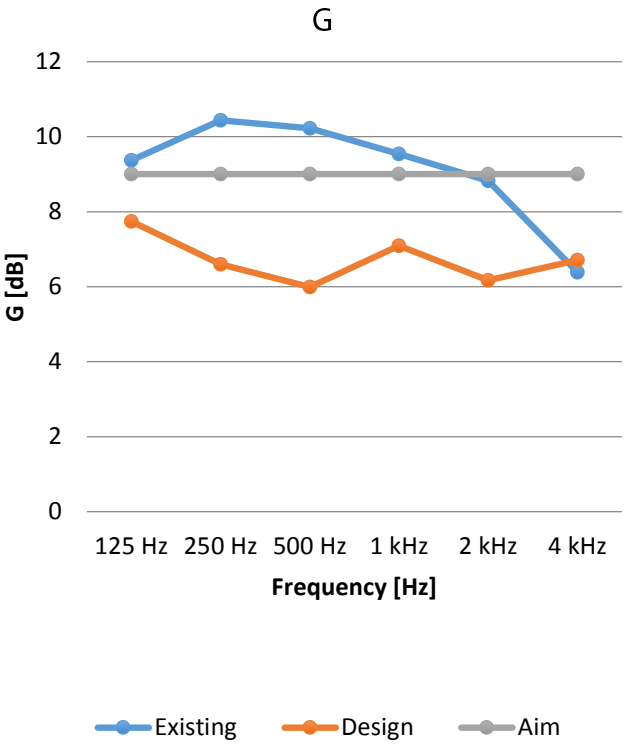
ARCHITECTURAL DESIGN

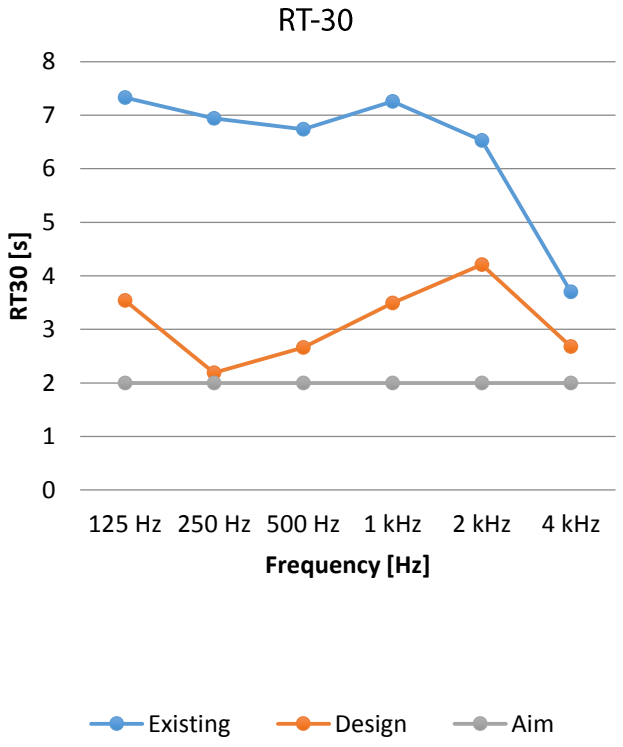


- Walls are finished with a Helmholtz resonator construction

ARCHITECTURAL DESIGN

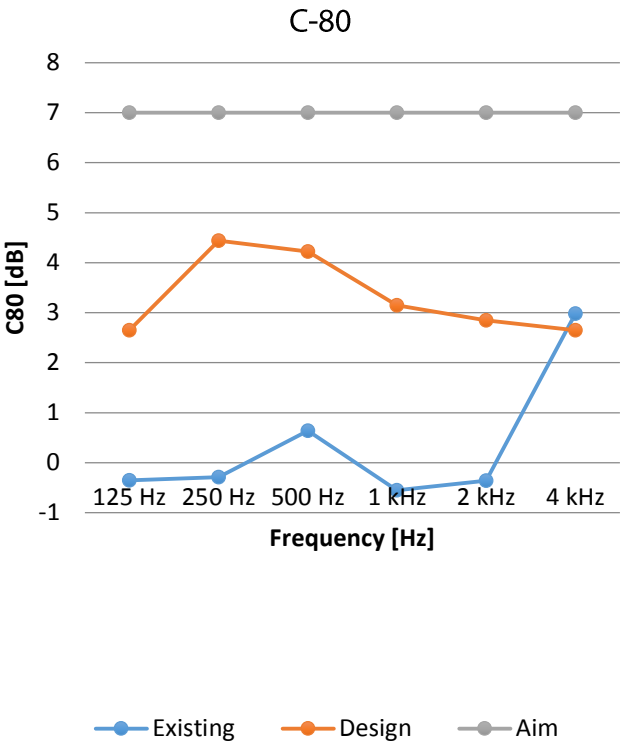
Simulation

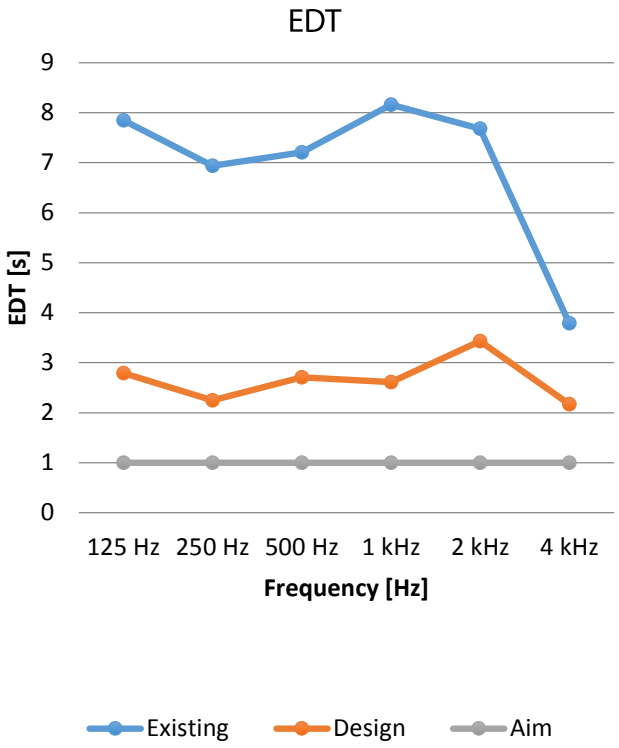




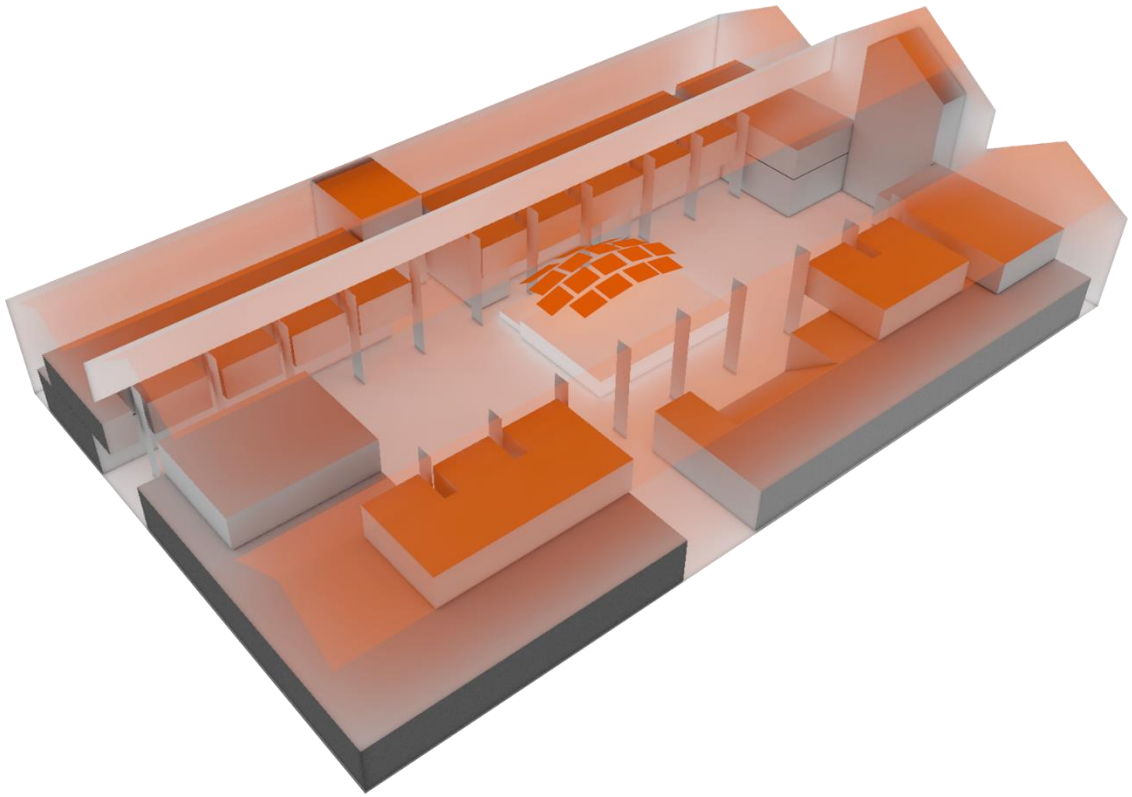
ARCHITECTURAL DESIGN

Simulation





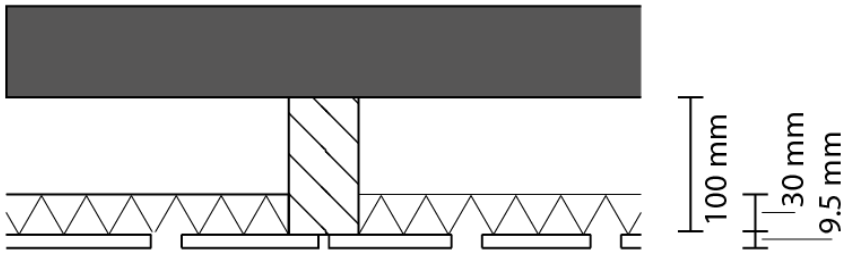
ACOUSTIC SOLUTION



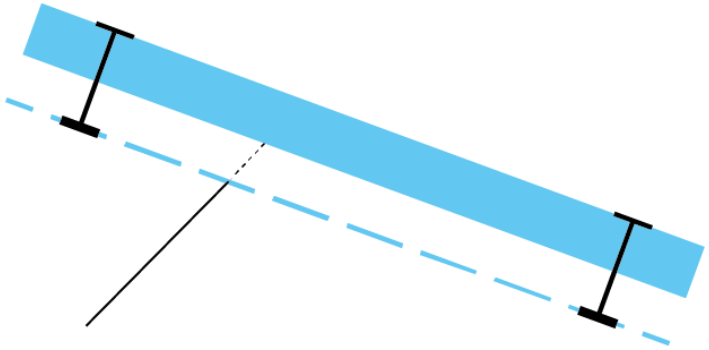
- Transparant sheet with holes in front of the glass roof: Helmholtz Resonator.
