

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

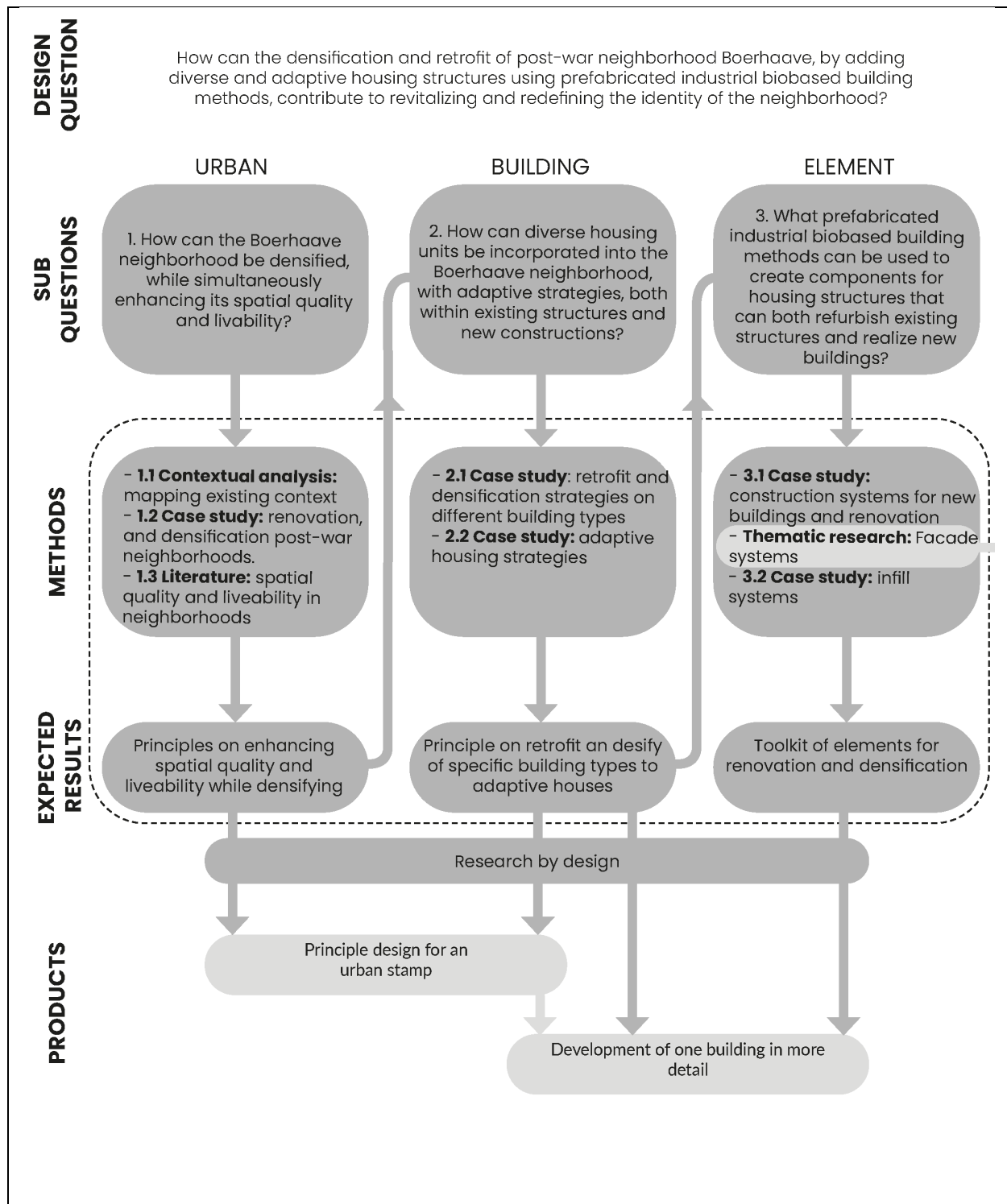
Personal information		
Name	Sanne Buser	
Student number	5720338	

Studio		
Name / Theme	Architectural Engineering	
Main mentor	Mo Smit	Design tutor
Second mentor	Pieter Stoutjesdijk	Research tutor
Third mentor	Paddy Tomesen	Building Technology tutor
Argumentation of choice of the studio	What I like about architecture is the combination of art and technology, designing buildings that perform well technically and are aesthetic at the same time. In addition, nowadays it is relevant to think differently about traditional building methods and materials, I find this development very interesting and relevant.	

Graduation project	
Title of the graduation project	Densifying post-war neighborhoods with biobased architecture.

