

Reflection on Graduation

Part of Architectural Engineering Graduation Studio

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Focus - This reflection paper aim at the results of the research and design in the graduation phrase (process, product and planning). It reflects on the relationship between the research and the design, the theme of the graduation lab and the subject, and the methodical line of approach of the graduation lab and the method chosen by me.

Abstract - The graduation started from the seismic studio of architecture engineering and designing a earthquake proof architecture. The context of the design in located in the historical garden of Uithuizen in Groningen, which is a potential seismic area. The research is based on the three different areas in seismic principles, biomimetic structure and climate. The final design is based on responding to the environmental, historical, social and seismic context with the method which I researched in the first part. The program of my design is a botanical education center for young children in uithuizen. As for technology part, I chose the solar-tracking panels and intelligent light diffusion glass to achieve my final goal: communicating with nature in the ways of architecture and human experience.

Key words -

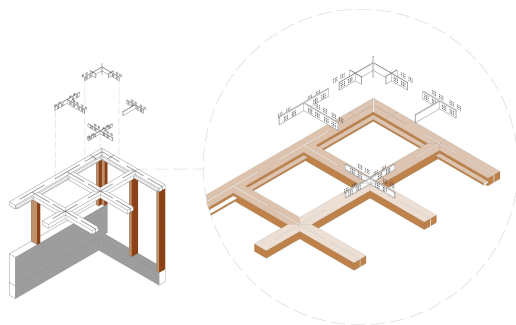
The Architecture Engineering, Seismic, Biomimicry Architecture, Nature, Responsive technology

Research & Design:

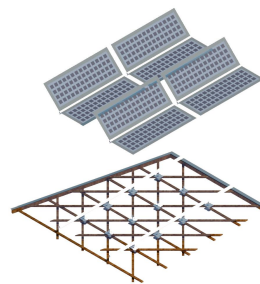
For me the relationship between the design and research is hard to separate. The design is a list of questions with multiple choices, which is a constant decision-making process. The research on the other hand is a process for infinitely expanding the choices. It is very hard to divide the research and design. For me the question of design concerns in all different areas, for instance the function requirement which is the amount and quality of the incoming light, or the seducing atmosphere of the transparent spatial experience, or the structure proposal to dissipate the earthquake energy in a more rational way. Each part of the design is a decision-making process. Every answer you gave comes from the choices collected by the research.

1. Structure proposals:

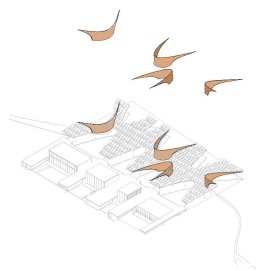
In the design of the botanical garden, my research question is, how to integrate the responsive and light weight structure into seismic architecture. Therefore I research the basic seismic proof principles and extensive collections of bio-mimetic structure as the toolbox for my future choices, which is not only the answer to the structure optimization, but also probably offering the inspiration and solution for my further design. To consider the right structure, two facts need to be considered. The plan arrangement of the building and the material property. Uniform arranged plan is chosen with the material of concrete which stiffen the bottom part of the building. On the other hand, Timber is adopted because of its advantages to dissipate the earthquake energy. Finally I choose the light weight timber structure and fiber membrane as my structure due to its flexible and lightweight property. The cross timber grid beam bring out the 18 meters span without leaving the columns in the middle, for the curved wall I use CLT (cross-laminated-timber) which acts as both vertical load-bearing elements to support the roof and the horizontal arch to resist the horizontal earthquake force. The roof of the pavilion is combined by three layers of cross-shaped battens. The fiber membrane is also advantageous for its lightweight and easily-change property as the water-proof layer above the timber roof.



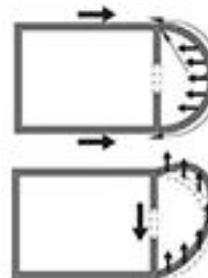
Cross-timber grid beam



Timber diagonal grid system & solar-tracking louver



CLT timber wal(Loading bearing element)



horizontal arch principle

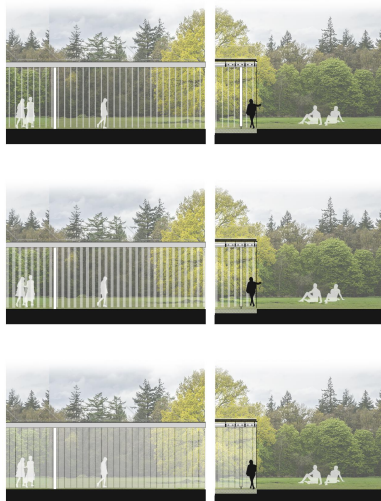
2. Energy gaining way:

My research is also about utilizing the bio-mimetic solutions to make architecture responsive to the environmental, therefore the architecture is not a static existence. Although I did not use the tree-shape structure or other types of structure, bio-mimetic approach is also appearing in my design as a form of solar-tracking louvers on top of the roof to seize the solar energy. The recycled energy system is where the biological systems stands in different from the linear and wasteful human-made system.

