REFLECTION

DUTCH HOUSING

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TU Delft, Architecture
Dutch Housing Graduation Studio MSc4
Between Standard and Ideals- Havenstad Amsterdam

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Preface

During my graduation year in the Dutch housing studio the focus was on the following question: How will we live in the future cities? The past year I worked on a design that responds to this question.

In a world where the cities are getting bigger and housing shortages are growing, there is a need for smaller and affordable houses, especially for people working in the city, *keyworkers*. Simultaneously, the co-living building I designed, stimulates social interaction and sharing of spaces and other utensils.

The past year research and design alternated constantly. Various ways of researching have led me to a result; a building. In this report I reflect on the research methods and design process. By writing this down, I think I will be more aware how the design process works and I hope this knowledge will help me in future projects.

May 16th, 2019

Winde Schipper

Content

Image 1: Visualisation of the design process. Squiggle by Daniel Newman.

Introduction

The design process started as a confusing mess, consisting of many questions and no clue what the result would be like. By doing research in many different ways, I was able to develop my design a bit further each time. Although, it sometimes was a process of trial and error.

Research is an important part of the education programme of the faculty of architecture. It underpins design decisions and makes the final results stronger and defensible.

During the design process I did research in various ways, in order to develop the design. In this report I will examine, discuss and reflect on a number of research methods that I used in my design process.

To structure these ways of doing research and to show its role in the greater whole in this report, I used a conceptual framework, in which the design process is described on the basis of five generic elements (Van Dooren, Boshuizen, Van Merriënboer, Asselbergs, Van Dorst, 2014). These elements are briefly explained below:

- Experimenting: investigating and generating variants.
- Guiding theme: an inspiring direction, which gives guidance in making design decisions and coherence within the design.
- Domains: a designer works in a lot of aspects, for example materials, functionality, construction and situation.
- Frame of reference: 'library' in the mind of designers, in which patterns, references and rules of thumb are saved.
- Laboratory: the way how ideas are transmitted visually, for example by sketches and models.

Finally, this report will end with a reflection on a number of subjects that are part of the Master track Architecture, Urbanism and Building Sciences. The five subjects are about the relationship between research and design, the relevance of the project and research methods in the wider context and the transferability and future applications of the project.

RESEARCH & DESIGN

REFLECTION REPORT

Experimenting

Piles of tracing paper are scattered throughout the house, probably something that sounds familiar for many designers. Those piles of sketches are the result of generating, exploring, testing and transforming new ideas: experimenting, a process of trial and error (Van Dooren et al., 2014).

By making quick sketches, I was able to get an overview of the ideas I had in my mind. Some of these ideas seemed potential in my mind, but when I drew them they were disappointing and vice versa. Each time I asked myself: *what happens if I do this or this?* The result is a series of drawings. The first drawings, made by hand, are more conceptual in nature and are very different from each other. Then, I choose a number of sketches that I will develop further, usually on the computer. The drawings are becoming more precise and the difference between variants are getting smaller. The guiding theme, functionality and regulations play and important role, when choosing a variant.

"To start with you see the thing in your mind and it doesn't exist on paper and then you start making simple sketches and organising things and then you start doing layer after layer… it is very much a dialogue" (Cross, 2006, p.33).

Calatrava

When I started to design the floor plans, I sketched different ideas. It soon became clear which options had potential and which I had to reject. For example because of spaciousness or practical reasons. In order to see how realistic the remaining options were, I started to work on the computer to test and develop those variants. The floor plans became more precise and the differences between variants smaller. If I wanted to test new aspects in a quick way, I printed the drawings and sketched new ideas over it. The experimenting was about the interaction between gaining ideas and adapting and refining them.

I came to the point where multiple variants met the requirements. Which one should I choose? In this case I figured that it could be of added value for the building to have multiple dwelling options, so residents can choose for themselves and personalise their house. If this was not the case and variants are equally good -they meet the requirements concerning guiding theme,

functionality, maintenance, costs and spatiality-, then I would choose to intuition.

