A PARADISE FOR STARTERS

an affordable, adaptable, and collective way of living for starters

By Fido Melskens

Graduation Studio 2022-2023
Master of Architecture

“A Paradise for Starters” is an architectural graduation project that focuses on an alternative way of living, seeking to strike an effective balance between affordability, living space, qualitie of life and co-living. The aim is to create an ideal living environment for starters who wish to start a family and have the ability to customize their homes according to their preferences. To achieve this, various concepts have been tested, and the most effective ones are integrated into the project. By combining these concepts with qualities such as space, light, and sight lines, a paradise for starters can be realized.

The Netherlands is currently facing a housing crisis, posing challenges for starters. A significant scarcity of ground-level single-family houses has resulted in a challenge for 43% of first-time buyers who aspire to acquire a detached property with a garden. This shortage has made it increasingly difficult for them to easily find such housing options. By utilizing an alternative typology that possesses nearly identical qualities and efficiently utilizes space, an alternative can be offered.

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“an environment designed for increased density, adaptivity and sharing results in a functional and affordable living environment for starters”

This quote is my vision of a better future: A living environment where we live close together with lots of social interaction and safety. A diverse environment with attention to quality, harmony, light and space. A future that gives starters an affordable opportunity.

CONTENT

Starter
A starter in the housing market is someone who is buying a home for the first time and has never had to deal with a mortgage before.

Housing shortage
The housing shortage in the Netherlands is characterized by insufficient supply to meet the growing demand, leading to rising prices and affordability challenges.

Adaptive architecture
Adaptive architecture is the ability of a building to adapt to changing conditions by transforming structures of dynamic elements.

Increased user control
High control is achieved through freedom in the configuration of the house. This can be achieved by a physical separation between the structure and infill, such as interior and exterior walls.

Financially accessible
The ability of individuals to obtain financial services, including credit, deposit, payment, insurance, and other risk management services

Densification
Densification refers to the process of increasing the population density of an area by building more housing units or structures in a given space.

Collective living
Collective living refers to a housing arrangement where individuals or families choose to live together, sharing common spaces, resources, and responsibilities, in order to foster a sense of community and create a more sustainable and supportive living environment.

Winter garde
A winter garden is an indoor garden or conservatory filled with plants that thrive in cooler temperatures and low light conditions, designed to be enjoyed during the winter months when outdoor gardening is not possible.

INTRODUCTION

From student accommodation to high monthly rent costs, the monthly costs for renting are nearly twice as high as the average mortgage payment. On average, rent amounts are 41.2% of an individual's salary, whereas homeowners only allocate 23.4% towards housing expenses (CBS 2021). The Netherlands is currently facing a housing crisis, posing challenges for starters. A significant scarcity of ground-level single-family houses has resulted in a challenge for 43% of first-time buyers who aspire to acquire a detached property with a garden. This shortage has made it increasingly difficult for them to easily find such housing options.

abstract

The aim of this research is to explore the potential for achieving affordability in starter homes. The search for innovative housing models should not solely revolve around the ongoing reduction of living spaces. It is crucial to strike a balance between the urgency for compactness and the aspiration for increased spaciousness, adaptable architectural designs, and the concept of communal living. Living in proximity to one another increases the visibility and exposure of the boundaries between private and public spaces.

Objective

The aim of this research is to create a housing typology that is affordable for starters, with a focus on ensuring the quality of compact living spaces. By incorporating adaptable design principles, individuals can comfortably reside in smaller spaces and modify the layout according to their specific requirements and activities. This approach promotes efficient space utilisation, enabling multiple functions to be accommodated within a single area.

Adaptable architecture addresses the problem of expensive housing by enabling functional and compact living. However, it is seldom applied and lacks sufficient research. Adaptable architecture focuses on the use of spaces and functions, minimising the transition between architecture and interior design. This specific relationship is under-researched and often addressed using standard living dimensions and building regulations.

Hypothesis

The Netherlands faces a substantial housing shortage, posing challenges for starters. To address this issue, a new housing typology is proposed, featuring adaptability, high density, and an emphasis on collective living, aiming to enhance affordability for starters. The modification of spatial characteristics in line with specific functions enables multiple functions to be accommodated within a compact area. Nonetheless, it is essential to ensure the preservation of desirable attributes such as natural light, ventilation, and communal living while compacting housing units.

Starting statement

As an architect, we intend to create a program that assumes the future needs of the users. But in case, the building is able to adapt to the users' program at that time, it presents an opportunity for space optimization. Through new adaptable and collective typologies, we enable people to share, adapt, live smaller and only use what they need.

Goal

Create affordable housing for starters

Shift

A new typology that is adaptive, collective and affordable for starters.

EXPECTATION

Through careful analysis of different optimizations, we can identify the most effective elements and incorporate them into the design of a residential building that prioritizes quality of life and communal living.

- It is difficult for starters to buy a house
- Our living efficiency suffers due to the need to adapt to the fixed living environment.
- Dutch residents have a large living area of 63 m^2.

WHY

Housing crisis

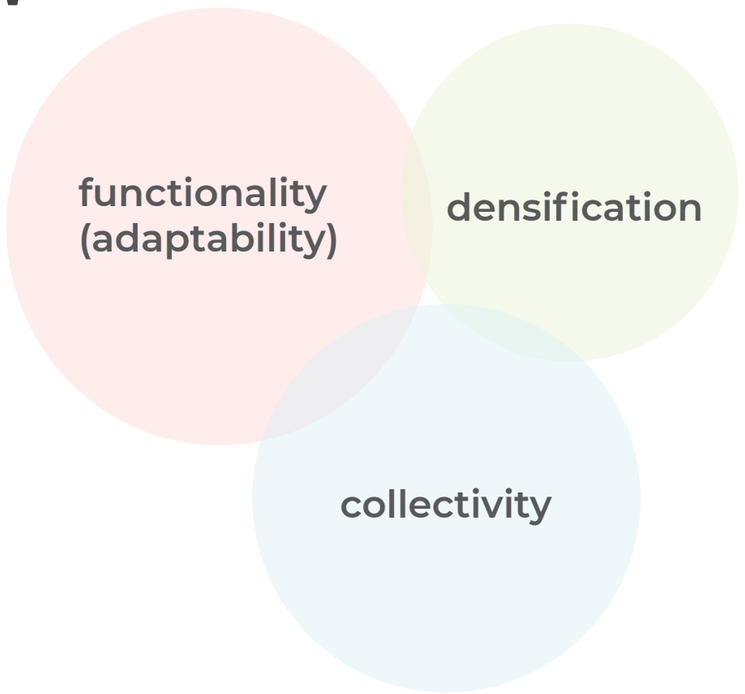
The Netherlands faces a substantial housing shortage, posing challenges for starters.

Young startes

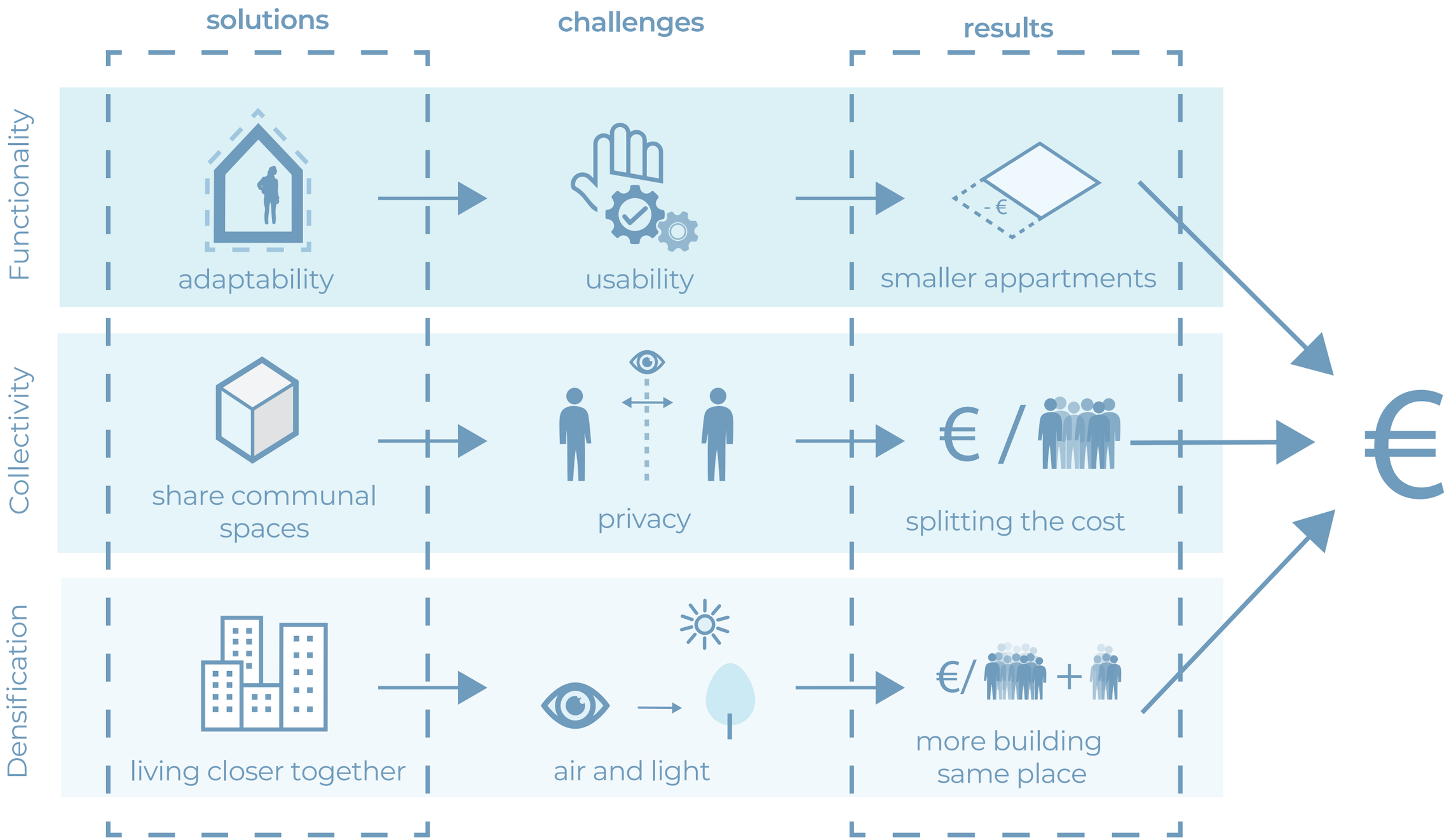
"renters pay 41.2% of your salary buyers only 23.4%" (CBS 2021)

"more starters and renters want to buy a single-family home" CBS

HOW



AFFORTABLE LIVING FOR STARTERS



ESSEAY

A new typologie for starters

An affordable, adaptable, and shared way of living for Starters

Fido Melskens - MaU 4

Keywords: space efficiency, properties, functionality, adaptable architecture, high density, co-living

abstract

The aim of this research is to explore the potential for achieving affordability in starter homes. The search for innovative housing models should not solely revolve around the ongoing reduction of living spaces. It is crucial to strike a balance between the urgency for compactness and the aspiration for increased spaciousness, adaptable architectural designs, and the concept of communal living. Living in proximity to one another increases the visibility and exposure of the boundaries between private and public spaces.

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Research questions

1 What architectural design principles can be applied to increase the functionality of the home?

2 What architectural design principles can be applied to promote the sharing of spaces and functions in the urban living environment?

3 How to create higher space efficiency in the living environment?

4 How to accommodate housing for starters in higher spatial efficiency housing?

1 What architectural design principles can be applied to increase the functionality of the home?

Adaptable architecture
Adaptable architecture can be realised in various ways, such as through the use of movable partitions, overlapping functions, or the alteration of a space's properties to accommodate different uses.

Research on "analysis of apartment use" reveals that storage space in apartments is often underutilised and takes up a significant amount of space. This is often due to the space not being designed efficiently, resulting in a large amount of space being lost to access the closets. The use area for storage does not overlap with other use areas (Figure 1). A more efficient solution could be to better utilise the space, for example by applying smart storage solutions such as an archive cabinet. Additionally, closets could also be integrated into the walls that border the circulation space as applied in Japanese architecture.

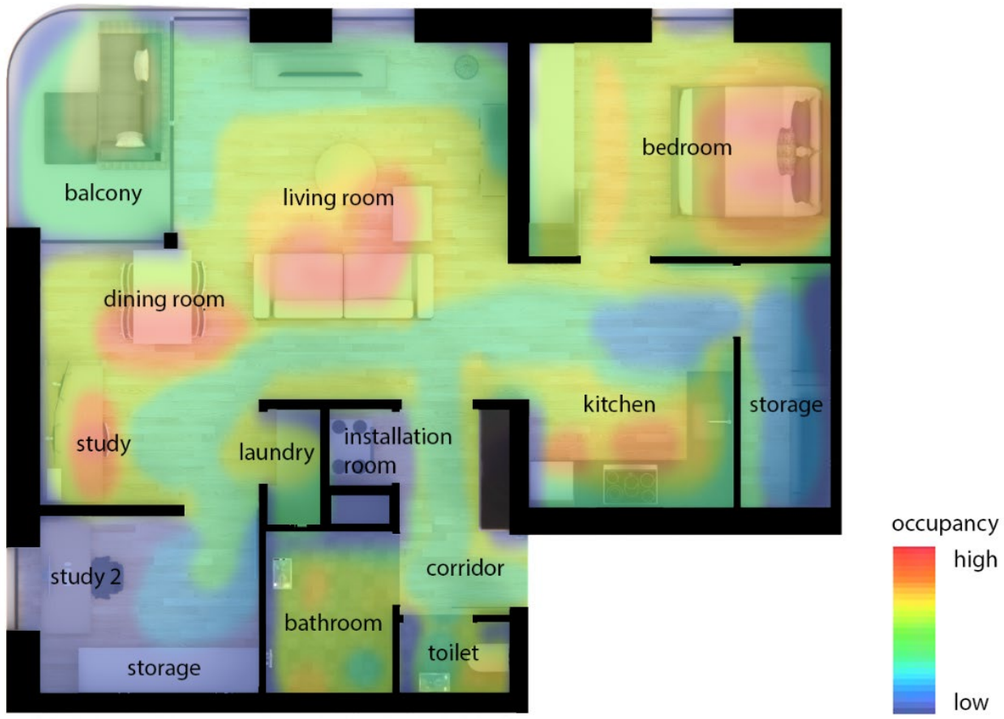

Figure 1 Analysis use of apartment

Research on "analysis of apartment use" reveals that no single function or use space overlaps, leading to low space efficiency. According to Neufert (2007), the dimensions for different tasks are regulated by standards (Figure 2), however they can overlap if it does not result in a limitation of the function. The required functional space is composed of different areas.

The areas are:

Work area: furniture layout
Furniture function area: space needed for the use of the furniture
Traffic and through-passages area

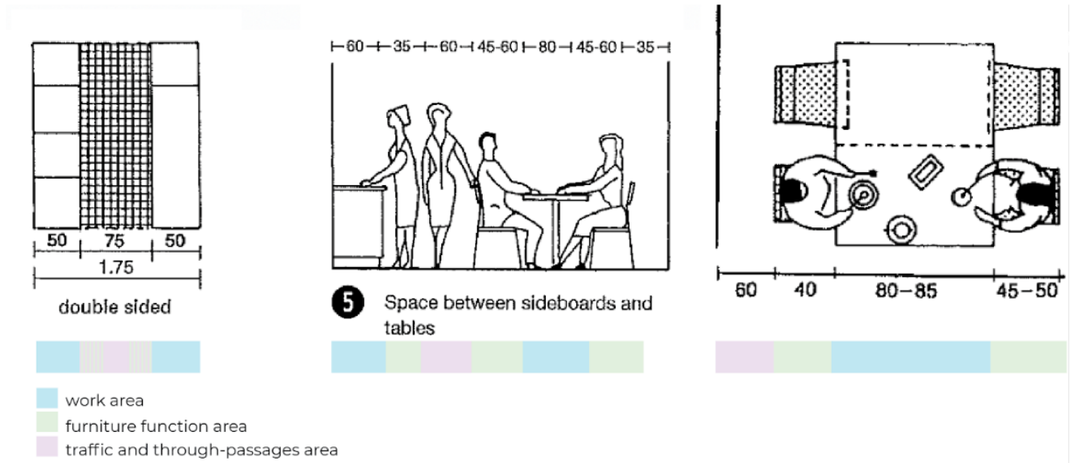

Figure 2: Neufert function space page 235

The concept is based on minimising space when a function is not in use, such as with an archive cabinet. An archive cabinet can move, reducing the functional space of the furniture and allowing it to be used for another cabinet or function. This allows for high-density storage to be created. The concept of the archive cabinet can be applied to other functions. These elements include various functions and the corresponding furniture. The functional space of the furniture and circulation space can be minimised, allowing multiple functions to be performed in the same space. However, this means that not all functions can be performed simultaneously. To enhance ease of use, the system is inspired by the adaptable system developed by Ori and incorporates automation through the integration of a rail mechanism in the baseboard.

The effectiveness of the concept diminishes in bedrooms, as they require constant accessibility. It is impractical for an individual to be unable to sleep due to another person utilizing a different function within the same space. Moreover, discomfort will also arise if someone were to disturb the sleeping module while in use. In addition, soundproofing poses a significant challenge, given the movable nature of furniture modules, making it difficult to establish soundproof connections. The concept of “My own Neufert” draws inspiration from the principles of ergonomics and functionality, as outlined in “My own Neufert” (Figure 4). The primary objective is to create a comfortable and functional bedroom space for adult occupants, with specific attention to accommodating a double bed, a work desk, a TV, and storage within a limited volume. The research on “living on 6.5 m²” has demonstrated that various functions can be performed within a small space, provided that the space is appropriately adapted and designed.

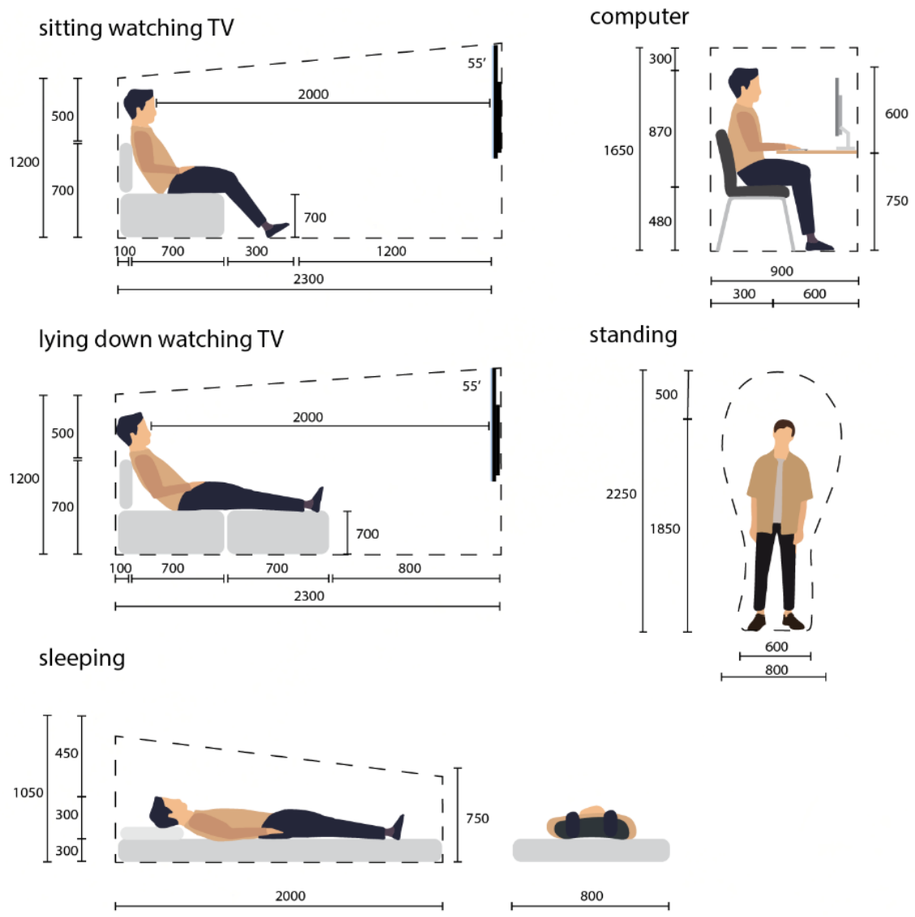

Figure 4 “my own Neufert”

Figure 5 adaptive space

SEMI-OUTDOOR SPACES

Semi-outdoor spaces (Figure 6)are commonly used in foreign countries due to their climate, allowing for extended periods of use. However, as the climate changes and temperatures become warmer in the Netherlands, the addition of semi-outdoor spaces can extend the living area. These “Larger & Cheaper” outdoor spaces, inspired by the concepts of French architects Lacaton & Vassal and Japanese in between spaces, can be furnished as a living room and can be used for three-quarters of the year. This “inexpensive” solution significantly increases the living space and has the qualities of being outdoors, but can be shielded from the wind with their large glazing area. In the winter, this space retains warmth within the house, and in the summer it keeps the house cooler. Therefore, each house has both a summer and a winter space that is inspired by Japanese houses.

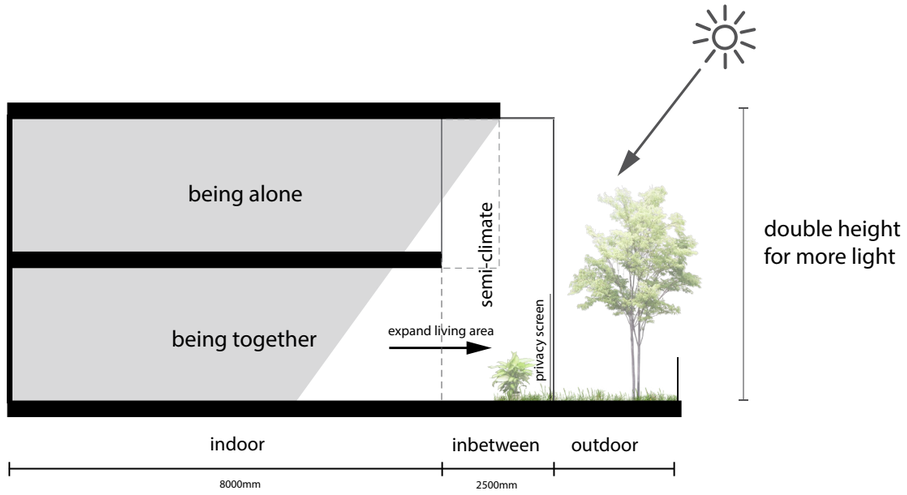

Figure 6 Semi-outdoor spaces

2 What architectural design principles can be applied to promote the sharing of spaces and functions in the urban living environment?

Sharing spaces is a strategy aimed at enhancing the living environment and maximising space efficiency. By sharing spaces and adapting them based on supply and demand, the utilisation of spaces can be intensified. Moreover, this approach offers the possibility of incorporating additional functions that are not typically available in individual apartments, such as a gym or a playroom for children. Sharing space yields several advantages, including:

Sharing spaces offers cost savings by pooling ownership and equipment, resulting in a larger living environment and improved access to amenities. It promotes a sense of community and social connectedness among residents. Additionally, living together enhances security through increased surveillance. The flexibility of shared spaces allows for adjustments based on supply and demand, ensuring efficient utilisation.

Co-living

According to Space10, a research and design institute focused on future living environments and co-living, the primary appeal of shared living lies in its potential to foster social connections. While financial savings, access to shared amenities, and affordability of certain neighbourhoods are often cited as reasons for the attractiveness of shared living, the social aspect emerges as the most significant benefit according to surveys (Space10, 2018). This emphasis on social interaction is understandable, given the rise of loneliness worsened by the COVID-19 pandemic and increased digitalization.

The Space10 survey on co-living reveals that people value living with a diverse group and have concerns about privacy. Shared utilities such as internet, garden, bike storage, workspaces, and equipment are preferred, while sharing bedrooms is not favoured. Pets are welcomed and individuals prefer personalising their living spaces while leaving the design of shared areas to professionals. Many are willing to pay for additional services like a gym or storage. People desire private and exclusive areas, and shared living arrangements prioritise democratic principles.

3 How can we create higher space efficiency in the living environment?

One solution to increasing space efficiency in urban environments is to build higher density housing. Higher buildings can be constructed in areas that currently have relatively low density, such as urban fringe areas or on underutilised land. However, building higher has challenges, such as shadow, privacy, and transport issues.

High-rise buildings can block sunlight and cast surrounding areas in shadow, which can negatively impact the quality of life for residents. Careful consideration must be given to where high-rise buildings are constructed to minimise the impact on surrounding areas. Higher density also reduces privacy. High-rise buildings can also obstruct the views of neighbouring residents and threaten their privacy. The composition and orientation of buildings should be designed to minimise privacy issues to promote quality of life.

Inspired by Charlotte Perriand, several orientations were tested. The results of these tests revealed that a 45-degree rotation of the apartments allows for increased direct sunlight penetration into the living space, creates a corner that ensures privacy, and provides a larger facade area for indirect lighting. Moreover, the oblique sightline from within the apartment allows for extended views into the distance.

High-rise construction can be more expensive than low-rise due to structural considerations and fire safety regulations. The minimum 120 minutes fire resistance requirement for structural elements contributes to the higher costs. However, taller buildings can reduce land costs by accommodating more housing units on a smaller footprint. Studies suggest that buildings taller than 5 stories significantly affect privacy and direct sunlight. To avoid additional expenses, building heights should not exceed 5 stories, with the highest floor below the 13-metre threshold for fire safety measures.

Mixed-use developments

Integrating housing, work, and recreation in a single location improves space efficiency and reduces transportation strain, resulting in cost savings. The current separation of land use in cities leads to extensive commuting, requiring people to travel long distances for various activities. By integrating land use, traffic flow can be distributed evenly, maximising infrastructure usage throughout the day. Moreover, this approach saves land, reduces city segmentation caused by roads, and offers potential economic benefits (Paul, 2001).

The desired residential quality is achieved by prioritising direct sunlight and sightlines. However, limitations arise when the volume on the northern side lacks direct sunlight, affecting the attainment of these qualities. To utilise this space and create volume, it can be designated for shared areas. Additionally, alternative functions like offices, supermarkets, retail stores, gyms, and other amenities can be considered based on local demand.

Compact housing designs

Compact housing designs offer an opportunity to maximise living space within a limited area. Adaptable designs that allow for overlapping functions can maintain comfort in a smaller footprint. However, it is crucial to consider the impact on light, spaciousness, and outdoor connectivity. Incorporating features like large windows and terraces can address these concerns and improve the visual appeal. Moreover, residents' specific needs and preferences, especially regarding the division of private and shared spaces, should be taken into account. By carefully balancing these elements, efficient and appealing compact homes can be created.

4 How to accommodate housing for starters in higher spatial efficiency housing

According to a study conducted by CBR in 2018, 43% of individuals looking for housing desire a single-family house with a garden, which is difficult to find due to a shortage of ground-level single-family houses. The “Living on 6.5 m²” experiment highlighted the importance of a connection with the outdoor environment when living in compact spaces. Incorporating light and open space can create a sense of spaciousness in small dwellings, while social interaction and access to greenery and views are equally vital.

Furthermore, an analysis of existing high-rise flats revealed that the overhang of outdoor spaces often led to shading inside the dwellings. To address this, an isosceles trapezium shape was designed by increasing the ground floor of the flats and relocating certain functions to the building’s core. This design allows for enhanced light penetration, directing light from two levels towards the living room instead of the bedroom. The building’s north-facing transverse façade orientation maximises natural daylight and solar heat in the flats, while minimising solar glare and overheating. It was determined that all apartments have access to either morning or evening sun. Residents who do not currently have access to sunlight in their gardens can still benefit from it in the rooftop garden.

Figure 6 illustrates the transition from existing flats to the new typology, featuring the isosceles trapezoid shape. This design provides sufficient space for a garden in front of each apartment. Adaptive plants can be planted in the garden, allowing residents to adjust the greenery to create desired levels of privacy and visibility. The leaves of these plants act as a natural barrier, regulating heat in the summer and allowing light in the winter.

In order to enhance social connectivity and ensure privacy within the garden area, the circulation space is situated on the first floor at the core of the building (Figure 7). All apartments are accessed through this space, which is intended to function as a street-like environment and a meeting place within the building. The “street” will be designed to seamlessly extend the living area and encourage interactions among neighbours. This architectural design allows for the integration of the desirable features found in a terraced or detached housing, within a higher-density setting. The presence of a garden and the inclusion of double-height apartments, which provide a clear demarcation between shared spaces and private retreats, contribute to a similar experience as that of a terraced house.

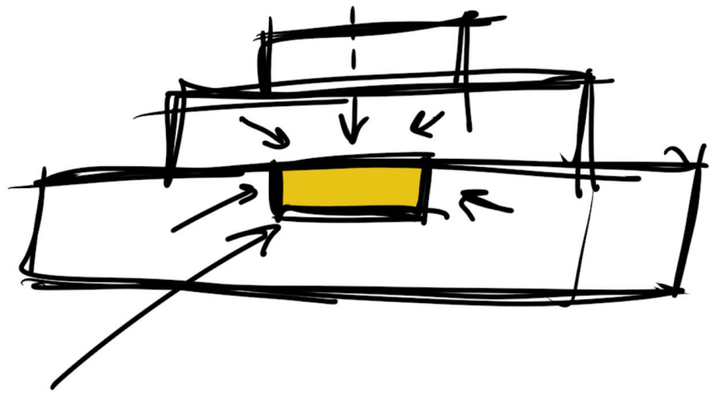

Figure 7: the “street” within the building

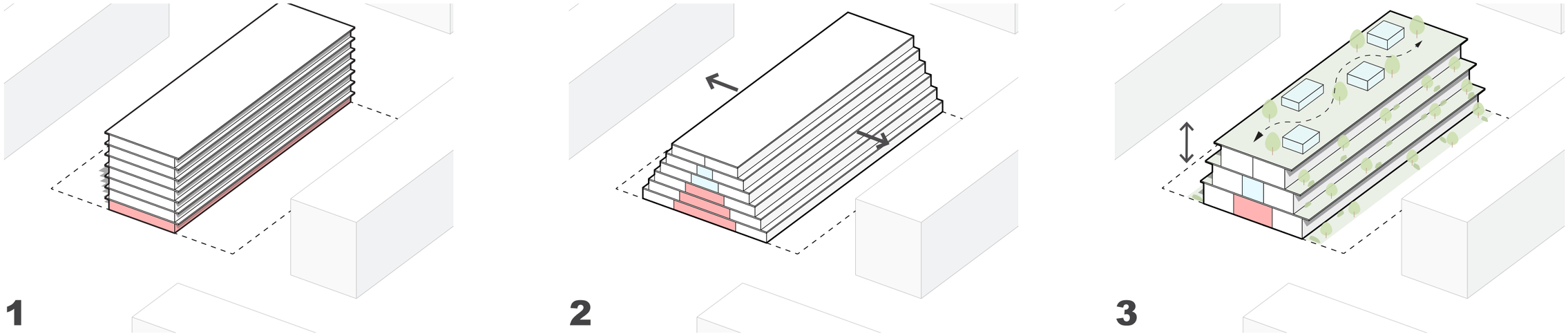

Figure 6: Transitioning existing flat and new typology

Reflection & conclusion

Affordability remains a significant challenge for starters, and a single comprehensive solution is yet to be found. Adaptable housing, shared spaces, and increased density can contribute to affordable housing solutions. Detached and terraced houses with gardens come at a high cost, but increasing the density can contribute to making housing more affordable. By creating an additional level above the terraced houses, a garden can be provided to a new layer of houses. Rotating the houses by 45 degrees allows for increased direct sunlight, a larger facade area, extended sightliness, and privacy between the units. However, this rotation presents limitations as the building is restricted to a single orientation. Additionally, the arrangement of the houses poses challenges and results in unused spaces in the hallway, which can be repurposed for shared areas. Furthermore, the corridor spaces experience reduced quality due to a lack of sunlight. Partial resolution of this issue has been achieved through the removal of a single apartment in the middle and the strategic positioning of functions. However, the task of creating a pleasant environment in this space remains a challenge.

Adaptable housing offers functional living, but the adaptability should be easy to use. Overlapping functional spaces with furniture can save space, enabling the dwelling to meet the residents' changing needs. Each individual should have the ability to retreat without being disturbed by others. Incorporating a second floor provides a sound barrier and imparts the feeling of a ground-level residence. Introducing an intermediate space between inside and outside allows for an expanded living area for a significant portion of the year. Modifying the characteristics of the space enables the fulfilment of various functions.

Expanding the living area can be achieved by sharing spaces with other residents. Placing shared spaces along a circulation area promotes social interaction and is easy to access. Residents can determine the functions assigned to these shared spaces. Moreover, the shared spaces incorporate the sharing of items, which reduces the need for individual occupants to personally own those items, thereby leading to space-saving.

Designing the apartments as modules enables automated production processes, leading to cost savings. The use of timber frame construction can limit costs and minimise environmental impact.

During the design process, a multitude of decisions are made, leading to a range of potential outcomes, and the current design is one of them. In this project, choices were informed by surveys among the target audience and experimentation. Different outcomes would have yielded a different design. Achieving full optimization of all concepts is not feasible, as there is a need to strike a balance between different priorities. Occasionally, it is necessary to make sacrifices in one concept in order to strengthen another. While the design is not entirely tailored to the specific locations, the plan is adaptable and can be better integrated into the chosen sites.

The living space of the apartment is expanded through various means. Despite the apartments' compact size of 58m2, the additional features and improvements contribute to a total space of 86m2 for an estimated unit price of €146.500,- (Excluding land and shared spaces). Additionally, there are multiple shared spaces that enhance the advantages of the apartment, totalling at least 224 m2. Moreover, the higher density of the apartments, compared to terraced houses, reduces land expenses, resulting in additional cost savings. The construction method with units also presents opportunities for efficiency and cost reduction. By prioritising space and light, the apartment offers high-quality living conditions similar to those found in a terraced or detached house, yet at an affordable price. Overall, it is an ideal choice for individuals starting a family.

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RESEARCH

Experimental research

LIVING ON 6.5 M²

To explore how individuals adapt their living environment to accommodate specific functions, an experimental research was undertaken. The research was conducted within a compact area in a 6.5 m² apartment, typically designated as a study area and dining room, but temporarily repurposed as a living space for the experiment. In order to create a habitable environment, various items were introduced, including a mattress, pillows, a refrigerator and clothing, among others. Activities such as showering and using the toilet were allocated to different areas. Given that the participant shares the living space with others, certain activities will be performed collectively within this confined area. Additionally, the participant will leave the space to attend work. The primary objective of this experiment is to observe how the living space is adapted to accommodate specific functions and to identify the essential characteristics that contribute to a comfortable experience.

Objects

- mattress and pillows
- sleeping bag
- desk with computer and accessories
- books
- dresser with clothes
- fridge with food
- plates and cutlery
- chairs
- dining table
- lamp
- air mattress
- sheet

Activities

- sleeping
- eating
- studying
- watching film with girlfriend
- relaxing
- showering
- receive visitors and eat together
- studying while in contact with the outdoors
- cleaning

render of starting position

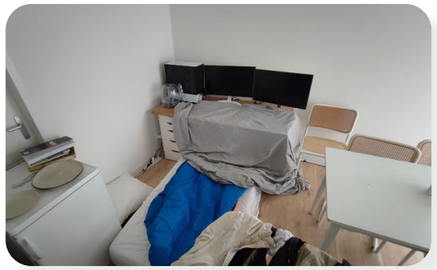
picture of living erea

EXPERIMENTAL RESEARCH DATA

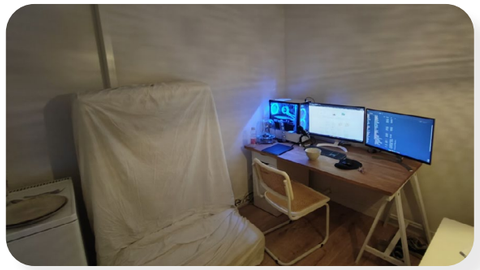
	Functions	Properties	Adaption	Privacy	Sound	Light
Monday	Watching video	sitting comfortable, low surrounding sound, privacy, low surrounding light	creating a seat on my mattress with pillows and against the	++	+	+
	Studying	comfortable upwards sitting position, good lighting, control noise, stay organized, reduce distractions	Putting all stuff away, so I can sit at the desk. Block out environmental noise	++	--	++
	Sleeping	Comfort bed, no sound, no light	Making bed with mattress, closing curtains, organize clothes	+++	---	--
Tuesday	Eating	comfortable sitting position, place to put board and cutlery on. Contact with other people that are eating	Clean stuff in living space, Clean table for cutlery and plates, light candles, turn on background music	++	++	++
	Watching a video with girlfriend	Comfortable sitting position, privacy, dark, good view of the video, being together	Closing curtains, place the mattress against the fridge. Turn on the candle	+++	--	-
	Studying	comfortable upwards sitting position, good lighting, controlling noise, staying organized, no distractions	Cleaning up the mattress and making room to sit at the desk	+	--	++
	Sleeping	comfortable lying position, low sound, low light, privacy	Moving mattress under the desk, create dark space with curtain	+++	---	--
Wednesday	Changing clothes	Privacy, enough space	taking clothes out of drawers, and closing curtains	+++	++	+
	Eating	comfortable sitting position, place to put board and cutlery on. Contact with other people that are eating	Spacing all the stuff, so I can sit at the desk and see the screen clearly. Trying to block out ambient noise and distractions	+	+	++
	Studying	No sound, enough light good sitting position, good viewing angle to screen	Spacing all the stuff, so I can sit at the desk, trying to block out ambient noise	+	--	++
Thursday	Sleeping	comfortable lying position, low sound, low light, privacy	Make bed under desk and close with sheet. Pillow in front of refrigerator	+++	---	--
	Studying	remove mattress and make space for sitting at desk	Putting all stuff away, so I can sit at the desk. Block out environmental noise	+	--	++
	Lazy relaxing	comfortable sitting, privacy, entertainment	I did not want to put too much effort in creating a comfortable sitting position	+	-	+
Friday	Sleeping	Comfortable bed, no sound, low light	Make bed under desk and close with sheet. Pillow in front of refrigerator	+++	---	--
	Changing clothes	Privacy, enough space	taking clothes out of drawers, and closing curtains	+++	++	+
	Washing	Space for hanging cloths, warm, dry	Make room for laundry rack, move laundry rack to accommodate space	+	+	+
Saturday	Sleeping	comfortable lying position, low sound, low light, privacy	Make bed under desk and close with sheet. Pillow in front of refrigerator	+++	---	---
	Studying and contact with the outside world	comfortable upwards sitting position, good lighting, control noise, stay organized	Clearing the table and opening curtains. Place a chair at the head of the table.	+	++	++
	Lazy relaxing	comfortable sitting, hangover, privacy, entertainment	Place mattress on floor and place pillows against wall	+++	-	+
Sunday	Sleeping	comfortable lying position, low sound, low light, privacy	Make the bed under the desk and close it with a sheet. Pillow in front of the refrigerator and air mattress between mattress and window	+++	---	---
	Cleaning up	clean room, organized, no stuff lying around, light	Clearing and storing all items in drawers and behind refrigerator	+	+	++
	Receive visitors and eat together	good sitting position, clean house, soft light, music, space	Enlarge table and place in centre, dim light slightly to create atmosphere and turn on music	+	+	++
Monday	Studying	no sound, enough light good sitting position, good viewing angle to screen	Cleaning up the mattress and the room and making room to sit at the desk	+	---	++

SOUND IS A CHALLENGE

first night sleeping



second night sleeping



studying, no distraction

sound from watching a video

NOISE FROM EQUIPMENT

After preparing the space and assembling the necessary equipment, I proceeded to attach some emblems onto my jacket. This task required me to prioritise adequate lighting and seating comfort. I then prepared the room for sleep by closing the curtains and repositioning my desk chair, creating a designated area to arrange my mattress and bedding. Unfortunately, I soon discovered that the refrigerator emitted significant noise, which proved bothersome during sleep. To mitigate this, I placed a pillow between myself and the refrigerator, although the reduction in noise was insufficient. As a result, I experienced a restless night, awakening to external lights and the presence of my girlfriend in the morning.