- Glass reflectors

ACOUSTIC SOLUTION

Transparent Helmholtz resonator



'Normal' helmholtz resonator



- Transparant sheet with holes in front of the glass roof: Helmholtz Resonator.

ACOUSTIC SOLUTION

Helmholtz resonator with paterns

- The white boxes

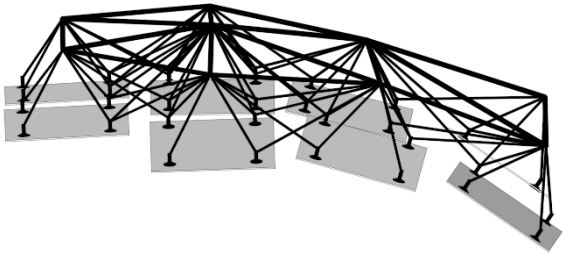
ACOUSTIC SOLUTION

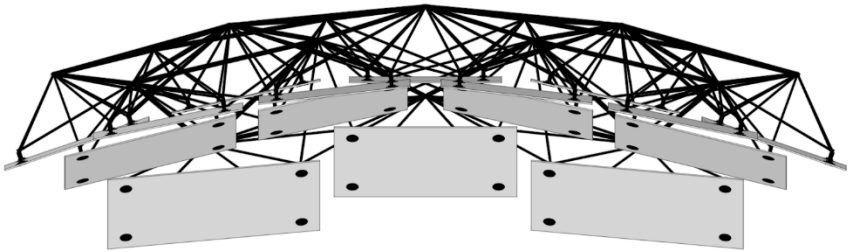
Reflectors

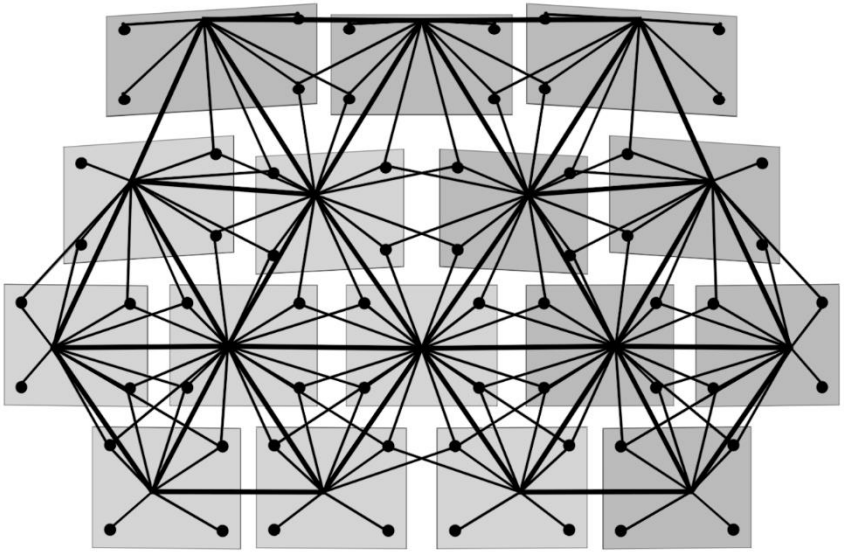
- Transparant, refractive construction
- Heated glass produces heat radiation
- LED-based neonlike lamps in between construction

