

FOLDING FAN

Bachelor Thesis of Architecture and Engineering 2018

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INTRODUCTION

The scope of this project entailed the design of a municipality building featuring a community hall and a courtroom joint by a common lobby, complete with related rooms and functions. A major component of the design process included room acoustics for the courtroom and community hall, as well as building acoustics for the entirety of the project.

The chosen location was Gretna, a suburb of New Orleans (LA). This provided the opportunity to draw inspiration from the rich Creole architecture heritage of the region. Guided by this background, materials, colors, and shapes of windows and other building parts were chosen. The most prominent evidence of this can be seen in the facade facing the river, which lends its motif- the folding fan- from Creole architecture. The site also inspired the creation of exterior spaces that provide shelter from the rain, which is a frequent element of the region.

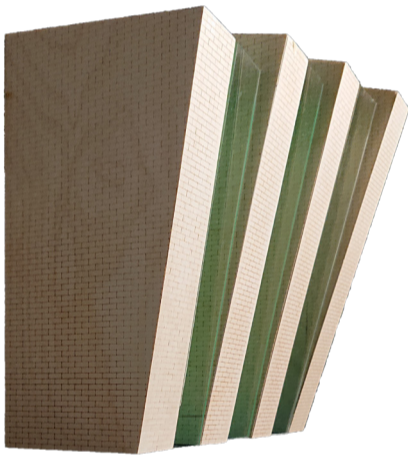
Other core values that informed the project were ideas of transparency, visibility and equal treatment of any person somehow subjected to the building, as well as the strive for a residential, relatively intimate architectural language, as to invoke feelings of civilian possession and benevolence rather than fear of the institution.

FOLDING FAN

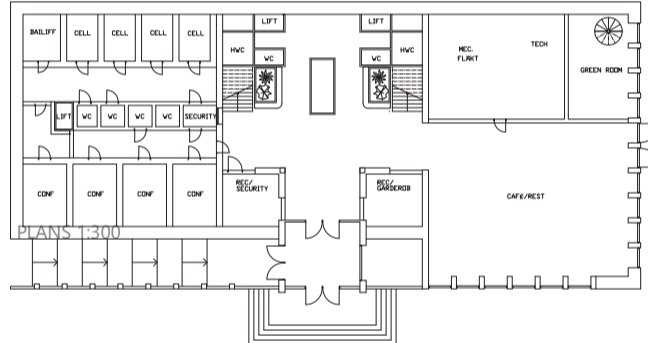


A dramatic fan shaped façade made up of brick pillars folding out towards the river, offers this New Orleans suburb a sumptuous yet intimate municipality building with a creole touch.

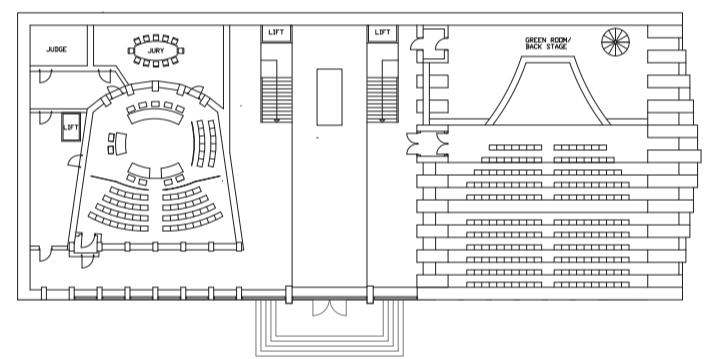
The pillars appearing in the exterior façade, in the community hall, and in the courtroom are a part of the acoustic concept. Different blends of mortar make the construct absorbing, reflective, or a mix of both, making pillars and walls diverse in finding good quality room acoustics.



