SCATTERED

MONTREAL'S PUBLIC EXCITEMENT

VISUAL SCATTERING

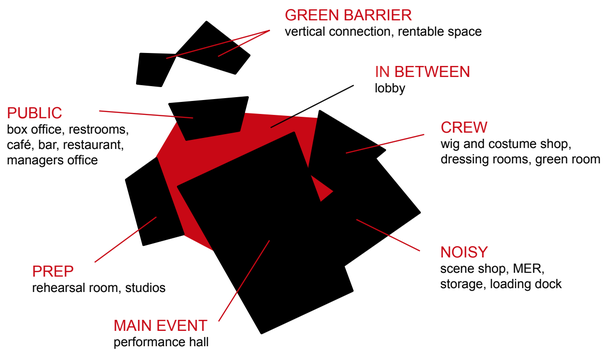
1. Start with a rectangle

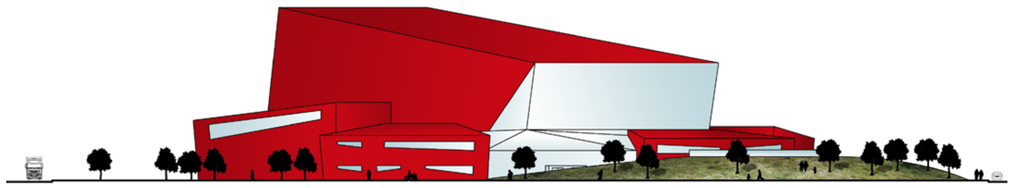
2. Make divisions according to a pattern

3. Scatter the pieces

FUNCTIONAL SCATTERING

Every piece in the pattern has its own theme and function.

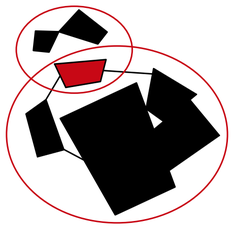




FACADE FACING RUE PEEL
1:500

AN INTERACTING PUBLIC UNIT

A public unit is located by the entrances of the opera house, in between the performance hall and the green barrier. It rooms all the public facilities, such as restrooms, box office, house managers office, café, restaurant and bar. Located in between it interacts with both units; with the opera house when open to the public and when closed with the green barrier. The opera house offers an inviting atmosphere with activities and movement during the whole day.



MODERN AND UNCONVENTIONAL MATERIALS

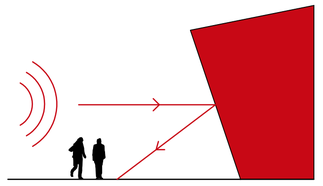
The opera building has choice of common unconventional materials, but with great quality and selected acoustic values. The materials present a modern interesting look in a new way of simple composition.

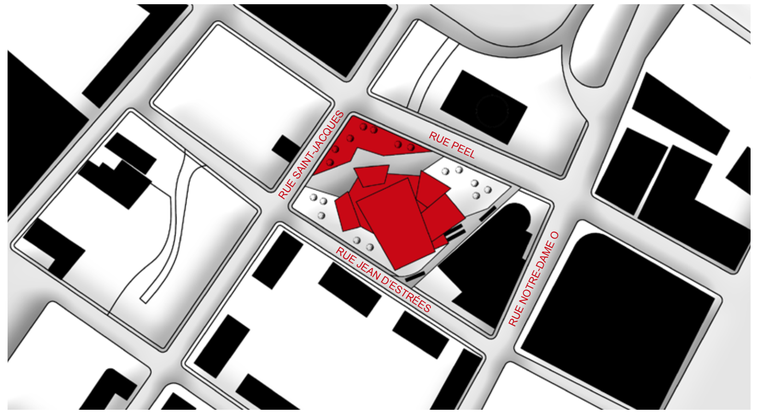
The facade material is red high-pressure laminate, with dense and resistant properties. Other materials used in the building are concrete, glass, black rubber floor, plastic and Plexiglas.

High-pressure laminate layering

A TILTED FACADE

The exterior walls are tilted to reflect the sound striking the building to the absorbing ground. The tilted walls also give the opera house a dynamic look and embrace the visitors. Indoors the tilted walls also balance a good sound and reduce flutter echoes.

