A new venue for Université de Montreal’s performing arts and music program is being presented in the industrial and urban environment of Griffintown in central Montreal Canada. In this group assignment me Emma Blomqvist, Emna Hachicha and Ståle Engvik Ellingsen have with the layering of the building want to captivate the vibrant feel of the location, and its unusual space. It defines the creative use of acoustical design for a wide range of performances.
There are many noise sources in the site’s proximity. A busy street is located next to the venue, an underground tunnel run beneath the site, and an interstate highway and a railroad are located 350 and 300 m away, respectively. The flight path of Montreal’s international airport goes directly over the location at a 500 m height.

An outdoor entrance area is placed above the tunnel and noise-sensitive areas, such as the auditorium, are located at the other end of the site. Existing buildings screen the site from the highway and railroad, and only noise from aircrafts and the adjacent street is therefore considered. The street’s noise contribution is more or less continuous, while the aircraft noise only will occur over short periods. Equivalent and maximum levels are therefore considered for road traffic and aircraft noise, respectively.
**CONCEPT**

The concept uses layers to define the building’s variations in intimacy, openness and spaciousness. The layers gradually close in as the audience moves towards the auditorium - surrounding the heart of the building. The glass façade is open and inviting while thick slate stone walls mask the auditorium making it private and alluring.

**RESTAURANT & CAFÉ**

A combined restaurant and café have been incorporated into the building to service visitors and students with refreshments, snacks and light foods. It’s a way to stimulate usage of the venue in all hours of the day. The restaurant is a versatile space to cater the different needs of the building’s residents and the neighborhood as a whole.

**GLASS FAÇADE**

A double glazing façade consisting of thick laminated windows with 150 mm spacing together with stone walls of stacked slate give an industrial appearance in accordance with Griffin Town’s past. The thick glass and big spacing give the necessary façade sound reduction. A further reduction improvement is achieved by using different glass thicknesses for the two windows and covering the frame in the air gap with mineral wool. A perforated metal foil covering the mineral wool adds to the industrial look while still being acoustically translucent.

**WARDROBE**

The main wardrobe on the ground floor functions as a sound barrier. The additional wall and the absorbers of coats, textiles and fabrics help secure optimal acoustics in the auditorium.

**LOADING DOCK**

The loading dock is situated on the south corner of the building to isolate noise from sensitive areas in the performance hall. In connection with Rue Jean d’Estrees the loading dock transports gods down to the scene shop, stage and storage with a two story lift.

**GREEN ROOM**

In the versatile green room extending over two levels, the performers, musicians and employees have a place to relax and unwind. It’s located in a near proximity to the stage for easy access and in a quiet part of the building. The nearby staircase leads you up to practice rooms and dressing rooms, or down backstage.

**INDOOR/OUTDOOR SPACE**

The building’s orientation provides the south side with an acoustic shadow. It becomes a natural meeting place where the audience move towards the auditorium - surrounding the heart of the building. The glass façade is open and inviting while thick slate stone walls mask the auditorium making it private and alluring.

**GIFT SHOP**

The gift shop embodies the spirit of music, both as a service for visitors with a big interest in music and arts as well as for students and local artist to display and sell their work. As a layering and barrier between the lounge and the active wardrobe/bathroom area, it becomes a natural focal point in the lobby.

**LOBBY**

A combination of an urban, vibrant restaurant with calm and tranquil lounge areas, together with the many visitor services form a flexible and welcoming space. The lobby is an invitation to a musical experience, taking the visitor on a journey into an incredible world of song, dance and theatre.
The auditorium has three different acoustic modes: Concert, opera and lecture. It is designed for the background noise criteria RC 15 due to its noise sensitive use. A double wall consisting of two thick concrete layers with mineral wool in the cavity is used for the hall’s outer shell, and the audience entrance is designed as a sluice with quiet closing doors and absorptive materials in the ceiling and walls to minimize noise transmission from the lobby when the doors are opened.

The stage reflector and ceiling provide first order reflections to all seats and to the performers on stage and in the pit. Clarity is important for the listener’s word perception. A relatively high clarity for singers on stage makes it a suitable venue for operas where perception of the lyrics is desirable.

All seats have unhindered sightlines to the stage. The balcony fronts consist of a hard reflective surface covered with brass piping for scattering. This gives an old industrial touch.

