

# RESEARCH PLAN

AR3A010

**Graduation Studio - Resourceful Housing  
Adapting 20<sup>th</sup> century heritage**

Julia Veerhuis | 4870123

3 November 2023



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## Reviving the past in modernity: Design guidelines for the transformation of 20<sup>th</sup> century residential buildings in Amsterdam Nieuw-West

*A research on the principles of Western Garden Cities  
and the implementation of this through adaptable  
building systems in the transformation of 20<sup>th</sup> century  
residential buildings in Amsterdam Nieuw-West*

Delft University of Technology  
Master track Architecture  
Heritage & Architecture Department  
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Tutors - Telesilla Bristogianni (research)  
Uta Pottgiesser (design)



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# 01 INTRODUCTION

## 1.1 Housing crisis and circularity

One of the biggest social problems facing the Netherlands today is the lack of sufficient housing (Weijer, 2022a). A big change to tackle this issue is to rethink the existing building stock. In 2050, 90 percent of the current dwellings still exist, and these buildings are a great change for renovation (Weijer, 2022b).

*"We now have 7.9 million homes of which about 7.3 million must be renovated in some way by 2050. In short: 270,000 renovations per year, and thus 1,000 homes per day to be addressed"*

- Weijer, 2022b

This can only be achieved by scaling up the renovation concepts and execute this in many projects, a comprehensive approach. Building in an adaptable way is necessary states van Nunen, lecturer in Sustainable Renovation at the Hogeschool Rotterdam, advisor at BouwhulpGroep and columnist of RenovatieTotaal, in an article from Weijer (2022b). Building with adaptable building systems means thinking about using prefabricated materials, flexibility and demountability in order to accelerate the process, make it cost efficient and minimizing errors in the construction phase. And next to this, the large advantage is that this is a circular way of building. The lifespan of the buildings will be extended and the building materials can be reused in the future.

The Ministry of Economic Affairs and at that time VROM set up the Industrial, Flexible and Demountable (IFD) program. But, the IFD program has not been adequately translated to the demand, so it never came to scale up in renovation projects. Meanwhile, the principles have also changed, but IFD is still relevant. IFD 2.0 is the follow-up program, where it is more about creating scale by producing building elements in an industrial and flexible way. Moreover, we have too few people on the construction site. So producing building elements in an efficient way is good for the whole construction chain.

Adding an extra layer on top of 20<sup>th</sup> century residential buildings forms a big change to tackle the renovation issue. This is mentioned in the SEV studies (social-economic research) on redevelopment of existing housing as one of the most promising possibilities (Weijer, 2022a). Next to this, many other interventions in the

current housing stock can be done in order to achieve more circularity, energy efficiency and differentiation in housings.

In this research, Amsterdam Nieuw-West is being investigated. This post-war city district offers numerous opportunities for revitalization, making it a potential solution to the housing shortage in the Netherlands. This city district is part of the Western Garden Cities and has recently been listed by the National Cultural Heritage Agency of the Netherlands to have national importance (Havinga et al., 2019).

## 1.2 Amsterdam Nieuw-West

Amsterdam Nieuw-West is a relatively new city district. It was created after the Second World War. The historical roots of the area lie in Sloten, which was initially characterized by peats (Vashti, 2021). Various efforts were made to transform it into a fertile agricultural land, supplying Amsterdam's daily needs. However, as urbanization gradually encroached on this rural landscape, the 'Algemeen Uitbreidingsplan' (AUP (General Expansion Plan)) emerged between 1934 and 1958 (van Eesteren Museum, 2017). The Western Garden Cities are considered a textbook example of modern urbanism as propagated in the 1930s by the architects of Nieuwe Bouwen, who had united in the Congres Internationaux d'Architecture Moderne (CIAM) (Mens, 2020). This is not remarkable, given that the AUP was designed by the chairman of CIAM, Cornelis van Eesteren. The AUP revolutionized Amsterdam's neighbourhood concept, leading to the creation of Amsterdam Nieuw-West.

The AUP was influenced by Ebenezer Howard's garden city concept, emphasizing greenbelts around the city and open building blocks that prioritized green spaces and improved living conditions. The result was an urban plan that featured segregated functions within neighbourhoods, a well-connected green structure, open building blocks, recreational opportunities for all residents, and optimal natural light and air flow.

These thoughts are also implemented in the Western Garden City of Nieuw-West, where the motto 'light, air and space' became important in the development of Dutch post-war expansions. The ideal image of the Western Garden City was about the design of a green structure that had to form a coherent whole,

with a hierarchical structure from the level of the neighbourhood to the level of the city. This created a balanced composition between the built and unbuilt space (Feddes, 2012). Besides this, the 'neighbourhood concept' also became important. This concept was developed from a sociological point of view (Havinga et al., 2019). Where every neighbourhood had its own facilities.

The execution of the plan started with Slotermeer in 1951, this is followed by the construction of the Garden Cities Geuzenveld, Slotervaart, Overtoomse Veld and Osdorp. The entire area was completed in 1965. The focal point of Nieuw-West is the Sloterplas, surrounded by the named Western Garden Cities. With a later expansion in the 1990s with the neighbourhoods Oostoever Sloterplas, Nieuw Sloten and De Aker. The main dwelling typologies in Nieuw-West consist of tower blocks, slab blocks with gallery access, slab blocks with point access, row houses and duplexhouses (Havinga et al., 2019).

However, the euphoria about these neighbourhoods did not last for a long time. In the 1980s, the Western Garden Cities even became synonymous with squalor crime and social problems (Mens, 2020). The current housing stock is considered as obsolete, both architecturally and physically (van Eesteren Museum, 2022). This area faces many problems and threats, making it an ideal location for transformation and renewal.

City planners in the past already created plans for urban renewal of this city district. The urban renewal led by Bureau Parkstad ran from 1999 to 2007 was characterized by large-scale demolition and new construction plans. The ambitions were concretized in the

development vision 'Richting Parkstad 2015', that was published in 2001. The report contains the spatial, programmatic, social, financial and procedural aspects of the proposed renewal projects (Mens, 2020). However, the outbreak of the financial and economic crisis in 2008 made the market fall silent, leading to the return of smaller-scale interventions. This had a positive effect on the initial principles of the AUP, they stay remained. Corporations began to focus more on their existing building stock, the heritage values and the relationship between architecture and public spaces.

This indicates that although the principles of Western Garden Cities are not readily apparent now, it is an important aspect for this neighbourhood. The task of renovation is a contemporary one, but can be linked to principles of the past in order not to lose the qualities conceived then.

