

# Reflection Paper

Master of Science Architecture, Urbanism  
& Building Sciences

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## Studio information

**Name**

Architectural Engineering

**Theme**

2nd life – The future of the work building

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# Relationship between master programme, studio and graduation topic

During my time as an Architecture student in Delft, college students often criticize the study due to its lack of scientific foundation. The question of alumni should be titled as a Master of Science or Master of Arts is an all time-question. This reflection paper doesn't aim to find an answer to that question but addresses the duality within the profession of an architect. The duality with on the one hand the architect and on the other hand the engineer. This dilemma was often found during my studies and especially when choosing between the many specializations within the various master's programmes. The question of whether I would do the master track Architecture or Building Technology was, therefore, a difficult one. I endeavoured to approach architecture from the perspective of both an architect and an engineer and therefore I choose for Architectural Engineering within the Architecture track. The underlying idea behind this choice was that the various disciplines could reinforce each other, instead of having to choose between them. A transdisciplinary collaboration between the disciplines seems to me to be the most valuable, in contrast to the inter and multi-disciplinary collaboration as shown in figure 1.

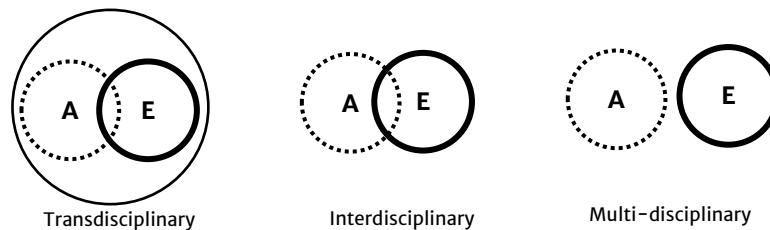


Figure 1: Basic models for cross-disciplinary working. Source: Own image.

In architecture, my fascination is with the integration of sustainable- and bioclimatic design. The integration of sustainable- and bioclimatic design in new-build architecture is nothing new. But the integration of sustainable design in the existing building stock is more uncommon and challenging. This fascination fits well with the Second Life context, since it addresses the major renovation challenge of the existing building stock and looking for inspiring and innovative solutions. The topic of my graduation project is the energy transition of a monumental building and its surrounding neighbourhood. Thereby I focus on minimizing energy losses through energy reduction, reuse and local production. This topic goes hand in hand with the Flow direction within the Intecture specialization of the Architectural Engineering studio. This direction focusses on the functional-, material and technical aspects and therefore in line with my analytical and pragmatic approach of architecture.

During my graduation, I often wondered if the wide variety of specializations, directions, studios and master tracks contributes to becoming an all-round architect. Afterwards, I see that the ambition to graduate from the masters as an all-round architect turns out to be optimistic, since becoming an all-round architect requires many years of working experience. I now know how quickly a graduation year is over and I think specializing was the most educational and enjoyable approach to this year.

## Relationship between research and design

The buildings stock of the Central Government Real Estate Agency is facing a major renovation challenge and therefore is a problem within the challenge of the energy transition. Solutions can be found in terms of improving the way energy is used on the urban and building scale. My research focuses on the urban scale, while my design is based on the building scale. My research shows the possibilities of a collective heating system based on the principle of heat-cascading, heat-storage on different temperature levels and building renovation strategy, as shown in figure 2. While the design focuses on the sustainable integrated renovate the monumental Palace of Justice in Arnhem as part of a collective heating system.

The difference in scale between research and design made it hard to directly translate the findings from the research into design solutions. During my P2, I was therefore uncertain about the added value of the research in the following design phase. My mentors pointed out to me that the theoretical knowledge retrieved during the research could be used in various ways other than the direct translation into a design, for example in forms of technical requirements.

Afterwards, my mentors turn out to be right. Besides that I used my research for drawing up the technical requirements, I used it in multiple ways. The calculation tool developed in the research is used for testing different design solutions and the validation of the final design. Another important part of the relationship between research and design is the contribution of the research in finding a standpoint within the various studies to be made during designing. The knowledge gained in the research is something to fall back on and has guided in making various design decisions. For example, often a choice had to be made between different design alternates with qualities in different fields, such as aesthetic, energetic and functional. The research has given me the knowledge to argue in which choices the energetic ambitions should prevail and when these could be more flexible. In the end, I think my research and design together form a complete story about the challenge for the energy transition within the built environment.