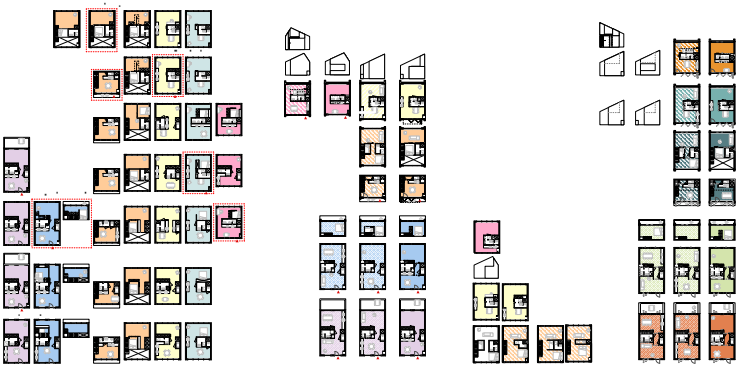

Image 2: A series of experiments of the dwelling floorplans.

Another experiment I did at the beginning of the design process, was a wind study in relation to the building mass. Early in the process it became clear that the wind possibly could cause inconvenience. I wanted to investigate how much that would be and how it could be reduced. Information about average wind force, direction, movement and air pressure, was input for the variants I made. I added for example a windshield, trees and a ribbed façade to the building volumes. Then I placed the various models in a wind simulator, which showed the wind pressure on the building mass. The result was surprising. First, the impact of the wind turned out to be less severe that I thought initially. Second, some measures I took, made the wind impact worse instead of better. To solve the problem, a number of trees were enough.

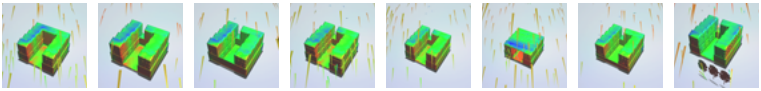

Image 3: Windsimulation of various building volumes.

In conclusion, experimenting turns out to be something I use throughout the whole design process. It helped to organise the ideas in my mind by sketching plans, sections, facades and perspectives. Later I elaborated and adapted those variants on the computer.

Guiding theme

A guiding theme, or concept, gives direction and helps to make decisions during the design process. In the end it will give the design identity and coherence (Van Dooren et al., 2014). From the first day of my graduation year, the guiding theme keeps me busy. What kind of building will it be? Who will live there? How do these people live? How do people live in Amsterdam? How will they live in the future? What will fit at the location?

It is frustrating and fascinating at the same time; the elusiveness of the guiding theme. In the beginning it felt as if nothing fit together. By examining the history, current situation, relevance of the subject and target group, the story and concept became more clear. It was a search for the right answers and words, that eventually will form a coherent story in the end.

My interest in cohousing was the starting point of the search for a coherent and suitable story for the given location. The target group I had in mind, were people who deal with irregular working hours. In retrospect, it turned out that cohousing did not fit the design assignment appropriately, which I adjusted later into co-living. I also adjusted the target group, in order to make it less specific.

Adjusting and sharpening the guiding theme is part of the design process. It is a way of trial and error. The guiding theme will develop in time (van Dooren et al., 2016). To develop my own story, it helped me to wonder aloud why I did something and why it would fit my building, target group and location.

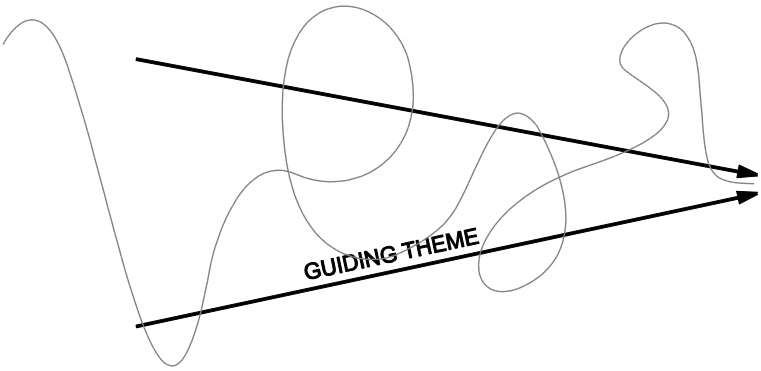

Image 4: Designing is developing a guiding theme (Van Dooren et al., 2016).

