INTEGRATING DENSITY, LIVABILITY, AND HERITAGE IN POST-WAR NEIGHBORHOODS

Master Thesis: Adapting 20th Century Heritage: Resourceful Housing

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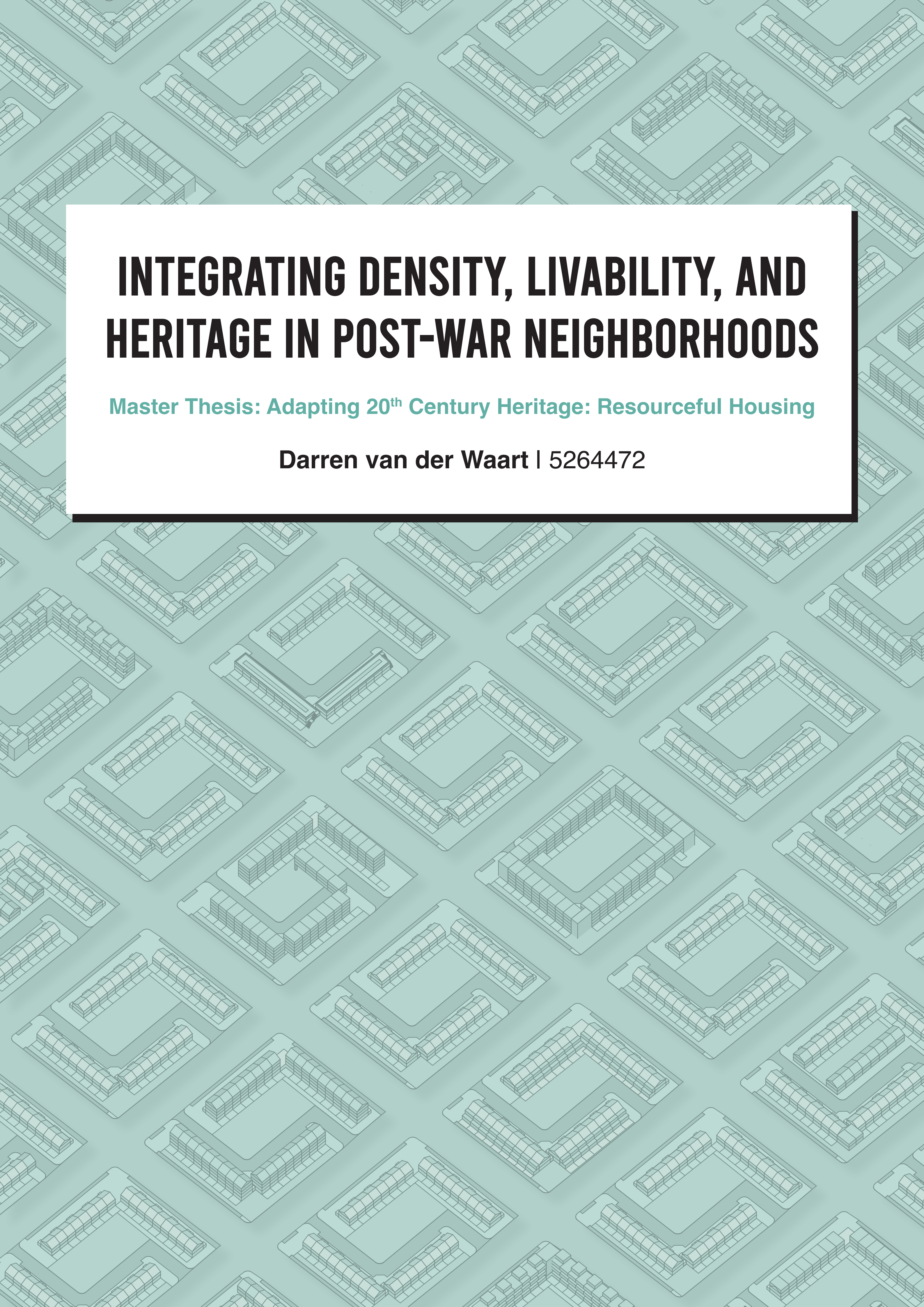

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ABSTRACT

With the growing population, high rates of migration together with de high demand for housing, densifying the existing built environment is inevitable. For this, countries are looking primarily to post-war neighborhoods because of their spatial layout and low density. However, the densification of these neighborhoods threatens the loss of potentially valued heritage and in addition, densification can diminish livability. Therefore, the purpose of this research is to answer the following question: How can a post-war neighborhood be densified while improving its livability and preserving its heritage values? As the case study of this thesis, the Louis Couperus neighborhood was chosen in the Western Garden Cities of Amsterdam New West.

On the basis of literature research and comparisons along with observations, different methods of densification are discussed and a framework has been established that can be used for measuring livability. In choosing the most appropriate method for densifying post-war neighborhoods, present heritage values are leading. These values may also play a part in improving the livability of neighborhoods. Based on these three interconnected topics, a design strategy is formulated in this thesis. This design strategy was subsequently applied to an open courtyard parcellation consisting of duplex typology dwellings within the chosen case study.

Densifying post-war neighborhoods contributes to the current housing crisis and reduces potential heritage demolition. Less demolition, in turn, contributes to a circular economy and deals with existing buildings in a sustainable and resourceful way. Improving the livability of neighborhoods ensures the long-term wellbeing of individuals and communities. This in turn leads to more attractive and suitable areas for communities to live in.

Keywords: *densification, livability, heritage, post-war neighborhoods, sustainability, western garden cities*

PREFACE

Architecture is a fascinating field that serves as a reflection of the thought process on social and cultural aspects of a particular time together with its technological advancements. It is a visual representation that captures the essence of the identity and history of societies. Therefore, the motivation for this thesis was to contribute to social challenges such as the current housing crisis and cultural challenges of how to deal with heritage. In addition, my goal is to design livable spaces and buildings where people enjoy living. Because ultimately, architecture is all about people.

This thesis represents the academic exploration through literature, analysis, observations, and design that has been both challenging and rewarding. Embarking on this journey, I am filled with gratitude and it is with a sense of pride that I present this work.

First and foremost, I would like to express my sincere appreciation to my tutors, Lidwine Spoormans, Ana Pereira Roders, and Elina Karanastasi, whose expertise, encouragement, and guidance have been invaluable throughout this process. Their insightful feedback and tutoring have shaped the trajectory of this work.

Additionally, I would like to extend my heartfelt thanks to my family and friends for their unwavering encouragement and understanding during moments of doubt and frustration. Their belief in my abilities has been a constant source of strength and motivation.

Last but not least, I wish to acknowledge my fellow graduation students of the studio, Adapting 20th Century Heritage, whose work and insights have enriched this research immeasurably. It is my hope that this work will contribute to a deeper understanding of densification, livability, and how to deal with heritage and with post-war neighborhoods in particular.

I wish you a lot of reading pleasure.

Sincerely,

Darren van der Waart
Delft, July 02, 2024

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01 INTRODUCTION

This introduction chapter provides the contextual information about the subject matter, including relevant historical, social, or scientific background that sets the stage for the research.

1.1 BACKGROUND

Worldwide, the population is expected to increase due to a combination of factors, including higher birth rates, life expectancy, increased fertility, immigration, and economic stability. As a result of this phenomenon, the United Nations (2023) estimates that there will be a 1.7 billion increase in the population from the current 8.1 billion to 9.8 billion by the year 2050. Due to the increasing population, a demographic transition is taking place across the world, which requires urban expansion to facilitate the increasing number of inhabitants. Cities are expanding globally, and are becoming more urbanized. While only 3% of the population lived in cities in 1800, that number has since increased to roughly 56%, and by 2050, it is predicted to reach 68% (United Nations, 2018).

This is especially the case for growing cities in Europe. These cities are getting denser because of higher immigration rates and reduced land used for housing (Cordis, 2022). Cities generally offer more economic opportunities than rural areas because they bring together work opportunities, industry, education, and cultural facilities. These amenities attract people seeking a better quality of life.

However, this migration has multiple implications for the urban future of European cities, including the various demands for land use in and around cities, urban configurations, housing stock, and housing policies (EEA, 2006). The expansion of cities beyond its borders is considered a concern for sustainable development. The expansion would threaten biodiversity, lead to the loss of agriculture, increase travel distances and gas emissions, and contribute to climate change (Artmann et al., 2019). Because of this urgent need for urbanization, densification is inevitable. Jenks et al. (2003) define densification as an urbanization strategy for achieving compact cities as opposed to expanding cities, intensifying the built form, and making optimal use of limited space for living. Densification stimulates direct and indirect socio-economic effects by increasing the housing stock and helping to ensure housing affordability on a wider metropolitan scale (Ahlfeldt & Pietrostefani, 2019). However, recent studies indicate that densification can negatively impact how livable cities are (Pont et al., 2020). According to the Cambridge Dictionary (2023), livability is the degree to which a place is good for living. Livability refers to the concerns related to the long-term well-being of individuals and communities. This term is often confused with 'quality of life' although the two have different definitions. While the quality of life relates to personal experiences and perceptions of happiness, livability is more concerned with the communal connection with the urban surroundings and how desirable and suitable an area or community is to live in (Van Kamp et al., 2003).

For suitable areas that can be densified, many countries are looking at post-war neighborhoods because of their low urban density. However, densifying these neighborhoods may result in the loss of their heritage values. Therefore, these must be treated with care. In theory, densification is not necessarily that difficult. The challenge isn't finding more space to build dwellings. The challenge is to maintain and preferably improve the livability, sustainability, and heritage values in these possible densification areas. However, little research has been done on the potential advantages of densification and livability (Mouratidis, 2019). This research seeks to find the balance between densification, livability, and heritage by exploring densification strategies and approaches that align with the principles of these cities while improving their livability and preserving their heritage values. As a project location to study this balance, the Western Garden Cities in Amsterdam New West is chosen. Within this project location, the post-war neighborhood Louis Couperus neighborhood in the Slotermeer district is chosen.

1.2 PROBLEM STATEMENT

Like other countries, the Netherlands is facing how to deal with its growing population. The current population growth along with immigration, an aging society, and an increase in the number of single-person households is causing a great shortage of housing in the Netherlands. The current housing shortage in the Netherlands is approximately 390.000 dwellings (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2024). This, combined with long construction procedures and limited building space, makes it difficult for many people to acquire a home that suits their needs and capabilities (Central Government, 2023).

In response to the great shortage of housing, the City of Amsterdam plans to expand by 150.000 new homes to accommodate the expected 250.000 new residents by the year 2050 (Gemeente Amsterdam, 2021). According to CBS (2023), this will bring the population of Amsterdam to about 1.19 million inhabitants by 2050 (see Figure 1). However, this growth is subject to conditions that result in limiting expansion opportunities. The Municipality of Amsterdam (2021) wants the expansion to take place only within the current city borders. Because Amsterdam was originally densely built, the City of Amsterdam (2021) sees great potential for densification mainly in the city districts outside the center. Especially post-war neighborhoods such as in the Western Garden Cities in Amsterdam New West, due to the relatively large amount of public green areas and low urban density. The “Algemeen Uitbreidingsplan” (AUP), formulated in 1934 by urban planner Cornelis van Eesteren, envisioned the expansion of Amsterdam, which included the development of the Western Garden Cities. The Western Garden Cities’ neighbourhoods were constructed using modern design principles following World War II. Wide-open dwelling blocks with lots of open green areas were realised under the concept “light, air, and space” (Rijksdienst voor het Cultureel Erfgoed, 2016).

However, as previously stated, densification can have an impact on how livable a city is (Pont et al., 2020), since it may result in less space for greenery and a decline in urban quality. According to research, density is the factor that negatively affects livability the most in the Dutch livability meter (leefbaarometer). A greater number of participants stated that they were uncomfortable with their living conditions in denser areas (Burema et al., 2021). It is therefore important to investigate the balance between densification and livability and how these can go hand in hand. This is especially the case for the Western Garden Cities. This district scores lowest on neighborhood satisfaction compared to the other city districts (Gemeente Amsterdam, 2022). Every neighborhood in this district scores below average and most neighborhoods score the lowest in all of Amsterdam. It can be concluded from the scores that the livability of the Western Garden Cities needs to be improved.

In the Netherlands, urban renewal initiatives over the past few decades have mostly concentrated on demolishing and replacing its current housing stock (Gruis et al., 2006). Certain areas were severely impacted, such as the Western Garden Cities, and numerous housing corporations started large-scale demolition projects on the less appreciated post-war social housing estates. According to Flier and Thomson (2006), the Western Garden Cities became one of the four biggest demolition sites in the nation as a result of this initiative. This demolition is causing the heritage values of post-war neighborhoods in the Western Garden Cities to fade, which must be preserved. In 2011, the Western Garden Cities were selected by the National Cultural Heritage Agency as one of the 15 post-war neighborhoods that are of national importance. The listing’s aim states that the post-war construction period 1940-1965 shall remain recognizable on the level of the area in future developments (Havinga et al., 2020).

In this context, the problem statement revolves around the need to reconcile densification with livability while retaining the heritage values of post-war neighborhoods. This challenge demands thoughtful strategies and approaches that align with the principles of urban development and simultaneously enhance the well-being of residents. Therefore, there is a pressing need to explore how densification can be carried out in a manner that not only addresses the urgent need for urbanization but also contributes positively to the overall livability and sustainability of cities while preserving their heritage values.

1.3 RESEARCH GOALS

The goals of this research are to contribute to the great shortage of housing, and the challenges posed by densification with a focus on balancing densification and livability in post-war neighborhoods while preserving their heritage values. For this purpose, a strategy must be developed that allows post-war neighborhoods to densify while preserving existing heritage values and simultaneously improving the livability of the neighborhood.

To develop this strategy, knowledge must be acquired on what the challenges and methods are for densifying post-war neighborhoods while preserving their cultural heritage. Also, a set of factors needs to be determined to measure the livability of a neighborhood and how these can be improved. To do this, it is important to get an understanding of the Western Garden Cities and what the heritage values are.

The acquired knowledge will be translated during the research phase into a design strategy that serves as a program of requirements for the densification of the Louis Couperus neighborhood in Amsterdam New West. In the design phase, one open courtyard parcellation in the Louis Couperus neighborhood will be densified using the developed strategy. The aim hereby is that the results achieved during the design phase of the open courtyard parcellation can be transferred to other open courtyard parcellations in the Louis Couperus neighborhood and form a basis for other equivalent urban or architectural situations.

1.4 RESEARCH QUESTIONS

To respond to the problem statement, research should be conducted accompanied by several research questions, starting with the main research question, to develop a strategy for the identified challenges. The main question for this research is as follows:

How can a post-war neighborhood be densified, while improving its livability and preserving its heritage values?

To further develop the necessary background knowledge to develop a strategy for the problem statement, a selection of sub-questions is formed. The answers to the sub-questions will result in an answer to the main research question. The sub-questions for this research are the following:

1. *What are the heritage values of the Louis Couperus neighborhood in Amsterdam New West?*

2. *What set of factors determines the livability of a neighborhood?*

3. *What is the current livability of the Louis Couperus neighborhood in Amsterdam New West and how can this be improved?*

4. *What are the challenges and methods for densifying a post-war neighborhood?*

1.5 RESEARCH HYPOTHESIS

The hypothesis for this research is that by developing a comprehensive strategy that addresses the challenges of densifying post-war neighborhoods, incorporates factors contributing to neighborhood livability, and values the preservation of heritage, it is possible to densify post-war neighborhoods while improving their overall livability. The application of this framework to the Louis Couperus neighborhood in Amsterdam New West will demonstrate the feasibility and effectiveness of this approach, resulting in a more sustainable, and livable urban environment.

The research hypothesis acts as a guided master while conducting the research. The research hypothesis can be compared with the conclusion after the research has been conducted. Any divergences or outcomes can be explained and addressed in the reflection.

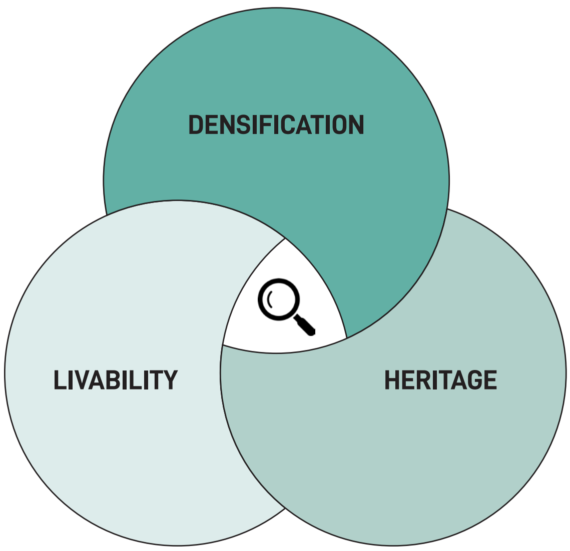


Figure 1.1: Diagram illustrating the interconnected subjects of the research that are equivalent (by author).

1.6 THEORETICAL FRAMEWORK

This theoretical framework gives a summary and definitions of studies that have already been performed within the subjects of this research. Figure 1.2 illustrates the used studies and literature of livability and densification in this research.

Livability

Research on livability is a relatively new field. When social aspects were examined as part of scientific studies of quality of life, the concept first surfaced in the 1960s. In the 1980s, the term "livability" was introduced to refer to the growing interest in urban quality of life research (Myers, 1987). Over the years, livability has received increasing attention due to the globally increasing population. However, a fixed definition and framework for defining the factors that determine livability is still lacking. Livability has been defined in different ways based on different urban contexts and dimensions, all of which emphasize different livability factors (Satu & Chiu 2017). According to Stuve (2018), livability is influenced by people's views of urban life as well as tangible outcomes of ideal urban environments. Pacione (2003) highlights that the definition of livability differs depending on location, time, and the reviewer's values.

Van Kamp et al. (2003) reviews multiple concepts of livability, environmental quality, and quality of life. These different concepts are compared along the factors of domain, indicator, scale, time frame, and context in understanding these concepts. Examples of underlying conceptual models of these different concepts are provided but the study concludes that is not possible to formulate one framework with fixed factors that determine livability.

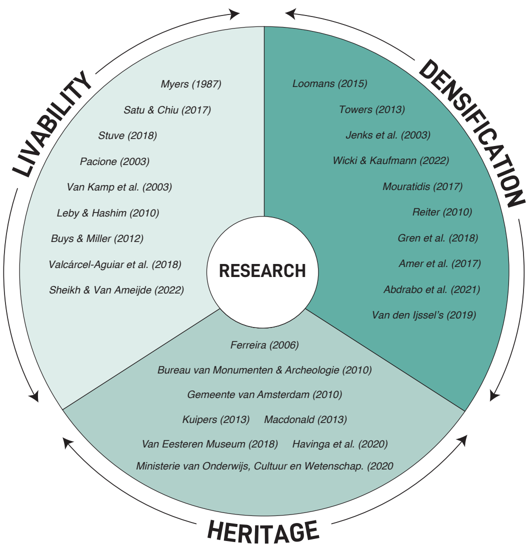


Figure 1.2: Diagram illustrating the summary of used studies and literature in this research (by author).

However, several studies are proposing different frameworks to measure livability. The article by Sheikh & Van Ameijde (2022) proposes a livability framework based on Abraham Maslow's Theory of Human Needs, which integrates important factors of urban design with the needs of different types of user groups. Factors such as belongingness, safety, accessibility, and the availability of social and cultural urban facilities are used. The framework aims to promote livable communities by identifying and addressing the challenges of spatial justice and social segregation. The study by Leby & Hashim (2010) aims to identify the factors and dimensions that residents take into account when assessing the livability of their neighborhoods, as well as to assess the value of these factors and dimensions. This study measured livability along four factors: social, physical, functional, and safety. Additionally, sixteen factors are found to be indicators for the four dimensions. 170 questionnaires in all were used for the study, with the greatest concern of the residents, according to the results, is safety, with social issues seen as the least significant consideration. The article by Valcárcel-Aguiar et al. (2018) defines livability as a form of sustainability that aims to improve the environmental, social, and economic characteristics of an urban area and by doing so the quality of life. The article proposes a framework of multiple natural- and built environment factors to determine livability. The article by Satu & Chiu (2017) investigates the livability of dense residential neighborhoods. Focusing on the role of housing and planning in reducing density problems and utilizing the benefits of high-density living. To determine the livability factors such as accessibility, public transport, community facilities, open spaces, sense of community, sense of safety, and dwelling space are analyzed. The findings suggest that while there are challenges in terms of accessibility and public transport, residents generally express satisfaction with community facilities and open spaces. The study emphasizes the importance of considering residents' experiences and views at the neighborhood level.

In the existing literature, social and physical factors consistently emerge but a concrete set of factors to determine livability cannot be described. The literature also deals primarily with livability at the neighborhood scale. The livability of dwellings themselves is not addressed. Buys & Miller (2012), however, assert that the built environment, of both dwellings and neighborhood features, has a major influence on the physical character and livability of a place.

Densification

Since the 1990s, densification has been associated with the compact city concept, which is the primary planning strategy to address the tensions between land uses driven by global urbanization (Haaland & Van Den Bosch, 2015). The compact city approach suggests that existing urban areas should be utilized as much as possible. This can be achieved by building at high densities, mixing functions, and keeping new urbanization compact in close proximity to the existing built environment (Clerque & Hagendoorn, 1983).

Jenks et al. (2003) advocated densification as an urbanization strategy for achieving compact cities rather than growing cities, intensifying the built form, and to enable efficient use of limited space for living. The main goals described by Wicki & Kaufmann (2022) for densifying existing areas are to protect undeveloped land, reduce CO2 emissions, and the provision of housing. This theory aligns with the current goals set by the Municipality of Amsterdam (2021) in the 'Omgevingsvisie Amsterdam 2050', where the expansion of the city of Amsterdam only can take place within the current city borders to keep the vulnerable landscapes outside its borders intact.

However, there is a contrasting stigma on densification and its application. Various advantages and disadvantages are pointed out. Towers (2013) states that living in close proximity to others promotes attractive facilities, including shops and efficient public transport, enhancing the area's appeal. Dense neighborhoods also offer environmental advantages, particularly in transport, significantly reducing energy consumption due to mutual insulation in row housing and stacked housing. Mouratidis (2017) suggests that social segregation could decrease as a neighborhood becomes denser and that inhabitants of dense areas are generally found healthier. This is because dense areas are less dependent on cars, which stimulates physical movement. In contrast, Reiter (2010) argues that urban densification poses several risks, including increased air pollution, traffic jams, the creation of heat islands, and wind discomfort. Reiter also states that densification poses a risk to existing urban morphologies, architectural typologies, and urban heritage. Gren et al. (2018) state that higher density could result in reduced daylighting for inhabits and environmental degradation with the loss of public green areas.
A methodology for making decisions on urban densification using roof stacking is presented in the report by Amer et al. (2017). Three categories make up the methodology: social, engineering, and urban. In terms of location and amount of additional stories, it outlines several criteria to evaluate and map the possibility of roof stacking. Additionally, a methodological approach to sustainable urban densification for microscale urban expansion control is presented by Abdrabo et al. (2021). The purpose of the study is to create a framework for identifying possible urban densification sites and evaluating them according to sustainability criteria. Roof transformation, roof stacking, demolition and rebuilding, infilling land, and filling backyards are the five densification methods taken into consideration. The article by Loomans (2015) suggests different methods for densification and focuses on rather internal densification methods than external ones. The five densification methods mentioned are making single-family houses into community houses, accessory dwelling units, scaling duplexes into fourplex dwellings, tiny house communities, and shared urban facilities. Van den Ijssel's (2019) research report focuses on the role of high-rise buildings in the densification of post-war city districts in Amsterdam. It also explores the role of discourse coalitions in the high-rise building debate and how this role can be explained. The findings suggest that post-war neighborhoods are seen as suitable locations for densification due to their building typology and open spaces.

From the retrieved literature it can be concluded that urban densification is a complicated but necessary method that calls for careful planning and consideration of sustainability. Achieving a successful implementation requires balancing the benefits and drawbacks. The various methodological approaches that are found could aid in the decision-making process for determining a densification strategy.

Heritage

Heritage is not a new phenomenon; it has existed for many centuries as societies have consistently valued and preserved aspects of their past. However, the practices and opinions around heritage have evolved significantly over time. According to UNESCO (2024), heritage is the designation for places or buildings on earth that are of outstanding universal value to humanity and to be protected as such so that future generations can appreciate and enjoy them.

Kuipers (2013) states that heritage is generally associated with tradition and history, while modernity strongly prefers the new. These tensions between heritage and modernity are often discussed, especially for post-war architecture because it is a relatively modern heritage. Macdonald (2013) indicates that there is much criticism of modern heritage and that post-war architecture suffers from negative perceptions. Macdonald (2013) points to the following statements about modern heritage: “There is so much of it,” “We don’t like it,” and “It’s too hard to deal with”. Havinga et al. (2020) point out that the challenge of post-war architecture is that these buildings are yet to be loved.

Havinga et al. (2020) indicates that although post-war architecture has not yet achieved widespread recognition and support, the last two decades have seen considerable progress. In the Netherlands, in 2007, the National Cultural Heritage Agency selected 100 buildings from the 1940-1958 period to be officially listed as national monuments together with 15 post-war neighborhoods that are listed as of national importance (Ministerie van Onderwijs, Cultuur en Wetenschap, 2021). The selection as an area of national importance ensures greater attention and appreciation. The listing’s aim states that the urban design of the post-war construction period of 1940-1965 shall remain recognizable on the level of the area in future developments. According to Ferreira (2016), the greatest challenge of post-war neighborhoods is potential aging, altered demography, and growing demands for energy efficiency, as well as new standards of living. These factors threaten these neighborhoods with demolition or alteration before their heritage values can even be recognized.

It emerges from the existing literature that although heritage has always been valued by societies, the appreciation and preservation of modern heritage, particularly post-war architecture, faces significant challenges. These challenges derive from negative perceptions in which the biggest challenge remains finding a balance between preserving such heritage and the need for modernisation, energy efficiency and accommodating demographic changes.

1.7 RESEARCH METHODS

The research methods used for this research are literature review and comparison together with fieldwork consisting of mapping. Below the approach for each given sub-question is described with the steps, tasks, and output of the method.

1. *What are the heritage values of the Louis Couperus neighborhood in Amsterdam New West?*

The first sub-question, dedicated to gaining knowledge about the heritage values present in the Louis Couperus neighborhood, will be investigated through qualitative research by the means of a literature review and a policy analysis. To determine the heritage values, multiple sources will be reviewed. For this the research article, ‘Heritage attributes of post-war housing in Amsterdam’ by Havinga et al. (2020) will be reviewed to develop a better understanding of the heritage significance of post-war housing in general and the Western Garden Cities in particular. Also, the ‘Algemeen Uitbreidingsplan (AUP)’ by Cornelis van Eesteren (Van Eesteren Museum, 2019) and the ‘Wijkgedachte’ by Ebenezer Howard (Van Der Lans, 2021) will be reviewed to get an understanding of the concepts by which the Western Garden Cities were constructed. Lastly, municipal policy documents are reviewed from the National Cultural Heritage Agency (2010) and the Bureau of Monuments & Archaeology (2010) which made an assessment with heritage valuations of the Western Garden Cities and Louis Couperus neighborhood.

Based on the above sources, the heritage values of the Louis Couperus neighborhood will be determined as to which values should be preserved during the neighborhood densification.

2. *What set of factors determines the livability of a neighborhood?*

The second sub-question, concerning what set of factors determines the livability of a neighborhood, will be will be investigated through qualitative research by a literature review and comparison. The following sources are used for this purpose:

- ‘Environmental Quality and Human Well-being’ by Van Kamp et al. (2003)
- ‘Promoting livability through urban planning: A comprehensive framework based on the theory of human needs’ by Sheikh & Van Ameijde (2022)

- ‘Liveability Dimensions and Attributes: Their relative importance in the eyes of Neighbourhood’ by Leby & Hashim (2010)
- ‘Sustainable Urban Liveability: A practical proposal based on a composite indicator’ by Valcárcel-Aguiar et al. (2018)
- ‘Livability in dense residential neighborhoods’ by Satu & Chiu (2017)

On the basis of the above studies and literature, the factors that determine the livability of a neighborhood will be compared. From this comparison, the most predominant factors will be determined. These factors will be categorized into a framework with indicators and assessment criteria on how these livability factors of can be measured.

3. *What is the current livability of the Louis Couperus neighborhood in Amsterdam New West and how can this be improved?*

The third sub-question, dedicated to measuring the current livability of the Louis Couperus neighborhood and how this can be improved, will be investigated through qualitative and quantitative research. Based on the outcome of sub-question 2, a framework with livability factors will have been defined with indicators and assessment criteria for measuring livability. The indicators will be examined in the Louis Couperus neighborhood. This will be done through fieldwork in the form of mapping. Furthermore, literature review will be used to collect data on the neighborhood, including residents’ perceptions on the livability of the Louis Couperus neighborhood based on surveys previously conducted. The following sources are used for this purpose:

- The ‘Wonen in Amsterdam’ by Gemeente Amsterdam (2024)
- ‘Buurt: Slotermeer Zuid’ by KadastraleKaart (2023)
- ‘Louis Couperusbuurt (Gemeente Amsterdam) in cijfers en grafieken’ by AlleCijfers (2024)

Based on the current livability of the neighborhood, it can be determined where opportunities to improve livability exist. Based on literature and mapping, a toolbox with tools that can be applied to improve livability will be created.

4. *What are the challenges and methods for densifying a post-war neighborhood?*

The fourth sub-question, dedicated to gaining knowledge about the challenges and methods for densifying a post-war neighborhood, will be investigated through qualitative research by the means of a literature review. The following literature will be review to discover multiple densification methods and frameworks:

- ‘A methodology to determine the potential of urban densification through roof stacking’ by Amer et al. (2017)
- ‘A Methodological Approach towards Sustainable Urban Densification for Urban Sprawl Control at the Microscale’ by Abdrabo et al. (2021)
- ‘5 Ways to Add Density without Building High-Rises’ by Loomans (2015)
- ‘Densification by High-Rise?’ by Van Den IJssel (2019)

These various methods and frameworks will be compared, based on their advantages and disadvantages, to determine the most suitable densification strategy for the Louis Couperus neighborhood in Amsterdam New West. This densification strategy will take into account the heritage values and tools for improving the livability investigated in the previous sub-questions.

1.8 RESEARCH DIAGRAM

The research diagram shows the steps that will be taken in the research with the accompanied research methods. The results of the research will provide a strategy that will be used as input for the design phase.

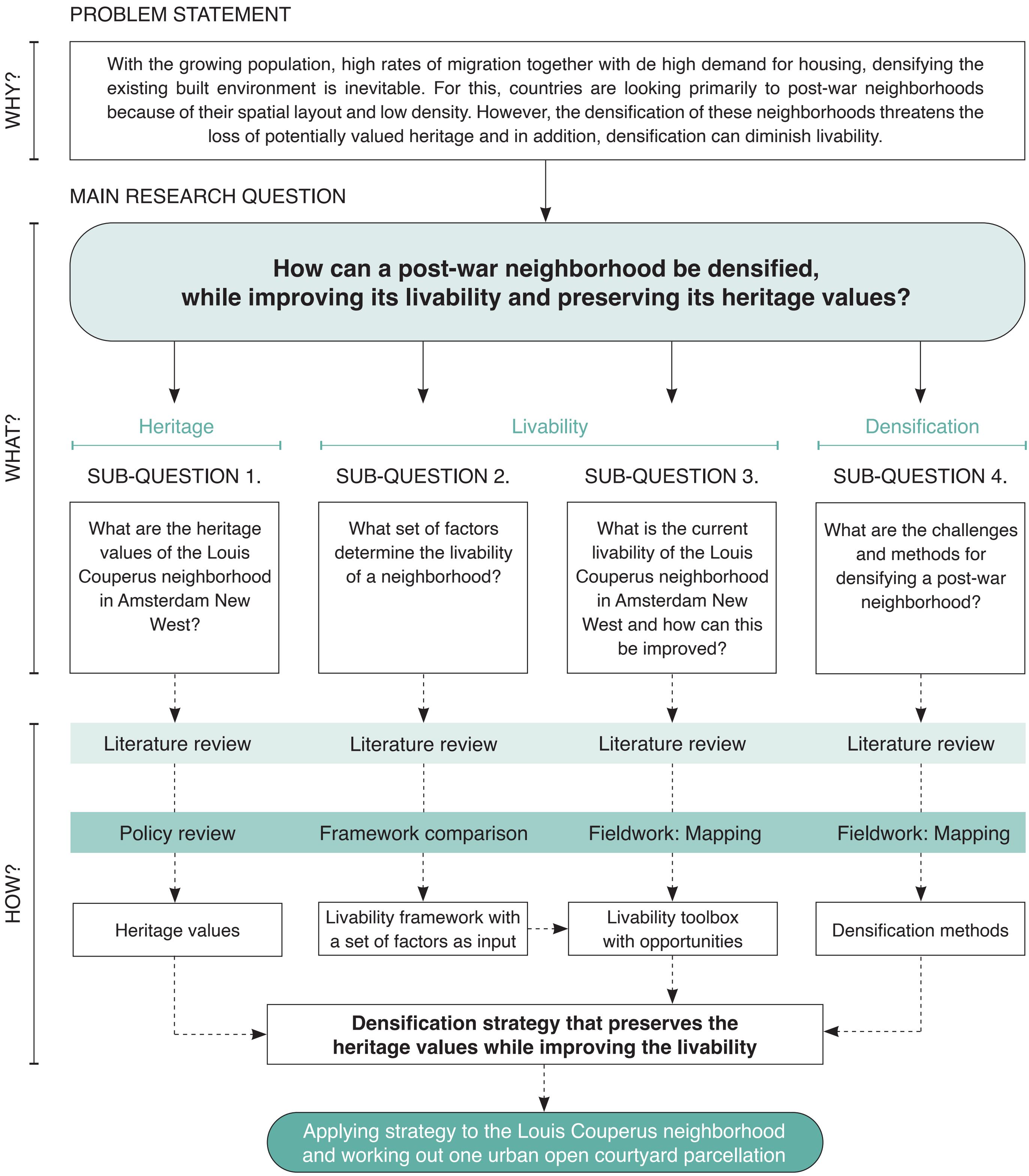


Figure 1.3: Diagram illustrating why, what and how of the research (by author).

02 SITE CONTEXT

The site context section provides contextual information on the history of the Western Garden Cities and on the existing situation and future developments of the Louis Couperus neighborhood.

2.1 CITY OF AMSTERDAM

The project location of this research is the capital of the Netherlands, Amsterdam. This city has grown considerably over the years and has a population of approximately 920,000 inhabitants (CBS, 2023). Due to the growing population, along with immigration and migration to the city, the number of inhabitants will only increase over the years. According to CBS (2023), this will bring the population of Amsterdam to about 1.19 million inhabitants by 2050 (see Figure 2.1). This phenomenon puts development pressure on Amsterdam to keep densifying within its city borders.

In the development of Amsterdam, the city has expanded several times over the years. Figure 2.2 shows these expansions by the corresponding periods. These expansions were done using several urban plans such as the 19th century Ring Plan, Berlage Plan South, and Algemeen Uitbreiding Plan (Expansion Plan of Amsterdam). In the late 20th century, Amsterdam expanded with South-East and Westpoort. Following these expansion plans, urban districts were established in 1981, dividing Amsterdam into seven administrative districts and one non-administrative district Westpoort. This is because of the industrial and business-oriented character of the Westpoort (Vashti, 2021). Since March 2022, the city of Weesp also forms a city district within the municipality of Amsterdam (Gemeente Amsterdam, 2023b).

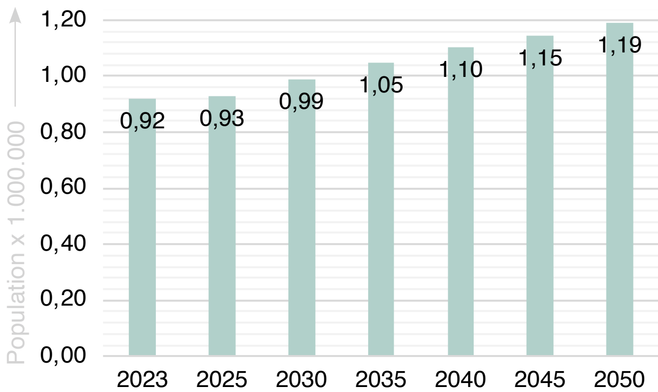


Figure 2.1: Diagram illustrating population prognosis of Amsterdam, 2023-2050 (by author, based on CBS, 2023).

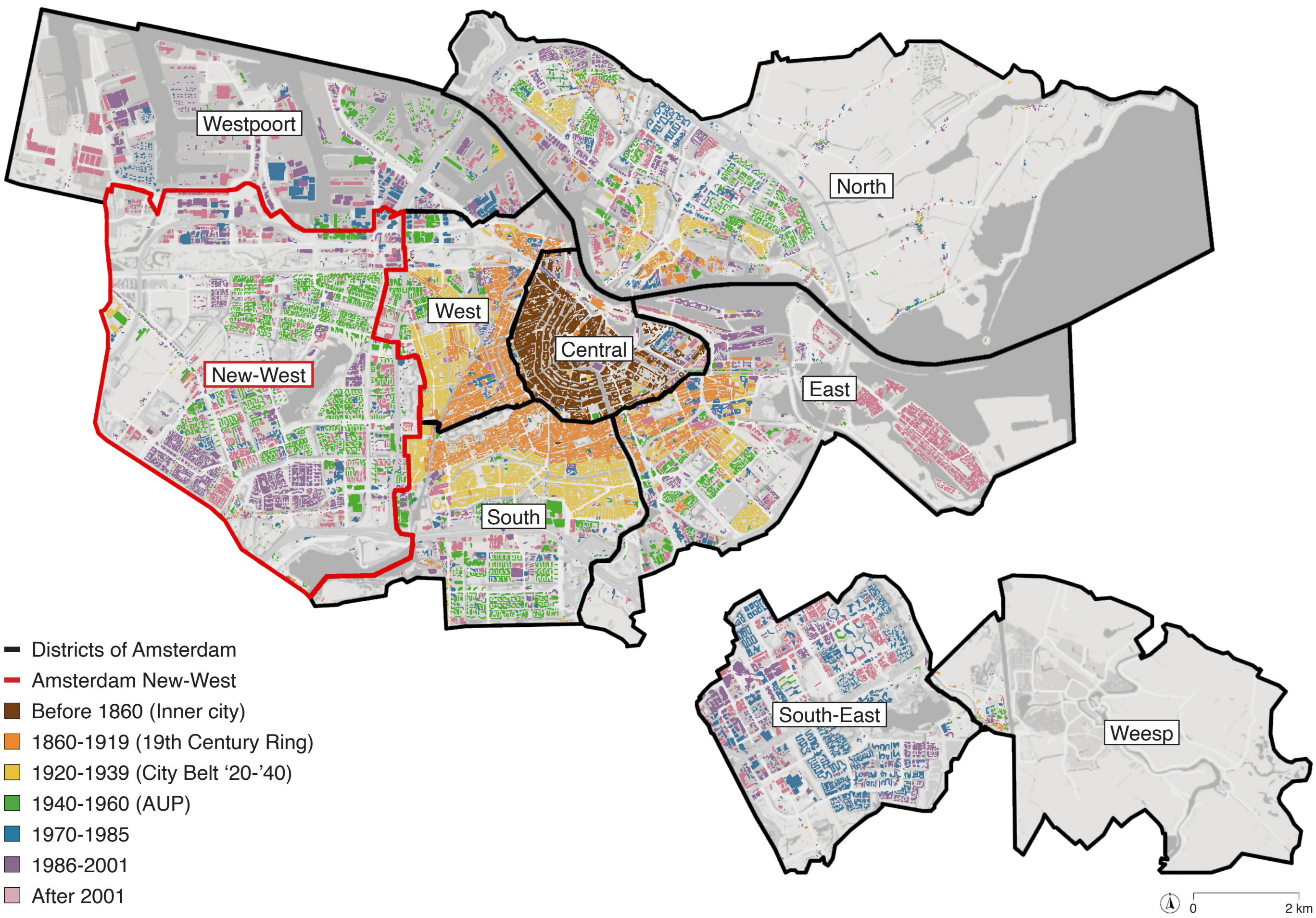


Figure 2.2: Urban growth of Amsterdam
(by author, based on Gemeente Amsterdam, 2023a).

2.2 AMSTERDAM NEW-WEST

New-West is a district of the municipality of Amsterdam and has approximately 170.000 inhabitants (Gemeente Amsterdam, 2023c). This is 18% of Amsterdam's total population, making New-West the district with the most residents. New-West developed from a large-scale urban expansion in the 1950s and 1960s after World War II. This expansion included the merging of several smaller villages and areas into one large city district in the western part of Amsterdam. Plans for the city's western expansion date from 1935, when the Algemeen Uitbreiding Plan (AUP or translated as the General Expansion) was adopted by Dutch urban designer Cornelis van Eesteren. The neighborhoods in New-West were designed based on Garden City principles: planned, self-contained communities surrounded by green belts and the Wijkgedachte (Neighborhood Idea) concept by British journalist Ebenezer Howard. Most of these neighborhoods are known as the Westelijke Tuinsteden (translated as the Western Garden Cities).

The Western Garden Cities include: Geuzenveld-Slotermeer, Slotervaart, and Osdorp. In the 1990s, several more expansions were developed in Amsterdam New-West: the neighborhoods Sloterdijk, Overtoomse Veld, Oostoever Sloterplas, Nieuw Sloten, and De Aker. In the middle of New-West is the lake the Sloterplas, which was dug for sand extraction to raise the surrounding garden cities. Sloterplas and the surrounding Sloterpark form the heart of the Western Garden Cities. Currently, New-West is divided into 5 main districts within its borders. These districts are divided into 15 areas and 72 neighborhoods (see Figure 2.3). This research focuses on the Louis Couperus neighborhood in the Slotermeer-South area, which was dominantly developed by the AUP after World War II.

2.3 SLOTERMEER

In 1939, Slotermeer was developed as the first sub-plan of the AUP. As a result of World War II, the construction of Slotermeer was delayed by more than a decade. The start of construction of the area began on December 1, 1951. In the fall of 1952, the first homes could be occupied (Van Eesteren Museum, 2016b).

The name of Slotermeer is derived from the Slootermeer lake that used to be in this area. The Slootermeer lake was drained in 1644 for the Sloterdijkermeerpolder, which was then excavated between 1948 and 1956 to create the Sloterplas. Slotermeer is located north of the Sloterplas lake with its eastern boundary being the Ringspoorbaan, which runs throughout Amsterdam. Plein '40-'45 forms the center of Slotermeer, with an indoor shopping center, stores, and a market. The Louis Couperus neighborhood , the main focus of this research, is located on the north side of Slotermeer-South.

During the development of Slotermeer, six architects were responsible for designing the buildings: B. Merkelbach, A.J. van der Steur, B. Bijvoet, A. Eibink, C. Wegener Sleeswijk and M. Duintjer. However, according to the Van Eesteren Museum (2016), they didn't have much artistic freedom, both the plots and the building technique were fixed. However, Slotermeer received a new typology for that time, the duplex house. This housing typology featured a single-family house with two front doors so that the upper and lower floors could be occupied separately. These houses were used during a housing shortage with the idea that after the housing shortage, the floors could be joined together. However, this happened almost nowhere.

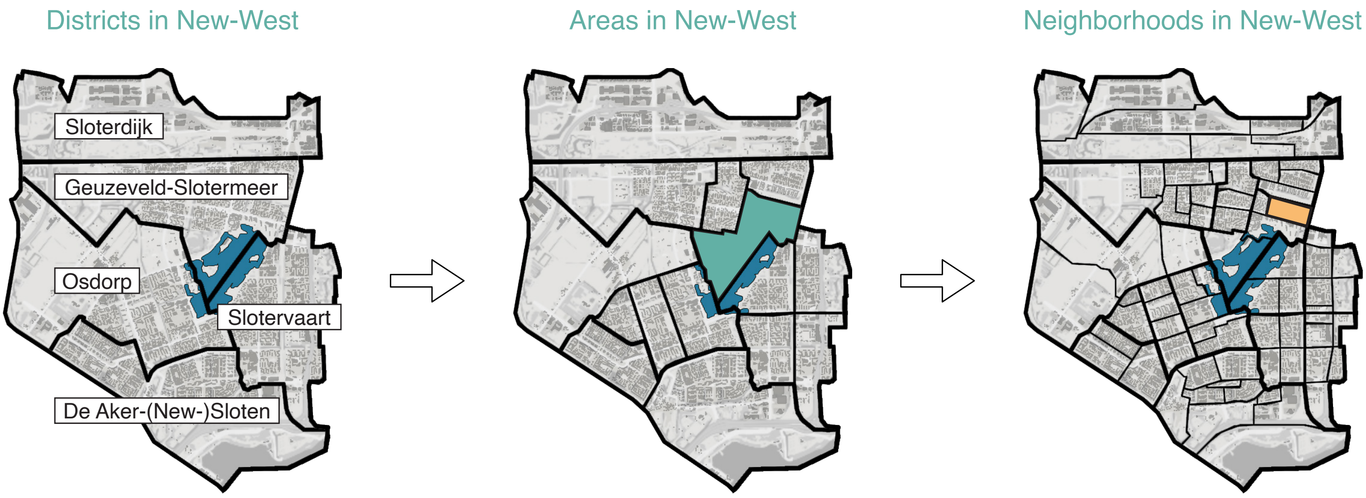


Figure 2.3: Urban districts, areas and neighborhoods of Amsterdam New-West (by author, based on Gemeente Amsterdam, 2023a).

2.4 CORNELIS VAN EESTEREN

Cornelis van Eesteren (1897-1988), portrayed in Figure 2.4, was a Dutch architect and urban planner known for his functionalist urban designs, including the Algemeen Uitbreidingsplan (AUP) for Amsterdam. This plan came about in 1934 and eventually meant the realization of the Western Garden Cities, Buitenveldert, and parts of Noord and the Watergraafsmeer.

Cornelis van Eesteren's father wanted his son to take over the family construction company and sent his son to study at the Academy of Visual Arts and Technical Sciences in Rotterdam in 1914 (EFL Stichting, 2021). Here Van Eesteren developed an interest in architecture and won the 'Prix de Rome' in 1921 with his design for an Institute of Fine Arts. Attached to the prize is a trip through Europe involving contact with many international architects and designers. In Berlin and Weimar, Van Eesteren became acquainted with a new generation of architects, designers, and artists, including Erich Mendelsohn, Adolf Behne, Hans Richter László, Moholy-Nagy, Walter Gropius, and El Lissitzky. With artist and poet Theo van Doesburg and a teacher at the Bauhaus, he collaborates for some time. He also witnessed the design process of one of the first garden cities with strip construction: the 1928/1929 Hellerhofsiedlung in Frankfurt am Main. This trip in 1922 was crucial in his development as an urban planner (Van Eesteren Museum, 2016a).

Van Eesteren's early designs betray Berlage's influence. In 1925, he won a design competition for Unter den Linden in Berlin. This means his international breakthrough. A few years later, Van Eesteren went to work for the City of Amsterdam. From 1930 to 1947, Eesteren chairs the Congrès Internationaux d'Architecture Moderne (CIAM), a series of international conferences on modern architecture and urban planning (Van Eesteren Museum, 2017). As a guiding principle, Van Eesteren maintains four primary functions: living, working, leisure, and traffic. These functions will always play a role in his vision of 'the functional city'. This vision with functions is also reflected in the AUP. Since 2017, the Van Eesteren Museum has been established in Amsterdam New-West at the Sloterplas lake in Slotermeer (Figure 2.5)

2.5 LOUIS COUPERUS

The Louis Couperus neighborhood located in the Slotermeer area of Amsterdam New-West, owes its name to the Dutch writer Louis Couperus. Couperus (1863-1923), born in Den Haag is regarded as one of the most important writers in the canon of Dutch literature (Kralt, 1983). He wrote various novels, short stories, poetry, and plays, in which he captured the turbulent developments in the political, social, and cultural life of those days (Louis Couperus Museum, 2013). Couperus gained recognition for his novels: 'Eline Vere (1889)', 'The Hidden Force (1900)', and 'The Books of Small Souls (1902)'. His writing has been praised for its elegance, depth of emotion, and perceptive awareness of the way individuals behave in various social circumstances. Couperus is still regarded as an influential author in Dutch literature, and his writings are still studied and honored. In the Louis Couperus neighborhood, several streets are named after acclaimed writers and poets from the same period as Couperus. For example, streets are named after: Aart van der Leeuw (1876-1931), Adriaan van Oordt (1865-1910), and Arthur van Schendel (1874-1946).

Figure 2.4: Portrait of Cornelis van Eesteren (Delpher, 1948).

Figure 2.5: Van Eesteren Museum in Slotermeer (Kramer, 2020).

Figure 2.6: Portrait of Louis Couperus (Goldsmid, 1900).

2.6 LOUIS COUPERUS NEIGHBORHOOD

As previously indicated, the Louis Couperus neighborhood in the Slotermeer area forms the case study of this research to which the findings will be applied and tested. The neighborhood is located north of Sloterplas and is characterized by its spacious layout, with lots of greenery and wide streets.

The dwellings of the neighborhood were built starting in 1953 using the General Extension Plan (AUP). The neighborhood has a population of 2.330 residents distributed among 1.280 dwellings (AlleCijfers, 2024). Most dwellings (90%) in the neighborhood are social housing and are owned by housing corporations. Of these, the Stadgenoot housing corporation owns most of the dwellings and Ymere owns a small percentage of the housing inventory. 10% of the housing inventory in the neighborhood is privately owned by individuals (see Figure 2.X). The average WOZ-value (Waardering Onroerende Zaken, translated as Property Value) of the dwellings in the neighborhood is € 224.000. This is 29% lower than the Dutch average of € 317.000 (Buurtje, 2024).

Different types of typologies have been adopted for housing in the neighborhood. Duplex houses, townhouses, detached houses (villas), and apartments have been implemented in the neighborhood (see Figures 2.X and 2.X). The most commonly found typology in the neighborhood is duplex dwellings. These dwellings were developed in the reconstruction period after World War II to meet the urgent high demand for housing (De Cler, 1949). As a temporary solution to this problem, the duplex dwelling was intended to provide shelter for people while still allowing families to maintain their privacy. The duplex houses were single-family homes that were temporarily divided into an upstairs and downstairs dwelling or two-story houses for two families. The idea was that over time these homes could be transformed into single-family homes (see Figure 2.X). However, this transformation from duplex dwellings to single-family dwellings has taken place very little, if at all, including in the Louis Couperus neighborhood. Besides the dwellings in the Louis Couperus neighborhood that are often built in a typical post-war style, the neighborhood also has various amenities such as schools, parks, local stores, and religious facilities.

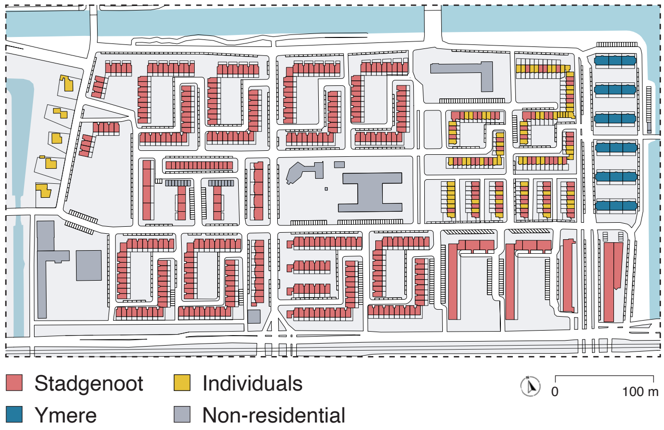


Figure 2.7: Map of the ownership in Louis Couperus neighborhood (by author).

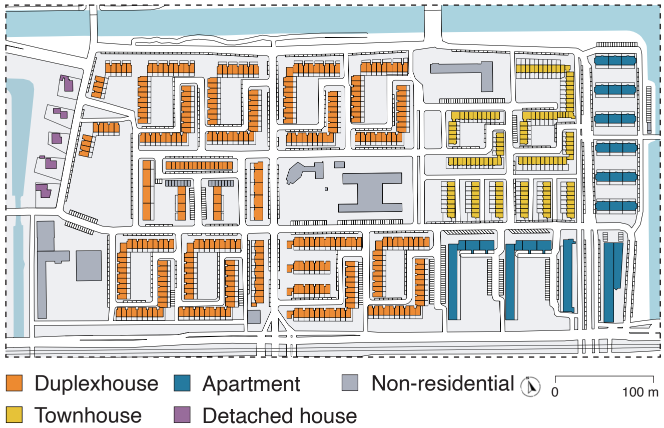


Figure 2.8: Map of the dwelling typologies in the Louis Couperus neighborhood (by author).

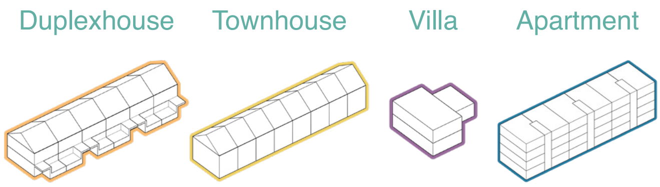


Figure 2.9: Diagrams of the dwelling typologies in the Louis Couperus neighborhood (by author).

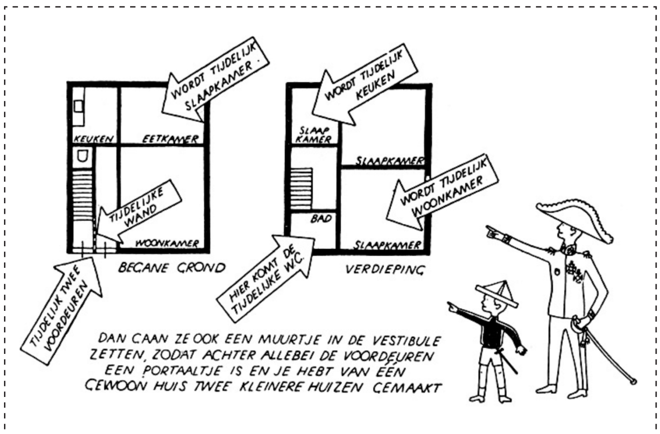


Figure 2.10: Sketch explaining the duplex dwelling concept (De Cler, 1949).

2.7 ALGEMEEN UITBREIDING PLAN

In the previous subchapters, it has been mentioned several times that Cornelis van Eesteren was responsible for the Algemeen Uitbreidingsplan (AUP) during his work from 1929 until 1956 at the municipality of Amsterdam. He was given this task because of the housing demands at that time and had to come up with a plan that could accommodate the housing demand of the population until the year 2000 (Van Eesteren Museum, 2018).

The population of Amsterdam had increased substantially since the late nineteenth century, making housing a problem. Furthermore, one-third of the population was unemployed in the winter. Hunger and poor hygiene caused high mortality rates. A decisive moment was the collapse of a building block in the Dapper neighborhood in 1899. The city council recognizes the need for decent housing for all classes of the population (Bock, 1993). For this reason, the Woningwet: a housing law and building supervision was first introduced in 1901. The Woningwet was to make the construction and living in poor and unhealthy housing impossible and to promote the construction of good housing. The great shortage of housing after World War I from 1914 to 1918 made the construction of good housing even more necessary.

In response to the great demand for housing, in 1921 the City of Amsterdam allocated surrounding agricultural land where the city could grow. For this area expansion, Dutch urban designer H.P. Berlage (1856-1934) is chosen. This resulted in the famous expansion plans: Plan Zuid and Plan West. Typical of these new area expansions are long street walls, closed building blocks, and the presence of the architectural style of the Amsterdamse School. The main streets have continuous walls and parallel closed building blocks and at intersections are the plazas that act as facilities centers for the surrounding neighborhoods.

In the 1920s and 1930s, urban planning ideas changed. Influential is the Garden City concept by Ebenezer Howard (1850-1928) and the modern movement in architecture known as the Nieuwe Bouwen from Germany. Under the supervision of Van Eesteren, parts of the plans: Plan Zuid and Plan West were adapted. In 1935, the General Extension Plan was adopted (see Figure 2.11), however, the implementation of the plan and the realization of new Western Garden Cities had to wait until after World War II (Van Eesteren Museum, 2019).

The plan for the Western Garden Cities put an end to how Amsterdam's urban expansions of the 1920s and 1930s in particular had been organized by Berlage. In the postwar Garden Cities, the city avenues were given an asymmetrical profile with a low, continuous wall on the south side, often with stores and open blocks or strips on the opposite side. Plazas such as Plein '40-45 were not located at the intersections but next to them, increasing the possibilities of use, such as holding a neighborhood market. In contrast to the earlier expansion plans by H.P Berlage, such as Plan Zuid, the AUP is based on scientific research, industrial planning, and analysis. The difference between the parcellation of the closed building blocks of Plan Zuid and the open building blocks of the AUP is shown in Figure 2.12. Van Eesteren took several factors into account in the design. For example, by separating traffic roads and neighborhood roads together with providing facilities such as stores, schools, parks, and churches on the main traffic roads. With this Van Eesteren aimed to offer residents a large degree of independence compared to the old city (Van Eesteren Museum, 2019).

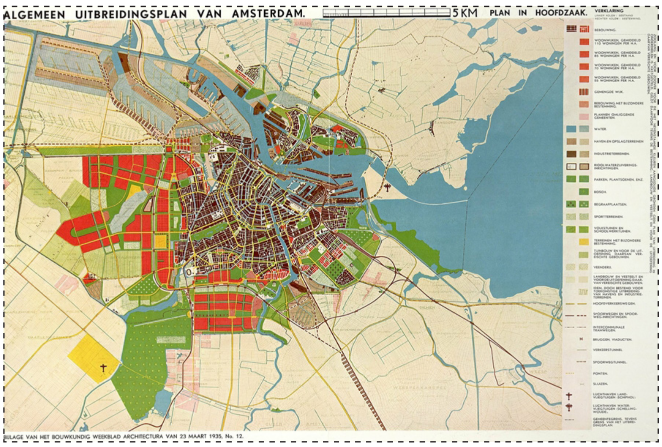


Figure 2.11: Map of the Algemeen Uitbreidingsplan van Amsterdam, 1935 (Gemeente Amsterdam, 2019).

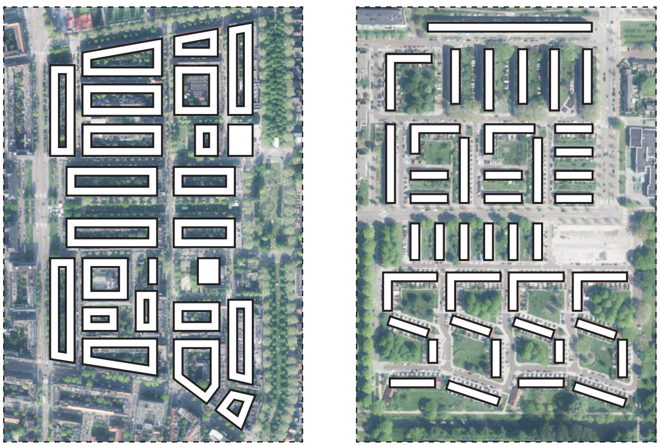


Figure 2.12: Closed building blocks from Plan South (left) and open building blocks from the AUP (right) (Google Earth, 2023).

Open building blocks containing high-rise and low-rise buildings are mixed which are optimally orientated to the sun to provide sufficient access to daylight. Unlike the traditional city, the structuring element was not buildings, but greenery and water to provide clean air with greenery and sufficient open space. The new urban planning principles and ideals from Van Eesteren can be summarized as 'light, air and space'.

The parcellation plans for the residential neighborhoods are the product of a continuous search for the best alternative to the closed building block. Van Eesteren proposed strip allotments, but this quickly produced a monotonous image. Another disadvantage was that many residents faced backsides. Therefore, over time experiments were made with the open courtyard, in the form of two mirrored hook shapes or a combination of hook shapes and strip allotments (Ministerie van Onderwijs, Cultuur en Wetenschap, 2020). The different types of parcellation allotments are shown in Figure 2.13. These different parcellation allotments are also found in the Louis Couperus neighborhood (see Figure 2.14). Located on the north and south sides of the neighborhood are the open courtyard allotments. This is the most prominent form of parcellation in the neighborhood. In the middle of the two mirrored hook shapes are green fields situated with a one-lane roadway through the courtyard. The strip allotment is the most common form of parcellation after the open courtyard. These allotments are mainly situated on the east side of the neighborhood with two more strips in the middle of the neighborhood. The strip allotments have green strips on the back facade that separate the strips. The hooked allotments and combination of hooked and strip alloments occur in a few places on the south side of the neighborhood.