Following the initial restless night, I sought to improve my sleep by adjusting my sleeping position. Desiring increased rest and reduced light, I positioned the mattress beneath the desk and draped a sheet over it, creating a dark and cosy space. Placing a pillow between the refrigerator and my mattress further minimised the sound, enabling comfortable sleep. The compact area beneath the desk provided seclusion and a sense of privacy, with no unexpected occurrences due to its limited dimensions. Additionally, the sheet allowed a warm light to filter through, enhancing my feeling of safety. This experience revealed that small spaces can provide a pleasant and secure environment, offering an ideal retreat when equipped for comfort and seclusion.

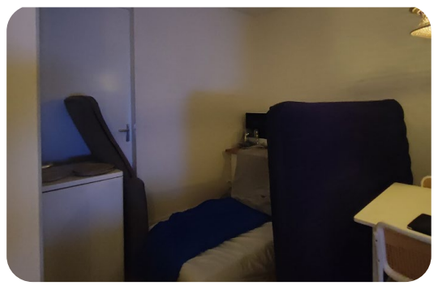
SOUND & LIVING TOGETHER

Studying at my computer was a regular occurrence for me, requiring the rearrangement of my space. Maintaining a clean and organised desk was crucial to minimise distractions. Furthermore, minimising ambient noise and ensuring consistent lighting were important factors. Achieving a silent environment was crucial for concentration, which proved challenging when sharing a room with a television. Although I attempted to use an air mattress to block out sound, it proved ineffective. Pillows provided some improvement, but I struggled to position them optimally. Nevertheless, I highly value interpersonal interaction, which is why I still regard the living room as a suitable space for studying. Each individual has distinct requirements for an ideal study environment. I have recognized the significance of maintaining tidiness to enhance adaptability and liveability in my space. Additional storage space that is easily accessible would have improved adaptability and tidiness.

Considering the impact of sound on others is important, and while using headphones can address immediate disturbances, it may not be a sustainable or entirely comfortable solution. A more permanent and comfortable resolution to this issue would be to create a sealed-off environment within the room.

“Noise is often the first irritation”

LICHT



CHANGING → MOOD

On Saturday morning, I encountered the issue of excessive light entering the room. The sheet I had used as a makeshift barrier proved ineffective in blocking the light. In an attempt to address this issue and mitigate the noise coming from the living room, I positioned an air mattress between the window and my mattress. However, I discovered that inflatable objects do not provide adequate sound insulation, and they cannot serve as an independent partition to create a completely secluded space. On a positive note, the sheet and pillow did offer satisfactory sound insulation. It may be worth exploring the possibility of constructing a partition using pillows with an inflatable edge, as this could effectively seal off the space and minimise sound transmission. Furthermore, a cushion-based partition would offer a level of safety due to its softness and reduced risk of toppling over.

USE OF SPACE

easy to adapt

little maneuvering room

mattress with pillows

laundry rack in living space

“adaptation should be easy”

EASY TO ADAPT

There were occasions when I returned home feeling tired and unwilling to rearrange the entire room. On such occasions, I opted to place the mattress on the floor and quickly arranged a comfortable seating position using pillows. This experience taught me the importance of ease in adjusting the space. Furthermore, effective adjustment requires an empty and well-organised space to facilitate transitioning to the next function. So it is an advantage that stuff can be easily stored out of sight.

Throughout the experiment, I still had to carry out household chores. Consequently, I had to find space to hang laundry, which significantly reduced the available area in my experimental living space and rendered it uncomfortable. The presence of a laundry rack created a messy appearance and necessitated constant manoeuvring around it. It would be preferable if the hanging of laundry did not have to occur within the living area, but rather in a separate room or closet, enabling the area to be closed off.

cleaning

adapting furniture

changing atmosphere

GUESTS AND THE USE OF SPACE

easy to adapt → clean space

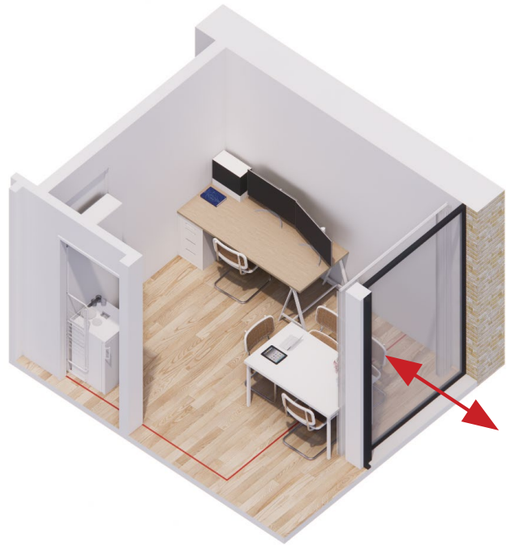
On Sunday, I had guests visiting, and while my girlfriend suggested stopping the experiment, I found it interesting to explore how I could adapt the environment to accommodate them. Initially, I focused on cleaning up the area, relocating the mattress behind the refrigerator and storing loose items in the cabinets and behind the mattress. Despite limited storage options, I successfully achieved a tidy space. Next, I aimed to provide sufficient seating at the dining table. To my surprise, my girlfriend informed me that the table was extendable, proving to be advantageous for the occasion. By extending the table by approximately 40 cm, we ensured sufficient space for everyone to sit comfortably. The orderly environment allowed us to position the table centrally, enabling everyone to congregate in my living space.

“adapting is creating space”

From this experience, I have come to appreciate the importance of tidiness and organisation. Additionally, the ability to customise the interior design can enhance enjoyment and satisfaction. I discovered that being together in a compact space can evoke a sense of cosiness. In addition, it is worth noting that suitable lighting choices can effectively establish a welcoming and cosy atmosphere, particularly when accommodating guests in a confined area. Thoughtfully curated sounds further enhance the overall ambience, contributing to a pleasant and enjoyable experience for visitors in a limited space

“You can create an atmosphere through light, sound and space.”

engage in a shared activity



workspace by the window

- connection outside
- missing intimacy
- comfortable sitting
- too much effort

INTIMACY

being together

“a small space brings people closer together”

After a few days had passed, I began to yearn for the intimate connection I shared with my girlfriend. Despite residing in separate areas within the living space, I desired to engage in a shared activity with her, such as watching a film. Consequently, I endeavoured to adjust the space to accommodate our joint movie-watching experience. A consideration in this endeavour was the establishment of a comfortable seating arrangement. To that end, I positioned the mattress between the drawer unit and the refrigerator, enabling both of us to sit comfortably side by side. This highlights the significance of creating adaptable spaces that facilitate both communal gatherings and individual comfort, and offers flexibility to accommodate different preferences.

LAST DAY

what do I miss

“Interaction with the outdoors reduces loneliness”

As the week progressed in my confined living space, my yearning for external contact grew stronger. I found myself longing for the familiarity of my former corner apartment, where I could engage with neighbours and relish in the sight of lush greenery. One day, I chose to arrange my workspace near the window, granting me a link to the external environment and a feeling of spaciousness, which was satisfying. However, the experience differed from that of an enclosed apartment, where one can sit in closer proximity to the window and immerse oneself in the surroundings. This encounter taught me the value of occasional interaction with individuals beyond my living space and the importance of having the ability to look outside. Engaging with people from the outside realm alleviates feelings of solitude, while residing in close proximity to a window imparts a sensation of openness and liberation.

EXPERIMENT CONCLUSION & REFLECTION

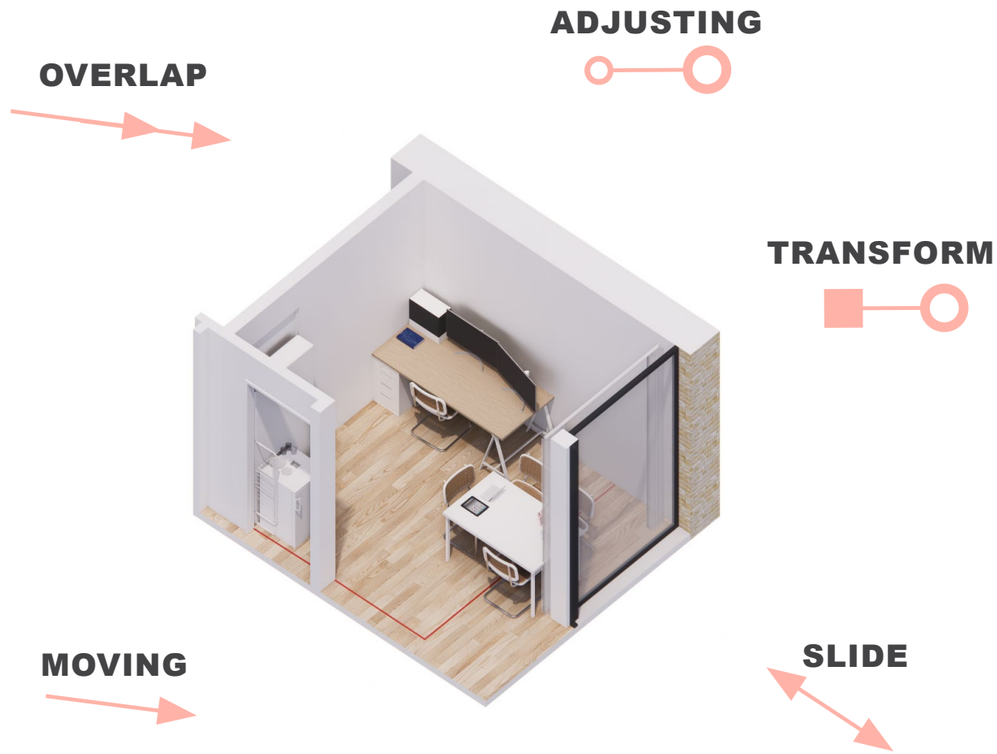
The main goal of the experiment was to investigate how individuals adjust their living spaces to accommodate different activities. The experiment took place within a 6.5 square metre area, primarily designated as a study and dining area. Participants were tasked with transforming this space into a liveable environment for the duration of the experiment, using provided furnishings like a mattress, pillows, refrigerator, and clothing. Some activities were performed jointly with a partner in the limited space. The experiment aimed to observe the adaptation processes used to fulfil functional needs and identify the crucial factors that contribute to comfort in a small area.

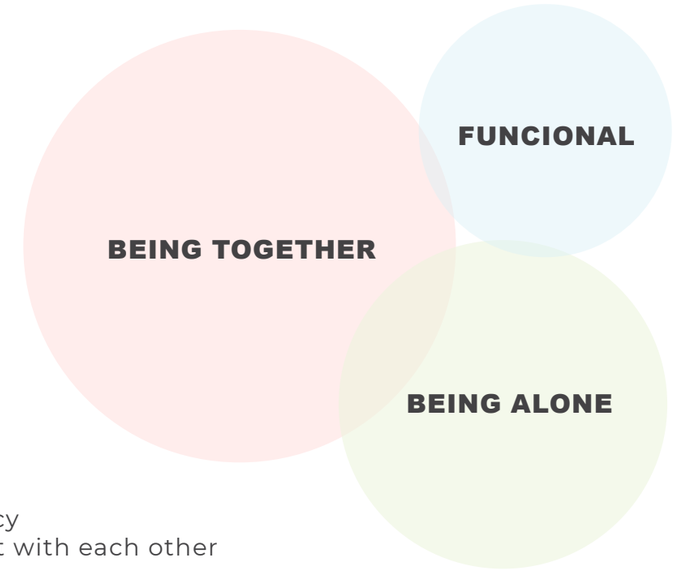
The participant found the experiment interesting and pleasurable, similar to the process of constructing a structure using Lego blocks. Rapidly, he developed an understanding of the essential qualities a space should possess to effectively support specific functions. Noise emerged as a notable annoyance, particularly the sound produced by the refrigerator during sleep. To address this issue, the participant rearranged the furnishings and discovered that the strategic placement of sheets and pillows served as effective sound barriers, offering a lightweight solution. Conversely, an inflatable air mattress was found to provide insufficient sound.

After a few days, the participant began to experience a sense of solitude within the confined space, as his partner resided in the living room. They yearned for intimacy and shared experiences. However, the act of watching a film together in the limited area brought them closer. By the eighth day, the participant desired more comfortable amenities, such as a proper bed or sofa, as the bed caused discomfort. Additionally, the continuous adjustments required in the space posed challenges, given its inherent inflexibility. A space designed to be adaptable is preferable as it allows for easier modifications, thereby eliminating any inconvenience. The participant also expressed a longing for a connection to the external environment, as the window only provided a view of the balcony rather than the surroundings. Adequate daylight and the presence of greenery were identified as crucial components for creating an agreeable living environment.

properties of the space

In my experience, the characteristics of the space have a significant impact on the number of people performing a specific activity. For example, when engaging in activities such as studying, reading or working, it is preferable to have a space with minimal noise pollution when the activity is performed alone. However, if the activity is performed in a group, this requirement may be less critical. Based on this observation, it is recommended that spaces be divided on a floor plan according to activities that are performed alone.





compact
integration
soundproof
not in living erea

intimacy
contact with each other
• view
• hearing
Interaction with outside privacy

close yourself off
• light
• sound
organizing → cleanup
privacy
contact with outside

ANALYSIS OF APARTMENT USE

funcion of space

An analysis was conducted on an apartment with the aim of obtaining a comprehensive understanding of the current living situation of the target market. The preliminary examination of the residence revealed the effective allocation of spaces for various functions and their efficient utilisation. Moreover, potential areas for optimisation were identified to better meet the needs of the target group and improve the current situation.

The initial step involved evaluating the placement of furniture and its surrounding spaces. Through this analysis, it was determined that there were no overlapping usage spaces, with each function having its dedicated area, indicating sufficient space allocation for each activity. This led to the conclusion that the apartment provided sufficient space for its occupants, yet there was sufficient room for optimisation. The analysis revealed the existence of multiple circulation areas and unused spaces, mainly arising from numerous partition walls and suboptimal layouts. For instance, the kitchen was found to be disproportionately large, with an unused room adjacent to it, while the storage room situated behind the kitchen was too narrow, resulting in a considerable portion being utilised as circulation space. By reconfiguring the kitchen and integrating storage solutions within the walls, a significant reduction in traffic areas could be achieved. Consequently, although potential efficiency improvements could be made, such modifications were deemed unnecessary in this instance, as the current layout already adequately accommodated the inhabitants' spatial requirements.

"The overlap of functional areas enhances the efficiency of a given space."

Furniture and function space

privacy and willingness to share

willing to share

- storage
- outlying area
- study room (quiet)
- washing machine
- technical room

Privacy and willingness to share

An investigation was undertaken to evaluate the preferred level of privacy and its association with specific functionalities. Those functions necessitating a heightened level of privacy, such as bedrooms, toilets, and bathrooms, were highlighted in red, indicating the need for complete isolation from the external environment. Furthermore, the provision of locks for the shower and toilet facilities from within the dwelling is deemed desirable. The desired level of privacy may vary when engaging in activities like dining or relaxing on the couch. While privacy may be of lesser concern during daylight hours, the option to draw curtains in the evening contributes to a sense of privacy maintenance. Balancing privacy and connectivity with the outside world, as well as fostering interaction with neighbours, is of equal importance. Curtains offer a convenient means to manage privacy levels effectively. The desired degree of privacy in a workspace is individual-specific and contingent upon the nature of desk-related tasks. In the context of work-related activities, privacy may be essential, especially when engaging in digital communication, while it may be of lesser significance in the context of hobbies.

Use of furniture and function

The apartment undergoes an analysis of its functional usage. The “Use of Furniture” diagram provides insights into the frequency of specific functions performed within the space. It reveals that the toilet and bathroom are frequently utilised, albeit for short durations. To gain a more comprehensive understanding, a heatmap (“Heatmap Usage of Apartment”) is generated to visualise the time spent in different areas. The analysis concludes that significant living activities occur near the windows, benefiting from sufficient natural light. Conversely, the outdoor space is primarily utilised during the summer months and serves a similar function as the living room, only with distinct characteristics. This suggests the potential for combining the area and changing the properties. Furthermore, utility spaces such as installation rooms, although not frequented by occupants, are of essential importance. Therefore, positioning these utility spaces in areas with limited natural light is recommended. Another notable finding is that the storage room and bedroom 2 are underutilised, occupying considerable space and traffic areas. Integrating storage solutions into the walls would facilitate the combination of traffic and functional space, significantly enhancing the apartment’s functionality. Additionally, decentralising storage by placing it outside the apartment, yet within the building, offers the opportunity to share storage space and only pay for the utilised portion. To optimise space, sliding cabinets or integrating storage into the hallway walls can be employed.

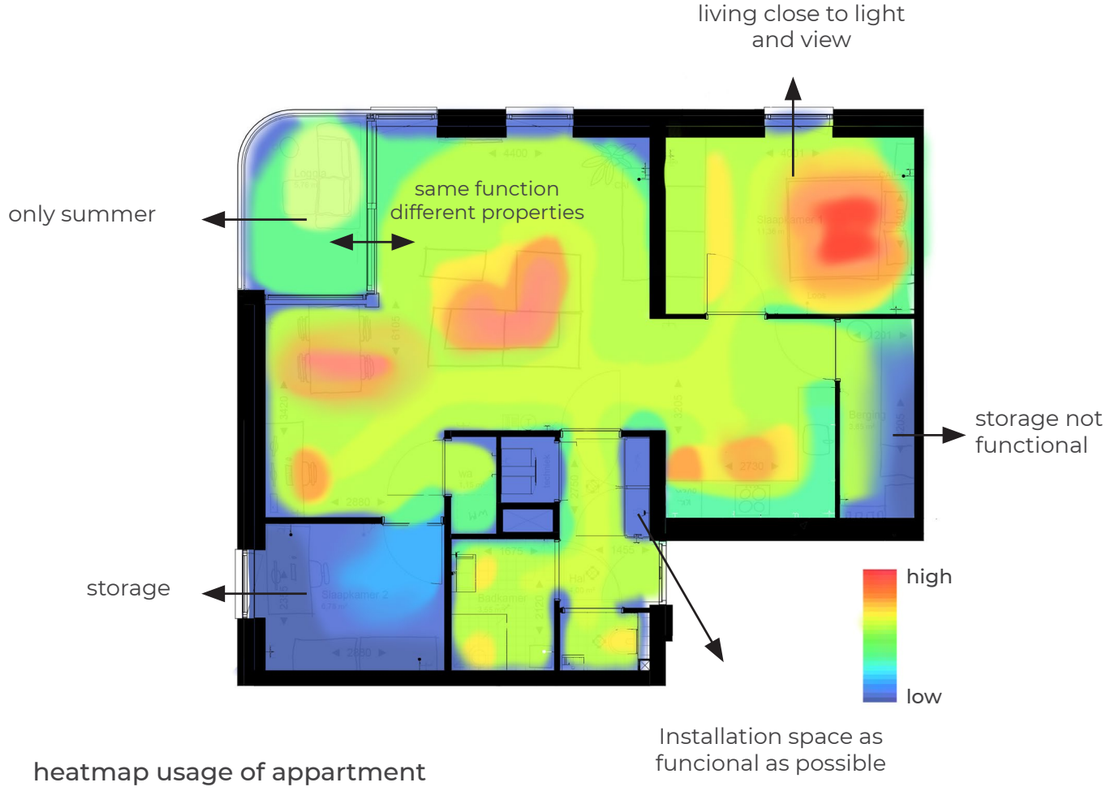
“Significant living activities occur near the windows”

“the outdoor space is primarily utilised during the summer months and serves a similar function as the living room”

findings

- The house layout has no overlap of functions
- The dwelling has a lot of traffic space due to many interior walls
- House is too big for 2 people
- Curtains are an easy way to create privacy, even outside.
- Contact with outside is important for contacts within the neighborhood
- Privacy of workplace depends on work
- Outdoor space has almost the same function as living room
- There is most living along the windows
- Storage can be much more functional and possibly outside the home

use of furniture



heatmap usage of appartment

THE REQUIREMENTS OF STARTERS

What requirements do starters have for their houses?

The availability of suitable housing for first-time homebuyers, referred to as “starters,” is a significant issue in the Dutch housing market. Starters are defined as homebuyers with an income of up to the gross moderate income of € 36,500 per year. In recent years, the number of available starter homes has decreased, while the demand for small and medium-sized single-family homes has increased. This leads to an imbalanced supply and demand. Although the housing shortage is expected to decrease, the situation for starters is not likely to improve. To improve this situation, more affordable and middle-class homes will need to be built.

Data from the CBR shows that starters have a preference for single-family homes, but there are not enough of them available. 43% of starters want a single-family home, which they find difficult to find due to the shortage of such homes, forcing them to rent or live in an apartment. In addition, the rapidly increasing prices make it even harder for starters to buy a home.

There are not enough homes to buy due to government policies that lead to limited land availability. However, can we not better utilize the land that is already available? Can we create apartments with the characteristics of single-family homes?

“An apartment needs to adapt to various life stages“

lifecycle

The theory of “lifecycle” as described by Hooimeijer & Mulder (2001) highlights how life events influence the housing needs and preferences of individuals and, in turn, their housing behavior and the meanings they assign to housing. This model states the existence of various parallel careers that an individual goes through throughout their life, such as household career, work career, and housing career.

The aim of this model is to explain how events in the work and household careers affect transitions in the housing career. The lifecycle can be described as the social-societal process of positions that an individual goes through throughout their life (Clark and Dieleman 1996).

The biggest challenge lies with a household of a middle-aged couple and grown children (Table 1). The grown children require a space for studying, gaming, watching tv and often desire a room with a large bed for overnight guests. As their lifecycle changes, a small child’s bedroom is no longer adequate. Therefore, attention must be paid to creating a suitable compact home for this type of family composition.

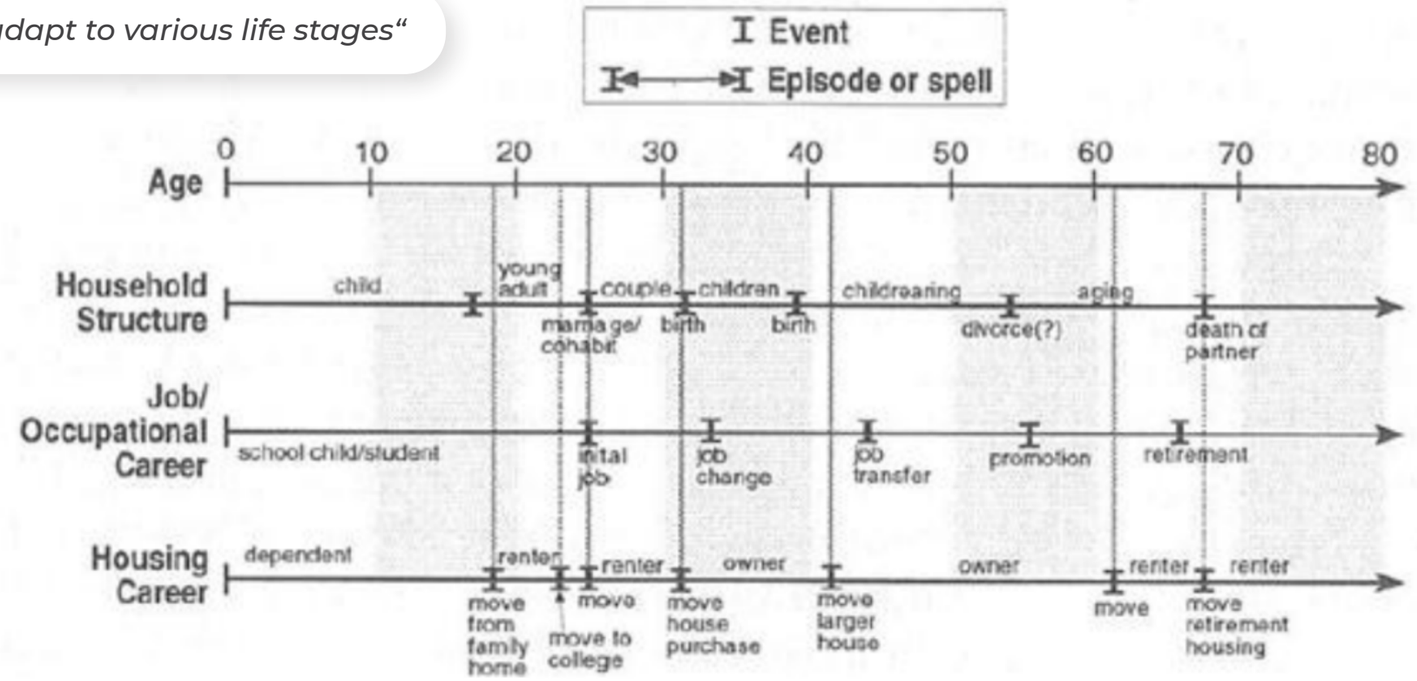


Figure 1: lifecycle, Clark & Dieleman, 1996

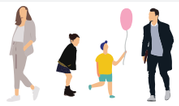
		Functions couple	Functions children
	**Young couple**	studying, sleeping, eating, relaxing alone, watching video together, changing clothes, washing, showering and brushing teeth	
	**Young couple, young children**	sleeping, eating, relaxing alone, watching video together, changing clothes, washing, showering and brushing teeth, reading	sleeping, eating, changing clothes, washing
	**middle age couple Teen age children**	sleeping, eating, relaxing alone, watching video together, changing clothes, washing, showering and brushing teeth, reading	sleeping, eating, changing clothes, washing, gaming, playing, watching tv
	**Middle age couple grown children**	sleeping, eating, relaxing alone, watching video together, changing clothes, washing, showering and brushing teeth, reading	sleeping together, eating, changing clothes, washing, gaming, studying, watching tv
	**Middle age Couple**	sleeping, eating, relaxing alone, watching video together, changing clothes, washing, showering and brushing teeth, reading, privacy is more important	
	**Elderly couple**	sleeping, eating, relaxing alone, watching tv together, changing clothes, washing, showering and brushing teeth, reading, privacy is more important	

Table 1: functions by household composition

“a design for middle-age couple and grown children is most difficult”

THE MOTIVES BEHIND THE RELOCATION OF YOUNG ADULT STARTERS TO CERTAIN NEIGHBORHOOD TYPES

The research “Young Adults in the City” (Slegers, 2010) examined the motivations for the relocation of young adults to specific neighborhood types. The study found that young adults, or “starters,” often have a preference for urban living environments, which can manifest as a preference for city centers or suburban neighborhoods. These preferences are influenced by factors such as social identification, availability of facilities, and housing options. City centers are characterized by high population density and a high level of facilities, while suburban neighborhoods often offer more green space and a larger stock of single-family homes. Starters are often interested in neighborhoods where they can identify socially and where there are sufficient facilities such as shops, sports clubs, and public transportation.

When it comes to facilities, the study found that liveliness is crucial, which includes small-scale restaurants, a combination of leisure, work, and living spaces, and no large stores but rather unique shops, eateries, and galleries. The importance of certain physical and environmental features were also evaluated in the survey by asking respondents to rate the importance of certain facilities and characteristics on a scale of 1 to 5, with 1 being the least important and 5 being the most important. The following table illustrates the significance of facilities in the immediate living environment.

Voorziening	Waardering belangrijk tot zeer belangrijk in procenten - totaal (%)	Waardering belangrijk tot zeer belangrijk in procenten – centrum (%)	Waardering belangrijk tot zeer belangrijk in procenten – aan de rand(%)	Waardering belangrijk tot zeer belangrijk in procenten – geen voorkeur voor locatie (%)
Dagelijkse winkelvoorzieningen (supermarkt, etc)	85,7	87,3	77,0	87,3
Bereikbaarheid openbaar vervoer	80,6	82,5	62,3	86,4
Groenvoorziening	53,9	52,8	59,0	56,4
Bereikbaarheid auto	47,7	42,3	67,2	55,5
Sport- en recreatiefaciliteiten	39,6	40,2	42,6	37,3
Parkeermogelijkheden	38,0	35,6	55,7	41,8
Horecagelegenheden	36,7	43,7	16,4	25,5
Afhaalgelegenheid	36,3	36,9	39,3	32,7
Eetcafé	35,8	41,2	24,6	24,5
Buurtcafé/kroeg	25,7	30,2	18,0	14,5
Restaurant	24,1	27,5	16,4	17,3
Danscafé/ discotheek	8,3	8,9	9,8	5,5
Kantoor-/werkruimte/atelier	7,9	7,5	13,1	6,4

Table 2: Rating of facilities in the immediate area, Hoefnagel, 2011

programs & functionalities

starters

CBR:
- starters want a single-family homes
  - grow familie
  - have a garden
- urban living environments
  - social identification, availability of facilities

survey
- buying as an investment
- starters are willing to give up laundry room
- starters are not willing to fold their beds
- they are willing to easily adjust furniture layouts
- good public transport = car away
- starters like extra facilities in their building
- they are willing to walk 50 metres for extra storage

Rating by starters of facilities in nearby area

supermarket	85%
public transport	80%
green facility	53%
accessibility by car	47%
sport and recreation	40%
takeaway opportunity	36%
local pub	25%
restaurant	24%
office workspace	8%

Rating of facilities in the immediate area, Hoefnagel, 201

common activities household

activities couple

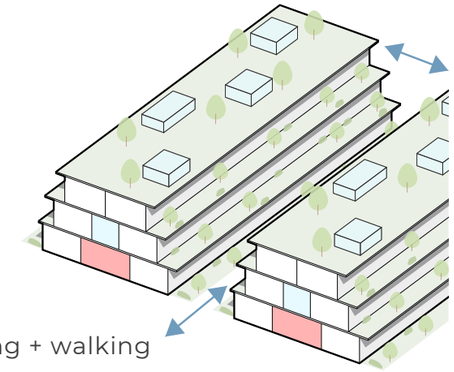
sleeping, eating, relaxing alone, cooking, watching video together, changing clothes, washing, showering, brushing teeth, refreshing of yourself, reading and go to toilet

activities children

sleeping together, eating, changing clothes, washing, gaming, studying, watching tv

dencification

- create a high density
- daylight for daily activities
- focus on views and spaciousness →
- relationship with outside is important
- mixed-use developments → 24-hour use
- facilities in the core → high density
  - low sunlight at the core
  - higher sunlight at the head
- no cars and parking inbetween buildings
- high-density requires high-quality public spaces



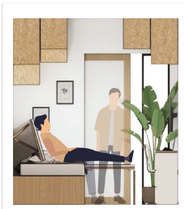
collectivity

- common spaces near routes or public places
- adaptability of shared space → supply and demand
- connecting different buildings ensuring better circulation and sharing of functions
- mix of functions creates a 24-hour infrastructure
- biggest benefit → social life
- people desire their own private and exclusive areas
- promoting social interaction is important

SHARED SPACE

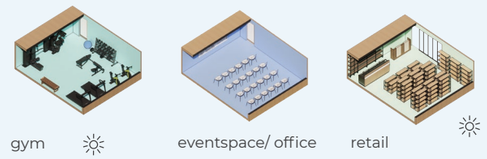
adaptebillity

- easy to use
- moving furniture for living erea
- everyone a space to be alone
- the bedroom should be an enclosed space
- adaptable furniture not walls for enclosed space
- plants behave as an adaptive system
- semi-outdoor space increases living area



enclosed space 5m²

GENERAL UTILITYS



high sunlight requirement

laundry
clothing manufacturing
schools
doctor
childcare
police

low sunlight need

library
manufacturing industry
distribution centres
museums
theatre
cinemas
sports halls

TALKS

LIST OF EXPERTS

STORA ENSO - CLT CONSTRUCTION

Charly Reignier

Stora Enso is a prominent player in the field of Cross-Laminated Timber (CLT) constructions. An extensive discussion was conducted with Charley regarding the construction of residential units using CLT. The company has a vast amount of digital information about the construction process of these units. Charley indicated that utilizing a beam layer for the floor is the most cost-effective option and that a width of 4000 mm is achievable with their construction system. He explained that the modules are interconnected using special corner connections and sound absorbing material, ensuring the structure is fully fire-resistant. However, when employing a wooden beam layer, additional weight must be added to mitigate impact noise. Charley emphasized that transportation is best carried out via water, and there is a maximum width of 4000 mm for road transport. He also advised providing each unit with its own ceiling to facilitate damage-free transportation. Regrettably, he noted that CLT is not the most economical choice, but certain components of it can still be utilized.

URSEM MODULAR CONSTRUCTION SYSTEMS:

Niels Doodeman

During the interview, various aspects of construction methods were discussed, including Cross-Laminated Timber (CLT) and steel-based Integrated Design System (IDS). The maximum width for CLT units is 3500 mm in terms of external dimensions, whereas steel can accommodate widths up to 4000 mm. Steel units can be stacked up to 5 levels high, with a maximum size of 12500 x 4000 mm. Each unit is equipped with its own floor and ceiling to minimize transportation damage and reduce impact noise.
The possibility of combining two units with an opening in between to create a larger living space was discussed, although additional construction may be necessary. Openings in the external walls on the side of the unit are feasible but may require extra construction work. Direct attachment of cantilevered balconies to CLT floors is not feasible, whereas concrete floors with a thickness of 300 mm can accommodate such attachments. Furthermore, compared to CLT, the steel module offers advantages in terms of cost and building height.

SOPHIE VALLA ARCHITECTS - COLLECTIVE LIVING

Sophie Valla

During the conversation with Sophie Valla, the importance of collectivity and the creation of appealing communal spaces, such as the inner courtyard and circulation areas, were discussed. Involving the community in the decision-making process regarding shared functions within the building would have a positive impact. This approach ensures that the activities taking place in these spaces align with the residents' needs, fostering a sense of involvement and greater responsibility.

Furthermore, it is essential to activate the plinth of the building by incorporating residential units, while avoiding the inclusion of bedrooms in this area. Natural elements, such as wadis, can serve as a natural boundary between private and public areas. The bicycle storage should be discreetly placed, preferably at the core of the building.

One of the key principles for effective communication is to encourage coincidental encounters. This can be achieved by transforming circulation areas into more than just a corridor. By incorporating additional features, such as meeting points and shared spaces, opportunities for interactions among residents can be increased. Furthermore, a wider circulation space promotes greater social interaction.

RESPACE - MOVABLE INNER WALLS

Joost Thus

The internal walls of Respace can indeed be relocated. These walls are constructed using LVL (Laminated Veneer Lumber) studs and rails, filled with acoustifit, and finished with birch plywood. The walls are equipped with compression strips and comply with the sound regulations of the building code. They are delivered with untreated plywood, which can be treated when desired. In some cases, Respace also uses Unilin's clicwall as an alternative to plywood. This clicwall is delivered in a standard white finish and can be further customized if needed. The materials used are fully sustainable, and the walls are affordable.

A JOURNEY THROUGH GRADUATION ▼

LOGBOOK

ADAPTABILITY

THEORIE 1
MORE SPACE ▶

THEORIE

Spatial planning is a common design strategy that provides users with spatial options to utilise a building in different ways (Schmidt & Austin, 2016). The goal is to identify patterns of use and translate them into design. This allows designs to be developed based on evidence rather than intuition.

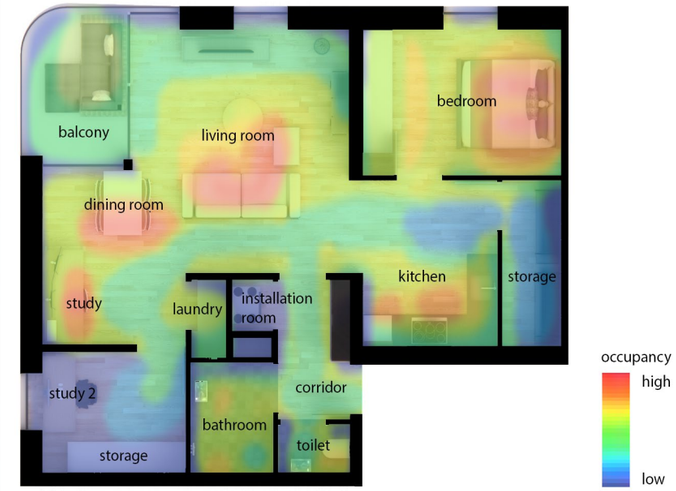
Research on “analysis of apartment use” reveals that storage space in apartments is often underutilised and takes up a significant amount of space. This is often due to the space not being designed efficiently, resulting in a large amount of space being lost to access the closets. The use space does not overlap with other use spaces (Figure 1). A more efficient solution could be to better utilise the space, for example by applying smart storage solutions such as an archive cabinet. Additionally, closets could also be integrated into the walls that border the circulation space.

Research on “analysis of apartment use” reveals that no single function or use space overlaps, leading to low space efficiency. According to Neufert (2007), the dimensions for different tasks are regulated by standards, however they can overlap if it does not result in a limitation of the function. The required functional space is composed of different areas.

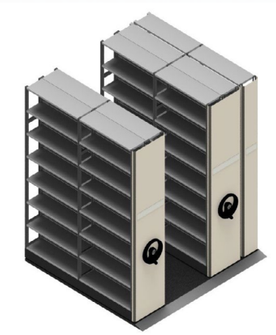
The areas are:

Work area: furniture layout
Furniture function area: space needed for the use of the furniture
Traffic and through-passages area

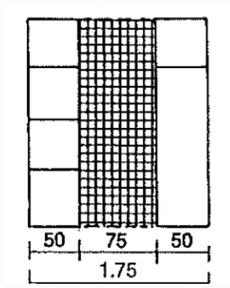
The concept is based on minimising space when a function is not in use, such as with an archive cabinet. An archive cabinet can move, reducing the functional space of the furniture and allowing it to be used for another cabinet or function. This allows for high-density storage to be created. The concept of the archive cabinet can be applied to other functions. These elements include various functions and the corresponding furniture. The functional space of the furniture and circulation space can be minimised, allowing multiple functions to be performed in the same space. However, this means that not all functions can be performed simultaneously. The “space” is defined by the elements with furniture in it. By adding a sliding partition perpendicular to the furniture modules, a space can be created. Although, soundproofing remains a challenge with so many movable elements.

