

# Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



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<b>Personal Information:</b>	
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<b>Studio</b>	
Name / Theme:	Architectural Engineering / Second Life
Main mentor:	Annebregje Snijders
Second mentor:	Pieter Stoutjesdijk
Argumentation of choice of the studio:	The Architectural Engineering Studio caught my interest since it focuses on the technically oriented approach to solutions in the field of architecture. In addition, the tutor's high level of expertise in different topics like circular economy and digital fabrication was a direction I wanted to explore further before joining the studio.

## Graduation project

Title of the graduation project:	The Bergweg Platform
Location:	Bergweg 335, Rotterdam
Problem statement:	<p>The construction industry is facing a growing challenge in addressing the issue of demolition and construction waste while filling up landfills, both in terms of the environmental impact and financial costs. The lack of design for disassembly is one possible reason for that.</p> <p>The circular economy model, which aims to maintain the maximum value of materials through closed loops, has been adopted by various industries to address this problem. The use of lightweight structures in combination with "Design for Disassembly" could lead to a new perspective on buildings, where interior spaces can be easily readjusted to meet the changing demands of users and keep the building at its optimal use. However, in order to achieve this, building components must be designed to be easily demountable, so that they can adapt to the ever-changing demands of the users of the workspaces.</p>

Overall design question:	How can a community hub on the vacant train platform on the Hofbogenline be designed that it can effectively adapt to the ever-changing demands of work, community events and leisure while considering nature inclusiveness and lightweight construction.
Research Question:	<p>Can CNC-milling increase the ease of assembly of biobased and demountable partition wall systems?</p> <p><i>Subjections:</i></p> <p>What advantages can CNC milling bring in comparison to manual work?</p> <p><i>What demountable partition wall systems already exist?</i></p> <p><i>What assessment methods can be used to quantify the ease of assembly?</i></p> <p><i>How can the criteria of existing ease of assembly methods be adjusted to be used for partition wall systems?</i></p> <p><i>How useful is the adjusted DfA evaluation for creating guidelines and how can it be improved</i></p>
Design assignment in which these result:	<p>The repurposing of a vacant former train platform towards a community-based, nature-inclusive center for work and collaboration for the Hofbogen community and the Hofbogenpark. Based on principles of adaptable spatial layout, enabled by digitally fabricated spatial layout elements and a sustainable lightweight architecture perspective.</p> <p>The program for the Community Hub includes facilities for community events, creative workspaces, and leisure. The architectural design of the project aims to foster connections between the neighborhoods through the nature-inclusiveness of the Hofbogen park and to promote well-being and balance between work and leisure. The research on design for disassembly (DfD) and digital fabrication is closely related to circularity, as it not only potentially saves waste but also enables material recovery, programmatic changes, making it easy to reconfigure spaces for different activities and events, and for the reduction of possible waste due to changes of program.</p>

## **Process**

### **Method description:**

The research for this architectural project focuses on the benefits of using CNC milling and demountability in architecture, specifically the use of a demountable layout for interior walls. The goal is to create guidelines for demountability at different architectural scales.

The primary research method is a literature review, which examines different methods for designing for demountability (DfD), products for demountable partition wall systems, and digital fabrication techniques. In addition to the literature review, case studies were analyzed to investigate the market for demountable partition wall systems and to simulate the use of CNC-milled systems in 3D software. An existing evaluation method was adjusted and criteria were added for a closer assessment of the case studies. The assessment was then used to compare the qualities of four examples of existing demountable partition wall systems. The results of the research indicate a correlation between the use of a CNC-mill in the production of the system and increased ease of assembly. The research also leads to the conclusion that the methodology can be used to create guidelines for future designs.

Additionally, the design research includes gaining knowledge about lightweight structures to enable the building addition on top of the former train platform of the architectural monument. The design process is informed by a detailed context analysis, which includes in-person site visits of the existing historic building through photography and historic plans, investigations of the planned Hofbogen Park and nature inclusiveness, as well as an analysis of broader spatial site conditions.

### **Literature and general practical preference:**

The research for this architectural project focuses on the advantages of Design for Disassembly (DfD) and CNC-milling in architecture, with the goal of creating guidelines for demountability across different architectural scales. The literature review includes examination of different DfD methods across various industries, products for demountable partition wall systems, and digital fabrication. The prior research and assessment by the student group of Steven Lammersen served as the foundation for the assessment. Literature such as Philip Crowther's guide to disassembly and Nicolas Ciarimboli's DfD guide to a closed loop design and building were used to define guidelines that work across scales of architecture. The project is closely connected to current developments in Rotterdam, specifically the renovation work of the architecture office Jager&Janssen from 2015 for the Bergwegstation, and plans for the future Hofbogenpark by De Urbanisten. Additionally, the detailing about the Hofbogen line itself was also considered.

## Reflection

### **Relation between your graduation project, studio and your master track:**

The Bergweg platform project is part of a second-life program for an architectural engineering graduation studio and deals with combining elements across different scales and specialties characteristic of the Faculty of Architecture, Urbanism, and Building Sciences. The former Bergweg train station is a part of the Hofbogen, an architectural monument since 2002. The goal of the design is to create synergy with the upcoming Hofbogen Park by providing spaces for community, work, and leisure, and to increase the use of the second life of the Hofbogen line.

### **Relevance of the project:**

The concept of "design for disassembly" is an essential aspect in achieving a circular approach within the built environment. This approach begins with the consideration of details, such as the appropriate use of materials and the ease of assembly and disassembly.

With societal demands ever-changing, particularly in vibrant cities like Rotterdam, the design takes into consideration the shifting programmatic changes in physical space and creates encounters for social interaction. As the pandemic has shown, physical meetings can mostly be exchanged through digital platforms, decreasing the need for physical exchange with other professionals. Nevertheless physical social encounters still play a major role in community spaces despite increasing digitalisation. The multifunctional floorplan and the demountable and reusable infills system aims to display adaptability for workspaces of different kinds.

As the existing plan of the office *De Urbanisten* aim at revitalising the Hofbogen line with the Hofbogen park, the Bergweg platform could be an approach complement their urban design to create a way to experience the nature-inclusiveness within a urban work environment. The design integrates features that promote physical, mental, and social well-being by fostering the synergy of the future nature-inclusive Hofbogen park and the Bergweg platform community hub, while amplifying the local qualities and potential of the context and community development in the future.