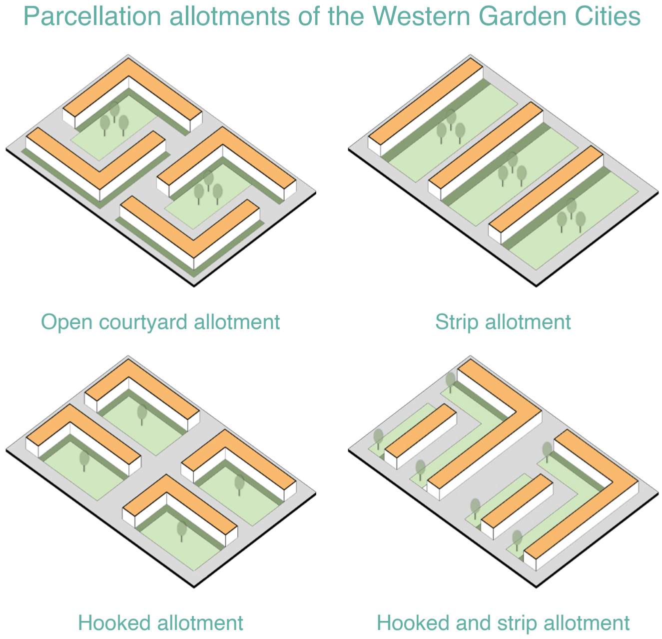


Figure 2.13: Diagrams of the different parcellation allotments used in the General Expansion Plan (AUP) (by author).

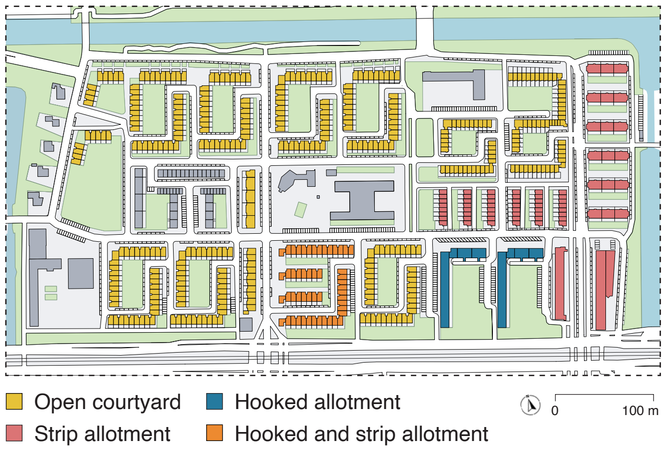


Figure 2.14: Map of the different parcellation allotments in the Louis Couperus neighborhood (by author).

2.8 WIJKGEDACHTE

The postwar reconstruction and expansion of cities was initially based on the Wijkgedachte, by journalist Ebenezer Howard (1850-1928). The concept of the Wijkgedachte had been implemented before the development of the Western Garden Cities in the United Kingdom and in the United States. The philosophy of the Wijkgedachte was articulated in 1946 by Ebenezer Howard in his urban planning and socio-cultural study: ‘De stad der toekomst, de toekomst der stad’ which translated means “The city of the future, the future of the city. The idea was to turn neighborhoods into stable and healthy social communities in a rapidly changing world, which could act as a buffer against the dangers of modern urban life such as anonymity and moral depravity. Neighborhoods should be the place where the different pillars of society can live together as a community where citizen involvement can be realized (Van Der Lans, 2007).

Before the Wijkgedachte, in 1898 Ebenezer Howard introduced the garden city concept in his book “Garden Cities of Tomorrow”. This urban planning concept was for promoting satellite communities that surrounded the central city and were separated from each other by green belts. These Garden Cities would contain proportionate areas of housing, industry, and agriculture (See Figure 2.15).

The Wijkgedachte focuses on the family as the center of activities. As the circle grows, the community grows along with the facilities that the people need. The segregated function system in the Western Garden Cities makes sure that each neighborhood has its school, shops, and working area, and more extensive services and facilities are provided on the district scale. This concept makes sure that people always have shared activities and spaces to meet in their neighborhood (Vashti, 2021). Figure 2.16 shows the distance to different facilities in the Wijkgedachte concept where the family is at the center. In the neighborhood with a radius of 5 minutes, a kindergarten and playgrounds for children can be found. Within a 15-minute radius primary schools and stores. In a 30-minute radius the city hall, special facilities, industry, and middle and high schools can be found. This structure of the city was intended to encourage a sense of community and counteract the chaotic growth of cities. The Catholic south of the Netherlands had a variation on this type of layout and structure. Here these neighborhoods were called “parochiewijken”, where the church instead of the family was literally and figuratively central (see Figure 2.17) (Ministerie van Onderwijs, Cultuur en Wetenschap, 2020).

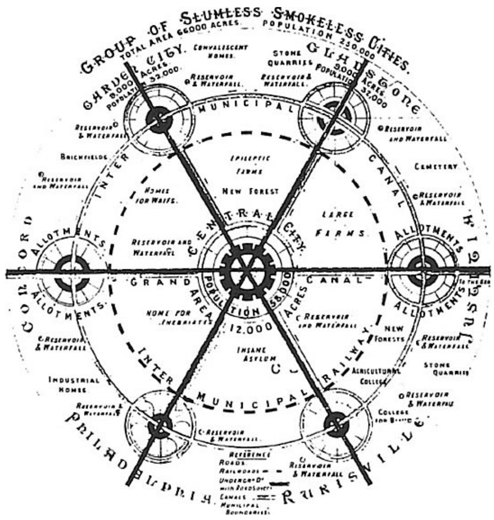


Figure 2.15: Schematic diagram of Ebenezer Howard’s Garden Cities system in Garden Cities of Tomorrow 1898 (Howard, 2021).

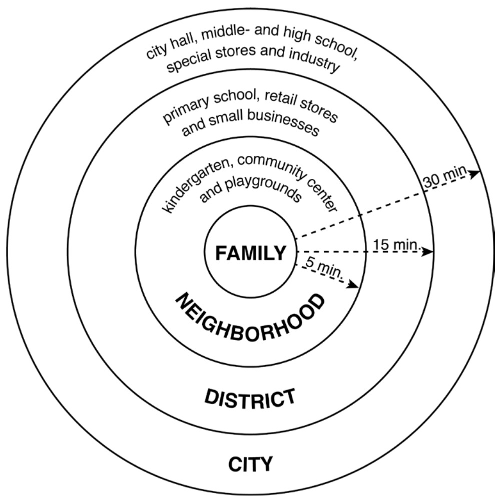


Figure 2.16: The segregated system of functions of the Wijkgedachte (by author, based on Vereniging Deltametropool, 2020).

Figure 2.17: Wijkgedachte of the Parochiewijk where church is central (Ministerie van Onderwijs, Cultuur en Wetenschap, 2020).

The distinctive characteristics of the Wijkgedachte in the Western Garden Cities are as follows:

1. Segregation of functions within neighborhoods
2. Well-connected green structures from city-scale greenery to neighborhoods and individual home-scale
3. Open building blocks with rhythmic division and repetition
4. Opportunity for recreational activities for different age groups
5. Optimize space for natural daylight and air flows.

These characteristics were the ambition to provide a better quality of living considering the poor condition of Amsterdam in the early 20th century. The application of the Wijkgedachte with its segregated function system of the Louis Couperus neighborhood is illustrated in Figure 2.18. In this situation, the open courtyard allotment is central where the families live. At the neighborhood scale facilities such as a school, kindergarten, playgrounds, and religious amenities are present. On the district scale is Plein 40-45 situated where the stores are present. Also on this scale is the Gerbrandy Park where the residents can take a walk and where sports fields are located. On the city scale are the Slotermeer lake and the Sloterpark which form the heart of the Western Garden Cities. All scales are connected by the Burgemeester Röellstraat which serves as a city avenue. Furthermore, the different scales are connected by smaller roads, green strips, and waterways.

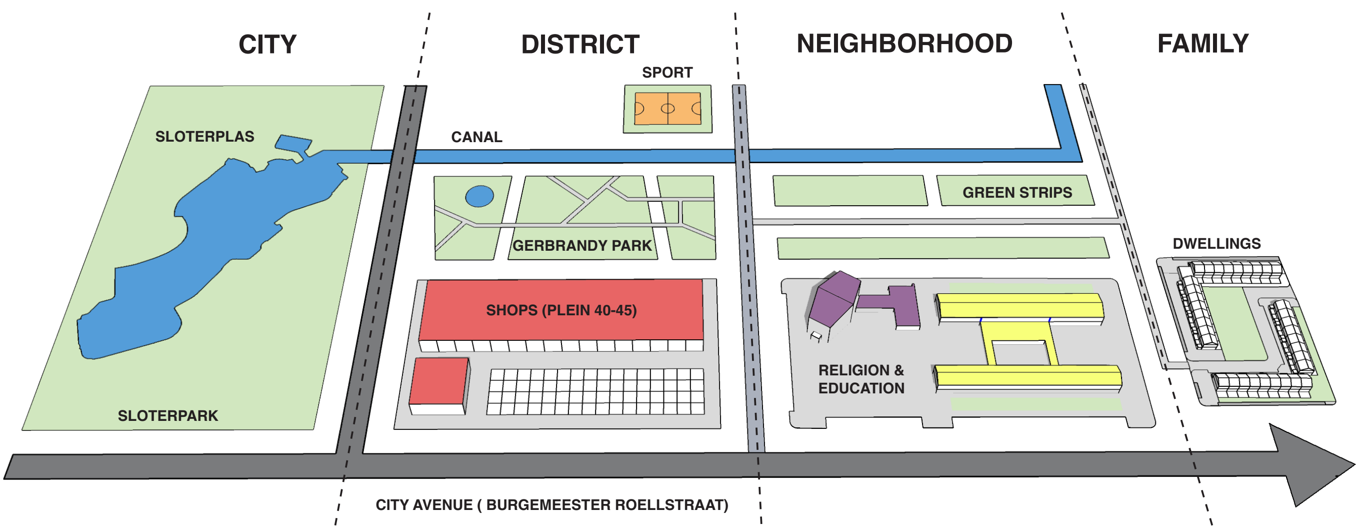


Figure 2.18: Diagram of the segregated functions and scales of the Wijkgedachte in the Louis Couperus neighborhood (by author).

2.9 DEVELOPMENT OF THE WESTERN GARDEN CITIES

Richting Parkstad 2015

In the 1950s and 1960s, Western Garden Cities in Amsterdam-New West were an example of a new way of life. However, this changed in the 1990s because of the socioeconomic downturn, outdated housing, and a worn-out spatial structure (Mens, 2017). For this reason, in 1999 the Municipality of Amsterdam and the housing corporations in the area established Bureau Parkstad. The purpose of Bureau Parkstad was to come up with a strategy for improving the spatial, programmatic, social, and financial shortcomings in the Western Garden Cities. This resulted in the development plan 'Richting Parkstad 2015' (translated Towards Parkcity 2015) proposed in 2001. The development plan proposes to demolish more than 13.000 dwellings over the next 15 years because the existing housing stock no longer meets current requirements. Dwellings built in the 1950s and 1960s are small and of poor quality by present-day standards. Furthermore, Bureau Parkstad wants to sell 9.000 social housing units to create more owner-occupied housing in the area. In the plan there will be 24.300 new dwellings of which 14.500 will be owner-occupied, thus increasing the share of owner-occupied dwellings from 15 percent in 2001 to 40 percent in 2015 (Archined, 2001).

In 2005 the first evaluation of the development plan followed. The parties concluded that, despite the physical renewal, the socioeconomic position of the residents remained behind the average of Amsterdam. Furthermore, the new owner-occupied dwellings that were realized proved to be too expensive for current residents who wanted to make the step from social housing to owner-occupied dwellings (Pots, 2011). In 2007, Bureau Parkstad published a revision of the development plan. This states that greater efforts will be made to improve the position of the current population. Emphasis will be placed on utilizing jobs and encouraging local entrepreneurship. However, this plan was difficult to realize because of the economic crisis of 2008. In 2011, many hundreds of new apartments and ground-level dwellings were up for sale, and in 2012 the plan "Richting Parkstad 2015" is abandoned (Pots, 2011). After long discussions, the municipality of Amsterdam, the district New-West, and the housing corporations agreed on the new course: smaller scale, spread over a longer period, and less radical development (Helleman, 2018).

Transformation Burgemeester Röellstraat 2021

In 2021, the Municipality of Amsterdam announced that Burgemeester Röellstraat would be transformed and redeveloped. The reason for the transformation is because of the renewal of the three adjacent neighborhoods: the Lodewijk van Deyssel neighborhood, the Dichters neighborhood, and the focus of this research the Louis Couperus neighborhood. With the transformation, the ambition is to transform Burgemeester Röellstraat into an attractive city avenue (see Figure 2.19). This will not only improve the street's appearance but also its safety and quality of life. Making the main street narrower will create space to accommodate approximately 1.600 dwellings (Gemeente van Amsterdam, 2021).

Burgemeester Röellstraat is one of the most important access roads for the districts of Geuzenveld and Slotermeer. This street connects the center of Amsterdam with the Western Garden Cities. The street received its name in 1952 and was named after Antonie Baron Röell (1864-1940), mayor of Amsterdam from 1910 to 1915, then commissioner of the Queen for North Holland (Gemeente van Amsterdam, 2021). In the

Figure 2.19: Impression of the Burgemeester Röellstraat as a city avenue in Geuzenveld-Slotermeer (Gemeente Amsterdam, 2021).

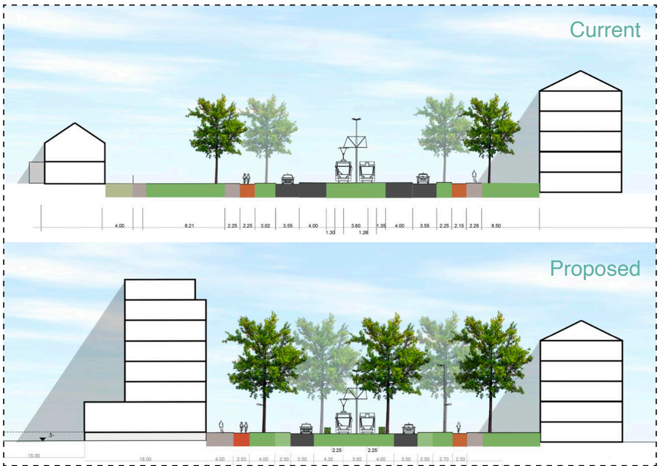


Figure 2.20: Current and proposed street profile of the Burgemeester Röellstraat (Gemeente Amsterdam, 2021).

future narrower street profile, the tramway will remain in greenery. The street will have 2-double rows of trees, a hedge on both sides, and berms with flowers along the roadways. The roadways will be narrowed from two-lane to single-lane. On both sides of the street, there will be a separate bike lane with a wide pedestrian path on the side of the higher new development dwellings. A lively plinth that interacts with the street will be located on the pedestrian path of the new construction dwellings (see Figure 2.20).

Renewal of the Louis Couperus Neighborhood 2021
In 2021, the Municipality of Amsterdam announced that the Louis Couperus neighborhood in Slotermeer would be renewed. Neighborhood residents complain that the housing is out of date and that there should be more diversity in facilities. Furthermore, neighborhood residents complain that they have been waiting 20 years for definite plans on how and when their neighborhood will be renewed (see Figure 2.21). The Municipality of Amsterdam (2021) also indicates that the livability of the neighborhood must be improved concerning safety, maintenance, and more space for playing and meeting. The renewal of the neighborhood is in consultation with the housing corporation Stadgenoot, which owns most of the dwellings in the neighborhood. Forming the renewal plan is in consultation with the neighborhood residents. For this purpose, quarterly meetings were scheduled in the period from the end of 2021 to the end of 2023 where Stadgenoot and the Municipality of Amsterdam together with the residents formulated a social plan. Furthermore, Stadgenoot conducted research into the wishes and needs of the dwellings to identify what the residents need. The social plan states how the homes will be renovated and which new dwellings will be added. It also indicates the height of the dwellings and where new plants, trees, playgrounds, and parking spaces will be located Gemeente van Amsterdam, 2021). The concept of the renewal plan was completed in early 2024 and the final plan with the elaboration of the architecture is currently being worked on. The start of the renewal of the Louis Couperus neighborhood is scheduled for the end of 2024. In the concept of the renewal plan, 370 of the existing 700 social housing apartments will be demolished and 330 of them will be renovated. In addition, the neighborhood will be densified and 500 dwellings will be added, bringing the number after the renovation to a total of 1.200 dwellings. Of these 1.200 housing units, 700 will be social housing apartments and the remaining 500 will be medium-rent and/or owner-occupied dwellings (Gemeente Amsterdam, 2024b).

The renewal of the neighborhood will be carried out in 3 phases (See Figure 2.22). Phases 1 and 3 involve the dwellings that will be renovated. Phase 2 is about the dwellings that will be demolished and new construction will come in return. Phase 1 will begin in late 2024 and will continue until sometime in 2026. The northern courtyards will be renovated, remain green, and retain their character. The courtyards will turn into residential yards (woonerven) and the parking spaces will move to the outer sides of the courtyards so that it will be a lot more child-friendly. Phase 2 will begin in 2026 and last until sometime in 2028. In this phase, the dwellings of the southern courtyards will be demolished in return for new construction ranging from 3 to 7 stories. The new construction will make room for lots of greenery and playground facilities. Phase 3 will start in 2028 and will be completed in 2029. In this phase, the dwellings will be renovated and the working areas will be preserved. The character will remain quiet, but the public space will become greener (Stadgenoot, 2023).

Figure 2.21: Illustration of the thoughts of residents of the Louis Couperus neighborhood (Gemeente Amsterdam, 2019).

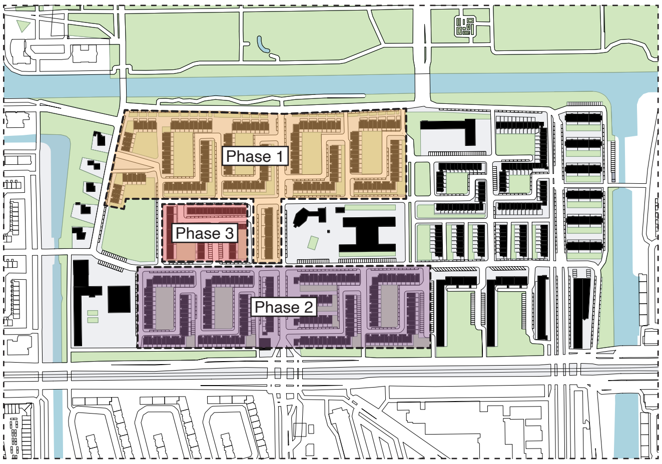


Figure 2.22: Illustration of the thoughts of residents of the Louis Couperus neighborhood (Gemeente Amsterdam, 2019).

03 HERITAGE CONTEXT

This heritage chapter provides information on the heritage significance of the Western Garden Cities and discusses the heritage valuation of the Louis Couperus neighborhood.

3.1 HERITAGE OF THE WESTERN GARDEN CITIES

The current heritage values of the Western Garden Cities must be identified to develop a strategy for the densification of the Louis Couperus neighborhood. Kuipers (2013) states that heritage is generally associated with tradition and history, while modernity strongly prefers the new. These tensions between heritage and modernity are often discussed, especially for post-war architecture because it is a relatively modern heritage. In 2013, the Getty Conservation Institute, an institute dedicated to promoting cultural heritage conservation internationally, noted the lack of recognition and protection of post-war architecture. They point out that the challenge of post-war architecture is that these buildings are yet to be loved (Havinga et al., 2020). Macdonald (2013) indicates much criticism of modern heritage and that post-war architecture suffers from negative perceptions. Macdonald (2013) points to the following statements about modern heritage: “There is so much of it,” “We don’t like it,” and “It’s too hard to deal with”.

Although post-war architecture has not yet achieved widespread recognition and support, the last two decades have seen considerable progress. In the Netherlands, in 2007, the National Cultural Heritage Agency selected 100 buildings from the 1940-1958 period to be officially listed as national monuments. In addition, in 2011, the Western Garden Cities of Amsterdam New-West were selected by the National Cultural Heritage Agency as one of the 15 post-war neighborhoods that are of national importance (Ministerie van Onderwijs, Cultuur en Wetenschap, 2021). The selection as an area of national importance ensures greater attention and appreciation. The listing’s aim states that the urban design of the post-war construction period of 1940-1965 shall remain recognizable on the level of the area in future developments. While the urban design of the Western Garden Cities has gained recognition of significance, this is not the case for the architecture of the buildings, many of which have been demolished or transformed without regard to their potential heritage value (Havinga et al., 2020). According to Ferreira (2016), the greatest challenge of post-war neighborhoods is potential aging, altered demography, and growing demands for energy efficiency, as well as new standards of living. These factors threaten these neighborhoods with demolition or alteration before their heritage values can even be recognized.

Since 2008, before the selection of the Western Garden Cities as national importance in 2011, the Municipality of Amsterdam has already designated two different parts within the Slotermeer district as municipal protected cityscapes (see Figure 3.1). These two areas are called the Van Eesteren Museum. The Municipality of Amsterdam hereby describes that the Garden City of Slotermeer was the beginning of a new era. It was the first residential neighborhood outside the Ringspoorbaan and the buildings in the Van Eesteren Museum are both on an urban and architectural level representative of the experimental development of the post-war residential district. In many ways, it is a transitional form between pre-war innovations and later parts of the Western Garden Cities such as Slotervaart and Osdorp (Municipality of Amsterdam, 2008). The Louis Couperus neighborhood lies between the two parts of the Van Eesteren Museum and is therefore not included in the municipal protected cityscapes.

The National Cultural Heritage Agency published two additional publications outlining the heritage significance of the Western Garden Cities (Ministerie van Onderwijs, Cultuur en Wetenschap, 2020). These publications describe two main overarching principles as essential to the heritage significance of the post-war neighborhoods in the Western Garden Cities. The first principle of heritage significance is the so-called ‘Wijkgedachte’ concept by Ebenezer Howard. The second principle is the planning concept by Cornelis van Eesteren: light, air,

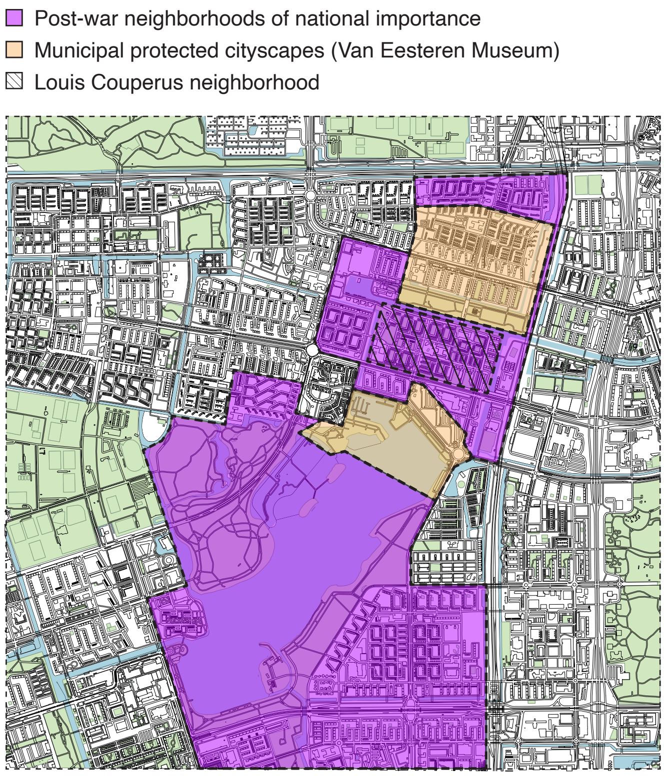


Figure 3.1: Map showing the area of national importance and the municipal protected cityscapes in Amsterdam New-West (by author).

and space. Both these principles have been discussed in the previous chapters.

The Western Garden Cities are significant because of the three spatially distinctive core traits listed below, according to the National Cultural Heritage Agency (2011) The first fundamental feature is the distinctive sun-facing orientation of high- and low-rise buildings, as well as the recurring pattern of building blocks. The infrastructure and greenery are arranged hierarchically, which is the second essential characteristic. The so-called "city avenues," which act as a path linking the urban growth to the existing city, are the first in the hierarchy of the infrastructure. The city avenues give way to district roads, neighborhood roads, streets, lanes, and courts as part of the infrastructure. The greenery was arranged in a hierarchical pattern across the urban architecture, ranging from landscape, park, park strip, green strip, and green space to front- or backyard. The third core quality is the balanced relationship between the buildings and the public space (Havinga et al., 2020). These spatial core qualities are illustrated in Figure 3.2.

The buildings in these post-war neighborhoods are predominantly modern, constructed of brick or industrialized building systems, with a sober appearance. The main dwelling typologies in the Western Garden Cities consist of tower blocks, slab blocks with gallery access, slab blocks with point access, row houses, and duplex houses. According to Davies and Jokiniemi (2008) almost 60% of the dwellings in the Western Garden Cities consist of slab blocks with point access (see Figure 3.3 & 3.4). This translates to a total of 142 ensembles with approximately 21.700 dwellings consisting of this typology.

Havinga et al. (2020) acknowledge several attributes that are of significant value in the architecture of these slab blocks with point access. The first attribute is the balconies that play a strong role in the front facade by accentuating the building entrances. The second attribute is the rhythm and composition of the facades created by the windows, balconies, and stairwells. The third attribute of significance are the chimneys, eaves, and raised stoops. Havinga et al. (2020) described the architecture as "sleek and simple" which is typical for the architecture of post-war buildings (see Figure 3.9).

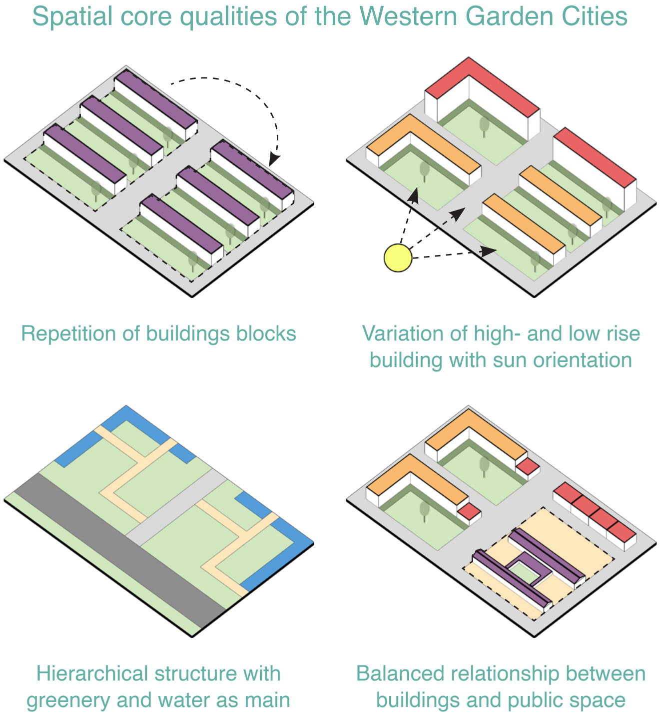


Figure 3.2: Diagrams illustrating the spatial core qualities of the Western Garden Cities (by author, Havinga et al., 2020).

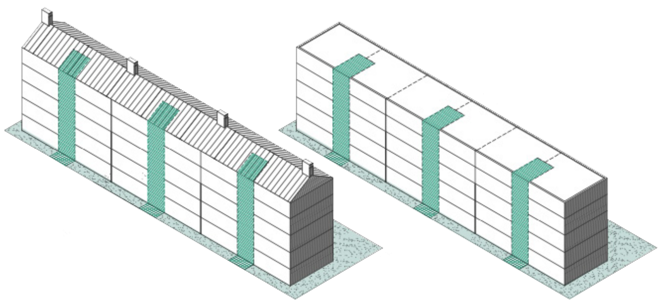


Figure 3.3: Diagram of slab blocks with point access in the Western Garden Cities (by author, based on Havinga et al., 2020).

Figure 3.4: Examples of slab blocks with point access in the Western Garden Cities (Havinga et al., 2020).

3.2 AUP VALUATION

In 2010, the Bureau of Monuments & Archaeology (BMA) completed the valuation maps for the AUP areas of 1935 (Gemeente Amsterdam, 2024d). The BMA was established by the Municipality of Amsterdam in 1953. This was because after WWII the historic center of Amsterdam was in a neglected state. During this period many plans were made for demolition and new construction in the city. On the other hand, during the planning of the redevelopment of the city, there was the realization that more research was needed on how to preserve the historic buildings. In recent decades, an inventory was made by the BMA of buildings in Amsterdam that were to be preserved as monuments, and building history research was conducted on the history of Amsterdam's buildings (Gemeente Amsterdam, 2024c). The valuation maps for the AUP areas came about in close consultation with the city districts and Bureau Welstandszaken, which functions as the Committee on Environmental Quality. The directors and project managers of the housing corporations operating in New West were kept informed of the progress of the project. Comments from their side, which mainly concerned the motivation of the value assessments, also influenced the final result.

The BMA summarizes that the quality of the postwar neighborhoods from the period 1945-1970 lies mainly in the great cohesion between the architecture, infrastructure, and public space. Water and greenery play an important connecting role in this. Cornelis van Eesteren's design is set up differently from neighborhoods in the 19th-century Ring and the Plan South from 1920-1940. In these neighborhoods, the architecture of the large housing blocks determined the shape of the spaces, trees, and parks served as furnishings. In the open, organic urbanism, Van Eesteren wanted to place the dwellings in the sun as much as possible. He grouped them in such a way that there would be a strong interaction between housing and the design of the public space around it, in which greenery played an important role. The infrastructure has a strong hierarchical layout with large urban avenues as a connection between the old city and the new neighborhoods, neighborhood streets that make the neighborhoods accessible, and residential streets along which the houses are located. In most of the successful parts of the AUP areas, you can see that there is a good transition between the private greenery of the gardens and the semi-public greenery of the courtyards, which in turn are connected to the public space of the greenbelts, parks, and gardens.

In the case of renovation and renewal of dwellings and other types of buildings, the valuations are a tool for the Spatial Quality Commission in its assessment. The degree of evaluation determines how the renovation may take place. The higher the order value, the more strongly the existing architectural qualities must be respected. The valuations of the built environment in the AUP area were made using architectural considerations (A+B) and urban design considerations (C+D). The architectural qualities are based on the typology or floor plan (A) and the architectural design (B). The urban design qualities are based on the grouping of the objects in a parcellation (C) and the contribution of the objects to the design of the public space as a whole with the garden city character (D). The level of the cultural-historical value of a dwelling or building depends on the total of the four mentioned criteria. Each of the four criteria can be given 1 to 5 points. When adding up the points, the final score can be determined with the corresponding valuation order. The different orders of valuation are described below.

Order 1: Monument/monument-worthy (18-20 points)
An architectural entity that, based on typology, architectural design that is distinctive and/or characteristic of the period, its position in a parcellation unit, and/or its contribution to a parcellation and site, has or is eligible for national or municipal monument status.

Order 2: High Value (15-17 points)
An architectural entity with architectural design and/or typology characteristic of the period, which also makes a significant contribution to the composition of the parcellation structure and site.

Order 3: Medium High Value (11-14 points)
An architectural entity with design and/or distinctive typology characteristic of the period and/or significant contribution to the composition of the allotment and field.

Basic Order - Low Value (0-10 points)
An architectural entity characteristic of the period without architectural or urban design added value, either created by low design quality or subsequent substantial alterations that have caused it to lose architectural added value and/or contribution to the composition of the allotment.

With the accompanying order and valuation of the architectural considerations (A+B) and urban design considerations (C+D), the Bureau of Monuments & Archaeology (2010) further explains what this means for the renovation and renewal of dwellings and other types of buildings. These requirements must be respected during the alteration of the built environment. The scores summed up for architecture and urban design are explained below.

Architectural considerations (A+B)
• A+B = 8-10 points: Preserving and restoring original elements in form, size, material, detailing, proportion, and color.
• A+B= 6-7 points: Preserving and restoring the original elements in form, size, material, detailing, proportion, and color or design of comparable quality. The use of non-original materials is possible as long as it is done with respect to the authenticity of the facade.
• A+B = 4-5 points: Preserving and restoring the original characteristic regardless of the material and detailing used.
• A+B = 2-3 points: Preserving the form and massing to the extent that it is important to the composition of the parcellation and its relationship to the site as a whole.

Urban design considerations (C+D)
• C+D = 8-10 points: Preserving the spatial quality of the parcellation as expressed in the relationship between the buildings and the design of the public space when it comes to the composition of elements such as sightlines, the relationship between public and private areas, and the coherence with the garden-city ensemble of the site.
• C+D = 6-7 points: Preserving the design principles that form the basis of the relationship between the buildings and public space when it comes to the composition of elements such as sight lines, the relationship between public and private areas, and the coherence with the garden-city ensemble of the site.
• C+D = 4-5 points: Preserving the coherence between the parcellation of the buildings and the composition of the site as a whole as expressed in the connection of the green structure at the different scale levels should be the starting point.
• C+D + 2-3 points: Preserving the spatial continuity that is characteristic of the composition of the building site should be the starting point.

Figure 3.5 illustrates the overall valuation of the Louis Couperus neighborhood along with several orders from the Bureau of Monuments & Archaeology (2010). Based on the total valuation, it emerges that the mosque and H-school in the center of the neighborhood receive an order 1 valuation with a monument or monument-worthy assessment. This also applies to the Spring High School and workhouses situated next to the

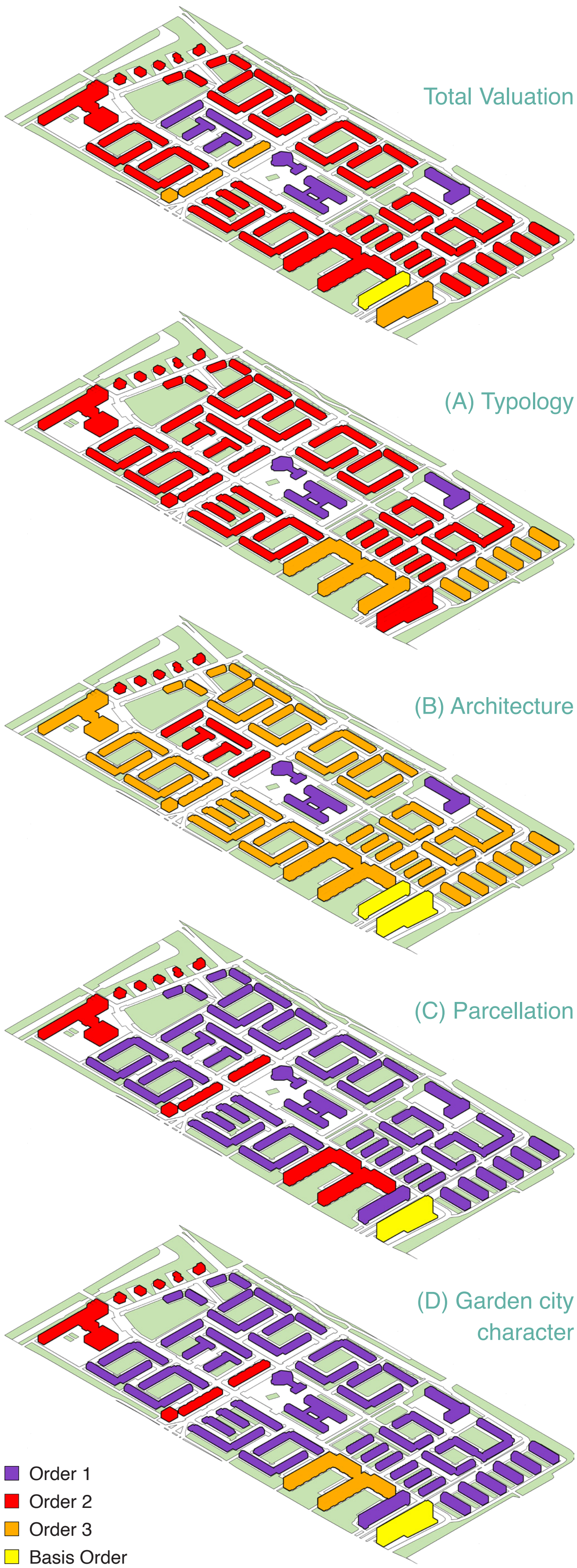


Figure 3.5: AUP valuation order maps of the Louis Couperus neighborhood (Bureau of Monuments & Archaeology (BMA), 2010).

center of the neighborhood. Most of the dwellings in the neighborhood particularly the duplex, townhouse, and detached villas are given an order 2 valuation with a high-value assessment. A handful of dwellings, mainly on Burgemeester Rendorp Street get an order 3 valuation with a medium-high value and one residential building receives a basic order valuation with a low-value assessment.

In addition, a distinct difference can be observed in the architectural considerations (A+B) and urban design considerations (C+D). For the typology (A) most dwellings are assessed as high value and for the architecture (B) as medium-high value. For the urban considerations of parcellation (C) and garden city character (D), most dwellings are assessed as monument or monument-worthy value. From this, it can be assumed that the urban design of the Louis Couperus neighborhood has a higher overall value than the architecture.

Figure 3.6 zooms in on the valuation of duplex typology in the Louis Couperus neighborhood as it has the focus in the design phase. As a total valuation, the duplex typology receives a high-value assessment. For the architectural considerations (A+B), the duplex receives a high value with 4 points for typology and a medium-high value assessment with 3 points for its architecture. For the architectural considerations of the duplex typology this results in a total of 7 points. This means that when altering the architecture, the original elements in form, size, material, detailing, proportion, and color or design of comparable quality must be preserved or restored. Hereby the use of non-original materials is possible as long as it is done with respect to the authenticity of the facade. For the urban design considerations (C+D), the duplex is assigned a monument or monument-worthy rating for parcellation and garden city character with both 5 points. This results in a total of 10 points which translates into that the spatial quality of the subdivision as expressed in the relationship between the buildings and the layout of the public space when it comes to the composition of elements such as sightlines, the relationship between public and private and the coherence with the garden city ensemble of the site must be preserved. Based on the different value orders, the architecture of the duplex typologies receives the lowest assessment. As in the whole Louis Couperus neighborhood, a clear distinction can be observed in the values of the architectural and urban design considerations.

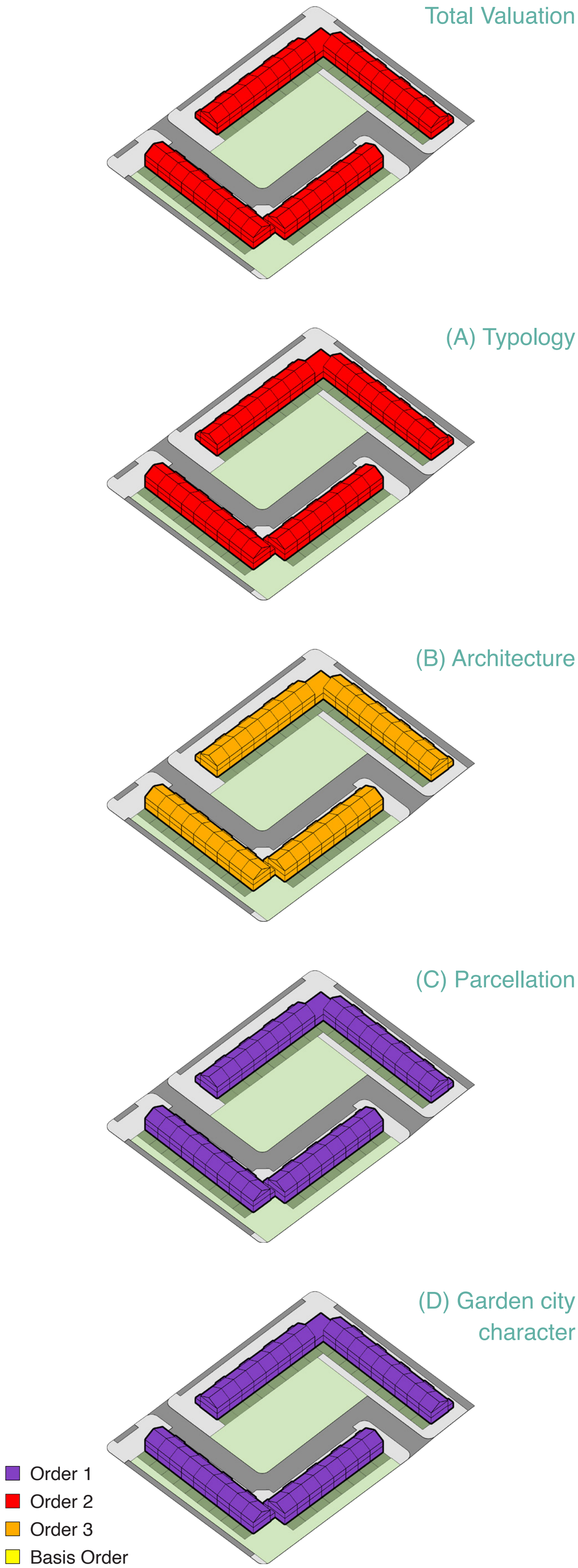


Figure 3.6: AUP valuation order maps of the duplex typology (Bureau of Monuments & Archaeology (BMA), 2010).

3.3 HERITAGE CONCLUSION

The research on heritage in the Western Garden Cities and Louis Couperus neighborhood in Amsterdam New West was conducted to answer sub-question 1 of this thesis. Sub-question 1 is as follows:

What are the heritage values of the Louis Couperus neighborhood in Amsterdam New West?

In conclusion, identifying the current heritage values of the Western Garden Cities is crucial for developing a densification strategy for the Louis Couperus neighborhood. The tension between preserving heritage and embracing modernity is particularly pronounced in post-war architecture, which has yet to achieve widespread recognition and support. This architecture often faces negative perceptions and the threat of demolition or alteration before its heritage value is fully recognized. Despite these challenges, significant progress has been made in recent decades, with the National Cultural Heritage Agency acknowledging the Western Garden Cities as areas of national importance. The urban design of these neighborhoods, characterized by the principles of the Wijkgedachte by Ebenezer Howard and Cornelis van Eesteren's light, air, and space, has gained recognition for its heritage significance.

The valuation maps created by the Bureau of Monuments and Archaeology (2010) address the valuation of the architectural and urban design of the Louis Couperus neighborhood and emphasize based on the given valuations the elements and qualities that need to be preserved. The neighborhood's urban design holds higher overall heritage value than its architecture, emphasizing the need to maintain the spatial quality, the relationship between the buildings, and coherence of the garden-city ensemble. The duplex typology within the neighborhood, while architecturally assessed as medium-high value, holds significant urban design value, necessitating careful preservation of its original elements in form, size, material, detailing, proportion, and color. When renovating the duplex typology, the use of non-original materials is possible as long as it is done with respect to the authenticity of the façade.

Although the valuation by the Bureau of Monuments and Archaeology (2010) describes the architectural and urban elements and qualities that need to be preserved, these elements are not further justified. Neither does it describe what the architecture of potential new construction in the area should comply with. In developing a strategy for the densification of the Louis Couperus neighborhood, it is essential to balance modern needs with the preservation of its post-war heritage values. This approach will ensure that the neighborhood's unique historical and cultural significance is maintained while accommodating the current living standards and contributing to the Dutch housing crisis.

04 LIVABILITY

This chapter discusses and compares different frameworks of livability to determine the factors by which livability can be measured. The factors identified are used to measure the current livability of the case study and recommendations are made for improving livability.

4.1 LIVABILITY FRAMEWORK

The densification of an area poses a threat to its livability. Because of this, getting a good understanding of what determines the livability of a neighborhood and how densification and livability can go together is essential. This chapter will compare several literature sources with frameworks for measuring livability. Based on these existing frameworks, a framework will be developed for measuring the current livability of an area. This framework will be used to assess the livability of the Louis Couperus neighborhood.

The first framework is from Satu and Chiu (2017) in their article 'Livability in Dense Residential Neighborhoods of Dhaka' in the Housing Journal. In their article, they state that improving livability and social spatial equity among residents is as important as reducing environmental impact to promote urban sustainability. Because of the increasing population and thereby the densification of cities, they want to measure the current livability to reduce density problems and exploit the benefits of high-density living. The city of Dhaka, the capital of Bangladesh, was chosen for this purpose. Based on a thorough literature review on livability, Satu and Chiu (2017) developed a livability framework (see Figure 4.1).

The livability framework by Satu and Chiu (2017) is divided into three main columns: key issues, indicators, and assessment criteria. The key issues, which serve as main themes within the topic of livability, are public transportation, community facilities, open space and public space on street corners, sense of community, sense of safety, and living space. For each key issue, several indicators are presented that address the main themes. For these indicators, assessment criteria are then given as to how these indicators can be analyzed.

The second framework is from Leby and Hashim (2010) in their article 'Livability Dimensions and Attributes' in the Construction in Developing Countries Journal. They state that a neighborhood should provide a good quality environment to ensure that inhabitants can satisfactorily live their lives. To investigate what makes a neighborhood livable and to come up with a framework, several studies and literature sources were reviewed and 170 questionnaires were conducted in a neighborhood in Subang Jaya, Malaysia. To create a framework by which livability can be assessed, Leby and Hashim (2010) also reviewed a previously proposed framework. The existing framework they looked at is that of Vergunst (2003). This framework indicates that livability is formed by the interactions between five variables: local inhabitants, service level of amenities,

Key issues	Indicators	Assessment criteria
Public transport	• Modes used • Duration of waiting time • Average distance to the public transport station • Residents' satisfaction	• Variety of choices • Short waiting time • Within walking distance (5–10 min) • High satisfaction level
Community facilities	• Provision nearby • Average distance to the nearest facilities • Transport used • Residents' satisfaction	• Adequacy and good variety • Within walking distance (5–10 min) • On foot • High satisfaction level
Open space and public space at the street corners	• Average distance to the nearest open space and street corners • Transport used • Residents' satisfaction	• Within walking distance (5–10 min) • On foot • High satisfaction level
Sense of community	• Frequency of using community facilities, open spaces and public spaces per week • Number of social contacts on street and other public spaces in the last month • Number of communications (chat-ting), while meeting each other in last month • Self-reported involvement in various community activities at in last 12 months • Residents' satisfaction	• Once every one or two weeks • Higher frequency connotates stronger community sense • High satisfaction level
Sense of safety	• Perceived safety during day-time and night-time • Residents' satisfaction	• Good sense of safety and security • High satisfaction level
Dwelling space	• Size of dwelling unit • Residents' satisfaction with the dwelling space	• Sufficient usable space • High satisfaction level

Figure 4.1: Livability framework for urban neighborhoods: key issues, indicators and assessment criteria (Satu and Chiu, 2017).

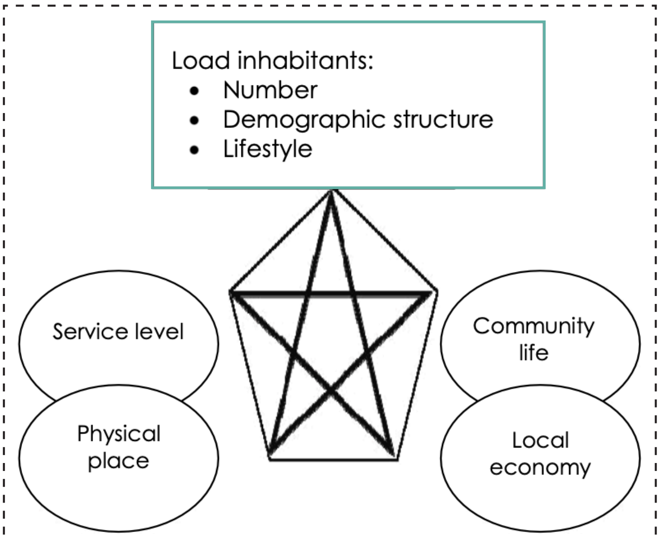


Figure 4.2: Livability framework (by Vergunst (2003) in Leby and Hashim, 2010).

Liveability Dimensions Defined in the Selected Studies

Omuta (1988)	Holt-Jensen (2001)	Visser et al (2005)	Heylen (2006)	ODPM (2006)
Employment Housing Amenity Educational Nuisance Socio-economic	Aesthetics of living environment Personal Social relations Functional	Housing Social environ-ment Physical environment Functional	Dwelling Social environ-ment Physical environ-ment Safety	Environ-ment quality Physical environ-ment Functional environ-ment Safety

Figure 4.3: Livability dimensions defined in selected studies (Leby and Hashim, 2010).

physical place, community life, and local economy. The variable local inhabitants include factors such as the number of inhabitants, demographic structure (age and gender), and lifestyle of the inhabitants (see Figure 4.2). Vergunst (2003) suggests that this framework should be viewed as a heuristic model to enable different communities to discover and explore the perspectives in a wider context. Based on a selection of studies, several livability dimensions have been found that can be compared with each other to establish an overarching set of factors that determine livability (see Figure 4.3).

Using the existing framework, selection of studies, and questionnaires, Leby and Hashim (2010) conclude four main dimensions that determine the livability of a neighborhood. These dimensions are shown in Figure 4.4 along with the themes within the dimensions. The four main dimensions are social, physical, functional, and safety. These dimensions reflect people's common understanding of living environment quality. Because the study of Leby and Hashim (2010) focuses on urban neighborhoods, housing dimensions were excluded from the analysis.

The third framework is from Aernouts (2023) in the thesis 'Improving Livability through Densification.' Aernouts states that livability is an urban design concept that can be divided into two main factors: the needs and wishes of people, and the physical and biological character of the neighborhood. However, livability is subjective and challenging because everyone has particular needs and desires, which could shift over time. As a result, livability is location-specific and always adaptable. Based on a literature study and the Dutch Leefbarometer 2.0 and 3.0, which are used to define livability in the Netherlands, he has created a framework. This framework for measuring livability is divided into five main categories: housing, safety, physical space, people, and services, each of which has subcategories (see Figure 4.5). Aernouts (2023) states that there are numerous other factors contributing to livability for example politics is mentioned significantly within the literature. Because political changes in the Netherlands are stable, politics will not significantly affect livability.

To develop a framework for measuring the livability of the Louis Couperus neighborhood, the above three frameworks were compared. To be able to compare the frameworks, the main dimensions were determined. The five main dimensions are social, physical, functional, safety, and dwelling (see Figure 4.6). These five dimensions were determined based on the most

Liveability dimension	Theme
Social dimension (social relations)	behaviour of neighbours (nuisance) community life and social contact sense of place
Physical dimension (residential environment)	environment quality open spaces maintenance of built environment
Functional dimension (facilities and services)	availability and proximity of amenities accessibility employment opportunities
Safety dimension (crime and sense of safety)	number of crime number of accidents feeling of safety

Figure 4.4: Livability framework: summary of livability dimensions and indicators (Leby and Hashim, 2010).

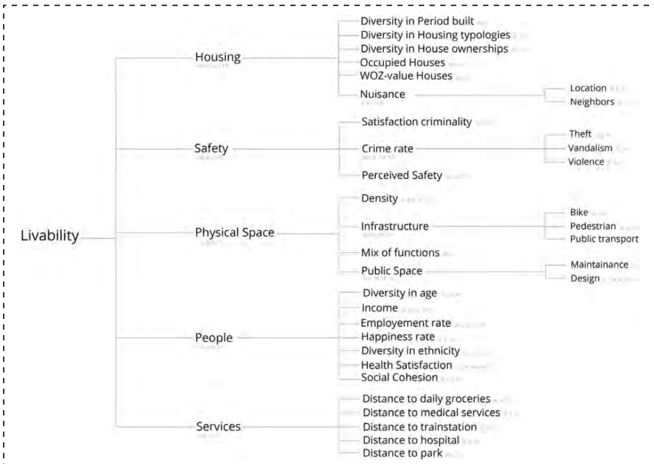


Figure 4.5: Livability framework: summary of factors with subcategories (Aernouts, 2023).

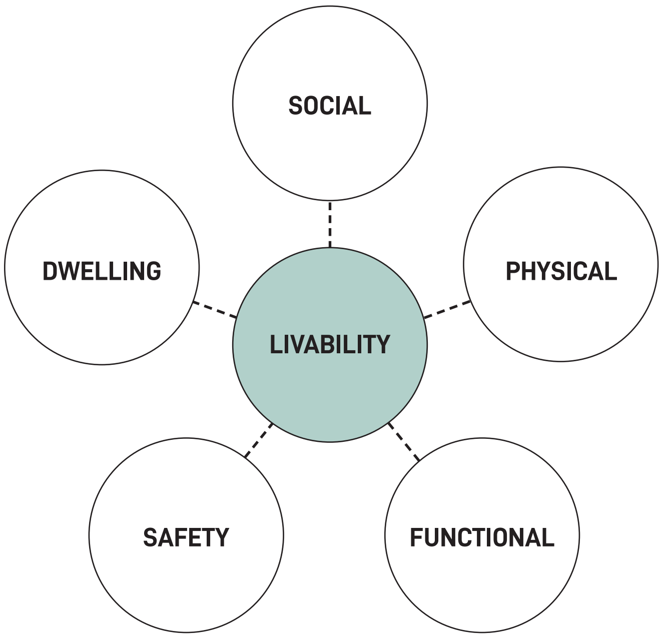


Figure 4.6: Livability dimensions: social, physical, functional, safety, and dwelling (by author).

frequent and overlapping dimensions mentioned in the three frameworks. All indicators mentioned in the three frameworks were then placed within these five dimensions for comparison (see Figure 4.7). Within the frameworks many indicators overlap with each other but are phrased differently, these overlapping indicators can be combined into one indicator. For example, Satu and Chiu (2017) cite “average distance to the nearest facilities” and Leby and Hasmin (2010) describe this as “proximity of facilities”. These two phrases have the same meaning. Some indicators are not applicable within this study because they are more individual and personal than at the neighborhood level. Examples are health satisfaction and income. Merging the frameworks resulted in the livability framework (see Figure 4.8) that will be used to measure the livability of the Louis Couperus neighborhood. The five dimensions are further divided into indicators and then assessment criteria.

Social livability

The first dimension is social and deals with measuring the status and relationships of various social elements. The indicators address social cohesion within the neighborhood and the residents’ sense of community. This can be used to investigate whether there are sufficient places in the neighborhood to meet and whether there are activities that bring residents together. Furthermore, the indicators examine the residents’ satisfaction, behavior, diversity (age and background), and the employment rate.

Physical livability

The second dimension is physical and deals with the physical environment of the neighborhood. The indicators address the availability and proximity to open public spaces, greenery, parks, and playgrounds that the residents can use for leisure or social purposes. It should also be investigated whether residents actively use the spaces, how they interact with the spaces, and how they perceive the spaces. This also applies to the infrastructure and its articulation. How residents perceive the physical environment also has to do with the density, environmental quality (such as pollution, litter, noisiness, and congestion), and maintenance of the built environment.

Functional livability

Functional is the third dimension and focuses on the availability of facilities. Holt-Jensen (2001) implies that well-being depends on good facilities such as supermarkets, stores, medical and hospitals. This implies as well for educational facilities such as kindergartens and schools. A further indicator in this dimension is the proximity and availability of public transportation and sufficient spaces to park your car. Accessibility is also considered important and includes how user-friendly the neighborhood is for wheelchair users, for example. The last indicator is employment opportunities, which

Livability Framework Comparison: Van Der Waart (2024)

Dimensions	Framework 1: Satu and Chiu (2017)	Framework 2: Leby and Hasmin (2010)	Framework 3: Aernouts (2023)
Social	Frequency of using community facilities Frequency of using open spaces and public spaces Number of social contacts on street Number of communications Self-reported involvement in community activities - -	Behaviour of neighbours (nuisance) Community life Social contact Sense of place - - -	Diversity in age Income Employment rate Happiness rate Diversity in ethnicity Health satisfaction Social cohesion
Physical	Average distance to the nearest open space Average distance to the nearest street corners Transport used Residents satisfaction	Environment quality Open spaces Maintenance of built environment -	Density Infrastructure (bike, pedestrian, public transport) Mix of functions Public space (maintainance, design)
Functional	Modes used Duration of waiting time Average distance to the public transport station Residents satisfaction Provision nearby Average distance to the nearest facilities Transport used	Availability of facilities Proximity of facilities Accessibility Employment opportunities - - -	Distance to daily groceries Distance to medical services Distance to trainstation Distance to hospital Distance to park - -
Safety	Perceived safety during day-time and night-time Residents' satisfaction -	Number of crimes Number of accidents Feeling of safety	Satisfaction criminality Crime rate (theft, vandalism, violence) Perceived safety
Dwelling	Size of dwelling unit Sufficient usable space Residents satisfaction with the dwelling space - - -	- - - - - -	Diversity in period built Diversity in housing typologies Diversity in house ownerships Occupied houses WOZ-value houses Nuisance (location, neighbors)

Figure 4.7: Livability framework comparison (by author, based on Satu and Chiu, 2017, Leby and Hasmin, 2010 & Aernouts, 2023).

develop social networks in addition to economic benefits. For many, work can also provide psychological satisfaction because it allows them to demonstrate their abilities and have a sense of accomplishment (Leby and Hasmin, 2010).

Safety livability

The fourth dimension is safety, an important basic need reflected in the fact that everyone wants to live in a crime-free and safe neighborhood (Leby and Hasmin, 2010). Residents of a neighbourhood with a high crime rate will experience feelings of stress and worry due to the unsafe surroundings. Indicators used to assess neighbourhood safety include perceived safety, crime rates, and accident rates, including traffic accidents.

Dwelling livability

The fifth and final dimension is dwelling and focuses on the buildings themselves. The first two indicators of this dimension are not at the neighborhood level but at the building level. These are the size of the dwelling unit and the availability of outdoor spaces such as balconies or gardens. The neighborhood-level indicators are diversity (construction periods, typologies, and ownership), vacancy rates, and nuisances such as from the neighborhood itself or neighbors.

Livability Framework: Van Der Waart (2024)		
Dimensions	**Indicators**	**Assessment Criteria**
Social	Social cohesion	Availability and use of meeting Places
	Community feeling	Activities and relation of the residents
	Residents satisfaction	Interviews/Questionnaire
	Behaviour of neighbors	Nuisance
	Diversity	Age and background
	Employment rate	Interviews/Questionnaire
Physical	Proximity of open public spaces	Measuring the distance of open public spaces
	Proximity of parks and playgrounds	Measuring the distance of parks and playgrounds
	Infrastructure	Separation of car, bicycle and pedestrian
	Density	Dwellings within a given area of land
	Environment quality	Biodiversity and pollution
	Maintenance of built environment	Builiding and infrastructure maintenance
Functional	Availability of facilities	Supermarkets, stores, medical and hospital
	Availability of education	Kindergarten and schools
	Mix of functions	Presence of variation in functions
	Proximity of transport	Public transport and parking
	Accessibility	Infrastructure, public transport and parking
	Employment opportunities	Availability of workplaces
Safety	Perceived safety	During day-time and night-time
	Crime rate	Theft, vandalism and violence
	Accident rate	Traffic accidents
Dwelling	Size of dwelling unit	Sufficient usable space
	Availability of outdoor space	Balconies and gardens
	Diversity	Construction periods, typologies and ownership
	Vacancy rate	Number of vacant dwellings
	Nuisances	Location and neighbors

Figure 4.8: Livability framework: dimensions, indicators, and assessment criteria (by author).

4.2 SOCIAL LIVABILITY OF THE LOUIS COUPERUS NEIGHBORHOOD

Based on the proposed livability framework in the previous chapter (see Figure 4.8), this and subsequent chapters will measure the livability of the Louis Couperus neighborhood using this framework. The first dimension that will be measured is the social dimension. This dimension explores the types of people who live in the neighborhood and what social aspects are present that can connect its residents. The Western Garden Cities including the Louis Couperusbuurt were built for Amsterdam workers and their families after World War II. But who are the people now living in the Louis Couperus neighborhood?

The Louis Couperusbuurt has a population of 2.330 residents and counts a total of 1.280 dwellings (AlleCijfers, 2024). This translates to approximately 1.8 persons per household. Of the residents, the largest group in the age distribution is young adults aged 25-44 (37%) (see Figure 4.9). Of the household statuses, divided into single households, families with children, and families without children, single households are in the majority with 63% (see Figure 4.10). Vashti (2021) argues that the large number of single-person households is due to the students and young starters in the neighborhood. One of the main reasons is the housing corporation's attempt to rent housing to students to minimize the overcrowding of families in the neighborhood. Providing opportunities to rent housing to students or young starters will reduce spatial pressure in the neighborhood and increase diversity in the neighborhood. Most of these resident groups are in the term of the youth contract, which means that their rent can only be in effect for five years. Therefore, the densification plan should strongly consider the needs of these residents because the presence of these groups is vital to the diversity of the neighborhood. The Western Garden Cities was also built on the concept of a neighborhood for families. Now, however, the target groups have shifted. The presence of the elderly is not as large as other groups, but this is also an important group of residents. Most of the elderly are local Dutch who have lived in the Couperus neighborhood since the beginning. Their bond with the neighborhood is the strongest, and in some cases, they are the main binding factor for residents.