## 1.3 Research

This research paper dives into Amsterdam Nieuw-West, exploring the principles of Western Garden Cities and the shift toward adaptable construction processes. Recognizing the pressing housing crisis and the urgent need to transform existing buildings in a circular way, this research looks into innovative approaches of adaptable building systems, to efficiently revitalize this city district. The aim is to propose design guidelines for the transformation of residential buildings in Amsterdam Nieuw-West that revive the Western Garden City principles in a modern way and to the current needs while applying adaptable building systems. A matrix will be made in order to get an overview of the principles and ways to transform. This will provide a comprehensive approach for the neighbourhood.



Figure 1: Nieuw-West with the Sloterplas (Stadsarchief, 1974)



Figure 2: Daily life in Nieuw-West (Stadsarchief, n.d.)

# 02 PROBLEM STATEMENT

## 2.1 Housing crisis

The Netherlands currently faces a significant housing crisis (Weijer, 2022a). With a growing population and limited available land for new construction, finding a solution has become an urgent matter. The housing crisis is characterized by factors such as a shortage of affordable housing, rising property prices and an increasing demand for housing.

The housing crisis needs to be tackled. This can be done in two ways, building new houses or rethinking the existing housing stock. Where the last strategy is the most sustainable, as we have a large existing building stock. Thus, the housing crisis should be tackled with the transformation of buildings we currently have. They form a perfect opportunity for an innovative approach, also aligning with sustainability goals, making it a promising solution for the Netherlands. As mentioned in the introduction, this can only be achieved by scaling up the renovation concepts and create a comprehensive approach. It offers the opportunity to optimize available space and provide new spaces for dwellings.

## 2.2 Need for circular solutions

The earth is under great pressure, there are growing needs for raw materials and energy. The construction sector plays a big role in this, this is why change is necessary. Namely, the construction industry consumes 40% of the materials in the world economy, of which only an estimated 20-30% are recycled or reused at the end of their life (Leising et al, 2018). Until now, non-renewable materials are widely used in construction. The extraction, processing and transportation of these products causes a great environmental effect on the earth (Geldermans en Jacobsen, 2015). This means that currently, mainly the linear economy is going on, where products are scrapped after use and are landfilled or incinerated. A solution for this is going from linear processes to circular processes, see figure 4. The definition of building circular can be found in the Circular Economy. This is an economic system that focuses on structural changes in the existing economy. With an increasing population, and thus increasing demand for housing, measures will need to be taken. The Circular Economy is all about the infinite reuse of products, a closed loop.

For the building industry, we must consider adaptable building systems with a focus on renewable materials, demountability and flexibility. Prefabrication and off-site manufacturing leads to a reduced overall construction schedule, improved quality, and reduced resource wastage (Lacey et al., 2018). Besides this, transformation or renovation of existing buildings is more sustainable since the carbon emissions, development costs and construction materials are lower than if demolished and rebuilt.

## 2.3 Quality Western Garden City

As stated in the introduction, Amsterdam Nieuw-West, while recognized as a post-war heritage site, is facing significant issues. The city district contains outdated buildings, limited living space, and shifting functions.

When the city district Amsterdam Nieuw-West developed, the vision of the Western Garden Cities was implemented, this brought a new face to the city. This post-war neighbourhood with at that time an innovative approach. It was created with open building blocks in order to create more light, air and space. There is lots of space for greenery that promotes outdoor activity and stimulates social activities (figure 5). At the moment, this vision is long gone, green spaces around housing blocks are barely used and houses are outdated. There is a need for renewal and identifying the initial principles in order to create a liveable environment.

Despite the challenges and changing urban dynamics over time, the Western Garden Cities remain significant in Amsterdam's urban development. The cultural-historical significance of the design and layout of Amsterdam Nieuw-West is expressed primarily in the way that housing plans, building subdivisions and the long lines of public spaces in the form of watercourses, roads and green spaces have been dimensioned and arranged in relation to each other (Mens, 2020). But some of these principles may not meet the current needs of the users.

The neighbourhood shows low satisfactory scores from its residents (figure 6). This is a worrying fact, and due to the lack of renewal and transformation in the neighbourhood the score will not improve soon. In the AUP, the Western Garden Cities should promote the urban quality and the living qualities with several facilities and lots of green, it seems that this failed.

Therefore an investigation is necessary into these principles in order to revive the district, preserve the values and meet the current needs of residents. Transformation is urgent in order to upgrade the buildings, add new dwellings and functions and create a comfortable environment for all its users.

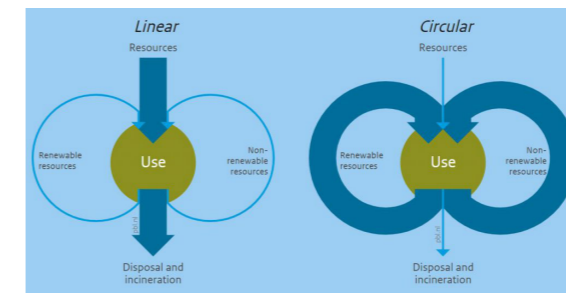


Figure 4: Linear to circular economy (Kenniskaarten, n.d.)



Figure 5: Children playing in Osdorp (Stadsarchief Amsterdam, n.d.)



Figure 3: Vibrant plinth Amsterdam Nieuw-West (Stadsarchief Amsterdam, 1971)

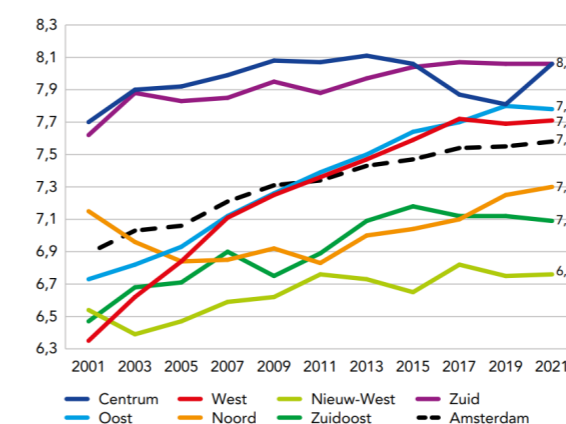


Figure 6: Satisfaction with city district (Gemeente Amsterdam, 2021)

# 03 RESEARCH QUESTION

### 3.1 Research question

The research question that will be tackled is a fundamental question that stems from the problem statement. It is a response to a pressing need for circular solutions in the building industry where there is a housing shortage, the growing dissatisfaction with the current living environments and the recognition that the quality of Western Garden Cities is no longer present in Amsterdam Nieuw-West.

