SHIFT

Housing for the maker

Pelle Leijten 4478274
Tutors:
Theo Kupers
Ferry Adema
Pierijn van der Putt

Contents:

Introduction

My master thesis focused on the development of an housing complex in Rotterdam Keile district. Since the start of my architecture studies I was fascinated by the idea of creating something useful, but also personal for people. However I came to the realization that many dwellings were created for a generalized public. However, this causes many buildings to be abandoned or needing complete redesigns much before the end of their natural lifespans. By studying existing projects, diving deep into literature, intensive counseling sessions, and interviewing different groups of people I tried to reimagine what a building could be to people and how I could provide residents with a personalized dwelling. This book is the product of that research.

Flexible housing for the amateur

Flexible building concepts explored in the age of the amateur

Abstract:

Flexible housing is offered as a way to extend the lifespan of architecture. This research paper explores the different ways to design flexible housing through the publications of Habraken, Brand, and Leupens as well as the findings by organizations like OBOM and Openbuilding.co. Three modern housing projects in Amsterdam, Superlofts houthavens, CiWoCo, and Patch-22 are analyzed on the criteria of flexibility as proposed in the publications. While highly flexible, some choices made either by the architect, constructor, or the current resident, might limit the choices a prospective resident might be able to make when they want to rearrange the interior.

A newly emerging target audience called 'the amateur', that greatly values high quality and customization, would be very suitable for this type of flexible housing. The paper analyses their preferences based on three case study projects (Superlofts houthavens, CiWoCo, and Patch-22) as well as a questionnaire and a series of short interviews. it is essential to consider the character of each design element (site, structure, skin, circulation, services, space plan, and stuff) in order to study the effectiveness of this building strategy.

Keywords:

Flexible housing, Habraken, Leupen, The maker

Illustration 1 (cover): *INTERSECTION FIELDS IV: Highrise of Homes* (Wines, 1981)

Contents:

"Het is een van de grote wonderen van ons bestaan dat de bevrediging van sommige behoeften een zeer positieve, persoonlijke, ja bijna creatieve actie van ons verlangt. Zelfs vandaag behoeft het nog geen betoog dat wij niet kunnen leven van consumptie alleen, hoe aantrekkelijk en vernuftig deze ook mag worden aangeboden. Maar de massawoningbouw reduceert de woning tot een consumptie—artikel en de bewoner tot een consument. Want alleen in deze sfeer kan verlangd worden dat de gebruiker afwacht tot het pro dukt hem geheel voltooid wordt aangeboden."

- John Habraken (1985 p.19)

"It is one of the great wonders of our existence that the satisfaction of some needs requires a very positive, personal, even almost creative action from us. Even today, it goes without saying that we cannot live on consumption alone, however attractive and ingenious it may be. But mass housing reduces the house to a consumer article and the occupant to a consumer. Because it is only in this sphere that the user can be expected to wait for the product to be offered completely completed. "

- John Habraken (1985 p.19)

Habraken, N. J. (1985). *De dragers en de mensen.* Scheltema & Holkema.

Problem statement

The current housing shortage in the Netherlands has created a need for mass-produced housing. While convenient in creating large amounts of dwellings in short amounts of time, mass-produced housing also has its drawbacks. Personality and customization for residents get lost in the process. In the 1960's John Habraken noticed a very similar situation. The Netherlands was building large amounts of residences without truly considering the needs of the residents. This would often lead to unhappy residents and many of these buildings becoming unwanted only years after completion. Are the ideas of John Habraken from the mid 20th century still applicable in 2020?

Research questions

This research paper looks at the flexible housing movement, and how its ideas can be applied to modern architecture. This paper looks at the historical context of the flexible or open building movement and analyzes its most important characteristics. Furthermore, the paper looks at the application of these ideas in three modern architectural projects in Amsterdam, because of the nature of these projects the experiences of the residents is of utmost importance. The main question this paper tries to answer is *'How can the ideas of the flexible housing movement be used to facilitate the amateur?'*. To answer this question a series of sub-questions have to be answered first. The first set of questions relates directly to the historical context of the flexible housing movement; *'What are the ideas of the flexible housing movement?'*, and *'How did the ideas of the flexible housing movement develop over the last 60 years?'*. The second set of questions looks at the application of the ideas from the flexible housing movement in architectural projects from the last 10 years; *'How have the ideas of the*

Grimm, M. (2020, April 8). Amsterdam is sinds de coronacrisis één groot broodparadijs. *Het Parool*. https://www.parool.nl/nieuws/amsterdam-is-sinds-de-coronacrisis-een-groot-broodparadijs~b4946c7e/?referrer=https%3A%2F%2Fwww.google.com%2F

Habraken, N. J. (1985). *De dragers en de mensen.* Scheltema & Holkema.

v.d. Haak, B., Vermeulen, B., & Wiering, F. (2020, April 5). *Virus vergezichten.* VPRO. https://www.vpro.nl/programmas/tegenlicht/kijk/afleveringen/2019-2020/virus-vergezichten.html

flexible housing movement been applied in the last 10 years?' and *'How do the different applications of the flexible housing movement allow for flexibility?'*. The last set of questions asked in this paper relate directly to the resident; *'Who is the amateur?'*, *'Which parts of their residence do residents want to be flexible?'* and *'How do residents use this flexibility after the project has been completed?'*

Relevance

On the 5th of April 2020, only weeks after the WHO announced the coronavirus to be a global pandemic on March 10th 2020, the Dutch television show 'Tegenlicht' presented two interviews about life after the crisis (van der Haak et al., 2020). Li Edelkoort and Dirk de Wachter predicted that the world would experience a reset after the crisis: our culture could drastically change. Dirk de Wachter (a psychiatrist) saw new types of solidarity emerge, and a lack of social contacts during the corona epidemic could lead to people realizing the value of human relations. Whereas, Li Edelkoort (a trend forecaster) saw the corona epidemic as the catalyst for her long-predicted 'Age of the Amateur'. While our current society had grown accustomed to consumerism and mass-produced goods, the early days of the corona epidemic had renewed interest in making your own goods. (van der Haak et al., 2020) A resurgence of the *arts & crafts*, goods produced locally, but more importantly of high quality. (Grimm, 2020)

The amateur is defined by their heightened interest in quality and personalization, plus they reject mass-produced goods; these views align very much with the views of John Habraken. In his book 'De dragers en de mensen' he states that mass housing has reduced the dwelling to consumption, and the resident to a simple consumer. All personal and creative acts that are part of a home have been lost in the process of mass production

homes. (Habraken, 1985) This paper explores the current preferences personalization and adaptability of their residence and compares these to the ideas of the flexible housing movement as first proposed by John Habraken in 1961.

Source analysis

Since the publication of John Habrakens book 'De dragers en de mensen' in 1961, many publications have come out in the Netherlands with similar concepts. Each of these had in common that they tried to lengthen the lifespan of a building, by allowing its infill to be flexible and change over time. This paper looks at the publication made by John Habraken, as well as Bernard Leupen, OBOM, and Openbuildin.co. While much is published about the architectural principles that allow for flexibility, less has been published about the impact these principles have on the lives of the resident, and if the resident is content with the solutions that have been provided.

Methodology

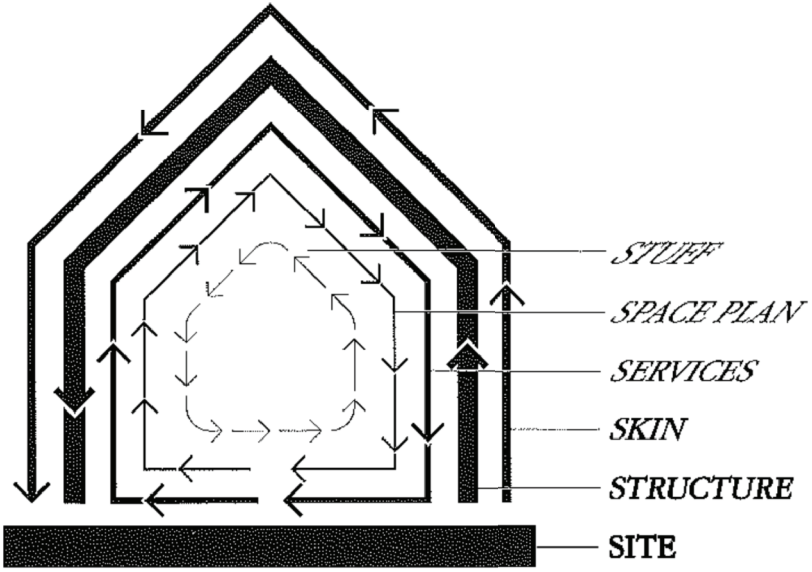
To answer the research question *'How can the ideas of the flexible housing movement be used to facilitate the amateur?'* this paper will utilize 3 different research methods. We will looks into existing publishings, both from John Habraken as well as other works based around the same topic.

To answer the first set of questions *('What are the ideas of the flexible housing movement?', and 'How did the ideas of the flexible housing movement develop over the last 60 years?')*, we are going to consider the **historical context** around the flexible housing movement.

To answer the second set of questions *('How have the ideas of the flexible housing movement been applied in the last 10 years?' and 'How do the different applications of the flexible housing movement allow for flexibility?')*

Habraken, N. J. (1985). *De dragers en de mensen.* Scheltema & Holkema.

a **case study** of three modern projects is conducted. This way we can analyze the modern interpretation of the flexible housing movement.
To answer the third set of questions *('Who is the amateur?', 'Which parts of their residence do residents want to be flexible?' and 'How do residents use this flexibility after the project has been completed?')*, the paper investigates what residents of these projects liked and disliked about the approach to flexible housing taken by the chief architect, through means of a **questionnaire**, and a series of **interviews**.



SHEARING LAYERS OF CHANGE. Because of the different rates of change of its components, a building is always tearing itself apart.

Illustration 2: Shearing layers of change (Brand, 1994b, p. 13)

Brand, S. (1994b). Shearing layers [Illustration]. In *How Buildings Learn: What Happens After They're Built* (p. 13).

Discussion

The supports:

When the book *'De dragers en de mensen'* was first published in 1962, it did not perform very well. The publisher even commented that the book would not be read by many; however, everyone that read it had an opinion of the matter. He seemed to have been right on this matter, only 40 books were sold per year within the Netherlands. However, when the book was translated into English, this changed drastically. The book quickly became translated into many languages, and Habrakens ideas quickly made their way around the world. (Supports, z.d.)

Eleven years after the original publishing the English version was released, *'De dragers en de mensen'* was translated to *'Supports: An Alternative to Mass Housing'*. The title had become less poetic, but certainly more straight forward, making it for many readers more enticing. Reviews at the time found the translation to be long overdue and welcomed it with open arms. They were especially fascinated by the new role Habraken proposed for architects and planners. Since Habraken argues that building is implicitly involved in possession, homeowners should take part in the construction of their own homes. *"Habraken no longer sees the architect playing his traditional role of the creative dictator."* Habraken proposes a way to solve the *"confused professional relationship"* between the architect and the homeowner. Both parties felt responsible for the creation of their home, but according to Habraken, this should be more of a symbiotic relationship. But of course, mass housing stood central in the book. Habraken showed how the system fails to develop the technology. Housing shouldn't become obsolete as it grows old, the housing should transform along with the needs of the inhabitant, and this would only be possible if dwellings were designed for the individual rather than the masses. (Lawson, 1973, p. 130; Habraken, 1985)

The idea of a dwelling adapting to its owners would inspire many architects after Habraken, Frank Duffy would later come up with the concept of "Shell, Services, Scenery, and Sets" or "Shearing layers" (Depicted in the illustration 2 on the left). Steward Brand would later expand on this concept in his book '*How buildings learn: What happens after they're built*'. In this concept, Frank Duffy describes a building and its many layers, each of these layers however has its own lifespan. Take for instance the outer layers of the diagram, in many instances, the 'site' goes unchanged for a very long period; even the 'structure' of a building might last anywhere between 30 - 300 years. On the other hand, the inner layers might change on a whim: how often won't the furniture you own be replaced within the lifespan of the entire dwelling? (Brand, 1994) Similar to the design strategy as proposed by Habraken, in the model of 'Shearing layers' if the structure and the skin have been designed flexibly, the lifespan of a building can be extended far beyond what it would have normally been. (Habraken, 1985)

Bernard Leupen looks at multiple case studies in his book *'Kader en generieke ruimte: Een onderzoek naar de veranderbare woning op basis van het permanente' (Frameworkandgenericspace:Aresearchontheadaptable dwelling on basis of the permanent)* these case studies all overcome the problem of adapting dwellings within an existing structure. His research started with the realization that the average building has a lifespan of 100 years, over time different households will inhabit the dwelling, and each one of these households will have different wishes. Like Duffy before him, he splits architecture up into a set of distinct layers:

-The supporting structure (which carries the building),
-The skin (which separates inside and outside),
-The staging of the space (furniture, inner walls, and

Brand, S. (1994aw). *How Buildings Learn: What Happens After They're Built* (Reprint ed.). Penguin Books.
Habraken, N. J. (1985). *De dragers en de mensen.* Scheltema & Holkema.
Lawson, B. (1973). A review of: "Supports: An Alternative to Mass Housing." By N. J. HABRAKEN (Translated by B. Valkenburg). (London:
Architectural Press, 1972.) [Pp. viii + 97.] £3·00. *Ergonomics*, 16(1), 130–131. https://doi.org/10.1080/00140137308928400
Supports. (n.d.). Habraken.Com. Retrieved December 10, 2020, from https://www.habraken.com/html/supports.htm

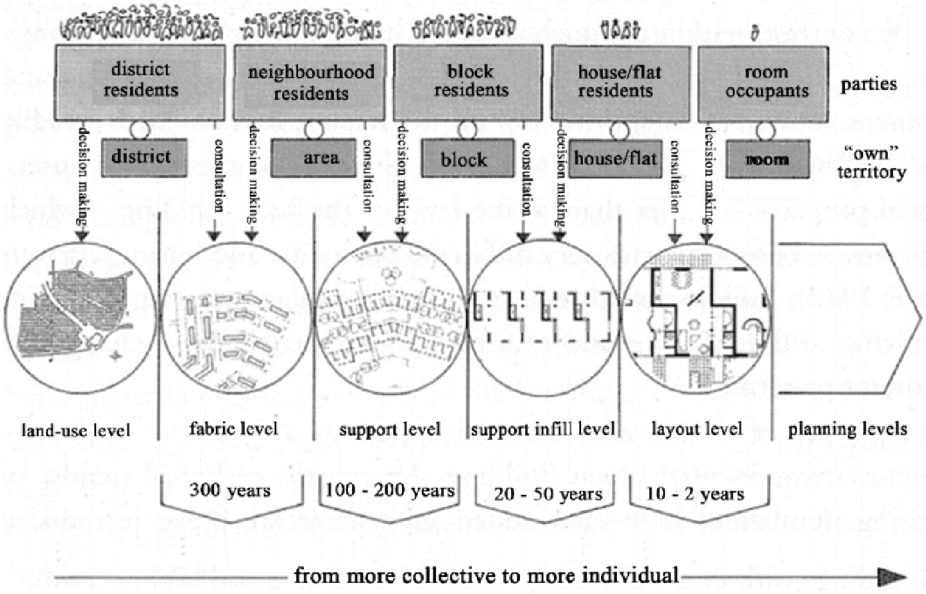


Illustration 3: Levels of decision making (Cuperus, 2001a, p. 3)

Cuperus, Y. (2001a). Levels of decision making [Illustration]. In *An introduction to openbuilding* (p. 3).

detailing of the dwelling),

-The service elements (shafts and installations),

-The circulation (stairs, hallways, and elevators).

Additionally, he identifies three ways of flexibility; renovation, expandability, and versatility. Renovation and expandability can be designed quite straightforward, with the use of a light structure as proposed by among others Habraken. Versatility on the other hand has more intricacies to it, by designing spaces without a very strong purpose in mind, these spaces can later be reused with different functions, giving the dwelling a new life without much intervention. The danger with his design principle is that the space can quickly feel without any purpose at all. (Leupen, 2002)

The Technical University of Delft launched the OBOM (open building strategic studies) in 1985. Led by Age van Branden and later Ype Cuperus, OBOM continued their research into the concepts of flexible architecture as described by John Habraken. In his paper '*An introduction to Open Building*' Ype Cuperus described the levels of influence for the neighborhood, and the individual to support the Open Building design process as first described by John Habraken (Illustration 3 - Shown left). They described six levels of decision making, each level was assigned a lifespan, and one or two occupants have control or influence over the design. Since the higher levels both accommodate and limit the lower levels, and vice versa, these different levels of decision making should be disconnected but coordinated. The longer the lifespan of the level, the larger the group making decisions should be. (Cuperus, 2001)

The openbuilding.co foundation is the unofficial continuation of OBOM, it was founded by a collective of architects within the Netherlands. Just as OBOM,

Cuperus, Y. (2001b, January). *An introduction to open building.* https://www.researchgate.net/publication/237116327_AN_INTRODUCTION
TO_OPEN_BUILDING
Leupen, B. (2002). *Kader en generieke ruimte.* Uitgeverij 010.
Open building. (2019). *BUILDING FOR THE FUTURE.* Openbuildings. https://www.openbuilding.co/

openbuilding.co continues the work as laid out by Habraken in his book 'Supports'. While OBOM applied a more theoretical approach, openbuilding.co takes a very practical approach and applies these ideas directly to architecture. They aim to extend the lifespan of architecture by designing structures that can adapt to many ways of use. Openbuilding.co has subdivided their efforts into three scales, 'open cities', 'open architecture', and 'open systems'. According to openbuilding.co, urban designs filled with open buildings are better at adapting to changing needs and thus more resilient for the future resulting in what they call the 'open city'. 'Open architecture' allows residents to make changes to their dwelling and their surroundings, giving the building ways to adapt to changing circumstances the architect could not have foreseen. And lastly, 'open systems' to provide truly flexible housing, the systems within the architecture would also have to allow for these changes, these would include among others the structure, the technical systems but also the facade. Openbuilding.co aims to research different solutions and the consequences of this way of designing for each of these three scales. (Open building, 2019)

Superlofts

Ciwoco

Patch-22

Fenix I

Modern architecture (case studies)

To analyze the three case study projects the five layers of flexibility as proposed by Bernard Leupen in his book; 'Kader en generieke ruimte: Een onderzoek naar de veranderbare woning op basis van het permanente' (Framework and generic space: A research on the adaptable dwelling on basis of the permanent) are used:

1. The supporting structure (which carries the building)
2. The skin (which separates inside and outside)
3. The staging of the space (furniture, inner walls, and detailing of the dwelling)
4. The service elements (shafts and installations)
5. The circulation (stairs, hallways, and elevators)

(Leupen, 2002)

Photograph 1: De Hoofden backfacade (v.d. Burg, 2017)

MarcKoehlerArchitects. (2016). *Superlofts Houthavens gives 70 families personal freedom, views and community.* https://marckoehler.com/project/superlofts-houthavens/

Superlofts - Houthavens
Architect: Marc Koehler Architects
Apartments: 70
Status: Build
Year: 2016
Location: Amsterdam

Description:

Marc Koehler Architects designed together with Architecten Cie, Thijs Asselbergs, Space encounters, and Hootmans ArchitectuurBureau three plots in the Houthavens Amsterdam. These three plots would be the first of a series of projects led by Marc Koehler Architects called 'Superlofts'. These superlofts were to be constructed according to the principles of Openbuilding.co and would not rely on a developer for funding, but instead, be funded directly by the prospective buyers, cutting out the middleman. (MarcKoehlerArchitects, 2016)

Superlofts Houthavens consists of 70 lofts, the lofts range in size from 35m² upto 200m². The superlofts consist of three separate plots. Each plot has two buildings, a low-rise, and a mid-rise section, connected on the ground floor by an elevated courtyard. This paper will focus on the midrise building of the superlofts. This section is 70 meters tall and consists of ten floors. On the ground floor is a collective lobby, on the second to ninth floor consist of double high casco lofts, with large lofts on the tenth floor. (MarcKoehlerArchitects, 2016)

1. The supporting structure (which carries the building)
The lofts of the Houthavens are constructed with concrete. Both walls and ceiling are made up of two-meter wide panels. All of these prefabricated elements are load-bearing, because of this it will be difficult to merge multiple units. The outer shell of the superloft thus dictates the maximum floor space. (MarcKoehlerArchitects, 2016)

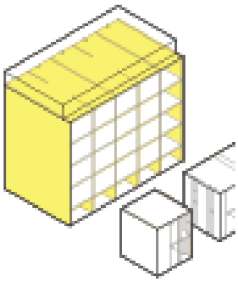


Illustration 4: The supporting structure in Houthavens *(Own image)*

2. The skin (which separates inside and outside)

The facade consists of a modular system of aluminum frames and glass. The windows are split into four main sections, the bottom two have a height of at least 2.6 meters and the two sections have a height of at least 2.4 meters. In case an added mezzanine reaches the facade these top and bottom sections dictate the height at which the floor can be placed. Multiple infills for these sections were available giving prospective buyers a small amount of freedom to choose their facade. The balconies have variable widths depending on the interior layout. (MarcKoehlerArchitects, 2016)

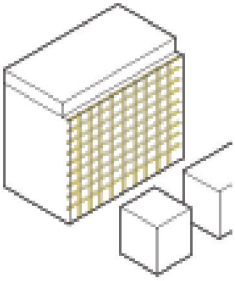


Illustration 5: The skin in Houthavens *(Own image)*

3. The staging of the space (furniture, inner walls, and detailing of the dwelling)

Each loft is between 3 to 8 meters in width, and 5 to 6 meters deep. The depth of the space depends greatly on the typology, but the maximum depth is 18 meters for a double-sided apartment. Because of the height of the space, a 10-centimeter tick mezzanine can be mounted anywhere in the loft, these structures are hung from the ceiling and give the resident the ability to double the floorspace of their loft. (MarcKoehlerArchitects, 2016)

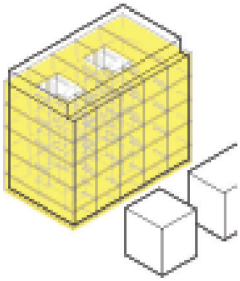


Illustration 6: The staging of space in Houthavens *(Own image)*

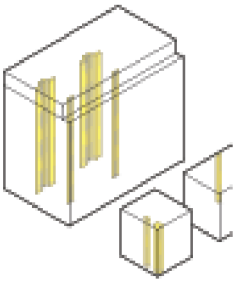


Illustration 7: The service elements in Houthavens *(Own image)*

4. The service elements (shafts and installations)
Each apartment is fitted with floor-heating and cooling, eliminating the need for extra installations to be installed above the floor. Each superloft is outfitted with double shafts allowing for relative flexibility when positioning the facilities and installations. The use of wireless lighting switches gives residents a bit of extra flexibility when installing their electrical wiring. (MarcKoehlerArchitects, 2016)

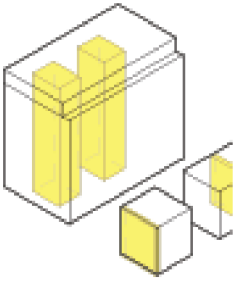


Illustration 8: The circulation in Houthavens *(Own image)*

5. The circulation (stairs, hallways, and elevators)
The superlofts are a portico typology. An elevator and set of stairs connect the ten floors of the superlofts, because of the double-height of the lofts the elevator only stops every other floor. Two doors provide access to the lofts, one on the ground floor and another situated directly above it on the first floor. The extra front door gives the residents the ability to move their 'public' space to the first floor, however, because the elevator does not stop here this becomes less practical. (MarcKoehlerArchitects, 2016)

MarcKoehlerArchitects. (2016). *Superlofts Houthavens gives 70 families personal freedom, views and community.* https://marckoehler.com/project/superlofts-houthavens/

Photograph 2: CiWoCo Facade boterbloemstraat (Gaaga, 2019)

GAAGA studio for architecture. (2019). *Gaaga | CiWoCo Amsterdam.* Caaga.Nl. https://www.gaaga.nl/projecten/ciwoco-amsterdam
Wilde, A. (2019, August 31). *ARC19: CiWoCo 1.0, Amsterdam – GAAGA.* De Architect. https://www.dearchitect.nl/projecten/arc19-ciwoco-1-0-amsterdam-gaaga

CiWoCo
Architect: Gaaga Architects
Apartments: 11
Status: Build
Year: 2019
Location: Amsterdam

Description:

Similar to the Superlofts, CiWoCo consists of two buildings connected on the ground floor by an elevated courtyard: a lowrise building that consists of four stories and three ground-bound residences on the opposite side. The building in total has space for 11 residences and is thus much smaller compared to the other two case studies. To create visual unity between the two buildings both are cladded with reclaimed Adobe wood. (GAAGA studio for architecture, 2019; Wilde, 2019)

Studio Gaaga designed CiWoCo with sustainability in mind, for them this also meant extending the lifespan of the building. They applied multiple ways to expand the lifespan of CiWoCo, the building had to be adaptable to the changing needs of future residents, but also demountable. Instead of pouring concrete directly on top of the pipework, Gaaga separated the structure from the systems. (GAAGA studio for architecture, 2019; Wilde, 2019)

1. The supporting structure (which carries the building)
Like the structure of the Superlofts, the structure of CiWoCo is built with prefab concrete panels. There are two small columns on each floor, otherwise, the floorplan is free from structural elements. Each floor is split up into two apartments, due to this structure, these can still be merged. However because the floors are made of concrete as well, it is not possible to merge apartments vertically. (GAAGA studio for architecture, 2019; Wilde, 2019)

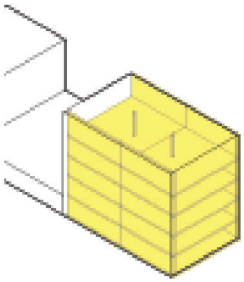


Illustration 9: The supporting structure in CiWoCo *(Own image)*

2. The skin (which separates inside and outside)
The windows of CiWoCo are positioned playfully with varying width and positions. This gives each apartment a different set of rules to play with when designing the interior walls. Because interior walls are only able to connect to the closed part within the facade the options for creating interior spaces are greatly limited by the facade. (GAAGA studio for architecture, 2019; Wilde, 2019)

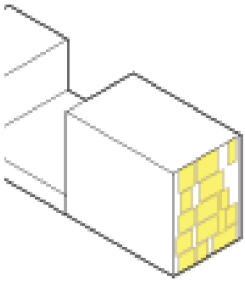


Illustration 10: The skin in CiWoCo *(Own image)*

3. The staging of the space (furniture, inner walls, and detailing of the dwelling)
The floors consist of one large open space split in the middle to create two smaller apartments. While this gives residents the possibility to merge two apartments in the future, the apartment at the moment is quite small resulting in slight limitations when designing the layout of the interior. Studio Gaaga designed the apartments to include a variable zone, these zones allow for multiple functions, relating to the idea of versatility as proposed by Leupen. (GAAGA studio for architecture, 2019; Wilde, 2019)

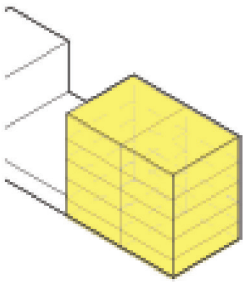


Illustration 11: The staging of space in CiWoCo *(Own image)*

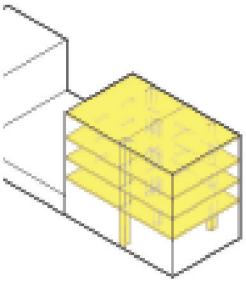


Illustration 12: The service elements in CiWoCo *(Own image)*

4. The service elements (shafts and installations)
Two of the four cores are situated in between the two apartments, combined with retention walls and a lowered ceiling, these give the resident different possibilities when placing their installations. However, while one core is situated directly against the close exterior wall, the other core is right in the middle of the apartment: this can create problems when merging multiple units. (GAAGA studio for architecture, 2019; Wilde, 2019)

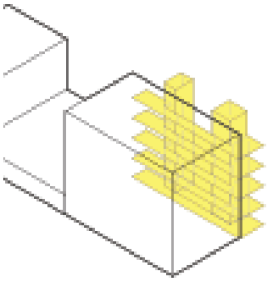


Illustration 13: The circulation in CiWoCo *(Own image)*

5. The circulation (stairs, hallways, and elevators)
Studio Gaaga utilized a corridor typology for CiWoCo allowing them to create multiple access points to the dwellings. These allow residents to use different entrances to their dwelling than originally conceived by the architect as well as allowing residents to rearrange the interior layout around different access points giving residents more freedom when they adapt their dwelling. (GAAGA studio for architecture, 2019; Wilde, 2019)

GAAGA studio for architecture. (2019). *Gaaga | CiWoCo Amsterdam.* Gaaga.Nl. https://www.gaaga.nl/projecten/ciwoco-amsterdam
Wilde, A. (2019, August 31). *ARC19: CiWoCo 1.0, Amsterdam – GAAGA.* De Architect. https://www.dearchitect.nl/projecten/arc19-ciwoco-1-0-amsterdam-gaaga

Photograph 3: Patch-22 SouthWestview (v.d. Burg, 2016)

ARC16: PATCH22 – FRANTZEN et al. (2016, September 8). De Architect. https://www.dearchitect.nl/projecten/arc16-patch22-frantzen-et-al-2
Frantzen, T. (2016). The architect as developer. Patch 22. https://patch22.nl/
Patch 22 | ARCAM. (2016). Arcam.Nl. https://www.arcam.nl/en/patch22-2/

Patch-22
Architect: Tom frantzen et al architecten
Apartments: 26
Status: Build
Year: 2016
Location: Amsterdam

Description:

Tom Frantzen believed in the future of flexible housing, so much that in 2009 he created together with his business partner Claus Oussoren a development firm, aimed at funding projects based around this principle. Patch-22 was their first project as a team, the tower is 30 meters tall and consists of 6 residential floors and offices on the plinth, behind the tower is a small row of ground-bound dwellings. (arc16: patch22 – Frantzen et al, 2016; Frantzen, 2016)

Patch-22 is a mostly wooden structure, the facade, columns, and beams are all made of cross-laminated timber, only the central core and the floor slabs are due to technical reasons made of concrete slabs. The core is placed decentrally in an open space, this allows a maximum of eight apartments to be located on each floor. (arc16: patch22 – Frantzen et al, 2016; Frantzen, 2016)

1. The supporting structure (which carries the building)
The structure of Patch-22 is solely placed around the core and in the facades. Because of this, the residents are entirely free to choose their interior layout. This is especially evident in the horizontal merging of multiple units. Many residents of the building have opted to buy two or three units and make a larger dwelling. While in the initial design phase it was also possible to merge units horizontally, due to the use of large concrete slabs this has now become technically challenging. (Frantzen, 2016; Patch 22 | ARCAM, 2016)

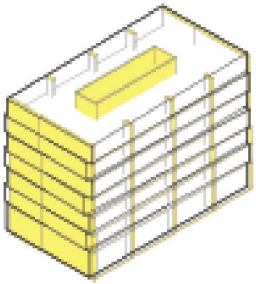


Illustration 14: The supporting structure in Patch-22 *(Own image)*

2. The skin (which separates inside and outside)
Over the length of the Southern and Northern facades run large balconies, giving all units equal outdoor space. The windows have a width of three meters, in between each window is a small column, allowing interior walls to connect to the facade. These exterior columns dictate the grid on which residents can design their apartment. This is especially evident in the existing floorplans, all spaces are a multitude of 3 meters wide. (Frantzen, 2016)

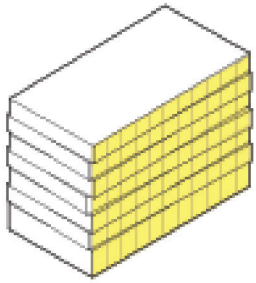


Illustration 15: The skin in Patch-22 *(Own image)*

3. The staging of the space (furniture, inner walls, and detailing of the dwelling)
The floorplan of Patch-22 consists of a large open space that can be divided up into 8 smaller sections. The decentrally placed circulation shaft gives residents the ability to combine units of varying sizes. This allows residents to create more interesting floorplans, tailored to their personal preferences. The only objects that restrict the freedom to design the interior are placed in the facade namely, the large wooden columns, and the 3-meter wide windows. (Frantzen, 2016; Patch 22 | ARCAM, 2016)

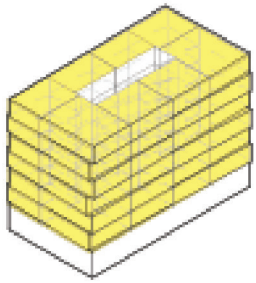


Illustration 16: The staging of space in Patch-22 *(Own image)*

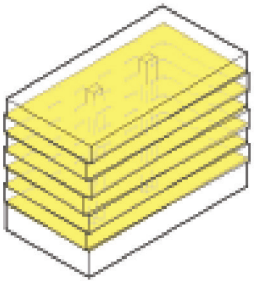


Illustration 17: The service elements in Patch-22 *(Own image)*

4. The service elements (shafts and installations)

Each apartment is outfitted with a heat exchanger situated above the balcony and is connected to a collective wood pellet burner for heat. Originally Tom Frantzen had designed an innovative floor system that would allow residents to easily swap in and out different technical systems, this floor was however never realized and instead replaced with concrete. Nonetheless, the elevated floor connects all eighth units to two installation shafts located in the circulation core allowing residents more freedom when designing their interior installations. (ARC16: PATCH22 – FRANTZEN et Al, 2016)

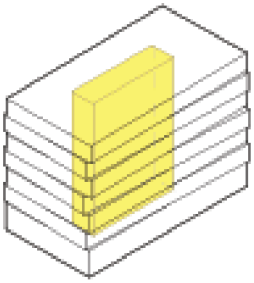


Illustration 18: The circulation in Patch-22 *(Own image)*

5. The circulation (stairs, hallways, and elevators)

The eight units are located around a central corridor core, which provides access to two sets of stairs and an elevator. Because residents can merge multiple units, they can choose which doors they want to keep as a front entrance. However, on some floors, where only a few dwellings remain, this does create very long and sterile corridors. Luckily this does not seem to be a restricting factor when designing their interior (Frantzen, 2016)

ARC16: PATCH22 – FRANTZEN et al. (2016, September 8). De Architect. https://www.dearchitect.nl/projecten/arc16-patch22-frantzen-et-al-2
Frantzen, T. (2016). *The architect as developer.* Patch 22. https://patch22.nl/
Patch 22 | ARCAM. (2016). Arcam.Nl. https://www.arcam.nl/en/patch22-2/

The amateurs

First described by Li Edelkoort, the term 'amateur' is not meant to be derogatory, but rather shows that these people do not have a desire to specialize in one specific trade. While only described as a group very recently, these people have of course been around for a longer time. As described in the introduction, the amateur is an emerging group of people highly interested in good quality and personalization. (van der Haak et al., 2020) This description fits also very well with the audience targeted with the development of open buildings, people that have very specific needs, want to be able to change their mind, and desire high-quality products in their life.

Response

To analyze the satisfaction about the process of designing their own home within one of these projects, a questionnaire was performed. In total, 19 respondents gave their opinion about the open building design process. Out of these, 19 respondents, 6 live in Superlofts, 2 in CiWoCo, and 11 in Patch-22. Although none of these projects is more than 10 years old, 5 residents were not first-time owners of their dwelling. Of those 5, one ended up changing their apartment layout, the other 4 indicated that the apartment was still too new. In total 15 respondents changed their apartment in one way or another.

Changing the layout

For residents, there were two main reasons to change the layout of their apartment; the first, 'because the residence was delivered empty', and the other was a change in needs. While the first reason is self-evident, the second is very interesting. It shows that even within only 10 years residents can change their needs enough to adapt their residence. These changes were often minor but could have a large impact on the way residents use

v.d. Haak, B., Vermeulen, B., & Wiering, F. (2020, April 5). *Virus vergezichten.* VPRO. https://www.vpro.nl/programmas/tegenlicht/kijk/afleveringen/2019-2020/virus-vergezichten.html

their apartments. In total 3 respondents chose to adapt their dwelling, the first respondent split a space into two, and added extra floorspace by closing a vide, the second respondent merged two rooms, expanding her living room, and changing her dwelling from a 4 to a 3 bedroom apartment, the third respondent bought the dwelling from a previous owner, and decided to completely change the layout of the apartment (they moved, for example, the kitchen).

What is interesting to note is that out of the 15 respondents that changed the layout of their apartment, 8 did not have contact with the architect of their building. Three of these respondents did however end up hiring an architect to design their floor plan.

The respondents were also asked about the possible reasons they would change their dwelling in the future. For most respondents, two reasons stood out: a change in employment and a change in the household. This shows that while architects often design with a clearly defined target group in mind, this target audience is far from well defined, and will constantly change their needs and lifestyle. A flexible open building would allow for these unforeseen changes.

Priorities

Fifteen of the respondents provided in the questionnaire the most important reasons for them to change the layout of their apartment. Respondents were asked to rate a series of topics from 1 to 5 (1 being not important and 5 being very important). To a large proportion of the respondents the ability to change the size of their apartment (86.6% rated it a 4 or higher) and the ability to change the size of their rooms (80% rated it a 4 or higher) result essential. This shows that, while not always available in the projects analyzed in this paper, the option to adapt the apartment on a large scale is still very important to

these residents.

73.3% (rated a 4 or higher) of respondents noted that they would like their dwelling to be easily adaptable, while only 26.7% (rated a 4 or higher) of respondents thought it was important to change their dwelling without professional help. This shows that while these homeowners do want their dwelling to adapt with them as their needs change, they are not afraid to ask a professional for help. This is also reflected in their need to change any technical systems: about 60% of respondents found it important to change the technical systems in their dwelling, something that is commonly left to professionals to adapt.

The outdoor space (20% rated a 4 or higher), as well as the facade (26.7% rated a 4 or higher), were not regarded as important factors while changing the layout. Important to note that all respondents live in buildings whose facades could be considered architectural and are not able to be changed by the resident, and outdoor spaces are all limited to private balconies, or communal gardens. This group of respondents likely chose this project because the facade and outdoor space offered already fit their needs.

