



# A HABIT BASED DESIGN FOR HEALTHY LIVING

## P5 PRESENTATION

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Environment, Dwelling Department

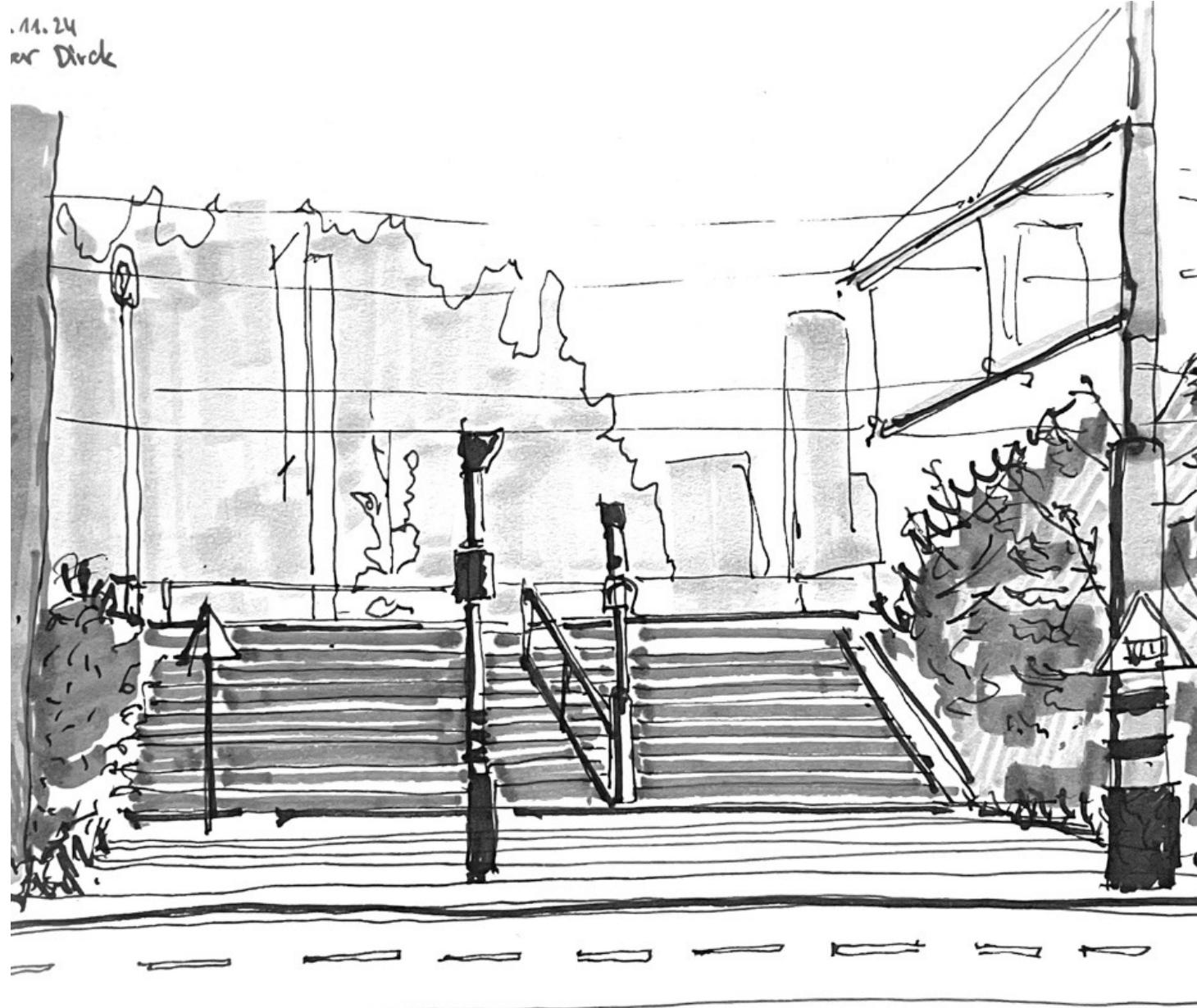
AR3AD110 Dwelling Graduation Studio:  
Designing for Care in an Inclusive Environment  
2024/2025

Birgit Jurgenhake, Kobe Macco, Birgitte Hansen,  
Annemarie Eijkelenboom

02.07.2025

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# RESEARCH

*what is a habit-based design*

# Problem Statement

70% of deaths worldwide is caused by non-communicable diseases, of which the primary modifiable cause are unhealthy habitual behaviours

## Global

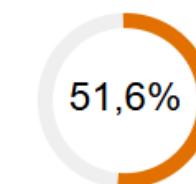
### Noncommunicable diseases

According to recent research (Balwan & Kour, 2021; Senapati et al., 2015; Tabish, 2017), conducted amongst others by the Sher-i-Kashmir Institute of Medical Sciences in India, lifestyle diseases, also called noncommunicable diseases (NCD's), are responsible for over 70% of deaths worldwide recently (over 40 million people per year). The most popular are: cardiovascular disease (CVD), cancer, diabetes type two (D2T) and chronic respiratory disease (CRD). Typically, besides non-modifiable risk factors such as age or genetic predisposition and family history, they are caused by unhealthy habitual behaviour, maintained over long periods of time – years or sometimes decades.

The main primary causes are: physical inactivity, unhealthy diet, smoking and alcohol abuse. In the Dutch context, the Centraal Bureau voor de Statistiek (CBS) and the Rijksinstituut voor Volksgezondheid en Milieu (National Institute for Public Health and the Environment, RIVM), established health indicators for each neighbourhood, characterizing the health level of the area (RIVM, 2022, 2024c). In the Lifestyle and Habits category (originally in Dutch Leefstijl en Gewoonten), two subcategories are additionally included – mental resilience and loneliness factors, relating to the social interactions or the lack thereof, and possibly resulting in such.

## Local

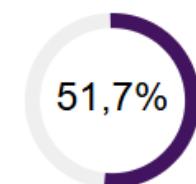
### The Netherlands



### The Netherlands

Number of inhabitants  
17,590,672

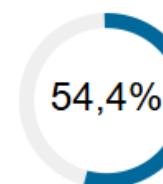
### Local authority



### The Netherlands

Number of inhabitants  
655,468

### Neighbourhood

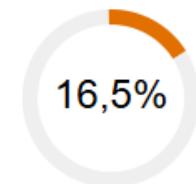


### The Netherlands

Number of inhabitants  
12,400

Obesity in Tarwewijk (blue, marked as Wheat district), as of 2022, 18 years and older (Overgewicht | Buurtatlas, 2024)

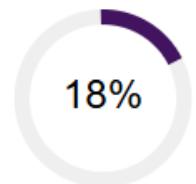
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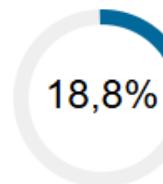
### Local authority



### Rotterdam

Number of inhabitants  
655,468

### Neighbourhood

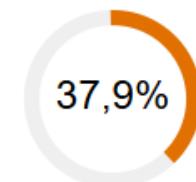


### Wheat district

Number of inhabitants  
12,400

Severe obesity in Tarwewijk (blue, marked as Wheat district), as of 2022, 18 years and older (RIVM, 2024a)

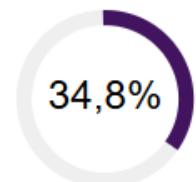
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### The Netherlands

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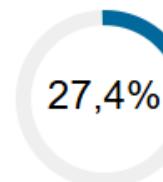
### Local authority



### Rotterdam

Number of inhabitants  
655,468

### Neighbourhood



### Wheat district

Number of inhabitants  
12,400

Cycling as commute in Tarwewijk (blue, marked as Wheat district), as of 2022, 18 years and older (RIVM, 2024b)

# Research questions

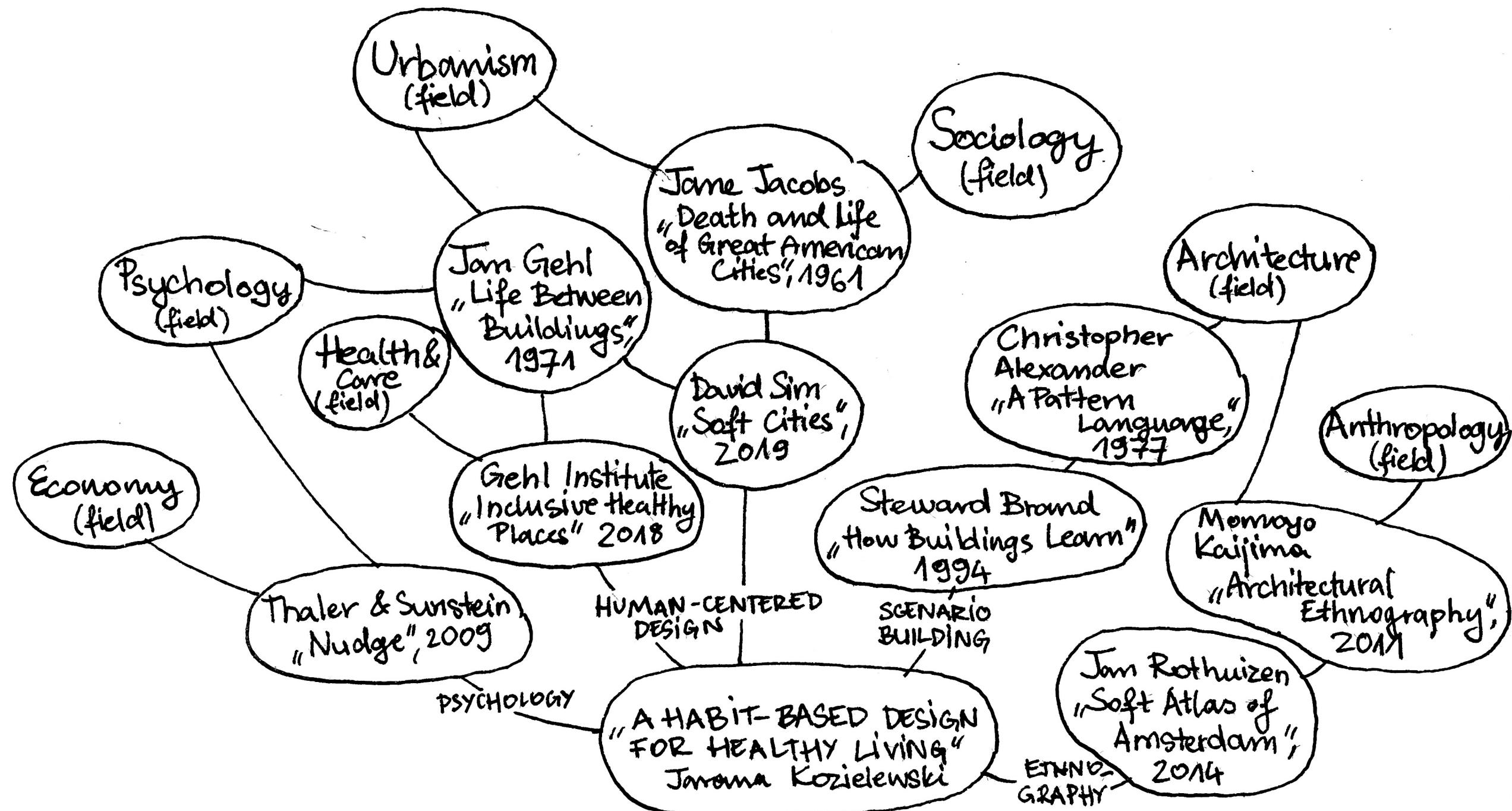
How can an architectural design approach informed by frequent local habits and potential post occupancy habitual scenarios support the mental and physical health of the Tarwewijk inhabitants?

**SUBQUESTIONS:**

1. What is the relation between habitual behaviours and health?
2. What major health and care challenges in Tarwewijk can be addressed through architectural interventions?
3. What habits frequently practiced in Tarwewijk and around the Balkon aan de Maashaven are influenced by architecture and could significantly impact residents' health?
4. Following Jane Jacobs, Jan Gehl, the Gehl Institute and David Sim, what elements and characteristics of an urban environment foster healthy habits?
5. How can architectural nudging influence health habits responsibly?
6. What is the relation between the meaning attributed to architectural elements and the perceived circumstances in which a habitual action is performed?
7. How does layouts of dwellings and access system of a building affect habitual actions performed in it?

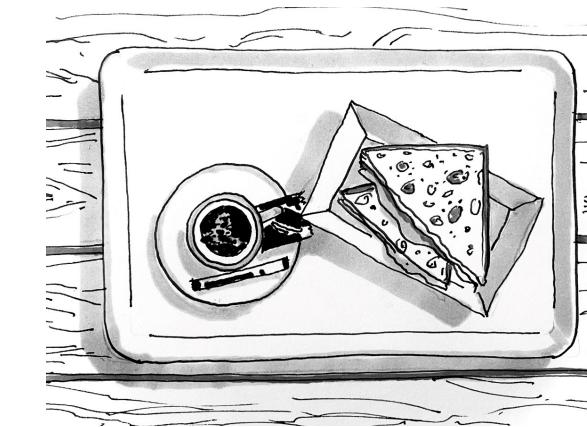
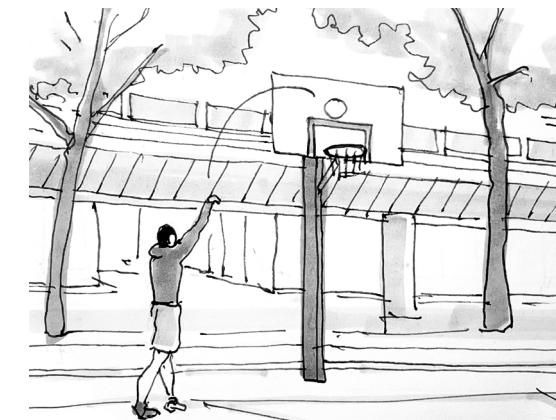
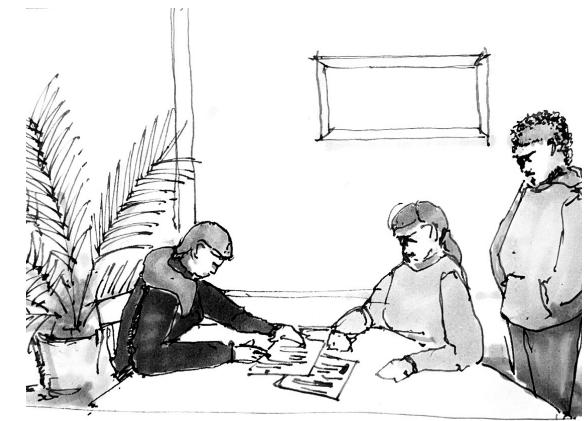
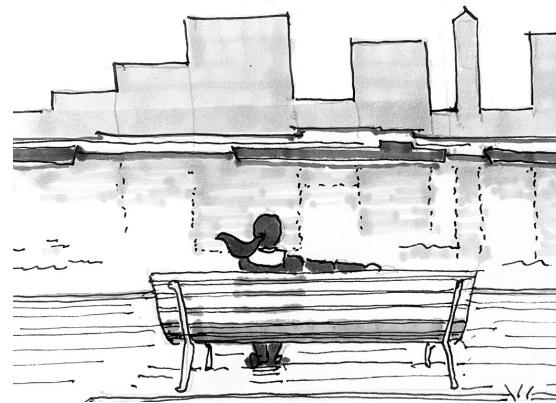


# Theoretical framework



# Fieldwork

Existing habits in the neighbourhood



# Conclusions

As a starting point, it is essential to analyse existing habits – using methods developed by anthropologists and ethnographers - and health guidelines that the project aims to address.

