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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The method of research and design can have a large impact on the final results. In this chapter a reflection is given on the chosen approach and the obtained results. The chosen subject and its relation to the graduation lab is discussed as well as the relationship between the research and design. The method is also compared to the methodical line of the graduation lab. Lastly the project is put in a broader perspective regarding the wider context.

The graduation assignment is performed within the Sustainable Design Graduation studio at the Building Technology department. The subject of zero-waste was based on a personal fascination with modular building technologies and fitted perfectly within this studio. Zero-waste is a relative unknown sustainable approach to buildings that focusses on the end of life of materials in a building and requires some kind of modular building approach. This combination of sustainability with technology is in harmony with the theme of sustainable design.

The goal of the research was aimed to accomplish a method of design that generates no waste in all phases of construction and demolition. This goal was broken down into three sub goals. The first sub goal was to determine the principles and requirements of zero-waste. The second sub goal was to find the important factors of a zero-waste design and the third was to create a practical solution for an industrial building designed using zero-waste methods.

In order to obtain these goals the research was structured into three stages. The first stage was to research the relevance of the subject and to determine the knowledge already available in the field. It also involved finding the definition and requirements of zero-waste and how to assess a design for zero-waste. This was a theoretical approach and involved literature study into the subject to obtain the required knowledge.

The second stage was to apply this knowledge into a design and involved designing a zero-waste industrial building. This building was designed to fully comply with all zero-waste requirements set up in the previous stage. During the design new challenges were discovered and needed to be solved. This was an iterative approach which involved research by designing but also required additional research in literature. The overall design is based on an approach solely from zero-waste requirements, and has led to a unique and innovative solution.

The third stage of the research was to assess the design made on the zero-waste requirements and to conclude the found knowledge. It also involved a critical reflection on how applicable the found solutions were. This stage provides the answers to the goals stated in the beginning of the research.

The execution of this research was somewhat special as it also involved cooperative work with another student. In the beginning this cooperation was established based on a common interest and earlier satisfying cooperative projects. It proved to add more depth to the subject and also made the research critical and even somewhat competitive.

The research was split into a façade section and a structural section (which was my responsibility), with a combined research for the common parts. The division led to an in depth research into each respective section but also resulted in an integrated solution for a zero-waste building.

The methodical line within the studio is to approach the project with either a research by design or a design by research. This means that the design can be made on obtained knowledge or that the research is obtained by making a design. This research used both approaches. In the first stage research was established on which the zero-waste design was based, but during the design phase the design by research method was also applied. This has led to a hybrid approach and has given satisfying results.

The subject zero-waste fits within the current trend to design sustainable buildings and takes a new look on what sustainable buildings can be. Energy is more and more sustainably generated and in the nearby future buildings will become energy neutral, but the impact of the use of materials are often overlooked. This research closely looks at the end of life of buildings and provides a method and solution to make buildings sustainable regarding materials. Buildings should not only be designed to withstand the test of time, but should also be designed for the end of life. This research forms a fresh and quite unorthodox method which may not be directly applicable in practice, but can be the first step into a more resource aware society.