

Concerns of the designer

The concerns of theatre, the concerns of architecture.

L(Renz).C.J. van Luxemburg

Acoustics matter(s) of reflections?

Building a new theatre involves a lot of basic questions to be answered before the design can start. Is the theatre meant for a special theatre group or just meant to facilitate all kinds of performances? Even in case of a symphonic concert hall nowadays all kinds of different performances have to be possible. It is not always evident who is leading the design process: the client, the architect or the future users?

The role of the acoustician, on the one hand, is to support the architect and to guarantee maximum quality and functionality to the client at the same time. As long as both are in the same line no problems will occur. The designers approach is a research oriented one, close to the scientific acoustic approach. Does a traditional approach guarantee quality? Directors can also have a different attitude: exploring or institutional.

Being responsible for the acoustics we often are confronted with this dilemma.

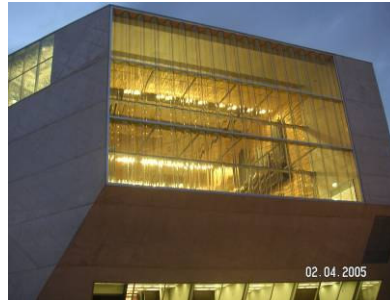
Examples of projects we worked on with some unconventional architectural and unconventional scenographic approaches are presented in this paper. The acoustic approach in all these projects was focussed on maximum freedom for the architect and client by controlling the acoustic energy propagation in the hall. This implies understanding of early reflections and sound distribution. Flexibility or multi-use in our understanding should not mean a lot of mechanical or technical modifications. The theatre itself must be able to adapt to the different use. To be able to control room acoustics also the sound transmission has to be controlled.

I hope these projects will give enough material to discuss the developments in the field of Architecture and Theatre. Striking nowadays is the architectural obsession for open performance spaces and flexibility. The theatre as a building opens to the outside.

The first project refers to the design of the **Casa da Música in Porto**. This project has been inaugurated April 2005. The brief asked for a symphonic music hall for 1500 people that can be modified for theatre/show spectacles and a small auditorium for chamber music. The architect designed the halls opening to the outside. The main auditorium for instance has glass on both sides looking out to the city, protected by foyers as an acoustic buffer.



Interior view sala 1 (bron Hoekstra)

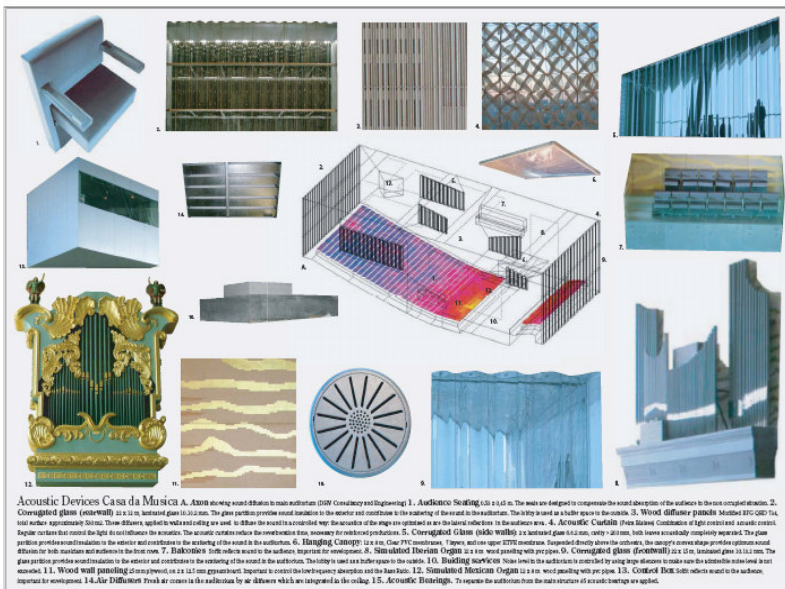


The concert hall seen from the square



Casa da Música

As a consequence the hall has a shoebox shape. No rear balcony is taken into account. Also the number of side balconies is limited. Diffusing elements in the wall look after the lateral reflections (kick down) necessary for the musical envelopment. Important in a concert hall is to distinguish stage-acoustics from audience-acoustics. For the latter a canopy above the stage is used. Because of the windows this canopy also had to be transparent.



The foyer looking out to the square

The main auditorium with the acoustic devices

The transparent front and rear walls had to contribute to diffusing the interior sound field. Therefore a smooth surface was not acceptable. The architectural concept also implied a solution with enough sound insulation as the building is situated in an exceptional noisy environment. Noise loads of 75 dB(A) had to be taken into account.