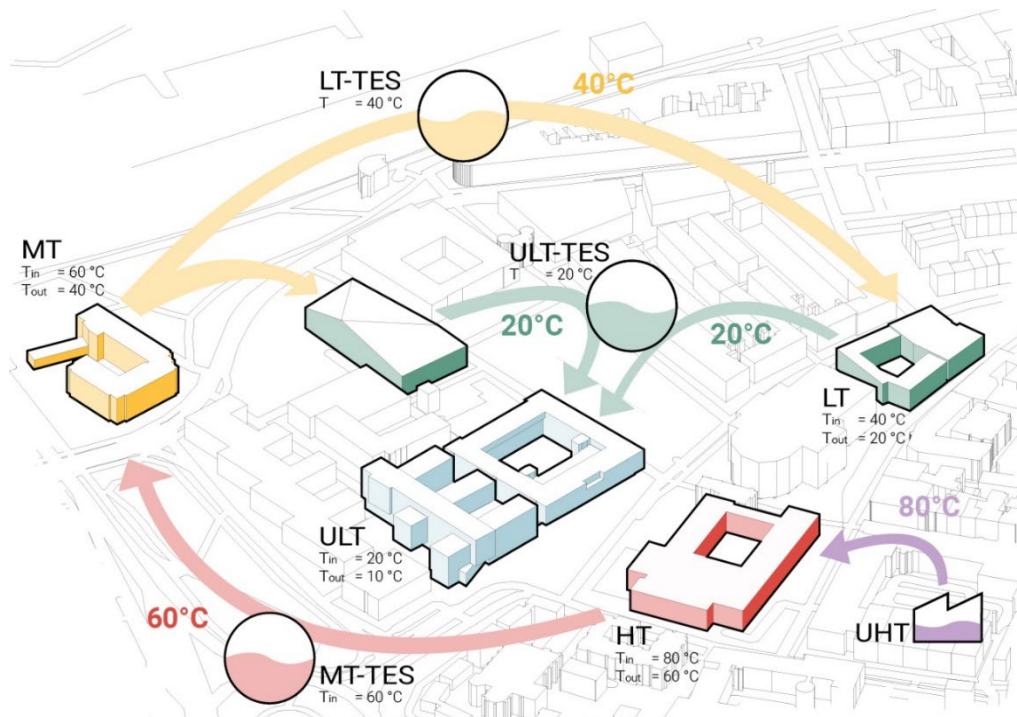


Figure 2: Conceptual representation of the thermal energy flows of a cascading-machine in the city-center of Arnhem. Own image, 2020.

## Relationship between studio research method and graduation research method

The Architectural engineering studio focuses on architecture inspired by new technologies based on research-by-design approach. In my graduation, various research approaches are used. During the research phase, a more analytical and pragmatic research method is used based on a combination of analysis-, simulation- and experimental research. The research contributes to the exploration of a concept for a collective heat grid, based on facts and figures and therefore can be considered as scientific relevant.

Within the design phase, my research approach is closely related to the research-by-design approach. During the design phase, I found out that the research-by design approach is a good way to produce multiple design variations. At the beginning of the design process, it was hard to make choices between this variety of design solutions. As my overall vision developed and my technical and functional requirements were determined decisionmaking became easier. Where drawing up technical requirements was straightforward, I struggled with determining the aesthetical requirements. The esthetics of the existing monumental building more than once contradicted to the chosen design solutions. An example in which this dilemma occurred can be found in the design of the south façade. The sketches of this dilemma are shown in figure 3. In my design, the south façade is used for solar harvesting, ventilation and traffic area. Next to these technical and functional aspects, the facades determine the appearance of the building and therefore should be aesthetically appealing. This conflict resulted in some interesting and innovative design solutions.

Reflection upon the scientific relevance of the research method and my work, I think that scientific relevance is based on the combination between innovativeness and validation of the design. As mentioned, the research-by-design approach resulted in a wide variety of design options. Searching for ways to validate these different options contributes to scientific relevance. However, this validation should not be at the expense of producing alternatives, as this would counteract innovativeness and therewith the scientific relevance.

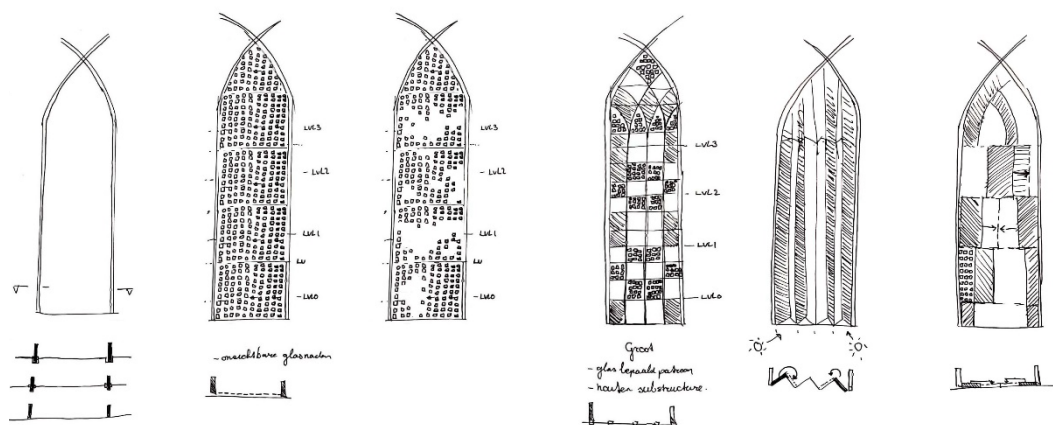


Figure 3: Design sketches south façade as representation of decisionmaking within the design process. Own image, 2020.