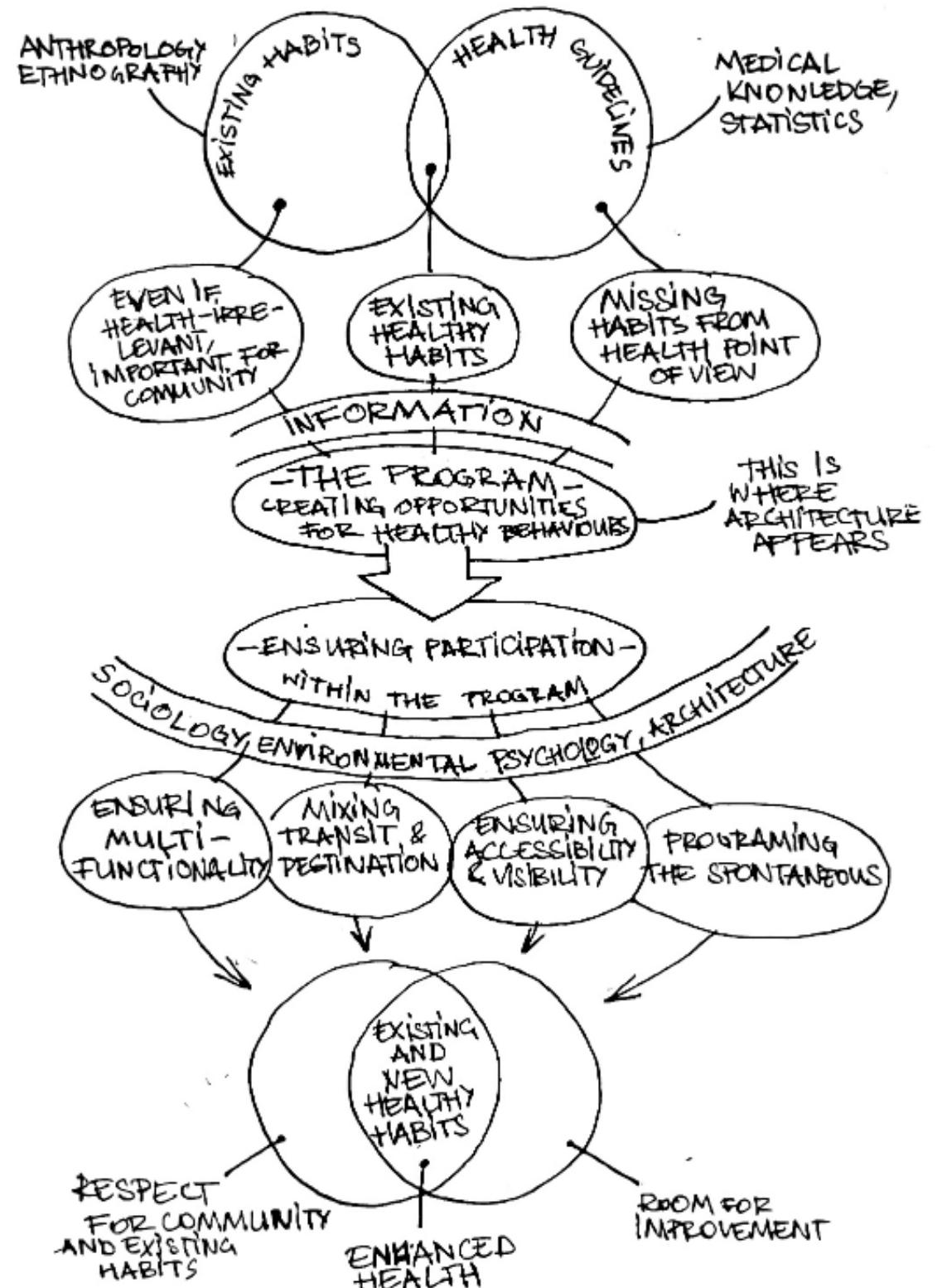
This information is then utilized to develop a program that fundamentally facilitates specific behaviours.

Subsequently, it is essential to ensure active participation in the program. Higher participation encourages more physical activity, foster social interactions, and positively influence dietary habits, particularly when diet-related elements are integrated into the program.

This involves fostering multifunctionality, ensuring accessibility and visibility, integrating transit with destination spaces, and accommodating spontaneous activities unrelated directly to the program.

The supposed outcome is a space tailored to the community, that effectively encourages healthy habitual behaviours through thoughtful design, that nudges users toward healthier choices, while achieving high participation rates.

## What is a Habit-Based Design for Healthy Living?



# Design guidelines

Creating opportunities in the program

## Social Interactions



Places to linger in the park



Places to linger in courtyards

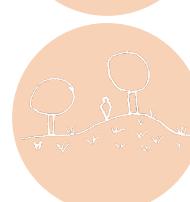


Places to linger next to dwelling access

## Physical Activity



Stairs



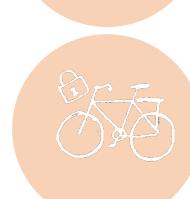
Terrain Topography



Elevated viewpoints



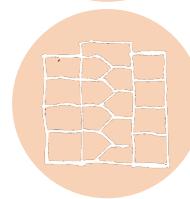
Accessible rooftops



Convenient bike storage



Destinations to walk to



Walk up buildings

## Healthy Diet



Communal gardens



Community kitchen



Gastronomic commercial spaces



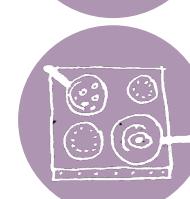
Market



Picnic tables



A rooftop greenhouse



Convenient apartments kitchens

## Social Interactions



## Physical Activity

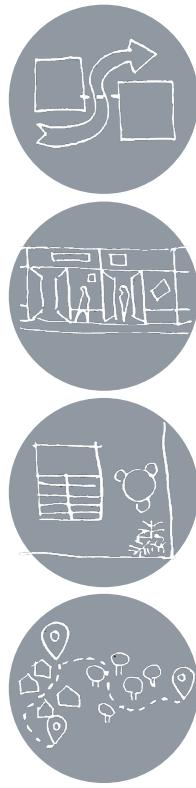


## Healthy Diet



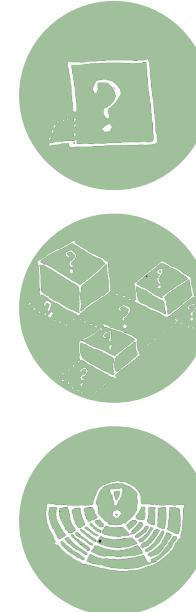
# Design guidelines

## Transit/ Destination



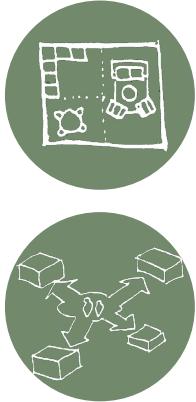
- Avoiding dead ends
- Open building fronts
- Communal functions in access systems
- Including transit roles in the park and courtyards

## Spontaneous act.



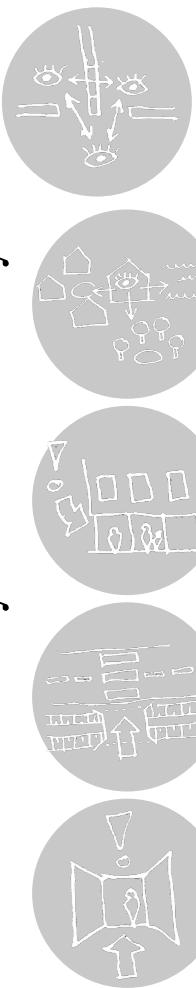
- Flexibility of use of rooms
- Adaptable outside space, in front of buildings, courtyards, rooftops
- Provide semi programmed space, podiums, amphitheatres, shades

## Multifunction.



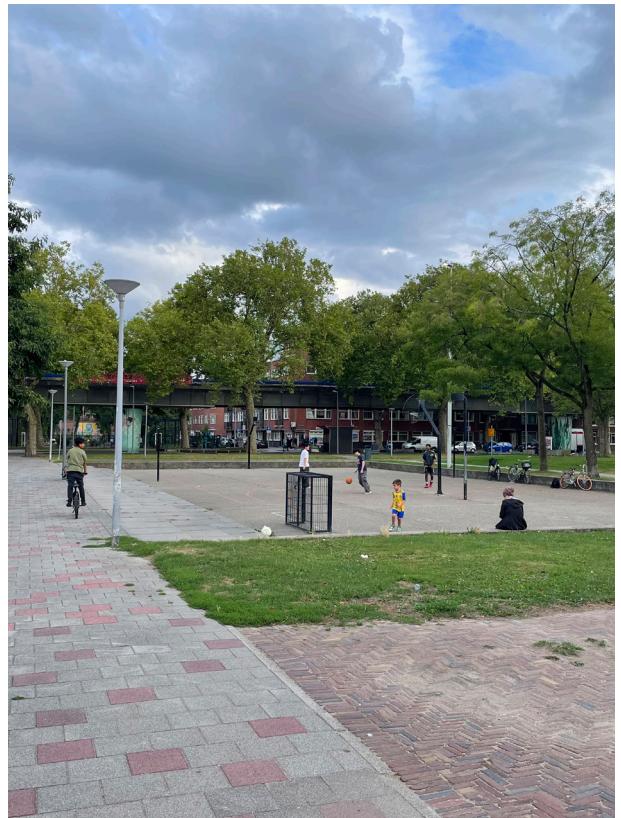
- Mixing functions of rooms - living room, dining room, kitchen
- Many functions accessible from each outside space

## Visibility/ Accessibility



- Visual connections between rooms in dwellings
- Visual connections between dwellings and public spaces
- Public Functions put on display
- Eliminating barriers - the dijk and street
- Ensuring clarity of access

## Increasing Participation



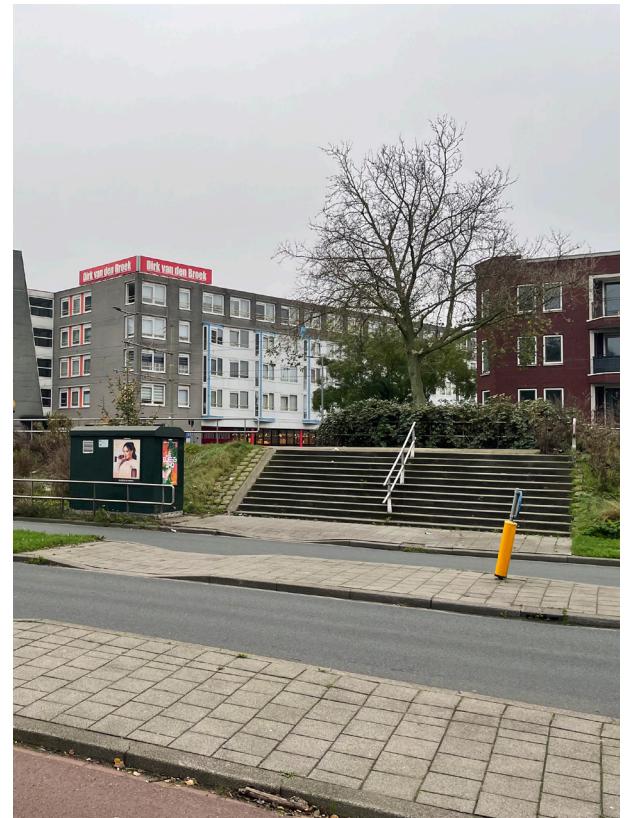
Spontaneous act.



Multifunction.



Visibility/ Accessibility



# URBAN INTERVENTIONS

*extending the neighbourhood*

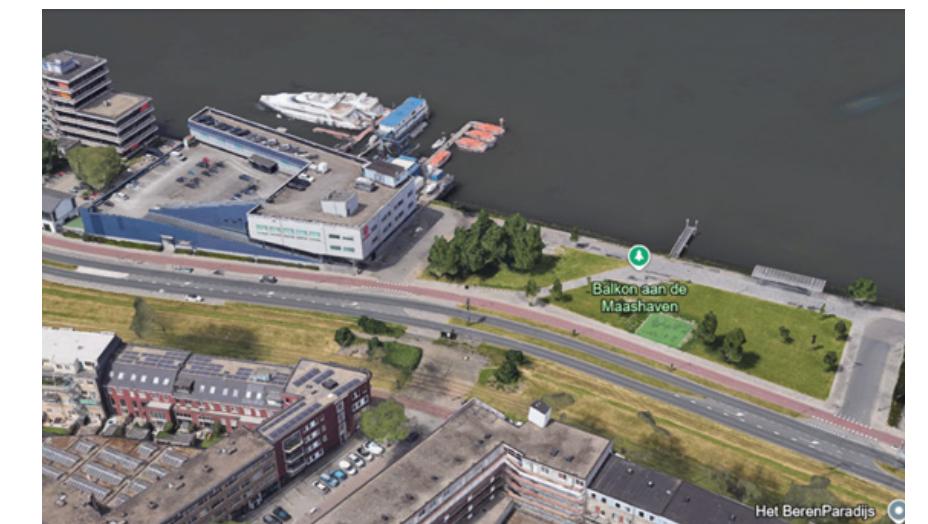
# Plot choice



Location of the plot in Tarwewijk, scale 1:5000



Photo of the current situation on the plot



Aerial view of the plot (Google maps, 2024)

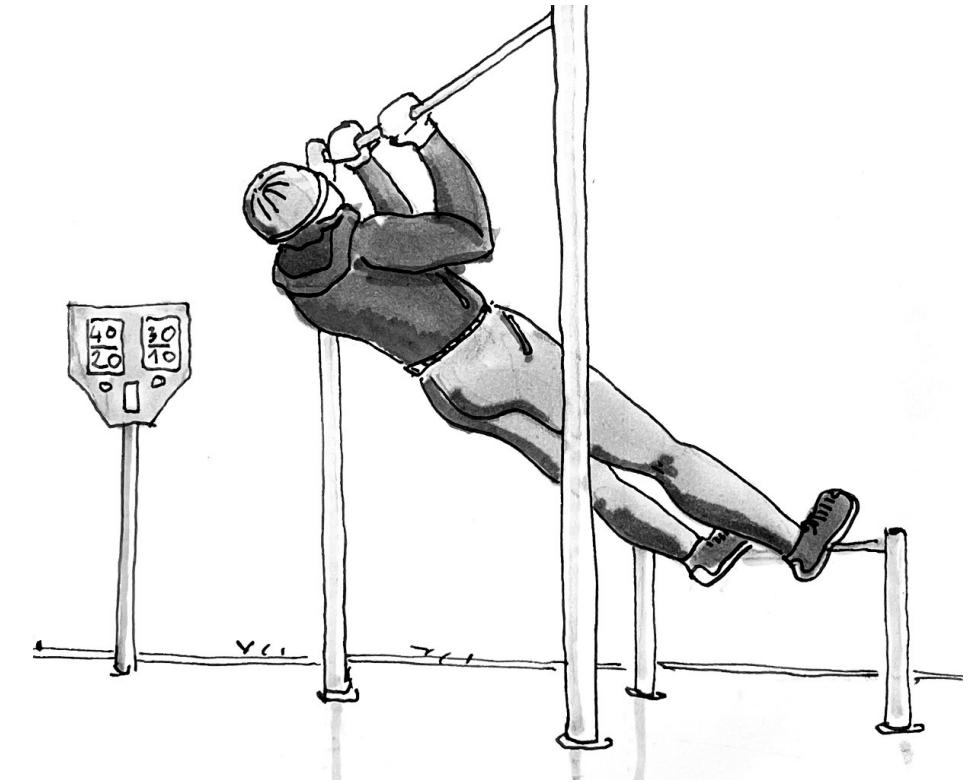
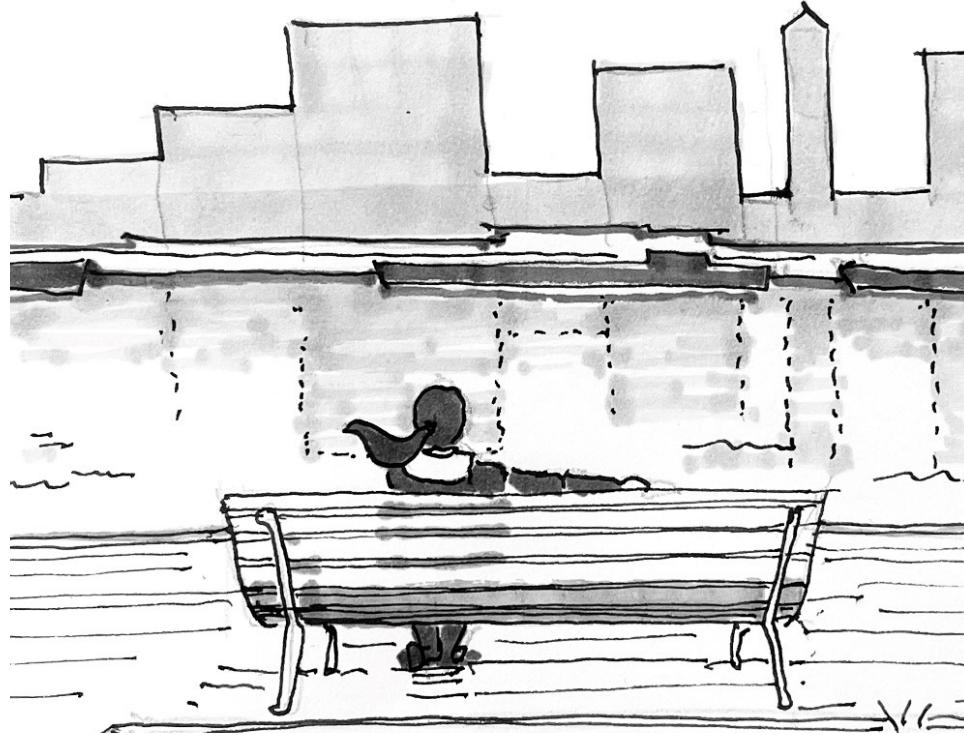
# Municipality plans

Opportunities for the future



# Habits around the plot

A base for further design



# Programme

## Basic functions

“First, a few early-bird walkers who live beside the park take brisk strolls. They are shortly joined, and followed, by residents who cross the park on their way to work out of the district. Next come people from outside the district, crossing the park on their way to work within the neighbourhood. Soon after these people have left the square the errand-goers start to come through, many of them lingering, and in mid-morning mothers and small children come in, along with an increasing number of shoppers.”

