

Graduation process

How is your graduation topic positioned in the studio?

The main goal of the Building Technology graduation studio is to create a sustainable design within the built environment. The tracks that contribute to this are Façade design, Structural design, Climate design and Design informatics. As the goal of my research is to create a façade system made of recycled borosilicate glass applied into interlocking cast glass components, the tracks Structural design and Façade design suit the most.

How did the research approach work out (and why or why not)? And did it lead to the results you aimed for? (SWOT of the method)

If applicable: what is the relationship between the methodical line of approach of the graduation studio (related research program of the department) and your chosen method

How are research and design related?

The main research approach of my thesis has been that of 'Design through research'. My thesis consists of two parts: a research to the recyclability of borosilicate glass and an application of this glass in a façade system. First, for both a literature study has been done. Secondly, an experimental research to the recyclability of borosilicate glass has been conducted. Thirdly, a design has been proposed to apply the recycled borosilicate glass into an interlocking cast glass façade system. To a certain point, this design was based on literature and previous studies. Then research through design has been done to finalize the design part.

The experimental research done to the recyclability of borosilicate glass showed some promising and interesting results, however this is based on merely a few created specimens. In addition, this research is one of the first that has been done on this topic, which creates a lot of possibilities for other researchers. For scientific relevance more research should be conducted to the recycling of borosilicate glass for building applications.

The design of the façade system has been based on literature and previous studies. The design has been created to show the possibilities of recycling high quality glass such as borosilicate.

The experimental research was very time consuming, however I enjoyed it a lot. The creation of the glass specimens was very labour intensive, which required some good planning skills. When encountering problems, asking the advice or help of several experts helped a lot.

Did you encounter moral/ethical issues or dilemmas during the process? How did you deal with these?

Recycling borosilicate glass reduces the environmental impact of the existing and growing pile of glass waste and reduces the melting temperature during the production of the glass. However, the production of glass still needs very high melting temperatures, were a lot of CO₂ gasses are emitted. Although this amount is much less compared to normal borosilicate glass production, it still is a lot. Nonetheless, recycling this high-quality glass is still better than throwing it away.

Societal impact

To what extent are the results applicable in practice?

This research is one of the first of its kind concerning the application of recycled borosilicate glass in the built environment. The results show that recycled borosilicate glass is comparable to normal borosilicate glass. This means that recycled borosilicate glass is applicable in the built environment. However, extensive research to go from experiments to an actual product needs to be conducted.

Previous studies show the possibilities of an interlocking cast glass façade. This study contributes to this and adds the possibility of an actual façade system. However, this has not been structural analysed thoroughly. Further research needs to be done on this topic as well. In addition, the design proposes a façade system which has never been built before. In terms of for example water tightness and feasibility extended research is necessary as well.

To what extent has the projected innovation been achieved?

Does the project contribute to sustainable development?

What is the impact of your project on sustainability (people, planet, profit/prosperity)?

This research contributes to innovation and sustainable development in several ways. Research to the recycling of borosilicate glass has never been done before to this extent. Currently, this high-quality glass ends up at landfills, while in general glass can be recycled almost 1:1. Through recycling borosilicate glass the environmental impact of the glass production and the glass waste can be reduced.

In addition, this thesis adds to the previous research in development of the interlocking cast glass system. Not only is it possible to apply such a system into a façade, but it can also be applied in for example internal walls.

What is the socio-cultural and ethical impact?

None

What is the relation between the project and the wider social context?

This project is a showcase of recyclability. To show that it is possible to create a (glass) façade out of recycled material. In addition, it shows that it is possible to create an aesthetically pleasing façade out of solely recycled glass. Making people aware that recycling/reusing is the future.

How does the project affects architecture / the built environment?

This thesis contributes to research of new building materials created through recycling old materials. To show to architects and designers that building environmentally friendly and aesthetically pleasing is possible. In addition, such a design as proposed in this thesis gives a higher aesthetical value to buildings.