Adaptille

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Figure 1: Front side of Hoptille after 1984 ("Hoptille. Woningverbetering. Ontworpen door L.R.R" by Stadsarchief Amsterdam, n.d.-b).
Figure 2: Front side of Hoptille (own photo)

Contents

Introduction 1

In the Netherlands there is currently a need for more housing, with a national shortage of about 300.000 dwellings (gebiedsontwikkeling.nu, 2020). This is not the first time that such a shortage is present in the Netherlands, as following the second world war there was a housing shortage as well. In an effort to reduce that shortage, expansion projects such as the Bijlmer were designed and built (BijlmerMuseum, 2014). As a result of those expansions currently about 30 percent of the housing market consists of housing built between 1965 and 1985 (CBS, 2020).

The initial expansion project in the Bijlmer consisted of high-rise apartment buildings with a lot of green space in between. Soon after completion problems arose in the newly created neighbourhood, such as a high amount of crime, and the project was deemed a failure (Verlaan, 2013). As a reaction to these buildings mid- and low-rise projects such as Hoptille were created in the Bijlmer. Hoptille consists of one mid-rise apartment building and multiple low-rise family houses. However, this project also had to deal with problems soon after completion (Bijlmer Museum, 2017).

Part of the problems are attributed to the types of inhabitants living in the building, which included students, formerly imprisoned criminals, and former psychiatric patients. Furthermore, the design of the building facilitated crime, for instance the corridor running through the entire building. This resulted in the building being renovated within a few years of completion. The layout of the building was changed, dividing the original interior corridor and integrating the space into the houses (BijlmerMuseum, 2017). In 1994 the building was renovated again, during which the access to some houses was changed again.

These renovations have reduced some problems greatly, such as the amount of crime. However, issues, such as multiple technical problems, are still present. During an interview, two girls who live in the building stated, "The neighbourhood used to be a lot worse, it has improved because of renovations, but it could improve further." (Two female inhabitants of Hoptille, personal communication, October 6, 2020).

At the moment, the building is considered for demolition, because of the present problems. However, by demolishing the building values, such as historical value, that are possibly associated to the building will be lost. Furthermore, demolition will result in the embodied energy of the building being lost (Pereira Roders, 2007). Adapting the building instead of demolishing it could solve the present problems while preserving its value, creating an opportunity to improve the current housing stock.

Figure 3: Backside of Hoptille ("Hoptille. Ontworpen door VDL (Verster Dijkstra Loerakker" by Stadsarchief Amsterdam, n.d.)

Problem Statement 2

As mentioned in the introduction Hoptille, and post war housing in general, could be adapted in order to improve and add to the current housing stock. This is especially needed because to the Dutch government's ambition to build a million more homes by 2030 (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2020).

As society changes constantly, so do the needs and demands of the users of buildings. Therefore, the buildings that are designed in the 80's will likely not match with the current demand, resulting in a mismatch between the current housing stock and the demand for housing.

As a result, buildings undergo changes during their lifespan, as people make changes to the buildings to better suit their wishes (Brand, 1997a). These changes can be necessary, as the designed buildings don't always match with the functions that are needed or wanted by potential users (Gans, 1968). This was and still is the case with Hoptille, which is apparent in the problems the users experience in the building (Two women working with inhabitants of Hoptille, personal communication, October 6, 2020). According to Brand (1997b), the buildings that last the longest are buildings that are able to adapt to the user's needs over time, buildings that learn.

Just as buildings change over time, cultural values also change over time. At one point in time people prioritize different values, than at another. Currently, the priority is focused on economic and political values, while other present values are overlooked (Pereira Roders, 2007). In the future these priorities will shift again. According to Pereira Roders (2007) a shift towards ecological values is needed to be able to create more sustainable buildings, as this is not the priority now. Furthermore, the values associated to a building change depending on the stakeholders' perspectives, as a user values a building differently than an academic (Meurs, 2016).

The way heritage is approached is based on the prevalent cultural values, and changes if the priority shifts from one value to another. For instance, the same strategy used to be applied to each heritage project, while at the moment the most appropriate strategy is chosen based on the individual project (Meurs, 2016). In the future, the approach towards with heritage will continue to change. Moreover, buildings that are not considered to be heritage at the moment, such as Hoptille, might be considered to be so in the future (Pereira Roders, 2007). It is important to keep both the changing priorities as well as all the values associated to the building in mind, in order to not 'destroy' heritage.

Figure 4: Backside of Hoptille (own photo).

2

This project will focus on Hoptille, which, based on the initial research into the H-buurt in Amsterdam, seems to deal with big challenges. These challenges include technical challenges such as poor maintenance as well as social challenges such as crime and a lack of social interaction. The aim of the project is to redesign the mid-rise building in Hoptille, adding to and improving the current housing stock in a sustainable way.

In this redesign the two topics, adaptability and social values, will be combined and applied to the building. In order to create a more adaptable building, which will allow for users to change the building to their wishes, as well as preserving the current values. The main research question will therefore be: 'How can a 1980's apartment building be transformed to become adaptable while maintaining the associated values?'. To find an answer to this question three sub-questions will be answered. The first relating to the values of the building, the second relating to the current user's needs, and the last focusing on creating the adaptability.

- What values are associated to the building?
- What building elements need to be adapted to suit the needs of the current users?
- How can the building become more adaptable to future changes?

Environmental Position 3

One of the goals of adding adaptability to buildings is to increase their lifespan. As adaptability increases, the building will more easily change based on the needs of the current and future users, therefore removing the need to demolish and completely replace the building. Instead, only smaller elements will need replacement over time. Doing so will minimize the loss of embodied energy. Furthermore, as little as possible of the current building will be removed in order to increase the adaptability, further ensuring a minimal loss of embodied energy.

Part of creating adaptability, is creating the opportunity to reassemble elements in new configurations. As a result, the aim of more adaptability can be combined with the aim of circularity. Circularity encompasses multiple strategies, as is illustrated in figure 6, in this project the focus will be on reuse. By only using building elements that are completely demountable, all added materials could be reused, if their technical lifespan is not surpassed. The ability to demount the building elements also allows the elements to be reassembled, adding to the adaptability.

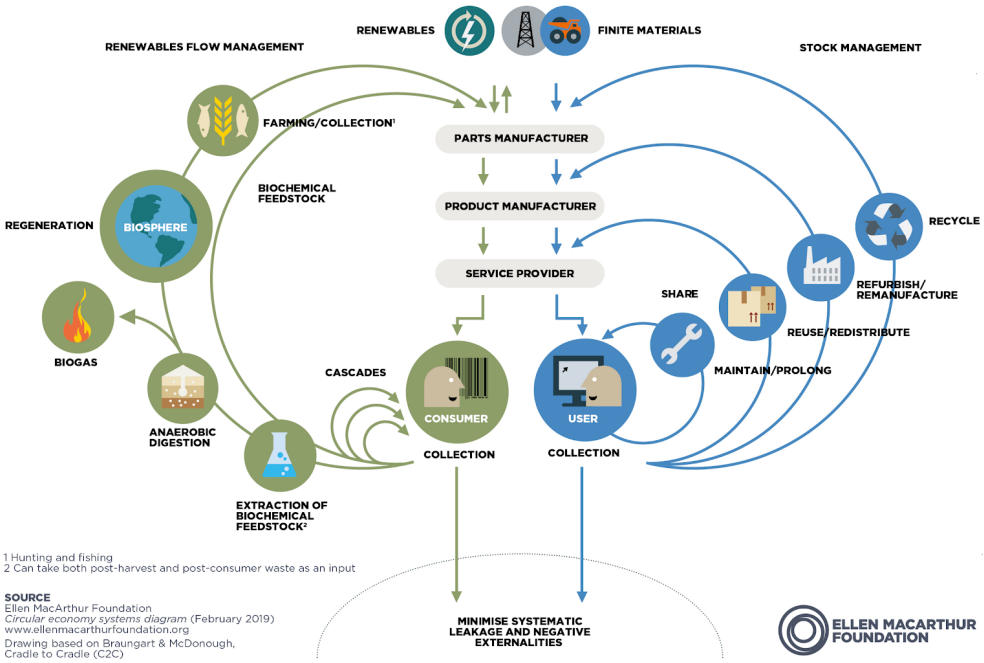


Figure 6: Circularity ("Circular economy systems diagram" by Ellen MacArthur Foundation, 2019)

Figure 5: Playground at Hoptille (own photo).

Another aim of the project is to increase the overall living conditions in and around the building. As mentioned, the building currently has technical issues, such as leakages, noise, and poor ventilation. The aim is therefore to improve upon these aspects, as well as others such as heating, in order to bring the building up to and if possible improve upon the current standard. The current standard being BENG, meaning almost energy neutral (Rijksdienst voor Ondernemen Nederland, n.d.). By bringing the building up to standard, the needs of the current users will be met. For the needs of future users, it is important that the opportunity exists to update the building's technical installations without having to do any major intervention to the rest of the building.

As mentioned, the aim is also to improve the immediate surroundings of the building. By improving the outside space, the quality of the building will also increase, having a positive effect on the residents. Furthermore, the surroundings can be used to improve upon the climate design of the building, such as creating a space where rainwater can temporarily be stored, as extreme rainfall becomes more frequent (Amsterdam rainproof, 2019).

Methodology 4

4.1 Research structure

The research consists of various phases. The first quarter of the year is solely based on collective research. The second quarter the research is partly collective, but this collective research is more tailored to the personal design interests. In the second half of the year the research will be individual to best support the individual design process.

Because of this structure the research will transition from collective and general to individual and more specific to certain design topics, as shown in the image below (Figure 2, own production). Simultaneously the collective research acts as a base for the personal research and design process (Figure 3, own production).

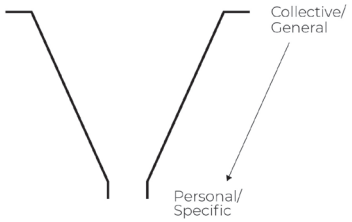


Figure 8: Transition from collective to individual research (own product).

Figure 9: Research as base for the design process (own product).

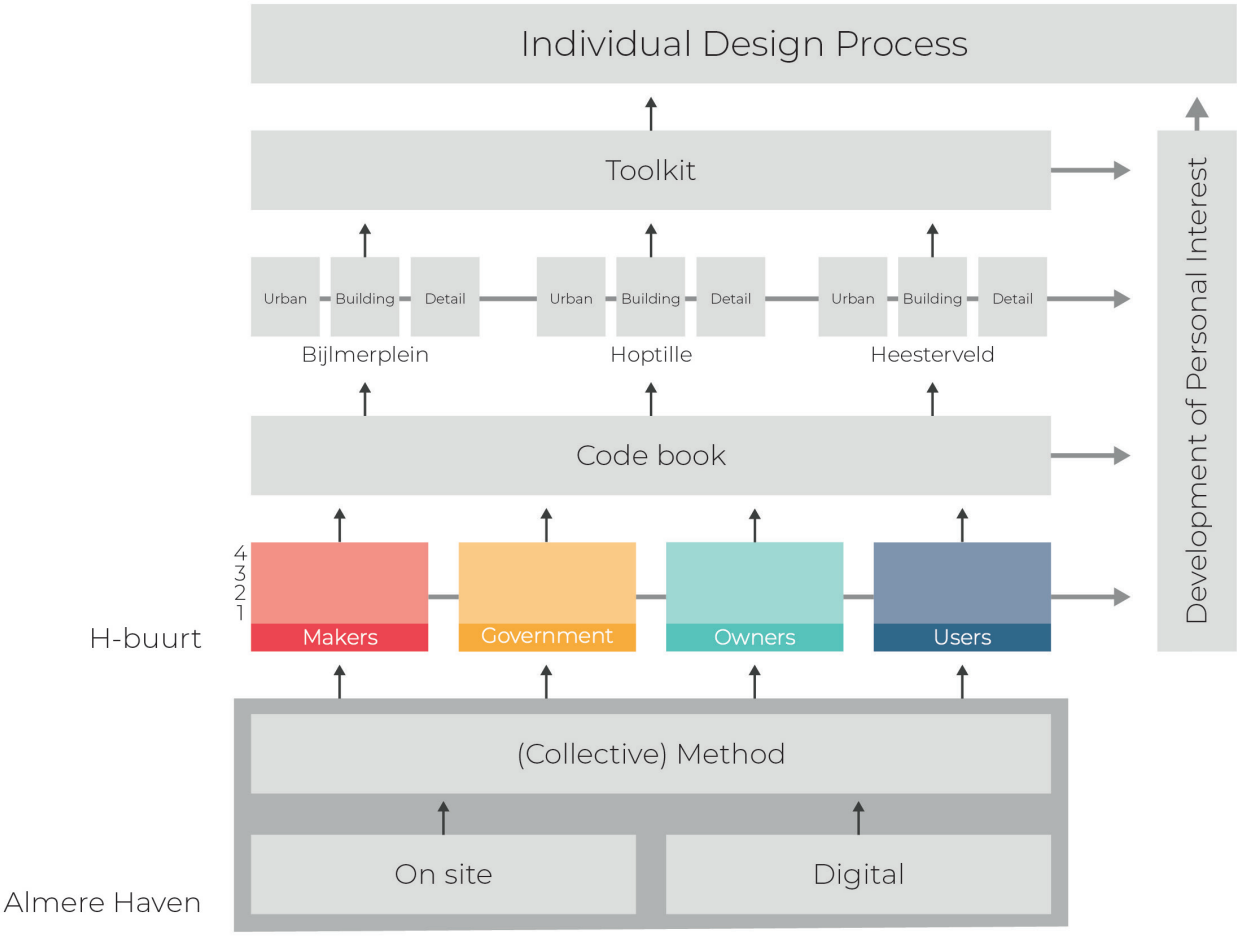


Figure 10: Research structure for the collective research (own product).

Figure 7: Passage (own photo).

4

The first quarter of the projects consists solely of collective research, gathering information about the design location, the H-buurt. In specific the goal is to gain an understanding of the values that certain stakeholders attach to the neighbourhood as well as to which attributes in specific. During this quarter the first two sub-questions will be answered.

- What values are associated to the building?
- What building elements need to be adapted to suit the needs of the current users?

First, a pilot research was done in Almere in order to learn which methods work best for which goals. After the collective method was determined and the research moved to the H-buurt the group split into four subgroups, each focusing on a different stakeholder. Each group followed the same structure in four steps: first gathering general information, then gathering more in-depth information, all this information is then interpreted and compared, to then process the data. An overview of the collective research structure is shown below (Figure 4, own production.

The second quarter of the year still consists partly of collective research. First, in groups concepts and tools were designed and discussed with other groups. Each group focussed on a specific theme. As a result, multiple perspectives in regard to heritage were explored and tested. This choice of themes allowed for the individuals to tailor the collective research to the personal interests.

Building from the collective concepts each individual can further develop their own ideas with regard to the project and decide which approach suits the project the best. At the end of the quarter each individual will choose one or more design concepts to develop further in the second half year. The research of the second quarter builds upon the research from the first quarter. During this part the third sub-question will be answered.

- How can the building become more adaptable to future changes?

The last phase, the third and fourth quarter of the year, will focus solely on individual research related to the individual design processes. Even during the design phase, research is necessary. The design will be tested and reflected on based on the research done during the previous quarters as well as any additional research done during the design phase. This phase will be tailored directly to the personal interests. The figure below (figure 4, own production) shows the relation between the research and the design process.

The last phase will start with more research done into topics of personal interest, being adaptability and social. This research will include case studies and literature reviews. This research will then be used to reflect upon the concept design, which will start the next designing phase. Creating an iterative process of research, design, and reflection.

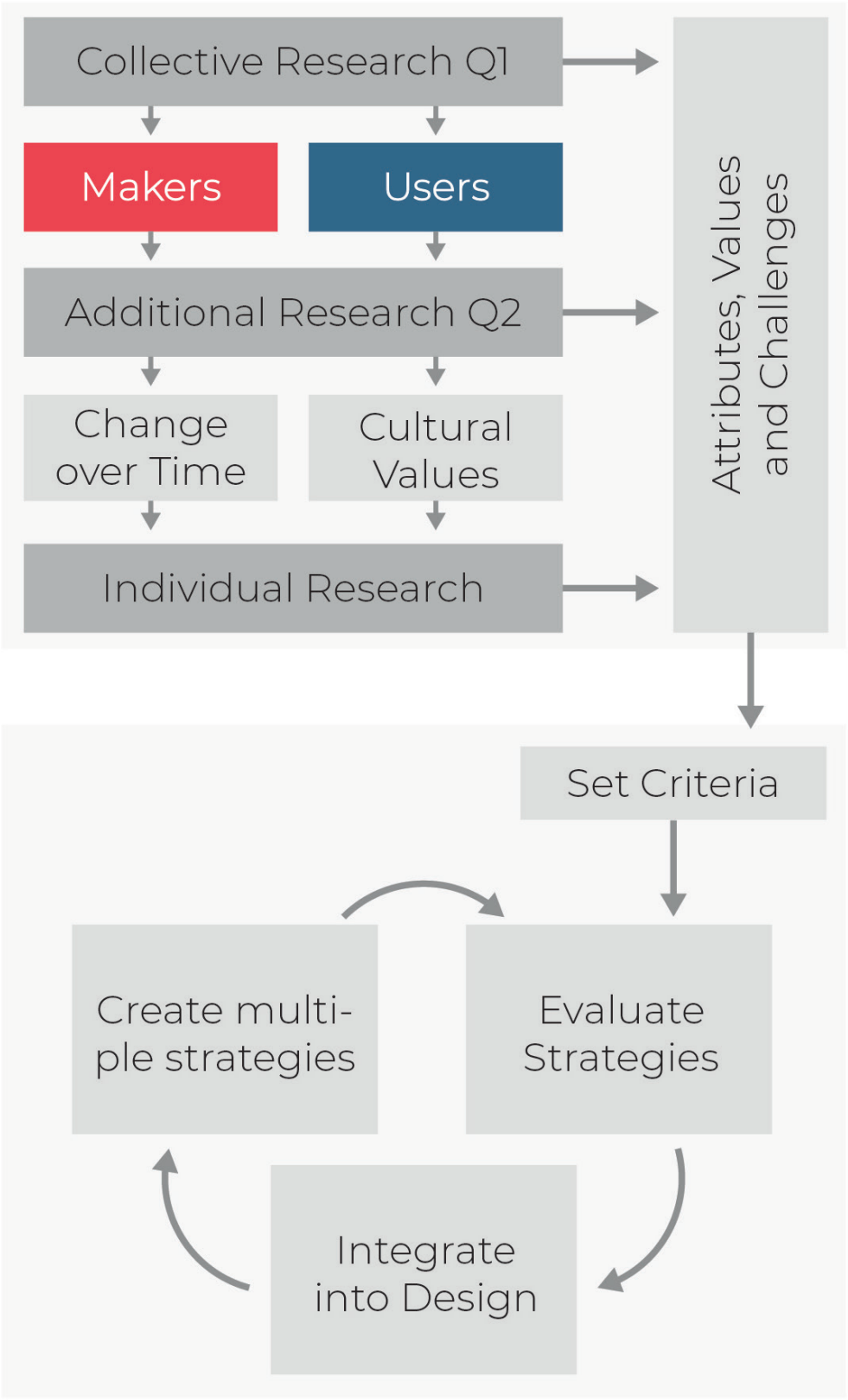


Figure 11: Research structure (own product).

4.2 Collective Research

Almere-Haven

The pilot research in Almere Haven is used as an experiment, before diving into the research in the H-buurt. The research method tested in Almere created a frame of reference for H-buurt. For H-buurt, there will be more time and multiple stakeholders. This will influence the methods used.

For the media research, data was collected from Facebook, Instagram, Flickr, and books. This data was interpreted by extracting values and attributes. This was used to create visualizations like hotspot maps, mind maps and a Sankey diagram.

Especially the social media sources and the corresponding maps were quite useful, as they provide quantitative as well as qualitative information.

During street interviews for the on-site research, 4 techniques were used, which were later ranked according to usefulness for the research in H-buurt

1. Questionnaire: a set of questions guide the conversation, making the gathered information comparable.
2. Pictures: opinions about a set of photos were asked, enabling the gathering of information about multiple subjects.
3. Drawings: the interviewees drew and explained what they value the most in the area.
4. Open conversation: letting interviewees lead the conversation resulting in much but regularly irrelevant information.

By colour-coding the gathered data, values and attributes were extracted, similar as to the media research (figure 7).

H-buurt

The methods were then used for research in the H-buurt. The group divided into four smaller groups, to each research from the perspective of a stakeholder according Howard (2003). The division was as followed: Users (Insiders/Outsiders), Owners, Academics/Makers, and Government. In this research plan, the users', and makers and academics' perspectives are most relevant to the individual project and are therefore highlighted.

The methods used by the groups differed slightly, focusing on different sources, in order to best research each perspective. However, to gain comparable results all groups used photo-elicitation (Harper, 2002), for which seven photos were selected and shown to all interviewees.

The method for processing data was also equal for all groups. The program Atlas.it was used to 'code' the data, adding keywords to the interviewee's quotes. An inductive strategy is chosen, the codes are not chosen beforehand but after the coding process. This ensures that the codes reflect the issues of importance from the interviewees, not the preconceived notions of the researchers (Hennink, Hutter, & Bailey, 2020).

Three Guys (< 20 years)
Location: Bivak, near the high school

These three guys are high school students in Almere Haven. One of the guys lives in Almere Haven, and the other two guys live in another part of Almere. They feel that the **shops, corrosia building and the port are representative for Almere Haven**. Although, one guy who lives in the Almere Haven mentioned that he noticed **the empty shops are more common these days**. He and his friends didn't deny that they often go to Almere Center as more branded shops are available there. They also feel that the buildings in **Almere Haven are old fashioned except for Corrosia**. They explained that the **old buildings should be renovated** like the **building across the old police station** – which they described as **colourful and modern**. They feel comfortable and safe walking around Almere Haven except in the area where the **"Coffee Shop"** is located which they explained don't feel comfortable walking around that area.

Figure 12: Colour coding of the gathered data (own product).

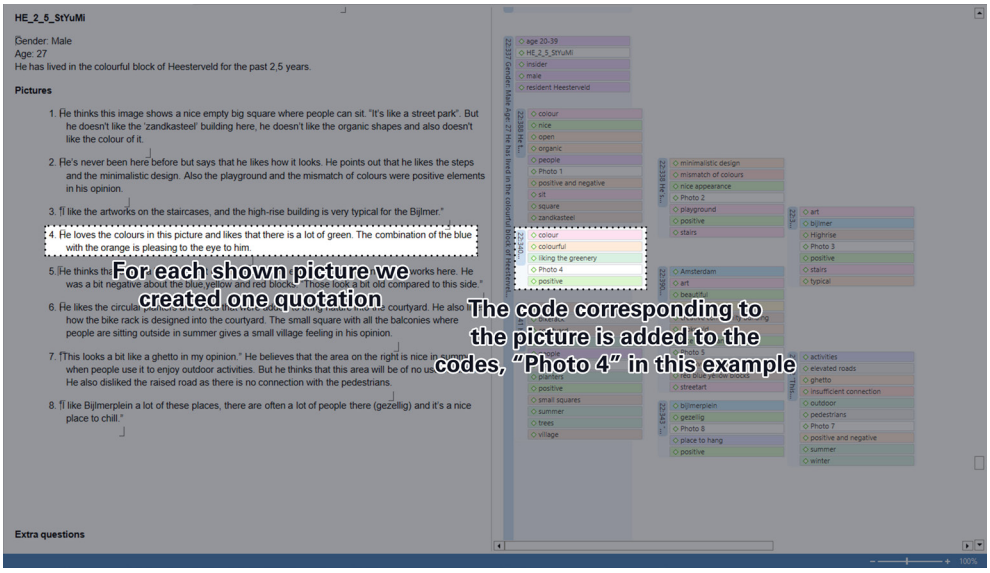


Figure 13: Using Atlas.it to code the gathered information (own product, adapted from Atlas.it).

4.3 Individual Research

After the collective research into the complete H-buurt the focus shifts towards more individual research. While the collective research was broader this research focusses on the two main topics of the project, adaptability and cultural values. The figure below (figure 5, own production) shows an overview of the methods which will be used for the individual research.

Literature research can be a valuable source of information, because of the availability of a wide range of sources (Lucas, 2016). During the project multiple sources will be researched, including sources from the period the buildings were built and later works.

Furthermore, the buildings themselves will be analysed as well as the different stages the buildings went through, to understand the way the building has already changed. This in combination with the literature will offer insight into why the buildings were designed the way they were and how this relates to the needs of the current users.

The building analysis can be split into three processes. First an informative, then deductive, and lastly an abstracting stage (Meyer, 2002). During the first phase the goal is to create objective visualizations of the development of the object. The second phase focuses on interpreting how this object cam to be this way. The final phase consists of prioritizing aspects, establishing themes, and creating diagrams.

At the beginning of this project, the plan was to do more ethnographical research, besides the interviews done during the first quarter. But because of the epidemic, this plan was changed. Instead the focus was shifted to literature and case-studies, as well as the information found during the first quarter. Lastly, more time was spent on the research by design phase.

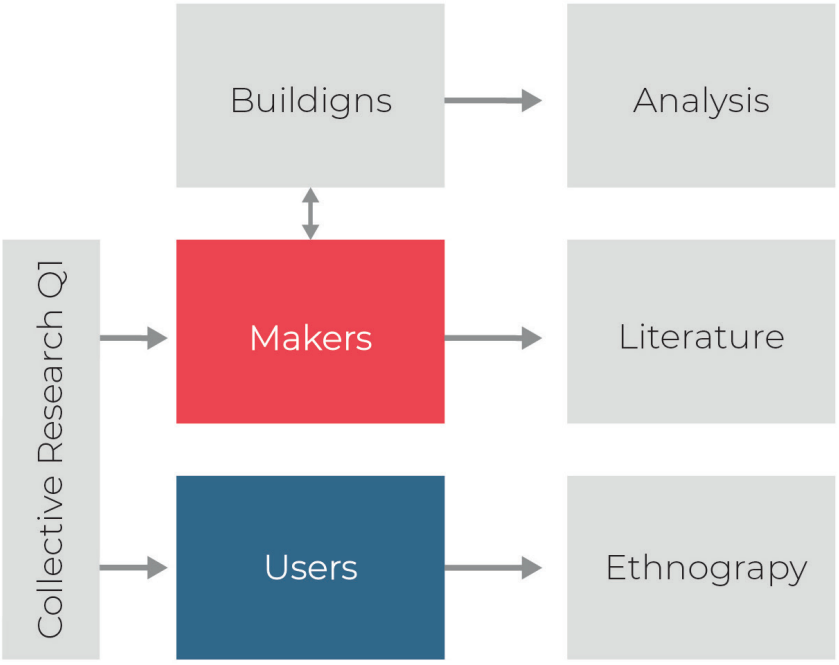


Figure 14: Overview methods (own product)

4.4 Research by design

During the design process, research by design was conducted. Multiple methods of research by design can be used, the methods differ based on variables in the design and research, for instance the chosen way of testing the designs (van der Voordt & de Jong, 2002). During this project, a combination of prototype design and scenario design was used.

Prototype design consists of an iterative process of designing, testing, and re-designing. During each round of testing the design is evaluated, so that during the next round of designing the design can be altered and improved.

Scenario design refers to creating multiple designs for one project simultaneously. The consequences of each design are then evaluated and compared to each other. By doing so the design that suits the project requirements best can be chosen

These two methods will be combined, to create an iterative process of experimenting and evaluating based on set requirements. Multiple strategies are created based on separate focus points. After evaluation, one of these strategies is chosen or multiple strategies are combined to continue with in the design process.

For example, strategies for socio-spatial focus include creating more physical connections and adding spatial diversity. After initial evaluation, these two were combined, to create a new strategy which was further developed and evaluated.

Figure 15: Combined strategy of creating connections and adding diversity(own product)

4

In order to evaluate the design, requirements have to be set, for which previous research is needed (van der Voordt & de Jong, 2002). For this the collective and individual research will be used. For the initial evaluations, aspects relating to social, spatial, and historical value were used as requirements. However, as the individual research will continue during the design phase, the requirements will change throughout the process. The requirements will also differ based on the stage of the design, as the scale and focus of the research by design shifts throughout the design process.