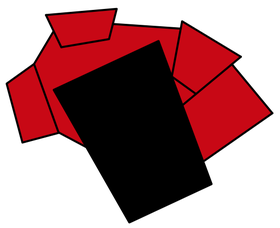




SITE MAP
1: 3000

INTERACTION WITH THE NOISY SURROUNDINGS

TWO ZONES REDUCING THE URBAN NOISE

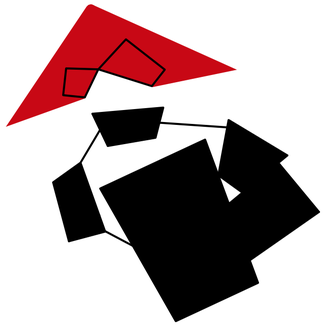


A SCATTERED BARRIER

The scattered units surrounding the performance hall and the lobby in between function as a shielding barrier, reducing the urban noise. The units are scattered in a way to embed and protect the performance hall, which is located in the quiet corner of the site.

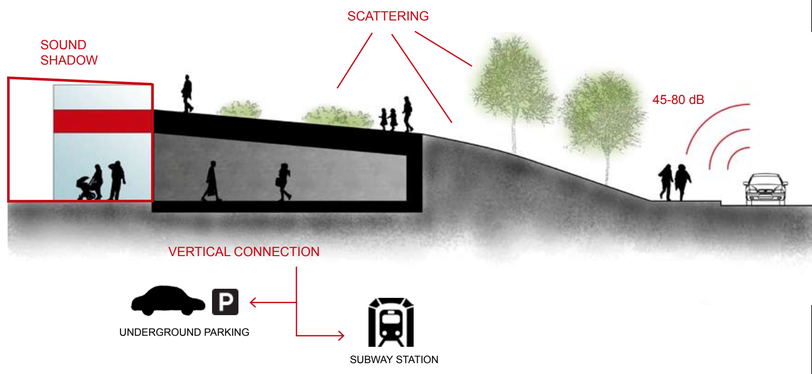
A GREEN BARRIER

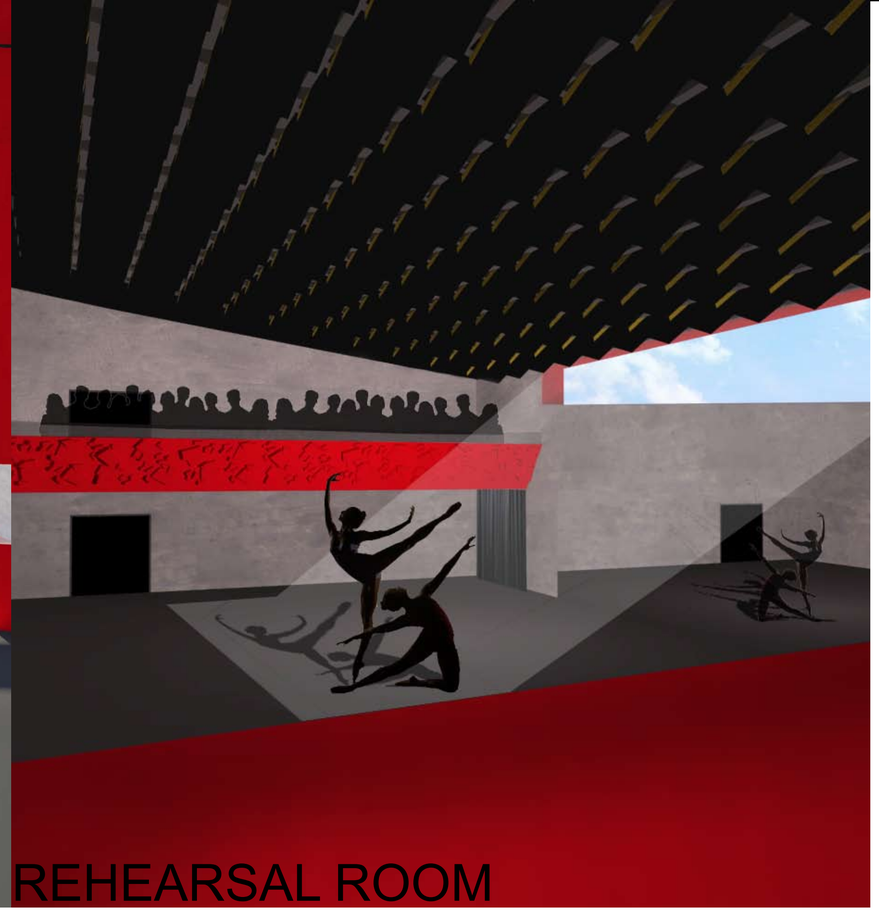
The two units by the crossover are covered with soil, creating a green barrier that scatters the urban noise. The inclination of the soil creates a sound shadow, providing a more quiet space in front of the building and reducing the sound striking the building.