Price did not seem to be indicative of changing the dwelling. Only 60% rated price as an important (rated a 4 or higher) factor when changing the layout of their dwelling. This is most likely due to the high initial startup costs combined with the location of the dwelling.

Interviews

To delve more into the wishes of the respondents, 5 respondents were interviewed to provide a bit more context.

Interviewee 1: Patch-22

The first interviewee works in the field of architecture, and greatly appreciated the different elements that allowed for flexibility. He loved the fact they could completely design their apartment without having to make many concessions. And while it was never called an open building during the

development phase, this was one of the more important factors while purchasing this apartment. The interviewee appreciated being able to merge multiple units: this allowed him to create a more personal dwelling, but also generated more diversity in apartment sizes within the building. He admits that while the original building could be adapted to changing needs very easily while designing their layout, they had made some choices that probably will make it hard for future residents to change some parts of the design.

Interviewee 2: Superlofts

The second interviewee designed their apartment completely with his wife, who is a designer. This made it a lot easier to design the basic layout, and picking the materials they wanted. However, they noticed that sometimes they lacked certain architectural expertise. This was especially evident during the construction phase when they would constantly need to check in on the constructor and see if everything was going according to plan. He concludes that in hindsight it would maybe have been better to hire a project manager, however, because of the cost, they had decided not to.

"It is truly like living in your own head, it really becomes the way you once drew it"

Interviewee 3: Superlofts

Interviewee three got involved in the building relatively early on, this gave them more time to think about the apartment that they wanted. While they initially decided not to hire an architect, they soon decided to get in contact with Marc Koehler Architects, who was able to solve some key issues they had been struggling with within their design. Like interviewee 2, she mentions that the detailing and construction phase was the most complex, in an instant something might go sideways. They had initially

expected MKA to help them in the construction phase as well, however, they soon found out they still had to do daily checkups. For them this was not a very big issue since they used to live relatively close; however for people further away, they would recommend a project manager.

Interviewee 4: CiWoCo

Interviewee four had bought the apartment from a previous owner, who had designed the apartment relatively close to their wishes. While they did shortly consider merging two of the smaller bedrooms, in the end, they did prefer to have the extra room. But while the idea of possibly changing their apartment in the future was nice, it was not a determining factor while purchasing the dwelling.

Interviewee 5: Patch-22

The fifth interviewee is himself an interior builder, so he was aware of the possible pitfalls when buying this apartment. But the ability to design their layout was an important reason while buying this apartment. He was unpleasantly surprised when he got the news that the original floor would no longer be installed, and the constructor had opted for a less modular system; this type of floor had in fact been one of the indicative aspects to choose this particular project. However, he was happy they only had to worry about their layout, and not about the communal parts of the building, like for instance the facade, which would, according to him, have become too messy of a process. While not necessary at the moment, being able to shed a third of their apartment in the future was also a nice added benefit.

"Everyone gets an empty canvas, and everyone makes something completely different with it, one starts their design with a set of decadent Moroccan doors, the other keeps everything sterile and white."

Conclusion

From the questionnaire and the interviews, can be seen how keen people are on designing their dwelling. While it does produce some small problems, by taking the process out of the hands of a professional architect, residents were always able to overcome these and create in their eyes the perfect residence. However because these decisions are taken by less skilled designers, these choices can sometimes deteriorate the flexibility of the design. Paired with a chaotic construction process designing their dwelling, can sometimes get out of hand for the amateur quickly. In some cases, it can be advised to involve a project manager that could keep an eye on these kinds of issues.

Conclusions

This paper aimed to answer the question; 'How can the ideas of the flexible housing movement be used to facilitate the amateur?' For that, a series of sub-questions had to be answered first. The first set related to the historical context of the flexible housing movement, 'What are the ideas of the flexible housing movement?' and 'How did the ideas of the flexible housing movement develop over the last 60 years?'. The ideas as proposed by Habraken in the early sixties revolving around flexible design have hardly changed over the last sixty years. However different publishings posed different ways to think about flexibility and how it can transform architecture. The shearing layers (Brand, 1994), for example, look at the different lifespans of architectural elements, while the elements of Bernard Leupen (2002), give residents the possibility to adapt their dwelling to changing needs.

The second set of sub-questions look at the modern interpretation of the flexible housing movement, 'How have the ideas of the flexible housing movement been applied in the last 10 years?' 'How do the different applications of the flexible housing movement allow for flexibility?'. The three case studies analyzed in this paper all had slightly different approaches to flexible housing, by analyzing them according to the elements of Bernard Leupen (2002) these differences were made clear. It is important to learn from these existing projects and their differences, so an improved hybrid solution can be created.

The third set of questions was aimed at the residents of flexible housing, 'Who is the amateur?', 'Which parts of their residence do residents want to be flexible?', and 'How do residents use this flexibility after the project has been completed?'. Utilizing the questionnaire and a series of interviews, a broad insight could be established about the aspects of the design the residents had considered as important or not. Residents wanted to be able to change

the size of both their dwelling and the individual rooms. However, residents are not afraid to ask for help from a professional, if it results in a better product.

From these conclusions, a set of recommendations can be constructed, which will be discussed in the next chapter.

Recommendations

The most important recommendation that should be taken from this research paper is to consider the many layers of a building, as proposed by John Habraken (levels of influence), Frank Duffy ("Shell, Services, Scenery, and Sets" or "Shearing layers") and Bernard Leupen (The supporting structure, the skin, the staging of the space, the service elements and the circulation), as they are essential while designing for an extended lifespan.

Site Involve future residents early in the process, this can create a stronger community in the long run.

Structure The structure will outlive most other parts of the designed building, for this reason, it is important to design open and flexible. The structure can strongly dictate the future use of the space.

Skin While less permanent compared to the structure the layout of the facade is very important to the infill of the dwelling, for this reason, it is important to have a good grip on the dimensions of the openable and transparent elements.

Circulation Not unlike the structure and the skin, the circulation can be freeing and restricting the choices a resident can make. Placing a circulation dictates where residents enter their dwelling, giving them multiple access points, opens up their possibilities while designing their dwelling.

Services The placement of services is important for flexibility, shafts are necessary for vertical connections,

however, they are a limiting factor when placed inconveniently in the floor plan. Added systems to included services in floor or wall space can free these limitations.

Space plan Even though in the process of open building the architect has very limited input on the space plan while designing the building it is important to consider the many different possibilities the design would allow.

Stuff Like the space plan, the architect has very little input in the stuff placed within the dwelling, but it is very important to consider the possibilities and limitations the design allows.

Bibliography

ARC16: PATCH22 – FRANTZEN et al. (2016, September 8). De Architect. https://www.dearchitect.nl/projecten/arc16-patch22-frantzen-et-al-2

Brand, S. (1994). *How Buildings Learn: What Happens After They're Built* (Reprint ed.). Penguin Books.

Cuperus, Y. (2001, January). *An introduction to open building.* https://www.researchgate.net/publication/237116327_AN_INTRODUCTION_TO_OPEN_BUILDING

Frantzen, T. (2016). *The architect as developer.* Patch 22. https://patch22.nl/

GAAGA studio for architecture. (2019). *Gaaga | CiWoCo Amsterdam.* Gaaga.Nl. https://www.gaaga.nl/projecten/ciwoco-amsterdam

Grimm, M. (2020, April 8). Amsterdam is sinds de coronacrisis één groot broodparadijs. *Het Parool.* https://www.parool.nl/nieuws/amsterdam-is-sinds-de-coronacrisis-een-groot-broodparadijs~b4946c7e/?referrer=https%3A%2F%2Fwww.google.com%2F

Habraken, N. J. (1985). *De dragers en de mensen.* Scheltema & Holkema.

Kendall, S. (1999). Open Building: An Approach to Sustainable Architecture. *Journal of Urban Technology,* 6(3), 1–16. https://doi.org/10.1080/10630739983551Kendall, S., & Teicher, J. (2000). *Residential Open Building.* E & FN Spon.

Lawson, B. (1973). A review of: "Supports: An Alternative to Mass Housing." By N. J. HABRAKEN (Translated by B. Valkenburg). (London: Architectural Press, 1972.) [Pp. viii + 97.] £3-00. *Ergonomics*, 16(1), 130–131. https://doi.org/10.1080/00140137308928400

Leupen, B. (2002). *Kader en generieke ruimte.* Uitgeverij 010.

MarcKoehlerArchitects. (2016). *Superlofts Houthavens gives 70 families personal freedom, views*

and community. https://marckoehler.com/project/superlofts-houthavens/

Open building. (2019). BUILDING FOR THE FUTURE. Openbuildings. https://www.openbuilding.co/

Patch 22 | ARCAM. (2016). Arcam.Nl. https://www.arcam.nl/en/patch22-2/

Sarja, A. (1998). *Open and Industrialised Building*. E & FN Spon.

Supports. (n.d.). Habraken.Com. Retrieved December 10, 2020, from https://www.habraken.com/html/supports.htm

v.d. Haak, B., Vermeulen, B., & Wiering, F. (2020, April 5). *Virus vergezichten*. VPRO. https://www.vpro.nl/programmas/tegenlicht/kijk/afleveringen/2019-2020/virus-vergezichten.html

Wilde, A. (2019, August 31). *ARC19: CiWoCo 1.0, Amsterdam – GAAGA*. De Architect. https://www.dearchitect.nl/projecten/arc19-ciwoco-1-0-amsterdam-gaaga

Images:

Brand, S. (1994b). Shearing layers [Illustration]. In *How Buildings Learn: What Happens After They're Built* (p. 13).

Cuperus, Y. (2001a). Levels of decision making [Illustration]. In *An introduction to openbuilding* (p. 3).

Gaaga. (2019). *CiWoCo Facade boterbloemstraat* [Photograph]. Https://Www.Gaaga.Nl/Projecten/Ciwoco-Amsterdam. https://www.gaaga.nl/

v.d. Burg, M. (2016). Patch 22 - SouthWest view [Photograph]. https://www.dropbox.com/sh/tzkp9qzltk0bhui/AAC94XUiPUuNV6r-iyoWMbyxa/photography/copyright_Marcel_van_der_Burg?dl=0&preview=MvdB_south-west.jpg&subfolder_nav_tracking=1

v.d. Burg, M. (2017). De hoofden backfacade [Photograph]. Archdaily.Com. https://www.archdaily.com/892160/superlofts-marc-koehler-architects/5aca77dff197ccfc05000178-superlofts-marc-koehler-architects-photo?next_project=no

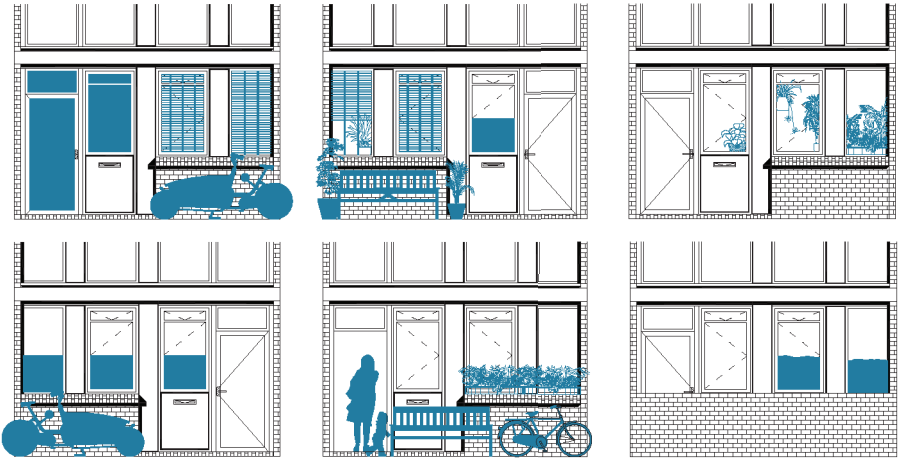
Wines, J. (1981). *INTERSECTION FIELDS IV: Highrise of Homes* [Illustration]. Http://Hiddenarchitecture.Net/. http://hiddenarchitecture.net/highrise-of-homes/

Collectiveness research Heliport & casestudies

The exterior facade of the heliport, while characteristic of the building, is very anonymous. The residents, however, have found new ways to personalize and identify their dwellings.
Four casestudies in Amsterdam and Rotterdam analyzed on their different approaches towards flexibility.

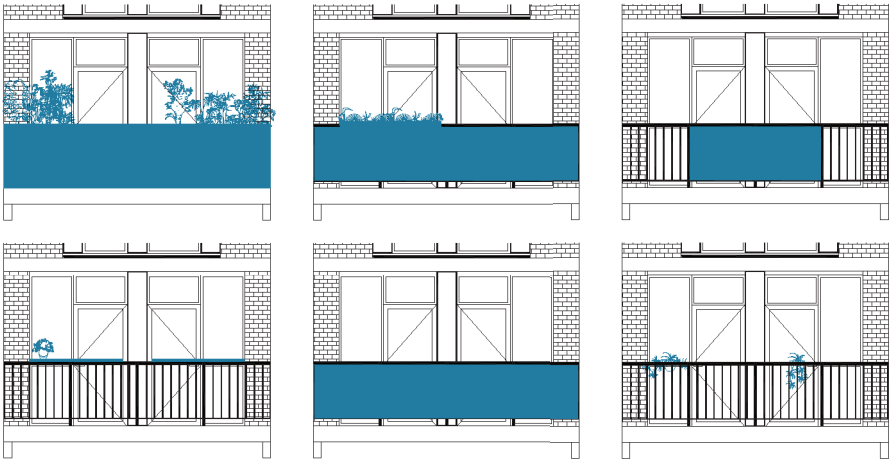
Groundbound apartments

The ground bound apartments are split into two sections: The hallway, with a glass frontdoor, a window and a small postbox. And a kitchen with two windows giving views straight through the apartment. The two sections are divided by a smooth wooden panel, the same material is used to split the two windows of the kitchen.



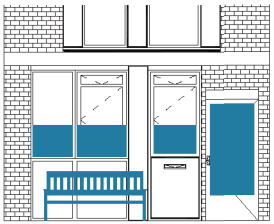
Balconies

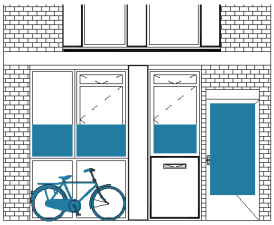
The balconies of Helipoort are for many inhabitants their only private outdoorspace. So the very open design of the railings doesn't suit everyone.

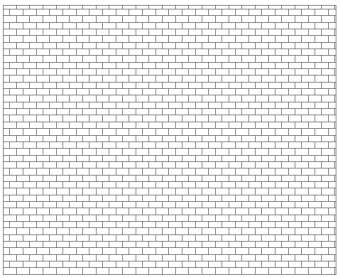


Gallery apartments

The gallery apartments are split into two sections: The hallway, with a glass frontdoor, a window and a small postbox. And a kitchen with two windows giving views straight through the apartment. The two sections are divided by a smooth wooden panel.

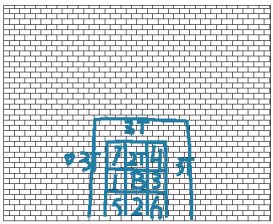


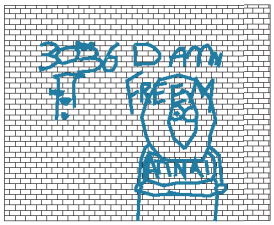


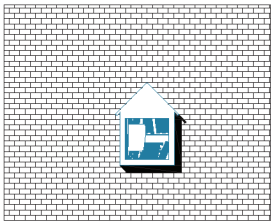


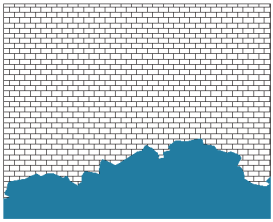
Blind walls

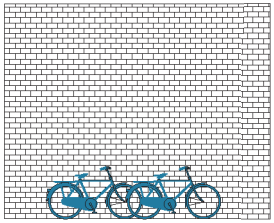
The Heliport project has around many of its courtyards, storage boxes, and circulation areas, closed brick walls. The inhabitants of Heliport have made good use of these areas in several ways aswell.

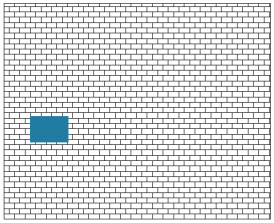










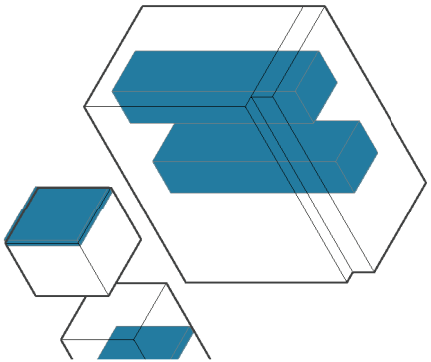


Superlofts - Houthavens

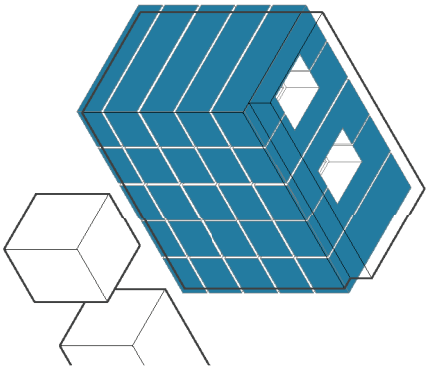
Architect:	Marc Koehler Architects
Apartments:	70
Status:	Build
Year:	2016
Location:	Amsterdam

The supporting structure
+ A simple concrete structure allows for flexibility in the vertical direction and gives residents the ability to significantly expand their m2.
- The concrete does not allow for the merging of multiple units.
The skin
+ The grid of the facade could be decided, and changed by the original homeowner.
- New homeowners won't be able to adapt the facade to the internal changes.
The staging of space
+ The units consist of a large open space with much internal freedom to design the wishes of the resident.
- There is not much possibility to merge multiple units within the building afterward.
The service elements
+ The service elements are located around the circulation core, giving a small degree of freedom around the dark areas in the building.
- The fixed shafts don't give residents the freedom to place systems in new locations
The circulation
+ The portico shafts allow for double heigh units.
- The portico shafts give the overall unit an unusual shape.

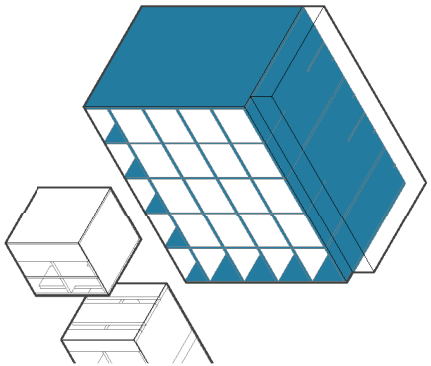
The circulation



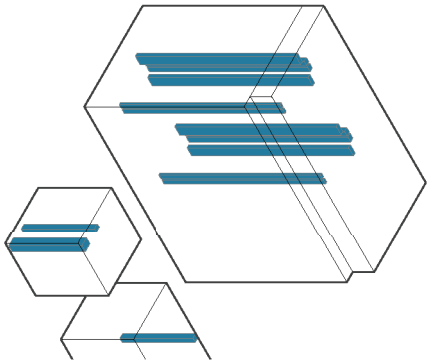
The staging of space



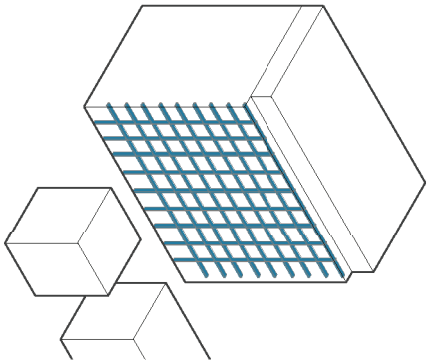
The supporting structure



The service elements



The skin

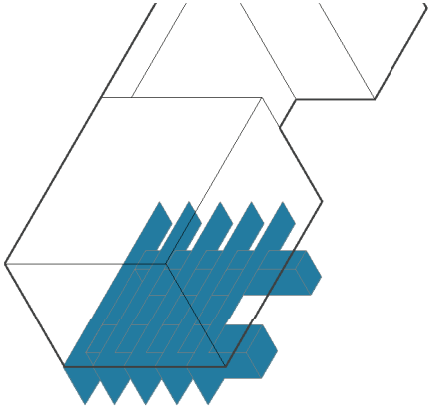


CiWoCo

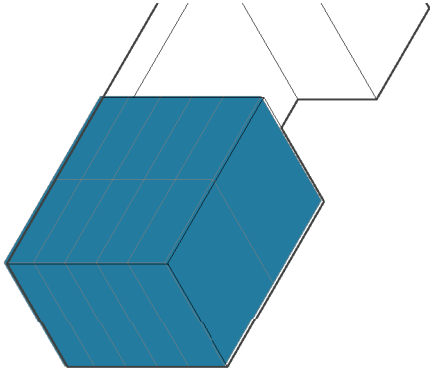
Architect:	Gaaga Architects
Apartments:	11
Status:	Build
Year:	2019
Location:	Amsterdam

The supporting structure
+ A simple concrete structure allows for one or two units per floor, these units are able to be merged since there are no structural elements between them.
- The concrete floor slabs don't allow for vertical merging of units.
The skin
+ The skin seems to be ordered along with a random pattern, the larger closed areas allow for more flexibility in the initial design phase.
- The less structured facade might become less flexible in the future when a new resident wants to change the internal layout.
The staging of space
+ Each floor consists of one or two units, these units can be combined within the floor in multiple different typologies.
- The size of the floors does not allow for the possibility of three units on one floor.
The service elements
+ The service elements are located in a series of shafts, and lowered ceilings, these give the resident more freedom to place their facilities.
- While most shafts are placed along the facade/closed wall, some are placed more central on the floor, this might limit the possibilities when designing the internal spaces.
The circulation
+ The corridor typology allows for multiple access points, this way residents are free to choose where they enter their dwelling.
- The corridor only connects two dwellings per floor, making the overall construction more expensive.

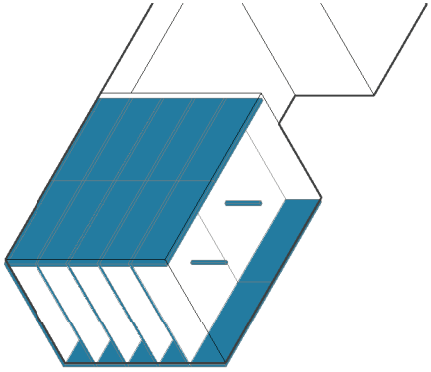
The circulation



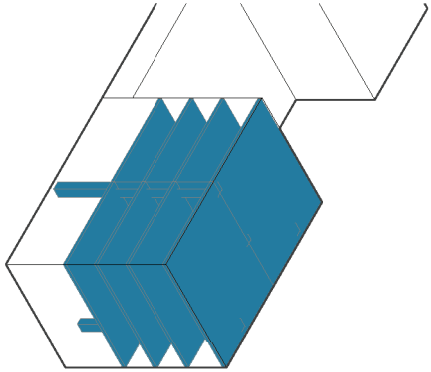
The staging of space



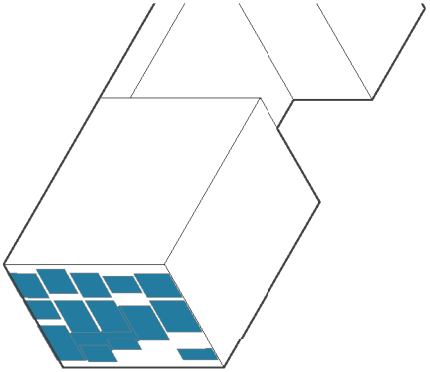
The supporting structure



The service elements



The skin

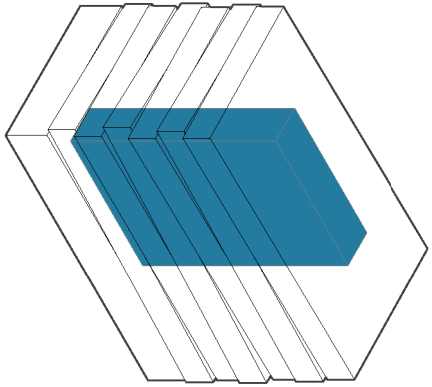


Patch-22

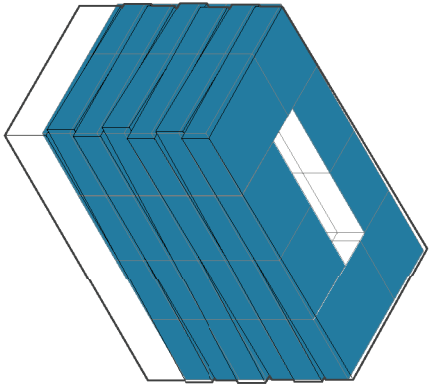
Architect:	Tom frantzen et al architecten
Apartments:	26
Status:	Build
Year:	2016
Location:	Amsterdam

The supporting structure
+ The structure of patch-22 consists of a concrete core, and cross-laminated timber columns in the facade, because of this placement, each floor becomes a large open space granting the resident much flexibility.
- Because the columns are made of CLT they have to be much larger compared to traditional concrete or steel structures.
The skin
+ The facade consists of large glass panels divided by a thin frame, each section is 3 meters wide and can be slit open.
- The 3-meter wide glass sections only allow the internal walls minimal connection points to the facade, limiting large parts of the internal design to a 3-meter grid.
The staging of space
+ Each floor consists of 8 units, these units are able to be merged in configurations of up to 3 units. These configurations consist of the following typologies: single unit, double 'i' unit, and a triple 'L' unit.
- The units are predetermined by the architect, and it is thus not possible to split units up into different configurations.
The service elements
+ The building has elevated floors, combined with two cores in the middle of the building. This system gives residents the possibility to place their services anywhere within their apartment.
- This system is much more expensive compared to traditional solutions.
The circulation
+ The core allows for multiple access points to the units. giving residents more flexibility.
- Many residents choose to close their additional access points off.

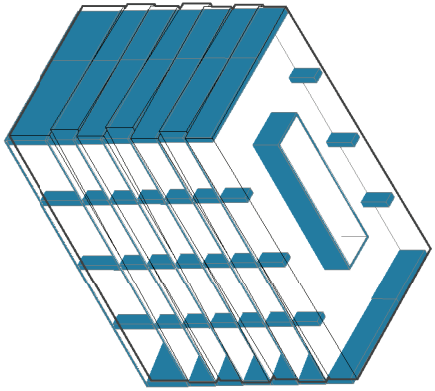
The circulation



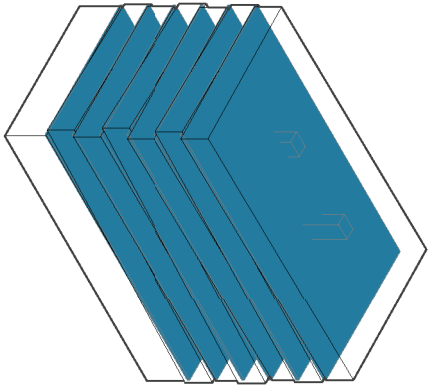
The staging of space



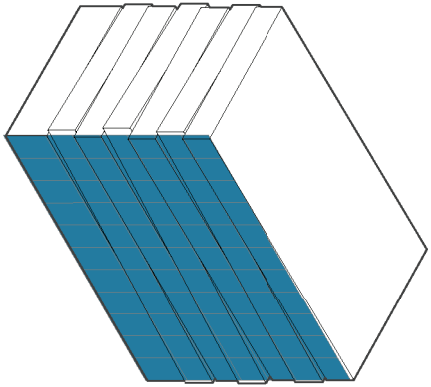
The supporting structure



The service elements



The skin



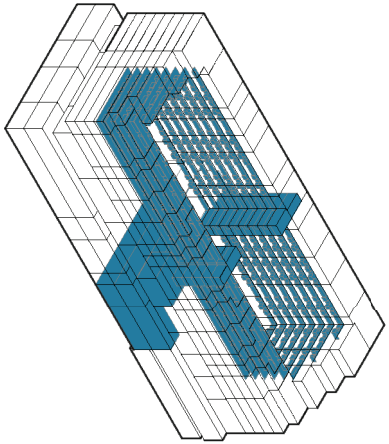

DOCKS

Fenix I

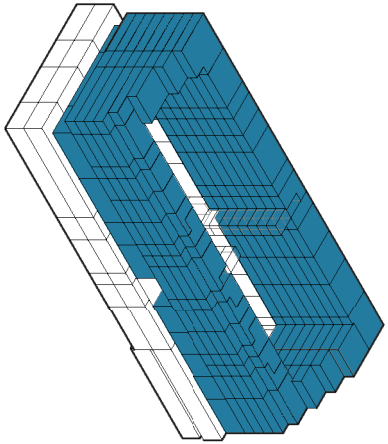
Architect:	Mei architects
Apartments:	212
Status:	Build
Year:	2016
Location:	Rotterdam

The supporting structure
+ Fenix I uses a concrete column structure, allowing for units to be placed in between the grid, and halfway in the grid, opening the door to more variety in unit configurations.
- When a unit is placed halfway the grid, the columns are placed in the middle of the unit, creating a more difficult design assignment.
The skin
+ The external facade of the building is very open, allowing for pleasant views, while the internal facade is more closed, allowing for better connections with the internal walls.
- The open external facade forces residents to position their largest open space in this position as well.
The staging of space
+ The floors are completely open, allowing for many different configurations of units.
- The spaces are set up in such a way that only very few logical configurations remain possible.
The service elements
+ The shafts are located towards the internal facade, allowing for larger open spaces towards the external facade.
- The shafts along the external facade limit the resident in their ability to position their small spaces elsewhere.
The circulation
+ The gallery system allows for units to be merged along the full length of the building.
- The units are limited to a single entrance point.

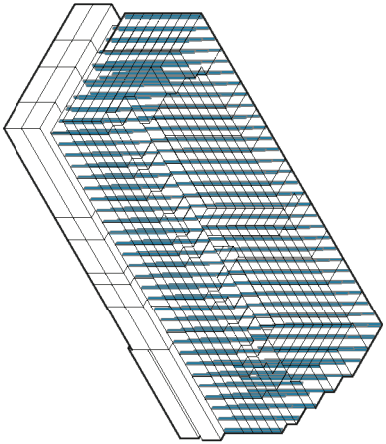
The circulation



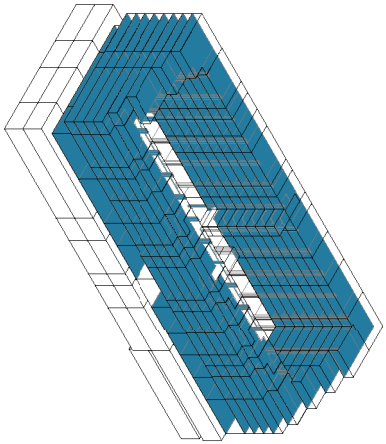
The staging of space



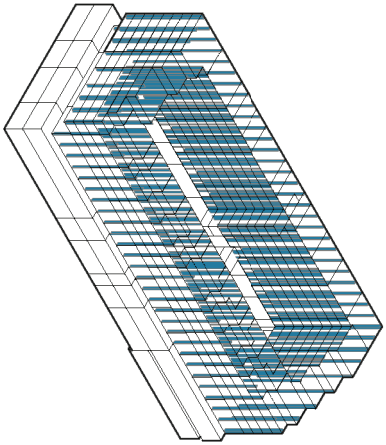
The supporting structure



The service elements



The skin



Shift concept & context

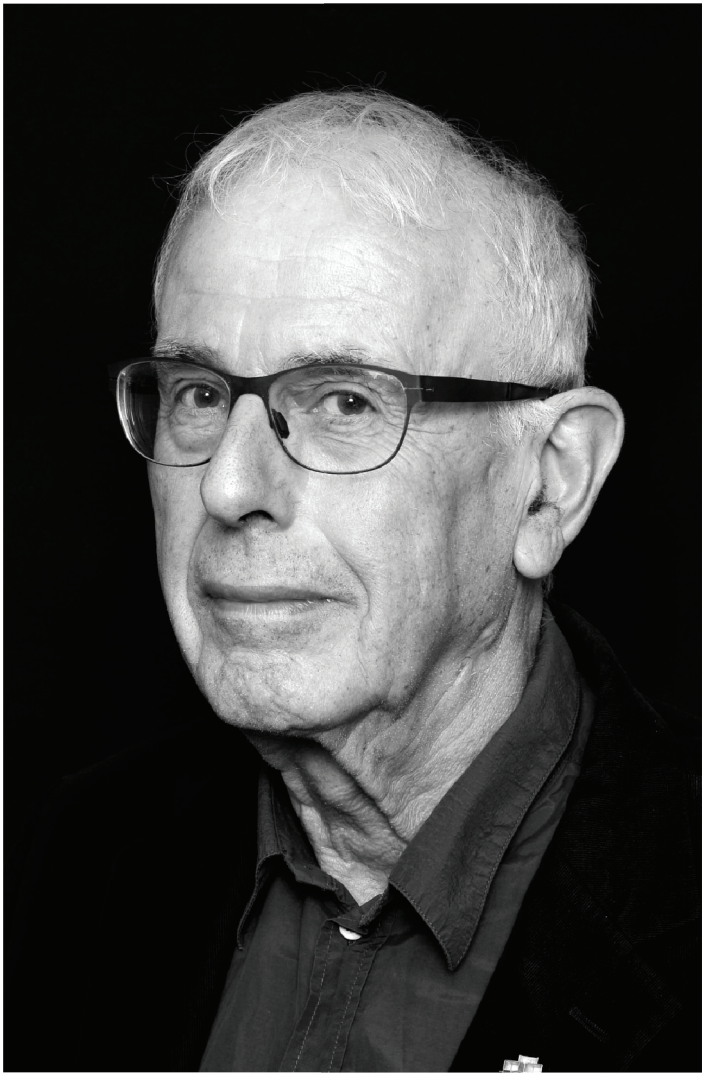
The design process and the main inspiration for the makers' dwelling

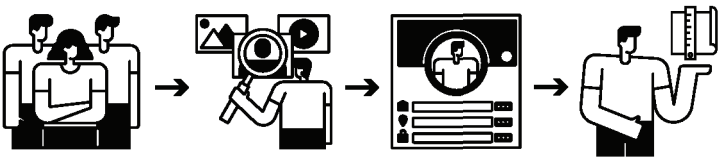
PERSONALISATION
JOHN HABRAKEN

Giving the resident the ability to personalize their dwelling, and remove the architect from its role of design 'dictator'

FLEXIBILITY
BERNARD LEUPEN

Five layers of flexibility
The supporting structure
The service elements
The circulation
The skin
The staging of the space





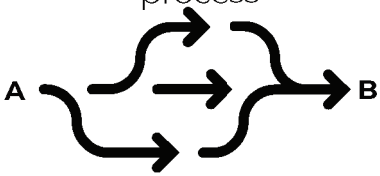
A diverse target group

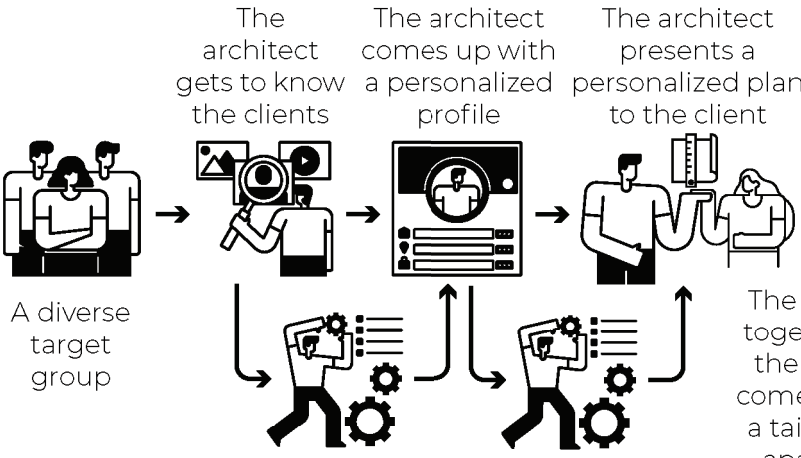
A architect researches and analyses the target group

The architect creates a generic profile of the target group

The architect presents a ‘mass-produced’ apartment plan tailored to the target group

My design process





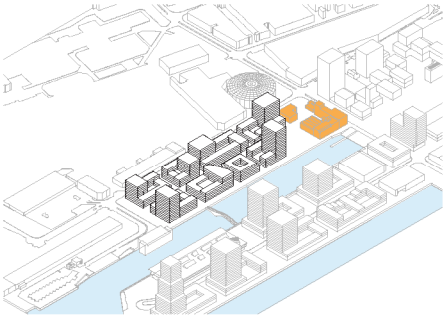

20 minutes biking
Rotterdam /
airport
Central station
Rotterdam
20 minutes w
Schiedam
city center
SHIFT
Dakpark
RDM
makers district


the Hague
Heliport
Rotterdam
city center
valking
Kop van zuid
Feijenoord
De kuip

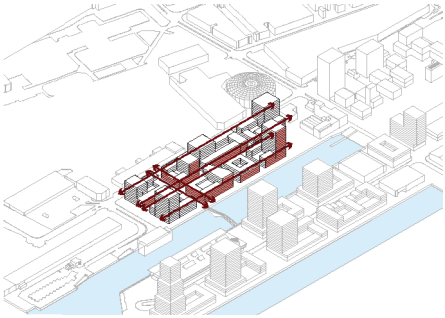

Ferrodome


Marconiplein
transportation hub
Leetowers
Atelier van Lieshout

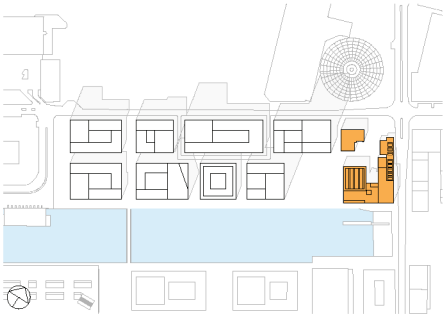

LEGEND
plot border
obligatory facade
facade can't cross this line
possible overhang
commercial ground floor
plot number
building's max. height
tower placement
residential
workspace
existing building
green/open space

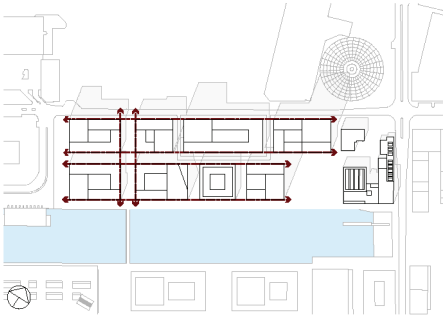


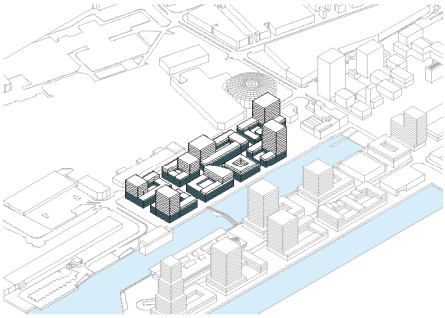
Existing cultural hub will be kept.