In order to create clear overviews, spider diagrams will be used to visualize the evaluations as visible in figure 16 (own product). The strategies are given a rating for the improvement or decline for each requirement. A diagram is created for the impact per attribute of that strategy, giving the opportunity to weigh the importance of each attribute. At the same time, a diagram can be created for the impact of the strategy in total, facilitating comparisons between different strategies.

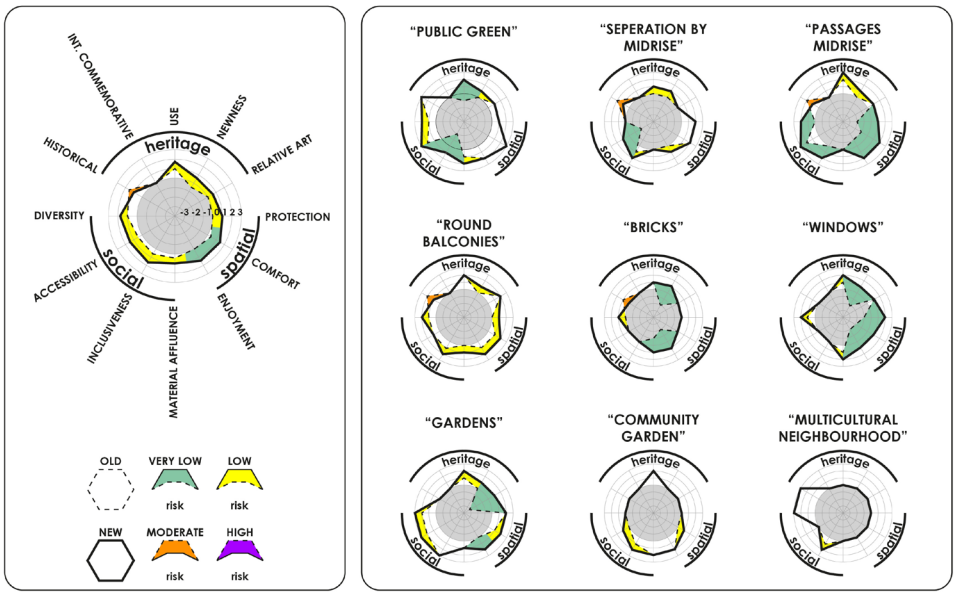


Figure 16: Evaluation of strategy using spider diagrams (own product)

5.1 Values and challenges

Before starting the design phase, research was done to support the following design process. This research will give basic information, as well as uncovering opportunities and challenges for the design process. The research will also lead to preliminary answers to the sub-questions, and function as a starting point to answer these questions with a design proposal.

In this chapter the first two sub-questions will be combined in one section, as much of the same research was used in order to answer these questions.

Literature

This project relates to the way people use buildings changes over time and the values people relate to buildings. At the moment there is already literature about these two topics. For the first topic this includes 'How buildings learn' by S. Brand and 'People and Plans' by H.J. Gans. The second topic is discussed in 'Re-Architecture' by A.R. Pereira Roders and 'Heritage-based design' by P. Meurs.

Brand has written and spoken about the life of buildings and how they change over time. He states that buildings are often not designed with the needs of the users in mind, but in order to create a statement, as an unchanging "lasting monument" (Brand, 1997b). Therefore, the architects focus on the image of the building, which becomes "detached from reality" (Brand, 1997a). As a result, the 'reality' becomes forgotten, the architects don't pay enough attention to aspects as the function, comfort, and maintenance of the building. In Brand's opinion, architects should start by looking at the use and how the building can develop after completion.

After completion, the user will shape the buildings to best suit their needs and wishes (Brand, 1997a). However, the adapted state is not the end state, as buildings are continually changing. Some parts of the building change faster than others. Brand mentions six layers: site, structure, skin, services, space plan, and stuff. The last layers generally change faster, offering newness to the building. The first layers are generally more constant, offering stability (Brand, 1997b).

Brand concludes by stating that some buildings improve over time, while others don't. Buildings last by being loved and being adapted and refined and in turn "Age and adaptivity is what make a building come to be loved. The building learns from its occupants and they learn from it" (Brand, 1997b).

In 'The Potential Environment and the Effective Environment' Gans (1968) starts with describing that not all problems can be directly fixed by a change in the urban structure. Planners focus on the aspects they can manipulate, even though these aspects regularly can't impact the social problems. He continues by writing about the mismatch

Figure 17: Health facility at south side of the building (own photo).

between the values of the designer and the values of the potential users. If this mismatch is too big, the plan will not be used in the way it was intended. Instead, it could be disregarded or altered by the users.

According to Gans designers should question what aspects impact the users and in what way and how the design can improve the lives of the users. "The facilities planned must be better in terms of the of the frames of both the planner and the users." (Gans, 1968, p.8) He introduces the effective environment in contrast with the potential environment. The potential environment is how a project is designed. The effective environment refers to the eventual use of the environment. Therefore, the effective environment acts as a step between the physical environment and human behaviour.

Pereira Roders focuses on the importance of taking ecological values in account. At the moment, resources are wasted by continuing to build new buildings, even though a lot of unoccupied buildings are available. Many of these unoccupied buildings contain resources that could be reused. At the moment, these buildings are mainly demolished without reusing anything. "Problem is that often the arguments behind such massive demolitions are not at all sustained by lifespan consciousness (ecological values). They are said to be sustained by social values, but in reality they are either sustained in profit (economic values) or power (political values)" (Pereira Roders, 2007, p. 192).
She continues by stating that it is not possible to know which buildings will be valued in the future, as some buildings seen as valuable today weren't always considered valuable, for instance gothic buildings. This is because the values deemed important by society change over time. At the moment, society mainly focuses on economic and political values. A change of perception is needed, as well as more focus on ecological values, for the preservation of buildings.

"Otherwise, future generations will inherit an even more problematic environment and look back to the present generation with no less regret than how the current generation looks now back to the previous generations who allowed industry and development to deploy most natural environments of the world" (Pereira Roders, 2007, p. 192).

Meurs (2016) sees value as the starting point for a design. The values that people emphasize change over time, and with that the way designers handle heritage. In the twentieth century interventions were generally designed to look modern and separate from the original. However, now a lot of possibilities are accepted and there is no standard intervention. Instead, each building is analysed to decide which approach fits the building the best.

One of the reasons why there are more possibilities when designing with heritage is the increased amount of heritage buildings. The monument list expands continuously, while monuments are rarely removed from the list. This also raises the question of what heritage is and how it differs from other buildings.

Meurs (2016) discusses three pairs of values, which can be used to analyse heritage. First, he mentions age and design value. The best intervention for age value is to keep the building as close to the original as possible. But the value could also be in the concept, instead of the material, in which case bigger interventions could be possible. Secondly, he mentions expert and community value. Experts and community have a different perspective towards heritage, it is possible that these don't overlap or even contradict each other. Lastly, he mentions object and context value. Object value focusses on the building itself, while context focusses on a larger whole. If a building doesn't have object value, demolishing the building could still seriously impact context value.

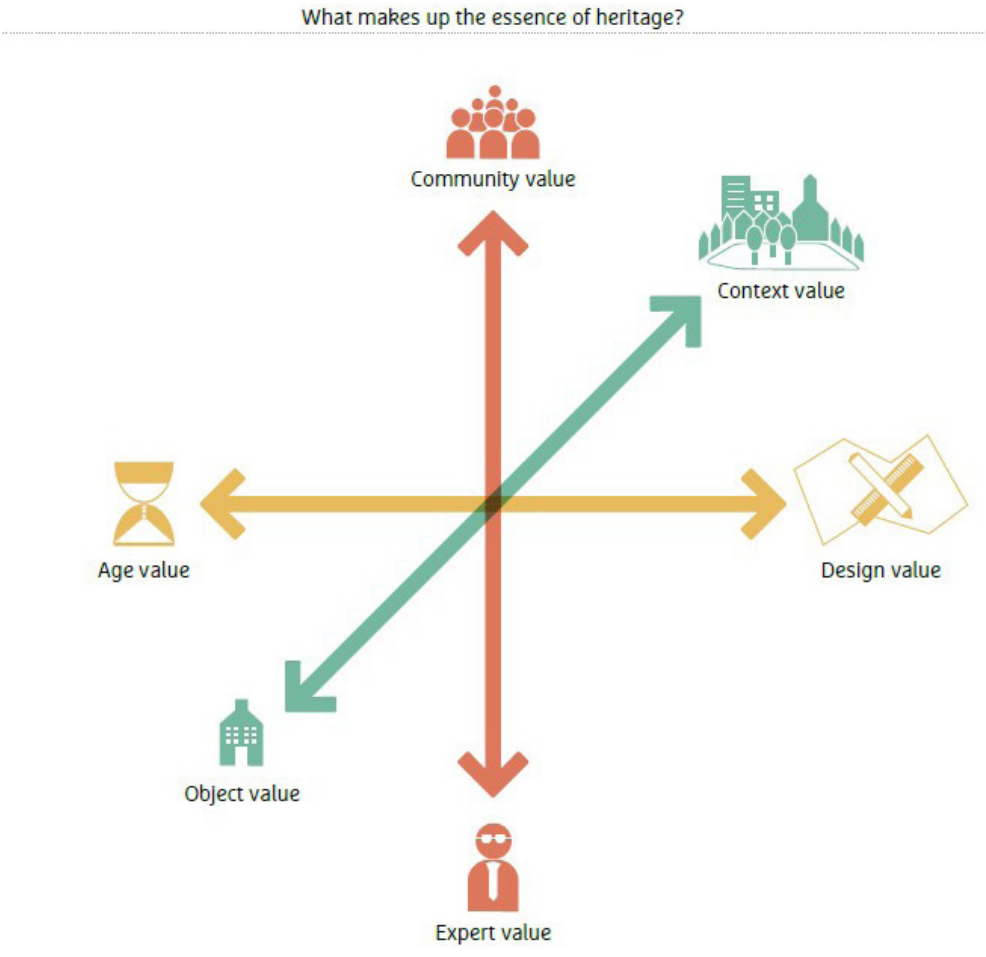


Figure 18: The dimensions of cultural value (From "Heritage-based Design,"by P. Meurs, 2016, p. 34)

As mentioned on these two separate topics, change through time and cultural values, a lot of research is already available. However, the combination of these topics has not been researched, even though they are relevant to each other, as the values impact the way buildings change and vice versa.

This project combines the two topics, investigating how these topics interact. During the project, the values that are assigned to the buildings are investigated as well as the changes made to the building.

The research will be applied to Hoptille in order to create a design where the mismatch between the design and the users' needs is minimal. This research can then be applied to other projects of 80's housing as well, as the research into the values and how to adapt these dwellings is still limited.

Interviews

During two site visits 19 interviews were held in Hoptille. On top of those, 4 in-depth interviews were held at a later moment. While the number of street-interviews exceeds the in-depth interviews, the latter offered more information, as more questions could be asked about the context and the reason behind the answers. When interviewing people on the street, they were also more likely to say they did not have an opinion about the building.

During the interviews it soon became apparent that the opinions of the users regularly contradict each other, as each person has their own opinion about Hoptille. As a result, some of the conclusions that were gathered from the interviews also contradict each other. For instance, the green around Hoptille is appreciated, however the green is also considered as not diverse enough.

Furthermore, it proved difficult to focus the interviews on the specific surroundings of the building and even more difficult to focus on the building itself. By using photos and interviewing nearby the building this became easier (see Appendix A for photos).

The results of the interviews were put in matrices, to create a clear overview of the different opinions. These matrices do not show all the information, but rather the opinions that were voiced most frequently or opinions that stood out.

The interviewees mentioned aesthetical and social values the most. Political and historical values on the other hand weren't really mentioned. This probably had to do with the fact that an effort was made to keep the interviews as open as possible. This means that people probably did have an opinion about the political or historical values, but that the interviewer should ask specifically about it to get a response from the users in the areas.

In conclusion there were four values, which were very important for the users (figure 19). These values are the aesthetic, ecological, economic, and social values, these were the values mentioned most by the residents, workers, and visitors. The attributes belonging to the values could be positive or negative.

Important attributes for the aesthetic value were the street art and the buildings itself. Garbage was mentioned a lot in a negative way in relation to the ecological value. The accessibility was mentioned in a positive way. While the stairs in front of Hoptille were mentioned as negative since they limit accessibility. The social aspect was also of great importance for the users, they were mainly positive about this subject. They only speak negatively about the crime and unsafe feeling.

Two aspects that arose from the interviews stand out and play an important role in this project. Being the lack of overview in and around Hoptille, as well as the feeling of community in contrast with the amount of crime.

Aesthetic	Ecological	Use	Social
	Greenery	Location Dwelling size	Community Emotional
Midrise	Technical issues	Circulation Technical issues	Crime Lack of social interaction

Figure 19: Conclusion interviews (own product)

Male, age 40-59,
Community Police Officer

"It's a nice neighbourhood, just every now and then there is a shooting." – volunteer at the Handreiking

Crime
- Safety

Social - Safety

Times mentioned: 5

Figure 20: Quote interviewee (own product)

Figure 21: Positive aspects mentioned by interviewees (own product)

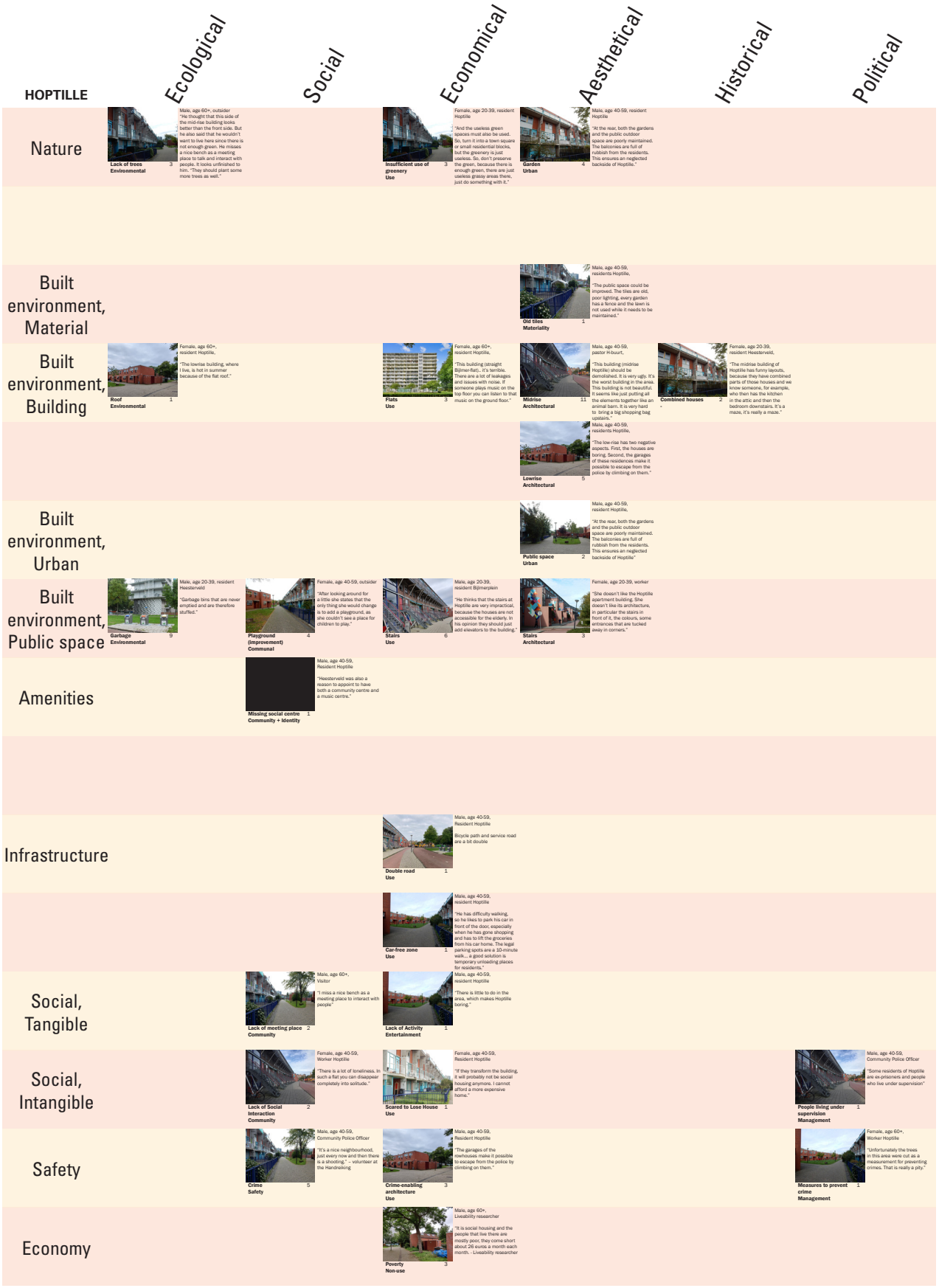


Figure 22: Negative aspects mentioned by interviewees (own product).

Building analysis

Besides the values attributed by the users to the building, the building also has other values such as historical values. The building was built as a reaction to the high-rise in the Bijlmer, since these buildings were deemed as unsuccessful because of the high amount of poverty, crime, and unemployment (Bijlmermuseum, 2017). Therefore, the elements that were added to explicitly contrast from the high-rise convey this historic value.

The Hoptille mid-rise building was meant to function as a wall between the low-rise and high-rise, in an attempt to protect the low-rise from the problems of the high-rise. This resulted in the height of the building being 5 stories high and the length of the building being 300 meters. Because of this length the building has two passages, to give access to the low-rise.

The historic value is also present in the interior corridor. Even though this corridor was removed during the first renovation within four years after completion of the building, the corridor plays an essential part of the original, maybe naïve, view of the designer.

The transition from high-rise to low-rise is also visible in two long facades. The façade facing the high-rise is stricter, with less diversity and a strict grid. The only diversity in this façade is created by the relief and the staircases. The façade facing the low-rise on the other hand has more diversity. This is present in the two types of balconies, as well as the ornamental concrete slabs creating more diversity in shape and material.

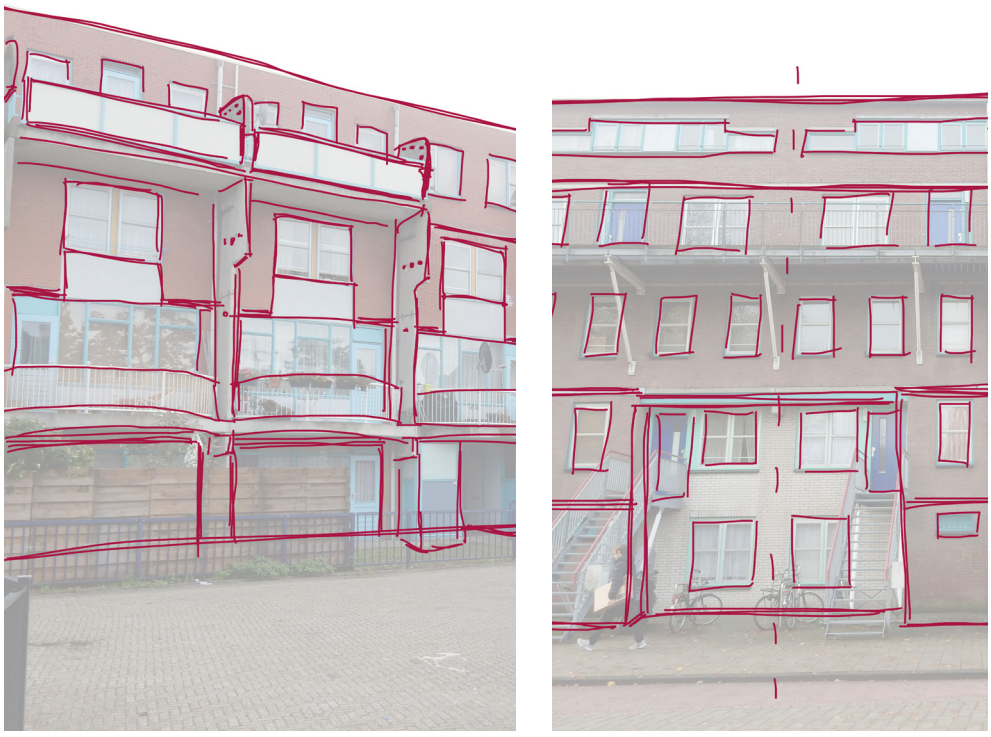


Figure 23: Analysis facade (own product)

Conclusion

Based on this research a preliminary answer can be given to the first two sub-questions, by identifying the values and challenges currently present in the building. In the design process it will be necessary to preserve the values as much as possible, while resolving the challenges.

The aspects relating to social and use are present in both the values and challenges and will therefore require more attention. These aspects also align the most with the main topics of the project. The social aspects will require even more consideration, as the exact social outcomes can not be predicted.

Furthermore, the historic value should be preserved as much as possible. Any transformation will result in a loss of historic value, as parts of the building in its current condition are changed. By focussing on preserving the attributes that are associated the most with the historic value, the loss can be minimized.

The ecological value on the other hand could be improved upon, if enough of the current attributes are preserved, and new ecological elements are added. For instance, more diverse green can be added.

Values

Ecological

Greenery

Embodied energy

Use

Location
- Near public transport
- Near shops

Large houses

Social

Community
- Hoptillehuis
- Handreiking

Emotional
- Recognizable

Historic

Anti-bijlmer
- Midrise
- Material
- Horizontality
- Diversity

Challenges

Aesthetic

Midrise
- Facades
- Colours
- Lack of openness
- Exterior stairs

Use

Technical issues
- Heating
- Ventilation
- Noise

Circulation
- Lack of accessibility
- Lack of overview

Social

Crime & Unsafe feeling
- Passages
- Circulation

Lack of social interaction
- Lack of meeting spaces

Figure 24: Conclusion values and challenges (own product).

5.2 Adaptability

In order to understand the possibilities for creating adaptability in Hoptille, the structure of the building has to be analysed. Furthermore, case-studies have to be done of adaptable buildings, so they can be compared to Hoptille. It can then be determined whether the strategies of the case-studies could be applied to Hoptille.

Building analysis

The building consists of load--bearing prefabricated concrete walls on top of which filigree slabs have been placed. These slabs consist of prefabricated floors slabs reinforced with steel lattice girders, which is later cast over forming one solid construction. On the ground floor another system is used, that of a prefabricated beam and block floor. Which is placed onto concrete foundation beams.

Most of the facades are also constructed with prefabricated concrete, albeit non-load bearing. The only exception is in the bottom two levels on the south-west façade of the building, which are constructed with sand-lime bricks.

The load-bearing walls are placed in an irregular grid. With 3,6 m between the walls on the north-east side and 4,8 m between the walls on the south-west side of the building. These two grids are connected in the middle to a wall, which runs the entire length of the building.

Since the building has been renovated twice, some former openings in the structure have been closed off, while other openings have been created. These already existing openings could be used to increase the adaptability.

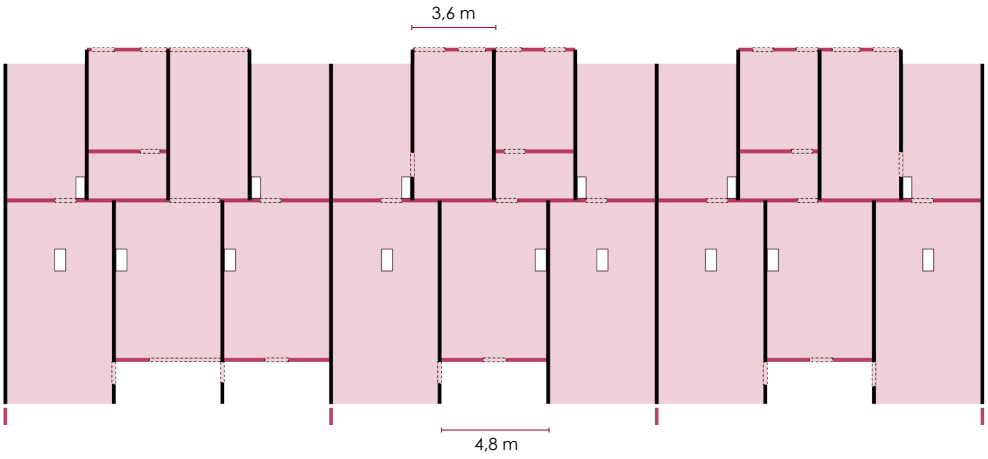


Figure 25: Analysis structure(own product)

Case study adaptability

To investigate strategies of creating adaptability four case studies have been done.

Solid

The façade of this building is load bearing, removing the need for structural elements within the building and creating large open spaces. The shafts are the only elements that can not be removed from this space. The shafts are oversized on purpose, to allow adaptability in services, as well as flexibility in functions (Mensink, 2016).

The shape and size of the separate dwellings or other functions is flexible. The infill is also flexible and belongs to the user. This way the user themselves can determine how much to invest in their space.

ERA flats

The dwellings in the ERA flats gain their adaptability through their size. Even though the size of the dwellings cannot be altered, the size of the grid in these flats allows for flexibility in the layouts. These layouts can therefore easily be changed, without a need to alter the structure of the building (ERA Flats, 2021).

Résidence pour chercheurs

The regular grid of columns allows for flexibility in this building, as this allows for flexible infill of the floorplan. Moreover, the columns allow for multiple units to be linked together easily, creating the opportunity to expand and decrease the dwelling sizes (Lacaton & Vassal, n.d.).

Furthermore, winter balconies are added to all units, adding floorspace and flexibility in function. These spaces can be used as balconies but can also be closed off and used for indoor functions.

Expandable house

This house consists of multiple small elements which can be linked together. As a result, different dwelling sizes and configurations are possible. The possibility to expand to multiple levels is also available. The only permanent element is the longer element at the side of the building, which is used for services (Archdaily, 2018).

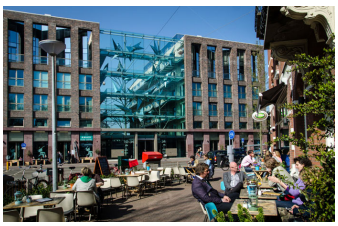
Conclusion

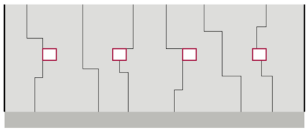
All these buildings have in common that at least one element is consistent throughout, creating a regular grid. This could be created with the load-bearing structure, such as is the case in the ERA flats and Résidence pour chercheurs. Within the grids many different options can be created. However, there are also limitations to these options. For the ERA flats the size of the dwellings can not be changed. With the Résidence pour chercheurs and Expandable house, the size of the dwellings can be increased, but only with set amounts. The dwellings in Solid have the most possibilities in term of size, but even here, the dwellings have to be connected to a shaft and the main hall.

Another aspect to keep in mind besides the structure, are the services, as each dwelling will need to have access to heating, ventilation, water, and electricity.

5

Solid
Stadgenoot



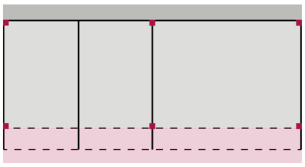


- Permanent shafts
- Loadbaring facades

ERA flats
Smits Vastgoedzorg & Era Contour

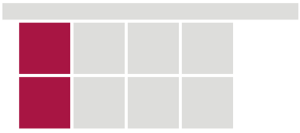
- Large units in regular grid

Résidence pour chercheurs
Lacaton & Vassal



- Regular grid of columns
- Winter balconies added

Expandable House
Urban Rural Systems



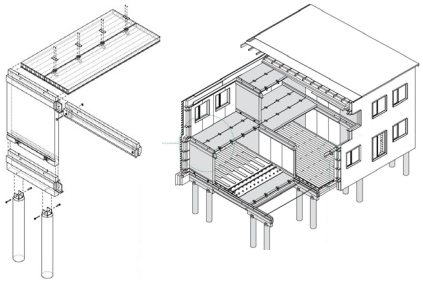
- Expandable housing by adding units

Figure 26: Case-study adaptability (adapted from "Solid Oud-West" by Schröder, n,d,; "Artist impressie eindresultaat ERAflat Purmerhoek" by A3 Architecten, n.d.; "Résidence pour chercheurs" by Lacaton & Vassal, 2013; "Expandable house / Urban Rural Systems" by Putra, 2018)

SUPER Local
Heem wonen

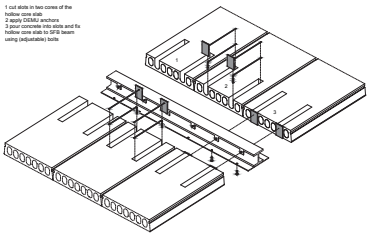
Materials used from nearby demolition
Multiple ways of recycling material tested

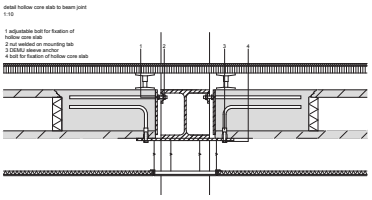
Circle House
Lerjerbo



Completely demountable house
Limited amount of elements with which many different design can be made

Temporary Courthouse
cepezed





Designed to be temporary
Completely demountable and reusable

Figure 27: Case-study circularity (adapted from: "Superlocal"by IBA, n.d.; "Sloop flat A"by Superlocal, n.d.; "Modular building system axonometry" by GXN Innovation, 2018; "demountable floor system" by cepezed, n.d.)