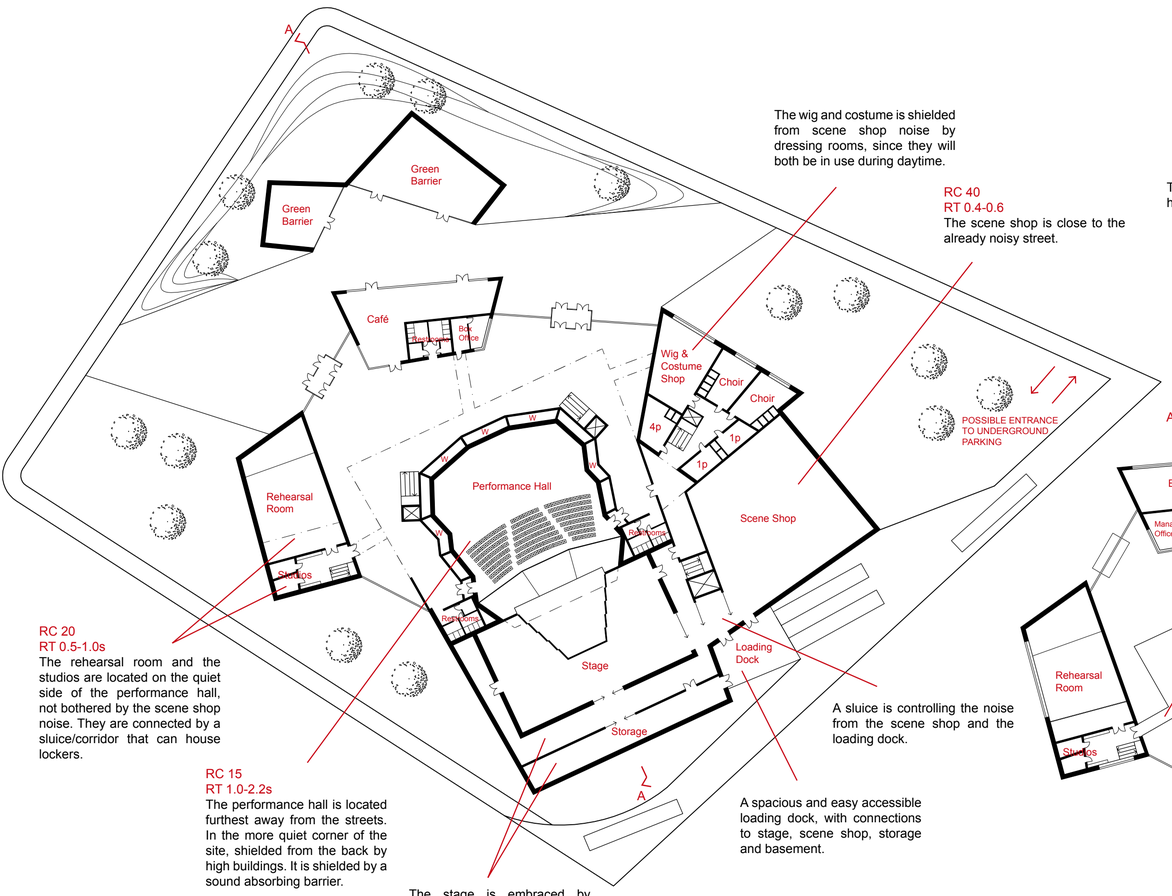
...WITH OPPORTUNITIES

The units creating the green barrier are separated from the opera building. They provide possibilities for a vertical connection to underground parking and a subway station. The space can also be rented out to finance the expenses of the opera house. The green barrier brings different activities to the site, and creates a living atmosphere during the entire day. For example it could house tourist information, café, shops, lecture rooms or small offices.





ACOUSTICAL ROOM ARRANGEMENTS



The wig and costume is shielded from scene shop noise by dressing rooms, since they will both be in use during daytime.