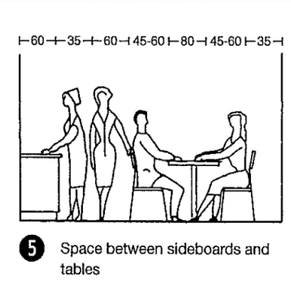


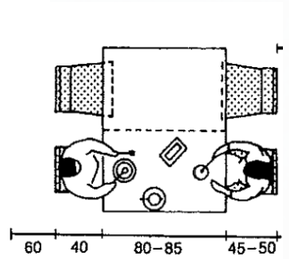
Heatmap Usage of Apartment


archive cabinet

neufert







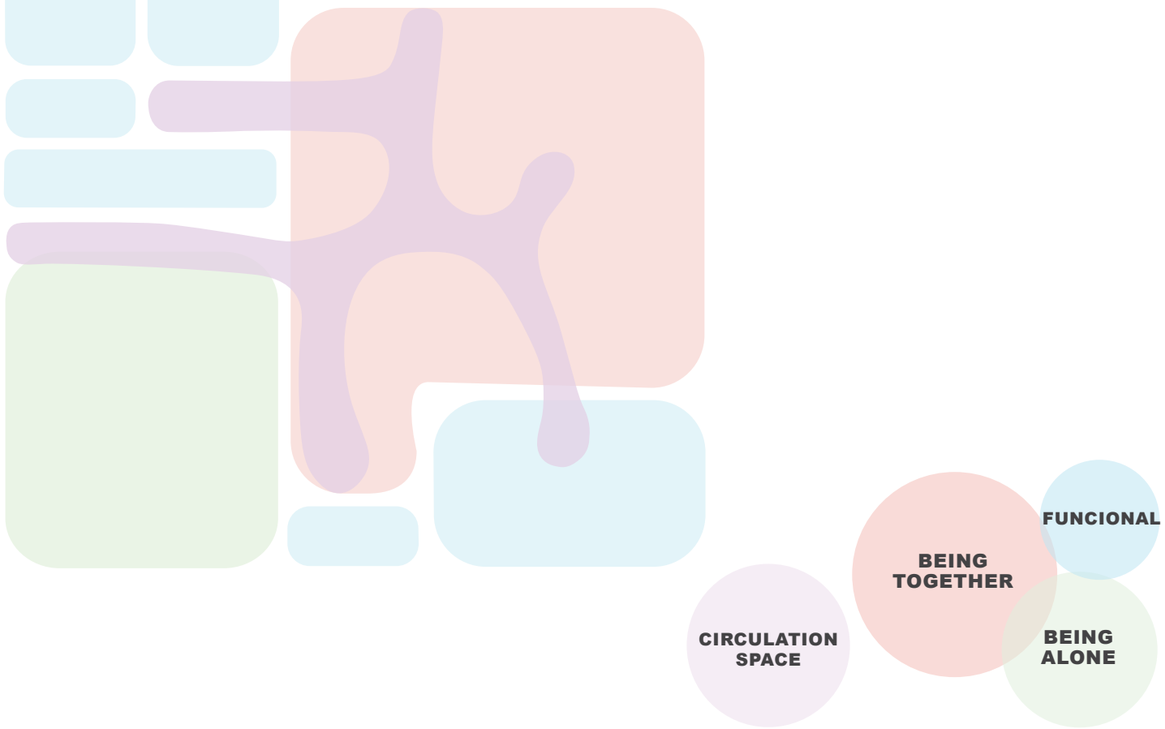
work area
furniture function area
traffic and through-passages

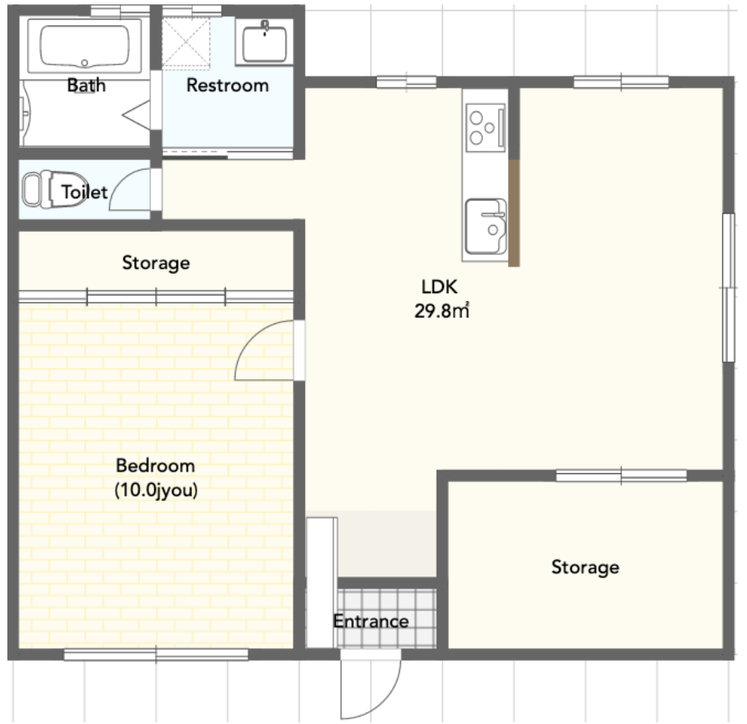
JAPANEES APARTMENT

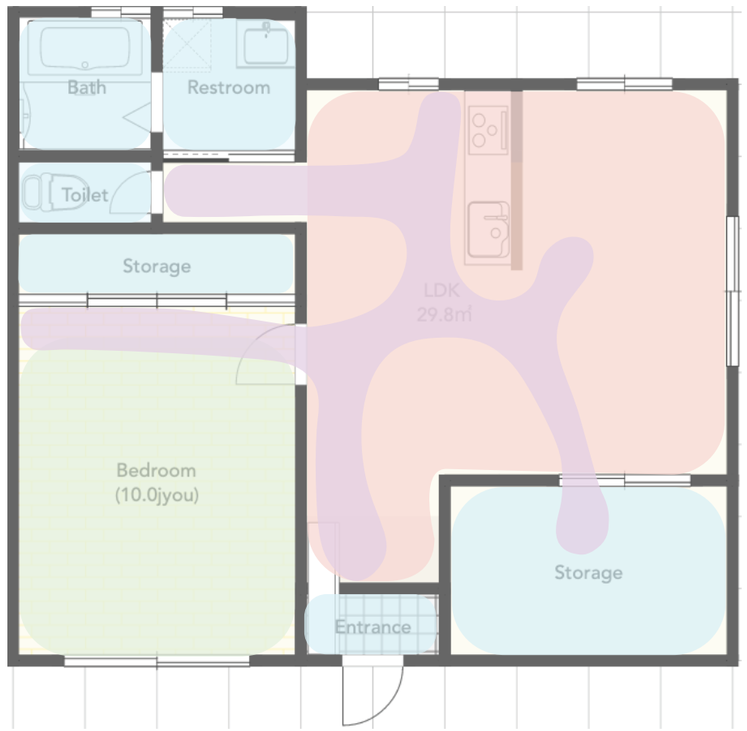
Standaard Japanees apartment

Upon initial observation, it became apparent that the apartment lacked a conventional hallway, but featured a small porch near the entrance. In this arrangement, the living area incorporates the functions typically associated with a hallway. This design choice, reminiscent of Japanese architecture, offers the advantage of utilising this space for various purposes. The layout allows for flexible use of the different areas, with the tatami mats providing comfortable seating options while also aiding in noise reduction. Additionally, sufficient storage is available, facilitating easy organisation and enabling the space to transition seamlessly to accommodate different functions.

Furthermore, the separation of the bathtub and shower from the rest of the bathroom is noteworthy. This design choice provides privacy without necessitating the closure of the entire bathroom area. Similarly, the toilet is situated separately, without an adjacent hallway, reducing the potential for unpleasant smells to spread to other areas. A clear pattern emerges where specific functions are grouped together, such as the bathroom, shower, bath, and toilet. Likewise, areas designed for communal activities are clustered together, while those intended for individual use are likewise consolidated. This functional approach optimises the layout based on the distinctive characteristics and requirements of each area.







JAPANESE TATAMI HOUSE

Sliding doors (fusuma)

Built-in shelves (chigaidana)

Partitions (byobu/tsuitate)

Futon folding mattress (Futon)

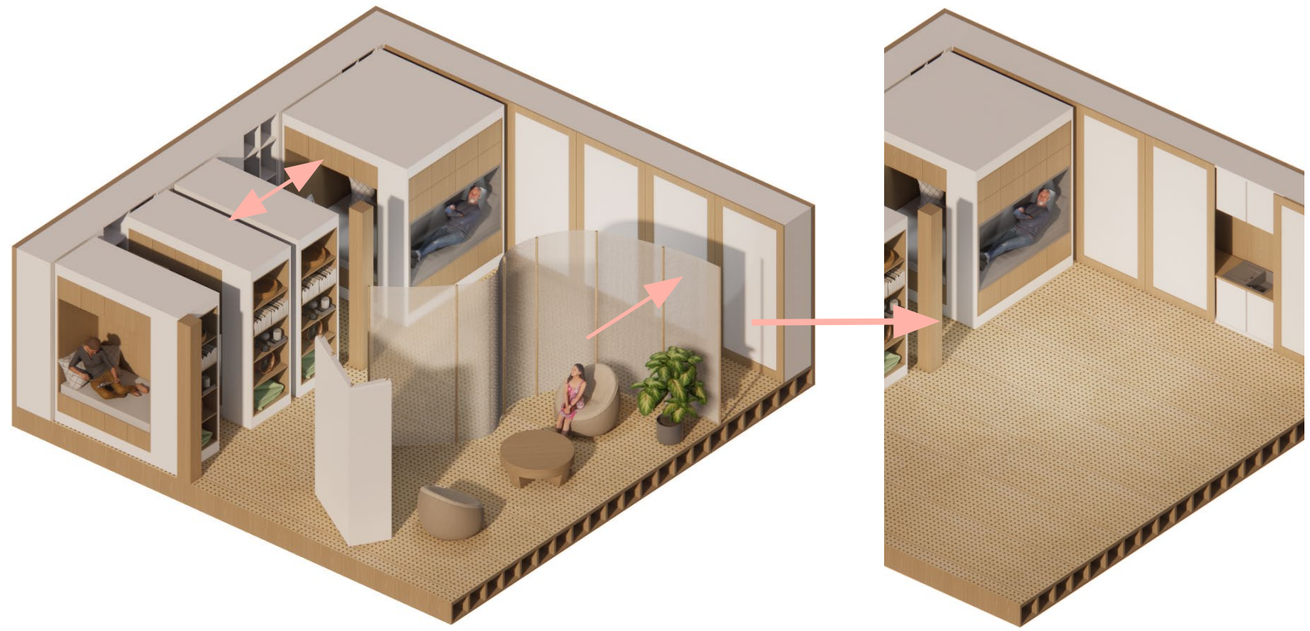
workspace intergrades in wal

MA: The Space In Between

DESIGN BASED ON TATAMI HOUSE

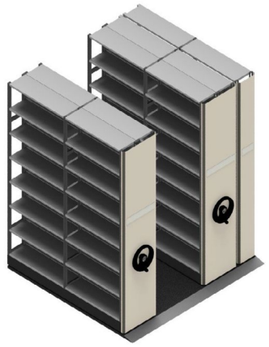
To make spaces adaptable for easy function switching, architectural interventions have been implemented. First and foremost, walls are extensively utilised. They serve various purposes, but the presence of an integrated storage system is particularly significant. Situating storage adjacent to the living area facilitates convenient storage of belongings and enables the space to accommodate a new function. Additionally, the absence of fixed furniture is notable, allowing for easy storage of items such as tables and beds, thereby freeing up the space for alternative functions. Furthermore, the use of folding screens (Byobu) enables the division of space into smaller sections. Sliding doors are also frequently employed, offering a space-efficient partition that does not require inward swinging, eliminating the need to consider people or objects behind the door and optimising the use of space.

The concept of “ma” in Japanese architecture seeks a harmonious integration of the built environment with the natural surroundings and influences both the functional and aesthetic aspects of architecture. It creates a feeling of openness, flexibility, and serenity in the space, blurring the lines between the interior and exterior.

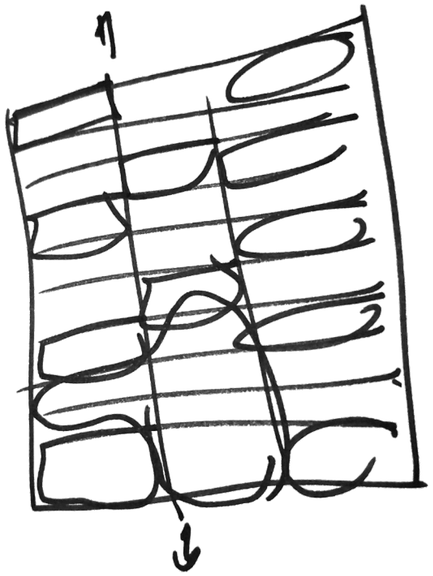


Design based on Tatami house

CONCEPT: MORE SPACE



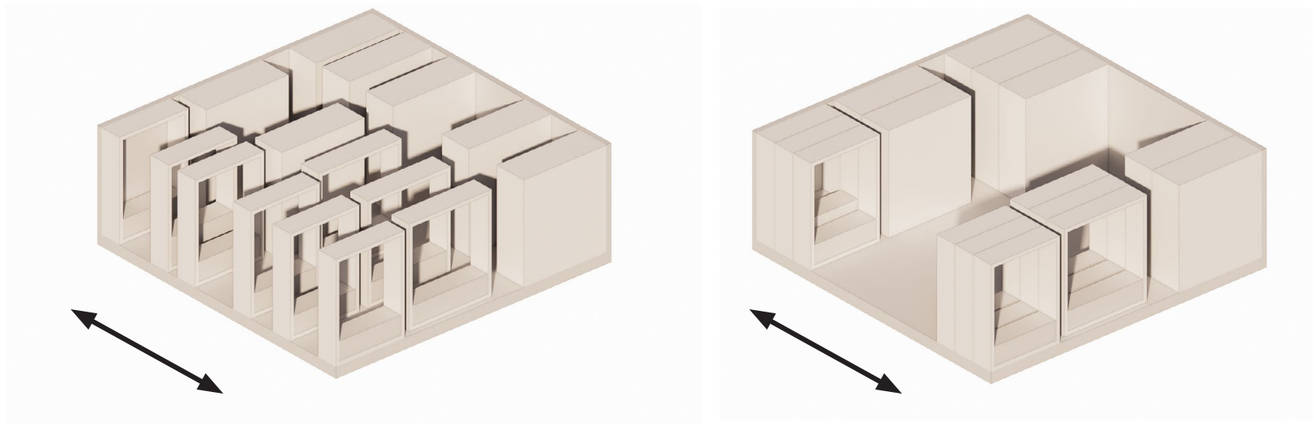
archive cabinet



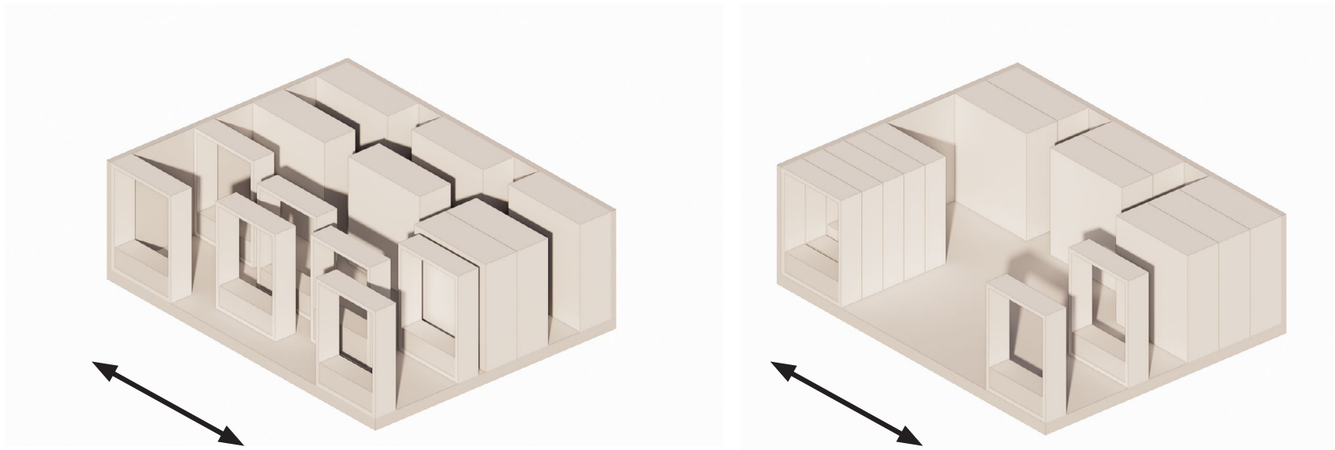
concept sketch

EVERY THING IN A CABINET

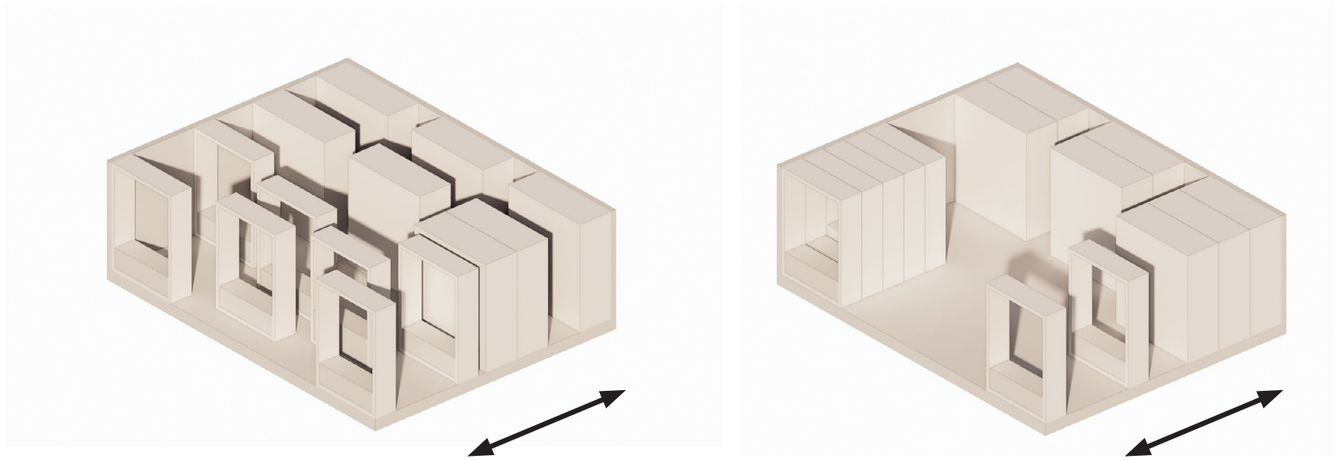
Research has indicated that archive cabinets are more space-efficient due to their ability to repurpose unused functional space for alternative uses. This concept has inspired the development of modules with integrated functions that can be shifted, similar to filing cabinets, in order to minimise utilisation space. Conducting a mass study revealed that lateral displacement of the module is the most practical approach, enabling the simultaneous execution of multiple functions. Implementing this concept throughout the entire dwelling can yield substantial space gains



Lateral shift of the module



Lateral shift side by side



Inwards shift of module

TEST RELATIONSHIP WITH OUTDOOR SPACE

movable fasace

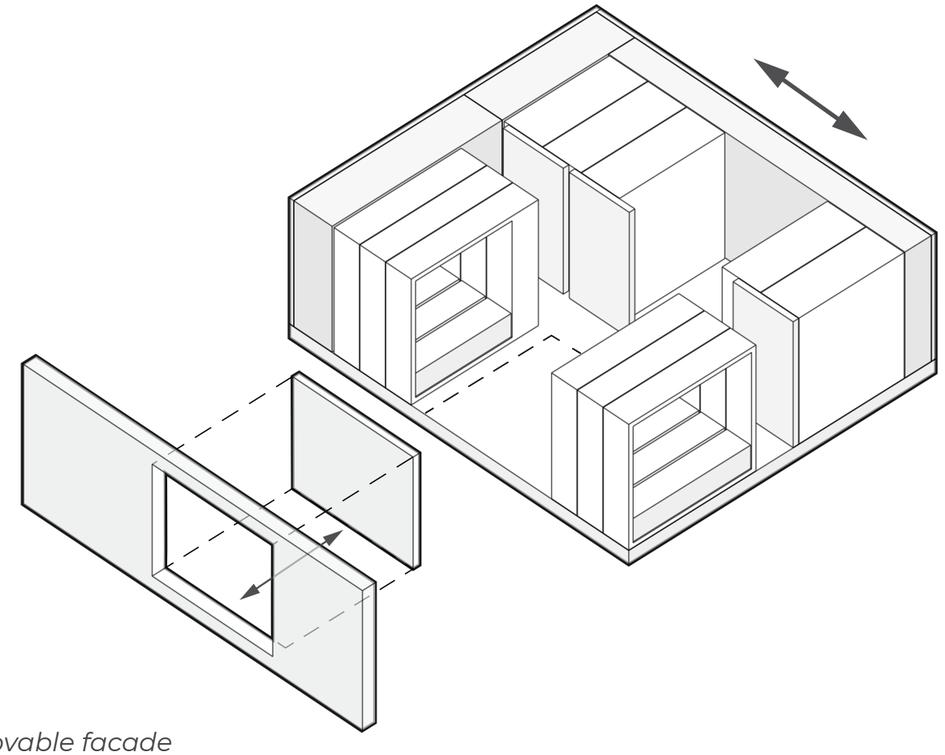
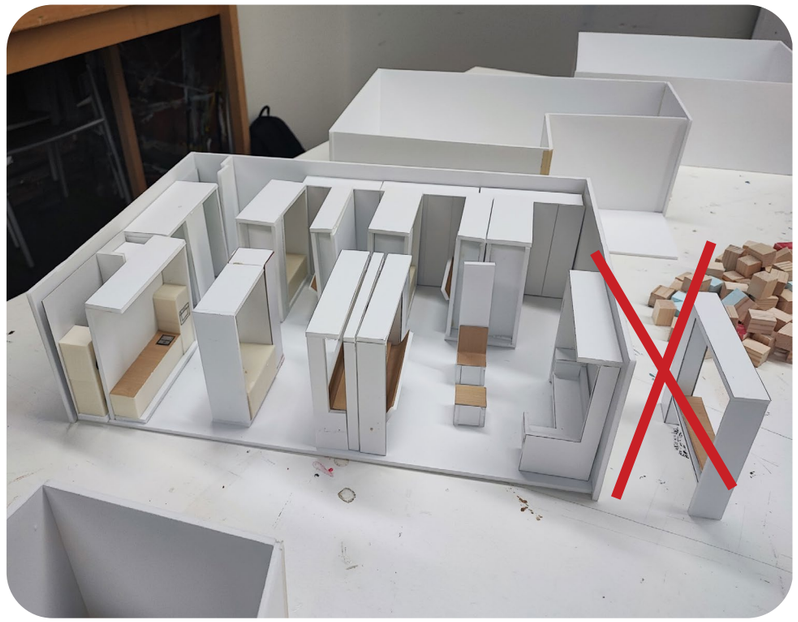


Diagram movable facade

EVERY THING IN A CABINET

During the winter school program, our objective was to explore the correlation with the outdoor space. By constructing models, we determined that the optimal placement for the outdoor space is in the centre, as it allows for the sliding of most cabinets into it and maximises natural light within the house. Furthermore, we deduced that an actual outdoor space is unnecessary if the characteristics of the indoor space can be adapted to emulate those of an outdoor environment. By relocating a partition from the façade to the interior, we achieved the desired qualities of an outdoor space.

Working collaboratively with my team, we critically assessed and enhanced the design. For instance, we reconfigured the dining room module to enable rotational seating, facilitating its utilisation from two sides. Consequently, we were able to eliminate a sofa element in the living room, optimising the spatial division of the apartment. Additionally, we made minor adjustments to the floor plan, reducing its width by 500 square metres, resulting in a 3.5 square metre reduction in the overall apartment size.



testing design in 3D

removed element

MORE SPACE ▶

final design Theorie1: more space

variation 1: Living room & laundry room

variation 2: kitchen & dining room

The concept revolves around minimising space when a specific function is not in use, drawing inspiration from the concept of an archive cabinet. Just like an archive cabinet, which can be moved to reduce the functional space it occupies and repurpose it for another cabinet or function, this approach enables the creation of high-density storage. The concept of the archive cabinet can be extended to other functions as well, encompassing various functional elements and their corresponding furniture.

By minimising the functional and circulation space of furniture, multiple functions can be accommodated within the same space. However, this implies that not all functions can be performed simultaneously. The notion of “space” is determined by the presence of furniture modules. Introducing a sliding partition perpendicular to the furniture modules can create distinct spaces, although ensuring effective soundproofing poses a challenge due to the presence of numerous movable elements.

MORE SPACE ▶

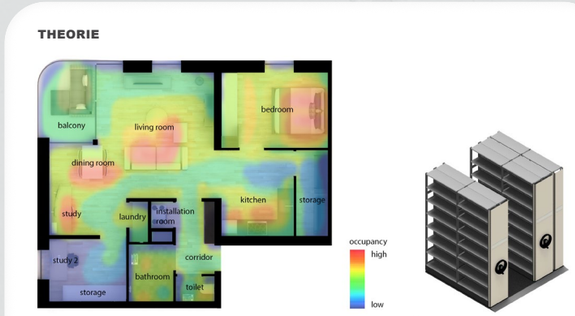
final design Theorie1: more space

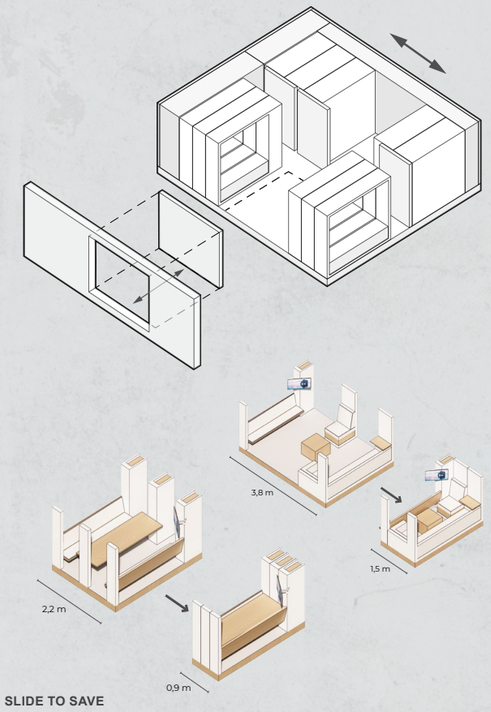
By reconfiguring the elements and optimising functional and circulation spaces, significant space can be conserved. The designed area measures 52 m²; however, by fully utilising all functions, a total space of 71 m² can be created, resulting in a gain of 37%. This compact and cost-effective housing solution can be constructed for €234,000 (52 m² x €4,500). The notable areas that contribute to this increased space are the kitchen, dining room, living room, and laundry room.

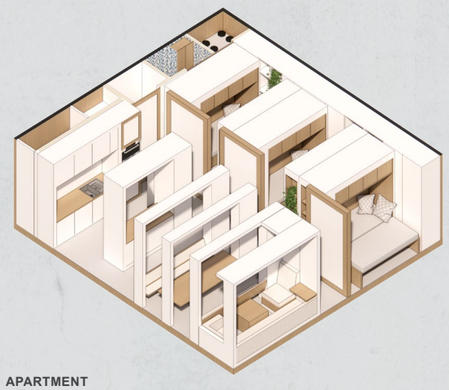
It is important to acknowledge that the concept is less effective when applied to bedrooms, as they require constant accessibility. It would be impractical for an individual to be unable to sleep due to another person utilising a different function. Additionally, it would be uncomfortable if someone were to move a module while someone else is sleeping. The challenge of soundproofing arises due to the movable elements, making it difficult to establish effective soundproof connections. Moreover, findings from the experiment "Living on 6.5 m²" indicate that adjustments should be straightforward to maintain a sense of comfort. These challenges can potentially be mitigated by incorporating hanging elements and employing lightweight materials. Further research is warranted to explore the potential benefits of separating the furniture from the walls, aiming to enhance the user experience and maximise space utilisation.

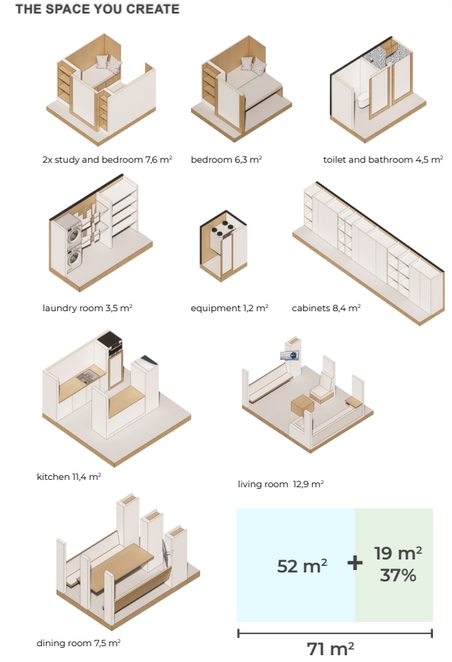
floorplan

MORE SPACE ▶





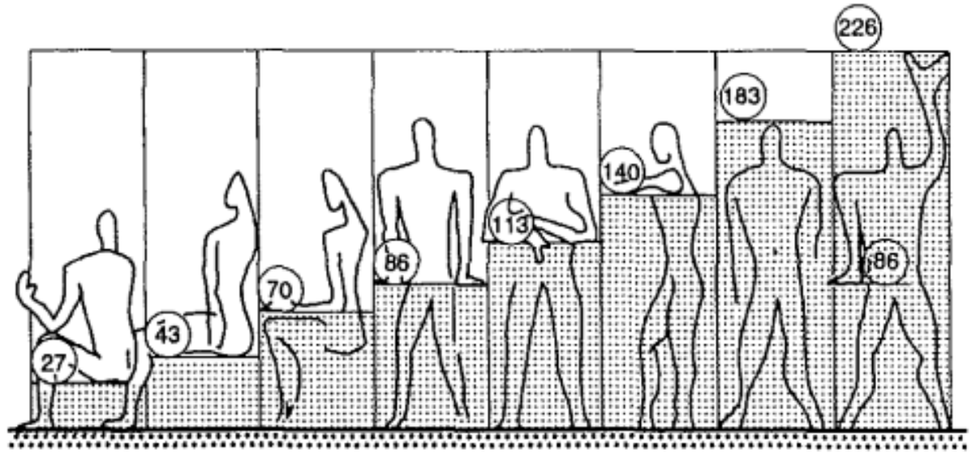




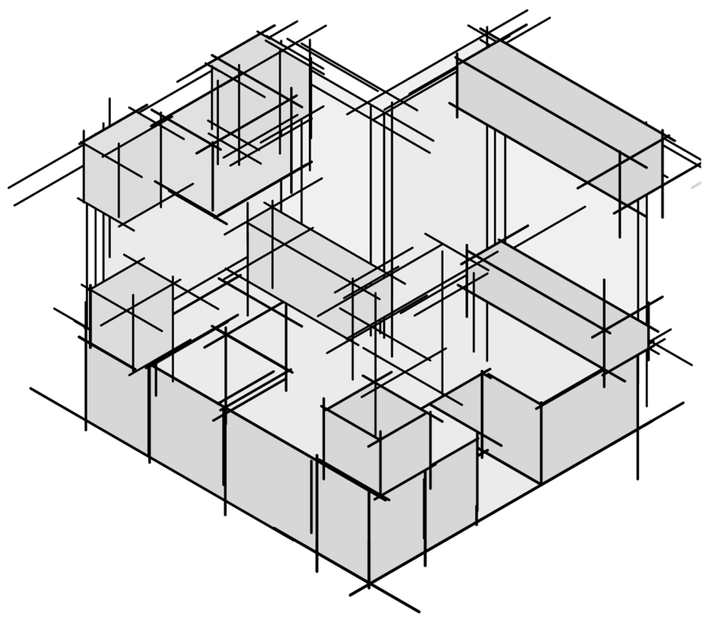
THEORIE 4

MY OWN NEUFERT

The concept of “My Own Neufert” originated from the idea of “Volumes to Create,” which offers the possibility of self-creating spaces using modular blocks. By combining hard and soft blocks, various forms and layouts can be achieved, enabling full customization of the space according to individual preferences. In theory, it would be possible to accommodate all desired functions within this space. Additionally, by combining cushions, it becomes possible to create any desired seating position. To investigate which positions are desired, I began observing my own behaviour and explored the positions I often assume myself



4 Unlimited values



volumes to create

MY OWN NEUFERT

final design Theorie4: my own neufert

Based on the findings of the experimental study “Living on 6.5 m²,” it was concluded that multiple functions can be incorporated into a small space as long as it is designed with adaptability in mind. The primary aim is to create comfortable arrangements. The study also emphasized the importance of simple adjustments for user comfort. Considering the challenge of accommodating adult children who require a double bed, a desk, a TV, and storage space, the design concept of “My Own Neufert” (Figure 5) was developed.

The concept incorporates a movable backrest that is typically positioned against the wall, serving as both a bed and a TV viewing area. A fold-out foot panel was integrated at the head of the bed to provide a reclining position. The TV screen is height-adjustable, allowing it to double as a computer monitor. The desk features a fold-down mechanism, enabling easy storage of items when not in use and providing additional space for functions like a second mattress underneath the bed. The bed can be converted into a double bed when needed.

Furthermore, storage boxes are integrated above the bed and desk, offering ample storage options while also creating a sense of spaciousness in the room. This design demonstrates that all desired functions can be accommodated within an area of 2,300 mm by 2,000 mm and can be further integrated into future designs.

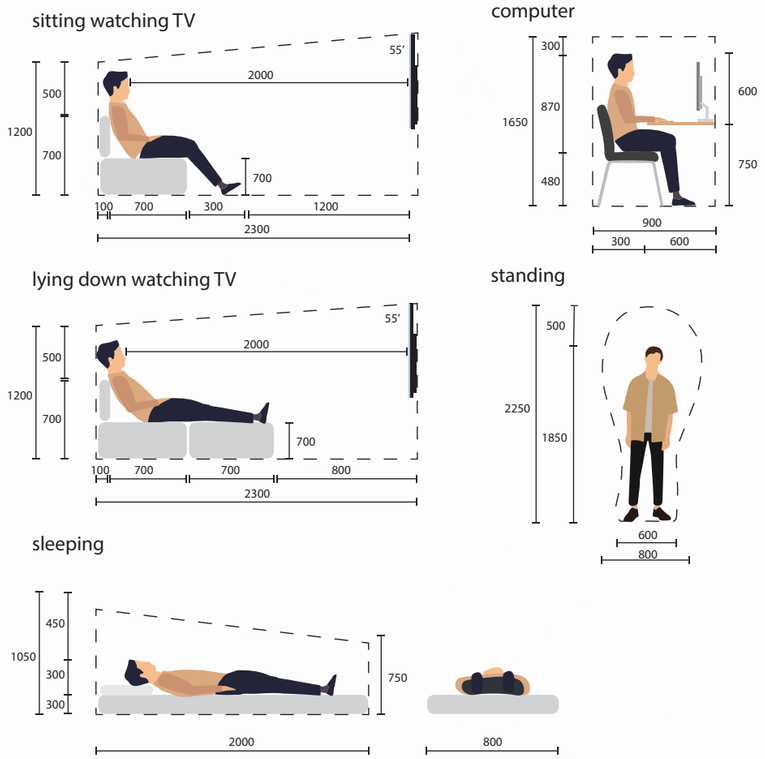
sleeping

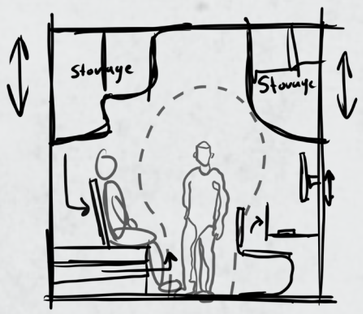
dubble bed

studying

watching tv

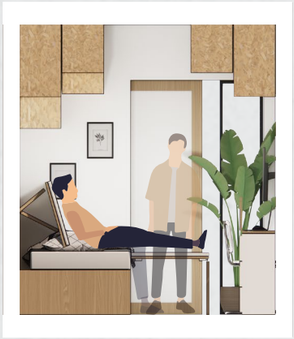
DIMENSIONS OWN NEUFERT



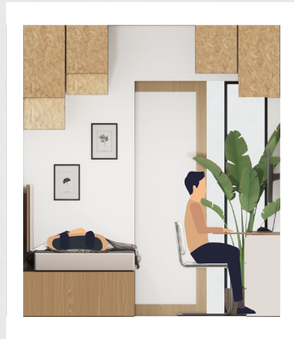


concept sketch

space

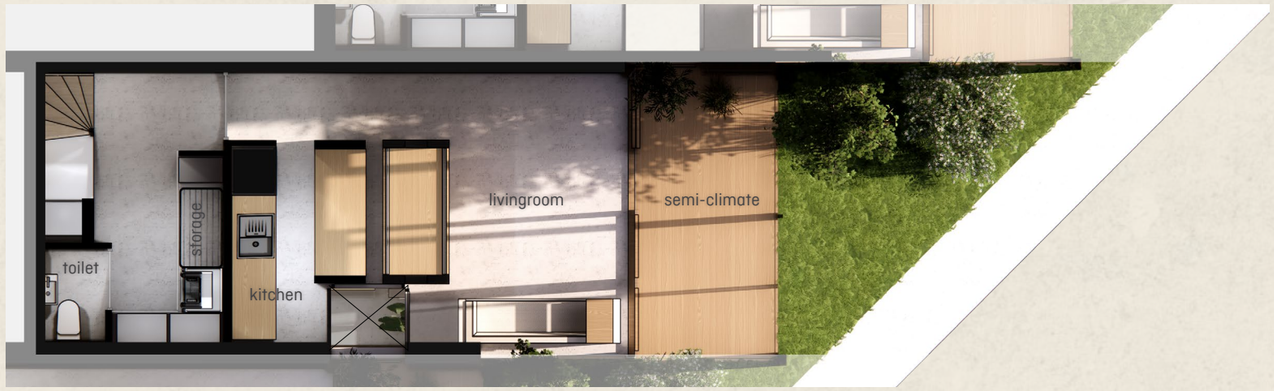


section watching, standing



section lying computer

APPARTMENT DESIGN 1

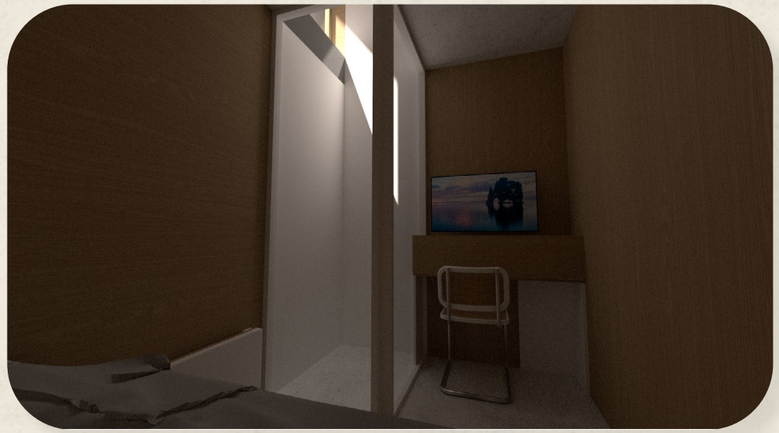


FOURTH FLOOR

THIRD FLOOR

SECOND FLOOR

LIGHT SHAFT SECTION



LIGHT TROUGH LIGHT SHAFT

When designing the 4-meter-wide apartments with three bedrooms, the amount of daylight was a key consideration. Adequate daylight is particularly important for the bedrooms. The initial design includes a light shaft, allowing light to enter the rooms from above. To further increase the amount of light in the shaft, a window has been included on the side. However, this window features frosted glass to ensure privacy for neighboring apartments. To test the effectiveness of this design in terms of daylighting, Vray was used to determine the amount of light entering the bedroom. While some light does reach the bedroom, the question remains whether this is sufficient and whether the quality of light in the lower-level bedroom is adequate.

APPARTMENT DESIGN 2

GROUND FLOOR

LIGHT TROUGH HALWAY

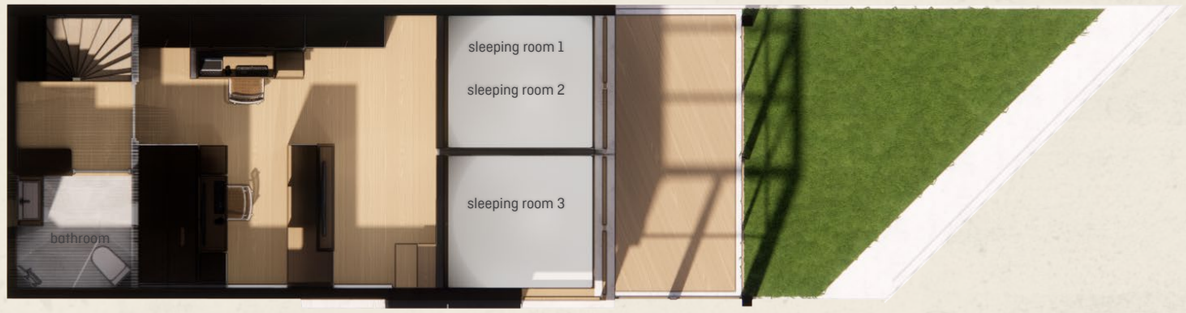
FIRST FLOOR

This apartment features side-by-side bedrooms, with each side slightly protruding to allow light to enter through the façade window. The angled design of the apartment allows for additional light to enter directly into the bedroom. Moreover, the hallway wall provides indirect lighting to ensure adequate illumination. Additionally, one can enjoy an outdoor view while working at the desk. Similar to Apartment 1, this design has been evaluated using a rendering program to assess the amount of light. It performs better than Design 1.