Case study circularity

Another three case studies have been done in order to investigate the strategies for creating circularity in buildings.

Temporary Courthouse

This building was designed with the knowledge that it would only be used temporarily. Therefor the goal was to create a design that could be disassembled, while the comfort and functionality of the building should be the same as a permanent building. All elements in this building are demountable and reusable (cepezed, n.d.).

Circle House

Similar to the courthouse, all elements in this building are demountable. For this dwelling a set of elements are used that can be used in multiple configurations. Therefore, allowing for diversity and adaptability (GXN Innovation, 2018).

Super local

This project focused on experimenting with different techniques for creating circularity. Material was gathered from a nearby demolition project, which was used in several ways to build new buildings. This included lifting out and reusing whole units, reusing building elements, and recycling the material into demountable building elements (Superlocal et al., 2019).

Conclusion

Circularity is mainly created by designing smaller elements which can be put together in many configurations. As a result, the elements can be reused in other structures or easily replaced when damaged. In order for this to be possible, the elements have to be demountable, which can be achieved in multiple ways.

Conclusions

The main difference between Hoptille and the case-studies for adding adaptability is the irregularity of the grid in Hoptille in contrast with the regular grids of the case studies. Each of the case studies has an element that is the same throughout the entire building. In order for this to be applied to Hoptille, a method has to be found to create a regularity in the grid of Hoptille. Furthermore, the adaptability of Hoptille is limited by the size of the units, in order to create dwellings multiple of these units have to be combined. All in all, none of the strategies used in these case studies could directly be applied to Hoptille, but they can function as a starting point in investigating other options.

The case studies for circularity however focus on smaller elements, which are demountable and can be reused. Because of the small size of these elements, this could be applied to Hoptille. Even the irregular structure will not limit this application, as both rhythms are multiples of 1,2 m.

During the design process the design soon split into separate interventions, which worked together to create one collective design. So the interventions were still connected to each other and depend on each other. But by splitting the design into these interventions it became easier to reflect on the consequences of the experiments on the design and the found values.

As a result the final design can be split into five main interventions. Each of these interventions focusses on specific values to preserve and challenges to resolve, as can be seen in figure 28 (own product).

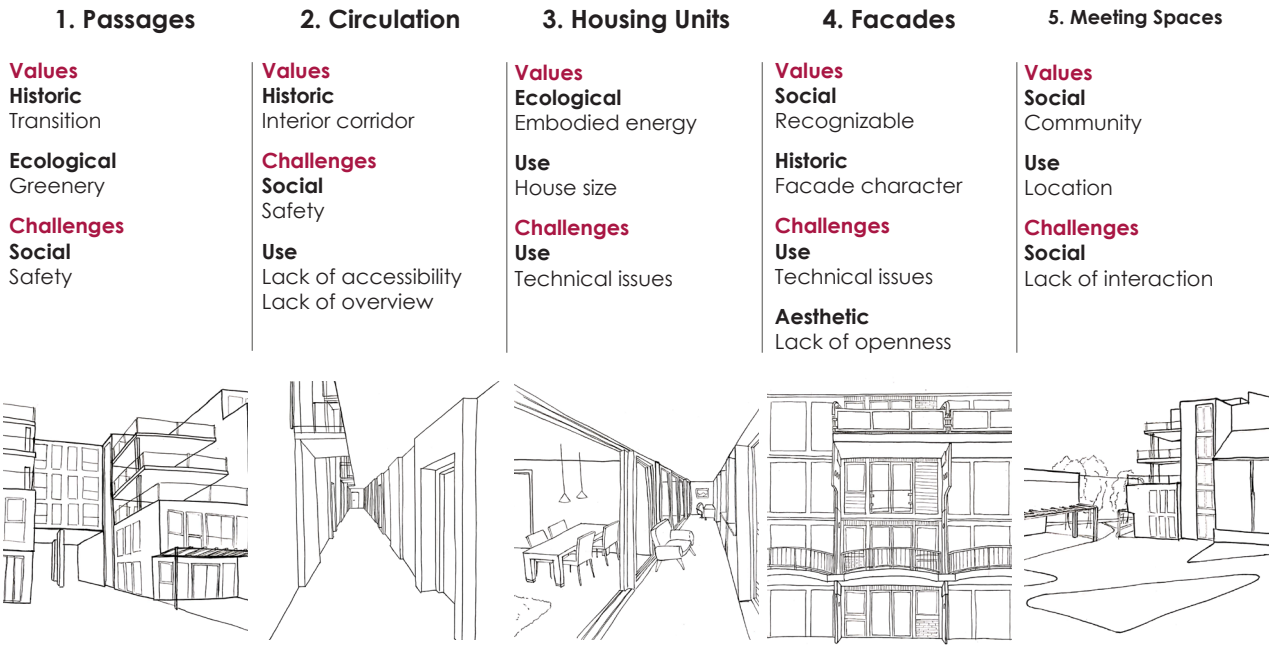


Figure 29: Design interventions (own product)

Figure 28: Health facility at south side of the building (own photo).

6

6.1 Passages

The design process started by creating a series of scenarios in groups of three. These scenarios were used to offer a first idea of all possibilities for the project. The focus of these scenarios was put on social and spatial aspects, for which criteria from Jan Gehl and criteria from the J. Max Bond Center were used (Gehl Institute, n.d.). It was found that Hoptille scores badly on protection as well as comfort.

In total 14 separate scenarios were created. Some of these were then combined into one scenario which was then tested, to understand how the scenarios would affect the current situation. The scenarios which were combined are: enhancement of visual and physical connections, enhancement of physical and visual diversity, and addition of communal space. Combined this resulted into the addition of communal space around the passages in Hoptille.

Due to the length of the building, Hoptille has two passages underneath it. The two passages connect the low-rise with the green in between the high-rise building and are an ideal location for enhancing the connection between the low-rise and high-rise. By the addition of communal space, more activity will take place around these connection points.

The scenario was then tested by comparing the proposed intervention to the current conditions, as well as assessing the likeliness of these outcomes. This resulted in the following spider diagrams based on the attributes they influenced.

Overall, the scenario leads to a positive outcome, only the historical value of the attributes is reduced by the interventions, which is to be expected by most interventions.

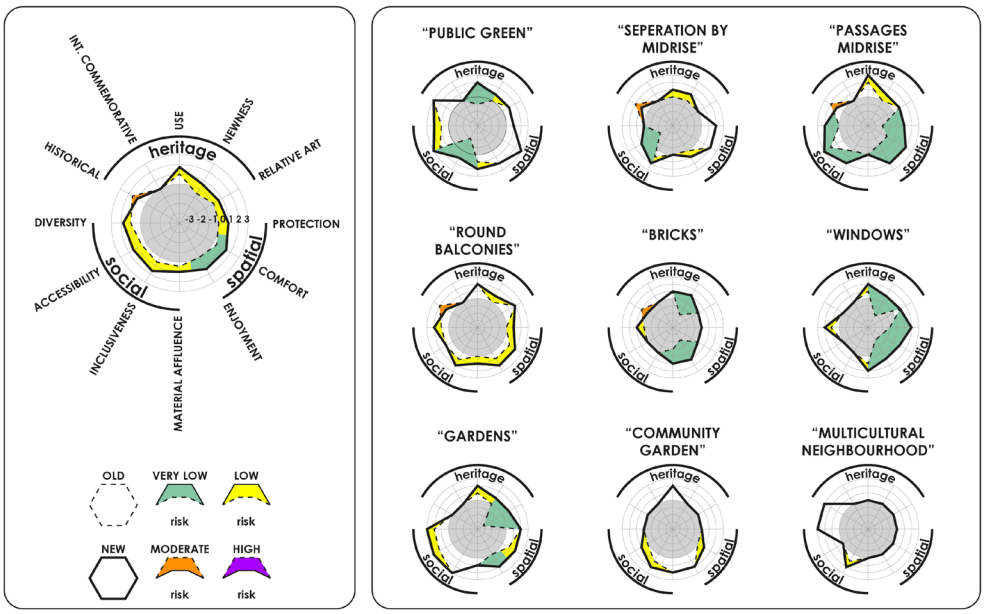


Figure 30: value assessment (own product)

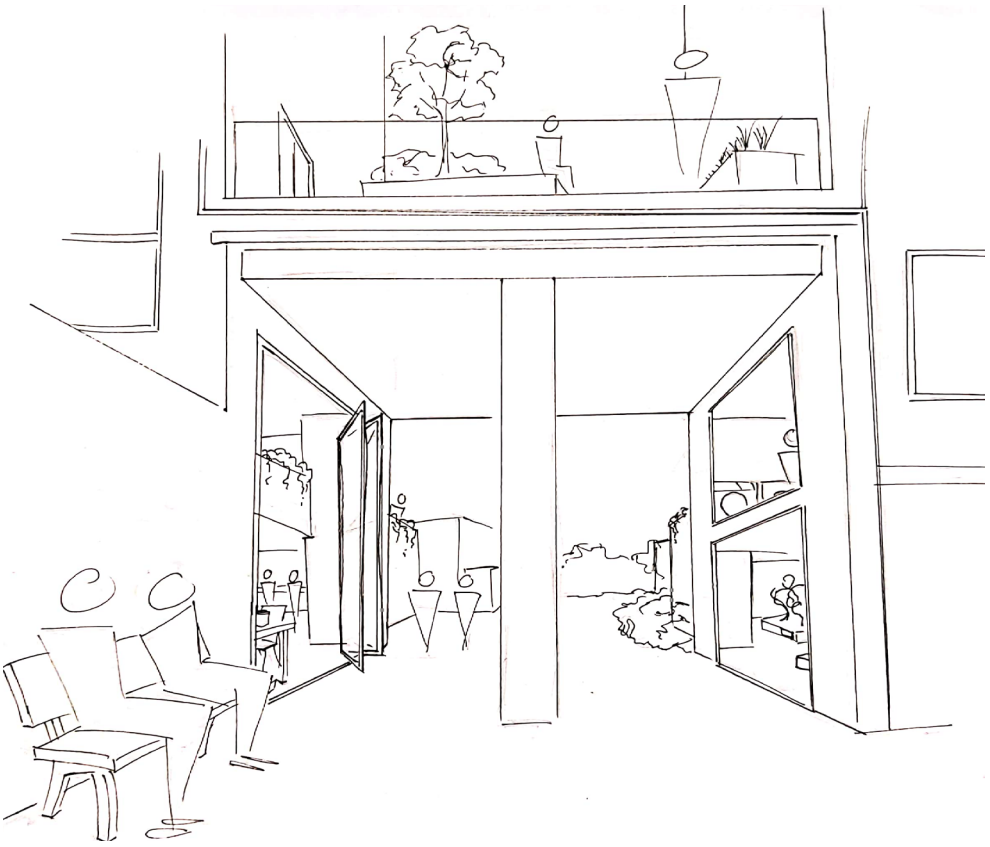


Figure 31: sketch scenario (own product)

Since these assessments focused on the attributes of the building with values associated to them, the challenges of the building are not taken into consideration. The main challenge of the passages is the feeling of unsafety they create, mainly because of the lack of overview and lack of light.

The lack of overview is the result of extruding elements on the north-east façade. The elements limit the view, so the passage is only visible just before you pass the opening.

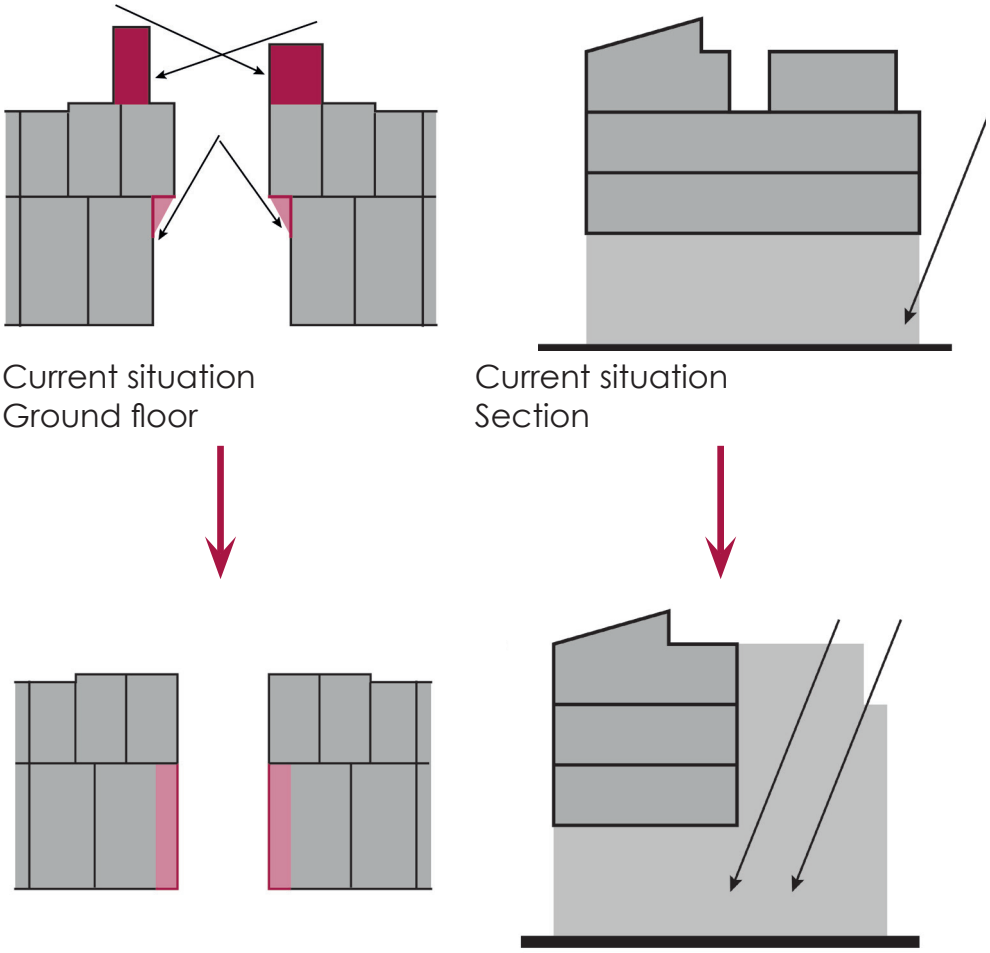
Corners within the passage further limit the view, as they create a space for someone to hide behind. By removing the extruding elements and adding volume to remove the corners, more overview in the passages can be created.

The lack of light is the result of the depth of the passage, as sunlight cannot reach under the entire passage. By removing half of the volume above the passage, less sunlight is blocked, allowing more daylight to enter the passage.

Lastly, public and communal functions are added to the passages, which will increase the social control, as well as the communal balconies which are situated beside the passages. This increased social control adds to the feeling of safety.

Furthermore, the building only has two passages, which are located around 50 m from the ends of the building. A length of 200 m of the building does not have a passage to connect to the low-rise buildings. Therefore, another passage is added in the middle of the building, creating more connection between the low-rise and the green between the high-rise buildings, which was valued by the users.

Figure 32: lack of sight into the passage (own photo)



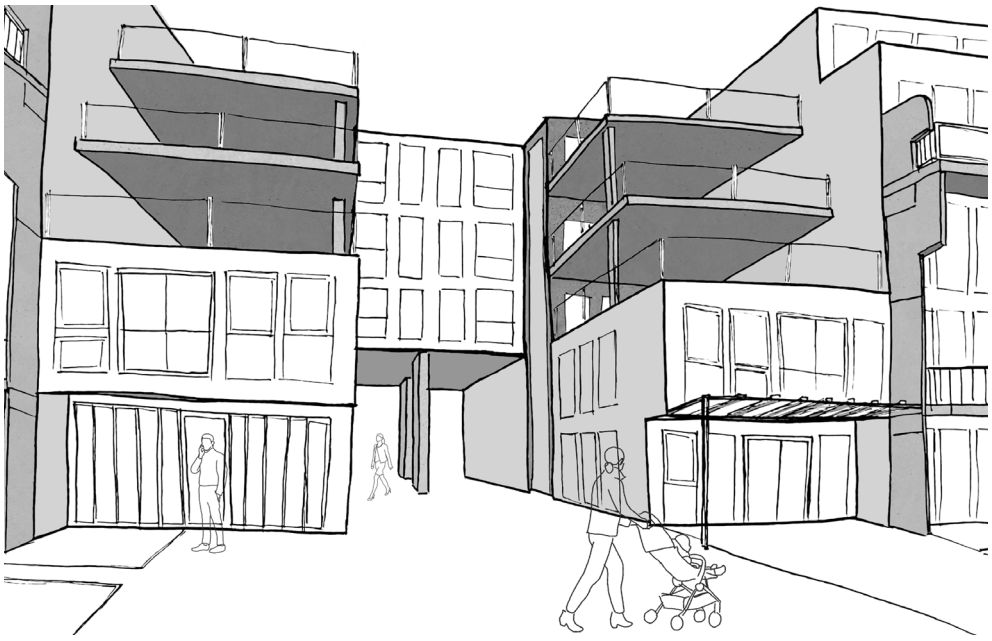


Figure 33: Proposed intervention (own product)

6.2 Circulation

In order to create more adaptability, the overall layout of the building had to be adjusted. To create adaptability in the long term, the opportunity to increase and reduce the size of the dwellings is necessary. Therefore, almost any space in the building should be reachable from the main circulation system.

Another requirement for adaptability is the need to be able to access any floor by elevator. This will ensure that people from all ages can live in the building. Furthermore, this allows for the building to be adapted to another function over time and for dwellings to be created on the top floor.

The last main criteria for the circulation was to use one type of access system throughout the entire building, as the previous renovations had let to a lack of overview. This lack of overview was worsened because the different systems all have different kinds of entrances, some of which appear to be hidden away in dark corners.

To investigate the possibilities of creating this adaptability, the strategies from the case studies were applied to the building. Because of the irregularity of the grid, none of the created options gave a satisfactory result. In order to create more regularity, the original corridor was reinstated, dividing the irregular grid into two regular grids.

To limit the number of elevators needed the corridors were quite long in the first drawings, as the building was separated into 6 parts. This would mean that a big number of households were connected to the same corridor, which resulted in social problems when Hoptille was first built. Furthermore, the distance from the dwellings to an exit would be too long in terms of fire safety.

As a result, the corridors were split in two, with two corridors leading to one elevator. Meaning that the length of the corridor was halved, but all units were still accessible by elevator.

This also resulted in an increased number of entrances. Some of these were placed in the passages to increase social control and social interaction in the passages.

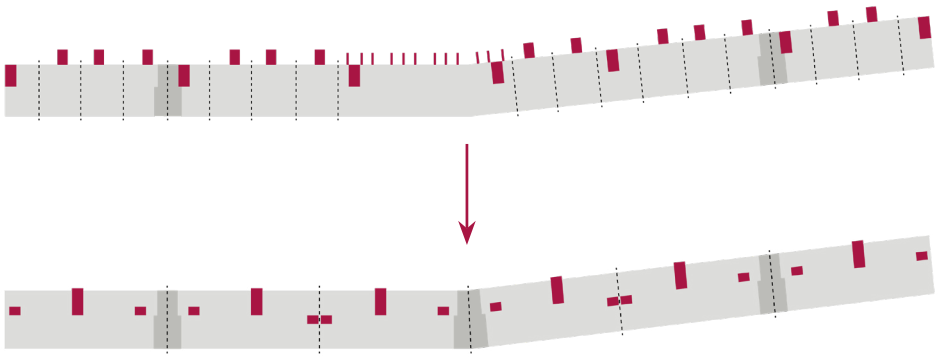
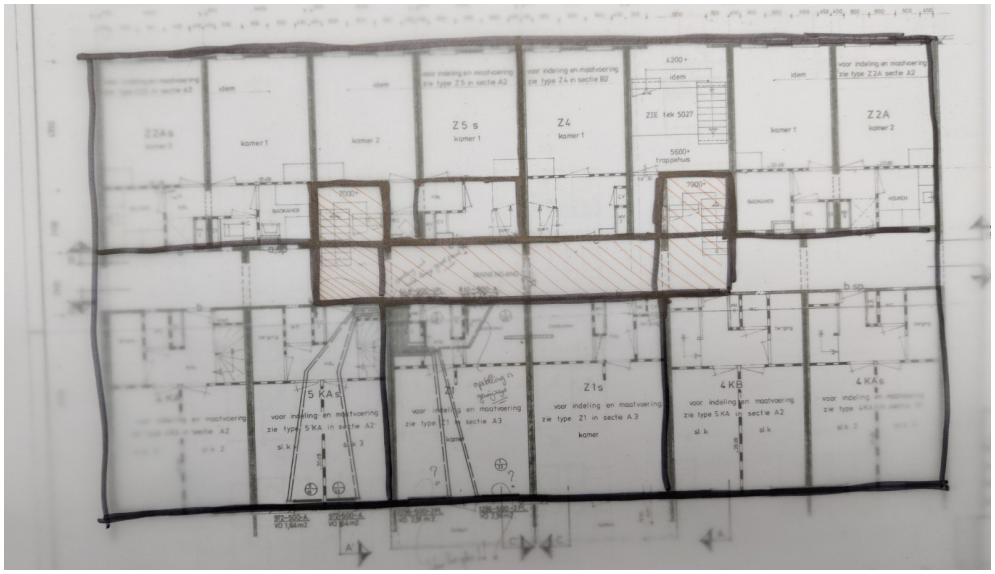
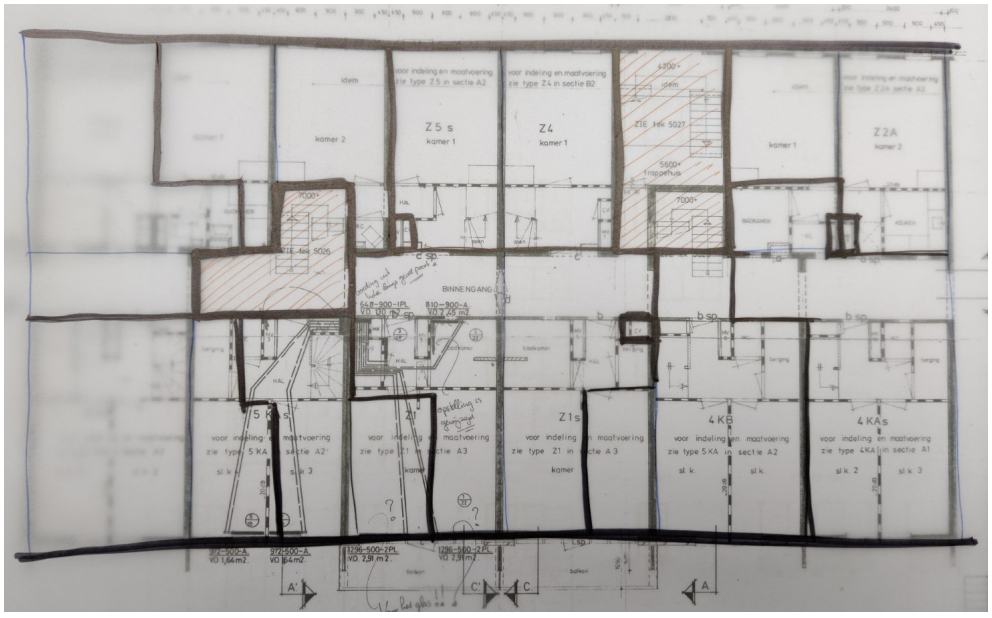


Figure 34: Proposed intervention (own product)





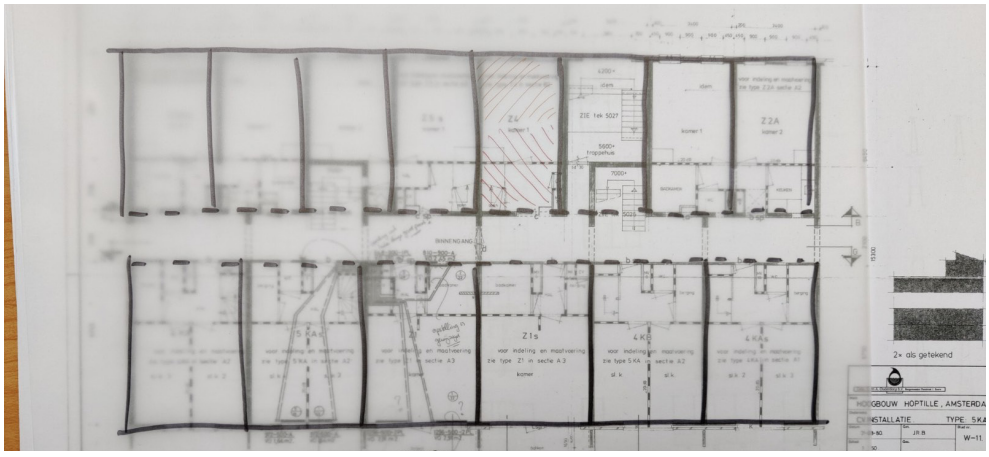


Figure 35: Experiments creating adaptability (own product)

Another concern about the corridors was the lack of daylight, as the corridors barely have contact with the facades. Therefore, the daylight had to come from the roof, by creating a skylights and openings in all the floors. The first experiments and tests showed that enough light could be let into the building to if the balustrades were made of glass. However, even too much could be let in resulting in glare. This let to the skylight to use translucent material, instead of transparent glass, fracturing the light and reducing glare.

Each corridor will also have access to a communal balcony, which can only be used by the residents of that corridor. These balconies are placed next to the secondary staircases, ensuring people frequently pass the space and can see if the space is in use, which according to Fromm (1991) will increase the use of the space.