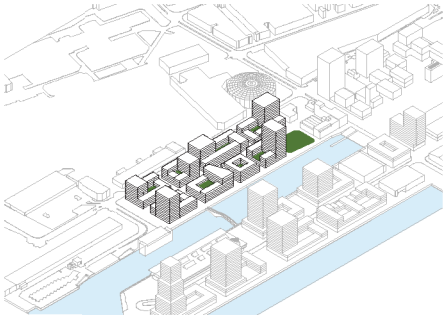
Facades on the main axes are continuous.



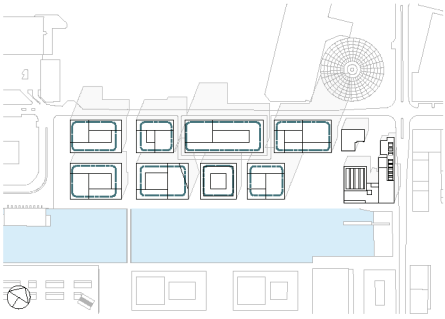


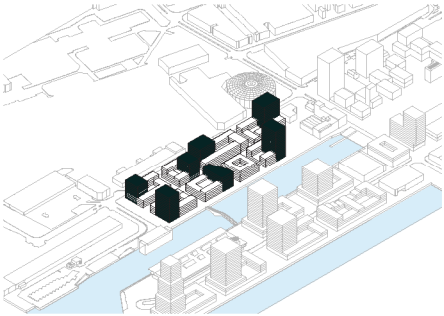


Closed building blocks seperate public and private life.

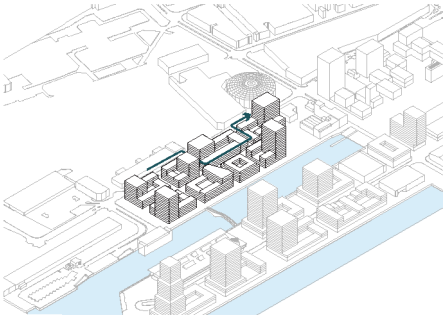


Green structures spread around the site give residents a pleasent place to stay.

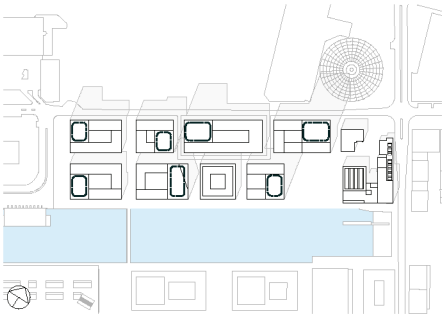


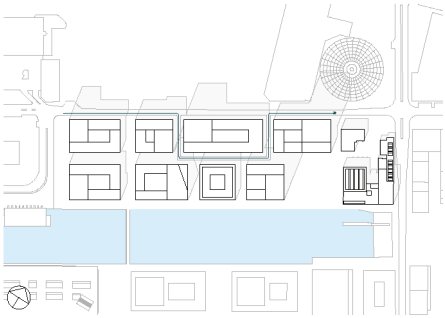


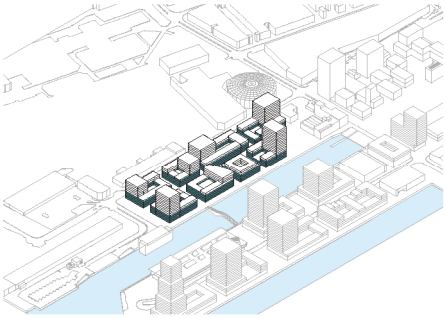
Towers are placed onstrategic point in order not to cast shadows on neighboring building plots.



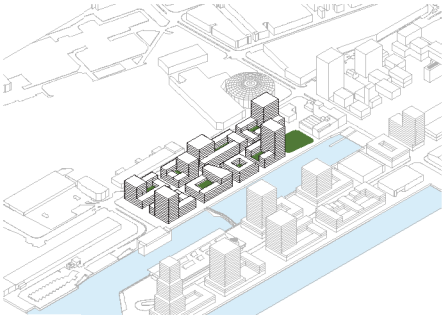
A single car road connects all buildings in Cluster D, This way the rest of the area are kept clear for pedestrians and bikes.



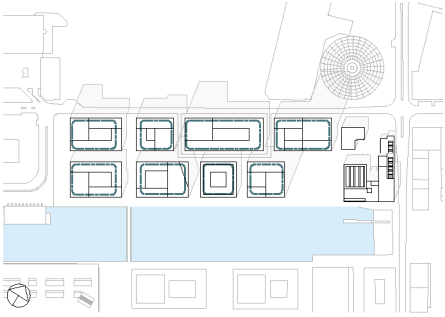


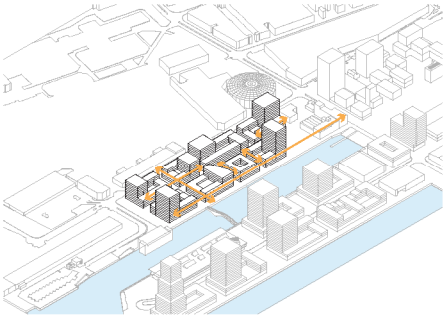


Closed building blocks seperate public and private life.

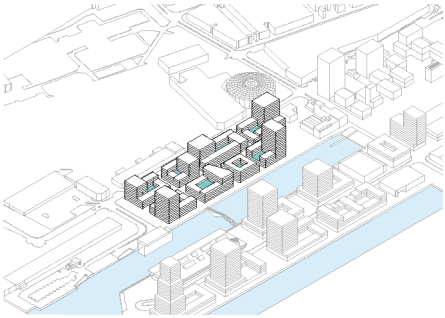


Green structures spread around the site give residents a pleasent place to stay.

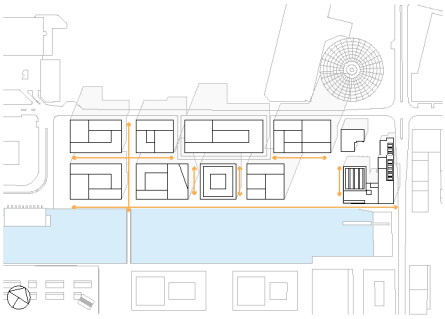


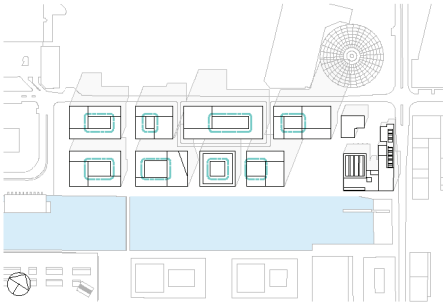


Pedestrians and bikes have the right of way in Cluster D, for this reason most streets are car free, and open for residents to explore freely.

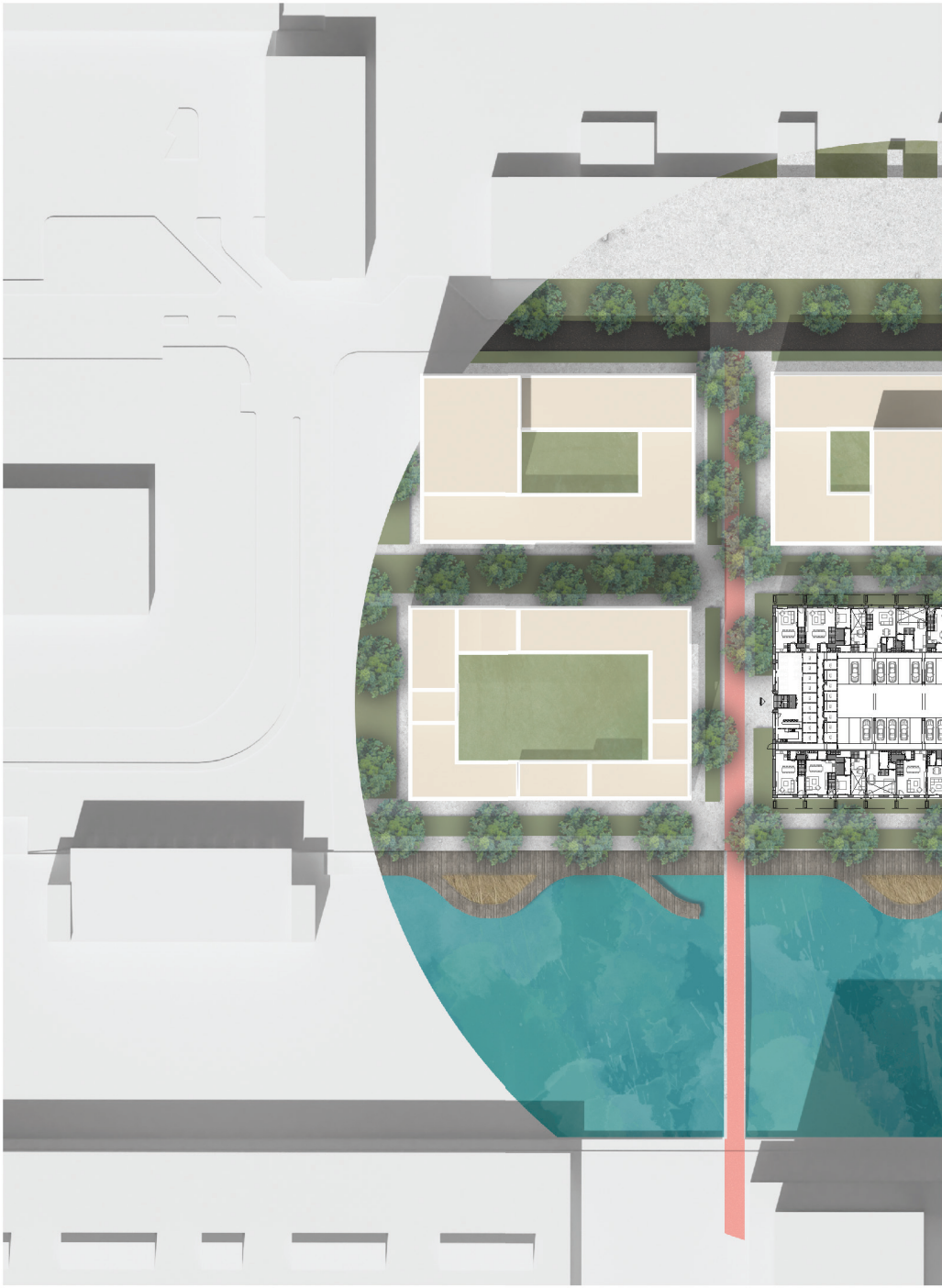


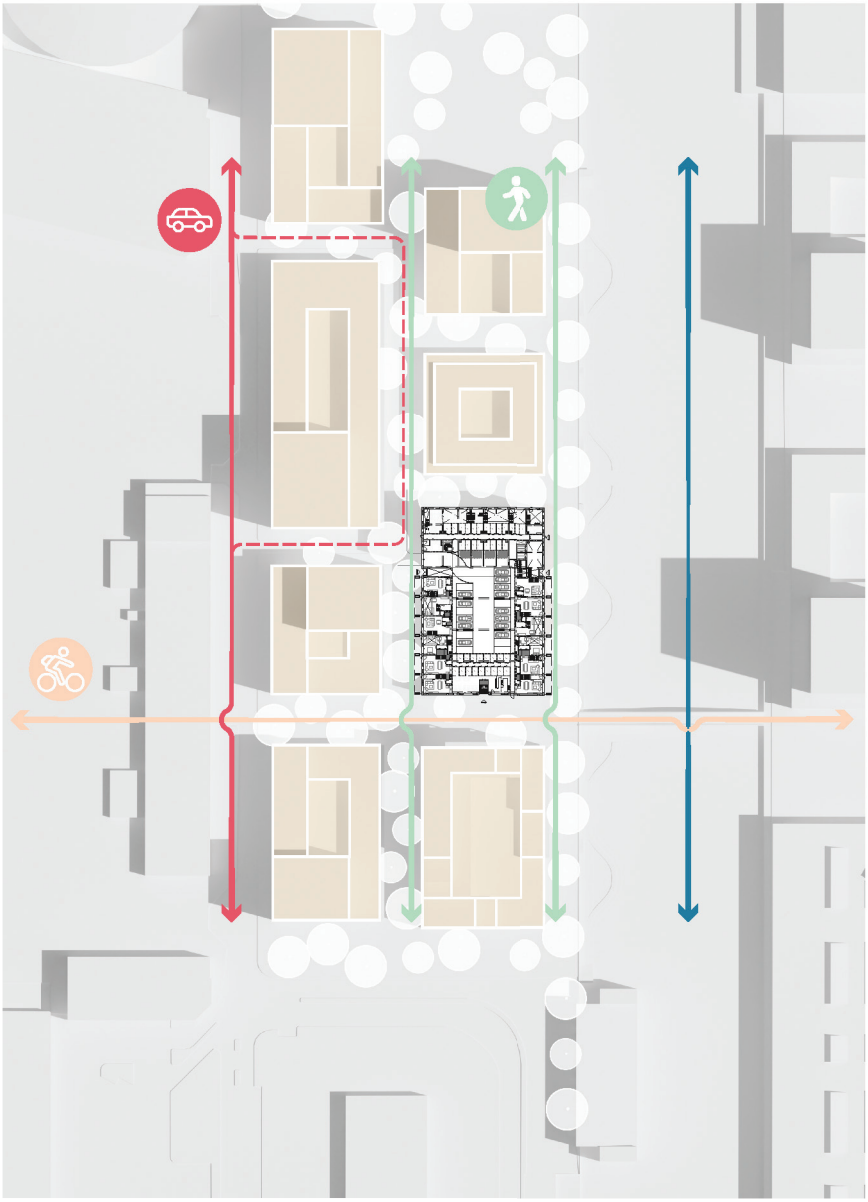
Due to the single car road, each building can solve their parking needs internally.





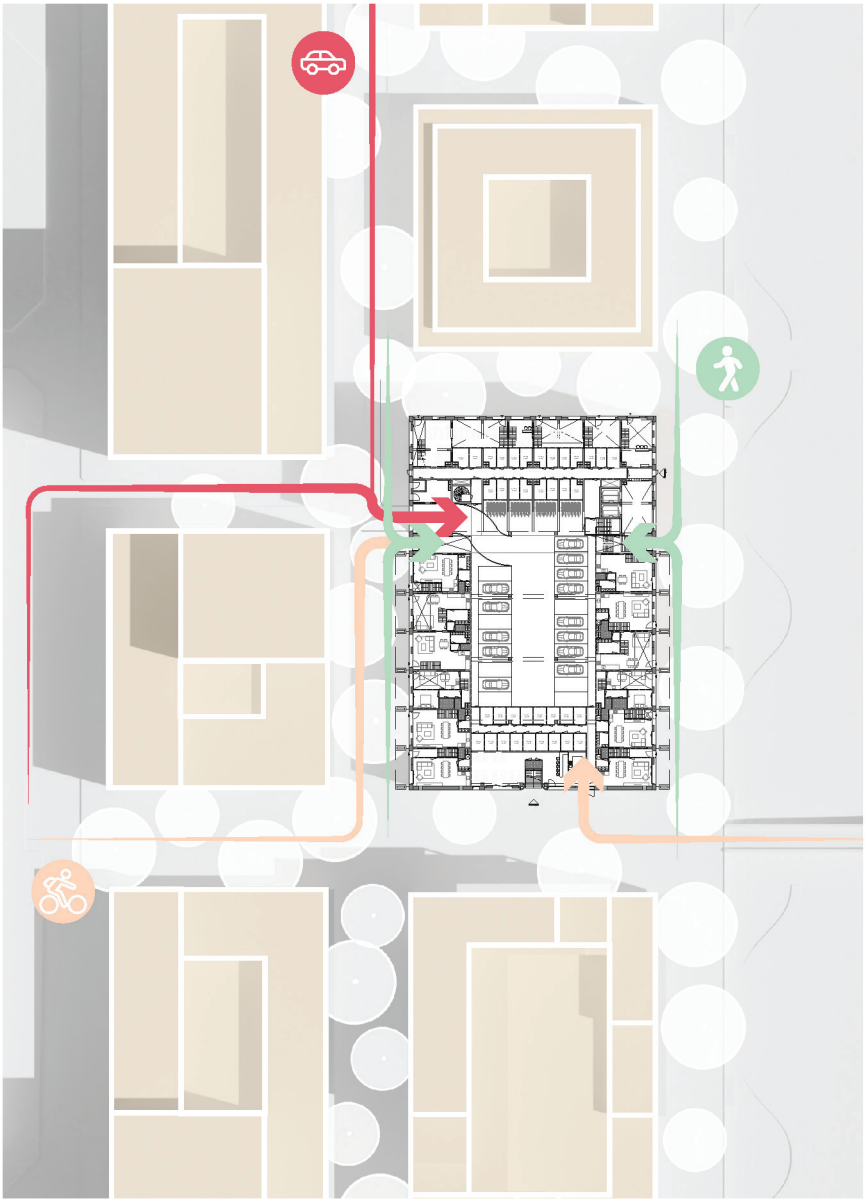

SHIFT





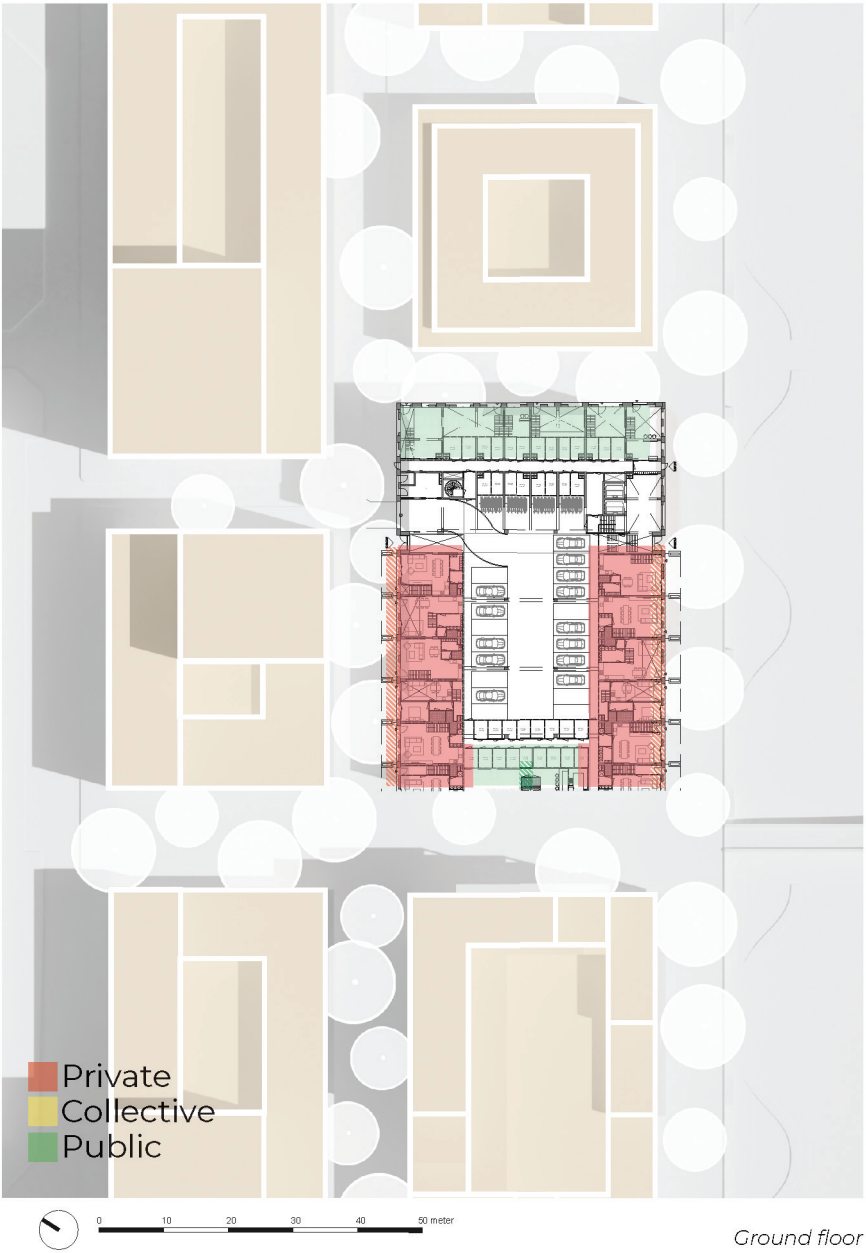
Ground floor

Most traffic moves from east to west through the area, except for a bike line connecting north to south



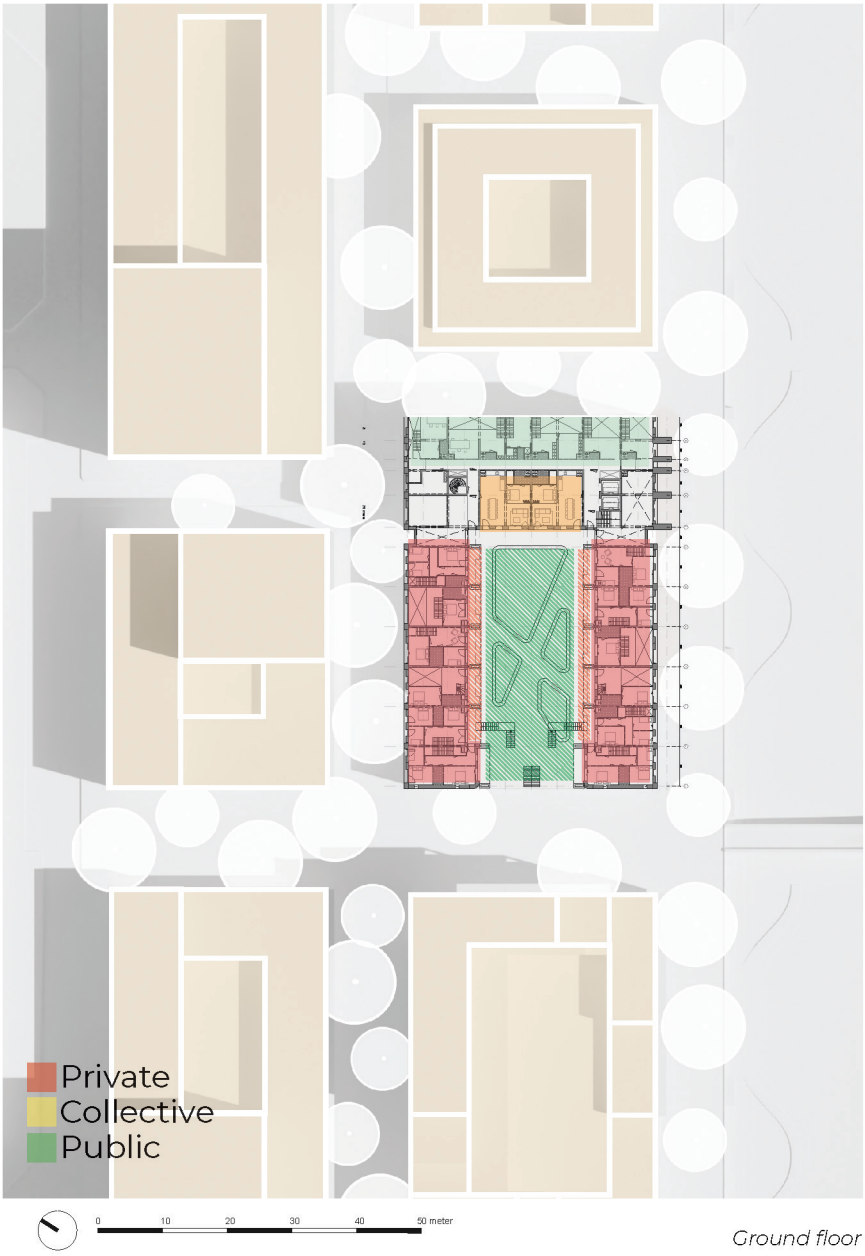
Ground floor

In order to connect to the different path ways three entrances to the building are created



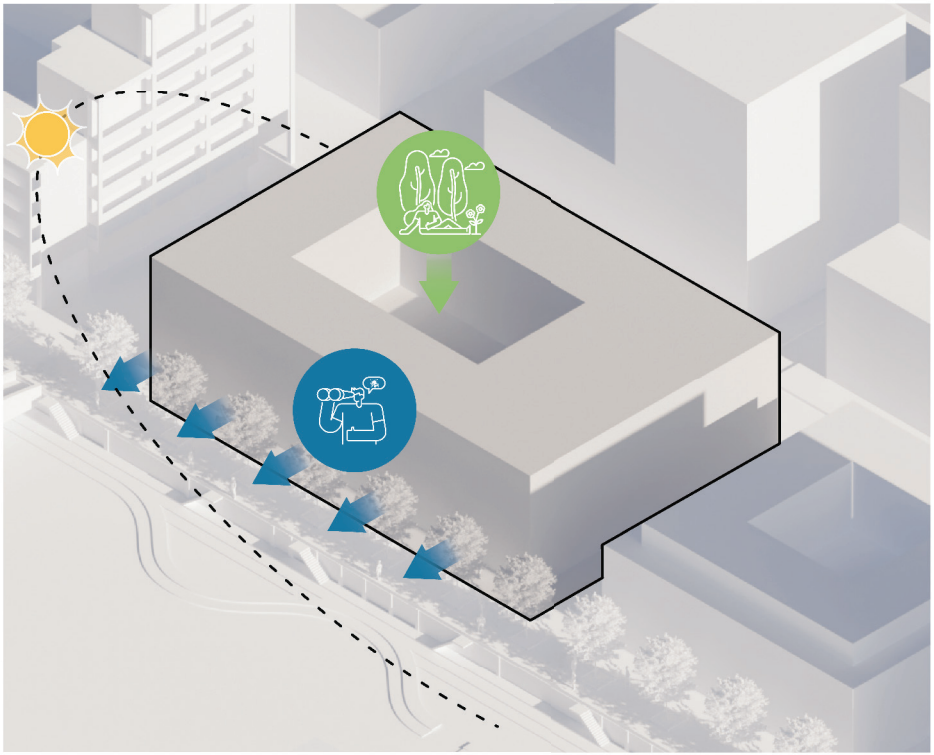
Ground floor

Around the dwellings on the ground floor pedestrains are kept at a distance by small facade gardens, while in the public areas people can walk much closer to the facade

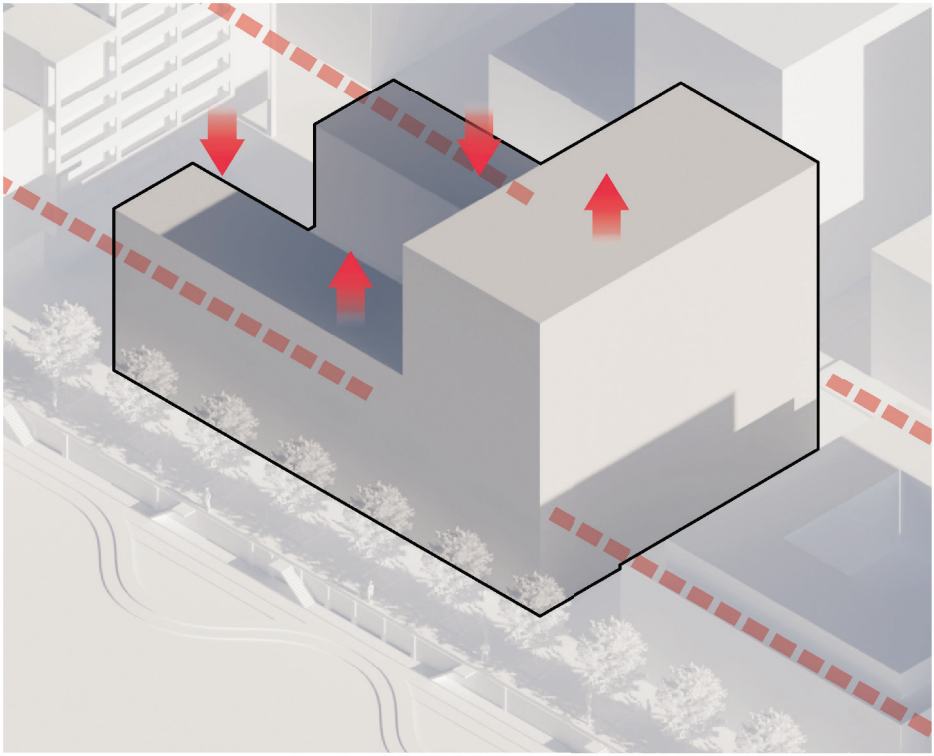


Ground floor

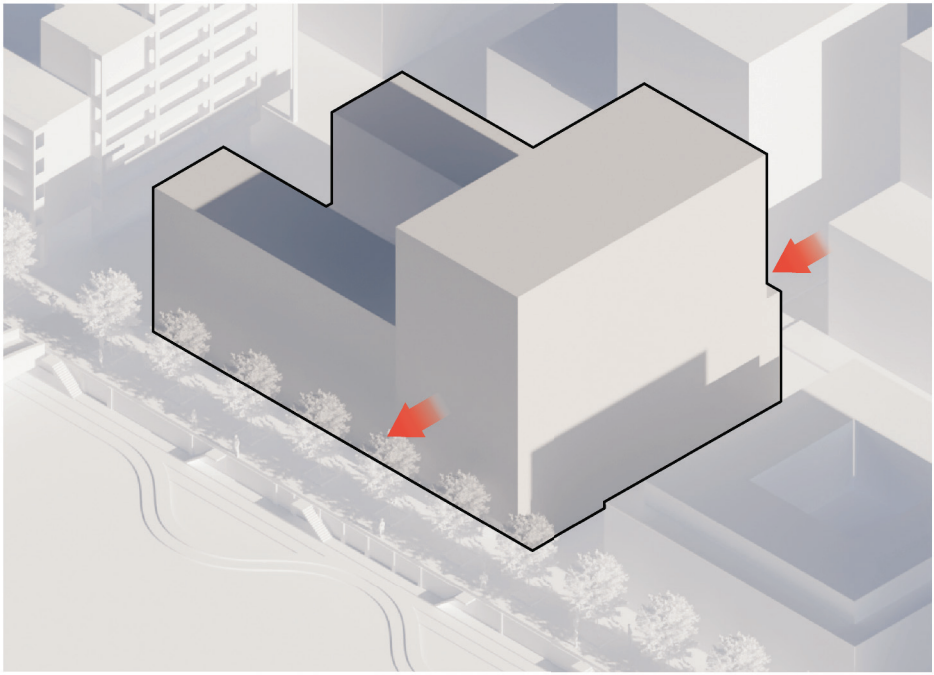
On the first floor a public courtyard provides large outdoor space to all residents. Aswell as two collective apartments for when residents require more space



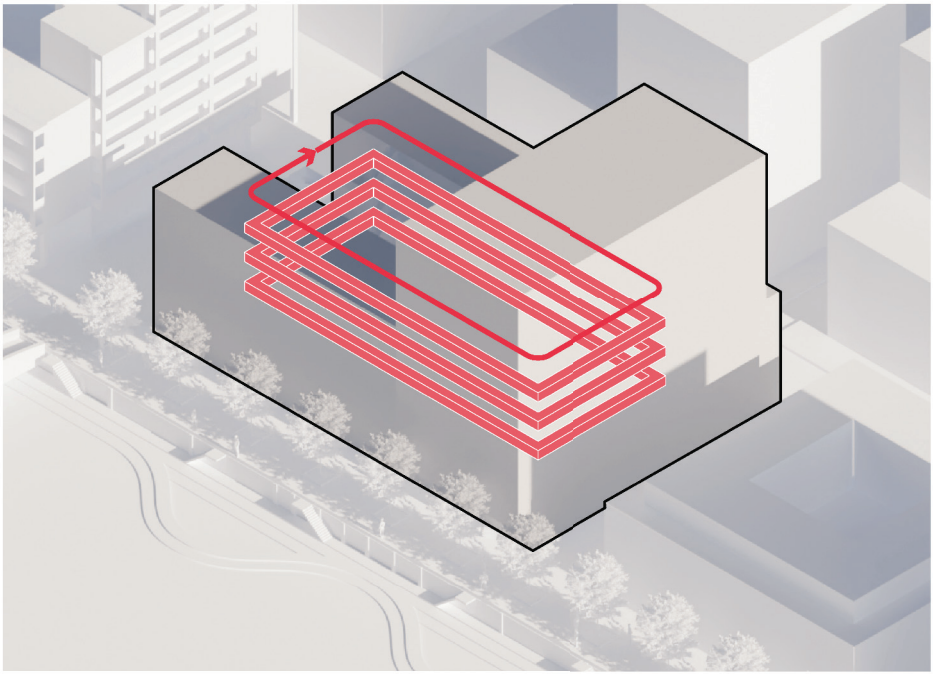
A closed building block, located on the waterfront in the Keilekwartier.



