

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Personal information	
Name	Yanzhen Wu
Student number	5584981

Studio		
Name / Theme	Architectural Engineering: Open building	
Main mentor	Thomas Offermans	Architectural technology
Second mentor (BT)	Paddy Tomesen	Architectural technology
Third mentor (research)	Gilbert Koskamp	Timber constructions
Argumentation of choice of the studio	<p>Architectural Engineering studio aims to achieve the goal of sustainability from a technical perspective. It sets its sights on the future, seeking innovative and practical solutions for environmental and societal issues. I have the same goals with it and am glad to learn more innovative technical approaches. The 'Open building' concept stresses the adaptability of a building to possible future changes during its lifetime. It is a new concept to me, and I think it is a clever solution trying to extend a building's lifetime and maintain its value.</p>	

Graduation project	
Title of the graduation project	Adaptable Timber Complex: From Student Housing towards a Mixed-used Community
Goal	
Location	Heertjeslaan, TU Delft Campus South
Problem statement	<p>The site's main problem is the contradiction between social needs and the campus development plan. On the one hand, the student housing corporation DUWO is planning to build student housing on the site, which can help alleviate the student housing shortage in Delft. On the other hand, TU Delft is developing the Campus South area into an innovative hub, providing more places for institutes and companies. According to the campus development plan, the site is part of the business & research zone and will be developed in the second phase about 15 years later. Therefore, TU Delft claims that student housing can only serve for 15 years until the arrival of the companies, while Duwo desires to have a longer time because of higher economic benefits. In addition, the demand for student housing is unlikely to reduce but to keep increasing in the future. It is unreasonable to demolish the existing student housing.</p>
Design question	How can we design an adaptable timber building that is convertible and expandable from student housing towards a mix-use community with a low cost?
Design assignment	The campus south can become an innovation hub as planned and simultaneously take the responsibility of alleviating the student housing shortage.

	<p>The graduation project intends to design an adaptable timber building which is convertible and expandable from student housing towards a mix-use community with a low cost. In the first 15 years, the project will be affordable and livable student housing (Phase I). It will contain at least 660 student housing units and other communal spaces for communication and activities. After that, the site will be developed into a research & business area as a part of the 'innovative hub', accepting institutes and companies to settle in. The building can be partly transformed into offices, labs, and studios for the institutes and companies and can gradually expand if needed. Finally, the building might develop into a mix-use community with residential, research and business programs (Phase II).</p>
Research questions	<p>The research aims to evaluate the adaptability of multi-storey timber buildings by analysing the independence of shearing layers, mainly focusing on the joint design between building elements.</p> <p>Main questions: How does joint design affect the independence of shearing layers to achieve an adaptable timber building under the scenario of altering the function?</p> <p>Sub questions:</p> <ol style="list-style-type: none"> 1. Which building elements belong to which shearing layers? 2. Which joint positions affect the independence of shearing layers?
Process	
Method description	
Design method	<p>Adaptability is closely related to the context, that is, what might change and what causes the change. To figure out the possible changes, the current and future situation of the site will be compared through mapping. It analyses the environmental factors, including roads, transportation, surrounding buildings, facilities, water and greenery. Besides, the occupants and demands will be analysed in the two phases mentioned in the design assignment, supporting the program planning of the project. The timeline is essential during the whole design process. It helps determine how the building responds to the various changes in different periods.</p>
Research method	<p>The case study will be the primary methodology of the research. Two cases will be analysed and compared using the Dependency Structure Matrix (DSM) model. DSM is considered a powerful tool to reveal the complex interdependencies between elements in a building system (Schmidt & Austin, 2016). An initial DSM is a square cell matrix, having the same elements in rows and columns, that shows relationships between elements in a system. The dependencies between every two elements are marked as '1' in the chart, while a blank cell means there is no dependency between those elements. DSM can be used for clustering and impact analysis. Clustering analysis involves rearranging elements into chunks that have high dependency internally and low dependency externally (Browning, 2001). One of the strategies is to isolate elements with high dependencies across several chunks as bus</p>

elements (Sharman & Yassine, 2004). Impact analysis studies the propagation impact when one element changes. The fewer impacted elements and propagation rounds, the smaller the caused impact. The research in this paper includes both two parts. (Figure 2)

Literature and general practical preference

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Reflection

See attachment.