RC 40
RT 0.4-0.6
The scene shop is close to the already noisy street.

RC 20
RT 0.5-1.0s
The rehearsal room and the studios are located on the quiet side of the performance hall, not bothered by the scene shop noise. They are connected by a sluice/corridor that can house lockers.

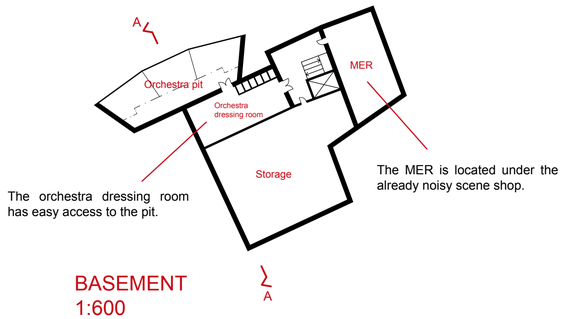
RC 15
RT 1.0-2.2s
The performance hall is located furthest away from the streets. In the more quiet corner of the site, shielded from the back by high buildings. It is shielded by a sound absorbing barrier.

A sluice is controlling the noise from the scene shop and the loading dock.

A spacious and easy accessible loading dock, with connections to stage, scene shop, storage and basement.

The stage is embraced by corridors and functional storage in the back.

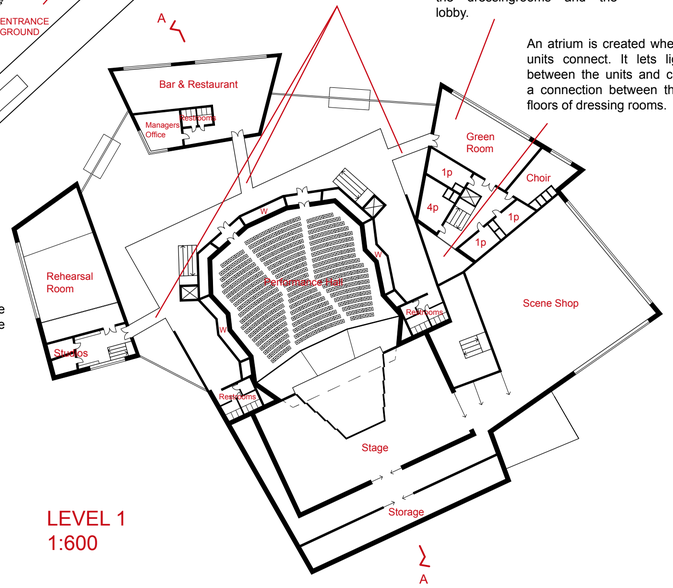
GROUND LEVEL
1:600



The orchestra dressing room has easy access to the pit.

The MER is located under the already noisy scene shop.

BASEMENT
1:600



Three bridges connects the performance hall to other units.

RC 25
RT 0.8-1.0s
A multipurpose greenroom with with easy access to the stage, the dressingrooms and the lobby.

An atrium is created where the units connect. It lets light in between the units and creates a connection between the two floors of dressing rooms.

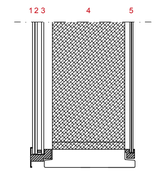
LEVEL 1
1:600

AN INVITING SOCIAL LOBBY

The lobby atrium connects the different parts of the opera house. Leveled bridges and open spaces invites the visitors to walk around the building units, seasonal exhibitions or experience temporary performances and concerts. The lobby offers an open-air-feeling with great views through the glazed walls and ceiling. This is the perfect social meeting place in Montreal - under the clear sky in the daytime and under the stars in the nighttime.

MICROPERFORATED LAMINATED GLASS

The glazed lobby atrium has a construction of laminated triple glass. The noise transmitted into the building is further reduced by large and different thickness of the glasses and different distances in between the glass surfaces. The air gap in between the glazing is lined with absorbing surfaces. Additionally the surfaces achieve a high flow resistance and reduce the sound level in the lobby through micro perforations on the inside surface.