1st FLOOR



2nd FLOOR



EXTERIOR NOISE CONTROL

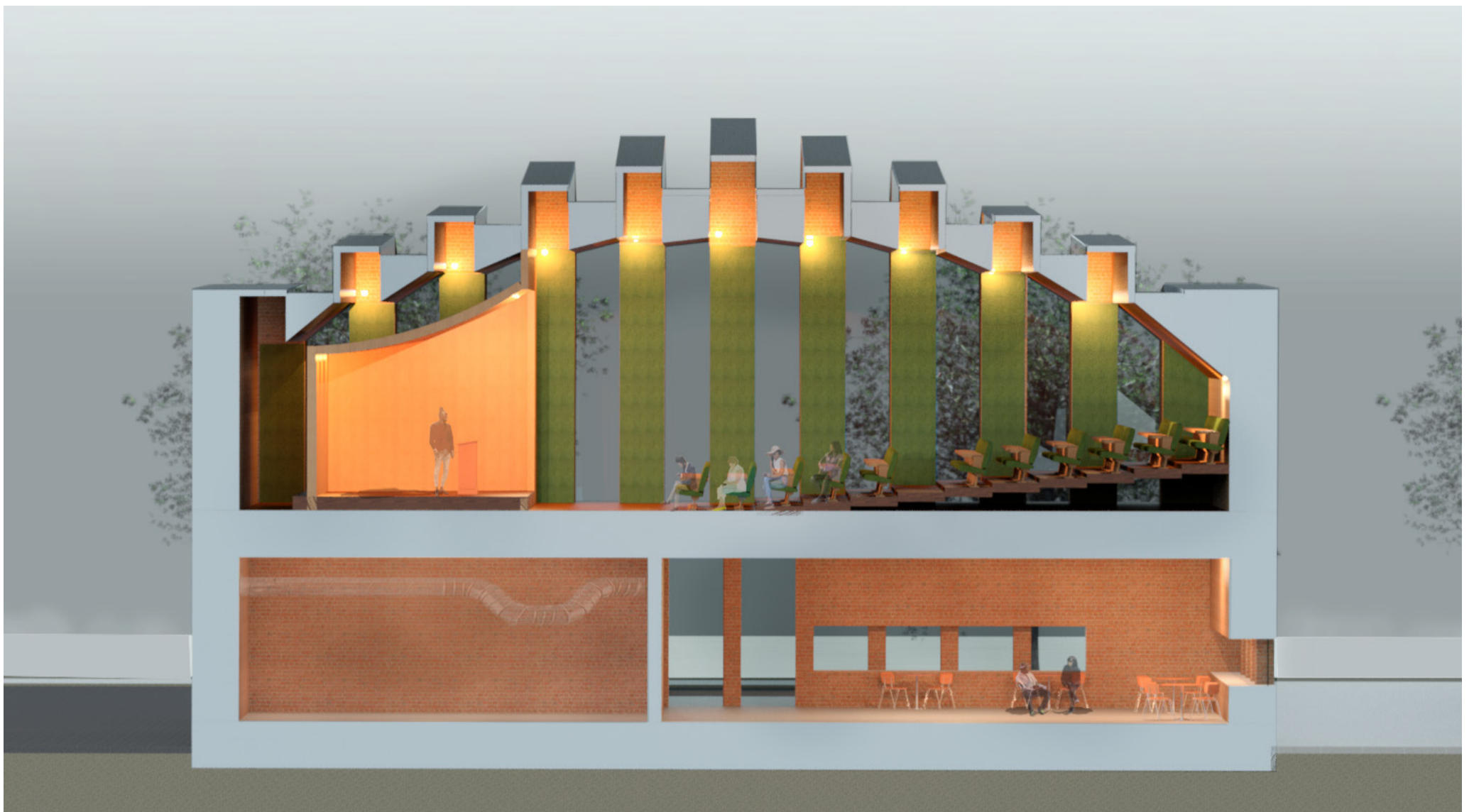
Going through the double doors leading into the lobby one leaves the city noises behind. Vibrations going through the ground are handled by decoupling the building with a permanently elastic foam rubber layer surrounding the buildings concrete foundation, decoupling at 15 Hz.

Heavy brick walls with batt insulation and resilient channel connecting the interior wall reflects the airborne exterior noises. All fitted windows are double glass where the two panes of different thickness are coated with a PVC foil. Between them a gas mixture further reduces exterior noise.

INTERIOR NOISE CONTROL

In the foyer, plants are placed in large boxes of dirt which in combination with the mortar in the brick walls dampens interior noise coming from people and the restaurant. The room housing airhandlers and electrical equipment are placed on the ground floor. Decoupling it from the rest of the house makes sure no vibrations are transferred from the mechanical and electrical equipment. Ample space for the HVAC system is allocated in the thick walls, floor and ceilings. Effective silencers make sure no sound is transferred between rooms by the airchannels.

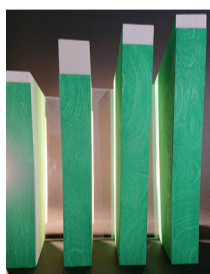




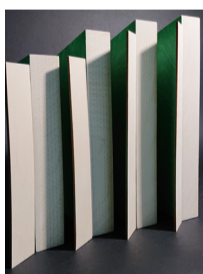
COMMUNITY HALL

Large windows open the city hall to the outside world, showing a glimpse of the ongoing political debate. Windows in the beams above add to the natural light entering the room.

An intimate seating arrangement with the furthest seat 15 m away from stage make sure that every word and facial expression is perceived by the audience. At 800 m³ or 4 m³/person the space is serving its main purpose of being a space where ideas meet and voices are heard.