Reading articles, books and news provided me with information and understanding the relevance of my topic. Additionally, it helped me to discuss my design with others. This forced me to explain my ideas and design briefly. For example, the conversations and questions that were posed during the studio meetings gave me fresh insights, but also food for thought. *What is 'feeling at home' and what are the consequences for your architecture?*

Image 5: News items concerning my targetgroup: keyworkers.

It was also refreshing to have a conversation with people who are not familiar with architecture. In the first place because I was forced to explain my idea in a understandable way and language. Secondly, it helped me to come back to reality. When I showed my boyfriend a brick façade with bulging joints, he asked: *"Should it be like that?! It looks like something went wrong…"* I think this might be the reaction of future residents as well.

To get a grip on those future residents, I interviewed a couple who want to live in a co-living building. During the conversation we discussed how a common room should look like, where it should be located in the building and what it can be used for. According to them it should be a *"Starbucks at home"*: a space in which various activities can take place, such as drinking coffee, reading, relaxing, drinks, parties, family visits, have a chat and so on. The conversation gave me a more nuanced view on the functions and atmosphere of such a space.

Another way to get to know the future residents is by conducting a survey, addressed to people with irregular working hours. I tried to distribute the survey via a number of acquaintances working in the healthcare, so they could spread it further. A handful of people responded to the survey. Although there were too few respondents for a reliable study, it did offer a glimpse into their lifestyles.

I asked them for example: "*Do you think your living environment can contribute to sleep better? If so, how?"* and "*In what way can your living environment/dwelling overcome the disadvantage of irregular work?*" Because I wanted to give respondents the freedom to come up with new ideas, the questions are open-ended. In this way I hoped to receive answers that I did not expect. In the end, most answers were a confirmation of what I already knew.

I think it is difficult for people who are not familiar with design or architecture, to see how the dwelling (layout) can contribute to sleep better, apart from shutters. One of the answers was: *"I go to a place where it is quiet"*. In retrospect, I might have asked multiple choice questions accompanied by images, in order to receive answers that are more related to the building design. I also would spread the survey in a different way, for example via a Facebook group, in order to get more respondents.

Although I consider the building type and target group as the most important part of the guiding theme, the location is also of great importance for the appearance, masses and organisation of the building.

To get to know the location, we visited the site at the first day of our graduation year. During the visit I made photos and audio recordings, so I could look at it again at home. I also tried to formulate my first impression of the location when I came home: *Surrounded by the large water surface, it feels calm, spacious and open. In the background the sounds of industry and the city, it is almost a bit abandoned.* The atmosphere, sounds and smells, are not visible on a photo or plan, I think it is important to be aware of them, in order to understand the location and its atmosphere completely.

A more objective way in which I have studied the location was by making analytical drawings, in which certain aspects are emphasised by reducing other information. These were for example drawings of wind direction, noise areas, sun paths, existing building ages and accessibility. The obtained information was a starting point for the urban design in this area.

Another way to learn more about the location, was done by comparing and looking at historical maps of the location. This gave me a better understanding of the current appearance and morphological shapes and what activities took place there. It gave me inspiration and the opportunity to embed my design in the environment; the industrial character and aspects of my

building refer to the history of the location, *de voormalige houthaven* (the former timber port).

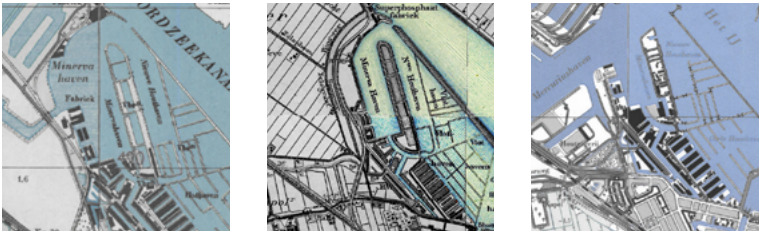

Image 6: Historical plans of Minervahaven in 1920, 1950, 1970 (Kadaster).

The location, target group and building type together are the guiding theme in my project. When making a design decision, the guiding theme was decisive.

In reflection on the guiding theme, I can say that it was a search for the right building type and target group, which was sometimes difficult, confusing and vague. Towards the end I noticed that it became more clear.

Domains

During the design process, a designer is confronted with various topics, that can be subdivided into domains. Van Dooren et al. (2014) distinguish 5 main domains: shape and space, material, function, physical context and social, cultural, historical and philosophical context. These domains are present during the entire design process. Each idea, sketch or 3D model says something about at least one domain, but more often about multiple domains.