ACOUSTIC SOLUTION

Reflector construction



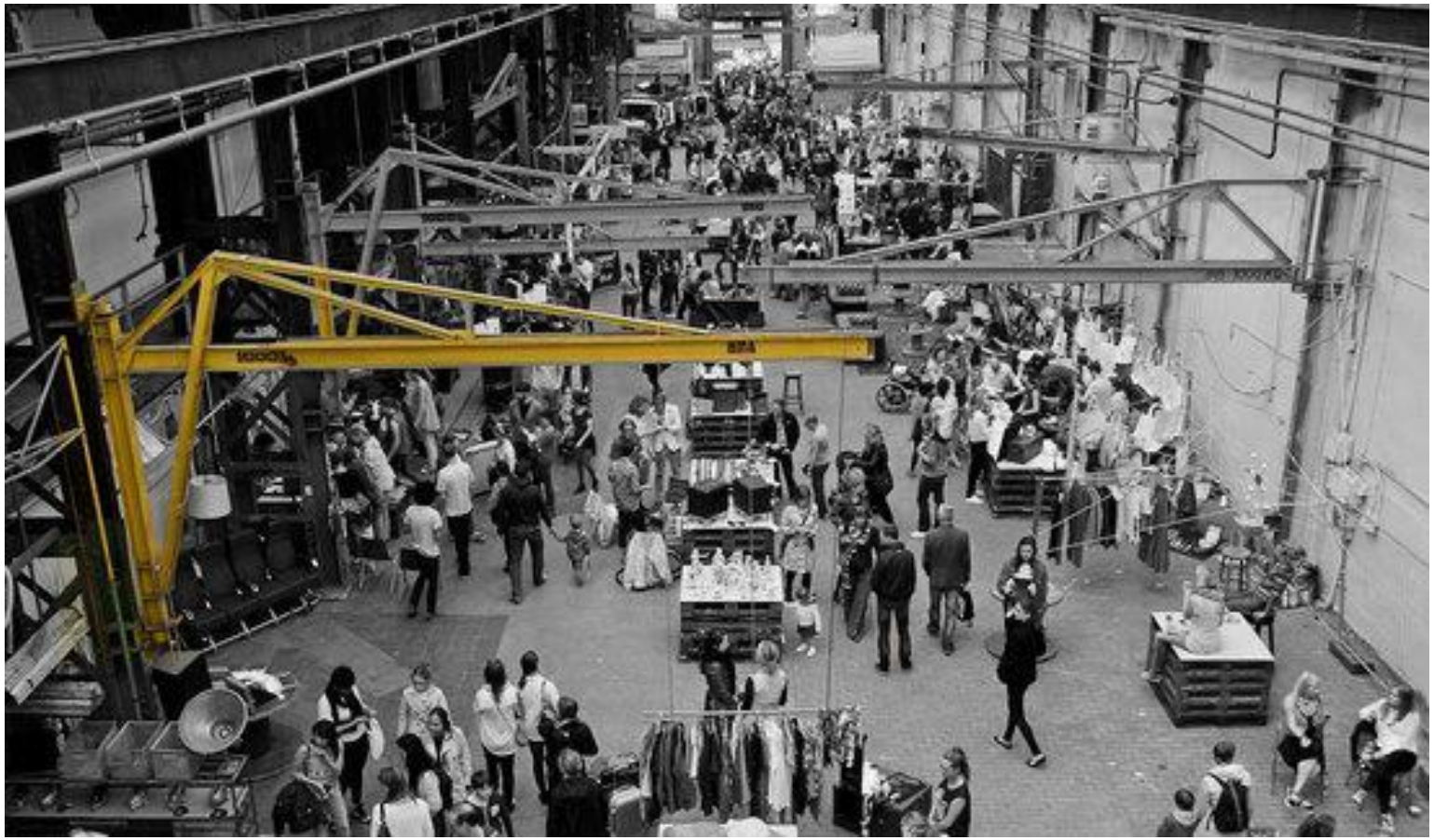




- Spidersystem combined with a steel structure

ACOUSTIC SOLUTION

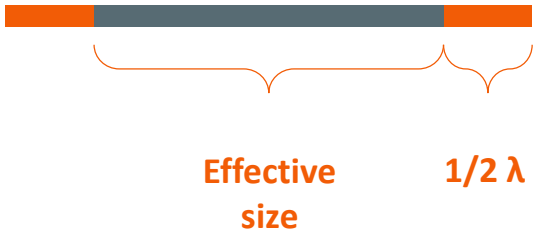
Reflector construction

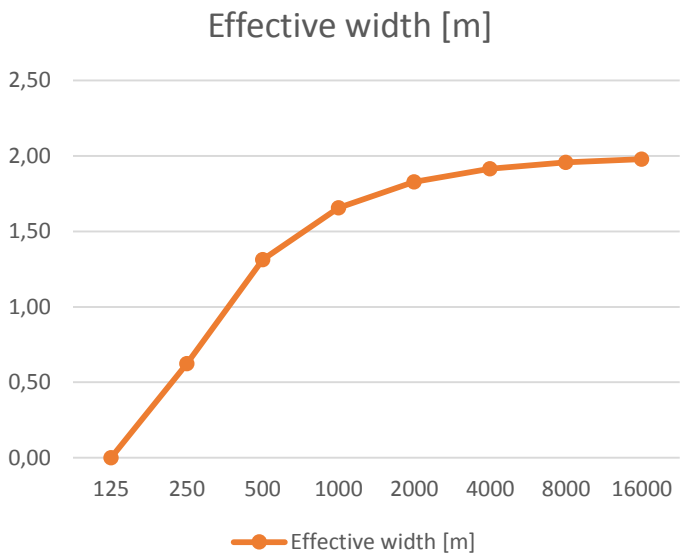


- Existing cranes

ACOUSTIC SOLUTION

Reflector size

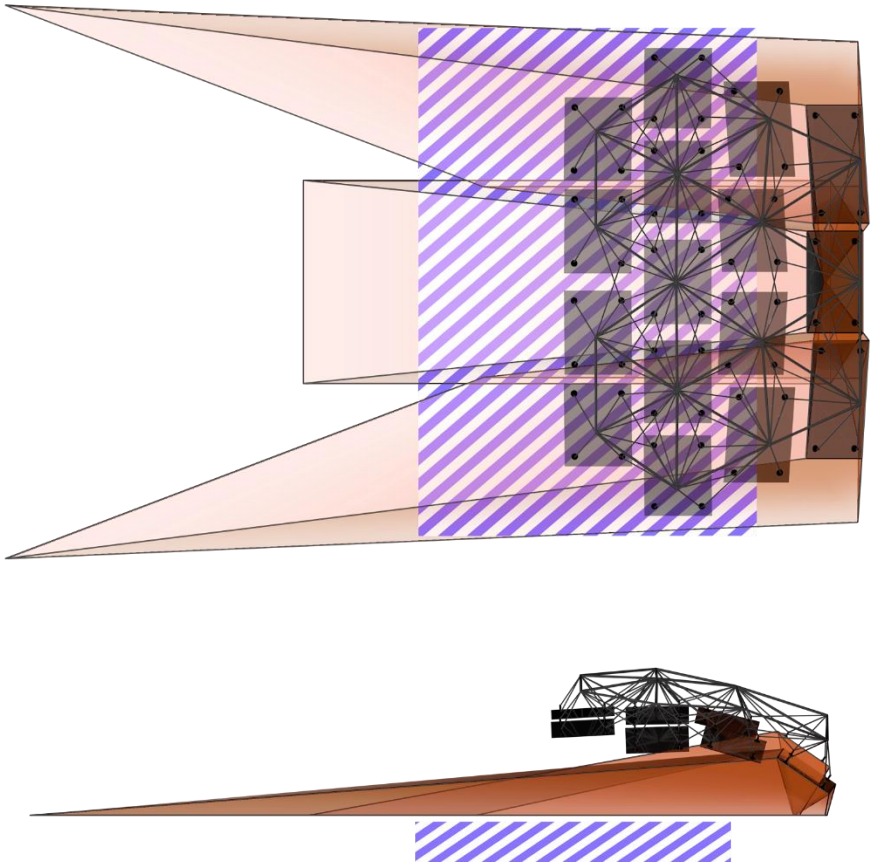