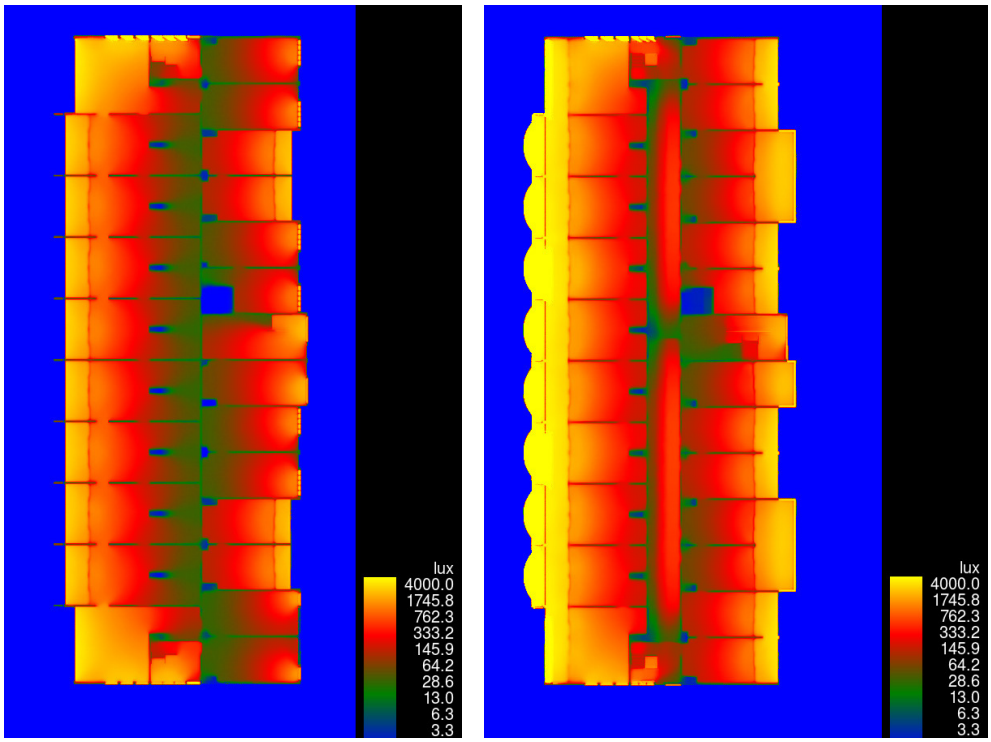


Figure 36: Light on ground floor and first floor (own product)

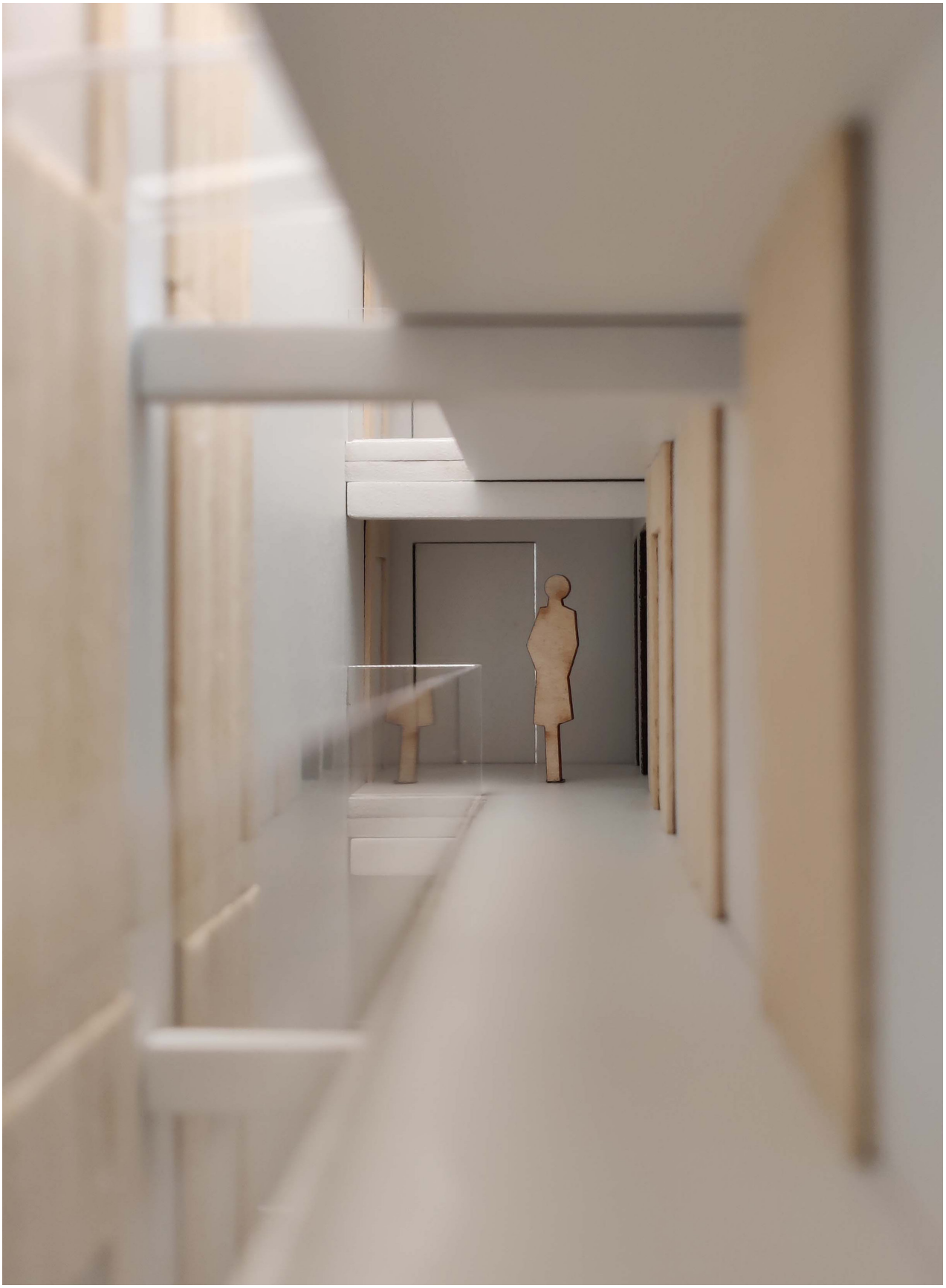


Figure 37: Interior corridor (own photo)

6.3 Housing Units

At the moment most of the residents of Hoptille live alone, about two thirds of the households, part of which lives in houses too big for just them alone. One of the interviewees even admitted they lived in a house far too big for them (Volunteer working with inhabitants of Hoptille, personal communication, October 20, 2020). To accommodate the current users, part of the dwellings should be reduced in size. However, the municipality of Amsterdam wants to create more housing for starters, immigrant families and elderly (Metropoolregio Amsterdam, 2018). If the houses can easily be changed, the current residents can continue living in the building, but the dwellings can be adapted for other users after they move out, or the dwelling can change with them, as their needs changes.

The different target groups have different requirements for the surroundings they want to live in. Hoptille is very accessible and is near a metro and a train station. Furthermore, there are many facilities nearby as well as shops at the Bijlmerplein. Therefore, this spot is suitable for many different target groups (see appendix B for urban analysis).

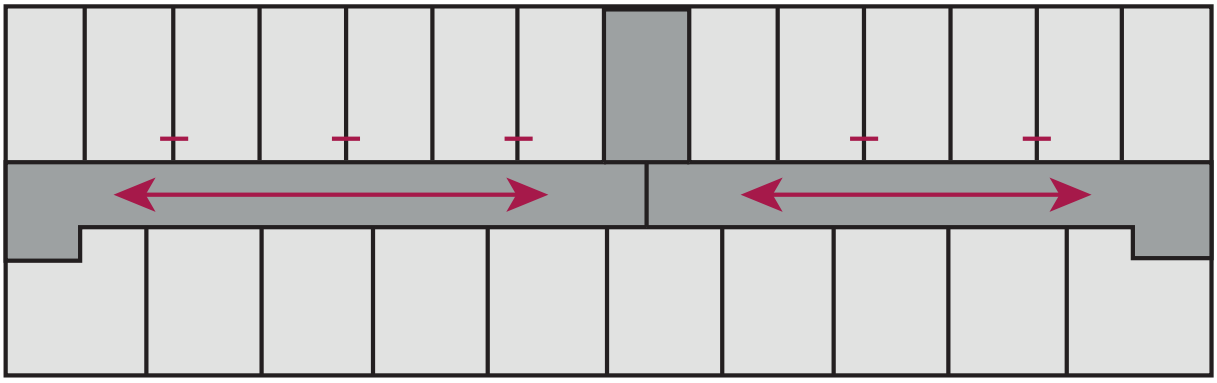
By adding the corridor and splitting the existing grid in two, some of the dwellings are also split in two. This creates units of roughly 40 and 20 square meters on the ground floor and units of 28 and 21 square meters on the upper floors. In order to create larger dwellings multiple of these units have to be connected to each other. By creating the opportunity to change the amounts of units connected more adaptability can be achieved. The housing types could change over time as the demand for certain housing types changes. Moreover, it creates the opportunity for a household to expand or reduce over time, as the dwelling size can change to their needs (figure 40).

To make this possible, openings are needed in the structure, which could be closed off if needed. However, creating openings in the existing structure reduces the embodied energy of the building and could damage the structural integrity of the building, so as little extra openings are created in the structure. By adding floorspace on either side of the building more connections can be made, without damaging the current structure. Furthermore, the added space will result in larger units, which on its own increases the adaptability of the building.

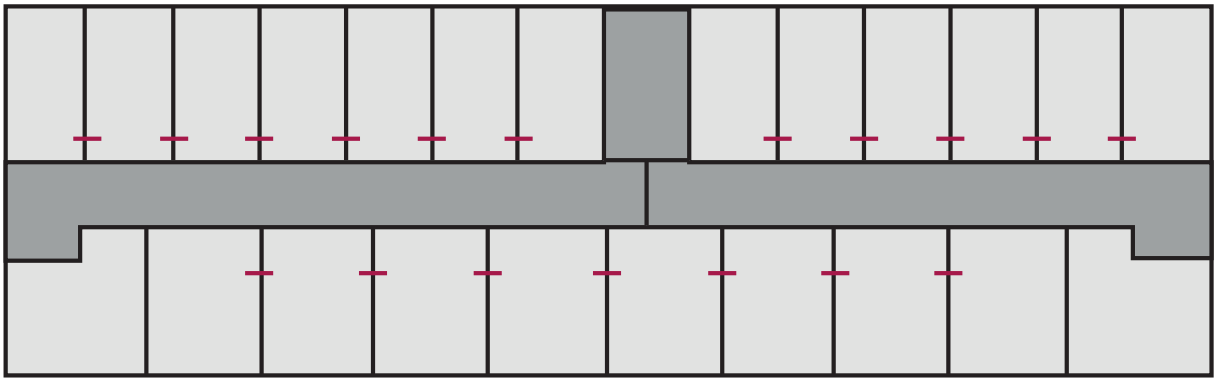
Besides the horizontal connections created by the added floorspace, vertical connections are also needed, to make sure every unit can be used. This is possible by creating openings in the floors, preferably where the stairs are currently located, and elements to close these off.

To further increase the adaptability, the layout within the dwelling needs to be demountable. Elements such as the shaft and location of the openings in the structure are permanent however. These elements limit the possibilities, mainly those of the service spaces, as these will have to be positioned adjacent to the shafts.

Step 1: reintroducing interior corridor



Step 2: adding connections



Step 3: adding floorspace

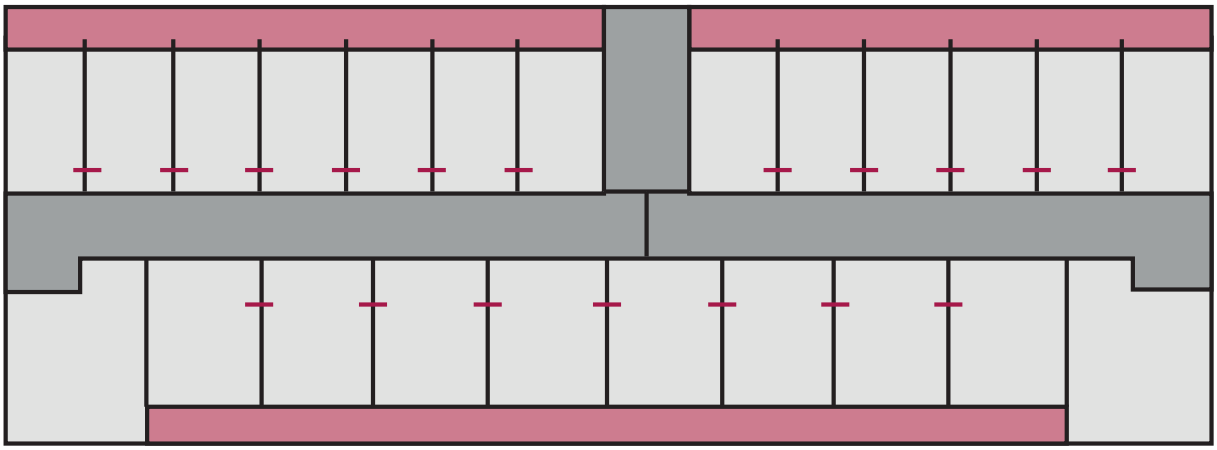


Figure 38: Creating adaptability (own product)

The possibilities to create dwelling for these and other (possible future) target groups was tested by designing example dwellings together with people belonging to the different target groups. Designing sessions have been held with an elderly couple, a starter couple, a student, and an 'empty-nester' couple.

During the sessions, the designs were sketched into drawings of the structure of the building. Meanwhile, questions about the needs, wants, and reasons behind those were asked. In the end, many configurations were designed. The larger dwellings created more different opportunities, while the options for smaller dwellings were limited. Especially the options for student housing were limited, since this dwelling only consists out of one unit.

Figure 39: Results of design sessions (own product)

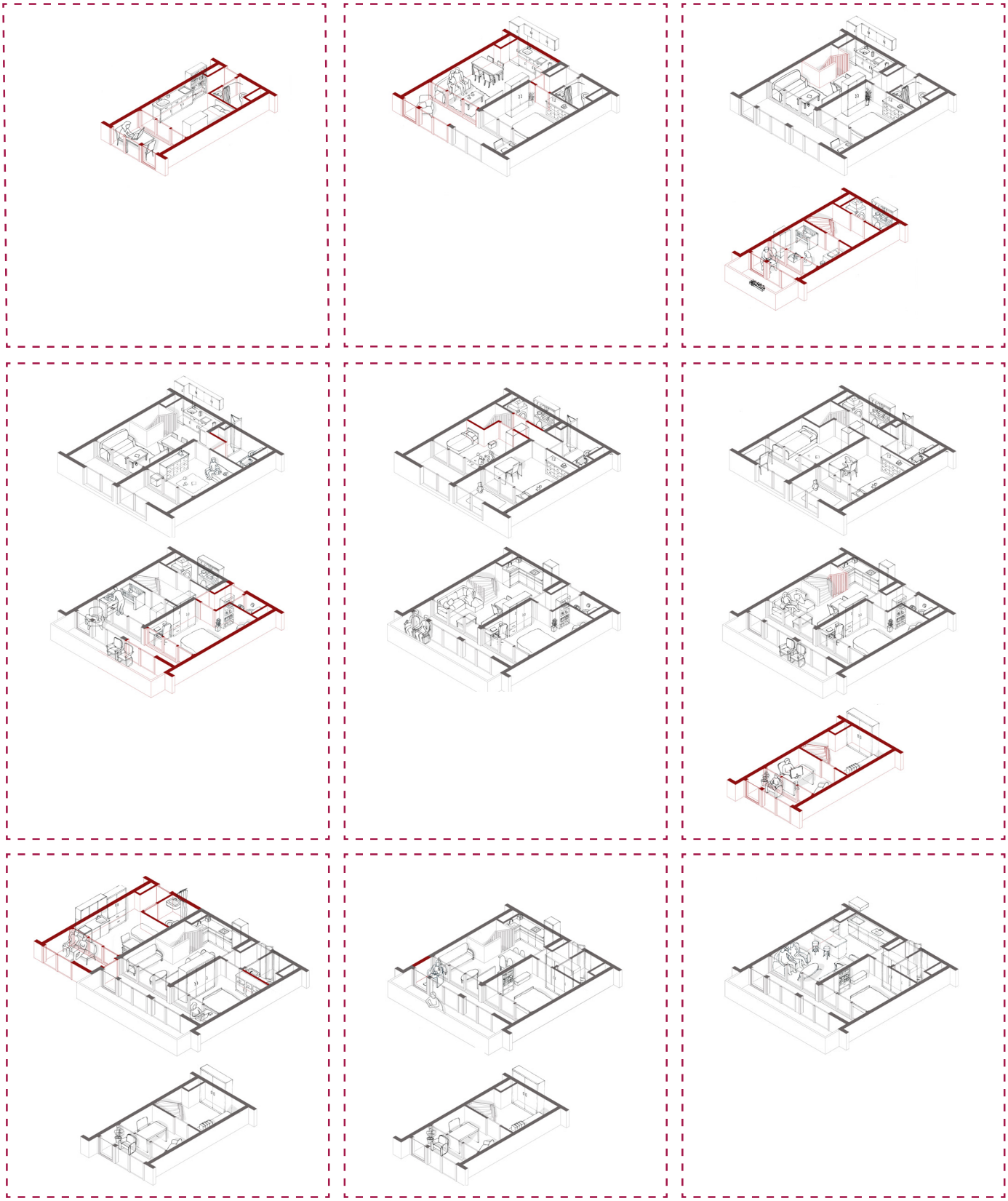


Figure 40: Changes made to a dwelling over time (own product)

6.4 Facades

In order to match the façade to the flexible infill off the building, flexible elements are incorporated into the façade. To reflect the current characteristics of the two facades, the facades should follow a grid. Furthermore, the diversity of the north-east façade will mostly be created by relief, while more diversity is created on the south-west façade. The two types of balconies and the concrete elements of the south-west façade are kept intact and re-used to create more diversity and preserve historical value.

In the original design the intention was also to let the users decide for the whole façade adjoining their unit, either 3 or 4 panels per unit. This could lead to a disruption of the grid and to a lack of light in the units, which is why the flexibility in the final design is limited to 1 or 2 panels per unit, with a French balcony to ensure enough daylight enters the dwellings. The north-east side of the building will have 1 flexible panel per unit, while the south-west facade will have 2, to further reflect the difference in diversity.

Because of the housing units intervention, which adds floorspace to the untis, the facades have to be moved. In the original design, the concrete and brick of the original façades was recycled and reused in the new façade. However, these materials have a lot of weight, which would limit the adaptability. So instead, the new façade is constructed using lightweight prefabricated wooden panels.

Since the goal is to give residents the opportunity to change the panels every time the lay-out changes, the panels should be demountable from the inside of the building. Thereby removing the need to use construction machines, which would cause a lot of nuisance for the residents. By reducing the size of the panels, and dividing the panels into a few parts the weight is limited. Even with the use of wood, the original design for the panels was too heavy to be carried and installed manually. By splitting the panels into two parts, the installation process was made possible (see Appendix C for detail drawings).

The ability to split the panels also allows for more diversity. The residents can choose between a completely closed panel, a panel with a closed panel and a window, or a panel consisting of two stacked windows. The ability to choose for a certain panel will increase the influence the resident has on the dwelling and therefore the sense of ownership and feeling of belonging (Habraken, 1985). As a result, they are more likely to live longer in the building and are therefore more likely to become part of the community.

Current North-east facade | Proposed North-east facade | Proposed South-west facade

Figure 41: Facades (own product)

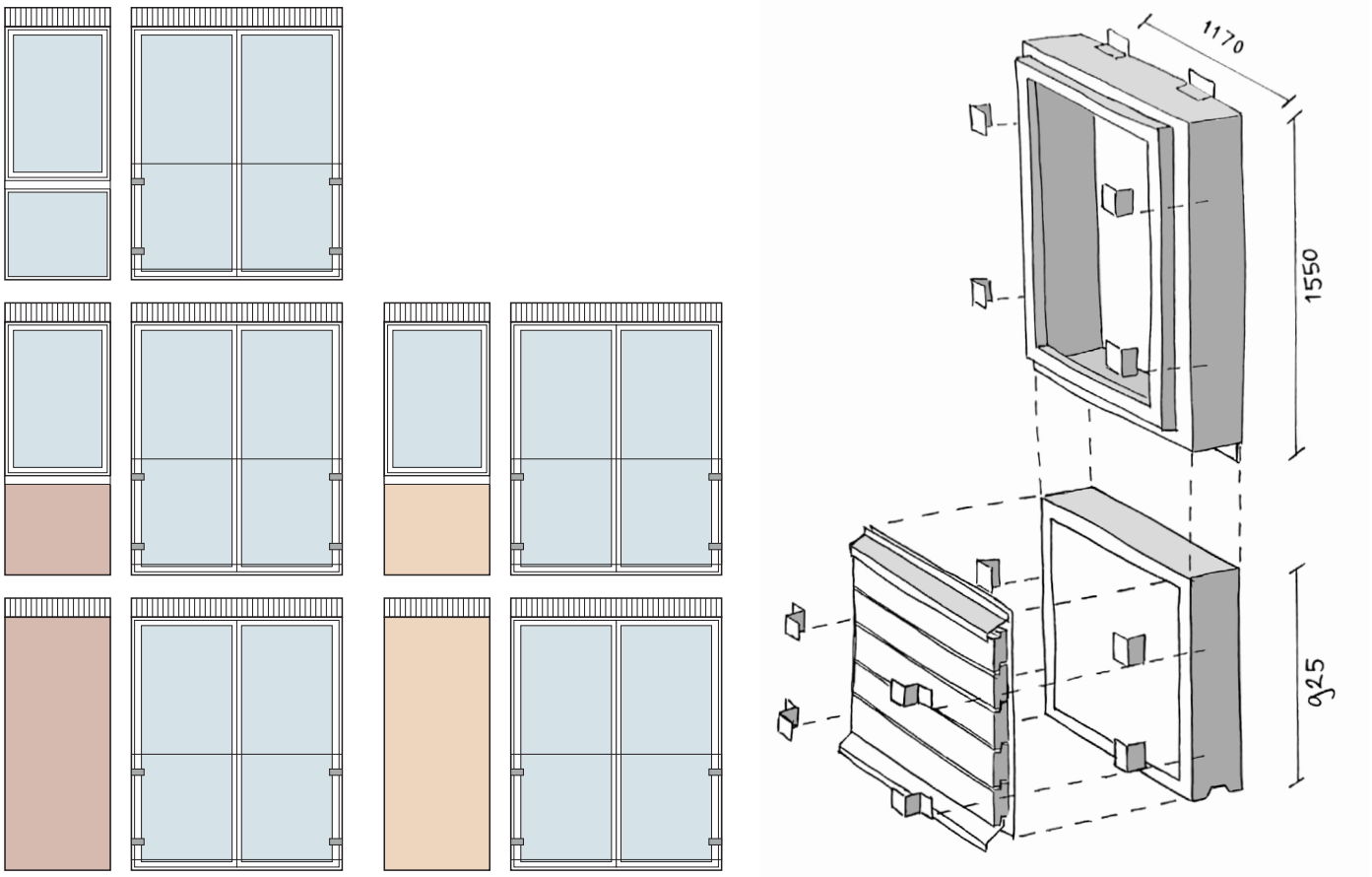


Figure 42: Changeable facade panels (own product)

Another aspect related to the facades, was the availability of balconies. Each dwelling has to have access to either a communal balcony, only if the dwelling is smaller than 50 squared meters, or a private balcony (Bouwbesluit afdeling 4.6. Buitenruimte, nieuwbouw, 2012). By only using the original balconies, not all units have access to a balcony. The design for the balconies has changed multiple times during the process.
First opting for a balcony that could be attached to the façade and could therefore also be removed. However, this would disrupt the grids on the façade and damage the historical value. Subsequently, this idea was changed into creating the possibility of logia's, by being able to move the façade back. This idea led to issues in water management, so the idea was changed into permanent logia's for half of the units in combination with communal balconies, if the units were used as separate dwellings smaller than 50 square meters. Finally, this design changed to the final approach of winter balconies, logia's which can be closed off and used as a climate bufferzone. In case the winter balconies are closed off, the communal gardens are still available for use.

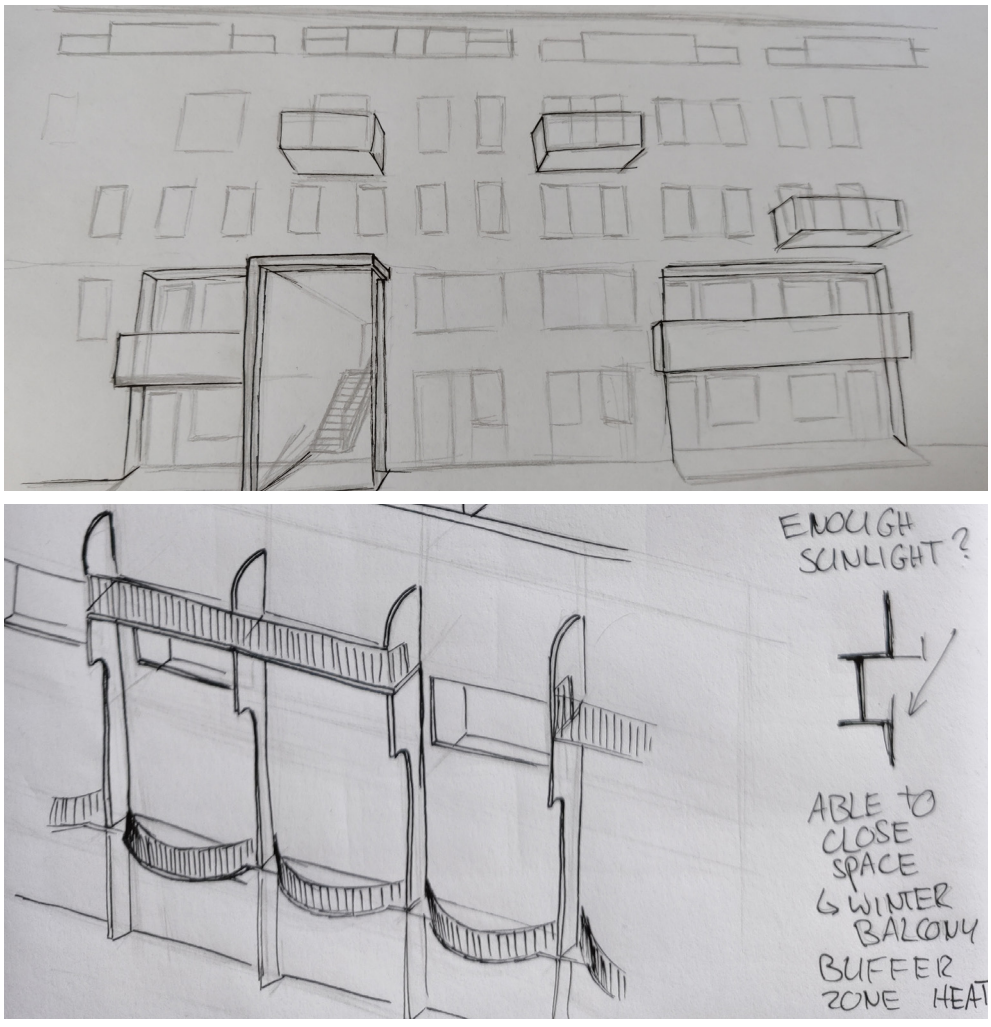


Figure 43: Experiments balconies (own product)

The addition to the building is completely demountable, by using a steel beam and column structure and wooden façade elements. Two separate demountable brick systems are used for the façade. For the permanent façade the Click Brick system is used, where the bricks are stacked and attached to each other using steel clips. Meanwhile the A-Brick system is used for the flexible panels, where brick strips are attached to metal cassettes, because of its low weight.

Figure 44: Impression south-west facade (own product)

6.5 Meeting Spaces

As mentioned before, Hoptille scores badly on portection and comfort, when compared to Jan Gehl's twelve urban criteria (Gehl Institute, n.d.). The lack of overview, which created the feeling of unsafety has been addressed with the circulation and passages, but the lack of comfort has not been addressed yet. This lack of comfort results in a lack of social interaction, as there are no places to meet and talk with neighbours or other users of the area. Therefore, these meeting spaces are added.

In general, Hoptille is very well connected, nearby a station, nearby a highway and along a widely used bicycle path. Furthermore, Hoptille is located close to the shops at Bijlmerplein as well as a community help centre and other facilities such as child day-care. This location makes Hoptille an attractive location to live for all types of target groups, as well as for public functions (for urban analysis see Appendix B).

As a result of the surrounding facilities, different parts of the building have different characters. Most notably there is a difference in the amount of public- and privateness. For instance, because a biking path runs through the right passage, the surrounding areas are more public. This difference affects the types of public functions added to the building. In order to determine the public functions and their location, a lot of experiments and tests have been done.

First, through a brainstorm session a list of possible functions was composed, which included anything from sports facilities to a small library. By looking at the urban analysis and the facilities already available in the area the list was reduced to 6 functions, one for each of the circulation blocks.

Figure 45: Publicness by sightlines in Hoptille (own product)

According to Fromm (2015), meeting spaces are more likely to be used if commonly used paths pass by them. Therefore, the spaces are placed besides these frequently used paths in the passages and ends of the building, as well as being positioned next to entrances to the building. The public spaces inside the building and public functions outside the building were then ordered in such a way that they match each other and relate to the amount of publicness.

After researching the demand for housing types and determining the current target groups for the building the layout was again revised. As mentioned, there is currently a high demand for dwellings for starters, elderly, and migrant families (Metropoolregio Amsterdam, 2018).