*What design guidelines can be employed to revive the Western Garden City principles into 20<sup>th</sup> century residential blocks in Amsterdam Nieuw-West while utilizing adaptable building systems?*

The sub questions that will help to answer the main research question are divided into two categories. With each their own research question in order to come to a conclusion. The questions are formulated as follows:

- *What are the principles of Western Garden Cities?*
- *What are the Western Garden City principles of the urban plan?*
- *What are the Western Garden City principles of the building typologies?*
- *What are the Western Garden City principles of the urban life?*

- *What adaptable building systems are suitable to transform in a sustainable way?*
- *What can we learn from literature?*
- *What is the transformation potential of Nieuw-West residential buildings?*
- *What building systems are used in transformation projects?*

### 3.2 Research aim

This research aims at investigating the Western Garden City principles while embracing adaptable building systems in order to create a sustainable, resilient, and vibrant living environment. Transformation is very important nowadays and helps to improve the building and living qualities while creating space for new dwellings and variations in floorplans. This research investigates the heritage value of the Western Garden City in Amsterdam Nieuw-West and looks at projects with innovative adaptive building systems that help to transform in a circular, cost-efficient and fast way. The importance of the past needs to be brought back to the modern times and relate to the current needs.

Three buildings in Nieuw-West will be evaluated in order to create design guidelines that will revive the district. These buildings are typical residential buildings in Nieuw-West and will therefore represent the housing stock in the neighbourhood. The three research cases, see appendix 7.2, differ in their typology, construction system, parcel form, materials and other aspects.



Figure 7: Sloterplass (own image)

The research will provide design guidelines in the form of a matrix on a spatial scale and building scale for Amsterdam Nieuw-West to transform existing post-war residential buildings to a modern, innovative and community based design while reviving the vision of the past.

### 3.3 Link to the project

This research links to the graduation project in two ways. (1) The investigation and goal of reviving the Western Garden Cities relates to the spirit of the city district Amsterdam Nieuw-West. The neighbourhood needs a boost and revaluation about the Western Garden Cities. (2) Next to this, there is an urgent need to transform in a circular way in order to stop the world from running out of its supplies sooner and sooner. Adaptive building systems can be applied when transforming. These two parts of the research link to the question of the studio: How can circularity and heritage approaches join forces? Thus, the past meets modern times.

### 3.4 Broader relevance

There is little knowledge of building with adaptable building systems in the transformation of existing residential buildings. In the future, this can be very relevant in order to transform these buildings in an efficient and fast way. Also, local residents will be less inconvenienced by the construction work. Additionally, Amsterdam Nieuw-West recognizes the importance of the principles of the past, yet there's currently no

overarching strategy for addressing the present condition comprehensively. Because this city district contains a lot of the same residential buildings, there is an opportunity to establish guidelines for the neighbourhood to transform. This could help the city district transform to a liveable environment with the use of efficient interventions.

### 3.5 State-of-the-art

Many research has been done about the Western Garden Cities, different books and articles form a very good overview of the principles on the neighbourhood and building scale (appendix 7.4) They all address the need for the neighbourhood to transform and their characteristics. Their is a discussion on how to transform and there is no clear answer, this research will try to fill this gap and create a comprehensive approach.

Adaptable building systems is a common approach in the construction of new buildings, there are many theories and examples of these structures. But, in transformation projects, this falls behind. As stated in the introduction, there is the IFD program (Weijer, 2022b). This is a contemporary approach in existing projects but still needs more attention and needs to scale-up. The gap in using adaptable systems in existing buildings will be filled with this research, in order to transform in faster and more circular in the future. The theoretical framework will further elaborate on theories that will be used in order to form a conclusion on the research questions.



Figure 8: Amsterdam Nieuw-West (own image)

# 04 METHODOLOGY

## 4.1 Methods

The research question consists of two parts, where the principles of the Western Garden Cities will be investigated on the one hand and the adaptable systems on the other hand. These two parts are subdivided by several questions in order to define a conclusion. Every subquestion has their own methods, where some will overlap. Literature review for example is very important for background information.

The used methods are outlined below:

### 1. Literature review

A literature review will be used in order to collect information about the historical development of Western Garden Cities and adaptable building systems. The information will be collected from books, municipal documents and other public documents. This will gain insight in the different topics and gives a comprehensive overview.

### 2. Site observation

This research looks at the existing situation of the built environment and collects information about the current state. Also, how the spaces are being used will be observed. This will provide pictures and an understanding about the neighbourhood and the current state.

### 3. Documentary analysis

This documentary analysis will look at historical photos from the 20<sup>th</sup> century derived from Stadsarchief. This will give insight in how the previous condition was and how this has changed over time. This is somehow also a comparative study where the values of the past will be compared to the current state.

### 4. Spatial mapping

Through mapping, the urban typology and principles will be made clear. The current situation has been changed over time and thus, the current situation will be compared with the historic map. This will make it visible that the Western Garden City has been changed. Shops are gone, green spaces are empty etc.

### 5. Comparative study (matrix)

A lot of buildings nowadays are built with modular systems, adaptable structures or are designed to be disassembled in the future. This provides an efficient and circular way of building. Through the comparison of multiple references, a matrix will be set up with some key aspects. This provides an overview of used systems in the building industry. Appendix 7.3 already shows examples of projects that could be relevant for this study. However, there is little knowledge about adaptable building systems, thus we can also learn from other references like

a church or an office building. This expands the research.

The research will also conduct a comparative study on three different buildings in the area (appendix 7.2), who represent the neighbourhood. These buildings will be assessed on their ability to transform, their role in Nieuw-West and the user preferences.

The methodological framework (figure 10) forms an overview of the used methods for the research. The different research methods are here connected to the subquestions of this research. Appendix 7.1 contains a preliminary structure for the research.