- Reflectors of at least 2 meters

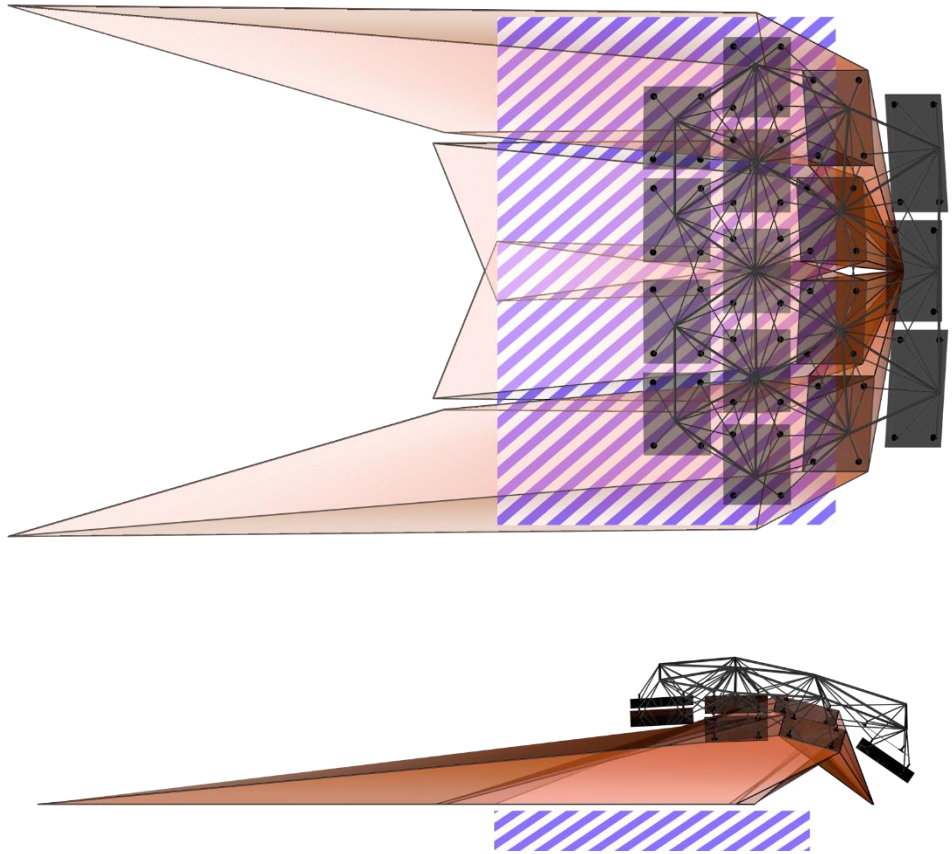
ACOUSTIC SOLUTION

Reflections row 1



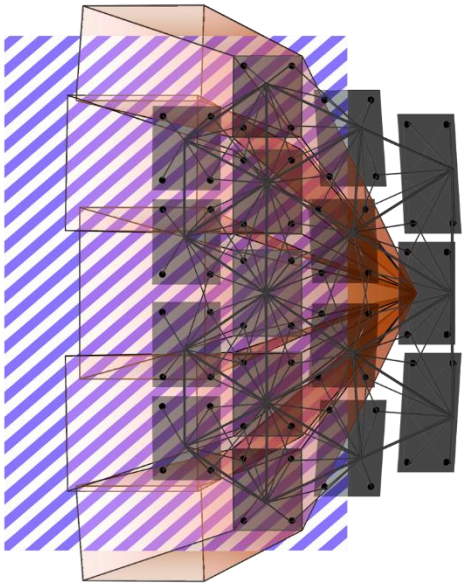
CHOOSING SOLUTIONS

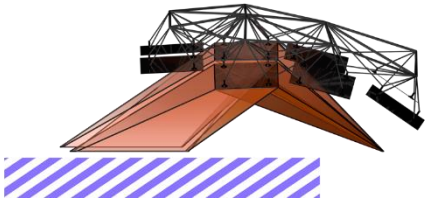
Reflections row 2



ACOUSTIC SOLUTION

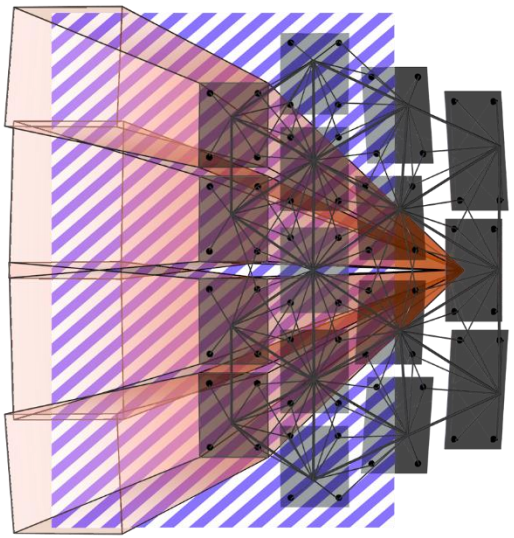
Reflections row 3