Subsequently, the design for one of the public functions was worked out in more detail, being the café. The café was placed on the end of the building, as this function has the most public character, and this part of the building is the most visible. At the moment a small building for health facilities is located at this corner. In the design this function is moved to another, more private, part of the building.

The small building closes of the low-rise area, leading people along the north-east side of the building, instead of creating another connection with the area. Therefore the first design removes this building completely, creating an open space and view to the low-rise. Multiple experiments were done in order to research the best method of conveying the public function in contrast to the dwellings in the rest of the building.

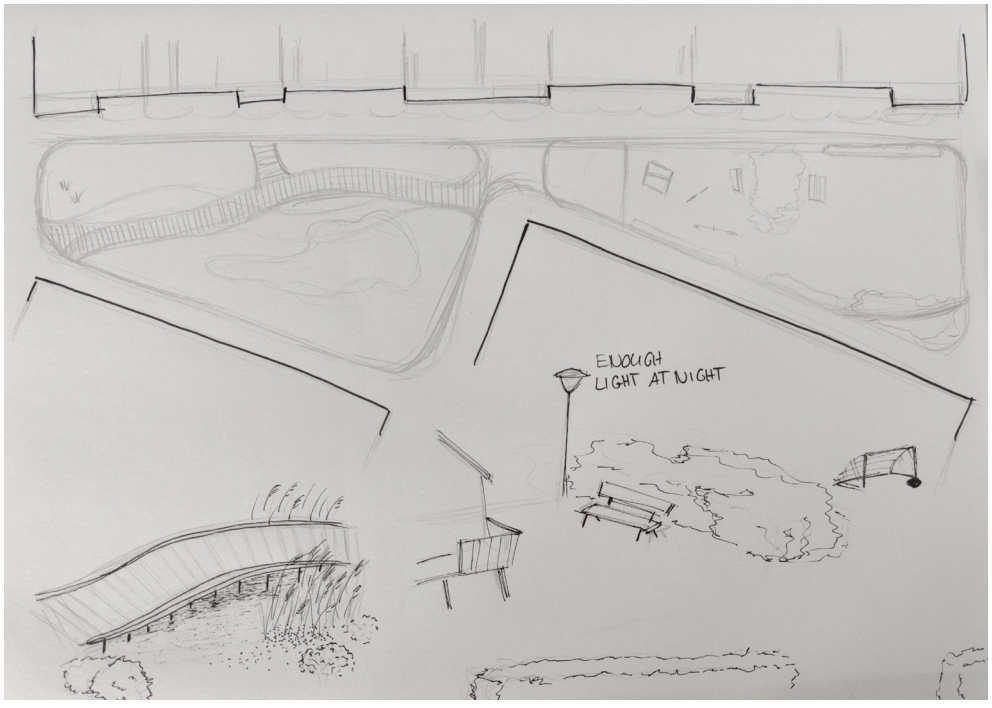


Figure 46: First experiments public outdoor functions(own product)

6

After reconsideration, it became clear that the small building did not have to be removed completely, as removing part of the building already opens up the area to the low-rise. The remaining part of the building defines the space more, instead of creating one big open area. The café was placed inside the building, replacing the sport facilities. Using this building also creates the opportunity to add another public function, which resulted in a laundromat being placed in the corner of the building.

Besides the public function, which are open to all people, other meeting spaces were also added, in the form of communal balconies. These balconies were added both as a necessity, as any dwelling is required to have access to private outdoor space, as well as a method to encourage social interaction.

To ensure the balconies would be effective, literature research has been done to research which characteristics these spaces should have. As mentioned, Fromm (2015) states that visibility form a common path encourages use. They also state that limiting the amount of households which share the spaces will create more intimacy but might also lead to more arguments. Furthermore, by the ability to see into a space will increase the frequency of use, but if the area is too open and anyone can have access, the use will decrease. Lastly, if residents can influence the space, they are more likely to use and take care of the space.

Figure 45: South corner Hoptille now and as proposed (own product)

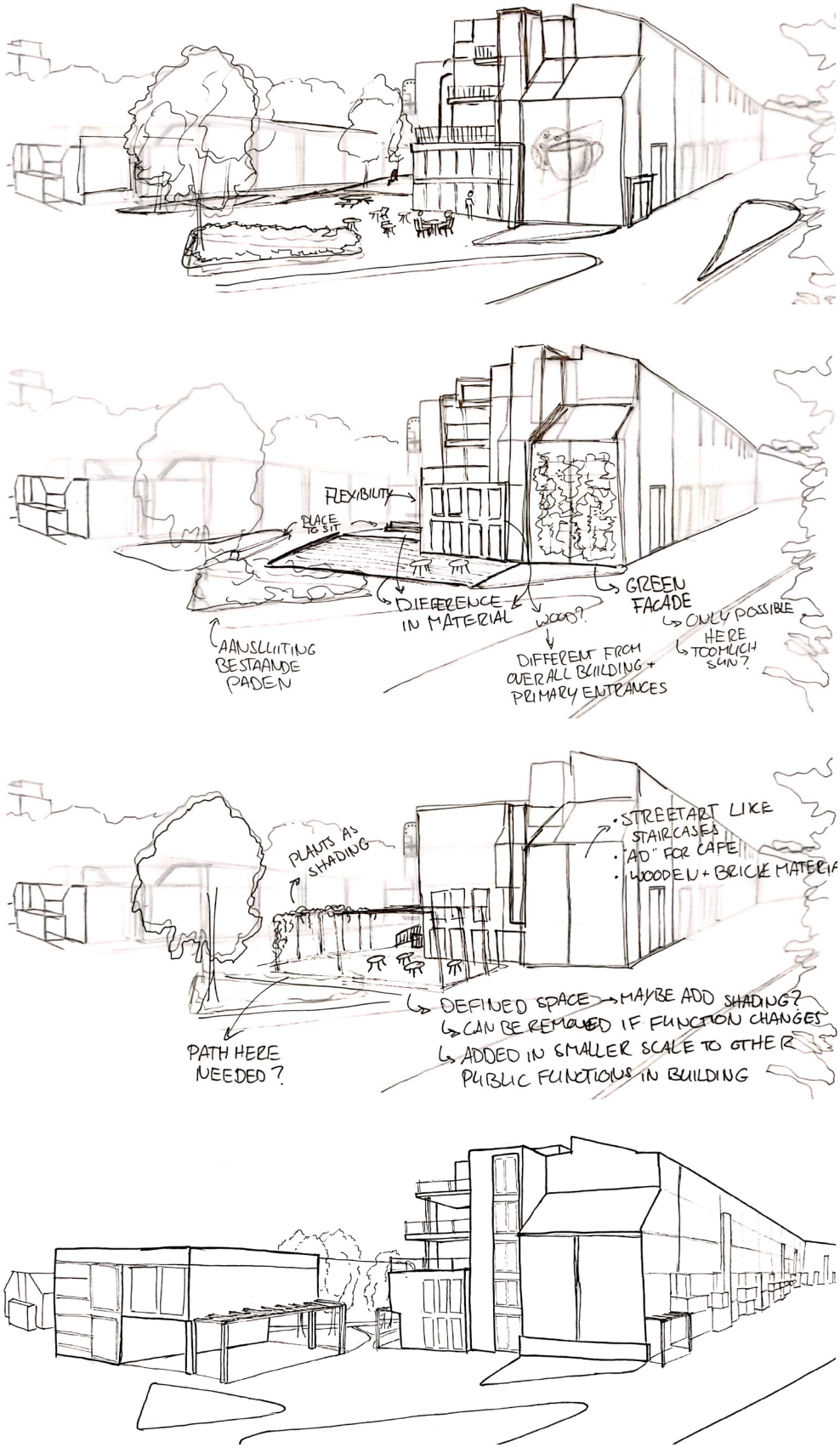


Figure 46: Experiments south corner Hoptille (own product)

Conclusion 7

The goal of this project was to answer the main research question:

'How can a 1980's apartment building be transformed to become adaptable while maintaining the associated values?'.

To evaluate if the research and proposed design interventions answer this question a few aspects will be discussed, being the created adaptability, the amount of climate adaptation, the preservation of values and the transferability of the research.

Figure 47: South passage ("Hoptille. Woningverbetering. Ontworpen door L.R.R" by Stadsarchief Amsterdam, n.d.-c)

7

7.1 Adaptability

With the proposed design for Hoptille in this project, adaptability is mainly created by being able to change the use of spaces over time. While only the last two interventions actively add flexible elements, all five interventions add adaptability by improving the quality of the building and creating a good frame in which change is possible.

This is similar to Stewart Brand's shearing layers, in which separate building elements have different lifespans (Brand, 1997b). For Hoptille the structure has the longest lifespan, which is still the same from the original building. After that comes the secondary structure, that has been added during the transformation and is demountable, after which come the installations, which have to be replaced roughly every 20 years to keep the building up to date. The lay-outs of the dwellings have a shorter lifespan, but even within the lay-outs there are differences. The kitchen and bathroom have a longer lifespan, 15 to 25 years, while partitioning walls can be repositioned or replaced and re-used more frequently, for instance every 5 years or whenever the household changes.

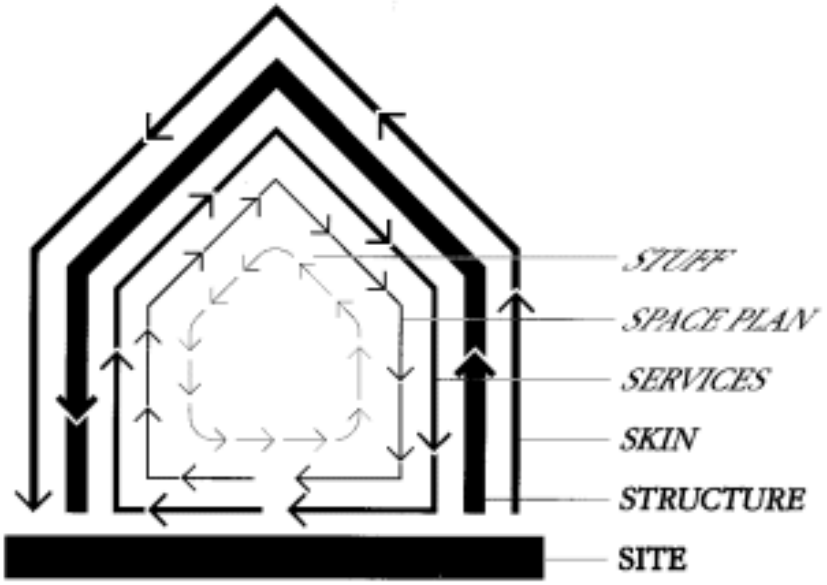


Figure 48: Shearing layers of Change (Brand, S. 1994)

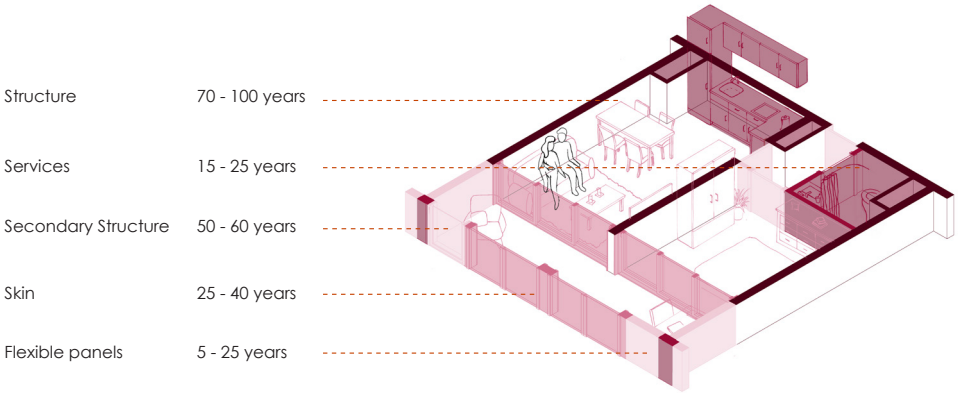


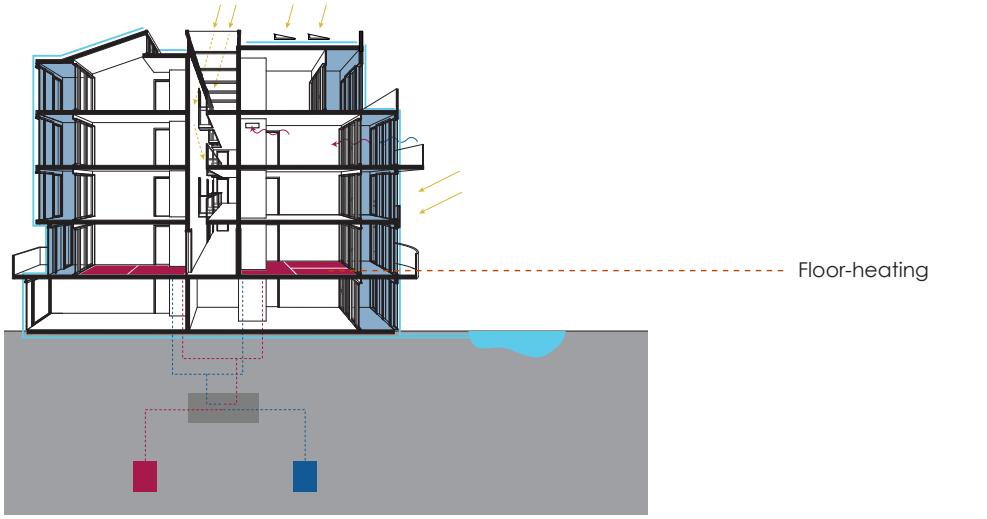
Figure 49: Lifespans of building elements (own product)

7.2 Climate adaptation

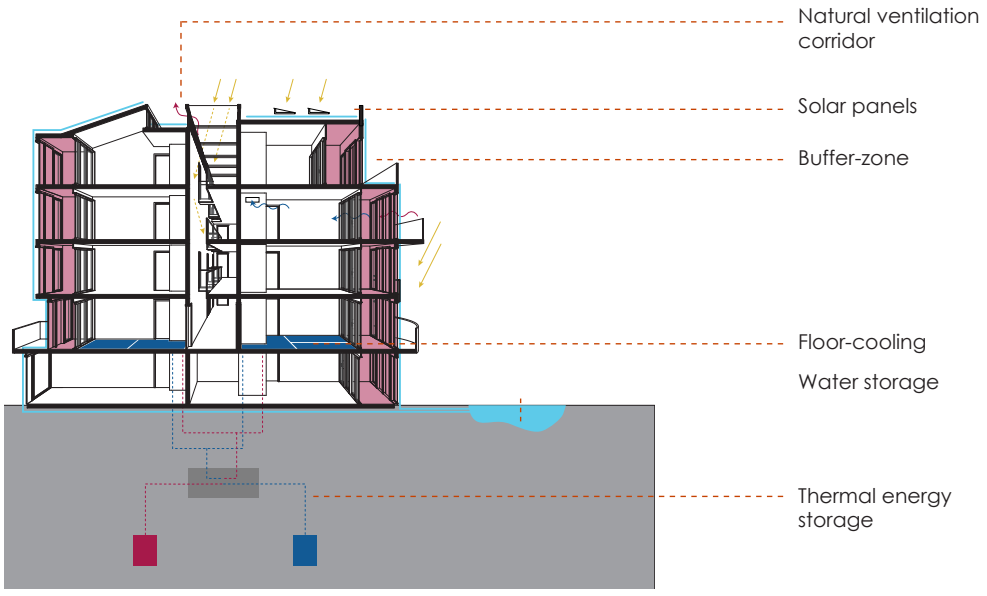
Another part of adaptability is the adapt to adapt to the changing climate. This also relates to the ecological value of Hoptille. This value relates to aspects such as the climate design, embodied energy, greenery etc.

Because of the adaptability, the embodied energy will be preserved as much as possible, especially during future renovations. Due to the demountability of the additions, the materials could be taken apart and used for other projects, so the materials will be used for their entire lifespan, after which they can be recycled.

Furthermore, the project adds green and water storages to the outdoor space, so the surroundings can more easily adapt to the rising temperatures, by cooling the area, and increase in heavy rainfall, by temporarily storing water.



Winter

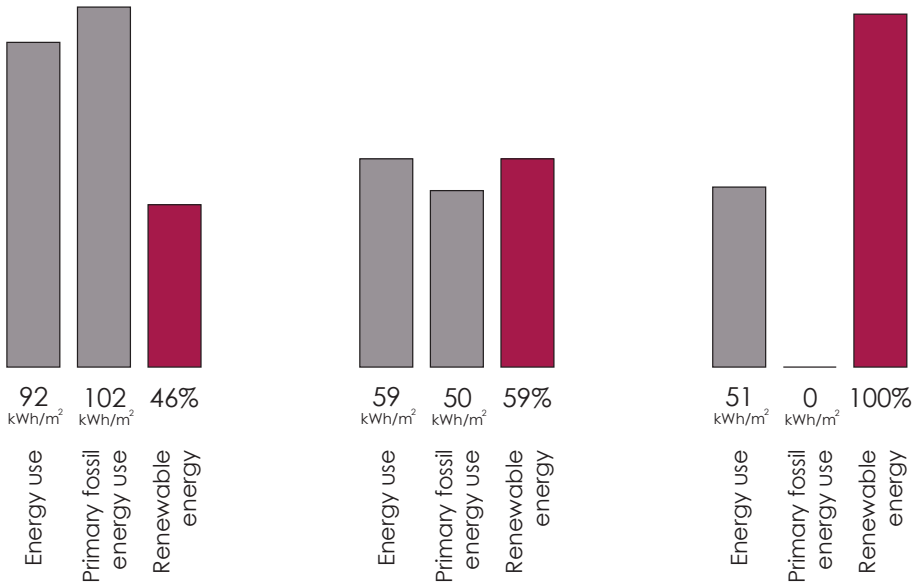


Summer

Figure 50: Climate design (own product)

One of the goals was also to bring the building up to the current energy standard, so the building can be used for years to come, this standard being almost energy neutral. At the moment the building is in poor technical condition, the building offers little insulation, and the installations are in need of replacement. By adding the floorspace on both sides of the building a buffer zone is introduced. In the winter, this space will be colder than the rest of the house and in the summer the space will be hotter. This zone allows for sustainable low-heat floor-heating and floor-cooling to be possible, without having to invest in triple glazed windows.

The transformation of the building results in the building being almost energy neutral, by adding a few more elements, the building could be made completely energy neutral in the future (see Appendix E for calculations). This includes adding more solar panels and replacing some of the installations with more sustainable systems than those that are now available. As well as replacing some windows, that are not part of the buffer system.



Current:
- poor insulation
- outdated and leaking climate control systems

Proposed:
- buffer-zone
- added insulation
- added solar panels
- thermal energy storage
- floor-heating

Future:
- added solar panels
- more sustainable installations

Figure 51: Energy use now, after the transformation and in the future (own product)

7.3 Values

As the main reason of adaptability was to preserve the values, it is important to reflect on the consequences the design interventions have on the values. Figure 52 shows the impact of each intervention on the existing values, as well as the impact of the combination of all interventions. As seen some interventions have more negative impact then others. And overall, the historical value is reduced. But since the overall impact is positive, this reduction of historical value could be accepted. Furthermore, some of the interventions have a high risk, especially in regard to social aspects, as the impact on the social value is difficult to determine. With more research it might be possible to determine the impact more precisely, but since this is a prediction, the result will never be 100% accurate.

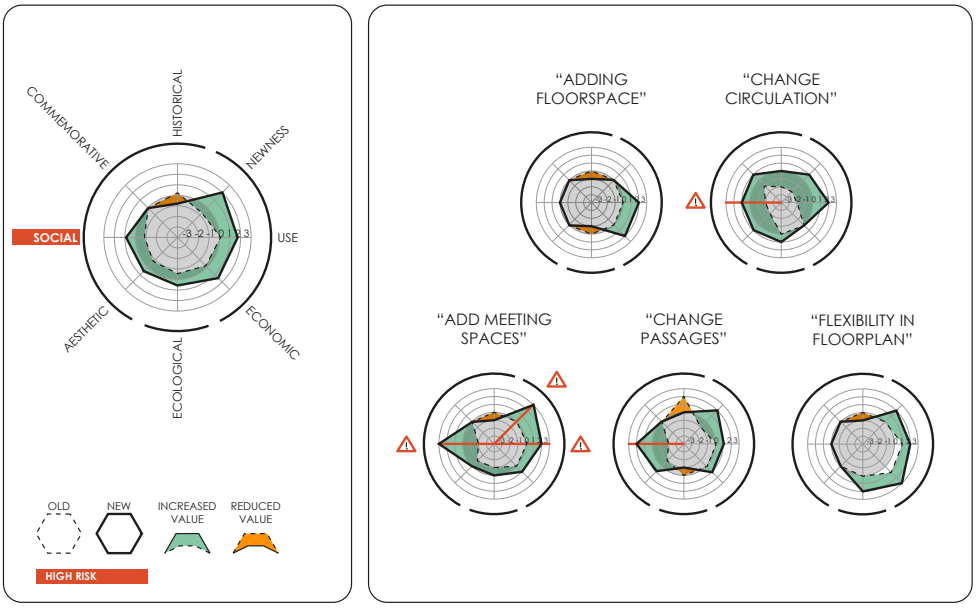


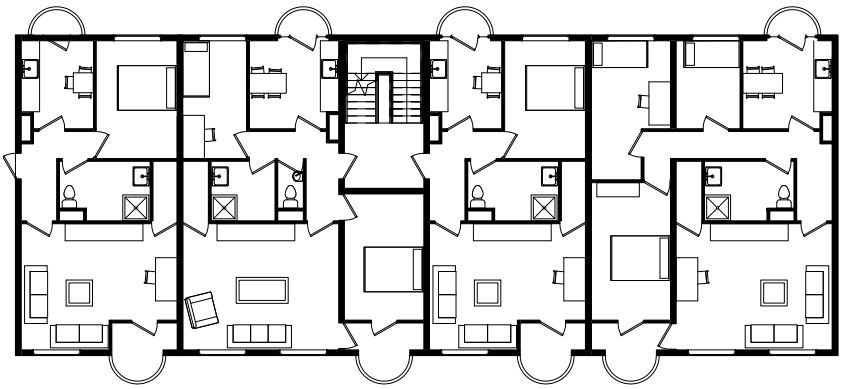
Figure 52: Value assessment (own product)

7.4 Transferability

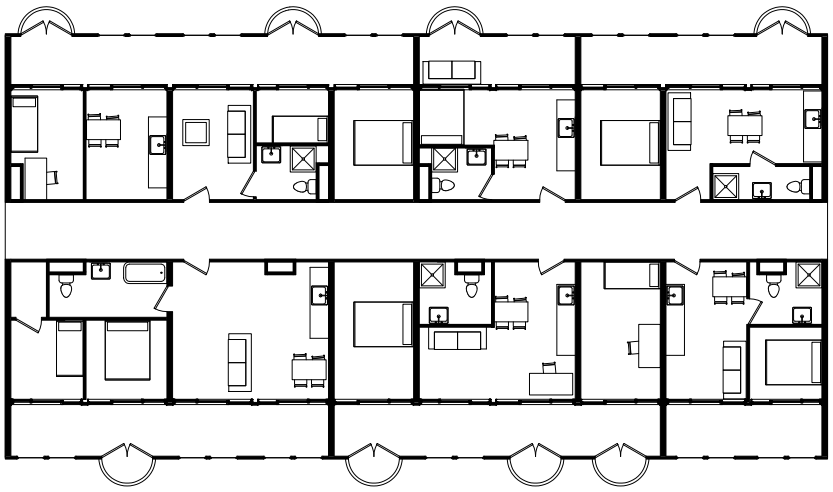
This project focused on Hoptille, as a building to apply the research and test it. However, this does not completely answer the main research question, as this relates to 1980's apartment buildings and not just Hoptille. So to fully answer the question, the research is also quickly applied to Heesterveld, a nearby apartment building built in the same period, to test the transferability.

First, the same interventions to add adaptability are applied to Heesterveld. For example, the interior corridor, added floorspace and adaptable housing units might be applied to Heesterveld, a nearby apartment building, built in the same time period. However, since the building doesn't have the same width as Hoptille, the corridor will take a large amount of space.

It might therefore be better to only apply the added floorspace, but even this might not be an option for this building, if the façade is highly valued. So, the proposed interventions work well for Hoptille but need to be carefully considered for other transformation, as each building has different values.



Heesterveld - current situation



Heesterveld - with design interventions

Figure 53: Transferability test on Heesterveld (own product)

However, the same research question of how to create adaptability for a certain building can be asked of many other buildings. To answer this question the same approach as used for this project can be used, consisting of three phases. The first phase included two sub-questions relating to the current values and attributes to preserve and the current challenges to resolve. This led to the overview of challenges and values as seen in the beginning of the presentation. The second phase focused on creating adaptability, including case-studies and a building analysis. By applying the found research this led to the third and final stage of experimenting and testing the results. For each experiment, a new question was asked, to then reflect on the consequences on the rest of the design.

The lack of transferability of the exact design interventions, shows that the first step of the approach is crucial, as each building will have to deal with different values and challenges.

How can an 1980's apartment building be transformed to become adaptable while maintaining the associated values?

1	What values are associated to the building? What building elements need to be transformed to suit the needs of the current users?	Interviews Building analysis Interviews Literature
2	How can the building become more adaptable to future changes?	Building analysis Case studies
3	How can Hoptille be transformed to become adaptable while maintaining its values?	Experimenting and testing

Figure 54: Research approach (own product)

7.5 Conclusion

To answer the main research question: 'How can a 1980's apartment building be transformed to become adaptable while maintaining the associated values?'.

In the case of Hoptille it was possible to achieve more adaptability by implementing the 5 design interventions as described in this research. Meanwhile the goal of updating the building to current standards was also achieved, as the transformation would lead to an almost energy neutral building, increasing ecological value.

As a result of the interventions the historic value would decrease, as changes are being made to the building. However, other values are preserved and even increased, so this loss of value could be accepted, as the overall value increases.

However, when the same interventions are applied to another building, this could result in an overall loss of values, as the associated values are different for each building. Still, the used approach during the research and design process can be used for other similar buildings. It might even be possible to apply the same approach to any building, regardless of the period the building was built and the function of the building.

Personally, I have learnt a lot this past year, including that any building will have some sort of value, whether it is social value or just the economic value of the used materials. But more importantly, I have learnt how to design with these values in mind and which methods can be used during this process.

Relation between project, design studio and master

This project focuses mainly on adaptability in relation to values. It proposes a method of adding more adaptability to a building while maintaining existing values. The method was applied to Hoptille, an apartment building built in the 1980's, which is currently being considered for demolition.

The project is part of the New Heritage design studio. The studio focusses on buildings built in the 1970's and 1980', which are not widely considered as heritage yet, and the values these buildings might already have. The topic of adaptability is especially interesting in relation to potential heritage, since adaptability creates the opportunity to easily make changes to a building while the overall identity and the building's values remain intact.

However, in order to create this adaptability, a big intervention is needed, which would more likely be prohibited in buildings which are recognized as heritage. Furthermore, added adaptability might not be necessary in established heritage, as there will be more efforts to maintain the building's values over time. Other buildings, which values are not widely recognized, are more likely to be demolished instead of transformed, resulting in a loss of values and embodied energy.

While adding adaptability, mainly three aspects are taken into account, being the spatial, functional, and social-cultural aspects of the building. The former two are mainly considered in the creation of more adaptability. All three aspects are considered in identifying and preserving the values associated to the building, while the focus lays on the last. The focus on these three aspects is in line with the main aspects considered in the architecture master track.

However, the project also relates to other aspects associated to the master Architecture, Urbanism and Building Sciences as a whole. For instance, the design connects the building to its urban context and takes the influence of the context on the building into account. Among other things the amount of public- or privateness in certain areas in the building influenced the certain functions that were added as well as the position of these functions in the building.

Furthermore, the project also relates to technical aspects and the detail scale, mainly in regard to the flexible elements in the design. This was necessary as a way to discover how adaptability can be added and to test the extent of the possibilities it creates.

Design process

As mentioned, the project focusses on adaptability and values, the main research question being: 'How can a 1980's apartment building be transformed to become adaptable while maintaining the associated values?'. In order to answer this question, two topics had to be researched.

