

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Personal information	
Name	Yujia Ren
Student number	5323576

Studio		
Name / Theme	Architectural Engineering	
Main mentor	Mo Smit	Design tutor
Second mentor	Olga Ioannou	Research tutor
Argumentation of choice of the studio	<p>The Architectural Engineering Graduation Studio focusing on innovative technological solutions is the main reason for my choice. Architectural engineering is both a cornerstone of architectural design and an impetus for the future development of architecture. The Harvest theme is more oriented towards circular design strategies, which is what I have been always focusing on. Under this theme, there is an opportunity to explore circular architectural design and to deepen the understanding of the inextricable relationship between society, architecture, economy, and humanity. Maintaining the balance between these four topics and reconciling them is a challenge and at the same time an opportunity for me. I will face this challenge to the best of my ability in my graduate architectural engineering studio.</p>	

Graduation project	
Title of the graduation project	Community-based materials' process centers: Applying the concept of Buildings as Material Banks to post-war community
Goal	
Location:	Western Garden Cities, Amsterdam
The posed problem,	<p>Many post-war social housings in the Netherlands await renovation. In the last century, the construction of these low-technology post-war estates helped alleviate the housing shortage in the Netherlands for a short period. However, because of small living areas, poor insulation, these dwellings no longer meet the needs of contemporary use. Amsterdam released a document called "Richting Parkstad 2015" in 2001, which presented a plan to renovate post-war housings.</p> <p>The renovation of many post-war housings poses a great challenge to manage the waste produced by demolition. According to the Dutch Material Flows Report, a large proportion of construction waste in 2014 comes from post-war housings between 1945 and 1970. Furthermore, many new materials are needed for the renovations.</p> <p>Circular principles in the construction industry advocate reusing materials via the R strategies. Some of the materials that have been discarded due to building</p>

	renovation still had the potential for secondary use. Therefore, introducing reuse practices into post-war neighborhoods presents a great opportunity for controlling waste flows especially today when there is still a large circularity gap.
research questions and	How to achieve a circular material supply chain by implementing "Buildings as Material Banks" in post-war communities
design assignment in which these result.	The establishment of a materials process center in the post-war community to help the implantation of "Buildings as Material Banks" and to explore the possibility of building a circular economy.

Process

Method description

For Research

Through the literature review, the basic definition of circular economy and its principle will be studied. Meanwhile, the notion of Buildings as Material Banks and the basic guidelines for its implementation will be discussed.

A case study based on the secondary use of materials will also be studied. By studying the characteristics of comparing different materials for reuse, different treatment methods can be targeted for different materials.

For design

The project will focus on two aspects. On the one hand, the project will focus on the technical reuse of building materials discarded as a result of post-war housing renovation. On the other hand, the project will focus on reversible building design. By improving the reusability of building materials, the value of the materials will be maintained as much as possible.

Literature and general practical preference

Precedent:

The Resource Rows – Lendager

People's Pavilion – Bureau SLA

The Circl – Cie Architect

Triodos Bank – RAU Architect

literature:

1. Akhimien, N., Latif, E. and Hou, S., 2021. Application of circular economy principles in buildings: A systematic review. *Journal of Building Engineering*, 38, p.102041.
2. Babbitt, C., Gaustad, G., Fisher, A., Chen, W. and Liu, G., 2018. Closing the loop on circular economy research: From theory to practice and back again. *Resources, Conservation and Recycling*, 135, p.1.
3. BAMB. 2021. BAMB - Buildings As Material Banks (BAMB2020) - BAMB. [online] Available at: <<https://www.bamb2020.eu/>> [Accessed 7 December 2021].
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6. Bocken, N., de Pauw, I., Bakker, C. and van der Grinten, B., 2016. Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, 33(5), pp.308-320.
Copeland, S. and Bilec, M., 2020. Buildings as material banks using RFID and building information modeling in a circular economy. *Procedia CIRP*, 90, p.143.
7. City of Amsterdam. (2020). Amsterdam Circular Monitor (p. 15). Amsterdam: City of Amsterdam.
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9. Heinrich, M. and Lang, W., 2019. Materials passports - best practice. München: Technische Universität München, p.5.
10. Honic, M., Kovacic, I. and Rechberger, H., 2019. Improving the recycling potential of buildings through Material Passports (MP): An Austrian case study. *Journal of Cleaner Production*, 217, pp.787-797.
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13. Potting, J., Hekkert, M., Worrell, E. and Hanemaaijer, A., 2017. CIRCULAR ECONOMY: MEASURING INNOVATION IN THE PRODUCT CHAIN. The Hague: PBL

Publishers, p.5.

14. Rose, C. and Stegemann, J., 2019. Characterising existing buildings as material banks (E-BAMB) to enable component reuse. Proceedings of the Institution of Civil Engineers - Engineering Sustainability, 172(3), pp.129-140.

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)?

My project revolves around circularity. It is about increasing the recyclability of building materials in post-war communities through the reuse of used materials and the design of material processing centers, which coincides with the goals of AE studio. AE studio's goal is to create inspiring architectural solutions through technology and innovation. Circularity is also an area of focus for AE studio. Through architectural design to give residents of post-war communities an example of reuse of materials, and thus give a possibility of implementation of circular economy. This is the power that technology demonstrates and the impact that architecture can have on people.

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

On the national scale, a circular economy achieved in a specific region will contribute to the goal of "50% reduction in raw materials consumption" by 2030 for the whole Netherlands. If it is possible to realize a circular economy in a post-war social housing area by designing a material processing center based on exhibition and education, can we also look for universal principles in this approach? This universal principle will have the opportunity to facilitate the achievement of a circular economy in different areas through appropriate localized modifications. This strategy offers the possibility to achieve the Dutch 2050 target----a circular economy by 2050, which is a waste-free economy that runs entirely on reusable materials

On the international scale, the circular economy, including waste and eco-design and reuse measures, can effectively reduce total annual greenhouse gas emissions, whereas the production of materials we use every day accounts for 45% of total CO2 emissions and the waste generated at this stage poses a major hazard to the environment and human health. Considering that only 8.6% of the world is recyclable today, there is a very large potential for the world's circular economy to be tapped, thereby further reducing environmental pressures, improving the security of raw material supplies, creating opportunities for employment and promoting economic growth.