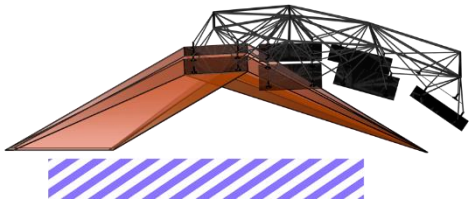




ACOUSTIC SOLUTION

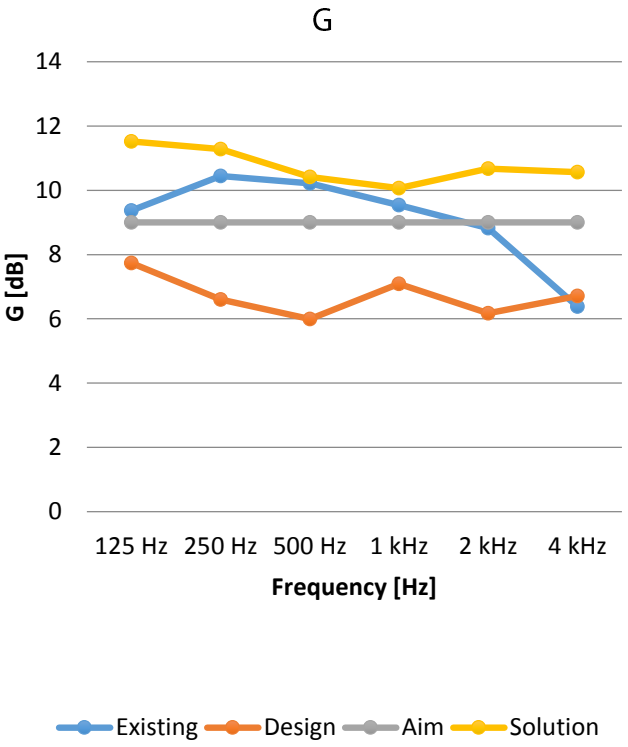
Reflections row 4

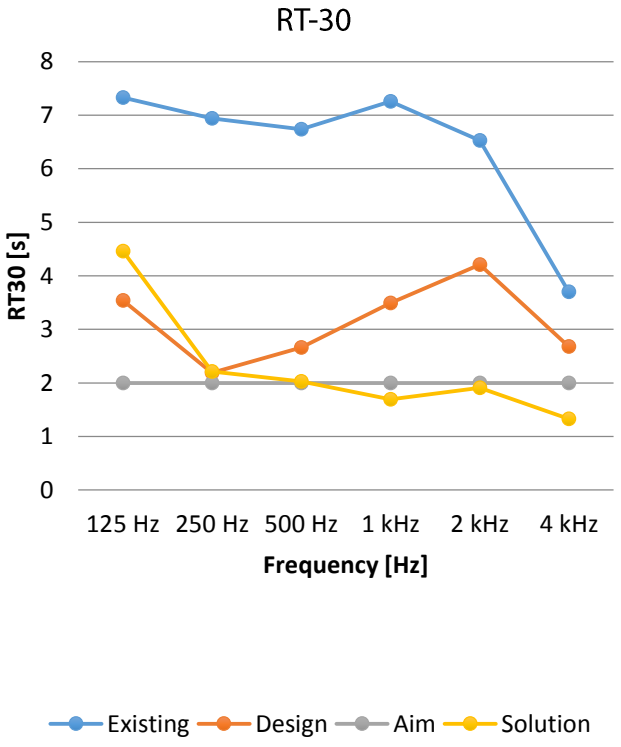




ACOUSTIC SOLUTION

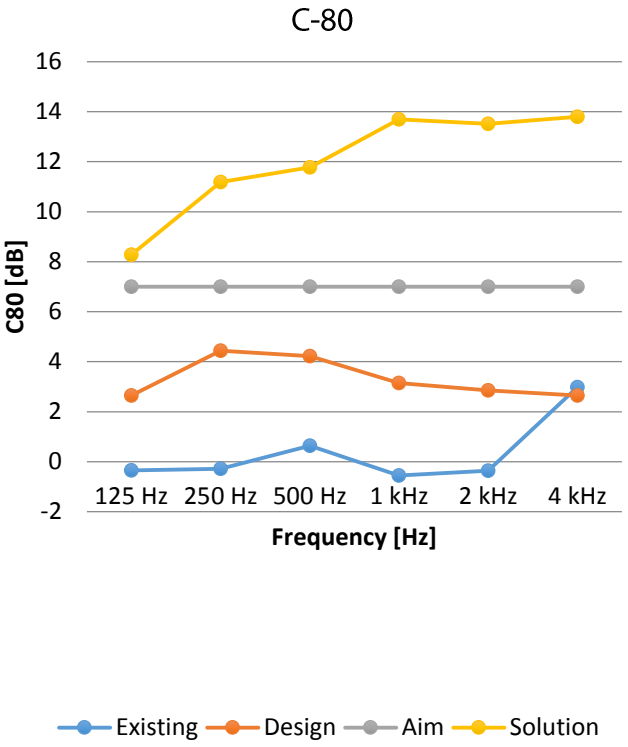
Simulation - results

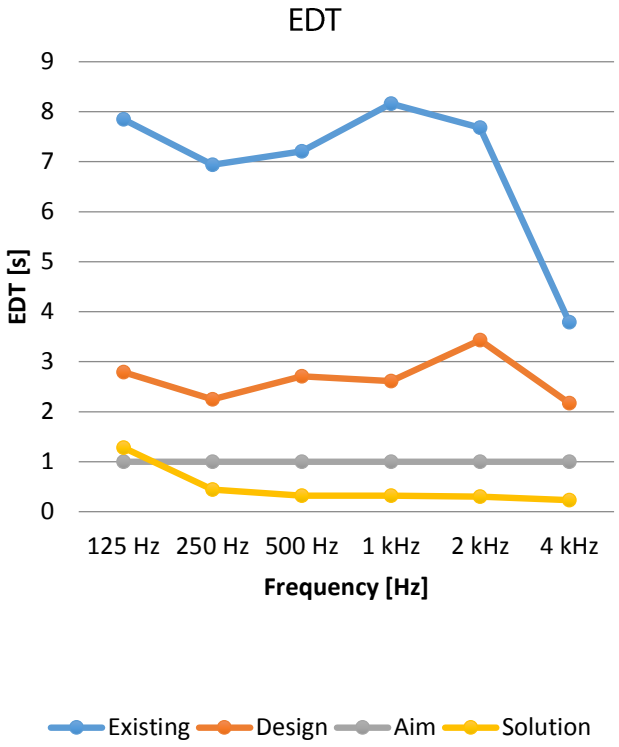




ACOUSTIC SOLUTION

Simulation - results