First, which specific values and challenges are associated to the building at the moment, in order to determine what can and what has to be altered. The following two sub-questions relate to this topic: 'What values are associated to the building?' and 'What building ele-

ments need to be adapted to suit the needs of the current users?'. Secondly, strategies to increase the amount of adaptability, and how these can be applied to a specific design, in particular to the transformation of a building. This topic is considered in the sub-question: 'How can the building become more adaptable to future changes?'.

Splitting the research in two topics creates more clarity about the criteria for the design, as these differ per topic and can even conflict with each other. This way the criteria can be considered separately, and an assessment can be made whether a positive outcome on certain criteria can outweigh a negative outcome on another criteria.

During the process, spider diagrams (figure 1) were used to visualize the impact of a design intervention on multiple aspects. Therefore, the design can be easily tested with the established criteria. The figure also clearly shows the limitations of the design, as not every value is increased by the design, and some interventions lead to a high risk. However, overall the design leads to a positive outcome in relation to the considered values.

The tests are used as part of an iterative design process. Based on the criteria and opportunities that arose from the initial research, multiple experiments were done, and the results of these experiments tested and compared. Van Dooren et al. (2013) describes experimenting as being crucial as one of five generic elements in any design project. These experiments and tests lead to new questions for further research, which lead to new research, new possibilities, and new experiments. Thus, the criteria and other research forms the base of the design, as well as being part of the design process. Feedback from tutors also aids in the design process, by providing more questions, as well as providing information to aid in the testing.

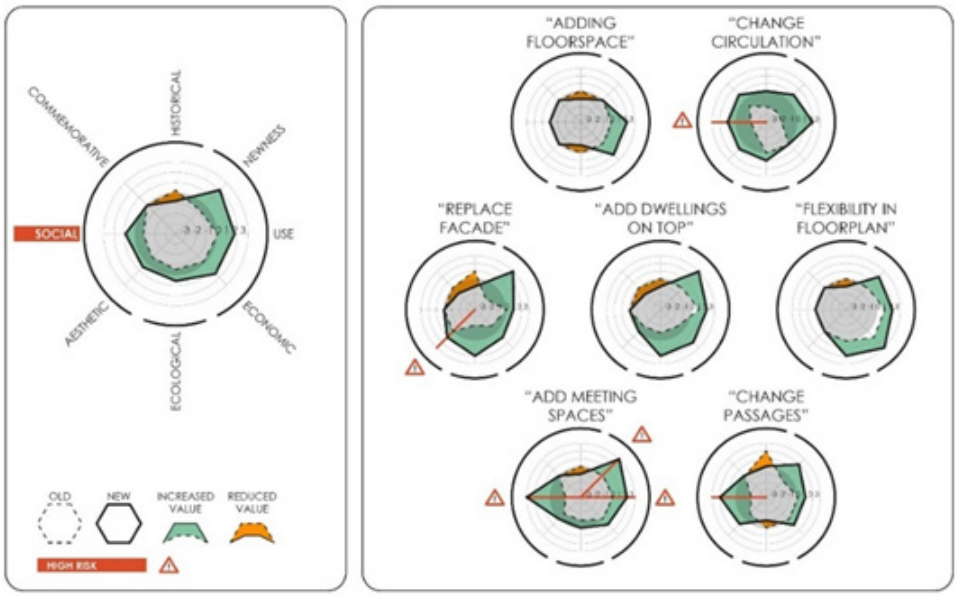


Figure 55: Value assessment (own product)

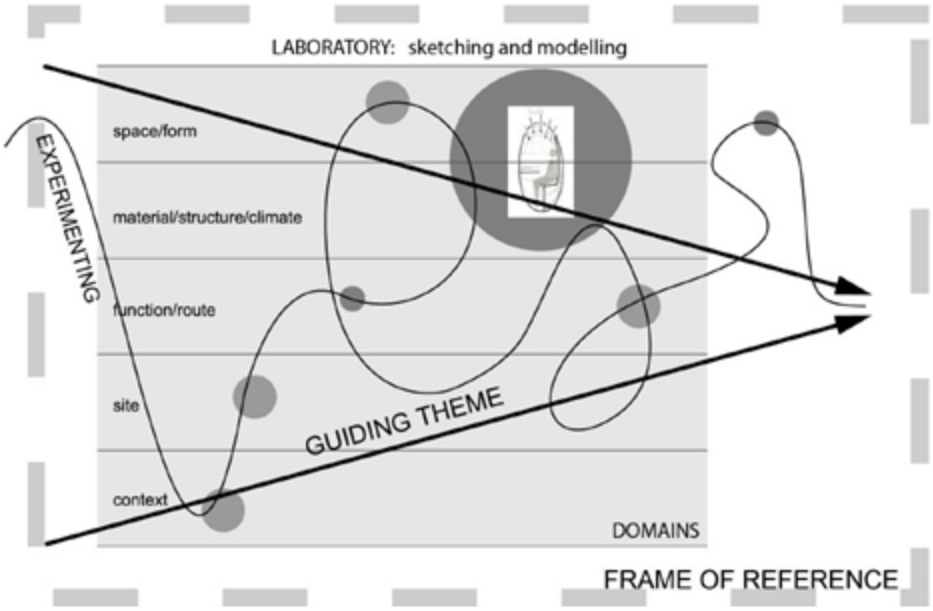


Figure 56: The five generic elements in the design process: experimenting, guiding theme, domains, frame of reference and laboratory (Van Dooren et al, 2013, p. 5).

While the separation into two topics does create more clarity, it is still easy to lose sight of the topics, as new and more questions arise. Even though it is not necessary to keep the criteria in mind at any given moment, as this would limit the experiments, it is crucial to regularly test the design and be aware of the criteria that are being tested. This was particularly hard at the start of the design process, but became more integrated in the process over time, especially after receiving feedback regarding which criteria were set. Nevertheless, the spider diagrams could have been used more regularly throughout the entire process.

Another issue arose during the design process, as sometimes it was difficult to deviate from a specific design idea and experiment more on certain aspects. At these moments, the process of experimenting and testing, was replaced by an approach of altering. Instead of creating multiple experiments at one moment to compare the outcomes, only one alteration to the design is created and reflected upon. This approach limits the number of possibilities that are researched. Moreover, it becomes easier to lose track of the set criteria, as there are multiple small reflection moments, instead of one assessment.

8

Relevance

The project proposes an approach of first analysing the building and its values, in order to understand what changes should and should not be made to the building. This approach can be applied to any other existing building in need of transformation, as this project made clear that a building does not have to be widely considered as heritage to have values.

The approach is currently especially relevant for buildings built in the 1970's and 1980's since many of these buildings are now met with technical issues and face the possibility of being demolished. Demolition of these buildings would result in a loss of values, but an ill-researched transformation design could also lead to a loss of values. Furthermore, because 1970's and 1980's architecture is not widely considered as heritage, not a lot of research has been done into the values associated to these buildings. This project illustrates a method for identifying these values.

Moreover, it is important to research what values residents attach to the built environment since the values of experts generally differ from the values of the community (Meurs, 2016). As a result, these values could be overlooked, as other values are prioritized. This project offers insights in how to research which values separate stakeholders attribute to the building, through different methods of interviews. As well as how these values can be integrated into a design.

The value analyses form the basis of the design and determine what attributes of the building are important in preserving the value, and what attributes could possibly be altered in order to create more adaptability.

More adaptability is needed in general, as this allows for buildings to be changed to the needs of its users. Therefore, when the needs change over time, the building can easily change to accommodate the new needs. As a result, the loss of values and loss of embodied energy will be kept to a minimum. Furthermore, the buildings will have longer lifespans, which in turn allows the building to age and gain more value.

At the moment, more and more research is being done on ways to create adaptable buildings as well as on buildings which have proven to be adaptable over time. However, not a lot of research exists yet on methods to add adaptability to an already existing building. Even though this creates an opportunity to increase the adaptability of the overall building stock.

This project could also be used as a reference for the exact strategies and interventions used in the final design. However, the applicability off these strategies will be limited, as the contexts of no other building will completely match the context of this building. Therefore, the criteria for other projects will differ, as well as the possibilities within the project.

Ethics

During the initial research phase, interviews were conducted as one of the research methods. This could lead to ethical dilemmas, as the privacy of the interviewees should not be violated. Therefore, it was essential that the data gathered from the interviewees remained anonymous. Information about the interviewees however could also provide a better understanding of the perspective of the interviewees. As a result, some information was gathered, such as age group, while making sure that this information could not be used to trace back to the interviewee.

If the project were to be applied in practice, this would result in further ethical dilemmas. Some of the questions that arise, related to the current users, are: Would the building still be aimed at the same household types? If not, would the current residents still be able to live in the building or would they be forced to move? If the current residents are able to live in the building after renovations, are they able to remain in their house during the renovation or will they have to be relocated temporarily?

Other dilemmas occur on a broader level: Could the design impact the surrounding area in a negative way? Does the design resolve the occurring social problems, or does it worsen them?

The former type of questions can be answered within the design, as they relate directly to the building and its use. The latter type of questions can not be answered as easily, as the definite answer would only become clear sometime after completion of the transformation. However, diagrams, such as the mentioned spider diagram, can be used to analyse the possible outcomes of the design interventions, as well as the likeliness and risk of these outcomes. It can then be considered whether the positive outcomes outweigh the possible negative outcomes.

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Interviews

Conducted with users of Hoptille on October 6 and October 20, 2020, including:
Three women doing social work with inhabitants of Hoptille
Two girls who live in Hoptille

Images

Figure 1

Stadsarchief Amsterdam. (n.d.-b). Hoptille. Woningverbetering. Ontworpen door L.R.R [Photograph]. Beeldbank. https://archief.amsterdam/beeldbank/detail/a1edd979-8cfa-5d44-5b54-5e068e192b1f/media/789afb7f-48ef-ea2b-3edd-a1b212d2bc77?mode=detail&view=horizontal&q=hoptille&rows=1&page=25

Figure 3

Stadsarchief Amsterdam. (n.d.-a). Hoptille. Ontwerpen door VDL (Verster Dijkstra Loerakker [Photograph]. Beeldbank. https://archief.amsterdam/beeldbank/detail/d1376ba4-0298-eee7-538d-fe7611b13524/media/e3a9aa70-4843-7304-5d98-504b62b32bb0?-mode=detail&view=horizontal&q=hoptille&rows=1&page=16

Figure 6

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Figure 18

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Figure 26

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Figure 27

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cepezed. (n.d.-a). demountable floor system [Illustration]. In temporary courthouse (p. 14).

Figure 47
Stadsarchief Amsterdam. (n.d.-c). Hoptille. Woningverbetering. Ontworpen door L.R.R [Photograph]. Beeldbank. https://archief.amsterdam/beeldbank/detail/1e9a685e-94c4-fe0a-5a67-73329cbafe38/media/f378e4b4-b18b-7f9f-5bf6-cbc99ebdefaa?mode=detail&view=horizontal&q=hoptille&rows=1&page=29

Figure 48
Brand, S. (1994). Shearing layers of Change [Illustration]. ResearchGate. https://www.researchgate.net/figure/Shearing-layers-of-Change-Brand-S-1994_fig1_228865622/actions#reference

Figure 56
Van Dooren, E., Asselbergs, T., Van Dorst, M., Boshuizen, E., & Merriënboer, J. (2013). The five generic elements in the design process: experimenting, guiding theme, domains, frame of reference and laboratory [Illustration]. In Making explicit in design education:generic elements in the design process (p. 5).

Appendix A

Photos used during interviews

A

VALUE MATRIX / photo 3

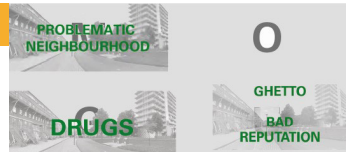
	ECOLOGICAL		SOCIAL		ECONOMIC		AESTHETICAL		HISTORICAL		POLITICAL		OTHER VALUES	
SITE	M	O	M	O	M	O	M	O	M	O	M	O	M	O
	G				G	U	G		G	U	G		G	U
SURROUNDINGS	M				M			O		O	M		M	O
					G	U		U	G	U	G	U	G	U
STUFF	M		M		M			O	M	O	M	O	M	O
	G	U	G		G	U	G		G	U	G	U	G	U
SURFACE		O		O	M	O			M	O	M		M	O
	G	U	G		G	U	G		G	U	G	U	G	U
AMENITIES	M	O	M		M		M	O	M	O	M	O	M	O
	G	U	G	U	G	U	G	U	G	U	G	U	G	U
SCALE	M		M	O	M	O	M	O	M	O	M	O	M	O
	G	U	G		G	U	G	U	G	U	G	U	G	U
TYPOLOGY	M				M		M		M	O	M	O	M	O
	G	U			G	U	G		G	U	G	U	G	U
SPACE	M		M		M	O	M		M	O	M	O	M	O
	G	U	G		G	U	G	U	G	U	G	U	G	U
STORY	M	O		O	M	O	M	O	M	O	M	O	M	O
	G	U				U	G		G	U	G	U	G	U
SOCIAL	M			O	M	O	M	O	M	O	M	O	M	O
	G	U	G	U		U			G	U	G	U	G	U
SERVICES	M	O	M	O	M	O	M	O	M	O	M	O	M	O
	G	U	G	U	G	U	G	U	G	U	G	U	G	U
VISION	M	O		O	M		M	O	M	O	M		M	O
	G	U	G	U	G	U	G	U	G	U	G	U	G	U
ATMOSPHERE	M		M		M	O	M	O	M	O	M	O	M	O
	G	U	G		G	U	G	U	G	U	G	U	G	U
PAST/PRESENT/FUTURE	M	O	M	O	M	O	M	O	M	O	M	O	M	O
	G	U	G	U	G	U	G	U	G	U	G	U	G	U

Hoptille

Hoptille is a controversial point, mostly focused on social values

social-typology

social-story



historical-surroundings

VALUE MATRIX / photo 4

	ECOLOGICAL	SOCIAL	ECONOMIC	AESTHETICAL	HISTORICAL	POLITICAL	OTHER VALUES
SITE	O	O	M O	M O	M O	M O	M O
			G	G	G U	G U	G U
URROUNDINGS	M	O	M	M	M O	M O	O
	G	G	G U	G	G U	G U	G U
STUFF	M	M O	M O	M O	M O	M O	O
	G	G	G U	G	G U	G U	G U
SURFACE	M O	M O	M		M O	M O	M O
	G U	G U	G U	G U	G U	G U	G U
AMENITIES	M	M	M O	M	M O	M O	M O
	G U	G U	G U	G	G U	G U	G U
SCALE	M	O	M O	M O	M O	M O	M O
	G U	G	G U	G	G U	G U	G U
TYPOLOGY	M		M		M O	M	M O
	G U	G	G	G	G U	G	G U
SPACE	M	M	M	M	M O	M	M O
	G U	G	G U	G	G U	G U	G U
STORY	M O	M O	M O	M O	O	M O	O
	G U	G	G U	G U	G U	G U	G U
SOCIAL	M O	M O	M O	M O	M O	M	M O
	G U	G U	G U	G U	G U	G U	G U
SERVICES	M O	M O	M O	M O	M O	M	M O
	G U	G U	G U	G U	G U	G U	G U
VISION	M O	O	M	M O	M O	M	M O
	G U	G U	G U	G U	G U	G U	G U
ATMOSPHERE	M O	M O	M O	M O	M O	M O	M O
	G U	G	G U	G	G U	G U	G U
AST/PRESENT/FUTURE	M O	M O	M O	M O	M O	M O	M O
	G U	G U	G U	G U	G U	G U	G U

Hoptille

Inner street does not have a good reputation

aesthetical-surfaces

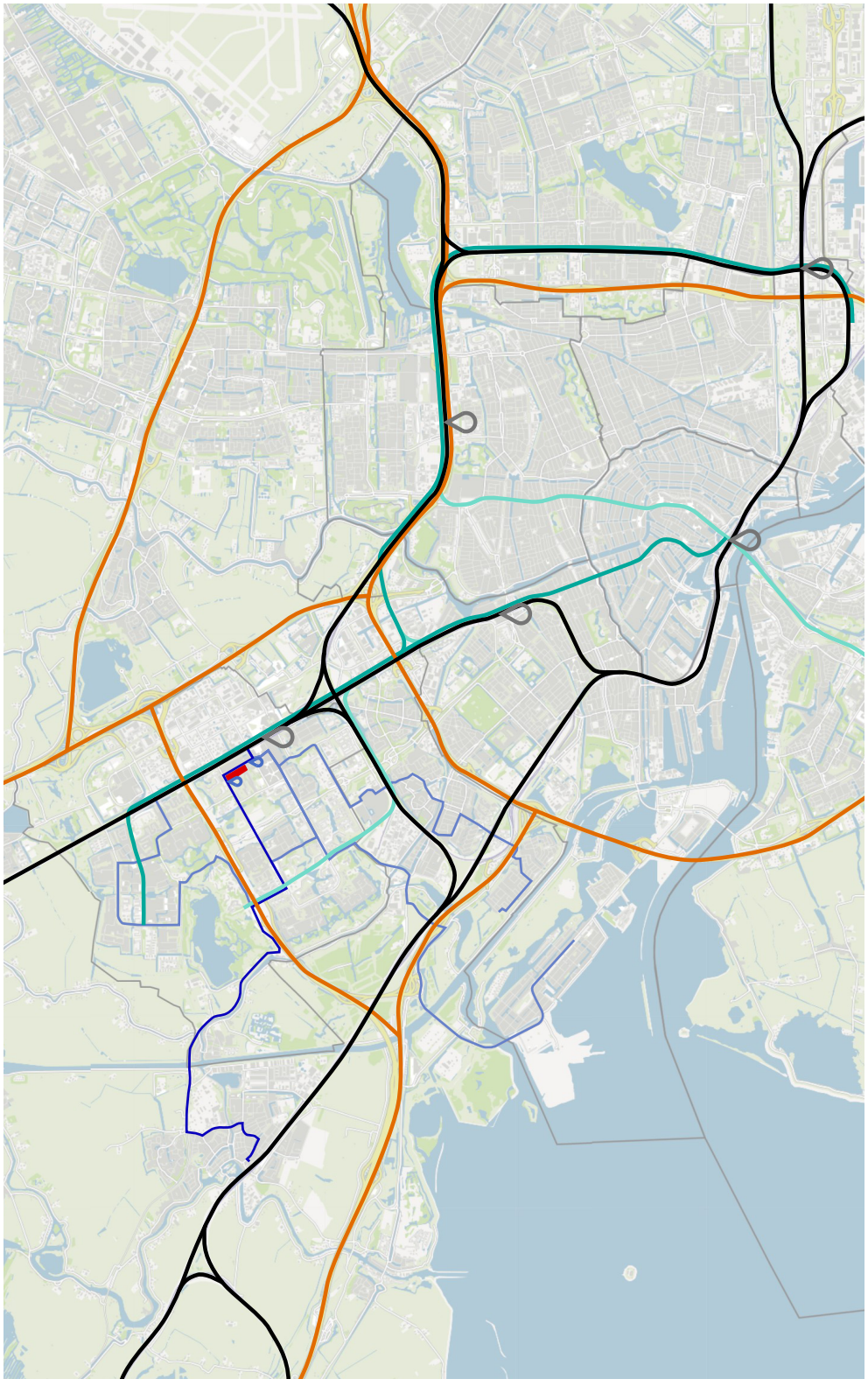
polical-typology

M

G

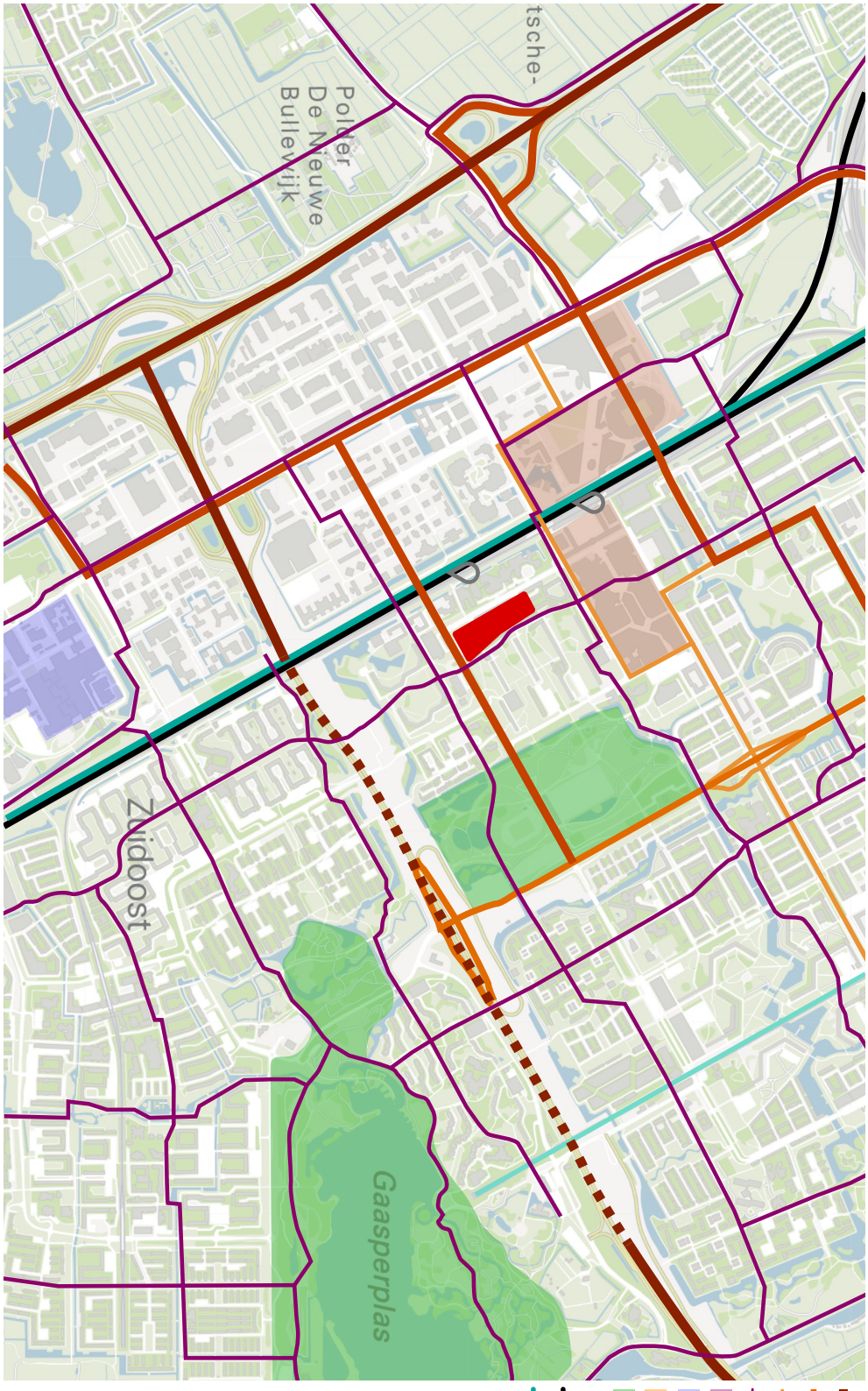
Appendix B

Urban analysis

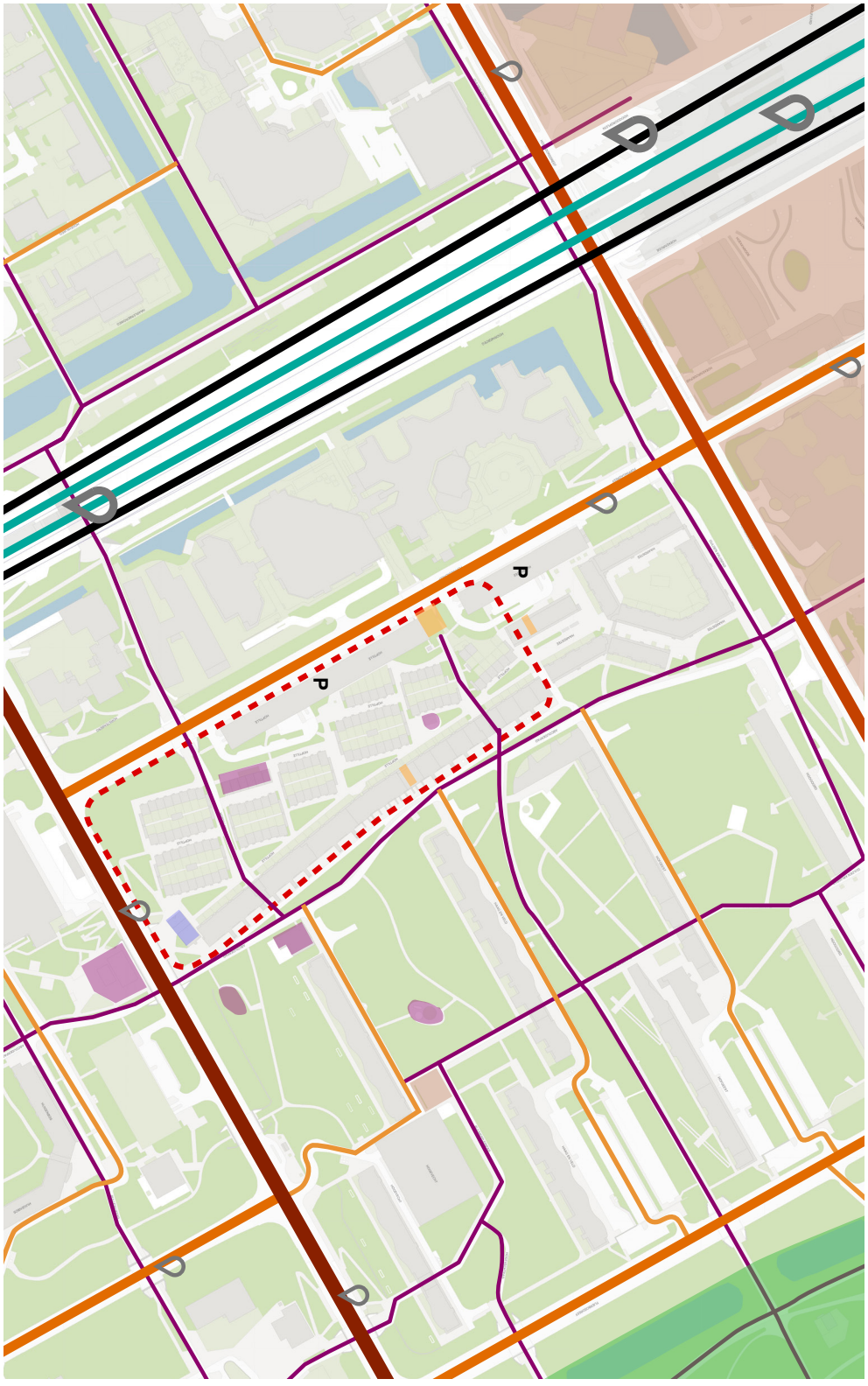


(adapted from Gemeente Amsterdam, n.d.)

B



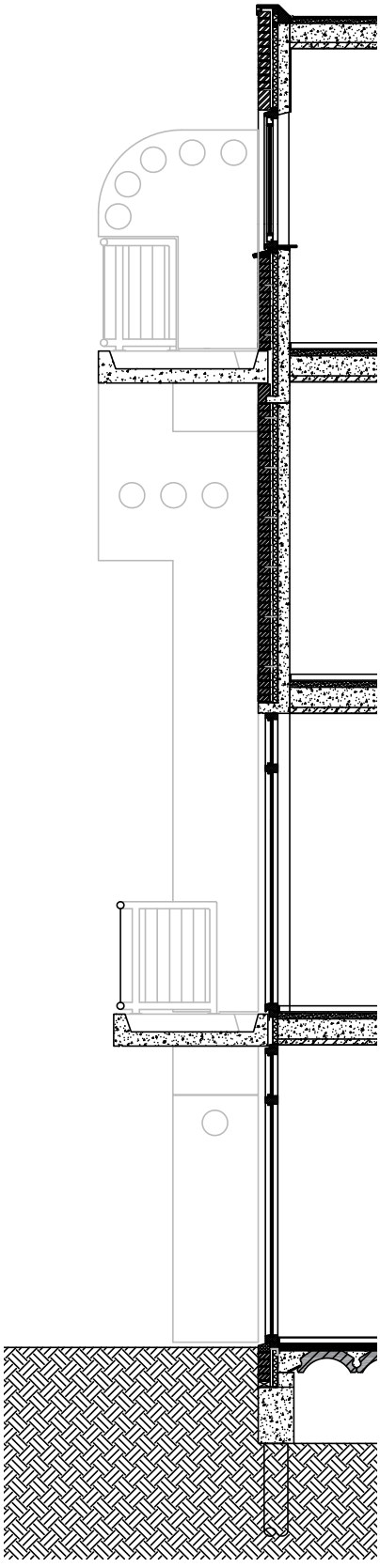
(adapted from Gemeente Amsterdam, n.d.)



