REFLECTION PAPER

MARTIJN ALING

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1. INTRODUCTION

The graduation project of the architectural engineering track is divided into two parts. Firstly the technical research to the fascination, and secondly the integration into a design. The fascination for the graduation studio has been the climate adaptive façade, which constitutes a vital building component and a crossing point between the ambient climate and the building interior. These characteristics make it both interesting as well as quite unique.

Within this reflection of my graduation process, I will look back on the research and design phase, and the result of the interaction and combination between them. What was the initial approach and how did this work out? Furthermore, I will discuss the relevance of this graduation project within the studio of Architectural Engineering and Technology, and its relevance within a wider social context.

2. RELATIONSHIP BETWEEN RESEARCH AND DESIGN

From the first moment, my fascination was the driving force for the design. Consequently, a suitable program and building that could facilitate the idea of a climate adaptive retrofit (modified building structure) façade were added. The graduation project, as well as all other projects, started with research on site, which was the Marineterrein in my case.

Designing an adaptive facade with a mixed-use building program at a historic location within Amsterdam was a complex assignment, because I wanted the progressive innovative character of the location to be reflected in my program and façade design. The search for a proper building program was not entirely simple. I opted for a mixed program consisting of living, working and a restaurant function, which creates a dynamic and vital building, where energy flows can benefit from each other.

By demolishing the shock concrete façades of the former school building, the possibility arose to give the building a new expression.

For this, I was inspired by the Delft artist Jan Schoonhoven. By choosing an optimum between its geometric shapes and possible applicable adaptive sustainability measures, an integrated façade system was born. The balance between living comfort and an adaptive climate facade was reasonably paradoxical. Perhaps I had already reached a façade concept in an earlier stadium by zooming in and out more quickly on the different scale levels. Although many façade configurations are discovered, based on the roadmap from my research, it is also important to look at the aesthetic consequences (e.g. to get enough daylight).

From the start of this graduation, a number of preconditions have been formulated from the outset; is there government policy for this plot, is there a certain need within the neighborhood, within the city? With these simple questions, 5 main ingredients were defined:

- Transformation (vacant building stock in Amsterdam, lack of housing)
- Retrofit (circular)
- Mixed-use program

- Adaptive concept (optimized to climatic circumstances)
- The use of a modular system (light, adaptive energy saving)

Combinging these factors leads to the following initial overall research question:

"How can a redesign for existing vacant stock in Amsterdam reduce energy demands and save energy to become energy neutral?"

3. RELATIONSHIP BETWEEN GRADUATION TOPIC AND STUDIO + MASTER TRACK

The studio of Architectural Engineering focusses on a design-based and technological fascination called: technology driven architecture. The proposal for the graduation subject started with my fascination for energy saving and integration in facade components.

As an architect, you have a great influence on this and the studio of Architectural Engineering provides me with the possibility to do just that. The freedom of choosing my own graduation topic within the research field and of using these as pillars for my eventual design offers me the possibility to learn valuable new skills. Something else I have always really strived for is designing through all different scale levels, in this case that would be from a neighborhood scale to the detailing of buildings.

Architectural engineering is, for me, a highly relevant discipline due to its ability to discover architectural potential in technological advancements. In the AE studio we essentially conduct inspiring thoughts and inventions from more technical disciplines to explore their potential for improving our built environment.

My inspiration came from the field of climatic design, where the idea is emerging that buildings should embrace their climatic surroundings instead of fighting them. The optimistic approach of climate responsive design is all about discovering potential in resources such as sunlight, solar heat and wind.

When architecture is considered as a means to climatize space, it regains the potential to take control of these natural influences. The shape of architecture can once again become the primary tool for creating habitable environments, with the support of passive climate systems and, when needed, active systems.

This alternative approach to building design brings huge potential for buildings to reinforce the connection between human and nature. Integrating climatic considerations in architectural thinking has benefits that strongly outreach technical issues. Buildings that reflect their climatic surroundings are more contextual, which results in an enrichment of local archetypes, as climates differ around the world. In this way our built environment will become more in touch with nature, while reinforcing local identity.

By exceeding the traditional borders of architecture in my research and design, I came to new insights that might lead to an architectural way of thinking that is more inclusive towards climatic adaptive retrofitting.

4. RELATIONSHIP BETWEEN METHODICAL LINE AND APPROACH CHOOSEN BY THE STUDENT IN HIS FRAMEWORK

According to the methodical line of approach of the studio, the main ingredients of the architectural design would be based on findings in the technical research, as documented in the P2 research report. In general the report provided me a technological toolbox: a flow chart for decision making façade refurbishment.