Open/ Speech



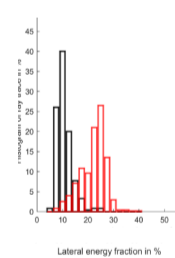
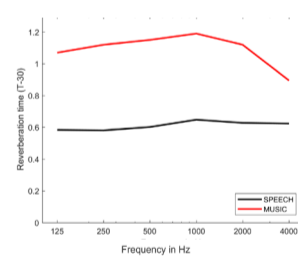
Closing



Closed/Music

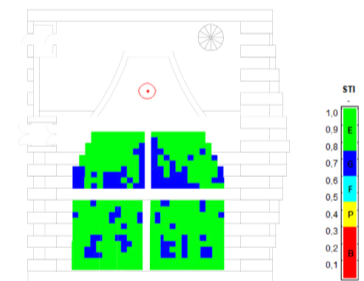
FROM CLARITY TO ENVELOPMENT

The reflections at 60-400 ms coming to the listener from the sides contribute most to a sense of envelopment. Early reflections from the ceiling contribute to a high speech intelligibility and localization. Our community hall is therefore easily adaptable to both scenarios.

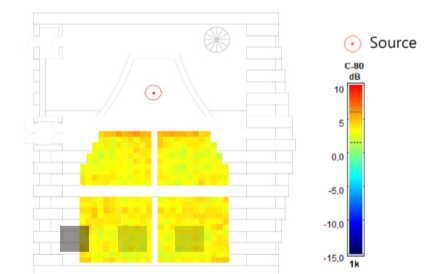


SPEECH

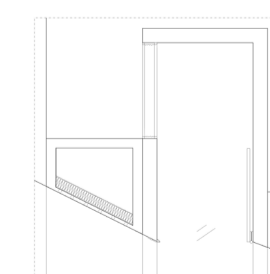
Folding windows closing the gap between beams create one big reflector optimized for even distribution of sound in the seating area. Absorbents on the doors covering the brick pillars, and on one side of each pillar removes reflections that are not from the ceiling. Thus making the room great for public speaking and theatre.



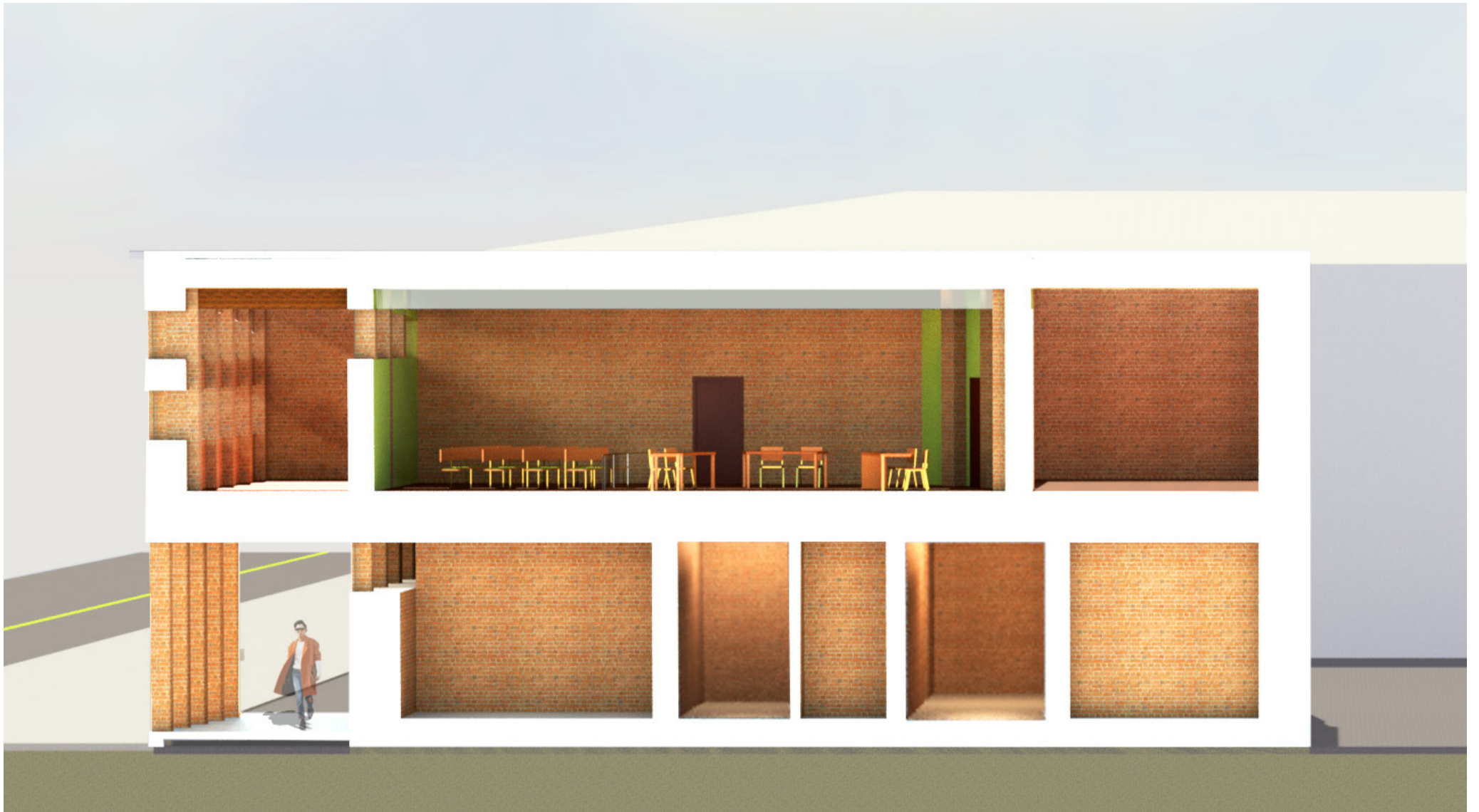
Excellent STI with strong ceiling reflections