The background of residents in the Louis Couperusbuurt is divided in Figure 4.11 into non-Western, Western, and none which represents other backgrounds. The neighborhood is primarily of non-Western background (64%). Of the non-Western background, residents with a Moroccan background (39.6%) and Turkish

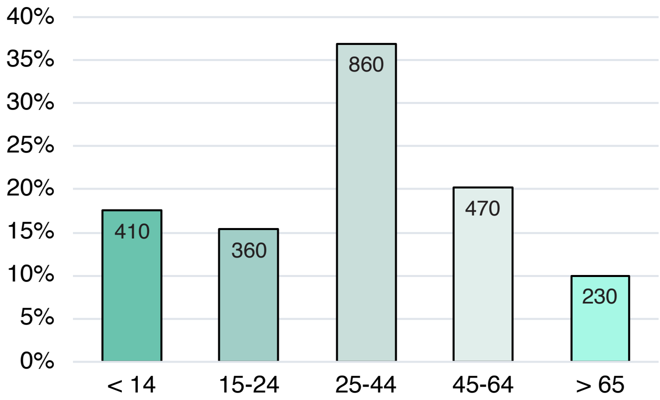


Figure 4.9: Bar chart of the age distribution of the Louis Couperus neighborhood (by author, based on AlleCijfers, 2024).

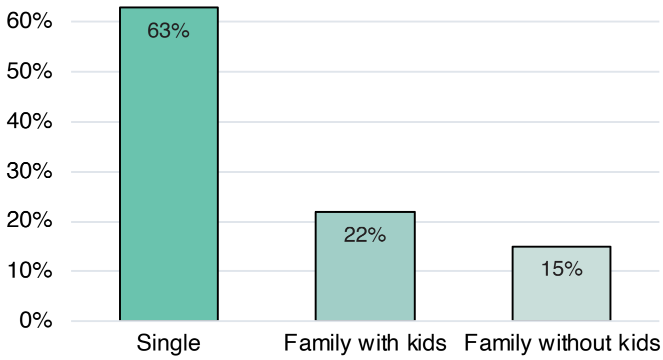


Figure 4.10: Bar chart of the household status of the Louis Couperus neighborhood (by author, based on KadastraleKaart, 2023).

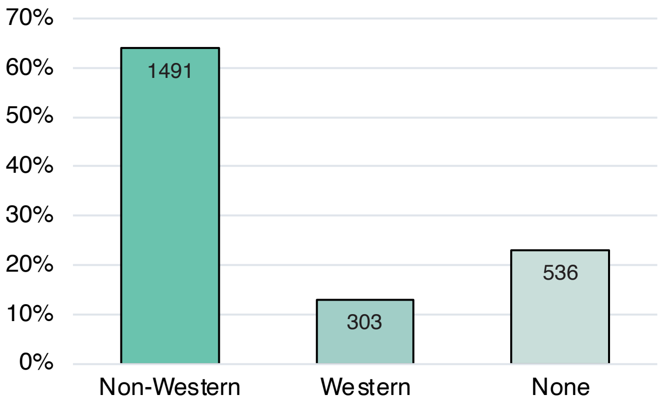


Figure 4.11: Bar chart of the migration background of the Louis Couperus neighborhood (by author, based on AlleCijfers, 2024).

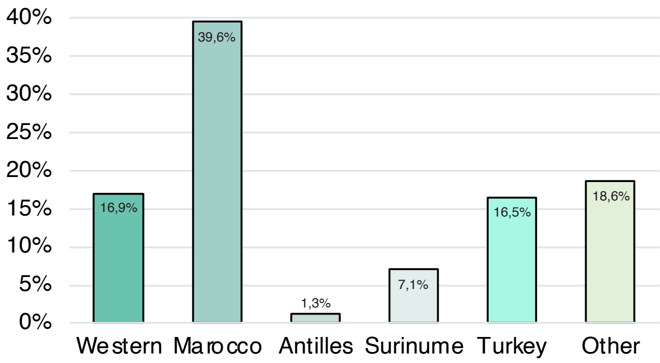


Figure 4.12: Bar chart of the migration countries of the Louis Couperus neighborhood (by author, based on AlleCijfers, 2024).

background (16.5%) are the most represented (see Figure 4.12). Based on these figures, it can be said that the neighborhood is very diverse and multicultural. Nio et al. (2021) states that many older Western residents want to stay in their homes and prefer renovation. Households from Moroccan, Turkish, and other migration backgrounds prefer demolition-new construction and would like a new, larger home. Students and starters live there temporarily and presumably have less trouble moving.

Since 1995, every two years the City of Amsterdam researches the living quality of the city. This survey is called the "WiA" which stands for "Wonen in Amsterdam" translated as "Living in Amsterdam". In this research, livability is a theme, and a view is given of the satisfaction with housing, living environment, and the housing and moving desires of Amsterdam residents (Gemeente Amsterdam, 2024). The latest "WiA" study of 2021 published in 2022 by the Municipality of Amsterdam shows that Slotermeer is one of the four neighborhoods with the lowest score in neighborhood satisfaction. Amsterdam's average neighborhood satisfaction score is 7.0 and Slotermeer scores a 6.5 just behind Osdorp which scores only a 6.4 (see Figure 4.13). For social interaction with residents, every neighborhood in Amsterdam scores a 6.0 or higher. The Louis Couperus neighborhood scores a 6.5 (see Figure 4.14). For neighborhood involvement, thirteen of the 91 neighborhoods score insufficiently. The Louis Couperus neighborhood scores a 6.0 (see Figure 4.15). What is notable about the scores in the WiA is that the lowest scoring areas, for both neighborhood satisfaction, social interaction, and neighborhood involvement, are clustered in the New-West district. From this, it can be concluded that New West's livability is the lowest of all the districts and needs improvement. Why the scores are lowest in these neighborhoods is not mentioned in the "Wonen in Amsterdam" study.

Based on questionnaires by AlleCijfers (2024) filled in by residents of the Louis Couperus neighborhood, it was found that 64% of the residents over the age of 18 feel lonely. Of these, 21% feel severely lonely, 45% experience emotional loneliness, and 41% social loneliness. From this, it can be concluded that the residents of the Louis Couperus neighborhood have a stronger need for social cohesion. The questionnaires that were filled in also revealed that 12% of the residents between the ages of 18 and 65 experience severe noise nuisance from their neighbors. Also, 85% feel that they are in control of their own lives. However, 38% of the

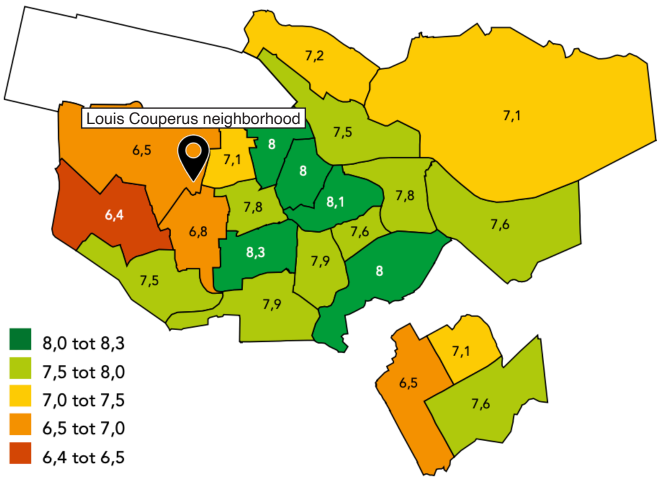


Figure 4.13: Neighborhood satisfaction scores of Amsterdam (2021) (based on WiA by Gemeente Amsterdam, 2024).

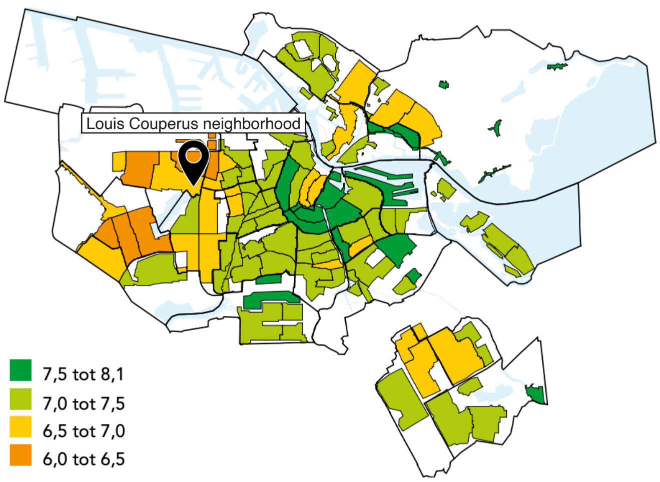


Figure 4.14: Social interaction scores of Amsterdam (2021) (based on WiA by Gemeente Amsterdam, 2024).

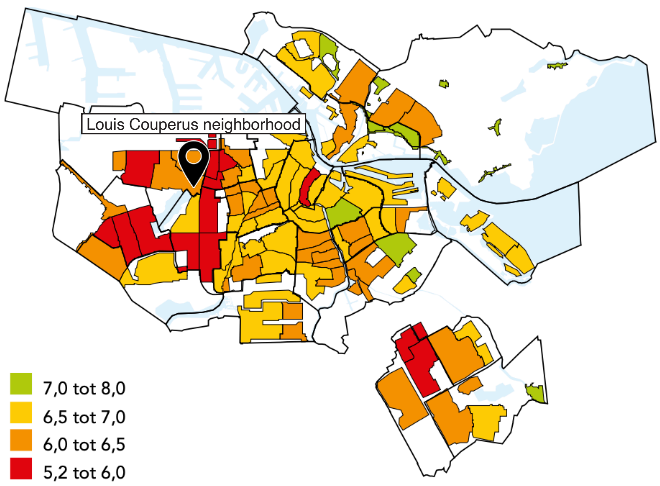


Figure 4.15: Neighborhood involvement scores of Amsterdam (2021) (based on WiA by Gemeente Amsterdam, 2024).

residents between the ages of 18 and 65 have difficulty getting by on finances.

The livability framework shows that an indicator of social livability in a neighborhood is the number of meeting places and how they are used. For this indicator, observations were used and photographs were taken in the Louis Couperus neighborhood. These observations and photographs are mapped in Figure 4.19. During the observations, three different attributes were discovered and mapped that provide social cohesion and where residents can meet. These attributes are the religious functions, playgrounds, sports fields, and benches. At the center of the neighborhood is a central plaza that serves as the heart of the neighborhood. On this plaza is located the El Hijra Mosque, and on the western side of the neighborhood is De Verbinding located a Baptist Church (see Figure 4.20). These religious functions provide daily services where residents, as well as residents in the surrounding neighborhoods, can come together. Because not everyone has the same religion or practices a religion, groups do arise and not everyone is involved in these meeting places. In addition, the presence of playgrounds and sports fields was examined. There are three playgrounds with sports fields in the neighborhood, two of which belong to schools but are accessible after school hours. The remaining playgrounds and sports fields are just outside the neighborhood boundaries and are located within a proximity of approximately 5 minutes walking distance (see Figures 4.21 & 4.22). Lastly, observations were conducted on the presence of benches where people can relax or meet. This shows that few benches are present in the neighborhood. The benches that are present are on the edges of the neighborhood, have a remote location, or the benches are broken and no longer usable (see Figures 4.23 & 4.24).

Based on the observations, it can be concluded that there are enough playgrounds and sports fields but after the densification, there will be more people living there. As a result, there is room for more. Furthermore, there are not enough benches in the neighborhood where residents can sit and meet. During the renewal of the Louis Couperus neighborhood, more playgrounds may be added and more benches should be present located along the neighborhood's walking routes. Furthermore, Nio et al. (2021) provide suggestions for creating more meeting places. Here it is indicated that community spaces can be created in the neighborhoods where residents can come and gather. Furthermore, community gardens for urban farming, picnic areas with benches,

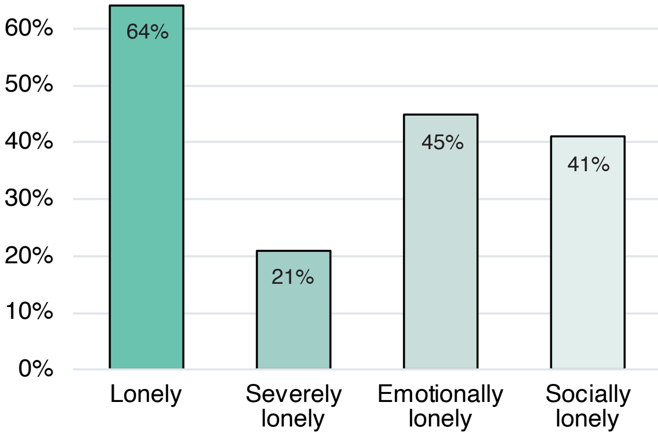


Figure 4.16: Bar chart of loneliness from the age of 18 of Louis Couperus neighborhood (by author, based on AlleCijfers, 2024).

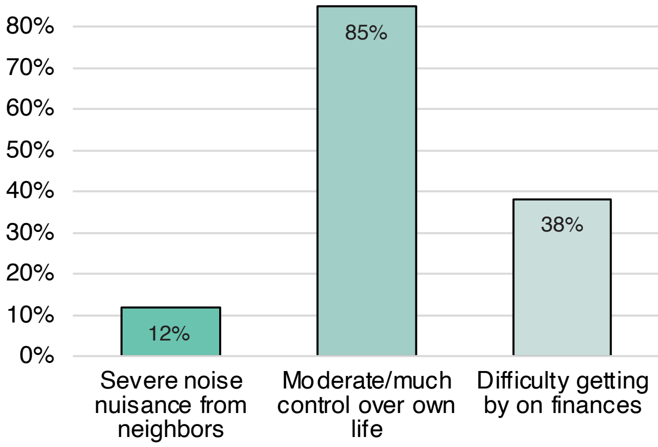


Figure 4.17: Bar chart of social aspects residents aged 18-65 of Louis Couperus neighborhood (by author, based on AlleCijfers, 2024).

Figure 4.19: Mapping of the social meeting places mapping of the Louis Couperus neighborhood (by author).

and outdoor gyms can be created to bring residents together. Nio et al. (2021) also suggest that rooftops can be used as public gardens along neighborhood walking routes and that an active plinth helps bring residents together and strengthen social cohesion.

Figure 4.20: Religious functions as meeting places (1. Mosque el Hijra & 2. De Verbinding, Baptist Church) (by author).

Figure 4.21: Playgrounds and sports fields between buildings in the Louis Couperus neighborhood (by author).

Figure 4.22: Playgrounds en sports fields just outside the Louis Couperus neighborhood (by author).

Figure 4.23: Broken benches as meeting places in the the Louis Couperus neighborhood (by author).

Figure 4.24: Remote benches as a place to relax or as a meeting place in the Louis Couperus neighborhood (by author).

4.3 PHYSICAL LIVABILITY OF THE LOUIS COUPERUS NEIGHBORHOOD

The second dimension of livability based on the framework is physical and deals with the physical environment of the neighborhood. The indicators for measuring the physical environment are the proximity to public spaces and parks, infrastructure structure, density, environment quality, and the maintenance of the built environment.

To measure the proximity of public spaces and parks, the central plaza in the Louis Couperus neighborhood was taken as the center. According to the University of British Columbia (2003), a 5-minute walk is equivalent to a 400-meter walk. Using this information, a radius of 400 meters was drawn from the central plaza to measure how far the public spaces and parks are located (see Figure 4.25). This 5-minute walking distance in the neighborhood itself also overlaps with the Wijkgedachte concept, which was used to design the neighborhood. Besides the central plaza, most of the public spaces are located within the open courtyard parcellations. These allotments are realized in the form of green spaces that function as viewing green and have no other assigned function (see Figure 4.26). However, several open courtyard parcellations when the neighborhood was constructed after World War II had playgrounds in the courtyard (see Figure 4.27). These playground facilities were designed by Dutch architect Aldo van Eyck (1918-1999) and featured concrete playing fields with a sandbox, play racks, and benches where mothers could keep an eye on the children. The concrete playfields were surrounded by greenery that in turn adjoined the backyards. According to the Van Eesteren Museum (2023), these playground facilities were removed over the years because the parents found the execution in concrete dangerous.

The Louis Couperus neighborhood is situated between the Sloterpark with the Sloterplas lake and the Gerbrandypark. The parks are connected by Burgemeester Rendorp Street which runs through the heart of the neighborhood. This street and Louis Couperus Street form the two main axes that give access to the neighborhood. The neighborhood has plenty of public space and the green courtyards, Sloterplas, and Gerbrandypark are all within a 5-minute walking distance.

The next attribute examined is the infrastructure of the Louis Couperus neighborhood and how its neighborhood is accessed. The infrastructure is mapped in Figure 4.28. In the site context chapter, it emerged that the infrastructure of the neighborhoods was designed with so-

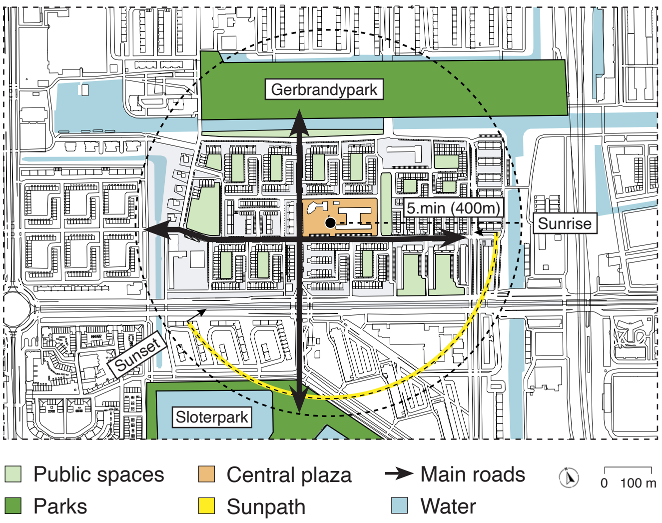


Figure 4.25: Proximity of the public places and parks in the Louis Couperusbuurt (by author).

Figure 4.26: Greenery in the open courtyard parcellation in the Louis Couperus neighborhood (by author).

Figure 4.27: Archive image of a playground in the Dichtersbuurt in Slotermeer by Aldo van Eyck (Stadsarchief, 1960).

called ‘city avenues’, which serve as a route connecting the urban expansion to the existing city (Havinga et al., 2020). This also applies to the Louis Couperus neighborhood which is accessed by the Burgemeester Röellstraat which serves as a city avenue connecting Amsterdam West and New-West. The infrastructure then branches off from the city avenues to the district roads, neighborhood roads, streets, lanes, and courts. In this case, the Burgemeester Rendorp Street, which runs vertically through the neighborhood, serves as a district road connecting Sloterpark and Gerbrandy Park. The main neighborhood road is the Louis Couperus Street which runs horizontally through the neighborhood along the central plaza. The neighborhood roads then branch off into smaller streets and lanes that provide access to the dwellings.

These different types of roads are all accessible by car, bicycle, and on foot. At the end of the streets surrounding the neighborhood borders are walking paths by which the neighborhood can be exited. There is a clear hierarchy in the neighborhood’s infrastructure with different types of roads branching off. Also, the concept of Cornelis van Eesteren: light, air, and space are reflected in the infrastructure of the neighborhood. The streets are large with sufficient space between the buildings with spacious walkways and car paths. Cars can be parked in appointed parking places on the neighborhood roads, streets, and in the courtyard lanes. Using the analysis and observations, a total of 930 parking spaces were counted. With the 1.280 dwellings in the neighborhood, this translates to about 0.72 parking spaces per household. During the observation in the neighborhood, it was apparent that many residents parked their motorcycles, scooters, and bicycles on the walking paths (see Figure 4.29). Several residents also park their vehicles at the entrances of their homes (see Figure 4.30). Parking in public spaces in non-designated areas blocks walkways, increases nuisance among residents, and creates a less safe living environment. In the renewal of the neighborhood, designated areas, such as bike sheds, should be provided where residents can park their vehicles without blocking the walking paths.

The last indicator of the physical livability that was investigated is environmental maintenance. The score for the perception of nuisance from pollution in the City of Amsterdam’s ‘WiA’ study (2024) scores an average of 5.4 in Amsterdam. Slotermeer scores a 5.0 (see Figure 4.31) which means that many residents acknowledge being bothered by pollution in their neighborhood.

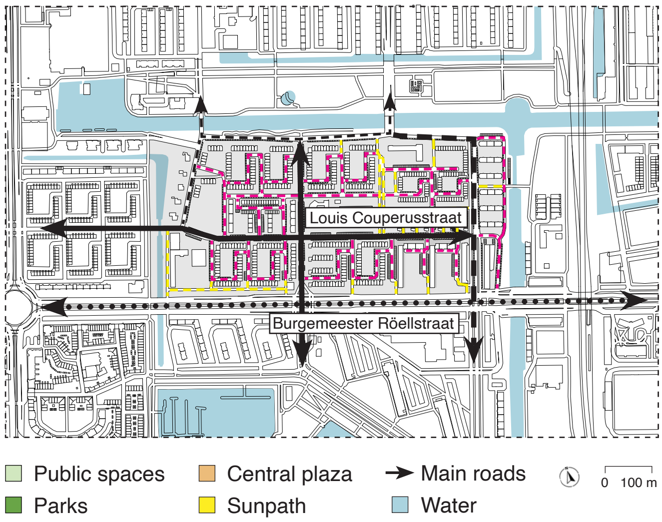


Figure 4.28: Proximity of the public places and parks in the Louis Couperusbuurt (by author).

Figure 4.29: Residents parking their motorcycles, scooters, and bicycles on the walking paths (by author).

Figure 4.30: Residents parking their motorcycles, scooters, and bicycles at their dwelling entrance (by author).

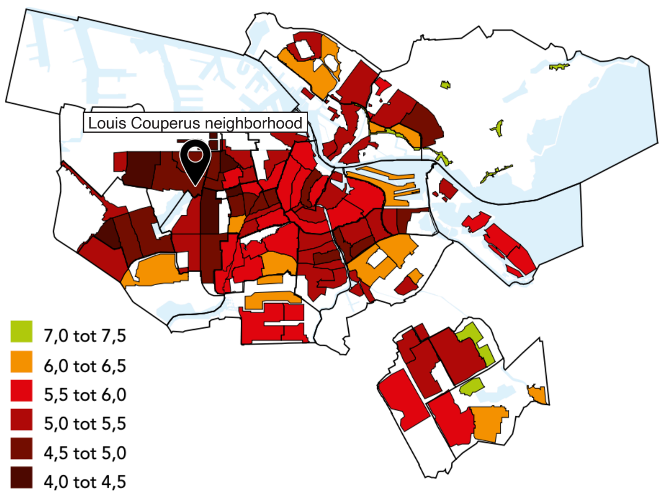


Figure 4.31: Perception of nuisance from pollution scores of Amsterdam (2021) (based on WiA by Gemeente Amsterdam, 2024).

Furthermore, Slotermeer scores a 6.0 in terms of how residents judge the maintenance of their streets and sidewalks (see Figure 4.32). During the observations in the neighborhood, a lot of trash was present on the streets (see Figure 4.33) and also a lot of trash in residents' gardens (see Figure 4.34). Based on these findings, it can be concluded that the neighborhood is in need of renewal and needs better maintenance. Furthermore, residents should be encouraged to be more responsible with their living environment. This can be done by creating more social control and placing more trash cans in the neighborhood to encourage residents to throw away their trash.

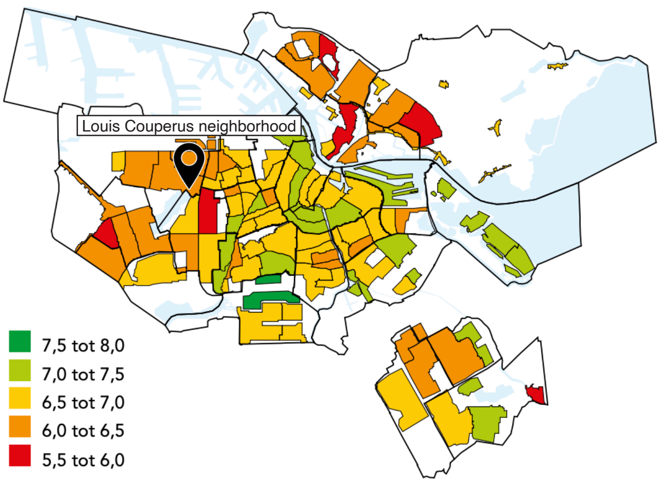


Figure 4.32: Maintenance satisfaction scores of Amsterdam (2021) (based on WiA by Gemeente Amsterdam, 2024).

Figure 4.33: Residents parking their motorcycles, scooters, and bicycles on the walking paths (by author).

Figure 4.34: Residents parking their motorcycles, scooters, and bicycles at their dwelling entrance (by author).

4.4 FUNCTIONAL LIVABILITY OF THE LOUIS COUPERUS NEIGHBORHOOD

The third dimension of livability based on the framework is functional and deals with the proximity and availability of facilities. Holt-Jensen (2001) implies that the well-being of residents depends on good facilities such as supermarkets, stores, medical and hospitals. This implies as well for educational facilities such as kindergartens and schools. Another indicator of the functional dimension that will be examined is the availability of public transportation.

To measure the proximity and availability of facilities a radius of 400 meters which is equivalent to a 5-minute walk was drawn from the central plaza. Facilities within the Louis Couperus neighborhood and in the surrounding areas are mapped in Figure 4.35. Within the radius of 400 meters are several educational functions including an elementary school, a middle school, a high school, and an elementary school for children who need special assistance. For practicing religions is a mosque on the central plaza and a Baptist church in the western part of the neighborhood. The radius of the neighborhood also includes some small businesses with office space. Store availability within the radius is scarce with only a few stores located on the Louis Couperus street. The parcellations of the neighborhood contain single-layer stores at several corners (see Figure 4.36). These stores are located at the beginning of allotments on the Burgemeerster Rendorpstreet and at the corners of several open courtyard parcellations. However, these spaces are no longer used as stores and in most cases are vacant.

Most stores are located outside the radius, with most stores situated on Plein 40-45. This plaza, which is just over a 5-minute walk away, is where most residents do their shopping. In the neighborhood itself are no hospitality facilities such as restaurants or cafes. Most hospitality facilities are located beside Plein 40-45 on the Burgemeester de Vlugtlaan to the north of the Louis Couperus neighborhood. There is a physiotherapist within a radius of 400 meters and a gas station on the other side of the Burgemeester Roëllstraat. For cultural facilities, at the Sloterplas lake is the Van Eesteren Museum and north of the neighborhood is a cinema. Except for the presence of stores and hospitality facilities, there are sufficient facilities in the Louis Couperus neighborhood and surrounding area. During the renewal of the neighborhood, more stores and hospitality facilities can be created where residents can come together. This also provides employment benefits for residents and attracts people outside the neighborhood to the area. The neighborhood lacks a community center and or co-working spaces. Nio et al. (2021) mention that community centers and co-working spaces can bring residents together.

Furthermore, in Figure 4.35 the public transport roads are mapped along with the bus, tram, and metro stops. On the Burgemeester Roëllstraat, which serves as the neighborhood's main access road, several bus and tram stops are located connecting the neighborhood to the rest of the city. These are all located within a radius of 400 meters with a walking distance of 5 minutes. Located just outside this radius is the Jan van Galenstraat metro station. Also, just outside this radius is the Burgemeester de Vlugtlaan, which also offers multiple bus and tram connections. Based on this information, it can be concluded that the Louis Couperus neighborhood is easily accessible using public transportation facilities within walking distance.

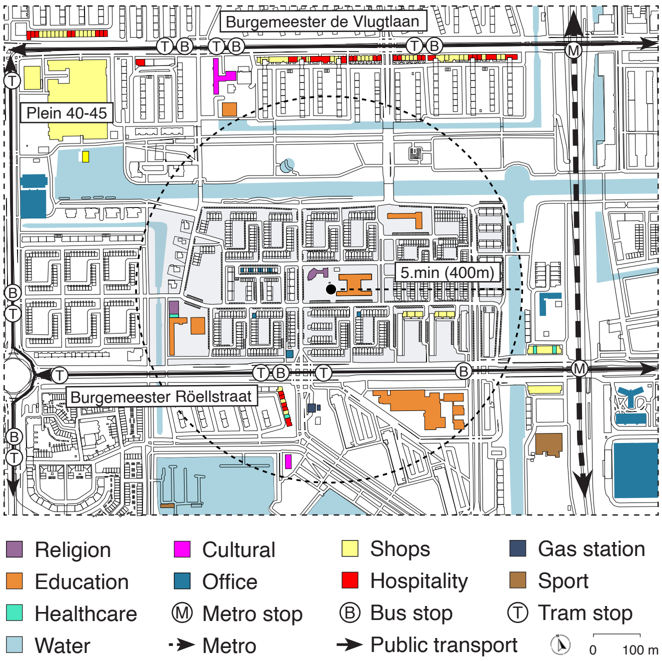


Figure 4.35: Map of the proximity and availability of facilities in and around the Louis Couperus neighborhood (by author).

Figure 4.36: Stores on the corners of the parcellations in the Louis Couperus neighborhood (Stadsarchief, 1960).

4.5 SAFETY LIVABILITY OF THE LOUIS COUPERUS NEIGHBORHOOD

The fourth dimension of livability is safety. This examines the perceived safety of the residents of the Louis Couperus neighborhood. The “Wonen in Amsterdam” study by Gemeente Amsterdam (2024) shows that Slotermeer, the area in which the Louis Couperusbuurt is located, scores below average based on how safe residents feel in their neighborhood at night. The average score for Amsterdam is 7.2 and Slotermeer scores a 6.5 (see Figure 4.37). For crime nuisance, Slotermeer scores insufficiently with a score of 5.5 (see Figure 4.38). Both scores of how safe residents feel in their neighborhood at night and crime nuisance are lowest in the New-West district. Based on this information, it can be concluded that residents do not feel completely safe and that safety in the neighborhood needs to improve.

Figures 4.39 and 4.40 show crimes committed and types of crimes in 2022 per 1.000 residents (AlleCijfers, 2024). The crime most prevalent in the neighborhood is theft followed by violence and traffic violations. The most common theft is the theft of vehicles such as cars (22 occasions), motorcycles, scooters, and bicycles (18 occasions). For violence, the most common type is the destruction of property (21 occasions). Furthermore, 20 accidents per 1.000 inhabitants were recorded due to traffic accidents. Safety is important in creating livability in a residential environment. Making the neighborhood safer can be done by having more eyes on the street, encouraging participation and more activities in the neighborhood, and better street lighting to reduce dark areas.

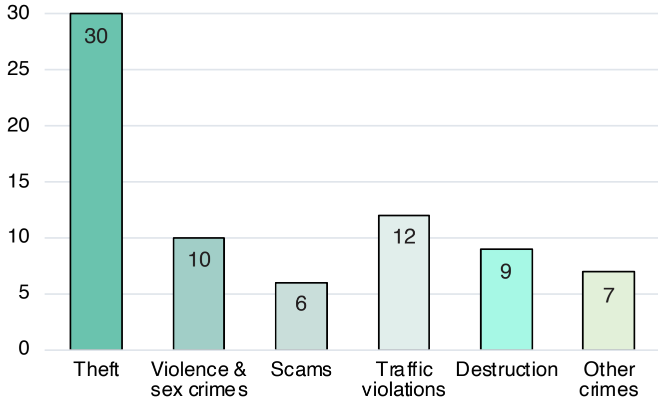


Figure 4.39: Bar chart of crimes per 1.000 residents (2022) in Louis Couperus neighborhood (by author, based on AlleCijfers, 2024).

Figure 4.40: Bar chart crime types per 1.000 residents (2022) in Louis Couperus neighborhood (by author, based on AlleCijfers, 2024).

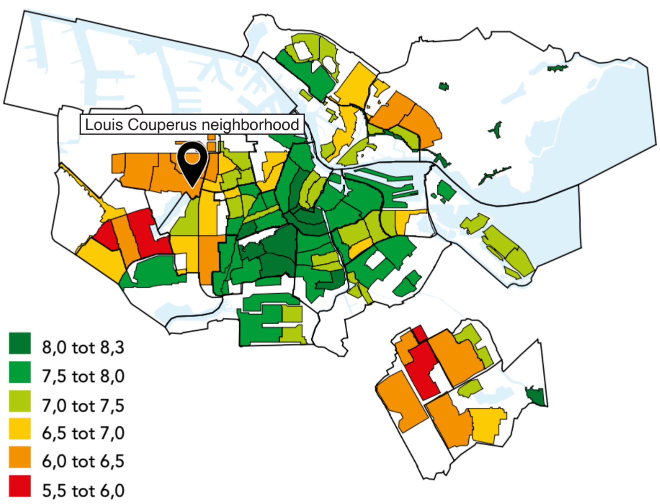


Figure 4.37: Feeling safe in the neighborhood at night scores of Amsterdam (2021) (based on WiA by Gemeente Amsterdam, 2024).

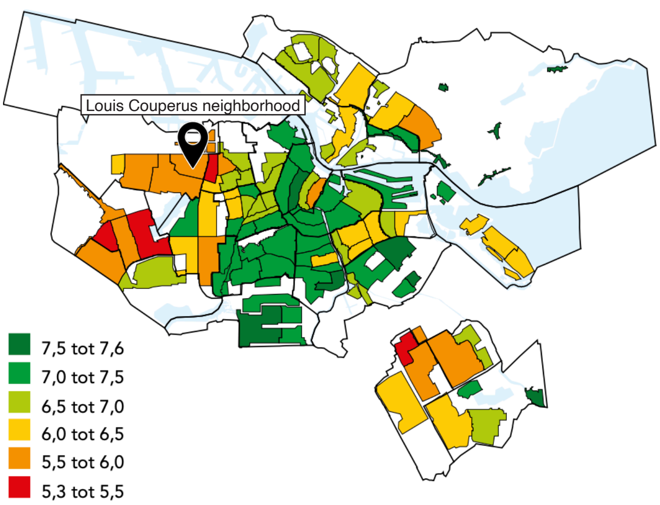


Figure 4.38: Nuisance from crime scores of Amsterdam (2021) (based on WiA by Gemeente Amsterdam, 2024).

4.6 DWELLING LIVABILITY OF THE LOUIS COUPERUS NEIGHBORHOOD

The fifth and final dimension of livability based on the framework is dwelling and deals with the buildings themselves. The indicators for measuring the livability of the dwellings are the size of the dwelling units and whether there is sufficient usable space available. The availability of outdoor spaces such as balconies or gardens, the diversity in construction periods, typologies, and ownership. Lastly, the number of vacant dwellings and the nuisances of the residents experienced in the dwellings.

In the chapter where the site context is discussed, it has already emerged that all the dwellings in the Louis Couperus neighborhood were built after World War II in 1953. It also revealed that 90% of the dwellings are social rental housing and are owned by housing corporations. The remaining 10% are privately owned by individuals (AlleCijfers, 2024). All dwellings are occupied and there is no vacancy in the neighborhood. Little diversity can be found in the ownership and construction periods of the dwellings. However, diversity in the typologies used in the neighborhood was found. The typologies: duplex houses, townhouses, detached houses (villas), and apartments were identified.

The design phase will focus on the open courtyard parcellations. In this type of allotment, the duplex typologies are applied which are also the most common in the neighborhood. For this reason, the study of the livability of the dwellings focuses on this typology. The duplex houses are single-family homes that are divided into an upstairs and downstairs dwellings. The previous chapters indicated that neighborhood residents complain that the homes do not meet the current standards and are out of date. The upstairs and downstairs dwelling of the duplex typology have both a floor area of 40 square meters (see Figure 4.41). The floor plans of the homes have a bedroom, living room, and kitchen with separate access. Furthermore, the downstairs apartment has a toilet that is also used as a bathroom and the upstairs apartment does have a separate toilet and bathroom. In both cases, the toilet and bathroom are small. The downstairs dwelling has an outdoor garden adjacent to the living room and kitchen that is accessible from both areas. The upstairs apartment, on the other hand, has no outdoor space. This dwelling has a French balcony adjacent to the living room and kitchen. The roof of the dwellings functions as a third floor but is not used as living space. This space can be used as storage and is accessed by an attic ladder.

The upstairs and downstairs dwellings are accessed by

Figure 4.41: Floorplans of the duplex typology in the Louis Couperus neighborhood illustrating the layout and ownership (by author).

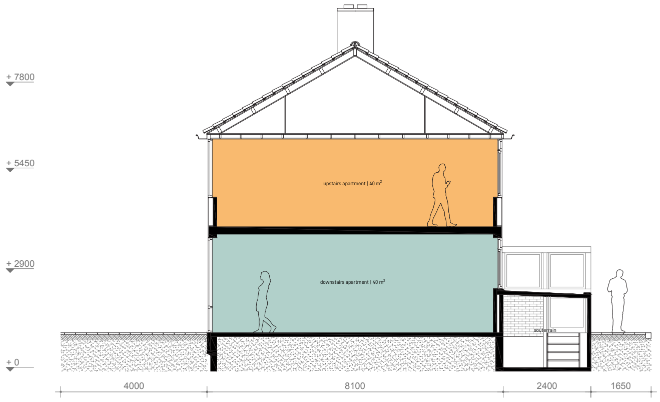


Figure 4.42: Section of the duplex typology in the Louis Couperus neighborhood illustrating the layout and ownership (by author).

Figure 4.43: Detached entrance portal of the duplex typology in the Louis Couperus neighborhood (by author).

a common detached entrance portal where the doors are located next to each other. In addition to the two front doors of the dwellings, the entrance portal has a third door leading to the basement used as storage. The basement was in the past mainly used to store coals for heating (Van Eesteren Museum, 2023). Furthermore, the basement rises above ground level for the most part and has a height of only 1,9 meters (see Figure 4.42). Dutch building regulations specify a minimum height clearance of 2.1 meters for existing construction and a minimum of 2.3 meters for new construction (Bouwbesluit Online, 2012). Due to the low height of the basement, this space is not pleasant to use and can easily cause someone to hit their head.

The facade of the duplex dwellings is also in an outdated state. The used board material in the facade, mainly on the entrance portals, is in need of renewal (see Figure 4.43). Furthermore, the facades consist of an inner and outer layer of brickwork with an air cavity in between. No insulation has been applied here, allowing much energy in the form of heated air in the dwelling to escape quickly. This also results in the use of more energy by the heaters which in turn results in more costs. The gable roof of the dwellings is constructed of a wooden structure with wooden rafters. As with the facade, no insulation was used in this regard.

The social plan, developed by Stadgenoot together with the residents, for the renewal of the Louis Couperus neighborhood confirmed the poor condition of the dwellings. For example, the plan describes that the poor condition is mainly in the insulation value of the facade and roof, the quality of the window frames, and the outdated installations and kitchens and bathrooms (Stadgenoot, 2023b). It is also addressed that livability is under pressure and the social and economic position of residents is vulnerable. This is also partly because the neighborhood has a low diversity and has almost only social housing with the same layout and the same floor area.

4.7 LIVABILITY CONCLUSION

The research on livability was conducted to answer sub-questions 2 and 3 of this thesis. Sub-question 2 is as follows:

What set of factors determines the livability of a neighborhood?

By comparing several existing frameworks for livability, five overarching factors were determined that can be used to measure livability. The determined factors are social, physical, functional, safety, and dwelling. These different factors each have their own set of indicators and assessment criteria by which they can be measured. These factors with indicators and assessment criteria were incorporated into a custom livability framework (see Figure 4.44).

By answering sub-question 2, sub-question 3 can be answered. This sub-question states as follows:

What is the current livability of the Louis Couperus neighborhood in Amsterdam New West and how can this be improved?

Using the custom livability framework that was formed through research, the current livability of the Louis Couperus neighborhood was measured. Based on the investigated livability of the neighborhood, recommendations are made to improve the livability.

Demographic insights revealed a diverse population, with a significant proportion of young adults and single-person households. The multicultural nature of the neighborhood adds to its vibrancy but also underscores the need for inclusive community initiatives. The social livability of the neighborhood scores low with a high rate of people feeling lonely and experiencing nuisance

Livability Framework: Van Der Waart (2024)		
Dimensions	**Indicators**	**Assessment Criteria**
Social	Social cohesion Community feeling Residents satisfaction Behaviour of neighbors Diversity Employment rate	Availability and use of meeting Places Activities and relation of the residents Interviews/Questionnaire Nuisance Age and background Interviews/Questionnaire
Physical	Proximity of open public spaces Proximity of parks and playgrounds Infrastructure Density Environment quality Maintenance of built environment	Measuring the distance of open public spaces Measuring the distance of parks and playgrounds Separation of car, bicycle and pedestrian Dwellings within a given area of land Biodiversity and pollution Builiding and infrastructure maintenance
Functional	Availability of facilities Availability of education Mix of functions Proximity of transport Accessibility Employment opportunities	Supermarkets, stores, medical and hospital Kindergarten and schools Presence of variation in functions Public transport and parking Infrastructure, public transport and parking Availability of workplaces
Safety	Perceived safety Crime rate Accident rate	During day-time and night-time Theft, vandalism and violence Traffic accidents
Dwelling	Size of dwelling unit Availability of outdoor space Diversity Vacancy rate Nuisances	Sufficient usable space Balconies and gardens Construction periods, typologies and ownership Number of vacant dwellings Location and neighbors

Figure 4.44: Livability framework: dimensions, indicators, and assessment criteria (by author).

from their neighbors. For this reason, the neighborhood requires more facilities that encourage social connections. Suggestions include the addition of more playgrounds, benches, and community spaces, as well as the availability of rooftop gardens and active plinths to strengthen social ties and address inhabitants' diverse needs. The physical qualities of the neighborhood are the balance between private and public spaces, along with the green character and hierarchy in infrastructure. Multiple parks can be reached within a 5-minute walk and the streets are designed with wide walkways and wide car lanes. However, many residents park their vehicles and bicycles on the sidewalk which leads to nuisances among the residents, and creates a less safe living environment. To solve this problem, clear parking areas should be designated and created, such as bike sheds. In addition, many residents are frustrated by street pollution and the neighborhood requires better maintenance. Furthermore, residents should be encouraged to be more responsible with their living environment. This can be done by creating more social control with more eyes on the street and placing more trash cans in the neighborhood to encourage residents to throw away their trash. The neighborhood has high functional livability with a wide range of facilities located within walking proximity. The neighborhood is easily accessible using public transportation with multiple bus, tram, and metro stops. The only lack of facilities in the neighborhood are stores and hospitality functions such as restaurants and cafés where residents but also people outside the neighborhood can gather. These facilities can be located on the main streets in the neighborhood and the vacant stores, located at the beginning of the allotments, can be used for this purpose. The residents in the Louis Couperus neighborhood do not feel completely safe and the safety in the neighborhood needs to improve. Making the neighborhood safer can be done by having more eyes on the street, encouraging participation and more activities in the neighborhood, and better street lighting to reduce dark areas. Finally, the dwelling dimension of livability within the neighborhood was thoroughly investigated, focusing on different aspects of the buildings themselves. The neighborhood has a good diversity of different housing typologies in which the duplex typology is the most dominant. Despite the typology diversity, little variation was found in the ownership and construction period of the dwellings. Furthermore, the large amount of social rental housing with the same floor area creates social segregation. As for the state of the dwellings, observations indicate several problems. Many residents express dissatisfaction with the outdated features of their homes. The duplex homes have small and poorly configured bathrooms and kitchens and lack facade and roof insulation resulting in inefficient energy use, and decaying facade materials. In addition, the low height and poor usability of basements contribute to residents' overall livability problems. Also, only the downstairs dwellings have outdoor space.

The above-mentioned findings of livability with associated recommendations were translated into a toolbox of diagrams illustrating how to improve the livability of neighborhoods (see Figure 4.45). These tools were then categorized based on the five factors of livability. Furthermore, the tools were categorized based on their presence in the neighborhood and in which different locations in the neighborhood these tools can be applied. For the possible locations in the neighborhood, the courtyards within the duplex typologies were included, the central heart of the neighborhood and finally the streets. Within its categorization, tools may also be applicable in multiple locations (see Figure 4.46).

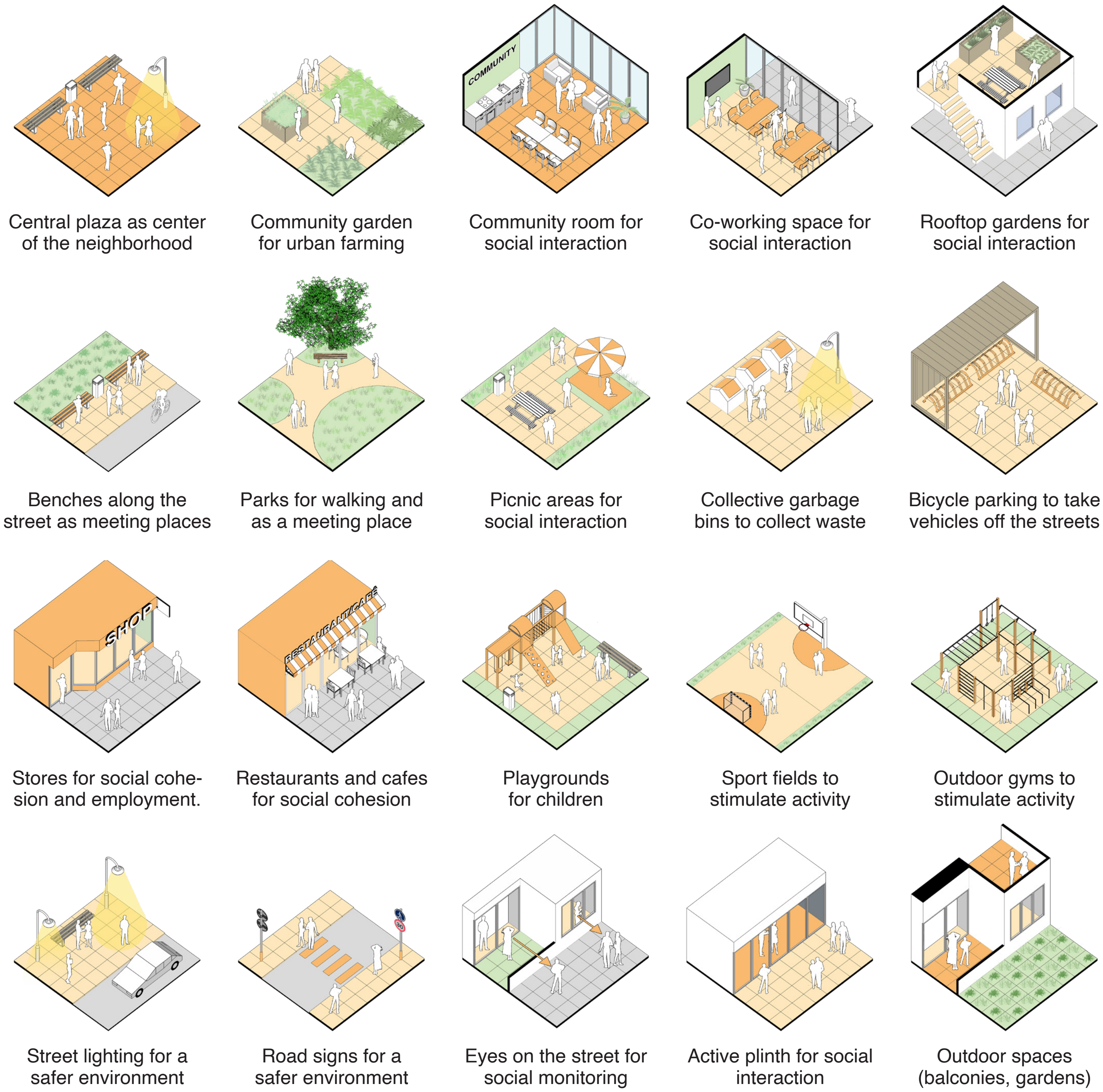


Figure 4.45: Livability toolbox with recommendations for improving livability in neighborhoods (by author).

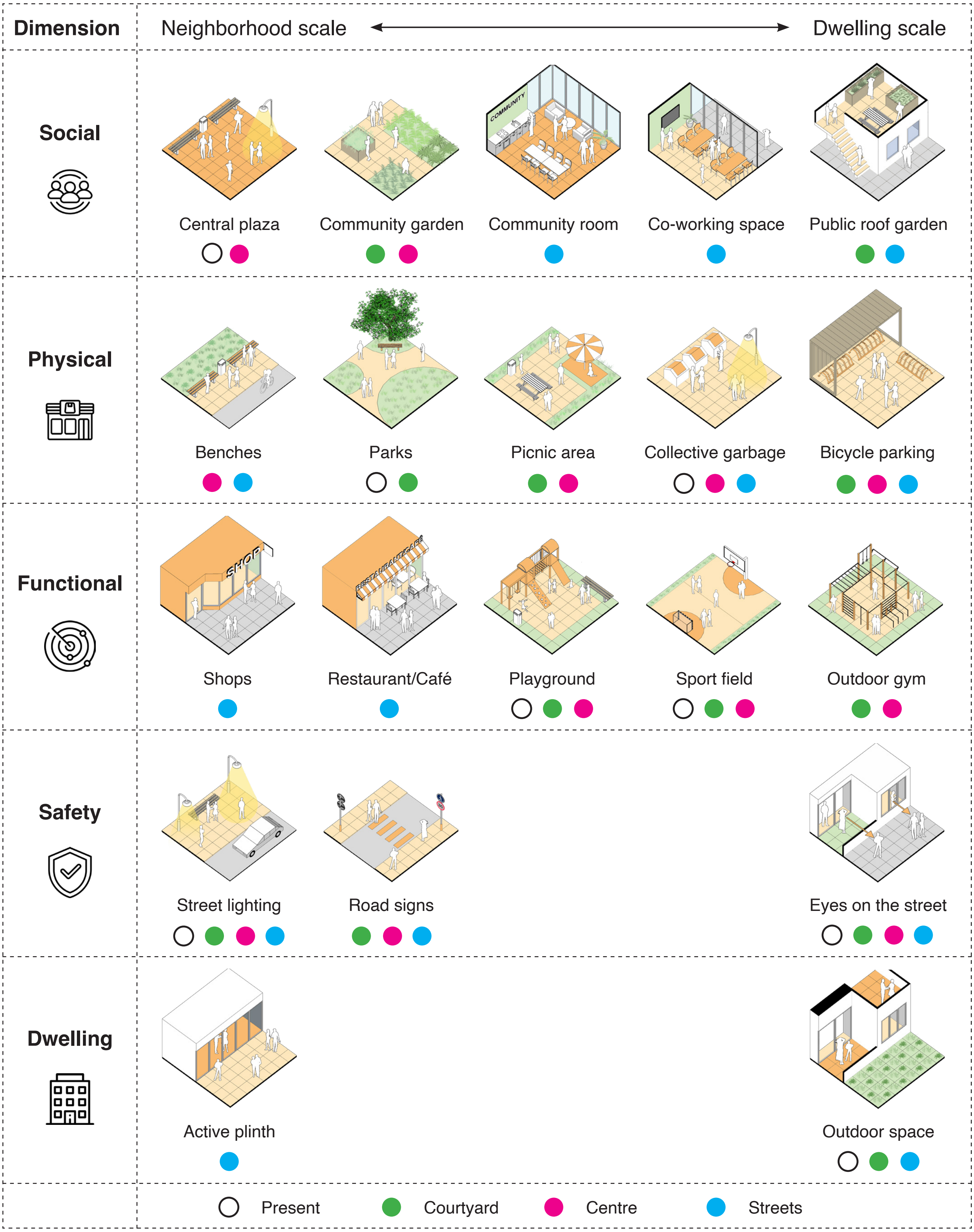


Figure 4.46: Categorized livability toolbox based on the livability factors for improving livability in neighborhoods (by author).

05 DENSIFICATION

This chapter discusses various methods and frameworks for densification to come up with a strategy for densifying the Louis Couperus neighborhood. It further explores how to measure the density of areas and what ensures a livable density.

5.1 DENSIFICATION METHODS

Densifying a neighborhood involves increasing the number of people or structures within the same existing urban area. Amer et al. (2017) suggest, based on a literature review, five different methods for urban densification. These five methods are listed in Figure 5.1 with their corresponding characterization, advantages, and disadvantages. In the next section, the five methods are further explained and visually illustrated in Figure 5.3/5.7. For the illustrations of the densification methods, a courtyard structure in the Couperus neighborhood was used as a base (see Figure 5.2).

Method	Characterization	Advantages	Disadvantages
Filling Backyards	Creating horizontal extension, increasing the surface area of existing buildings on their backyards (Attia, 2015; Marique & Reiter, 2014a)	• Provide additional space for the same property • Opportunity to improve the density while preserving the urban landscape • Retains the integrity of existing dwellings	• Seal more surface • Increasing carbon footprint • Reduce vegetation surfaces • Increase heat island effects • Needs to adapt transportation infrastructure and mobility strategies • Needs to increase urban services
Infill	Establishing new buildings on vacant lots and gaps between buildings or areas not built-up previously or built-up areas with other purposes (Brunner & Cozens, 2013; Marique & Reiter,2014)	• Usage of abandoned areas and opportunity of revitalizing these spaces • Usage of existing infrastructure • Opportunity to improve the density while preserving the urban landscape and urban morphology • Retains the integrity of existing dwellings	• Occupy spaces with a vegetation or recreational function potential • Occupy spaces with parking or collective service potential • Needs to adapt mobility strategies • Needs to increase urban services • Potential damage to the nearby buildings during construction process.
Demolish & rebuild	Applied in areas with lower density where houses are demolished and replaced with high-rise buildings or compact frame (Burton et al., 2013; Marique & Reiter, 2014a)	• Higher flexibility to increasing density on any certain plot • Opportunity to apply designs with higher efficiency	• Critical in already high dense neighbourhood • Increases the use of materials and construction waste • High cost is accompanied by demolition and new construction • Loss of resources (existing infrastructure, etc.) • Risk for the urban heritage • Transformation of the city skyline and urban morphology • Needs to adapt mobility strategies • Needs to increase urban services
Roof transformation	Transformation of saddle roofs into a complete storey with flat roof and larger floor area (Tichelmann & Groß, 2016)	• Does not occupy additional urban spaces and does not increase soil waterproofing • Requires a minimal cost compared to other methods • Easy and quick solution for already urbanized districts • Usage of existing infrastructure • Opportunity to reduce energy consumption of existing buildings through roof insulation	• Limited opportunity to increase density • Transformation of the city skyline • Limitation for heritage buildings • Needs to adapt mobility strategies • Needs to increase urban services
Roof stacking	Added structure over the rooftop of an existing building to create one or more stories of living spaces (Amer & Attia, 2017; Floerke et al., 2014; Nilsson, Blomsterberg, & Landin, 2016; Peronato, 2014)	• Does not occupy additional urban spaces and does not increase soil waterproofing • Keep the actual potential for green spaces, recreational function or urban services • Easily applicable in already urbanized districts • Usage of existing infrastructure • Opportunity to reduce cost-efficiently energy consumption of existing buildings (Attia, 2017; Attia, 2016) • increases the value of the existing property and creates a financial revenue (Amer & Attia 2017)	• Increases services loads on existing buildings and requires verification with actual strength of the building and foundation • Transformation of the city skyline and urban morphology, with potential negative impact on the urban microclimate (e.g. wind tunnels & overshadowing) • Risk of daylighting and solar access reductions for the neighbours • Limitation for heritage buildings • Needs to adapt mobility strategies • Needs to increase urban services • Potential of creating noise and dust during the construction process

Figure 5.1: Densification methods: characterization, advantages, and disadvantages (Amer et al., 2017).

Filling backyards method

The first method is densification by filling the backyards of existing buildings, thus creating a horizontal extension (see Figure 5.3). This method increases additional living space for the same property while preserving the urban landscape and retaining the existing integrity of the dwellings. However, this method seals more surfaces which leads to loss of existing backyard space, more carbon footprint, and reduction of vegetation surfaces.

Infill method

The second method, referred to as infill development, is the process of closing the gaps and vacant lots between buildings in the neighborhood (see Figure 5.4). This method exploits unused space and could be an opportunity to revitalize these spaces. The existing infrastructure can be maintained by improving the density, preserving the urban morphology, and retaining the existing integrity of the dwellings. The disadvantage of this method is that the infill of gaps and vacant lots could result in the loss of vegetation, recreational space, and parking space. If the gap between the dwellings is part of the infrastructure new mobility strategies should be adapted. During the infill, nearby dwellings could potentially be damaged by the construction.

Demolish method

The third method of densification is demolishing existing low-density buildings and replacing them with higher-density structures, for example, high-rise buildings or compact frame structures (see Figure 5.5). By demolishing existing dwellings, there is more flexibility in increasing density. This flexibility also provides more opportunities for higher efficient designs. The disadvantage of demolishing existing dwellings is that this increases the use of materials, construction waste, and loss of resources. The demolition comes also with high costs and is accompanied by new construction. The most important disadvantage of this study is that demolition comes with the loss of urban heritage and could alter the urban morphology.

Roof transformation method

A fourth method of densification is to transform and renovate saddle roofs on top of buildings into wider and livable spaces (see Figure 5.6). This method has the double advantage of taking advantage of the neglected area of the attic and helping to reduce the overall energy consumption of the building by improving the quality of the roof and insulation of the building. This method requires minimal cost, is a quick and easy solution, and does not take up additional urban space. However, the disadvantage of this method is the limited ability to increase density and that it will change the neighborhood skyline. This can be a problem for heritage buildings.

Roof stacking method

A fifth method is densification through roof stacking, which is the method of adding additional stories to existing buildings to accommodate more inhabitants (see Figure 5.7). Roof stacking as a densification method does not occupy additional urban space and allows urban green and recreation spaces to be preserved. It is easily applicable in urbanized neighborhoods, uses existing infrastructure, and could reduce the costs of energy consumption of existing buildings. The disadvantage of stacking roofs is that the load on existing buildings will increase, so the existing structure and foundation must be able to support this load. As existing buildings become higher, there is also a risk of limiting daylight and sunlight access. Adding additional floors will also change the neighborhood skyline, urban morphology and may result in the loss of heritage features. Amer et al. (2017) state that the capacity for any number of added stories depends on the densification needs of local authorities. It is also important to be aware if the neighborhood has a certain maximum building height, this will ultimately determine the allowable number of stories that can be added.

The described methods for densification are all different from each other and all have their advantages and disadvantages. However, with all methods, urban services must be increased because more residents will populate the neighborhood. Infrastructure, such as parking, must also be taken into account.

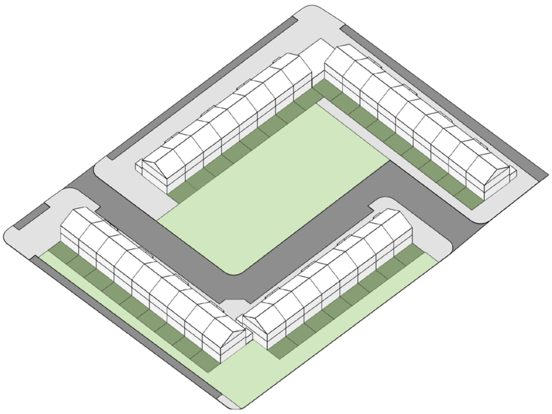


Figure 5.2: Diagram of the open courtyard parcellation in the Couperus neighborhood (by author).

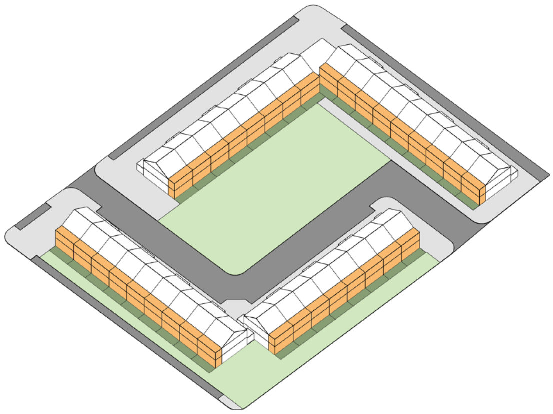


Figure 5.3: Diagram of the filling backyards method for densification (by author).

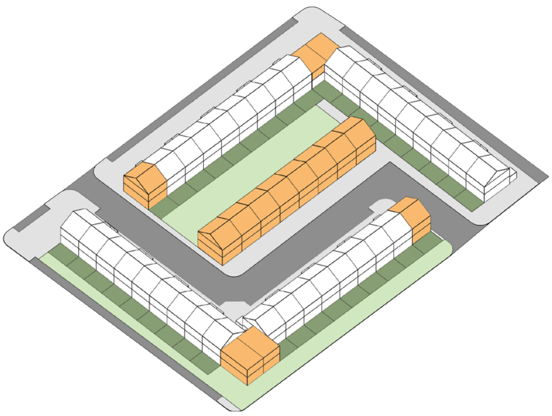


Figure 5.4: Diagram of the innfill method for densification (by author).

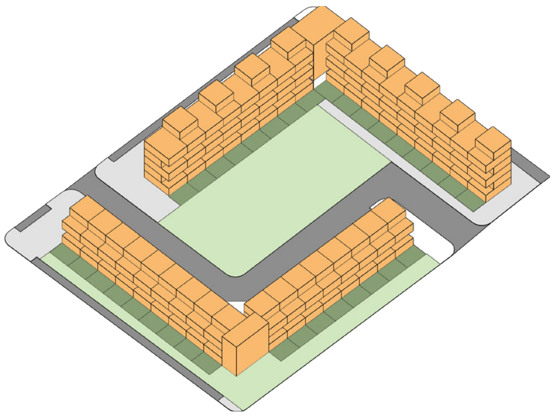


Figure 5.5: Diagram of the demolish and rebuild method for densification (by author).

