

1. Graduation process

The relationship between research and design

The thesis explores the possibility of integrating the Earth, Wind & Fire system into the Dutch Housing and analysing its energy saving potential. This involves studying and understanding the working principle of the system thereby exploring all the different variables involved in the system design. The research and design are thus inter-related and go together in a circular loop. The literature review phase concluded with basic design guidelines based on the PhD report by Dr. Ben Bronsema. To apply this system in the case study building, different design possibilities were explored, and the performance is simultaneously calculated. The thesis thus follows an integrated research and design process.

The relationship between graduation topic and master track

The Sustainable design graduation studio focuses on researching and innovating sustainable technologies for the built environment. The Earth, Wind & Fire system is an innovative solution to reduce the energy demand of the building when compared to a conventional ventilation system. However, no research has been performed to study the applicability of the system in the Housing. The graduation research on this system could open new possibilities to meet the energy goals set by the Dutch government and contribute towards the sustainability of the built environment which is also the motive behind the graduation studio. The focus of this topic is on climate design and building product innovation, two important fields in the Building Technology track and thus it is positioned well in the graduation studio.

2. Societal Relevance

The issue of climate change is getting bigger and affecting the world in serious ways. The world needs continuous improvement and innovation to progress towards achieving sustainability in the future. This research is a small step to help mitigate these adverse effects through technological development in the building industry. Earth, Wind & Fire system is an innovative concept which bridges the gap between architecture and climate technology and works as an integrated part of the building to reduce the energy consumption and provide a good indoor environment. The system needs to be introduced in the building sector as a suitable zero-energy technology and increase its application at a larger scale. However, the system needs to be explored for its applicability in the housing sector. This research thus aims to investigate the potential of the EWF system in the Housing sector and measure its effectiveness as an energy neutral technology. Moreover, the applicability of the system in the buildings would be feasible and preferred if the architects and engineers have a clear framework to apply this system and are aware of various constraints coming along the way of implementation. It is expected that the results of this research would serve as a starting point for refurbishment of similar buildings with the EWF system with a clear understanding of the technical constraints, potential and design strategies to achieve maximum performance. The research contributes towards a larger goal of serving the society and fulfilling the goal of a sustainable zero-energy built environment.

3. Personal Reflection

The entire graduation process has been an enlightening experience in terms of expanding knowledge and self-growth with developing both soft and hard skills. There were several challenges along the way with a few

uncertain situations. One of the major challenges encountered was modelling the EWF system in an energy simulation software for validating the performance of the system and the design. The validation phase thus consumed more time than planned initially in the thesis timeline. However, this situation taught an important lesson about being flexible and adaptable to any changing circumstance. Another important lesson is to incorporate uncertainties in the research process since the initial plan was to model the EWF system physically in the software and then validate its performance through simulation. However, as I proceeded with the work and dived deeper into the software, the realization that physical modelling is technically not feasible was a bit of a demotivating circumstance. However, the idea to imitate the Climate cascade rather than physically modelling the system saved the situation and provided satisfactory results. It is thus always important to have a plan B when framing the entire research process for the graduation.

This thesis project required a great attention to the technicalities of the system and installation design. Having lesser prior knowledge about these technicalities, it was sometimes challenging but also exciting to learn the various aspects involved in the system. Conversations with several experts in the industry who have explored EWF system in their research and design was certainly helpful to get more clarity and proceed further with the work.

With this ongoing unprecedented covid pandemic and the university shutting down, almost entire graduation work was performed from home. This was a drawback which sometimes also affected the progress in the work. However, with more resilience the difficult times can be conquered too and at the end the thesis project bearded successful results and I am happy to acknowledge that the results are quite satisfactory.