Figure 9: Impression Amsterdam Nieuw-West (own image)

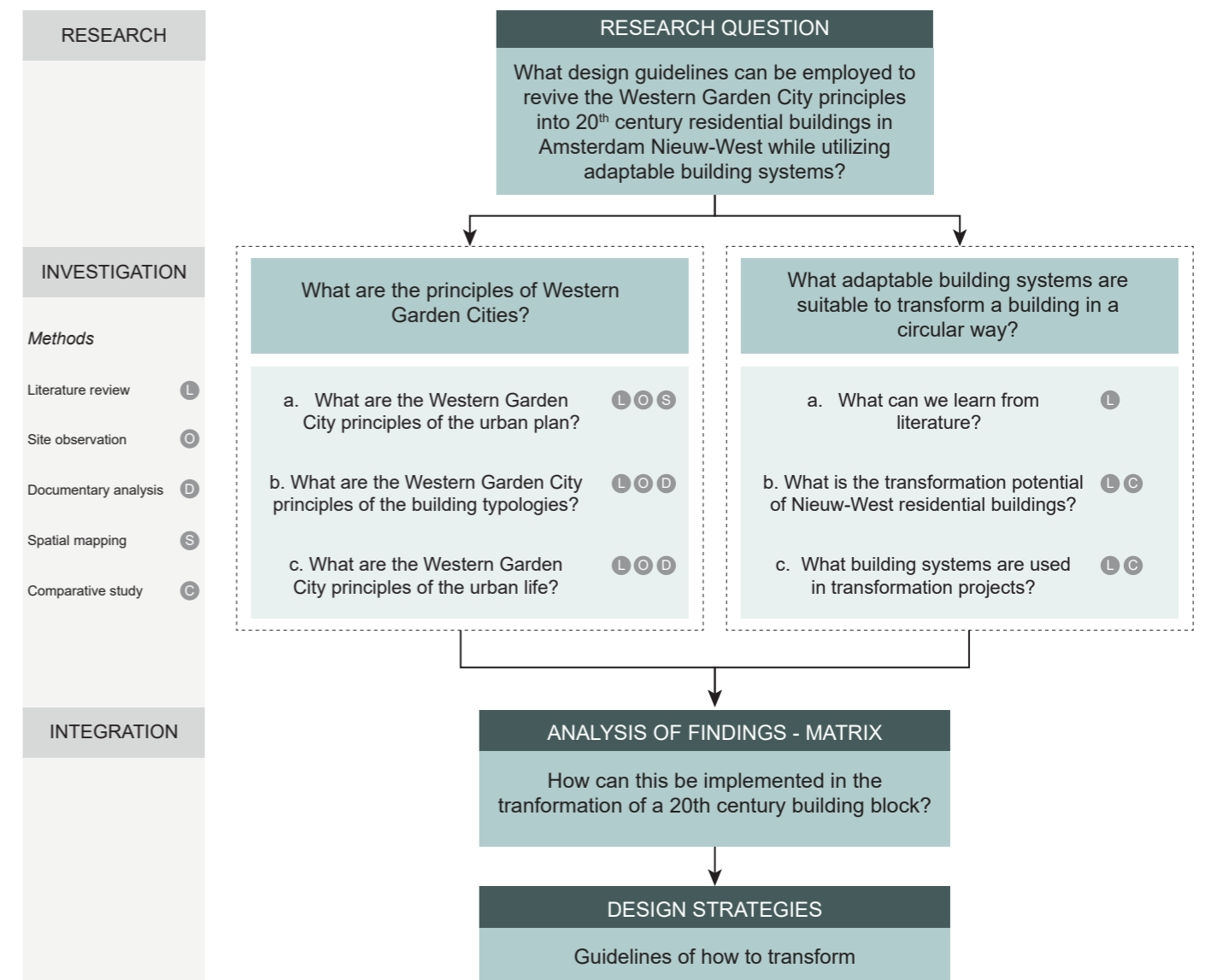


Figure 10: Methodological framework (illustrated by author)

# 04 METHODOLOGY

## 4.2 Theoretical framework

The research question will be answered by using the methods described on the previous pages. Some subjects in the research need extra theory in order to collect data. Therefore, a theoretical framework has been established (figure 11).

The transformation potential of Nieuw-West buildings will be assessed according to Bernard Leupen his approach from Yegenoglu et al., (2008). Leupen questions changeability of the permanent. Where a building is designed to last while society continues to grow. He identifies four functions in his framework to examine the layers of the building: the load-bearing structure, the skin, the interior and the serving elements. Yegenoglu et al. extend these functions by also looking at the surroundings, the framework is expanded to include the functions of parcel form, outdoor space and infrastructure. By applying Leupen's model at these two levels, it is possible to describe the transformation possibilities of the Western Garden Cities.

The adaptable building systems of existing transformation projects also need to be reviewed, therefore different aspects of these project will be assessed in order see how circular their adaptable building system is. To find these key aspects to form a matrix, the determinants of Hamida et al., (2022) will be used. They define aspects such as: flexibility, maintainability, materiality and dismantlability.

Also, material need to be collected about these projects. Weijer is specialised in renovations with adaptable building systems and writes a lot of articles about it. These articles from RenovatieTotaal will be used to collect several projects and information about it, see appendix 7.3.

RESEARCH SUBJECT	THEORY	VALUE
Transformation potential of Nieuw-West residential buildings	Bernard Leupen from Yegenoglu et al., (2008). Westelijke tuinsteden: Breukvlakken	Leupens' approach provides a strategy on assessing existing buildings and their transformation potential on different aspects
Determinants of adaptable building systems	Hamida et al., (2022). Circular building adaptability and its determinants.	This research will provide key aspects in order to assess the adaptable building systems
Transformations with adaptable building systems	Weijer, H. (2019-2023) RenovatieTotaal.	Weijer writes articles about transformations projects with adaptable building systems, this provides real life cases

Figure 11: Theoretical framework (illustrated by author)

## 4.3 Process & timeline

The process is visible in the timeline, figure 12. After a site visit and defining the problem statement, the research begins by collecting material from adaptive building systems in buildings (appendix 7.3), a selection will be made from this and what is useful for answering the sub-question. After collecting, the projects will be studied and see if enough information is available. This could also be a risk in the research as there is still little information about transformation projects with smart building systems. If this is the case, a construction company or architectural firm will be approached.

A lot of information has already been gathered about Western Garden Cities, but this will be further elaborated and compared with the current wishes of residents starting in week 10. For the different scales of the sub questions, maps will be made prior to that period in order to gain more insight into the area and already perform an initial analysis. After this, further work can be done to implement the principles during this time.