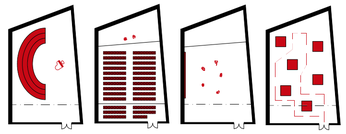
Estimated STC 50+

1. 13.1mm Laminated glass
2. 12mm Airgap with argon gas
3. 6mm Floating glass
4. 200mm Airgap with argon gas and absorption lining
5. 9.1mm Laminated glass with microperforations

A MULTIFUNCTIONAL AND PUBLIC REHEARSAL ROOM

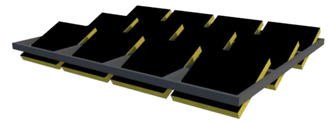
The rehearsal room has non parallel walls to avoid flutter echo, as well the ceiling and one of the walls are tilted. The shape of the rehearsal room is elongated, to mimic the shoebox shape and fit elliptical choir podiums.

The room follows the same theme as the performance hall, only in a smaller scale. It has one balcony, which can be seated by audience, the choir, opera or theatre practice as well as for dance choreographers. The floor material is black rubber carpet, since it has good acoustical properties.



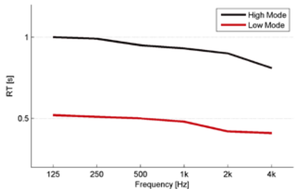
Orchestra or Choir practice | Lecture, Opera or Theatre | Dancing or Ballet | Exhibitions or Pre/Post events

The reverberation time can be adjusted by a curtain on the mirror wall and variable absorption on the walls and the ceiling. The variable absorption in the ceiling is controlled by computers that calculate the reverberation time for every use of the room.



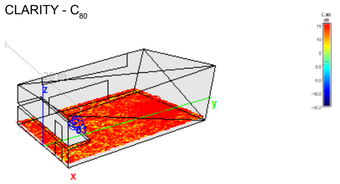
Computer controlled variable absorption ceiling panels to adjust the reverberation time

REVERBERATION TIME - RT

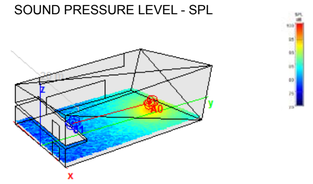


LOW MODE - RT 0.5s

CLARITY - C_{80}

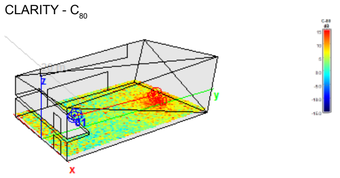


SOUND PRESSURE LEVEL - SPL

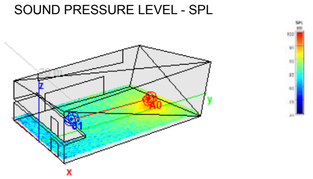


HIGH MODE - RT 1.0s

CLARITY - C_{80}

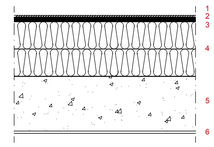


SOUND PRESSURE LEVEL - SPL



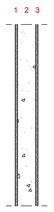
LOADBEARING AND SOUND REDUCING CONCRETE

Walls, roof and slabs are all constructed of concrete, since its mass and firmness provides high sound isolating properties and mutes low frequency sound. Additionally concrete will not be in resonance mode for audible frequencies.



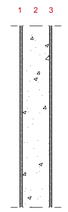
Estimated STC 90

1. 4mm Tin surface
2. 20mm Roof board
3. 2x150mm Insulation
4. Vapour barrier
5. 300mm Concrete
6. 13mm Interior finish