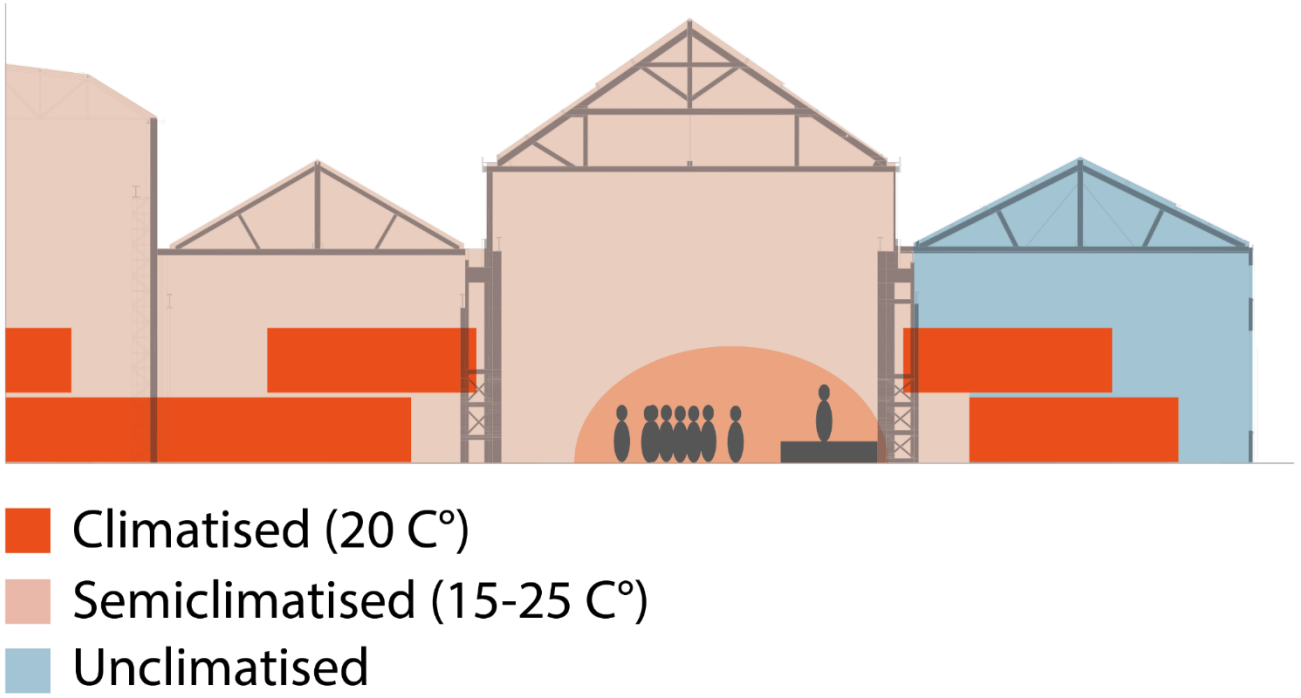




BUILDING TECHNOLOGY

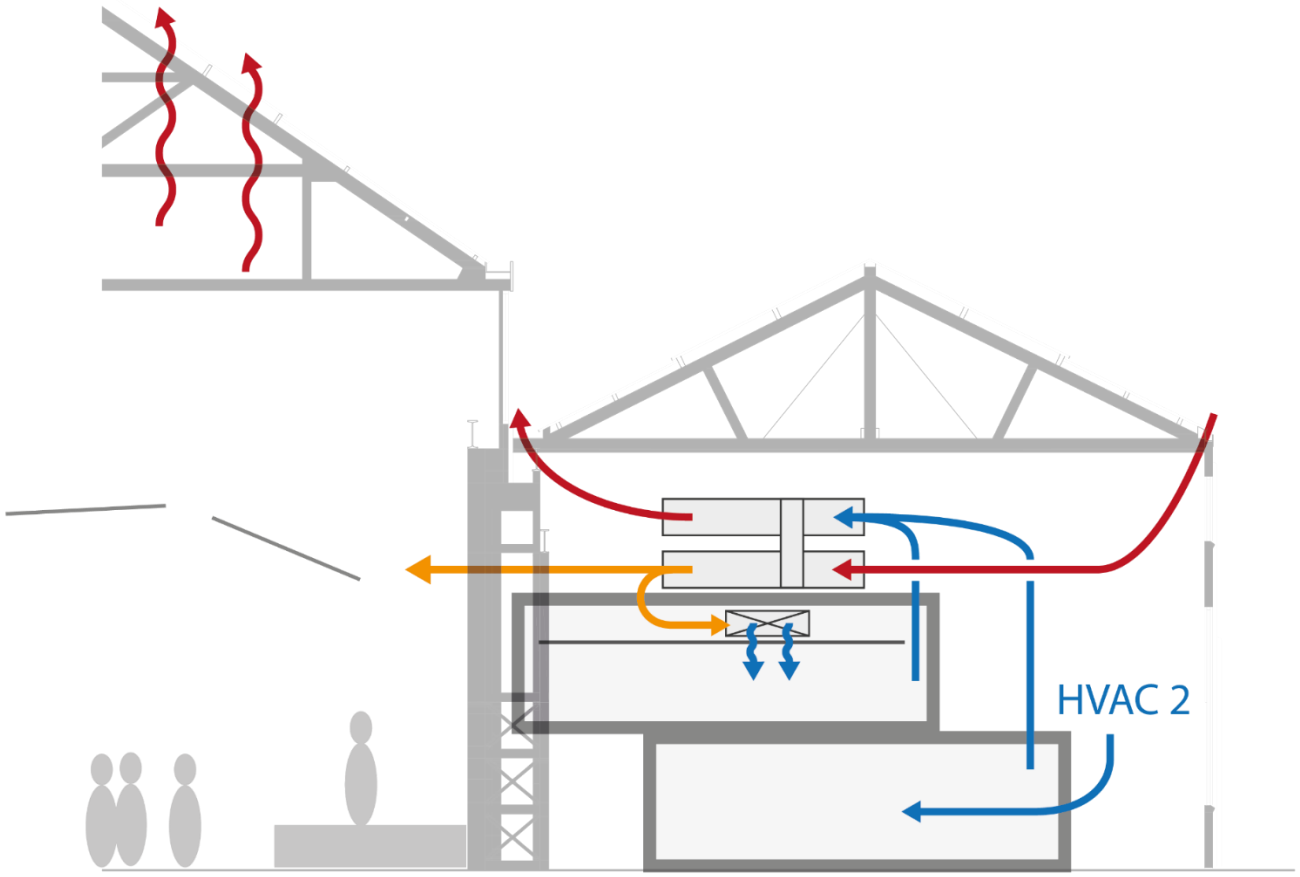
CLIMATE

Concept



CLIMATE

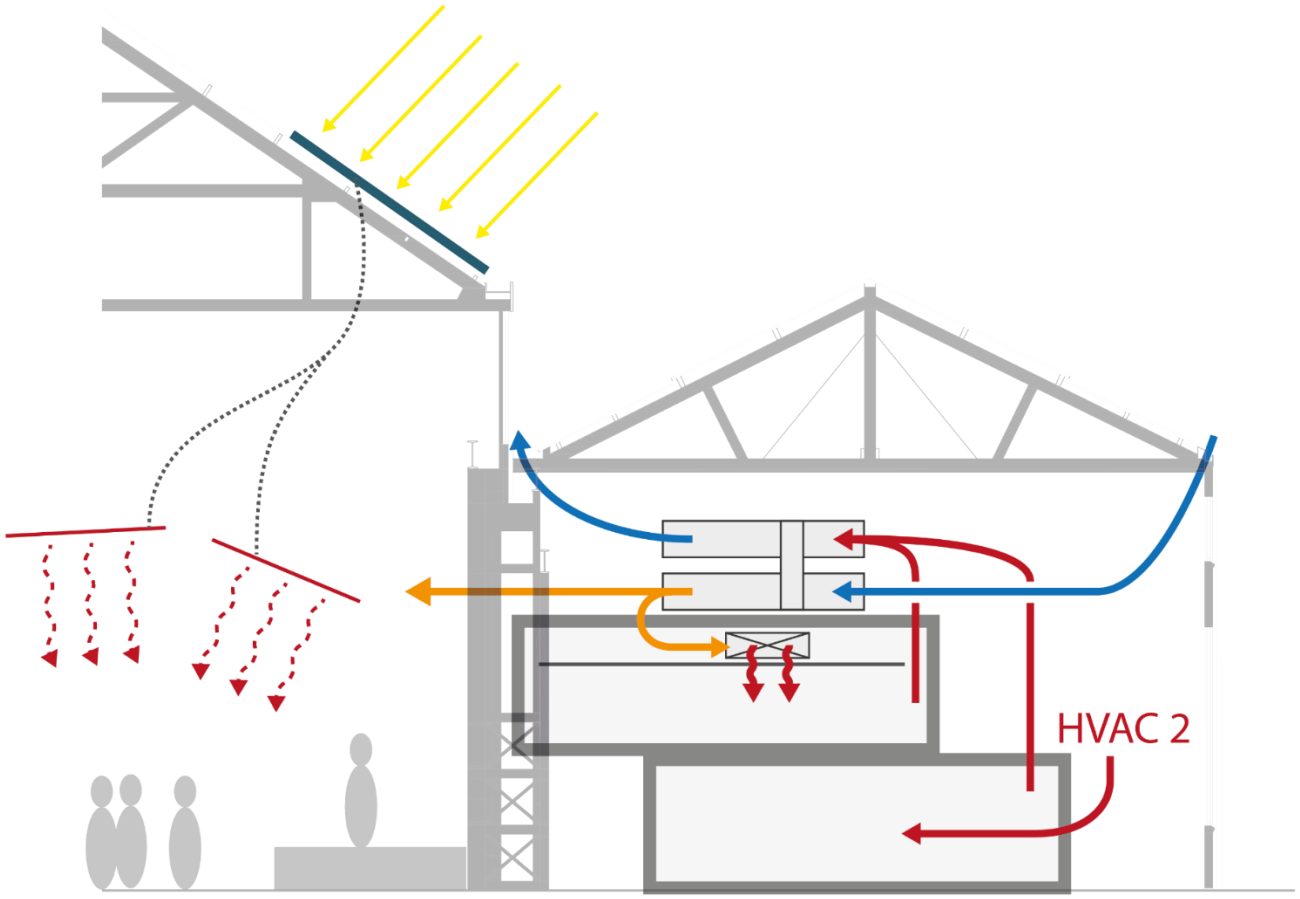
Summer



Summer

CLIMATE

Winter

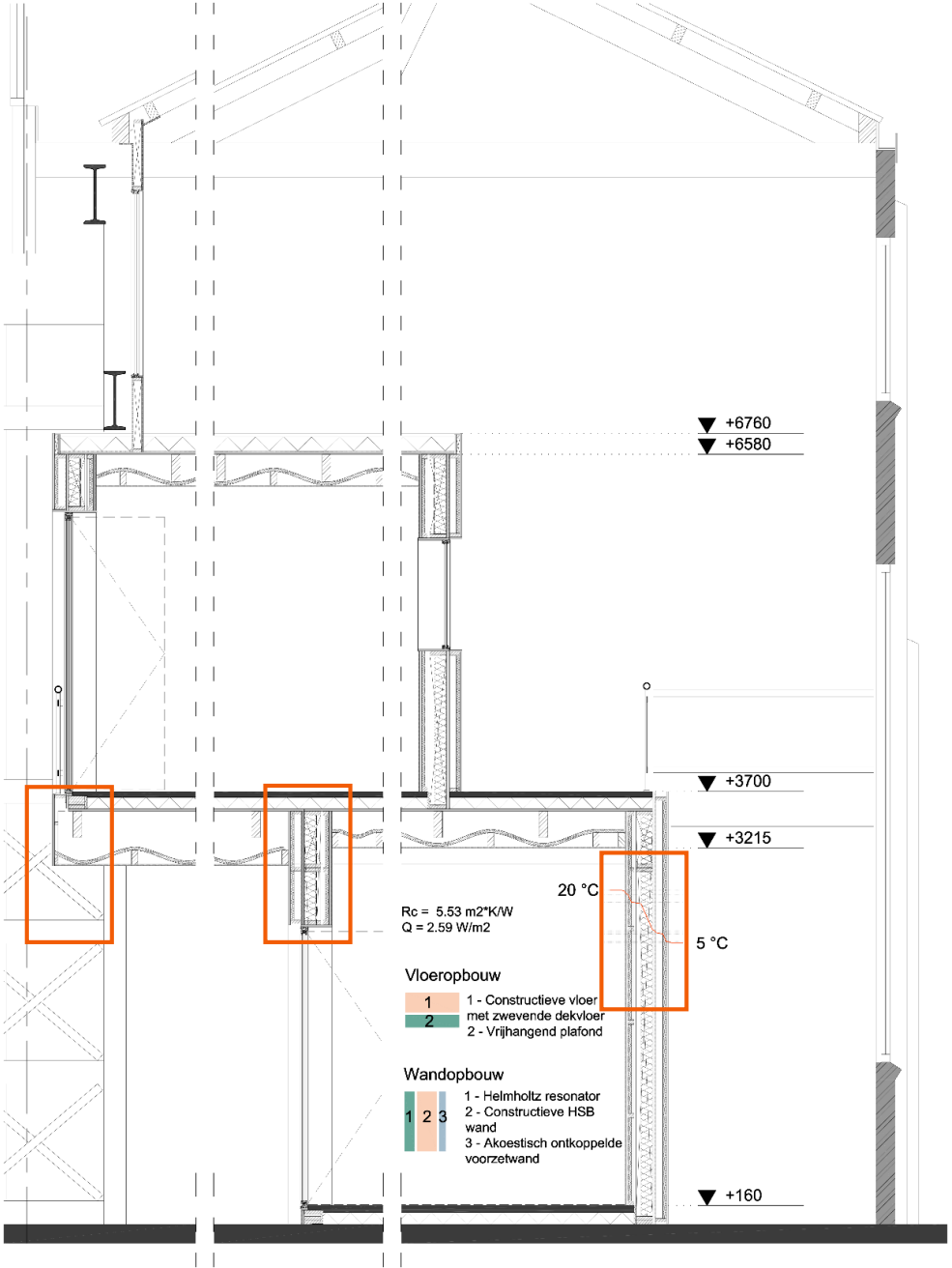


WINTER

DETAILLING

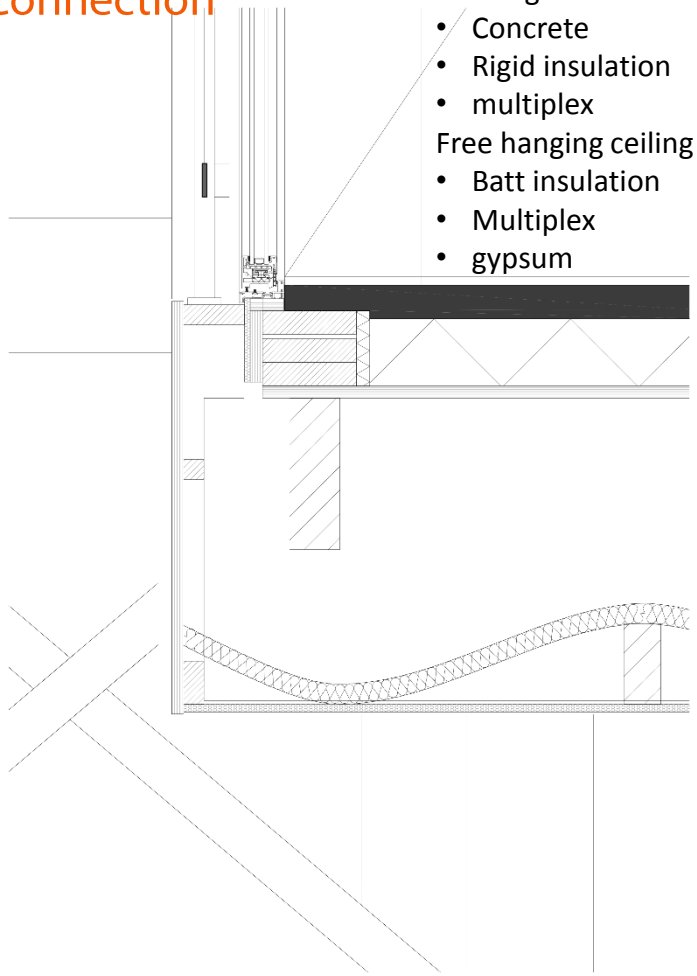
Façade fragment

- Walls consist of three ‘layers’.