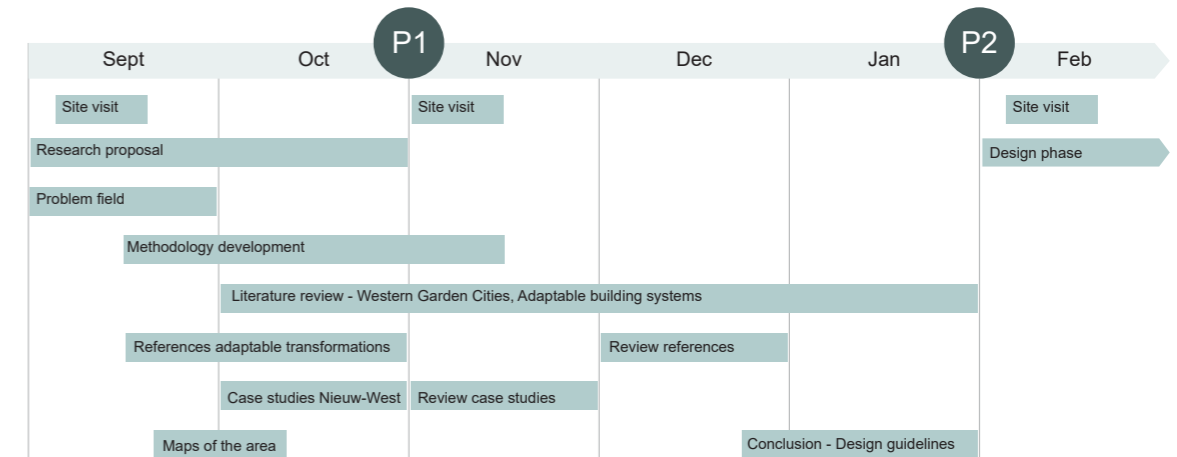


Figure 12: Timeline first semester (illustrated by author)



Figure 13: Impression Amsterdam Nieuw-West (illustrated by author)



# 05 DIAGRAM OF RESEARCH DESIGN

## 5.1 Diagram of research design

Figure 14 shows the diagram of research design. This provides an overview of the research in relation to the design case. The research came out of a personal interest about the technical side of buildings and the interest of diving into the history of existing urban plans in order to transform in the best possible way and not let past visions be lost. Besides this, transformation of existing buildings is a very sustainable solution to the housing crisis and smart building systems can help to do this quickly and efficiently.

In order to formulate the research question, the problems were defined. This problem statement results in a research question and a design question. The research question can be answered through a thematic research where literature, reference projects and other related aspects will be studied. This results in an analysis of the findings that can give grip and provide design guidelines, in the form of a matrix, for the design in the next semester. The design question overlaps with the research question, the findings of the research will be implemented in the design. But, the design case also needs an elaborate study. Where the site and building itself need to be analyzed, with aspects like context, scale, technology or typology. After this, a value assessment will be done that provides a framework of what to preserve and what to change.

## 5.2 Hypothesis

There are a lot of residential buildings in Amsterdam Nieuw-West with the same typologies, for this the research will give general guidelines to transform efficiently with adaptable building systems that contribute to a circular future. Because this area is recognized as national heritage, it is important to dive into the principles of the area and revive it in modern times. Of course, urban dynamics and residents' desires have also changed from the past, so some values will not matter and need to be modernized. It is expected that this research will provide a solid basis for transforming residential buildings in Nieuw-West, providing the municipality a matrix with guidelines. In the design case, this will be tested on one of the three research cases (appendix 7.2). The design case will form an example on how to transform residential buildings in Nieuw-West and revive the city district while not losing the vision of the past.

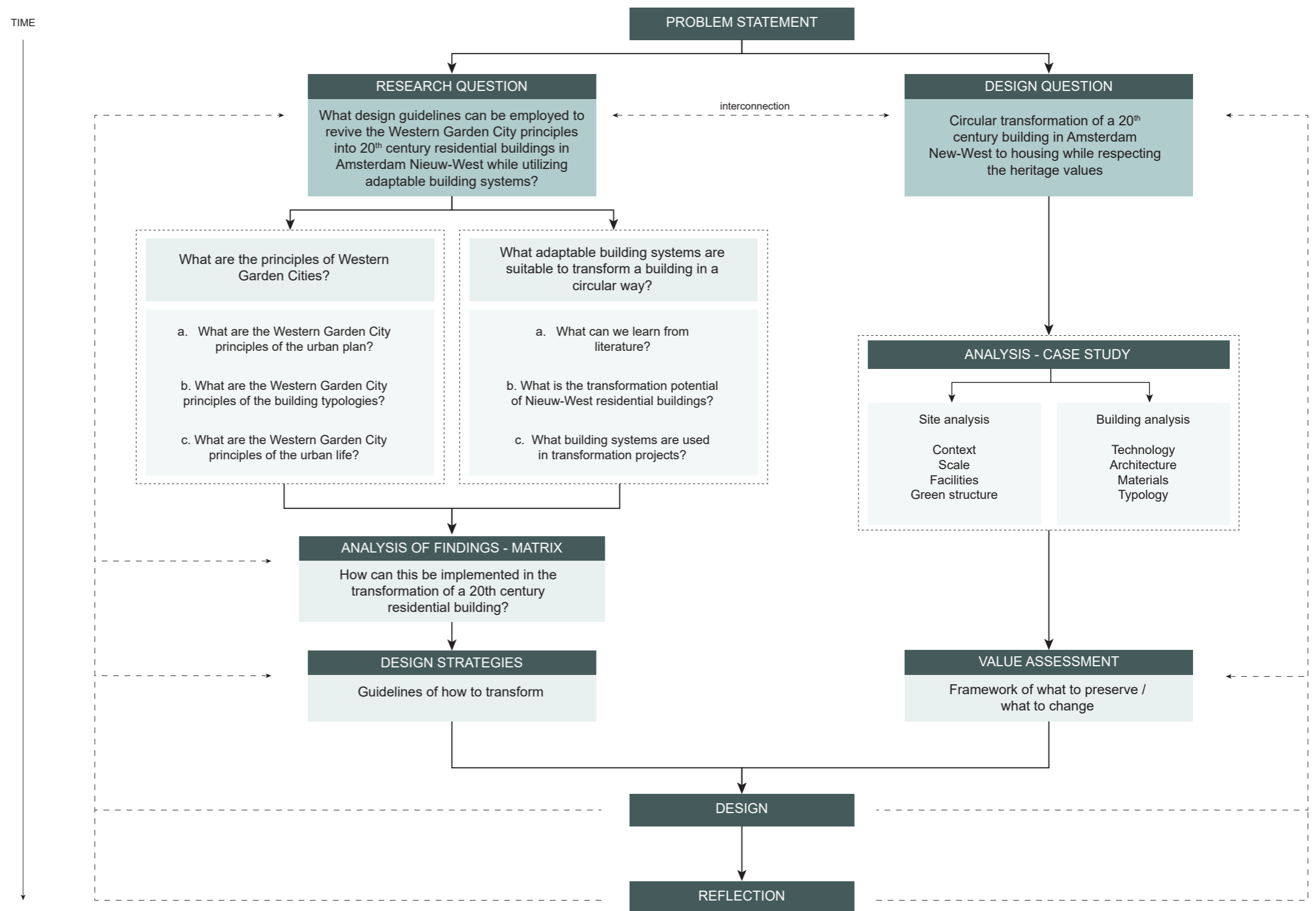


Figure 14: Diagram of research design (illustrated by author)