These five domains are closely intertwined. A decision in one domain, has consequences for another domain. Therefore it is not possible to oversee and solve all design problems at the same time. That is the reason why I often draw a number of possible solutions within a domain, choose the best option at that time and move on working on a different domain. In a later stadium I can always adjust that decision, based on new knowledge I have gained by studying other domains. Working alternately on the different domains, helped me to see the relations between the five domains within my project.

When designing dwellings and floorplans, it is not only about the functionality, but also about the social context and spatiality. By alternating between these domains, I was able to combine them in an integrated design. If I had only worked within the functional domain, I would have made a completely different dwelling.

Important within the practical domain was for example the size of the bathroom, position of the fuse box, the dimensions of the staircase, direction of the door rotation, and so forth. The book *Architects'data of Neufert* (2012) proved useful, because it provides information about minimum sizes of all sort of spaces, furniture and other things. I think it is important to reflect on the fact that this book is about minimal sizes and that it might be preferable to take it a little more generously. That is why I often measured things at home, for example furniture, but also the space you need for a certain move or action. In addition, I often used the building regulations (bouwbesluit), because the dwelling has to comply with these regulations to be realistic.

In addition, the spaciousness, dimensions and atmosphere of the dwelling is just as important. A part of the dwellings is smaller than 50 square meters, relatively small, but in my opinion spacious because of the raised ceilings, double heights and attics. Also sightlines play an important role for the spaciousness

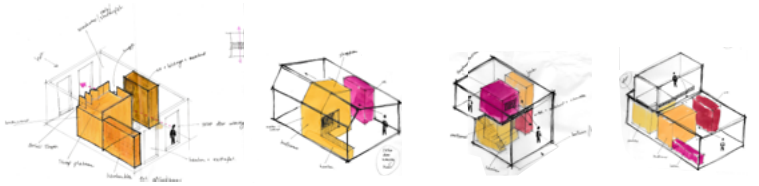

Image 7: Series of 3D models to test materials, clours and depth.

of the dwelling, they offer overview and light from two sides. To visualise the space and its qualities, I made sketches and built a 3D computer model of each apartment type.

Besides the functional and spatial domains, I think it is important to be aware of future residents. What are their needs and lifestyles? The resident profiles I made, helped me to create various dwelling types that would suit them. Each time I was working on those dwellings, I kept the future residents in mind. I wondered whether they could feel at home, now and in the future. To ensure the dwelling is still suitable in the future, in case of changing lifestyles, a selection of dwellings is easy to adapt.

The following example is about materialisation of the façade. Early in the design process, before the P2 presentation, I had the idea to use bricks in the façade, in order to establish a link

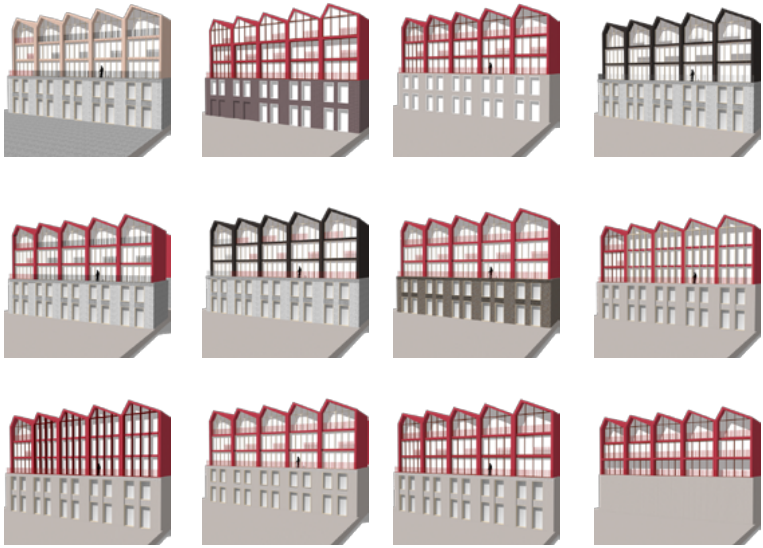

Image 8: Series of 3D models to test materials, clours and depth.

with the former industrial character of the location. This brick façade turned out to be a recurring theme during the entire design process. I asked myself questions concerning aspects such as: colour, appearance, depth, construction, patterns and manufacturers. I tried to find answers to these questions by using different techniques. For example photo collages and word webs to search for a certain atmosphere, 3D models to investigate depth and colour combinations, matrices to compare bricks and bonds and reading about brick to know what it is actually about.