- Floors consist of two layers



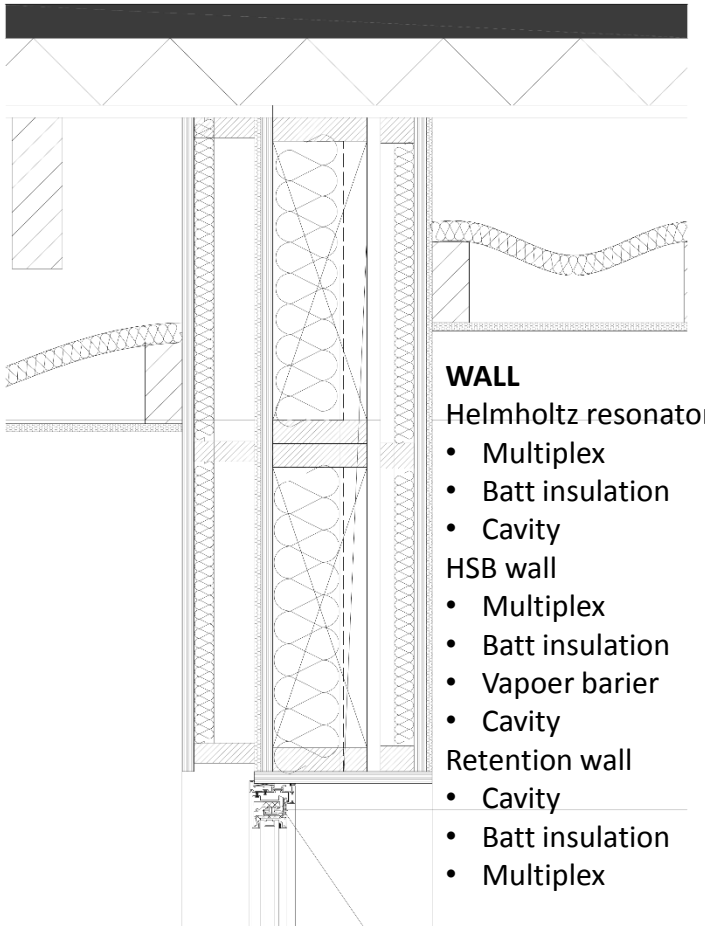
DETAILLING

Connection



FLOOR
Floating screed
- Concrete
- Rigid insulation
- multiplex

Free hanging ceiling
- Batt insulation
- Multiplex
- gypsum



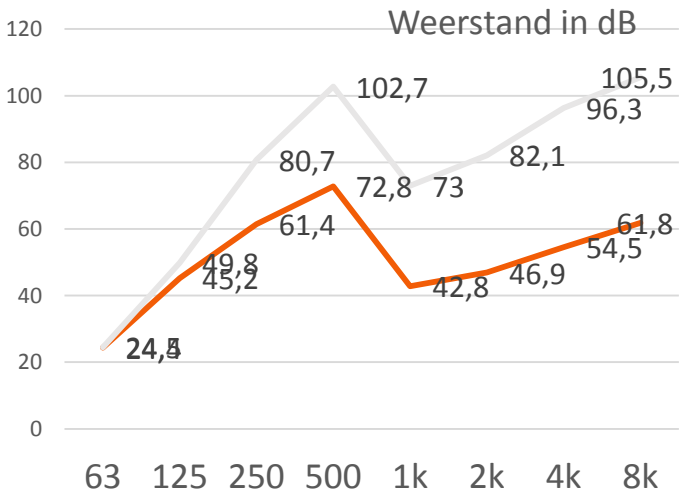
WALL
Helmholtz resonator
- Multiplex
- Batt insulation
- Cavity