FACADE DESIGN

APPARTMENT DESIGN 3

GROUND FLOOR



FIRST FLOOR

This design is based on a layout featuring bed alcoves, with three bed alcoves positioned near the window to meet the requirement of three bedrooms. This arrangement creates an intermediate space that can be flexibly used for various purposes. To assess the quality of this intermediate space, a lighting test was conducted using V-ray. Unfortunately, the test revealed that the intermediate space does not receive sufficient sunlight to be perceived as pleasant. Therefore, it was decided to select apartment layout 2 and make it more transparent to address this issue

LIGHT TROUGH BED ALCOVES OPEN

LIGHT TROUGH BED ALCOVES CLOSED

APPARTMENT FINAL DESIGN

GROUND FLOOR

FIRST FLOOR - ADAPTION 1

FIRST FLOOR - ADAPTION 2

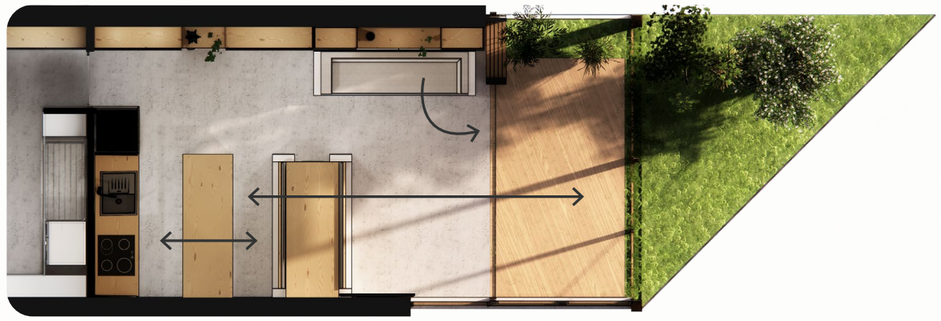
LIGHT TEST BEDROOM

INTERIOR LIVING ROOM

This apartment features side-by-side bedrooms, with each side slightly protruding to allow light to enter through the façade window. The angled design of the apartment allows for additional light to enter directly into the bedroom. Moreover, the hallway wall provides indirect lighting to ensure adequate illumination. Additionally, one can enjoy an outdoor view while working at the desk. By making the walls along the corridor transparent and able to be opened, the space in the corridor can be utilized as part of the bedroom, providing more space to perform a certain function. Additionally, the glass allows more light to enter the bedroom, creating a brighter and more spacious feel.

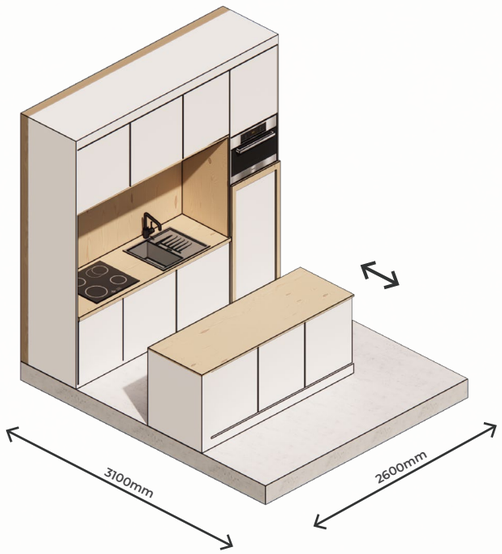
ADAPTIVE LIVING ROOM

LIVING SPACE

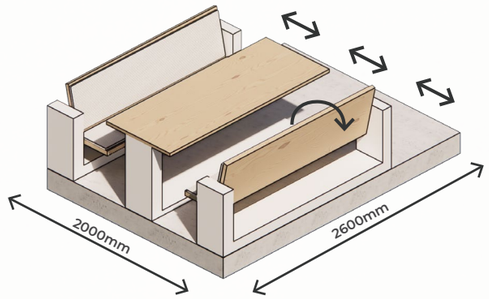


moving furtiture

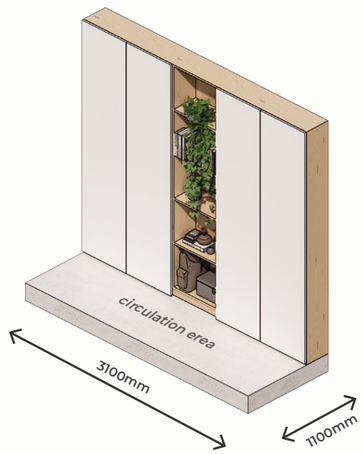
Increase living space during warm weather



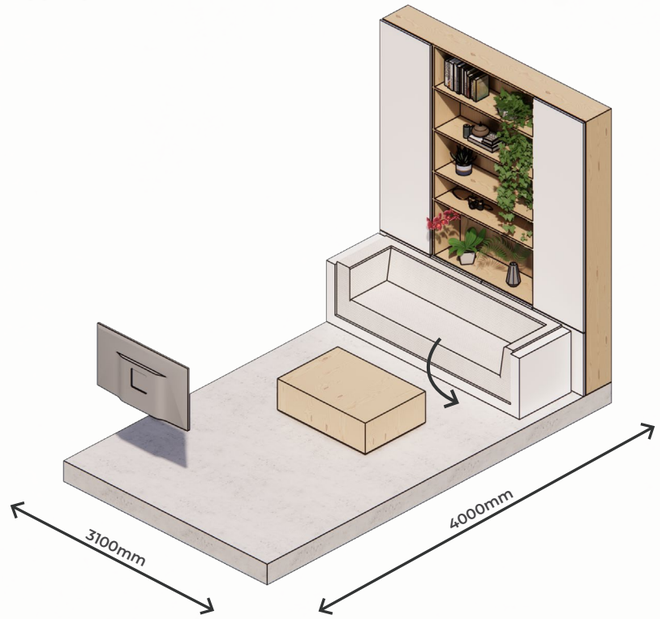
kitchen 8,1 m²



dining room 5,2 m²



storage 3,4m²



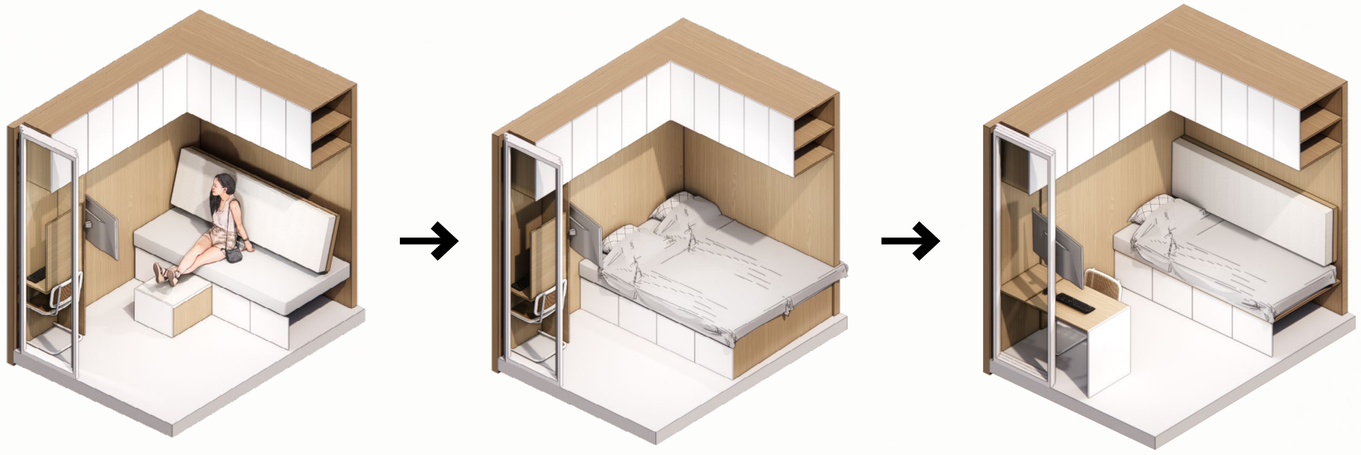
livingroom 12,4 m²

Inspired by filing cabinets, the furniture is incorporated into a module that can be slid. The module, to which the furniture is attached, has wheels and is connected to a wall-mounted rail driven by a silent electric motor. This concept is already proven by the company Ori living. With a simple press of a button, the modules can be moved to create space for another function. By minimizing the space occupied by unused furniture, room can be made for a different purpose. However, only two out of the three functions can be used simultaneously. Additionally, the dining room benches can be rotated to change their orientation and be used for other purposes. The element containing the sofa can also be rotated to be used in the winter garden, while also allowing for improved access to the cabinets located behind it. Furthermore, cabinets have been integrated into the walls to utilize this traffic space effectively for dual purposes.

ADAPTIVE PRIVATE SPACE

The experiment “Living on 6.5 m²” concluded that small spaces can incorporate multiple functions through adaptable design. The concept includes a movable backrest that serves as both a bed and a TV viewing area. A slide-out foot panel allows for a reclining position. The backrest also functions as a mattress, forming a double bed. The slatted bed base can be stored underneath to accommodate two mattresses. The TV screen is mounted on an adjustable arm for height adjustment and dual use as a computer monitor. The desk features a foldable mechanism and provides space for accessories such as a keyboard and mouse. Storage boxes are incorporated above, beneath the bed, and alongside the side walls. This compact design efficiently accommodates all desired functions while maintaining a sense of spaciousness.

PRIVATE SPACE

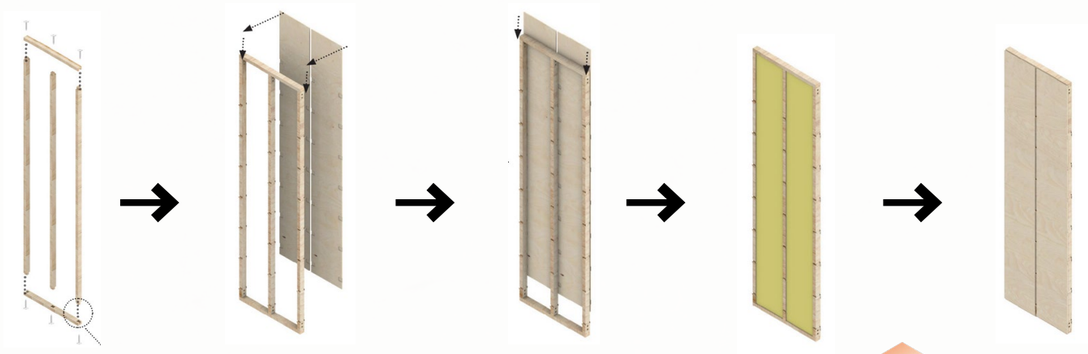


watching tv 3,6 m² → dubble bed 3,2 m² → studying & singel bed 2,8 m²

PRIVACY WITH NATURE AND SCREENS

ADAPTIVE LAYOUT

empty layout



respace adaptive wall element

RESPACE

COLLECTIVITY

THEORIE 2

SHARED SPACE ◀▶

THEORIE

The concept of shared space is founded on a modular grid arrangement measuring 2,500 mm by 2,000 mm. This grid layout facilitates the creation of individual bedrooms within each module, while simultaneously offering opportunities for the inclusion of diverse functions. The design emphasises the adaptability of the living space to accommodate evolving needs over time, achieved through the flexible allocation of space ownership between the apartment and circulation areas.

One approach to achieving this flexibility involves the rental of space, allowing for its seamless integration into the apartment without requiring any modifications to the building's facade. Once the rented space is no longer needed, it can be incorporated into the shared spaces available to the building's residents, effectively resizing the apartments to suit different life stages. Furthermore, the shared spaces themselves can be utilised for a variety of purposes, enhancing the overall quality of the living environment.

same space, more functions

OWN EXPERIENCE

Bart

Does anyone have a set of Phillips screwdrivers? I have, happily, only one and this one slips web at the last 5mm

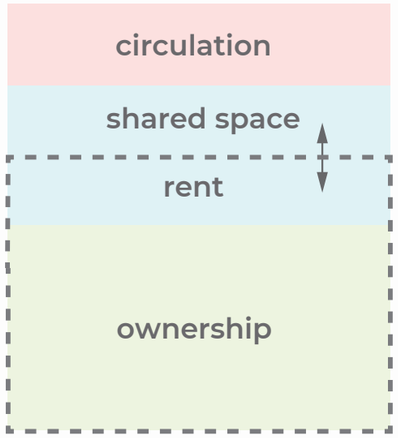
18:45

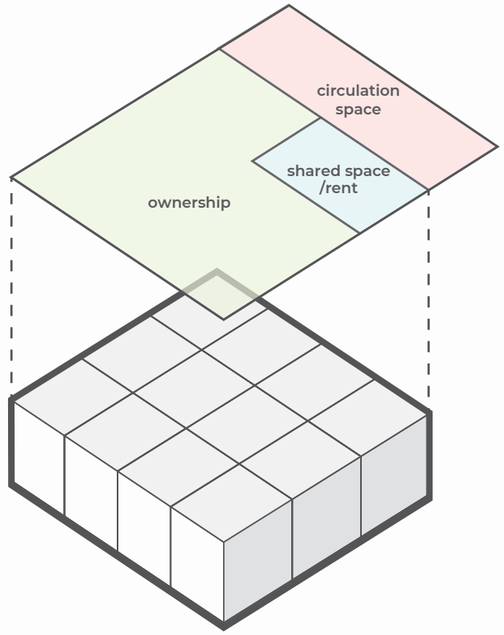
Mara

Does anyone from the Waterbies have a grater to borrow

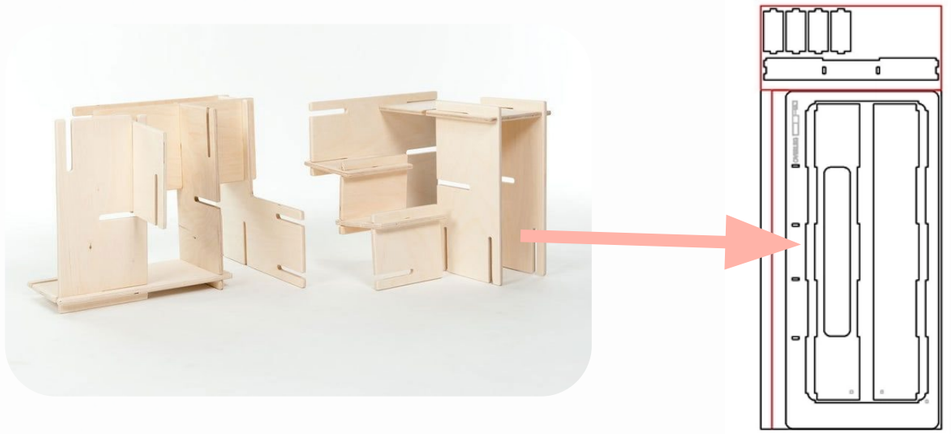
18:51

CONCEPT

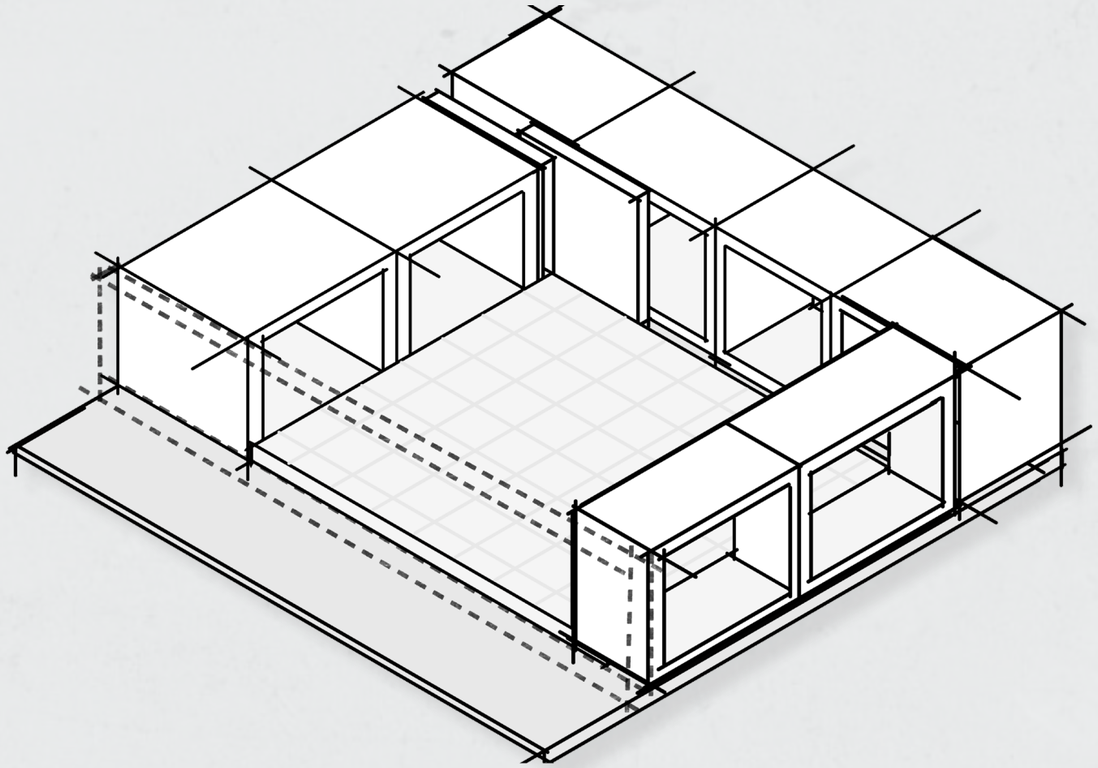




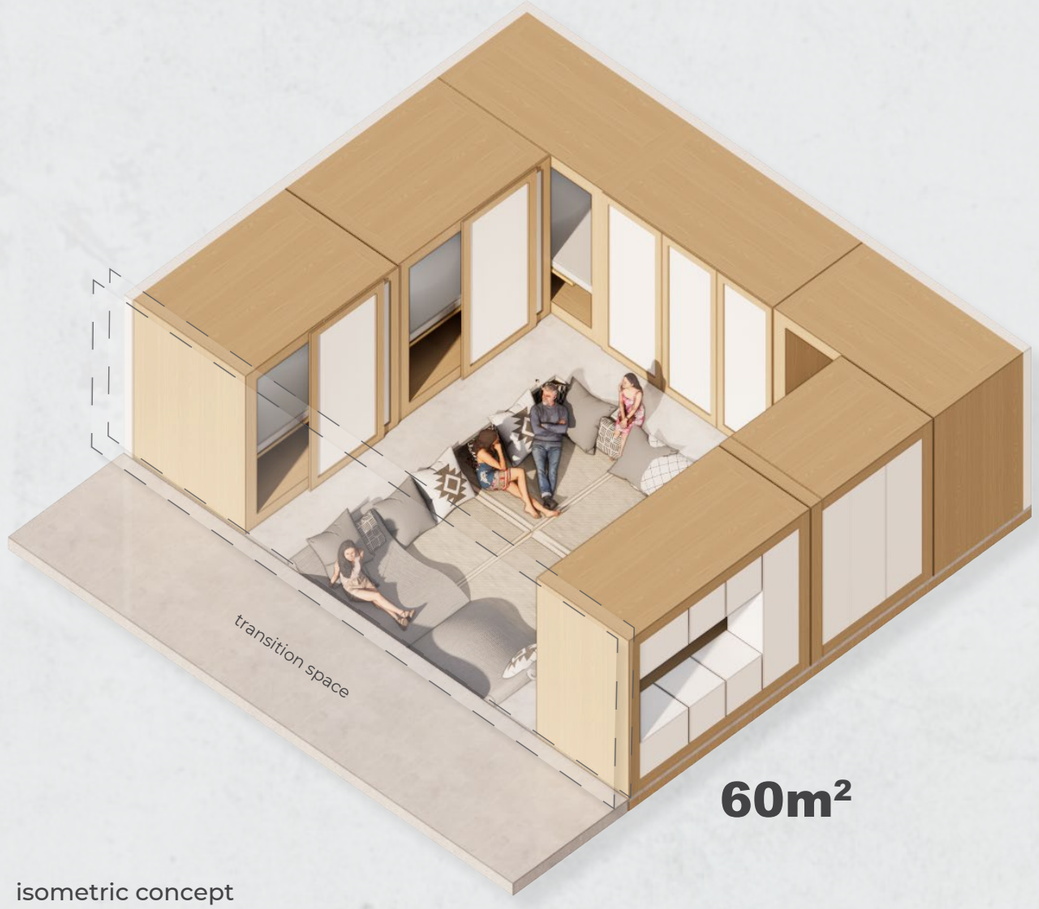
Concept diagrams



flatpack infil of modules



concept sketch



isometric concept

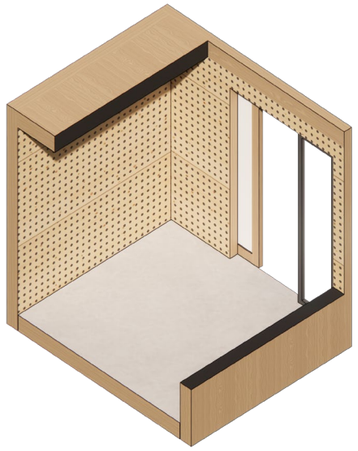
FIRST CONCEPT DESIGN

The initial design is based on an open space, drawing inspiration from Japanese architecture, and is surrounded by standardised modules. These modules share common dimensions, facilitating easy adaptation of their functions and the sharing of furniture within the building concept. The allocation of spaces is organised according to function, aiming to minimise disturbances. The spaces connected to the corridor can be incorporated into the apartment or returned to the community, allowing for flexible utilisation. The central area creates the perception of the circulation space as living space, enhancing the spaciousness of the living room. This area is intended for various activities such as relaxation, television viewing, and dining. The inclusion of a table that descends from the ceiling and a partition screen enables the performance of multiple functions within the space. Moreover, the facade between the outdoor area and the dwelling can be personalised by the residents, providing an opportunity to give the apartment its own identity.

Interior view

DESIGN SHARED SPACE

According to research conducted by Space10, multiple functions have been allocated to the shared spaces, including studying, reading, laundry, gaming, television viewing, storage, bicycle parking, DIY projects, sports, work, gatherings, and shopping. The modules have been designed with standard sizes and flatpack furniture to facilitate easy adaptability to different functions. The walls are constructed of highly insulating material that includes sound-absorbing holes which also serve as attachment points for furniture, further enhancing the space's adaptability. The design is adaptable and allows for the adjustment of functions based on demand and supply. However, it should be noted that such changes must be carried out by volunteers or employees.



base cabinet

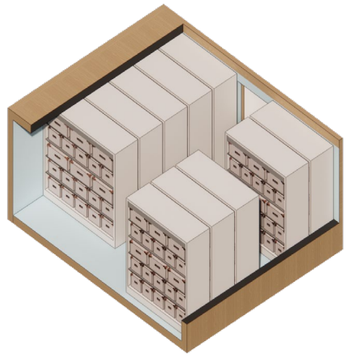
playscape

bicycle parking

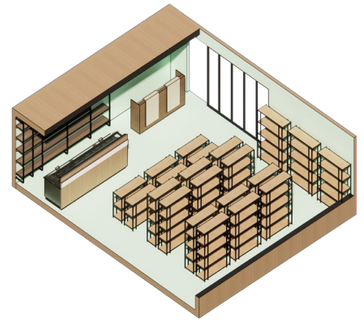
study

closset

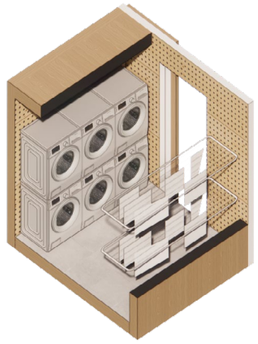
reading



storage



retail



laundry

gaming & tv

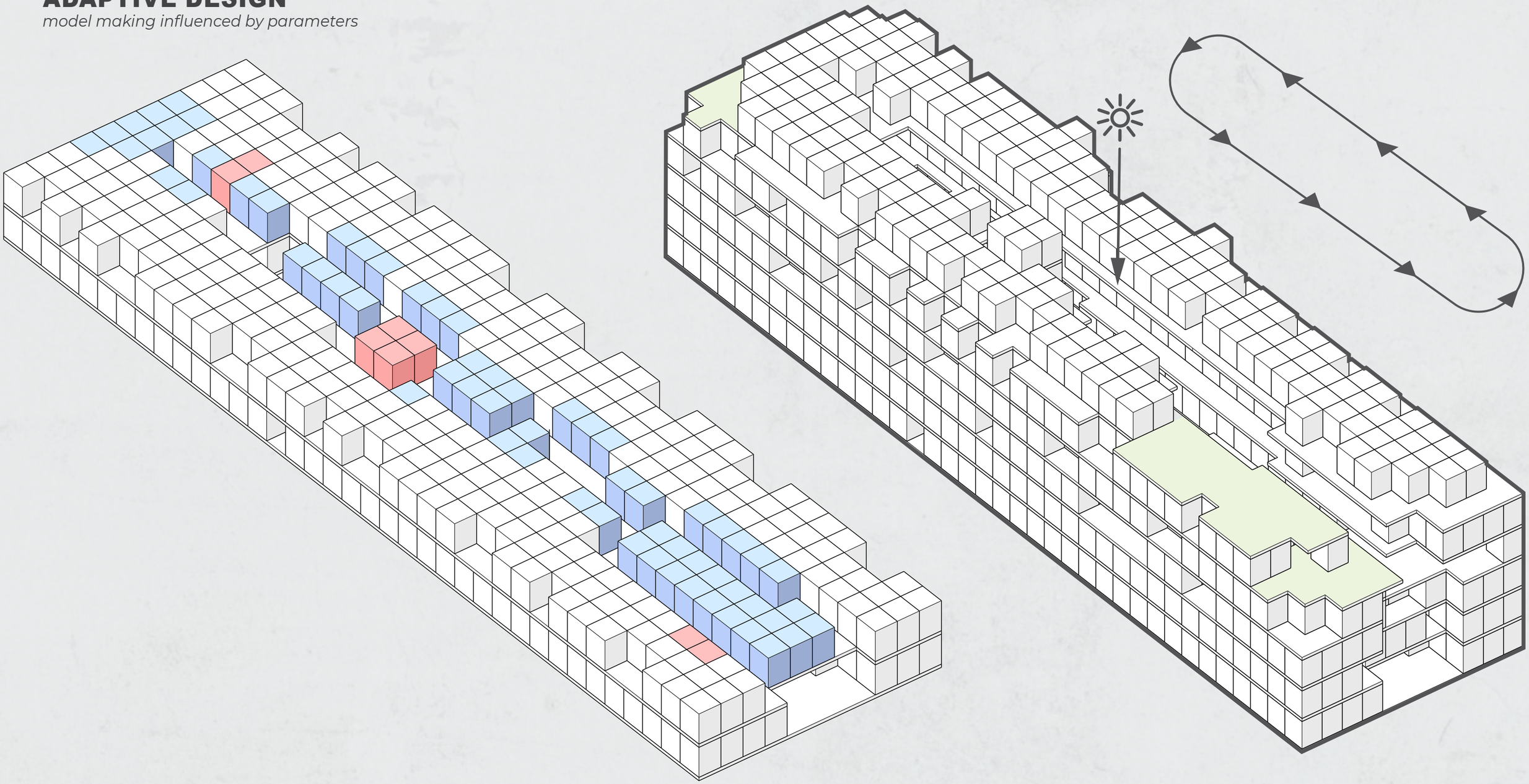
workshop

gym

eventspace

ADAPTIVE DESIGN

model making influenced by parameters



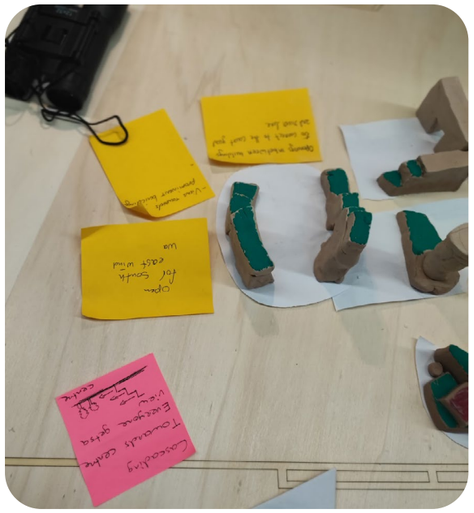
CONCEPT VOLUME

A sense of community enhances overall well-being as it reduces feelings of isolation, encourages social engagement, and fosters a sense of security. In order to accomplish such a community, the promotion of social interaction is important. This can be facilitated through increased opportunities for contact and engagement. Accordingly, the decision was made to incorporate transparency within the shared spaces, thereby facilitating interpersonal connections. Moreover, the design includes circular circulation spaces that promote interaction and flow of movement. Furthermore, the expansion of communal areas to include public spaces, such as a shared garden, serves to encourage social interaction and a sense of belonging.

WINTER SCHOOL WORKSHOP

model making influenced by parameters

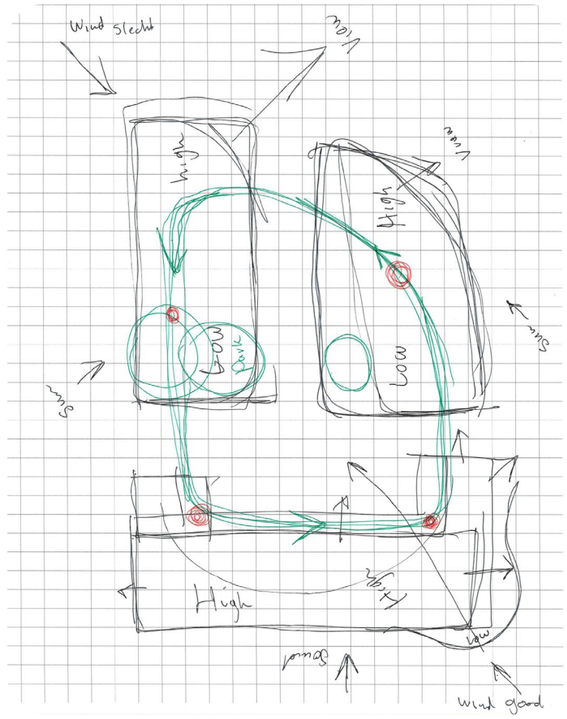
model making with clay



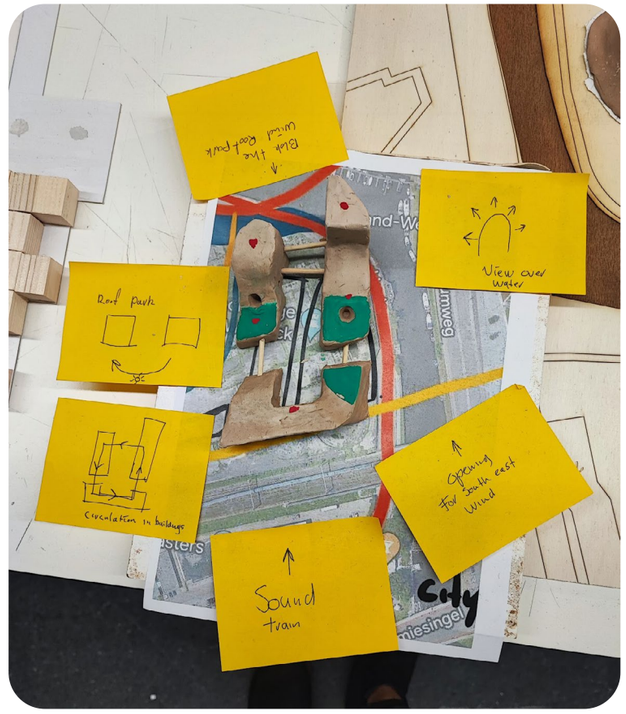
To assess the adaptability and responsiveness of the concept to various factors, the site ‘t Zoet in Breda was selected as a location for testing. This site offers a range of parameters, including noise, water, infrastructure, sight lines, wind, and shade. A clay model was constructed, taking into consideration these parameters and their impact on the design.

On the southern side of the model, a linear volume was incorporated to serve as a noise barrier. This space also accommodates office areas, as they require less outdoor space and are less affected by noise. The central area of the volumes houses a public garden situated on the rooftops. This placement ensures that the rooftop park receives sufficient sunlight throughout the day and is shielded from the northwest wind.

Two vertical circulation spaces were integrated to provide access to the rooftop park, thereby facilitating social interaction among residents. Furthermore, the buildings are interconnected by a bridge, creating a circular circulation space that enhances flow, safety, and social engagement. This connection also facilitates the sharing of functions among multiple buildings, promoting a sense of community and resource optimization.



first concept sketch



clay model influenced by parameters

FINAL DESIGN WINTER SCHOOL: SHARED SPACE

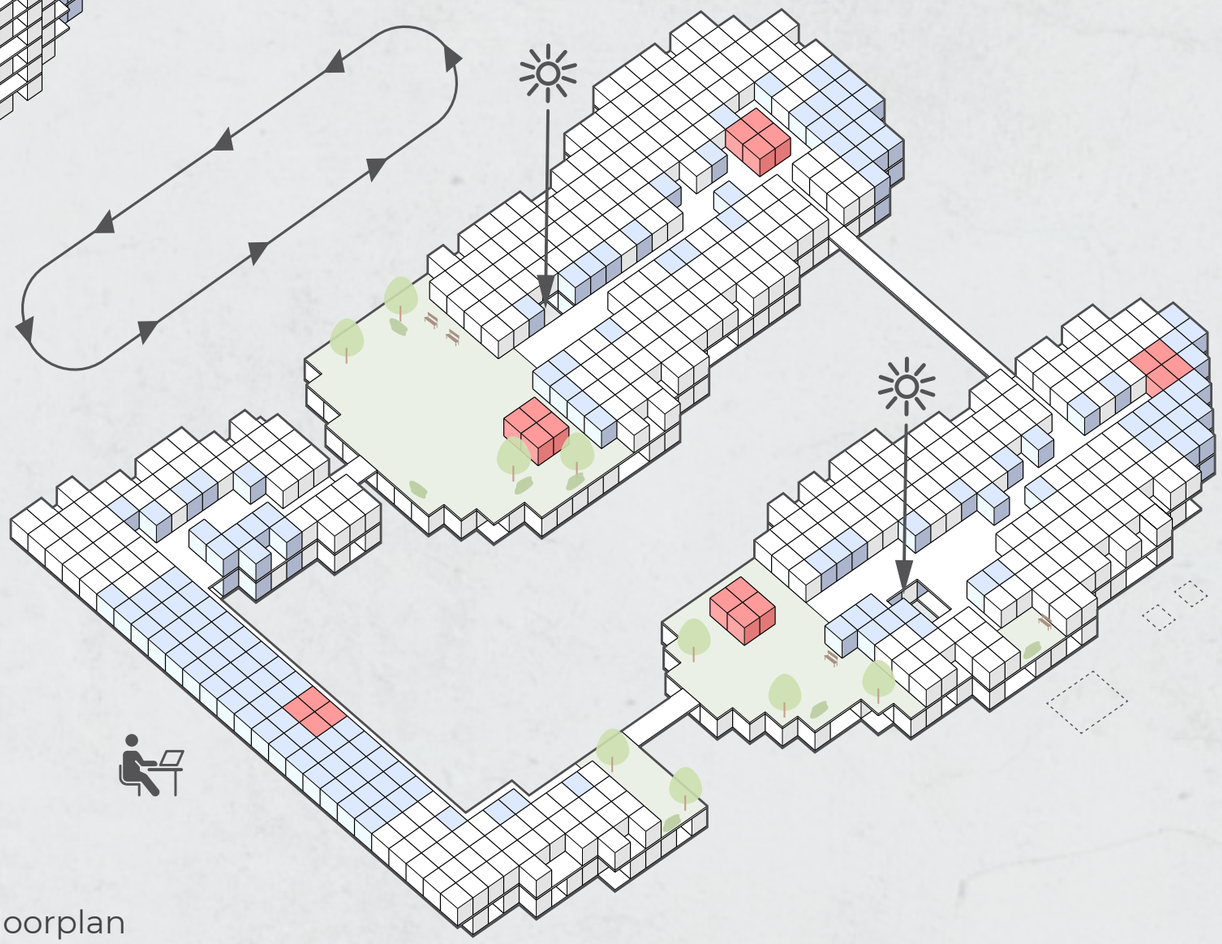
Design influences by parameters

vertical circulation

shared space/ rent

public outdoor space

appartments



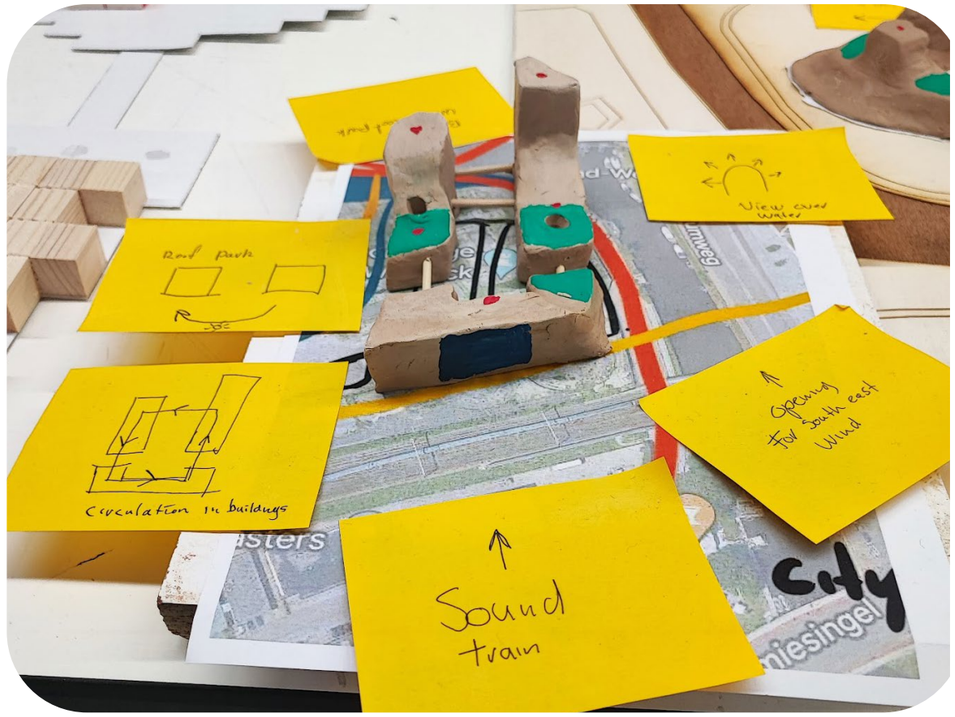
Floorplan

SHARED SPACE ◀▶

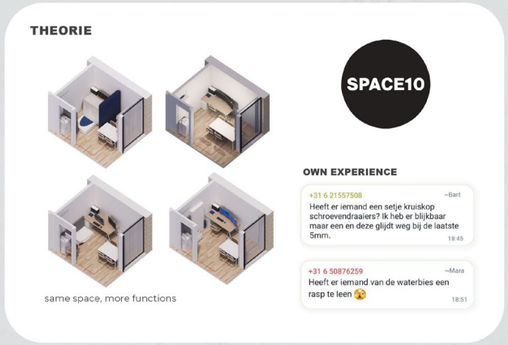
final design Theorie2: shared space

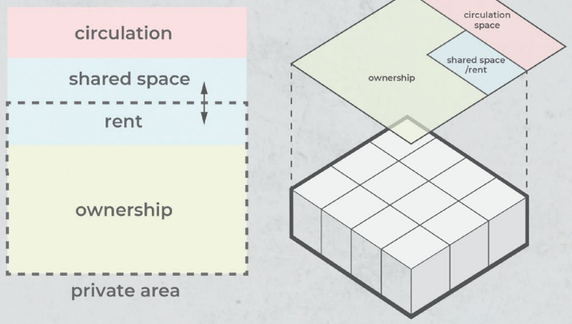
The test results reveal that the concept demonstrates adaptability and responsiveness to environmental influences; however, it also exhibits limitations. The volume needs to remain narrow to avoid creating spaces that receive insufficient light and to ensure that the central spaces maintain sufficient quality. The central corridor serves as a connecting element for social interaction and thus requires a high level of quality. Incorporating voids within the volume can introduce additional light into these spaces, although achieving direct light quality is challenging. Additionally, a greater width would enhance the experiential quality; however, this comes with increased costs, which weakens the concept.