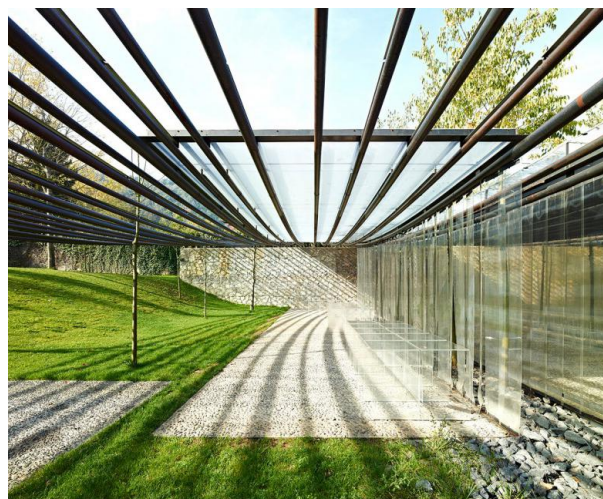
3. experiencing Nature:

As an architect, the question is always about the atmosphere, people's activities and spatial, visual and sensational experience. Therefore the questions are divided into two parts, how to make people feel the nature inside of architecture and how to create a communication between the nature and the people without feeling a definite boundary between inside and outside. An translucent boundary is designed by me with the transparent PVC vertical louvers, people can perceive the surroundings nature with vague or broad transparent sight view. The Earth Ground Museum designed by RCR is my reference in the case study, which gave me more inspiration and suggestions in people's ways of experiencing the museum. The similarity and the atmosphere can always be recalled by researching while i was doing my own design. These types of transformation and reinterpretation is my personal ways of learning from other design, which is not directly copied but a process of re-awaking similarity spatial experience process in my thought.

Of course the first semester's preliminary research is never enough for my latter design. Just like I said before, the design-oriented research is accompanying all the way of the design, which stimulates and make my design more and more abundant.



Transparent PVC louver of my design



Reference study from RCR Architect Company

Context & Theme:

The context in my site is a historical garden designed in 16th century, a quite traditional, classical garden design, all the elements are strictly arranged in the basic geometry shape. Therefore, I want to reinterpret a new garden in modern language, proclaiming that the architecture and human being should respect the nature, the rationalism can not conquer the nature itself. Firstly,

my botanical garden is an alien to the existing site at first in P3 period. How to reinterpret the garden and simultaneously invent into the site with new language is my question. As a result, I found the answer. Extending the existing grass into my design with several spatial assumptions, each one is cooperating with the specific botanical theme, such as herbal plants, seeds conservation, tropical room, forest pavilion, honey bee house and so on. During the P3 design process, in order to define the program clearly, I also research the botanical garden in Netherlands and have a program scheme for the further design. The program of the design is like the content of an article. In order to make the space compatible with the activities. The necessary research on the program of the botanical garden is done in time, which help me a lot during judging the spatial quality of the design.

Approach & Methodology:

The research method in this phase is mainly the design-oriented research. Especially for the structure design, In order to choose the proper and specific structure type in my design, the triangle truss system and fish-belly cable beam are both the choices in the preliminary research. I consulted the structure engineers in Arup and also considered the specific specific function and aesthetic requirements, the structure in the preliminary research are both abandoned by me.

The column plan configuration in my mind is not the orthogonal, so as to give people a sense of non-directional just like wandering along the forest, therefore after several weeks of trying out mistakes process, the structure engineers gave me the triangle grid system which perfectly fit into my design and also compatible with the seismic proof requirement. Although in the preliminary design phase I was worried that the curve form and the seemingly random positions of the columns are not in compatible with uniform plan principles, the final result in reverse transform the worries into the advantage for my structure. The curve wall is CLT acting as one part of load bearing system as an arch to resist the horizontal earthquake force.

The structure design is always integrated with the space, the construction part in the first research give me more confident and clear image in making decision of the latter design. Although the first assumption about cable-timber system does not realize in the latter phase because of more and more specific limit in design, The method concerning first broad then narrowing down into material and construction way help me out from the unsatisfying struggle in the design.

In conclusion, I think my structure design is also an integrated part of the space, and simultaneously under the guidance of seismic design principle.

Social Affection:

The design is resulted from the specific context in Uithuizen, the design can not be duplicated in other site. While the construction method and structure type can be a model for other pavilion design in nature environment.