This research offered a lot of information and possibilities. I came to a point where I did not know how to choose a brick and bond, that suited the informal and industrial atmosphere that I was looking for. As Jo Coenen says: *"The choice of colour and materials of the city is not simple. …In order to arrive at the right choice of colour and brick, it is essential that you surround yourself with the material with which you work. In this way, you can appreciate the colour of the brick both in the evening and during the day. Furthermore, you must examine the brick outside and in all climatological conditions"* (Wingender, 2016, p.50). And so I did. I went to see various types of bricks, which gave me a better understanding of shades and roughness. I have taken some of those bricks home, so I could look at them every day. I have not yet made a final choice, but as Sjoerd Soeters says: *"... at some point halfway through the final design you choose the colours and the masonry bonds"* (Wingender, 2016, p.50).

The five domains, distinguished by Van Dooren et al., show the various domains in which designers have to make decisions. However, one important aspect seems to be missing: money. On the Faculty of Architecture the aspect money is not emphasised, but in practice it certainly is an important part of the design.

During the design process, the five domains are something I constantly work on. Sometimes one at a time, but most of the time I worked on multiple domains at the same time. I tried to alternate a lot between the domains, which made me aware of their interrelationships, but also helped me to move on and not get stuck in the process.

Image 9: The bricks I took home with me.

Frame of reference

A lot of knowledge is embedded in the world around us. By collecting and analysing this knowledge, a frame of reference is built over the years. Simplifying, combining and transforming those references can lead to new ideas (van Dooren, 2014).

An example of collecting and analysing existing knowledge, is the precedent research I did. Hereby I analysed four comparable projects, with a similar program, including collective functions. I searched for the design tools that were used to activate social life within those buildings. In order to find those design tools, I used various drawing techniques, such as sections, plans and axonometries in a simplified and reduced form. By analysing each precedent similarly, it was possible to compare them and find the design tools that are used.

An important design tool that I found and that is reused in my own design, is the relatively broad gallery, which gives residents the possibility to put for example plants and benches. This forms the transition zone between the private and public realm and activates social interaction between residents. Another important design tool I used is the distinction between public and collective outdoor space. So, a number of design tool have been reused in my own design.

Additionally, later in the design process I used those references to inform myself on other aspects than I analysed in the first place. In particular the *Miss Sargfabrik* of *BKK-3 Architects* proved to be a useful example. For instance, I looked at the open façade on the gallery side and the dimensions and layout of the floorplans for inspiration.

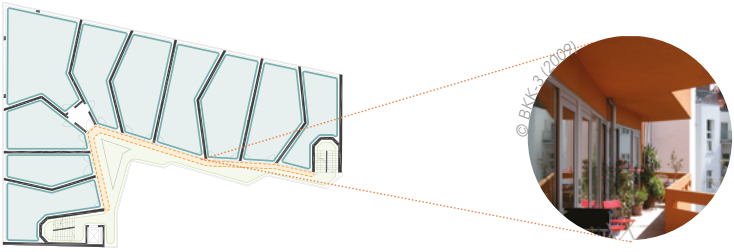

Image 10: Analysis of the Miss Sargfabrik and the galleries I reused in my project.

By analysing those precedents in a structured way and research questions, the results are relatively objective and usable for everyone. Another way to expand the frame of reference is by collecting images. During the entire design process I have collected images on Pinterest. This platform gave me the possibility to gain endless inspiration or find design solutions, but also saved images in an organised way. The images are saved in chronological order, so afterwards it is clearly visible which subjects and ideas followed each other. Although I like to work with Pinterest, I think it is easy to lose yourself in a search for the perfect image, that may not be there.