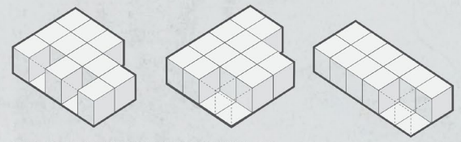
The combination of numerous different dwellings with cuboid modules proves challenging to distribute effectively. There will always be leftover pieces and apartments that are difficult to allocate. The concept demands careful attention to fully benefit from its adaptive form. Furthermore, there may be an excess of unused modules, which reduces efficiency and increases the cost of the concept.

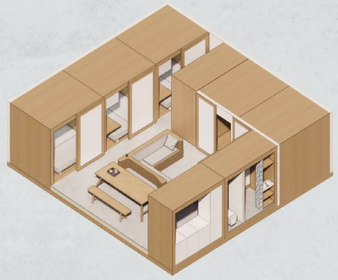


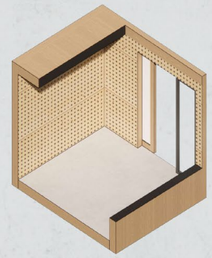
SHARED SPACE ◀▶

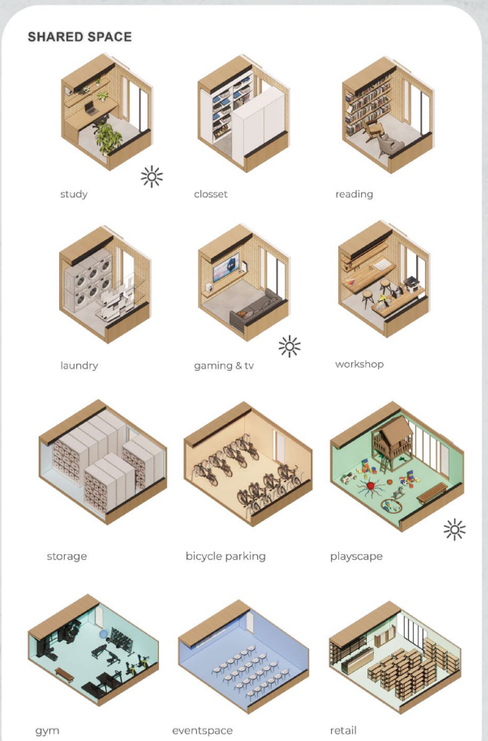


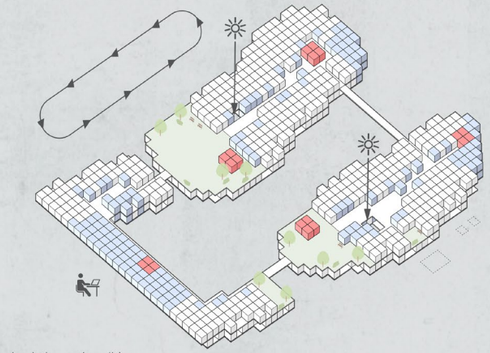


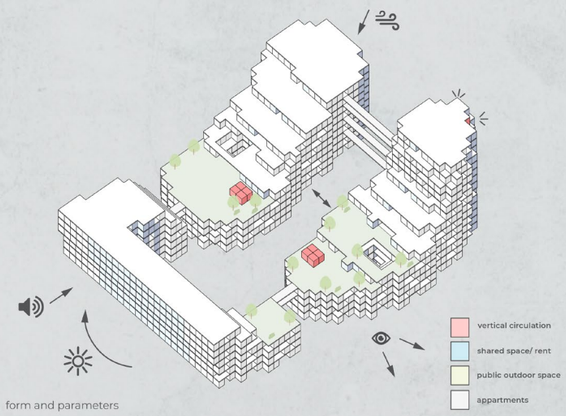












CONCLUSIONS

- sharing spaces increases your living environment
- modules can easily change function base on demand
- connecting different buildings ensuring better circulation and sharing of functions
- high-density living requires high-quality public spaces
- the modular system enables adaptation to the environment
- combining functions provide 24-hour infrastructure
- affordable house for €270,000 own property + rental shared spaces

COLLECTIVITY ▶

The design is centered around the concept of collectivity, and the corridor serves as a space to encourage community engagement and sharing of facilities. This approach allows for compact apartments to have access to a broad range of amenities, promoting efficient use of space. The community has the ability to select the functions they wish to add to their building, and an app is available to reserve certain spaces, preventing misunderstandings. The section shows that the majority of the building is dedicated to housing, which helps keep costs under control. By introducing a new type of housing unit where the bathroom is located on the ground floor, the empty space in the core on the ground floor can be eliminated. This enables the common area on the ground floor to be adjusted to the surrounding context.

S **5 m²**

- storage
- reading/ game room
- study
- workshop

50 m²

- quality fast food
- small retail
- kiosk
- hairdresser

M **50 m²**

- cafe
- business space
- shop
- atelier

500 m²

- restaurant
- childcare
- bakery / catering
- bike shop

L **750 m²**

- childcare
- warehouse/wholesale
- retail / showroom
- gym

XL **1500 m²**

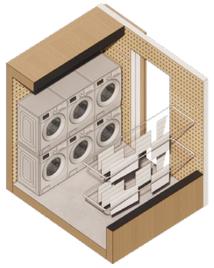
- office
- supermarket
- gym
- industrial workshop

SHARED SPACE

study

storage

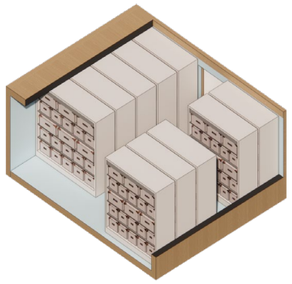
reading room



laundry

gaming & tv

2x workshop

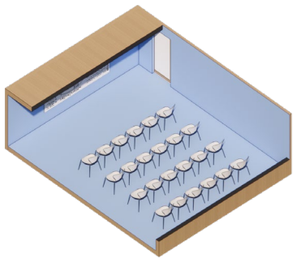


storage

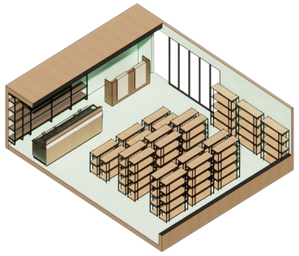
bicycle parking

playscape

gym



eventspace



retail

COLLECTIVITY ▶

final design

The “street within the building” is designed to promote interaction and provide access to all residents. By locating shared amenities largely within this space, the corridor becomes vibrant and inviting, encouraging people to make use of it. Transparent partitions and lively colours are employed to stimulate residents’ utilisation of the space. Furthermore, residents are collectively involved in deciding which functions are added to this area. Additionally, storage units are incorporated within the corridor. These storage spaces can be rented when residents require extra room without expanding their apartments. By charging rent for these additional storage units, residents are encouraged to organise their belongings and create more space. Shared items such as construction and gardening tools, folding chairs, and bar tables are provided, reducing the need for residents to own them themselves. Through the use of an app, residents can reserve spaces and items, ensuring their availability when needed. This system also allows for tracking the last user of the items and spaces, enabling the identification of any potential damage.

DENSIFICATION

THEORIE 3

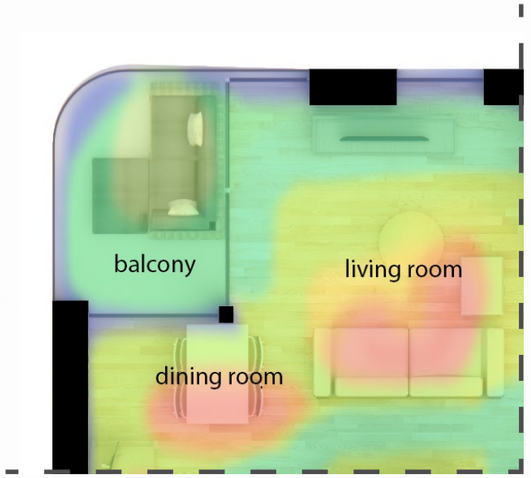
BETWEEN INDOOR AND OUTDOOR

THEORIE

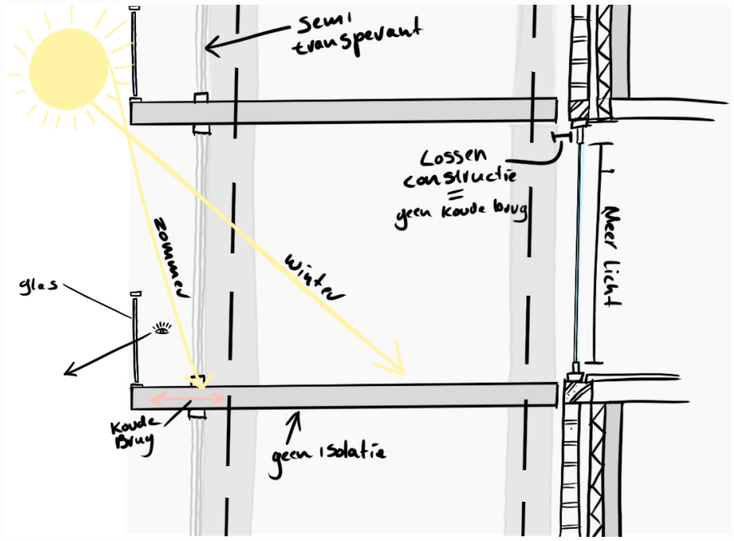
The experimental study “Living on 6.5 m²” has revealed that residing in a compact space requires a connection with the exterior environment. Interaction with others is just as important as access to greenery and views in a compact living space. A small dwelling can feel spacious through the incorporation of light and open space. Additionally, the study “Analysis of Flat Use” has shown that the living room and dining room share similar functions with balconies, with the primary difference being the properties of the respective spaces such as wind and sunlight.

By conducting a critical examination of the connection with the outside in existing high-rise flats, it was observed that the overhang of outdoor spaces often resulted in shading within the dwelling. By increasing the ground floor of the flats and relocating certain functions to the core of the building, an isosceles trapezium form is created. This shape allows for increased light penetration into the homes. By creating a double-height floor, light from two levels can be directed towards the living room as opposed to the bedroom. By enclosing the space between the overhang and the front façade, a semi-outdoor space is formed. Building orientation with the main façade facing north maximizes natural daylight and solar heat, while minimizing solar glare and overheating. It was determined that all apartments have access to either morning or evening sun. Residents who do not currently have access to sunlight in their gardens can still benefit from it in the rooftop park.

experimental research



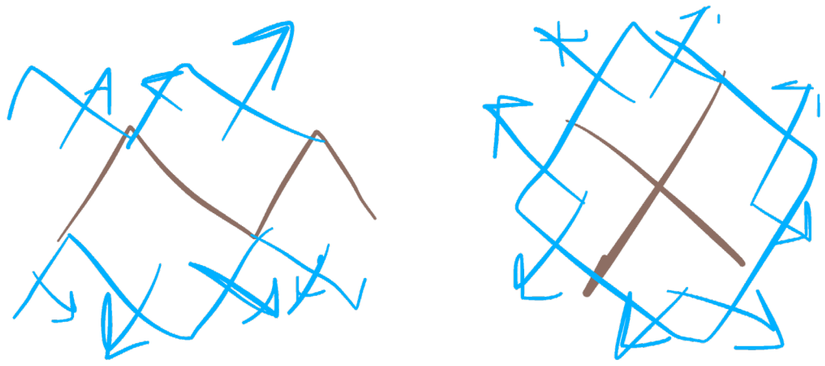
same function different properties



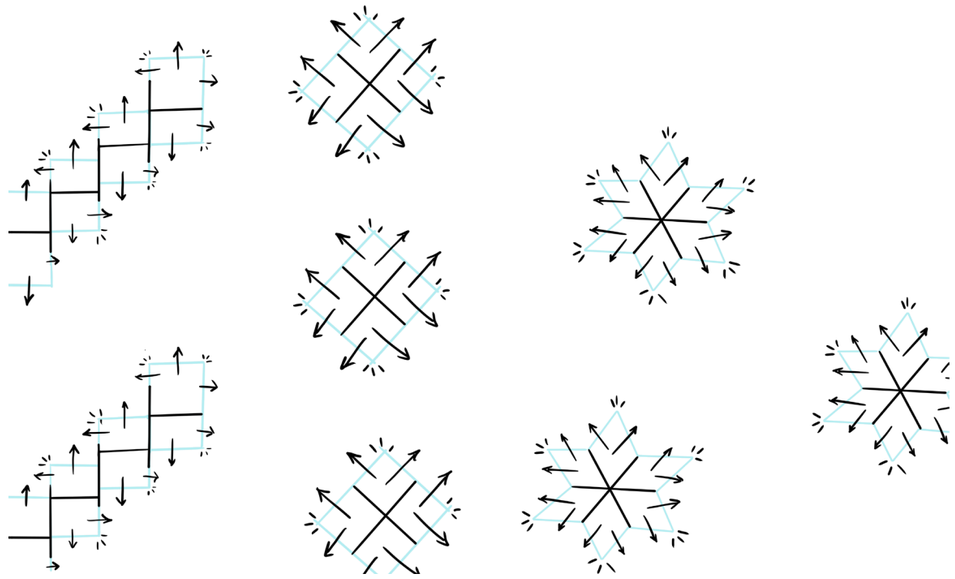
analyse lacaton & vassal semi-outdoor space

missed contact with outside

CONNECTION
with the outside



In bed sketches



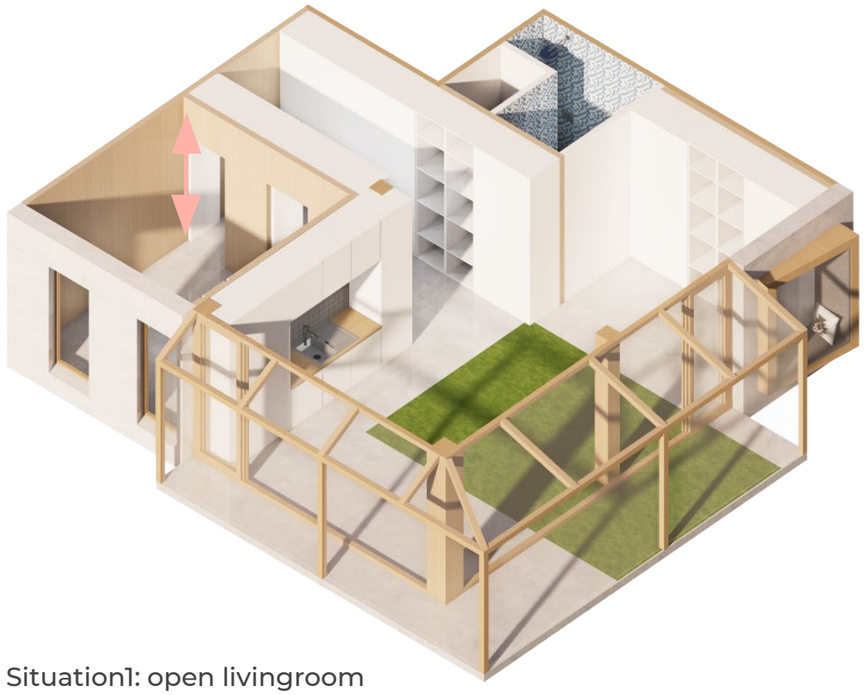
Concept sketches corner appartment

BRINGING YOU GARDEN INSIDE YOUR HOUSE

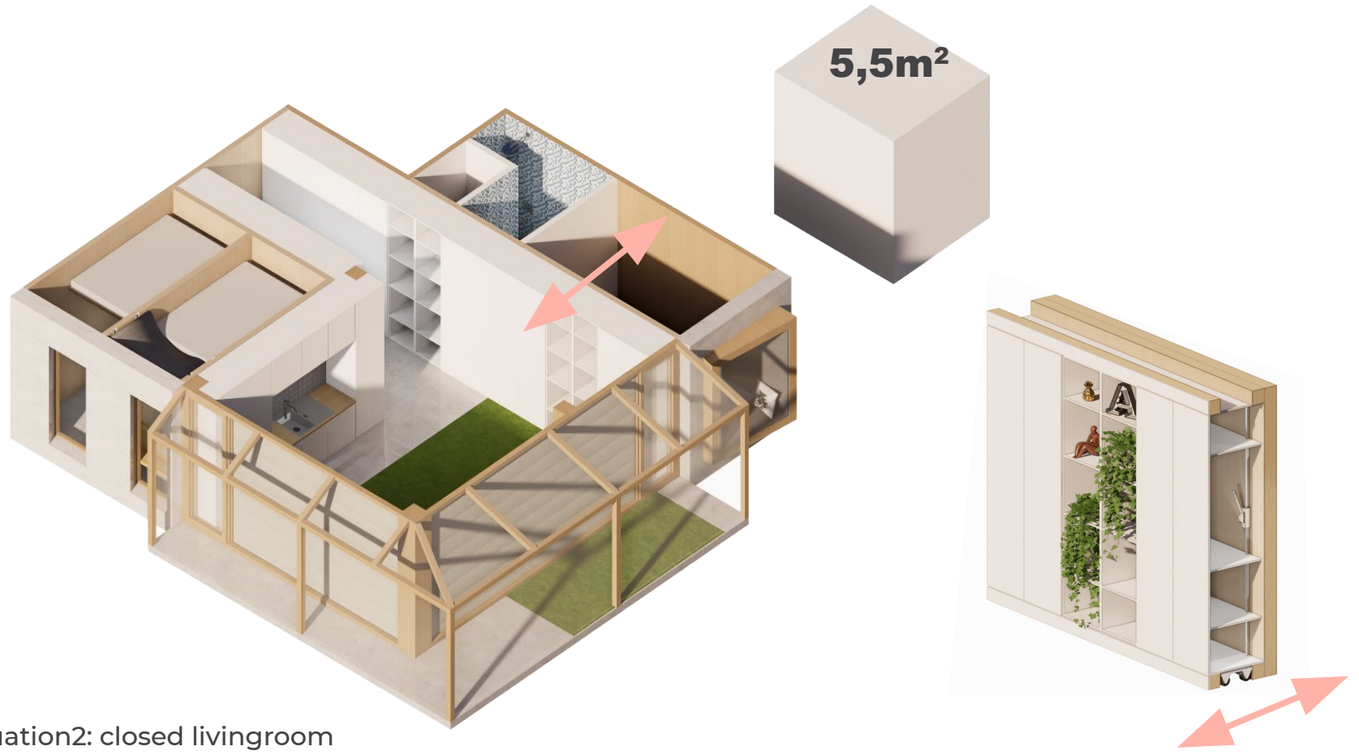
The design process was a quest for space, openness, and sightlines within a high-density context. Some ideas emerged during moments of relaxation, such as when lying in bed. It was during one of these moments that the concept of corner apartments arose. However, the challenge was how to incorporate them within a dense setting. Several sketches were made to explore and refine this idea. These sketches helped achieve the desired quality, but the issue of high density remained a challenge.

During the design process, the focus shifted to the layout of the apartment. The idea was to integrate the balcony/ outdoor space with the living room. This approach allows for the introduction of greenery into the dwelling and extends the living space outdoors for a significant part of the year. The boundary between indoor and outdoor spaces becomes blurred, creating a more harmonious living atmosphere and providing the experience of having a garden within the apartment.

Bringing you garden inside your house



Situation1: open livingroom



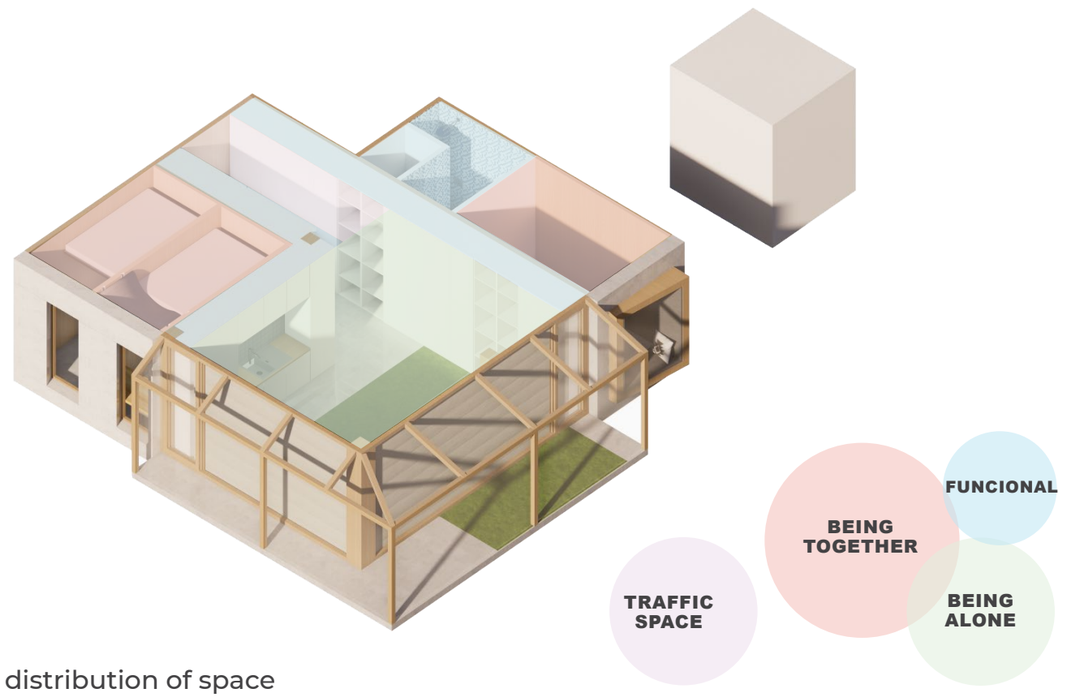
Situation2: closed livingroom

CONCEPT LAYOUT

distribution of space and funcionality

The architectural design aims to achieve a seamless integration of indoor and outdoor spaces, blurring the boundaries between them. However, a separation is still maintained through the use of a roller shutter system, which consists of an insulating and soft covering material. This covering acts as a comfortable “jacket” that adapts to the characteristics of the space, providing the ability to control sound, light, and heat to a large extent.

Furthermore, the apartment is designed with adaptability in mind. The master bedroom can be divided into two separate spaces, offering the flexibility to create a study area or a relaxation zone using a vertically movable bed. Additionally, there is a movable storage element that can be utilised to expand the living room. These elements are intended to cater to the user’s needs, ensuring flexibility and adaptability within the space.The allocation of functions is also important for minimising disturbance and providing the option of privacy when desired.



distribution of space

ADAPTABILITY TO FAMILY COMPOSITIONS

YOUNG COUPLE
Adapt to household

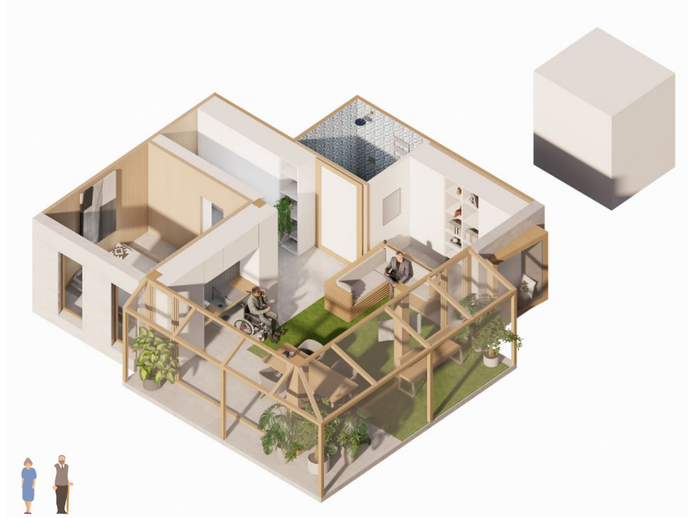
YOUNG COUPLE, YOUNG CHILDEREN
Adapt to household

MIDDLE AGE COUPLE, TEEN AGE CHILDEREN
Adapt to household

MIDDLE AGE COUPLE, GROWN CHILDEREN
Adapt to household

MIDDLE AGE COUPLE
Adapt to household

MIDDLE AGE COUPLE
Adapt to household

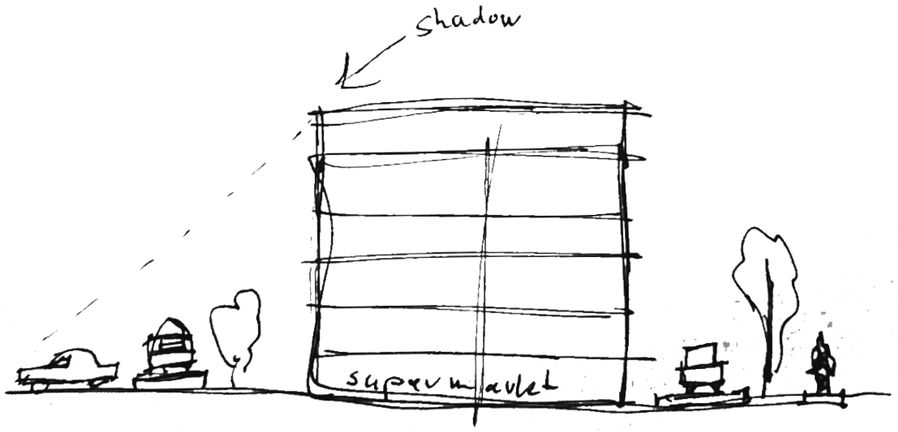


TESTING THE DESIGN

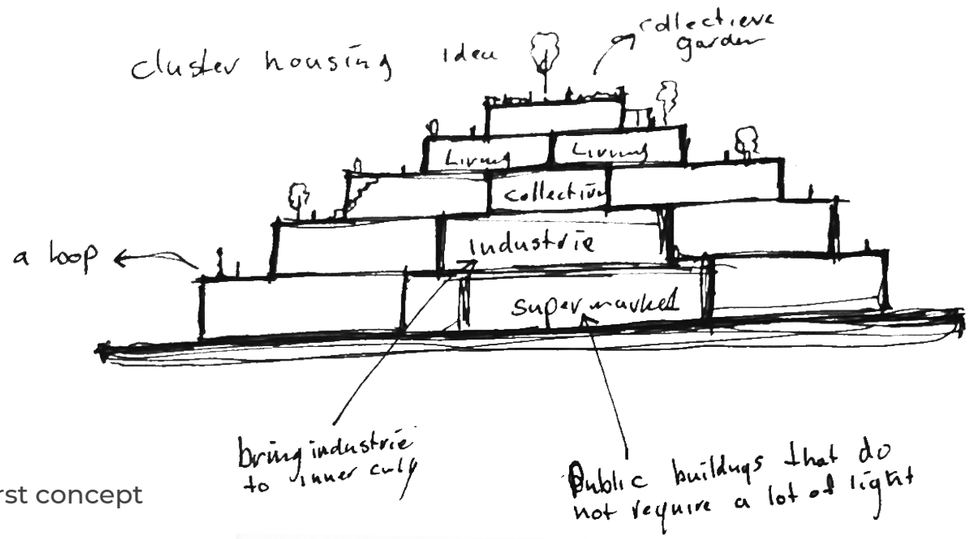
The apartment has been tested with different target groups to assess whether it meets their requirements. For example, young individuals without children have a larger bedroom and a study/workroom. A family with two children has a smaller room with two separate bedrooms. Elderly individuals have a larger bedroom and living room to allow for easy manoeuvrability around the furniture. We can conclude that the family with older children poses the greatest challenge. They desire specific features in the apartment design. These include a double bed to accommodate their sleeping needs, a dedicated study space to support their educational or professional pursuits, and a separate area where they can have privacy and retreat from the rest of the family.

“a design for middle-age couple and grown children is most difficult”

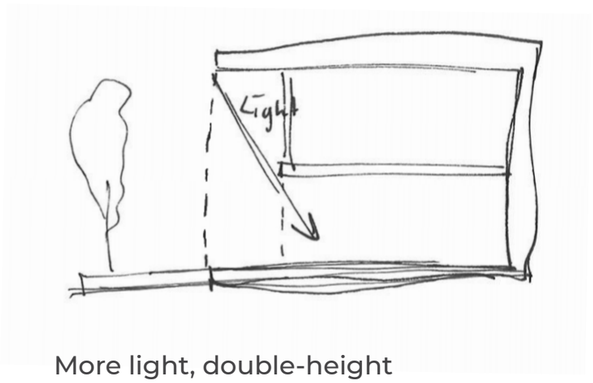
EXPLORING A NEW TYPOLOGY



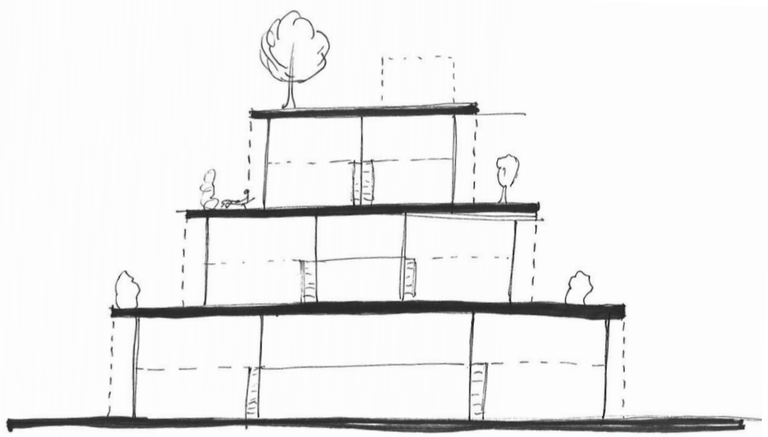
Standard appartments



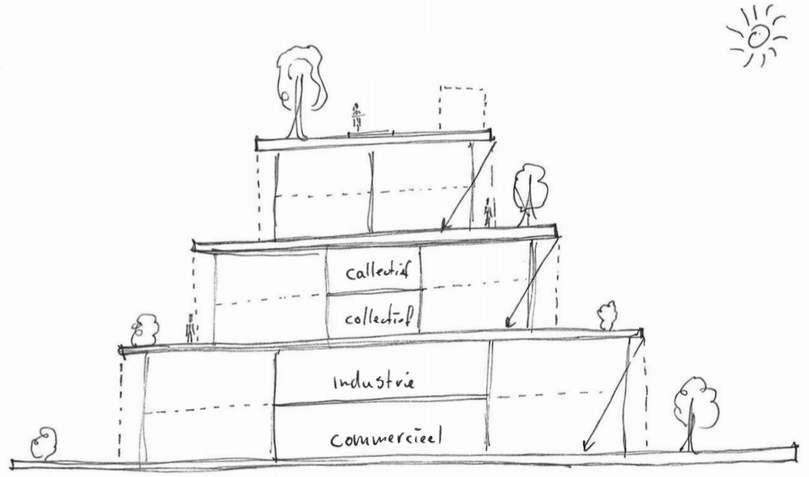
First concept



More light, double-height



double-height in concept

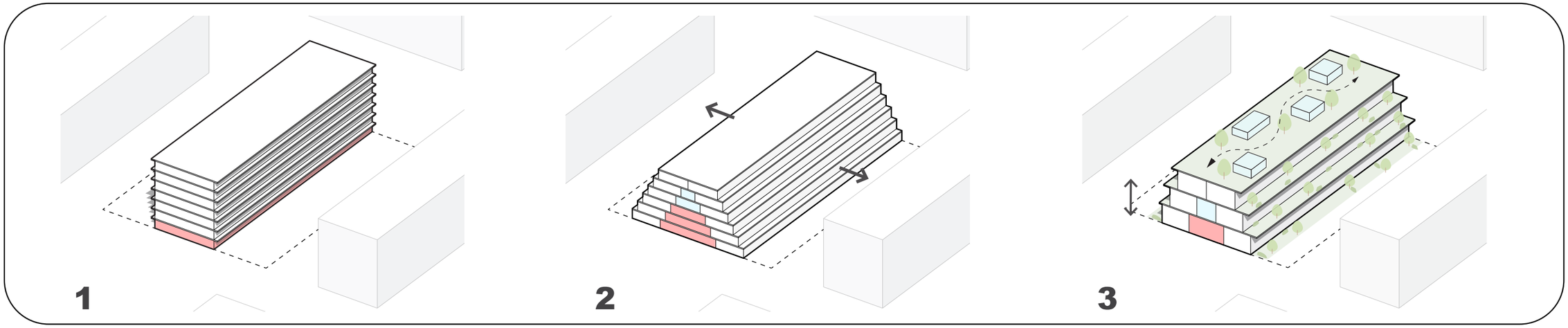


Functioning of the concept

With all the initial goals in mind, extensive research was conducted on the massing of the building. The primary aim was to provide all apartments with integrated gardens/outdoor spaces. By implementing a trapezoidal structure, this desire could be achieved, but it created a void space in the centre of the building. Finding a suitable purpose for this space is important. Additionally, the introduction of double-height spaces offers additional natural light in the living areas, but it requires proper orientation, meaning that the apartments receive direct sunlight in the morning or evening.

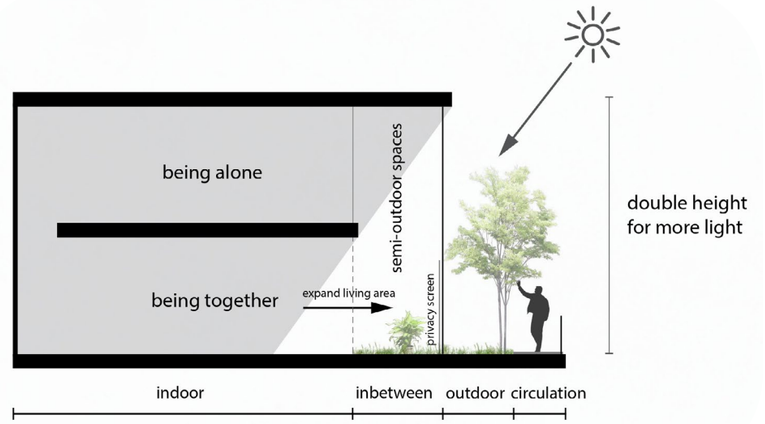
“It is important to find a suitable purpose for the space in the core”

REDESIGN WITH HIGHER DENSITY AND VOLUME



The design of the isosceles trapezoid shape and double-height flats provides a large space for a garden in front of the apartment. This garden can be planted with adaptive plants that allow residents to control the “facade” by adjusting the greenery, which can create privacy and visibility as needed. The plants’ leaves act as a natural barrier to keep out heat in the summer and let in light in the winter.

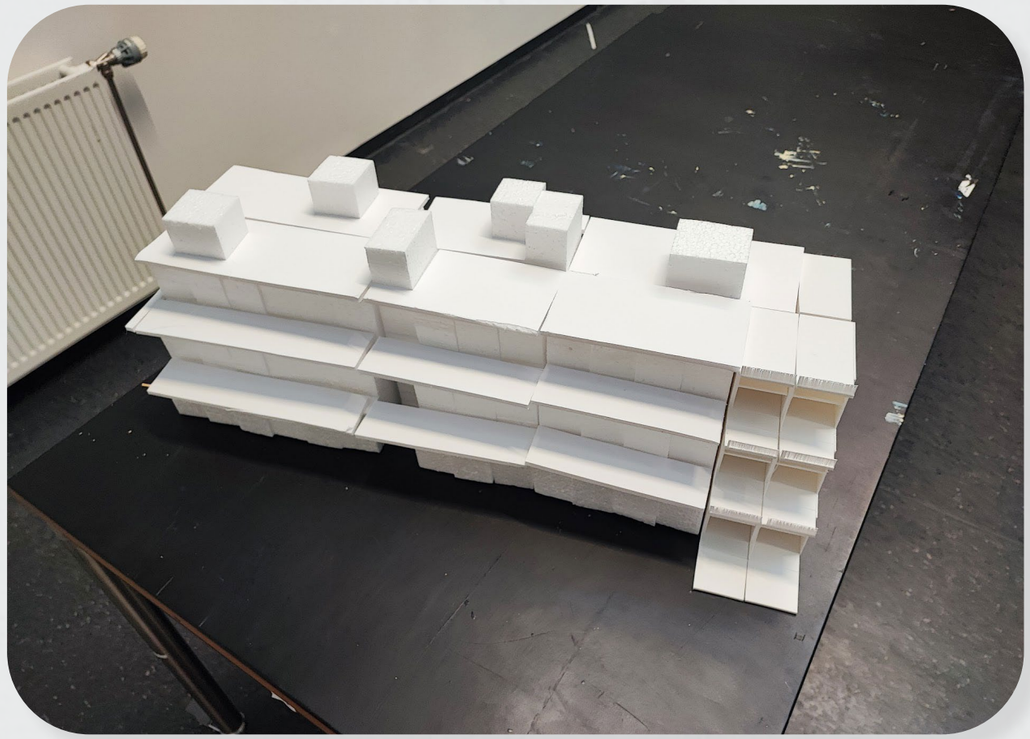
The design of the double-height apartment incorporates a clear distinction between shared spaces and individual private areas, similar to that found in terraced or detached houses. The additional floor provides a separate level where residents can retreat and enjoy privacy. Furthermore, the floor of the extra level is well-insulated, allowing for enhanced soundproofing. This feature is often absent in most apartments, making this design uniquely capable of providing a more secluded and private space for the occupants.

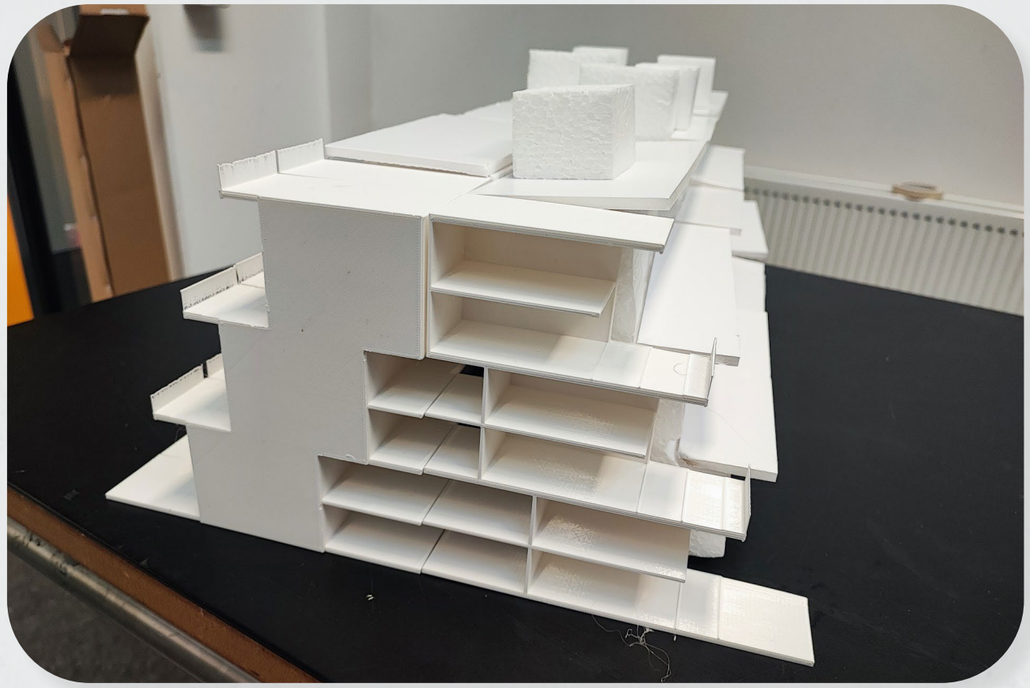


Cross section apartment improvement

“The additional floor provides a separate level where residents can retreat and enjoy their privacy.