HSB wall
- Multiplex
- Batt insulation
- Vapoer barier
- Cavity

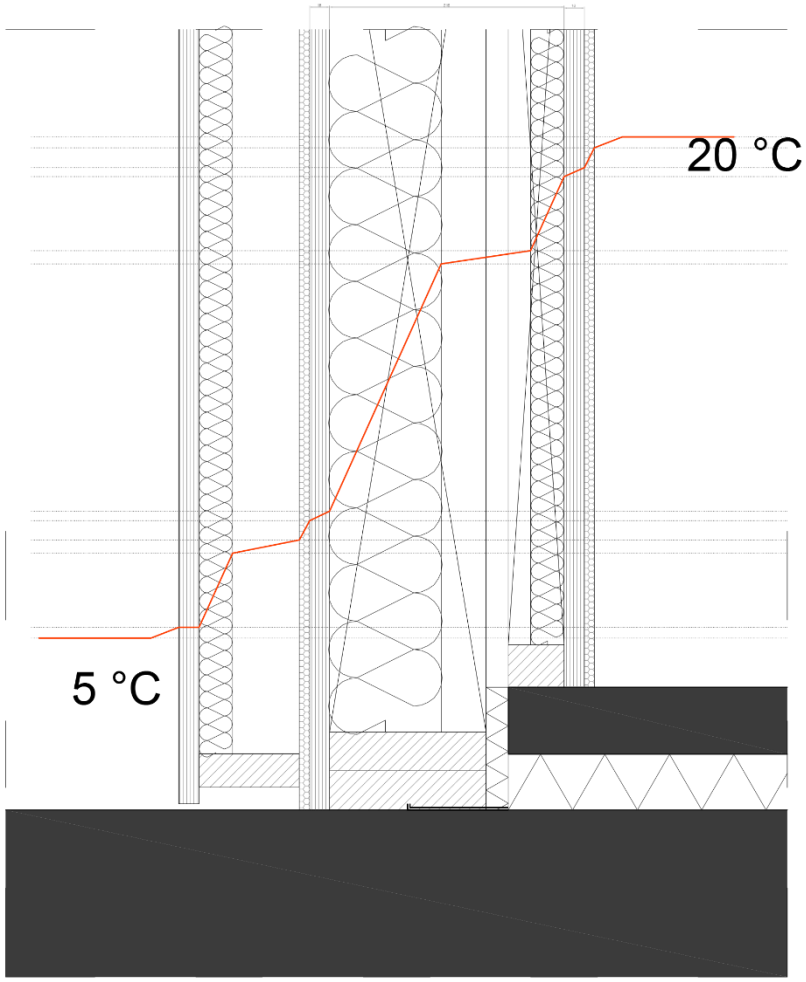
Retention wall
- Cavity
- Batt insulation
- Multiplex

DETAILLING

Standard exterior wall

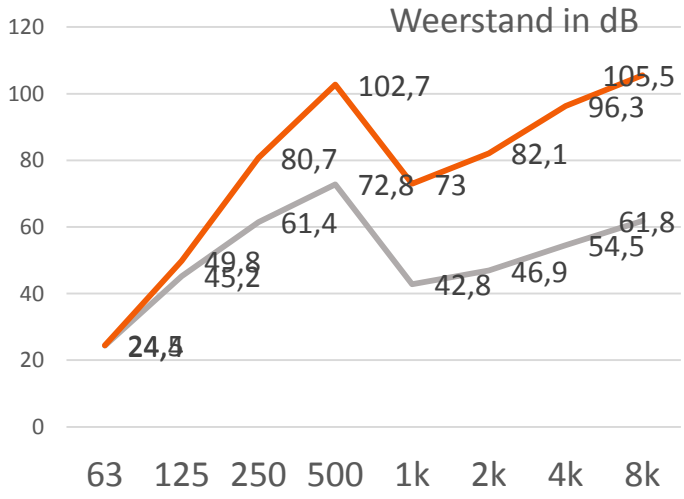


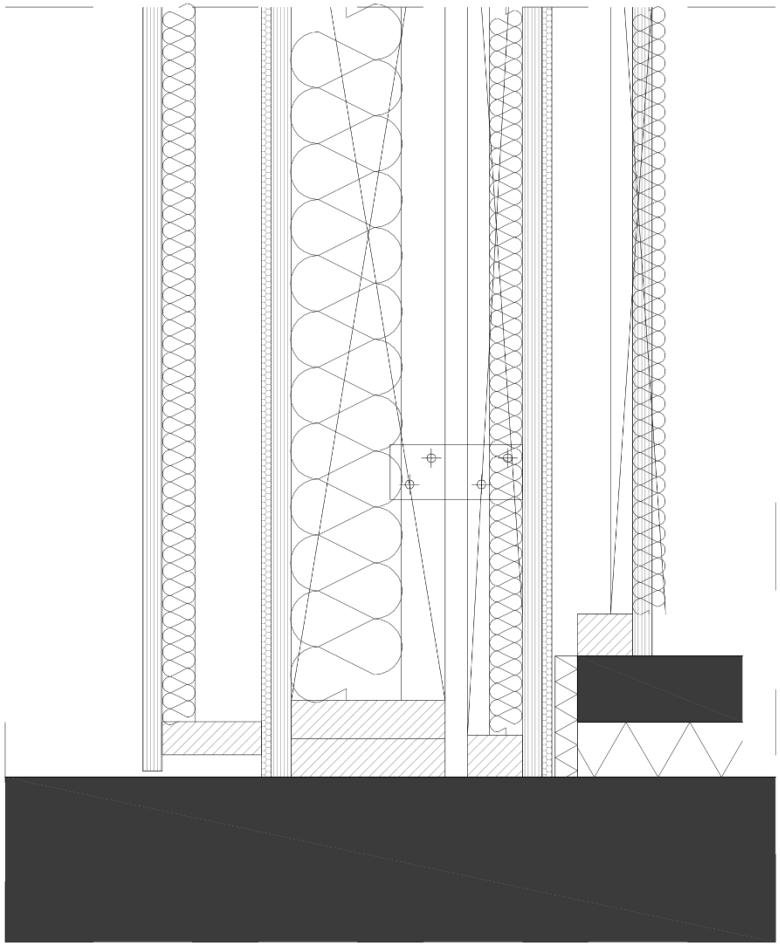
- Sound insulation
- Atmosphere of the program is influenced by halls



DETAILLING

Rehearsal room exterior wall





- Sound insulation
- Atmosphere of the program is influenced by halls

Here comes a video-impression with auralised sound.
Visit: vimeo.com/153086907