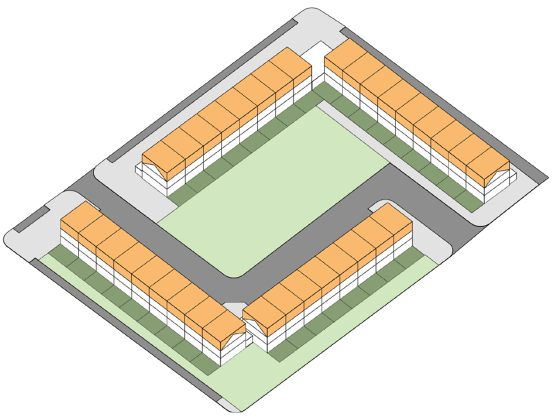


Figure 5.6: Diagram of the roof transformation method for densification (by author).

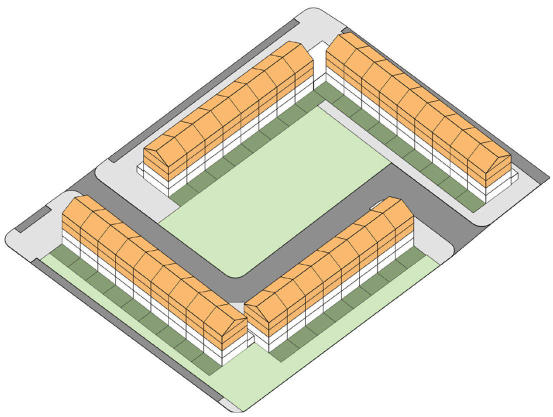


Figure 5.7: Diagram of the roof stacking method for densification (by author).

As stated by Amer et al. (2017), there are currently insufficient tools available to help local governments plan for an acceptable level of urban densification that respects both sustainable development and the standard of living in urban areas. For this reason, a workflow chart outlining the complete decision-making process for the roof stacking approach is created based on a review of the literature (see Figure 5.8).

The workflow chart for roof stacking is divided into three vertical phases consisting of urban and policy configurations, structural configurations of buildings, and architectural configurations. The first phase of urban and policy configurations starts by determining a particular area or neighborhood in a city that could potentially be densified. This requires examining the population based on growth, housing shortage, and maximum allowable density. If there is a demand to densify the chosen area or neighborhood, urban policies and regulations should be researched. For this, it should be investigated whether heritage is present in the chosen place that needs to be taken into account. The infrastructure and accessibility should be examined along with the facilities present in the chosen place. Lastly, the regulations of maximum building height and daylight access must be examined.

After defining the chosen site and obtaining the maximum building height, phase two can be initiated which deals with the structural configurations of buildings. This phase deals with the urban scale where the type of structure and foundation along with the type of soil should be examined. Further, the existing building heights, floor areas, and the weight that will be placed on the existing structure should be calculated based on the maximum building height. This information can be used to determine how many additional floors the existing structure can support and how many potential floors can be added.

Now that the floors have been determined that can be added to the existing buildings, phase three can begin which addresses architectural configurations. In the workflow chart, this phase begins with obtaining approval from the owners of the buildings. If the owners do not give permission, phase two must be revised or the roof stacking method is not feasible. If the owners agree to the densification method, the study can be zoomed in on the building scale. This involves architectural and structural analyses such as looking at heritage restrictions, vertical circulation, total load calculations, safety restrictions, and installation technology. If the above is seen as feasible by all parties, the implementation can begin.

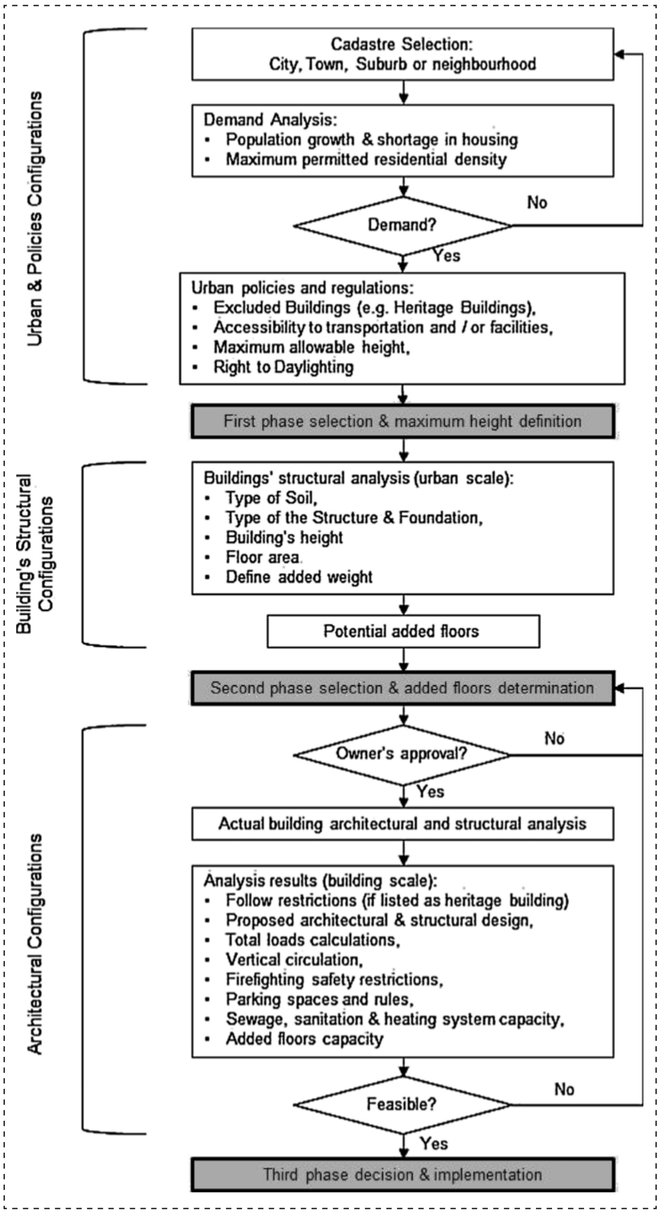


Figure 5.8: Workflow chart for the roof stacking densification method (Amer et al., 2017).

A comprehensive workflow chart, as suggested by Abdrabo et al. (2021), can be used to map and quantify possible densification sites and prioritise which ones should be included in the densification plan. The data processing, inputs and outputs, and current flows sections of the chart are separated horizontally (see to Figure 5.9).

The first part of the workflow chart is mapping potential sites for densification. For this aim, several geospatial analyses are represented as input data that are then linked to five possible densification methods. These five densification methods are similar to those of Amer et al.

(2017) and are: infill, roof stacking, roof transformation, filling backyards, and demolish and rebuild. The potential site map from the infill method is set by determining the vacant lands and building regulations, which include the use of the vacant land, the minimum allowable area for buildings, and the maximum allowable height. The potential sites for the roof stacking strategy are mapped by determining the building condition, excluded heritage buildings, and the current and maximum allowable height. The potential sites for the roof transformation strategy are mapped by determining the building condition, the current roof's area, and the maximum allowable height. The potential sites for the filling backyard strategy are mapped by determining the buildings with suitable backyards, the current area of the backyards, and the maximum allowable extension. The potential sites for the demolition and rebuilding strategy are mapped by determining the building conditions, slum areas, and maximum allowable height. Along with using the same densification methods as Amer et al. (2017), the data that should be examined for arriving at a densification method are also the same.

The second part of the workflow chart is prioritizing potential sites for residential densification. These three different prioritizations are stated: environmental, economic, and social. These are accompanied by the corresponding input data associated with them. For environmental prioritization, this is slope, natural and man-made risk areas, and accessibility to daylight. For economic prioritization, this is land value, industry, and commercial centers. Lastly, for social prioritization, this is accessibility to transportation, elementary schools, public green space, and population density.

According to Eggimann et al. (2021), there are no comprehensive frameworks for evaluating densification potentials on a wide scale or evaluating them. For this reason, a geospatial framework for evaluating densification potentials at the neighborhood level of established residential areas is offered. Post-war neighborhoods are highlighted because they hold great potential for long-term, sustainable densification. Eggimann et al. (2021) present a methodological overview with five main steps for densifying post-war neighborhoods accompanied by the modeling inputs with the data that needs to be collected (see Figure 5.10).

The first step is determining the scope of the analysis and the area to be investigated, this step is not included in Figure 5.10. The next step is data collection,

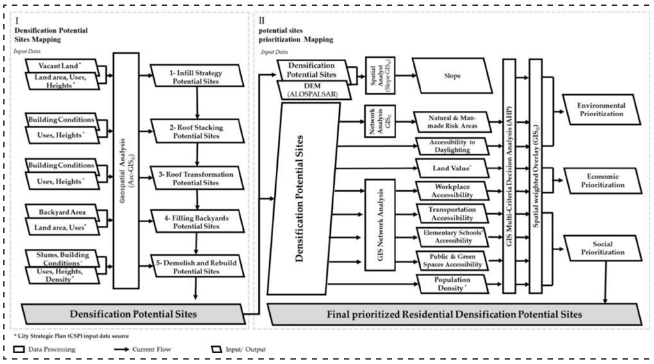


Figure 5.9: Workflow chart for potential densification site mapping and potential site prioritizing mapping (Abdrabo et al. (2021).

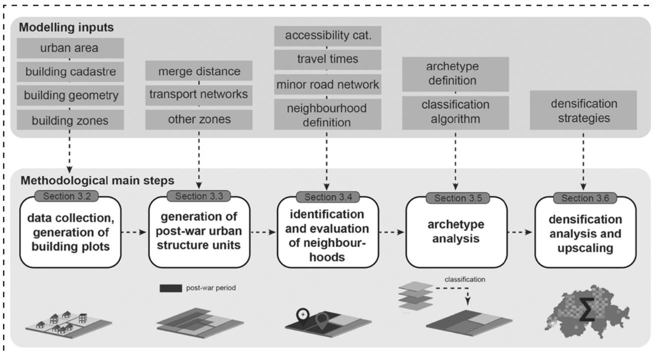


Figure 5.10: Methodological overview of inputs and main steps for densifying post-war neighborhoods (Eggimann et al., 2021).

preparation, and the generation of building plots. For this purpose, the urban area, the building cadaster, the geometry of the buildings, and the building zones are to be investigated. This information serves as input for the identification of postwar urban structural units. The merged distance, transportation networks, and other zones in the framework should be analyzed for this step. Once this information is obtained, which post-war neighborhoods are suitable for densification can be identified. To do this, the neighborhoods must be characterized by their structure. The inputs needed are accessibility, travel times, minor road networks, and neighborhood definition. The next step is classifying the neighborhoods into archetypes. Eggimann et al. (2021) use the definition of archetypes for this purpose but this can be seen as the typology of the buildings. In this step, the different archetypes are identified along with the rhythms present in them. Once the steps just described have been completed, the final step is to arrive at a strategy for the densification of the chosen neighborhood that is suitable. This requires analyzing how they can be densified. No methods for this are mentioned in the framework.

5.2 MEASURING DENSITY

In the previous chapter, various methods of densification were discussed, however, this did not reveal how density can be measured. Density in Dutch spatial planning practice is usually measured in dwellings per hectare, according to Planbureau voor de Leefomgeving (2022). This is interesting for the housing market since it measures the number of dwellings on a specific surface area, but it just indicates the number of dwellings. However, this measurement gives no insight into the size of the dwellings. A dwelling can be very small or, on the other hand, very large, and other functions besides housing are not included. Another commonly used density indicator is the number of inhabitants per square kilometer, possibly combined with the number of employees or visitors. This gives a sense of the intensity of use of an area but is not a physical indicator of building density.

By using the Floor Space Index (FSI) to measure density, the above limitations are overcome and the physical spatial appearance of an area can be measured. The FSI shows how the floor area (the area of all floors combined) compares to the site area, regardless of function and regardless of intensity of use. The same measurement is used in the United States only it is referred to as FAR instead of FSI, which stands for Floor Area Ratio. In addition to the FSI, the GSI (Ground Space Index) is also used in practice (Planbureau voor de Leefomgeving, 2022). This represents the amount of a site that is built on and is calculated by dividing the footprint of the buildings by the area of the site. Compared to the FSI, the GSI gives a more two-dimensional representation of the density of an urban environment because it considers only the footprint of the built-up area and not the potential area of the upper floors.

These indexes can be used to get an indication of the spatial density of an urban area. From the FSI and GSI, the L (Layers) and OSR (Open Space Ratio) can also be derived. These two indicators address the physical morphological characteristics of the living environment. Based on these indicators, the type of buildings, for example, tower blocks, gallery blocks, medium-height buildings, or row houses can be approximated based on numerical characteristics. In morphological urban planning research, the term L (Layers) is often used, which stands for the average number of building layers, including the underground layers. It is calculated by dividing the floor area by the building footprint or FSI by the GSI. The Open Space Ratio (OSR) is calculated by dividing the unbuilt site area by the gross floor area,

$$\textit{Floor Space Index (FSI)} = \frac{\textit{Gross Floor Area}}{\textit{Site Area}}$$

$$\textit{Gross Floor Index (GSI)} = \frac{\textit{Footprint of building(s)}}{\textit{Site Area}}$$

$$\textit{Layers (L)} = \frac{\textit{Gross Floor Area}}{\textit{Footprint of building(s)}} = \frac{\textit{FSI}}{\textit{GSI}}$$

$$\textit{Open Space Ratio (OSR)} = \frac{\textit{Unbuilt area}}{\textit{Gross Floor Area}} = \frac{\textit{1-GSI}}{\textit{FSI}}$$

Figure 5.11: Formulas for calculating the FSI, GSI, L, and OSR (by author, based on Planbureau voor de Leefomgeving (2022).

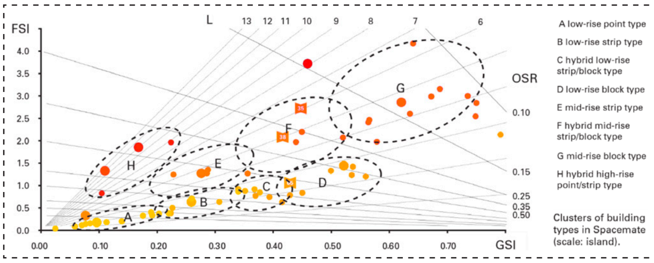


Figure 5.12: Spacematrix methodology showing the relation between the FSI, GSI, L, and OSR (Berghauser Pont, 2020).

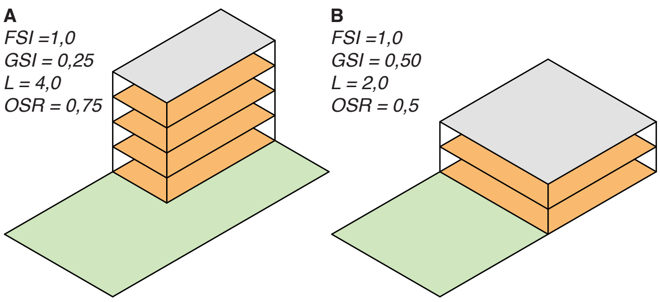


Figure 5.13: Diagram of two different buildings with the same FSI on the same area, but different GSI, L, and OSR (by author).

which is equal to the proportion of unbuilt site area divided by the FSI. The OSR is an internationally used indicator to measure the building pressure on unbuilt space. At an OSR of 1.0, there is as much gross floor area as unbuilt space. At a higher OSR, there is more open space than floor area. Figure 5.11 illustrates the above formulas for calculating the FSI, GSI, L, and OSR.

The FSI measures building density and also, in combination with the GSI, L, and OSR, provides insight into the morphology and typology of a site. Berghauser Pont (2020) shows in the Spacematrix methodology (Figure 5.12) how these four indicators are mathematically related and how the combined use of the indicators contributes to describing the urban living environment. Furthermore, using different combinations of FSI, GSI, L, and OSR, the Spacematrix methodology shows that they can be traced to clusters with similar building types. Although the FSI of two different sites can be the same, the GSI, OSR, and L can differ from each other. This depends on the type of buildings and the relationship of the buildings to the site. Figure 5.13 shows through two diagrams how two sites with the same amount of area, can have two buildings with the same FSI, which are morphologically different. Building A is a block consisting of four layers and B of two larger layers. Because of their different forms, the footprint (GSI), the pressure on unbuilt area (OSR), and the number of layers (L) differ.

Using the FSI, in combination with the GSI, L, and OSR, the density of an open courtyard parcellation with the duplex typology in the Louis Couperus neighborhood was determined (see Figures 5.14 and 5.15). This type of parcellation was chosen because it is the most dominant parcellation in the neighborhood and will be further elaborated in the design phase. The duplex typology has two living floors with an attic that functions as a third floor. The attic is not used as living space in practice, but it is included in the FSI calculation because it is calculated regardless of the intensity of use. The area of the entrance portals with storage units at the front of the dwellings is also included in the calculation. The gross floor area of the duplex houses is approximately 4290 m2. This together with the area of the site which is about 7725 m2 comes out to be a Floor Space Index (FSI) of 0.55. The footprint of the buildings is 1650 m2, this along with the area of the site comes out to a Gross Floor Index (GSI) of 0.21. The number of Layers (L) is determined by dividing the gross floor area by the footprint of the buildings. In this situation, this is 4290 m2 divided by 1650 m2 resulting in 2.6. By subtracting the 1650 m2 footprint of the buildings from the site area of 7725 m2, the unbuilt area can be determined which comes out to 6075 m2. To calculate the Open Space Ratio (OSR), the unbuilt area is divided by the gross floor area. This results in an OSR of 1.41.

According to Rommelse (2021), the average Floor Space Index (FSI) in Amsterdam's urban neighborhoods is between 1.5 and 2.0. The FSI of the open courtyard parcellation with the duplex typology in the Louis Couperus neighborhood results in 0.55, scoring considerably lower. This result comes as no surprise with the previous knowledge acquired that this urban parcellation of the AUP was designed to have an open character with lots of public space and greenery.

The results of the FSI, GSI, L, and OSR of the open courtyard parcellation with the duplex typology in the Louis Couperus neighborhood were then used as input into the spacematrix methodology of Berghauser Pont (2020). The spacematrix indicates that the morphology and typology of the results result in type B: low-rise strip clusters of buildings (see Figure 5.16). This corresponds to the reality where the parcellation is executed in two mirrored low-rise hook shapes which again consist of two strip clusters.

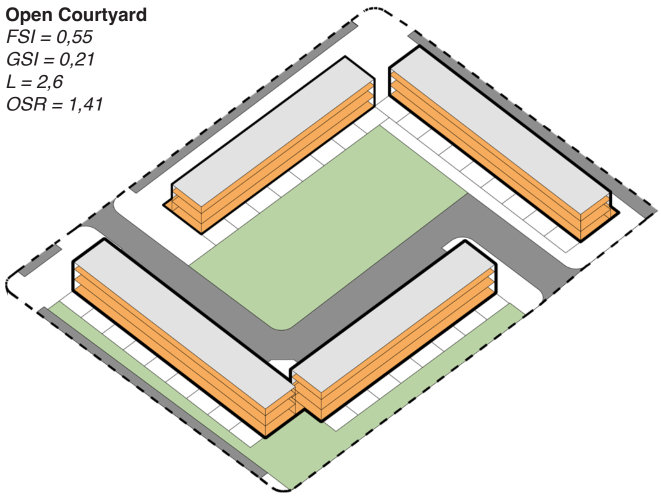


Figure 5.14: Diagram of the open courtyard parcellation (by author, based on Planbureau voor de Leefomgeving (2022).

$$\textit{Floor Space Index (FSI)} = \frac{4290\ m2}{7725\ m2} = 0.55$$

$$\textit{Gross Floor Index (GSI)} = \frac{1650\ m2}{7725\ m2} = 0.21$$

$$\textit{Layers (L)} = \frac{4290\ m2}{1650\ m2} = \frac{FSI}{GSI} = 2.60$$

$$\textit{Open Space Ratio (OSR)} = \frac{6075\ m2}{4290\ m2} = \frac{1\text{-}GSI}{FSI} = 1.41$$

Figure 5.15: FSI, GSI, L, and OSR of the open courtyard parcellation (by author, based on Planbureau voor de Leefomgeving (2022).

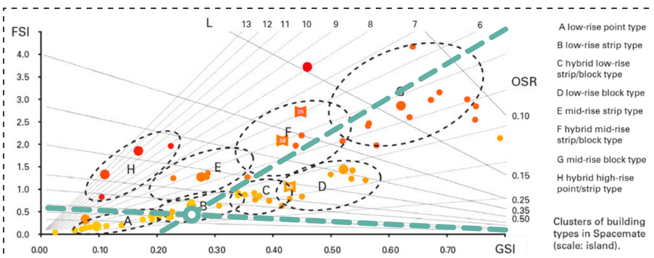


Figure 5.16: Result of the open courtyard in the Louis Couperus neigborhood - spacematrix methodology (Berghauser Pont, 2020).

5.3 LIVABLE DENSITY

Having identified the method on how to measure the density of an area, research will be conducted on what density makes for a livable environment. Although the FSI can be used to indicate the density of an area and the spacematrix methodology of Berghauser Pont (2020) shows that these values can be traced to clusters with the same building typologies, this data does not indicate the livability of the density.

Uytenhaak (2008), through his book “Cities Full of Space: Qualities of Density,” investigated the densities of the built environment and ways to provide sufficient spatial compensation for the density gained. In his book, he suggests that cities should be built into higher densities to avoid swallowing up the landscape. This means that it is needed to attract people to move to these compact cities, which only works if they offer a combination of cultural and spatial qualities. By building deeper or stacking higher, it is possible to achieve a suitable balance between built and unbuilt space while developing a densely livable environment. Some attributes are lost in both methods. Nonetheless, there is an increase in the proximity of urban activities, which leads to increased urban dynamism and effective land use. Uytenhaak (2008) states that the quality of density is what matters to the city. This means that if an area is densified, the physical possibilities must be increased for more diverse and more intensive use. When densifying an area, Uytenhaak (2008) states that four aspects must be ensured to create a livable environment. These aspects are daylight, view, privacy, and human scale.

Daylight

To ensure sufficient daylight enters the volume of the dwellings, Uytenhaak (2008) recommends maintaining a daylight angle of 45 degrees while designing the volumes. To achieve this angle, there must be sufficient space between the volumes, which ultimately provides the street width. The number of 45 degrees is recommended because this is approximately the average angle during the year at which the sun projects its light onto the earth’s surface. Earth’s axis is tilted 23.5 degrees in relation to the sun. On December 21, the sun is at its lowest point each year with an angle of 23.5 degrees, this is called the winter solstice. On June 21, the sun is at its highest point with an angle of 70.5 degrees, this is called the summer solstice. On March 21 and September 21, daylight reaches Earth at an angle of 47 degrees. This is the average of the winter and summer solstice and is called the equinox (Bonan, 2015). In addition to considering the angle of the sun, it must be ensured that there are sufficient openings in the façade to allow daylight to enter the volume. Bouwbesluit (2024), the Dutch document containing all building regulations for all structures, suggests that at least 10% of the living area of a dwelling should receive daylight. This means that if the total living area of a dwelling is for example 50 m2, there must be at least 5 m2 of openings in the facade. Furthermore, the depth of a dwelling also affects how much daylight can enter. The deeper a dwelling is the less daylight will be able to reach the center of the area.

View

In a high-density living setting, having a view of the surrounding neighbourhood is crucial, especially for smaller dwellings. No matter how many square metres they occupy, people are more likely to feel that they have enough space if they view into an open environment (Montgomery, 2015). According to Uytenhaak (2008), it is more beneficial to have a varied perspective from at least two different sides of the dwelling. Every building should have extra space on one side that allows for direct sunlight, a view of the sky, and sufficient open space. Additionally, it offers sufficient privacy from neighbours on the opposite side to allow residents to sit outside the dwelling (Gehl, 2010).

Privacy

As the living environment becomes denser, the privacy of residents may be diminished as a result. Privacy offers a sense of security and personal space. People need a place where they can feel safe and relaxed. Leaving some more space around one side of every building provides direct sunlight, a sight on the sky and it ensures enough open space. It also provides the opportunity to sit outside the house and have enough privacy from neighbors on the other side (Gehl, 2010).

Human scale

In the book “Cities For People,” Jan Gehl (2010) highlights the importance of human scale. Stacking dwellings as high as possible is a beneficial way to create a living environment with a high density. An environment with enormous skyscrapers situated in vast open areas will emerge when the 45-degree daylight angle is considered. However, those measurements will not create environments where people feel at ease. The connection between the dwellings and the public space will disappear above about six stories. High-rise buildings that still feel connected to the public space can only be achieved with buildings with a maximum of six floors, to maintain a human scale on street level (Gehl, 2010). Alexander et al. (1977) stated in “A Pattern

Language" that living in high-rise buildings takes people away from the ground and from the casual, everyday society that takes place on the sidewalks and streets. It also argues that high-rise buildings promote crime, is difficult for children, are expensive to maintain, and degrade the light, air, and view of the surrounding area. Alexander et al. (1977) suggest that four-story buildings should be the aim of livable environments, but that occasional deviations could be possible.

The orientation of the sun upon the open courtyard parcellation in the Louis Couperus neighborhood is illustrated in Figure 5.17. The corners where the two mirrored strip allotments meet are situated facing south. The entrances of the duplex dwellings are situated on the north side and the backyard gardens face south. However, the backyard gardens and the entrances both receive sufficient daylight during the day. In the solar study seen in Figure 5.18, the 45-degree angle for daylight penetration described by Uytenhaak (2008) is illustrated. Included in this are the angles during the winter and summer solstice. The distance between the dwellings inside the open courtyard is 37.5 meters and the distance between different open courtyard parcellations is 21.5 meters. In the current situation with the three-story duplex dwellings, it can be seen that the shadows from all the different angles of the sun are not projected onto the other buildings. Based on Gehl's (2010) statement that buildings should not be higher than six stories because otherwise the human scale is lost, six-stories buildings were tested in Figure 5.18. This shows that with a 45-degree angle, no shadows are projected onto the other buildings. However, during the winter solstice, with an angle of 23.5 degrees, shadows will be projected on the surrounding buildings. This means that during the winter there are times when certain dwellings receive no to less daylight. To avoid this and ensure that the dwellings receive optimal daylight throughout the year, a combination of 5 and 3 stories is most efficient.

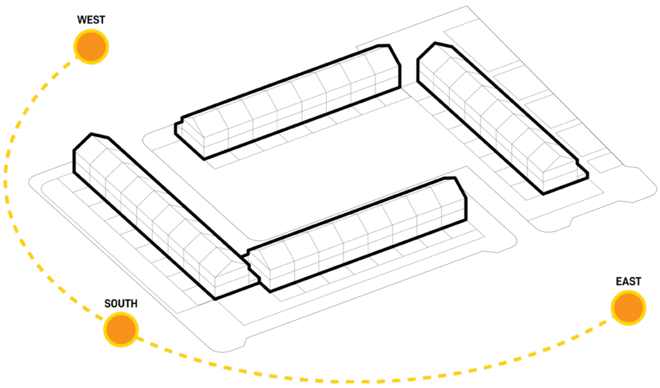


Figure 5.17: Diagram of the sun orientation upon the open courtyard parcellations in the Louis Couperus neigborhood (by author).

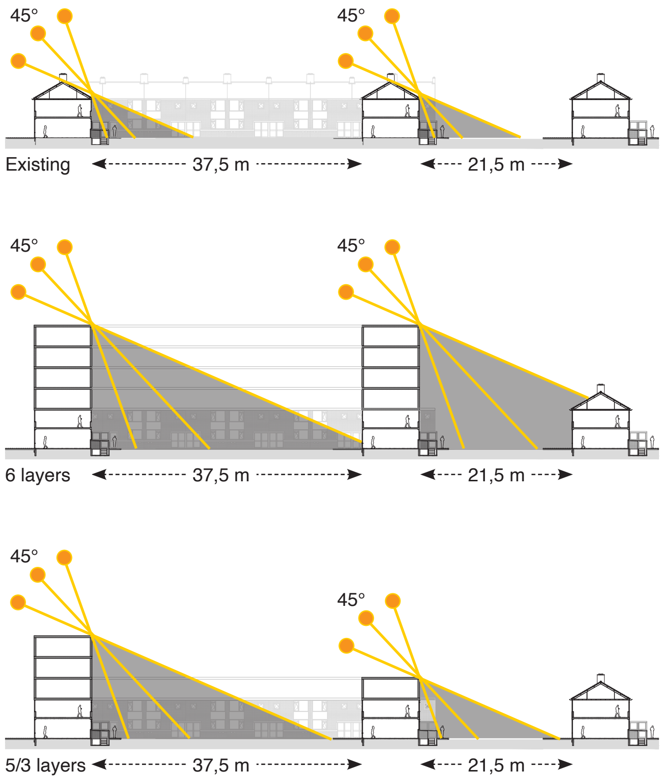


Figure 5.18: Solar study sections of the existing open courtyard parcellation and variants with 6 layers and 5/3 layers (by author).

5.4 DENSIFICATION CONCLUSION

The research on densification was conducted to answer sub-question 4 of this thesis. Sub-question 4 is as follows:

What are the challenges and methods for densifying a post-war neighborhood?

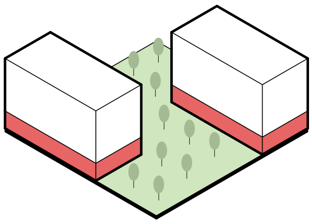
In conclusion, the process of densifying a neighborhood involves implementing one of several methods to increase population or structural density within an existing urban area. Amer et al. (2017) present five primary densification strategies: filling backyards, infill development, demolishing and rebuilding, roof transformation, and roof stacking. Each method offers unique advantages and challenges, from preserving urban landscape integrity to potential losses in vegetation and urban heritage. A critical aspect of these methods is the need for enhanced urban services and infrastructure to accommodate increased density.

For choosing the appropriate densification method, knowledge about the environmental, economic, and social status of the potential site must be accumulated. In the case of post-war neighborhoods, its heritage valuation is important. Furthermore, data must be collected on the existing built environment, infrastructure, urban policies, and regulations. Furthermore, it is important to measure the existing density when planning, with the Floor Space Index (FSI) being an important indicator. The FSI, along with the Ground Space Index (GSI), Layers (L), and Open Space Ratio (OSR), provides a comprehensive understanding of spatial density and urban morphology (Planbureau voor de Leefomgeving, 2022).

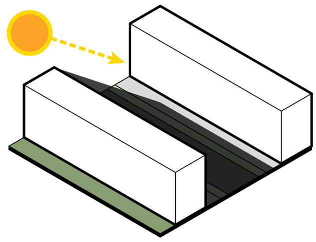
Finally, creating livable density requires a balance between built and open spaces where daylight, view, privacy, and human scale must be ensured. Here it is essential that buildings have sufficient openings in the façade and that other buildings do not block daylight. Furthermore, the buildings must offer sufficient views and privacy so that the residents feel safe. To ensure a human scale, buildings can be up to a maximum of six stories so that they do not lose their connection to the street.

Although densification offers significant benefits for urban growth and sustainability, it requires careful planning and consideration of several factors to maintain and improve the overall livability.

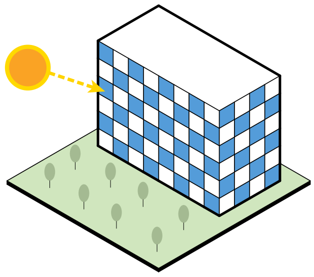
Guidelines for achieving livable density



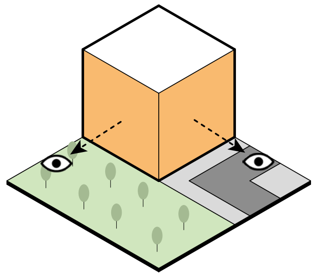
Facilities: Livable density is accompanied by the increase of facilities and a balance between built and unbuilt space (Uytenhaak, 2008)



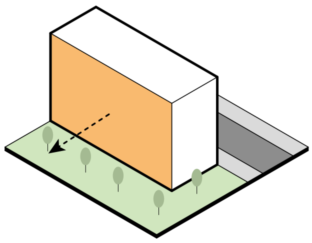
Daylight: Maintaining a daylight angle of 45 degrees while designing volumes (Uytenhaak, 2008)



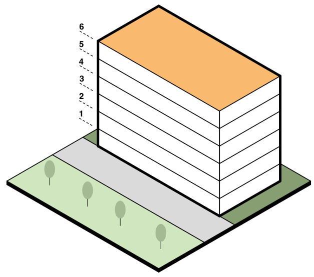
Daylight: Sufficient openings in the facade to allow daylight to enter the volume (Alexander et al., 1977) (Uytenhaak, 2008) (Bouwbesluit, 2024)



View: View from at least two different sides of the dwelling on the neighborhood surroundings (Uytenhaak, 2008) (Montgomery, 2015)



Privacy: Leaving space on one side of the building creates a sense of safety and enough open space (Gehl, 2010)



Human Scale: Maximum of six stories to maintain a connection on street level (Gehl, 2010) (Alexander et al., 1977)

Figure 5.19: Diagrams illustrating the guidelines for achieving livable density (by author).

06 CONCLUSION

The conclusion chapter summarizes the main findings of the research and highlights the recommendations for the Louis Couperus neighborhood densification strategy.

6.1 RESEARCH CONCLUSION

This thesis examined methods of densification to contribute to the current housing crisis and reduce potential heritage demolitions. For this purpose, the post-war neighborhood the Louis Couperus neighborhood in Amsterdam New West was used as a case study because of its spatial layout and low density. In addition, this neighborhood was chosen because of its low livability and plans to largely demolish its current dwellings. In turn, not demolishing contributes to a circular economy and deals with existing buildings in a sustainable and resourceful way. Because densification threatens to reduce the livability of a neighborhood, this thesis investigated what determines livability and how it can be improved. Therefore, the purpose of this research is to answer the following question:

How can a post-war neighborhood be densified while improving its livability and preserving its heritage values?

The thesis presents five primary densification strategies: filling backyards, infill development, demolishing and rebuilding, roof transformation, and roof stacking. Each method offers unique advantages and challenges, from preserving urban landscape integrity to potential losses in vegetation and urban heritage. A critical aspect of these methods is the need for enhanced urban services and infrastructure to accommodate increased density. Of the five strategies, the infill development and roof stacking method are the most appropriate for the Louis Couperus neighborhood. This is because with the demolishing and rebuilding method all heritage values are lost and constitute a waste of existing materials. The fillings backyards and roof transformation methods in this case provide larger dwellings but not a greater housing stock which is the purpose of the densification.

For the implementation of the densification methods, livability must be considered. Creating livable density requires a balance between built and open spaces where daylight, view, privacy, and human scale must be ensured. Here it is essential that buildings have sufficient openings in the façade and that other buildings do not block daylight. Furthermore, the buildings must offer sufficient views and privacy so that the residents feel safe. To ensure a human scale, buildings can be up to a maximum of six stories so that they do not lose their connection to the street.

Based on the research, five overarching factors of livability that can be used to measure livability have been determined. The determined factors are social, physical, functional, safety, and dwelling. These different factors each have their own set of indicators and assessment criteria by which they can be measured. Through the use of the five factors, it was revealed that the Louis Couperus neighborhood has a mixed target group of residents, with a significant proportion of young adults and single-person households. The neighborhood has a good diversity of different housing typologies in which the duplex typology is the most dominant. Despite the typology diversity, little variation was found in the ownership and construction period of the dwellings. Furthermore, the large amount of social rental housing with the same floor area creates social segregation. In order to improve this, different types of dwelling sizes should be added during densification to appeal to different target groups. The multicultural nature of the neighborhood adds to its vibrancy but also underscores the need for inclusive community initiatives. The social livability of the neighborhood scores low with a high rate of people feeling lonely and experiencing nuisance from their neighbors. For this reason, the neighborhood requires more facilities that encourage social connections. Suggestions include the addition of more playgrounds, benches, and community spaces, as well as the availability of rooftop gardens and active plinths to strengthen social ties and address inhabitants' diverse needs. In the Louis Couperus neighborhood, many residents park their vehicles and bicycles on the sidewalk which leads to nuisances among the residents, and creates a less safe living environment. To solve this problem, clear parking areas should be designated and created, such as bike sheds. In addition, many residents are frustrated by street pollution and the neighborhood requires better maintenance. Furthermore, residents should be encouraged to be more responsible with their living environment. This can be done by creating more social control with more eyes on the street. The neighborhood has high functional livability with a wide range of facilities located within walking proximity. The neighborhood is easily accessible using public transportation with multiple bus, tram, and metro stops. The only lack of facilities in the neighborhood are stores and hospitality functions such as restaurants and cafés where residents but also people outside the neighborhood can gather. These facilities can be located on the main streets in the neighborhood and the vacant stores, located at the beginning of the allotments, can be used for this purpose. As for the state of the dwellings, observations indicate several problems. Many residents express dissatisfaction with the outdated features of their homes. The duplex homes have small and poorly configured bathrooms and kitchens and lack facade and roof insulation resulting in inefficient energy use, and decaying facade materials. In addition, the low height and poor usability of basements contribute to residents' overall livability problems. Also, only the downstairs dwellings have outdoor space. In addition to densifying the neighborhood, these existing homes should be renovated according to the problems raised.

Finally, while improving livability and densifying the neighborhood the existing heritage values have to be preserved. According to the Bureau of Monuments and Archaeology's (2010) valuation maps, the neighborhood's urban design has a higher overall heritage value than its architecture, emphasizing the need to maintain the spatial quality and coherence of the garden-city ensemble. The relationship between the buildings and the layout of the public space in terms of the composition of elements such as sight lines and the relationship between public and private should be preserved. When altering the architecture of the duplex typologies the original elements in form, size, material, detailing, proportion, and color or design of comparable quality must be preserved or restored. Hereby the use of non-original materials is possible as long as it is done with respect to the authenticity of the facade.
In the design phase, is it essential to balance modern needs with the preservation of its post-war heritage values. This approach will ensure that the neighborhood's unique historical and cultural significance is maintained while accommodating the current living standards and contributing to the Dutch housing crisis.

Discussion

The results of the research indicate several methods for densifying post-war neighborhoods along with a framework for measuring livability. Furthermore, accommodations are made for how to improve the livability of a neighborhood. The heritage valuation provides the framework in which densification and livability should be conducted. However, this study was limited by the availability of detailed historical valuations for the buildings, which may affect the comprehensiveness of the heritage values assessment. The heritage values found indicate on an overarching scale which values should be preserved at the architectural and urban design level. However, the specific values of different elements that make up architecture and urban design are not addressed. Neither does it describe what the architecture of potential new construction in the area should comply with. For reaching a more precise conclusion on what the heritage values are, more in-depth research may be carried out that elaborates on the Bureau of Monuments and Archaeology's (2010) described heritage values.

In the outlined design strategy, of the five densification methods found, the infill development and roof stacking method were selected. This conclusion is made on the basis that the aim of the strategy is to create more housing to contribute to the Dutch housing crisis. The research revealed that the current structure of the existing buildings and urban policies such as, for example, the allowable building height need to be examined before arriving at a densification strategy. In arriving at the design strategy, this was not utilized due to the lack of available information on this matter. To make the design strategy more robust, more research should be carried out on the structure of the existing buildings and which urban policies apply to them.

07 DESIGN REPORT

The design report chapter shows the elaboration of the developed design strategy from the research on an open courtyard parcellation in the Louis Couperus neighbourhood.

7.1 CURRENT SITUATION PLANS

To elaborate the design strategy, the current situation of the duplex typology dwellings in the Louis Couperus neighborhood were first mapped (see Figure 7.1). For this purpose, drawings from 1952 from the archives of the Municipality of Amsterdam were used (Gemeente Amsterdam Stadsarchief, 2023). On the basis of the retrieved archive drawings (see Figure 7.2), the current situation, floor plans, sections with architectural and structural details were identified. These drawings serve as the underlying basis for applying the design strategy.

Figure 7.1: Duplex typology dwellings in the Louis Couperus neighborhood (by Stadgenoot, 2023b).

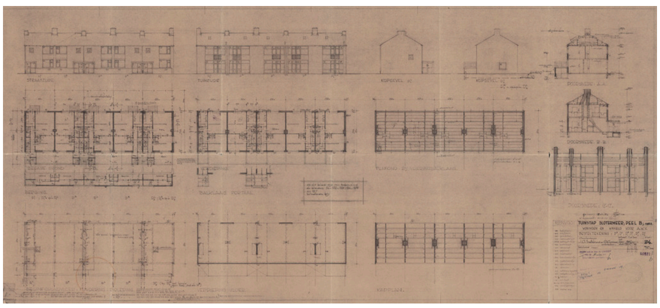
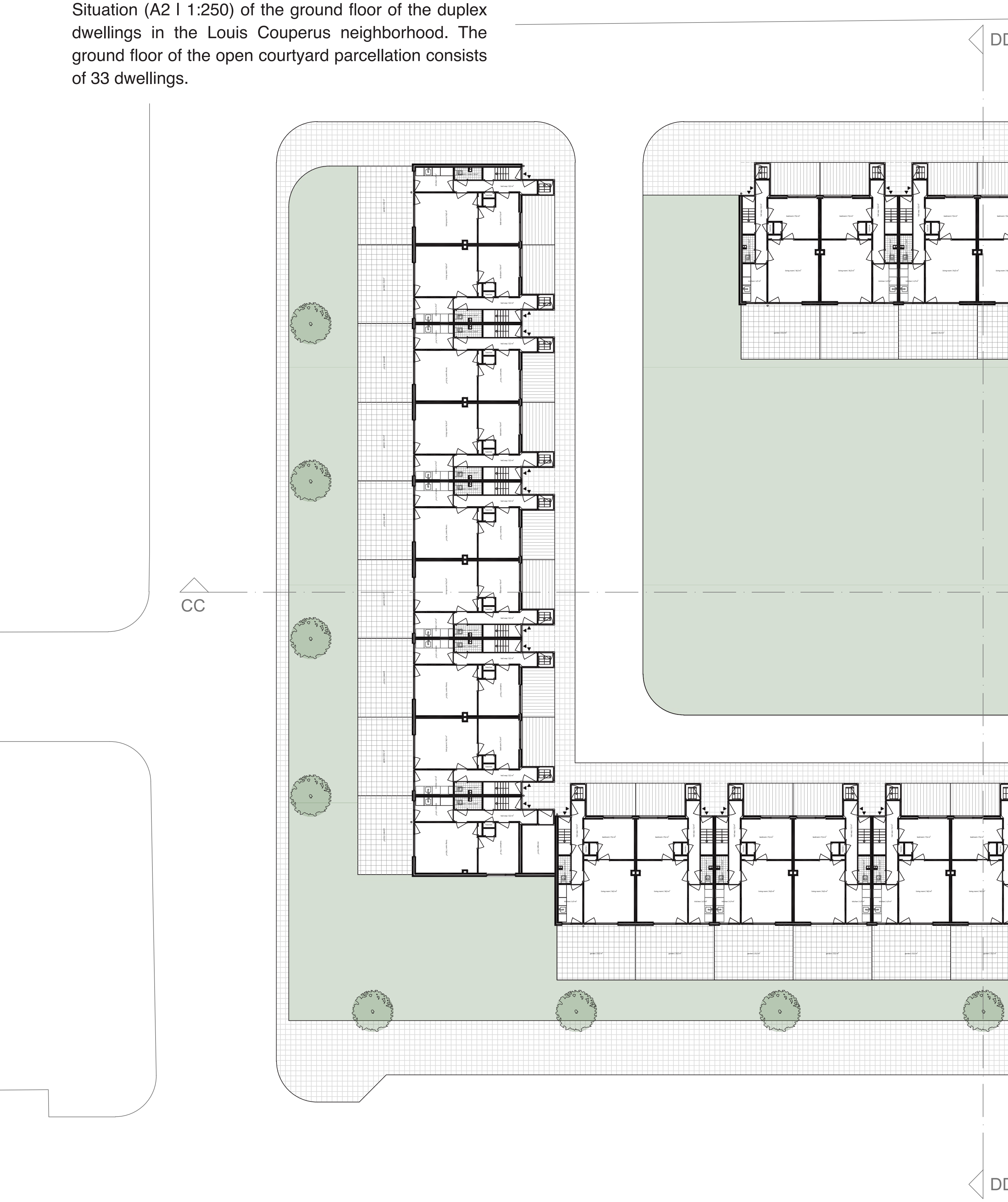
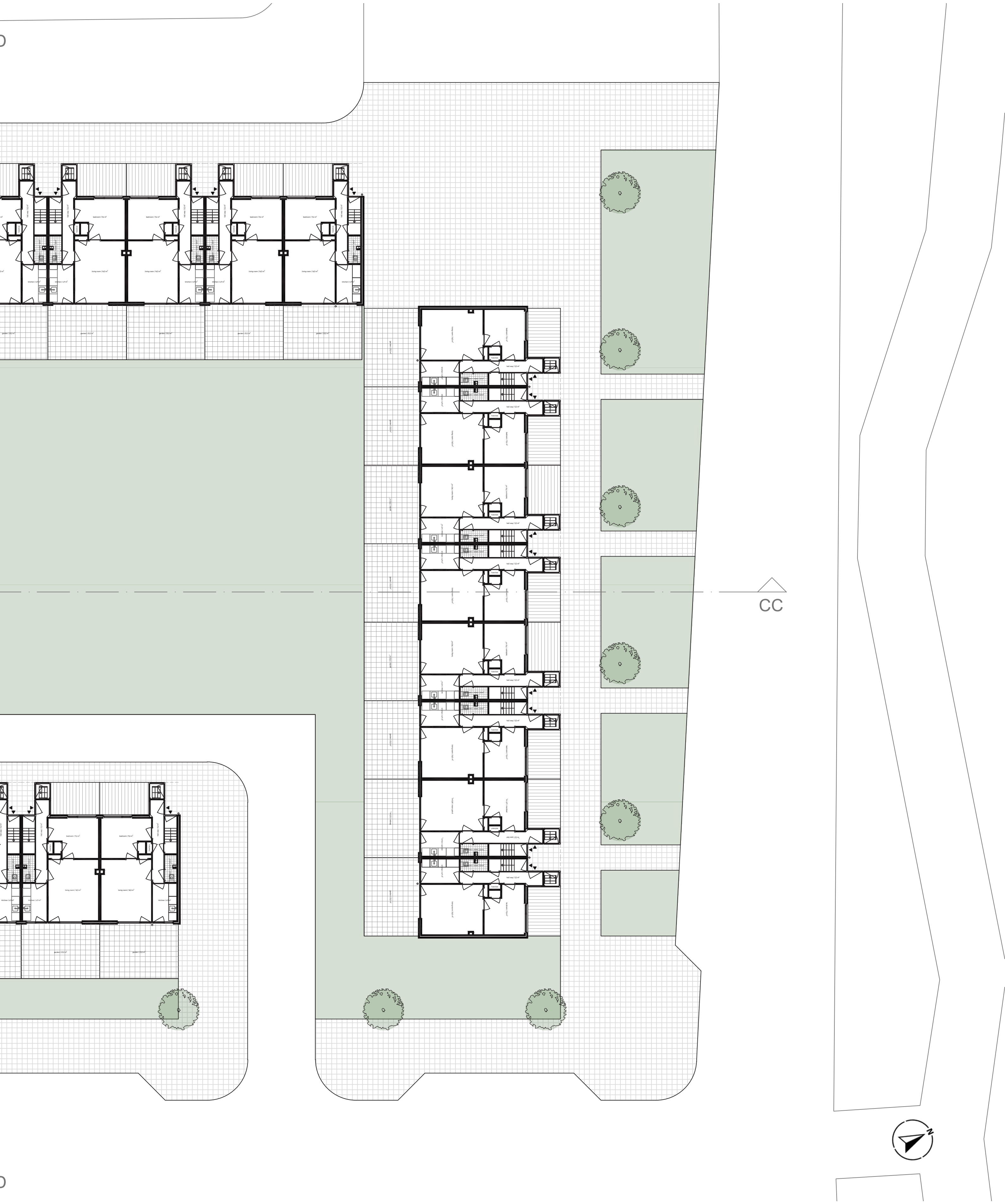


Figure 7.2: Archive drawings from the duplex dwellings (1952) (by Gemeente Amsterdam Stadsarchief 2023).

7.1 CURRENT SITUATION PLANS

Situation (A2 I 1:250) of the ground floor of the duplex dwellings in the Louis Couperus neighborhood. The ground floor of the open courtyard parcellation consists of 33 dwellings.

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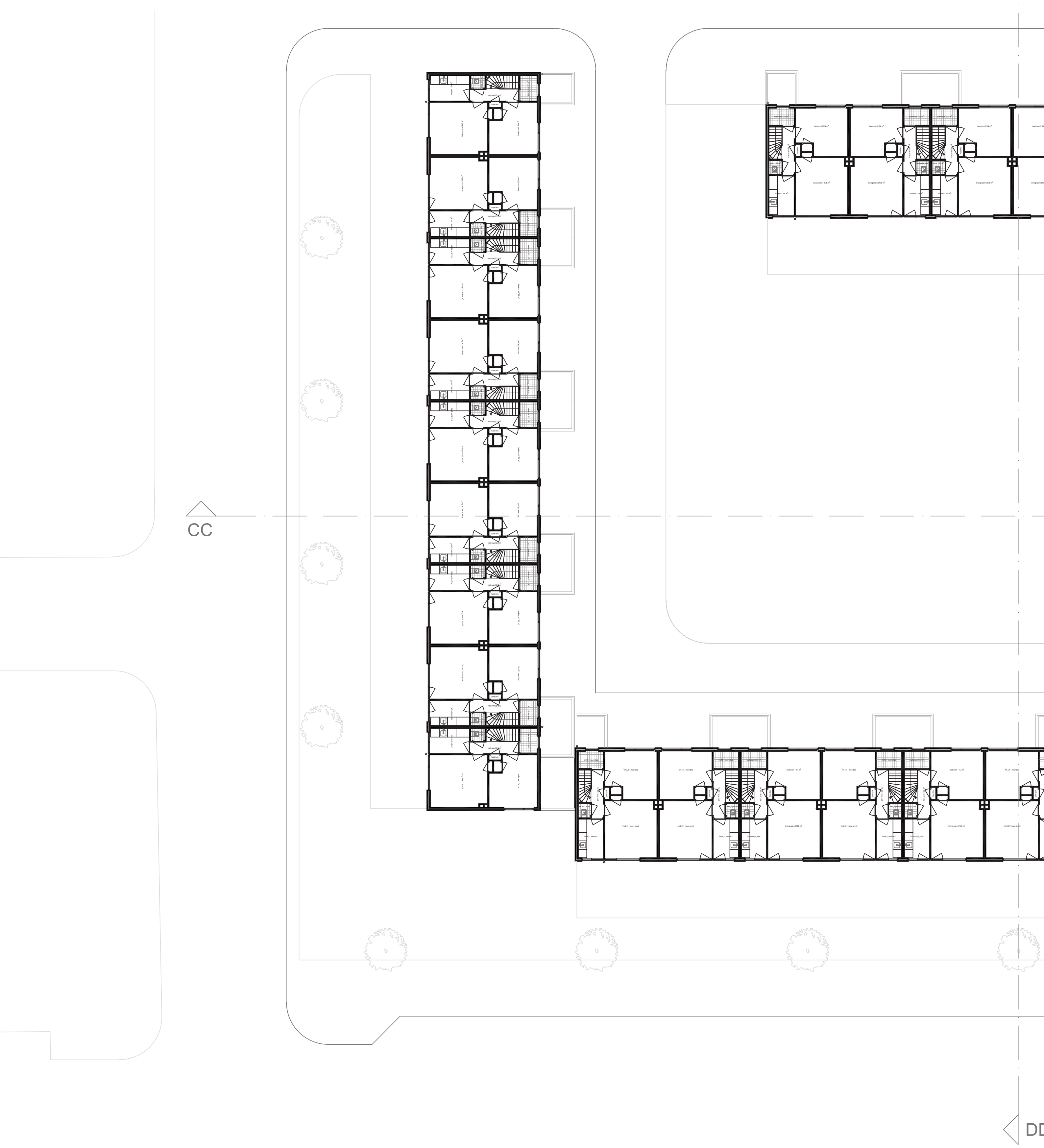
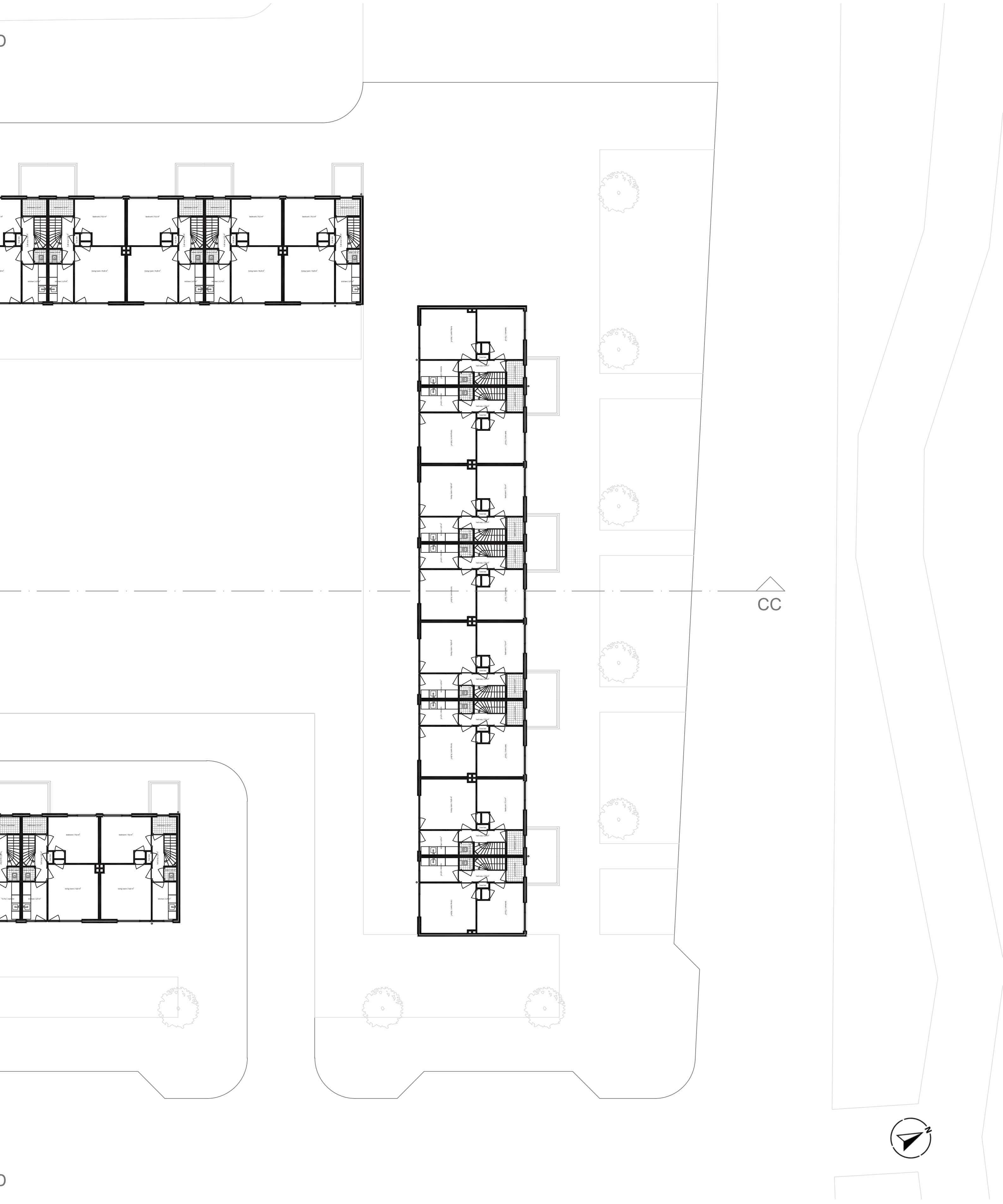
7.1 CURRENT SITUATION PLANS

Situation (A2 I 1:250) of the first floor of the duplex dwellings in the Louis Couperus neighborhood. The first floor of the open courtyard parcellation consists of 33 dwellings.

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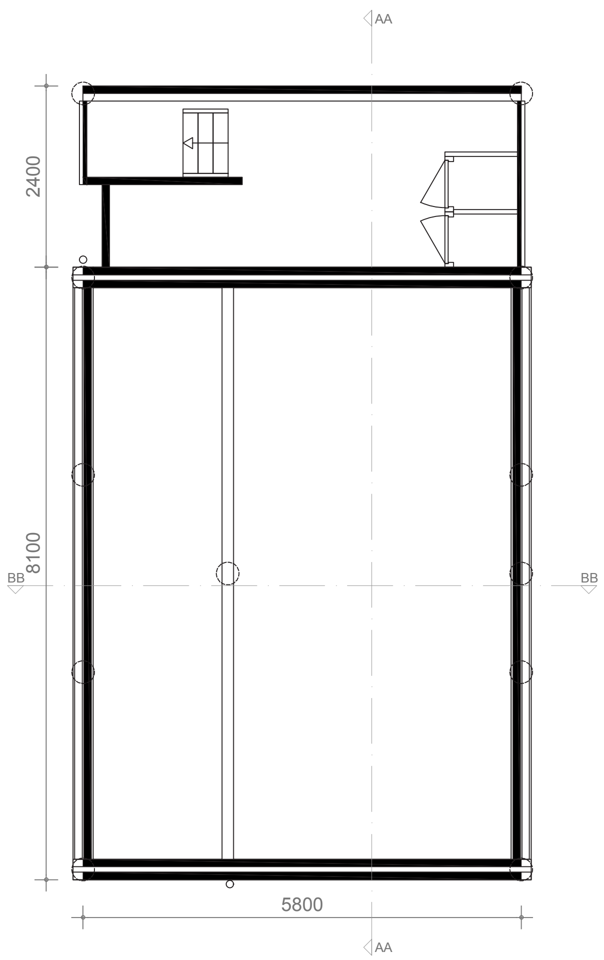
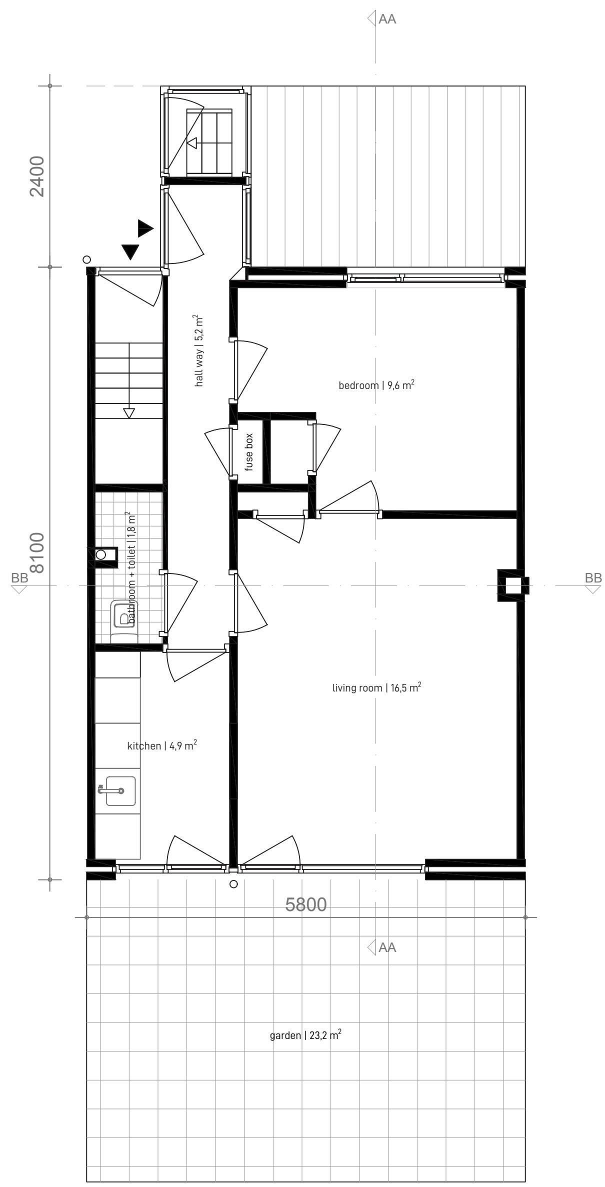
7.1 CURRENT SITUATION PLANS

Floorplans (A3 l 1:100) of the duplex dwellings in the Louis Couperus neighborhood. The ground floor dwelling and the first floor dwelling are 40m².