In a concert hall no technical provisions for theatre lighting are commonly foreseen. In Porto lighting galleries have been integrated in the ceiling and even a moving technical bridge has been designed. The stage has moving parts. Only two side balconies have been designed. Windows connect the hall to adjacent spaces like a cyberspace, educational and VIP Room. Heavy, special designed, curtains control the acoustics for show and theatre. A part of the possibilities for the use was mentioned in the brief, but a lot came in during the process. Flexibility and multi-use were key words, however no concessions with respect to the quality of symphonic music were accepted. So all the extra theatre technical provisions had to be compensated.

To be able to guarantee the acoustic quality of research proved to be necessary. Shape and acoustic performance of the glass has been studied, as well as the acoustic behaviour of curtains and lighting galleries. To be able to solve such a problem, standard knowledge of the design of a concert hall is not sufficient. The glass became curved, a shape that has been studied in computer models and scale models in the acoustic laboratory as well. As the stage position is low compared to the big windows sound incidence is always on an angle. This was one of the reasons to accept the curved glass.

Because of the sound insulation requirements the main auditorium is constructed as a box in a box: outer box with walls of 1 m concrete, a floating concrete inner slab with gypsum cladding and a concrete roof. It proved impossible to support the heavy windows in the inner box so we considered a construction with a frame held by the outer box keeping the inner window free from the inner box.

In China we are involved in the design for the new headquarters building for **China Central Television**. Part of the complex is a five star hotel building with a 1500 seating television theatre that also can be used as a regular theatre open to public. In a theatre with such a capacity natural speech intelligibility is impossible. The design is a huge television studio to record very big shows, with all its technical provisions and a fixed audience supporting shell. In such a television studio the comfort for the audience is of minor importance, but for this theatre the client insisted on maximum comfort for the audience. Because of the size of the theatre it was obvious that the acoustics mainly have to be controlled by the use of electro acoustic devices that distribute the sound to the audience.





Architectural impression of the CCTV television theatre and the foyer.

The stage area can be varied in height; seating can be stored under the floor. The volume of the theatre is approximately 85,000 m³, fly tower and backstage included. In the first concept the theatre was open to the lobby and all the other public spaces of the hotel. Because of security, fire regulations and visitors control the theatre changed more and more in an enclosed space. The acoustic concept: creating free field conditions with a lot of sound absorbing material has been kept.



The theatre of CCTV under construction

From a scenographic point of view the use as a television theatre flexible seating around the stage is interesting. Acoustic modelling is used to check different seating dispositions. The electro acoustic installation is used to control the sound in other settings. In small settings natural acoustics still are possible by using reflectors.

In **Dallas** a 600 seating theatre for the **Dallas Centre for Performing Arts** is under construction. The architectural concept is quite confronting and challenges the Dallas society. This theatre, together with the other buildings in the arts district, wants to bring people to the theatre and bring the theatre to the outside. So the result is an extrovert design, for which the control of sound transmission between interior and exterior is essential. The building is approximately 30 m x 30 m. The chamber is located on the first floor. The lobby is situated under the chamber and all the other spaces are stacked.



Design for the Charles and Dee Wyly Theatre

The design shows an audience area controlled by stacked balconies that can slide sideways and upwards. The seating in the parterre can be fully stored on level -2. The flexibility of the chamber varies from a common proscenium configuration to a thrust theatre, an arena theatre and even to a complete flat floor that can be visually and physically open to the outside.

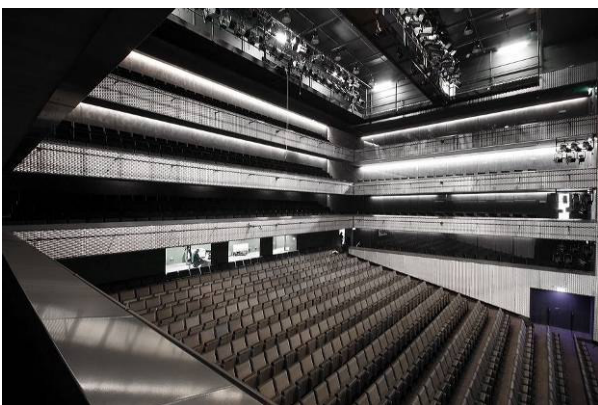
To a height of 9 m, the walls are transparent, in the shape of operable windows. Light is controlled by blackout devices. With these facilities the theatre can function as a drama theatre, completely isolated from the outside, the outside world can be allowed to come in partly or the hall can be fully exposed to the outside. By opening huge window parts the theatre opens to the outside world. The director of the theatre is very excited about the possibilities this machine offers him.