The room formed between the inner and outer auditorium shell will also contribute to the noise reduction from the lobby. A silent ventilation system is also required in order to fulfill the background noise criteria. Large variations in the acoustical properties are needed for the three modes. A short reverberation time and high clarity is necessary to achieve good speech intelligibility in the lecture mode. The opera and concert modes need longer reverberation times to support the singer and the orchestra.

An adjustable ceiling height and an openable inner shell makes it possible to change the room volume and thereby the reverberation time. Stacked slate stone of varying depth is used on the inner shell for its scattering properties and rough and industrial look. This surface roughness prevents coloration of the reflected sound together with irregularities in the stage reflectors, ceiling and balcony fronts. A minimum distance of 1.5 meters from the audience seating and the walls give unnoticeable difference in sound arrival time at the listener positions.
Light slipping through the openings in the inner shell guide the audience on their way into the auditorium. Winding balconies in two floors extending from the back to the side embrace the main floor seating and give an intimate feel.

This intimacy is further enhanced by a ceiling height of 15 meters and a maximum distance of 30 meters between the audience and performers. All seats are directed towards the stage, making the angle between the stage and audience less than 30°.

The side balconies are sloping towards the stage, ensuring good sight lines at all seats. Movable seats on the second balcony offer flexibility and allow standing public under graduations and other big events.

The first floor side balconies only overlap the side isles and the lowest under balcony ceiling height is 4.5 meters. This ensures envelopment and spaciousness for all audience positions.

AUDIENCE SEATING
Visitors are welcomed in the spacious lobby with cloud like absorbents floating above amongst thin light fixtures. The porous absorbers are fixed on top of perforated plates and suspended from the lobby ceiling to reduce reverberation time and noise buildup. The ground floor lounge, gift shop, wardrobe and box office are centralized round the staircase and elevators. Toilets are located away from the auditorium and on all main floors, with the largest one level down serving the main floor.

On performance nights there are several locations to find refreshments. A restaurant situated on the ground floor serve food and coffee and in addition there are several lounge areas with bars and serving carts for socializing. Linking the venue together, slatestone is featured as a façade as well as an outer auditorium wall and throughout the building. Bringing some of the outdoors and the industrial fell of the neighborhood in to the building makes it an urban, interesting and inspiring space for performances and creation.

The rehearsal room serves a multiple of purposes: dance, chamber and choir music, meetings and lectures. Variable acoustics is a necessity in order to accommodate the different requirements in reverberation times spanning from T30 values of 0.6 to 1.8 seconds for meetings and chamber music, respectively. A ceiling height of 4.5 meters gives a large room volume and longer reverberation time. Acoustic blinds give a scattering wall and can be opened for reduction of the reverberation time along with thick and heavily draped curtains. Scattering is further enhanced by irregularities in the ceiling, preventing coloration of the sound together with non-parallel walls that eliminate flutter echo. A heavy floating floor prevents impact noise from spreading to adjacent rooms. Double windows mounted in separate frames without rigid connection provide daylight while still accommodating the need for high sound isolation. The window’s sound reduction is further improved by slightly slanting the window glass.

The mechanical equipment room is placed on the underground floor to avoid vibrations spreading in the structure. Sound and vibration isolation is achieved by building it as a “box in box” construction with heavy double walls and floating floor in concrete. Spring-supports isolate vibrating machinery and heavy machinery is supported at the foundation. Piping does not have rigid contact with the walls in the conduit entries in order to reduce vibration transmission, and airborne sound is isolated using mineral wool and grout seals.

The scene shop is built using the same construction as the mechanical room for maximum sound reduction. Absorbers cover the ceiling and upper parts of the walls to reduce the noise buildup inside the shop. A double door design with heavy sliding doors in separate frames ensures the sound reduction required between the scene shop and backstage.
The practice rooms are built using the same “box in box” construction as the rehearsal room. Scattering is introduced by irregularities on the wall and in the ceiling, and an angled wall to prevent flutter echo. Reverberation time can be adjusted with a thick and heavily draped curtain. Longer reverberation times can be achieved by using an electroacoustic system such as LA-RES.
The auditorium has three distinct modes: concert, opera, and lecture. It is designed for background noise criteria RC 15 due to its noise sensitivity of the backing concrete layers with mineral wool. Two thick concrete layers with mineral wool in the cavity are used for the hall's outer shell, and the audience entrance is designed as a sluice with quiet and sound walls to minimize noise transmission from the lobby when the doors are opened. The noise level between empty and occupied halls is also required in order to reduce background noise.