Souterrain

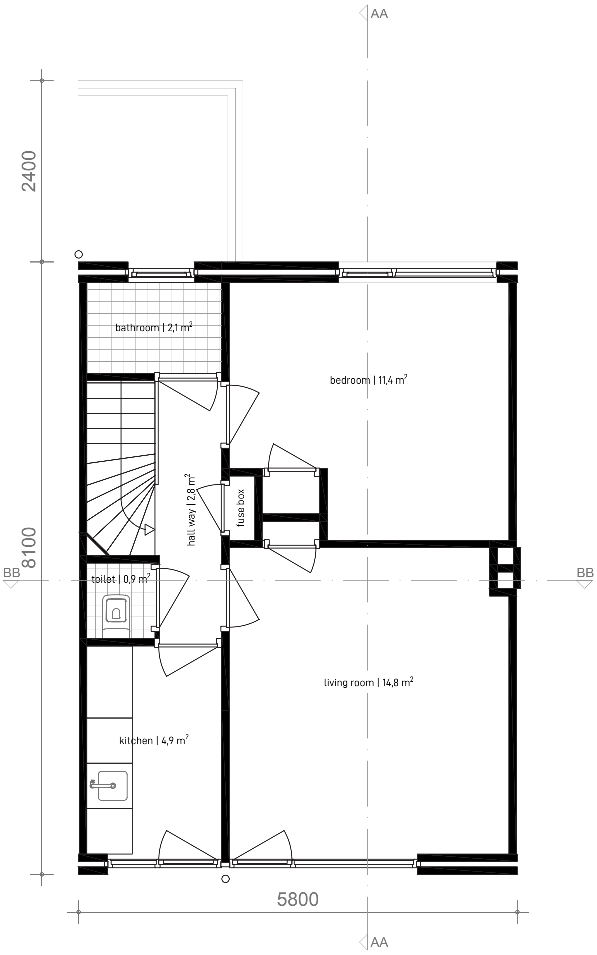


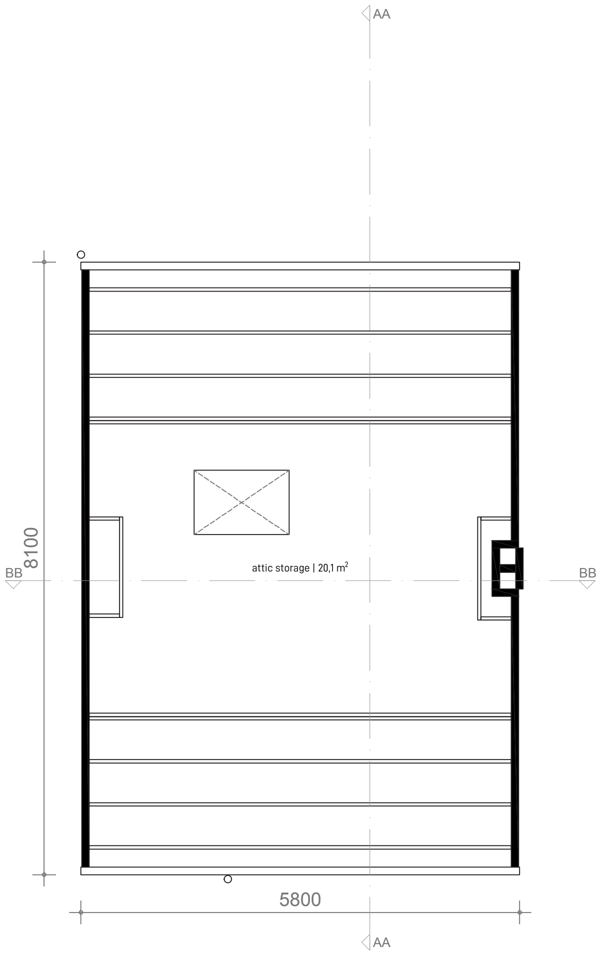
Ground floor



First floor

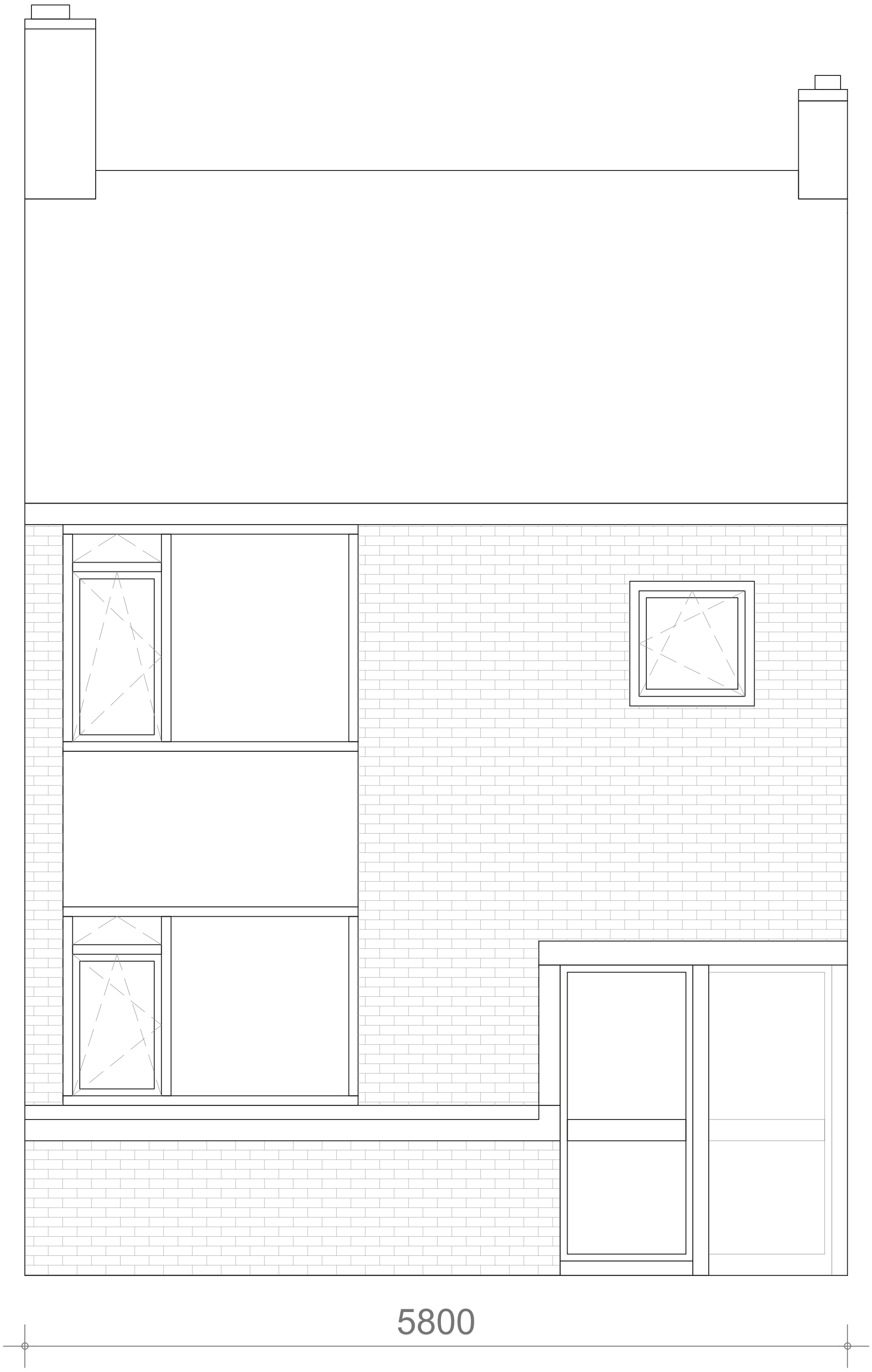
Second floor





7.1 CURRENT SITUATION PLANS

Elevations (A3 l 1:50) of the duplex dwellings in the Louis Couperus neighborhood.

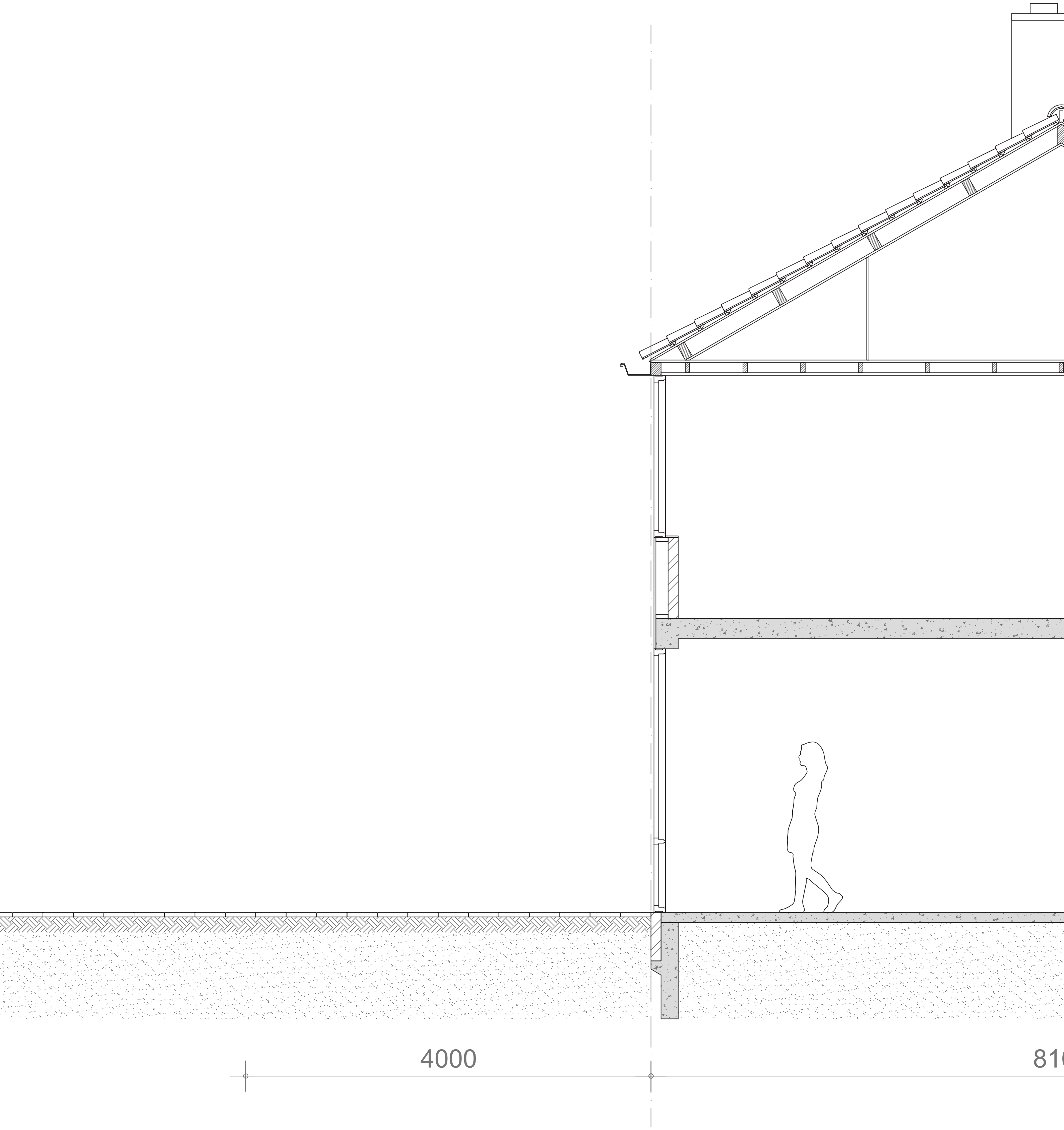


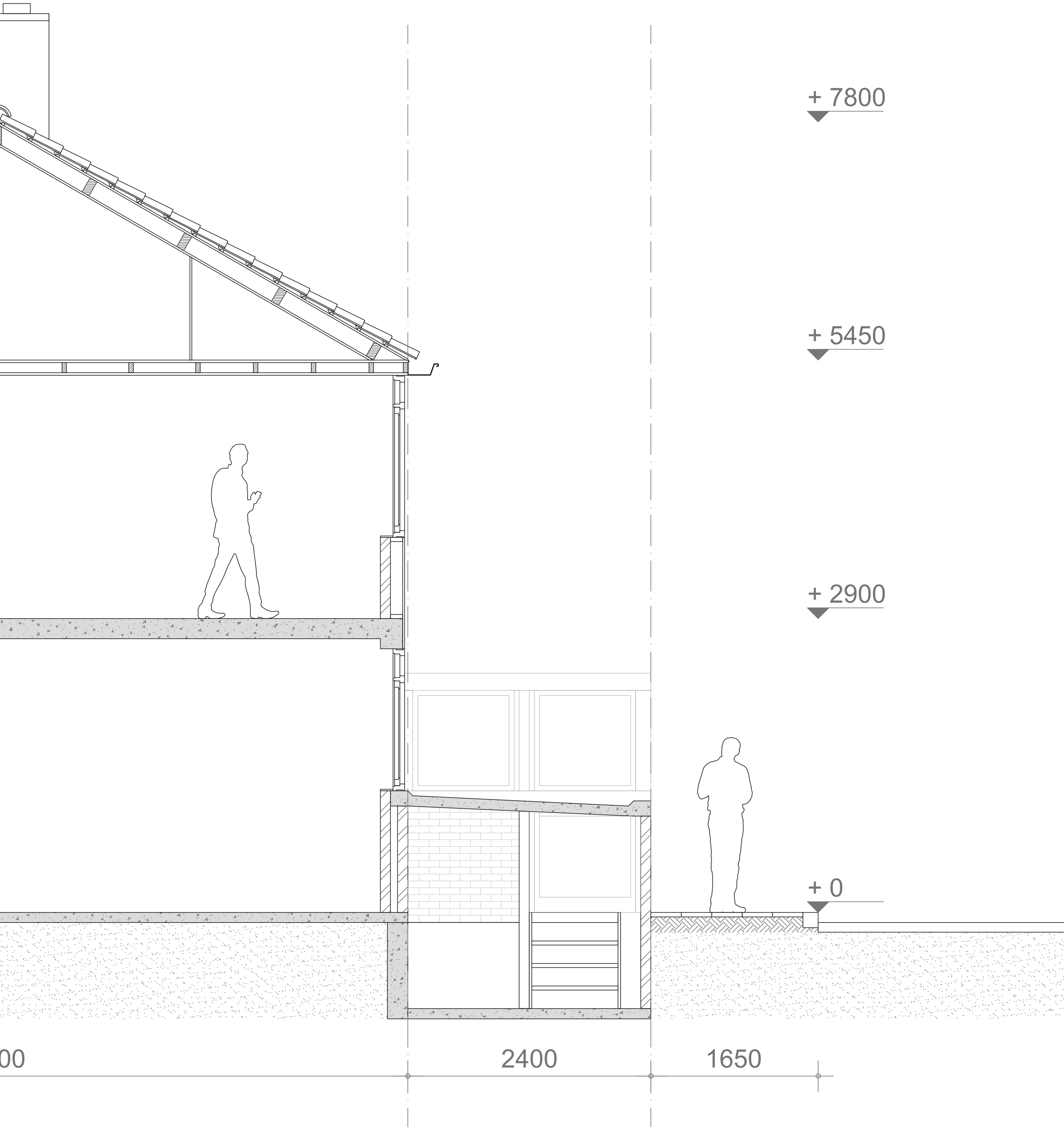
Front facade

Back facade

7.1 CURRENT SITUATION PLANS

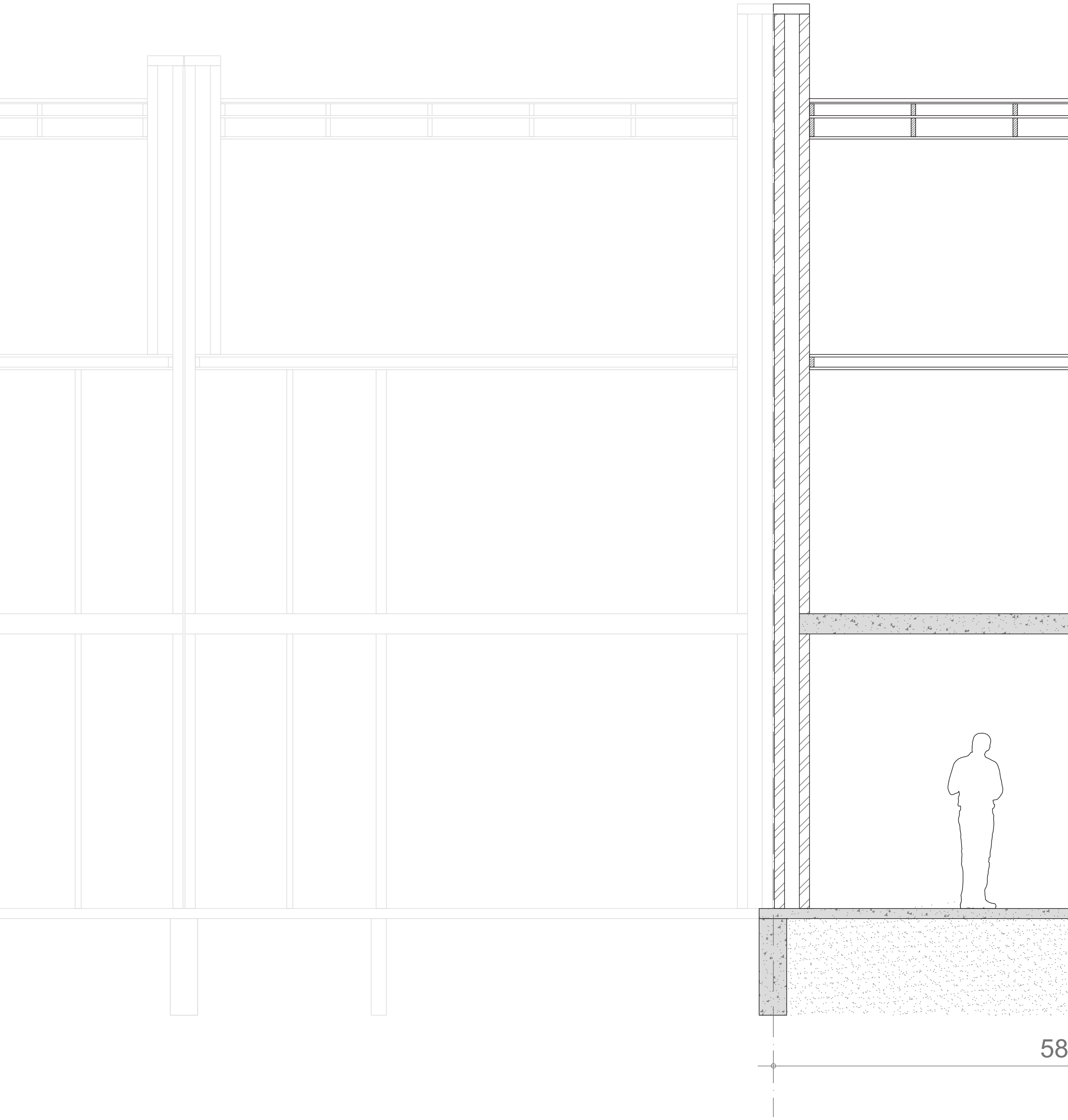
Section AA (A3 I 1:50) of the duplex dwellings in the Louis Couperus neighborhood.

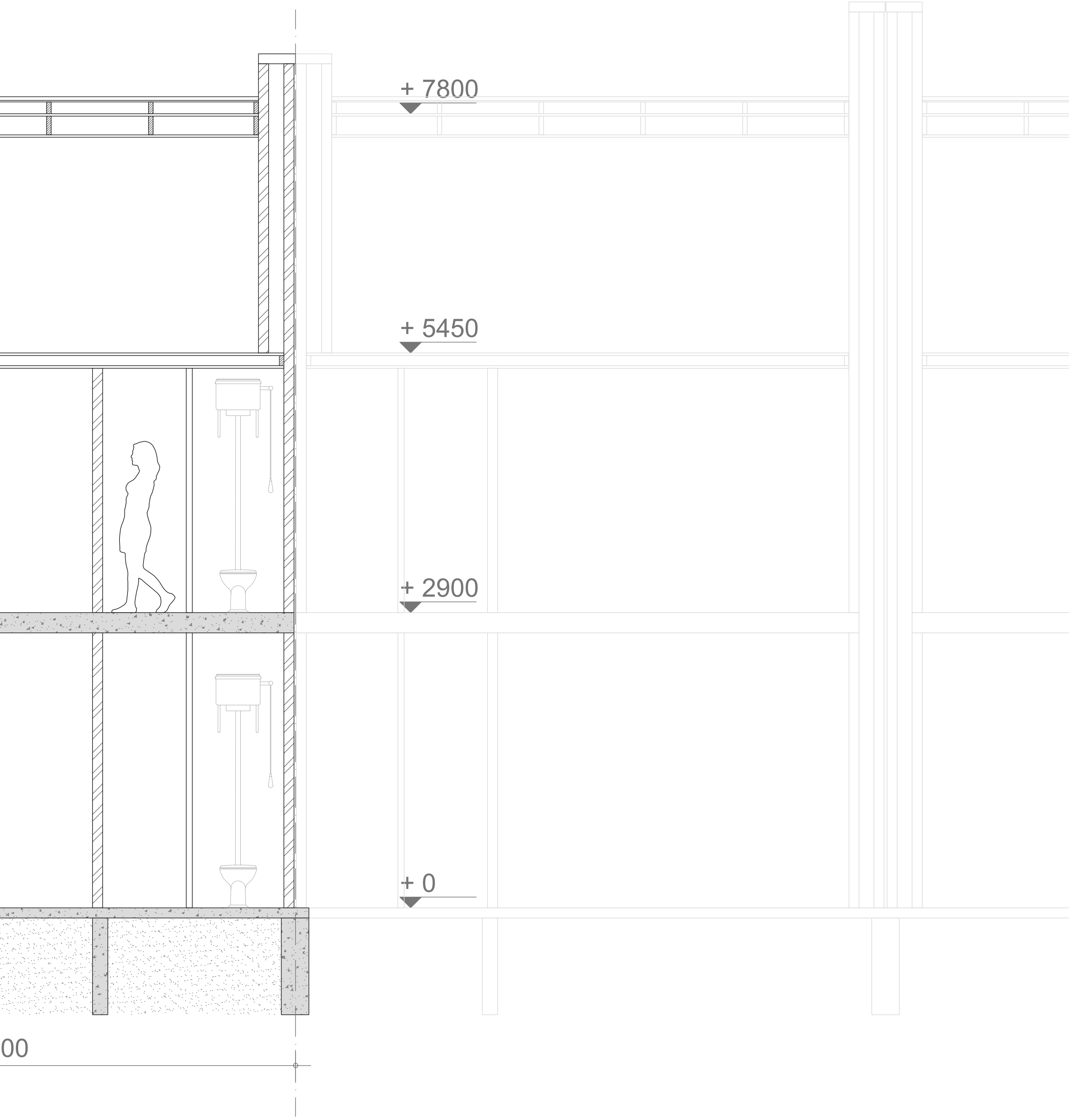



+ 7800
+ 5450
+ 2900
+ 0
00
2400
1650

7.1 CURRENT SITUATION PLANS

Section BB (A3 I 1:50) of the duplex dwellings in the Louis Couperus neighborhood.




+ 7800
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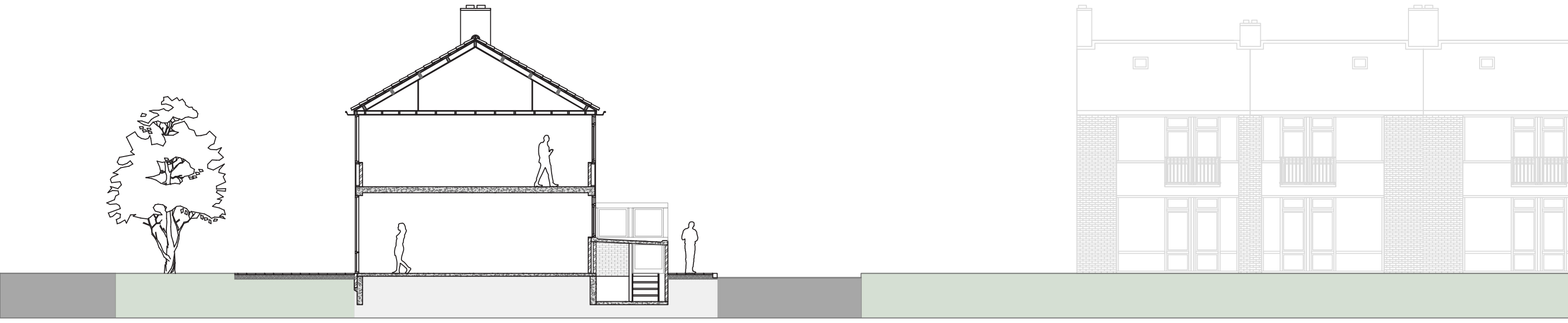
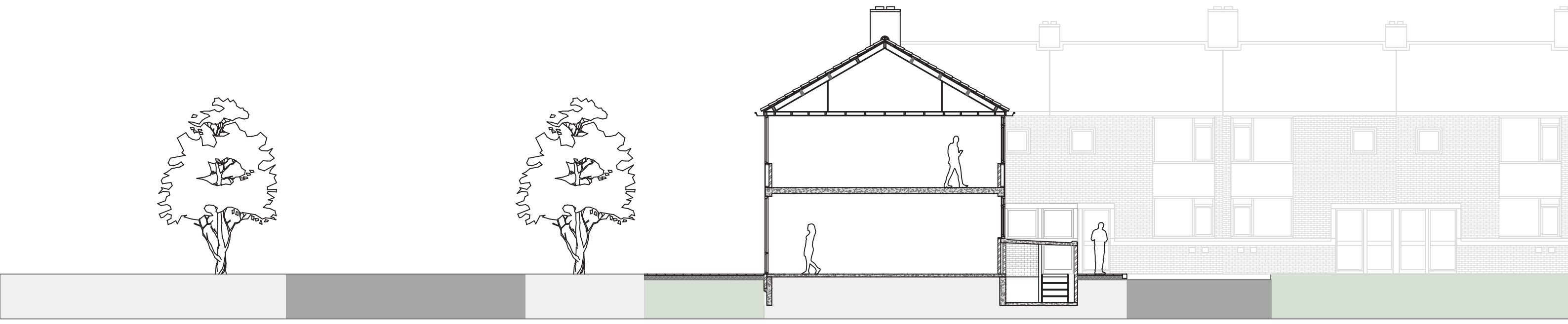
7.1 CURRENT SITUATION PLANS

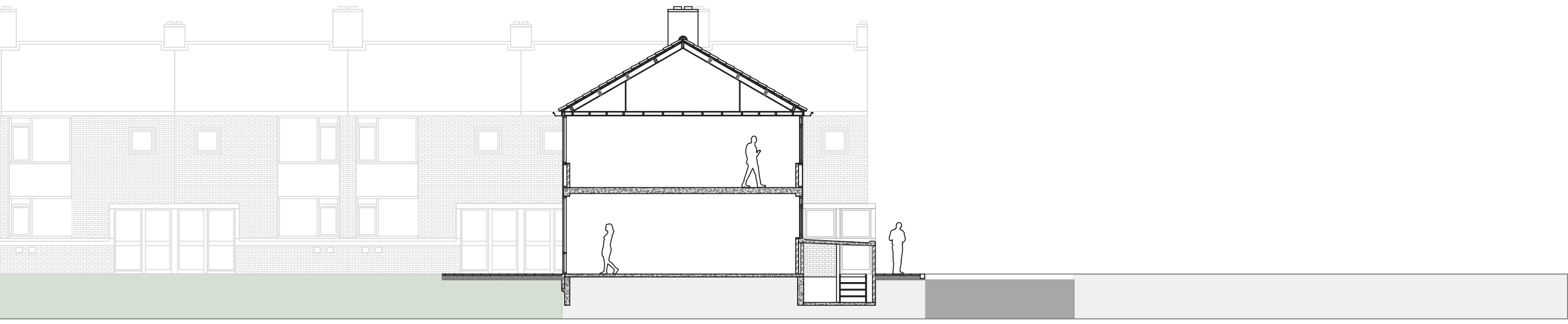
Section CC & DD (A3 I 1:250) of the duplex dwellings in the Louis Couperus neighborhood.



Section CC

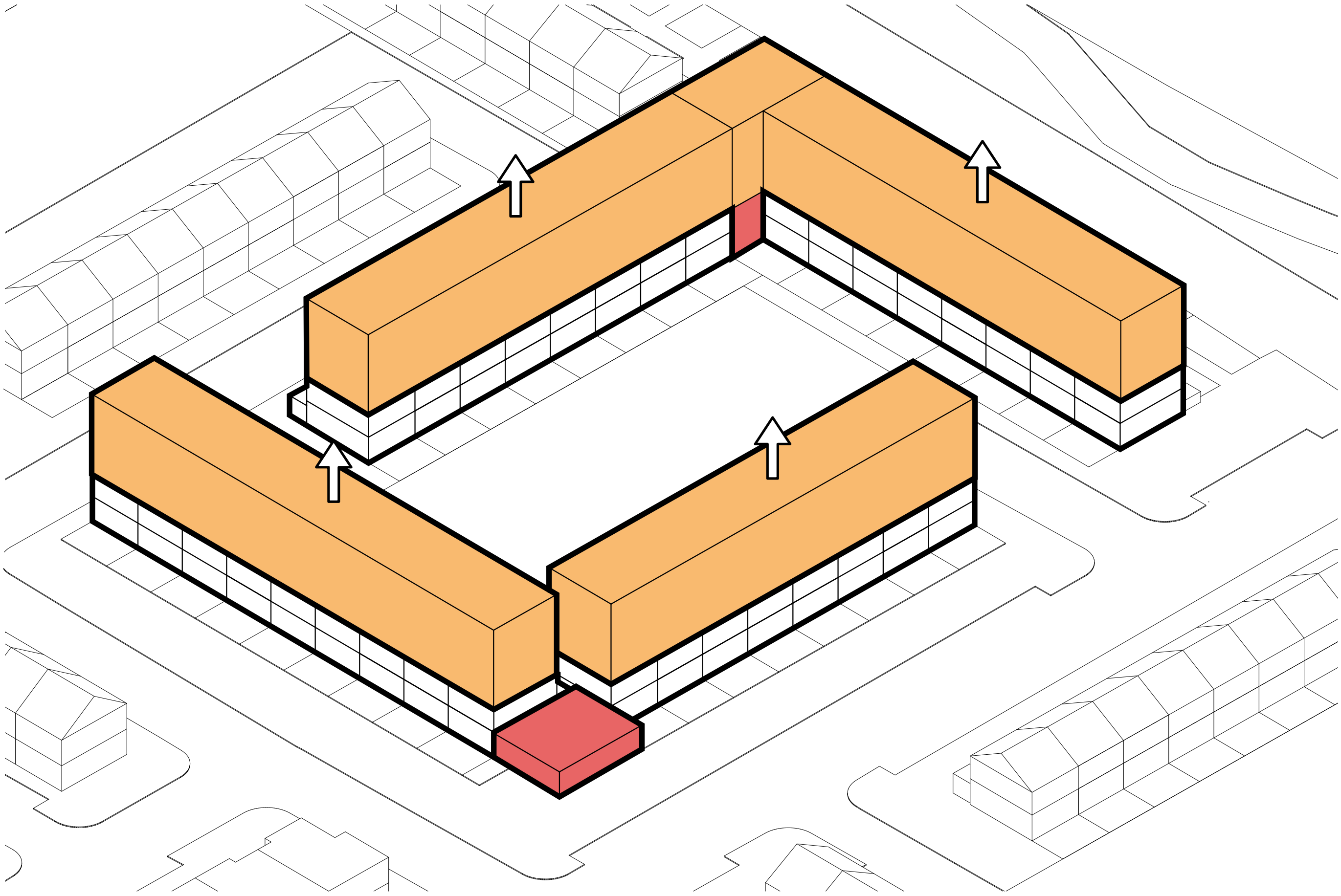


Section DD



7.2 DESIGN STRATEGY DIAGRAMS

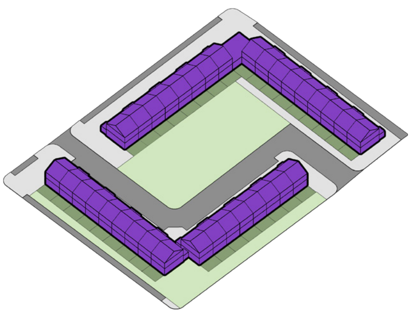
Based on the identified heritage valuation, the infill development and roof stacking methods were applied as densification methods to preserve the relationship between the existing buildings. The roof stacking method is applied to the existing buildings and the infill method on the corners.



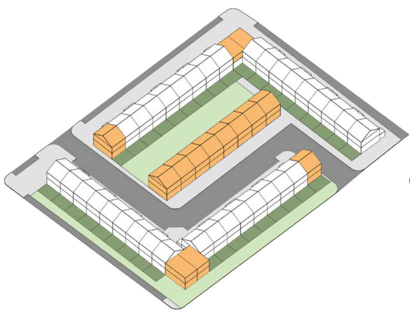
Roof stacking   Infill (facilities)

Heritage Valuation

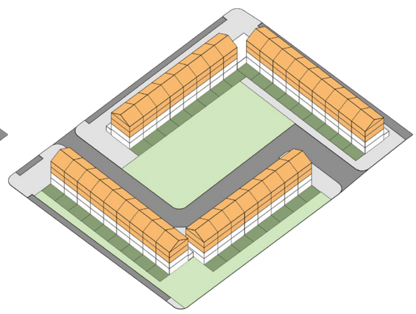
Densification Methods



Relation between buildings

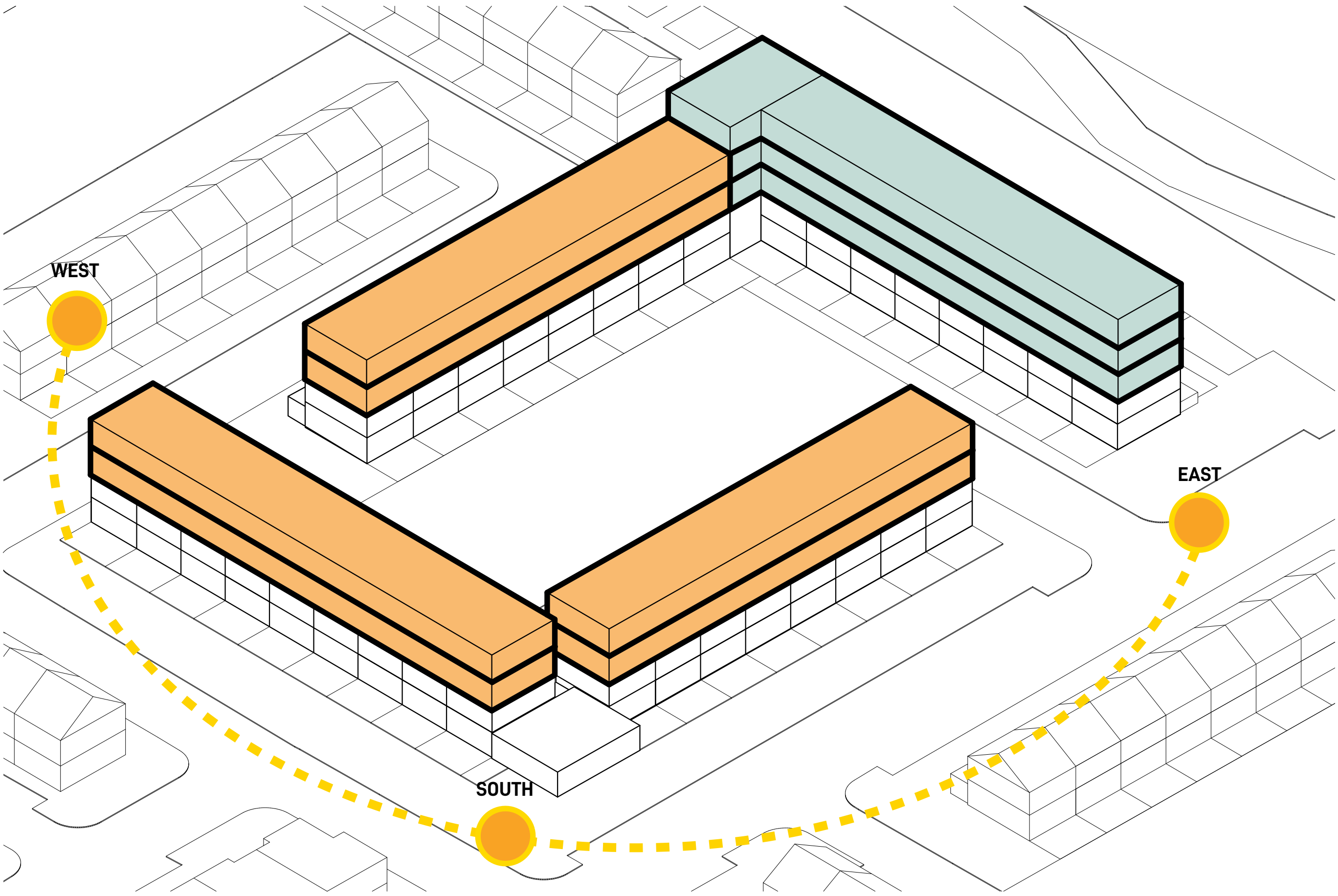


Infill Development



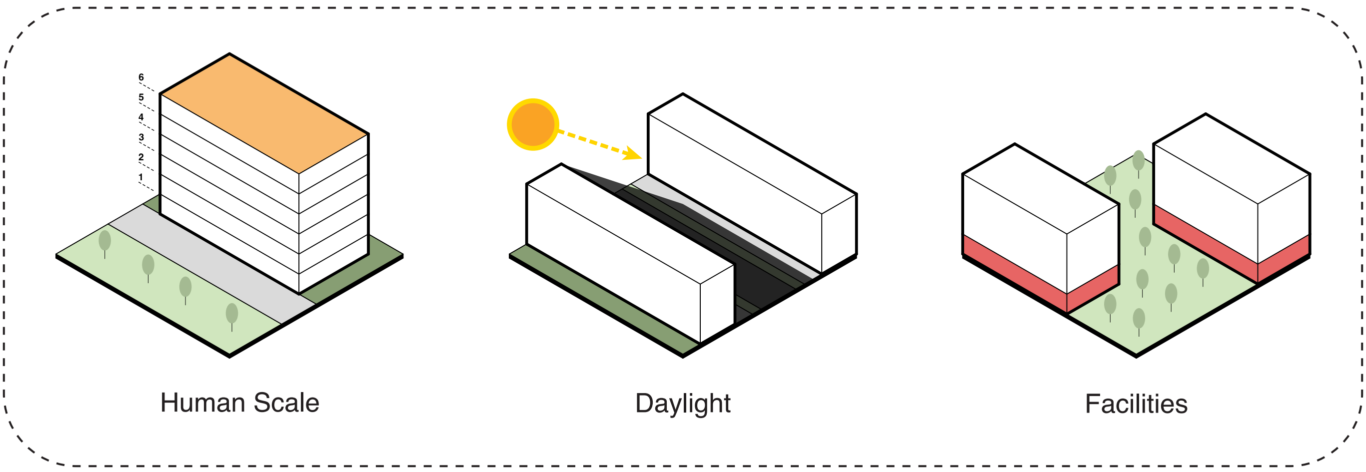
Roof Stacking

The heights of the roof stacking were determined using the found guidelines for achieving livable density. This ensures the human scale and provides all dwellings with optimal daylight throughout the year. Facilities for neighbourhood residents will be located on the corners.



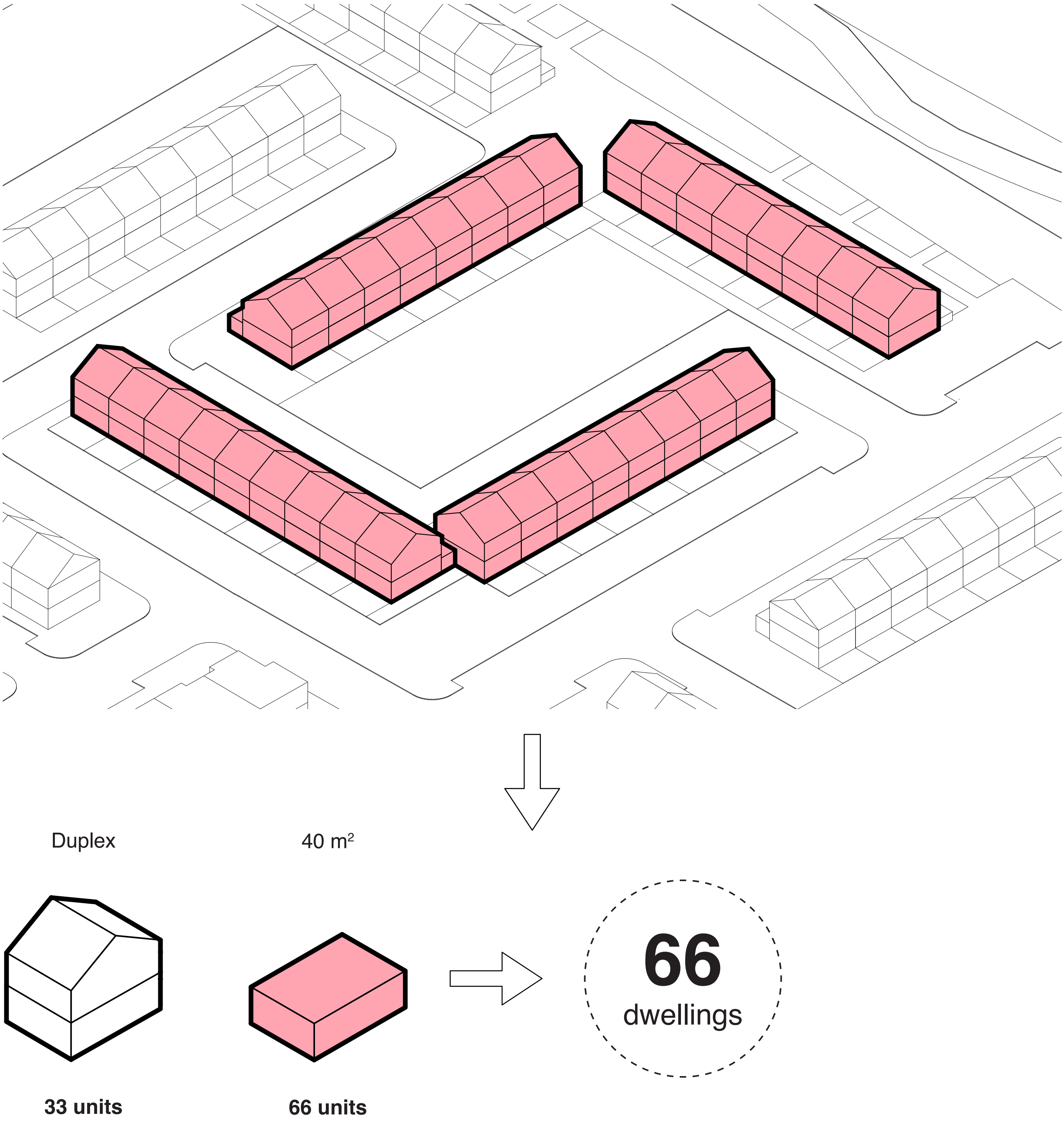
4 Stories   5 Stories

Livable Density Guidelines



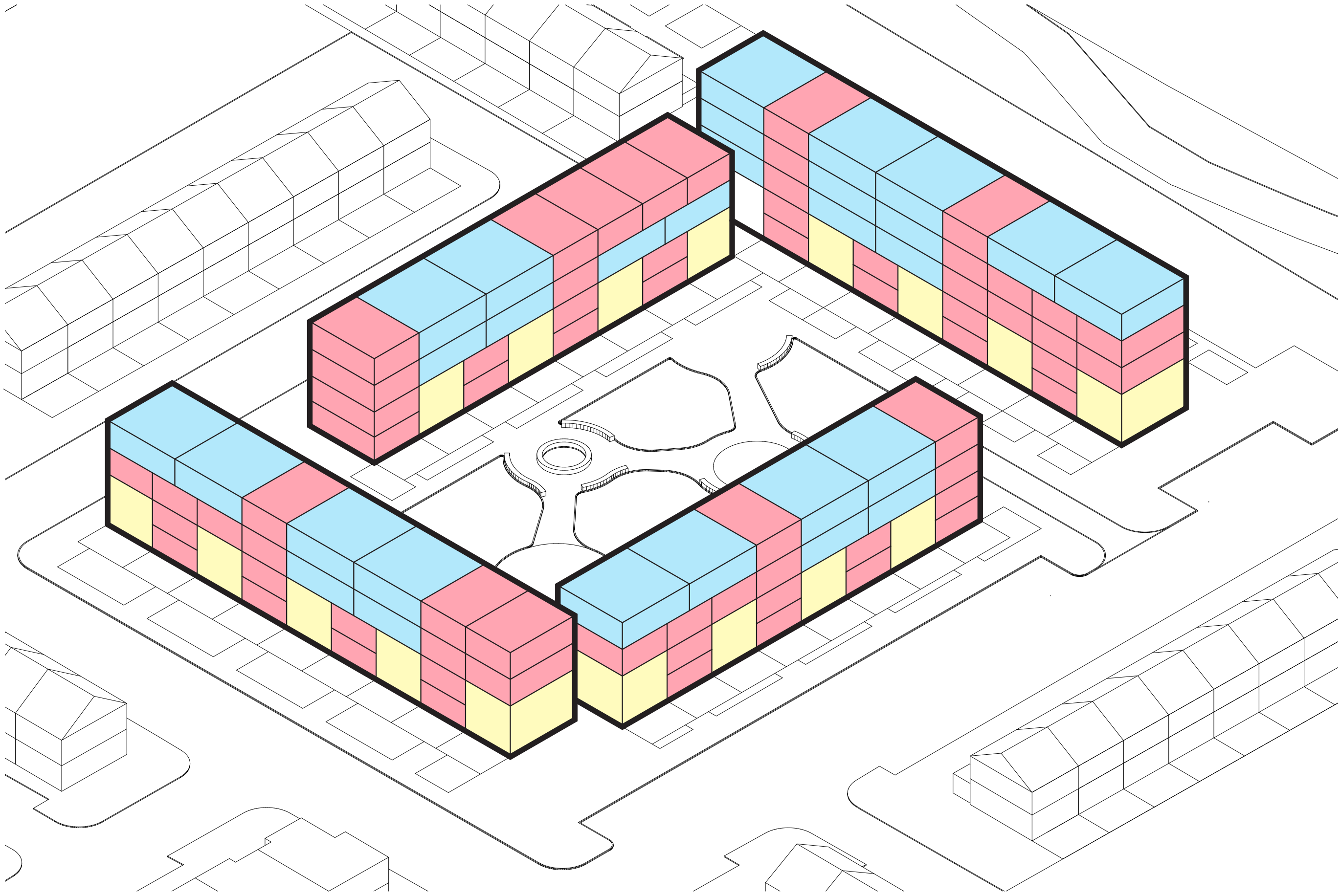
7.2 DESIGN STRATEGY DIAGRAMS

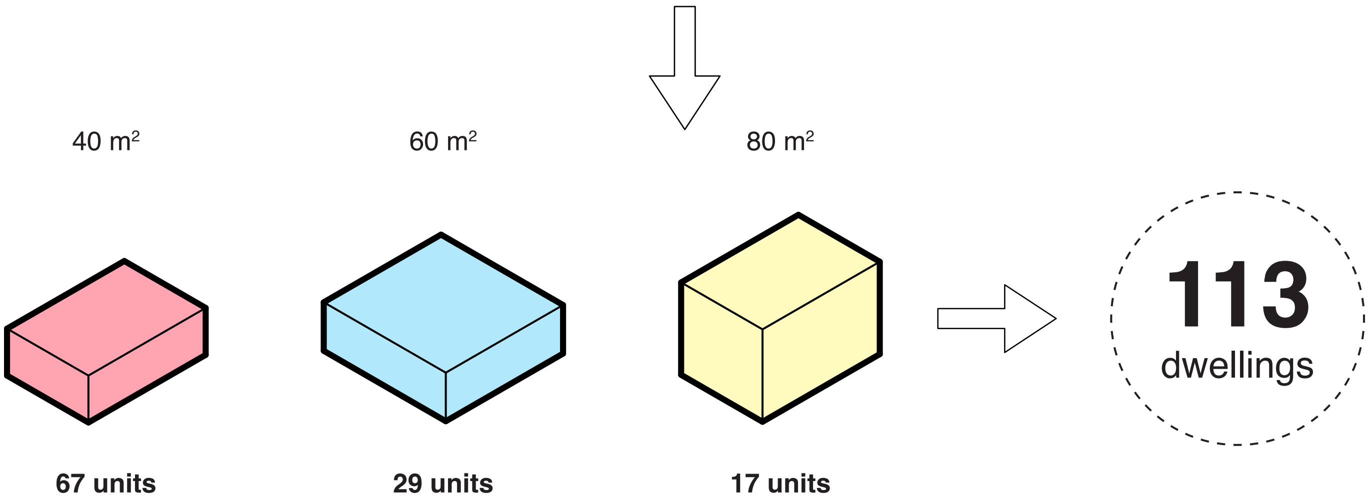
The existing situation of the open courtyard parcellation has a total of 66 dwellings consisting of 33 duplex dwellings distributed over two floors. Here, there is no variety of dwelling types with all the dwellings having an floor area of 40m2.



The new densified situation has a total of 113 dwellings. Here, half of the existing duplex houses will be transformed into 80m² dwellings. The new construction of the roof stacking consists of 40m² and 60m² dwellings.

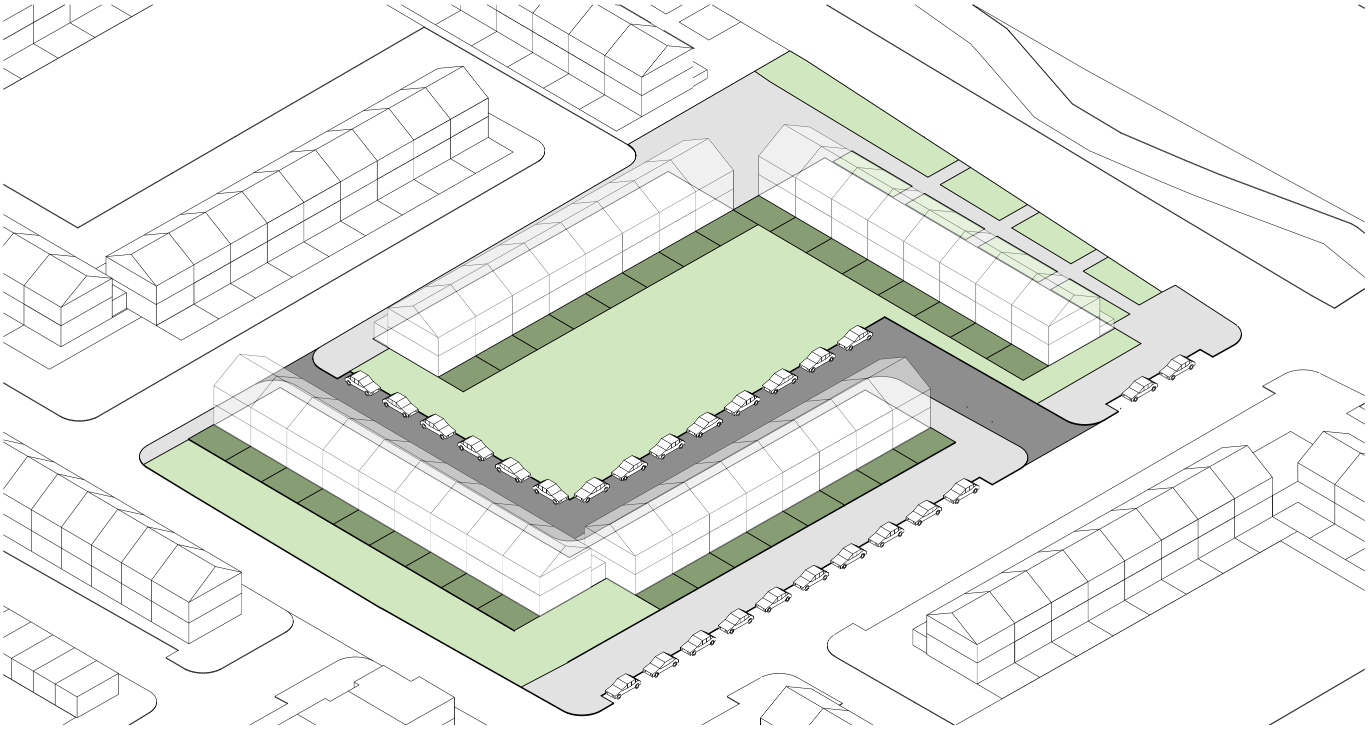
This provides a wider range of dwelling types to reduce social segregation. Here, the different dwelling types have been mixed together. Furthermore, current residents can continue to live in the densified situation.



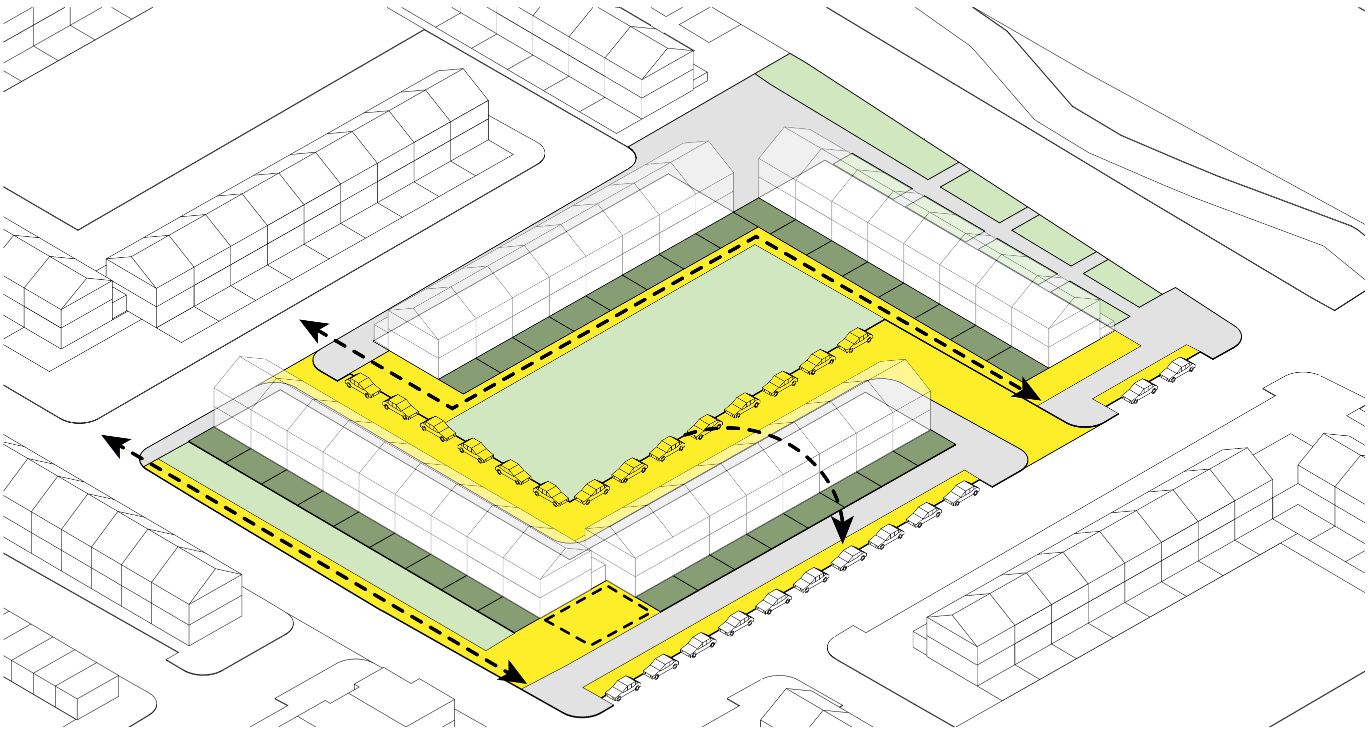


7.2 DESIGN STRATEGY DIAGRAMS

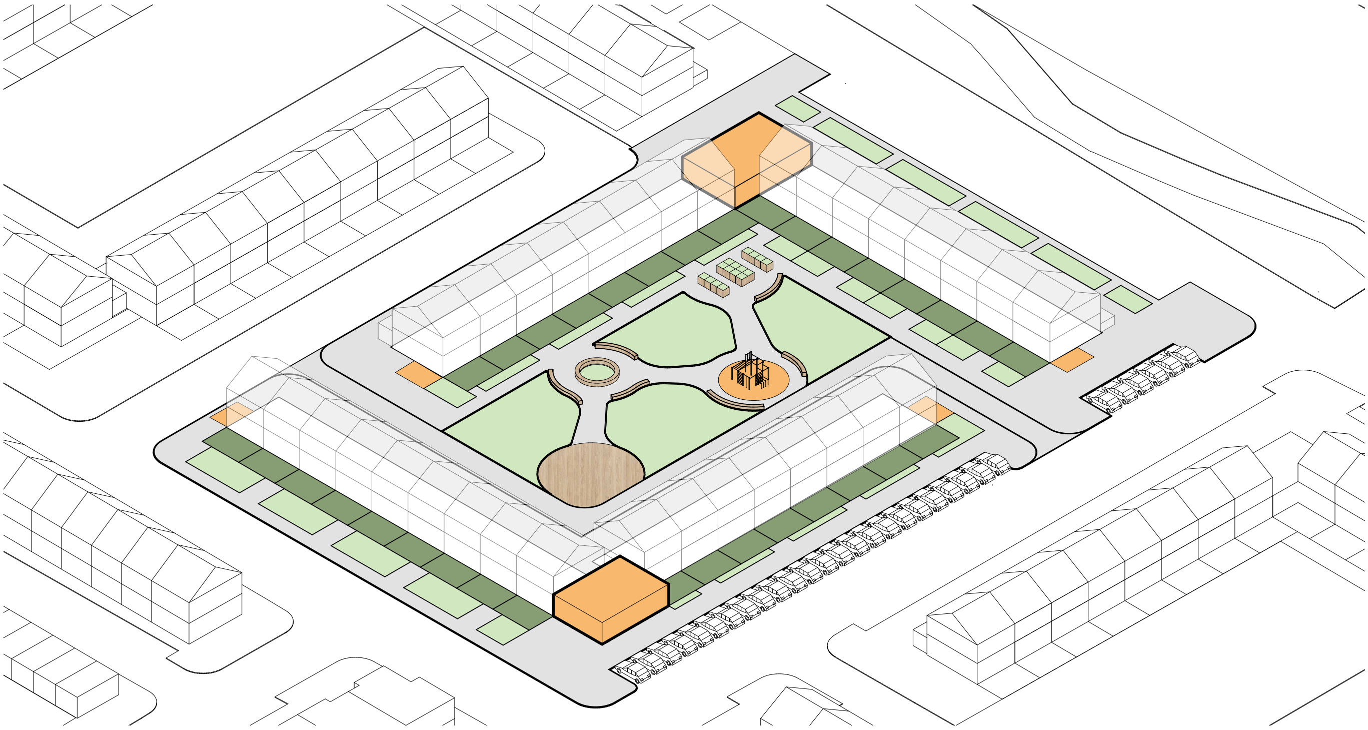
The current open courtyard parcellation is defined by a courtyard with a green field. Parking spaces are located adjacent to the green field and gardens adjacent to the courtyard are not accessible from the courtyard. There are no facilities in the courtyard that encourage residents to meet. The playgrounds were removed in the past because of the concrete design that parents considered dangerous.



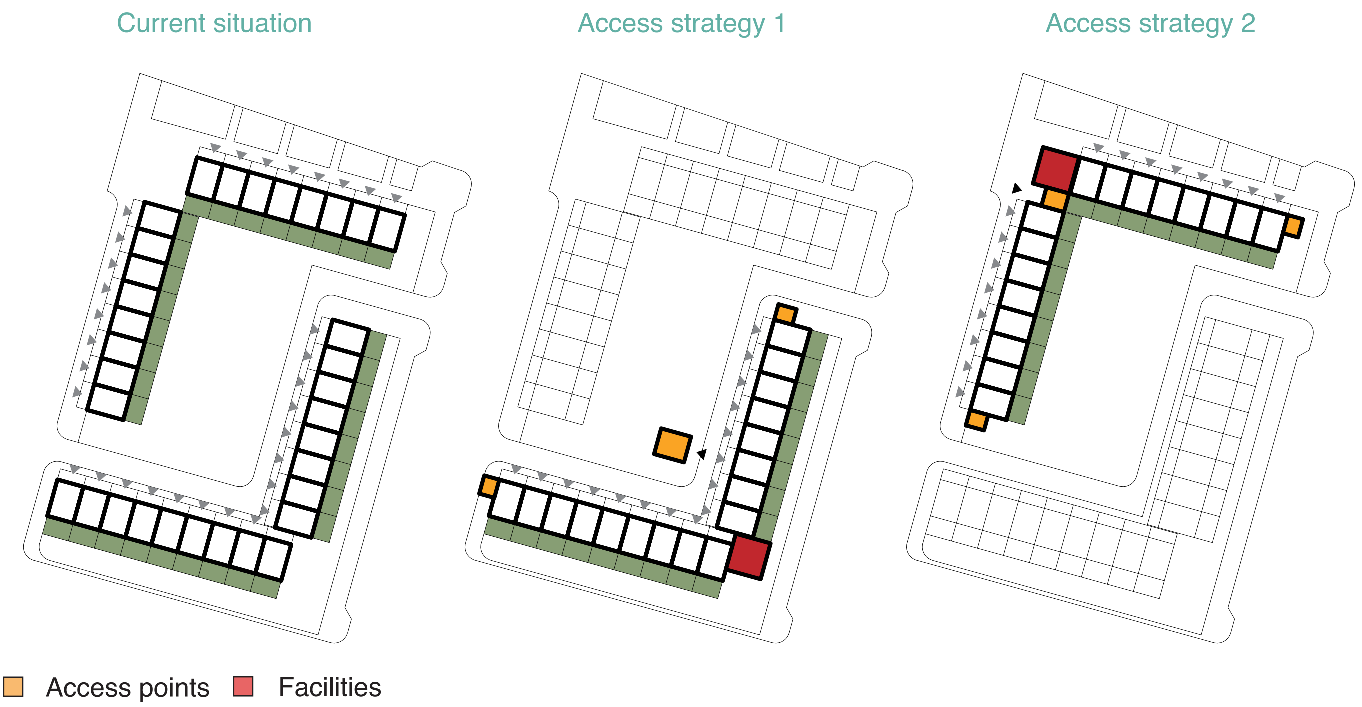
To make the courtyard more accessible to the residents, walkways will be added adjacent to the gardens so that they are accessible from the courtyard. The cars in the courtyard will be relocated outside the courtyard to create a safer environment were children can play. In the process, the existing parking spaces on the street side will be increased.



