

Reflection Paper – P4

Giuseppe Campo Antico

4454847

1. CONTEXT AND PROBLEM STATEMENT

The project is located in the port of Genoa, one of the largest ports in Italy in terms of tons of goods moved per year, and one of the main gateways to get access to central Europe.

The expansion of the city has reached its peak during the 80s and later, during the crisis of the heavy industry sector the port went through a process of abandonment, leaving behind empty buildings and warehouses.

The Hennebique building was dismissed during the 70s when grain silos became obsolete and a progressive shift of the port activities towards the outside of the city centre occurred.

The shift left behind an extensive area directly facing the sea, completely abandoned and with a high potential. In 1992 the old industrial old harbour was converted, thanks to Renzo Piano's masterplan, into a very thriving area full of leisure and recreational activities. Despite this mighty operation a small buffer zone between the new touristic waterfront and the cruise ship terminal was left out and nowadays it sits still, patiently waiting for a full renovation: **the area of the Hennebique building.**

An abandoned building becomes a plague in the urban quality of a city, but above all it represents an incredible possibility to develop and foster a new urban centrality. As a problem statement and as a starting point for my research I started looking into cheap construction methods and innovative ways of refurbishing the existing stock. In most of the cases the reason behind the inability to reconvert a building there is cost. Indeed, especially in the case of very old buildings that do not fulfil the requirements imposed by current regulation, sometimes it is cheaper to tear down and rebuild from scratch. **To avoid the unstoppable process of disruption of our industrial heritage, it is the duty of the architect to find feasible solutions to achieve quality results and respond to the need of the citizens to get back spaces that are already there, ready to be used.**

Moreover the area of Ponte Parodi (where the Hennebique building is located), has an incredible unexpressed potential. It is very close to educational buildings (University of Economics, and a high school), a museum (museo del mare Galata), wedged between the cruise ship docks that bring in 3 million passengers per year and the most touristic area of the city waterfront named Porto Antico. Ponte Parodi is also very well connected to the existing infrastructure: the train station of Stazione Principe with direct connections to the highway system and the airport. The old historical centre of Genoa is also one of the biggest of Europe, however, while the part adjacent to Porto Antico was positively affected by the 1992 renovation of Renzo Piano, the area behind Ponte Parodi didn't benefit from it and it is still considered to be a depressed area. I believe that given the incredible potential, such an intervention could have an impact which goes well beyond the scale of the single building, but it could have a positive echo effect on the whole area.

2. RESEARCH AND DESIGN AS A SINGLE PROCESS

I imposed myself a few objectives and restrictions as a first step. I tried to stay as close as possible to the guidelines imposed by the municipality on program, and the guidelines imposed by the heritage commission on monument preservation (the building, built in 1901, is one of the earliest examples of reinforced concrete in Italy). At the same time my biggest concern was to somehow being able to **push the boundaries of architecture, while maintaining the greatest possible degree of feasibility.**

I started by an analysis of the references, on one side looking into renovation projects and which kind of principles they followed, and on the other looking for cheap construction methods that allowed to have maximum results with a little cost.

After a keen analysis of the references I narrowed down the options to tensile structures, since they can be relatively cheap, they can cover big spans, and at the same time they fulfil the need to embody my personal fascination for high-tech thin structures into an architectural form. During this step I was fascinated by the approach of Frei Otto and the advantages brought by light structures, but I quickly realized how a purely tensile/fabric structure did not respond to the idea that was starting to rise in my mind about the transformation of the building. I moved on to the work of Candela and Isler while keeping in mind the amazing studies that Frei Otto conducted on the physical behaviour of tensile structures. The common denominator between these architects is their shared vision of **the laws of physics as form generators: a form that adapts to the distribution of the forces, the idea of an architecture that finds its optimization in the passive reaction to the principles of physics. Their buildings do not contrast the forces but they accommodate them achieving structural efficiency.**

The merger of these methods brought me to the study of a construction technique known as “Fabric formwork for concrete shells”. The literature on this specific topic is quite recent and its implementation is not on the market yet, but I found the method so interesting and innovative that I wanted somehow to include it in my design.

The analysis of the references and the extensive study of the possibilities offered by tensile structure was of fundamental importance in order to lead my design towards a path, but at the same time a sketchy idea of the design concept was necessary to lead my researches into the right direction. I would say that “learning by design” and “reference analysis” were really useful tools when used together while proceeding both with my research and my design. Research and design proceeded together, keeping a fluid hierarchy between the two, instead of having a rigid understanding of the research as a prelude to the design, and the design as a mere consequence of the research. The research was guided by the design and vice-versa, a mutual relation that brings benefits to both of these two elements, or even better I would say that they were mixed and intertwined into a single process, a unique stream of thoughts and ideas that push and complete each other.

