

Reflection P5

Relation between design and research

- The design is closely intertwined with the conducted research. In the beginning the idea was formed to build a tall building out of laminated Guadua bamboo in the local context of Ecuador. How this was to be done or if it could be done was unknown. The first months were used to get a better understanding of the materials, the current possibilities of the industry and the challenges. Findings throughout the research have lead to distinctive design choices. Such as the dimensions and round edges of the building (optimization floor plan by wind study), Determined the elements used in structural build up: CLT Floor, wall elements (Timber, structural and technical research), concrete floor topping of floors (structural research) Char technique to provide sufficient fire safety (technical and timber research), Pres-compressing the structure using steel tendons (Earthquake and timber research), orientation towers, height towers, overhang, demountable structure (Sustainability study).

The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework (location/object)

- Doing building technology only gives one possible graduation studio: the Sustainable Design Graduation Studio. The studio demands sustainable innovation in building technology (Climate, Structure or Facade). The constructed research and design are clearly compelling to these two criteria in the category structure. Structural laminated bamboo is a new structural product with a lot of uncertainties of how to implement let alone try to build a multiple story buildings. It is also generally regarded as a sustainable material. The thesis tries to answer the questions regarding how to implement it, but not in a normal building, but in an extreme case scenario trying to show the capabilities and the limitations of the material and at the same time it tries to map its sustainability and explaining the relation between context and sustainability.

Author:	Robert-Jan Vos,
Student numbers:	4219015,
Date:	06/21/15
Location:	TU-Delft
Faculty:	Building Technology
Academic year:	2014-2015
Course:	Graduation,
Course code:	AR1AE015
Supervisor:	1st. Bob Geldermans, 2th. Rob Nijssen



Project deals with Building technology issues

The relationship between the methodical line of approach of the graduation lab and the method chosen by the student in this framework

- There is little difference between the methodical line of approach of the graduation lab and the followed methodology. The only difference would be an early choose of direction (tall structural laminated building), but a relatively late formulation of the main question.

The relationship between the project and the wider social context. Laminated bamboo, as structural component, is on a breakthrough point. In fact, there has been developed a good amount of research from different areas around the world (USA, China, Colombia, Europe) regarding laminated bamboo, and even a few houses, bridges and other structures are been built. However, it doesn't show all the capabilities of the material. Therefore, the constructing world, and especially, bamboo producing countries still have to acknowledge laminated bamboo as a structural material of equal (if not better) quality than concrete or steel.

Nowadays, it is considered as a poor man's timber. People in developing countries need to start regarding laminated bamboo as a proper building and structural material. Therefore, one of the aims of this thesis is to design a multiple floored building to show the structural and sustainable solutions and possibilities of laminated Guadua bamboo.

In general, the bamboo industry needs more investments and people believing in the product. A high-rise building could have a similar impact as the Eiffel tower had for the steel industry over 100 years ago. It could give a tremendous economic boost to developing countries that have extensive amounts of bamboo available.

Besides, bamboo is also considered as a very sustainable material if it is used in its local context. It could lead to replacing current steel/concrete buildings and replace hardwood applications, reducing land-use, carbon emissions and saving the rainforest.

Process review

Throughout the process two major mistakes are made. The first happened between P1 and P2. The period there was reserved for research and creating the boundary conditions. The mistake made was that I was lost in the amount of data available. Looking back weeks have been "wasted" to irrelevant studies. This is partly, because the objective was not clearly framed yet and partly because bamboo and research fascinated me and I started reading research which was interesting but not relevant. The second mistake was the way the company was approached. For my thesis I wanted to construct some test to see if the claims of the company are valid, because many factories claim values they can not achieve. My first attempts before P2 were not assertive enough, I waited weeks and just kept mailing them. The mails were however not responded. After my P2 I start calling them first in Europe and afterwards in the USA, but the company proved to be reluctant to cooperate. Just before P3 it was agreed that I would obtain materials from them. However the company changed its mind. Throughout an alternative way I still tried to obtain the material, but in this specific process order a mistake was made and the wrong material was obtained. Overall obtaining material has been very difficult, time and energy consuming and it might have been more interesting to try and laminated the material myself and see if the results are comparable. The amount of research done for this thesis has drastically increase my personal knowledge base, but because it was at times unfocused or not directly written done, not all can be found back in the report.

Results review.

Regarding the final products I'm satisfied. Personally I believe my thesis is of added value to the building environment. I was able to do physical tests, although it turned out that the wrong material from the company was obtained, but over all it was of added value to my report and to my educational experience. The results could have been better, at times I got lost in the research, but I also believe that the extensive research led to a more coherent design. I think my drawings of floor plans and so on have room for improvement, but time was too short to cover everything the way I would like to.