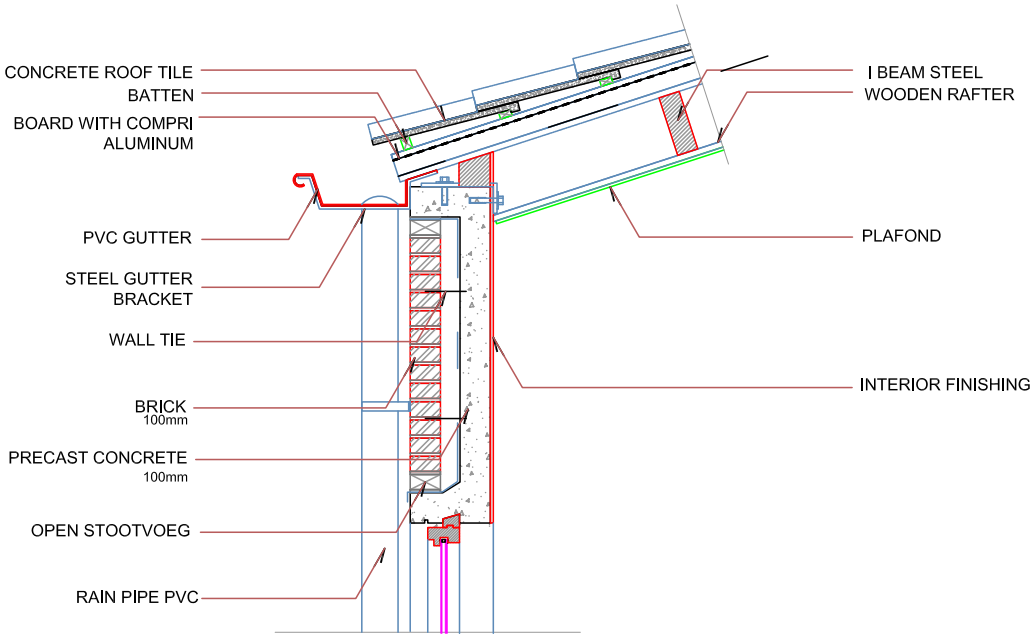
(adapted from Gemeente Amsterdam, n.d.)