Architectural concept with respect to the use of the chamber

His main worry though is to control the noise from the outside. This is exemplary for the design of new theatres: everything must be possible but with keeping the high quality we are used to. This implies that from an acoustic point of view we have to design for the extremes.

In **Almere** a new theatre will officially be inaugurated June 2007. **The theater** with a capacity of 1050 is designed by SANAA. Beside drama, show and dance, the theatre is also fit for opera and symphonic music. The acoustics for the opera have been adapted by adding a huge air volume above the chamber ceiling that is connected to the chamber by operable panels in the ceiling. Furthermore glass panels behind the lateral balcony seat will help to get a more lateral sound field.

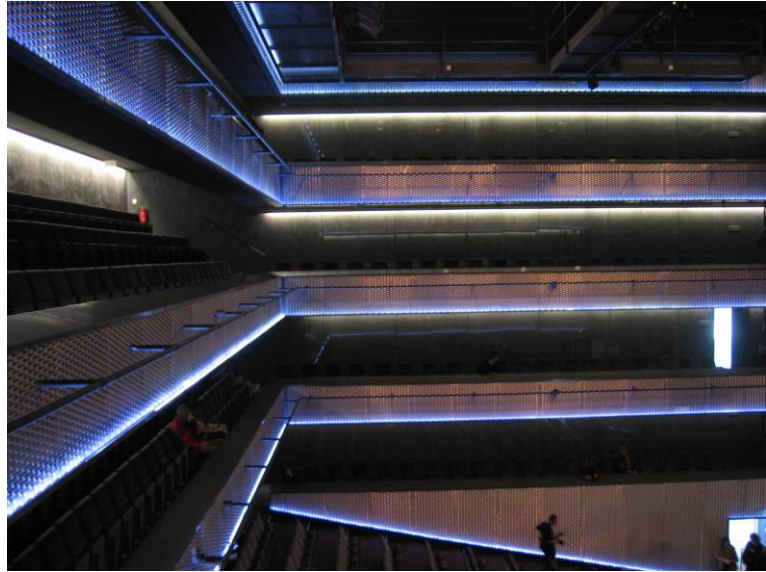


The new theatre of Almere

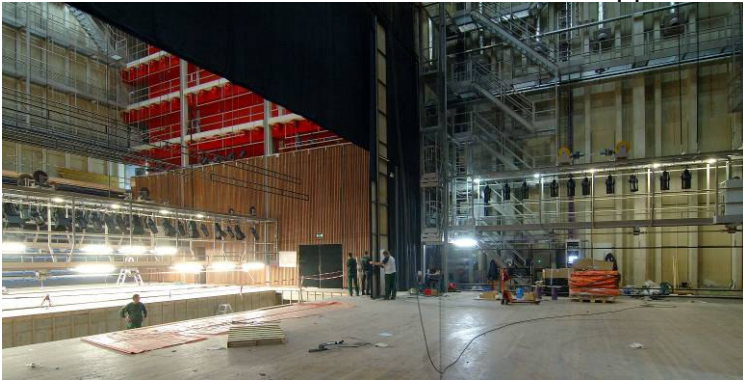




The new theatre of Almere



Finally a 500-seat hall in **Eindhoven**. Next to the existing 1000 seat theatre , an extension with a middle-sized hall was desired. Financially the theatre is doing very well. In the discussion with the architect it proved that the client did not want a traditional hall or black box. As a compromise the concept of the Teatro Central of Sevilla was chosen. Because of its location the side stage has a window that can open to the park in which case the window opening can function as a proscenium opening from both sides. Sound insulation from and to the environment was an important issue. Because of this the new hall has been constructed as a free concrete box supported by acoustic isolators.



The 500 seat auditorium in Eindhoven



Flexible reflectors above the audience control speech intelligibility in all possible configurations

All preceding examples show that we have to design possibilities instead of solutions. In dialogue with the client, the architect and the users, pros and cons of these possibilities have to be discussed and choices have to be made. The role of the acoustic expert is to reflect on concepts from his perspective, rather than to bring in proved solutions. Our approach is to create conditions in which we can control acoustics by energy. We try to avoid acoustic dominant solutions, as well as too complicated mechanical technical solutions.

Notwithstanding the fact that the acoustics are a very important issue in the whole design of a theatre, visitors however experience the total of the building and its operation.