TESTING WITH SCALE MODEL





The scale model provides insights into spatiality and privacy.

BETWEEN INDOOR AND OUTDOOR

final design Theorie3: Between indoor and outdoor

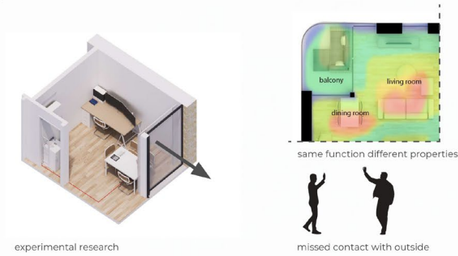
The semi-outdoor space, usable for approximately three-quarters of the year, serves as an extension of the living area, contributing to the overall spatial experience. Further investigation may be warranted to explore the potential for maximising the use of this cost-effective space.

To strengthen the connection with the natural environment, the circulation space is positioned along the building's exterior, fostering social interaction among neighbours. Privacy concerns are addressed by employing screens positioned behind the glass of the partially covered outdoor area. Even when these screens are closed, sufficient natural light is able to permeate the interior from above.

This design successfully integrates the desirable attributes of a terraced or detached house into a higher-density setting. The incorporation of a garden, circulation space, and separation of two floors achieves a harmonious balance between communal and private areas reminiscent of a traditional single-family home. The primary challenge lies in accommodating three bedrooms within the narrow volume while ensuring sufficient access to daylight and optimising functionality during the winter months.

living between indoor and outdoor

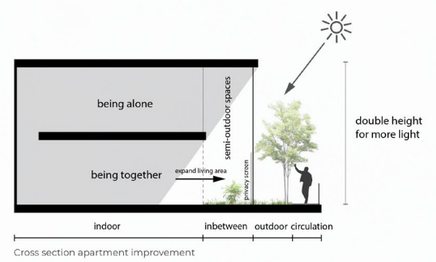
BETWEEN INDOOR AND OUTDOOR



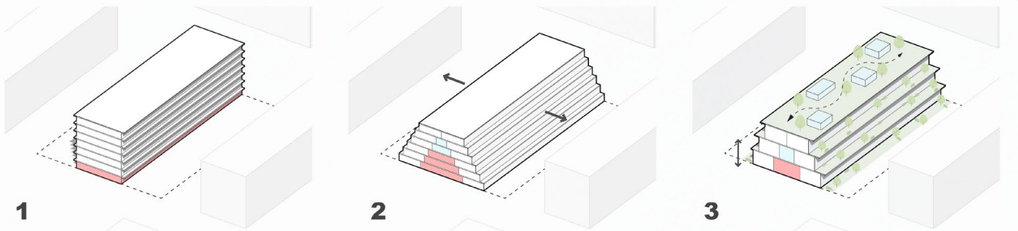
experimental research

same function different properties

missed contact with outside



Cross section apartment improvement



ground floor winter

ground floor summer

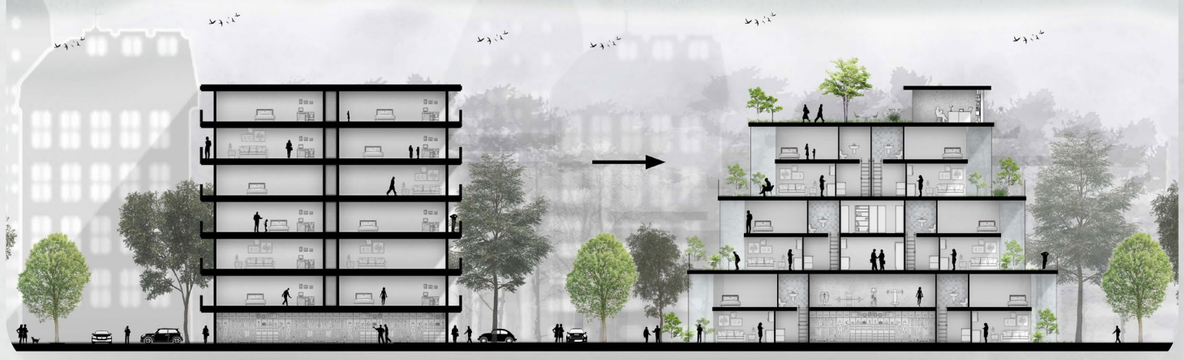
first floor
57m²+ 8m²

section close

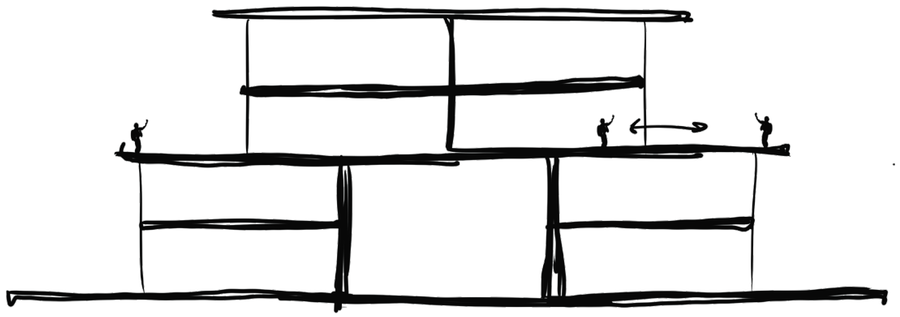
section open

CONCLUSIONS

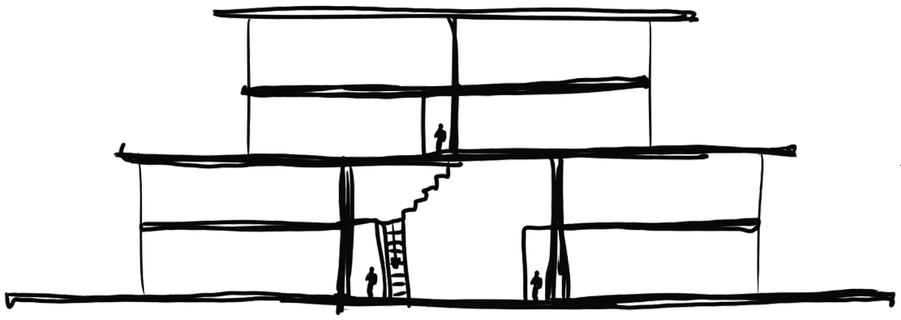
- garden gives qualities of a ground-level house
- semi-outdoor space increases living area
- semi-outdoor space improves thermal performance
- plants behave as an adaptive system
- challenge to fit 3 bedrooms in 4 metres
- affordable house with garden for € 279,000



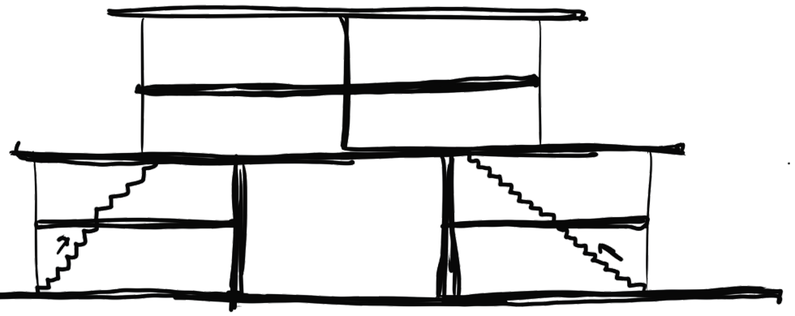
IMPROVING CIRCULATION



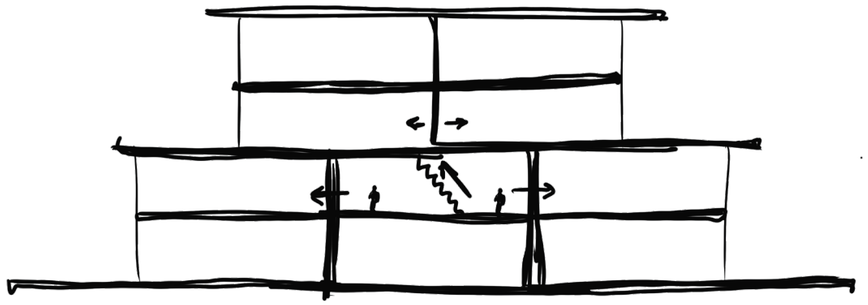
outdoor circulation (previous design)



circulation with three corridors



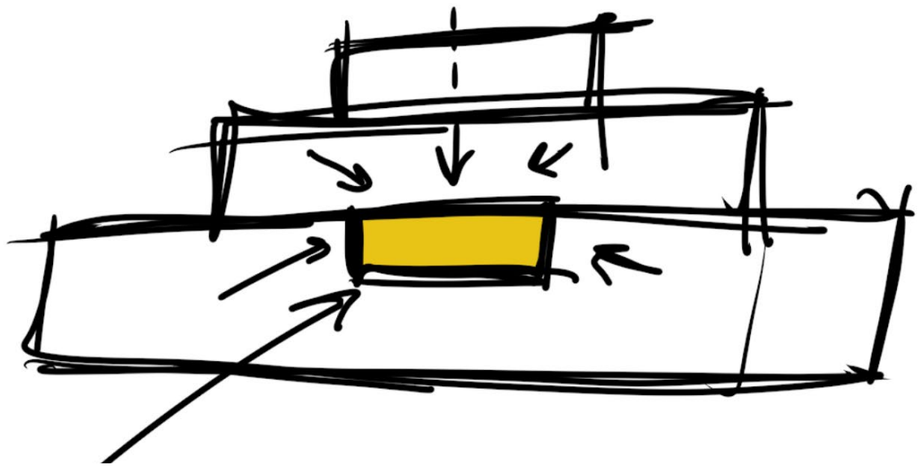
circulation with three corridors



circulation in core of building

THE STREET WITHIN THE BUILDING

The incorporation of circulation space within the building was a response to privacy concerns encountered in the previous design. To enhance the design, the circulation space has been integrated into the building itself. To prevent each floor from having a long corridor with limited activity, a central corridor has been created in the core of the building. This corridor functions as a social hub, similar to a street, giving rise to the concept of a “Street within the Building.” To encourage interaction, specific spaces have been allocated along this corridor, facilitated by the 45-degree rotation of the apartments. Additionally, an apartment has been removed from the middle of the corridor to allow more natural light to enter and establish connections to the outside and the spaces below. These underlying spaces can serve as storage areas, technical rooms, and bicycle storage facilities.



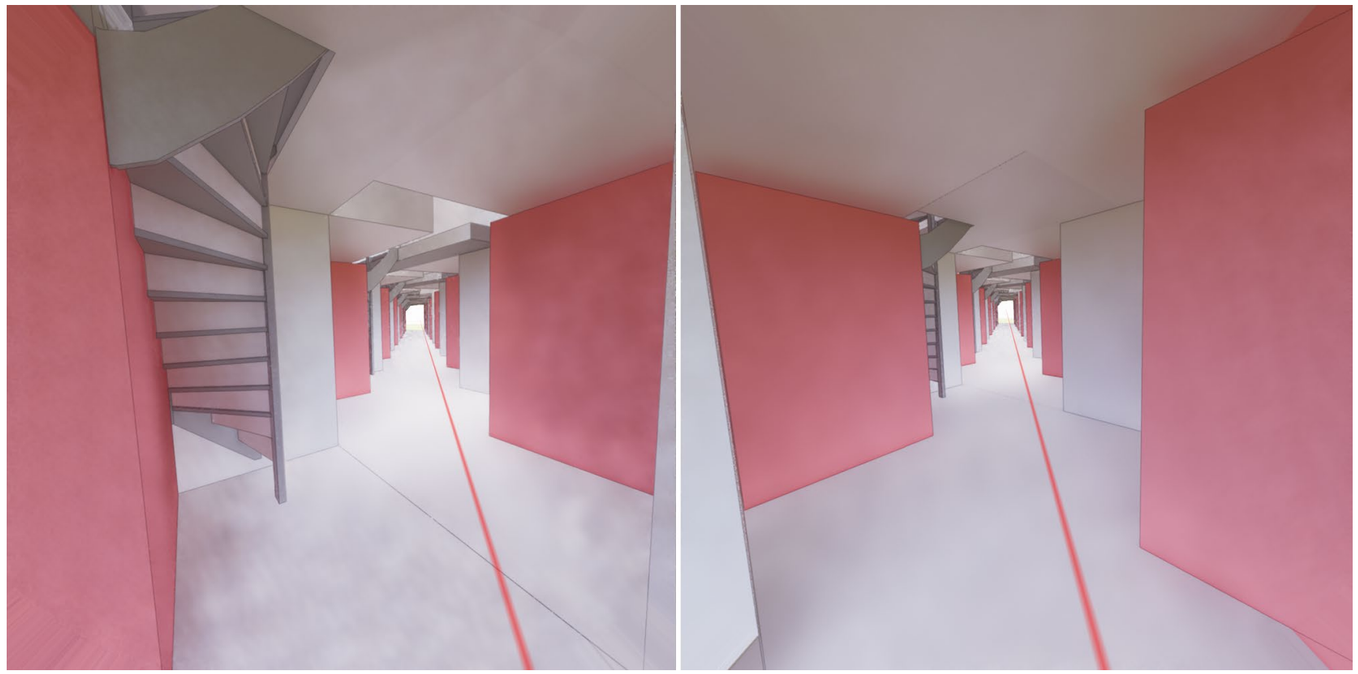
The street within the building

THE QUALITIE OF THE CORRIDOR

Testing with virual reality

The quality of the circulation space was assessed using virtual reality to evaluate the spatial experience and mitigate any design flaws at an early stage. Although the corridor appeared reasonably spacious in 2D drawings, it was found that the partitioned areas (highlighted in red) disrupted the sense of spaciousness. To address this issue, the corridor was widened, and the positioning of the stairs was strategically adjusted to enhance the perception of space. Furthermore, the guiding principle was to ensure that most partitioned areas are either transparently enclosed or entirely open, promoting spatial continuity and facilitating social interaction.

testing with vr variant 1

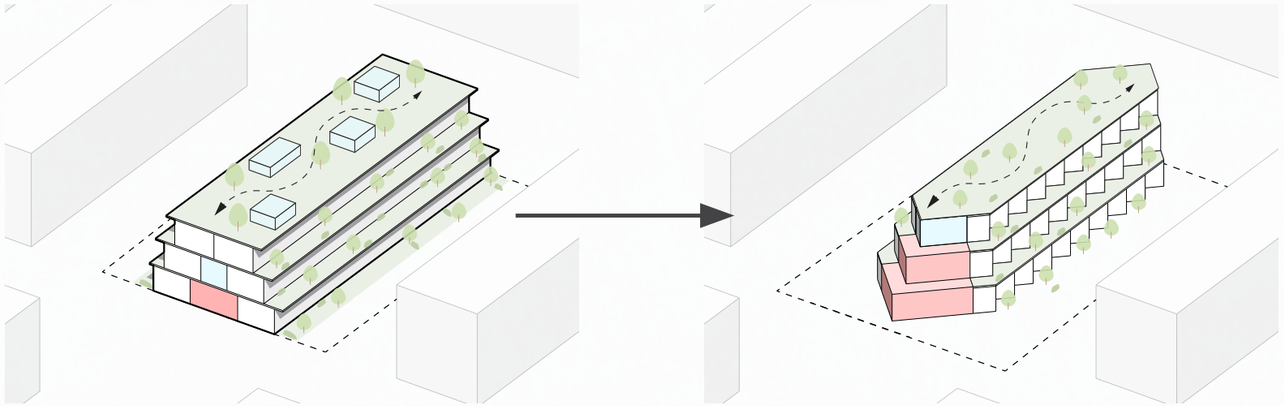


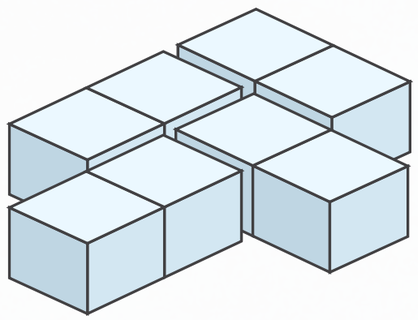
testing with vr variant 2

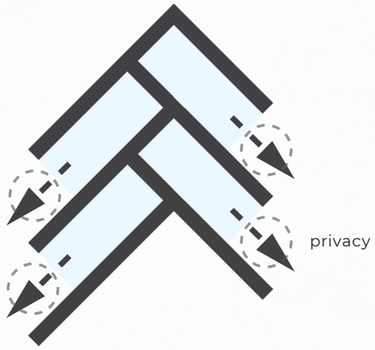
TYPOLOGIE

Inspiration: Charlotte perriand

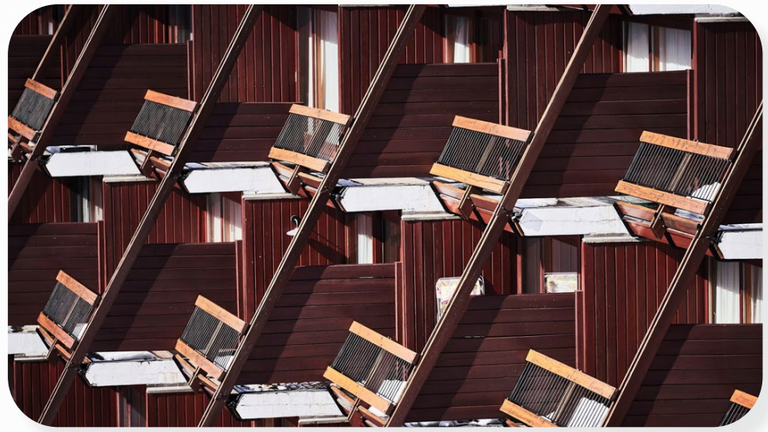
Taking inspiration from Charlotte Perriand, a study has been undertaken to explore strategies for maximising direct sunlight in living spaces. By rotating the apartments, a triangular space is formed between the front of one apartment and the side facade of the neighbouring unit. This outdoor area offers increased privacy and is easily achievable as it hangs between two units, eliminating the need for free-hanging elements, thus providing cost efficiency. Furthermore, the rotation improves views and maximises the amount of direct sunlight entering the apartment. Additionally, the rotation creates a natural separation between the apartment's garden and that of the neighbouring.







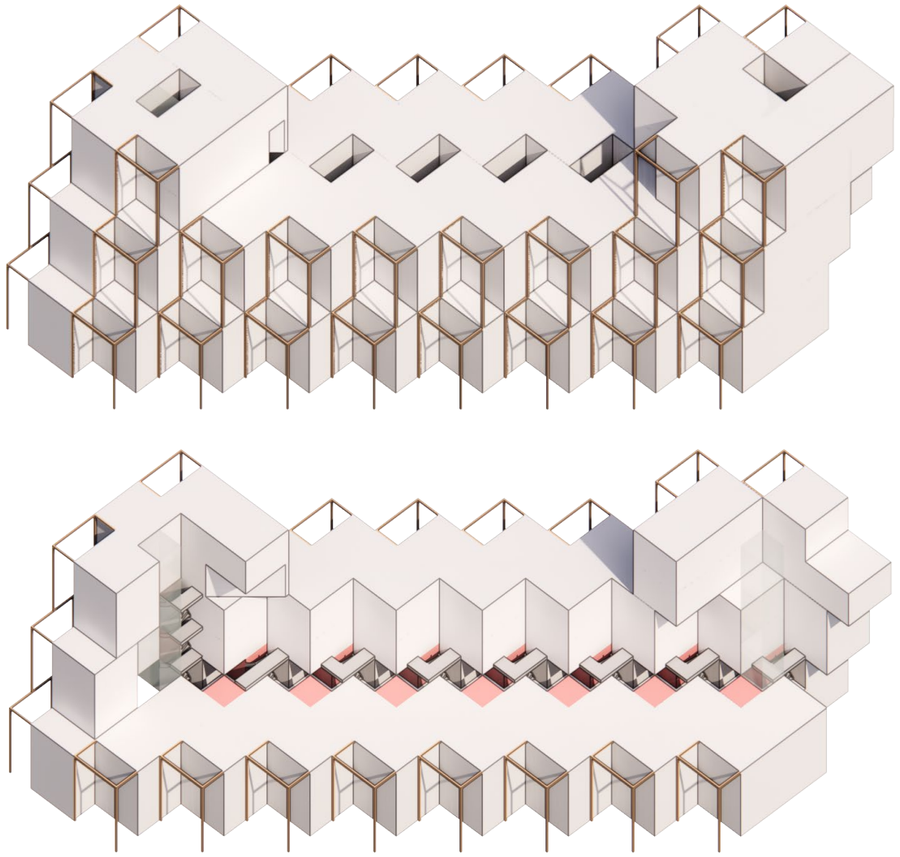
Charlotte Perriand's Les Arcs ski resort



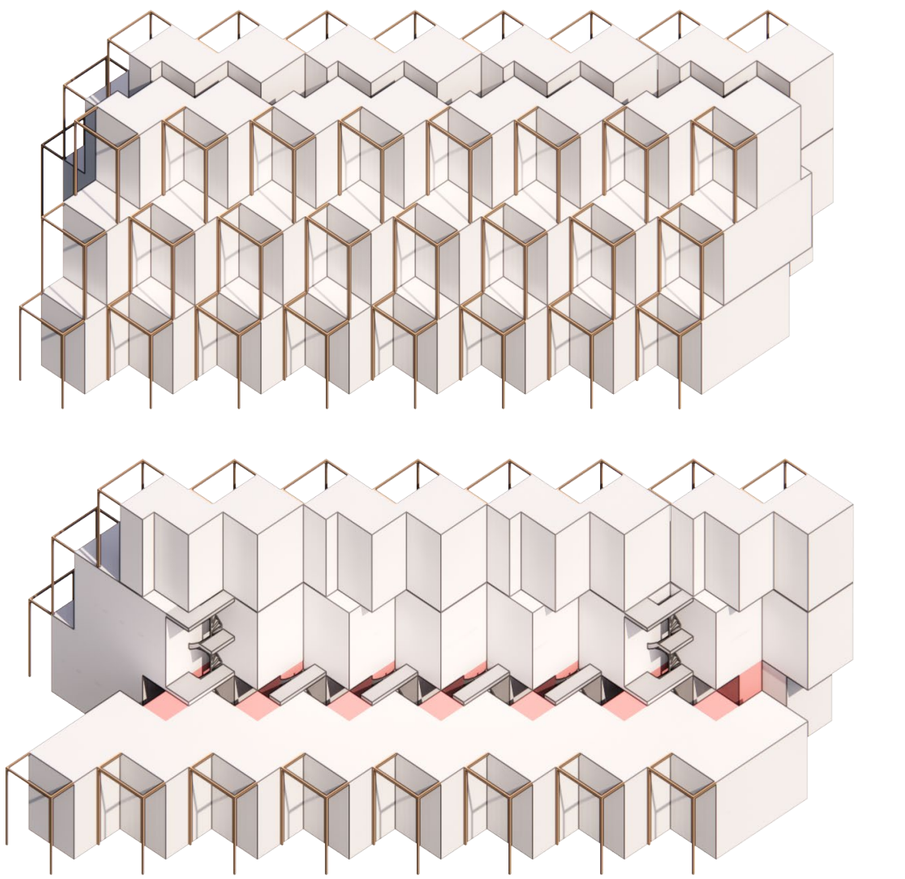
Charlotte Perriand's Les Arcs ski resort

Charlotte Perriand's Plan Neige in Val Thorens

HIGHER VOLUME

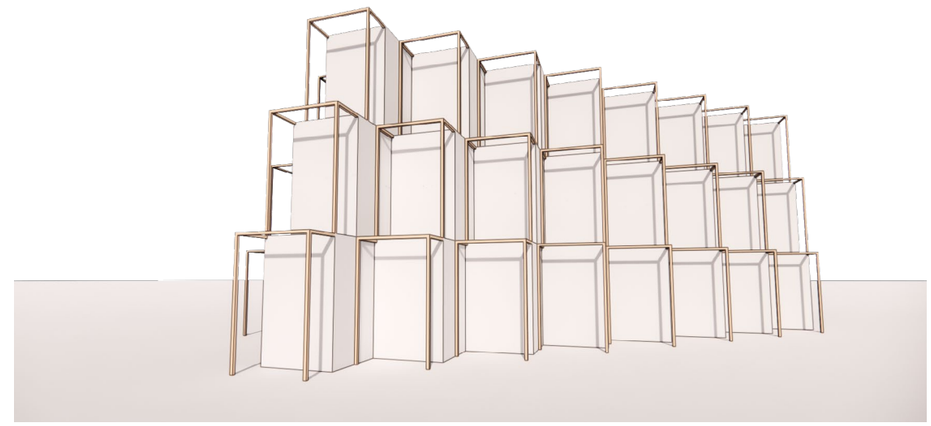


Variant 1



Variant 2

Research was also conducted to explore the possibility of increasing the density of the complex by adding an additional floor. After careful examination, it was determined that this additional level would involve significant drawbacks. These include the need for additional fire safety measures due to the increased height of the highest floor and a wider footprint of the building. Moreover, an additional corridor would have to be added to meet evacuation requirements, resulting in smaller apartments. The heightened volume would also restrict direct sunlight access for the lower-level dwellings. Considering these additional provisions, the benefits were not deemed sufficient. Instead, densification was achieved by optimising the U-shape of the building. Along the south facade, a five-apartment facade was created, allowing for an increased density while avoiding the mentioned drawbacks.

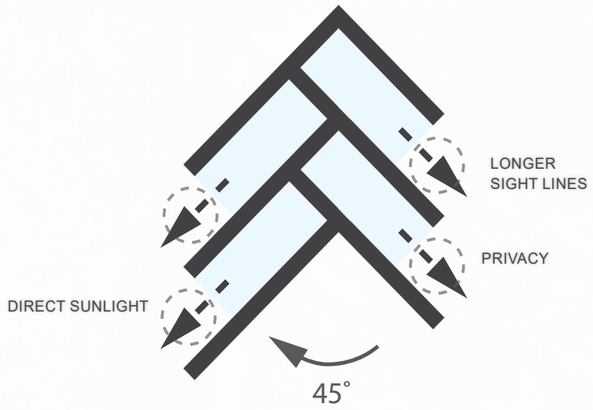


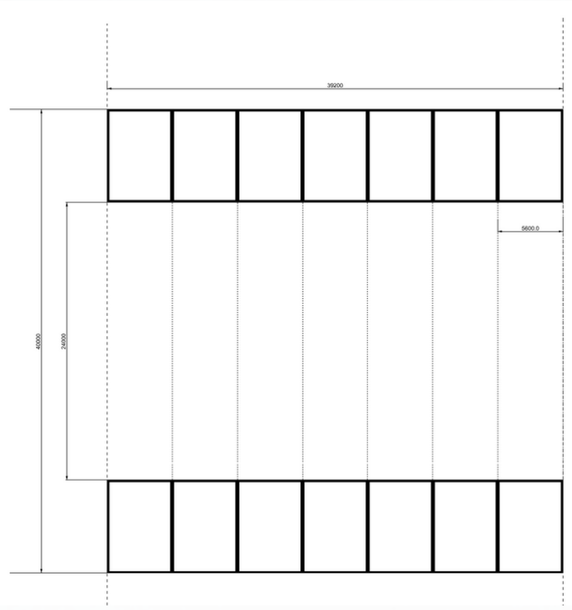
Variant 2

TYPOLOGIE

Inspiration: Charlotte perriand

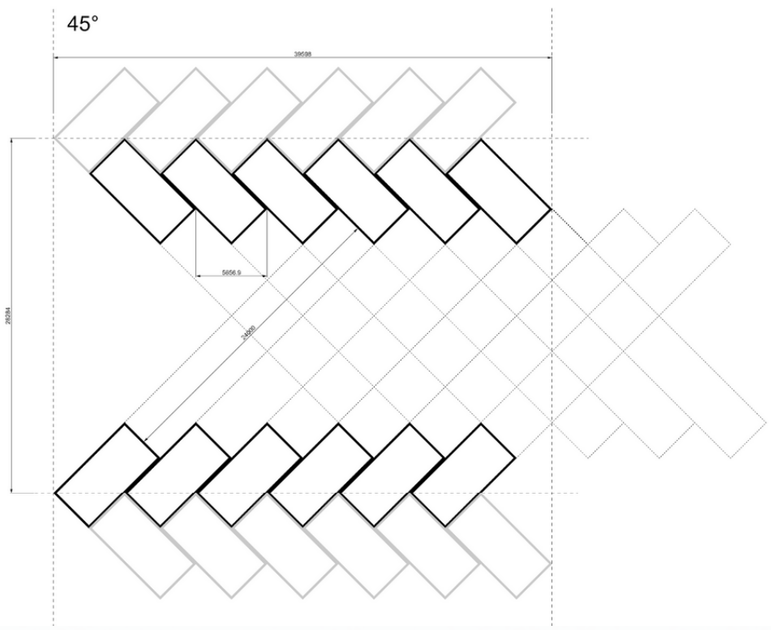
In order to optimise the utilisation of this rotation, various angles were tested to achieve optimal performance. Considerations were given to sight lines and the surface area between the apartments. The facade area was also considered in order to attain the optimal outcome. The tests revealed that surfaces at a 45-degree angle were most favourable, compared to an apartment with the same width between units. While rotating the apartments offers numerous advantages, it is important to consider the limitations associated, such as orientation with this design approach.



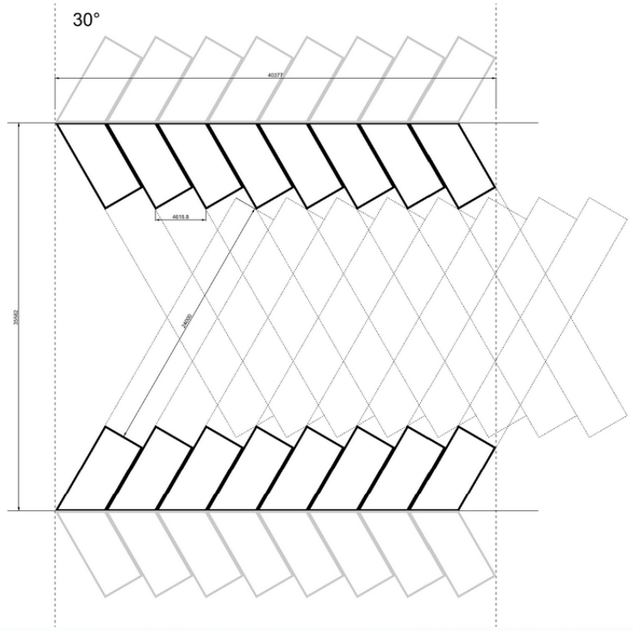


14 appartments
area = 1120m²
1568/14=112m² per appartement

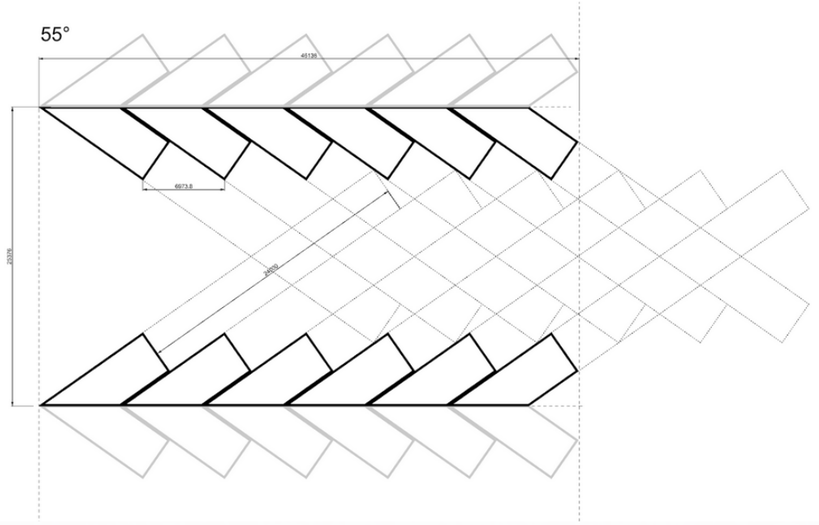
“Tests showed that a 45-degree angle for positioning the appartement is most efficient”



12 appartments
area= 1120m²
1120/12=93m² per appartement



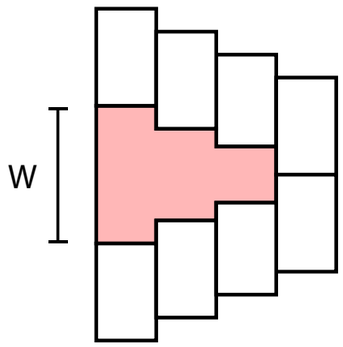
14 appartments
area = 1438m²
1438/14=102m² per appartement

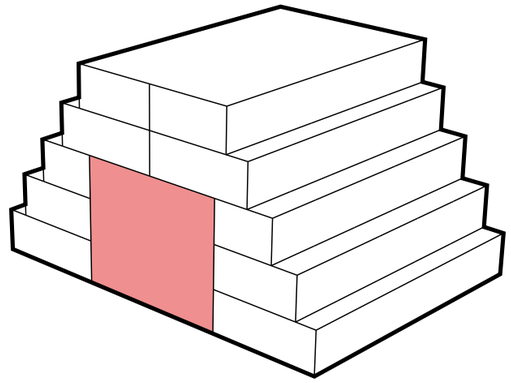


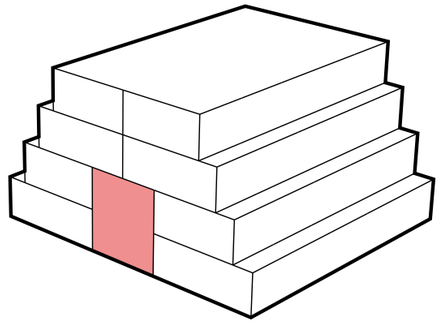
12 appartments
area = 1171m²
1171/12=98m² per appartement

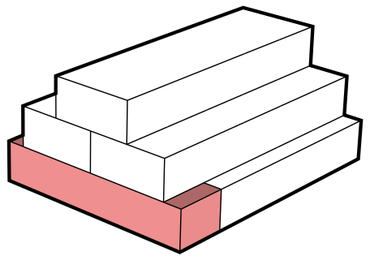
MIXED USE

closed facade

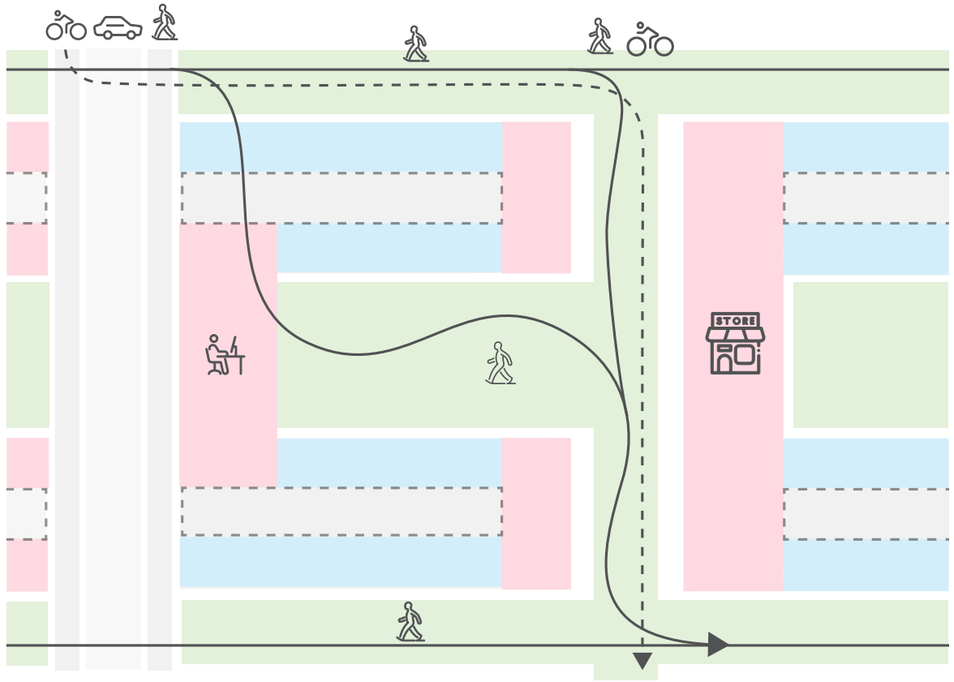








adaptable volume



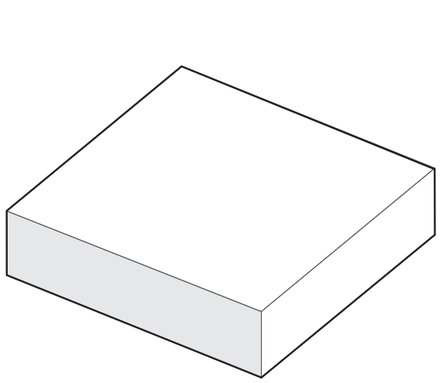
combination of functions

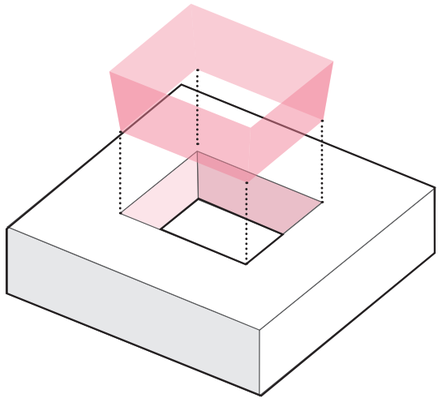
mixed use

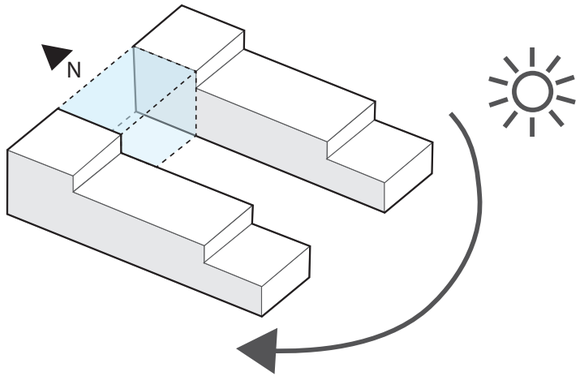
The integration of residential, commercial, and recreational functions in one location improves space efficiency and reduces transportation pressure, resulting in cost savings. Additionally, functions that require less sunlight can be situated in the core of the building, increasing its mass and making it more affordable. The current separation of land use in cities leads to extensive commuting, with people having to travel long distances for various activities. By integrating land use, traffic flow can be evenly distributed, maximizing the utilization of infrastructure throughout the day. The existing segregation also results in numerous inactive facades that have a negative impact on their surroundings.