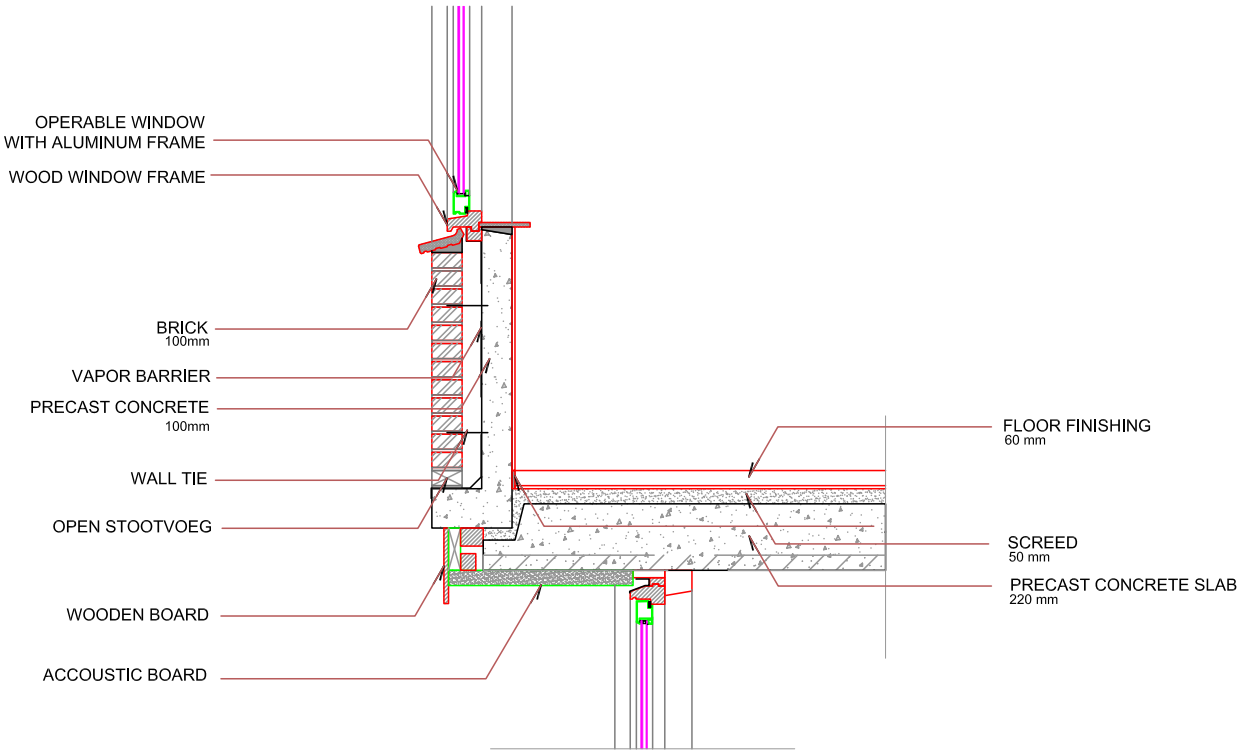
C Appendix

Current south-west facade - 1:60



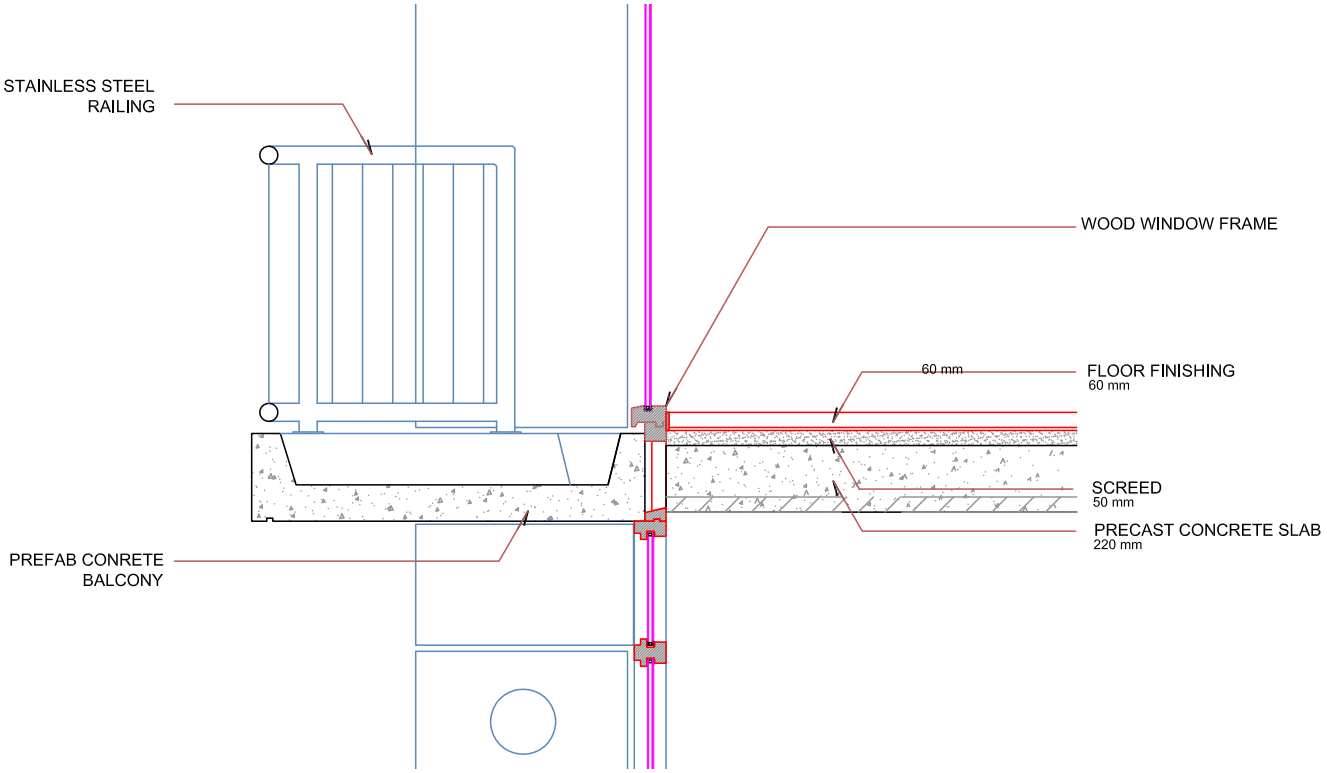
Current details - 1:25

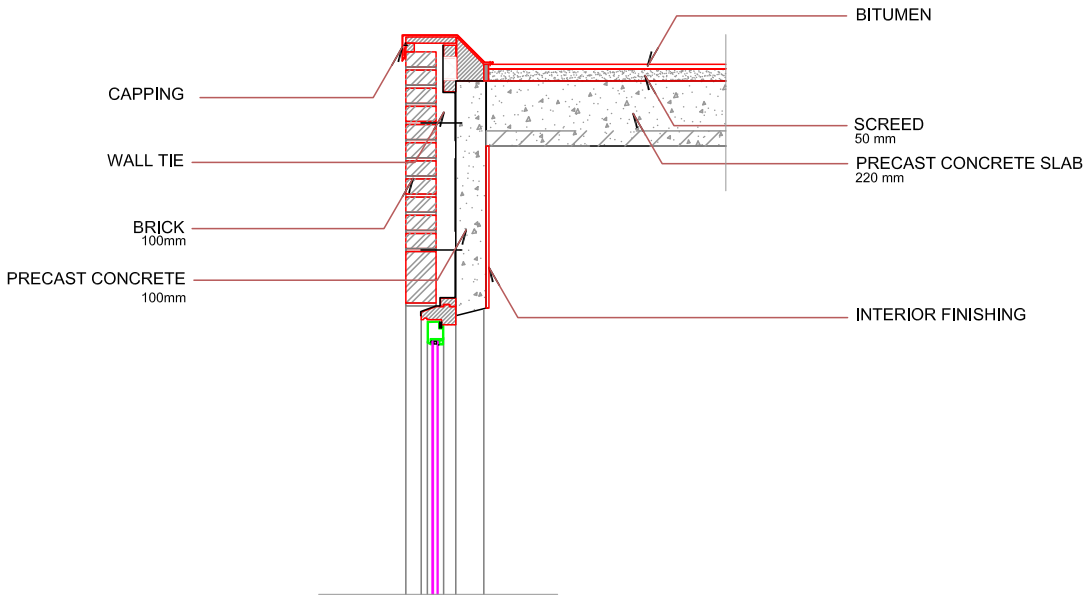




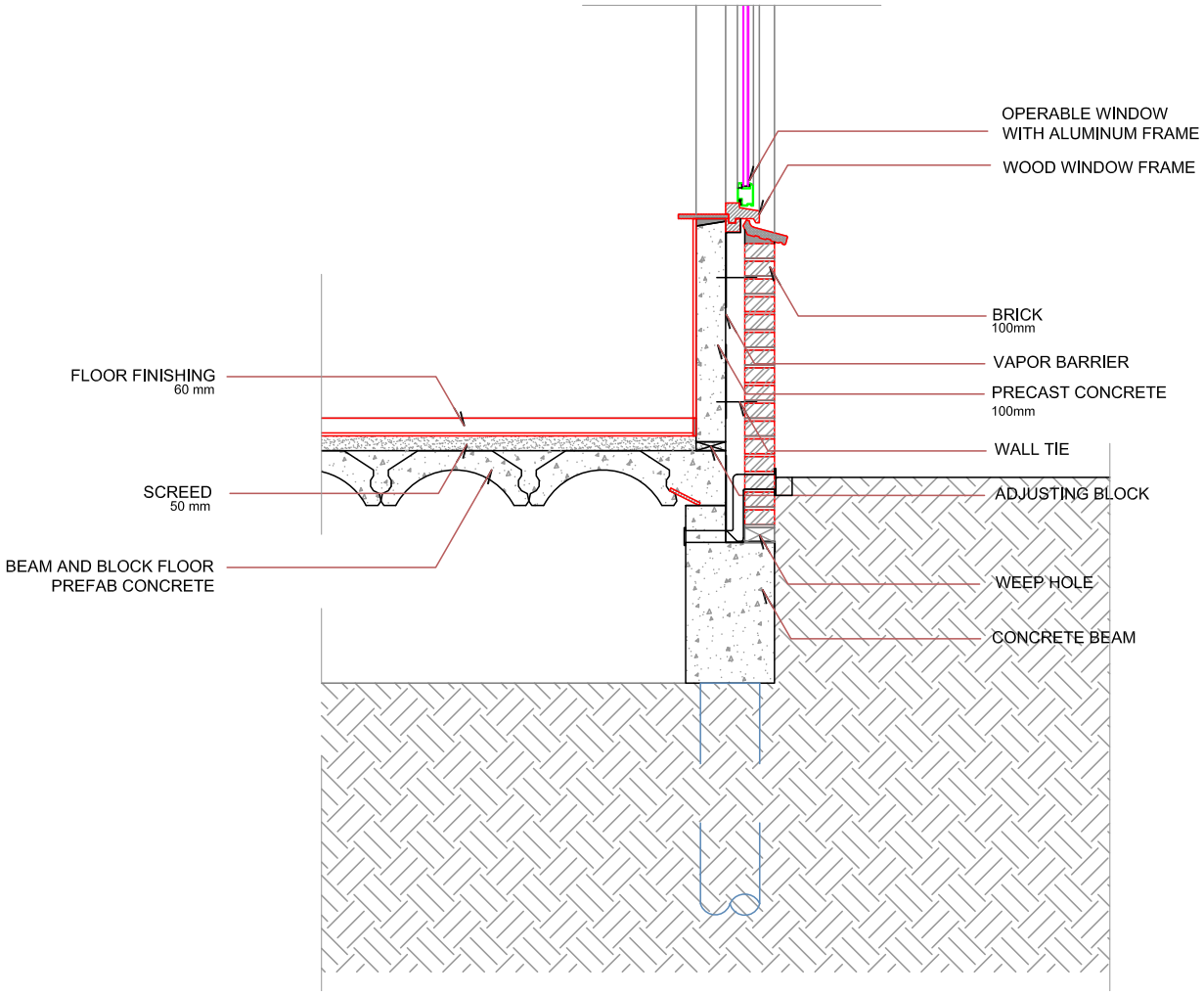
C

Current details - 1:25

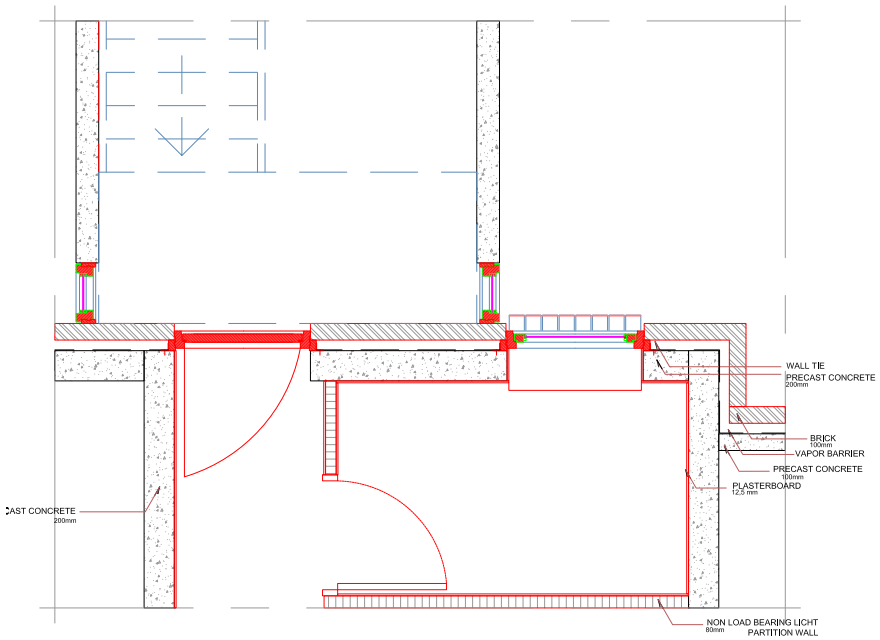




Current detail - 1:25

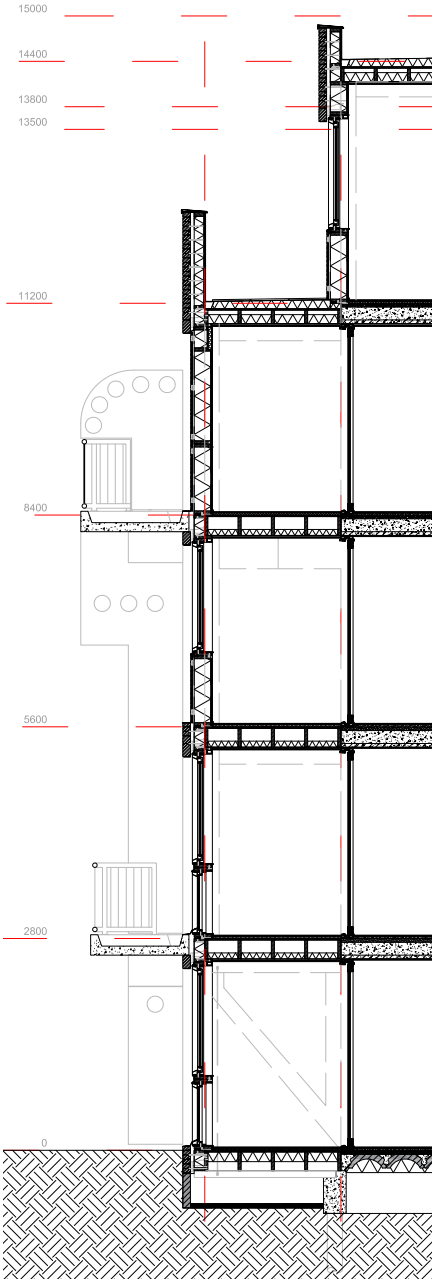


Current detail - 1:50

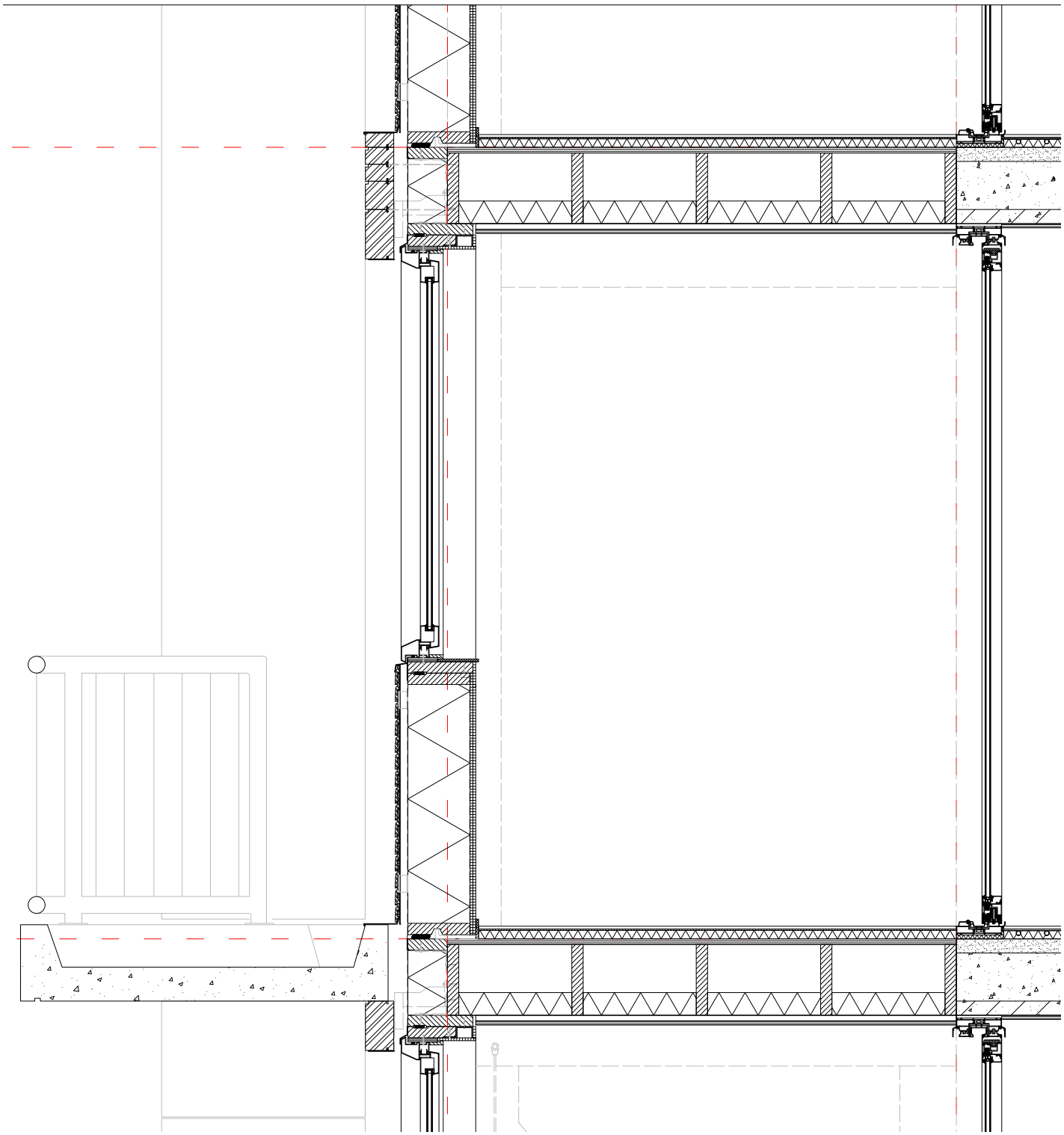


C

Proposed south-west facade - 1:100

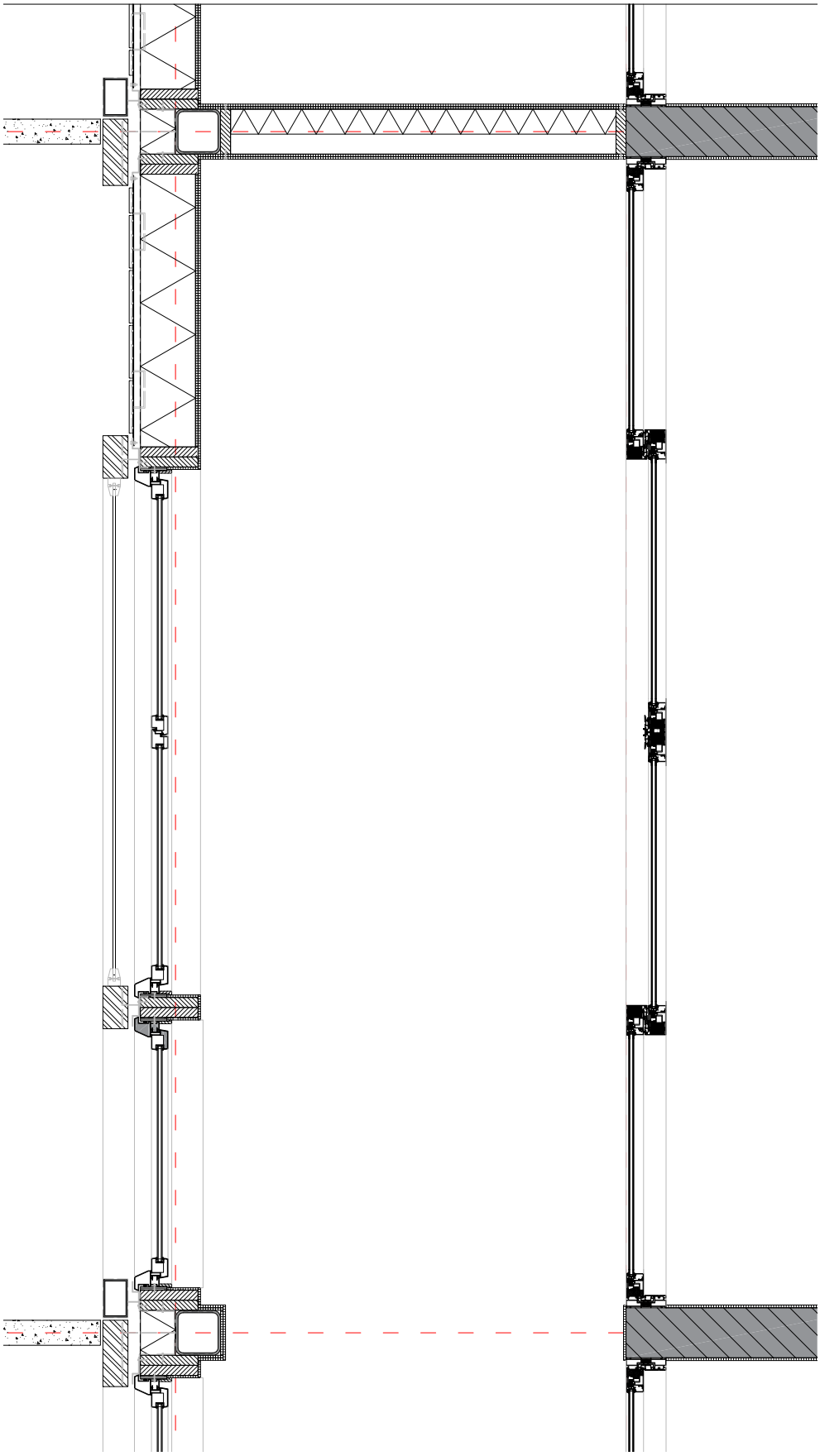


Proposed buffer-zone - 1:20

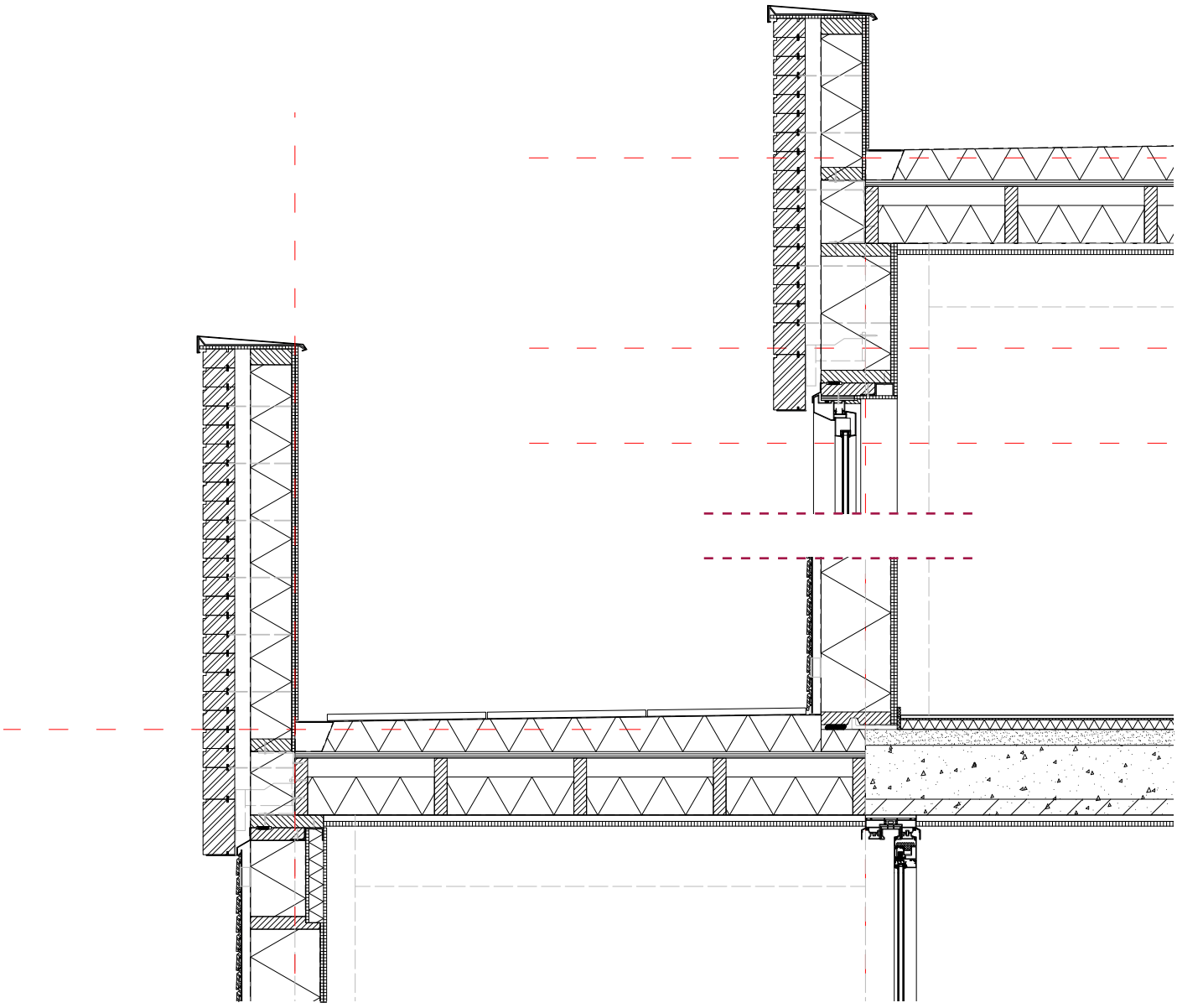


C

Proposed horizontal section - 1:25

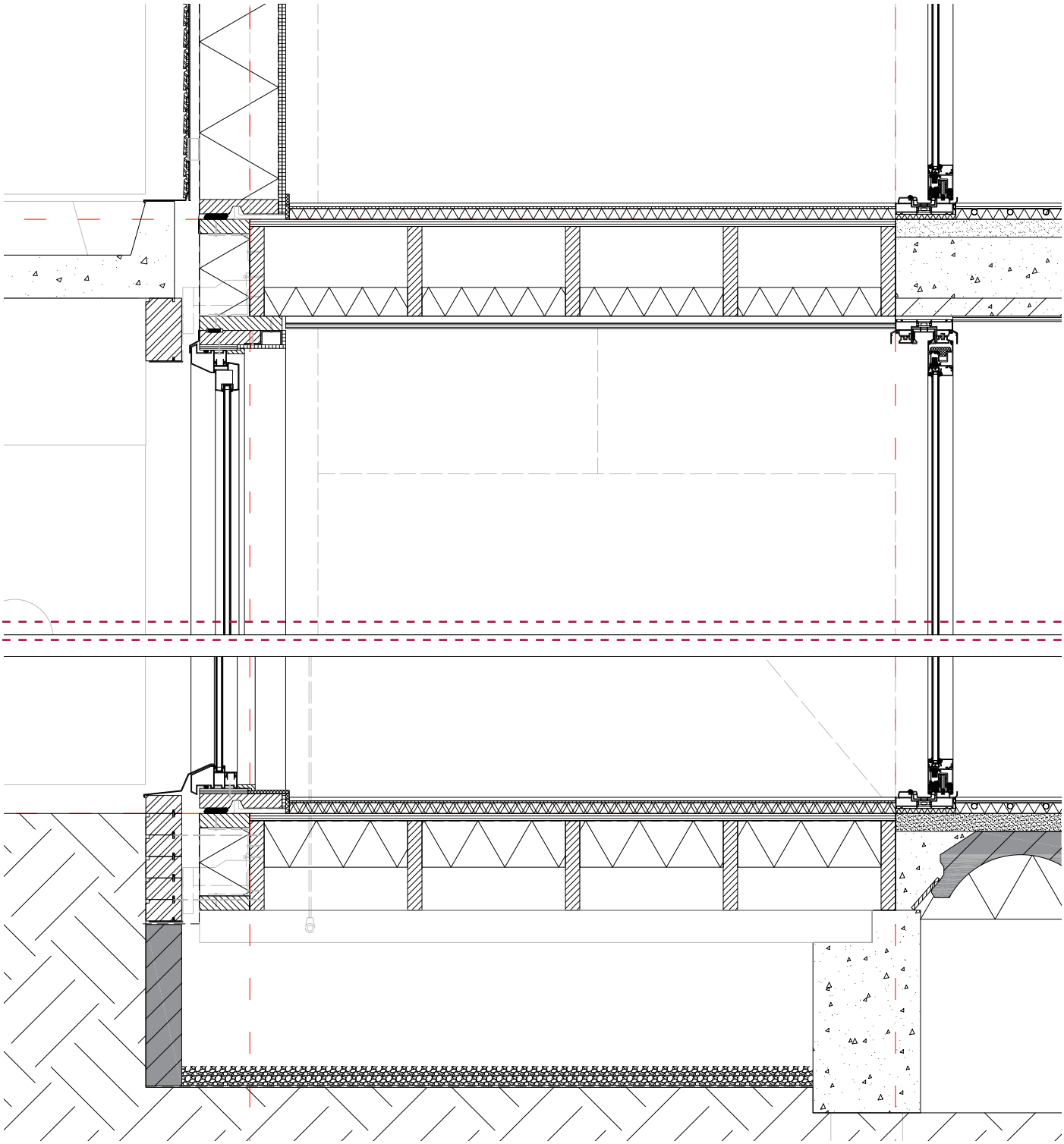


Proposed connection to the roof - 1:20

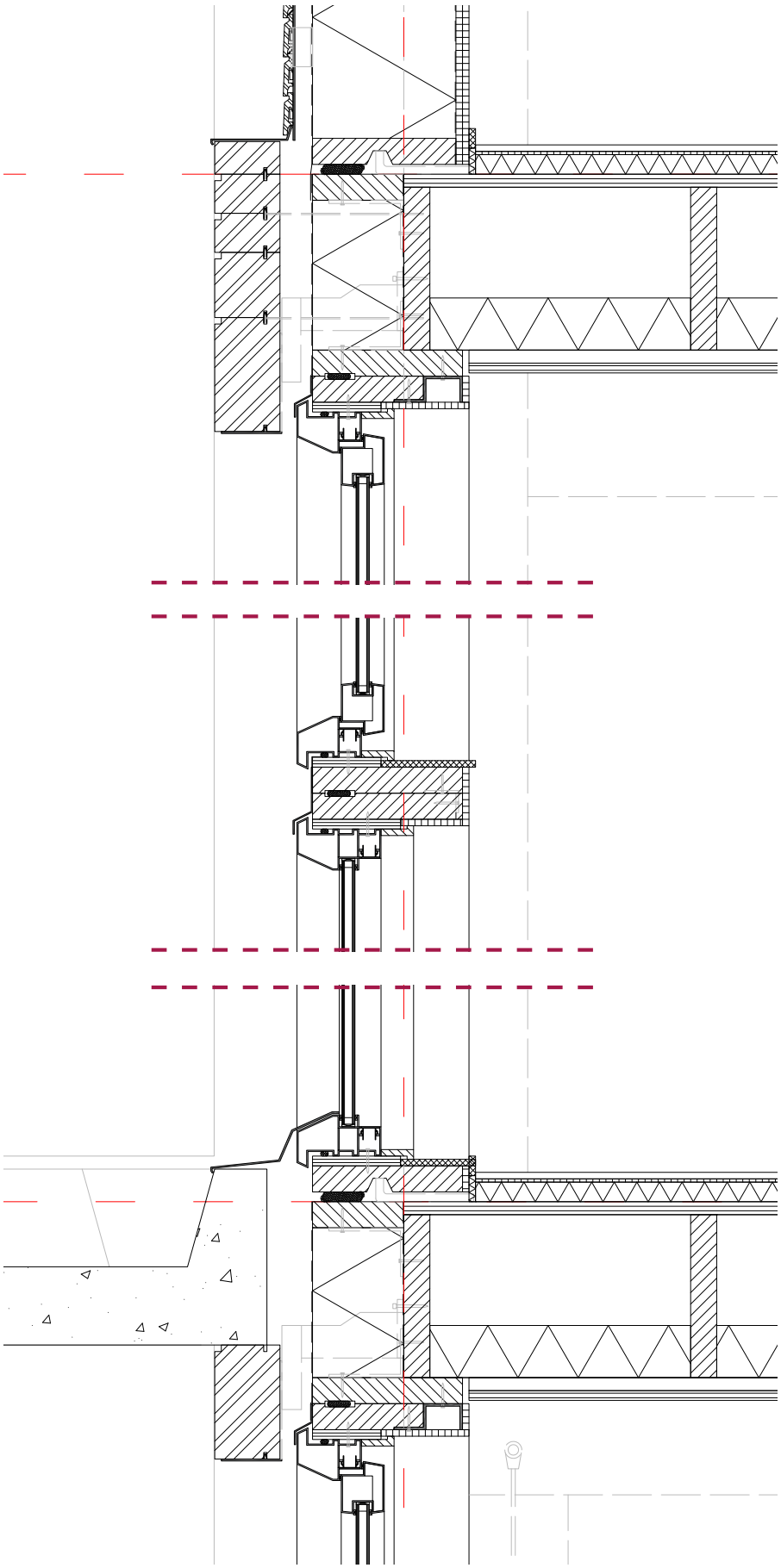


C

Proposed ground floor - 1:20

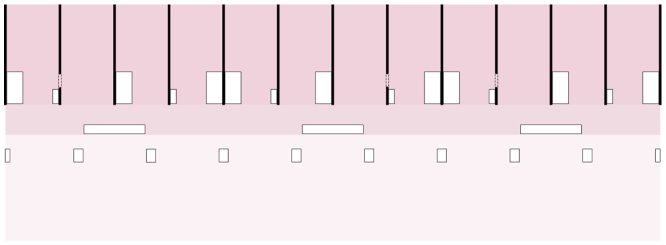


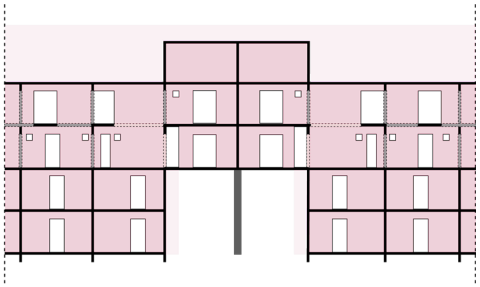
Proposed facade - 1:10

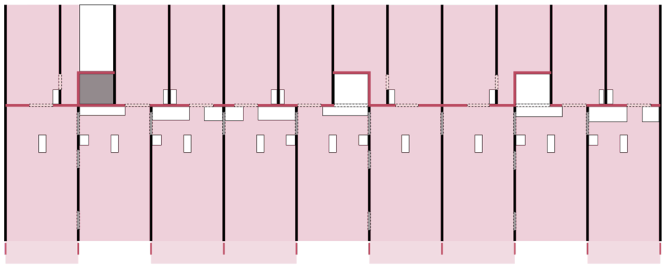


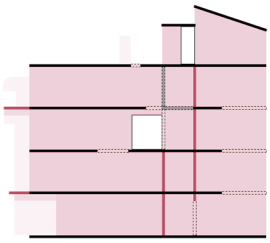
D Appendix

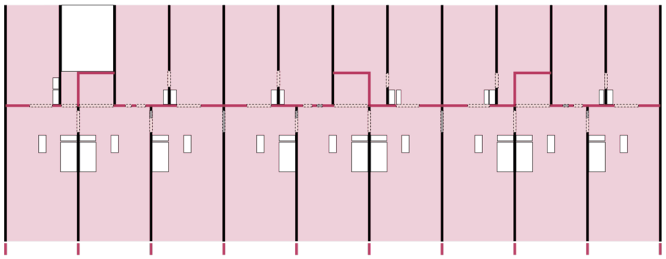
Building structure analysis

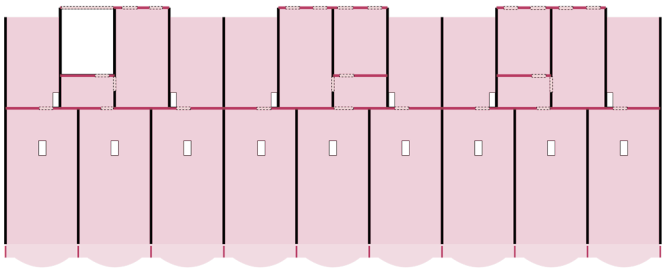


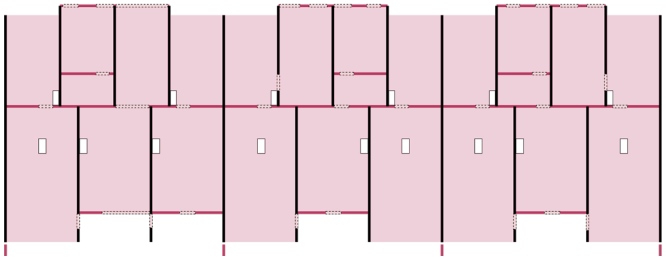


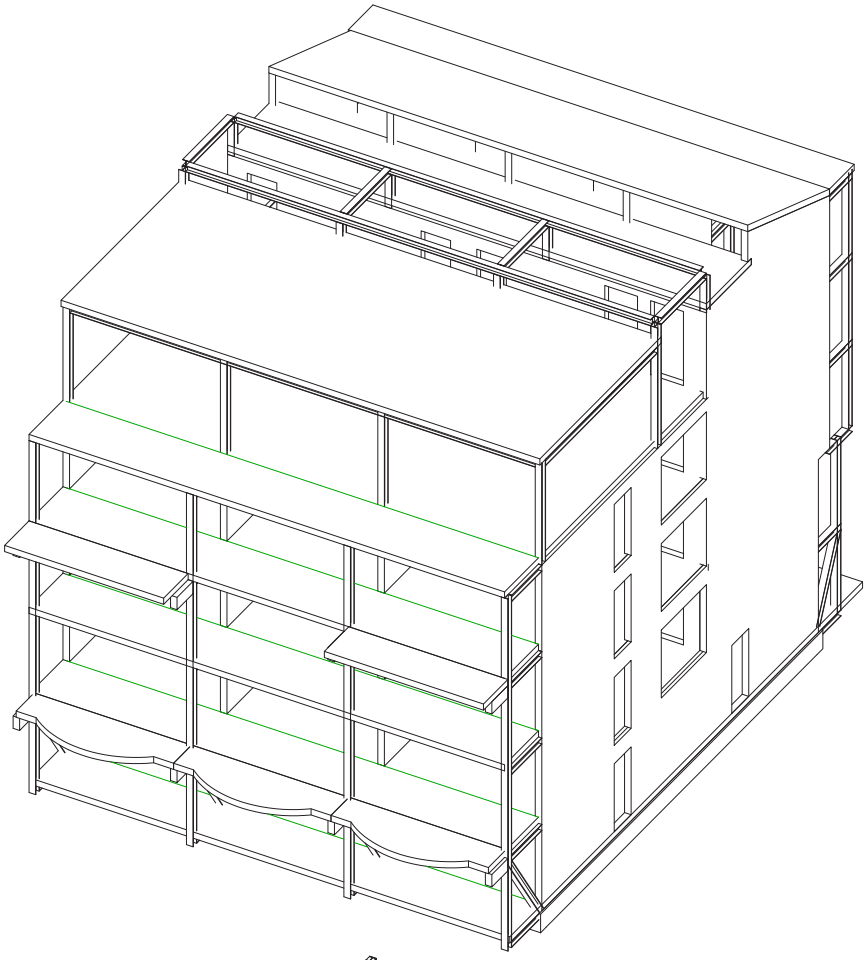


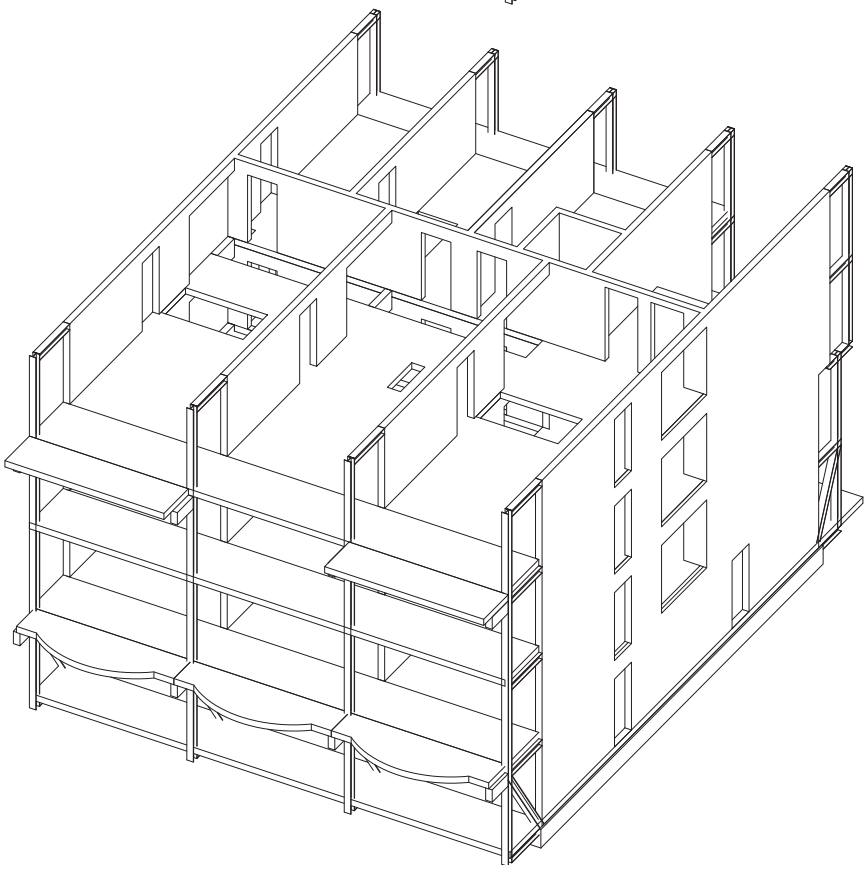












E Appendix

Calculation energy use - current situation

Model used for calculations provided by TU Delft for educational purposes

Calculation energy use - situation after transformation

Resultaat:	59	50	59	TU Delft BK Bouwkunde
Eis:	Beng1: < 67,5	Beng2: < 51	Beng3: > 39%	

Totale gebruiksoppervlakte	20648	m²	gebruiksoppervlakte van alle gebruiksfuncties samen
Bouwvolume V	73630	m³	totaal gebouwvolume

	1	2	3		het gebouw kan tot 3 gebruiksfuncties hebben
Gebruiksfunctie	Woonfunctie - woong	Bijeenkomstfunctie -	Sportfunctie		gebruiksfuncties (pulldown menu)
Percentage van totale oppervla	90	10	0	%	aandeel gebruiksfuncties (let op samen 100%)
Aantal woningen	285	totaal aantal woningen			

	Gevels (zonder kelderwanden) Noord	NO	Oost	ZO	Zuid	ZW	West	NW	Dak	Vloer en kelderwanden Aan grond	Boven lucht		
Oppervlakte	0	4476	0	825	0	4476	0	825	5550	0	5550	m²	totale oppervlakte uitwendige scheidingsconstructie
Raampercentage		60		18,6		60		18,6	10,7			%	raampercentage (glas+kozijn) t.o.v. geveloppervlakte
Gemiddelde Rc-waarde dichte delen		6,7		6,7		6,7		6,7	6,8		4,7	m²K/W	gemiddelde Rc-waarde dichte delen
Gemiddelde U-waarde ramen		1,4		2,8		1,4		2,8	2,8			W/(m²K)	gemiddelde U-waarde van de ramen, incl kozijn
g-waarde glas		0,5		0,7		0,5		0,7	0,4			-	bij zonwering op
g-waarde glas+zonwering		0,5		0,7		0,2		0,7	0,4			-	bij zonwering neer

Type verwarming	Bodemwarmtepomp		type verwarming dat wordt toegepast in de meeste verblijfsruimten
Type warmtapwater	(Booster)W-pomp / S		type tapwaterbereider dat wordt toegepast in de meeste verblijfsruimten
Tapwater centraal / decentraal	Centraal		centrale tapwaterbereiding voor meerdere tappunten of decentraal per tappunt
Percentage douchewater WTW	60	%	gemiddeld percentage warmteterugwinning bij de douches
Zonneboiler	90000	kWh/jaar	opgewekte warmte door een zonneboiler *LET OP: ook meetellen bij totale energieopwekking, zoals onderstaand gevraagd!*
Type koeling	Bodemwarmtepomp		type koeling dat wordt toegepast in de meeste verblijfsruimten
Percentage natuurlijke ventilatie	10	%	vloeroppervlakte met koeling door natuurlijke ventilatie in tussenseizoenen en zomer (voorwaarde voldoende te openen ramen)
Type ventilatie (luchtverversing)	C		type ventilatie dat wordt toegepast in de meeste verblijfsruimten
Percentage warmteterugwinning	30	%	gemiddeld percentage warmteterugwinning van de ventilatie (alleen bij C en D)
Percentage daglicht	90	%	vloeroppervlakte met 70% van de gebruikstijd voldoende daglicht (daglichtsector)
Vermogen verlichting	10,8	W/m²	gemiddeld geïnstalleerd vermogen aan verlichting
Thermische massa Dm	180	kJ/(m²K)	default waarde 110 of bepaal Dm volgens tabblad Thermische massa
Energieopwekking	90000	kWh/jaar	opgewekte elektriciteit (bijvoorbeeld PV-panelen) en warmte (bijvoorbeeld zonneboiler)

Indicatief BENG-label

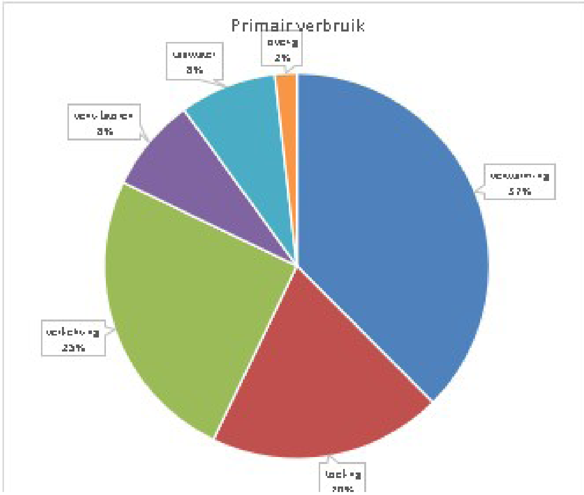
Project: Adaptille

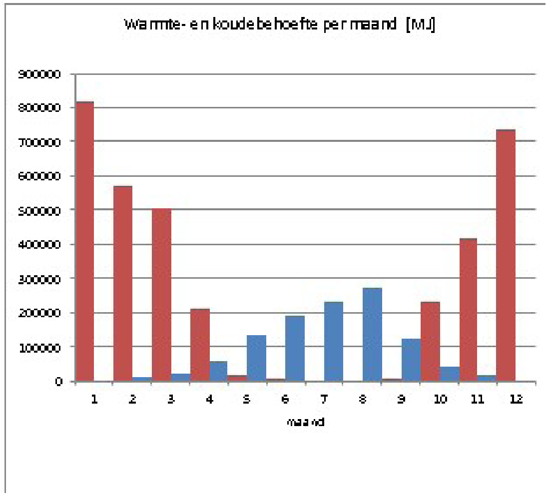
KENTALLEN

Gebruiksoppervlakte Ag	m²	20648
Verliesoppervlakte/Volume	m²/m³	0,29
Ugemiddeld	W/m²K	0,581
Glaspercentage*ZTA-zonwering	%	0,22
% Natuurlijke ventilatie	%	10
% Daglicht	%	90
Elektriciteitsproductie /Ag	kWh/m²	4,4

BENG indicatoren

Energiebehoefte	< 67,5	59	kWh/m²
Primair fossiel energiegebruik	< 51	50	kWh/m²
Aandeel hernieuwbare energie	> 39	59	%





Calculation energy use - situation after further future adaptations

Resultaat: 51 0 142

Eis: Beng1: < 67,5 Beng2: < 51 Beng3: > 39%

TU Delft BK Bouwkunde

Totale gebruiksoppervlakte	20648	m²	gebruiksoppervlakte van alle gebruiksfuncties samen
Bouwvolume V	73630	m³	totaal gebouwvolume

	1	2	3		
Gebruiksfunctie	Woonfunctie - woong	Bijeenkomstfunctie -	Sportfunctie		het gebouw kan tot 3 gebruiksfuncties hebben
Percentage van totale oppervla	90	10	0	%	gebruiksfuncties (pulldown menu)
Aantal woningen	285	totaal aantal woningen			aandeel gebruiksfuncties (let op samen 100%)

Gevels (zonder kelderwanden)

	Noord	NO	Oost	ZO	Zuid	ZW	West	NW	Dak	Vloer en kelderwanden Aan grond	Boven lucht	
Oppervlakte	0	4476	0	825	0	4476	0	825	5550	0	5550	m² totale oppervlakte uitwendige scheidingsconstructie
Raampercentage		60		18,6		60		18,6	10,7		%	raampercentage (glas+kozijn) t.o.v. geveloppervlakte
Gemiddelde Rc-waarde dichte delen		6,7		6,7		6,7		6,7	6,8	4,7	m²K/W	gemiddelde Rc-waarde dichte delen
Gemiddelde U-waarde ramen		1,4		1,4		1,4		1,4	1,4		W/(m²K)	gemiddelde U-waarde van de ramen, incl kozijn
g-waarde glas		0,5		0,7		0,5		0,7	0,4	-		bij zonwering op
g-waarde glas+zonwering		0,5		0,7		0,2		0,7	0,4	-		bij zonwering neer

Type verwarming	Bodemwarmtepomp
Type warmtapwater	(Booster)W-pomp / S
Tapwater centraal / decentraal	Centraal
Percentage douchewater WTW	80 %
Zonneboiler	170000 kWh/jaar
Type koeling	Bodemwarmtepomp
Percentage natuurlijke ventilatie	40 %
Type ventilatie (luchtverversing	C
Percentage warmteterugwinning	50 %
Percentage daglicht	90 %
Vermogen verlichting	7 W/m²
Thermische massa Dm	180 kJ/(m²K)
Energieopwekking	360000 kWh/jaar

type verwarming dat wordt toegepast in de meeste verblijfsruimten
type tapwaterbereider dat wordt toegepast in de meeste verblijfsruimten
centrale tapwaterbereiding voor meerdere tappunten of decentraal per tappunt
gemiddeld percentage warmteterugwinning bij de douches
opgewekte warmte door een zonneboiler *LET OP: ook meetellen bij totale energieopwekking, zoals onderstaand gevraagd!*
type koeling dat wordt toegepast in de meeste verblijfsruimten
vloeroppervlakte met koeling door natuurlijke ventilatie in tussenseizoenen en zomer (voorwaarde voldoende te openen ramen)
type ventilatie dat wordt toegepast in de meeste verblijfsruimten
gemiddeld percentage warmteterugwinning van de ventilatie (alleen bij C en D)
vloeroppervlakte met 70% van de gebruikstijd voldoende daglicht (daglichtsector)
gemiddeld geïnstalleerd vermogen aan verlichting
default waarde 110 of bepaal Dm volgens tabblad Thermische massa
opgewekte elektriciteit (bijvoorbeeld PV-panelen) en warmte (bijvoorbeeld zonneboiler)

Indicatief BENG-label

Project
Adaptille

KENTALLEN

Gebruiksoppervlakte Ag	m²	20648
Verliesoppervlakte/Volume	m²/m³	0,29
Ugemiddeld	W/m²K	0,523
Glaspercentage*ZTA-zonwering	%	0,22
% Natuurlijke ventilatie	%	40
% Daglicht	%	90
Elektriciteitsproductie /Ag	kWh/m²	17,4

BENG indicatoren

Energiebehoefte	< 67,5	51	kWh/m²
Primair fossiel energiegebruik	< 51	0	kWh/m²
Aandeel hernieuwbare energie	> 39	142	%

Model used for calculations provided by TU Delft for educational purposes