Jane Jacobs cites Joseph Guess, Death and Life of Great American Cities, 1961, p. 96

“Density x Diversity = Proximity”  
David Sim, Soft City, 2019, p.12

### Housing

60 dwellings, average 62,5 m<sup>2</sup>

**Subtotal 3750 m<sup>2</sup>**

### Circulation space

With added communal spaces

**Subtotal 1316 m<sup>2</sup>**

### Commercial activities

#### Groundfloors

630 m<sup>2</sup>

**Subtotal 630 m<sup>2</sup>**

### Supporting facilities

Storage 150 m<sup>2</sup>

Climate controls 180 m<sup>2</sup>

Parking garage 1270 m<sup>2</sup>

**Subtotal 1600 m<sup>2</sup>**

### Community spaces

300 m<sup>2</sup>

### Resident's spaces

240 m<sup>2</sup>

### Greenhouses

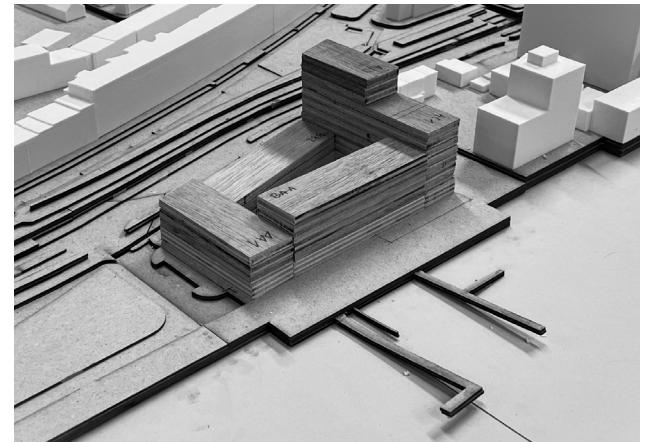
288 m<sup>2</sup>

**Subtotal 828 m<sup>2</sup>**

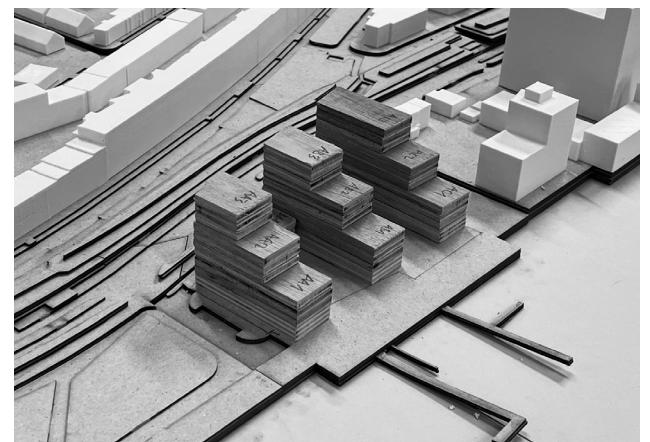
**Total: 8124 m<sup>2</sup>**

**Ground floor area: 2480 m<sup>2</sup>**

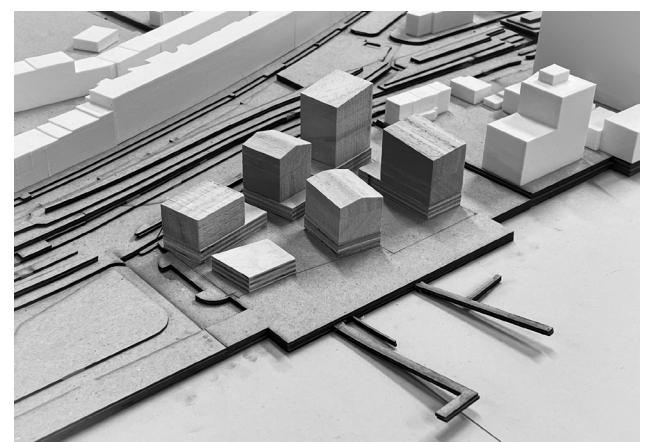
# Massing



Mass model, version 1, scale 1:500



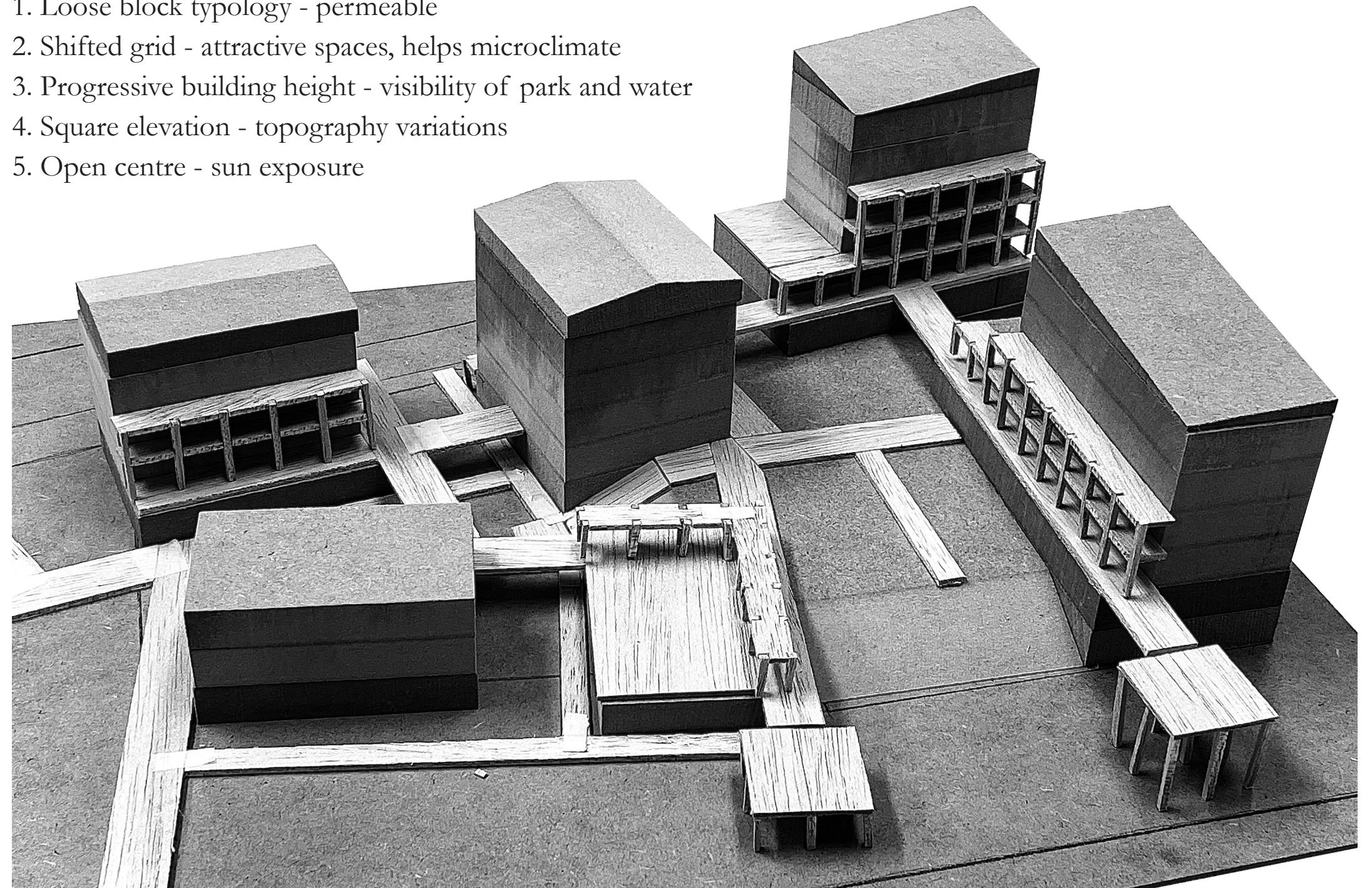
Mass model, version 2, scale 1:500



Mass model, version 3, scale 1:500

## Key principles:

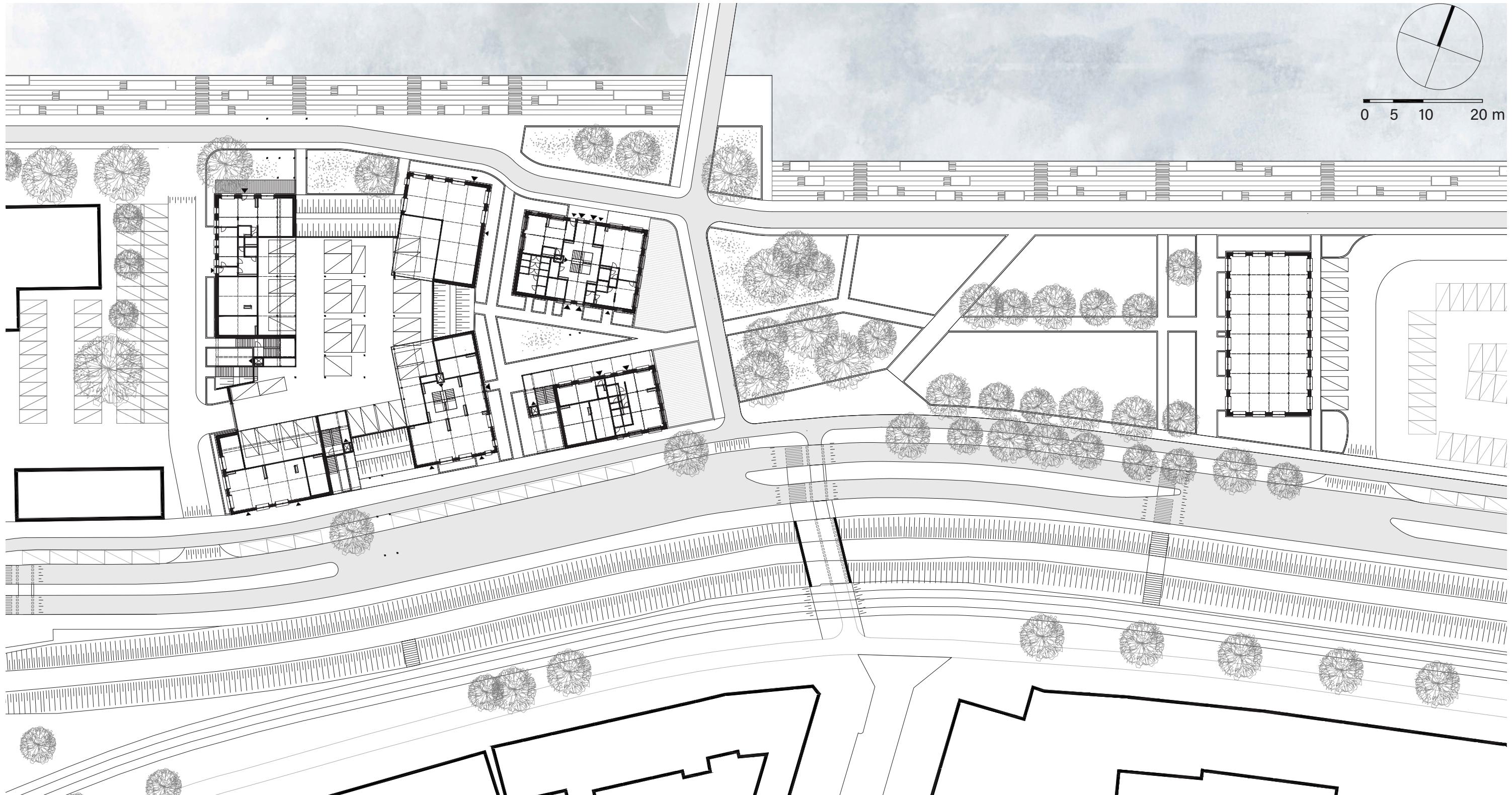
1. Loose block typology - permeable
2. Shifted grid - attractive spaces, helps microclimate
3. Progressive building height - visibility of park and water
4. Square elevation - topography variations
5. Open centre - sun exposure

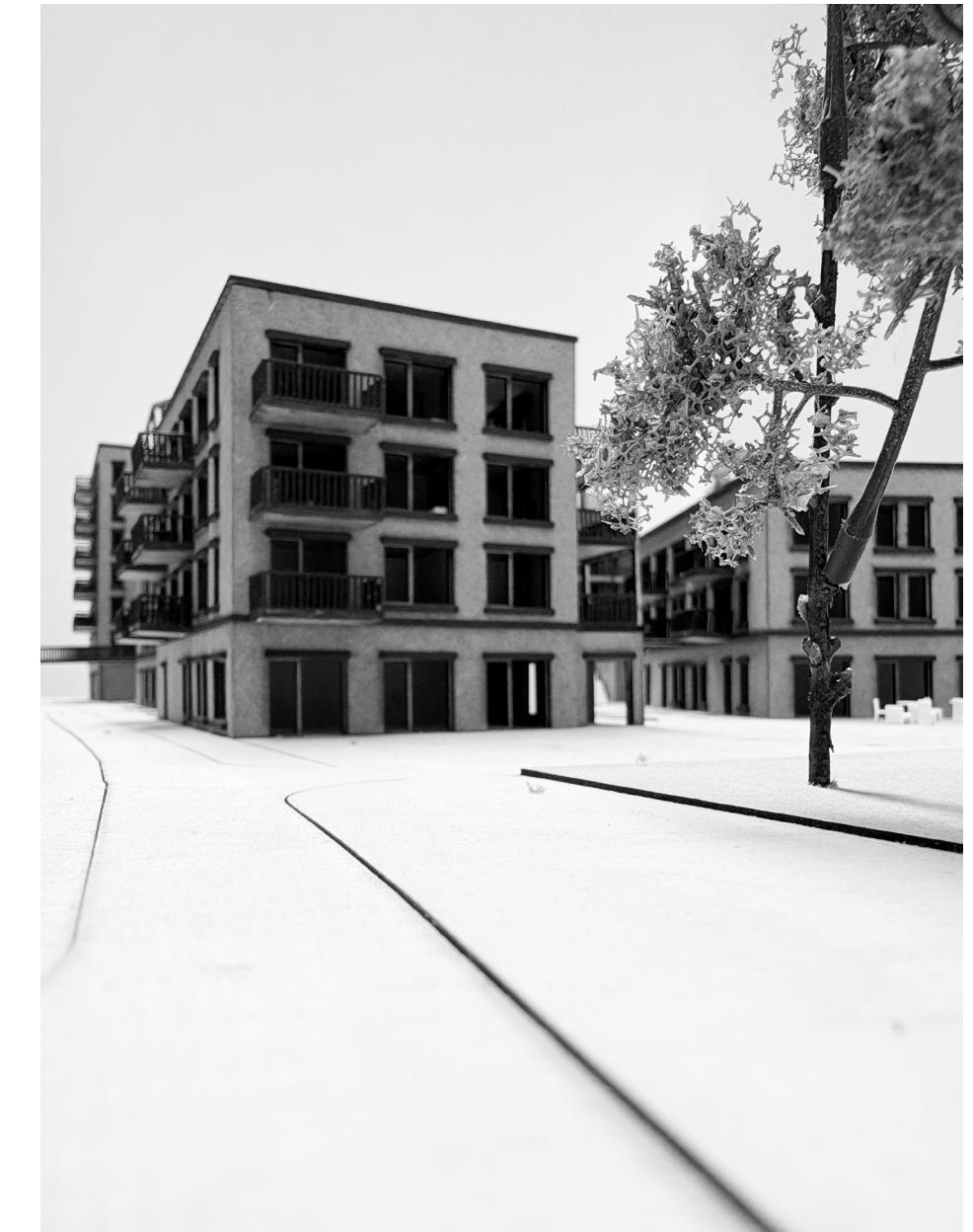


Mass model, version 4, scale 1:200

# Connections with the neighbourhood

Urban scale interventions





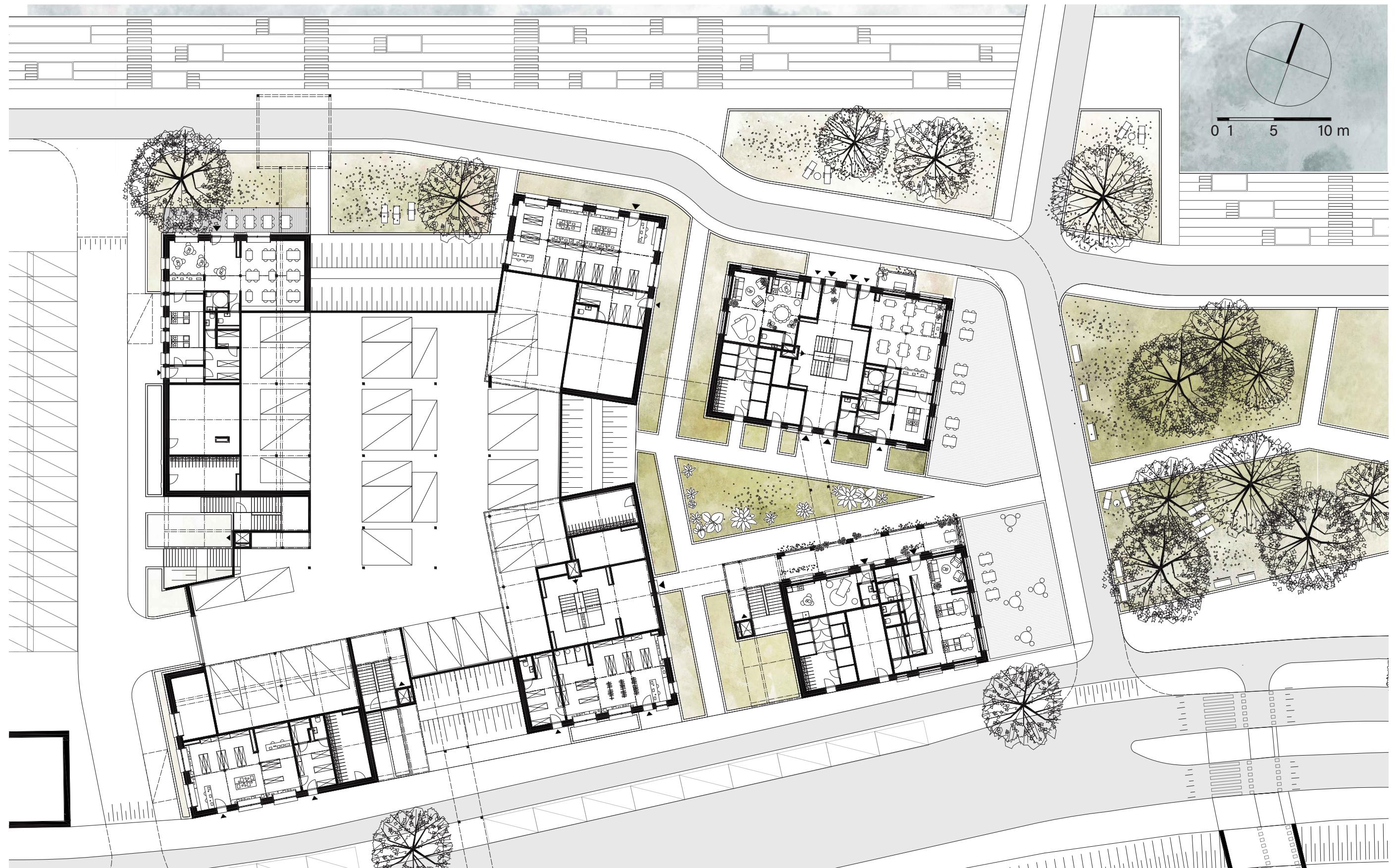
Access to the housing ensemble from Tarwewijk