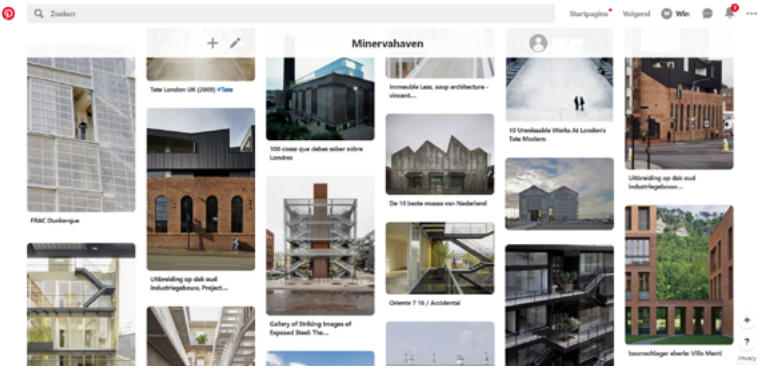

Image 11: My Pinterest page.

Although, you can find all sorts of inspiration and information on the internet, it can be enlightening to have a look in the real world. By looking consciously, our direct living environment can give us new information every day. In addition, there are things to discover that are not visible on a drawing. For example, how do people use a building? How do they personalise their home? What kind of atmosphere evokes the building? There is much to discover by just looking, but a conversation with residents can also provide insights. For example, how do they experience the building? I think that we consciously and unconsciously store this sort of information, as a part of our frame of reference.

An example is the train journey from Utrecht to Delft, which takes me along many housing projects. I automatically start studying the facades, materials, window partitions or building mass, depending on the subject I worked on. Last week I studied masonry patterns and brickwork and noticed how many examples I have in my immediate living environment. A walk

to the supermarket suddenly became a lot more interesting; I saw variations in bricks, colours and patterns that I had never consciously noticed before. Some examples are a source of inspiration, others show how I do not want it in my own project.

Another way of looking at the environment is to deliberately visit projects. During our studio excursion to Hamburg last September, we gained inspiration in Hafencity. The way building volumes are organised, the large water surface, the size of building blocks and the used materials, gave Hafencity a certain atmosphere and appearance. I kept this in mind during the design process. A guided tour provided more information about the buildings and surroundings, which gave the trip to Hamburg more depth.

My own (living) experiences, interests and the places and buildings I have been in the past, are also part of my frame of reference. It is a kind of personal library, that expands constantly. The past year I expanded my frame of reference in multiple ways, which served as input when I was experimenting.

Laboratory

"Engineers have laboratories for experimenting. Designers have their own laboratory for the process of experimenting: the language of images." (Van Dooren, 2014, p.13). By sketching and making models, ideas can be made explicit: it is a way to make ideas comparable and more understandable for yourself and others.

What I like about sketching, is how an idea can be made clear in a quick and simple way. It helped to organise the ideas in my mind. Most sketches look a bit messy and are not intended to present, but they can show the potential in certain ideas and can make clear whether it is worth to continue with the idea. For example the quick perspectives I made of the dwelling types showed me the impact of moving a wall or stairs.

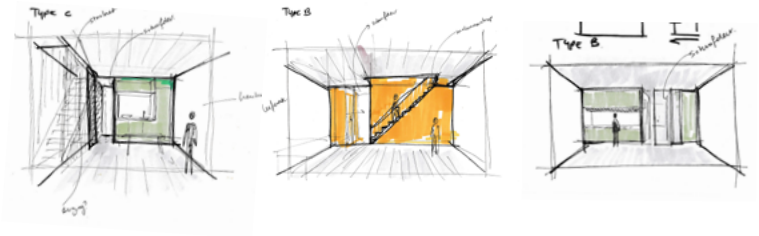

Image 12: Quick sketches of dwelling interiors

To visualise my ideas about the building façade and mass, I made a series of sketches from the same perspective, so they could easily be compared. Among these sketches, there is also a sketch of which I knew in advance that it would not work. But by drawing the idea anyway, I figured out why it did not work and why others did work. By making a series of sketches, new and unexpected ideas are also generated, it is almost similar to creating a word web; one word may lead to another word, a word that you would not come up with initially.

Although sketching is a nice way of working, I also think that it is important to know when to stop sketching and start drawing in the computer (2D). Then it becomes clear whether it fits or not. Especially when designing small apartments, when it comes to a few centimetres, drawing in a more precise way turned out to be useful.