The research topic; "adaptive façade retrofitting for energy neutral mixed-use

buildings", was the determining factor during the design process. The report set the technological boundary conditions and defined the possibilities and principles for the design. Also, the site and urban boundary conditions have been defined during the first semester of the graduation process.

The adaptive façade, typology and modular design are based on conclusions drawn during the research. The optimized extended façade modules for energy generation are a result of research by design during the p3 phase and give the building a sleek and playful geometric appearance. This approach did work well for me in order to find the desired solution to link a mixed-use program and adaptive façade retrofit. I would have preferred to perform slightly more research to the north- east façade, however, as this side of the façade can probably also contribute to the energy-efficiency of the building.

In addition to this research, further investigation can be performed to the question how the mixed-use program components can exchange waste in a sustainable manner to become renewable energy. Nonetheless, the innovative design contributes to an energy-efficient building transformation. This also guarantees the traditionally innovative character at this historical location. Today, not as a location where innovative warships were built to defend our society, but as an innovative living environment where solutions and innovative ideas are tested towards a sustainable society anno 2100.

5. RELATION BETWEEN PROJECT AND WIDER SOCIAL CONTEXT

This graduation project demonstrates how a climate responsive way of thinking about architectural design can affect aspects of sustainability, comfort and building transformation. Re-use and transformation of vacant buildings is a matter of consideration for the future development of Amsterdam and the Netherlands.

The current inner-city design goals are mainly about reuse, circular construction and combining multiple functions designed or modified for densification. I have therefore been guided by the possibilities and qualities of the existing building structure.

Refurbishment is a necessary step for reaching the ambitious energy and decarbonisation targets for 2020 and 2050 that require an eventual reduction of up to 90% in CO2 emissions. Since the built environment represents one third of the Netherlands' energy demands, retrofitting projects are becoming an important tool for reducing urban fossil fuel dependency and lowering greenhouse gas emissions (Ministry of Economic Affairs, 2014). In this context, the rate and depth of refurbishment need to grow. The number of buildings to be renovated every year should increase, while the energy savings in renovated buildings should reduce the current energy demand by more than 60%. In order to achieve this, the city of Amsterdam commissioned the report 'Energiestrategie Amsterdam 2040', which stated the mission to become the beating heart of a sustainable metropolis by 2040. Therefore, it is also necessary to enable the building industry to design and construct effective refurbishment strategies.

For a reduction of the energy consumption to be realized, a transformation into a mixed-used building with residential and restaurant functions at the ground level has been chosen. This research and design investigated the potential of energy and carbon emission reduction in combination with a building transformation for mixed-use. For this purpose, a former school building in Amsterdam at the Marineterrein was assessed as a demo-case.
In this context, former stacked school buildings are often considered to be more cost-effective targets for retrofitting, because of the consisted architecture and

economies of scale on a large block. Moreover, they are considered to be retrofitted more easily because their exteriors are more uniform than single-family houses – which makes external insulation or replacement glazing easier to install.

The achievement of an energy efficient building that reaches nearly zero energy consumption through the assistance of a climate adaptive facade was an important goal of the design. It is significant, as architects, to consider the energy design, the architectural design and the technical part of those combined. The modular adaptive façade gives the building a total new identity, which matches the innovative spirit of the site.

However, transformation and retrofitting of existing building stock in Amsterdam occurs through a number of projects. Amsterdam's former Marineterrein is currently one of these projects that is transitioning from a restricted navel site into public space. The city is looking for ways to connect the Marineterrein to the urban fabric, drawn on its historical identity, and include a smart energy infrastructure. As much as 70% of the energy consumed in Amsterdam is used for heating and electricity in buildings. Making savings here and increasing their sustainability will be an especially large challenge for Amsterdam.

6. ETHICAL ISSUES AND DILLEMMA'S

Specifying a modular facade retrofitting for an existing building ensemble generally results in a site- and function specific building. This raises the issue of adaptability, because a building that is optimized to fit a specific scenario is vulnerable to change in program and climate conditions. In this sense, climate responsive building opposes a popular alternative; the modular design strategy, with benefits in terms of flexibility.

When choosing for a climate responsive design strategy, one must realize that the flexibility of the building is limited. However, the building's risk of becoming obsolete can be limited by designing a variety of climatic and programmatic scenario's. In addition, it is wise to be conscious of the limited expiration date of the designed building in its technical elaboration. For instance, a building's materials and construction techniques should be chosen carefully based on their embodied energy and laboriousness.