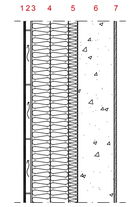
Estimated STC 43

1. 13mm Interior finish
2. 100mm Concrete
3. 13mm Interior finish



Estimated STC 49

1. 13mm Interior finish
2. 150mm Concrete
3. 13mm Interior finish



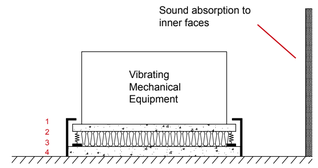
Estimated STC 65

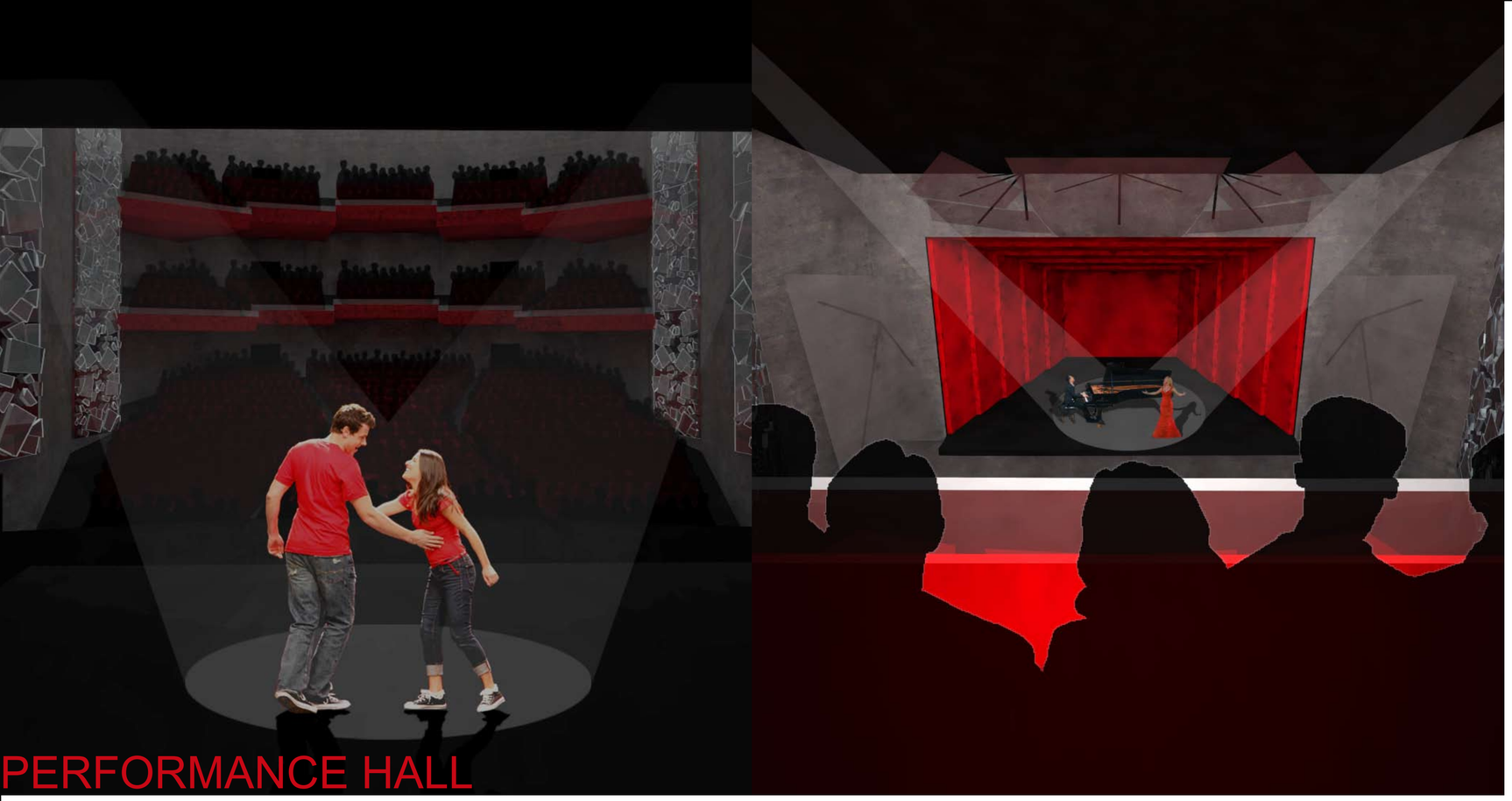
1. 12mm High-pressure laminate
2. 20mm Airgap and mountings
3. 2x100mm Insulation and steel studs
4. Vapour barrier
5. 50mm Insulation board
6. 200mm Concrete
7. 13mm Interior finish

HANDLING NOISE AND VIBRATIONS

Noise and vibrations from mechanical equipment are handled by sound absorbing inner walls in the MER and platform that reduces vibrations.

