

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Personal information	
Name	
Student number	
Telephone number	
Private e-mail address	

Studio		
Name / Theme	1 Million Homes - Architectural Engineering	
Main mentor		Architectural Engineering and Technology
Second mentor		Building Physics
Argumentation of choice of the studio	I am interested in the integration of architecture and engineering. The traditional way of designing only as an architect, dealing with the context, the needs, the function and aesthetics, or designing only as an engineer, dealing with the structure, sustainable systems and the calculations, are not enough nowadays. I am wondering how these two subjects can be combined and enhanced by each other and what the differences will be if one think as an engineer to design architectural space, or think as an architect to intervene in building technology design?	

Graduation project	
Title of the graduation project	Sustainable Single Living - 0.5 Million Homes
Goal	
Location:	Merwe Vierhavens (M4H), Rotterdam
The posed problem,	Consumption in the built environment accounts for 35% of the whole CO2 emission and 40% of the whole energy consumption. All new buildings must be nearly zero-energy buildings (NZEB) by 2020. Meanwhile, statistics show that the number of people living alone has risen sharply in the Netherlands. However, the traditional way of single living means less space efficiency and more energy consumption. In addition, mental happiness and living quality are seen as an important criterion of modern housing design, which is largely related to the new lifestyle and the living environment.
research questions and	How to achieve indoor comfort with minimum energy consumption in a single-living residential building in the Netherlands?
design assignment in which these result.	Sustainable single-living housing integrating living quality and eco-efficiency in an urban living & working & leisure context.

Process

Method description

The research consists of three topics to support the design. The main technical research question is how to achieve indoor comfort with minimum energy consumption in a single-living residential building in the Netherlands. It starts with the analysis of the climate and single living pattern. The solutions based on the analysis and literature research are integrated into collaboration. The prototype of the energy-efficient system which is an integration of the strategies is described in different climate conditions. Finally, the calculation provides evidence and support of the prototype, and test more detailed parameters in the system.

Other architectural research questions are how to use minimum space to provide sustainable and customized quality inside a sharing community and how to achieve flexibility in different layers. A combination of different methodologies will be used, including interviews, literature, drawings, and analysis diagrams.

After the research phase, a universal prototype of single-living housing will be established. Based on this prototype, adjustment and creativity will be made according to the certain urban context. Finally, structure and details will be carefully designed.

Literature and general practical preference

Practical experience /precedent

Earth, Wind & Fire - Ben Bronsema

Patch 22 - Tom Frantzen

de Nieuwe Meent - RAUMPLAN

One shared house 2030 -Space 10

Literature of the technical research

Brown, G. Z, and Mark DeKay. 2013. Sun, Wind, and Light: Architectural Design Strategies. Third [edition] ed. Hoboken: Wiley.

Košir Mitja. 2019. Climate Adaptability of Buildings: Bioclimatic Design in the Light of Climate Change. Cham, Switzerland: Springer.

Nabokov, Peter. 1986. Architecture of Acoma Pueblo: The 1934 Historic American Buildings Survey Project, Historic American Buildings Survey. Santa Fe, NM: Ancient City Press

Remco Looman. 2017. "Climate-Responsive Design: A Framework for an Energy Concept Design-Decision Support Tool for Architects Using Principles of Climate-Responsive Design" 1 (1): 1–282. DOI:10.7480/abe.2017.1.

Alsaad, Hayder & Chang, Jae. (2014). The Efficiency of Night Insulation Using Aerogel Filled Polycarbonate Panels During the Heating Season. Journal of The Korean Society of Living Environmental System. 21. 570-578. 10.21086/ksles.2014.08.21.4.570.

Atul Sharma; V. V. Tyagi; C. R. Chen; D. Buddhi (February 2009). "Review on thermal energy storage with phase change materials and applications". Renewable and Sustainable Energy Reviews. 13 (2): 318–345. DOI:10.1016/j.rser.2007.10.005

Fitton, R., Swan, W., Hughes, T. et al. Energy Efficiency (2017) 10: 1419.

<https://doi.org/10.1007/s12053-017-9529-0>

Lim B P, Hijazi H, Thiébaux S, et al. 2016. Online HVAC-Aware Occupancy Scheduling with Adaptive Temperature Control[C]. //International Conference on Principles and Practice of Constraint Programming. Springer, Cham. p. 683-700.

Okay Go'nu'lol, Ayc'a Tokuc, Dincer İbrahim. 2017. Net Zero Energy Residential Building Architecture in the Future. // C. Ozgur Colpan, and Onder Kizilkan, eds. 2018. Exergetic, Energetic and Environmental Dimensions. London, England: Academic Press.

Sabine Jansen. 2014. Exergy Guidebook for Building Professionals. Version 2. Delft University of Technology. <https://klimapedia.nl/publicaties/exergy-for-building-professionals/>

Literature of the architectural research

Blunt, Alison, and Robyn M Dowling. Home. Key Ideas in Geography. New York NY: Routledge, 2006

Susumu Masuda. The anatomical chart of homes. To'kyo : Ekusunarejji, 2009.

Lupton, Ellen, and J.Abbott Miller. The Bathroom, the Kitchen and the Aesthetics of Waste : A Process of Elimination. New York: Princeton University Press, 1996.

Bliss, Steven. Best Practices Guide to Residential Construction: Materials, Finishes, and Details. Hoboken: Wiley, 2006.

Colquhoun, Ian, and Peter G Fauset. Housing Design in Practice. Harlow: Longman Scientific and Technical, 1991.

Fromm, Dorit. Collaborative Communities: Cohousing, Central Living, and Other New Forms of Housing with Shared Facilities. New York: Van Nostrand Reinhold, 1991.

Schwartz-Clauss, Mathias, Alexander Von Vegesack, and Vitra Design Museum. Living in Motion: Design and Architecture for Flexible Dwelling. Weil Am Rhein: Vitra Design Museum, 2002.

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 studio is architectural engineering which is a combination of architecture and engineering. And my graduation topic is about sustainability, which is also a combination of architectural quality and eco-efficient engineering. I am trying to tackle the traditional architectural housing issue with a whole view of Architecture, Urbanism & Building Sciences.

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

The research of social and psychological in my graduation will redefine the home and the connection between the individual and the environment, depicting the ideal living environment and the imagination of home. In addition, the space hierarchy can be valuable for human behaviour studies and other sharing economy projects. The design is not only based on physical using of the space but more about the mental needs and living quality.

The balance of flexibility is about the life span of different layers of the building and the users' behaviour. The result can be a new view of which parts need to be flexible to reduce material usage and which parts can be relatively permanent.

The research about the energy-efficient system is largely based on the local climatic data. However, the methodology of analysis, the combination of building engineering and architectural design, and calculation approach can be used in the energy efficiency study in different contexts.