3. DESIGN SOLUTIONS AND STRATEGIES

As a result of the research I developed a method very much inspired by fabric formwork for concrete shells but at the same time I made a few changes in order to come up with a new solution which makes use of prefabricated beams, more beneficial for my project and that helped me achieving the architectural result as I envisioned it.

Referring to the main categories offered by the course of Architectural Engineering, my project was constantly on the edge between Stock and Make. Stock is about dealing with the existing urban fabric, the refurbishment of a building; but at the same time the researches into the possibilities offered by fabric formwork and concrete shells, and the development of a new construction method can very much fall under the label Make. Since in my particular case, as it can be seen in the design result, the intervention which makes use of fabric formwork is clear and limited to a portion of the building (along its main longitudinal axis) I had to develop another strategy to intervene on the parts of the building which were not touched by the concrete shell intervention.

I operated on two main levels, or we can call them, two separate workflows. On one side the concrete shell, and everything regarding what was underneath it (the market) and everything the dealt with its upper surface (the courtyard). Everything that is in relation to the surface doesn't follow the rigid grid given by the building, but it flows as the surface itself does. **It adapts to the given boundaries but it acts following the opportunistic principle of functionality and organic physical shapes.** Its funnels/columns and its cones/skylights are organically placed in the most strategic spots, but also its construction is in direct relation to the flow of the forces along the surface of the concrete shell. In this particular situation, while designing, all the tools relative to digital and analytical form-finding became very important in order to simulate the behaviour of a tensile formwork.

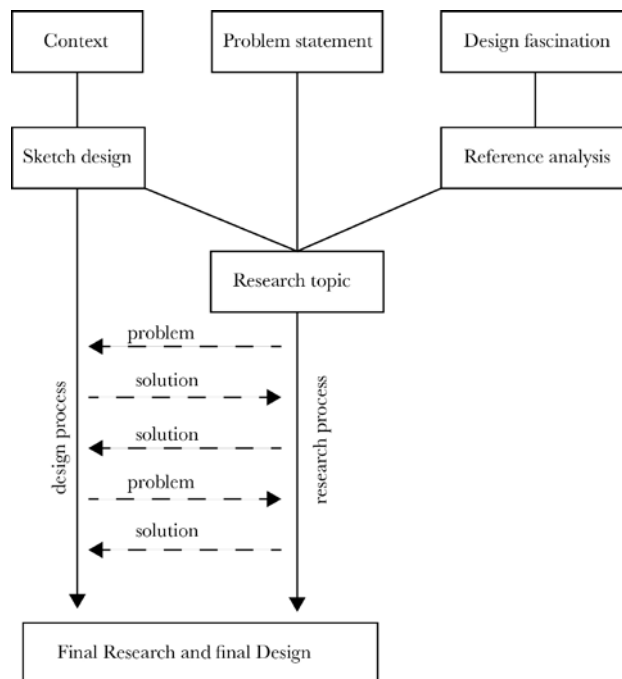
On the other hand I had to deal with the interior spaces where the silos cells had a major influence on the design choices. I tried to preserve as much as possible of the original structure and tried to fit the new program within the existing spaces of the cells, but in order to do so I had to cope with the rigid grid imposed

by the functional rigidity of the silos cells. Through a process of controlled demolition (in order to open up the cells and create continuous spaces) I found myself with a plan made of communicating rooms, without corridors but just 3x4m spaces flowing one into each other. As a strategy to break the rigidity of the grid I developed a system of configurable options. I developed several options for the market, the office, and the hotel that could fit into the grid, while at the same time giving the possibility to take advantage of the flexibility of a modular systems. All of these strategies can be seen as a way to rethink the **grid as a tool that gives freedom instead of a rigid tool that imposes restrictions.**

4. FINAL CONSIDERATIONS

Mixing the use of design and research tools during the process has been ultimately very helpful. Setting objectives for my design allowed me to refine the scope of the research. Moreover the research helped me figuring out new methods to improve my design and find logical answers to design problems, while at the same time giving more strength to the research itself. One of the greatest achievements during the thesis has been being able to develop a very personal method to tackle a design issue that also helped me to concretize the vision that I had for the building. One main critique I could move to the method I developed is that despite the fact that I started trying to figure out innovative and cheap methods to renovate buildings (a detailed analysis of the costs can be found in the research paper), in the end, given the newness of the method of fabric formwork, it would cost probably more than traditional construction techniques. The excessive cost would be related to the fact that it has never been used before in large constructions, hence the research and development costs would rise very quickly. However there is hope that through research and experimentation the method could become broadly adopted and hence much cheaper.

The process I followed through my graduation could be described as follows:



Towards my P4 I focused on the architectural expression of the building. Having a clear design goal and having a clear idea of the architectural tools that I wanted to use in the development of the design I tried to bring everything together in the most coherent way. I finalized and crystallized my ideas into built form, I went through the choices that brought me to this point in order to build up a clear story and a sound narrative. I believe that a coherent story which links research, design choices, impact on the context and atmosphere of the building can be a strong design when presented in a clear way.