# 06 REFERENCES

## 6.1 Literature

- Feddes, Y. (2012). Het groene kapitaal van tuinsteden. *AGORA Magazine* 28(2), 14-16. <https://doi.org/10.21825/agora.v28i2.2212>
- Geldermans, R. J., & Jacobsen, L. R. (2015). *Materialen & Circulair Bouwen: Vervolgonderzoek Pieken in de Delta project REAP+*. TU Delft Open.
- Gemeente Amsterdam. (2021) *Wonen in Amsterdam 2021 Leefbaarheid*. Amsterdamse Federatie van Woningcorporaties.
- Havinga, L., Colenbrander, B., & Schellen, H. (2019). Heritage attributes of post-war housing in Amsterdam. *Frontiers of Architectural Research*, 9(1), 1-19. <https://doi.org/10.1016/j.foar.2019.04.002>
- Lacey, A. W., Chen, W., Hao, H., & Bi, K. (2018). Structural response of modular buildings – An overview. *Journal of Building Engineering*, 16, 45-56. <https://doi.org/10.1016/j.job.2017.12.008>
- Leising, E., Quist, J., & Bocken, N. (2018). Circular Economy in the building sector: Three cases and a collaboration tool. *Journal of Cleaner Production*, 176, 976-989. <https://doi.org/10.1016/j.jclepro.2017.12.010>
- Mens, N. (2020). Waardering en stedelijke vernieuwing van de Westelijke Tuinsteden in Amsterdam. *Bulletin KNOB*, 19-37. <https://doi.org/10.7480/knob.119.2020.3.689>
- RenovatieTotaal (2022, December). Prefab oplossingen voor uw technische vraagstuk. *RenovatieTotaal*. Nr 7.
- RenovatieTotaal. (2023, June). Opgehoogde galerijen Wiltonflats worden echte ontmoetingsplaats. *Renovatiekrant*. Nr 4.
- Rijksdienst voor Cultureel Erfgoed. (2016). *Wederopbouw, een kansrijke erfenis*. Ministerie van Onderwijs, Cultuur en Wetenschap. Rijksdienst voor Cultureel erfgoed, 2016.
- Van Eesteren Museum. (2017, March 19). *Westelijke Tuinsteden*. Van Eesteren Museum. <https://vaneesterenmuseum.nl/nl/de-tuinsteden/westelijke-tuinsteden-2/>
- Van Eesteren Museum. (2022, May 23). *Vernieuwing Westelijke Tuinsteden - sociale huisvesting en erfgoed*. Van Eesteren Museum. <https://vaneesterenmuseum.nl/nl/vernieuwing-westelijke-tuinsteden-sociale-huisvesting-en-erfgoed/>
- Vashti, M., (2021). *Finding Common Grounds – Adapting Heritage Meaning in the Renewal of Socially Diverse Couperusbuurt*. Delft University of Technology.
- Weijer, H. (2019, September). Duurzame renovatie van woningen kan sneller en goedkoper met prefab. *RenovatieTotaal*. Nr 5.
- Weijer, H. (2021, December). Energieleverende hoogbouwflat in Utrecht dankzij prefab gevel. *RenovatieTotaal*. Nr 7.
- Weijer, H. (2022a, June). Optoppen als redding voor de woningnood. *RenovatieTotaal*. Nr 3.
- Weijer, H. (2022b, December). "IFD 2.0 hard nodig voor renovatie van 1000 woningen per dat tot 2050". *Renovatiekrant*. Nr 7.

Weijer, H. (2022c, December). "Prefab moet altijd ten dienste zijn van ontzorging in een project". *Renovatiekrant*. Nr 7.

Woutersen, B. (2022, September). Circulaire renovatie op Schiphol Trade Park geeft gebouw iets extra's. *RenovatieTotaal*. Nr 5.

Yegenoglu, H., Droog, M., Bolier, D., Vullings, N., Supèr, M., Goossens, L., Rohaan, G., Van Der Ham, M., Gielleit, T., & Avdic, M. (2008). *Westelijke Tuinsteden: Breukvlakken - Urbane woontypologieën in de Westelijke Tuinsteden*, Amsterdam. TU Delft.

## 6.2 Figure list

1. Nieuw-West with the Slotterplas (1974). Luchtfoto Slottermeer-Zuidwest. Stadsarchief Amsterdam.
2. Daily life in Nieuw-West (1971). De kar van kaashandel Gerrit Wals op Tussen Meer. Stadsarchief Amsterdam
3. Virbrant plinth Amsterdam Nieuw-West (1971). Behang Centrum West 'De Houtban' Stadsarchief Amsterdam
4. Linear to circular economy (2021, March 16). A circular economy differs from a linear economy, but how? Kenniskaarten - Het Groene Brein. <https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/how-is-a-circular-economy-different-from-a-linear-economy/>
5. Children playing in Osdorp (n.d.). Het winkelcentrum Osdorp met een beeldengroep en fontein naar het ontwerp van Bolhuis. Stadsarchief Amsterdam.
6. Satisfaction with city district (2021). *Wonen in Amsterdam 2021 Leefbaarheid*. Gemeente Amsterdam. Amsterdamse Federatie van Woningcorporaties.
7. Slotterplas (2023). Own image.
8. Amsterdam Nieuw-West (2023). Own image.
9. Impression Amsterdam Nieuw-West (2023). Own image.
10. Methodological framework (2023). Illustrated by author.
11. Theoretical framework (2023). Illustrated by author.
12. Timeline first semester (2023). Illustrated by author.
13. Impression Amsterdam Nieuw-West (2023). Own image.
14. Diagram of research design (2023). Illustrated by author.