Entrance to Balkon aan de Maashaven from Katendrecht

# PUBLIC LIFE

*in communal and commercial spaces*

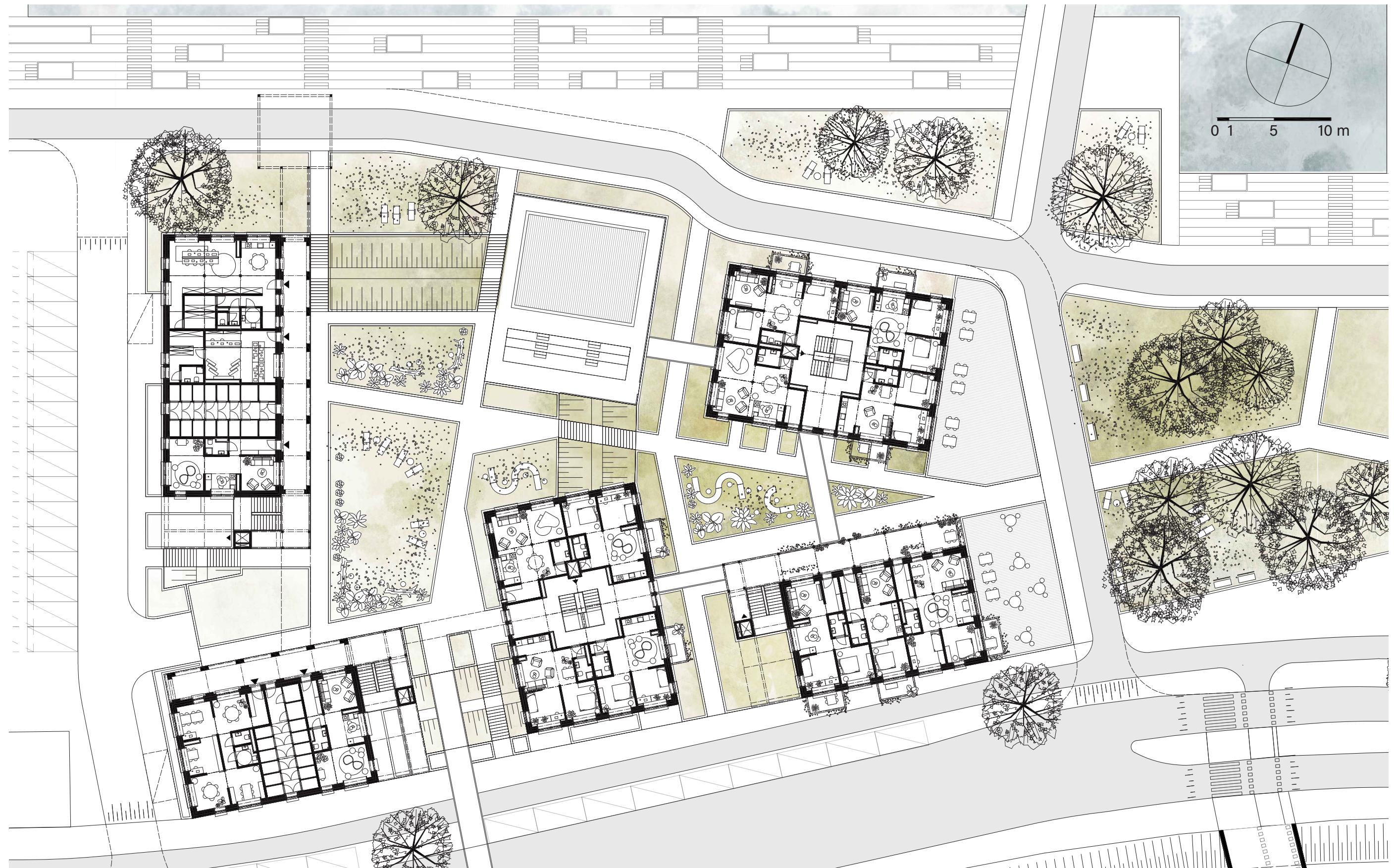








Public life in communal and commercial spaces







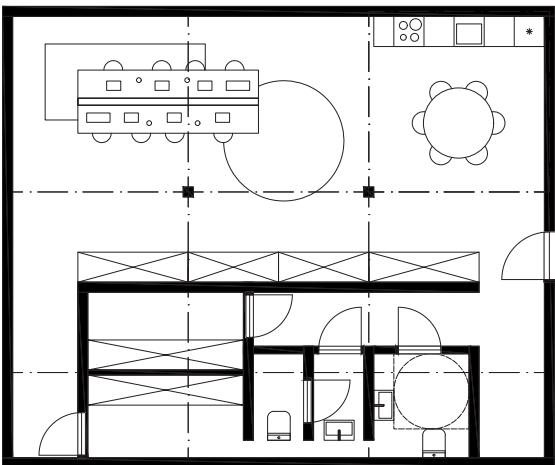


Upper square - birds eye view

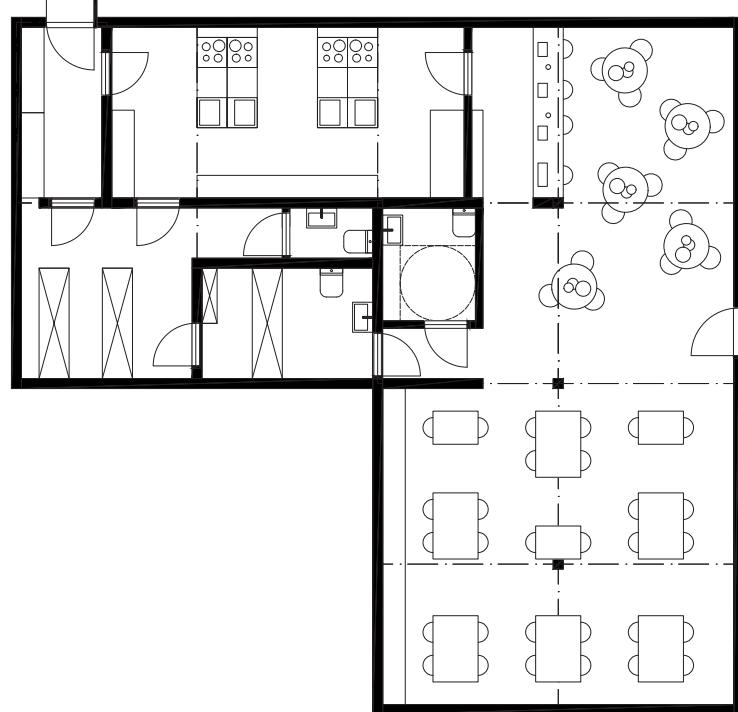
# Ground floor - scenarios

Commercial and communal functions

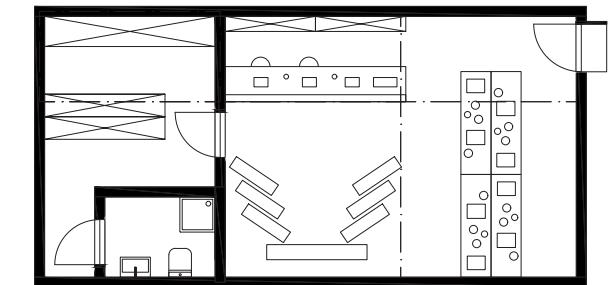
7,5 modules, community centre



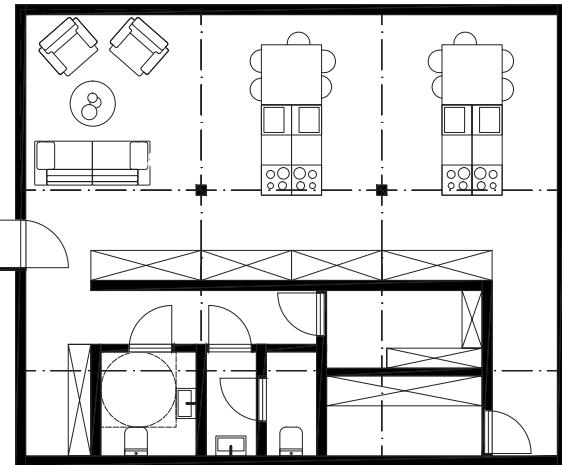
12 modules, restaurant



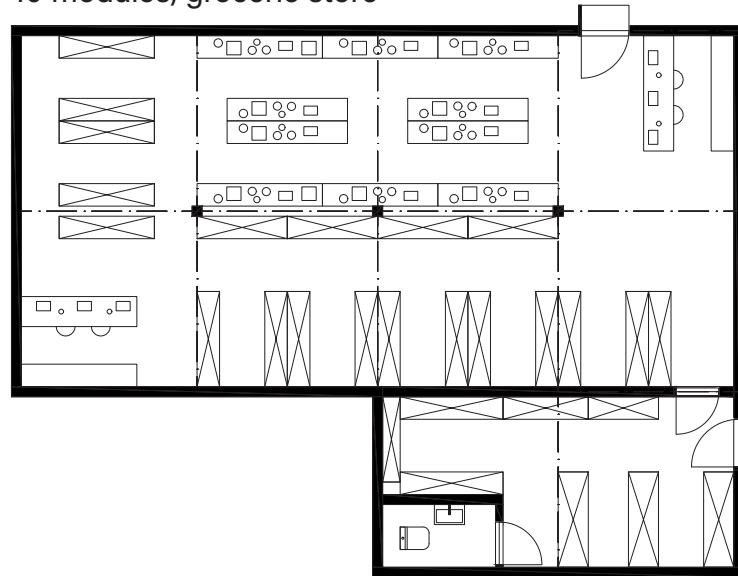
4,5 modules, specialist shop



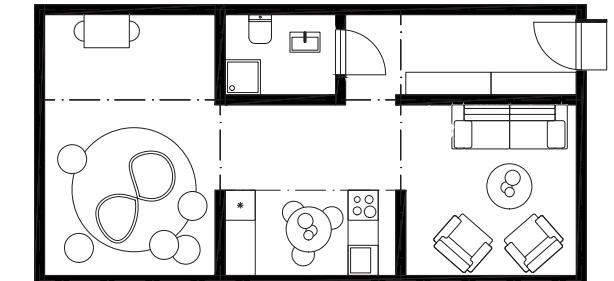
7,5 modules, community kitchen



10 modules, grocery store



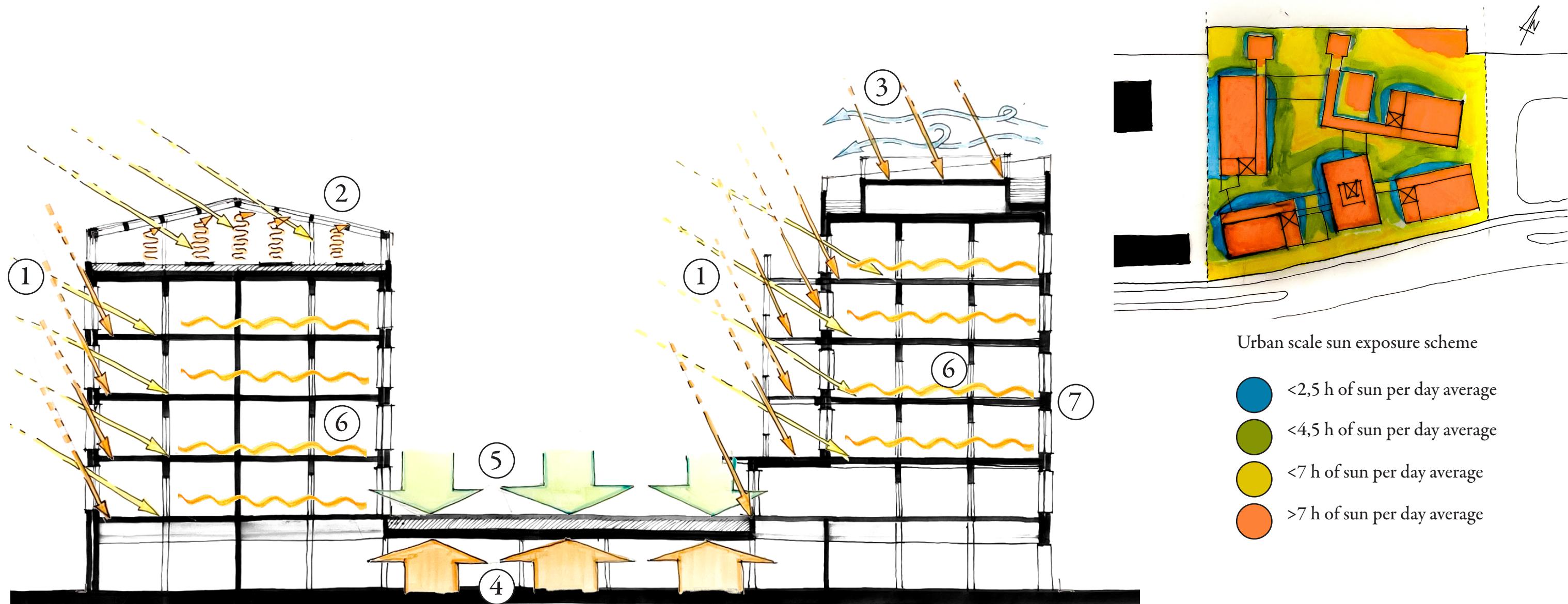
4,5 modules, residents space



# SUSTAINABILITY

*in massing and structure*

# Sun exposure



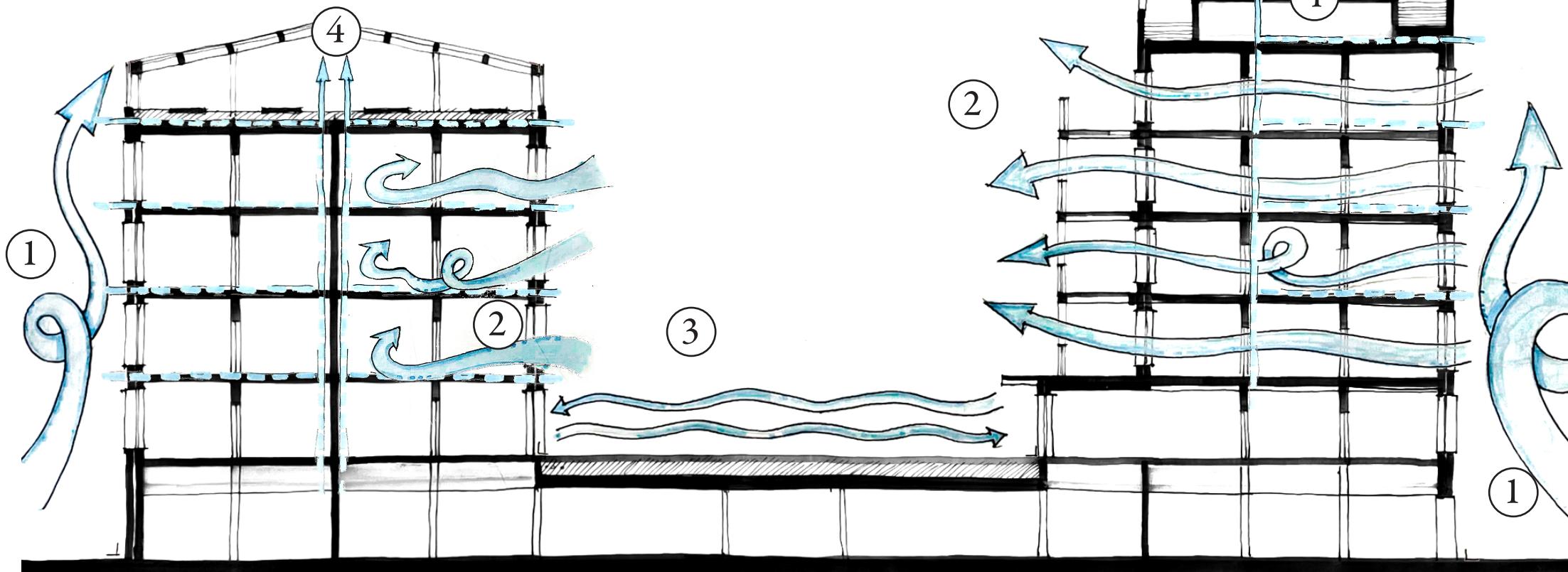
1 - Galleries acting as overhangs, naturally regulating sunlight penetrating the buildings 2 - The rooftop greenhouse as a pleasant place during winter due to sun heating. 3 - The external rooftop as a pleasant space in the summer due to wind cooling and sun heating balance. 4 - Semi-public square elevation making it more sunlit through the year. 5 - Balancing with cooling effect of vegetation in the summer. 6 - Floor heating activated during colder days. 7 - External walls made of bricks increase the thermal mass of the building, helping cool it during the summer