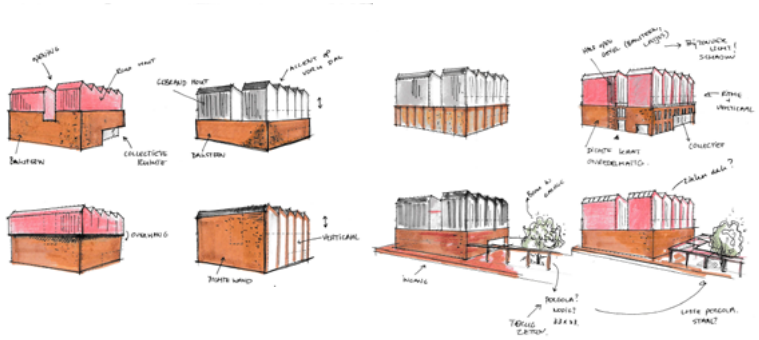

Image 13: Sketches of the building mass and façade

Sometimes these kind of sketches do not offer sufficient precision, for example when I worked on the façade layout. Which was about the precise window distribution, proportions and depth of the façade. At those moments I choose to make a 3D model in the computer. Once the model has been built, it can be easily adapted in various ways. The result was a series of variants, that I compared and analysed. In the end I choose one that suited the guiding theme well. In the event that multiple variants are sufficient, I choose the one I prefer; on intuition.

Creating a 3D computer model offers often a good insight into the spatial qualities and proportions of a design. However, sometimes I prefer making a physical scale model, because to me it seems more expressive and appealing to the imagination. It can be picked up easily and studied from all sides. During the design process I work with different types of models; work models and presentation models.

Especially in the beginning of the design process, I work with models that are easily adaptable. For example the model of the courtyard with galleries and stairs, that I made to explore the right proportions, size and position of the stairs and galleries in relation to the size of the courtyard. The galleries and stairs were attached with pins, so that I could test and photograph different variants.

A complete different type of model is the 1:50 façade fragment I made for the P3 presentation. The intention of this model was not to experiment, but rather served as a kind of review. Is this the atmosphere I want to achieve? Are these the right proportions? What is the effect of the masonry bonds, materials and colours? Eye-level photos gave me a good idea of the atmosphere and proportions of the façade.

Image 14: Working & presentation model

Image 15: Eye-level photographs of the 1:50 model.

The interaction between manual work and computer work appears to work well for me. Sketching is a quick, simple and creative way to try out ideas. The precision of computer drawings is useful to see if it is really possible; they complement each other.

Nowadays digital drawing techniques are becoming increasingly sophisticated and 3D models become more important in the construction, architecture and real estate world. Although many fellow students use *Revit*, a 3D computer program, I consciously chose to work in *Vectorworks*, which gives me the possibility to work in 2D. In addition, I use *Sketchup* for making 3D models. This way of working may not be the most efficient, but it gives me more freedom during the design process. Each line is drawn by myself, which forced me to think carefully about how something should look like. When I worked with *Revit* in the bachelor, it felt unfree, like everything was already fixed. For example when drawing a roof or window, *Revit* draws automatically a certain roof edge and standard window frame. It is of course possible to adjust this to your own preferences, but that requires some experience with the program.

During the design process I used various ways to express my ideas. What worked best for me is the alternation between them.

WHO I AM AS A DESIGNER

REFLECTION REPORT

Who I am as a designer

As mentioned, various ways of research were important to develop my project. But in what way is this design, *my* design? And what is typical for my designs?

The design is not only created by these different types of research. Intuition also played an important role in the design process. Everyone has a different and personal design approach, which means that different outcomes, on the same design assignment, are obvious. Wim Crouwel says about intuition: "*Design dat uitsluitend op rationale gronden wordt bedreven leidt toch altijd tot een afschuwelijk zoutloos resultaat.*" (Groeneveld, 2006, p.125).

During the bachelor I searched for a style and way of designing I felt comfortable with. I experimented with different styles in my design projects. For example a red steel building, in a curved shape; a contrast with my design now.

When I started my Msc1, Interiors, Buildings, Cities, I felt comfortable with the style and approach of the studio. I developed my personal style, in which I often choose for simple shapes, reluctant use of materials and colours, functionality and subtle details. Additionally, I do not feel the need to design a highly remarkable building. In my opinion a building that is functional, simple and anchored in its environment, has the potential to be timeless.