In the new situation, the courtyard becomes a residential yard (woonerf) by removing the cars. In the new situation, cars are the guests and new walkways make the courtyard more accessible. In the existing green field, functions are facilitated using the liveability toolbox to bring residents together. Furthermore, at the corners of the parcellation space is reserved for parking bicycles.



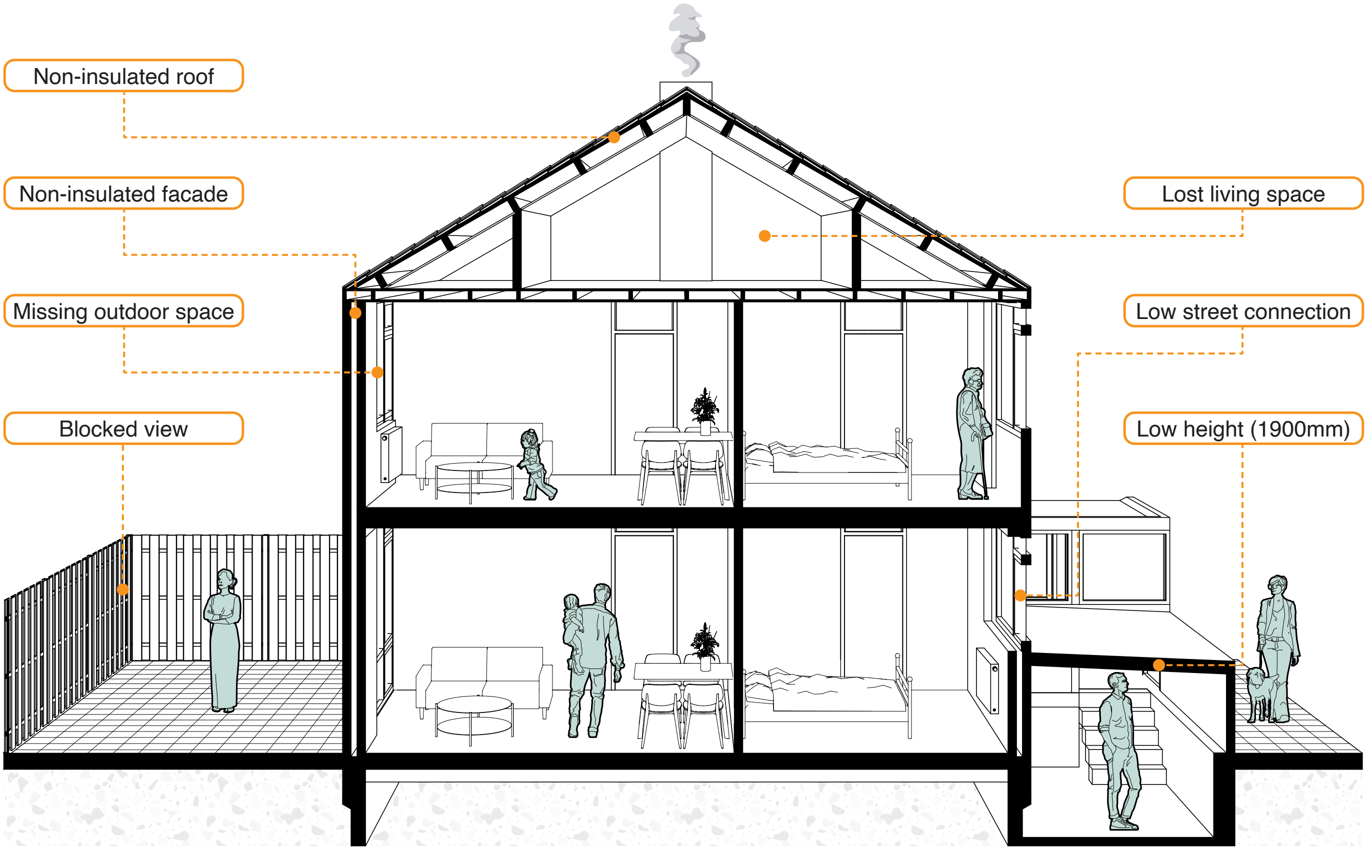
In the current situation, all entrances are oriented north and northwest and the gardens are oriented south and southeast. To densify the open courtyard parcellation, two access strategies will be applied as a study. In access strategy 1, the main access will be located in the courtyard so that residents must enter the courtyard at all times. In access strategy 2, the main entrance will be located on the corner where the two building strips join. In both strategies, access points for escape and facilities will be located at the corners.



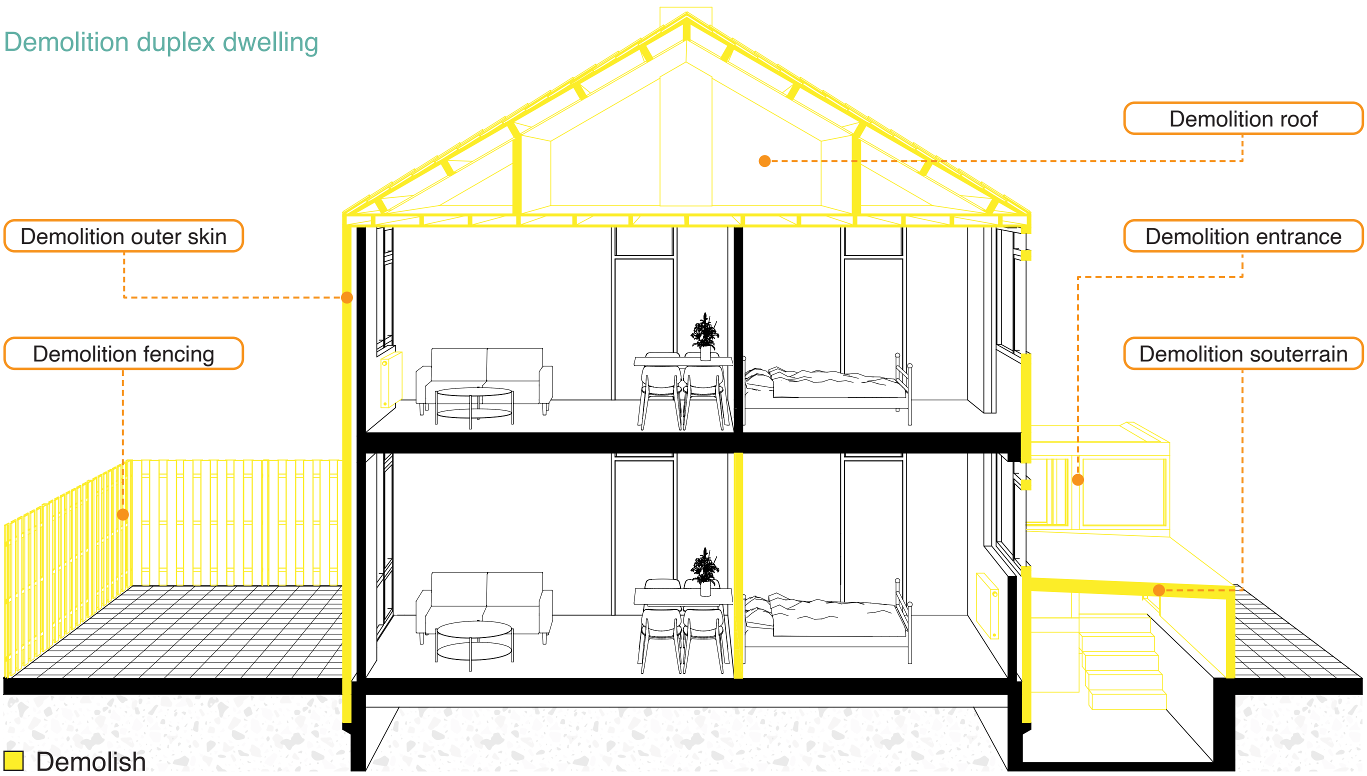
7.2 DESIGN STRATEGY DIAGRAMS

According to the research on the livability of the duplex dwellings, it was revealed that the facade and the roof are not insulated. Furthermore, the roof is only used as storage and thus is lost living space. The dwelling on the first floor has no outdoor space and the entrance has a low connection to the street because of the souterrain. Finally, the souterrain only has a height of 1900mm which can easily cause someone to hit their head.

Livability duplex dwelling

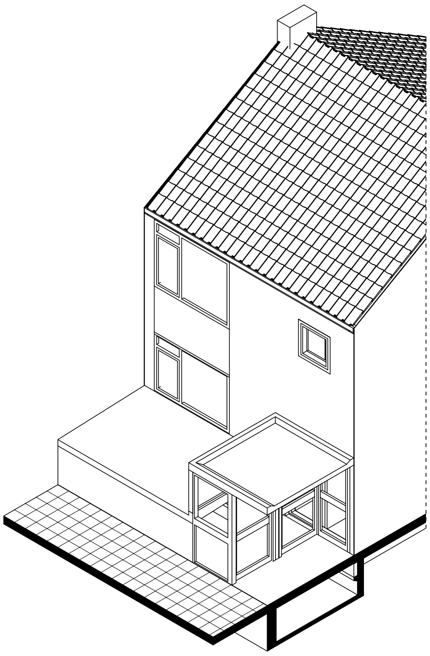


Demolition duplex dwelling

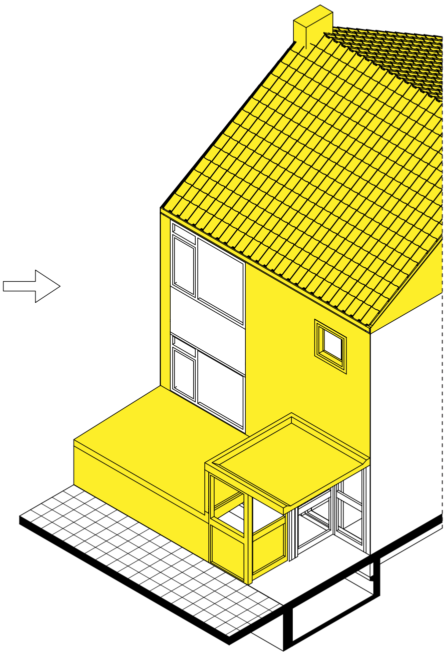


To improve the livability of the duplex dwellings, the facade, roof, souterrain and entrance portal will be demolished. The facade will be rebuilt with insulation and existing architectural details will be restored. By removing the roof, the roof stacking method can be applied. The removal of the souterrain and entrance portal allows the addition of outdoor spaces for both the ground floor dwelling and the upper floor. This provides more eyes on the street and contributes to a safer and more social living environment. The second floor dwelling will also have an outdoor space oriented to the south on the back facade. During the renovation, the windows will be preserved and reused.

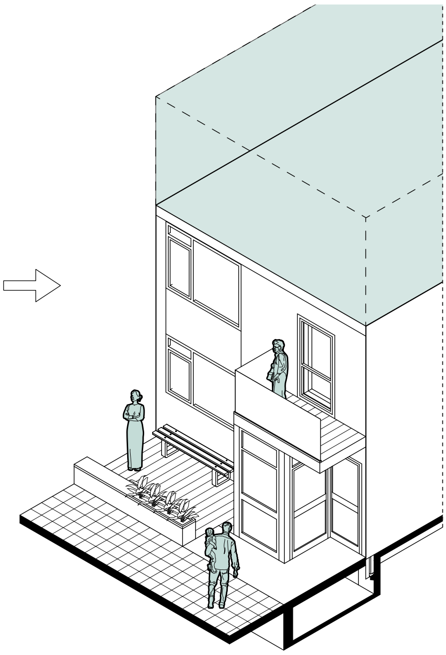
Current front facade



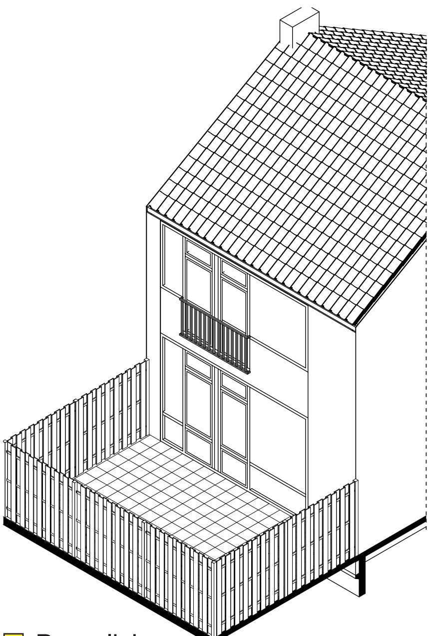
Demolition front facade



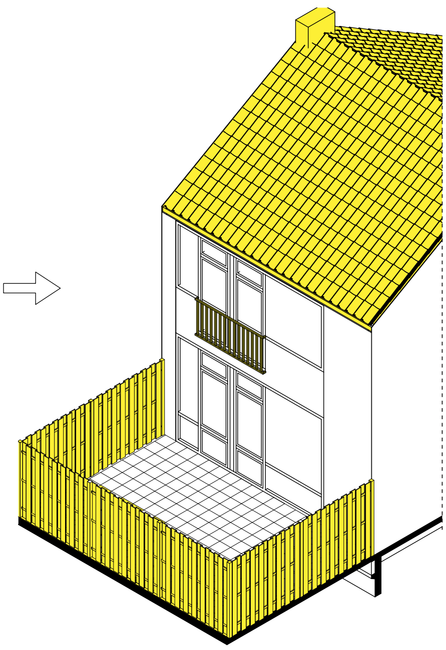
New front facade



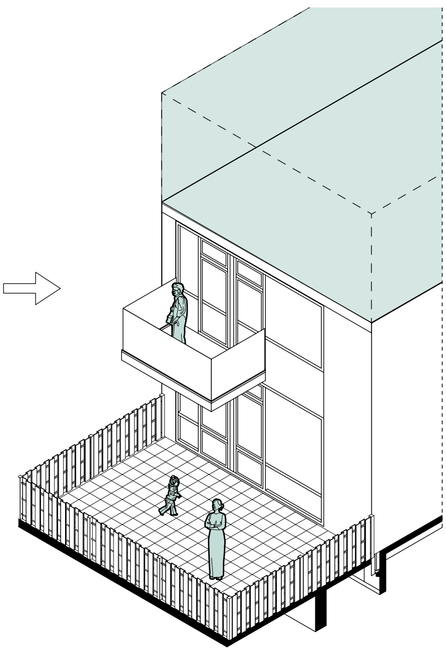
Current back facade



Demolition back facade



New back facade



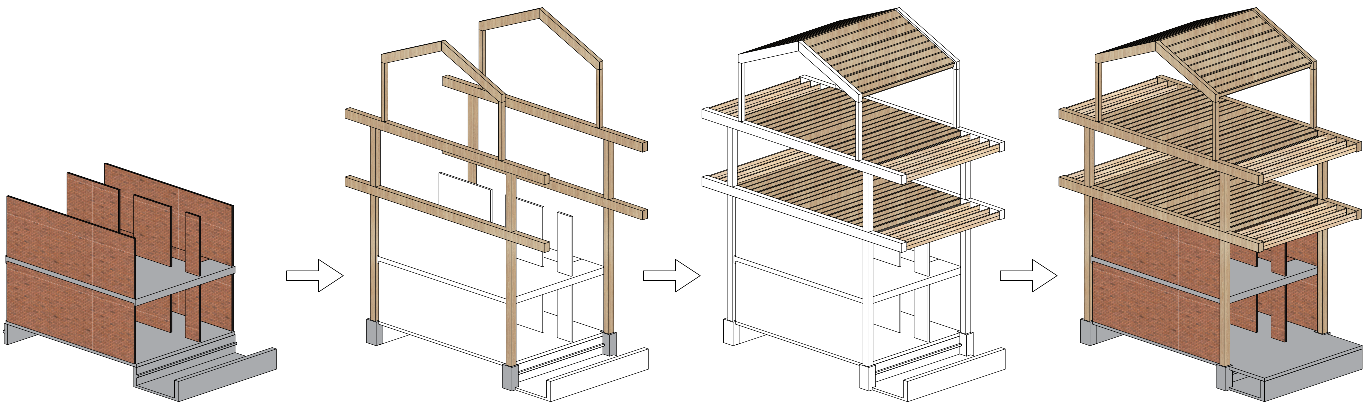
Demolish

7.2 DESIGN STRATEGY DIAGRAMS

Throughout the renovation of the front and back facade, the heritage values were considered to preserve the authenticity of the existing facade as much as possible. The same materials and colors are used in the new situation. The demolished entrance portal is rebuilt only higher so that the second floor gets an outdoor space. The implementation of newly added extended balcony on the back facade will be finished in the same color as the existing situation.

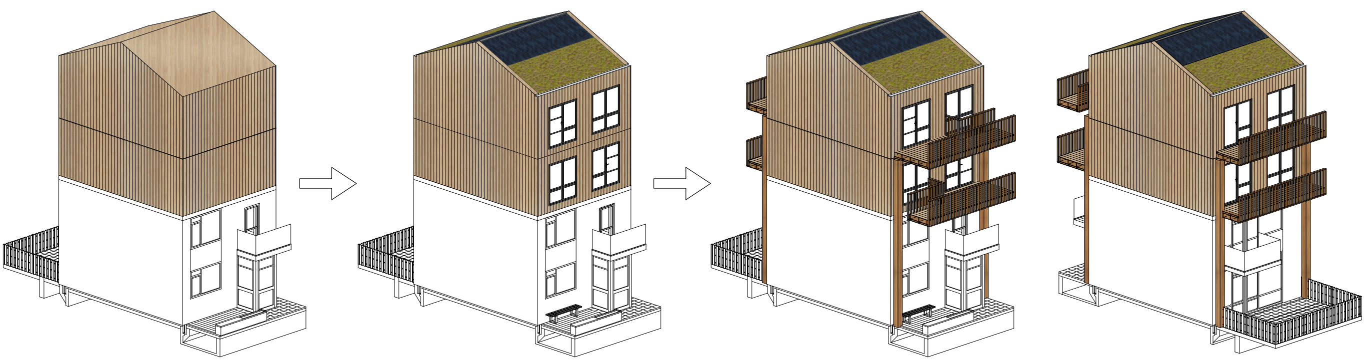
The current structure of the duplex dwellings consists of brickwork loadbearing walls and concrete floors. A column structure was chosen for the roof stacking strategy as it requires less material than loadbearing walls. Furthermore, a column structure offers more flexibility allowing for different dwelling types. Laminated wood was chosen as the material for the new structure due to its sustainability compared to steel and concrete. The floors and roof for the roof stacking structure are constructed of prefabricated wooden Kerto-Ripa elements. These hollow wooden elements can be filled with insulation for noise control between the dwellings. Furthermore, a faster construction period is ensured due to the prefabrication of the elements.

Roof stacking structure strategy



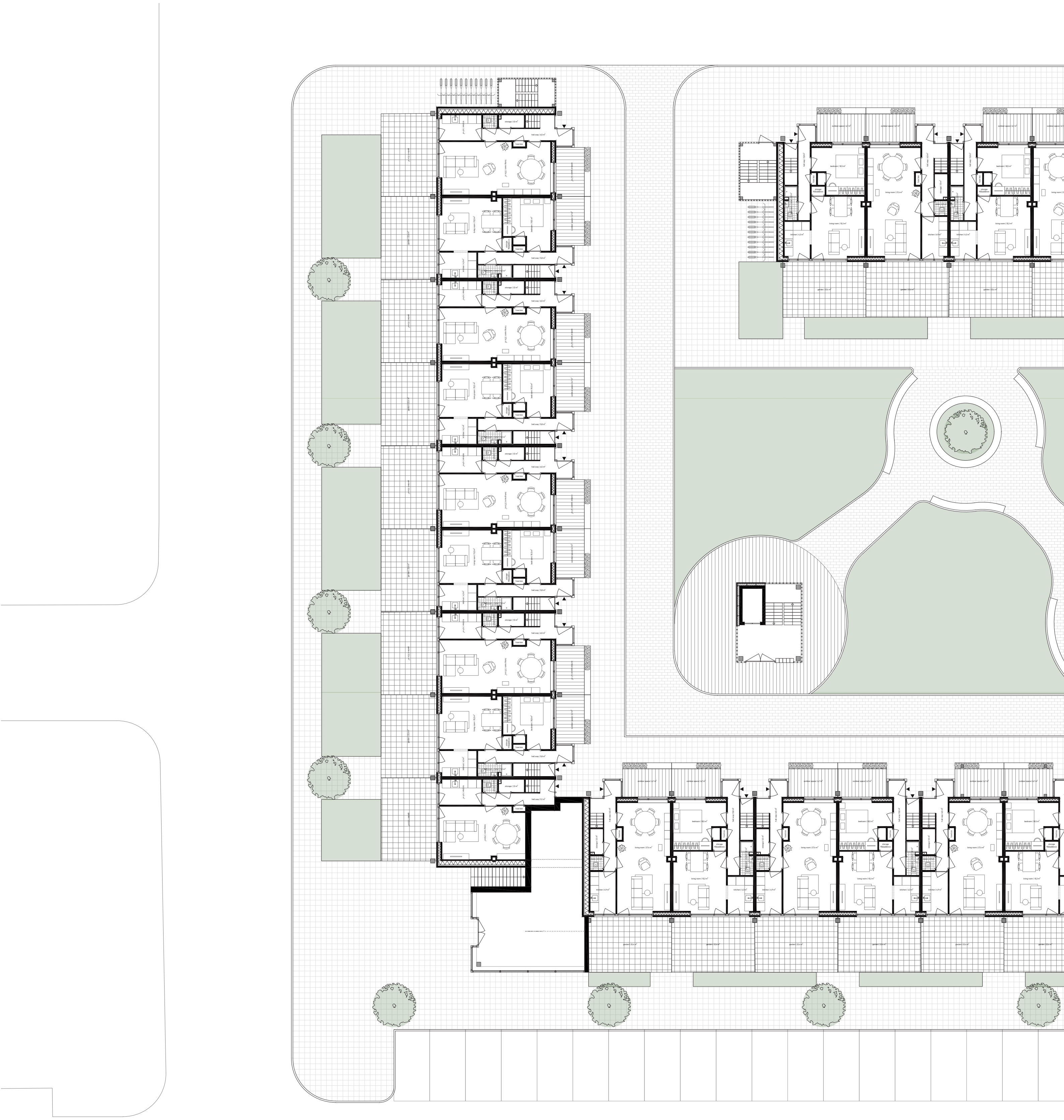
For the architectural expression of the roof stacking, a constrast is established with the existing duplex dwellings. For this reason, the facades are finished in a light color wood that contrasts with the dark brown brickwork of the existing situation. In order to access the new roof stacking structure, galleries are utilized. These galleries have a width of 2.5 meters so that besides being used as access it may also be used as outdoor space. The galleries are executed in wood and have voids to allow more daylight and give more openness. The roof will be executed with a green roof as a water buffer and pv-cells for generating energy.

Roof stacking facade strategy



7.3 NEW SITUATION PLANS

Situation floor plan (A2 I 1:250) of the ground floor of the duplex dwellings in the Louis Couperus neighborhood.

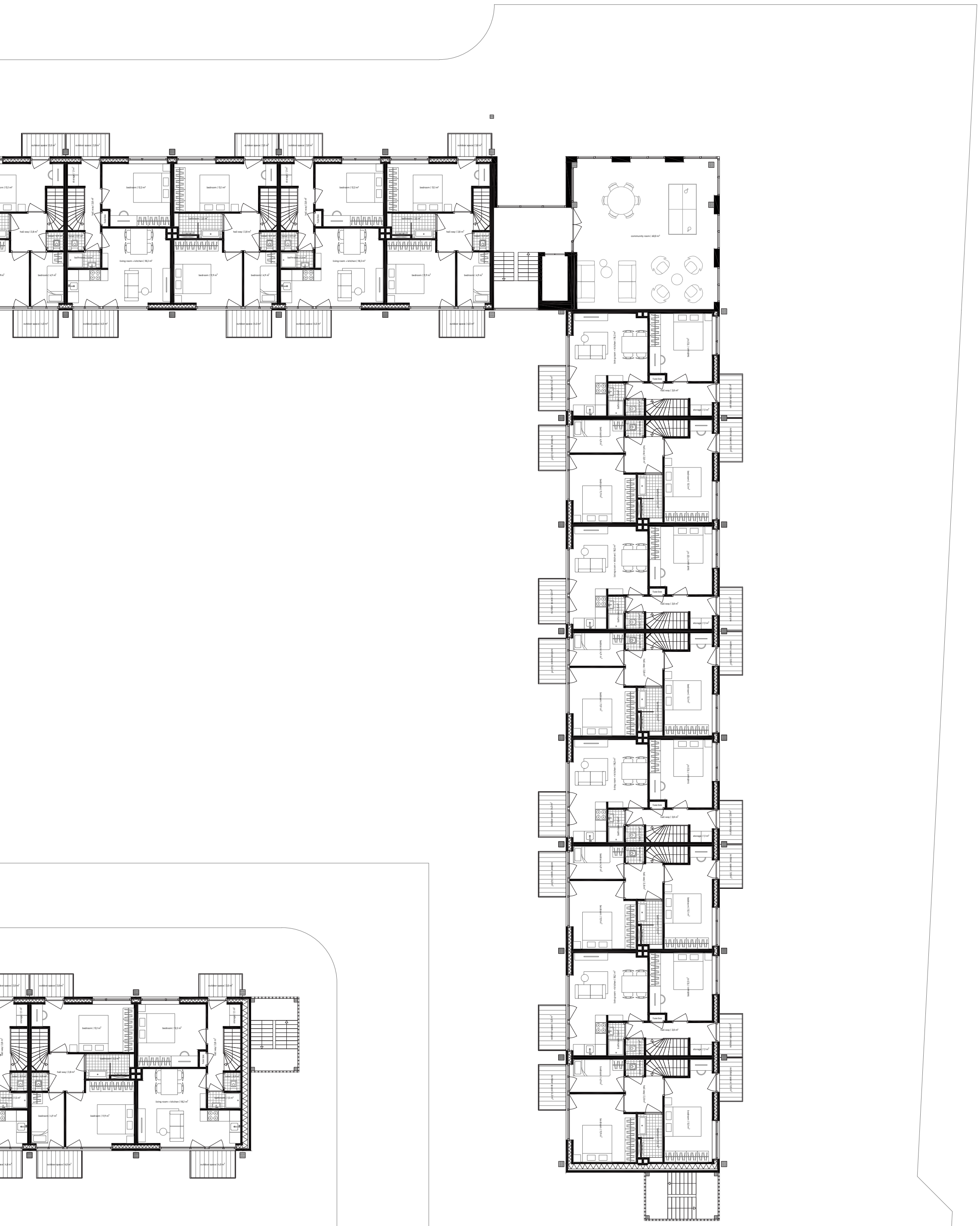


00 I GROUND FLOOR

7.3 NEW SITUATION PLANS

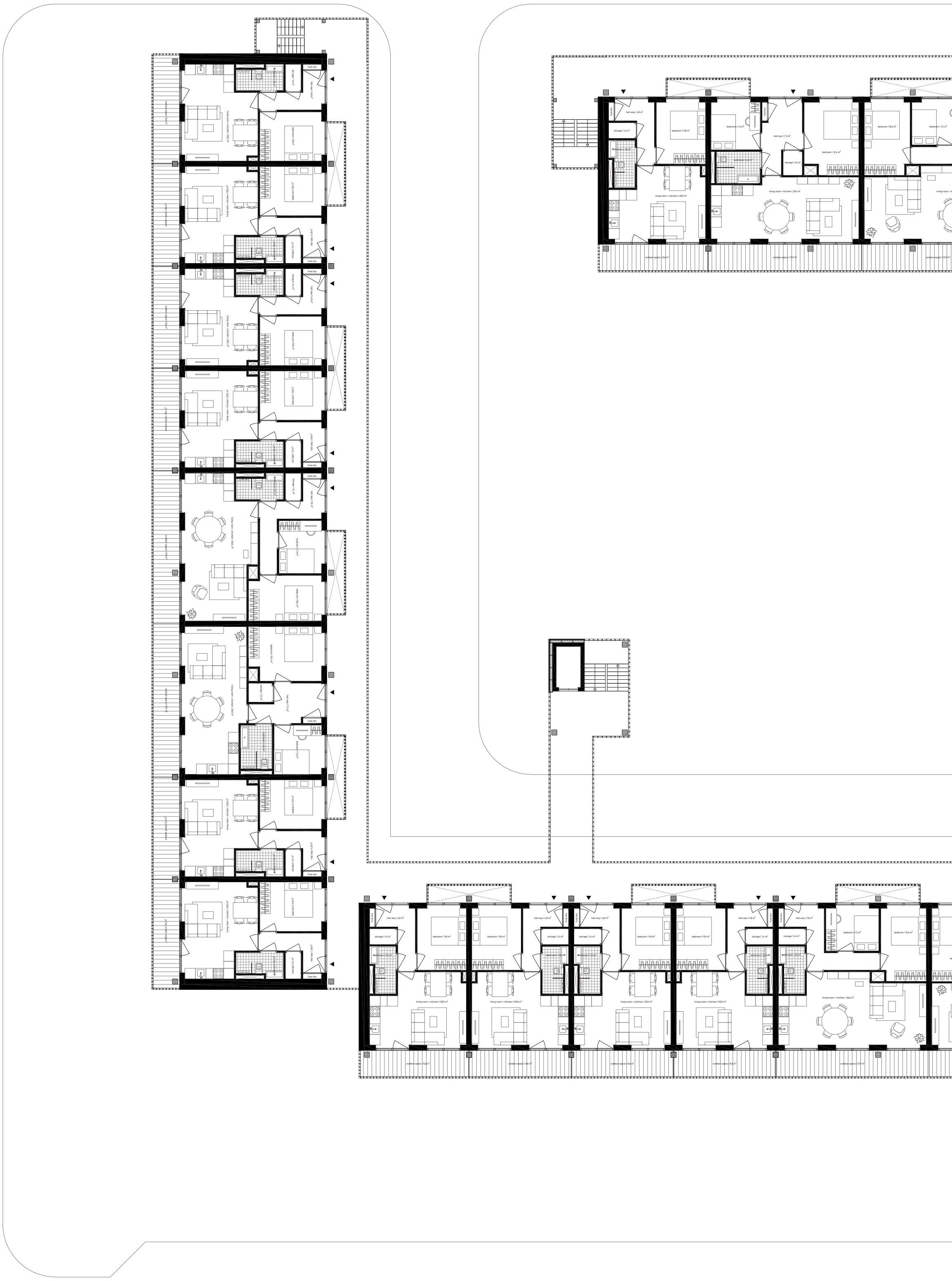
Floor plan (A2 I 1:250) of the first floor of the duplex dwellings in the Louis Couperus neighborhood.

01 I FIRST FLOOR

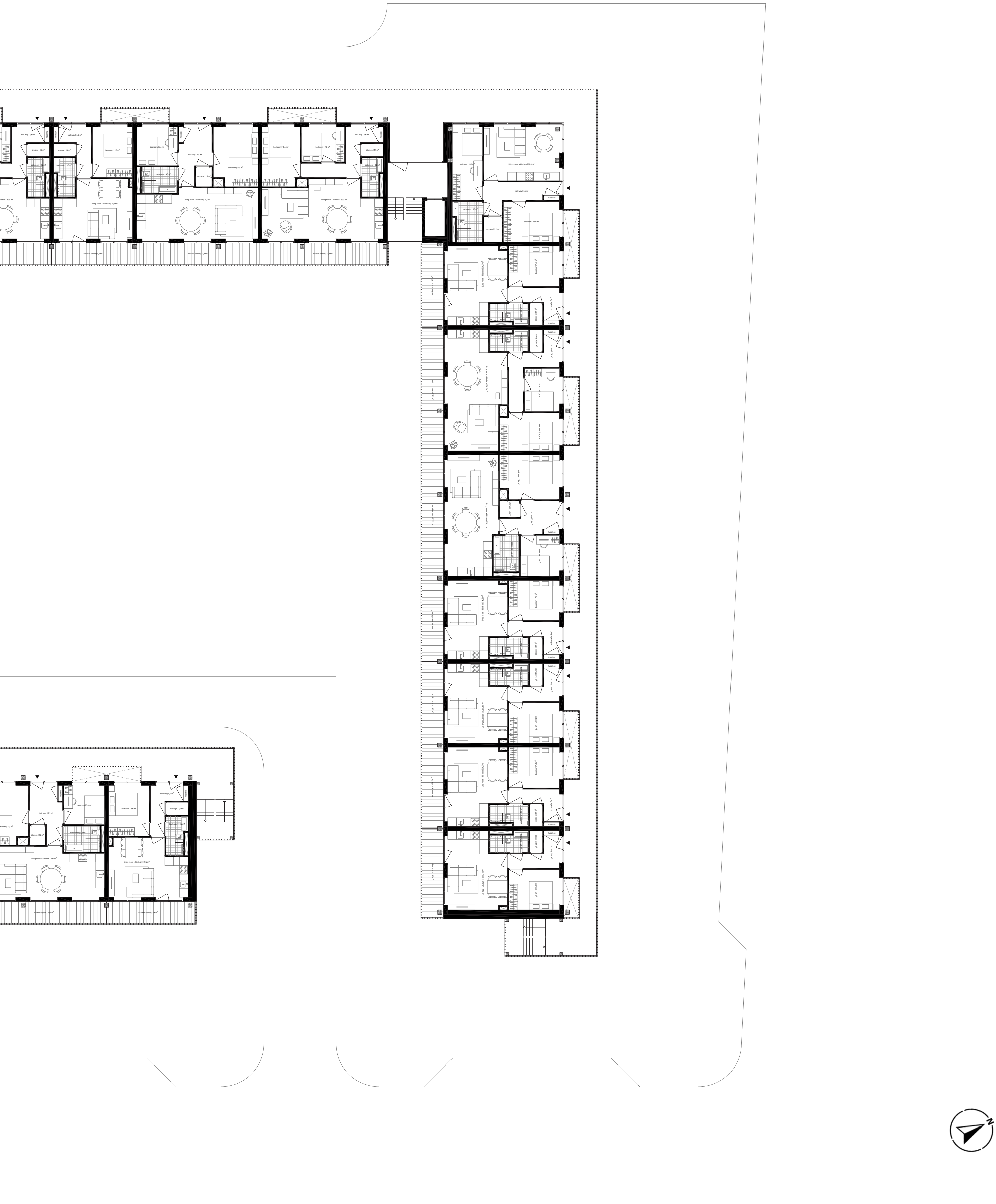


7.3 NEW SITUATION PLANS

Floor plan (A2 I 1:250) of the second floor of the new roof stacking dwellings in the Louis Couperus neighborhood.

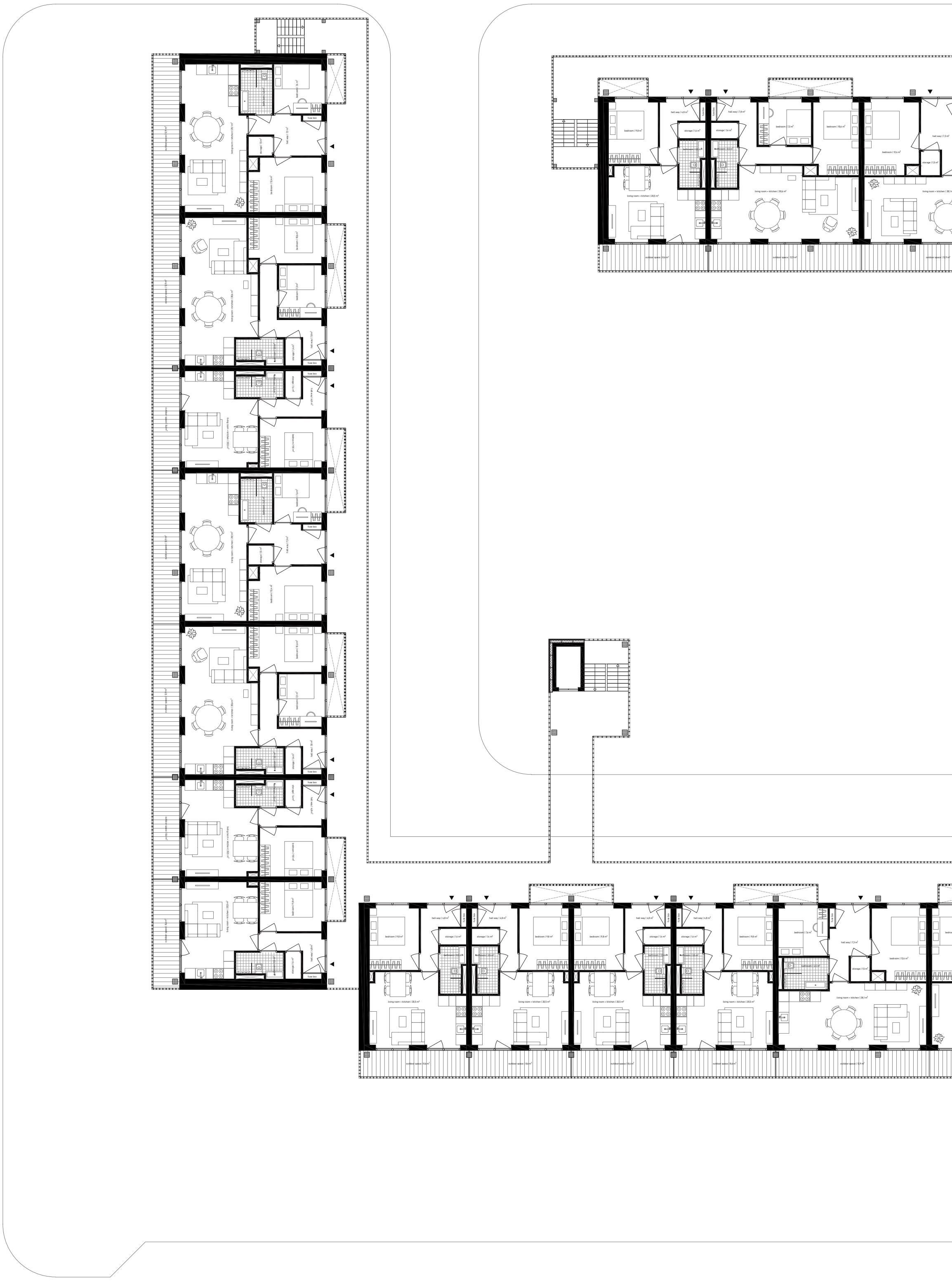


02 I SECOND FLOOR



7.3 NEW SITUATION PLANS

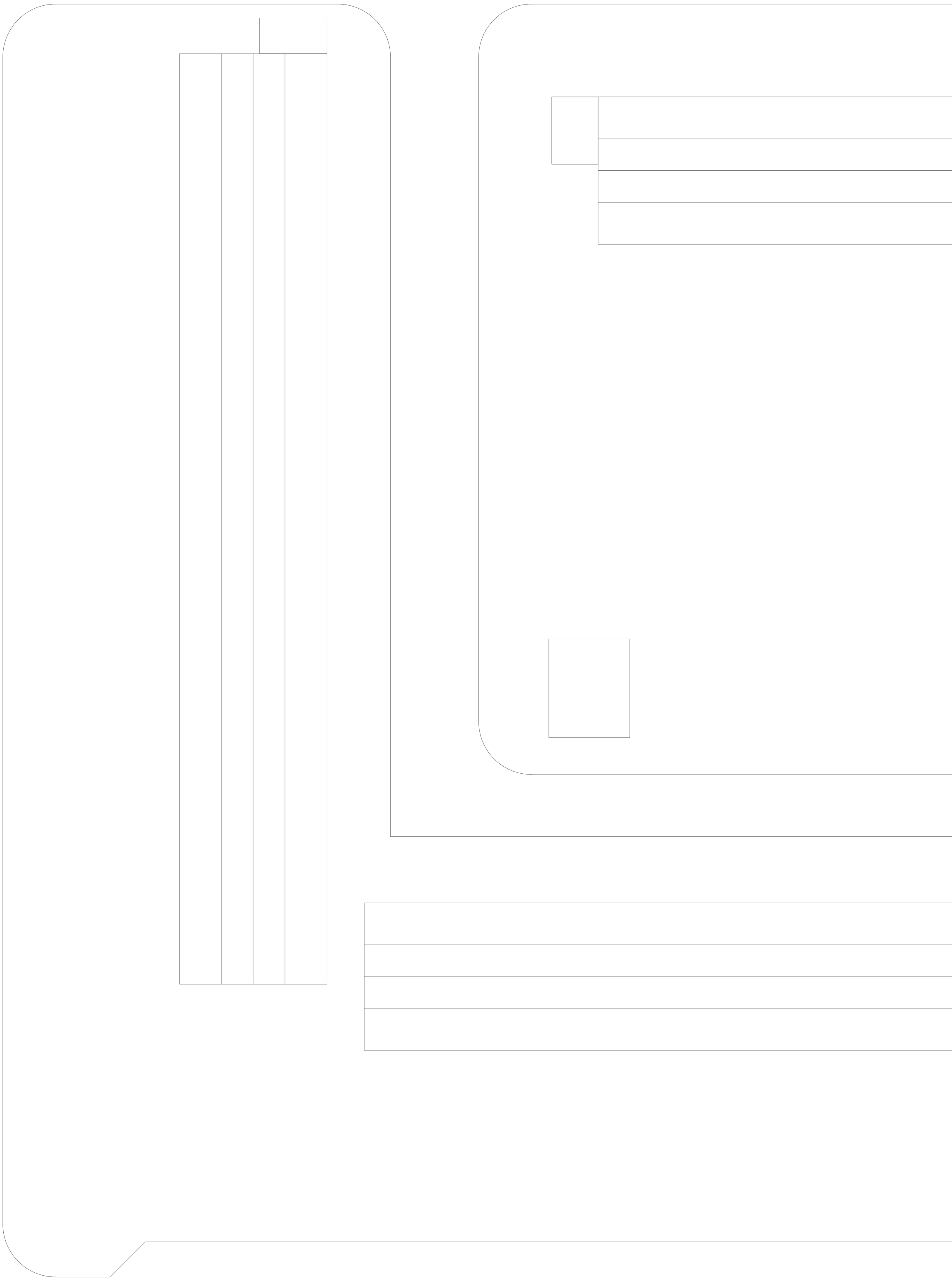
Floor plan (A2 I 1:250) of the third floor of the new roof stacking dwellings in the Louis Couperus neighborhood.



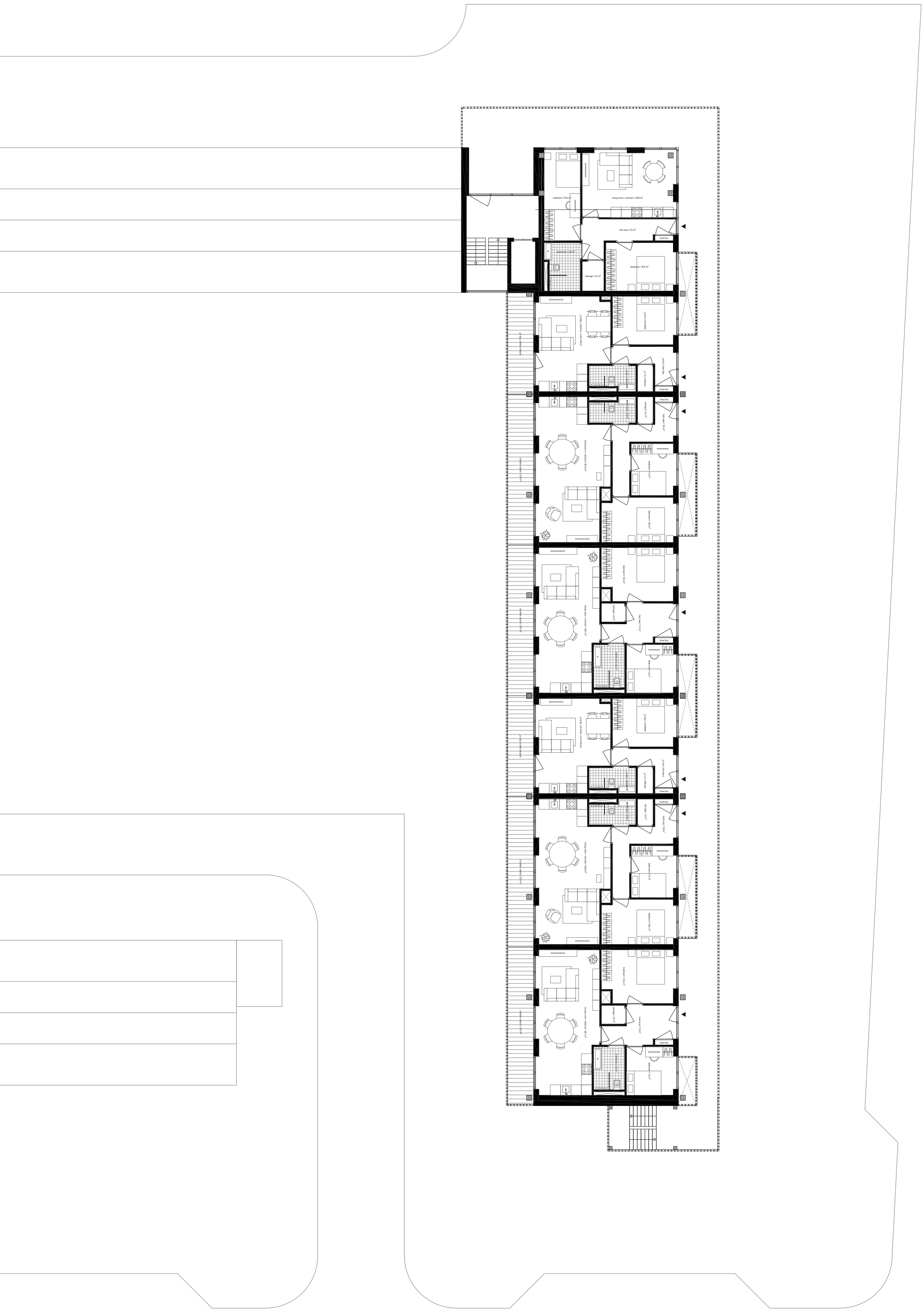
03 I THIRD FLOOR

7.3 NEW SITUATION PLANS

Floor plan (A2 I 1:250) of the fourth floor of the new roof stacking dwellings in the Louis Couperus neighborhood.

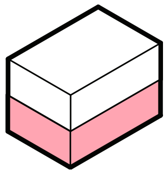


04 I FOURTH FLOOR

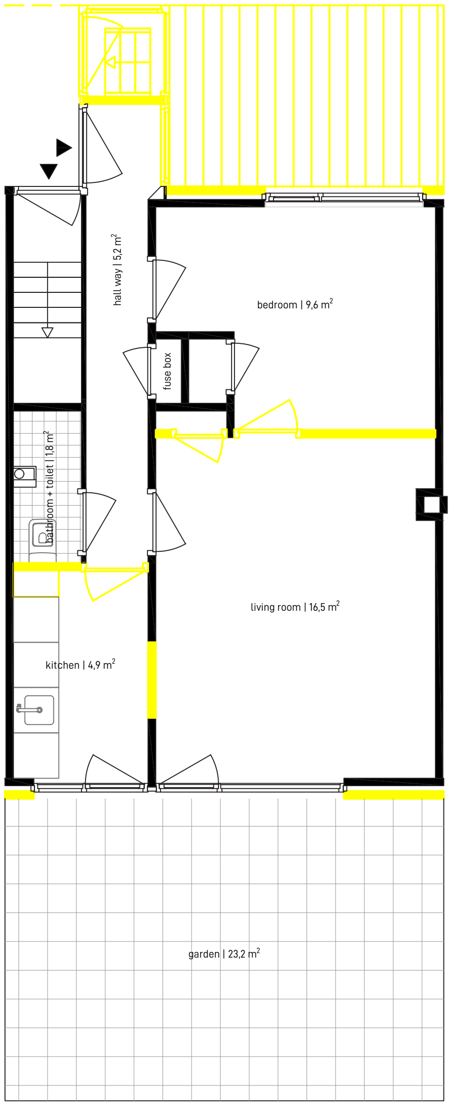


7.3 NEW SITUATION PLANS

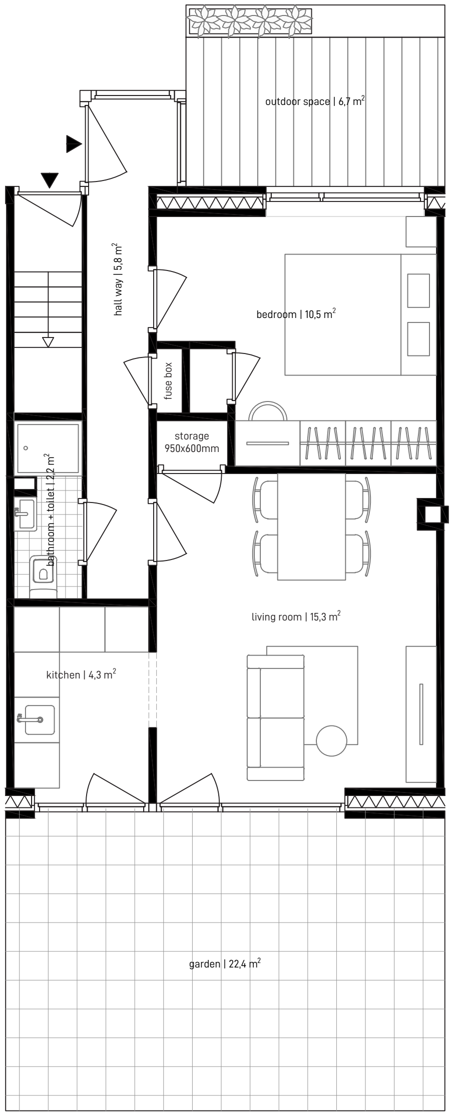
Floor plans (A3 I 1:100) of the ground and first floor of the renovated duplex dwellings in the Louis Couperus neighborhood.



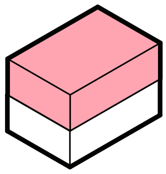
Demolition current ground floor



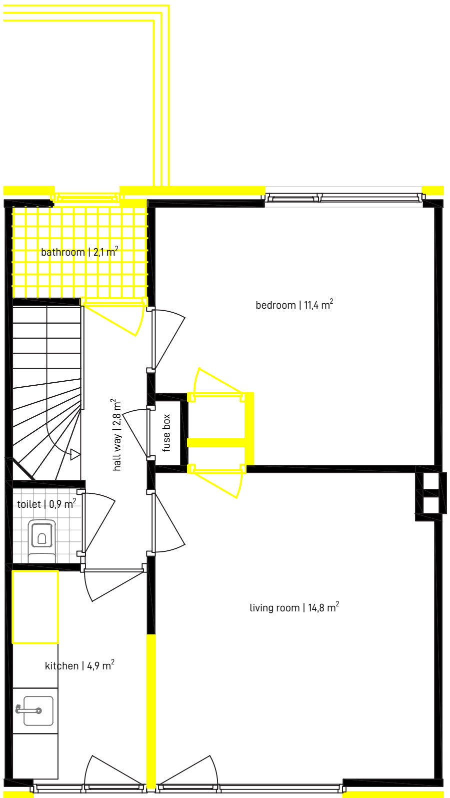
New ground floor



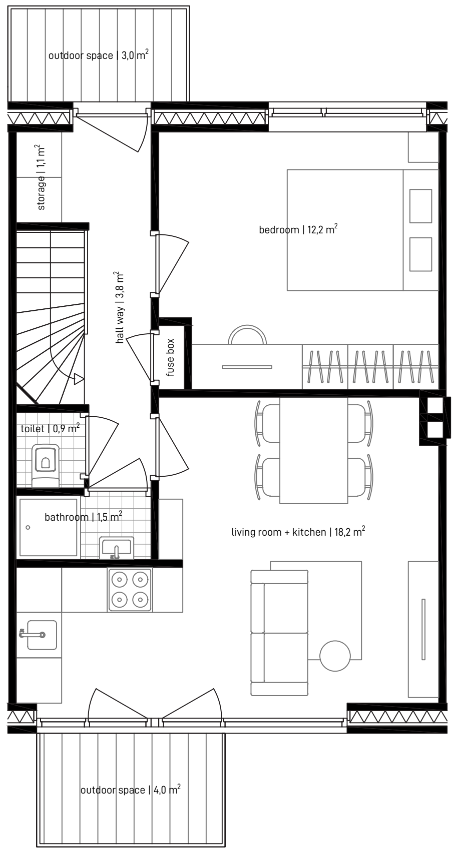
Demolish



Demolition current first floor



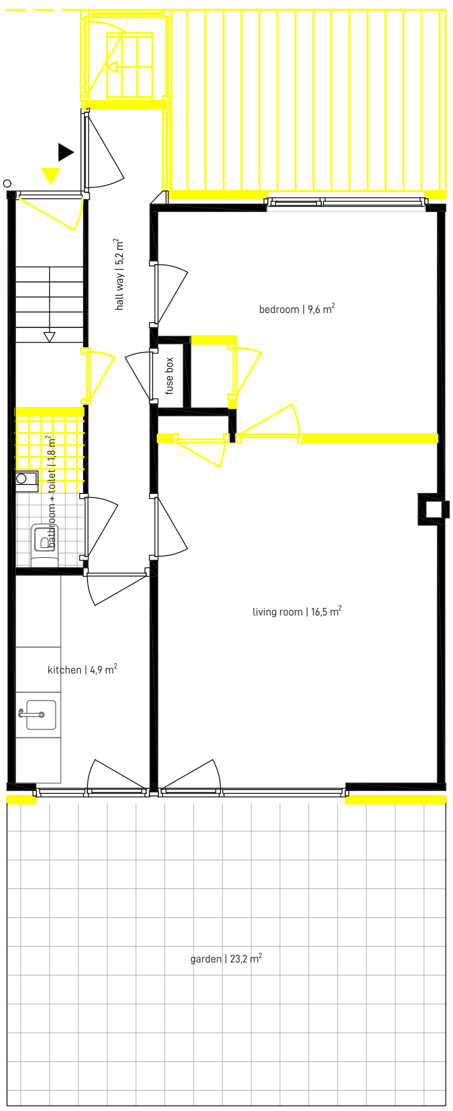
New first floor



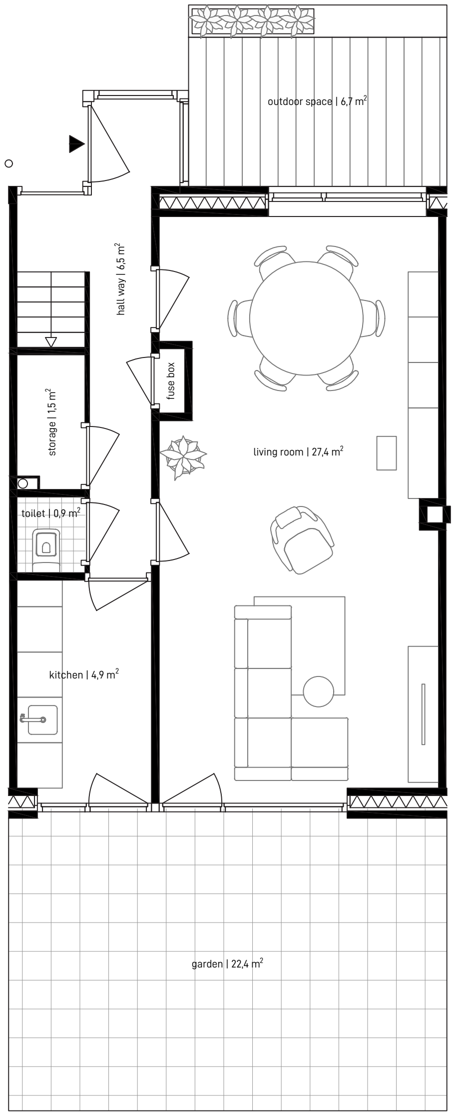
7.3 NEW SITUATION PLANS

Floor plans (A3 I 1:100) of the ground and first floor of the renovated duplex dwellings into one dwelling in the Louis Couperus neighborhood.

Demolition current ground floor

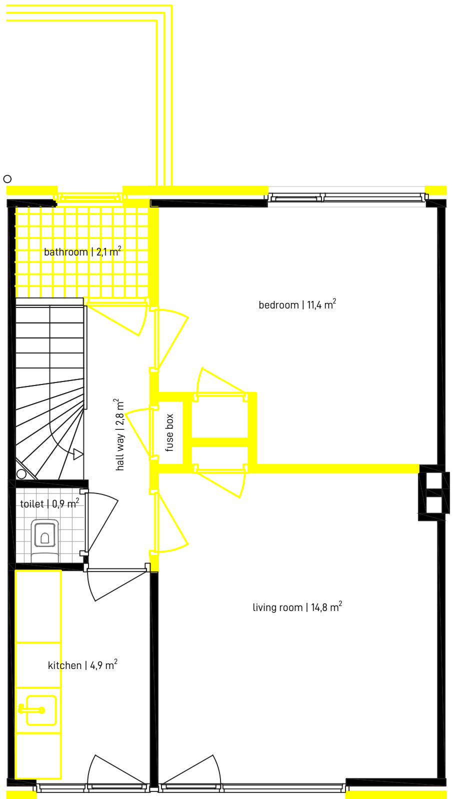


New ground floor

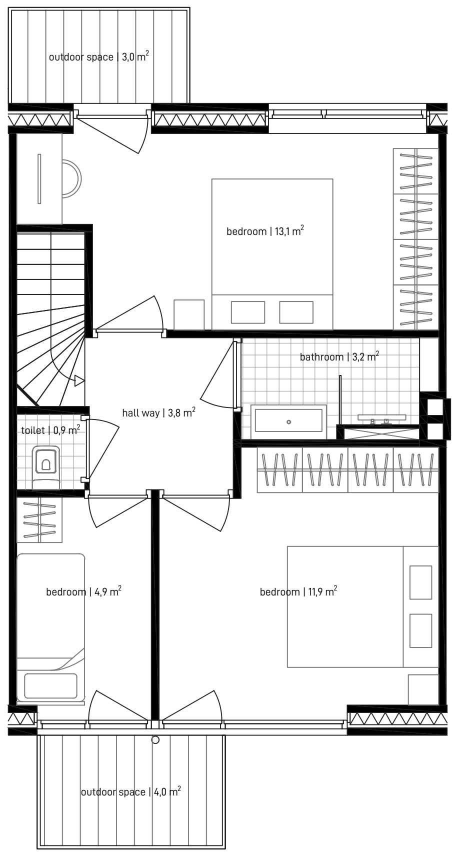


Demolish

Demolition current first floor

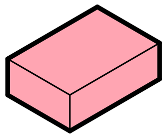


New first floor

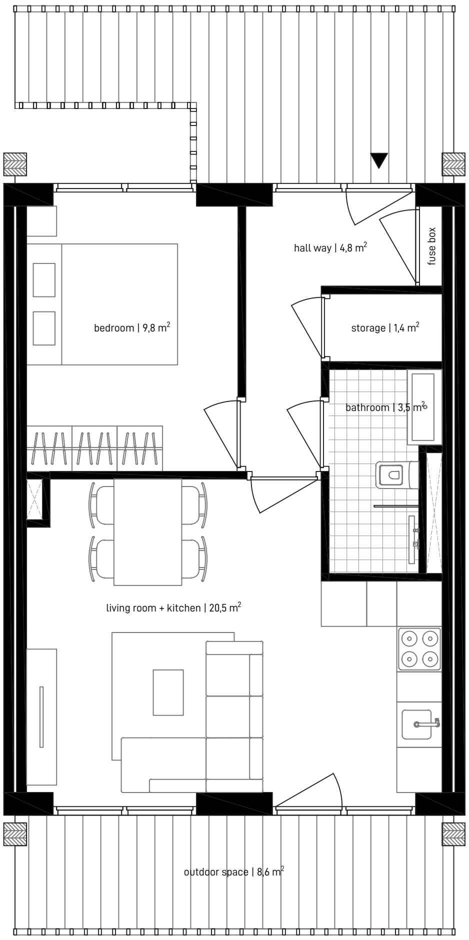


7.3 NEW SITUATION PLANS

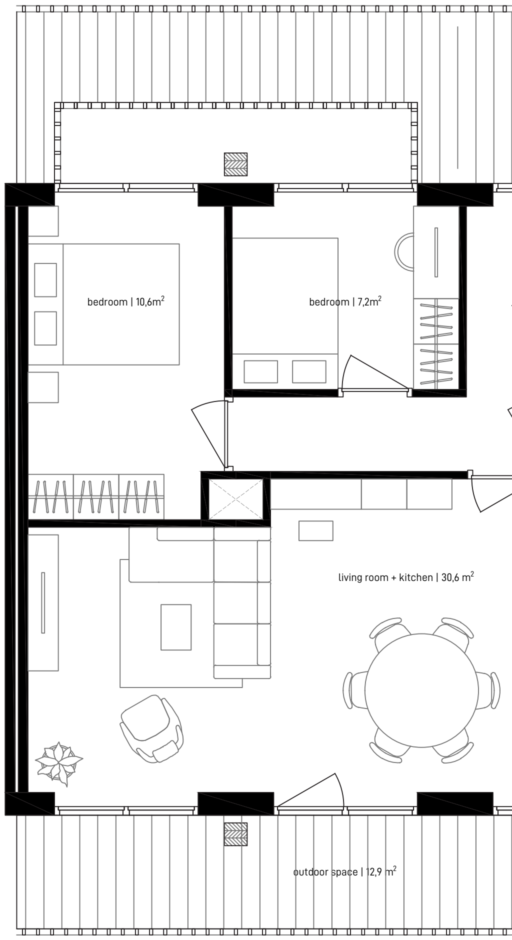
Floor plans (A3 I 1:100) of the new roof stacking dwellings on the second, third and fourth floor in the Louis Couperus neighborhood.