# 07 APPENDICES

## 7.1 Preliminary structure research report

### 00 Abstract

### 01 Introduction

- 1.1 **Site introduction**
  - 1.1.1 City of Amsterdam
  - 1.1.2 Amsterdam Nieuw-West
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### 08 Conclusion

- 8.1 **Conclusion**
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### 09 Reflection

### 10 References

- 10.1 **Literature list**
- 10.2 **Figure list**

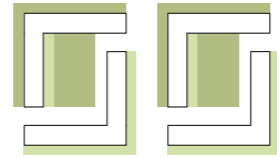
### 11 Appendices

7.2 Research cases

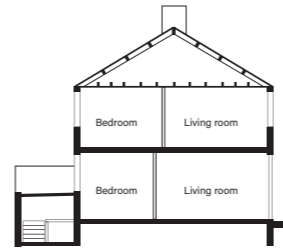


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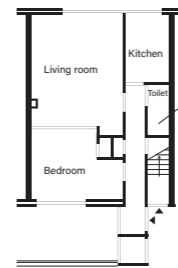
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 Construction: Concrete + timber  
 Parcel form: Open



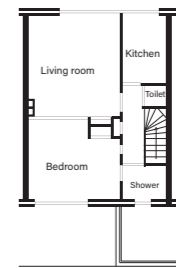
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Ground Floor



First Floor

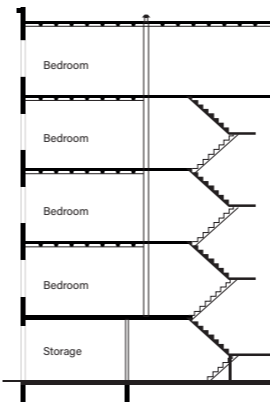


**Johan Jongkindstraat**

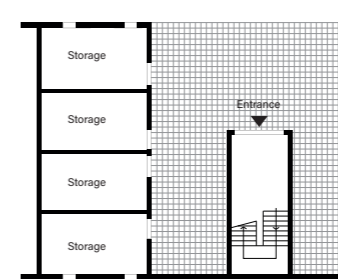
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 Construction: Airey  
 Parcel form: Strips



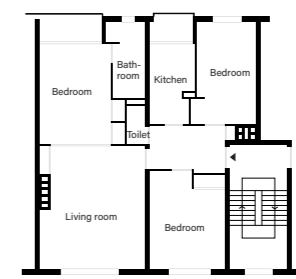
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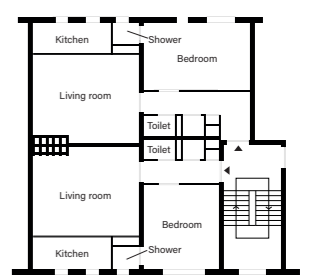
Ground Floor



Dwelling type A



Dwelling type B

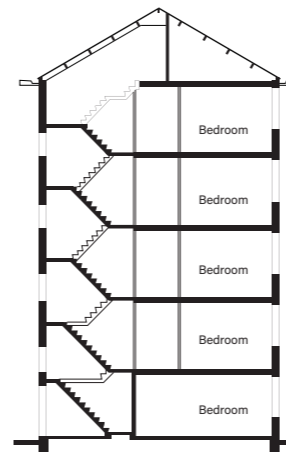


**Isaak Gosseshof**

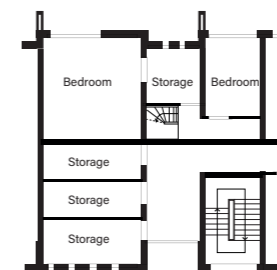
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 Parcel form: Hooked



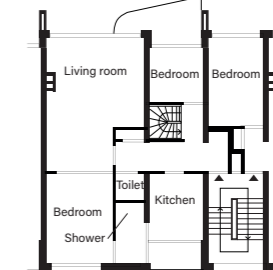
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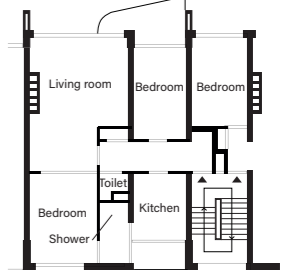
Ground Floor



First floor



Second, third, fourth floor



### 7.3 Reference projects

#### 1. Jan Kattein Architects - Garages into studios for young entrepreneurs Noth London, United Kingdom

- Minimum amount of construction work, they use the existing structure
- Use of low-carbon materials, that can be repurposed later
- Temporary project, demountable



Frearson, A. (2023, July 14). Jan Kattein Architects converts garages into studios for young entrepreneurs. Dezeen. <https://www.dezeen.com/2023/07/12/angel-yard-studios-jan-kattein-architects/#:~:text=Jan%20Kattein%20Architects%20has%20created,facility%20that%20supports%20young%20enterprise.>

#### 2. Solar Decathlon Delft University of Technology - Transforming 'portiekflats' The Netherlands

- Transform the buildings blocks to comfortable and low-energy homes
- Turning porch flats into gallery flats to achieve more social cohesion and create more space
- Circular facade system, newly developed composite material from recycled materials and with high insulation values
- Focus on rapid execution, teams works with prefabricated materials



BNA Branchevereniging Nederlandse architectenbureaus. (2022, January 12). Nederlandse inzending Solar Decathlon biedt oplossing voor circulaire transformatie van naoorlogse portiekwoningen. <https://www.bna.nl/nieuws/nederlandse-inzending-solar-decathlon-biedt-oplossing-voor-circulaire-transformatie-van-naoorlogse-portiekwoningen>

#### 3. De Loods Architecten en Adviseurs - Office spaces to housing Flierbosdreef, Amsterdam

- Transformation and addition of two storeys
- Plinth is transformed to mostly glass for transparency, connect with the public space
- Smart and flexible solutions, future proof
- Relate to the human scale, new facade panels, more subtle frame layouts
- Prefab elements



GoedverzorgdOnline. (2022, May 30). Transformatie Flierbosdreef | Projecten | De Loods Architecten en Adviseurs. De Loods Architecten En Adviseurs. <https://deloods.nl/projecten/transformatie-flierbosdreef/>

#### 4. Plegt-Vos (commissioned by housing corporation SWZ) - Office spaces to housing Zwolle, The Netherlands

- The new 'Stimuleringsregeling Flex- en Transformatiewoningen' makes it possible to transform existing buildings to new houses in a quick way
- Use of the 'Slimme Huizenfabriek', a factory that builds standard / prefab materials
- Fast, sustainable en affordable housing



Plegt-Vos. (n.d.). Transformatie kantoor levert Zwolle 88 woningen op | Plegt-Vos. Plegt-Vos. <https://www.plegt-vos.nl/verhalen/transformatie-kantoor-levert-zwolle-88-woningen-op/>

5. MOR Studio - From abandoned data centre to sustainable housing  
Utrecht, The Netherlands

- A net-positive transformation of an old data centre into housing for 206 students
- This adaptive reuse strives for a positive social impact while being as sustainable as possible
- Materials are being reused and carefully selected, water and energy strategies are implemented so that the building contributes positively to its surroundings
- Striving for an energy positive and nature inclusive design



MOR Studio. (n.d.). Baobab Utrecht, Van leegstaand datacenter Naar Duurzame Studentenhuisvesting. <https://www.morstudio.nl/nl/baobab-utrecht>

6. Space&Matter - Transforming Nokia Island into an innovation district for circularity  
Tehdassaari, Finland

- Combining sustainable development and circular economy solutions
- "Once closed off to much of the general public, the Nokia factory will be transformed into a site where all people can see, feel and experience first-hand the principles of the circular economy."