Urban scale sun exposure scheme

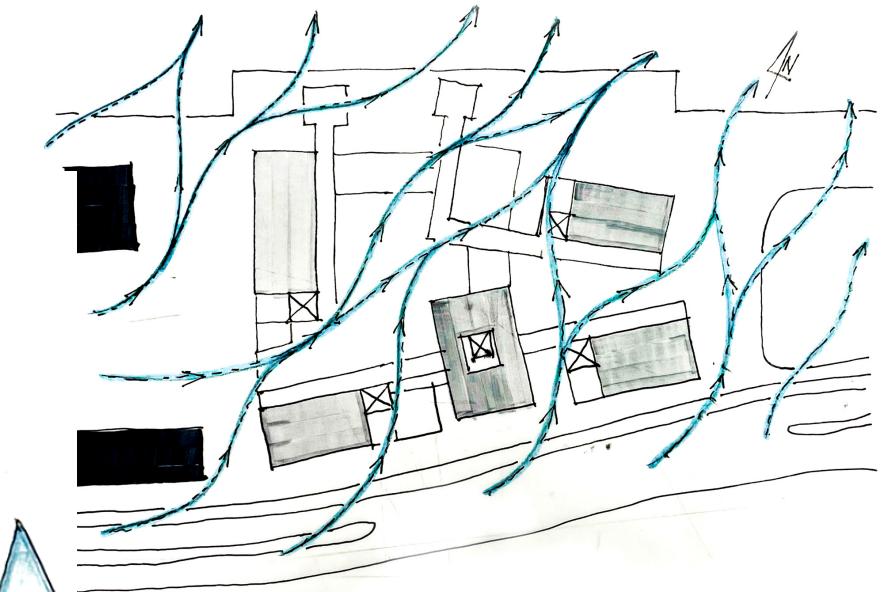
- <2,5 h of sun per day average
- <4,5 h of sun per day average
- <7 h of sun per day average
- >7 h of sun per day average

# Wind and airflow

## Wind and airflow



1 - Buildings acting as a barrier breaking the wind. 2 - Airflow through apartments - corner or galleries. 3 - Semi-public square covered from main wind flows. 4 - Mechanical inlet and outlet ventilation (type D), water heatpump in Maashaven

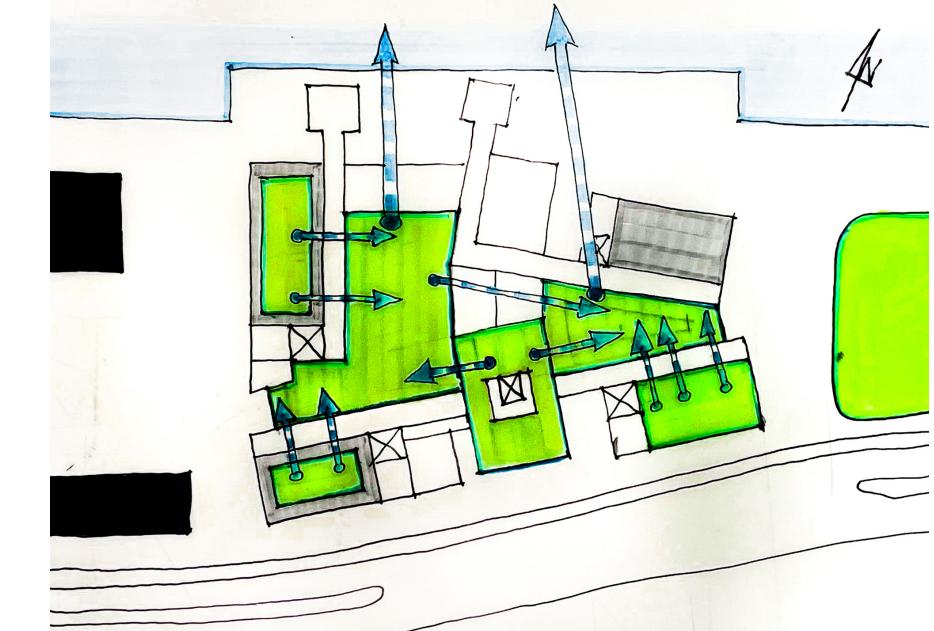
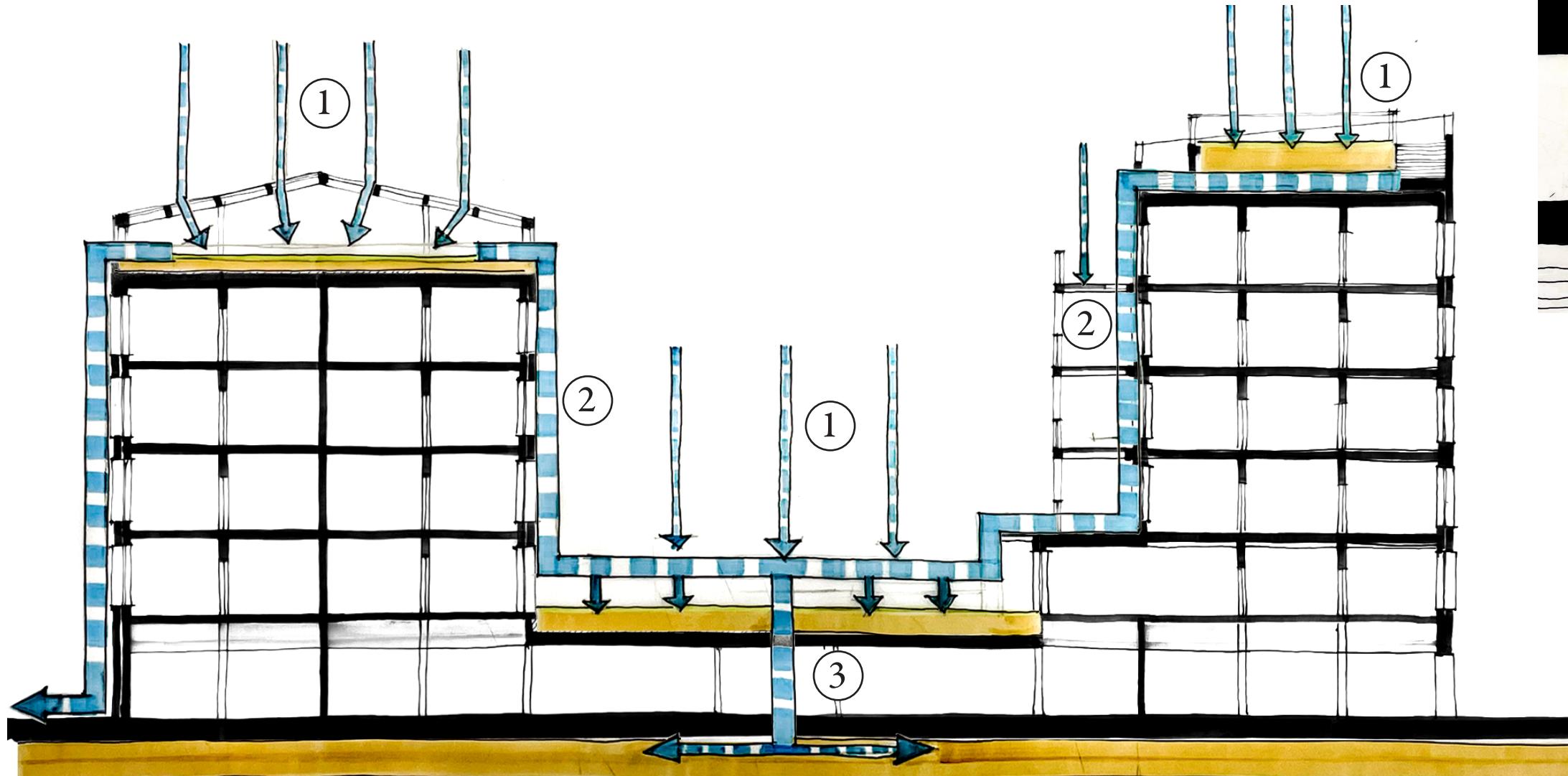


Urban scale wind and airflow scheme - The irregular grid created by the building, and variating inbetween spaces, permits the wind permeate the complex, while also breaking down it's speed.

Additional ventilation strategies:

- During winter, the mechanical ventilation systems are using a heatpump going to the Maashaven as an energy supply to heat up the air entering the building.
- As the ground floor is public and the upper floors are dwellings, the ventilation systems are separated to avoid unnecessary ducts and collisions

# Water management



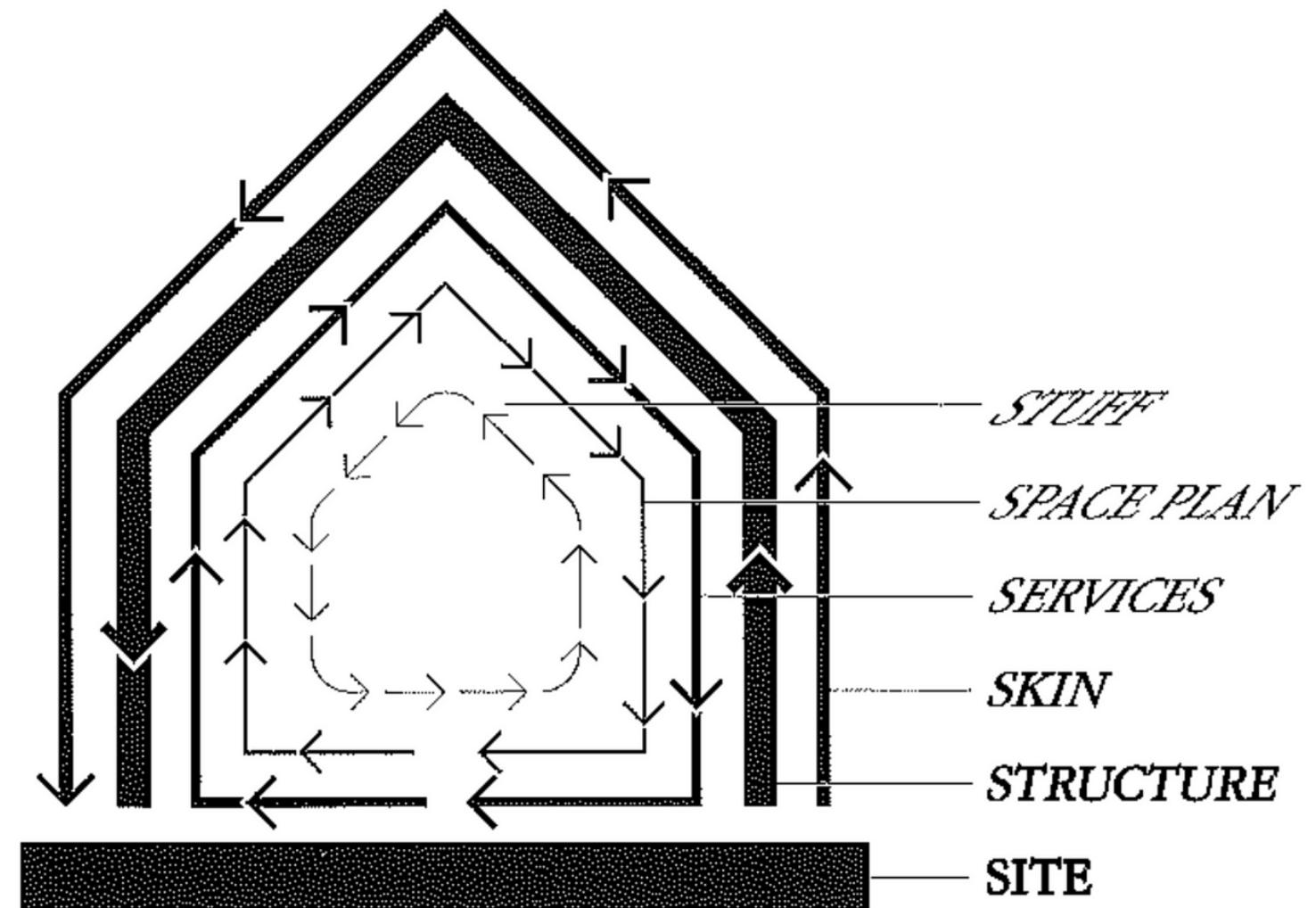
- Maashaven
- Bioactive layers in the park and on the rooftops



Climate and amtmosphere on the upper square

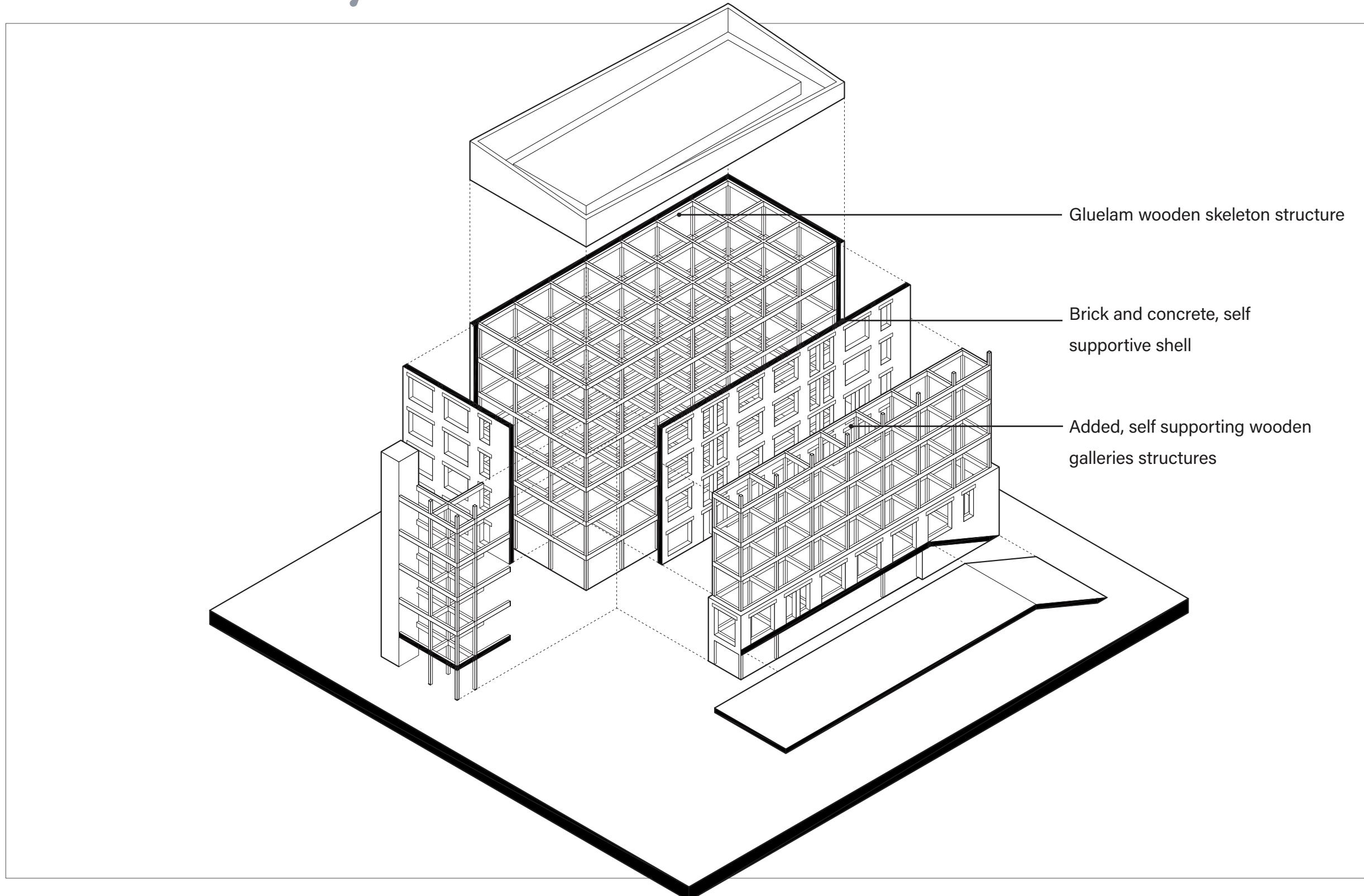
# Structural principle

Separation of shearing layers



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

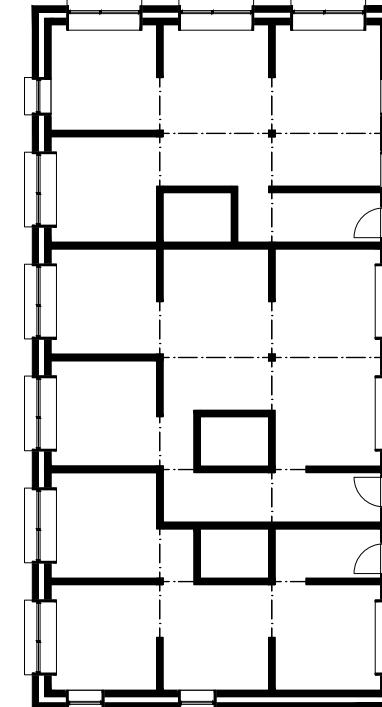
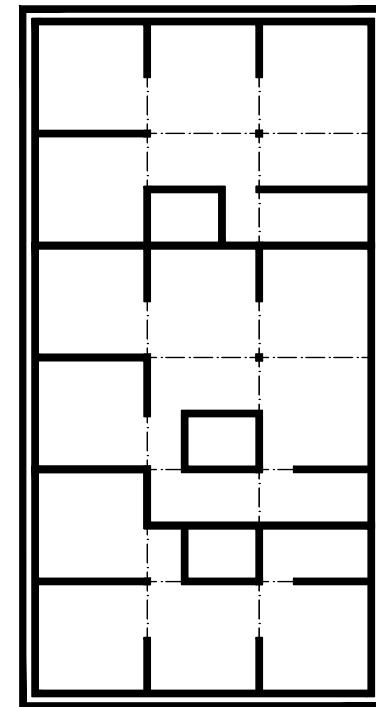
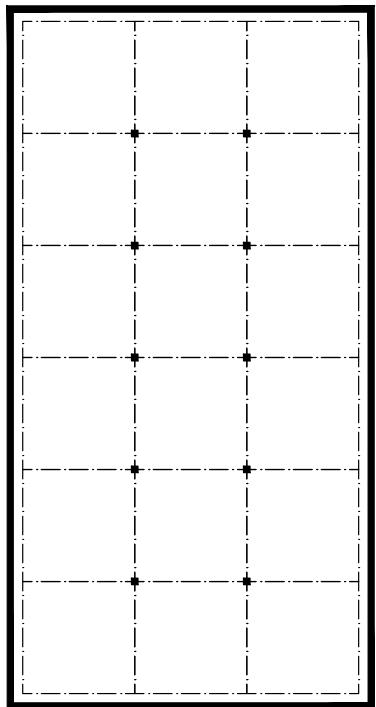
# Structure - main systems