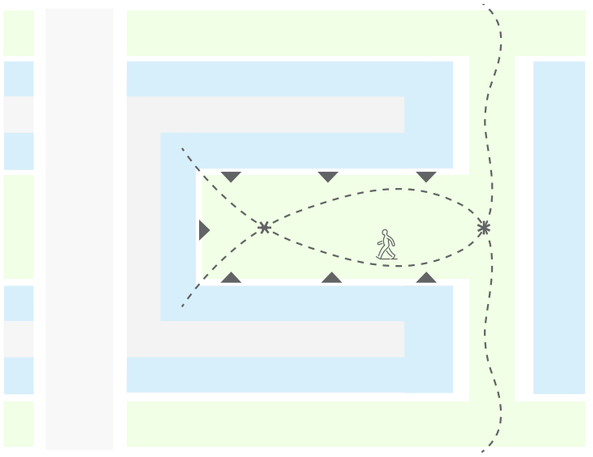
“Integrating living, working and leisure in one location improves space”

TYPOLOGIE

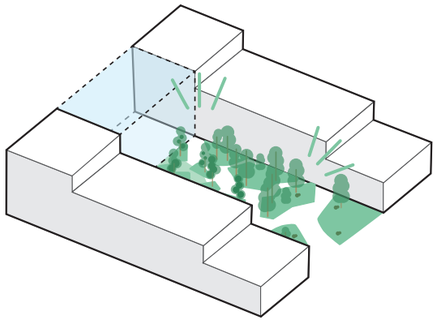


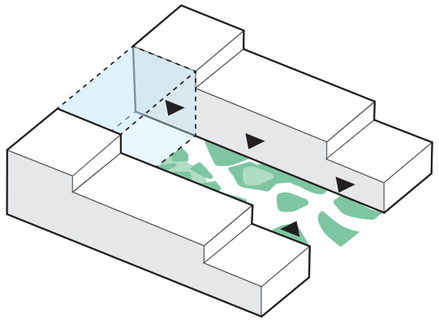


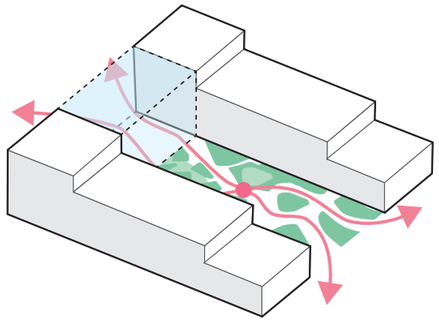


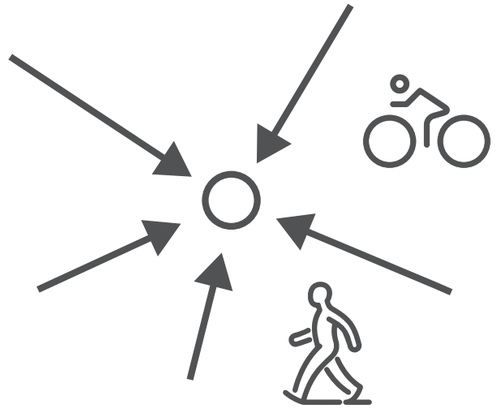


coincidental encounters









Typology sketch design

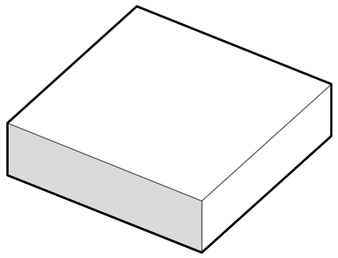
The U-shaped design of the building emerged from the ambition to combine high density with sufficient facade area and direct sunlight. The design began with a square volume, to which an inner courtyard was added to introduce more light into the centre of the building. An opening was created on one side of the volume to provide the inner courtyard with additional light, and if necessary, the volume on the north side can also be opened to connect with the urban context. The aim is to foster interaction and vibrancy in the intermediate space, which is envisioned as an oasis and paradise for the residents. By orienting the communal space inward and providing access from there, social interaction is encouraged. This is the place where coincidental encounters between residents occur.

Semi private erea

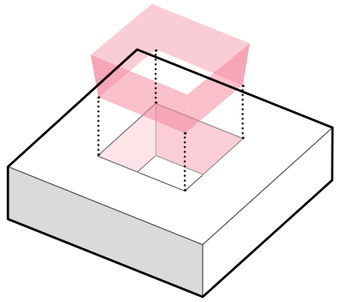
Loneliness is a big problem among young and old people. Therefore, our design is focused on encounter each other. The wide gallery has room for a traffic route and private space. This makes it possible to use the gallery for other activities. You can sit here and encounter neighbors. In addition, each floor has a collective outdoor space on the cascade. This collective space is green and is arranged to meet with each other.

In the inner garden, a circuit has been introduced so that you can meet each other and have access to the smaller courtyards. This circuit has access to all the entrances and the surroundings and provokes coincidental encounters and activities in the garden.

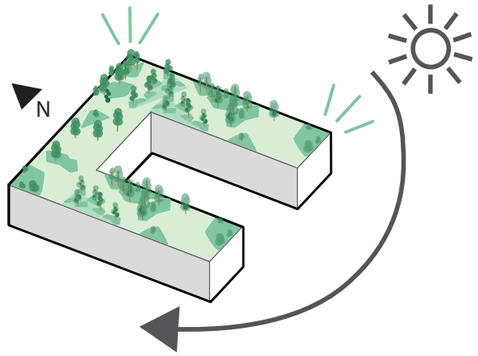
TYPOLOGIE FINAL DESIGN



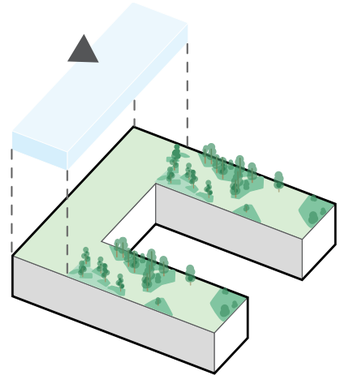
START VOLUME

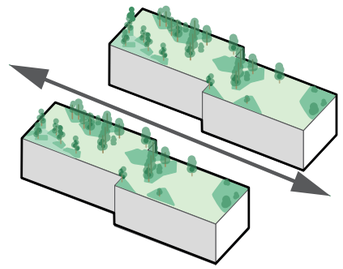


CREATING FACADE

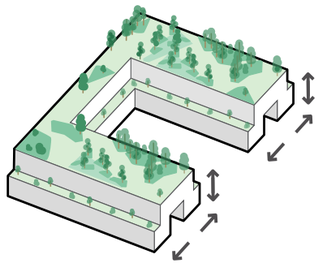


MAXIMIZE THE SUNLIGHT

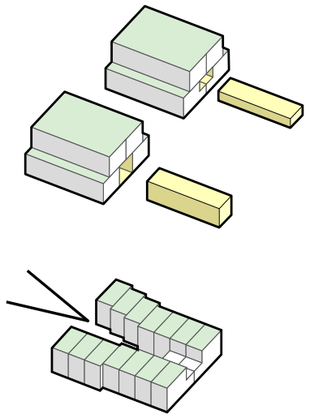




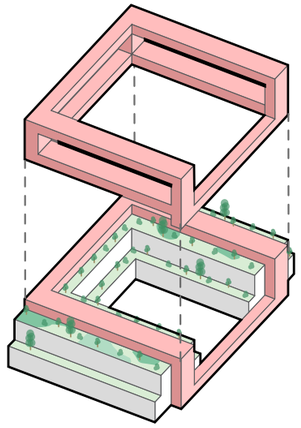
ADAPT TO THE CONTEXT



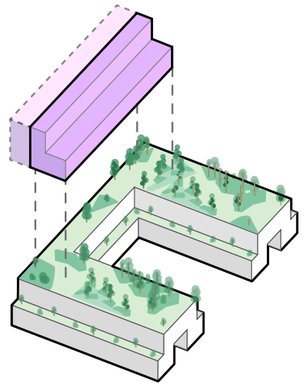
CREATING TERRACES AND HEIGHT



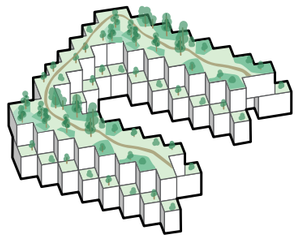
MANAGING THE VOID



CIRCULATION FOR INTERACTION



REMAINING SPACE FOR FACILITIES

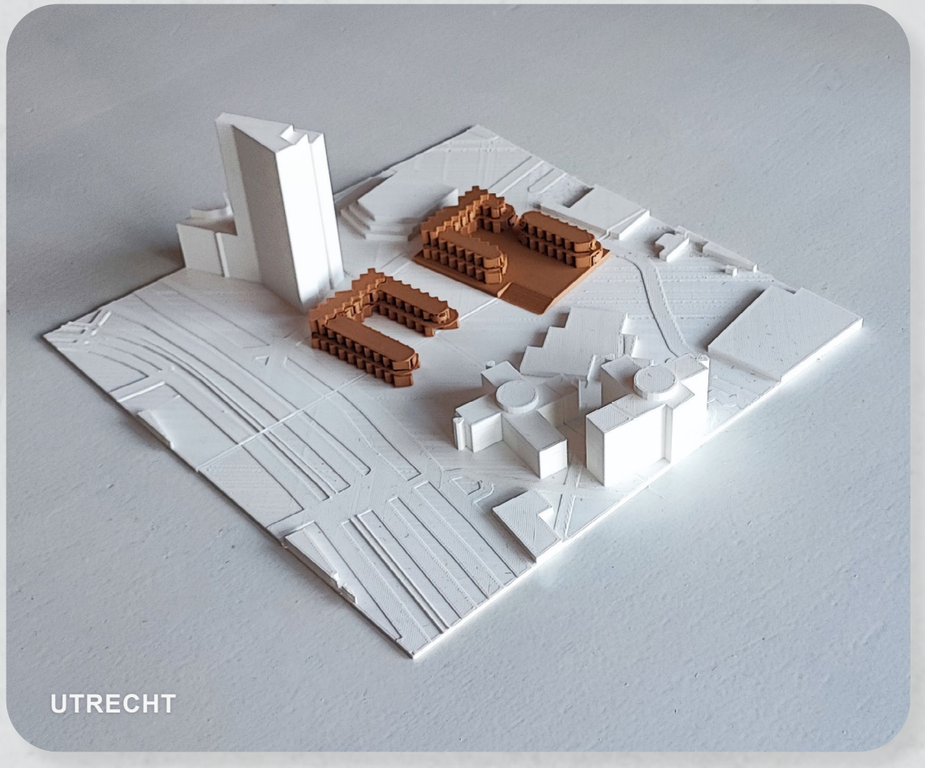


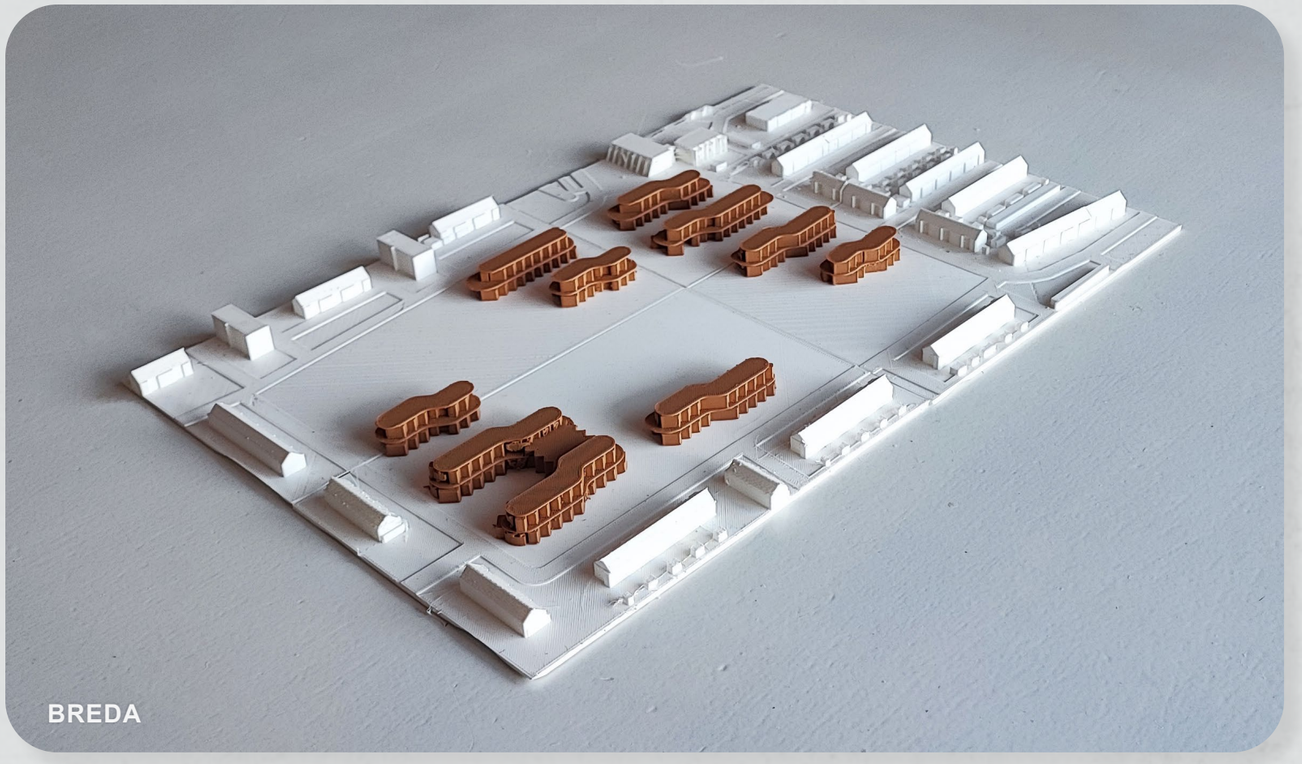
ROTATE FOR LIGHT AND PRIVACY

The design emerged from a quest for quality of life in high-density living. By opening the building block on one side allows sunlight to penetrate inside the heart of the building. By arranging the building in a staggered formation, sufficient space was created to accommodate a garden without impeding the flow of light to the level below. Furthermore, the apartments were made double-height to increase privacy and direct light towards the living areas. Furthermore, in order to increase privacy, the circulation space was moved to the center of the building. Additionally, if the program allows it, a new type of apartment can be added to either remove or open up the void in the core. To prevent dead ends, a circulation is established by interconnecting all the hallways with each other. The leftover spaces on the nord can be filled in with other functions to create more mass and make the holeplan more affordable. Inspired by the work of Charlotte Perriand, the apartments were rotated a quarter turn, allowing light to penetrate deeper and creating longer lines of sight from within. This also provides a private space for the residence, which is a suitable location for a garden.

LOCATIONS ▼

To test the concept, three different locations have been chosen, each with its own context and requiring a different adaptation of the design. In order to gain a thorough understanding of the built environment, research has been conducted, and scale models have been created to assess the design and integration. The design for the Utrecht location creates a sense of seclusion from the surrounding environment, as it is situated in an industrial area, with the inner courtyard providing a peaceful space. Additionally, the north-facing space can be utilized for offices or other functions. The Amsterdam location requires the addition of a new elevated ground level to enhance the quality of the gardens. The north-facing area and the space beneath the new ground level can be used for offices, retail, and shared spaces. The design for Breda requires an open structure to welcome residents and visitors to approach the new residential block and park. This exploration has demonstrated the design's ability to respond to the contextual nuances of its surroundings. Nonetheless, it is important to acknowledge its inherent limitations.

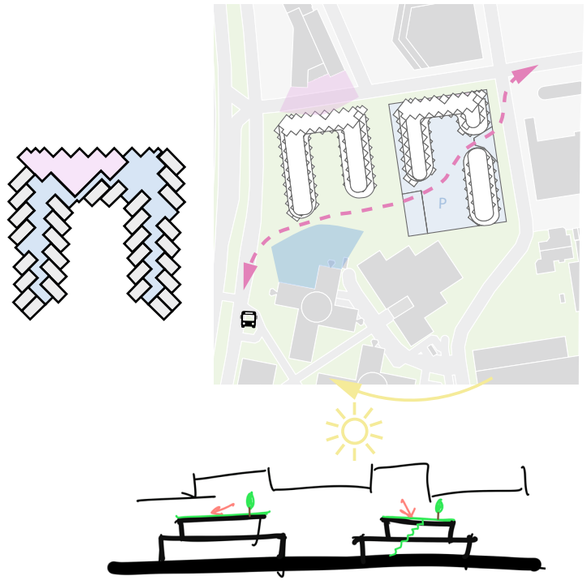

UTRECHT


BREDA


AMSTERDAM

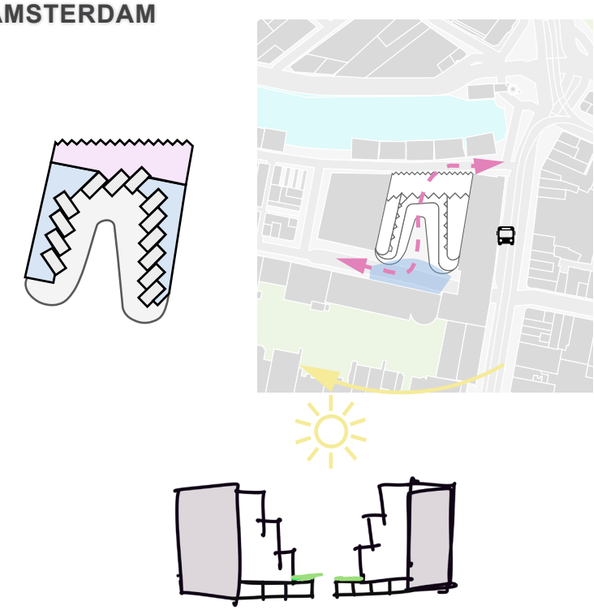
LOCATIONS ▼

UTRECHT



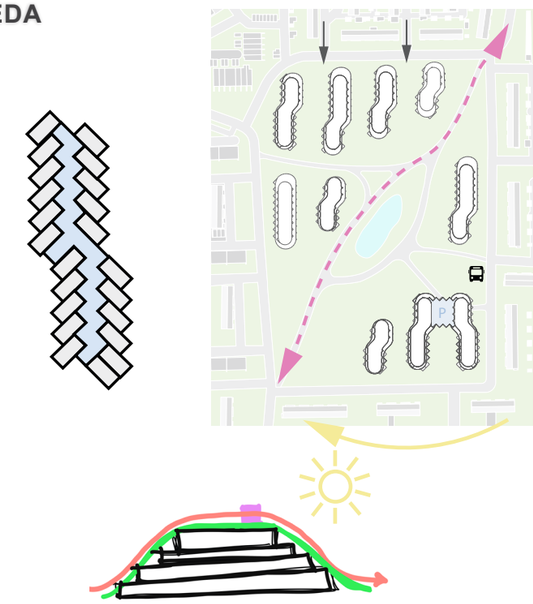
This project is distinctive because it secludes itself from the existing urban context by building at a higher level from the street and incorporating other functions, such as an office. The rooftop garden is also accessible from the office, allowing it to be utilized throughout the day.

AMSTERDAM



A new ground level has been created in Amsterdam to enhance the quality of housing. The layer beneath the new ground level can be utilized for communal space and retail.

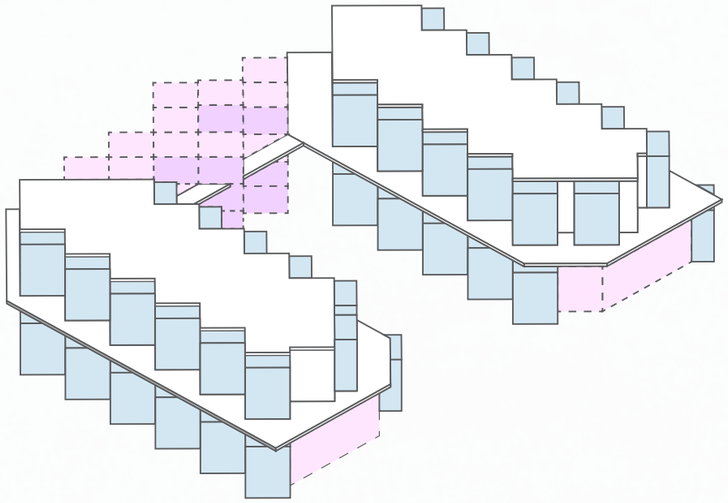
BREDA

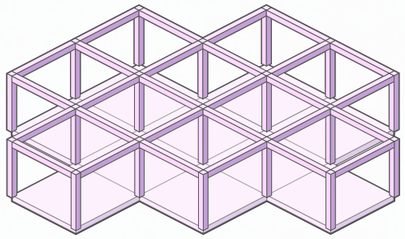


The project in Breda requires an open building block that responds to the surroundings to establish a connection with the adjacent streets and become a valuable addition to the neighborhood. By curving the buildings, they can better align with the shapes of the surroundings and break up the repetitiveness.

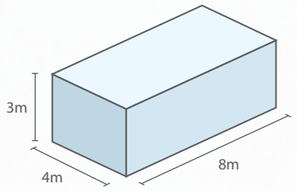
CONSTRUCTION ▶

CONSTRUCTION CONCEPTS





ADAPTIVE SPACE

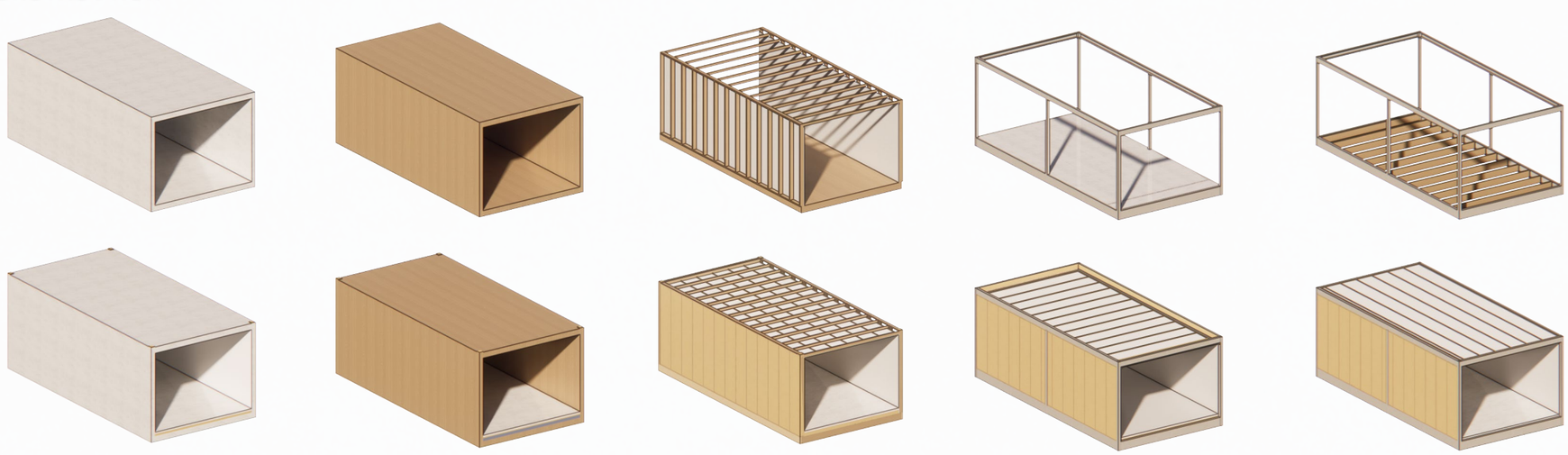


RESIDENTIAL UNITS

Construction

The construction is divided into two parts. The residential area is repetitive and is therefore made up of a unit that can be produced on a large scale. The remaining spaces are filled with a column structure to allow for free layout selection. Various construction methods were considered for the unit and a choice was made using a matrix table. Considerations included cost, weight, lead time, and environmental impact. A steel frame with HSB filling was chosen, along with a profiled steel plate for the roof. A beam layer was used for the mezzanine floor, and a CLT floor for the ground floor.

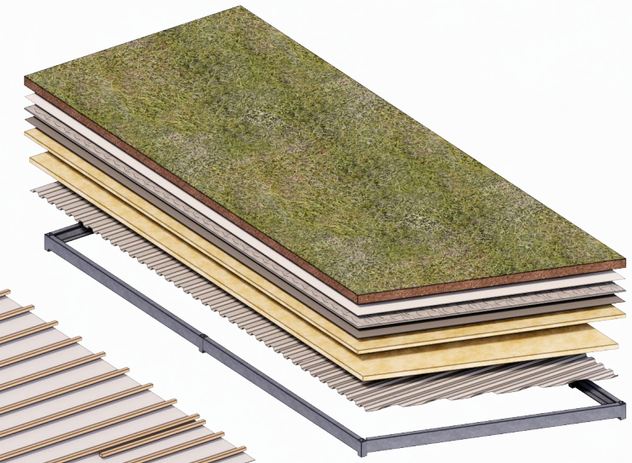
CONSIDERATION CONSTRUCTION



	Concreet	CLT	HSB-CLT	Steel-HSB-steel plate concrete floor	Steel-HSB-Beam layer
Cost	+++	-	+	+++	++
Process time	+	+++	++	+	+++
Environment impact	-	+++	+++	+	++
Weight	-	+	++	++	+++
Total	1	6	8	7	10

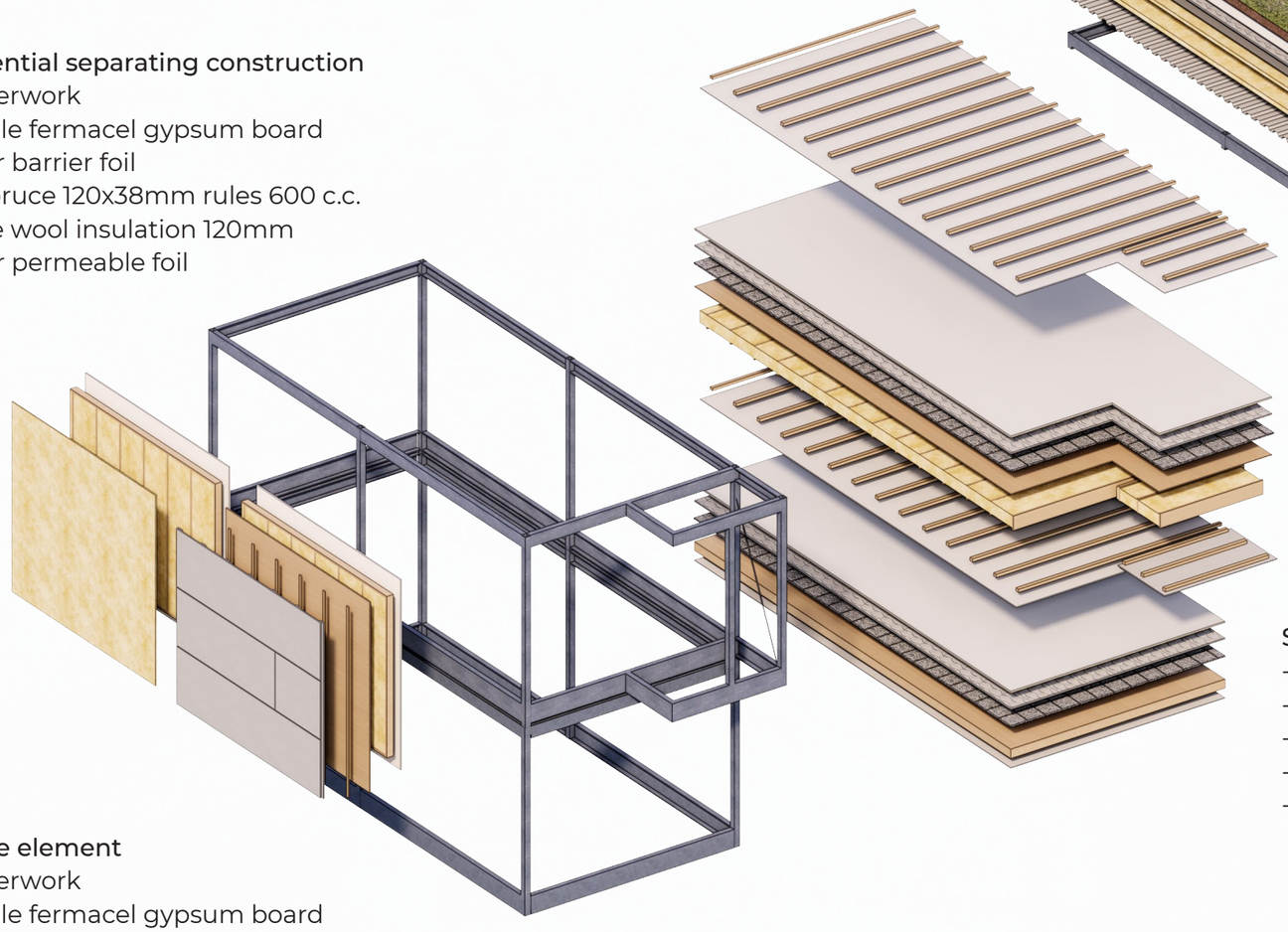
CONSTRUCTION OF MODULE

Ceiling
- spruce framework 44 x 70
- gypsum board 12mm
- plasterwork



Roof construction
- vegetation
- soil 200mm
- filter fleece
- drainage layer
- root-resistant foil
- EPDM
- Eps insulation (continuous) 140mm
- Eps insulation 80mm
- perforated steel plate 106mm

Residential separating construction
- plasterwork
- double fermacel gypsum board
- vapor barrier foil
- sls spruce 120x38mm rules 600 c.c.
- stone wool insulation 120mm
- vapor permeable foil



Intermediate floor
- Fermacell 2E32 floor plate
- dry floor heating system
- gravel tiles
- beams sls 38x235mm
- vlas wool insulation 180mm

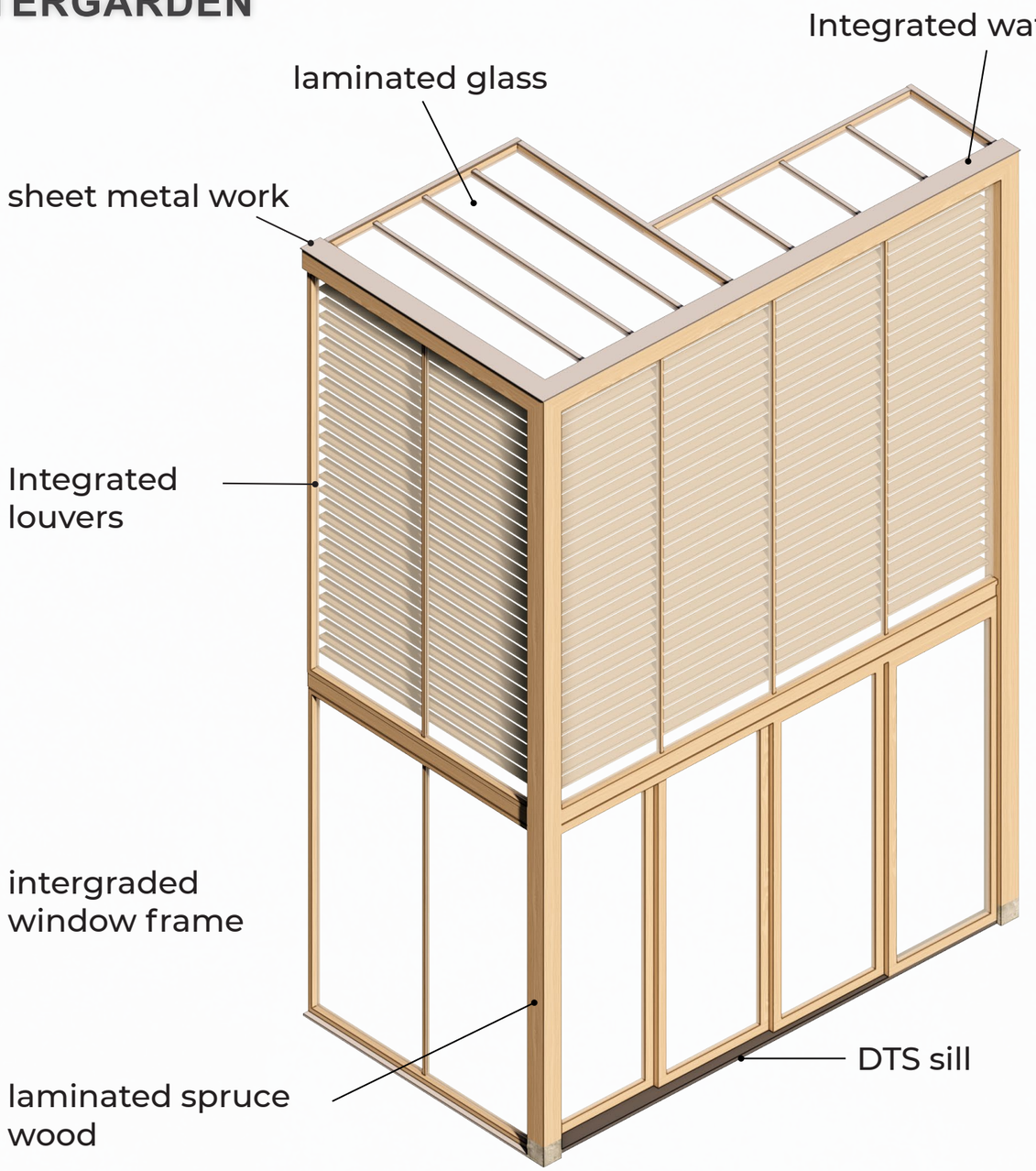
- spruce framework 44 x 70mm
- gypsum board 12mm
- plasterwork

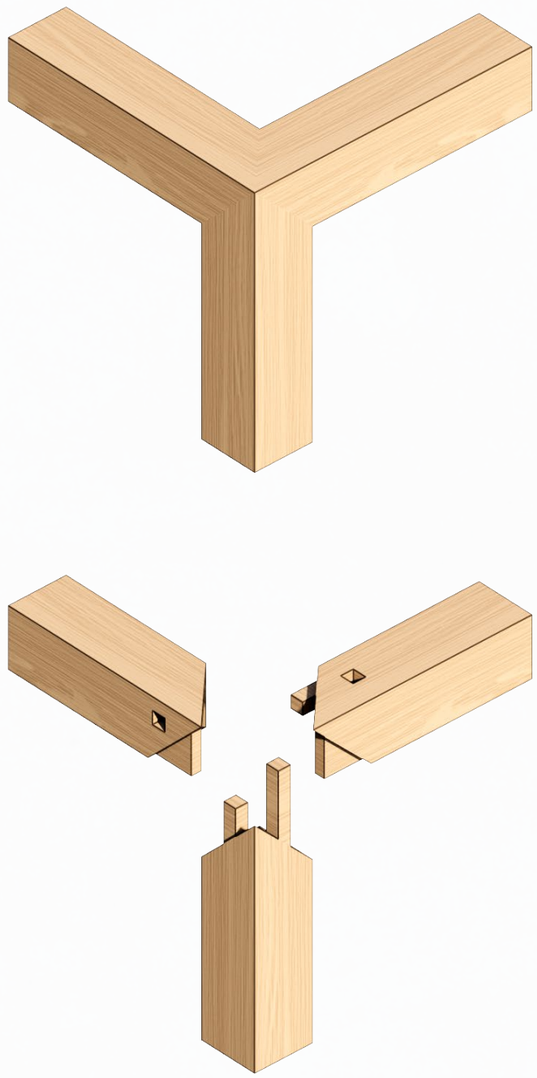
Separating/ground floor
- Fermacell 2E32 floor plate
- dry floor heating system
- gravel tiles
- CLT wood floor
- mineral wool board 140mm

Facade element
- plasterwork
- double fermacel gypsum board
- vapor barrier foil
- sls spruce 120x38mm rules 600 c.c.
- Cementitious wood fibreboard 12mm
- wooden rule 30mm
- Equitone strip 12mm
- Equitone structurally bonded 12mm

The guiding principles for the construction are affordability, speed of construction, and modularity. To ensure affordability, a logical structure has been devised for each element. For the roof, a folded steel plate with insulation and ground cover as ballast has been chosen, as it is cost-effective and does not involve wet elements. The intermediate floor consists of a beam structure with gravel tiles for sound insulation. This floor is inexpensive and can be easily disassembled. The ground floor and separating floors are made of CLT for moisture resistance and to prevent sound transmission to the floor below. The walls consist of timber frame construction elements, as this approach is cost-effective, sustainable, and easily manufactured in a factory setting.

