



# Research Plan | aE Studio

## Personal Information

Name

Pim Brueren

Student number

4658752

## Studio

Name of studio

Architectural engineering – Second life

Design tutor

Anne Snijders

Research tutor

Serdar Asut (not confirmed)

Argumentations of choice of the studio

Renovation – technical approach

## Graduation Project

### Title

Preparing for a modular future

### Keywords

Modular, renovation, third live, digital computation, adaptability, Digital fabrication

### Problem Statement

After the Second World War, the demand for new housing increased rapidly, which led to the necessity for optimization and rationalization of the building process. Shortage on the conventional building materials wood and brick and the urge to speed up construction time stimulated research of cast and prefabricated concrete structures. (i.e., the British Airey system, imported by the Dutch government in 1948). The tradition in building concrete flats still marks a significant part of the Dutch building stock, providing housing which we see as poor performing buildings nowadays. With government ambitions to have the entire countries building stock energy neutral in 2050, there is an enormous challenge to convert existing, poor performing buildings into energy neutral ones. These flats are in need for renovation; to achieve better living conditions, cope with achieving the referendum of Paris and fix the housing problem. However, these buildings are renovated for fitting needed in this age not taken into account the needs and renovations of the future.

### Objective

Therefore, a system which takes into account these problems would eventually make renovation easier and affordable and creates opportunities for customization. In short, a system which takes care of the 'third-life'. By achieving a more modular approach and with the help of computational design and prefabrication the whole renovation process could be simplified and sped up while increase the customization of the different building blocks.

## Overall design question

How does a modular system generated by computational design change the renovation process of post war buildings for several renovations in their lifespan?

## Thematic Research Question

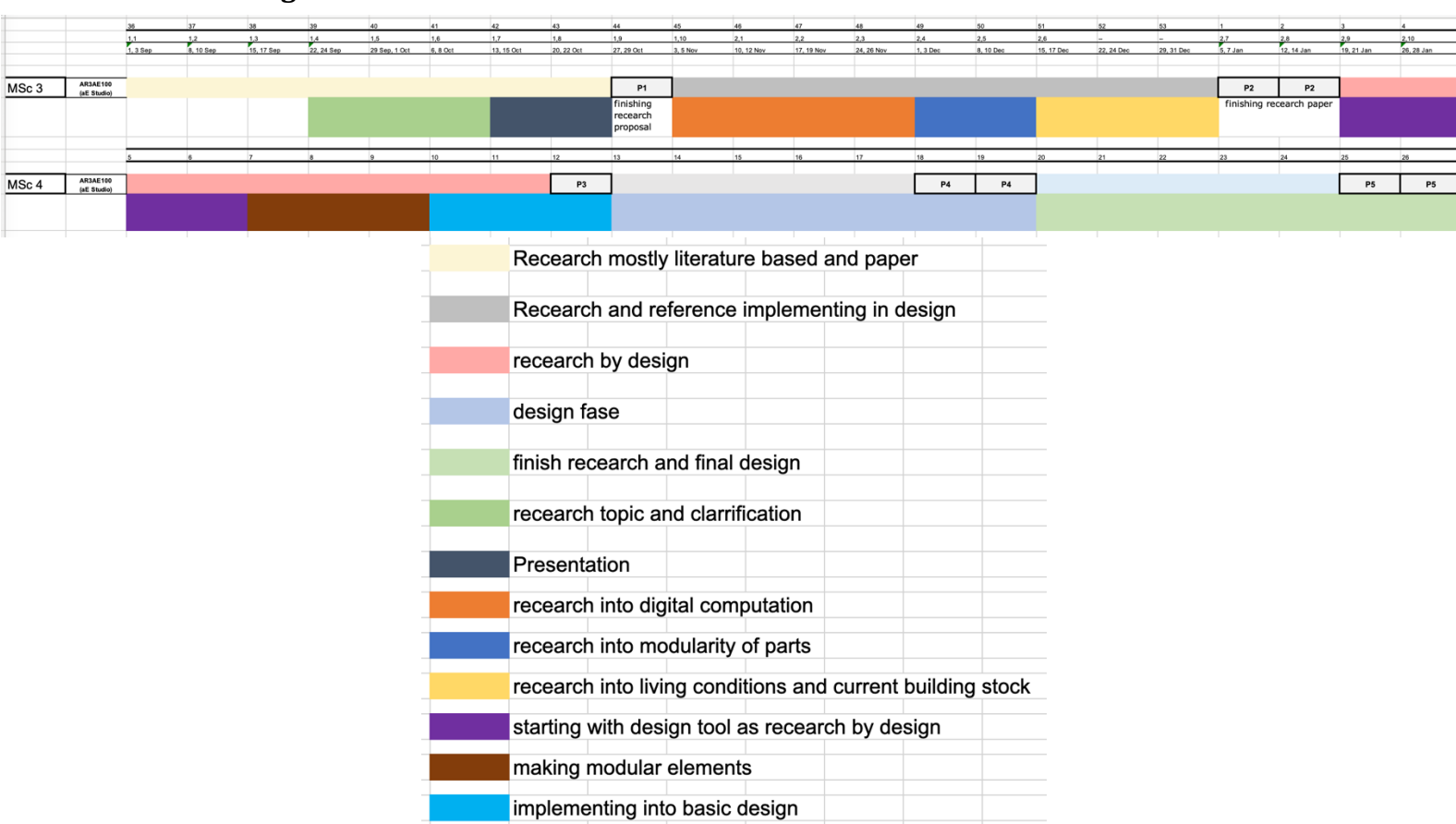
Several different points have to be taken into account. To cover all these topics that are addressed in the overall design question, 3 sub-questions need to be answered.

- How does renovation change the living conditions of post war buildings?
- How does modularity of building parts change the customization of buildings
- How does computational design change the renovation of buildings?

## Methodologies

First a literature study is needed for knowledge of previous findings and conclusion not only on renovation but also modularity and buildings systems. For these findings reference projects are gathered for an overview of existing projects and their strong and weak points. Eventually research by design is done to combine the different elements in a final design project.

## Planning



## Relevance

The housing shortage and goals for the climate-referendum of Paris are a contemporary problem. Therefore, different solutions could be implemented. With the goal to be carbon Neutral in 2050 solutions for third-life renovation could be a positive outcome to both of this current time problems.

The solution would be a generic problem statement as u could possibly implement the outcome on several different buildings but the design aspects within the modularity side possibly outcome more specific.

## **Literature**

Issa J. Ramaji & Ali M. Memari, 2017, Extending the current model view definition standards to support multi-storey modular building projects

Hu Du, Puxi Huang & Phillip Jones, 2019, Modular facade retrofit with renewable energy technologies: the definition and current status in Europe

Mark Lawson, Ray Ogden & Chris Goodier, 2014, Design in Modular Construction

Joep Hövels, 2007, The Open Modular Façade Concept

Josef Hargrave, 2013, it's alive; can u imagine the urban building of the future?

F. Salvador et al., 2002, Modularity, product variety, production volume, and component sourcing: theorizing beyond generic prescriptions

Leo Oorschot, Lidwine Spoormans, Sabira El Messlaki, Thaleia Konstantinou, Tim de Jonge, Clarine van Oel, Thijs Asselbergs, Vincent Gruis and Wessel de Jonge, 2018, Flagships of the Dutch Welfare State in Transformation: A Transformation Framework for Balancing Sustainability and Cultural Values in Energy-Efficient Renovation of Postwar Walk-Up Apartment Building