

REFLECTION

Master thesis: Design for reclamation of unitized façade systems

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At the start of my research on ‘Design for Reclamation of Unitized Façade Systems’, I found it challenging to determine a clear direction. Within the field of façades and circularity, there is no single obvious entry point or topic to investigate. During the first few weeks, I explored various options in an effort to identify a specific aspect that academic research could focus on and that might contribute to one part of the circular approach. One example of a potential research direction I considered was the feasibility of refilling IGUs (Insulated Glass Units) with argon gas. Although this would have been interesting research, there was no proof that this ‘problem’ was really the important factor in the reclamation potential of facades, or that a solution would be beneficial for circularity in façade industry. For that reason, after several weeks, I found out that my focus should be at a more holistic way of research. As a result, I focused on the whole spectrum of connections in unitized façade systems.

By trying to keep the options for the exact final product open, the research could keep a wide view on which connection or part needed redesign for improving circularity, rather than giving the answer upfront. However, this holistic way created little uncertainty if the research would really lead to a useful output.

During the literature research the option came for redesigning the old ABN AMRO panel at Scheldebouw which could create an opportunity for finding real barriers during a circular design process. At the same time, I could help Scheldebouw and my supervisor to give ideas in their demand for ‘adaptability’ of their systems. This opened much more insights than only listing and observing connections in contemporary systems. During the process of analyzing and determining reclamation potential of components, the idea of adding a new sub frame came into being. The main reason was literature indicating that IGUs are the component with the shortest lifespan. This, combined with the finding that most façade frames are only compatible with one specific IGU dimension and thickness, supported the relevance of this focus. I was determined, however, to create a product that would not only work with the ABN AMRO but in other systems as well. Therefore, the geometry of the carrier frame is rather simple so the idea could be feasible on other projects. The carrier frame is therefore introduced as a ‘principle’ instead of a specific design.

During the design process I found that I was trying find a way in which I could change the depth of the thermal break and in that way could make the front more adaptable. This would be much easier if the thermal break was a reversible connection. This way I proved that using a design-based research process helped the holistic way of thinking. In the beginning I would have never known that the thermal break in a façade system would be a barrier in adaptability or reclamation potential if I had not experienced the problem myself during an actual design process. Unfortunately, the timespan of this research was too short, due to the holistic approach, to validate the new thermal break connection by structural tests or in a visual way of using it in a scale 1:1 system. It is therefore my opinion that this project would need additional research for validation of the new thermal break design.

I think this research shows the more practical approach, using the industry itself to find new ways in the circularity of facades. Although quite some theoretical research have created usable frameworks and gave important information in barriers of different stakeholders, it is my believe that it is important to now focus on the practical engineering approach. I think this research has created some important insights in the connections we want to avoid or change. In this research I did not only provide new ways for more circular designs of façade units. I also tested different methods to rank the ease of disassembly of façade systems where I have created two sheets based on the MaxiMOST measurement system. These sheets, specifically focused on connections and disassembly processes in façade units, can be used in future research and connections or processes can be added. This research shows that, although in-depth understanding of the eDim and MOST method is necessary, the methods can be used in future circular design processes.

During my thesis period I found that the collaboration with Scheldebouw was essential for the outcome of this research and the final products. I would not have been able to create this without the knowledge and insights this company gave me. Next to that, the knowledge, help and guidance of both of my mentors Rebecca and Marcel was key to go through this process and I would not have been able to achieve the same results without them.

It is important to state that during my research I found that there is a gap between the façade industry and the research conducted on universities like TU Delft. The reason for this was the fact that I saw that certain information or knowledge from a company like Scheldebouw was not known by my mentors. At the same time important research findings from several studies conducted by TU Delft researchers was not known by my supervisors at Scheldebouw. It is my belief that closing this gap is essential and can only be achieved through future collaborations between industry and universities on circularity projects.