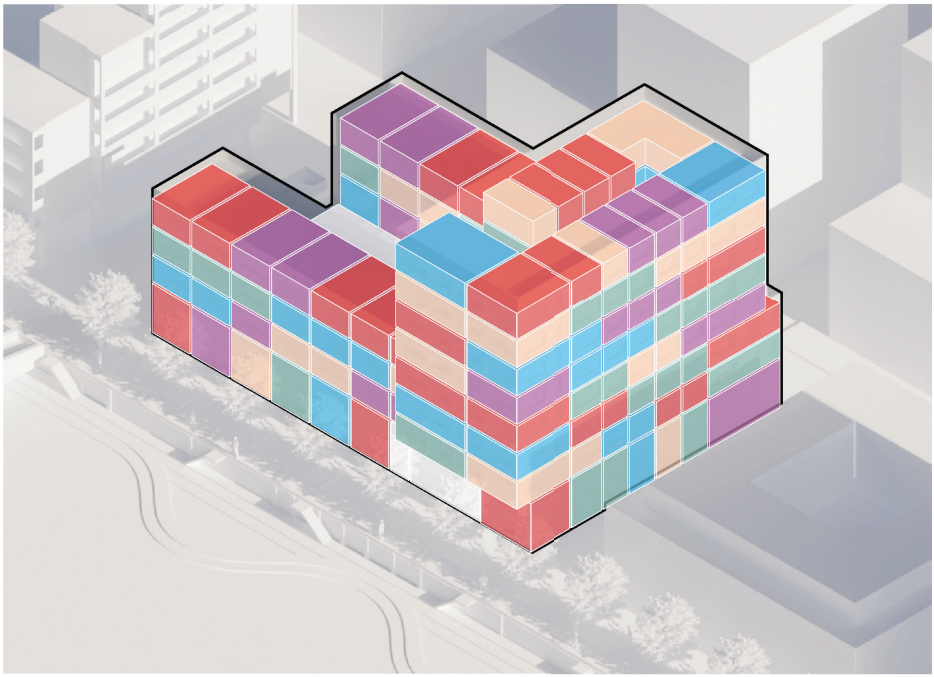
Adapt massing heights to surrounding building blocks,
add tower on the east side to densify



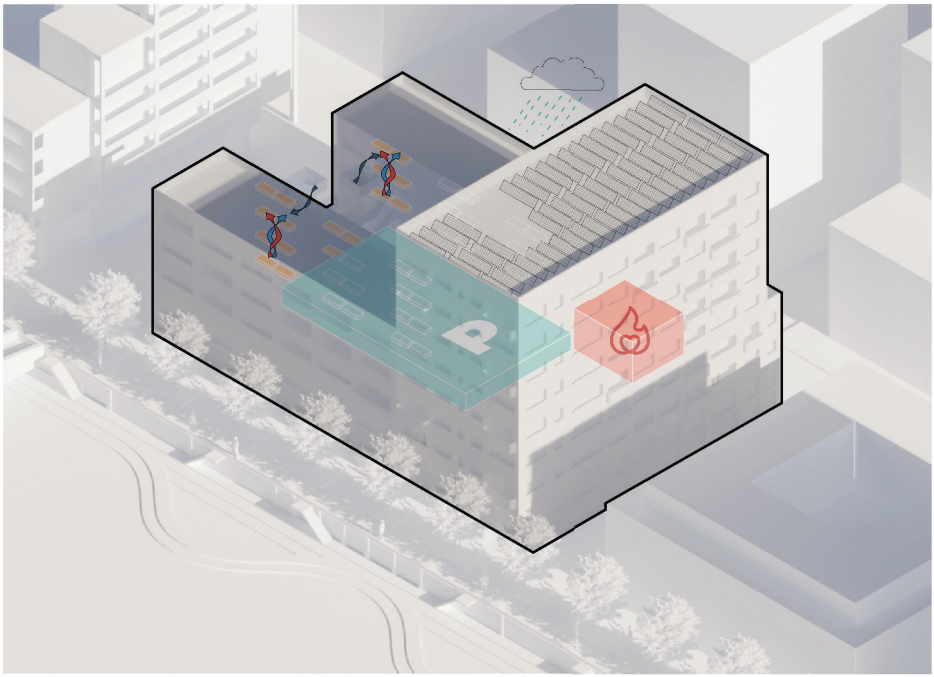
By shifting the tower towards the water the building becomes more dynamic as a whole



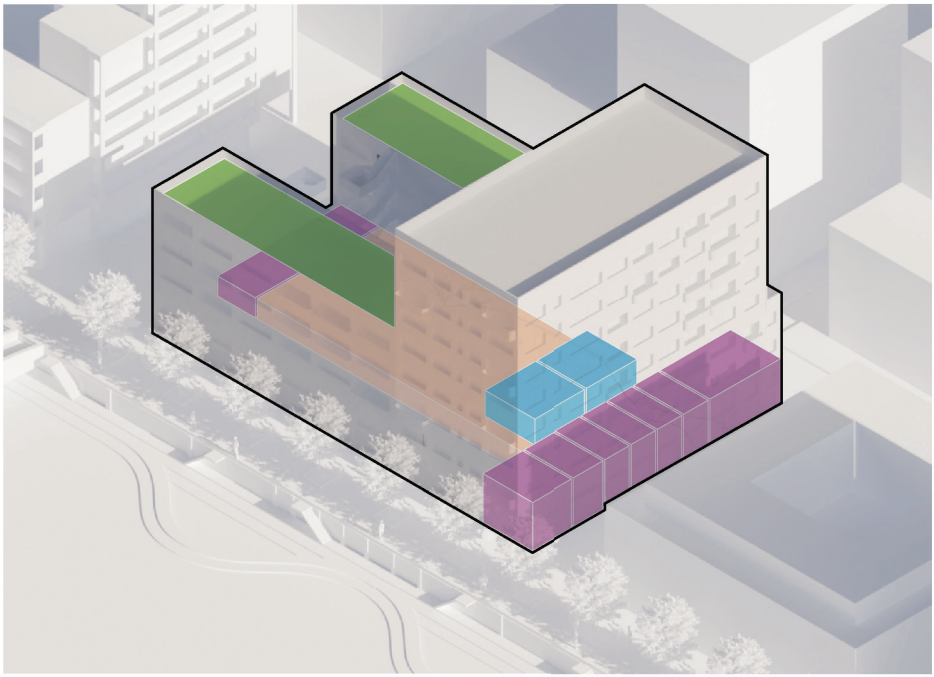
By connecting the two galleries, residents can move through the building more easily



A flexible building system allows for many different configurations

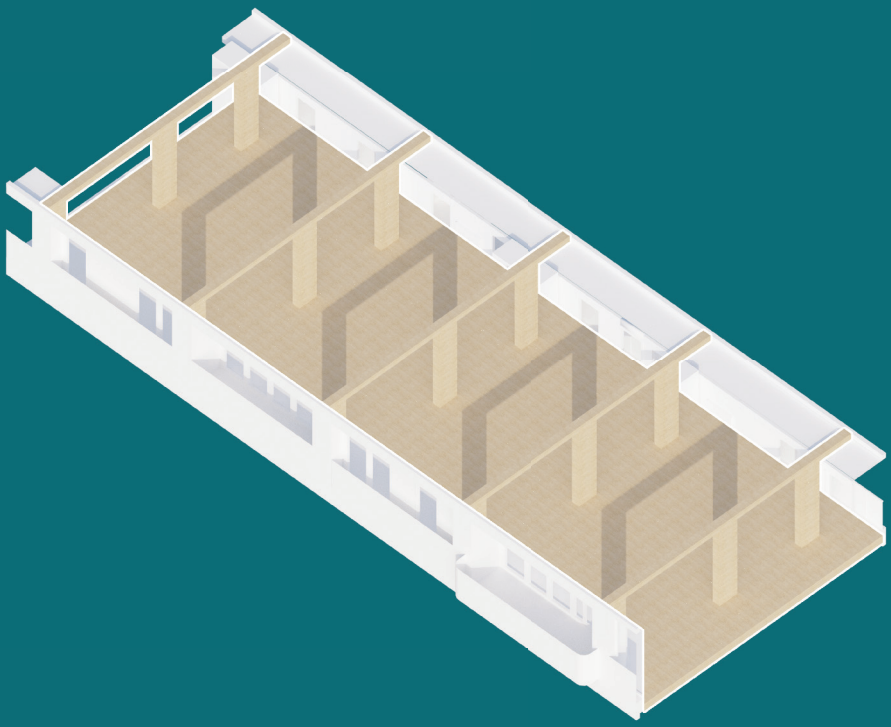


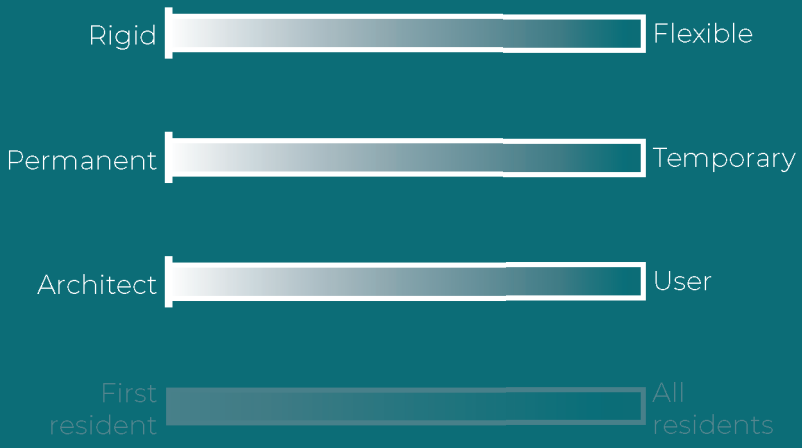
Sustainability is central in shift



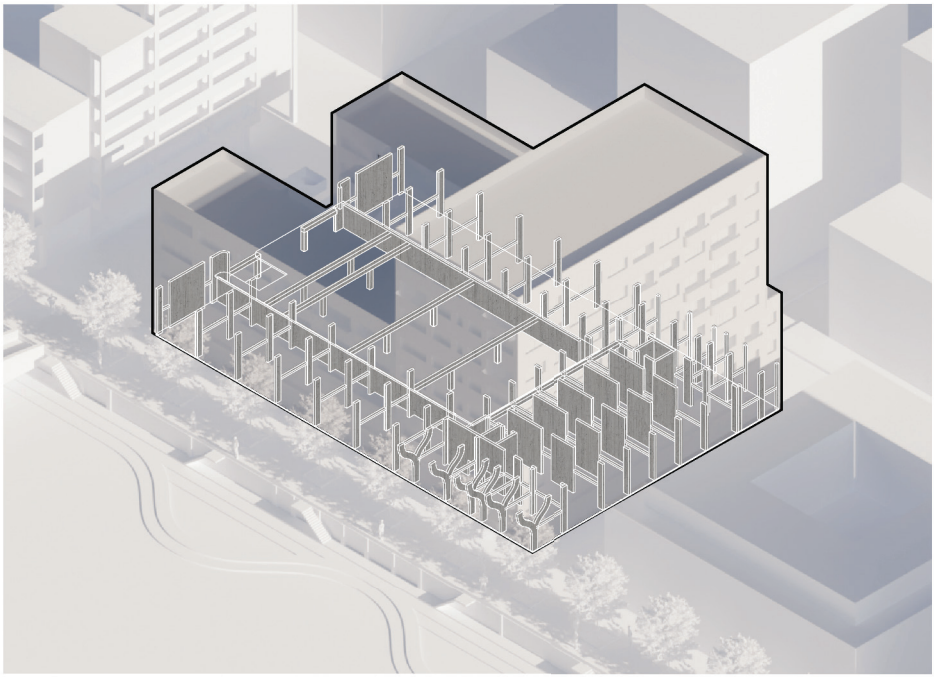
By giving residents many multifunctional spaces the building lifespan can be greatly expanded

Layer 1: The supporting structure



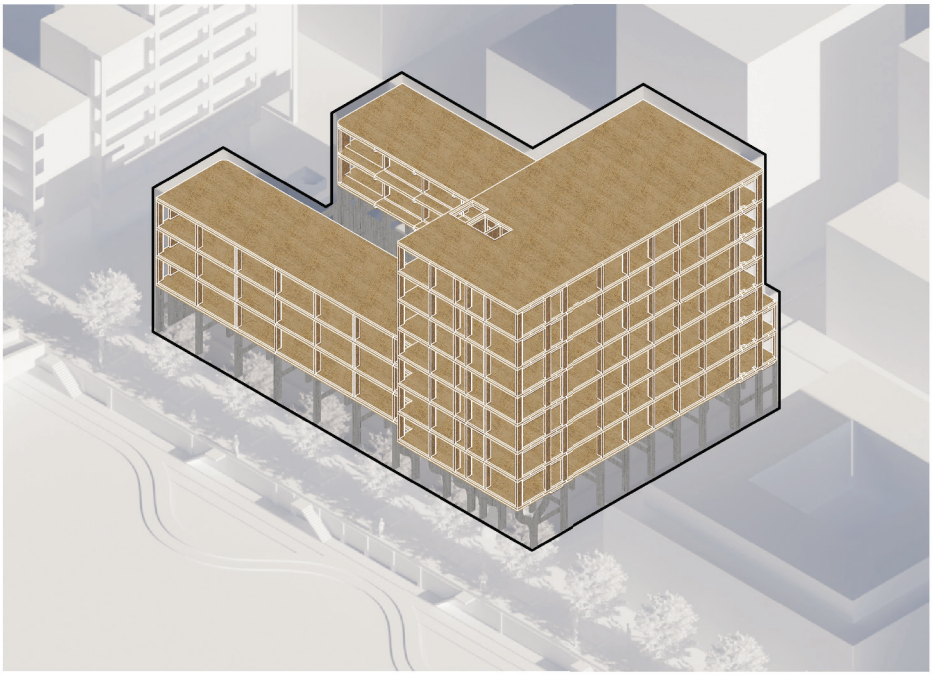

Rigid
Flexible
Permanent
Temporary
Architect
User
First resident
All residents

STRUCTURE
SPECIALS



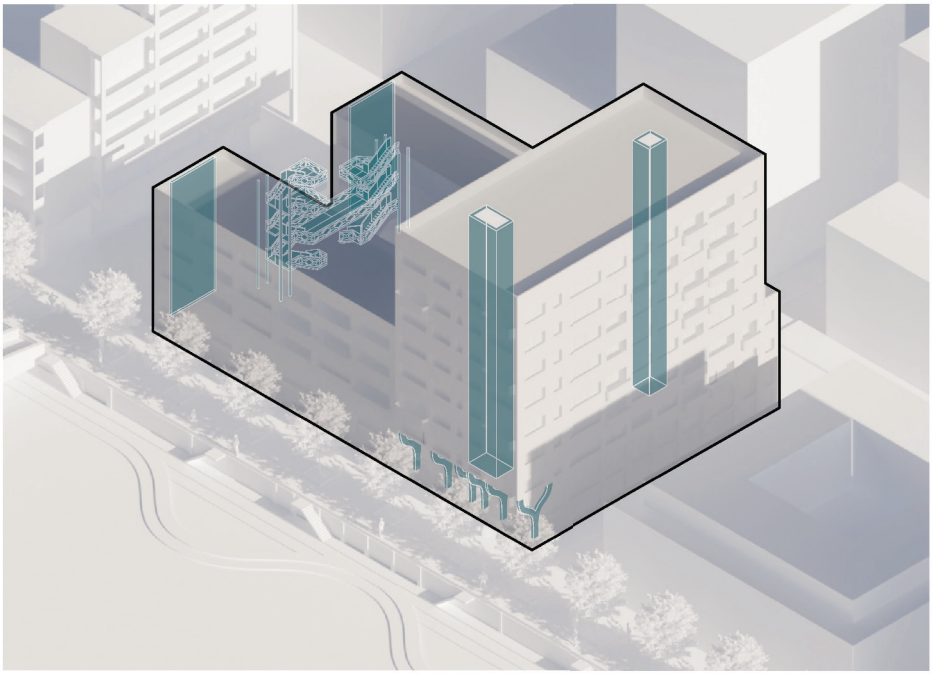
The structure on the ground floor is made of concrete providing stability and strength

STRUCTURE
SPECIALS



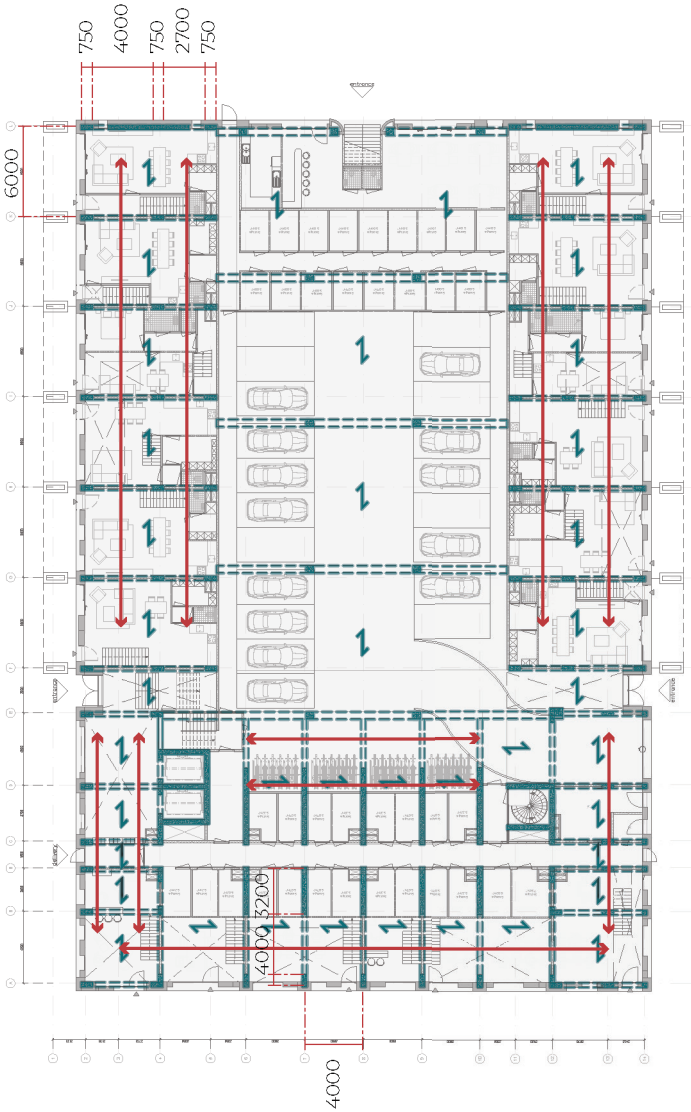
CLT provides light and flexible structure on top of the concrete base

STRUCTURE
SPECIALS

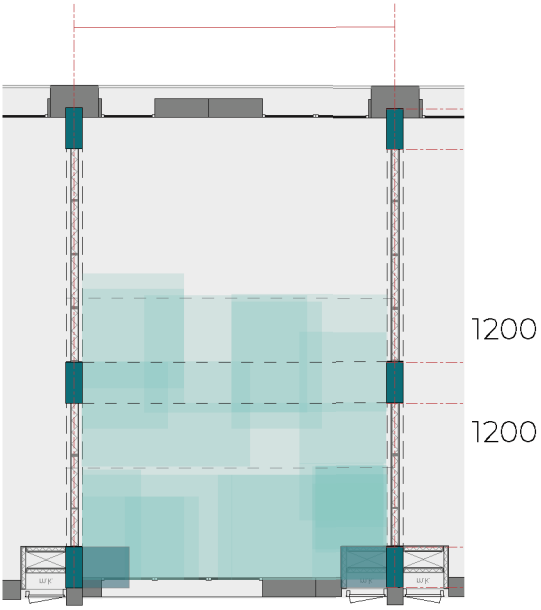


Additional elements provide stability and strenght to the building

STRUCTURE
DIMENSIONS

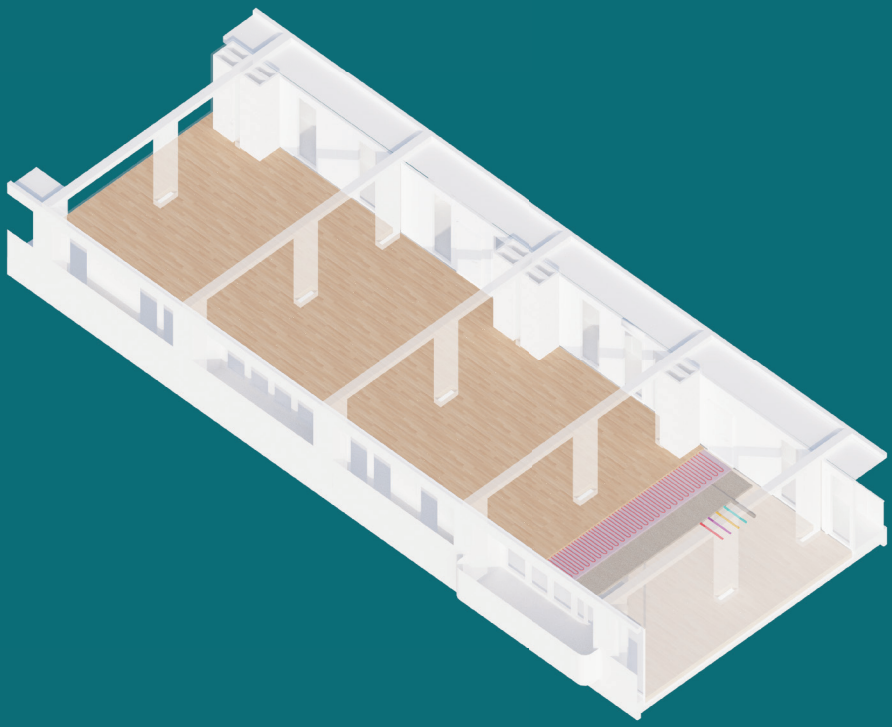


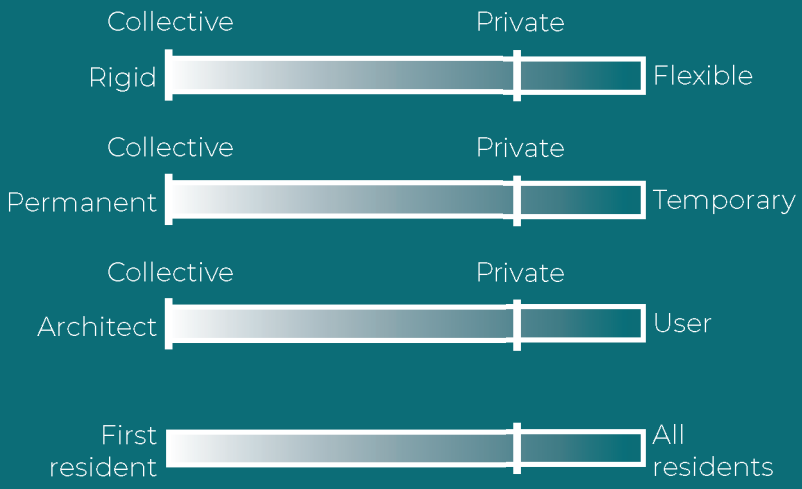
STRUCTURE
DIMENSIONS

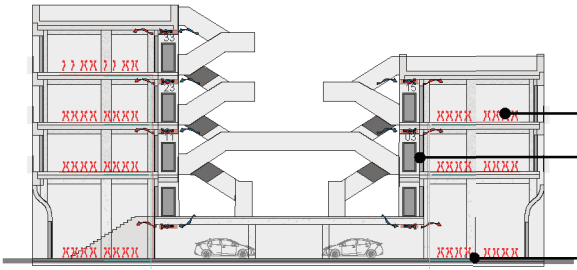


A study was performed to determine the optimal positions in of the structural elements to allow residents freedom when planning their apartment

LAYER 2: THE SERVICE ELEMENTS



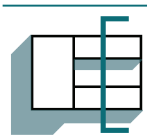

Collective
Private
Rigid
Flexible
Collective
Private
Permanent
Temporary
Collective
Private
Architect
User
First resident
All residents

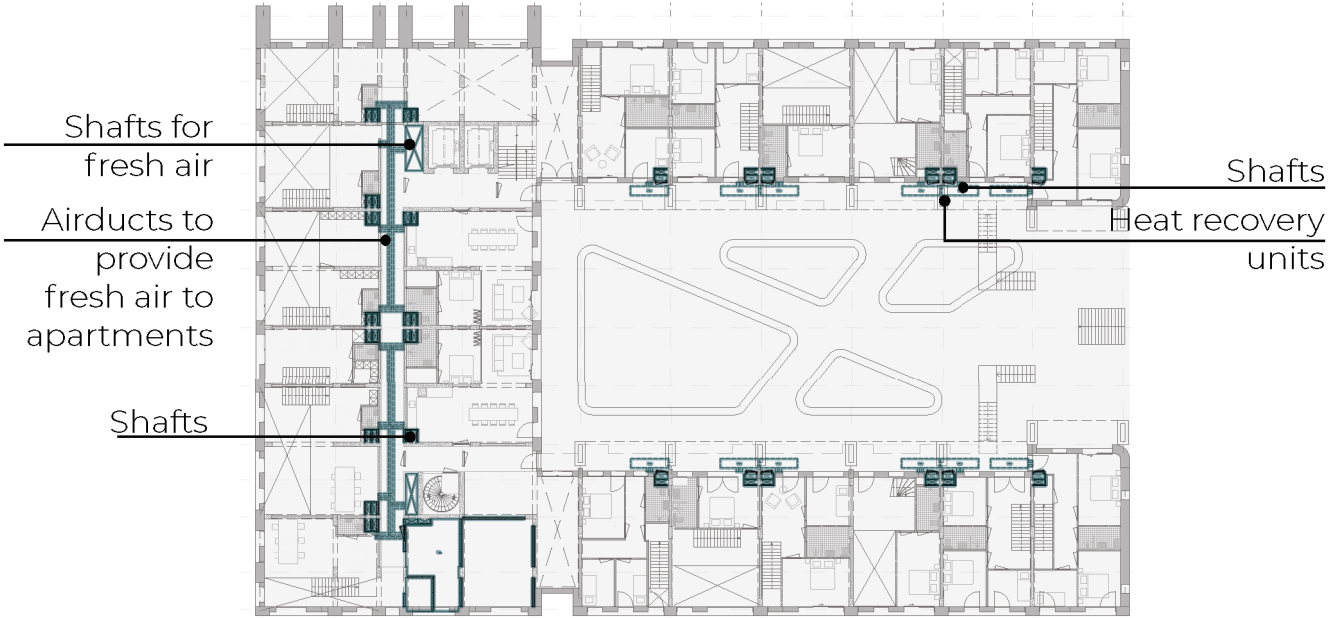


Heated floors

Heat recovery units

Elevated floorsystem for easy adjustments to plumbing



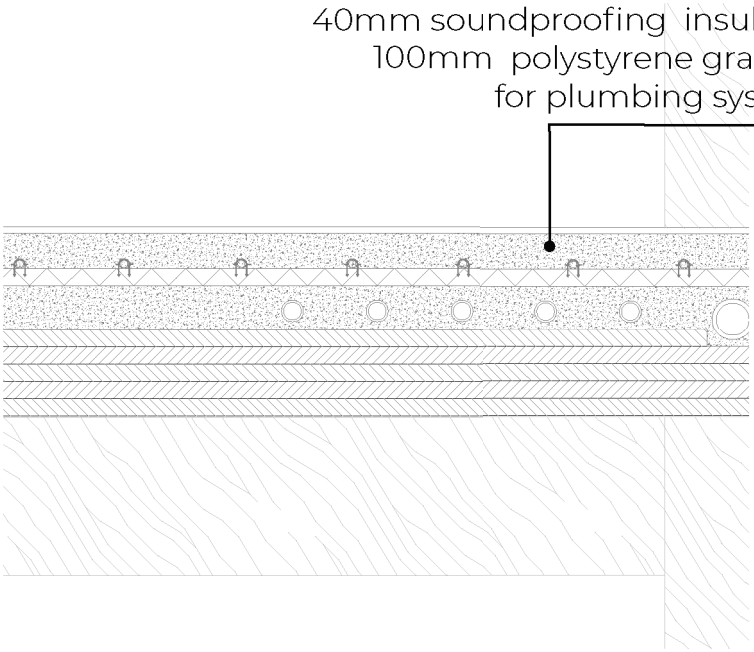


Layer 2: The service elements

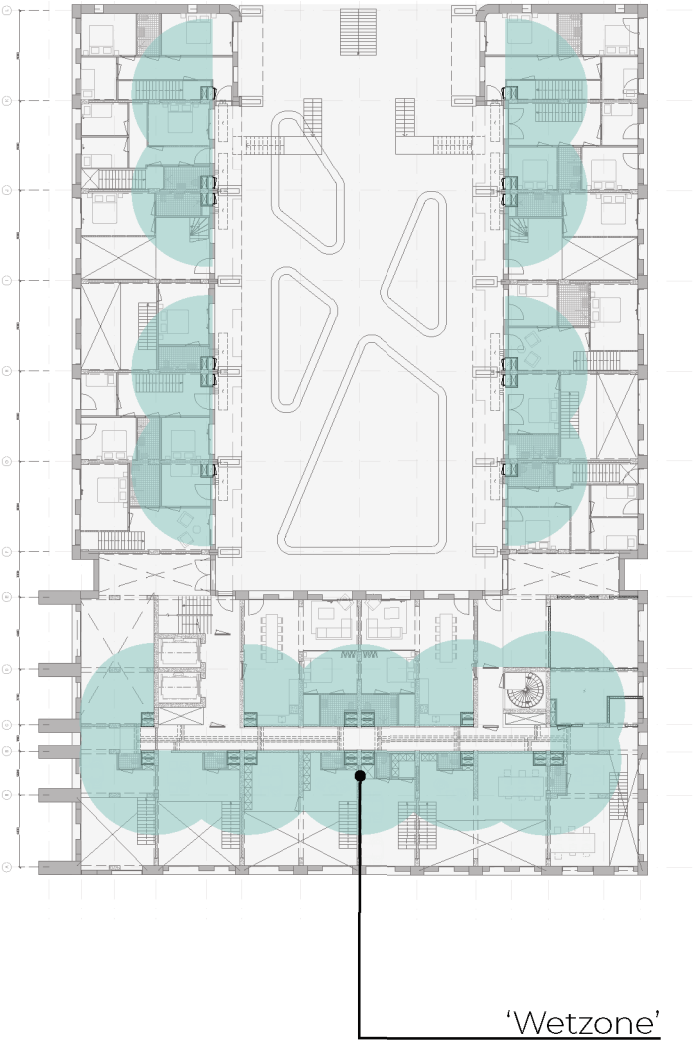
A demountable floorsystem
allows residents to lay plumbing
anywhere in their apartment and
connect to the communal shafts.

Flexible floorsystem

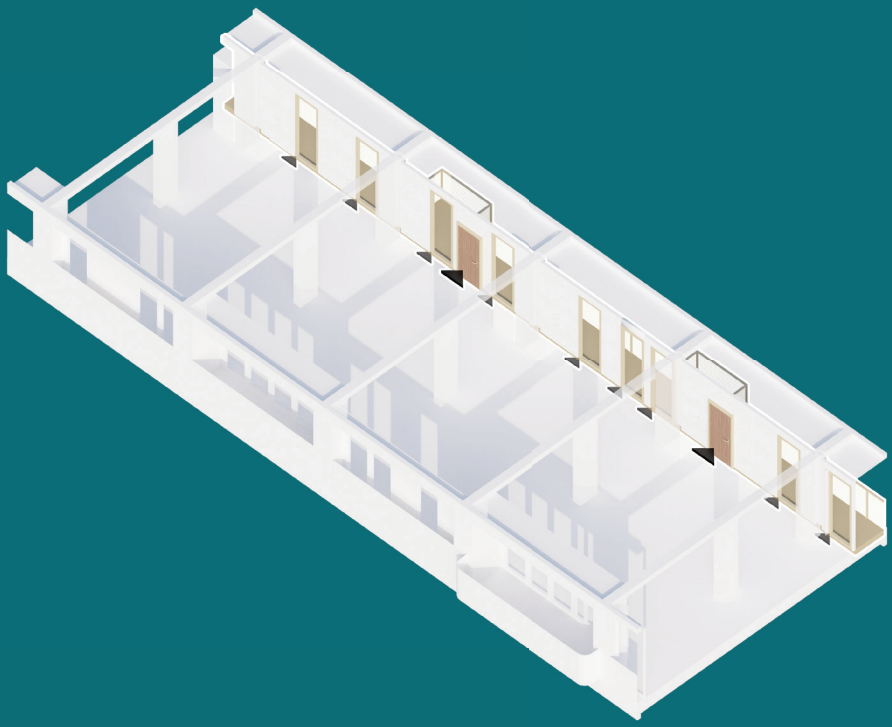
top floor to be determined by resident
80mm polystyrene granules
with integrated floor heating
40mm soundproofing insulation
100mm polystyrene granules
for plumbing systems

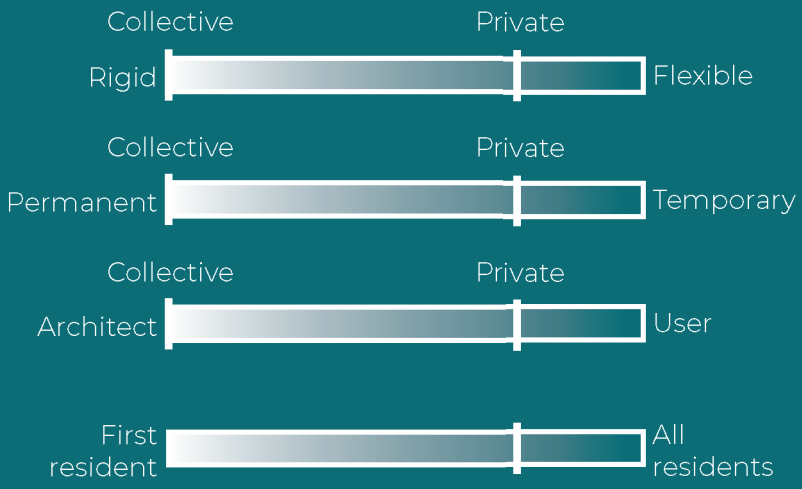


Floor buildup


‘Wetzone’

LAYER 3: THE CIRCULATION

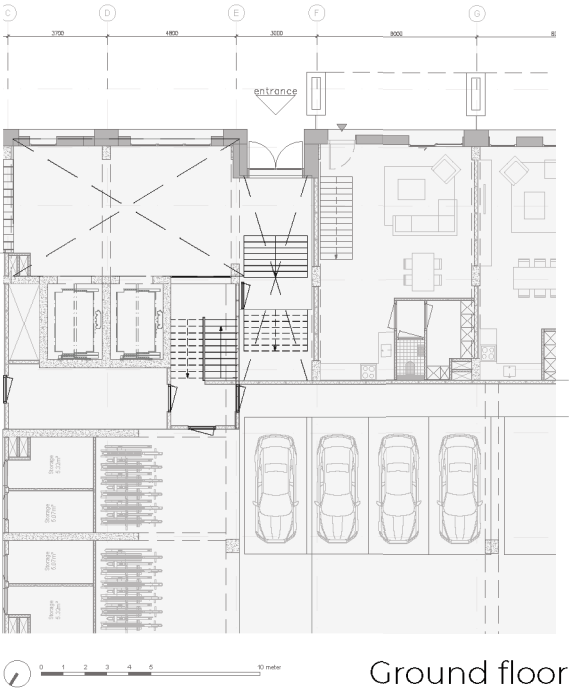



Collective
Private
Rigid
Flexible
Collective
Private
Permanent
Temporary
Collective
Private
Architect
User
First resident
All residents


SHIFT

MAIN ENTRANCE

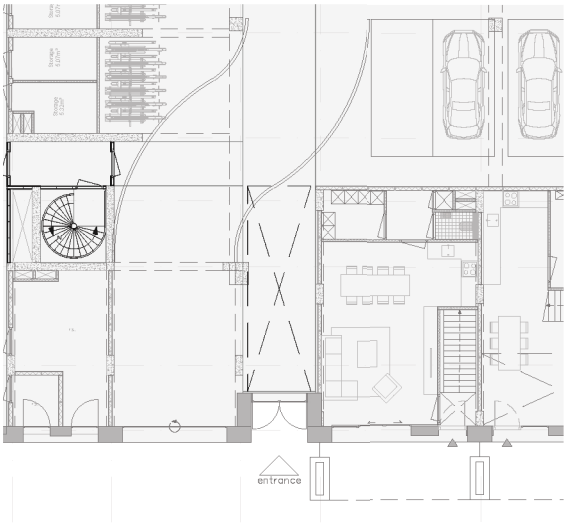
The entrance connects the water front directly with the courtyard, while also giving all residents access to their dwellings.



Ground floor

SECONDARY ENTRANCE

The secondary entrance gives direct access to the bike and car parking, and to the individual dwellings. The courtyard is not directly accessed from this entrance

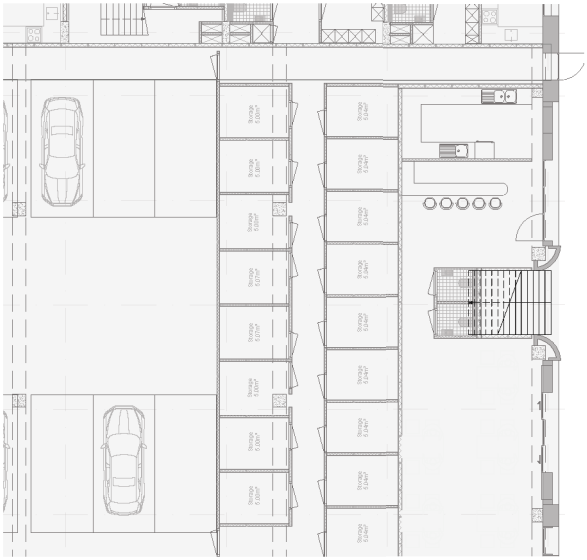


Ground floor

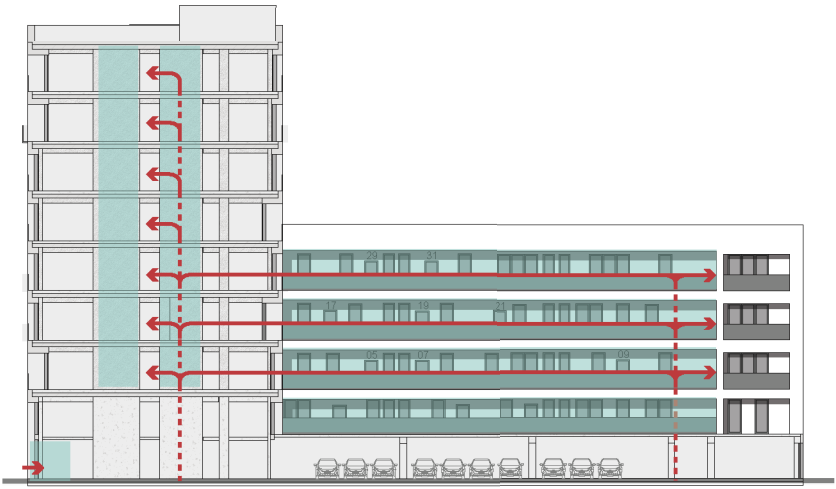

SHIFT

STAIRS

The stairs connect the street and pedestrain life directly with the courtyard, this way people residing in the gallery apartments dont have to travel through the entire building to access their dwellings



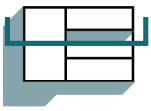
Ground floor

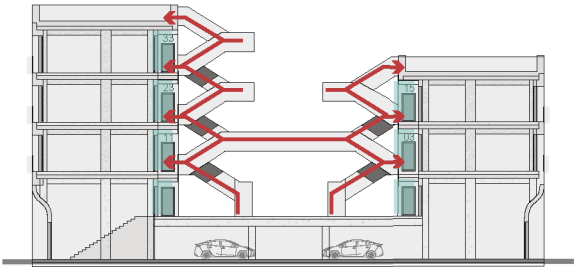


2 4 6 8 10 20 meter

Section length

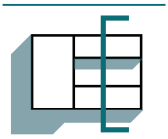
Together with the long corridors
and the flexible facade system
the first resident is able to decide
where to place their front door.