Space&Matter. (n.d.). Transforming Nokia Island into an innovation district for circularity. <https://www.spaceandmatter.nl/work/tehdassaari>

7. Space&Matter - Transforming a municipal district office into an open, residential building  
Amsterdam, The Netherlands

- Giving new meaning to existing structures
- Together with future inhabitants, they transformed a former municipal district office into a multi-residential building filled with 36 distinct Smartlofts and various shared spaces
- Efficient layout: with minimal circulation space and no separation of functions, the residents are free to define and adapt the infill of their homes however they please



Space&Matter. (n.d.). JFK Smartlofts — Transforming a municipal district office into an open, residential building. <https://www.spaceandmatter.nl/work/jfk-smartlofts>

8. Zijdekwartier (commissioned by Willems Vastgoed) - Elevated galleries in Schiedam Wilton flats  
Schiedam, The Netherlands

- Focussed on sustainability, increased comfort and improved liveability
- Indoor balconies have become outward-facing
- Galleries twice as wide



RenovatieTotaal. (2023, June). Opgehoogde galerijen Wiltonflats worden echte ontmoetingsplaats. *Renovatiekrant*. Nr 4.

9. *Bouwhulpgroep - Renovation of 10 houses*  
*Montfoort, The Netherlands*

- 1970s social housing owned by housing corporation GroenWest
- De Poorters of Montfoort are the first houses in the Netherlands renovated according to the principles of Active House, using a sustainable renovation concept developed by the VELUX Group and Danfoss
- Completely natural gas-free and demountable renovated
- Energy-generating dwellings



Weijer, H. (2022b, December). "IFD 2.0 hard nodig voor renovatie van 1000 woningen per dat tot 2050". Renovatiekrant. Nr 7.

10. *HappelCornelisseVerhoeven - Transformation of Christus Koningkerk into depot of Historical Center*  
*Heerlen, The Netherlands*

- Modernist parish church designed in 1965 by Jan Jozef Fanchamps
- Hebel aerated concrete was used in this project, because of its good fire resistance properties and speed and efficiency in execution
- After assembly of the steel structure, construction of Hebel walls in combination with sandwich panels could start immediately. The construction time was now several days versus weeks, if plaster walls had been used



Weijer, H. (2022c, December). "Prefab moet altijd ten dienste zijn van ontzorging in een project". Renovatiekrant. Nr 7.

11. *BBM Architects - Transformation of the Heilige Hart Kerk to housing*  
*Breda, The Netherlands*

- 18<sup>th</sup> century church designed by Piet van Genk
- Using Silka sand-lime brick elements, twenty homes were built, varying in surface area from 50 to 232 m<sup>2</sup>
- Built in between the existing structure



Weijer, H. (2022c, December). "Prefab moet altijd ten dienste zijn van ontzorging in een project". Renovatiekrant. Nr 7.

12. *Kokon Architectuur & Stedenbouw - Addition of 5 homes on top of existing Heiligharn apartment building*  
*Den Helder, The Netherlands*

- Apartment building 1970, 237 rental homes
- On the roof, a steel structure is made on steel legs, which rest on the existing exterior walls and load-bearing partitions. The steel beams form the foundation for the Ytong Cascos system. Aerated concrete is 3x lighter than concrete, which is a significant advantage when elevated. But besides the light weight, the building physics properties of aerated concrete were also very important in the choice of housing foundation Den Helder. This mainly concerned the heat-accumulating, sound-insulating and fire-resistant properties.



Weijer, H. (2022c, December). "Prefab moet altijd ten dienste zijn van ontzorging in een project". Renovatiekrant. Nr 7.

13. Heembouw - Renovation of the Circular Pavilion at business park Schiphol Trade Park  
Hoofddorp, The Netherlands

- The architect had placed rental units in the remnants of the original shed, and for the construction of those rental units we chose Skellet profiles. Such a Skellet profile is a cruciform, steel tube with recessed surfaces, in which holes are punched every 25 mm. Each connecting piece is developed with the same holes and can connect to this grid each time, making building with Skellet very easy
- A new structure can be built using the loose parts, even with a completely new function



Woutersen, B. (2022, September). Circulaire renovatie op Schiphol Trade Park geeft gebouw iets extra's. *RenovatieTotaal*. Nr 5.

14. Inside Out - Renovation of a high-rise apartment building  
Utrecht, The Netherlands

- High-rise apartment building with 58 social housing units owned by housing corporation Bo-Ex
- Europe's first energy-producing high-rise apartment building
- Prefab solutions
- Innovative Inside Out renovation system, which integrates installation components such as heating, ventilation and energy generation into one multifunctional building element that is placed on the outside of the apartment.



Weijer, H. (2021, December). Energieleverende hoogbouwflat in Utrecht dankzij prefab gevel. *RenovatieTotaal*. Nr 7.

7.4 Relevant literature Western Garden Cities



Nio, I., Bekkering, H., Berkelbach, C., Michel, H., & Vrolijk, D. (2004). De tweede impuls: vernieuwing van de Westelijke tuinsteden. *Tijdschrift voor de volkshuisvesting*: 2004/5 supplement. Bijlage van *Stedebouw & Ruimtelijke ordening*: 2004/4.



Agricola, E., Feddes, Y., Hartman, H., De Hoog, M., Roosebeek, M., Van Rossem, V., Schilt, J., Sorgedragter, B., & Van Der Werf, J. (2013). *Atlas AUP Gebieden Amsterdam*. Valiz, Amsterdam. Bureau Monumenten & Archeologie.



Yegenoglu, H., Droog, M., Bolier, D., Vullings, N., Supèr, M., Goossens, L., Rohaan, G., Van Der Ham, M., Gielleit, T., & Avdic, M. (2008). *Westelijke Tuinsteden: Breukvlakken - Urbane woontypologieën in de Westelijke Tuinsteden, Amsterdam*. TU Delft.



Sabaté, J., & Galindo, J. (2000). *De kwaliteiten van de Westelijke Tuinsteden*. Amsterdamse Raad voor de Stadsontwikkeling.



Hellinga, H. (2005). *Onrust in park en stad: Stedelijke vernieuwing in de Amsterdamse tuinsteden 2000-2010*. Het Spinhuis.



Nio, I., Reijndorp, A., & Veldhuis, W. N. (2008). *Atlas westelijke tuinsteden Amsterdam: de geplande en de geleefde stad*. Trancity / EFL Stichting.