

Additive Manufactured Glass Connection

P4 Reflection

Student:

Willem Sebastiaan Koenen

Student number:

4321596

Mentor team:

Ulrich Knaack
Christian Louter

The relationship between research and design

The methodology followed by this project was research driven by design. This was in the first phase done by making an extensive literature study. This way a framework could be created to define the topic that had to be researched. But in the meantime this framework was also the basis for the design.

In this research process design and research influenced each other heavily. Not only the literature study was the basis for a lot of this, but also the more empiric approach where a lot of the sub components were tested on a one to one scale. This was especially done in relation to the different aspects of additive manufacturing. First of all to research how it worked after that it was researched further to see how this would impact the design. But that would then also begin to impact the research into the performance of the connection. This was done with analytical testing for which the basis was formed by the earlier research. So all these small steps helped to great essential feedback for the design process. What then in turn lead to a better design which could be further optimized. Although some additional problems still had to be solved in the final stages of the design, those were more of a practical nature and based on limitations of the manufacturing facilities that were available. But in the end the research and design were very closely related to each other.

The relationship between the theme of the graduation lab and the subject chosen by the student within this framework.

The Sustainable Design graduation studio falls under the department of Building Technology. The aim of this department is to explore new solutions for façade design, structural design or climate design with a sustainable approach. This graduation project is part of the chair of façade and structural design.

For this project the design was made to focus on a glass connection that was made with the help of additive manufacturing. This is then again related to the fourth chair of building technology being the chair for design informatics, because in an earlier stage of the design a decision was made to make use of topology optimization in combination with additive manufacturing.

All of these topics are currently under research by the different chairs, but so far they are only a few examples that combine all these elements in to one. So a glass connection in this case a new and improved spider profile is the ideal showcase for these challenges. But the connection is still small

enough to be completely understood and to be tested in a full size model, so that nothing of the complexity is gone.

This topic also relates to the new and innovative aim of this department. Because a joint like this has never successfully been manufactured. It is only so that recent innovation in the area of additive manufacturing have opened the way for application like this one.

The relationship between the methodical line of approach of the graduation lab and the method chosen by the student in this framework

The methodical line that is followed by the graduation lab is first of all related to the technical nature of the university. So it can be best described as technical-scientific where the actual study is driven by the design or helps to generate a design. For the facade design group this is definitely true because of the innovative nature of their research that is usually closely related to the market with very real applications. The projects that are done at this chair use research to drive the designs. The same method has been used with in this graduation project. Where the research in what there is now and how that could be used to make something new and innovative and that is also capable of filling a gap that currently exists in the market. Where the structural validation was needed to know if it actually has the potential to become a product that has a potential to further developed into a product that can be used.

The relationship between the project and the wider social context

This project shows a way of using additive manufacturing for something more than prototyping. Because this is something that is not done a lot in the building industry at this moment. This project attempts prove that it is possible to make a fully functional and adaptable connection for a free from facades. That in the process uses Topology Optimization to ensure that the design is at the same time the most optimal solution for this structural problem. At the same time this will ensure that the amount of material is the most optimal so nothing is wasted of the ever scarce becoming resources in the world.

But most of all if it this connection can be made working, It can open the way up for a whole range of new and improved glass connections. Which could be even further developed and have a whole range of additional benefits that could not be researched and developed in the short time of this master thesis.