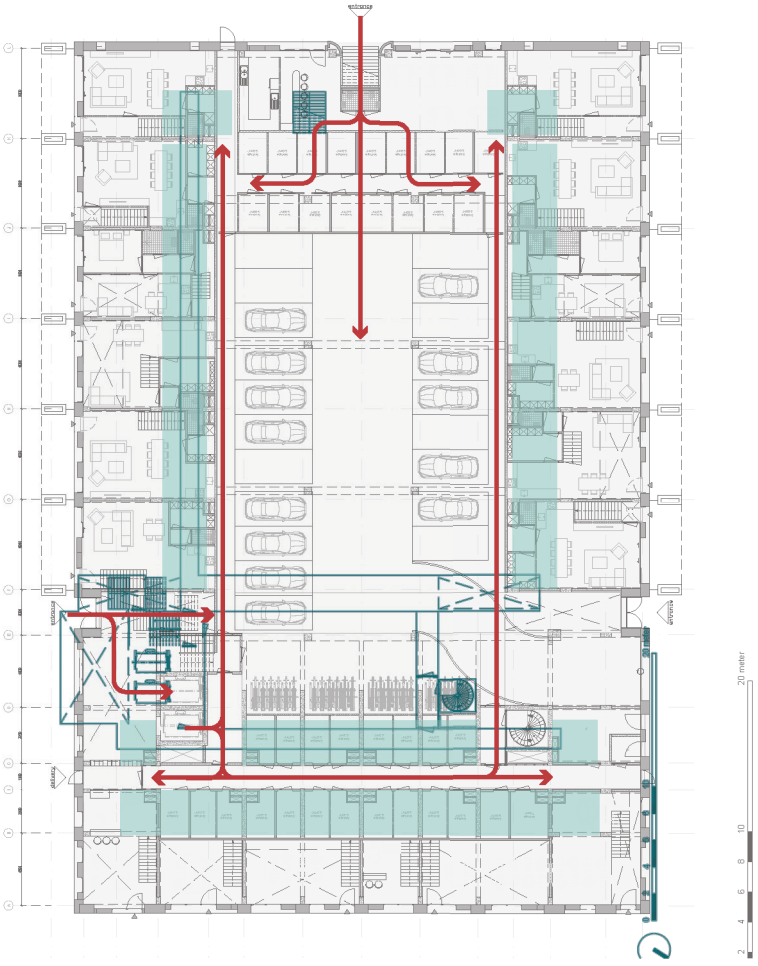




2 4 6 8 10 20 meter

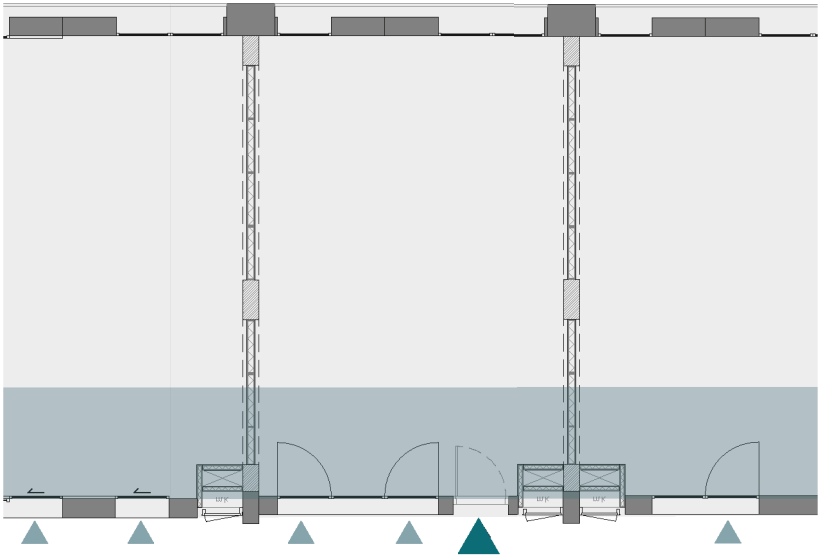
Section width





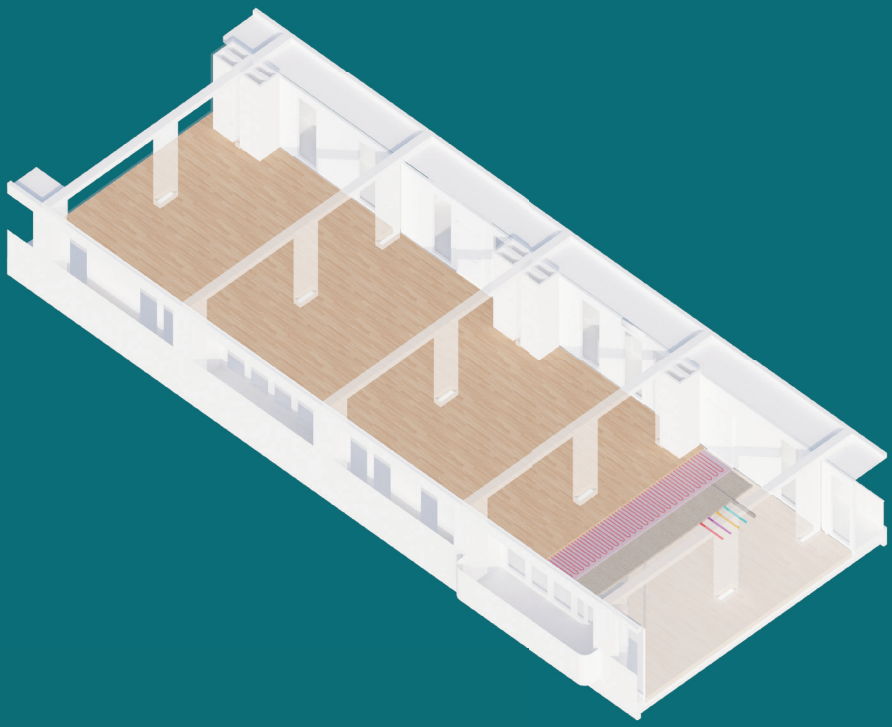
Ground floor

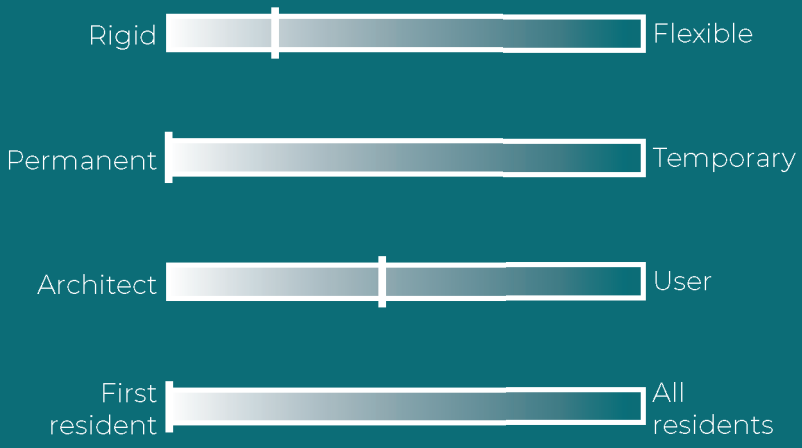
Together with the long corridors
and the flexible facade system
the first resident is able to decide
where to place their front door.

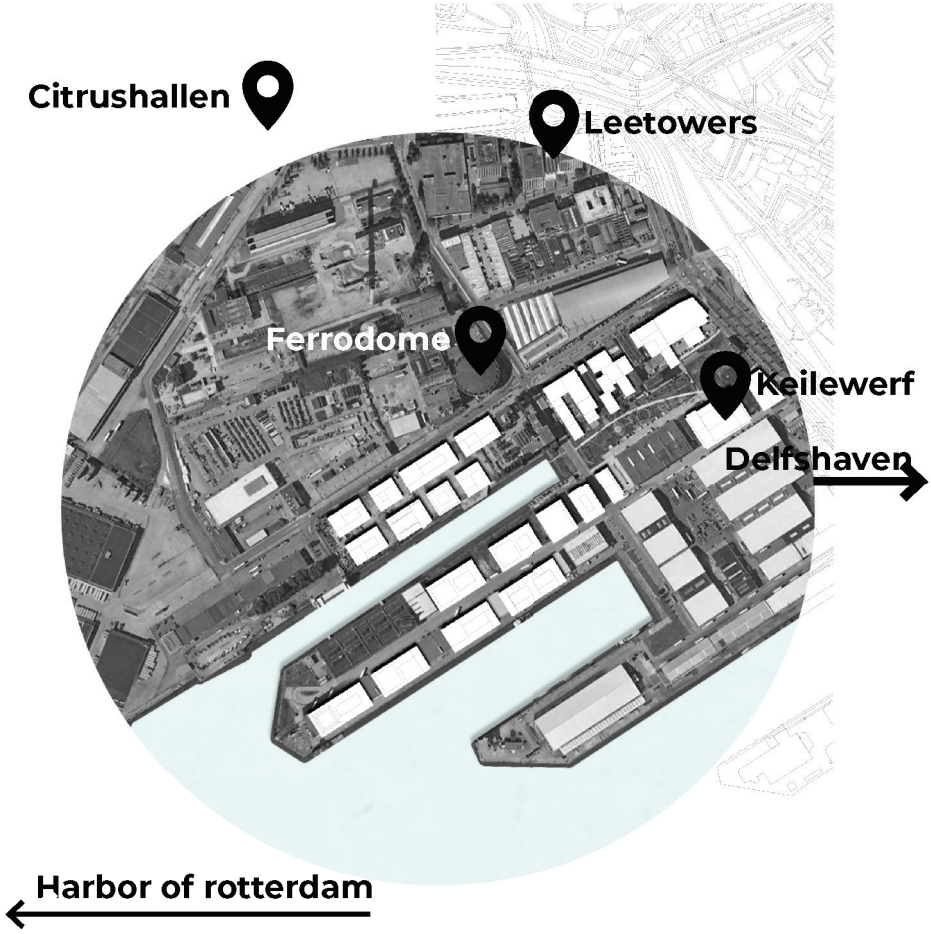


By having multiple access points towards the gallery other than their frontdoor residents have more freedom to include alternative functions in their dwelling

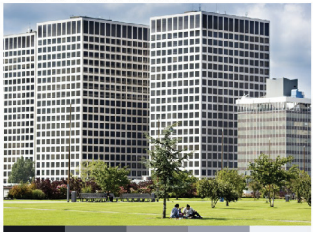
LAYER 4: THE SKIN




Rigid
Flexible
Permanent
Temporary
Architect
User
First resident
All residents


Citrushallen
Leetowers
Ferrodome
Keilewerf
Delfshaven
Harbor of rotterdam

Lee towers



In the keilewerf, the Leetowers currently dominate the skyline. The lee towers are defined by long orthogonally arranged lines. The three sister towers make use of a very sober two-tone color palette.

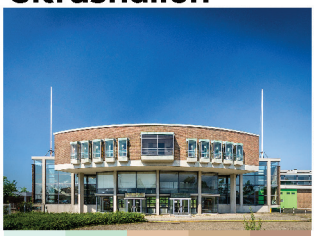
Ferrodome

Right next to the keilewerf is an old light blue silo. This bright sky blue makes the ferrodome stand out between its brick and steel sheets surroundings.

Delfshaven

Not far from the keilewerf you can find a small part of historic Rotterdam, Delfshaven. The area of Delfshaven is characterized by its brown brick color palette.

Citrushallen

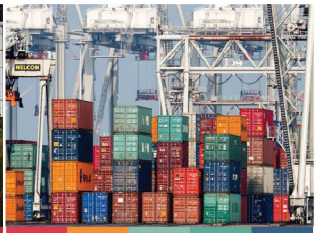


The citrushallen are a staple in the keilewerf area. From this location, all the fruits that arrived in the harbor were sold and distributed across Europe. The building uses a combination of brick and copper detailing.

Keilewerf 1

Keilewerf 1 is one of the first projects in the keilewerf to be converted from a harbor function to a new maker space. Due to its pioneering character, the building captures the ruggedness of the keilewerf perfectly. The building also adds a much-needed splash of color to the area.

Rotterdam Harbor

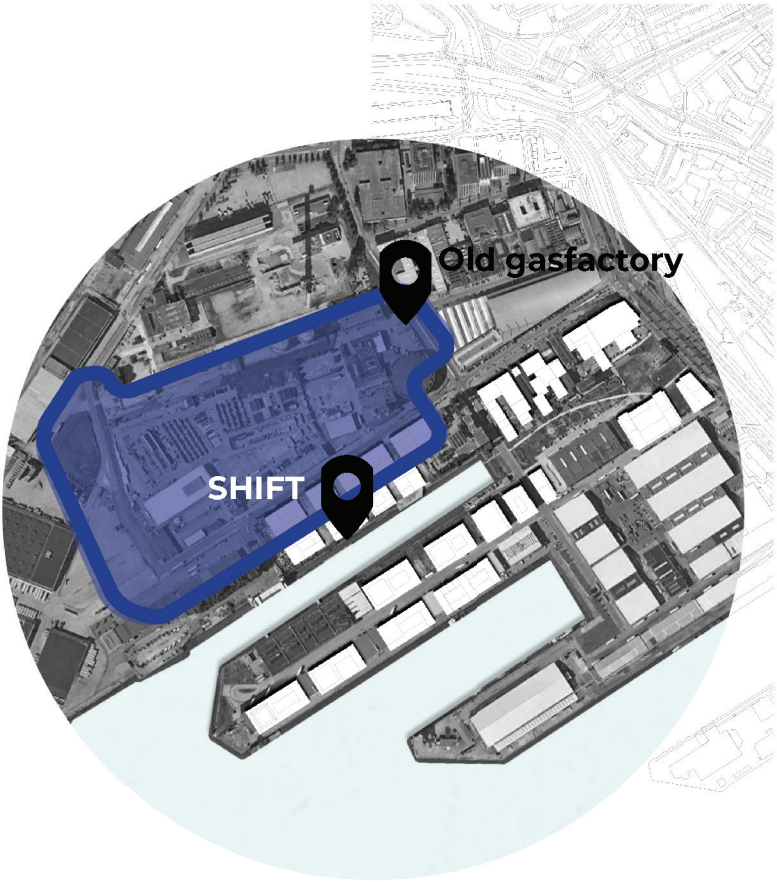


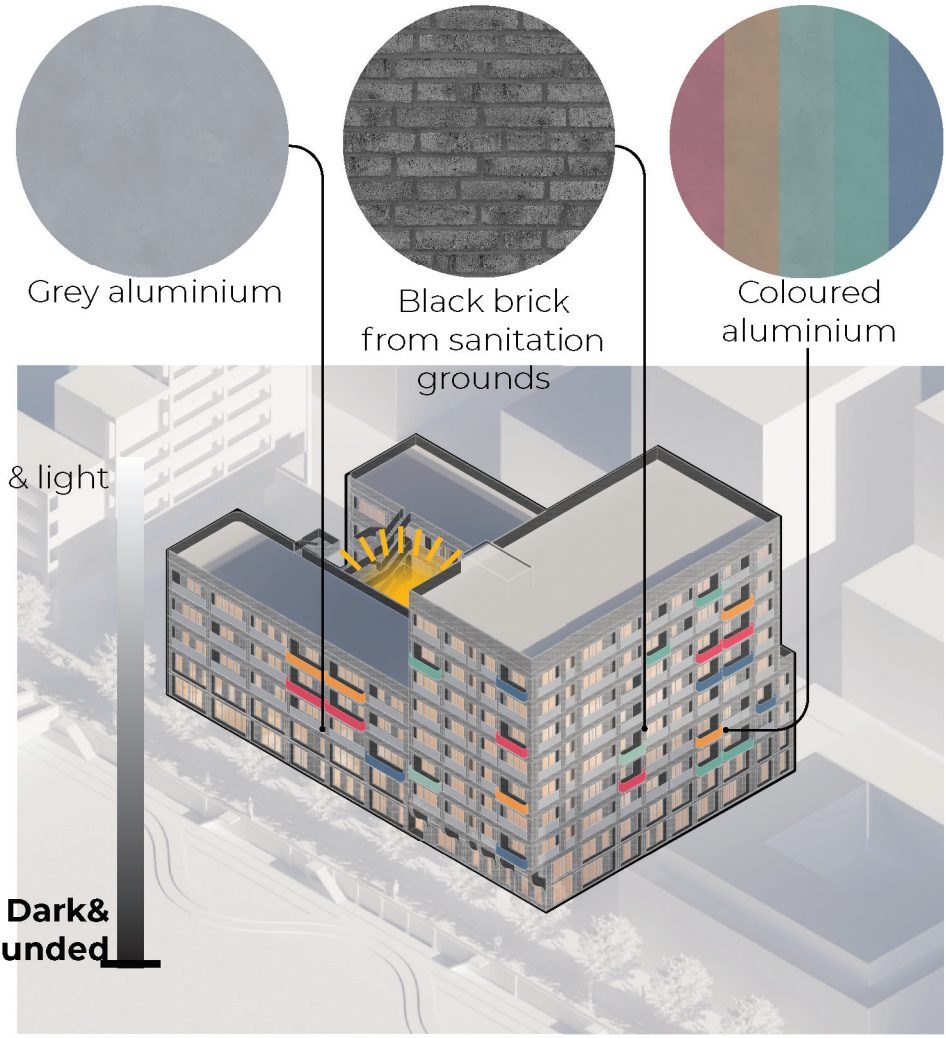
Much like any harbor in the world the harbor of Rotterdam is characterized by its widespread use of bright and colorful containers. constantly moving and being rearranged into new configurations.

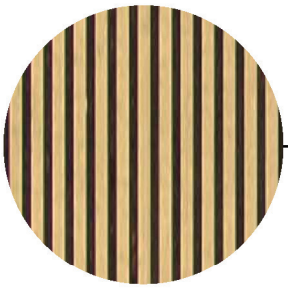
Brick from sanition ground

StoneCycling was conceived at the Design Academy in Eindhoven, The Netherlands.
Then student, Tom van Soest focused on upcycling waste he found in vacant buildings awaiting demolition.

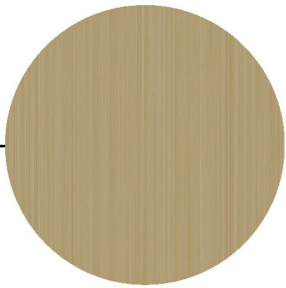
Tom began grinding, crushing, and mixing this waste in his homemade industrial blender and after many, many trials —and even more errors— he found a way to create new materials that were both resilient and appealing.


Old gasfactory
SHIFT

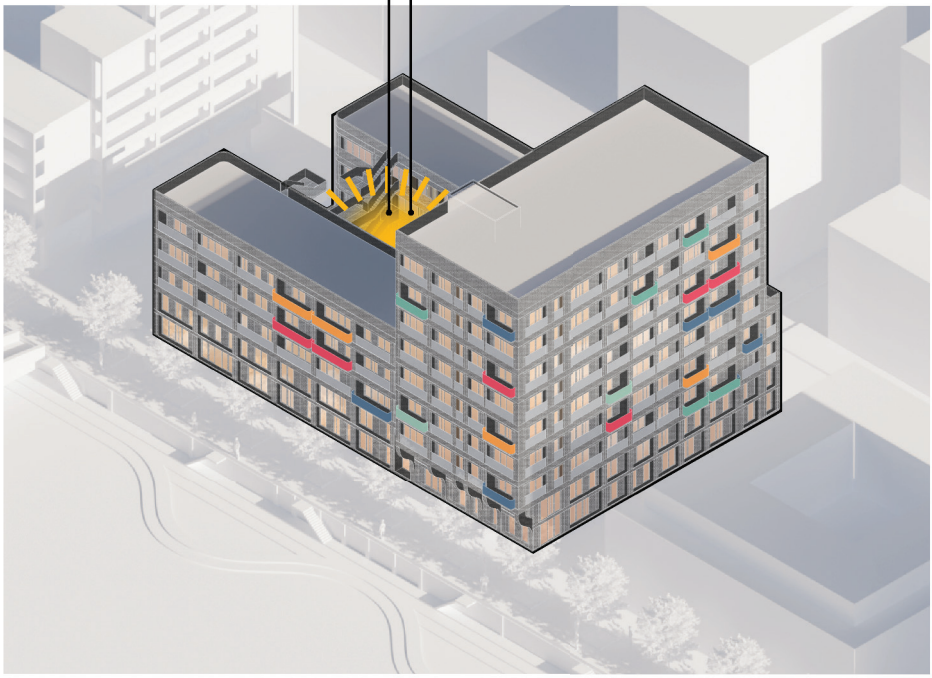

Grey aluminium
Black brick from sanitation grounds
Coloured aluminium
Airy & light
Dark& grounded



Profiled Wood

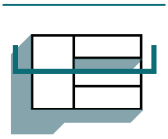


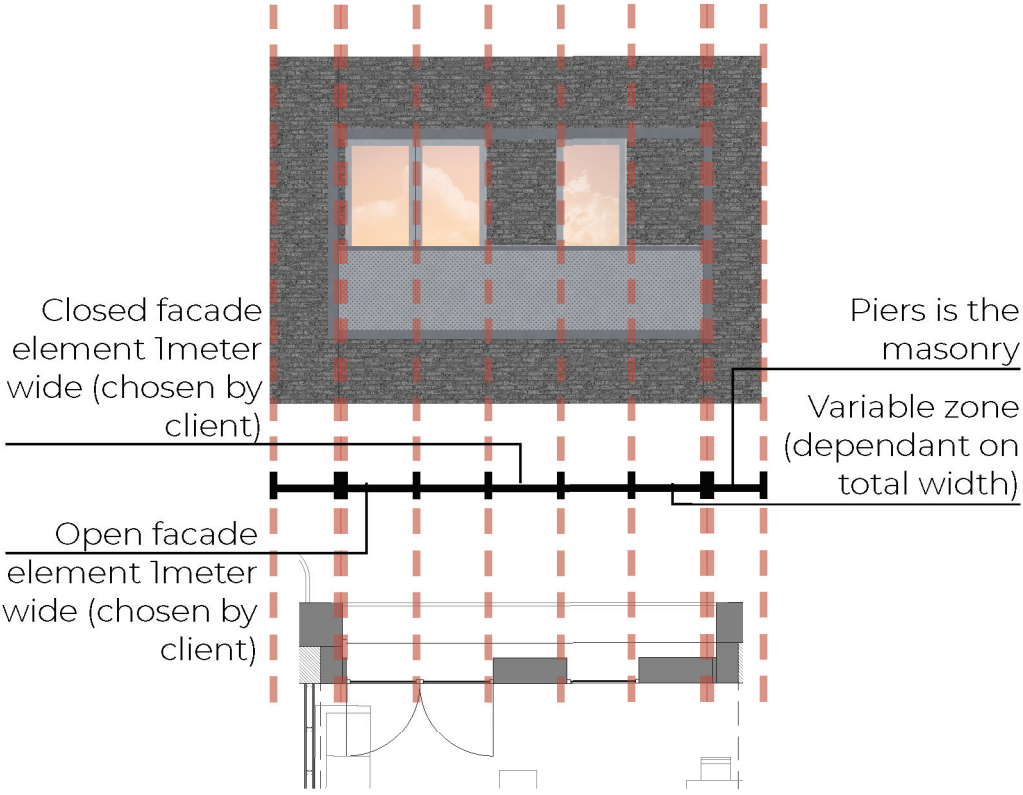
Golden aluminium




2
4
6
8
10
20 meter


0
2
4
6
8
10
20 meter

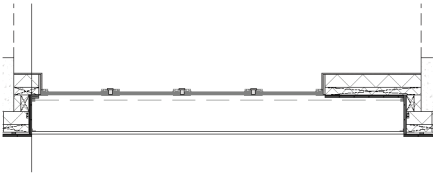


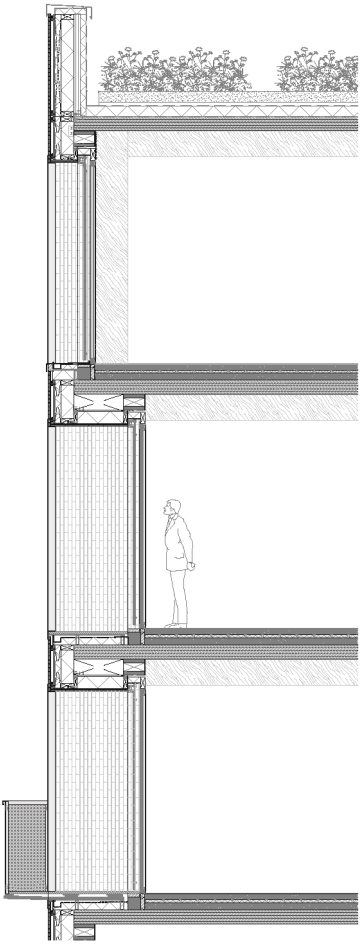

Closed facade element 1meter wide (chosen by client)
Piers is the masonry
Variable zone (dependant on total width)
Open facade element 1meter wide (chosen by client)

Normal window

Loggia

Balcony

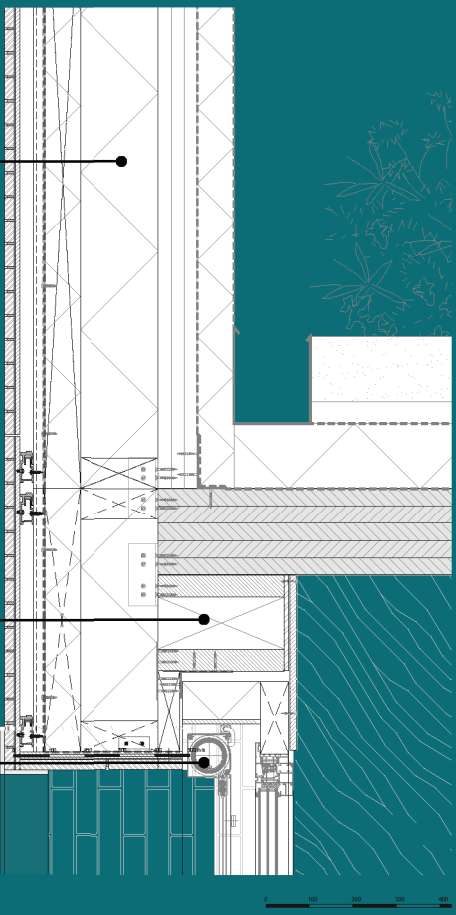


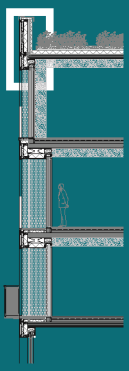


Facade system
Stone cycling Waste based strips
Trespa TS210 aluminium profile
Isovlas pn 180
Isovlas pn 90

Adjustable guiding element
220mm spruce wood
10mm plasterboard

Window system
97mm Reynaers
Masterline 8
Schellekens sun
protection



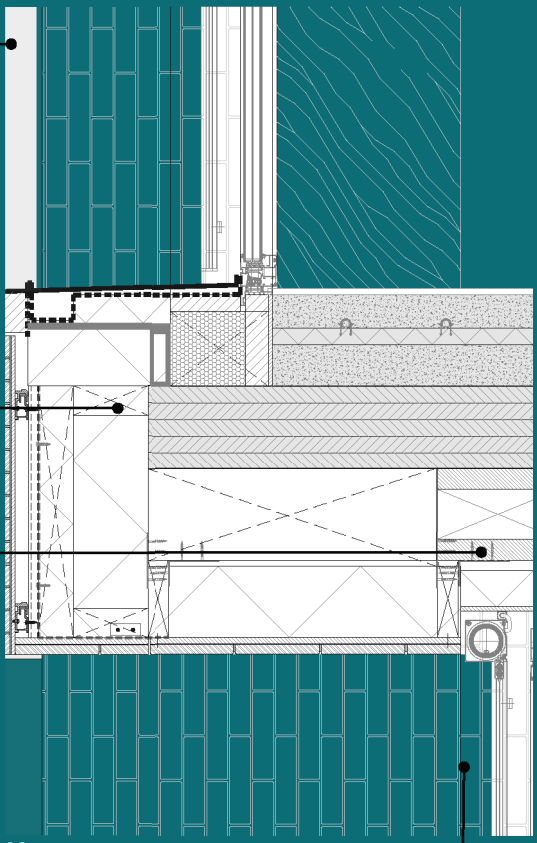


Balcony fence
Straight aluminium fence

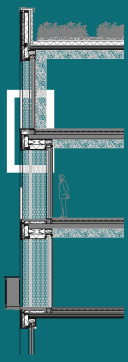
Facade system
Stone cycling Waste based strips
Trespa TS210 aluminium profile
Isovlas pn 180
Isovlas pn 90

Adjustable guiding element

220mm spruce wood
10mm plasterboard



Window system
97mm Reynaers Masterline 8
Schellekens sun protection



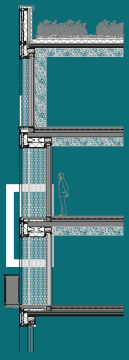
Balcony fence
Straight aluminium fence

Steel loggia structure

Facade system
Stone cycling Waste based strips
Trespa TS210 aluminium profile
Isovlas pn 180
Isovlas pn 90

Adjustable guiding element
220mm spruce wood
10mm plasterboard

Window system
97mm Reynaers Masterline 8
Schellekens sun protection

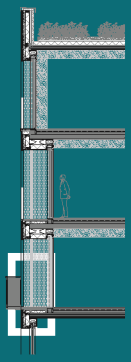


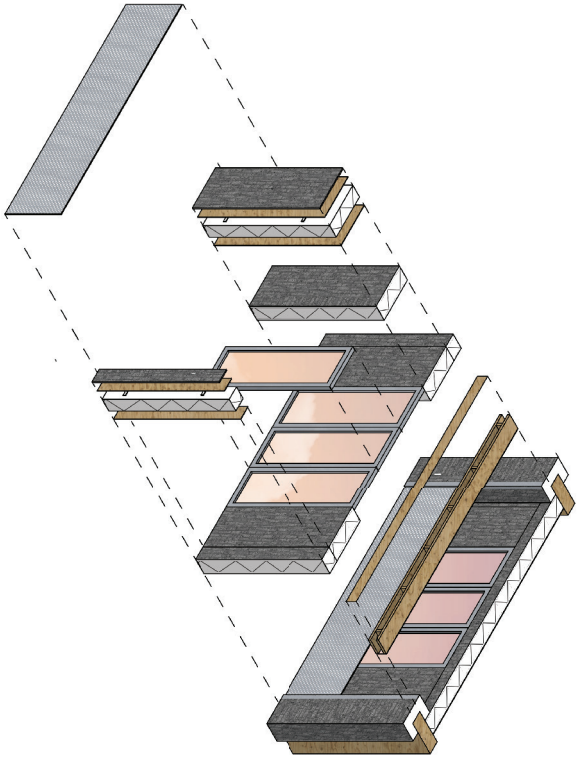
Balcony fence
Curved aluminium fence

Steel balcony structure

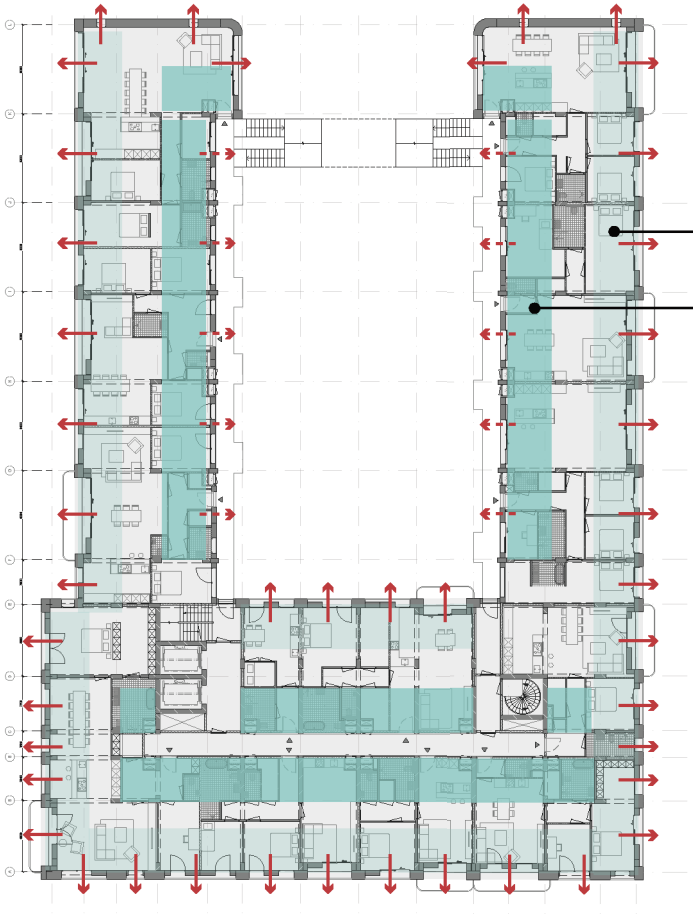
Adjustable guiding element
220mm spruce wood
10mm plasterboard

Window system
97mm Reynaers Masterline 8
Schellekens sun protection

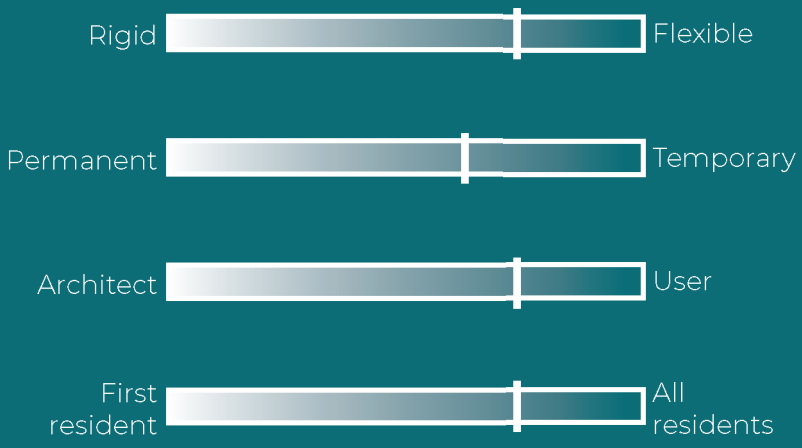




Layer 4: The skin

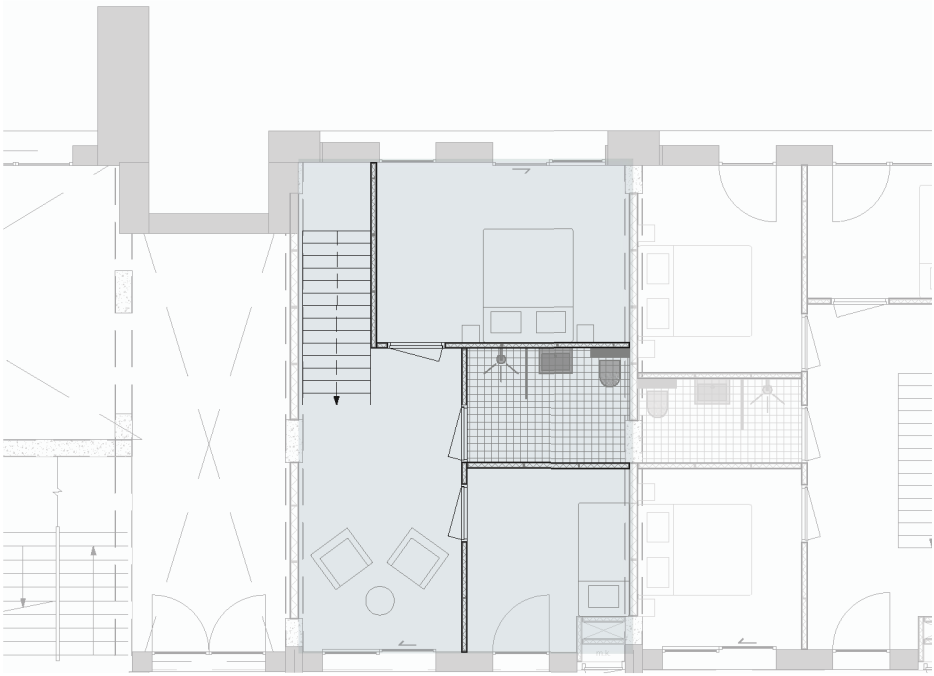

‘Lightzone’
‘Darkzone’

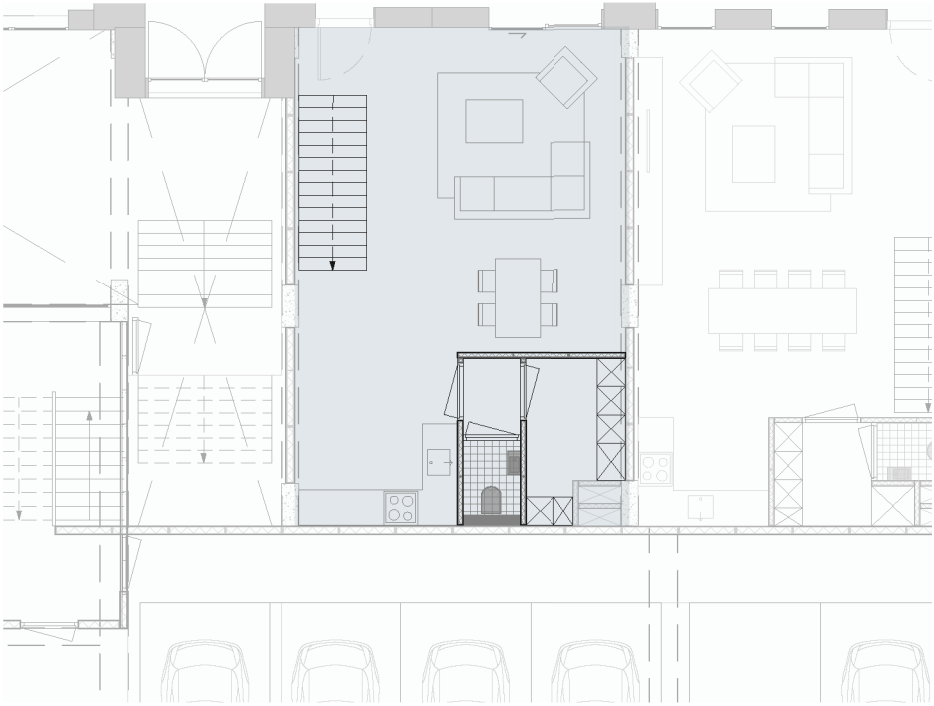
LAYER 5: THE STAGING OF SPACE


Rigid
Flexible
Permanent
Temporary
Architect
User
First resident
All residents

SPACE
[BOX]²

[box]² is a A prefab modular wall system. Easy to integrate into a design using the digital library of walls, roofs and facades. Computer-controlled produced with an accuracy of $^{0.1}$mm.