1. Platform
2. Spring mount
3. Rubber mount
4. Housekeeping pad



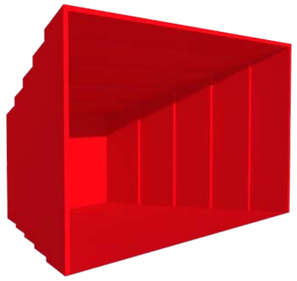


PERFORMANCE HALL

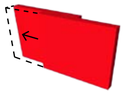
VARIABLE ACOUSTICS

A PORTABLE “OBJECTIVE” STAGE SHELL

The stage shell for orchestra envelopment is designed in segments, inspired by the camera objective. Hence the depth of the shell is adjustable and it can be pushed together to the back to save space and be portable. The stage shell is diffusive with a high surface weight. It is mounted onto and supported by a metal skeleton.



The segments of the stage shell can be pushed together like a camera objective

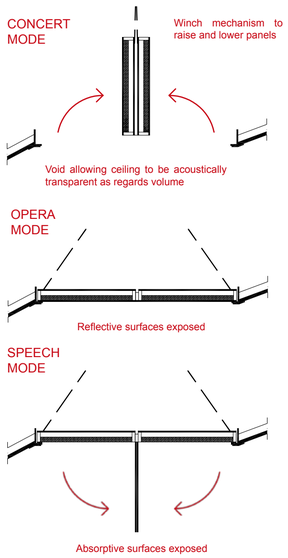


ADJUSTABLE CEILING ENABELING DIFFERENT MODES

The shape of the ceiling is designed to give optimal sound reflection to everyone in the audience.

INCREASE RT

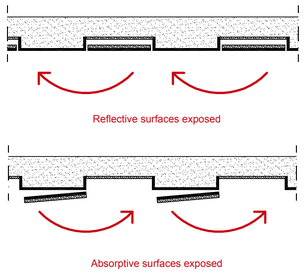
The ceiling can be opened to increase the volume by approximately 20% and give longer reverberation time for the concert mode.

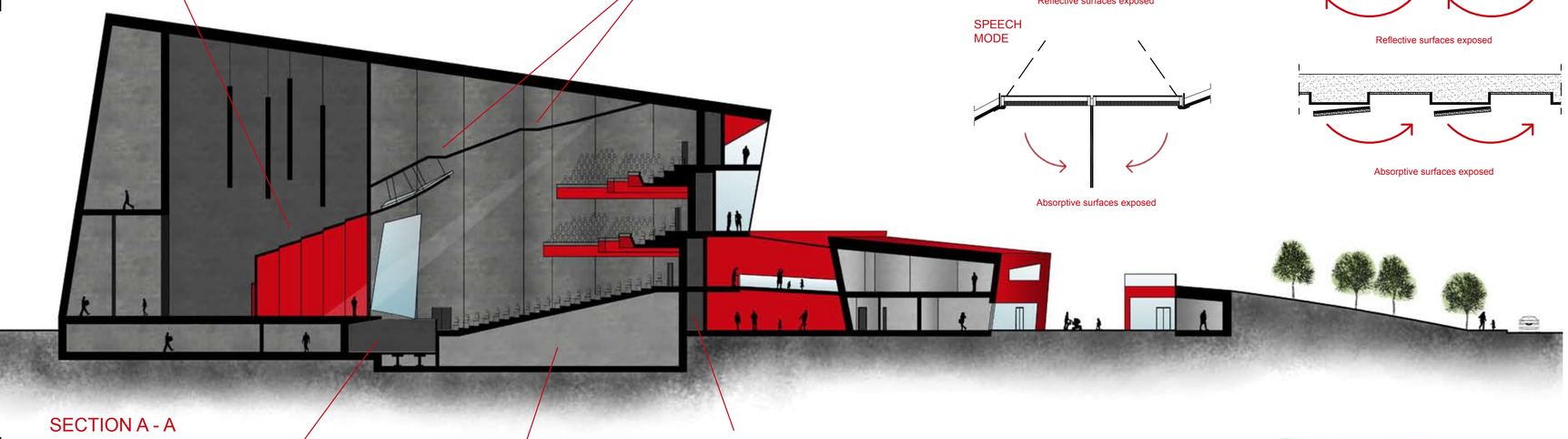


VARIABLE ABSORPTION

DECREASE RT

Variable absorption and reducing late reflections is possible by variable panels placed on the back walls behind the audience. It can be varied between reflecting or absorbing surface.





SECTION A - A
1:300

ORCHESTRA PIT

The orchestra pit has three lifts. The middle one can be lifted to create a podium for lectures or live concerts.

AIR SUPPLY

The air supply to the performance hall is managed by a ventilation room underneath. It enters the room from under the seats with a flow speed of 0.2 m/s.