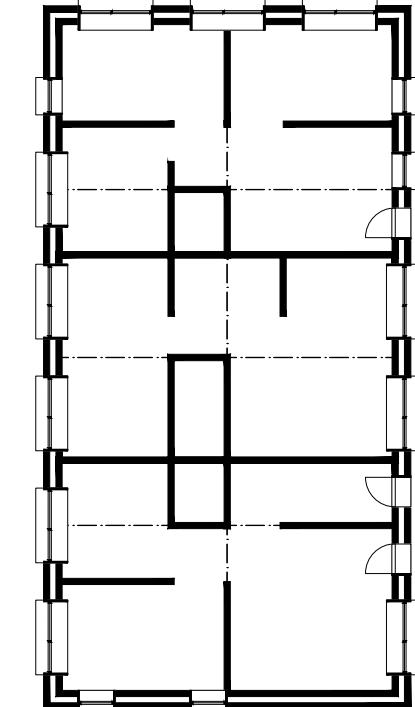
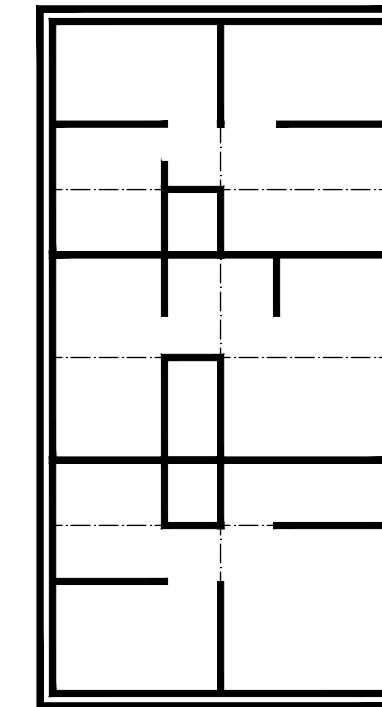
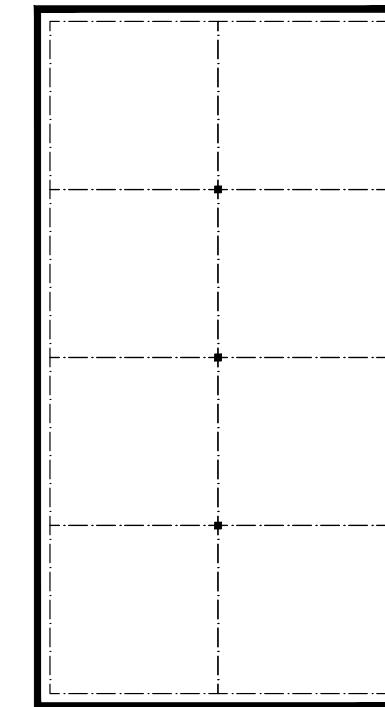
Axonometry - main structures division

# Layer separation

3,60 m x 3,60 m (developed further)



5,40 m x 5,40 m



# Base module

## Basic features of the systems:

- **No load bearing walls**

Leaving maximal flexibility

- **Gluelam beams and columns**

Negative CO2 emissions

- **3,60 by 3,60 [m] axes span**

Corresponding to the functional system,  
lowering the use of materials

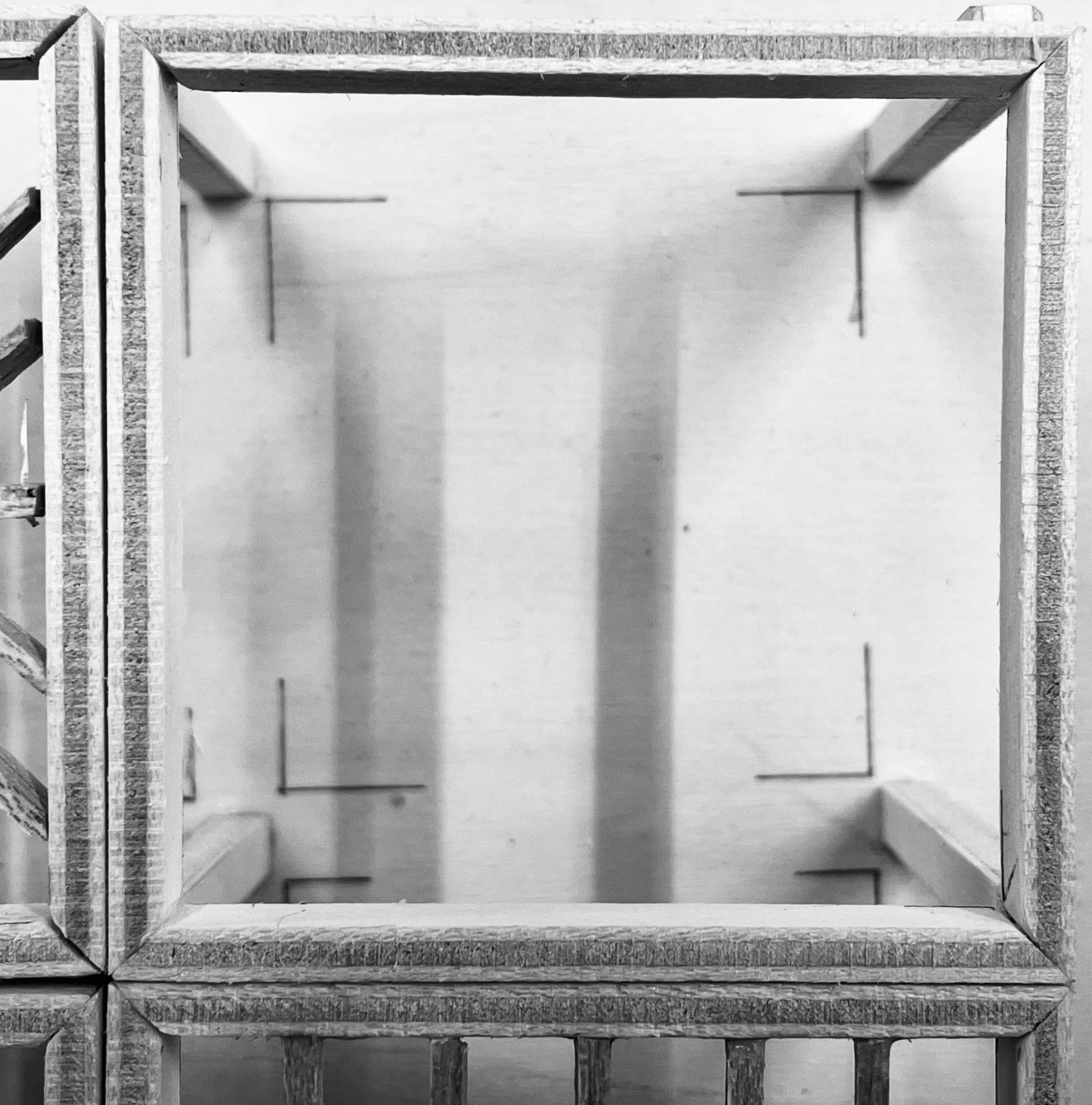
- **Connections made with click-in**

**Rothoblaas systems (steel hooks)**

Easy to dismantle and reuse

- **Prefabricated elements assembled at  
the construction site**

Faster construction, lower impact of  
weather

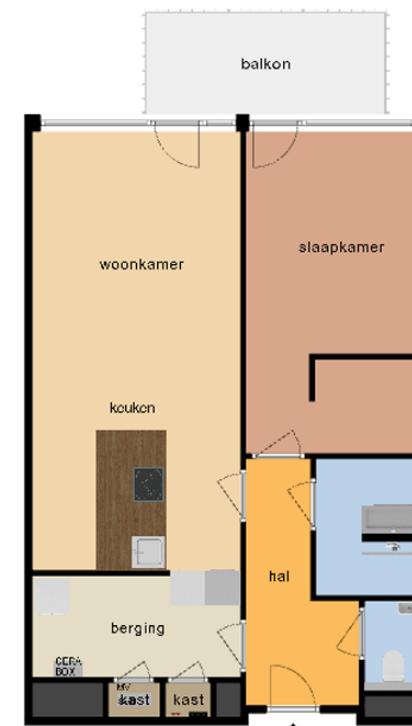
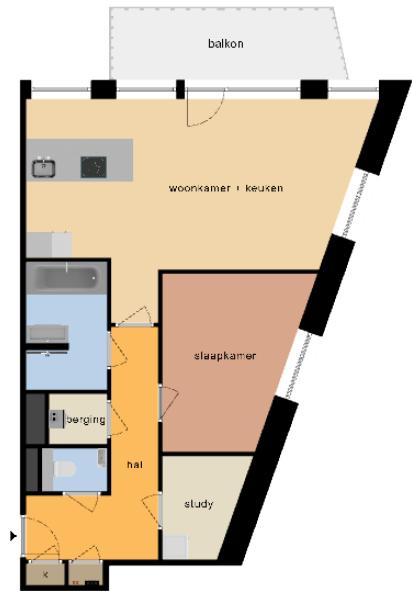


# DWELLINGS

*a system prolonging the research*

# Standard development apartments

Examples from Funda



## 1. Divided rooms

- easy ways to avoid contact between residents

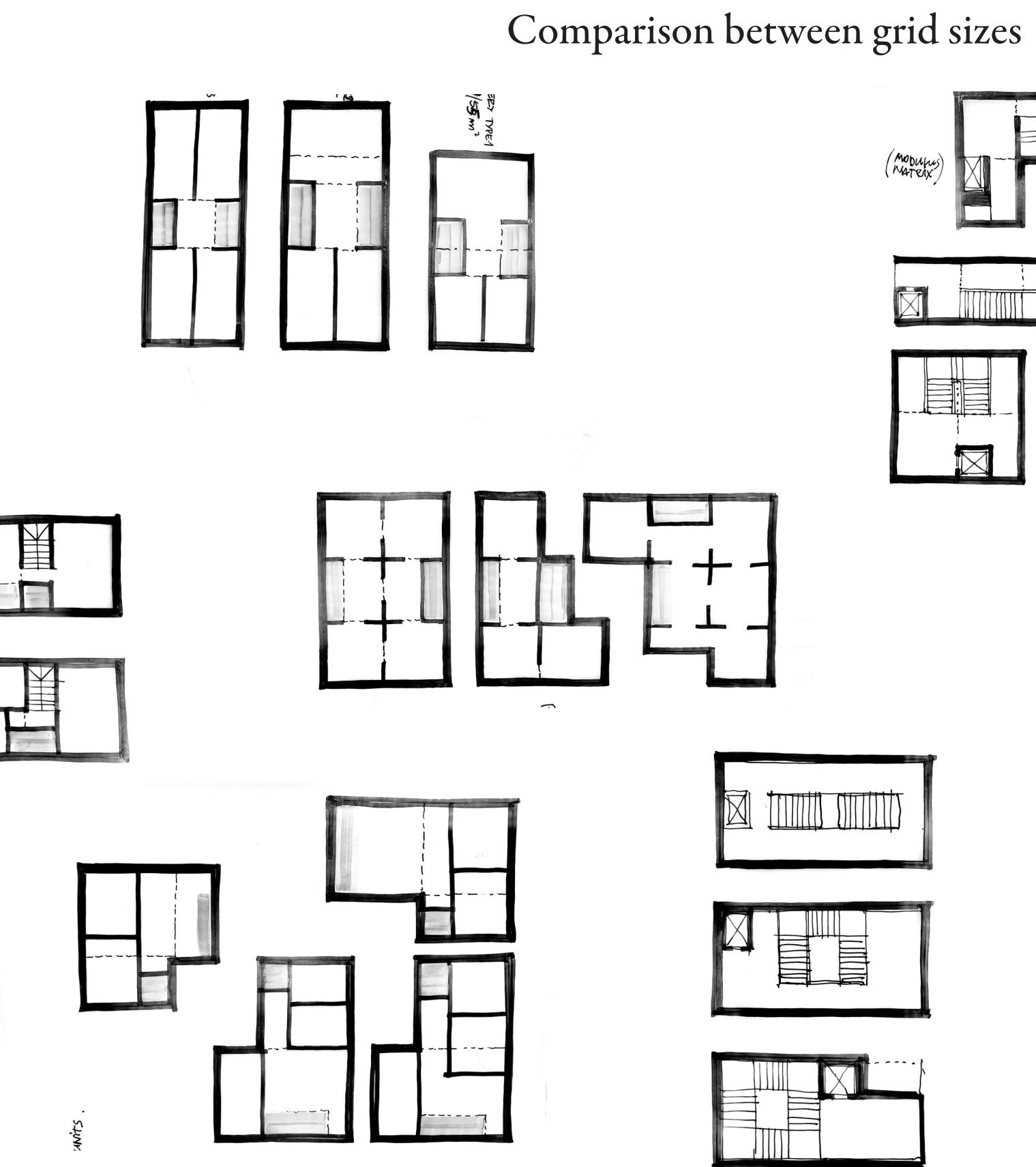
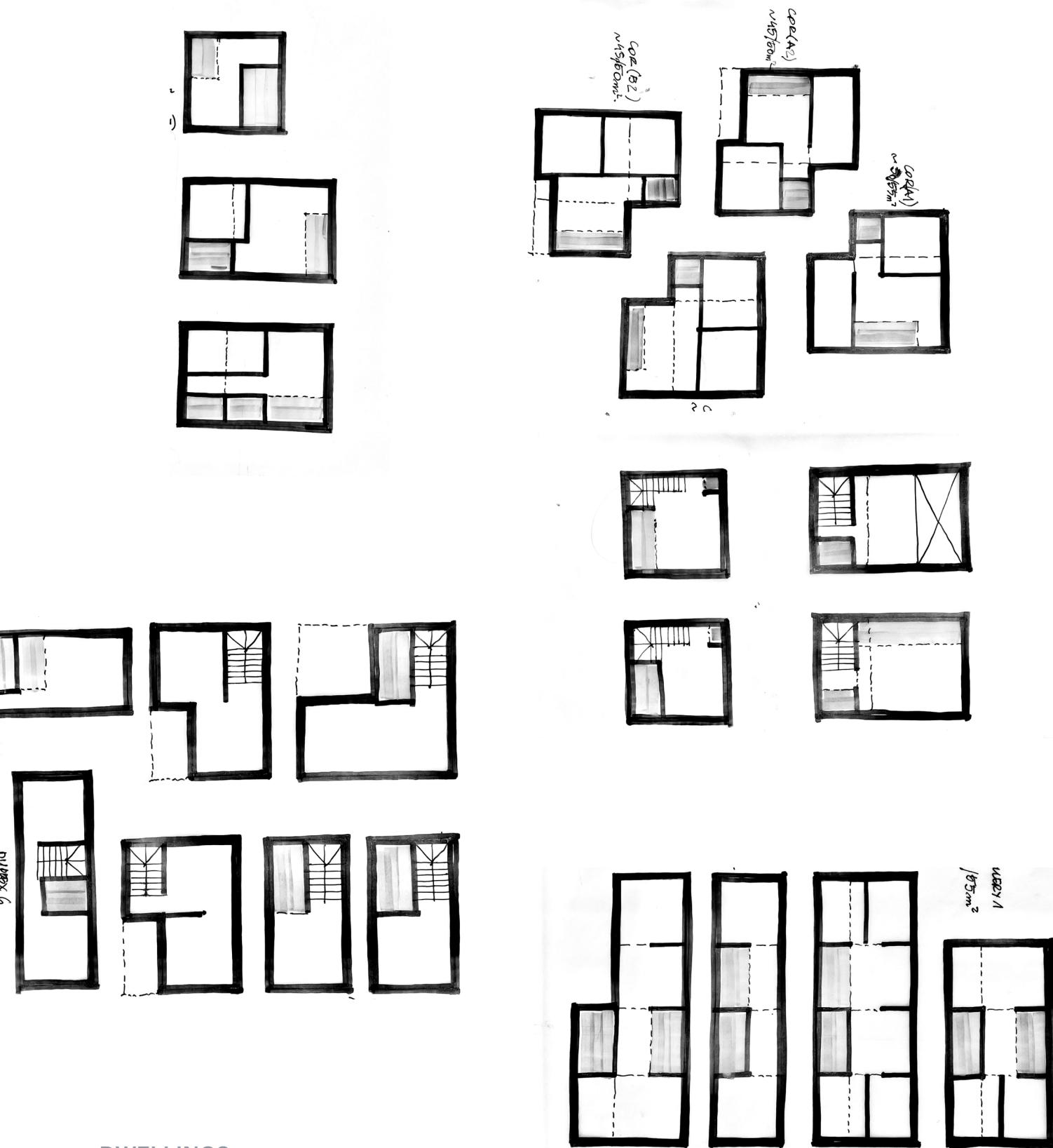
## 2. Hierarchy of spaces