APARTMENT: VAN TEWISGA

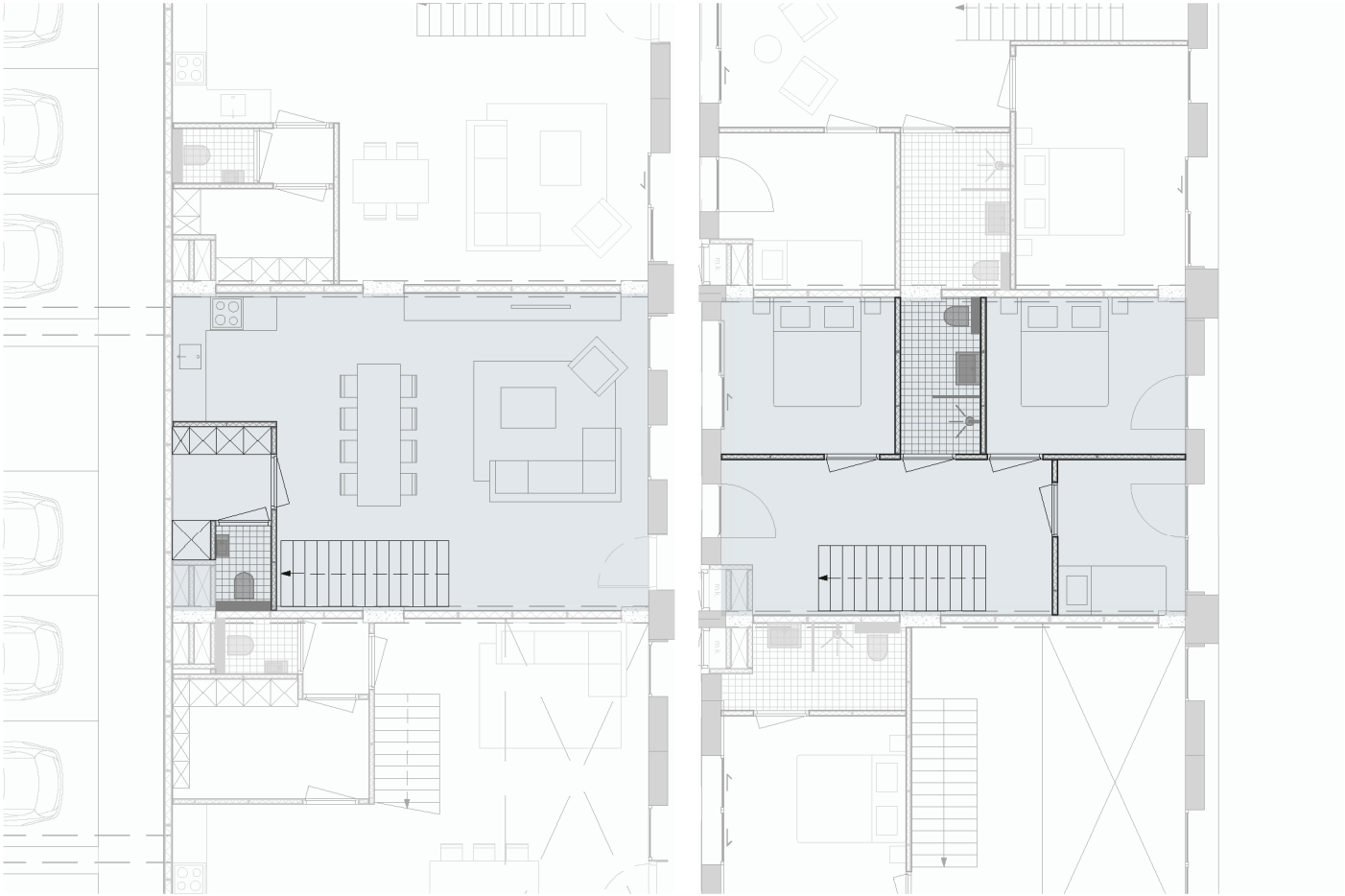
25-year-old man, naval Architect

Currently, van Terwisga lives with his girlfriend and their dog in a social housing single-family housing unit. Due to a change in employment van, Terwisga would like to move to Rotterdam, because he is not keen on moving multiple times in the near future, he would like a single-family house that can adapt to his future needs.

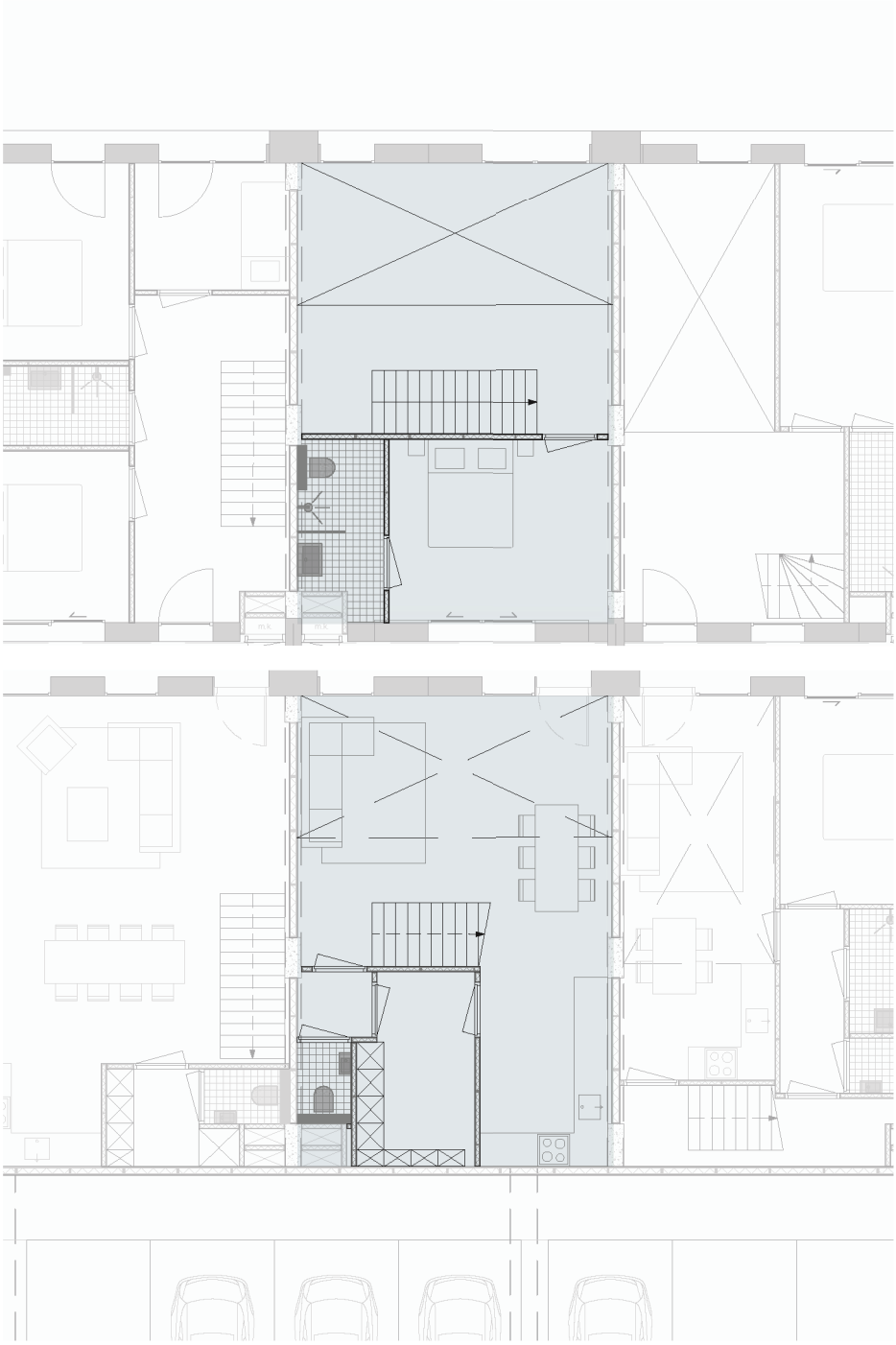
APARTMENT:
DE WILT

24-year-old man, recent graduate mechanical engineering

De Wilt lives together with his girlfriend. He wants a spare bedroom as well as a study. In the next 10 years, he is planning to get two children, so the possibility of adding additional spaces would be greatly appreciated.



Layer 5: The staging of space



APARTMENT: TER HAAR

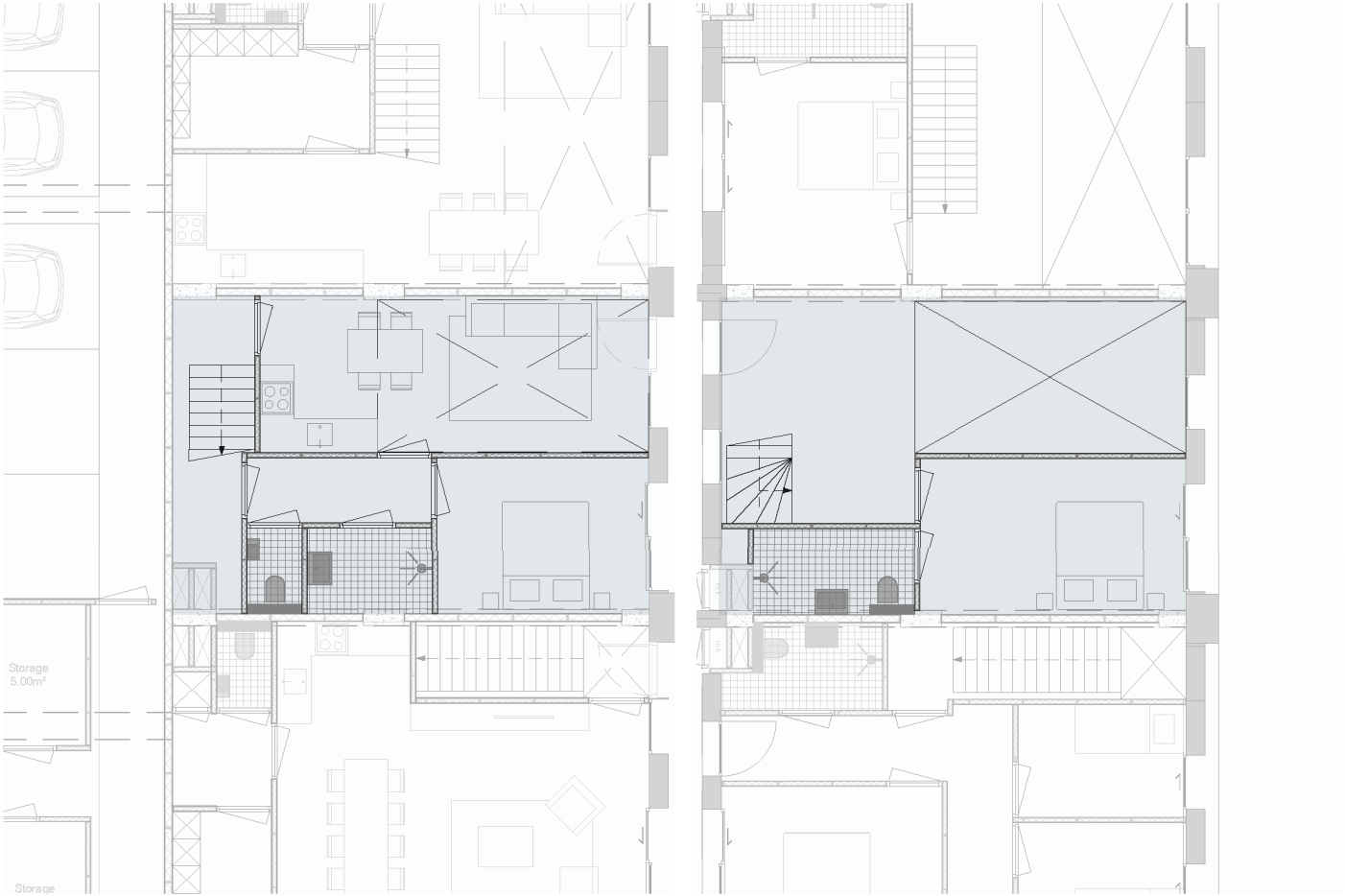
25-year-old man, recent graduate applied physics

Ter Haar lives with roommates and looking to start living on his own and planning to start a family in the next 10 years. At the moment he wants a moderately sized apartment with the possibility of expanding it slightly in the future.

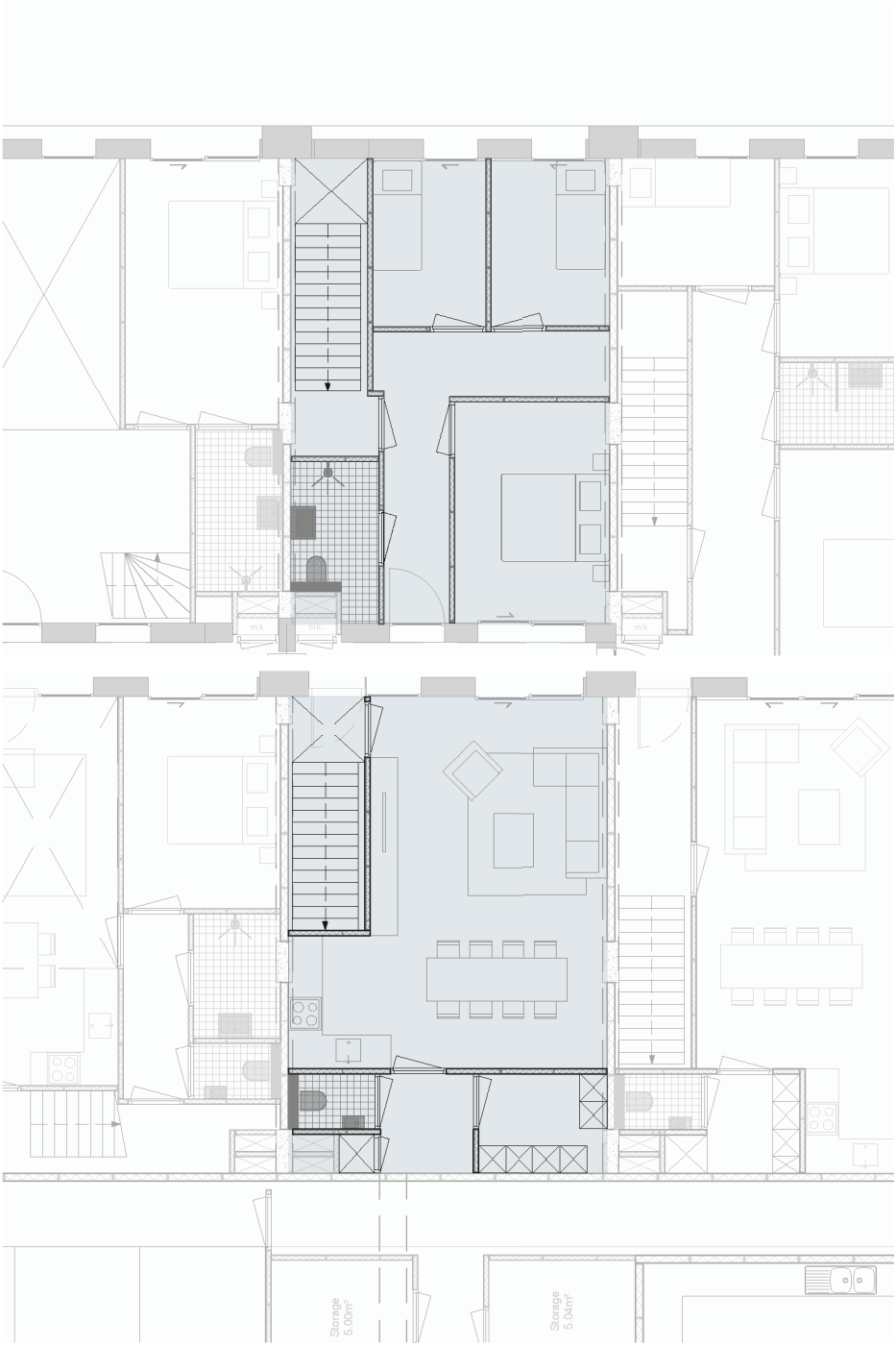
APARTMENT: DALL 'AGNOL

30-year-old woman, recent graduate psychology

Dall 'Agnol currently wants a small apartment to share with her boyfriend but wants to start a small family in the future, and would like to live in a single-family housing unit then.



Layer 5: The staging of space


m.k.
m.k.
m.k.
Storage
5.00m²
Storage
5.04m²

APARTMENT: NUGRAHA

29-year-old man, recent graduate architecture

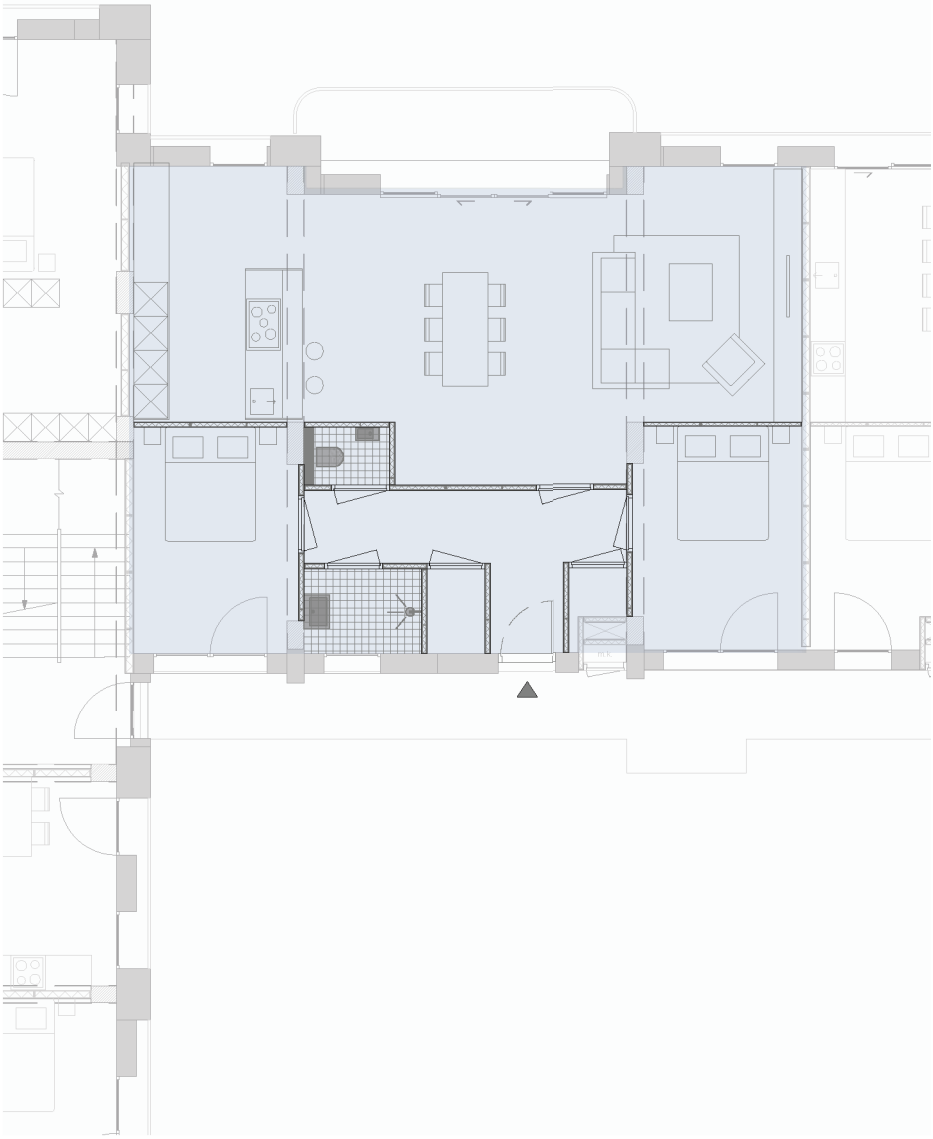
Nugraha would like to buy an apartment in Rotterdam. He currently has a small daughter that will need her bedroom, in the near future she can share it with additional siblings but it would be nice if additional rooms can be added to the apartment.

APARTMENT: VENDERINK

29-year-old man, IT trainee

Venderink wants to move from his apartment in Delft to a single family house in Rotterdam with a small garden.

Layer 5: The staging of space



APARTMENT: DE LEEUW

24-year-old man, student management

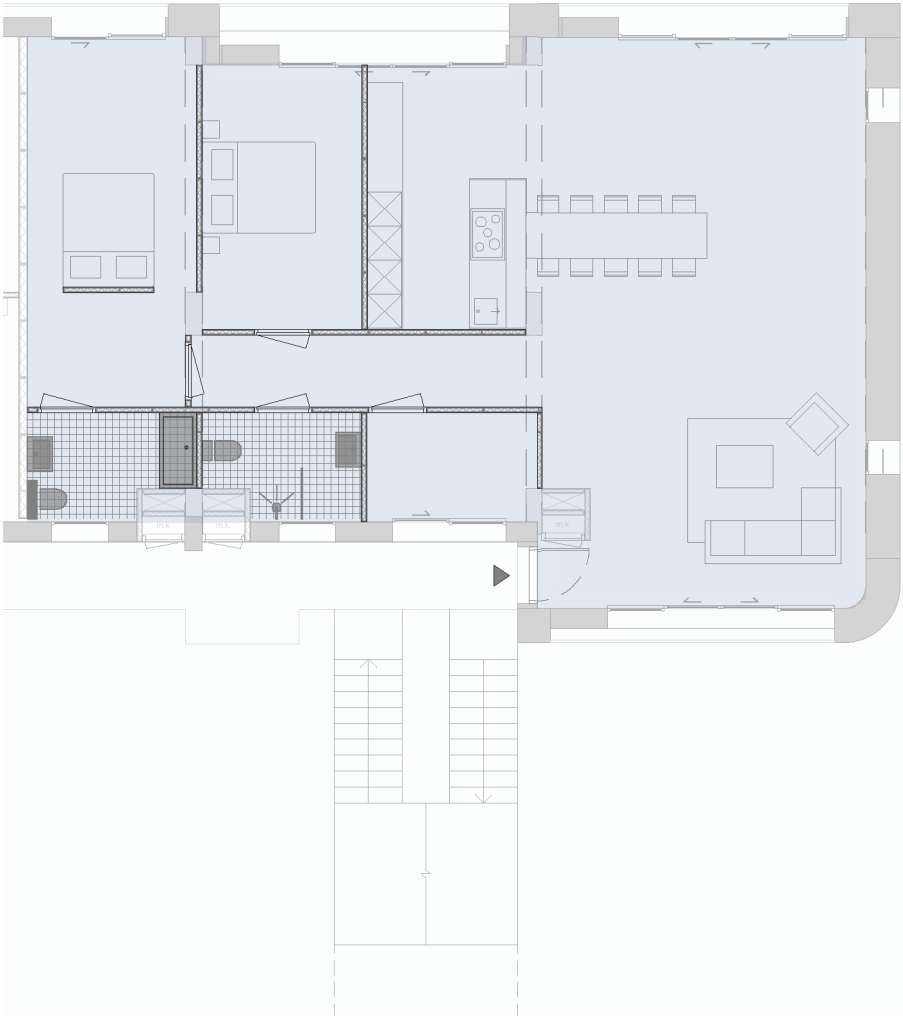
As an upcoming master student de Leeuw wants to move to a more quiet environment. For this reason, his parents help him with buying an apartment in Rotterdam where he can live after graduating as well. In order not to completely abandon his student life, de Leeuw would like to have a two-bedroom apartment so he can still live with a roommate, and in the future this room can be used as a spare bedroom.

APARTMENT: WINTERS

26-year-old man, recent graduate mechanical engineering

Winters is ready to leave his student life behind and move in with his girlfriend, together with some help from their parents they can afford a 3-bedroom apartment, because of the modular building system they can now choose to have a larger living room and add the additional rooms in the future.

Layer 5: The staging of space



APARTMENT: MAGGIONI

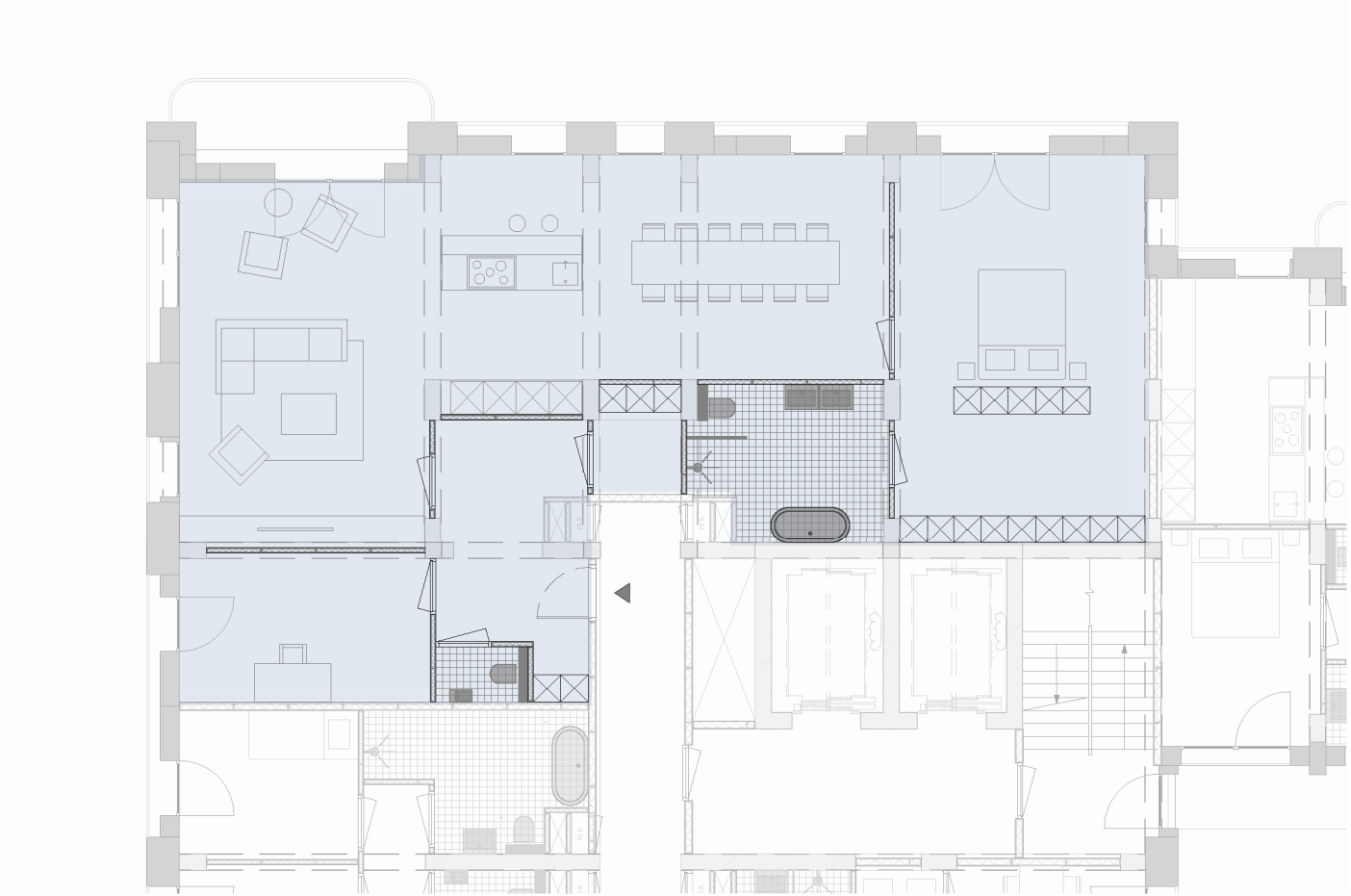
61-year-old woman, retiree

Currently living in a large home but ever since her daughter moved out this house has become too large and the garden has become too much trouble. For this reason, she would like an apartment with a large living room where she can entertain guests but without too many additional rooms.

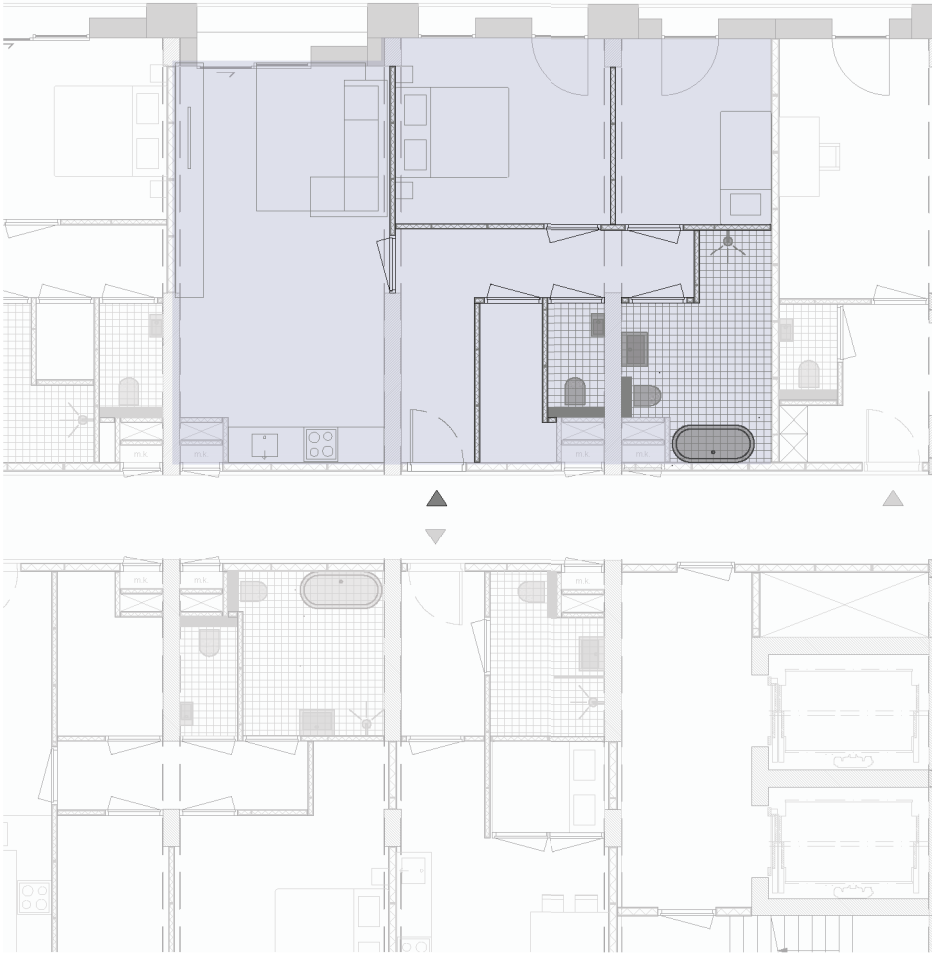
APARTMENT:
ROSA

57-year-old woman, personal assistant

Rosa currently lives in a large home but ever since her two children moved out this house has become too large For this reason, she would like an apartment with a large living room where she can entertain guests, additionally she would like to have a study and a large storage space.



Layer 5: The staging of space



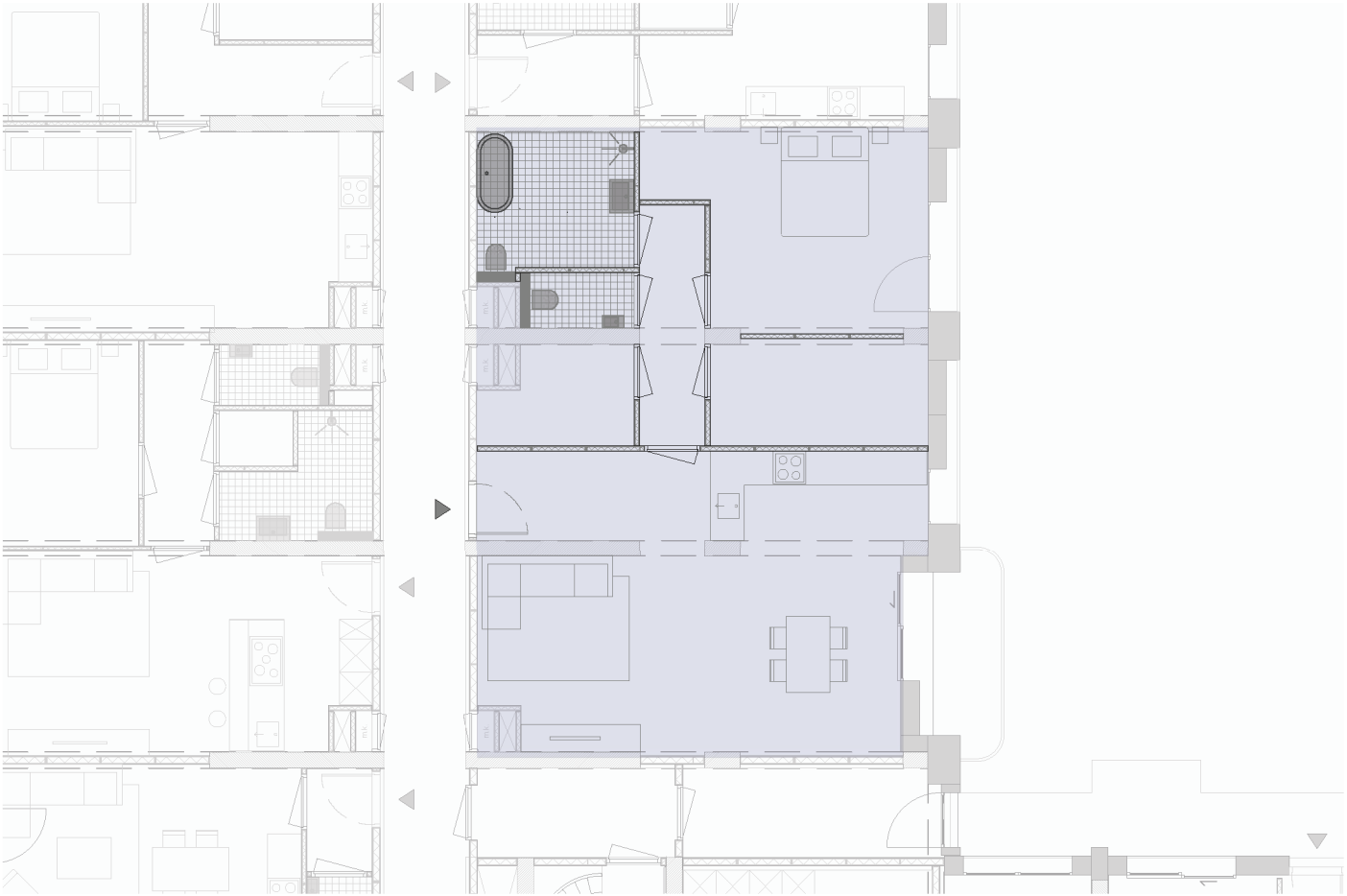
APARTMENT: RONCHI

31-year-old woman, architect
Ronchi has no children but lives together with her partner. She wants a second bedroom in case her mother comes to visit and needs to stay for a few nights and a large living room with an attached kitchen.

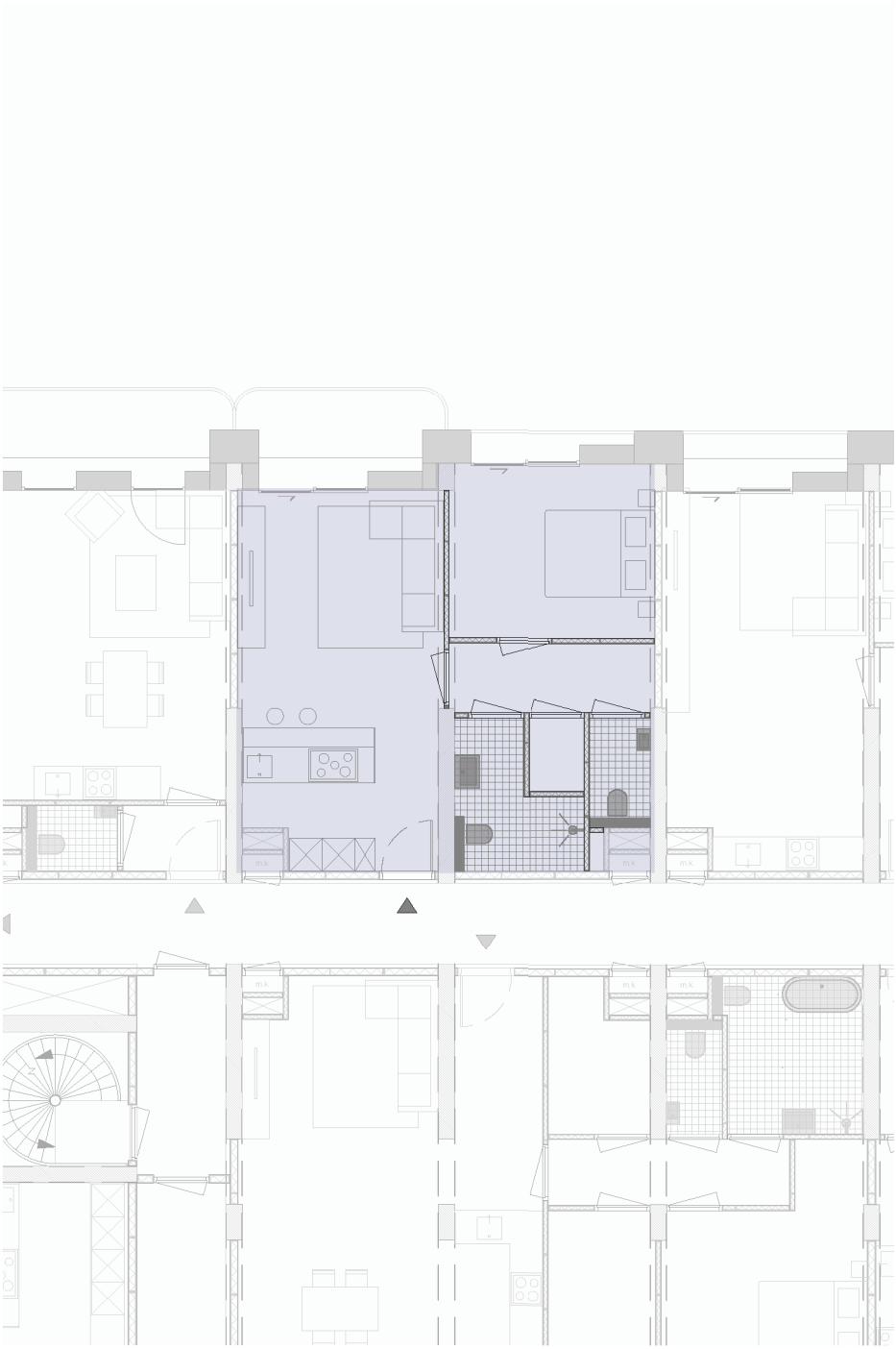
APARTMENT:
KOK

26-year-old man, recent graduate architecture

Kok is currently living with roommates, but looking for a place on his own in Rotterdam. As is only fitting with a last name as ‘Kok’ Kok is an avid hobby cook, so he wants a moderately sized living room with a large attached kitchen.