The concept of layers is desirable in the design of a reverberation system, as it can provide the auditorium with a suitable reverberation time for different performances. Thick upholstering minimizes sound in the pit. The concept of layers is further enhanced by the ceiling height of 15 m and maximum depth of 38 m, which allows for reverberation times of around 2.5 seconds for the first side, 3.0 seconds for the middle, and 3.5 seconds for the last side, making the auditorium suitable for chamber, while it also gives an old cinematic atmosphere.

Audience seating
Light slipping through the openings in the outer shell guide the audience on their way to the seating. All seats are directed towards the stage, giving a strong and direct sightline to the performers on stage and in the pit. The seating is organized in three levels to provide an unobstructed view of the stage. The seating is also designed to provide a good view of the stage for all seats.

The concept of layers is reflected in the pit design, helping to achieve a strong and direct sound. The concept of layers is further enhanced by the ceiling height of 15 m and maximum depth of 38 m, which allows for reverberation times of around 2.5 seconds for the first side, 3.0 seconds for the middle, and 3.5 seconds for the last side, making the auditorium suitable for chamber, while it also gives an old cinematic atmosphere.
**Lobby**

Visitors are welcomed in the spacious lobby with cloud-like absorbers floating above amongst thin light fixtures. The sliding doors in separate frames ensures the sound reduction required between the scene shop and backstage. The mechanical equipment room for maximum sound reduction. Absorbers cover the ceiling and upper parts of the walls to reduce the noise buildup inside the shop. A double door design with heavy absorbents fixed on top of perforated plates and suspended from the lobby ceiling to reduce reverberation time and increase acoustics. The ground floor lounge, gift shop, wardrobe and box office are centralized round the staircase and elevators. Toilettes are located away from the auditorium and on all main floors, with the largest one level down serving the main floor.

**Mechanical Equipment Room and Scenshop**

The mechanical equipment room is placed on the under-ground floor to avoid vibrations spreading in the structure. Sound entries in order to reduce vibration transmission, and airborne sound is isolated using mineral wool and grout seals.

**Reflektion**

"Efter avslutandet av ett stort projekt känns det som om inget kunde gjorts annorlunda, eller att allt kunde ha varit annorlunda om bara ett tidigt beslut hade ändrats.

I vårt projekt har focus legat mycket vid själva akustiken och designen kring denna samt miljön/platsen och dess omgivning. Detta har satt tonen för hela processen som helstän var ett sammarbete mellan 3 individer. Ett grupparbete först där just arbetet samarbetar är nyckelordet.

En öning i att formulera sig enkelt, tydligt och korrekt och att utnyttja samspellet mellan oss till att skapandet. Allt en utmaning i sig utöver det för oss grundläggande arkitektoniska i projekterandet.

Att för första gången få samla de kunskaper vi lärt oss under de snart 3 åren på arkitektur & teknik till ett så betydelsefullt projekt som kandidaten. Jag känner nu att cirkeln har slutt sig med de mål och önskningar som funnits sedan starten. Vi har blivit nyckspelaren, mitten pussliten och bron mellan världarna av arkitektur och ingenjörskonst.

Sedan har projektet inte alltid lackat fram de bästa sidorna och det har varit många timmar av slitet och stress. Nu i efterhand om jag hade fått möjligheten att arbeta vidare med projektet så hade jag valt att utveckla konceptet mer. Förtydliga och kanske tidigt valt en mer tydlig inriktning/profil och sedan framhåvde detta mer.


Jag är otroligt stolt över mitt kandidat arbete och anser själv att det är det bästa arbete jag gjort (hittills). Bland många andra tävlingsförslag är vårt genomarbetat med en nu djupare förståelse för akustik/planering och arkitektur.

Tillslut en så har jag även fått en insikt i världen utanför skolan, här där det hålls en skyddande kapa över oss elever. Att nu ha blivit granskad och kritiserad, synad i sömmarna och kommit ut på andra sidan fortfarande inspirerad och motiverad känns otroligt bra. Min lärdom är att detaljer är viktiga och vikten av planering, noggrannhet och struktur har inte gått mig förlorad."

/Emma Blomqvist maj 2013