

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Personal information	
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Studio		
Name / Theme	Architectural Engineering Graduation Studio	
Main mentor	Thomas Offermans	Architecture
Second mentor	Paddy Tomesen	Architecture
Research Mentor	Pieter Stoutjesdijk	Architecture
Argumentation of choice of the studio	I chose the Architectural Engineering graduation studio because of its technical, practical and solution-oriented approach to design and planning. Also the very open project brief that allows students to pick their topic of fascination was a key argument of choosing the studio. The strong focus on current problems in architecture and the building industry and the thematic orientation towards topics like circular design, energy efficient design, sustainability, manufacturing, prototyping and material flows were amongst the strongest arguments for me.	

Graduation project	
Title of the graduation project	Local Hero - Rethinking Urban Transformation toward a Local Micro-Economy
Goal	
Location:	Vierhavensstraat, Rotterdam
The posed problem,	<p>GLOBAL - Throughout the process of construction and predominantly at the end-of-life of a building or building component, large amounts of waste are generated. The building and construction sector contributes an estimate of at least one-third of all waste generated in the EU, even 41.6% in the Netherlands, posing a significant impact on the environment. Current building practices only rarely take into account the deconstruction or adaption of a building or building component and the reuse or recycling of its related materials. Most construction practice, ranging from building scale to component scale, is based on a linear economy model. This economic model consists of the following life cycle stages: resource extraction, processing and manufacturing of products, assembly and use and finally demolition and disposal. In the Netherlands, the greater part of construction and demolition waste finds, in one way or another, a recovery route, often described with the vague expression of useful application. This entails predominantly low-grade applications that can be considered down-cycling. A reason for these low-grade applications is the lack of demountability of building products, resulting in damaged or destroyed components and hard-to-separate materials, which makes potential reuse, recycling or up-cycling particularly difficult.</p> <p>LOCAL - The Vierhaven area in Rotterdam suffers from disconnection with the city. Over the years, a variety of makers, creatives and innovators have settled within the area, yet the disconnection and lack of communication remains. Part of that problem is a missing community and network; the area doesn't have a centre, a place that brings all those likeminded people together while also inviting people from outside by offering public functions.</p> <p>The HaKa building is the most recognisable and iconic building within the Vierhaven area, yet today it is being neglected and vastly underused. Newer construction of a large warehouse complex, a petrol station, the missing connection to city and water contribute to this current state. Furthermore, the building itself is outdated, from an architectural as well as technical viewpoint.</p>
research questions and	<p>How could the implementation of CNC Milling improve the ease of assembly and disassembly of demountable partition walls?</p> <p>SQ1: What are the technical advantages of CNC Milling in comparison to conventional fabrication methods?</p> <p>SQ2: How can ease of assembly and disassembly be evaluated and quantified?</p>
design assignment in which these result.	<p>Functional conversion and revitalisation of a 1930s office and factory building into a central node of a local micro-economy. This entails the inclusion of workspaces and studio spaces for local artists and crafters, public program such as a restaurant and cafe and productive functions to stimulate micro-economic autonomy such as an in house fabrication workshop and an urban farm. To further stimulate a local economy, in-house CNC production and construction with reused components from neighbouring buildings form the design drivers for new architectural interventions.</p>

The primary objective of this graduation project is the revitalisation of a neglected high-potential building, the HaKa building, located in the Vierhaven area in Rotterdam. This area, part of the Rotterdam city port, has been secluded from the city since its inception. Initially, this seclusion was intended and desired in order to keep residential neighborhoods away and provide sufficient space for transportation infrastructure. Today, the before mentioned reasons for spatial separation do not apply as the Vierhaven is not an active harbour anymore.

Revitalising the HaKa building comes with challenges beyond redesigning and upgrading an existing building. These include social, environmental and technical challenges as well as addressing issues of the larger urban fabric. Playing within the aE studios' theme 'Second Life', the project aims to tackle the challenges of the site around the building as well as the inherent issues of a 1930s industrial harbour building.

The project aims at creating a local micro-economic environment in the Vierhaven area with the HaKa building forming the centerpiece of that economy. To achieve this, modes of local production, in-house CNC production and reuse of locally harvested construction materials, are applied for new construction of building additions for the HaKa building as well as the rest of the neighbourhood. As part of the micro-economy concept, striving towards energetic autonomy is a vital aim for the area and the HaKa building to support itself energetically. To combine local production and local energy generation & storage, a strategy for choosing building components was developed. On the one hand, to support local production and to minimise negative environmental impact, low-impact, waste-based and locally harvested materials are being used. On the other hand, to enable sufficient local energy generation & storage and overall energetic performance of the building, investments in newly produced components with high efficiency were chosen.

The goal of this project results in the following design criteria:

- Reconnect with the city while promoting local autonomy
- Transform the HaKa building while preserving the essence of its character
- CNC milling and component reuse as design drivers
- In-house production of demountable infills
- Flexibility of interior layout
- Energetic & climatic upgrading (toward independence from energy grid)

Process

Method description

The thematic research covers the technical aspects of demountable partitioning systems enabled by CNC-milling fabrication. For the design exploration, the following methods are used:

- Site analysis and documentation
- Mapping of functions and flows around the site
- Photographic documentation of the building
- Analysing case studies of building conversions
- Research in user needs and developing a programmatic scheme
- Design through concept sketches, diagrams and drawings
- Literature research and case study assessment, resulting in the output of the research paper

Literature and general practical preference

Literature in the form of research papers as well as non-academic articles are consulted to gain information about the topics of technical and climatic upgrading of existing buildings, design for disassembly methods in architecture and spatial and programmatic strategies for flexible workplaces and community facilities.

For design inspiration, case studies of realised conversion projects are analysed.

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)? This design project aims to provide an answer to the question of how to functionally convert an existing building and make it future-proof. This links to the studios' topic 'second life', addressing the necessity of acknowledging the potential of existing structures and to develop a strategy to use the building in a flexible and adaptable way to prevent future demolition. The project deals with technical topics as well as social, spatial and programmatic topics, thus creating a complete and comprehensive design.
2. What is the relevance of your graduation work in the larger social, professional and scientific framework: The graduation project aims to contribute value within the overall technological, architectural and social framework with the goal of developing a strategy to convert underused open structure buildings by applying state of the art technology and principles of circular design. To move towards a circular economy in the building industry, the value of existing structures as capital for future-proof developments needs to be acknowledged. Especially in the urban context, land to build on is scarce and demolition and new reconstruction poses severe environmental issues. Although this graduation project focusses specifically on one building, it aims to develop a conversion strategy that is replicable and can be applied to open structure buildings in general.