Layer 5: The staging of space



APARTMENT: SLEBIODA

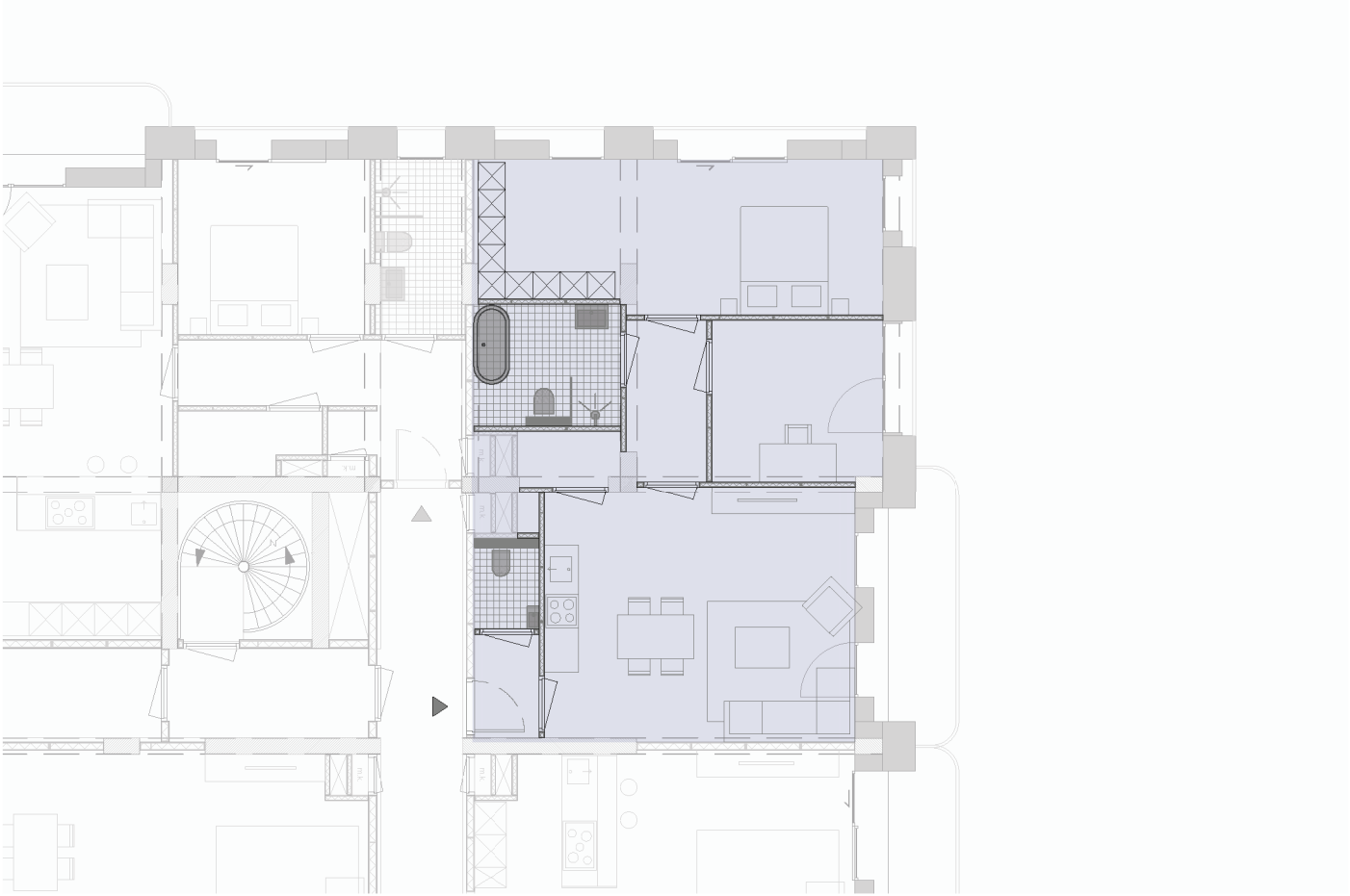
24-year-old man, student mechanical engineering

As a master student Slebioda wants to move to a more quiet environment. For this reason, his parents help him with buying an apartment in Rotterdam where he can live after graduating as well. Slebioda wants a small one-bedroom apartment where he can host friends for small get-togethers.

APARTMENT: YILEE

24-year-old woman, accountant

Yilee currently lives alone but she is planning to start a family in the next 10 years. At the moment she wants a small apartment with the possibility of expanding it in the future.



Layer 5: The staging of space

APARTMENT: PONZANELLI

47-year-old woman, business developer

Ponzanelli is self-employed and wants to have space where she can work undisturbed, and two bedrooms so she can host her entire family when they come to visit.

APARTMENT: SESANA

60-year-old woman, retiree

Sesana currently lives with two of her three children, but these are likely to move out in the near future, so for this reason she would like to move to an apartment without all the additional bedrooms, but with a large living room.

Layer 5: The staging of space

APARTMENT: GROENEN

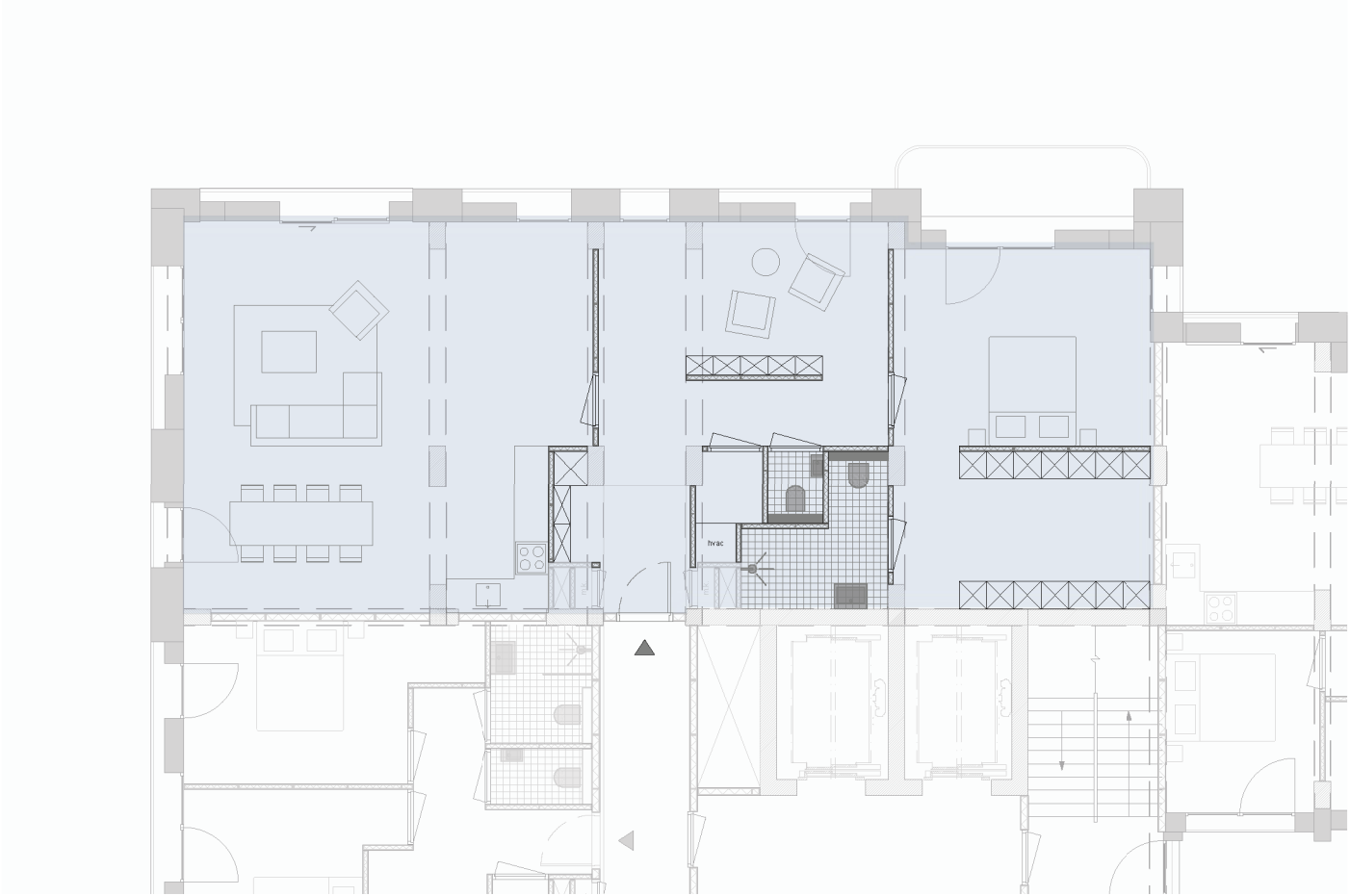
25-year-old man, student mechanical engineering

Groenen wants to move to a more quiet environment. For this reason, his parents help him with buying a small studio apartment in Rotterdam. Groenen wants a tiny bedroom that can be closed off from the living room, with the largest living room that space allows.

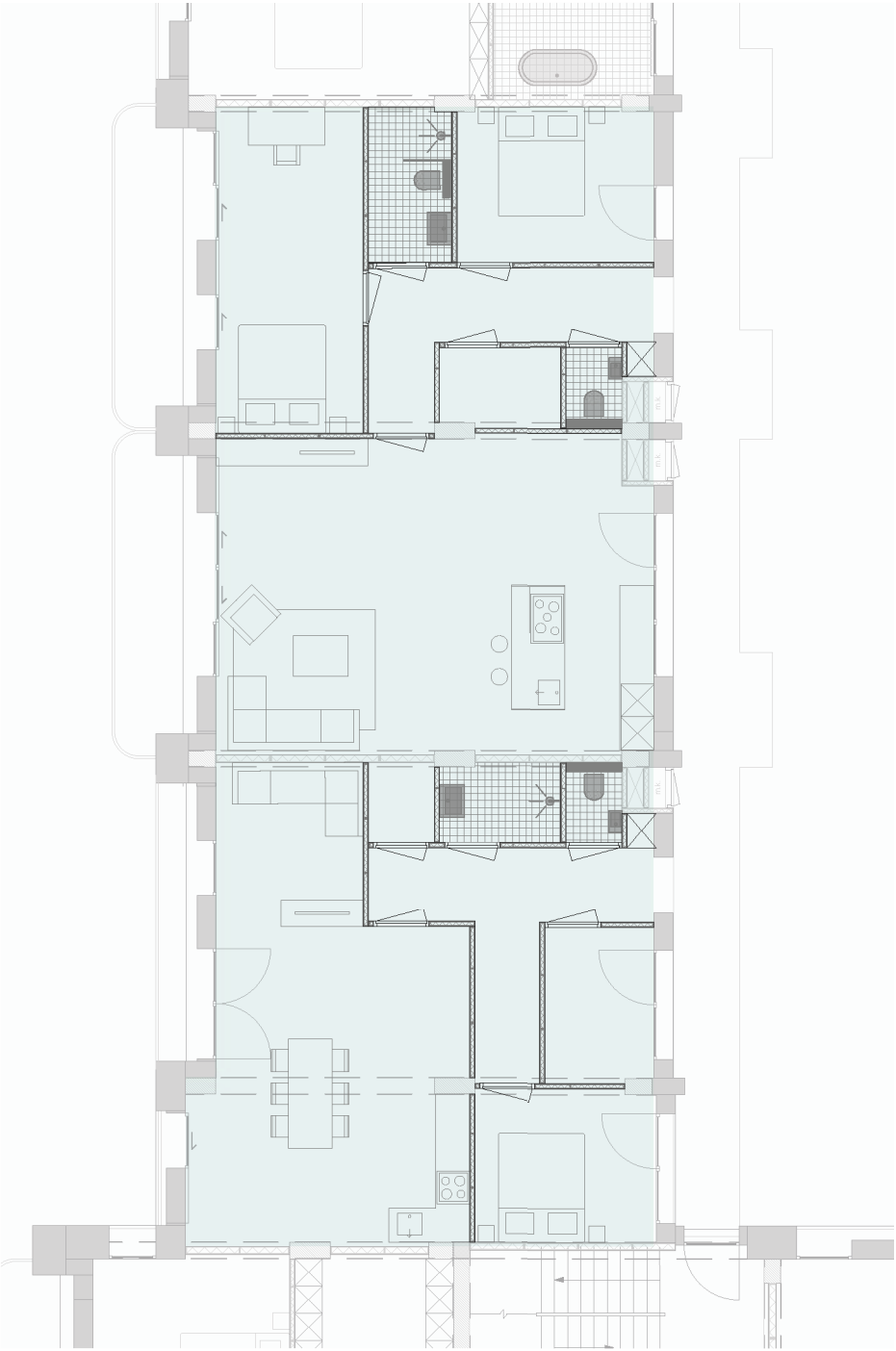
APARTMENT: HERMANS

31-year-old man, student mechanical engineering

Hermans would like a large apartment with a huge living room that can be split into multiple additional bedrooms in the future when his personal needs change.



Layer 5: The staging of space



APARTMENT: UITERWAAL

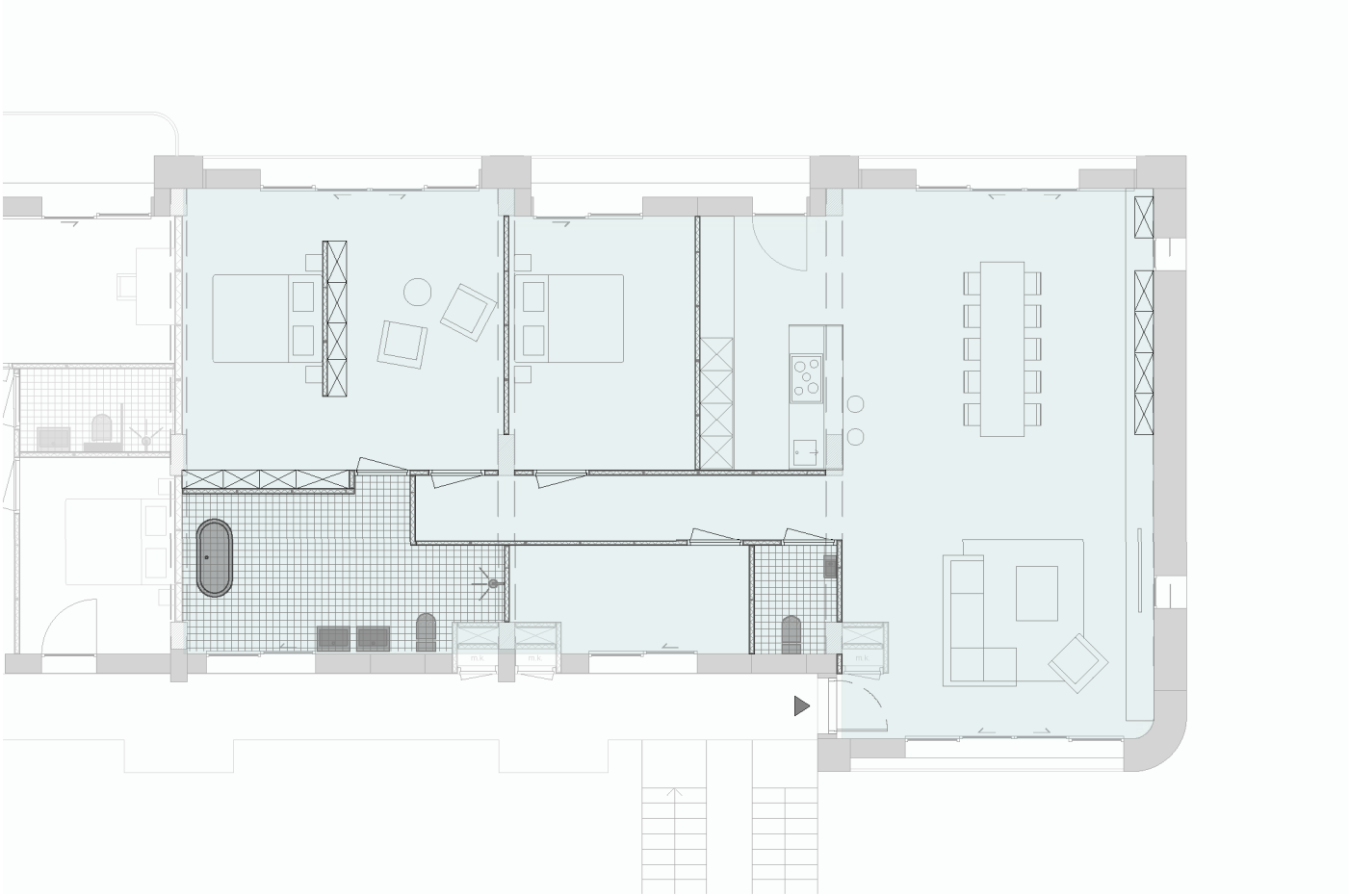
24-year-old woman, recent graduate pedagogy

Uiterwaal currently lives with roommates and looking to start living on her own and planning to start a family in the next 10 years. Her parents can help with the financing of the apartment, due to her wish for a large family she decides to buy two apartments and rent one out, with the possibility of merging the two in the future.

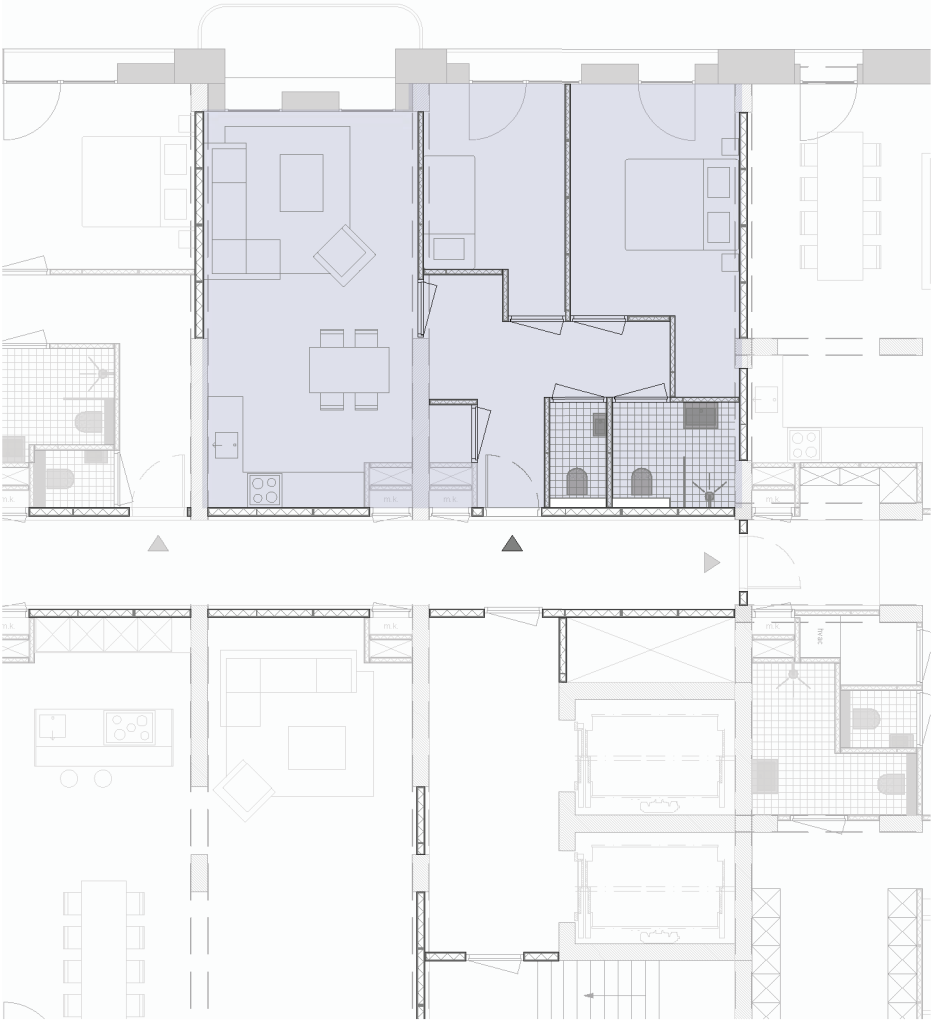
APARTMENT:
DAM

58-year-old woman, entrepeneur

Dam lives together with her husband, she has one son who no longer lives with them. She wants a large open house with a guest bedroom and a huge living room with an attached kitchen.



Layer 5: The staging of space



APARTMENT: DE JONG

26-year-old man, student applied physics

As a master student de Jong wants to move to a more quiet environment. For this reason, his parents help him with buying an apartment in Rotterdam where he can live after graduating as well. In order not to completely abandon his student life, de Jong would like to have a two-bedroom apartment so he can still live with a roommate, and in the future, this room can be used as a spare bedroom.

APARTMENT:
VAN OOSTERHOUDT

26-year-old man, recent graduate mechanical engineering

Van Oosterhoudt currently lives with roommates and is looking to start living on his own and planning to start a family in the next 10 years. At the moment he wants a moderately sized apartment with the possibility of expanding it slightly in the future.

Layer 5: The staging of space

APARTMENT: DE LANGH

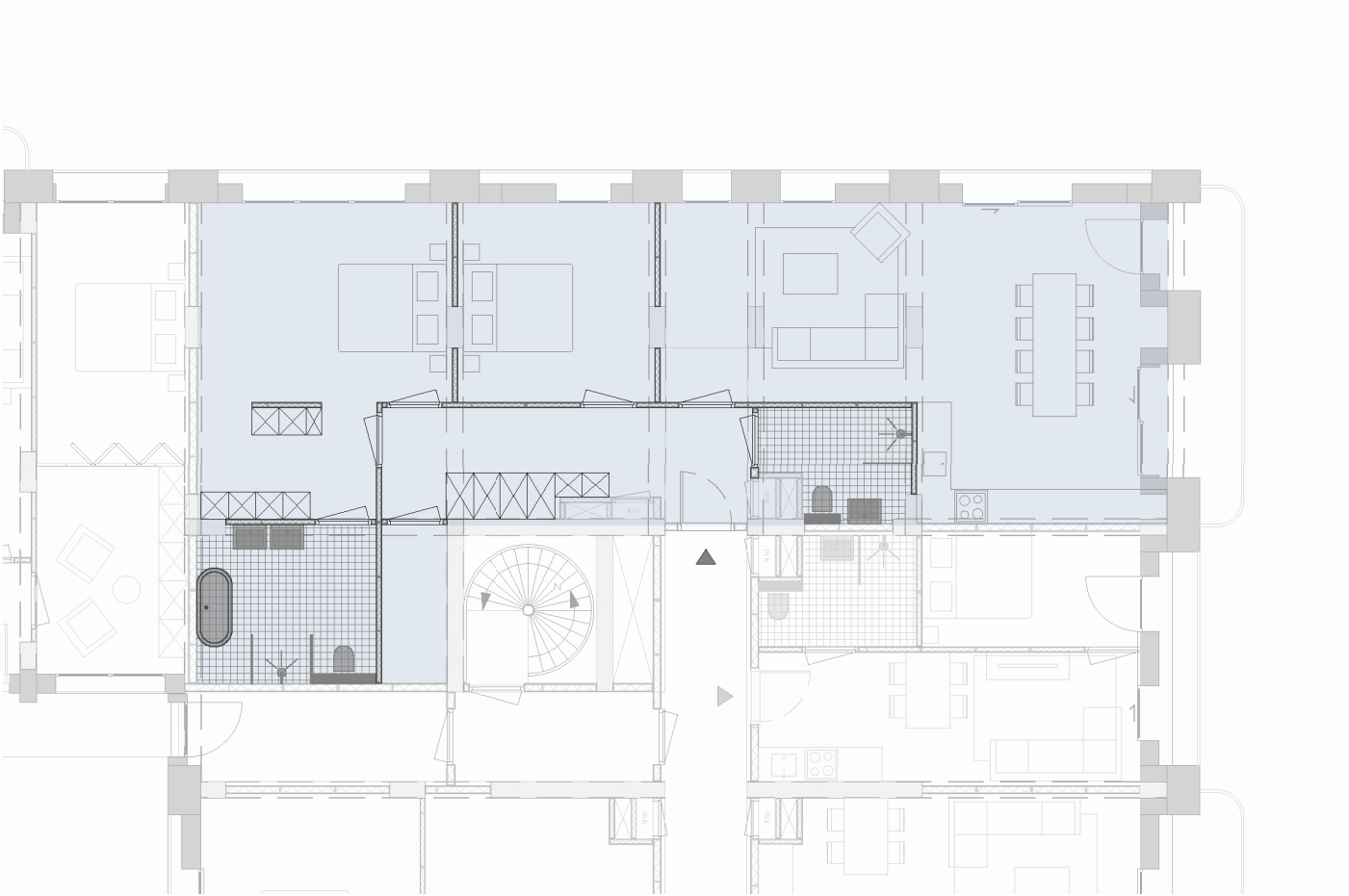
70-year-old woman, retiree

De Langh lives with her husband in her family home with two bedrooms for her children that have since moved out. Because of this, she wants a smaller apartment with an additional hobby room where she and her husband can work on their projects.

APARTMENT: ANDREOTTI

33-year-old woman, architect

Andeotti currently lives in a small apartment in Rotterdam. Because she would like to start her family soon she would like to move to a larger apartment away from the busy city center of Rotterdam. Her living quarters are oversized so they can be split up into smaller sections in the future.



Layer 5: The staging of space

APARTMENT: BRAULT

30-year-old woman, online marketer

Currently, Brault has the means to buy a large multi-bedroom apartment, however, at this moment she doesn't have much need for one. For this reason, Brault has decided to purchase multiple units in the building, which she can later merge into a single large apartment.

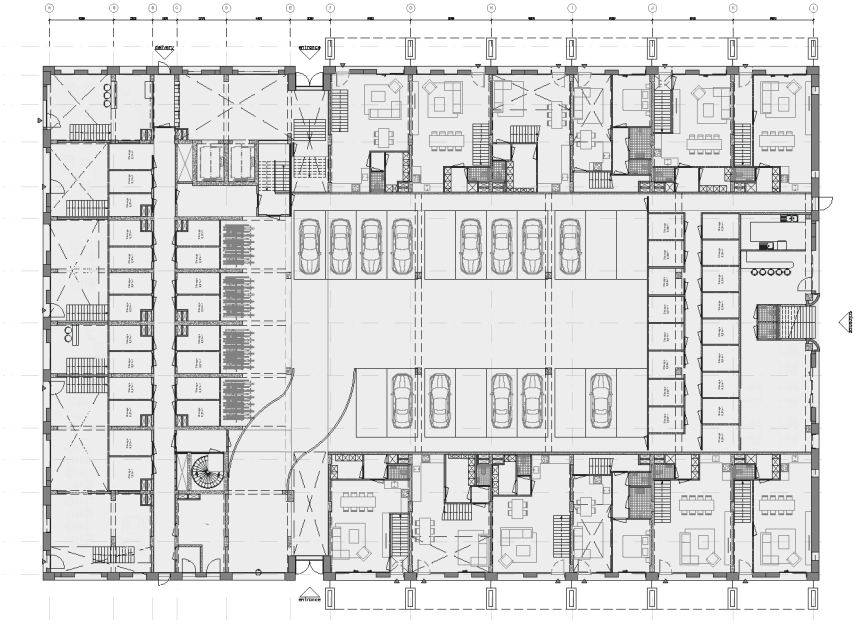
APARTMENT: GOLLÉ

34-year-old man, software engineer

After renting for the past 10 years Gollé is ready to buy his apartment. Gollé would like to live in a gallery apartment so he gets direct sunlight from two different directions. His two-bedroom apartment allows his current lifestyle, as well as future adjustments to his needs.