A SOUND REDUCING BARRIER

The performance hall is embedded by a sound reducing barrier. It consists of two shielding walls, offset to each other and with absorption in between, which stops the sound from transmitting both ways. In the barrier there are wardrobe space and entrances to the performance hall through double door sound sluices.

SCATTERING BALCONY FRONTS

The balcony frons are scattering with irregularities, incorporating the design of the “Scattered”-pattern. The irregularities vary in depth, to further increase the scattering effect. They are molded out of plastic and with a glazed segment.

A MULTIPURPOSE PERFORMANCE HALL

The performance hall is designed with an edgy shape, somewhat in between the shoebox and the horseshoe shape. The angled edgy walls contribute to reflect the sound to the audience. The balconies are designed as boxes with dynamic varying heights. The performance hall has a modern, tight, high-tech look incorporating unconventional materials with acoustic qualities. The walls are of grey concrete with a glossy finish and the floor is of black rubber. The red color functions as an accent for the chairs, the balcony fronts and the stage shell.

FLOATING REFLECTORS

The “Scattered-”pattern reoccurs in the reflector design. The reflectors are made of Plexiglas to give a modern, light and floating impression. They are double curved in segments to spread the sound and supported by visible black metal bars.

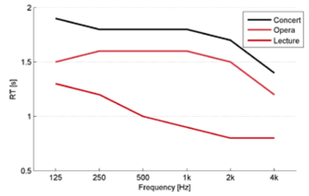
GLOWING AND SCATTERING DIFFUSION

Some of the walls in the performance hall are provided with Plexiglas panels, once again designed with the “Scattered”-pattern. They function as diffusors for the acoustics, but also creates a glowing effect when lit from behind. In the dark the Plexiglas panels will look somewhat like frozen ice or crystals.

THREE DIFFERENT MODES

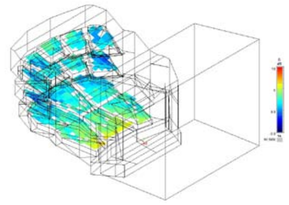
The performance hall is planned with high-quality standards and flexibility to offer great sound to the audience. The variable acoustics supports the multipurpose usage with three different modes - opera, concert and speech.

REVERBERATION TIME - RT

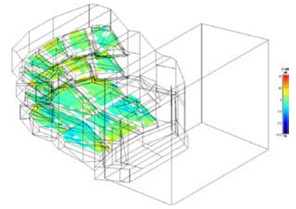


OPERA MODE

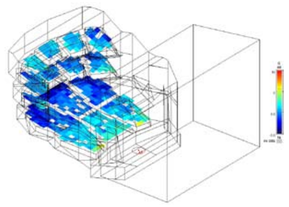
STRENGTH INDEX - G
Sound source on the stage



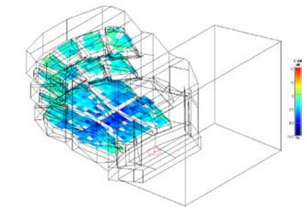
CLARITY - C_{80}
Sound source on the stage



STRENGTH INDEX - G
Sound source in the orchestra pit

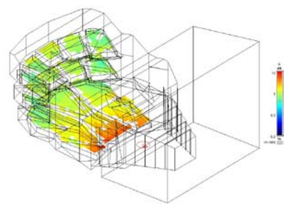


CLARITY - C_{80}
Sound source in the orchestra pit

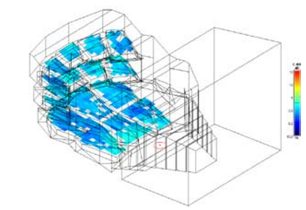


CONCERT MODE

STRENGTH INDEX - G



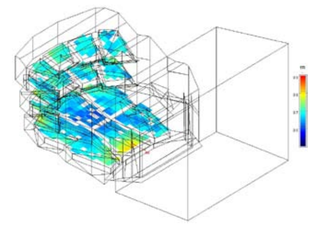
CLARITY - C_{80}



SPEECH MODE

The speech mode is achieved by closing up the proscenium opening by a firewall and making the rear parts of the ceiling and the back walls of the performance hall absorbing.

SPEECH TRANSMISSION INDEX - STI



LATERAL FRACTION - LT