- limited possibilities to adapt the apartments to the existing habits and preferences of the residents

## 3. Hallway entrance

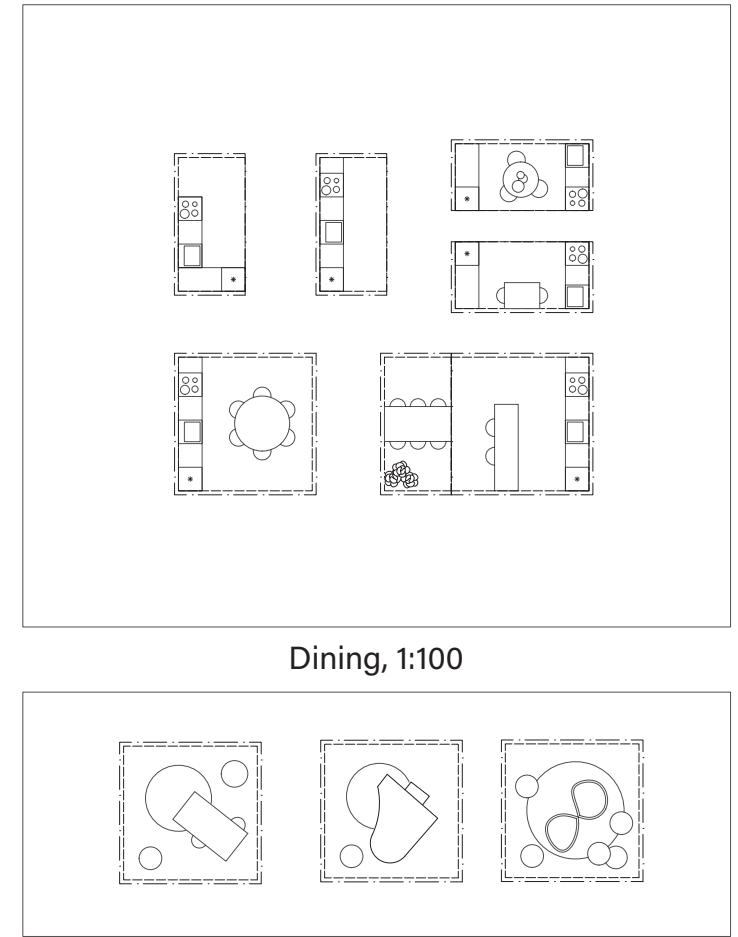
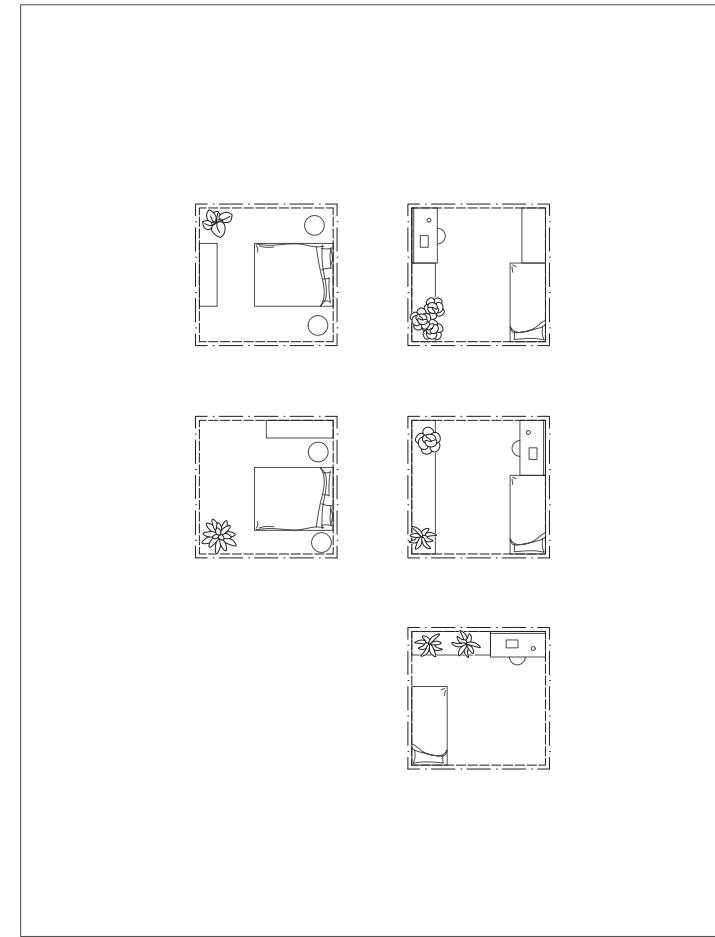
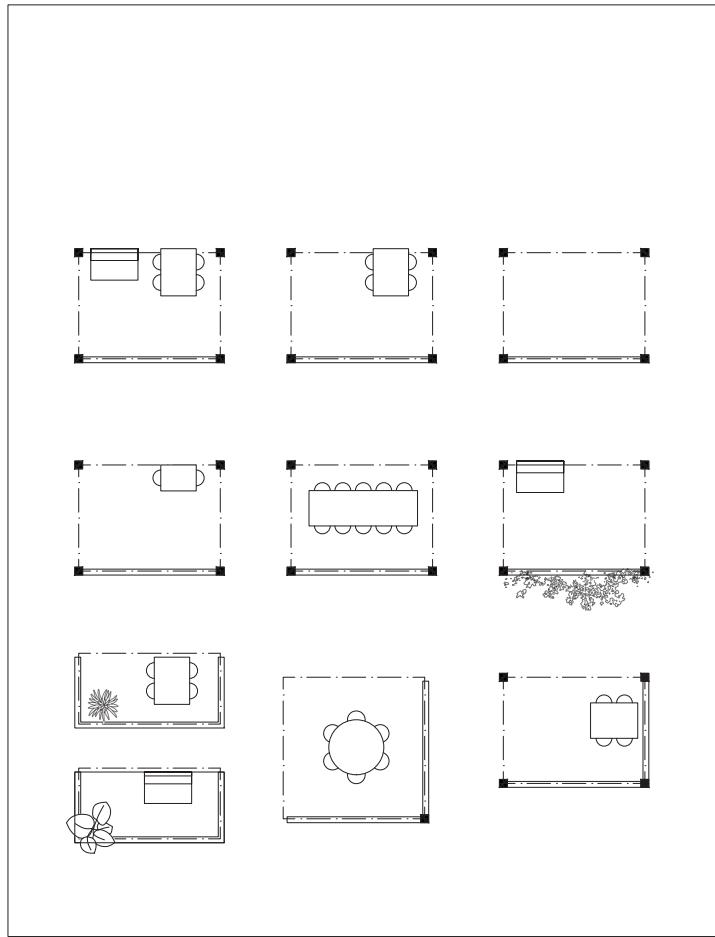
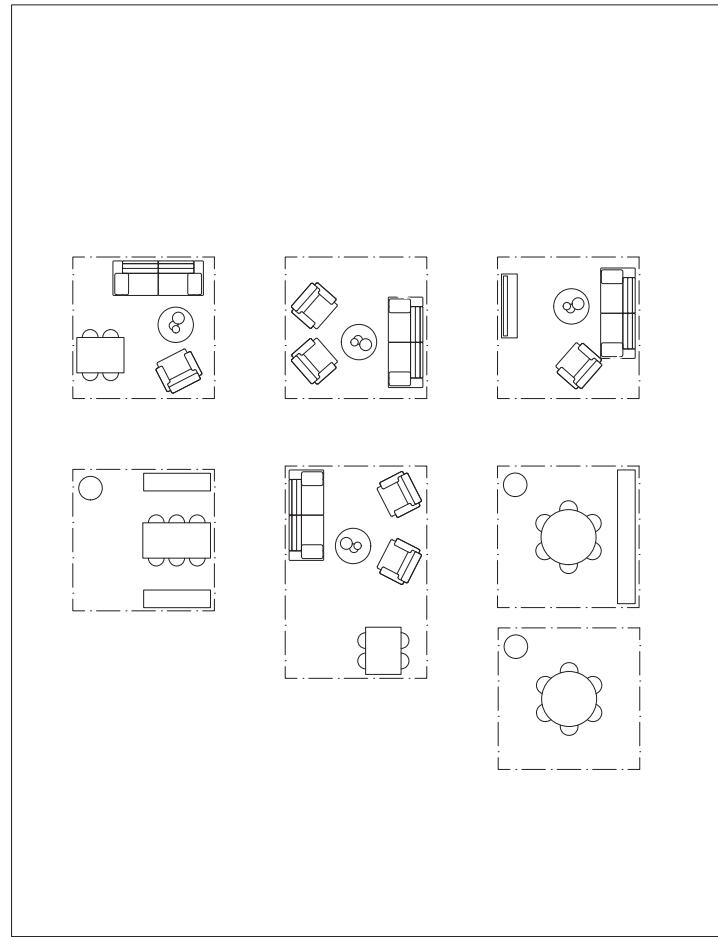
- very strong separation between the inside and outside

# Functional grid





# Scenarios

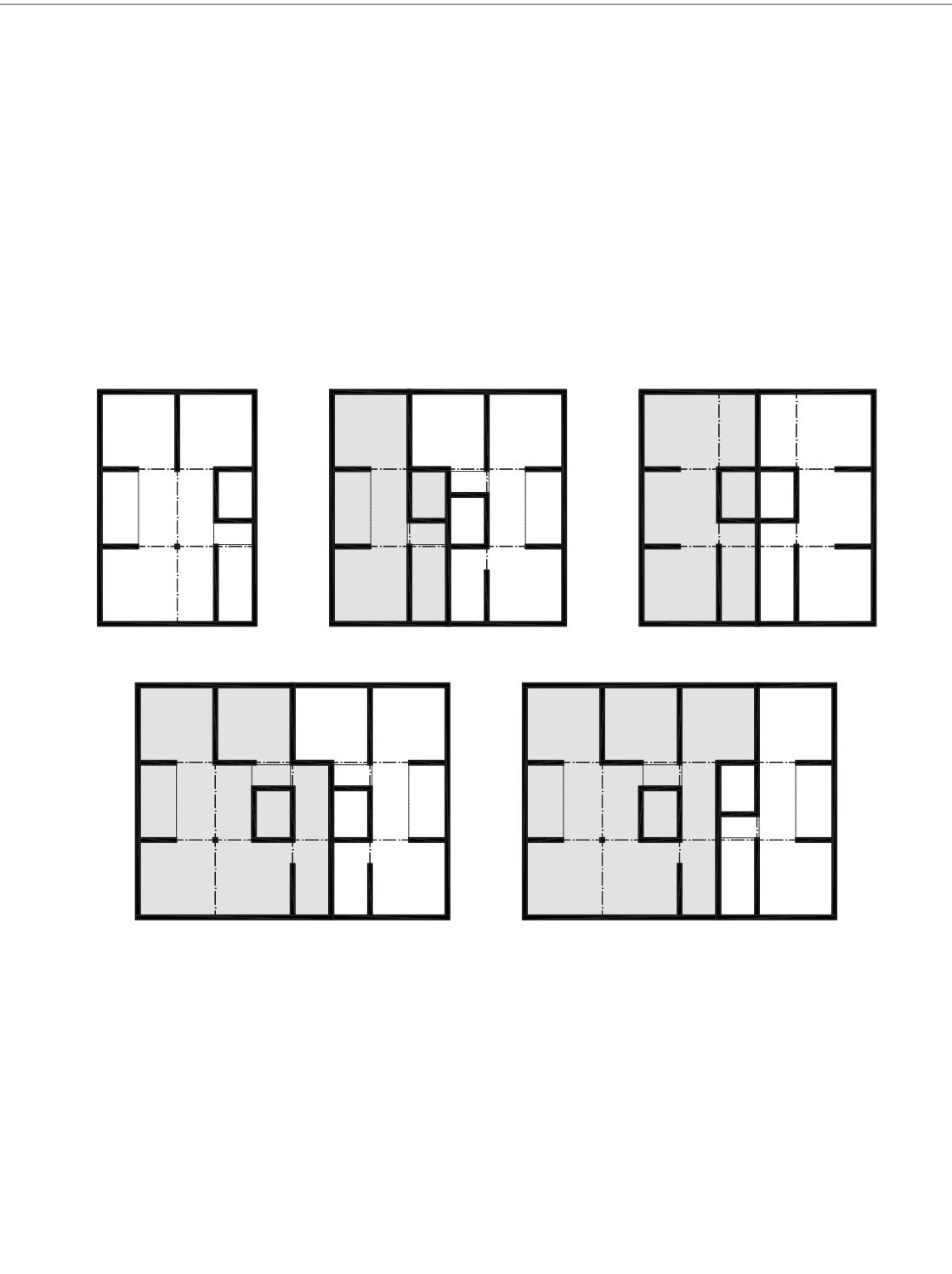


# Final dwelling choice

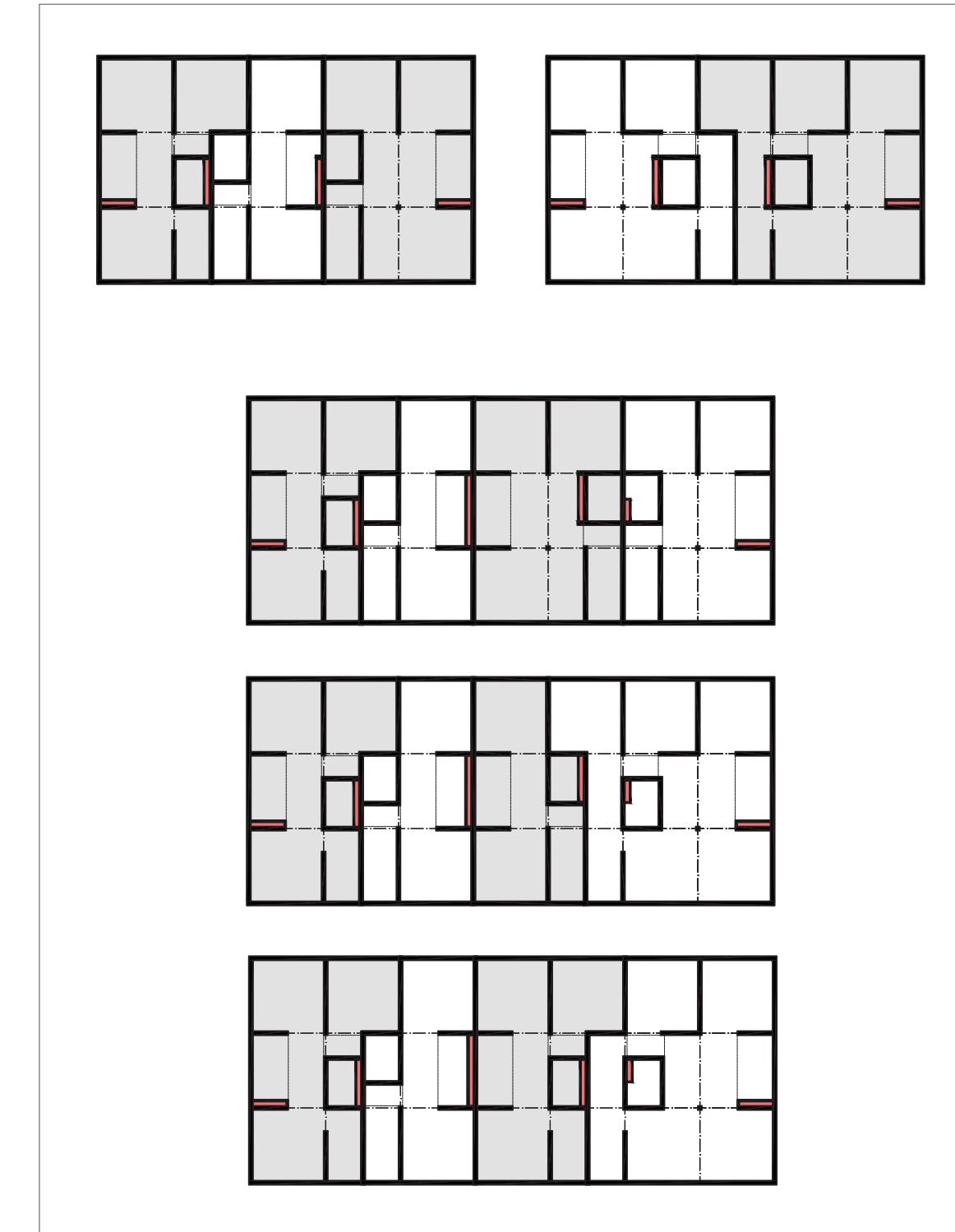
Possible combinations of spaces within the same apartment