WINTERGARDEN





japanese wood joint

The winter garden is inspired by Japanese architecture and, therefore, requires an appropriate connection influenced by this culture. The corners of the timber elements are therefore joined in the Japanese style, without the use of glue or anchors. This enhances modularity and simplifies on-site installation. Furthermore, the elements are processed using CNC (Computer Numerical Control) technology, allowing the profiles of the window frames to be milled directly. The wooden structure is protected by aluminium sheeting, which also incorporates ventilation.

cost calculation residential unit

28-05-23

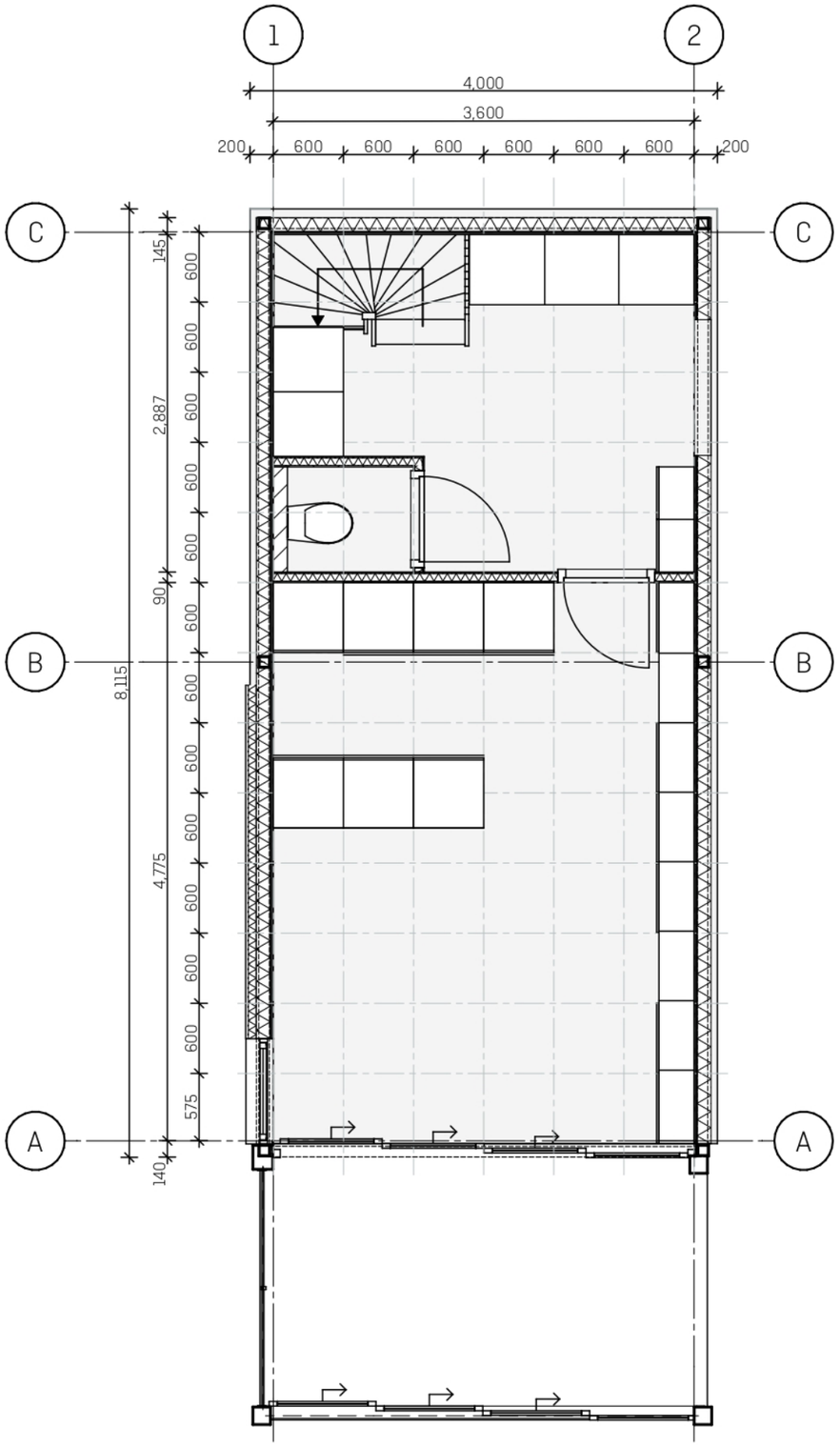
Description	Numbers	1h	price/1h	price
PROJECT ORGANIZATION				
project administration	2,00	wk	€ 185,00	€ 1.370,00
company management	2,00	wk	€ 2.725,00	€ 5.450,00
quality control	2,00	wk	€ 185,00	€ 370,00
				€ 6.190,00
OVERALL PROJECT ORGANIZATION				
FOUNDATION STRUCTURES				
concrete post 250x250x500mm	6,00	st	€ 42,01	€ 252,09
on stamped concrete, reinforcement 110kg/m3				
concrete pile [plate dimension] 900x900x200mm	6,00	st	€ 270,52	€ 1.623,12
				€ 1.875,21
TOTAL FOUNDATION STRUCTURES				
PILE FOUNDATIONS				
20-ton pile-driving rig	1,00	st	€ 2.041,20	€ 2.041,20
20-ton pile-driving rig	4,00	st	€ 2.041,20	€ 8.164,80
TOTAL PILE FOUNDATIONS				**€ 10.206,00**
EXTERIOR WALLS				
butyl tape 150 mm	48,00	m1	€ 5,52	€ 264,96
TOTAL EXTERIOR WALLS				**€ 264,96**
INTERNAL WALLS				
partition wall respace closed wall 90mm 12.5mm plasterboard and 40mm mineral wool	39,00	m2	€ 35,79	€ 1.395,78
TOTAL INTERIOR WALLS				**€ 1.395,78**
FLOOR				
wooden beam 38 x 286 mm, height 600mm	30,90	m2	€ 127,33	€ 3.934,40
solid wood floor element [span 3.85m], thickness 115mm 5-layer	30,90	m2	€ 212,18	€ 6.556,48
TOTAL FLOORING				**€ 10.490,88**
STAIRS AND RAMPS				
spiral staircase spruce, stained, height 2600mm	1,00	st	€ 989,31	€ 986,31
TOTAL STAIRS AND RAMPS				**€ 986,31**
ROOFS				
profiled steel roof plate type 106R [>500m2].	18,15	m2	€ 22,33	€ 405,20
Profiled steel roof plate (Garden/balcony)	7,75	m2	€ 22,15	€ 171,64
Green roof finishing	18,15	m2	€ 69,01	€ 1.252,60
Green roof finishing (Garden/balcony)	7,75	m2	€ 69,01	€ 534,86
TOTAL ROOKS				**€ 2.364,30**
MAIN SUPPORTING STRUCTURES				
steel profile UNP 200	49,59	m1	€ 23,19	€ 1.149,99
steel profile UNP 300	49,59	m1	€ 56,59	€ 2.806,30
steel profile tube	36,00	m1	€ 45,30	€ 1.630,80
Steel module welding and assembly	12,00	st	€ 270,18	€ 3.242,16
Wooden profile 200x200 Winter Garden	12,00	m1	€ 93,28	€ 1.119,36
TOTAL MAIN SUPPORTING STRUCTURES				**€ 9.948,61**
EXTERIOR WALL OPENINGS				
hardwood window frame 1-piece fixed glass, 1000x2200mm [wxh] incl. double glazing	4,00	st	€ 542,53	€ 2.170,10
hardwood window frame 1-piece fixed glass, 1000x2200mm [wxh] incl. double glazing	2,00	st	€ 558,78	€ 1.117,55
hardwood window frame 1-piece fixed glass, 1000x2200mm [wxh] incl. double glazing	2,00	st	€ 558,78	€ 1.117,55
hardwood window frame 1-piece fixed glass, 1000x2500mm [wxh] incl. double glazing	6,00	st	€ 592,53	€ 3.555,20
hardwood window frame 1-piece fixed glass, 1500x2200mm [wxh] incl. double glazing	2,00	st	€ 746,65	€ 1.493,30
hardwood front door frame 900x2350mm (wxh) with top and bottom double glazing	2,00	st	€ 1.265,30	
hardwood liftgate without skylight, width 4000mm	2,00	m1	€ 1.515,50	€ 3.031,00
concrete window sill 50/70x120mm	8,00	m1	€ 43,75	€ 350,00
TOTAL EXTERIOR WALL OPENINGS				**€ 12.834,70**
INTERIOR WALL OPENINGS				
pine post frame without fanlight, wall thickness 100mm primed 60mu, excl. mullion door	3,00	st	€ 148,67	€ 446,00
TOTAL INTERIOR WALL OPENINGS				**€ 446,00**
RAILINGS AND HANDRAILS				
glass balustrade 88.2 glazing [1kN], height 1000mm (Garden)	4,00	st	€ 552,54	€ 2.210,16
TOTAL BALUSTRADES AND RAILINGS				**€ 2.210,16**
ROOFING				
flat roof window 4000x1000mm winter garden	1,00	m1	€ 3.150,00	
TOTAL ROOF OPENINGS				
INSTALLATION KITS				
niche meter cabinet 814x350x2600mm, 1 door	1,00	st	€ 229,88	€ 229,88
TOTAL INSTALLATION PACKAGES				**€ 229,88**
EXTERIOR WALL FINISHES				
fiber cement EQUITONE lunara, horizontal spacing of battening 600mm	23,11	m2	€ 100,80	€ 2.329,49
exterior wall HSB 12.5mm plasterboard	23,11	m2	€ 31,90	€ 737,16
TOTAL EXTERIOR WALL FINISHES				**€ 3.066,65**
INTERIOR WALL FINISHES				
sauce-ready plasterboard, width 1200mm [level A].	106,00	m2	€ 17,70	€ 1.876,20
corner protector	40,00	m1	€ 7,81	€ 312,50
stucco plug	15,00	m1	€ 20,17	€ 302,55
painting wooden interior cladding width <100mm	30,00	m1	€ 8,88	€ 266,37
1x touch up primer, 1x primer, 1x deck paint				
Residential partition wall HSB 12.5mm gypsum plasterboard panel	47,88	m2	€ 103,00	€ 4.955,71
TOTAL INTERIOR WALL FINISHES				**€ 7.713,33**
CEILING FINISHES				
plasterboard (floor) type P on wooden battening, thickness 9.5mm suspended ceiling	30,90	m2	€ 64,82	€ 2.002,89
plasterboard (roof) type P on wooden battening, thickness 9.5mm suspended ceiling	34,20	m2	€ 64,82	€ 2.216,79
TOTAL CEILING FINISHES				**€ 4.219,68**
ROOF FINISHES				
EPDM roofing, fully bonded [>1000m2].	18,15	m2	€ 33,00	€ 598,95
TOTAL ROOFING				**€ 598,95**
HEAT GENERATION				
Heat pumps with electric supplementary heating 4.5 KW	1,00	st	€ 3.147,29	€ 3.147,29
TOTAL HEAT GENERATION				**€ 3.147,29**
DRAIN				
pvc down pipe Ø100x1,8mm, gray incl. bracket, connection socket and insertion diverter ring to sewer	8,00	m1	€ 20,26	€ 162,10
pvc down pipe Ø110mm incl. expansion piece	8,00	m1	€ 31,75	€ 253,98
TOTAL DRAINS				**€ 416,08**
WATER				
multilayer water pipe Ø20mm construction	20,00	m1	€ 9,67	€ 193,40
brass stopcock with drain Ø22mm [capillary x coupling]	1,00	st	€ 36,83	€ 73,66
bronze check valve 1/2"	1,00	st	€ 36,23	€ 36,23
flow-through aerator faucet 1/2"	1,00	st	€ 27,32	€ 27,32
water meter 5m3/h	1,00	st	€ 114,12	€ 114,12
multistage centrifugal pump 1" [330W], 230V	1,00	st	€ 404,82	€ 404,82
close-in boiler, capacity 10 liters [2200W] [water pressure].	1,00	st	€ 350,02	€ 350,02
TOTAL WATER				**€ 1.199,57**
HEAT DISTRIBUTION				
4-group underfloor heating 35m2 as main heating, excl. connection pipe	1,00	set	€ 2.286,46	€ 2.286,46
pressure expansion vessel, capacity 150liter	1,00	st	€ 236,30	€ 436,30
recessed circulation pump 15-14, 1 1/2" [230V], installation size 180mm	1,00	st	€ 372,23	€ 372,23
TOTAL HEAT DISTRIBUTION				**€ 3.094,99**
AIR TREATMENT				
Balanced ventilation system D, 2 levels [max. 325m3/h at 180Pa], direct current with bypass	1,00	st	€ 5.836,23	€ 5.836,23
TOTAL AIR TREATMENT				**€ 5.836,23**
CENTRAL ELECTRICAL FACILITIES				
ground wire 6mm2, in conduit	12,00	m1	€ 25,11	€ 181,32
switchboard 6 groups, on/off	1,00	m1	€ 314,00	
TOTAL CENTRAL ELECTRICAL SERVICES				**€ 495,32**
center box in front of living room	12,00	m1	€ 7,37	€ 88,42
center box in front of bedroom	17,00	m1	€ 7,11	€ 120,79
center box in front of kitchen	6,00	m1	€ 7,38	€ 44,29
center box in front of bathroom	8,00	m1	€ 7,27	€ 58,20
center box at hallway/corridor	3,00	m1	€ 7,81	€ 23,42
electricity living room, floor area <50m2	1,00	st	€ 367,72	€ 367,72
electricity bedroom, floor area <10m2	3,00	st	€ 185,22	€ 555,67
electrics kitchen, standard	1,00	st	€ 317,77	€ 317,77
bathroom electrics	1,00	st	€ 253,60	€ 253,60
electricity hallway/corridor	1,00	st	€ 264,94	€ 264,94
5-group divider [1-phase].	1,00	st	€ 623,32	€ 623,32
TOTAL POWER				**€ 2.718,14**
SECURITY				
optical smoke detector with backup	2,00	st	€ 48,61	€ 97,22
TOTAL SECURITY				**€ 97,22**
PERMANENT KITCHEN FACILITIES				
standard project kitchen	7,00	st	€ 1.307,28	€ 9.150,96
TOTAL FIXED KITCHEN FACILITIES				**€ 9.150,96**
PERMANENT SANITARY FACILITIES				
revolving door for width 900mm toughened glass, profile-arm	1,00	st	€ 774,70	€ 774,70
revolving door with side panel 900x900mm toughened glass, profile-arm	1,00	st	€ 1.313,69	€ 1.313,69
self-supporting toilet element 1120x500mm [front operation] rear wall	1,00	st	€ 374,44	€ 374,44
plastic shower tray 800x750x50mm, incl. mixer tap installation height 170-260mm	1,00	st	€ 1.022,31	€ 1.022,31
ceramic basin combination 600x460mm, wall pipe incl. toilet tap	1,00	st	€ 270,67	€ 270,67
ceramic basin combination 500x380mm, wall pipe incl. wash basin mixer	1,00	st	€ 331,16	€ 331,16
fountain 450x250mm, wall pipe	1,00	st	€ 222,69	€ 222,69
self-supporting washbasin element [wall fixture] 1300x500mm in system wall	1,00	st	€ 170,67	€ 170,67
mixer tap, shower fittings, seat and wall bracket	1,00	st	€ 762,47	€ 762,47
washbasin mirror 570x400mm	1,00	st	€ 25,45	€ 25,45
ceramic shelf, width 500mm, white	1,00	st	€ 66,81	€ 66,81
stainless steel shower channel 485x70x120mm, incl. manhole housing	1,00	st	€ 221,40	€ 221,40
TOTAL FIXED SANITARY FACILITIES				**€ 5.556,46**

Total:				€ 103.437,59
General construction site costs (BPK):	1,00 % over (HA + OA)		1.034,38	
Verlet (V):	0,00 % over (L)		0,00	
General operating expenses (AK):	7,50 % over (HA+ V)		7.285,86	
A.K. on Subcontracting:	3,00 % over (OA)		188,78	
Total cost (FP):				€ 111.946,61
Interest loss (RV):	0,00 % over (KP)		0,00	
Risk (RI):	3,00 % over (KP+ RV)		3.358,40	
Profit (W):	5,00 % over (KP+ RV+ RI)		5.765,25	
C.A.R. insurance (CAR):	0,00 % over (KP+ RV+ RI+ W)		0,00	
Budget sum excluding VAT:		EUR		€ 121.070,26
BTW:	21,00 %	EUR		€ 25.424,75
Budget sum incl. VAT:		EUR		**€ 146.495,01**

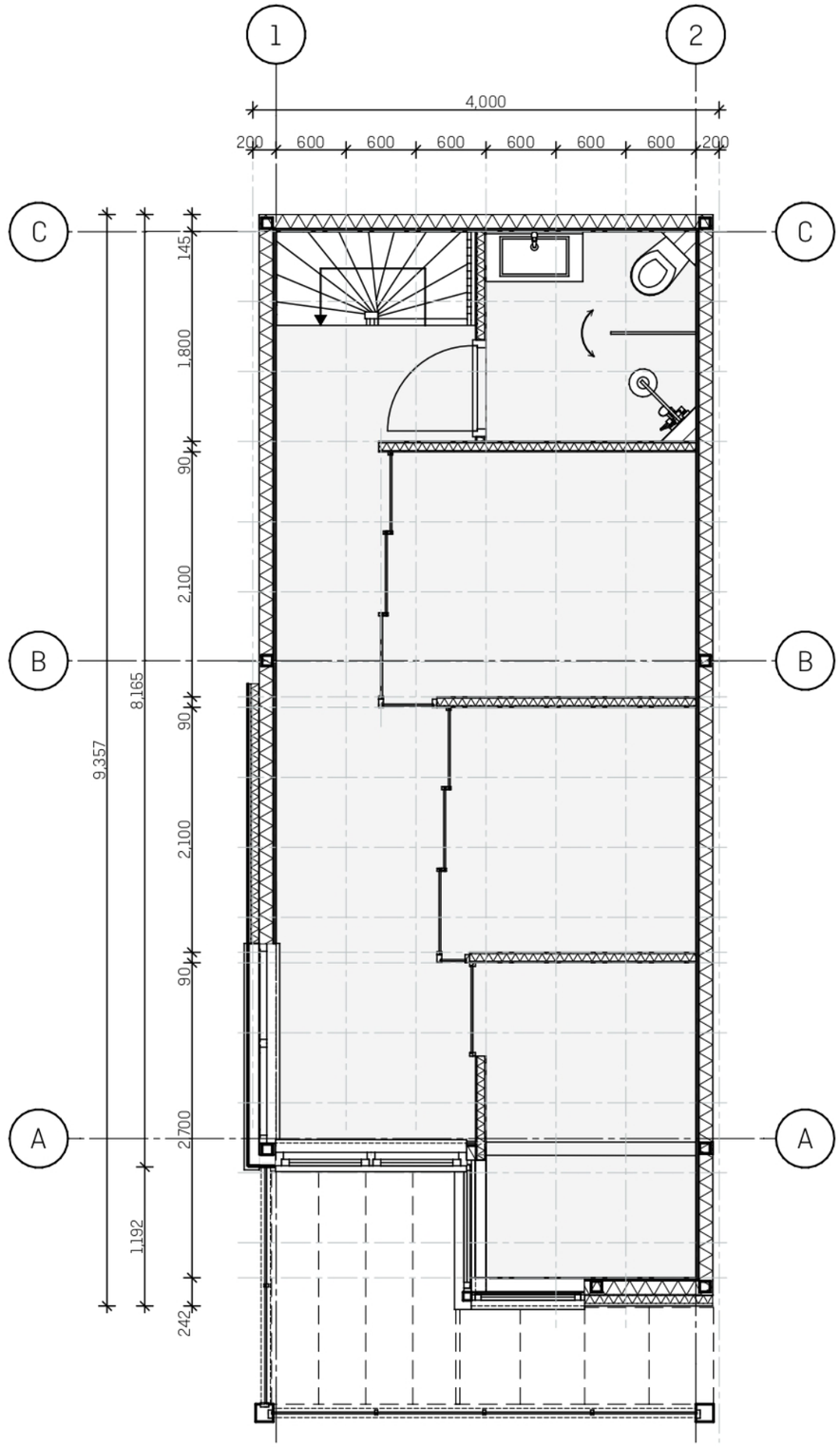
COST CALCULATION

The costs of the residential unit, including kitchen, bathroom, balcony, and rooftop terrace, have been estimated using the online cost estimation program provided by Bouwformatie. These calculations were based on constructing the unit on-site, so in reality, certain costs may be lower due to more efficient manufacturing in a high-productivity factory setting. Cost savings can be achieved when materials can be purchased on a larger scale. The cost estimation is an approximation, as it has not been verified by an expert and not all factors have been taken into account. The total costs, excluding land and shared spaces, amount to €146,495.

FLOOR PLAN APARTMENT A



ground floor



first floor

Drawingname
DD floorplan Ground floor

Description
floor plan
Standard

Project Name
Graduation Project model utrecht

Address
Vliegend Hertlaan 41 Utrecht

Date
12.05.2023
a. 06.06.2023
b.

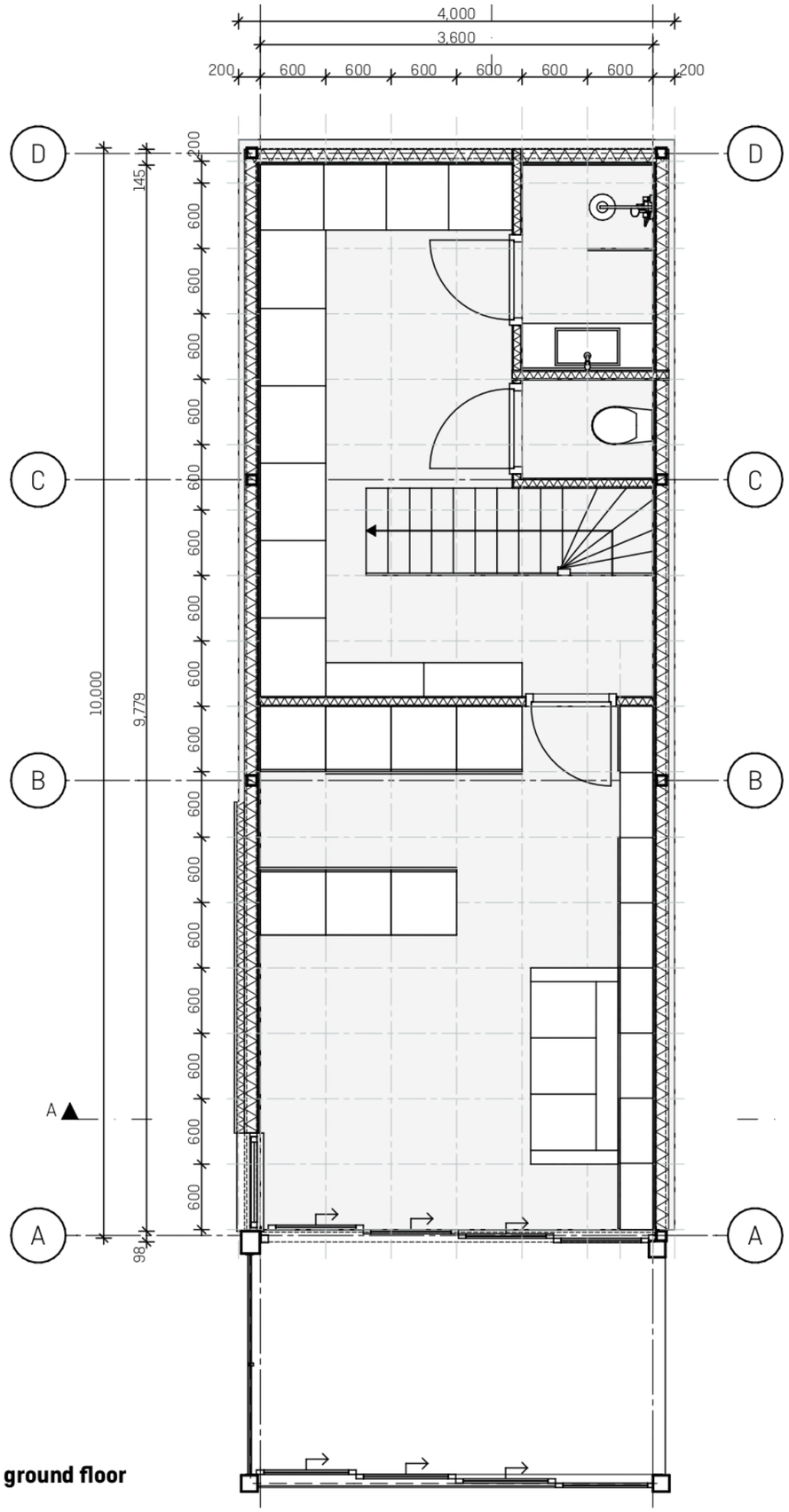
scale
1:50

Fase
DO

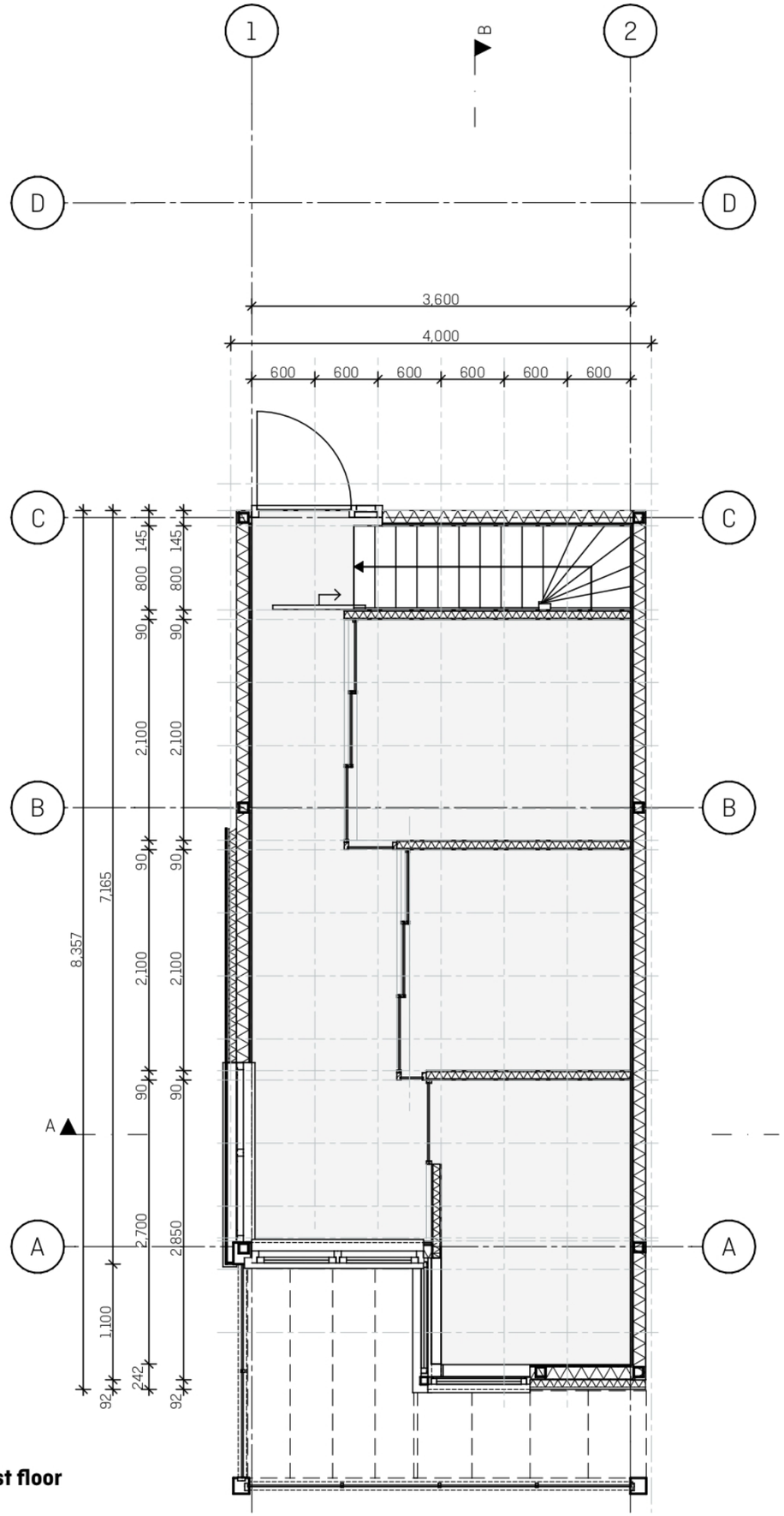
Client
Fontys
Zwijsenplein 1
5038 TZ
Tilburg

Fido Melskens
Watersloostraat
Breda
the netherlands
06 53210361
FidoMelskens@gmail.com

FLOOR PLAN APARTMENT B



ground floor



first floor

Drawingname
DD floorplan Ground floor

Description
floor plan
no basemant

Project Name
Graduation Project model utrecht

Address
Vliegend Hertlaan 41 Utrecht

Date
12.05.2023
a. 06.06.2023
b.

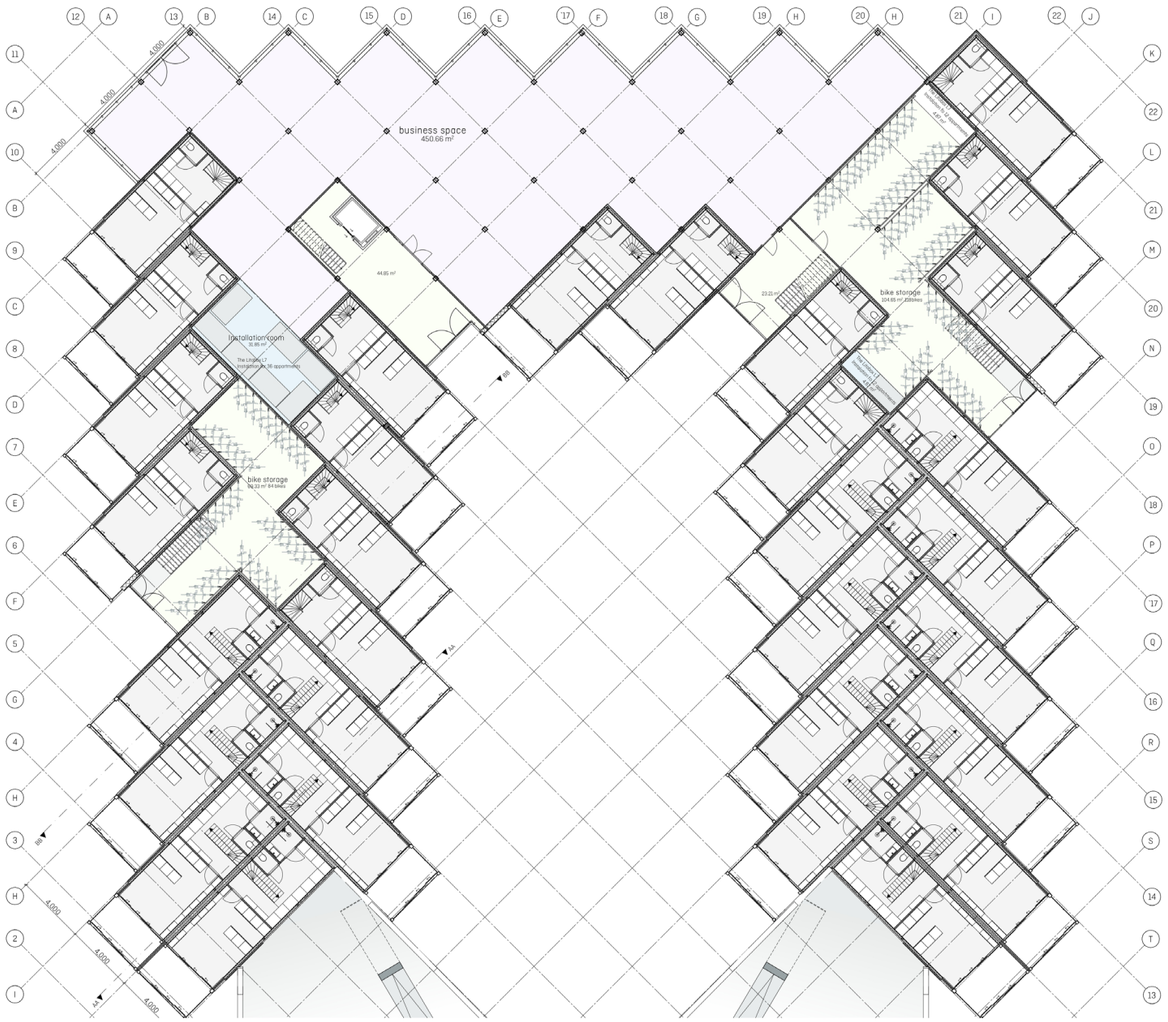
scale
1:50

Fase
DO

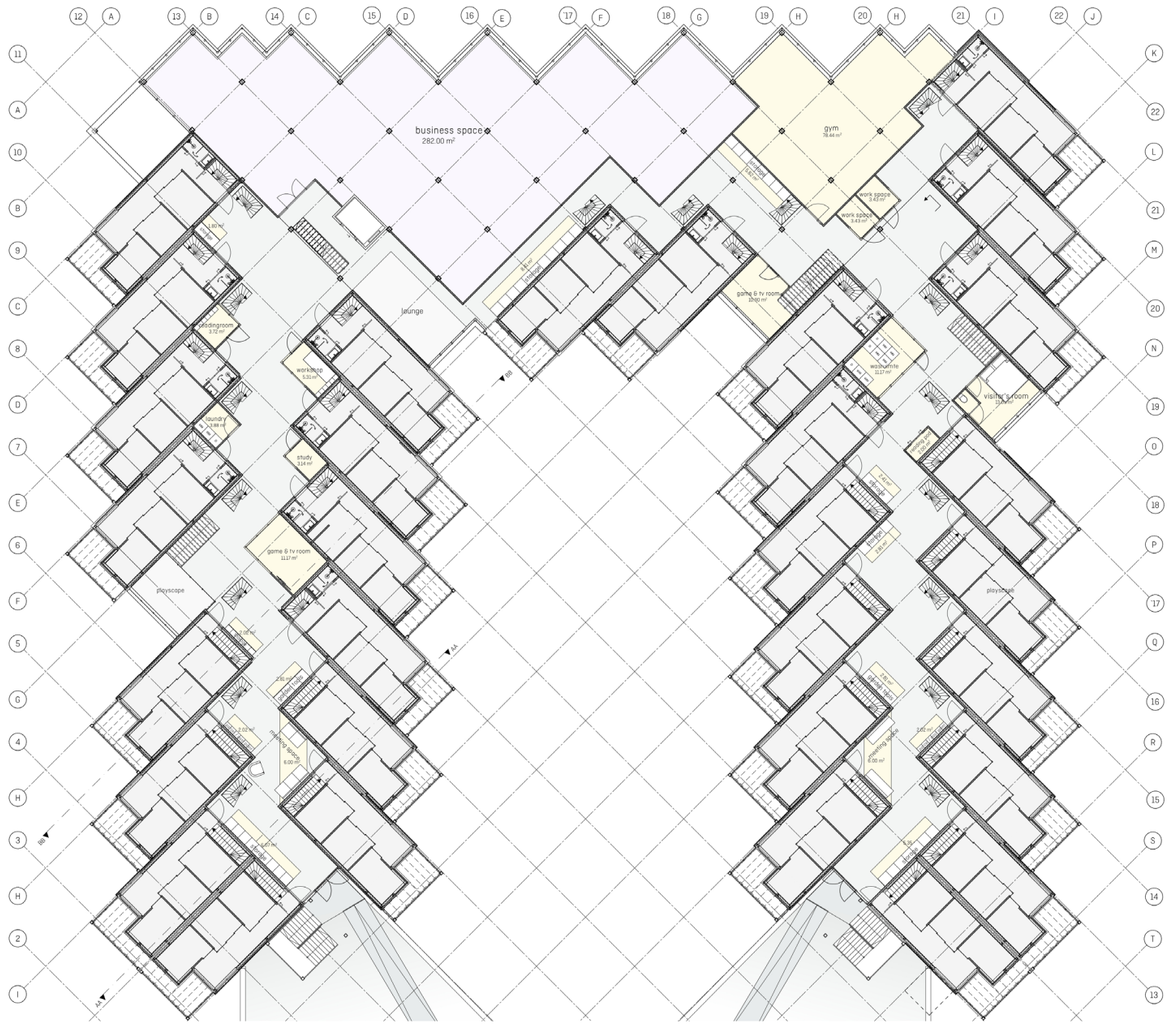
Client
Fontys
Zwijsenplein 1
5038 TZ
Tilburg

Fido Melskens
Watersloostraat
Breda
the netherlands
06 53210361
FidoMelskens@gmail.com

FLOOR PLAN

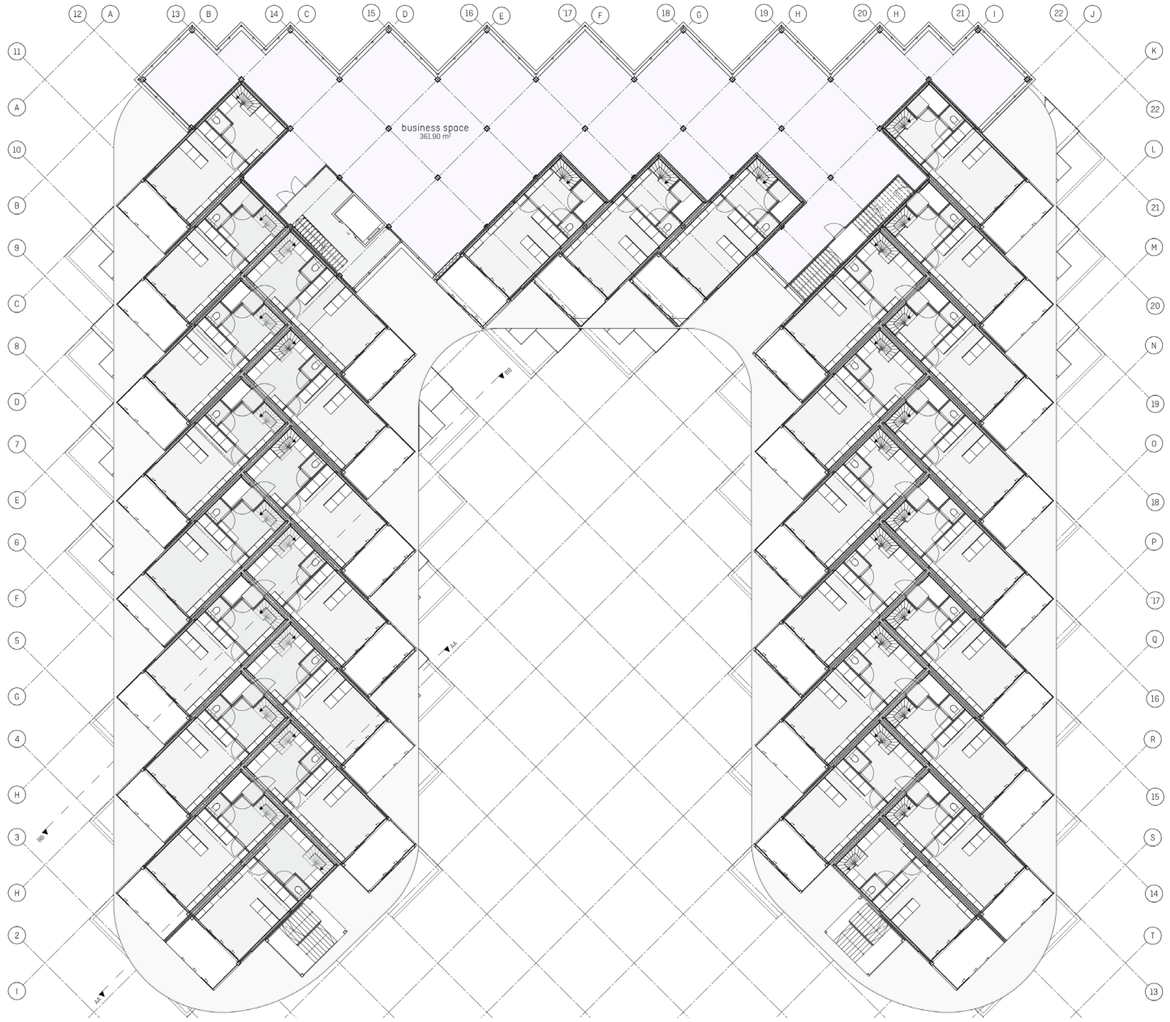


Ground level

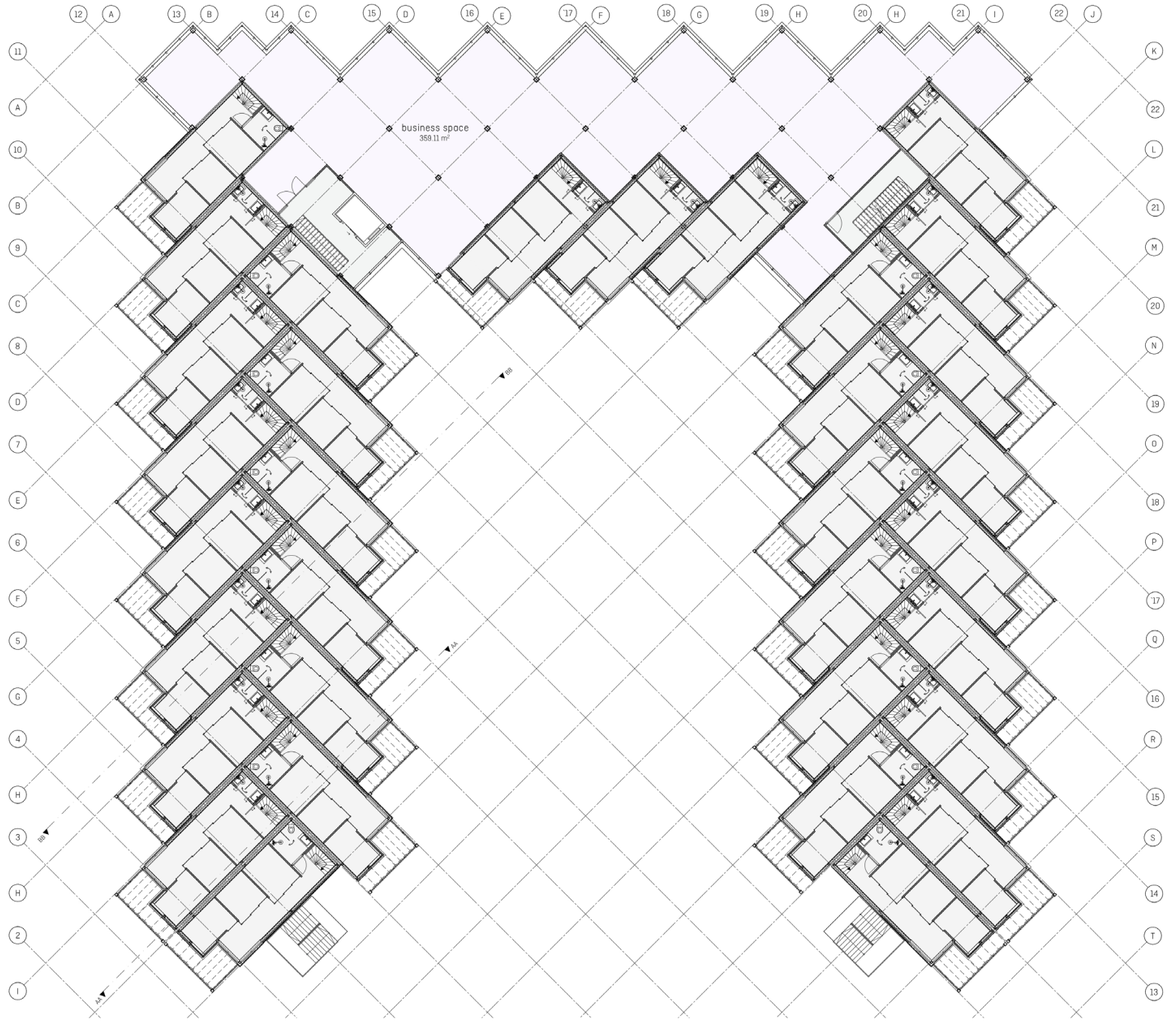


first floor

FLOOR PLAN



Second floor



Third floor

SECTION

doorsnede AA'

doorsnede BB'

Client
Fontys
Zwijsenplein 1
5038 TZ
Tilburg

Projectnaam
Graduation Project model utrecht
Vliegend Hertlaan 41
Utrecht

Description
floor plan

N

Date
10.05.2023
a. 06.06.2023
b.
c.

Scale
1:100

Print size
A1

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