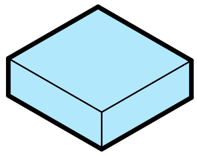


Floorplan new 40m^2 dwelling

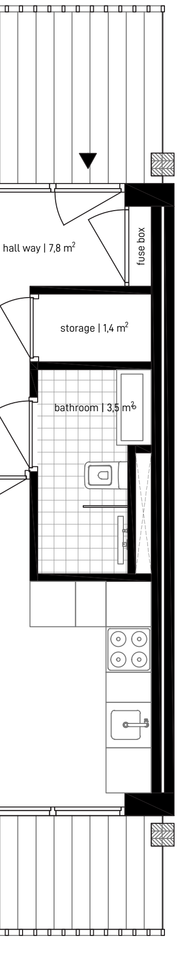


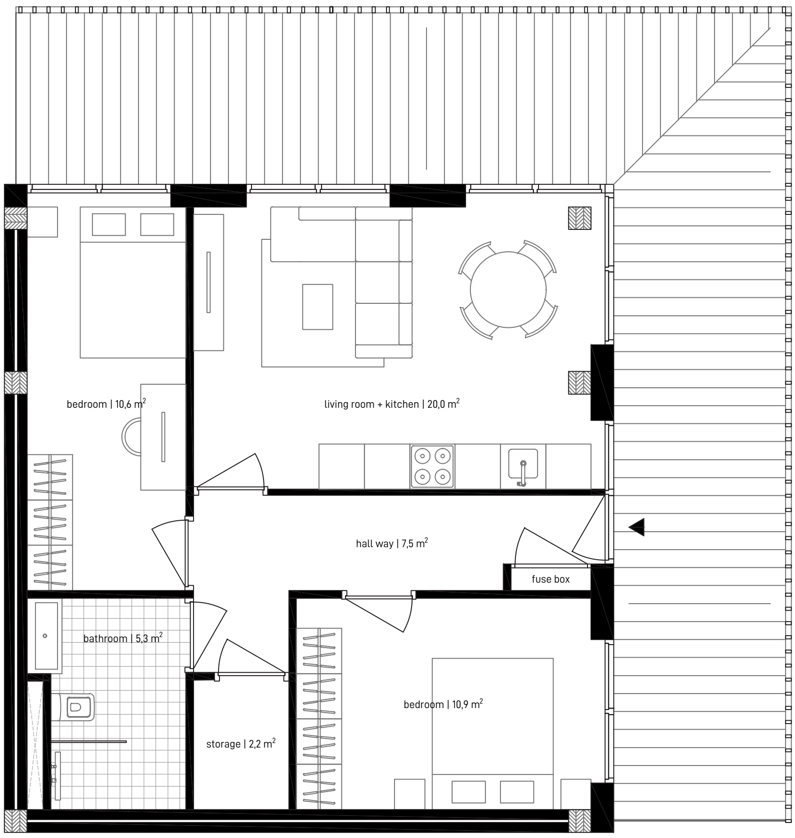
Floorplan new 60m^2 dwelling





Floorplan new 60m^2 corner dwelling





7.3 NEW SITUATION PLANS

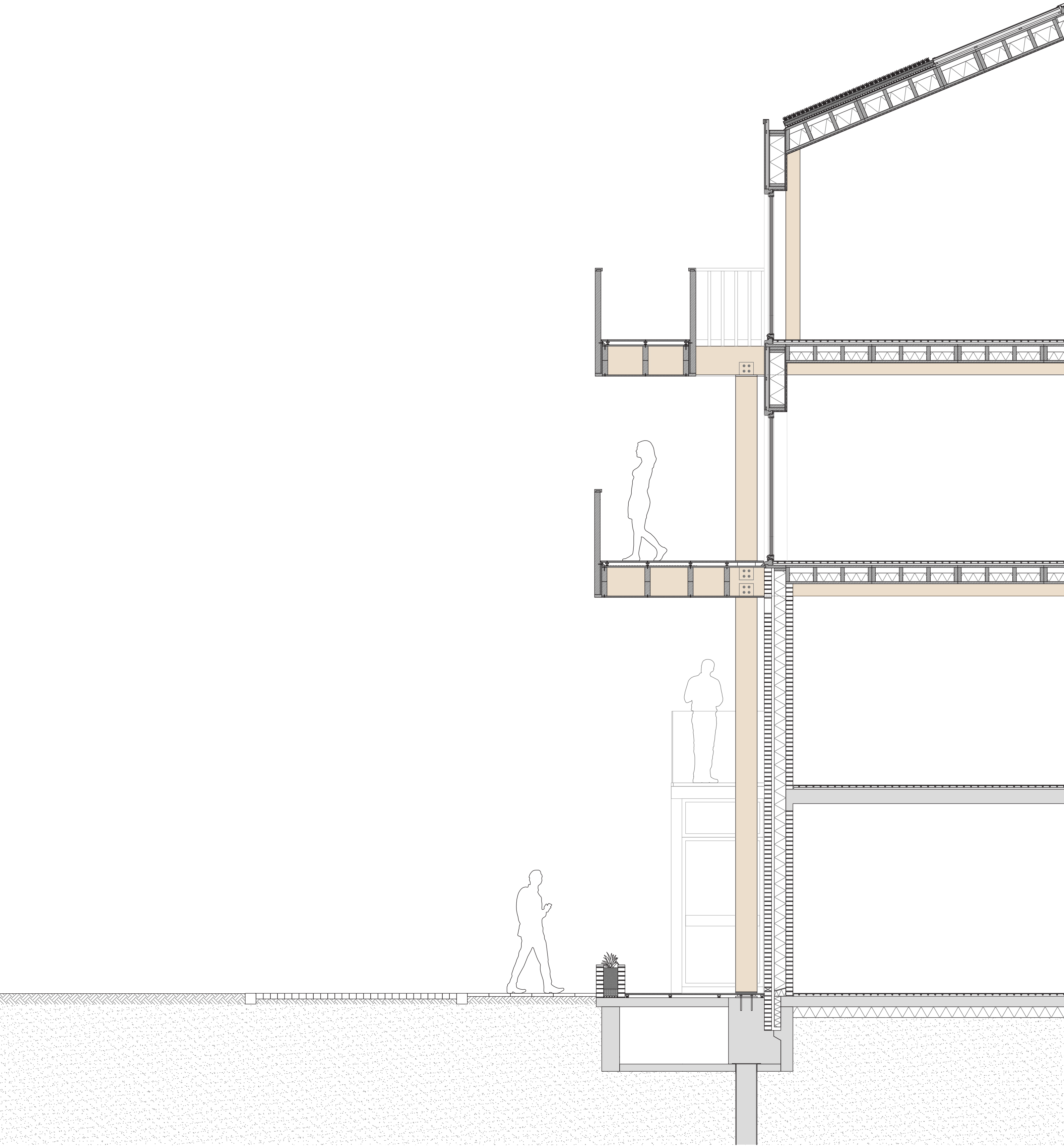
Elevations (A2 I 1:50) of the front and back facade of the new situation in the Louis Couperus neighborhood.

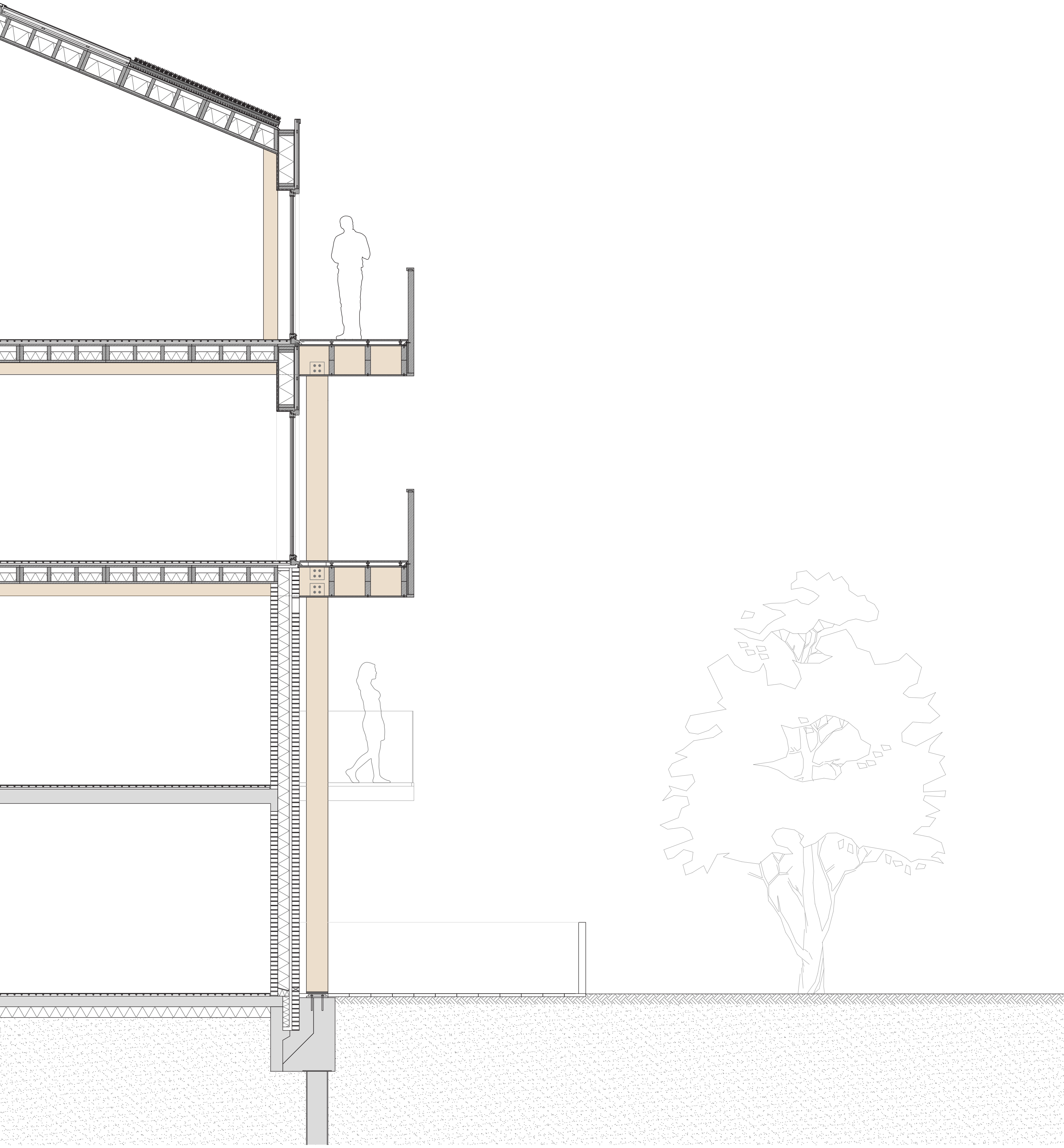
Front facade

Back facade

7.3 NEW SITUATION PLANS

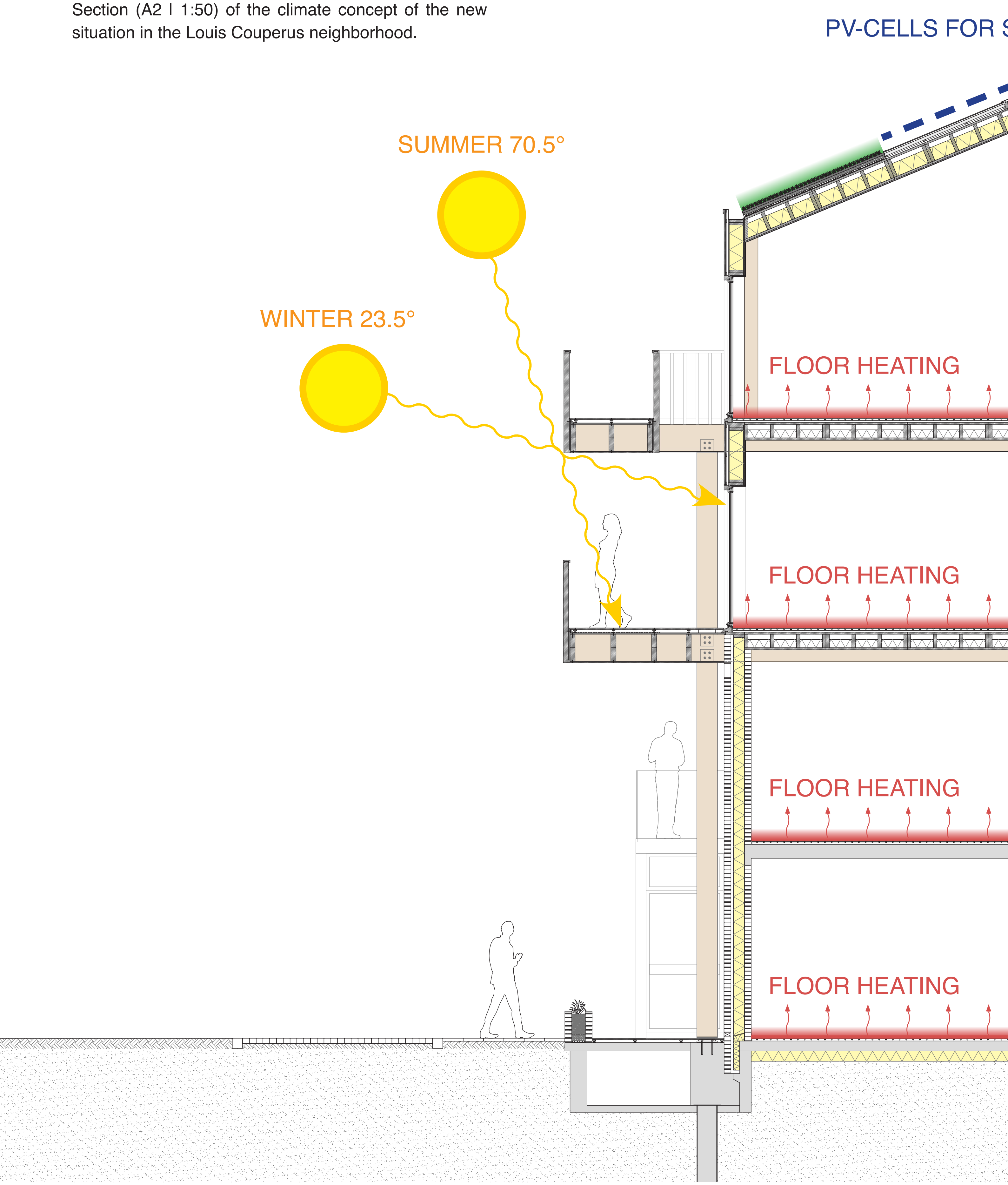
Section (A2 I 1:50) of the new situation in the Louis Couperus neighborhood.

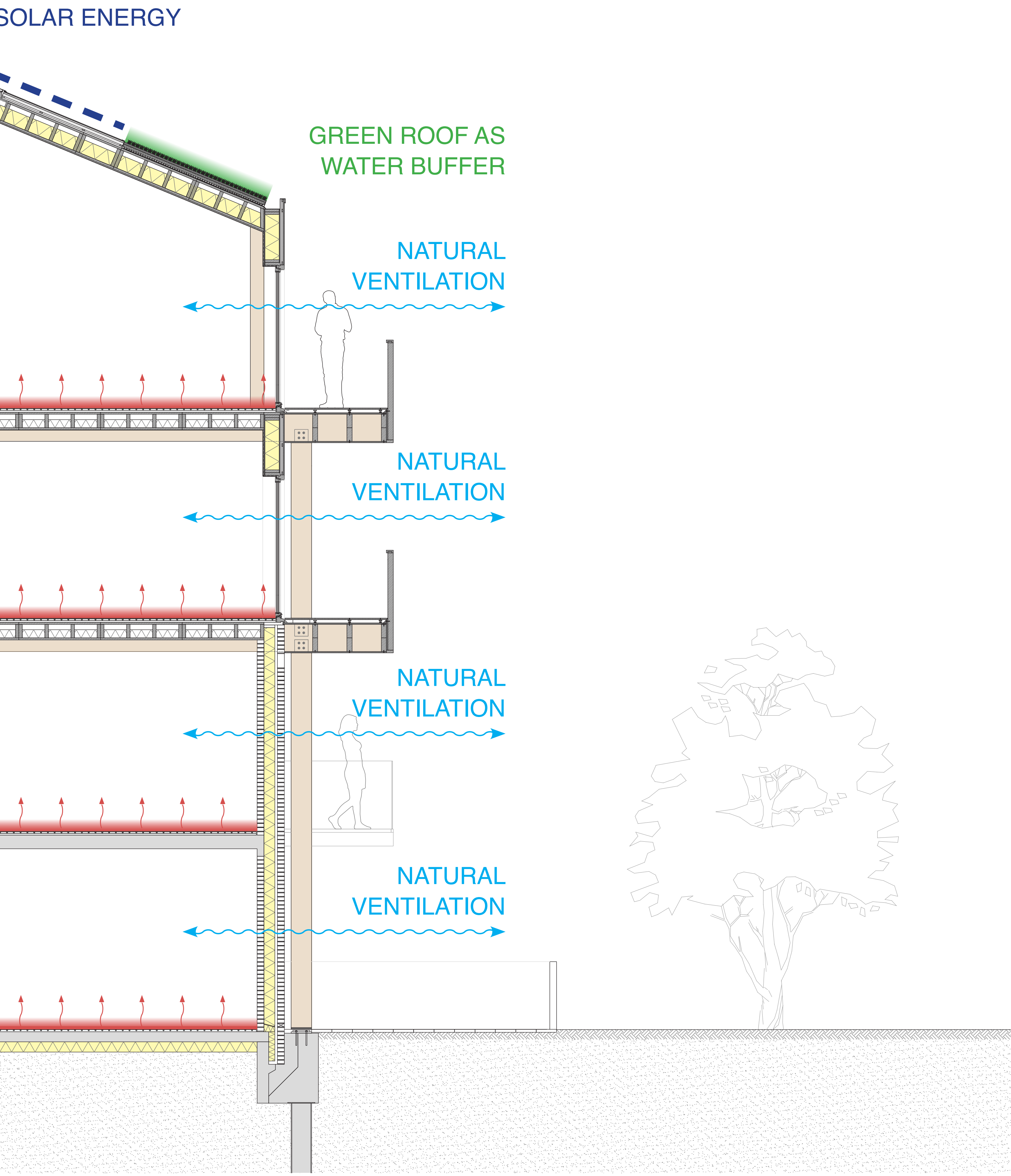




7.3 NEW SITUATION PLANS

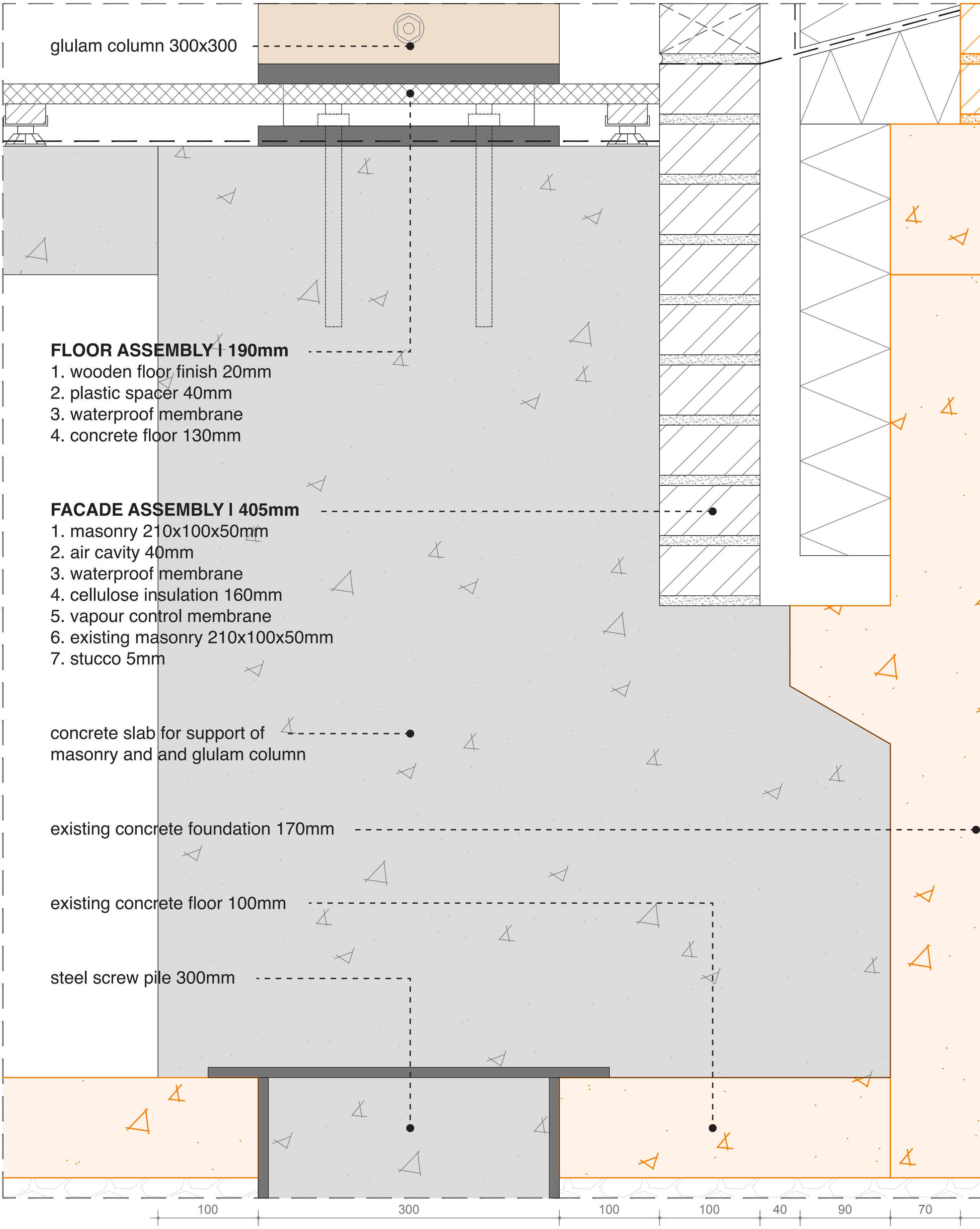
Section (A2 I 1:50) of the climate concept of the new situation in the Louis Couperus neighborhood.

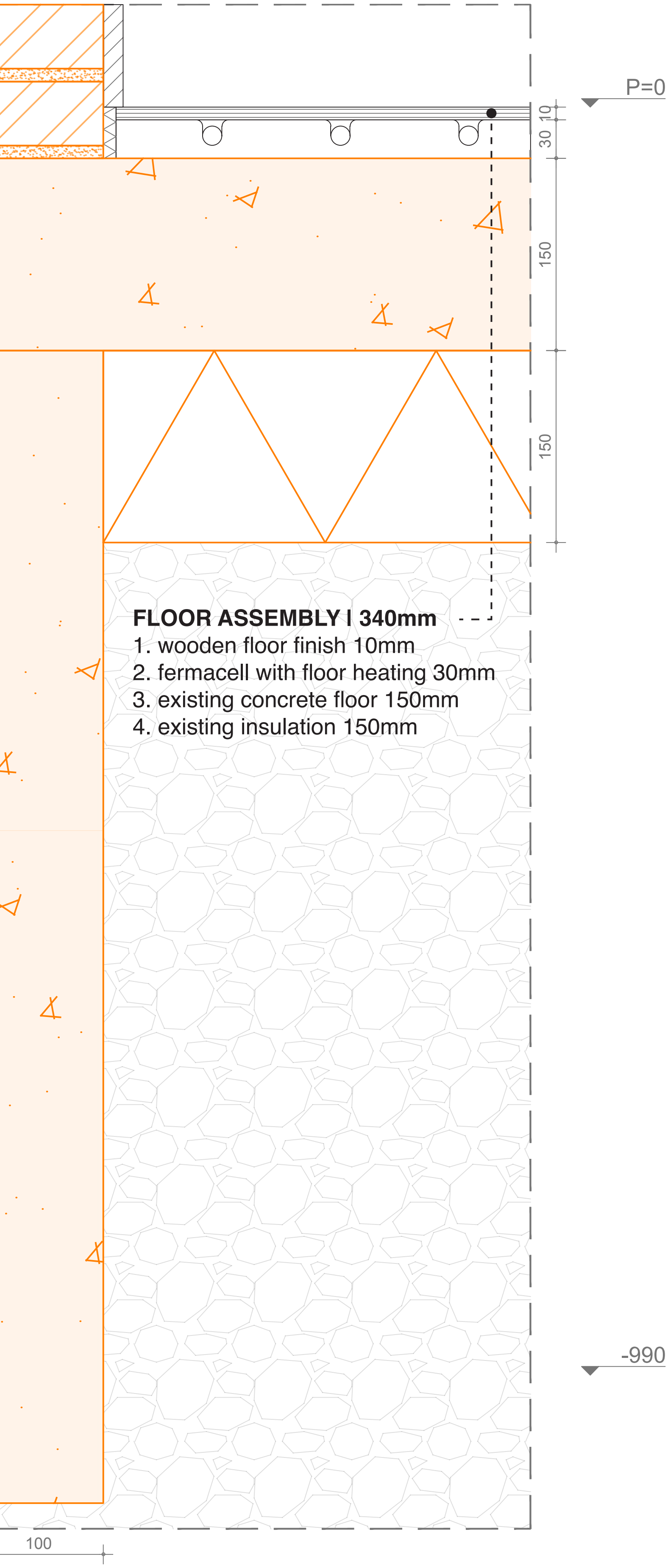


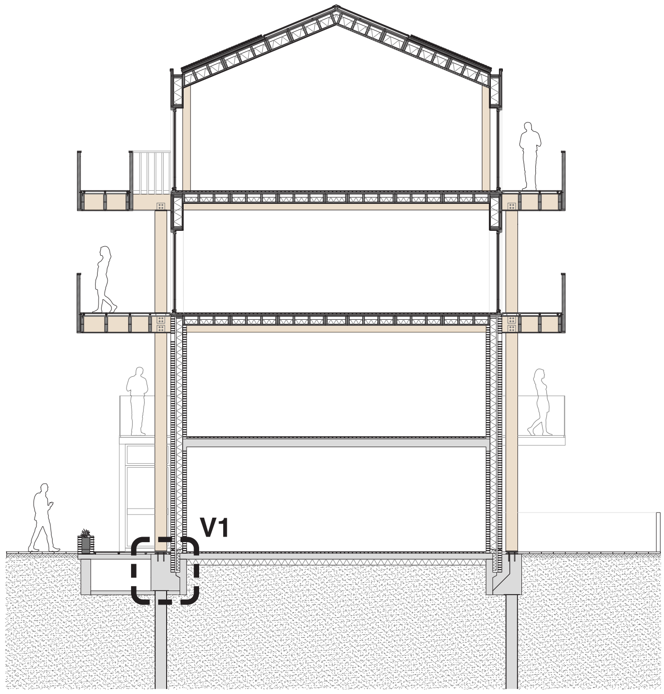

SOLAR ENERGY
GREEN ROOF AS
WATER BUFFER
NATURAL
VENTILATION
NATURAL
VENTILATION
NATURAL
VENTILATION
NATURAL
VENTILATION

7.4 NEW SITUATION DETAILS

Detail V1 (A3 I 1:5) of the ground floor.







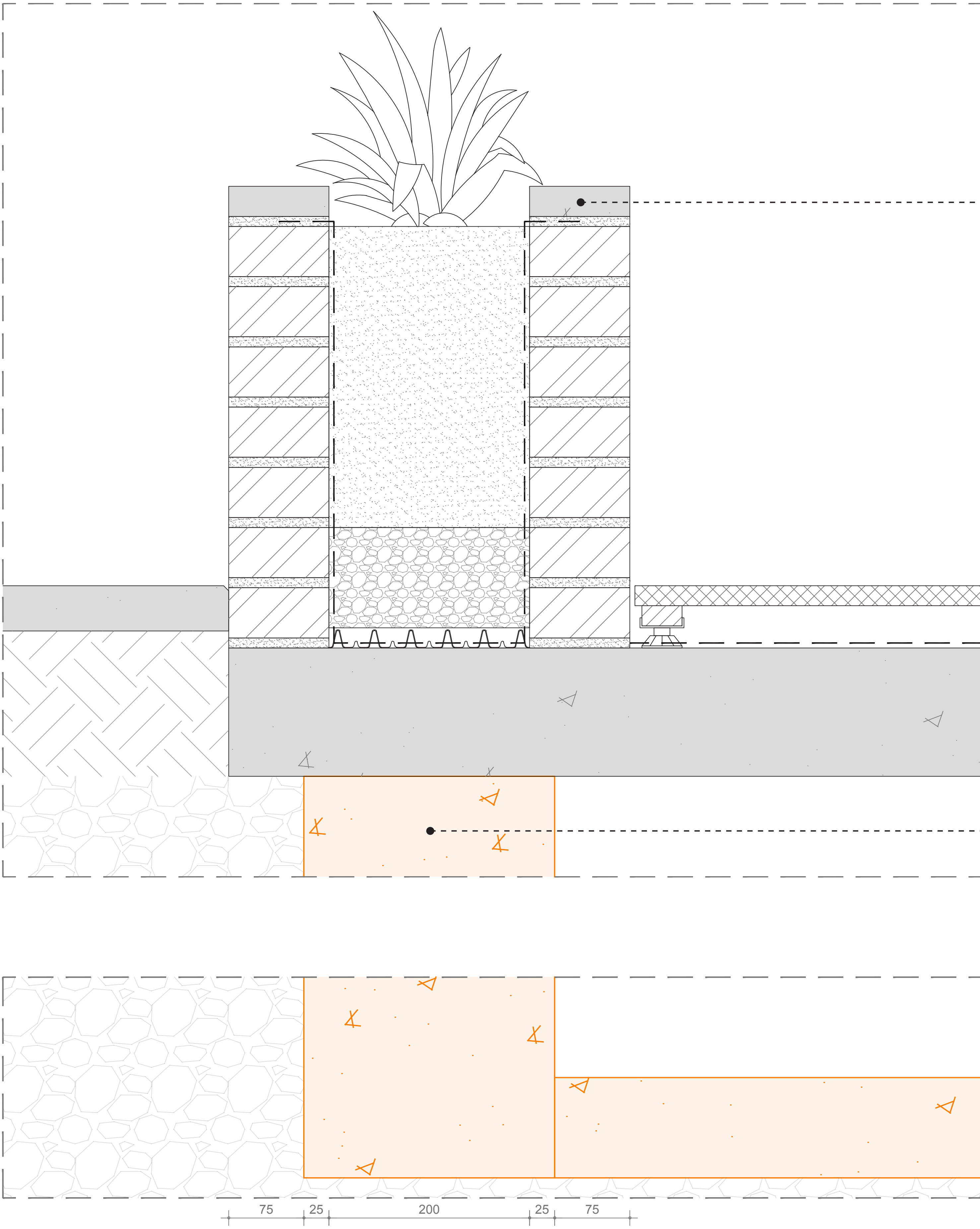
Existing

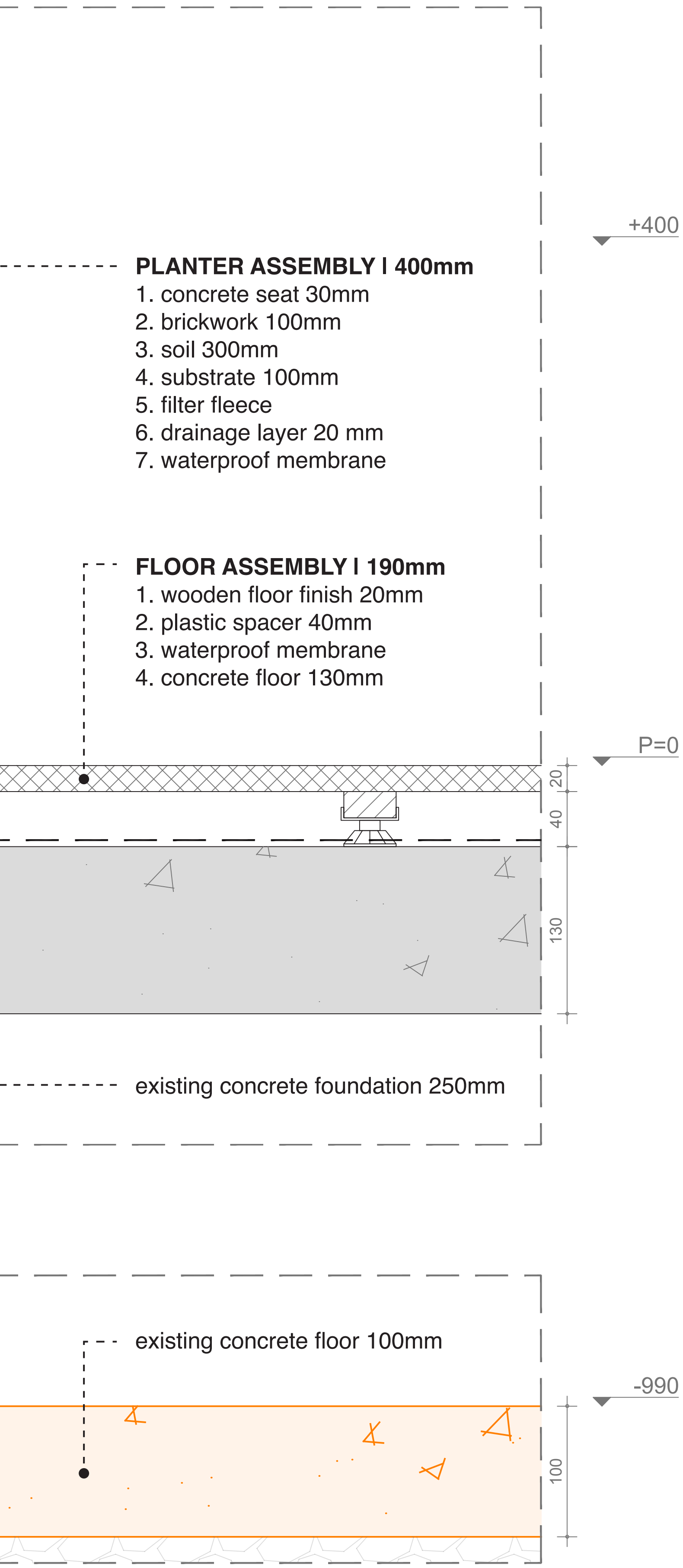
Glulam structure

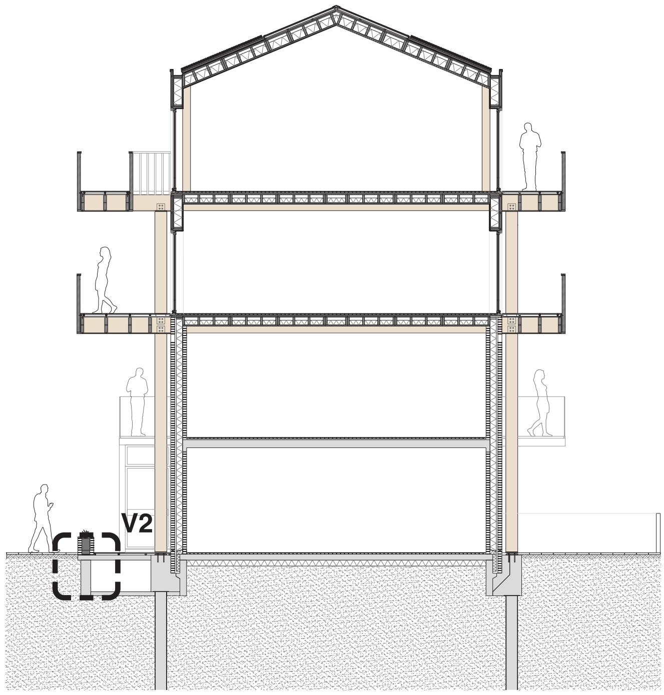
Concrete

7.4 NEW SITUATION DETAILS

Detail V2 (A3 I 1:5) of the ground floor.







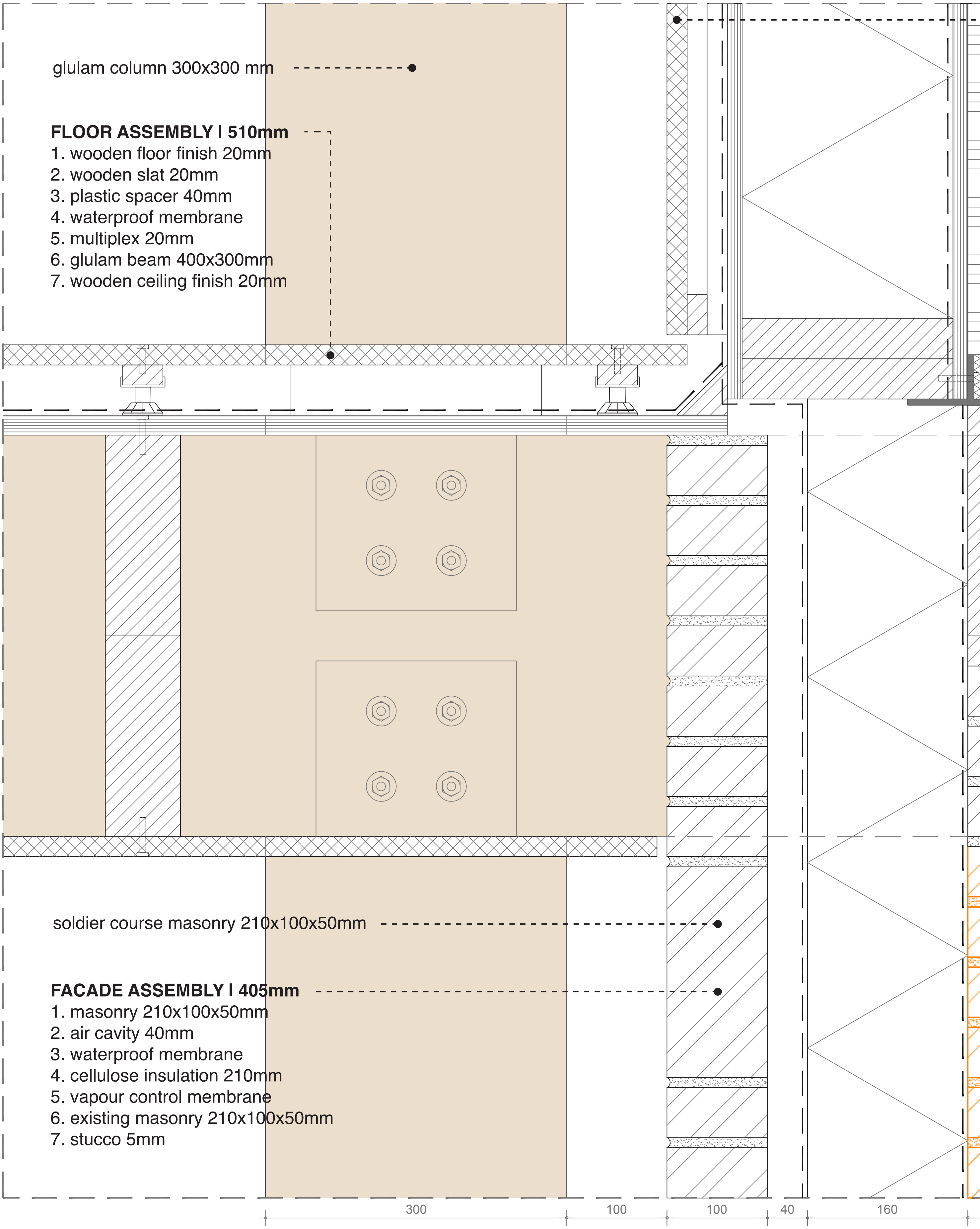
Existing

Glulam structure

Concrete

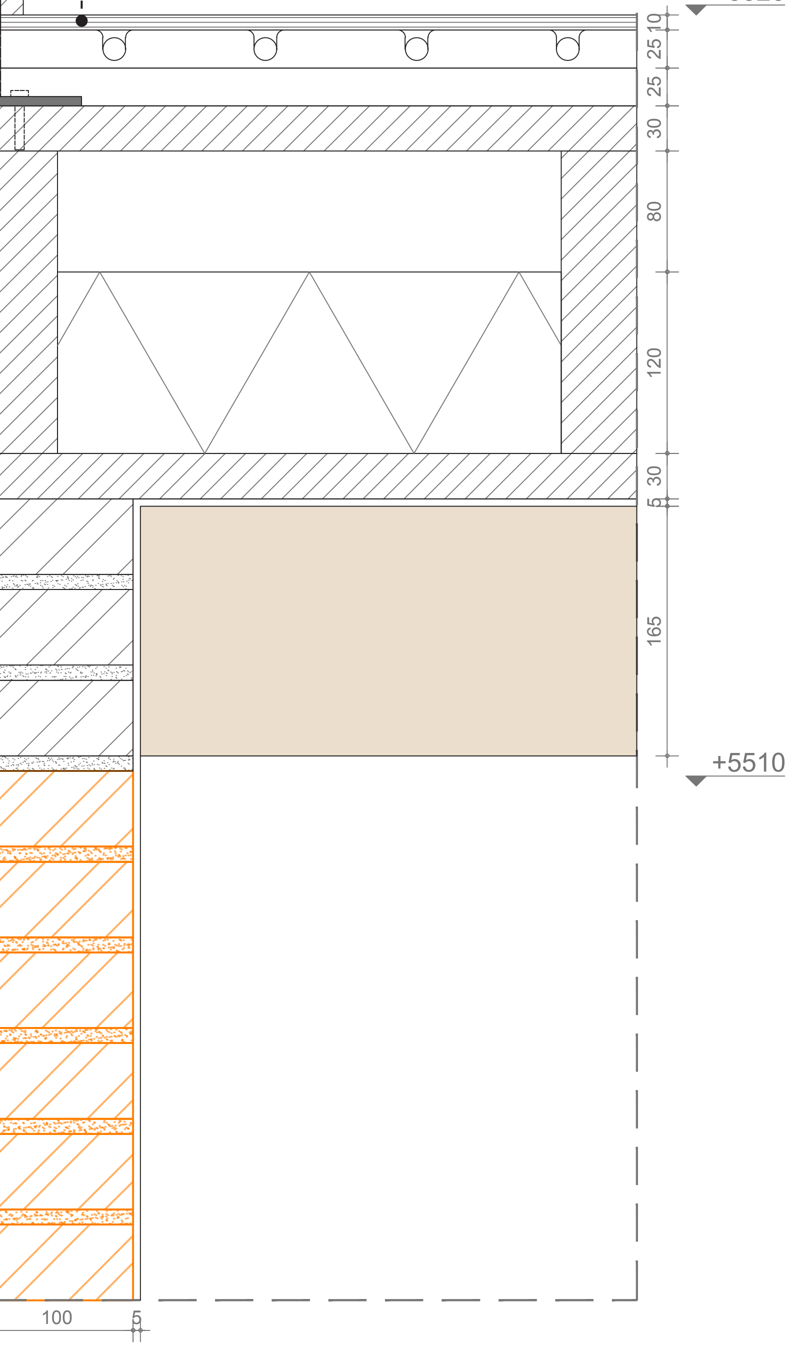
7.4 NEW SITUATION DETAILS

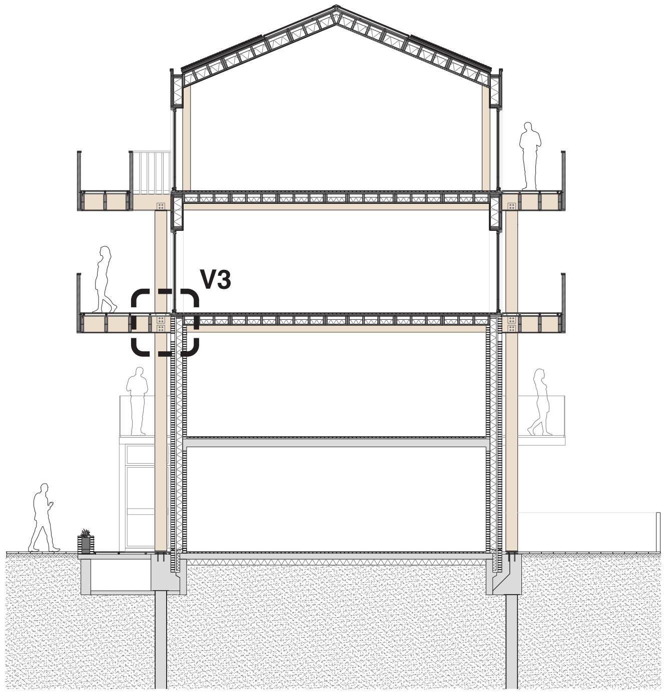
Detail V3 (A3 I 1:5) of the first floor facade



FACADE ASSEMBLY I 317.5mm
1. wooden cladding 20mm
2. wooden framework 40mm
3. waterproof membrane
4. multiplex 15mm
5. cellulose insulation 210mm
6. vapour control membrane
7. multiplex 15mm
8. plasterboard 12.5mm
9. stucco 5mm

FLOOR ASSEMBLY I 325mm
1. wooden floor finish 10mm
2. fermacell with floor heating 50mm
3. prefab kerto-ripa element 260mm
4. stucco 5mm

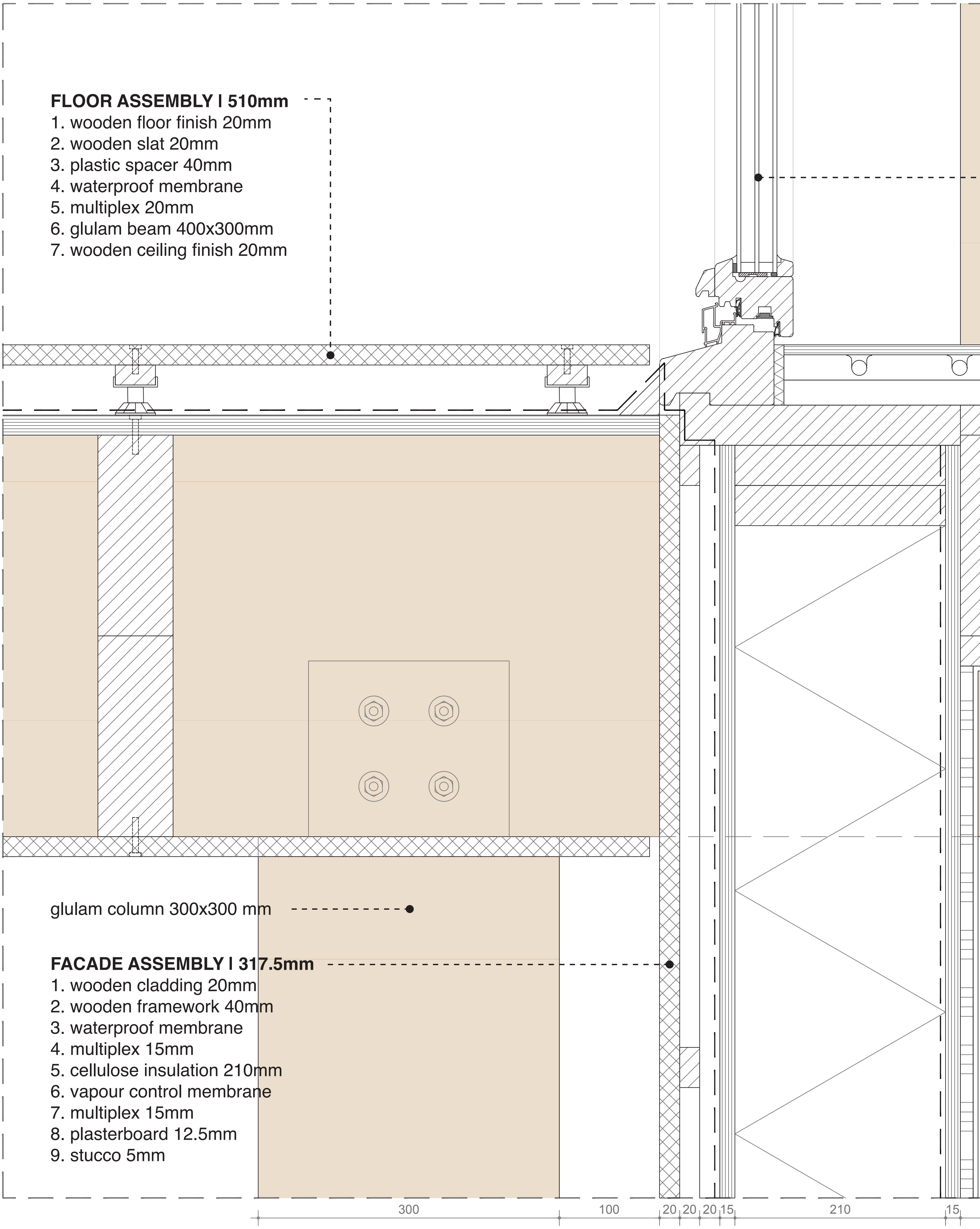


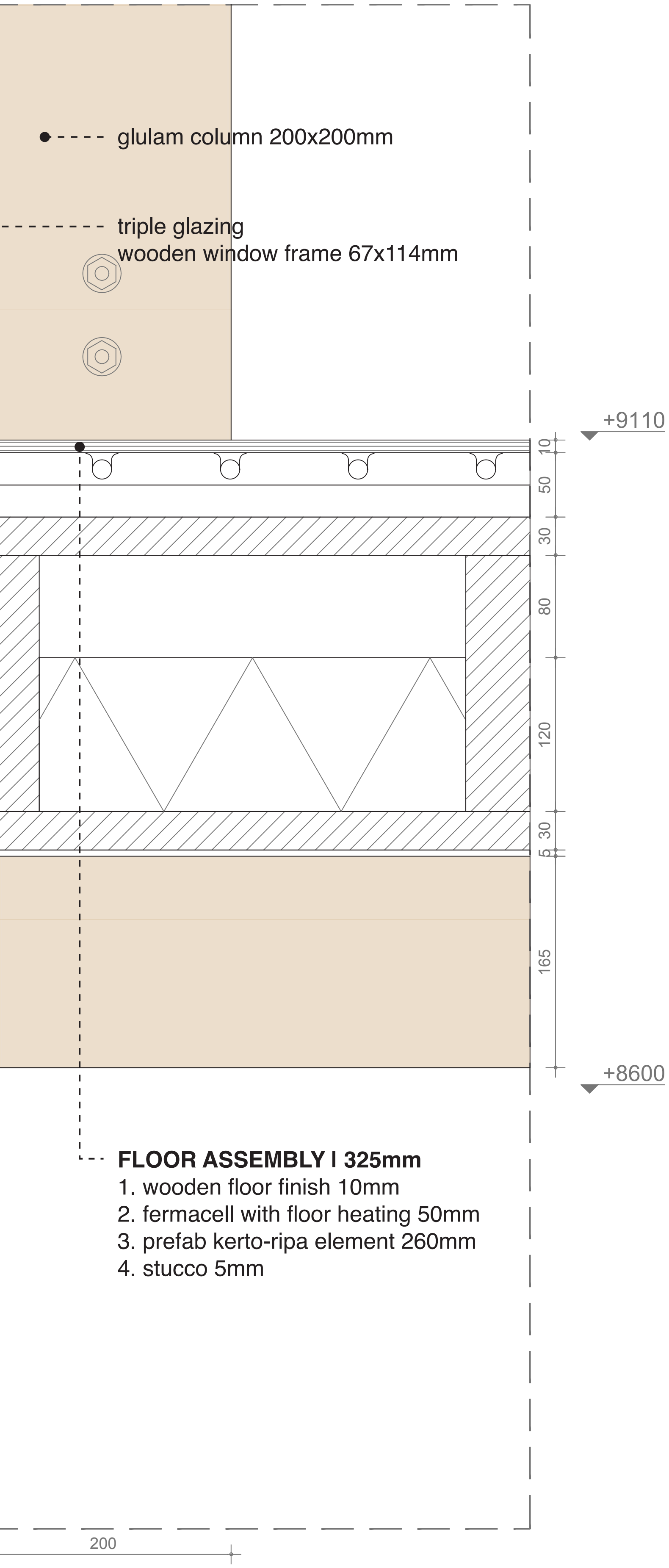


- Existing
- Glulam structure
- Concrete

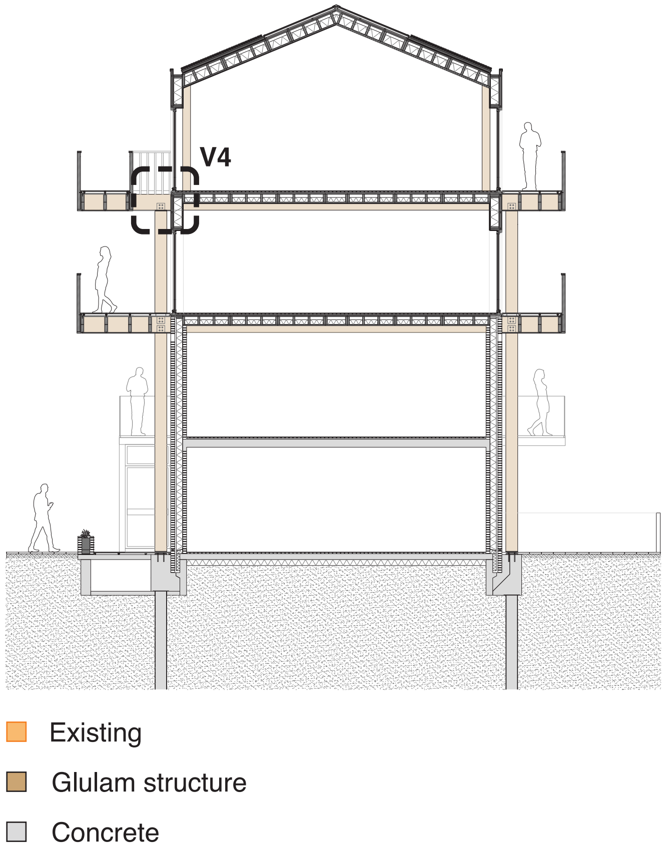
7.4 NEW SITUATION DETAILS

Detail V4 (A3 I 1:5) of the second floor facade



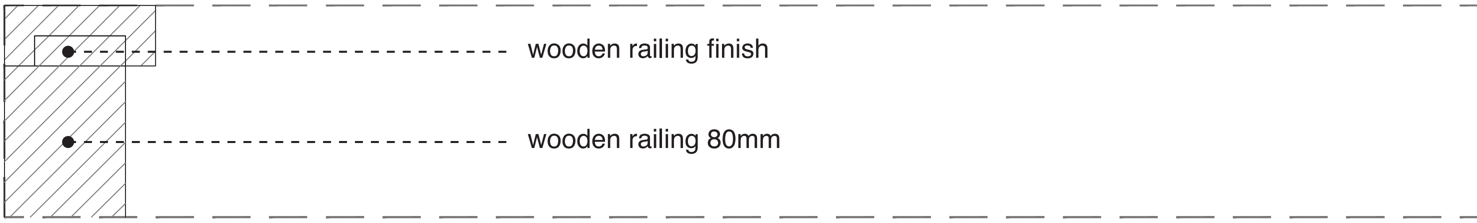


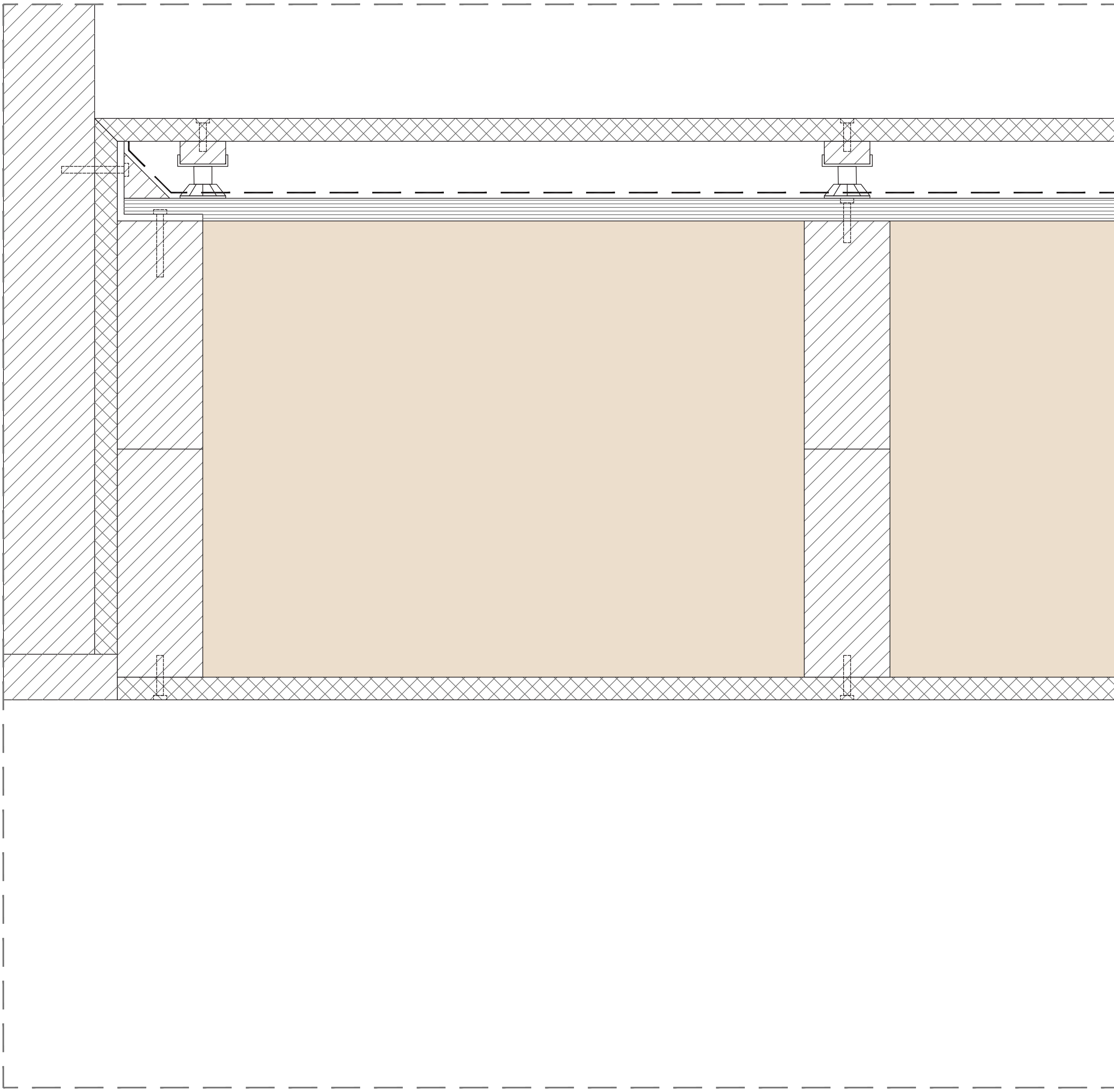
FLOOR ASSEMBLY I 325mm
1. wooden floor finish 10mm
2. fermacell with floor heating 50mm
3. prefab kerto-ripa element 260mm
4. stucco 5mm

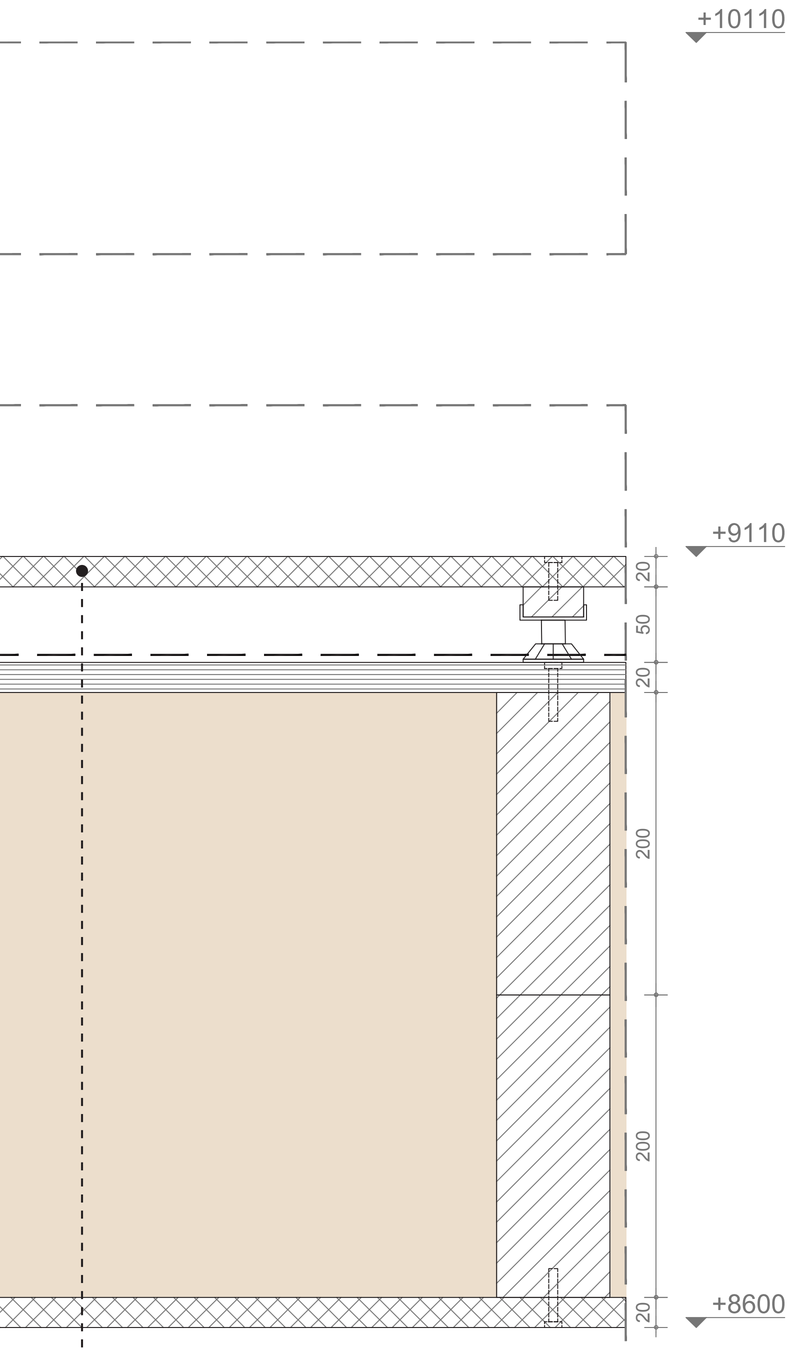


7.4 NEW SITUATION DETAILS

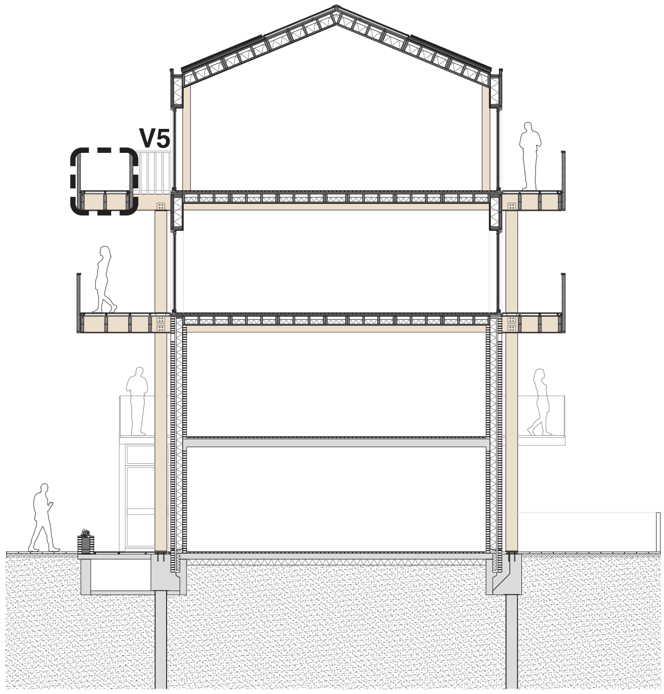
Detail V5 (A3 I 1:5) of the access gallery.