Remarkable is a recurring personal fascination for the medieval cloister, which is about enclosement of space, unwinding and rhythm. I used this scheme in various projects, in different ways, which gives a certain character to a building and space.

RETROPSECT

REFLECTION REPORT

Retrospect

The relationship between research and design.

This reflection has shown the various ways I conducted research, which I used to underpin my design decisions. Each piece of information took me a bit further in the design. So in my eyes the final design is the sum of all the answers I found in the studies I did. I have learned that research and design cannot be seen separately. They are interwoven and sometimes almost indistinguishable. It is the interaction and alternation between the two, that brought me further in the design process.

The relationship between the graduation project, the studio topic, master track and master programme.

The Dutch housing studio focusses on how people live in the city of the future. The topic I choose for my graduation project is based on this theme and on my own interests. For example, the theme of the studio can be seen in the dwellings types, which are easily adaptable.

The chair of Dwelling emphasises how the individual dwelling is part of the larger whole; the building, the neighborhood and the city. My design responds to the current housing shortages among keyworkers in the city. Without dwellings for those people, Amsterdam will soon have employee shortages in education, health care and police. This is an example of how a dwelling, can have influence on a whole city.

My graduation topic made me think about the housing challenge of the coming years and how to respond on such a challenge. Thinking in an innovative way about the future and meeting challenges concerning urbanisation, aging and sustainability, is part of the master programme of this university.

Elaboration on research method and approach chosen by the student in relation to the graduation studio methodical line of inquiry, reflecting thereby upon the scientific relevance of the work.

The way of working in this graduation studio was quite structured, especially the first semester. Fixed deadlines and presentations ensured a constant workflow, which made the graduation year

feasible and clear. The research methods we used during this first semester were for example; a literature study, precedents research and a site analysis. In the second semester there was more freedom to choose your own methods and approach, which I explained in this reflection.
During the first semester we worked in groups and discussed many topics during the tutoring moments. It gave me useful inspiration and insights, that I would not have had otherwise.
Comparing my graduation studio to some other studios, this structured approach seems to work well. It helped me to finish my work in time and gave direction what research methods I should use. The group fellow students motivated me to work on my own project and share information.

Elaboration on the relationship between the graduation project and the wider social, professional and scientific framework, touching upon the transferability of the project results.

I see my graduation project as the result of the various studies I have done the past year. The inspiration, information and answers I found in literature studies, references, conversations and news articles, together form the basis of my project. In other words: the knowledge resides in the design. I elaborated on existing information and combined this information in a new way.

In the past year I have expanded my knowledge, gained new valuable experiences and supplemented my frame of reference. This experience and knowledge is something I will take with me, consciously and unconsciously, to new projects. Additionally, my project can also serve as inspiration for others. For example, last December I spoke Anneleen Lagae of the Amsterdam municipality about new living forms and sharing. She was interested in the way I approached the current housing problem and the project itself.

As I mentioned earlier, the building type and target group were the most important themes during the design process. Although, the location determines the appearance of the building, the underlying principles and patterns that are used in the access system and the organisation of the building (the public, collective and private realm) are independent of the location. These patterns can form the basis of a new building, in a different city.

Discuss the ethical issues and dilemmas you may have encountered in doing the research, elaborating the design and potential applications of the results in practice.

The ethical issues I encountered were often about decisions concerning architecture and users. For example, the large windows on the gallery side. It has the advantage of plenty of light and openness, on the contrary it provides less privacy for its residents. Another example is the choice of materials. I was looking for wood that came from the Netherlands, because of sustainability reasons. However, the durability of the wood I found is much worse than the wood that comes from South Africa, New Zealand and Canada. I thought I had to choose between a short life span or importing it from the other side of the world. Both are not very sustainable. Fortunately, there was a third option; preserved Dutch wood.

In my graduation project I have brought together a number of relevant topics. Namely, the shortage of affordable dwelling for keyworkers in the city, smaller dwellings as a reaction to the growing cities and co-living in order to share social life and facilities. The many news items on these topics, show that it is on peoples' mind. Therefore, I have confidence that my results are relevant for future research and practical applications. I hope the number of co-living projects will increase in the future, and that people become aware of the benefits of this concept. My research is a contribution to this.

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