Even distribution of C-80 with closed walls



Helmholtz resonator and closable resonating ceiling window



COURTROOM

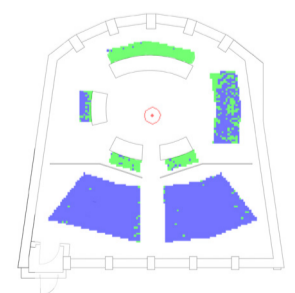
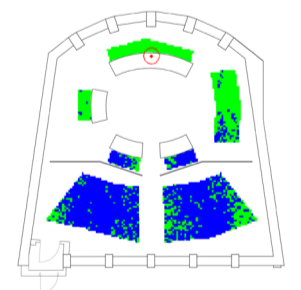
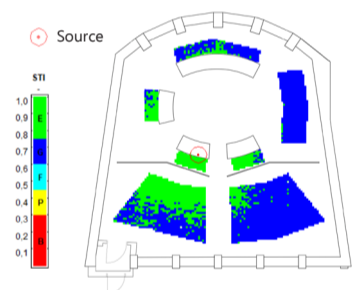
INTIMATE SOUND CLIMATE

Spectators enter through double doors in the back corner of the courtroom, ensuring no sound exits the room unwittingly. The walls surrounding the courtroom with its connecting jury and judge rooms are built heavy like the exterior walls. Flanking transmission is handled by having insulation interlayer at the junction where the ceiling or floor of two rooms meet. The pillars and walls are fitted with sound absorbing mortar making speech direct and intelligible. At 480 m^3 or $6.4 \text{ m}^3/\text{person}$, the room is spacious yet intimate.

HEIGHTENED EQUALITY

The different functions of the courtroom are made apparent by a traditional and expected placement of furniture, leaving out hierarchy by levels. The overall layout of the room instead channels a natural focus at the oval litigation area. This arrangement has been chosen to enable clear sightlines for everyone attending.

SOUND QUALITY THROUGHOUT



REFLECTION

The greatest strength of this project I find to be the usage of brick, and especially mortar, as a flexible material that can be adapted to the various desired room qualities, in terms of acoustics. This important concept however, arose quite late in the process, and there was hence not enough time to elaborate on the workings of it in detail. I would have liked to substantiate these claims (of mortar as an acoustically flexible feature) by further research on the composition/blend of the material, and new simulations where the findings of the research were included.

As to the design, structure and aesthetics of the project, I find the appearance of the facades and interiors of the community hall and courtroom quite pleasing, and attesting to the Creole inspiration I had throughout.

However, regarding the structure and its aesthetics (especially in the community hall), there is an inconsistency between the general construction logic of brick, and our design. Given that brick was such a dominant and fundamental concept here, that is quite lamentable. It is most obvious where the slanted columns and windows of the community hall meet the roof, and the beams of the roof do not rest on the pillars, but are wedged in between, above the windows. This is not at all a logical construction method when working with brick.

But the reasons for this design being conceived in the first place, was to accommodate our acoustic concept of transitioning from strong ceiling reflections to strong side reflections. This would not have been possible without the alternating columns and beams and thus the creation of spaces in between them in the ceiling and exterior wall, which allowed for collectively opening the wall spaces while closing the ceiling spaces, and vice versa. So for this concept to be truly successful, I would have liked to find a way this method could be used while remaining true to the building logic of brick. I would also have liked to elaborate more on how the acoustic doors meet the roof and beams, because it does not really look finished.

As to the graphic representation of the project, I realize in hindsight that sectional perspectives were maybe not the most telling images for the community hall and courtroom. It might have been more useful to focus on creating a couple of more perspectives to showcase the beauty, light and visual sequence of moving through these rooms.

The acoustics were well calibrated and the desired values were achieved, so in that respect the project was a success.