## Relationship between graduation project and wider framework

The built environment is subject to new technologies and increasing demand for renovation projects. The graduation project gave me insight into the new technologies and in the renovation of a monumental building. It gave me the change to extensively integrated the new modern technologies in an old monumental building, in a way that in the professional work of an architect would not be possible.

Personally, the knowledge gained from the design is a practical understanding of sustainable interventions, ranging from heat flows in a self-designed smart grid, to how monocrystalline solar panels can be connected in glass. Throughout the project, I have tried to understand the interventions and validate this as much as possible on a scientific basis. A time-consuming effort, but by doing so graduation projects have given me a lot of practical know-how that can be further developed into working life in the coming years.

In the wider framework sustainability and the energy transition are indispensable. We realize more and more that we can become much smarter with energy within the built environment. The graduation project can be used as an example of a hands-on approach of the energy transition into multiple scales. On the neighbourhood, further research into the technical and financial feasibility must show whether it is possible to implement the system. Besides, research will have to be carried out into the user performances and, based on this, an implementation plan must be elaborated.

On a building scale, the graduation project can be used as a collection of various sustainable interventions integrated into a monumental building. It focuses on the complementing The project focuses on the integration of sustainability, to improve the building use and building climate, so that interventions are added value to the building as a whole. A building part where various interventions come together with each other and with the existing building is the south facade, shown in figure 4. At this location construction, program, ventilation, heating, cooling, solar harvesting, aesthetics and monumentality come together and therefore was one of the most challenging parts of the design. The renovation proposal can be used as a showcase on how to improve the building energy performance of an energetic low-quality building in a low temperature heated building.

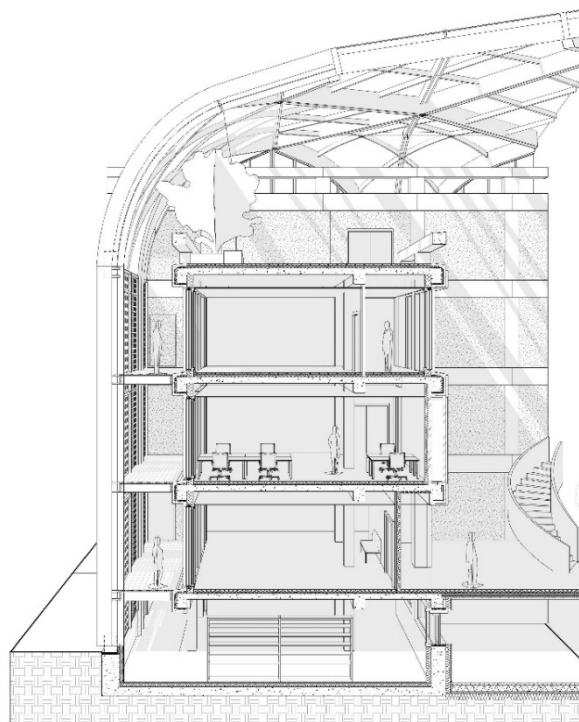


Figure 4: The south facade as a representation of the intergration between different design facets.  
Own image, 2020.

## Issues and dilemmas

During my research, design and potential application, no real ethical issues and dilemmas are encountered. What comes closest to an ethical dilemma within the research to the collective heating system is a financial matter. The collective heating system is based on the reuse of each other's residual heat, which results in the question: who pays for whom? This financial question I left unanswered as extensive research will have to be done into technical possibilities and consumption per user.

During the design process, I encountered two dilemmas. First of all the question to what level a monument can be adapted to the architect's liking. During my P3 presentation, several design decisions were difficult to make as the monumental values clashed with the technical requirements. On the advice of my mentors and the more technical of my graduation project, I kept the historical values of the monument to a minimum and allowed myself to be guided by the technical values. A second dilemma is encountered in the embedding of the court in the city and society. In practice, the influence of the architect in defining the safety boundaries and added public functions is determined by the program of requirements. However, this project gave me the freedom to design to personal preferences.

In conclusion, implementing the design proposal will lead to a discussion about taste between monumentality and modern architecture. A discussion that is unavoidable with the emergence of the new techniques within the built environment and the time will tell what the outcome of this matter will be.

## **Final graduation period**

In the final period of my graduation, I will focus on fine-tuning the story and the representation of it. In fine-tuning the story there are still steps to be made in prioritizing the different design interventions. With this step, my ambitions with the building and the potential of the plan will be made clear, without being distracted by non-essential issues. Besides this, creating attractive presentation images is something I can still learn a lot about. The conscious development of my presentation style and making it my own is something that can be very useful in the future.

My ultimate goal of the year is to look back on a project that inspires me and hopefully others to continue integrating energetic sustainability in the built environment. A project that emphasizes that in the pursuit of net-positive buildings there are many other design challenges in addition to the technical challenges.