Goal	
Location:	Boerhaavewijk, Haarlem
The posed problem,	The Netherlands faces the urgent challenge of constructing 2 million new dwellings and making sustainable improvements to 7 million existing residences by 2050, while reducing CO2 emissions. Current construction practices contribute significantly to global CO2 emissions, which creates difficulties in aligning these objectives (Studio Marco Vermeulen, 2020). The industrialization led to a surge in the use of fossil fuels for production, accompanied by a decline in natural materials and associated knowledge (Blom et al., 2004). But recently, obtaining knowledge about these materials and their applications has become relevant once again (College van Rijksadviseurs, 2023). The widespread use of these materials is impeded by a lack of knowledge, pricing, and risks. Furthermore, the benefits of these materials are not yet properly included in sustainability calculations. A significant portion of dwellings targeted for sustainable improvements were built in the period after the World War these, suffer from technical deficiencies and outdated aesthetics. Meeting

	climate objectives necessitates the transformation of post-war neighborhoods. Sustainable material choices must harmonize with architectural expression to restore vitality. To address this challenge, a structured product development methodology is proposed to create an industrial biobased façade element for the post-war Boerhaave neighborhood, optimizing material properties while allowing for a unique architectural identity.
research questions and	Main question: How can an industrial biobased façade element for the Boerhaave neighborhood be developed with product development methodology in which the properties of the materials are used optimally and at the same time the designer has the freedom to give the façade a certain identity? Q1: Which façade compositions are found in the Boerhaave neighborhood, and what architectural elements do they consist of? Q2: What criteria ensure that the façade system is industrial, sustainable, and allows architectural expression, and how can these be made measurable? Q3: Which industrial biobased alternatives are available for the different façade elements? Q4: How are the various alternatives of biobased materials quantified according to the predetermined criteria?
design assignment in which these results.	Design question: How can the densification and retrofit of post-war neighborhood Boerhaave, by adding diverse and adaptive housing structures using prefabricated industrial biobased building methods, contribute to revitalizing and redefining the identity of the neighborhood?
The table below shows that the design question is divided into three scales, urban, building, and element level. The thematic research is part of the element level, specifically about the façade. However, the methodology used can be applied further in the design process.	



Process

Method description

The thematic research used a literature review combined with a study of different market products and systems from reference projects.

The methods per sub-question are also listed in the table above. The research employs case studies and literature research to address sub-questions. At the urban scale (1:500) (1:1000), design principles are derived, leading to various urban design concepts. A 1:500 sketch design is created, illustrating program, public-private

relationships, mass studies, and cross-sections. A specific building within this urban context is chosen for further development. This section will be transformed using diverse housing types, adaptive spaces, separations between public and private, and retrofit principles, which are detailed at 1:100 and 1:50 scales. The final scale involves a detailed breakdown to the element level (1:50), incorporating construction, façade, and built-in elements in 1:50 fragments and 1:5 details.

Literature and general practical preference

Biobased building, renovating and densification principles, timber constructions, open building.

Interesting sources for the urban scale will be:

- Study Jeffery Bolhuis on Schalkwijk
- Study KAW architects on densifying post-war neighborhoods
- Transformation of the Kolenkitbuurt, Amsterdam
- Transformation Moerwijk, Den Haag
- Naoorlosge stadswijken, Tussen park en stad, handbook voor ruimtelijke ontwikkeling - André de Hoop, Roel van Aalderen, Klazien Haitjema en Shyam Khandekar
- Steden vol ruimte – Rudy Uytenhaak

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)?

The technical side of the subject emerges in the efficient and sustainable transformation of neighborhoods, with the use of bio-based materials, and industrial techniques that focus on harvesting and efficient making, two of the topics within the architectural engineering studio. By also looking at the diversity in dwellings and the aesthetic quality of residential areas, the relation with the architecture master track emerges.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

The design challenge for the Boerhaave neighborhood involves densification, revitalization, and adding vitality. Despite being designed specifically for this site, design principles, and methods can be applied in other post-war housing estates. Additionally, densification addresses the urgent housing shortage in the Netherlands, and this project looks at how vitality can be brought back to the neighborhood at the same time. The proposed industrial biobased construction method offers a versatile solution applicable not only to post-war neighborhoods but also to diverse transformation and construction projects, providing insights into sustainable materials and efficient construction techniques in architecture.

The research focuses on gathering insights into industrial biobased materials. It provides a comprehensive overview of these materials and their properties, emphasizing sustainable and esthetic applications in facade systems. Designers can use this overview to test materials to their project-specific criteria, considering factors such as context, culture, functionality, aesthetics, cost, sustainability, or history. This approach allows for optimal material utilization, leveraging their inherent strengths in design.