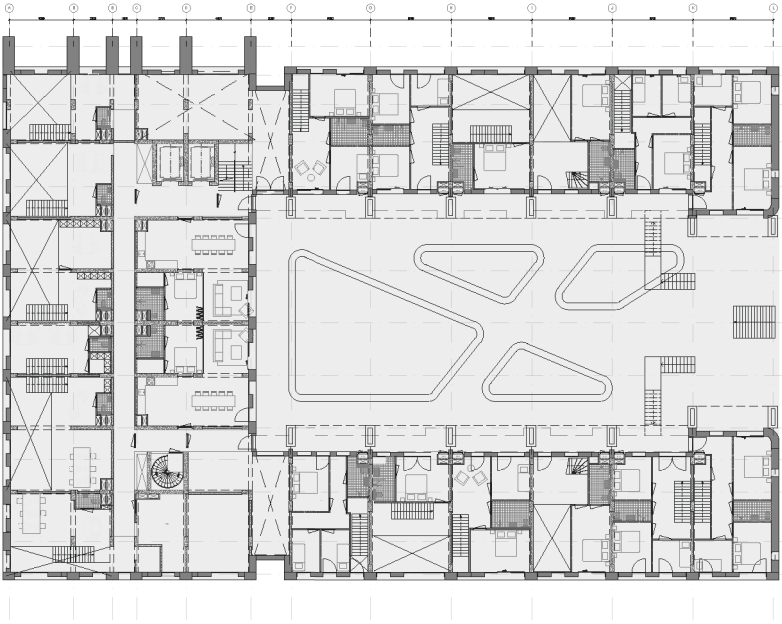
Layer 5: The staging of space

Drawingset



SHIFT

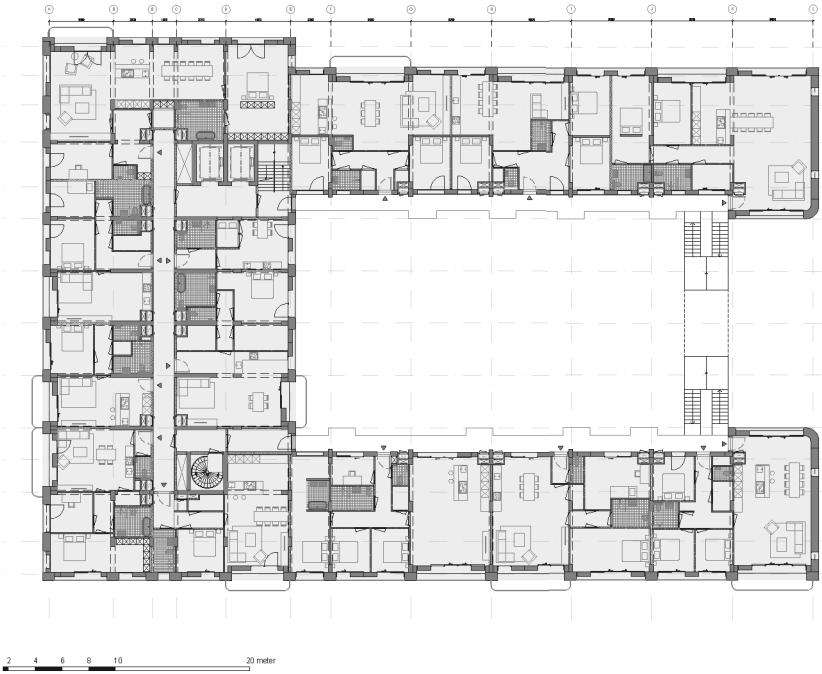
Plans
Groundfloor



2 4 6 8 10 20 meter

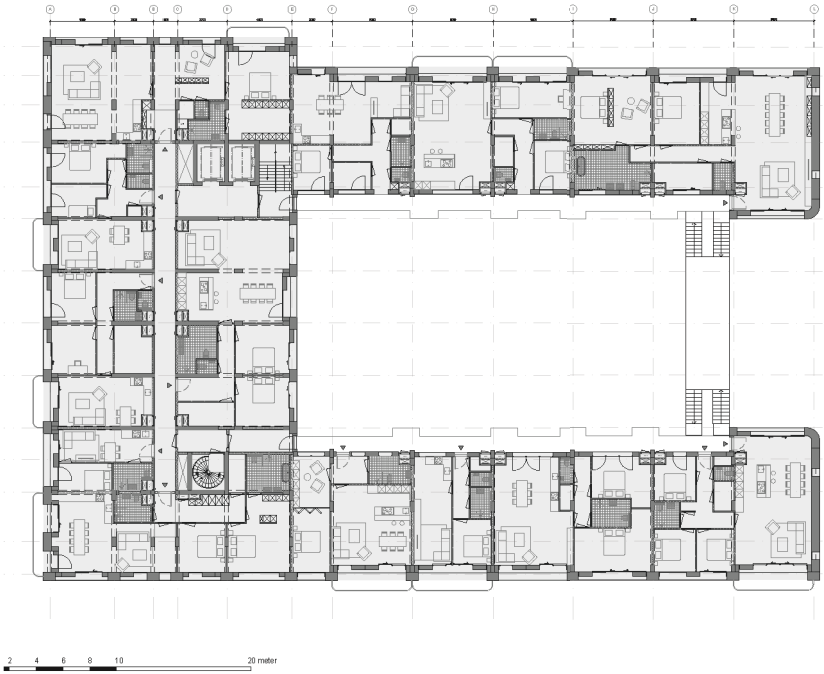
SHIFT

Plans
Firstfloor



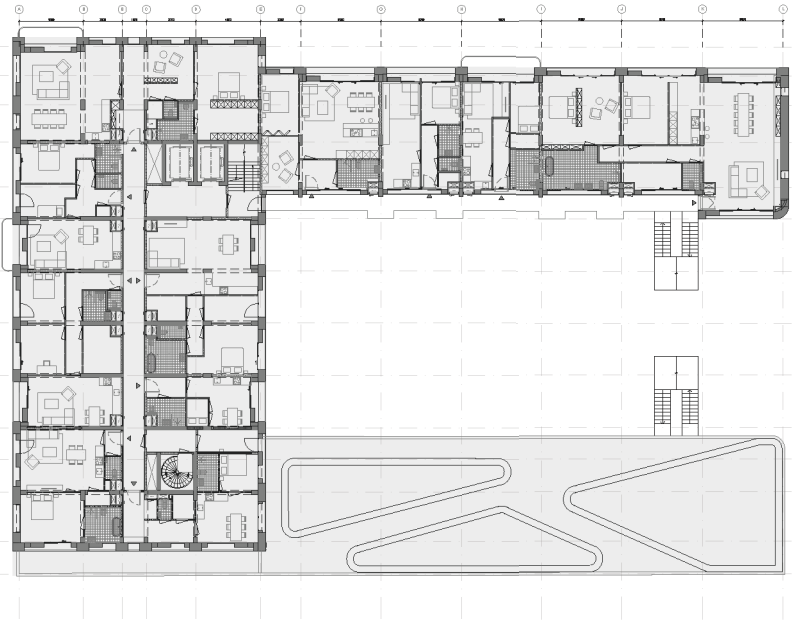
SHIFT

Plans
Secondfloor



SHIFT

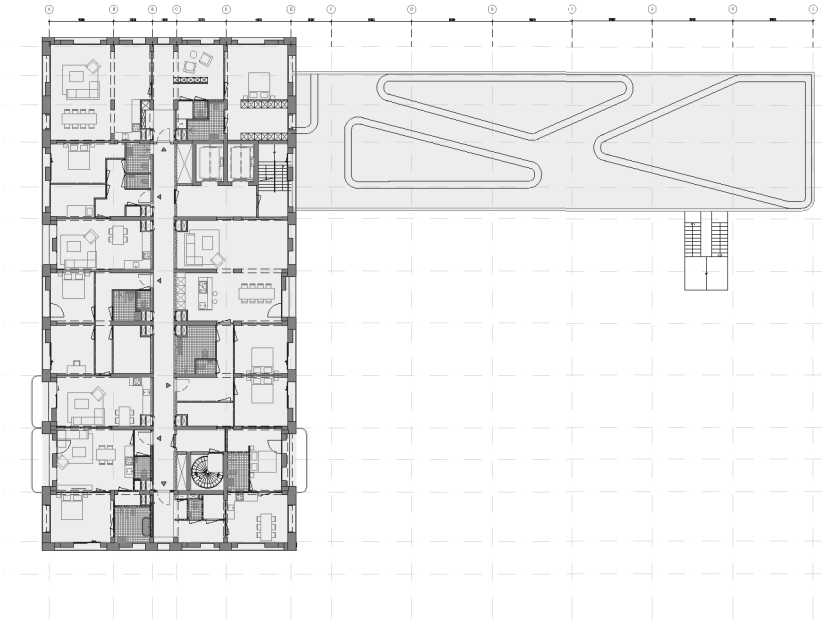
Plans
Thirdfloor



2 4 6 8 10 20 meter

SHIFT

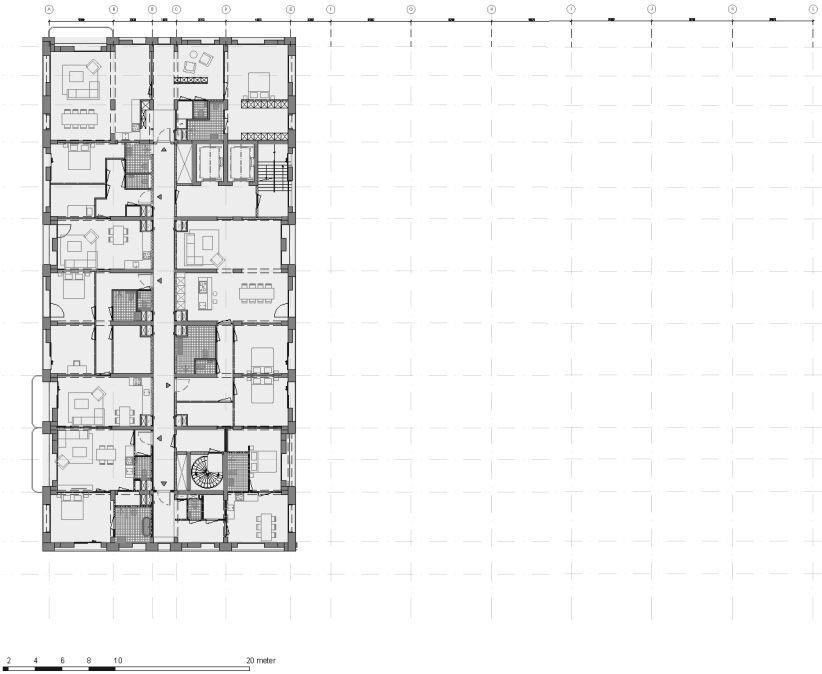
Plans
Fourthfloor



2 4 6 8 10 20 meter

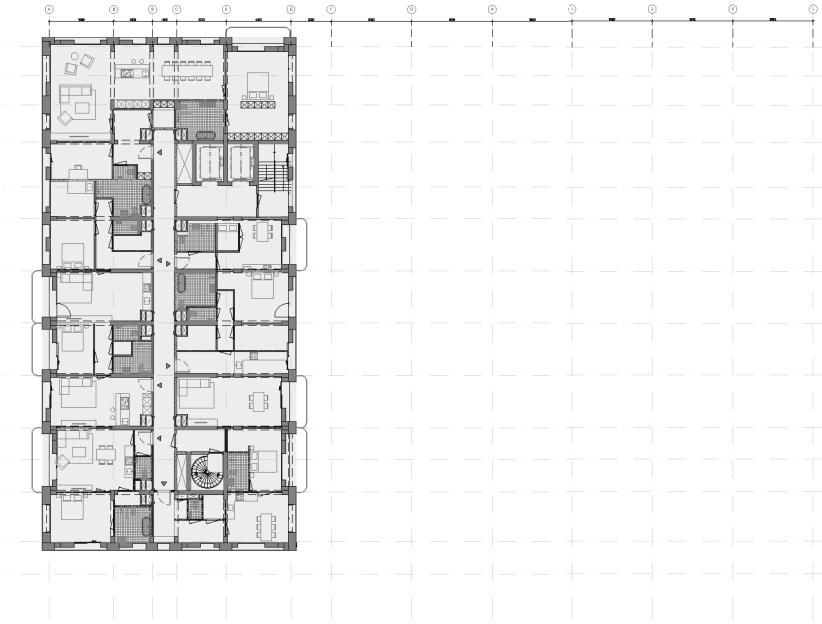
SHIFT

Plans
Fifthfloor



SHIFT

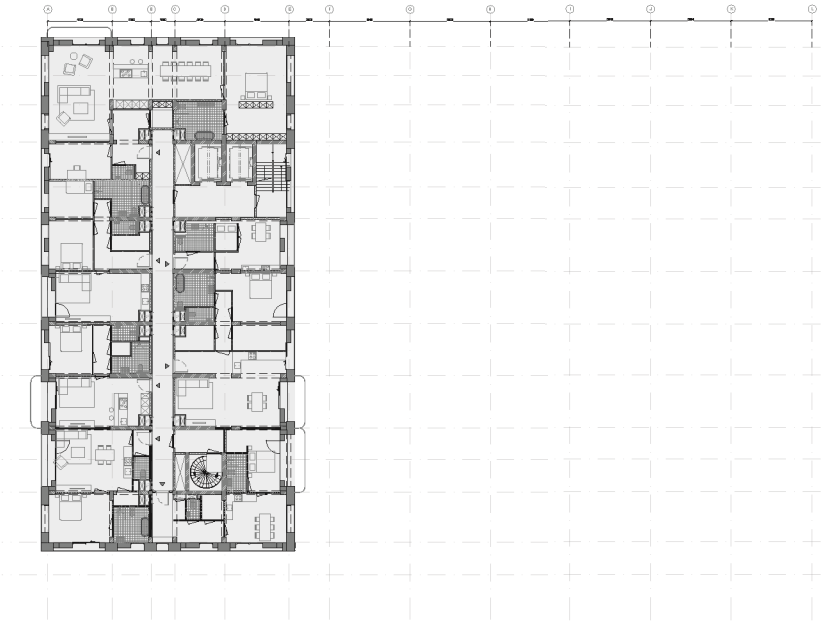
Plans
Sixthfloor



2 4 6 8 10 20 meter

SHIFT

Plans
Seventhfloor



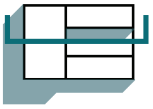
2 4 6 8 10 20 meter

SHIFT

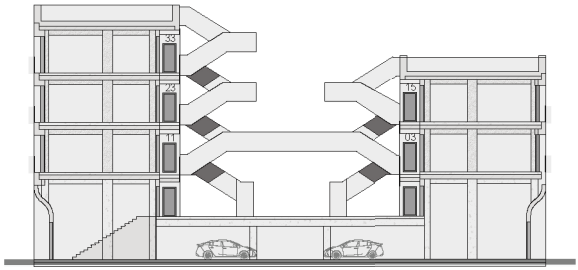
Plans
Eightfloor

0 2 4 8 8 10 20 meter

SHIFT



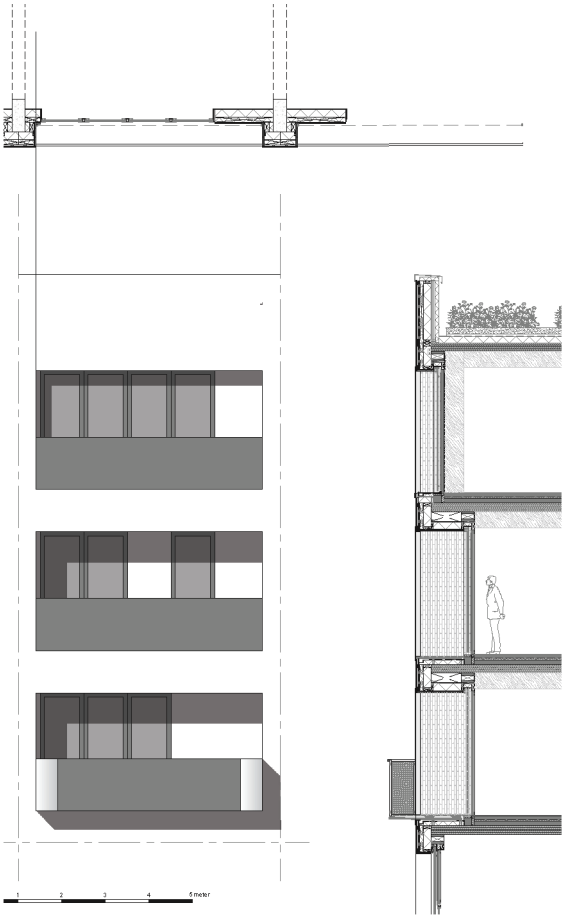
Section
AA Length



2 4 6 8 10 20 meter

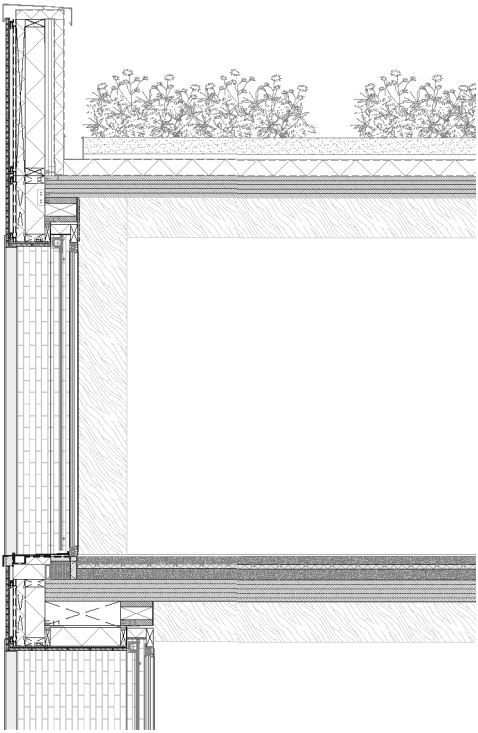
SHIFT

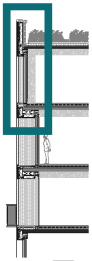
Plans
BB Width



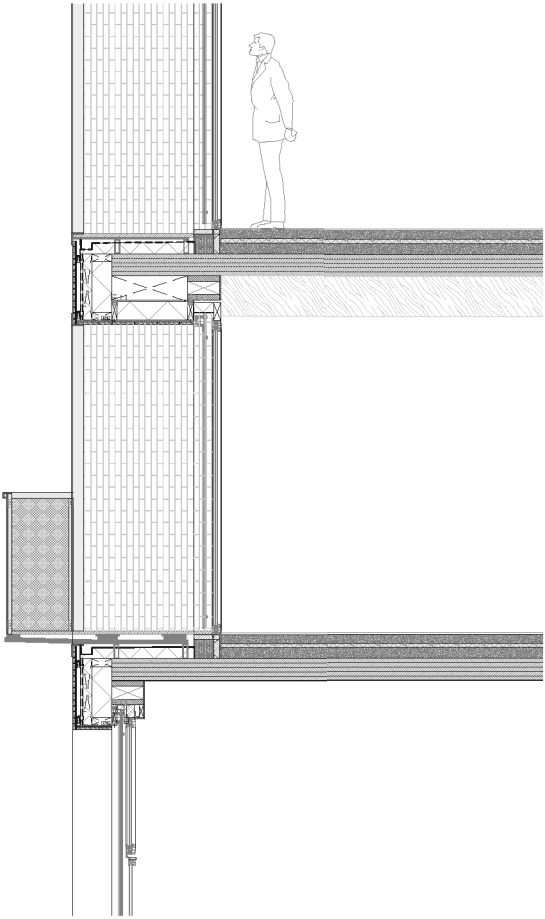
SHIFT

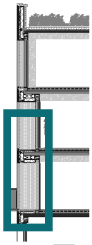
Detailing
1_50



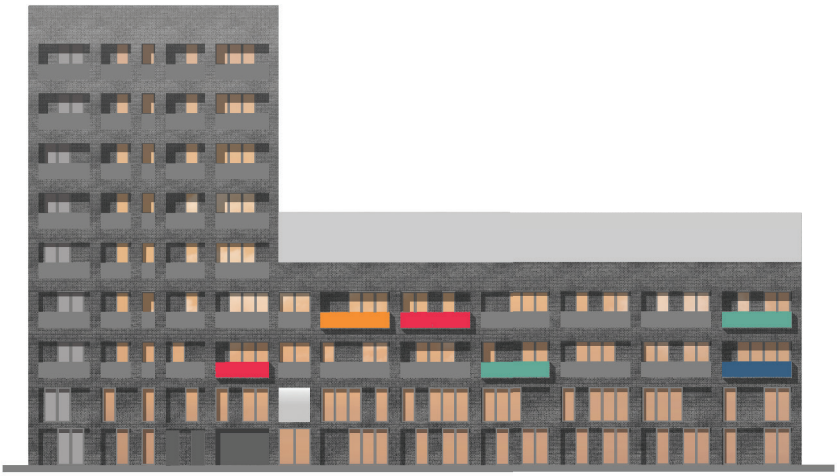


SHIFT Detailing
A (V)





SHIFT Detailing
A (V)



4 6 8 10 20 meter

SHIFT

Plans
Groundfloor

2 4 6 8 10 20 meter

SHIFT

Plans
Groundfloor

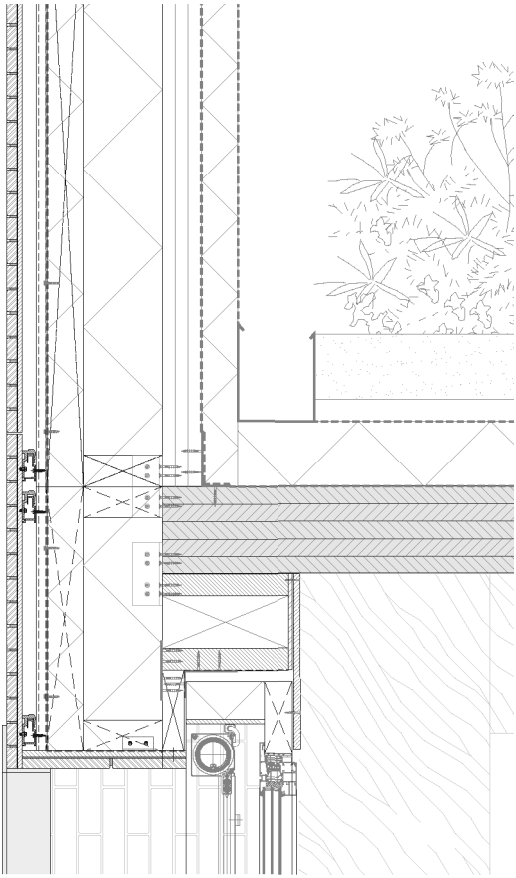
2 4 6 8 10 20 meter

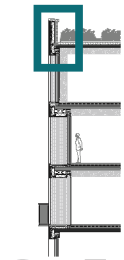
SHIFT

Plans
Groundfloor

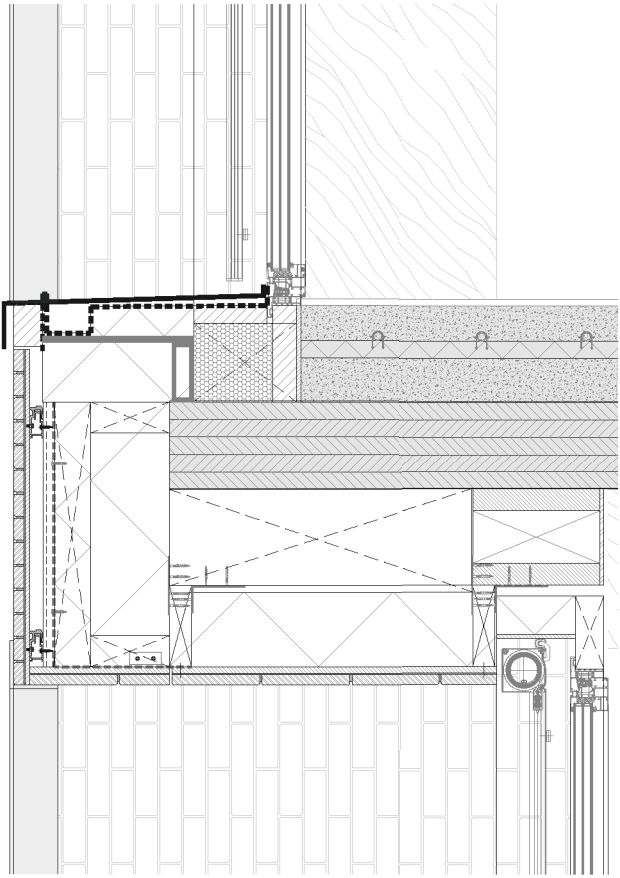
SHIFT

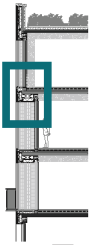
Plans
Groundfloor



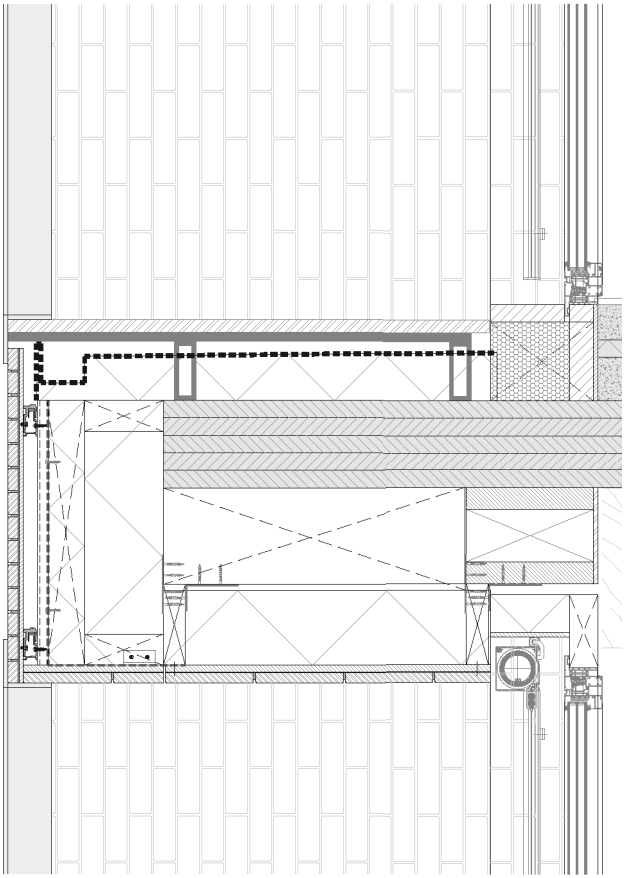


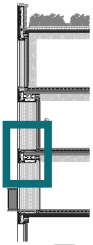
SHIFT Detailing
A (V)





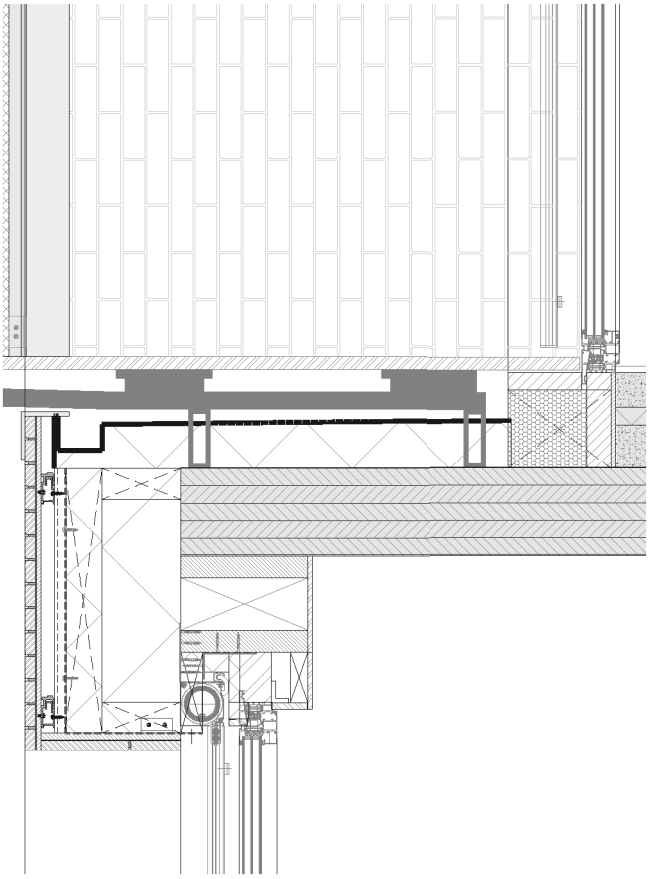
SHIFT Detailing
B (V)

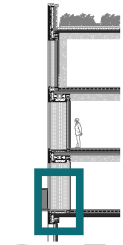




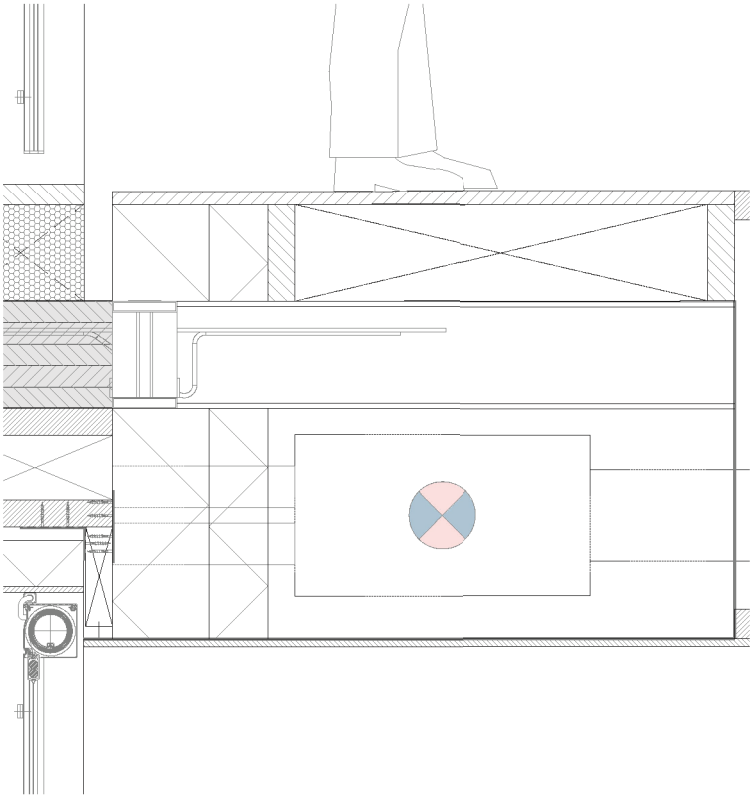
SHIFT

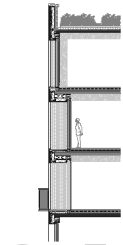
Detailing
C (V)



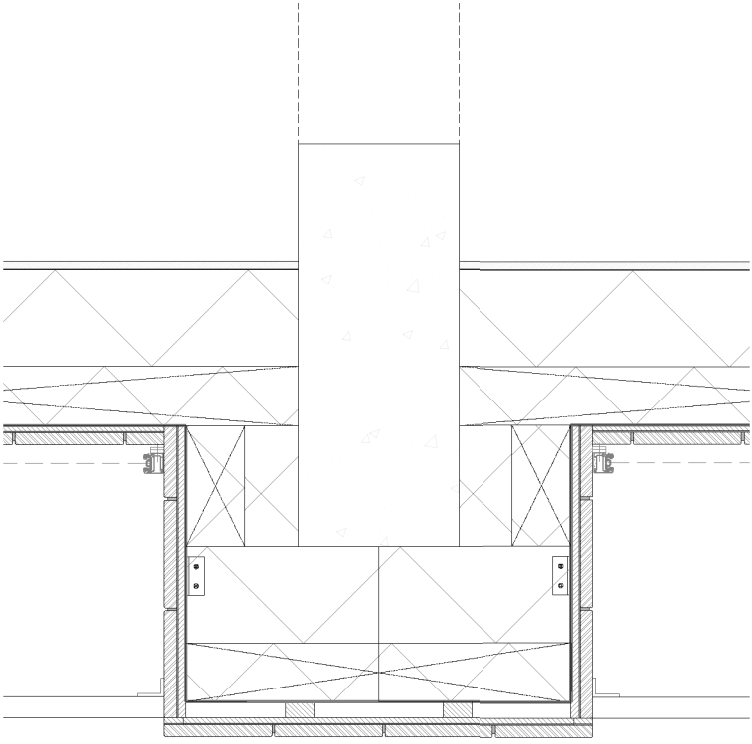


SHIFT Detailing
D (V)

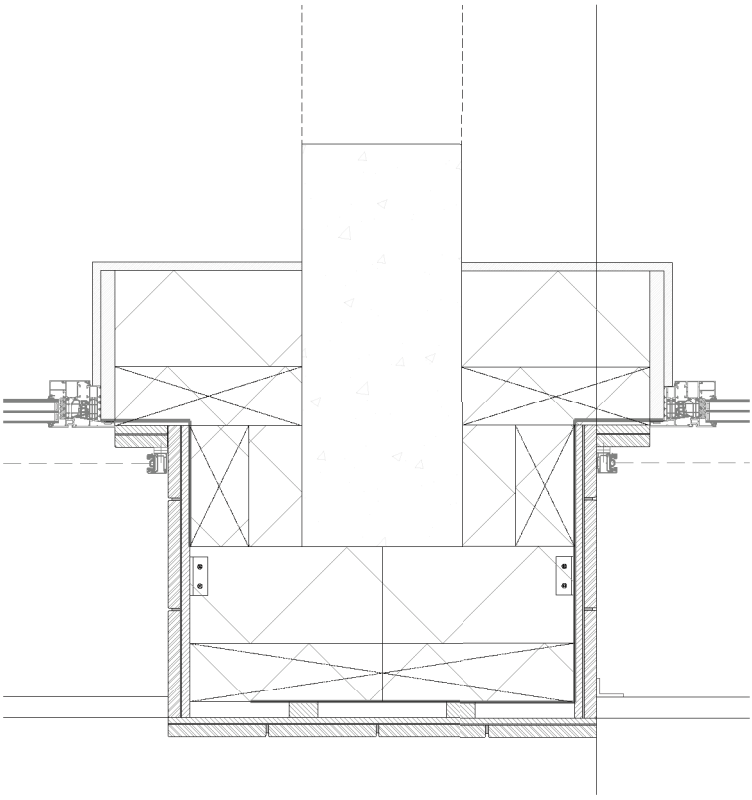




SHIFT Detailing
E (V)



SHIFT Detailing
F (H)



SHIFT Detailing
F (H)

Drawingset

Reflection
Introduction

When I started working on this project in September 2020, I set out to develop a housing project in Rotterdam. I had not imagined down which path my first research into the subject of housing would lead me. I quickly discovered that I did not agree with many of the mainstream concepts within the world of housing architecture. While designing dwellings the architect is often expected to research a group of people, and immediately understand their most important desires. Furthermore, the architect is expected to know what the future holds for these residents and design a dwelling that could theoretically stand the test of time. However more often than not the architect might turn out to be wrong and the building he had designed to stand for the next hundred years might be already outdated after only twenty years. For this reason, I set out to design a building where the architect does not have to make all the decisions but instead is assisted in the design by the actual resident. A building that can be adapted in the future when the resident might have changed its mind, or the housing is no longer needed.

Image 01: A sense of identity

Part 01 - Diversity

At the start of my graduation track, I studied the facades of Heliport in Rotterdam. While the architecture was characterized by strong repetition, many of the residents had decorated their environment with a strong sense of personality. On one hand, this helped residents navigate the complex set of stairs, corridors, and galleries. On the other hand, it also gave many residents the ability to express themselves and utilize communal spaces in ways the architect would never have thought of. However, since large parts of the building were not very well suited for this personalization, the homeowners association tried to block their attempts in several ways: this taught me the building should be designed with personalization in mind, and it should not come as an afterthought.

To grant residents the ability to personalize their parts of the facade, residents can decide from three different widths of windows and their relative placement. Additionally, residents can choose the type of outdoor space which they prefer, french balcony, loggia, or balcony. These balconies are boldly colored to reference the containers used in the former Merwe 4 Havens, giving residents additional reference points to refer back to.

Of course, there were many decisions to make in this process. Drawing the line between architectural design and individual design freedom is complex, and my approach is certainly not the only one possible. However, in the questionnaire that was performed in the research phase, many residents of flexible architecture noted that freedom in designing the facade was least important to them. For this reason, the facade design ended up being less expressive of personal choices than might have been possible.

Image 02: The maker makes it their own

Part 02 - The Makers

On the 5th of April 2020, only weeks after the WHO announced the coronavirus to be a global pandemic on March 10th, 2020, the Dutch television show 'Tegenlicht' interviewed Li Edelkoort (a trend forecaster) about the pandemic and its consequences. She foresaw the corona epidemic as the catalyst for her long-predicted 'Age of the Amateur'. While our current society had grown accustomed to consumerism and mass-produced goods, the early days of the corona epidemic had renewed interest in making your goods. A resurgence of the arts & crafts, goods produced locally, but more importantly of high quality.
These makers are the ideal candidates for flexible housing, not only is this group the most likely to get their hands dirty in the initial design phase of the dwellings, but they are also better suited for adapting their dwelling to their wishes over time. The interview conducted among residents of flexible housing seemed to confirm this conclusion. Many of these residents liked the design phase and construction phases. Large plusses for them were being able to choose exactly which materials they wanted, how their spaces connected, and knowing exactly what they were spending their money on. On the other hand, many residents also realized that they lacked certain specific knowledge about constructing their dwelling, and how to deal with contractors. For that reason, looking back at their projects many would recommend hiring a specialist in certain key moments.

For this reason, together with the advice from my graduation tutors, I decided to design the dwellings with feedback from the makers, instead of the other way around. By asking the potential residents beforehand what their wishes are, and what they might be in the future, I was able to design apartments that were close to what they had in mind, and of course, these plans could be revised

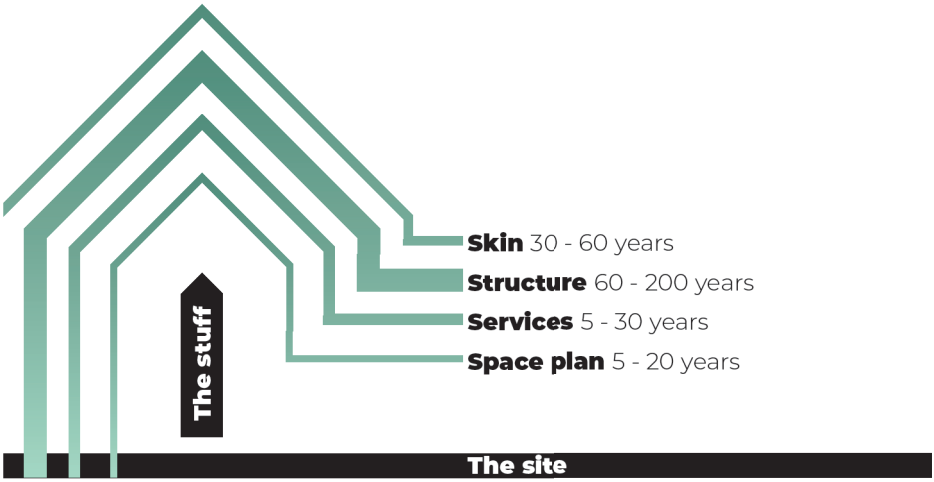


Image 03: The five layers of flexibility

during the process. However, by not fully integrating the client in the design phase, most of the designs came out more conventional compared to reference projects where residents were left completely on their own devices.

Part 03 - The Layers

From my research into flexibility, it became apparent that five aspects of the building were especially important to achieve flexibility and to extend the lifespan of a building. The five aspects or layers as called by Bernard Leupen are; the Skin, the Supporting structure, the Service elements, the Circulation, and the Staging of Space. Each of these five aspects can facilitate, or block the flexibility of a building. For this reason, I focussed my attention on each of these five aspects while designing my building. The skin, supporting structure and the service elements served as important starting points in the design, during the design process these 3 elements turned out to be much more rigid compared to the circulation and the staging of space. The latter two turned out to fit in place much more fluid and intuitive. For this reason, it was important to constantly adjust each layer to come up with better solutions for layers that interfere with each other. I tried to incorporate costs and feasibility with each decision made while not compromising too much on the flexibility. When I was satisfied with a separate element, I would compare it to the overall system and investigate how the individual layers would work together, adjusting elements as I went along.

Designing in separate layers brought a level of detail to the process which I am not used to. This detailed way of working caused the overall workflow to feel less intuitive, by being able to constantly weigh my design decisions the overall process became much more scientific compared to other design projects. Because this process was always very detailed, and I looked at each element from very close

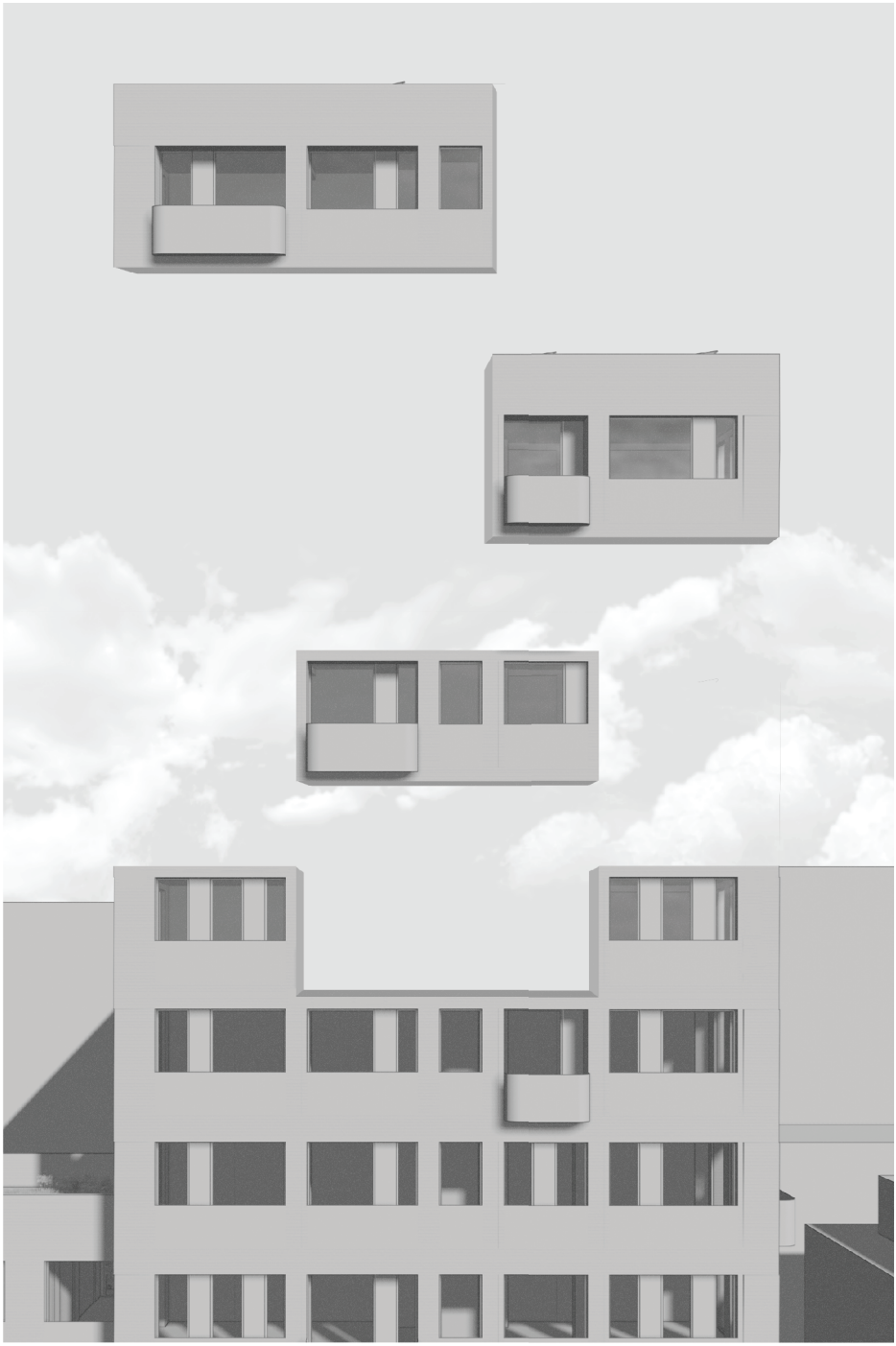


Image 04: The building as seperate components

up it was very important to me to take more and longer breaks from the individual elements than I was used to. These breaks were important for me to reevaluate my decisions and not get lost in the details whilst losing the bigger picture.

Part 04 - The mastertrack

The Advanced housing studio aims to find solutions to the one million homes problem. Due to a growing population combined with smaller family sizes the Netherlands is in urgent need of more housing. The best solution for this is to create one million homes before 2030. This can be done by transforming existing stock or creating new dwellings on the edge of cities.

To reach the deadline of 2030 creating new dwellings rapidly is important, it is also of great importance these new dwellings are not obsolete 20 years in the future. To extend the life cycle of Shift, my graduation project proposes a highly flexible structure in which residents can design a dwelling that can grow and shrink with them over time. By taking a closer look at five aspects of the building as described by Bernard Leupen, and further explored in my research paper, the lifespan of a building can be expanded dramatically.

Image 05: Making it your own

Part 05 - Methods and approach

The research into flexible architecture is highly transferable because this type of architecture is resident and not site-specific. This way the structure can be designed in many different configurations and locations. Of course, not every part of the final design is transferable to different situations. The material choices depend strongly on the existing situation and the infill on the residents' personal preferences.

So while the starting points and initial concepts that lead to flexible architecture are transferable, top different situations can always lead to new and diverse outcomes.

Image 06: Everyone their own personal space (work in progress)

Part 06 - Social, professional and scientific framework

The research into flexible architecture is highly transferable because this type of architecture is resident and not site specific. This way the structure can be designed in many different configurations, and locations. Ofcourse not every part of the final design is transferable to different situations, the material choices are depending strongly on the existing situation, and the infill on the personal preferences of the residents.

So while the starting points and initial concepts that lead to flexible architecture are transferable, top different situations they can always lead to new and diverse outcomes.

Image 07: Make the building uniquely yours (work in progress)

Part 07 - Ethical issues

Due to the corona measures, it was hard to contact people to fill in the questionnaires needed for my research. Because of this, the respondents were not a very diverse group of people. The first questionnaire was done among residents of three high-value apartments in Amsterdam, meaning that these respondents were all from high economic status. Because of this the design process for people with a lower income was not very well researched. In the second questionnaire, I got in contact with most people in my close circle of friends and acquaintances, this gave me the guarantee that I could get back in contact with these people at any time. On the other hand, this also meant that my research was based on a very specific group of people, that might not be representative of the actual market. With this knowledge, it might be important to repeat the questionnaires among other groups within the Dutch population and see if other outcomes might appear.