

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examenscommissie-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	Thijs van Amelsfort
Student number	4988922

Studio		
Name / Theme	Design and construction management	
Main mentor	John Heintz	Design and Construction Management
Second mentor	Peter de Jong	Building Economics
Argumentation of choice of the studio	Best suits the students' interest in regard to improve the construction value chain from initiation phase to delivery	

Graduation project	
Title of the graduation project	Mass timber social housing: Defining barriers and developing strategies to enable mass timber construction for housing associations

Goal	
Location:	The Netherlands
The posed problem,	<p>The Dutch construction industry operates within the principles of the linear economy, which results in substantial pressure on the environment. Besides, the industry faces the challenge of responding to a growing housing demand while the industry is subject to unproductivity, labor scarcity, and rising material prices. As a result, the need for the industry's transition towards a circular alternative is evident (Bocken et al., 2017).</p> <p>As one of the main clients of the residential real estate markets, housing associations bear a social obligation to construct as sustainable and circular as possible. Since mass timber construction reduces the carbon impact and helps to store carbon in the built environment, it is seen as a possible climate mitigation tool. However, housing associations perceive a variety of problems with embracing mass timber construction. As a result, mass timber construction companies face difficulties with addressing this customer segment. To enable</p>

	mass timber construction, these barriers need to be researched. Besides, strategies need to be developed to overcome these barriers for allowing mass timber to become a mainstream construction material for housing associations, thus helping to mitigate climate change, and achieving Dutch governmental goals of carbon reduction.
research questions and	"What are the barriers for the construction of modular mass timber social housing, and what might be strategies for overcoming them?"
design assignment in which these result.	Barriers are defined and strategies are developed to answer the main question
Process	
Method description This qualitative research aims to answer this question by design-based research. It follows the double diamond design cycle which consist of two stages, four phases and divergent as well as convergent thinking. It starts by exploring the barriers and ends with offering a solution in the form of strategies The first stage starts with a literature review on the main topics and continues with interviews. At first, these interviews are short and explorative (consultation of experts) to discover the problem, whilst the interviews will be semi-structured at the end to define the barriers. An expert panel is held to develop the strategies for overcoming the barriers	

Literature and general practical preference

To answer the main question, literature on the topics of the circular economy framework, social housing, mass timber and modular are needed. To do so, the main theory from the following sources is used: Circular economy: Bocken et al. (2016); Brand (1995); Jabbour et al. (2019); Lewandowski (2016). Social housing: Çetin et al. (2021); Koolma (2009); Elsinga and Wassenberg (2007). Mass timber construction: van der Lugt (2020); T. Nord (2008); Robati et al. (2021). Modular construction: Lidelöw (2016); Subramanya et al. (2020); Habraken (2003)

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 topic contributes to a more sustainable, circular built environment which suits the master programme. Besides, This graduation topic fits the master track 'Management in the Built Environment' because of its relationship with the different stakeholders in the built environment and supply, demand, and circularity. It, therefore, suits the 'Design and Construction Management' chair of the study.

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

Scientific relevance . Mass timber suits the circular economy principles. However, a recent article shows that Dutch housing associations conceived a Circular Economy as a new topic. Furthermore, little research about the implementation of the circular economy within housing associations has been done so far (Çetin et al., 2021). This research identifies barriers and proposes multiple strategies to enable mass timber construction, which suits the circular economy principles. Little to no research on this topic has been done so far.

Societal relevance . There is a societal need for social homes and an environmental obligation to construct them as sustainable as possible. Mass timber can contribute to both these tasks. However, there are some barriers with mass timber construction which need to be defined. The development of strategies allows mass timber construction for housing associations. As a result, inhabitants might live in healthier, more sustainable, social homes, which can be seen as socially relevant in today's economy.

Management in the Built Environment . As stated on the website of the TU Delft: "*The department of Management in the Built Environment (MBE) works towards a sustainable built environment where the interests of the end-user and other stakeholders are key.*" Since this research topic contributes to a more sustainable, circular, and affordable built environment, it suits the aim of the master program, and therefore it proves its relevance.