A Zero-Waste Approach in the Design of Buildings

Introducing a new way of approaching sustainability in buildings with a conceptual industrial building design as an illustrative example.

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Graduation thesis

Zero Waste Industrial Building System

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In this personal reflection the chosen subject, method and approach used will be reflected upon and related to the themes of the graduation studio. Furthermore the project is put in a broader perspective to show wider social context and relevance.

This project was inspired by the seemingly wasteful approach in which contemporary buildings are made, in combination with the personal fascination of modular building technologies. By researching these aspects important discoveries were made into how buildings lack certain aspects of sustainability, and how a different design approach could lead to improved efficiency of building material use. This lead to a framework showing the important factors of a zero-waste design approach, and a method on how these aspects can be measured. Furthermore, an example design is elaborated showing how a building could look if these zero-waste design criteria were followed.

This research and design was done in cooperation with another student, where my main focus was on the façade design, and the other student’s focus was on the structural design. This additional division of the project between two authors/students has led to increased depth into the subject and a broader result. The cooperation allowed for better boundaries of the otherwise large project and a more complete insight into the elaborated problem and design result.

Within the graduation studio ‘Sustainable Design Graduation Project’ of the Building Technology department, the themes of Structural Design, Climate Design and Facade Design are especially emphasized. Furthermore sustainability is one of the core aspects. All these elements were addressed in this graduation project. Improved sustainability is the key element of the proposed zero-waste design approach and elaborated design. The main personal focus in the project was on the facade design, in which climate design was an important element. Together with the cooperation and integration of the structural design as worked out by the other team member, all aspects of the graduation studio were covered in extend.

The project was split up in three parts. In the first part theoretical part the principles, requirements and literature relevant to zero-waste is shown. Then the practical aspect of zero-waste is shown in an example design. Finally, in the analytical part the report the design is analysed, which together with a review of the zero-waste design approach this lead to an overall conclusion about the design and research. Two methodical lines of approaches were used, which are in line with the approaches of the graduation lab.

In the design of the zero-waste framework a design by research approach was used. In this research problems of waste in the construction of buildings were looked into, and have led to the design of the zero-waste framework. This framework shows the current relevant knowledge related to wasteless design, and shows a definition and assessment method for zero-waste design.

In the design of the example zero-waste building a research by design approach was used. In this part the zero-waste framework was applied to an example building, in which the problem of waste generation was the most present. Feasibility of the framework was researched by designing the example building.

Finally in the third part the designed building was assessed on the zero-waste requirement. Also the found results were critically reviewed and have lead to a final conclusion about the zero-waste principle and the design. It concludes with the answers to the main research questions and goals as stated at the start of the research.

In the wider social context, the project and research have shown that sustainability in buildings can be far more extensive, and better elaborated in practice. There are many more aspects, such as waste and material usage of buildings that should be considered better during a design process. This awareness and application in design of these aspects is important if sustainability in buildings is to be further improved. The the used approached and the elaborated design in which this improved sustainability is the main aspect can be used to show this need and increase awareness. The zero-waste framework can be used as a base for further research into this topic. Most importantly is actual testing and validation of the shown concepts. This should be further researched by actually constructing and deconstructing the conceptual design.