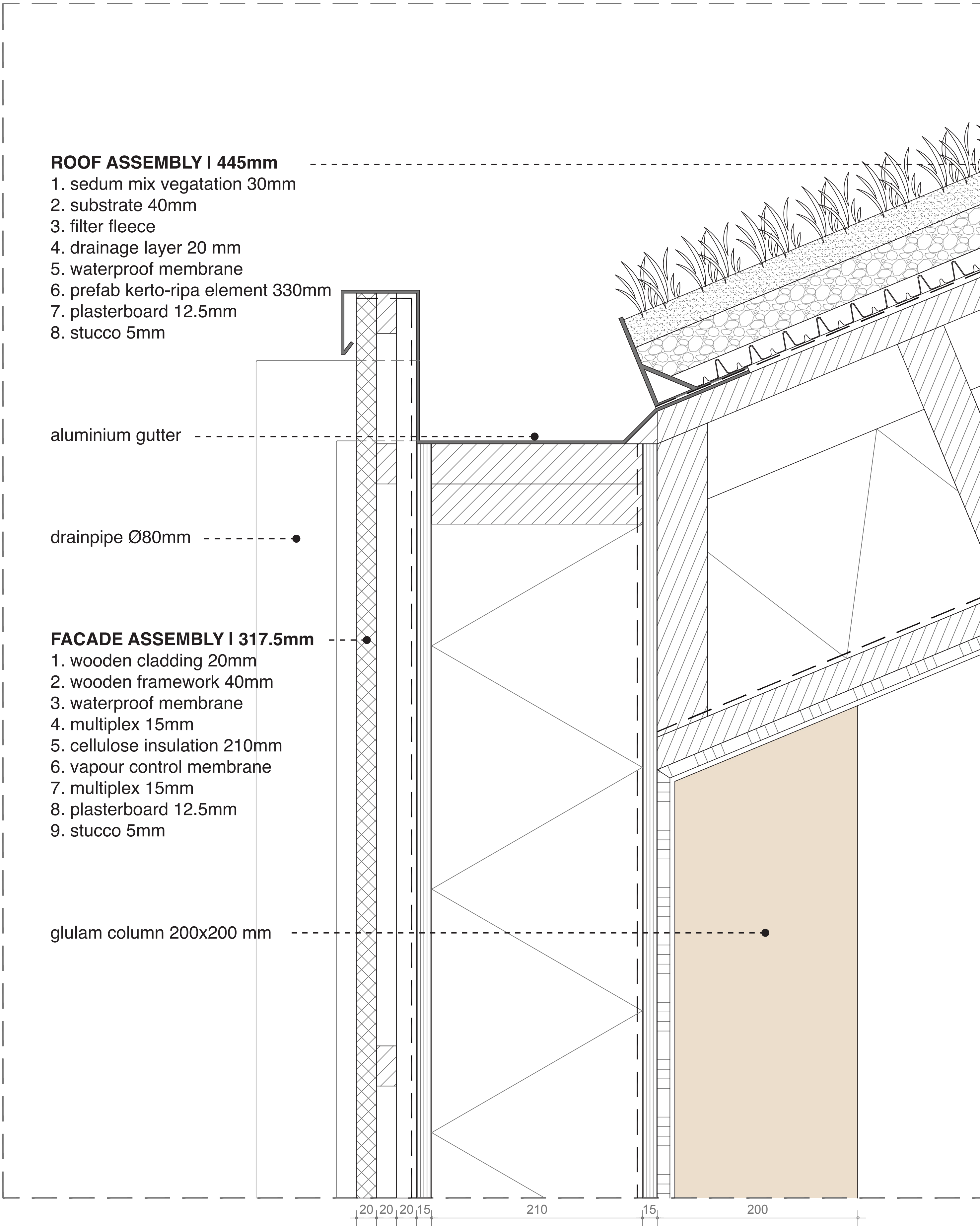
FLOOR ASSEMBLY I 510mm
1. wooden floor finish 20mm
2. wooden slat 20mm
3. plastic spacer 40mm
4. waterproof membrane
5. multiplex 20mm
6. glulam beam 400x300mm
7. wooden ceiling finish 20mm

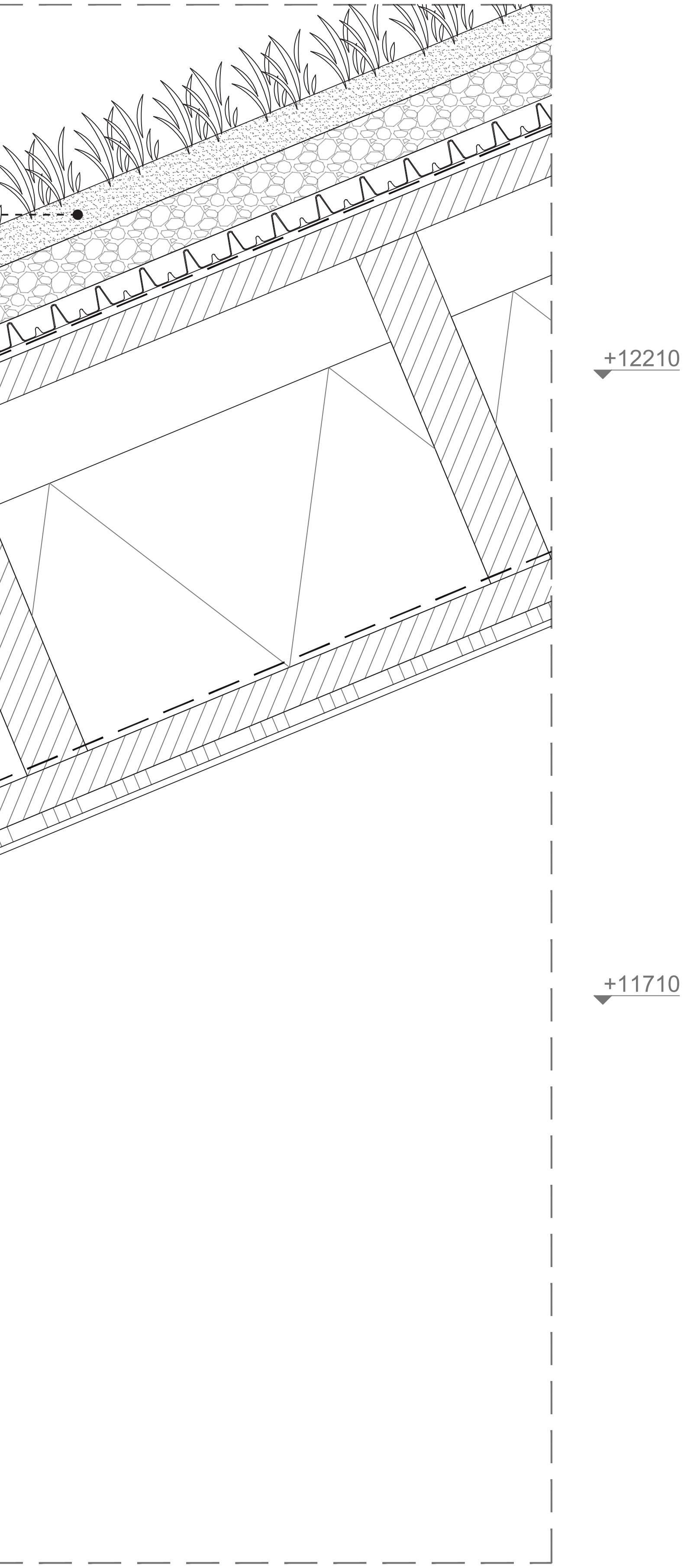


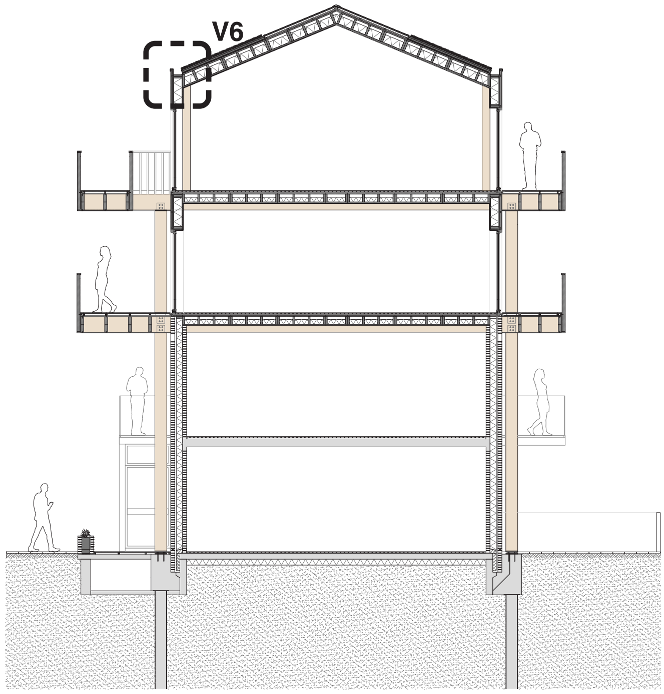
Existing
Glulam structure
Concrete

7.4 NEW SITUATION DETAILS

Detail V6 (A3 l 1:5) of the roof eaves.



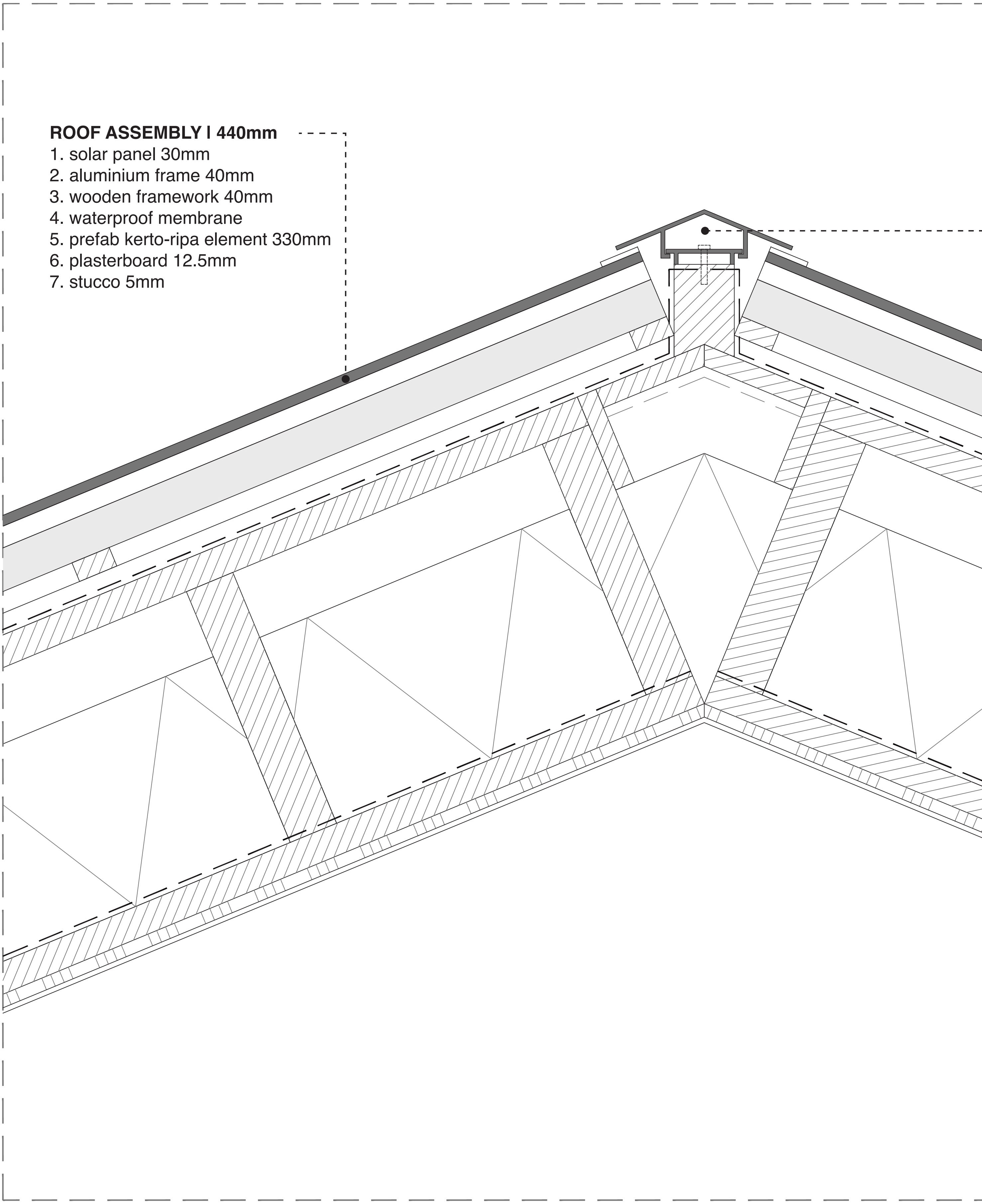


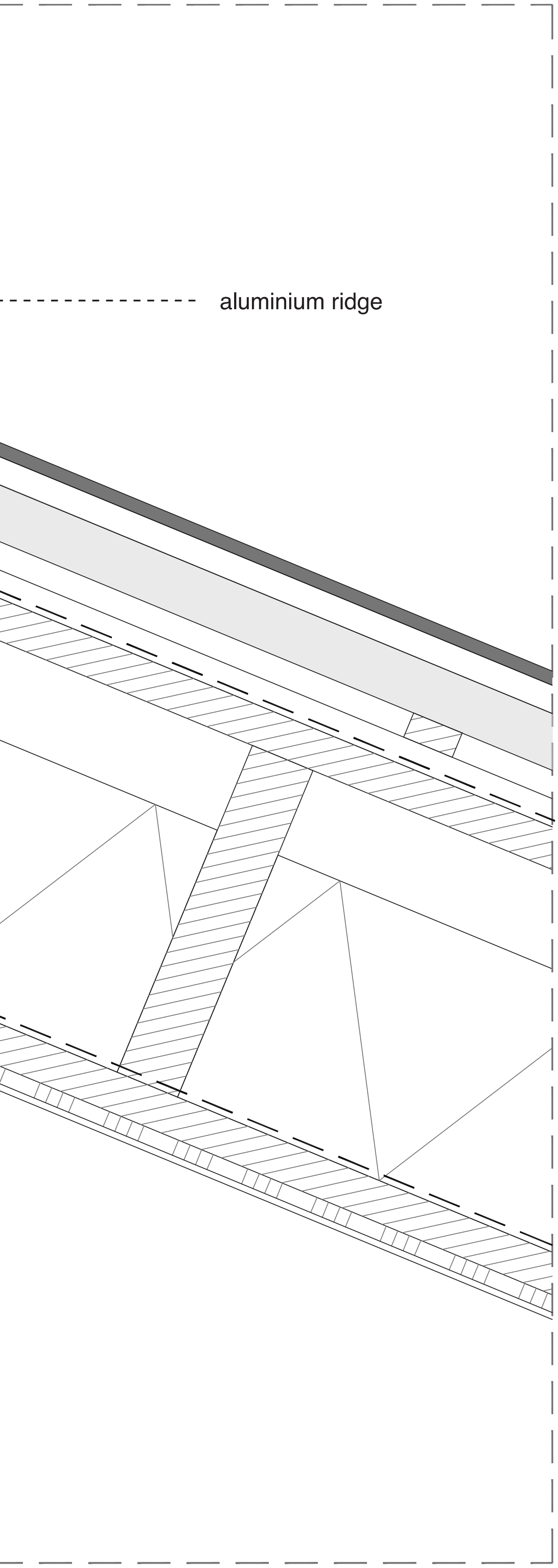


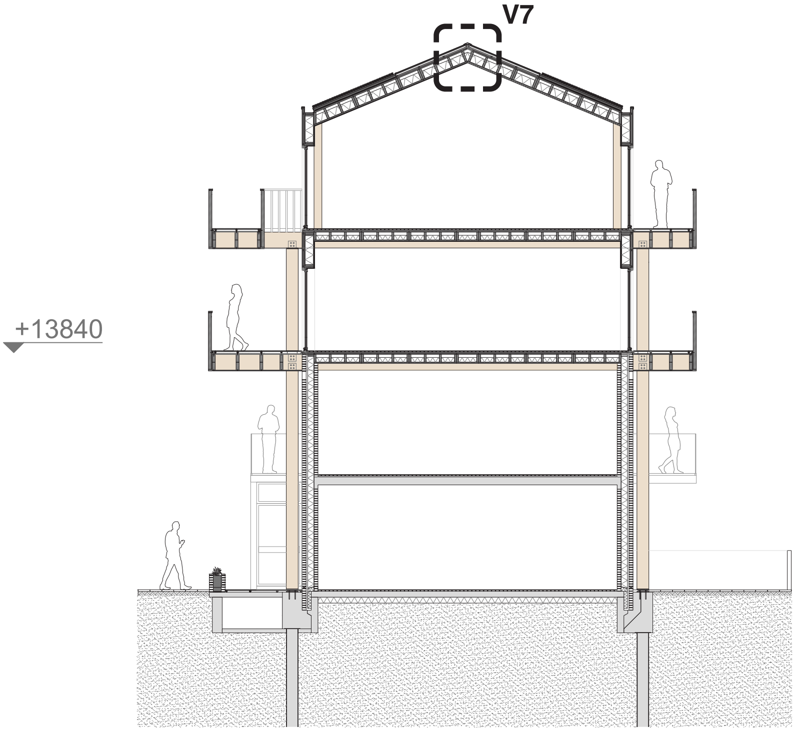
- Existing
- Glulam structure
- Concrete

7.4 NEW SITUATION DETAILS

Detail V7 (A3 l 1:5) of the roof ridge.







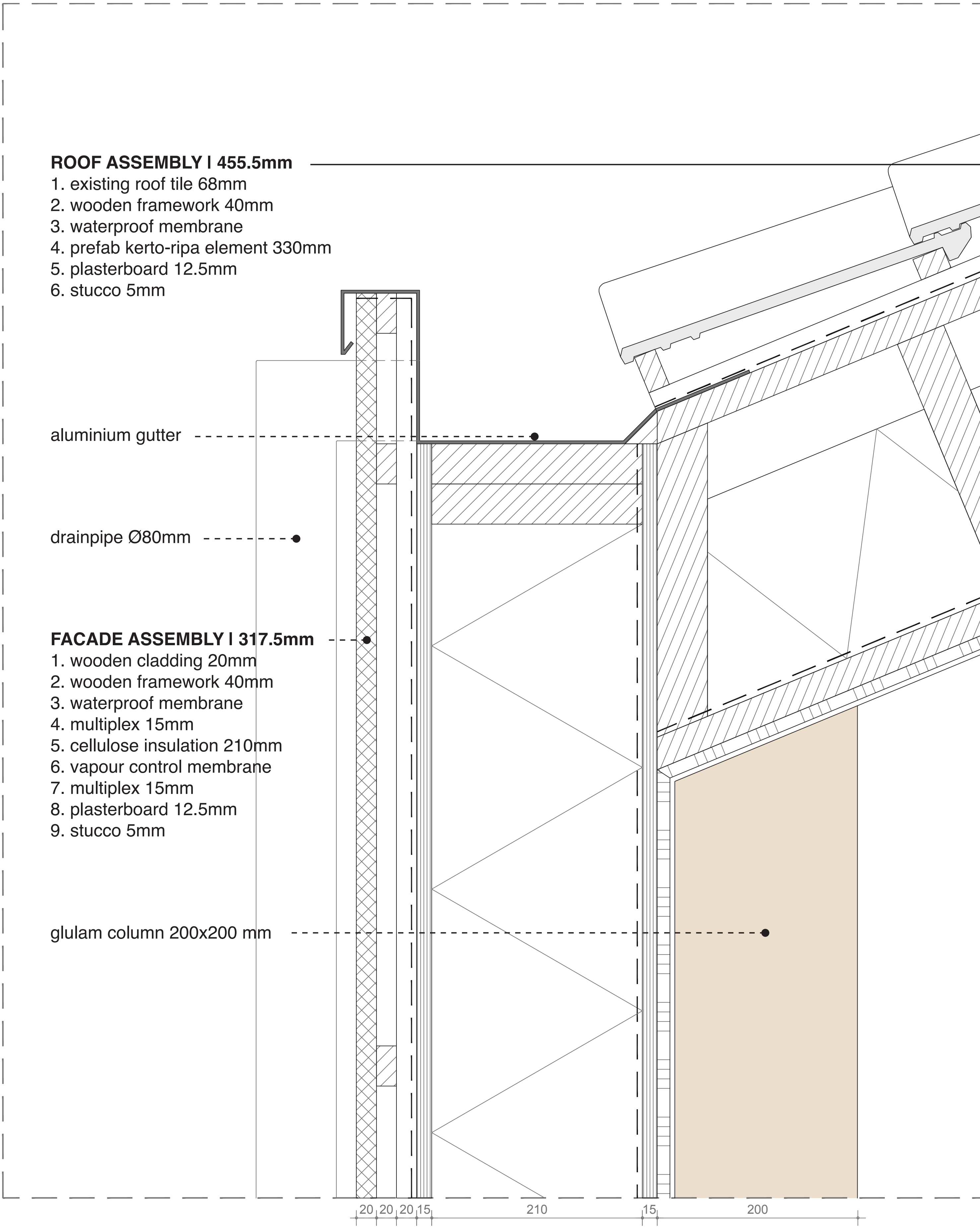
Existing

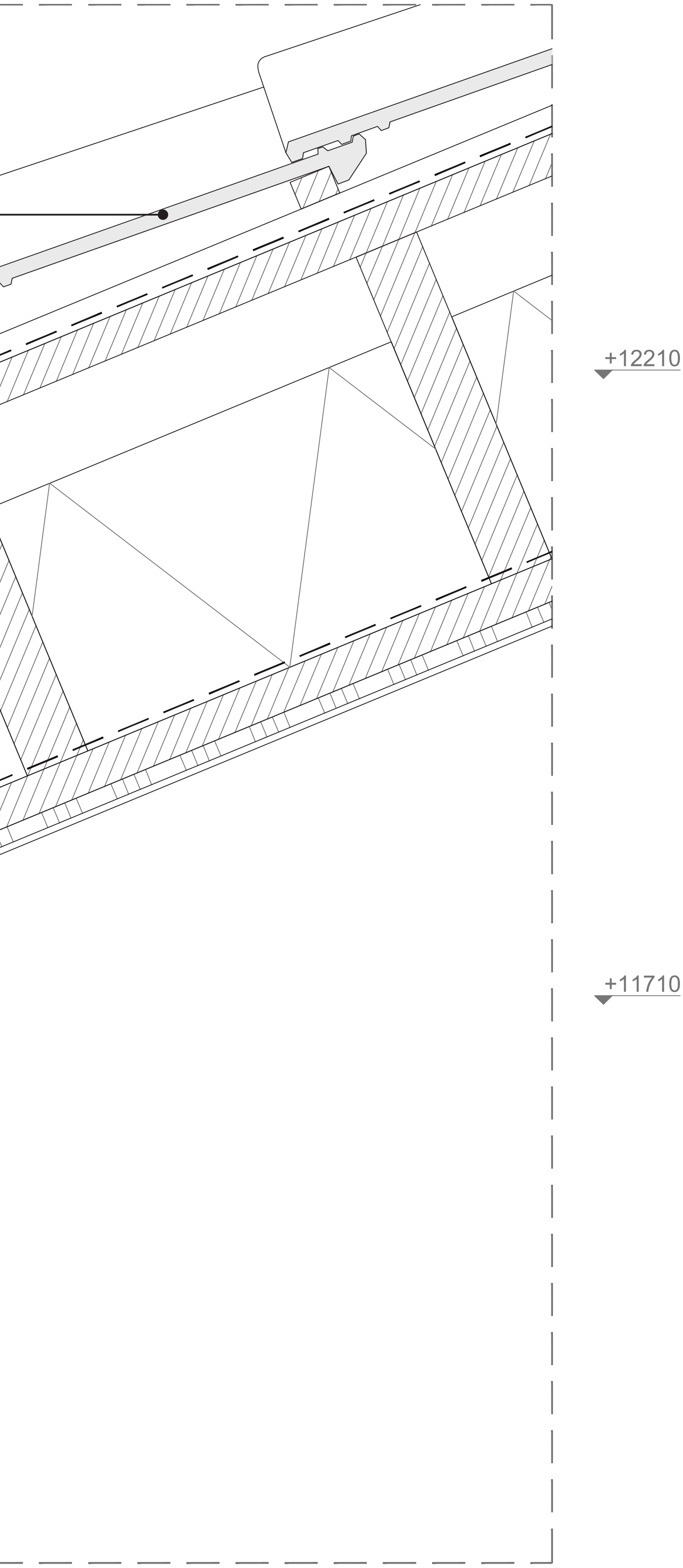
Glulam structure

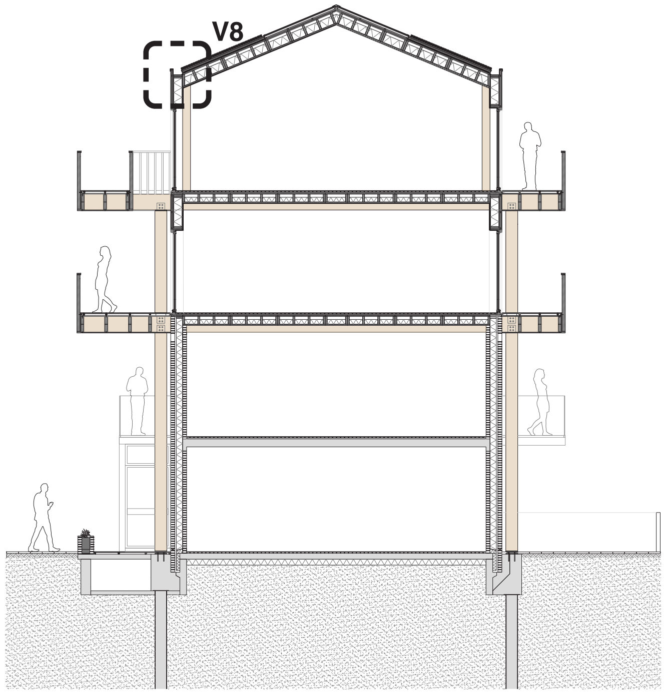
Concrete

7.4 NEW SITUATION DETAILS

Detail V8 (A3 l 1:5) of the roof eaves (variant existing roof tiles).



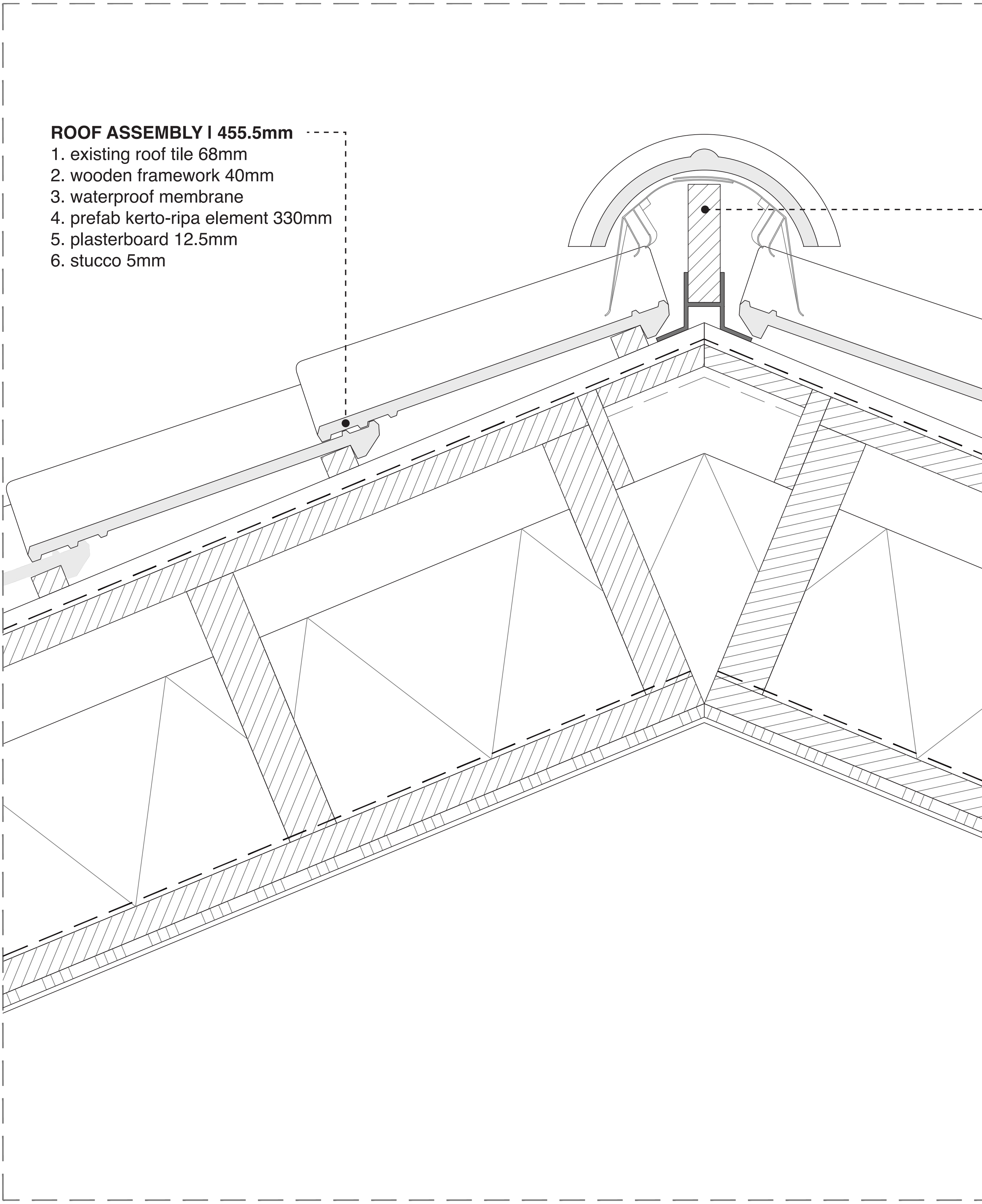


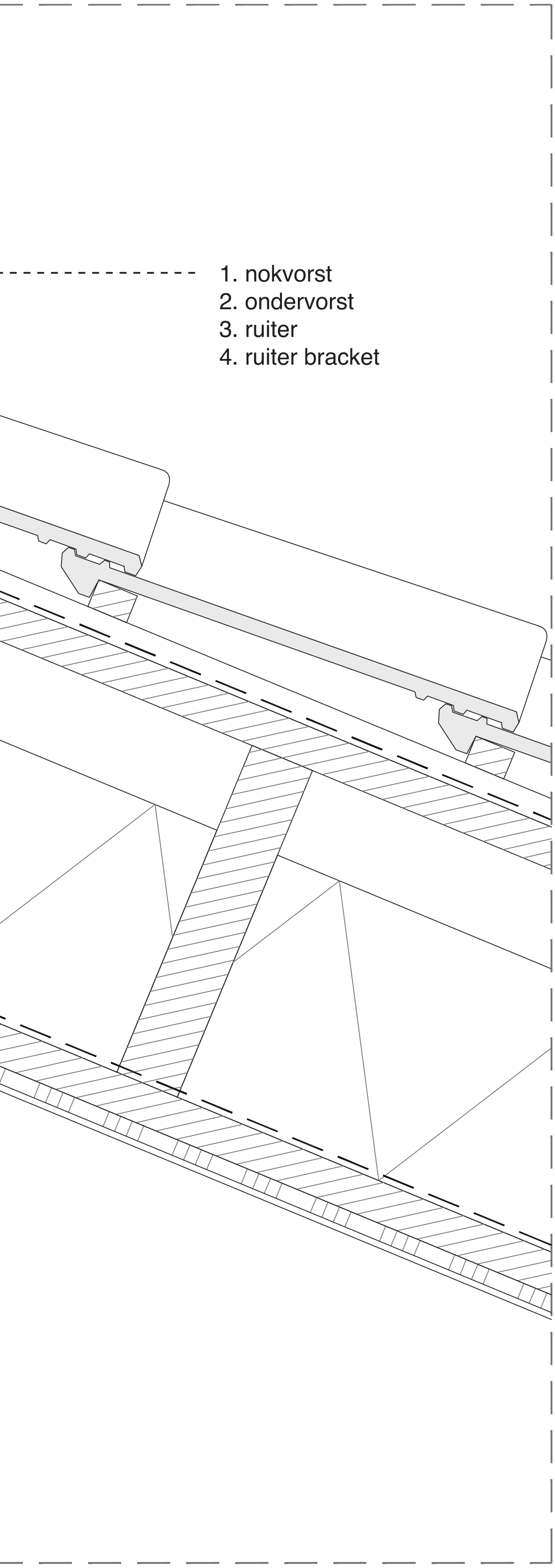


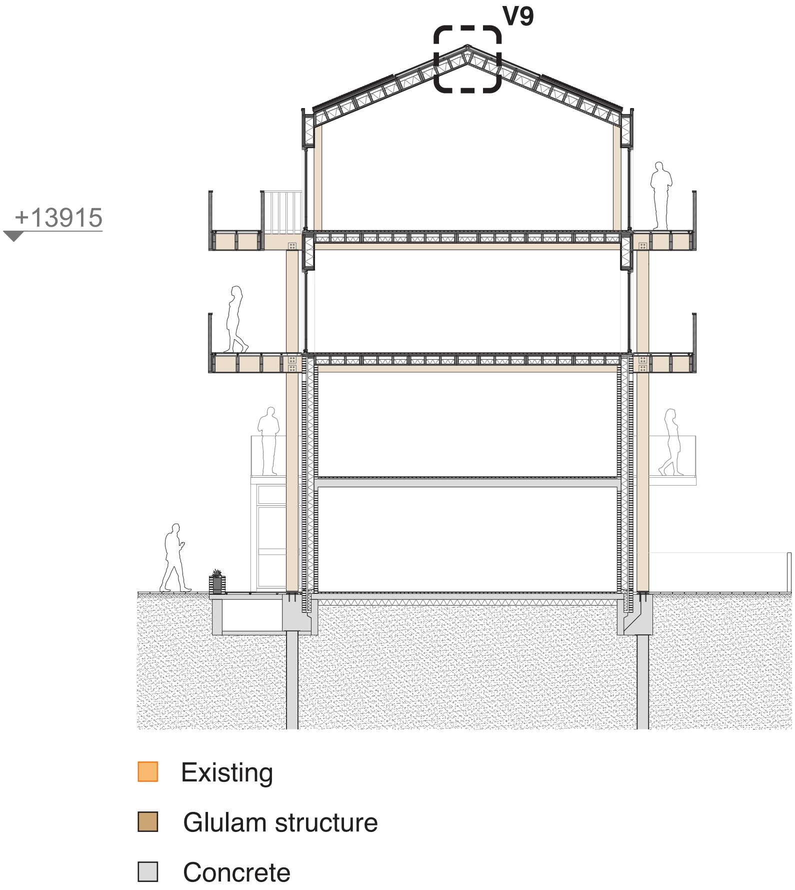
- Existing
- Glulam structure
- Concrete

7.4 NEW SITUATION DETAILS

Detail V9 (A3 I 1:5) of the roof ridge (variant existing roof tiles).




1. nokvorst
2. ondervorst
3. ruiter
4. ruiter bracket


V9
+13915
Existing
Glulam structure
Concrete

7.5 IMPRESSIONS

Impression of entering the courtyard in the new situation.

7.5 IMPRESSIONS

Impression of the the courtyard in the new situation.

7.5 IMPRESSIONS

Impression of the the courtyard in the new situation.

7.5 IMPRESSIONS

Impression of the corner (strategy 1) in the new situation.


Cafe

7.5 IMPRESSIONS

Impression of the corner (strategy 2) in the new situation.

7.5 IMPRESSIONS

Impression of the access gallery in the new situation.

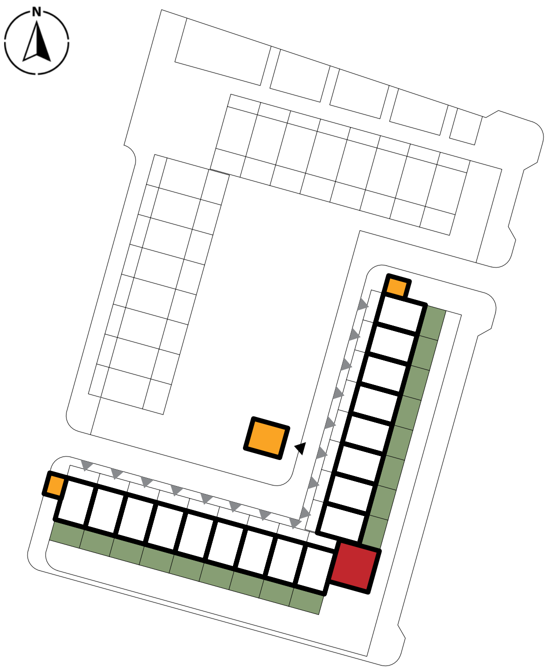
7.5 IMPRESSIONS

Isometric impression of the new situation.

7.6 DESIGN STRATEGY ASSESSMENT

Assessment of the access strategies and new FSI.

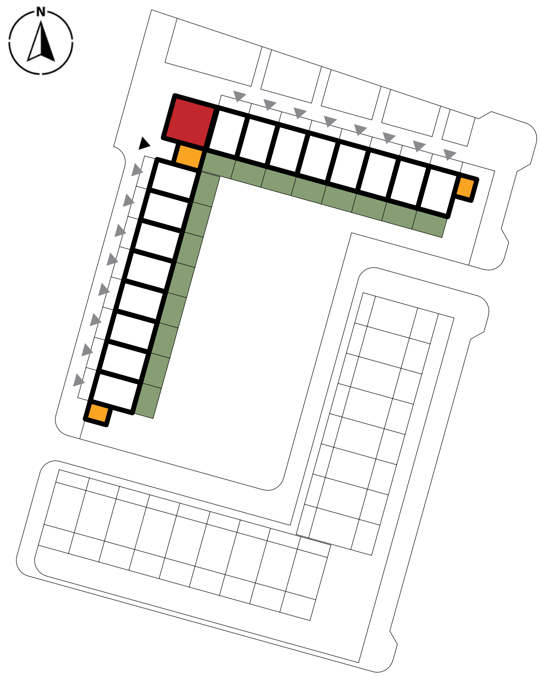
Access strategy 1



More social interaction and more eyes on the street, creating a safer living environment

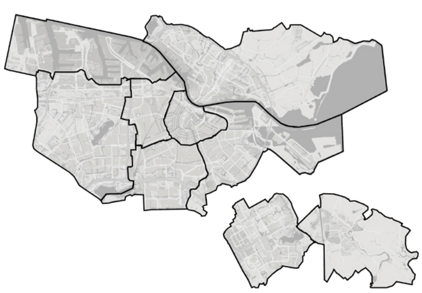
Livability

Access strategy 2

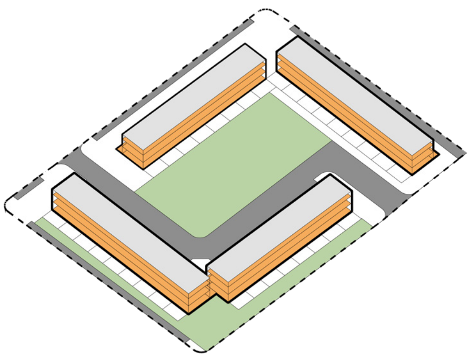


+1 more dwelling per floor

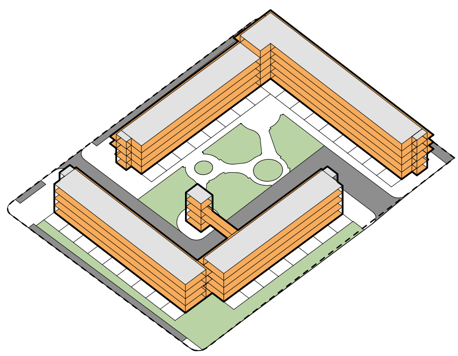
Densification



Amsterdam (Average)
FSI = 1.5 / 2.0
Rommelse (2022)



Current open courtyard parcellation
FSI = 0.55



New densified situation
(+5600m^2 Gross Floor Area)
FSI = 1.28

7.7 HERITAGE ASSESSMENT

Heritage assessment of the design.

Architecture

- Respect for the authenticity of the facade
- Similar materialisation, color, and detailing
- Entrance portal with altered proportions

- Vagueness for the new architecture of the added volume due to no regulations

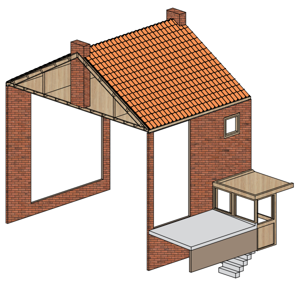
Urban Design

- Preserved relationship between buildings
- Preserved public-private relationship
- Adjusted sightlines due to new height

7.8 MATERIAL ASSESSMENT

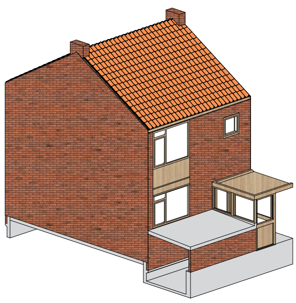
Material assesment with carbon footprint.

Demolition



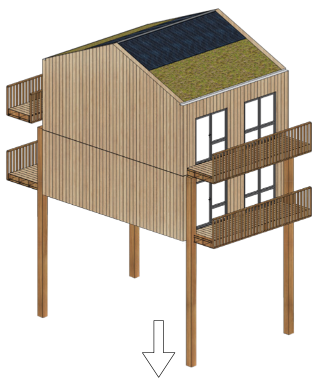
approx. **2.200 kg** CO2 eq/m^3

Existing duplex



approx. **7.400 kg** CO2 eq/m^3

Added



approx. **-14.000 kg** CO2 eq/m^3

REUSED | **ROOF TILES** *(OPTIONAL)
approx. **1.780 kg** CO2 eq/m^3

REUSED | **BRICKWORK**
approx. **1.725 kg** CO2 eq/m^3

REUSE

TOTAL

DUPLEX DENSIFICATION
approx. **-6.600 kg** CO2 eq/m^3

Household per year (average) = **18.500** CO2 eq/m^3
(Milieu Centraal, 2024)

08 REFLECTION

This chapter reflects on the relationship between the graduation project, the master track, and the program. It further discusses the influence dynamics of the research and design, the approach, academic and social value, and the transferability of the results.

8.1 INTERCONNECTION OF GRADUATION PROJECT, MASTER TRACK, AND PROGRAM

What is the relation between your graduation project topic, your master track architecture: Adapting 20th Century Heritage: Resourceful Housing, and your master program (MSc AUBS)?

The graduation project “Integrating density and livability in post-war neighborhoods” focuses on how post-war neighborhoods can be densified while improving their livability and preserving their current heritage values. This topic of the graduation project is directly related to the master track architecture: Adapting 20th Century Heritage: Resourceful Housing. This studio explores the two challenges of dealing with the current housing crisis and achieving a circular economy. Heritage forms the bridge between these two challenges, focusing on how to deal with 20th- century heritage in a resourceful way.

In response to the challenges posed by the graduation studio, this project explores ways to densify neighborhoods to contribute to solving the current housing crisis. Due to the increasing population, a demographic transition is taking place across the world, which requires urban expansion to facilitate the increasing number of inhabitants (United Nations, 2023). As a result, cities are growing and countries are becoming more urbanized. However, the growth and urbanization of cities have implications, including the various demands for land use in and around cities, urban configurations, and increased demand for housing (EEA, 2006). Expanding the cities outside its borders is considered to be a significant concern for sustainable development. The expansion would threaten biodiversity, lead to the loss of agriculture, increase travel distances and gas emissions, and contribute to climate change (Artmann et al., 2019). Because of this urgent need for urbanization, densification is inevitable. Jenks et al. (2003) define densification as an urbanization strategy for achieving compact cities as opposed to expanding cities, intensifying the built form, and making optimal use of limited space for living. However, current research suggests that densification could harm the livability of cities (Pont et al., 2020), as less space is available for nature, and the urban quality could decrease. According to the Cambridge Dictionary (2023), livability is the degree to which a place is good for living. Therefore, in addition to densifying neighborhoods, this project explores how to improve livability and what makes for livable density.

The graduation project also addresses the resourceful preservation of 20th-century heritage. For this purpose, the post-war neighborhood: the Louis Courperus neighborhood in the Western Garden Cities of Amsterdam New West was chosen as a case study. This specific post-war neighborhood was chosen because according to the Municipality of Amsterdam (2024), it scored second lowest on the livability of Amsterdam. Furthermore, this neighborhood was chosen because the City of Amsterdam together with the Stadgenoot housing corporation, plans to demolish 370 of the existing 700 social housing apartments. The demolition of these dwellings instead of the densification is a loss of resources and potential heritage. However, Mouratidis (2017) states that densification could result in the loss of heritage. Therefore, this graduation project introduces a strategy to not only densify and improve the livability of the Louis Couperus neighborhood but also to deal with the post-war heritage in a more resourceful way.

Furthermore, the topic of the graduation project relates to the master: Architecture, Urbanism, and Building Sciences, as it investigates methods and strategies for densification, improving livability, and 20th-century heritage preservation. By promoting sustainable development and resourceful architectural design, the findings contribute to the broader discourse on urban resilience and adaptive reuse.

8.2 INFLUENCE DYNAMICS OF THE RESEARCH AND DESIGN

How did your research influence your design/ recommendations and how did the design/ recommendations influence your research?

The research conducted has provided a foundation for the design strategy of the graduation project. As the beginning of the research, knowledge was obtained about the historical context of the Western Garden Cities and the Louis Couperus neighborhood. This research provided insight into the background information of the chosen case study and how the post-war neighborhood was created based on Cornelis van Eesteren's Algemeen Uitbreidingsplan (AUP) and Ebenezer Howard's Wijkgedachte. Following this, research was conducted on the heritage valuation of the Louis Couperus neighborhood. From this, the architectural and urban consideration assessments of the Bureau of Monuments & Archaeology (2010) were adopted. Based on this assessment, for the architecture of the duplex typology, the original elements will be preserved as much as possible in form, size, material, detailing, proportion, and color or design of comparable quality. For the urban parcellation, the spatial quality of the parcellation such as the composition of the buildings, and the relationship between buildings, public and private spaces, will be preserved.

Five different densification methods outlined by Amer et al. (2017) were considered for densifying the Louis Couperus neighborhood. The heritage valuation of the Bureau of Monuments & Archaeology (2010) served as a leading factor in choosing the densification method. This resulted in the selection of the roof stacking method as it will preserve the urban parcellation and the relationship between buildings, public and private spaces. The height of the new addition on the roofs of the duplex dwellings is influenced by the sun's orientation and human scale. For this, the recommendation of Uytenhaak (2008) was used by maintaining an angle of 45 degrees while designing the volumes so that sufficient daylight could enter, and the suggestion by Gehl (2010) to not build higher than a maximum of six stories so that residents still feel connected to the public space and to guarantee a human scale at street level. However, to ensure that the dwellings receive daylight even in the winter, 23.5 degrees was applied. This resulted in four-story south-facing dwellings and five-story north-facing dwellings. Due to the neighborhood's socio-economic challenges and outdated dwellings outlined by Mens (2017), the new addition will include 60 square meter dwellings in addition to the existing 40 square meter duplex typology dwellings. Furthermore, half of the current duplex dwellings will be combined into one dwelling, creating 80 square meter dwellings. This results in a wider range of housing which provides diversity among the residents and less social segregation.

To measure and improve livability, the frameworks of Satu and Chiu (2017), Leby and Hashim (2010), and Aernouts (2023) were examined and compared. From these, the five different dimensions of livability: social, physical, functional, safety, and dwelling were determined. Furthermore, the existing frameworks with indicators and assessment criteria for measuring livability were compared. Based on the comparison, a custom livability framework was created with the five mentioned dimensions. This livability framework was then applied to the Louis Couperus neighborhood to measure its current livability and possible improvements were identified. This resulted in the livability toolbox which offers tools to improve livability based on the five dimensions. These tools were then incorporated into the master plan and further developed in the open courtyard parcellation. To strengthen this outcome, the toolbox could have been distributed to the current neighborhood residents to implement the desired tools through community participation. The livability investigation of the duplex typology dwellings revealed that the underground storages are not properly accessible, the bathrooms are too small, the upstairs apartments have no outdoor space, and the facade is not insulated and no longer meets today's housing standards.

Using the recommendations that were discovered during the research for the heritage preservation, densification method, and livability improvement aspects, further research was done in the design phase. To improve the livability of the duplex dwellings, several variants were tested in which the architectural assessment of the Bureau of Monuments & Archaeology (2010) was leading. Because the assessment does not specifically address the elements of the architecture, a balance was struck between preserving the current architecture as much as possible and improving livability. This resulted in insulating the facade against the existing inner skin and rebuilding the outer skin. This allows the same architectural expression and detailing to be maintained and the facade to meet current standards. When renovating the facades, the existing window frames are reused. The current entrance portal will be demolished and rebuilt with the same architecture to provide an outdoor space for the upper floors of the entrance portal. The underground storage rooms will be demolished because of their poor accessibility and in their place will come front gardens connecting the dwellings more with the street. Internally, the dwellings will be reorganized to create more spacious bathrooms and living spaces.

To implement the recommendation for roof stacking as a densification method, research was done on how the newly added dwellings could be accessed. Two different variants were worked out with an access in the courtyard parcellation and an access at the corner where two-stroke allotments meet. Both access principles are implemented through galleries. These galleries will have openings in the floors along the facade to allow daylight through the galleries. In both variants, the galleries are positioned on the north so that the private outdoor spaces are located on the south. However, the galleries are designed with a certain width so that the entrance to the dwellings on the galleries can also be used as seating areas. With this, all homes have outdoor spaces on both the south and north sides with the aim of creating a vibrant neighborhood both internally and externally from the courtyard parcellation. To build the new dwellings on top of the current construction of the duplex typologies, the study lacks a structural evaluation. Due to the lack of this knowledge, the selection of lightweight materials was made, which resulted in choosing the material wood. A column structure was chosen for the supporting structure instead of load-bearing walls because this results in less use of materials and ensures flexibility in the layouts. For the floors, wooden Kerto-Ripa floors were chosen because they are lighter than other wooden floors such as cross-laminated timber floors. Furthermore, the Kerto-Ripa floors can be insulated from the inside, reducing the contact noises between the dwellings. Lastly, the Kerto-Ripa floors are prefabricated and can be installed on-site, allowing for a faster construction process.

8.3 APPROACH ASSESSMENT

How do you assess the value of your way of working (your approach, your used methods, used methodology)?

The research conducted has formed a sufficient foundation for densifying post-war neighborhoods and provides insight into how to improve the livability of neighborhoods. By comparing different densification methods with their advantages and disadvantages and the associated process, the study presents a framework of various possibilities for densification. Based on the location and objectives, an effective decision can be made as to which densification method is most suitable. For the subject of livability, several existing frameworks were compared. Based on these comparisons, main themes within the topic were created and a filtered livability framework was created that can effectively measure livability across the main themes. In the created livability framework the assessment criteria are stated how different aspects of livability can be measured. To make the framework even more effective, these criteria could be further explored and defined more broadly. Based on the analysis of the Louis Couperus neighborhood, using the livability framework, livability tools were determined to ensure a livable neighborhood. For the heritage party of the study, literature on the historical context of the Western Garden Cities was researched, and existing assessments of heritage valuation were identified. This knowledge, combined with the densification methods, allowed the development of a design strategy. However, because the identified heritage valuation does not specifically address the different elements of the architecture, more research could have been done on the individual elements. This could have improved the decision-making process of the design and contributed to a more robust final design strategy.

8.4 PROJECT IMPACT EVALUATION

How do you assess the academic and societal value, scope, and implication of your graduation project, including ethical aspects?

Research about densification and livability has previously been conducted through the years. However, little research has been done on the potential advantages of densification and livability (Mouratidis, 2019). Therefore, this graduation project, because of its interdisciplinary connections, contributes to the knowledge and relationship between the two subjects. Furthermore, this project contributes to the appreciation of post-war neighborhoods and how these types of neighborhoods can be densified. The Getty Conservation Institute (2013) states the lack of recognition and protection of post-war architecture. Havinga et al., (2020) point out that the challenge of post-war architecture is that these buildings are yet to be loved (Havinga et al., 2020). These factors threaten these neighborhoods with demolition or alteration before their heritage values can even be recognized Ferreira (2016). This project adds a sustainable contribution to demonstrating how dwellings of post-war neighborhoods can be given a second life instead of being demolished. Lastly, societal value was derived from the plan to densify the Louis Couperus neighborhood because it contributes to the current Dutch housing crisis.

8.5 TRANSFERABILITY ASSESSMENT

How do you assess the value of the transferability of your project results?

The knowledge acquired along with different methods for densifying neighborhoods can be transferred to other post- war neighborhoods as well as neighborhoods with other years of construction. However, the applied design strategy for the Louis Couperus neighbor can be carried over in its entirety to other neighborhoods in Western Garden Cities with the same open courtyard parcellation. For applying the design strategy in other neighborhoods outside the project site, research on heritage values should be conducted again. Furthermore, the adaptive reuse of the duplex typology in this project can be used as a starting point for similar duplex dwellings. The livability framework which resulted from the research of this project can be used in other studies to measure livability. Also, the livability toolbox containing tools for improving livability can be transferred to other projects. Finally, this project can be used as a reference for how the existing architecture was approached and preserved based on the heritage values found.

09 PERSONAL REFLECTION

This chapter reflects on the personal journey and lessons learned during the graduation project and provides an evaluation throughout the research and design phase.

9.1 PERSONAL REFLECTION

Looking back on the entire process of graduation, I am delighted that I chose the studio: Adapting 20th Century Heritage: Resourceful Housing. Through the research phase and design phase, I learned to look more critically at the information obtained and also not to adopt information one-on-one. Furthermore, I gained a good idea of how to densify neighborhoods and how to improve the livability of neighborhoods. The most important thing I have learned is to reflect more often and more critically on my findings and design choices.

In the first weeks of graduation, it was difficult to find the focus and determine where within the heritage field my ambition lay. Based on the desire to contribute to current social problems such as the housing crisis, the theme of densification was determined. After briefly researching this topic, it emerged that densification could be a threat to the livability of neighborhoods. Based on this connection, the second theme of the graduation project was determined. After having determined two main themes within my research, the next step was to find a suitable project location. I had to think about this for several weeks because several neighborhoods in the Western Garden Cities were suitable for this research. Through a site visit together with the studio to the Van Eesteren Museum, I discovered the Louis Couperus neighborhood. During the walk through the neighborhood, it quickly became clear that the neighborhood was in need of renewal due to the amount of garbage in the streets, the scooters parked on the sidewalks, and the poor condition of not only the dwellings but also the public spaces. I was very pleased with the final result of my research plan. Based on P1, research methods were sharpened and the theme of heritage became more prominent and incorporated into my main research question.

After the two-week long vacation after P1, starting the research was difficult and proceeded slowly at first. Because there were so many different aspects to investigate, I was a bit overwhelmed by the amount of work to be done. Once this was started the process went well and I also started to like it more and also became curious about the results of my research. Before the P2 presentation, most of the research questions had been mostly answered. However, the results of the heritage values were scarce. This was also reflected in the feedback from P2 where the proposed heritage values were not values. Based on this, I researched further and found the AUP valuation maps that were more helpful for the heritage values of the Louis Couperus neighborhood. Also, following P2's feedback, more consideration was given to responding more to socio-economic and sustainability issues.

After P2, the design phase began. In this phase, I first digitalized the existing situation as a basis for the design. During the digitizing, more knowledge was gained about the architecture of the duplex houses and the opportunities for improvement. Then several options were made and tests were performed for different elements of the existing architecture and layout of the duplex typogies. Furthermore, during this phase, I explored how to implement the roof stacking method and how to design it both structurally and architecturally. These findings were then presented during P3. Here the feedback was that I needed to think more about what architectural expression I wanted to show and how this interacts with what already exists. After this feedback, I started to explore, using research-based design, how the old and new come together and what the relationship between the two should be. During this process, different accessibility variants were also tested which ultimately resulted in the application of two different accessibility principles. This was done based on feedback to show different strategies that could then be compared.

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