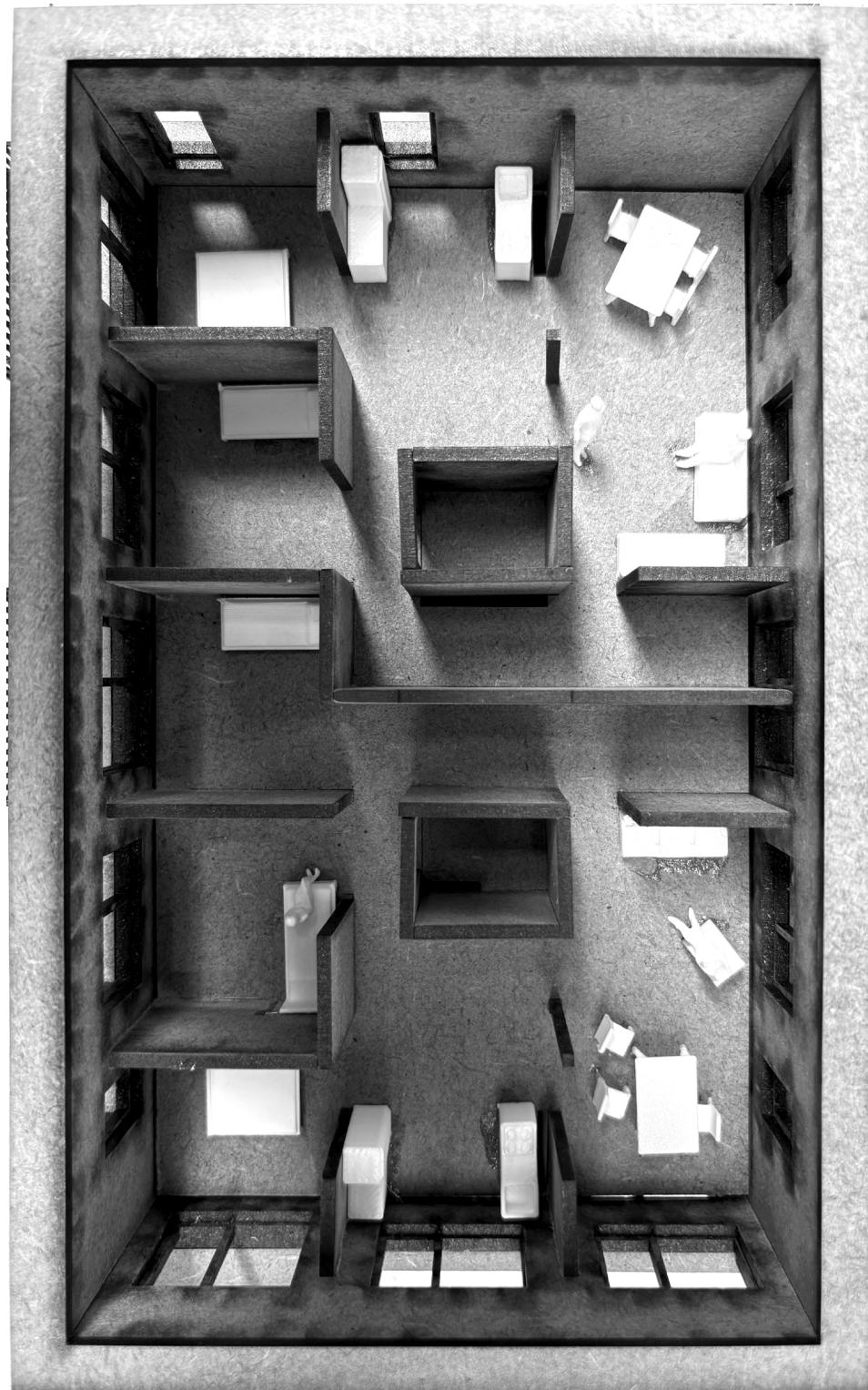
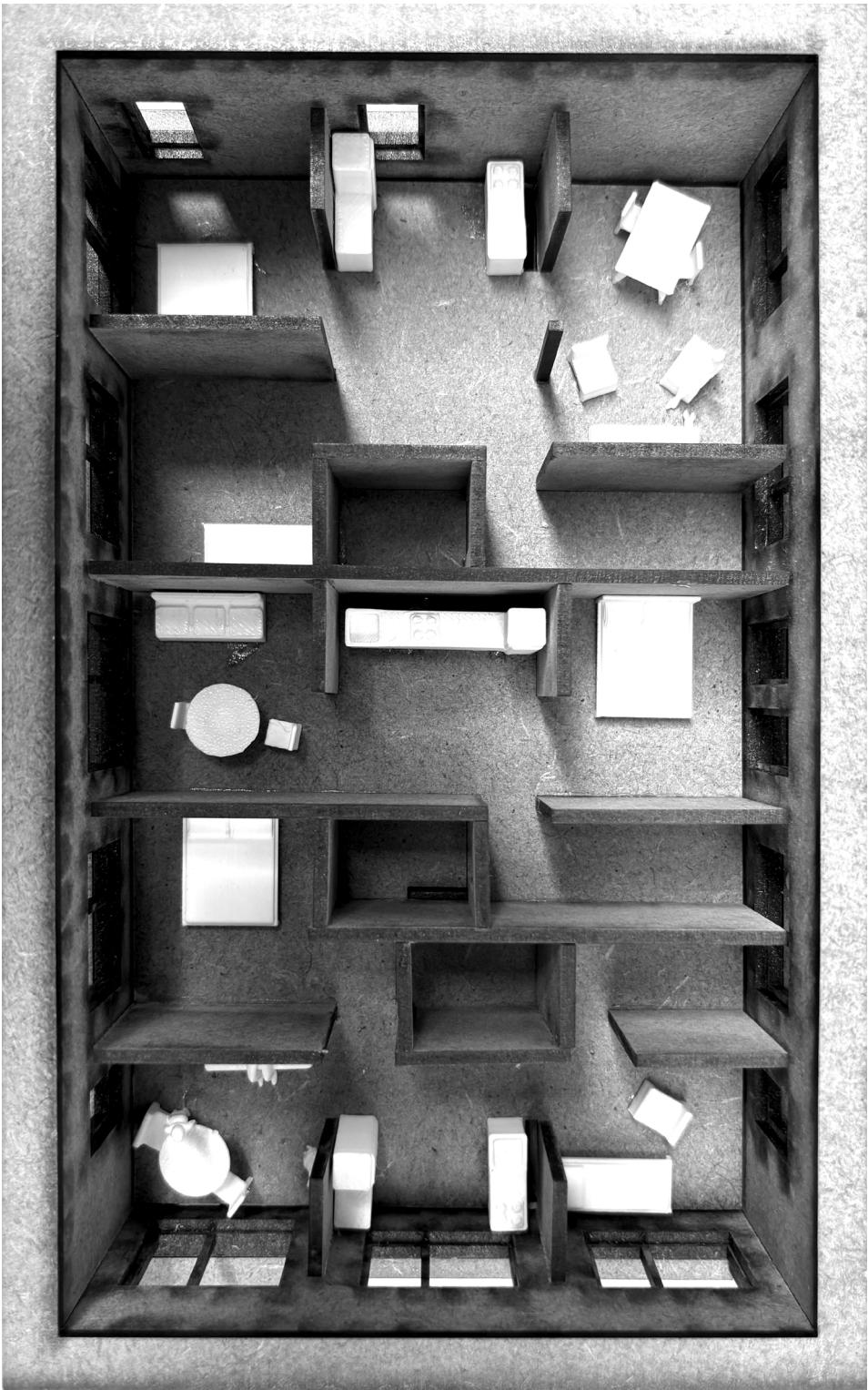
# Stacking



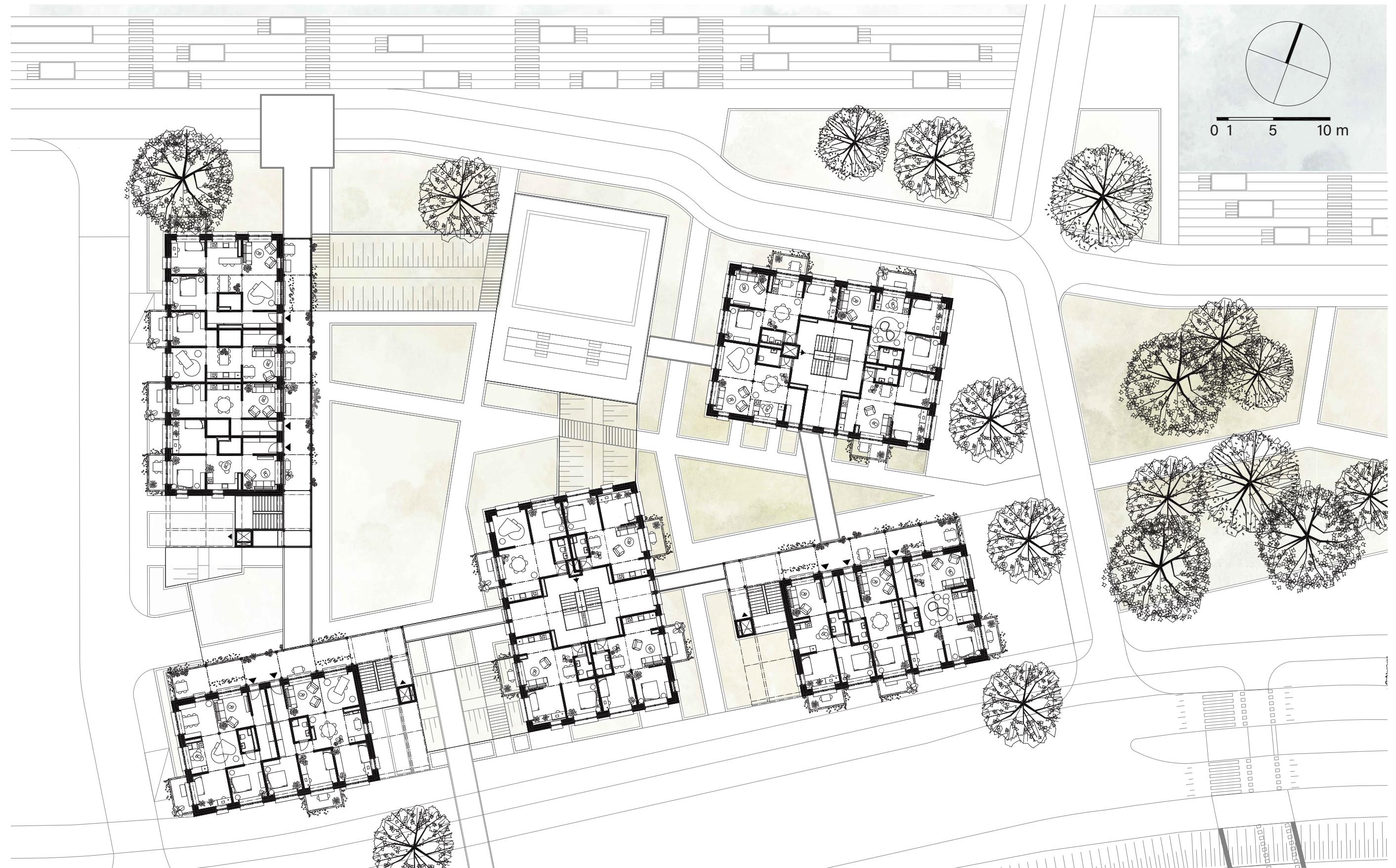
Clusters, 1:100



Floors, 1:100



Floorplans - model photograph

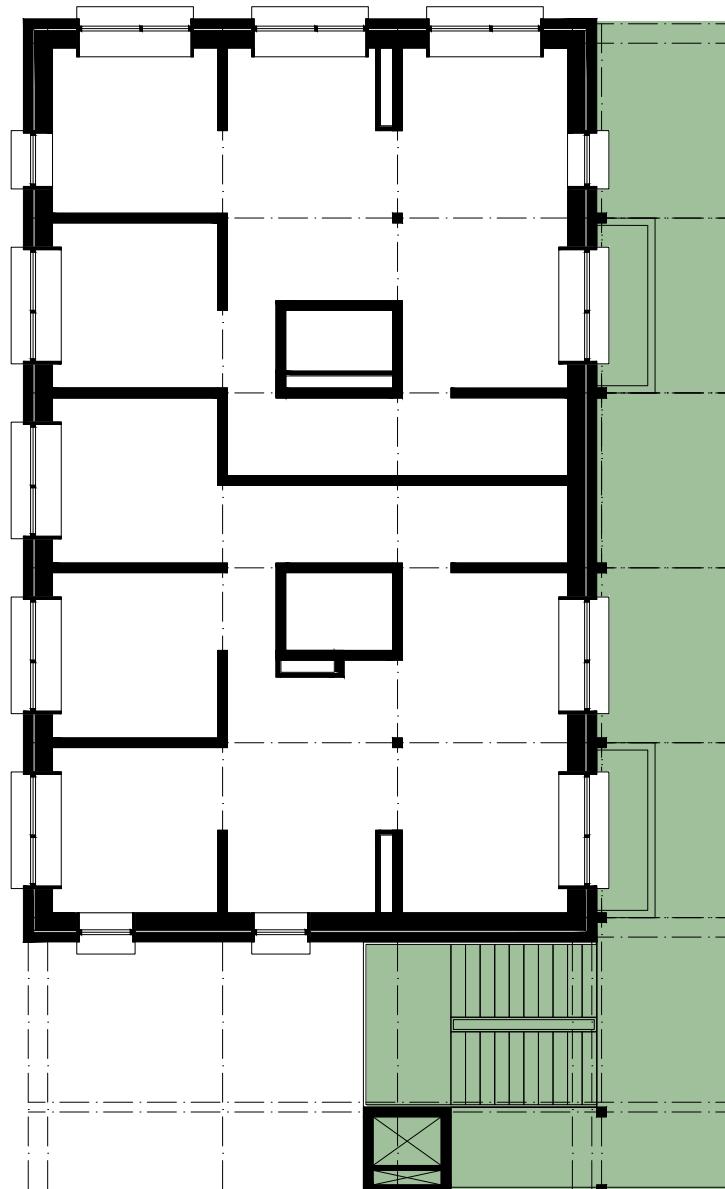


# CONNECTIONS

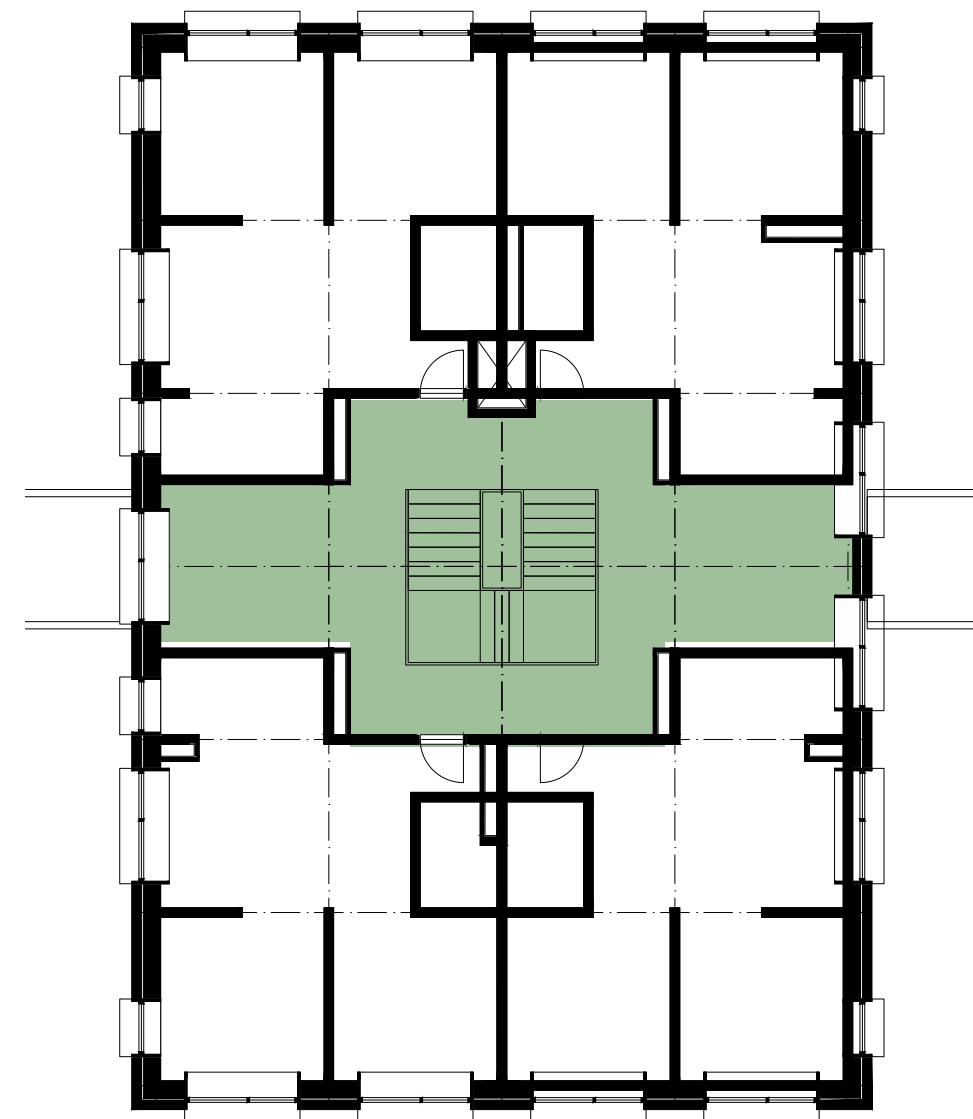
*the human scale*

# Access systems

Main types of accesses



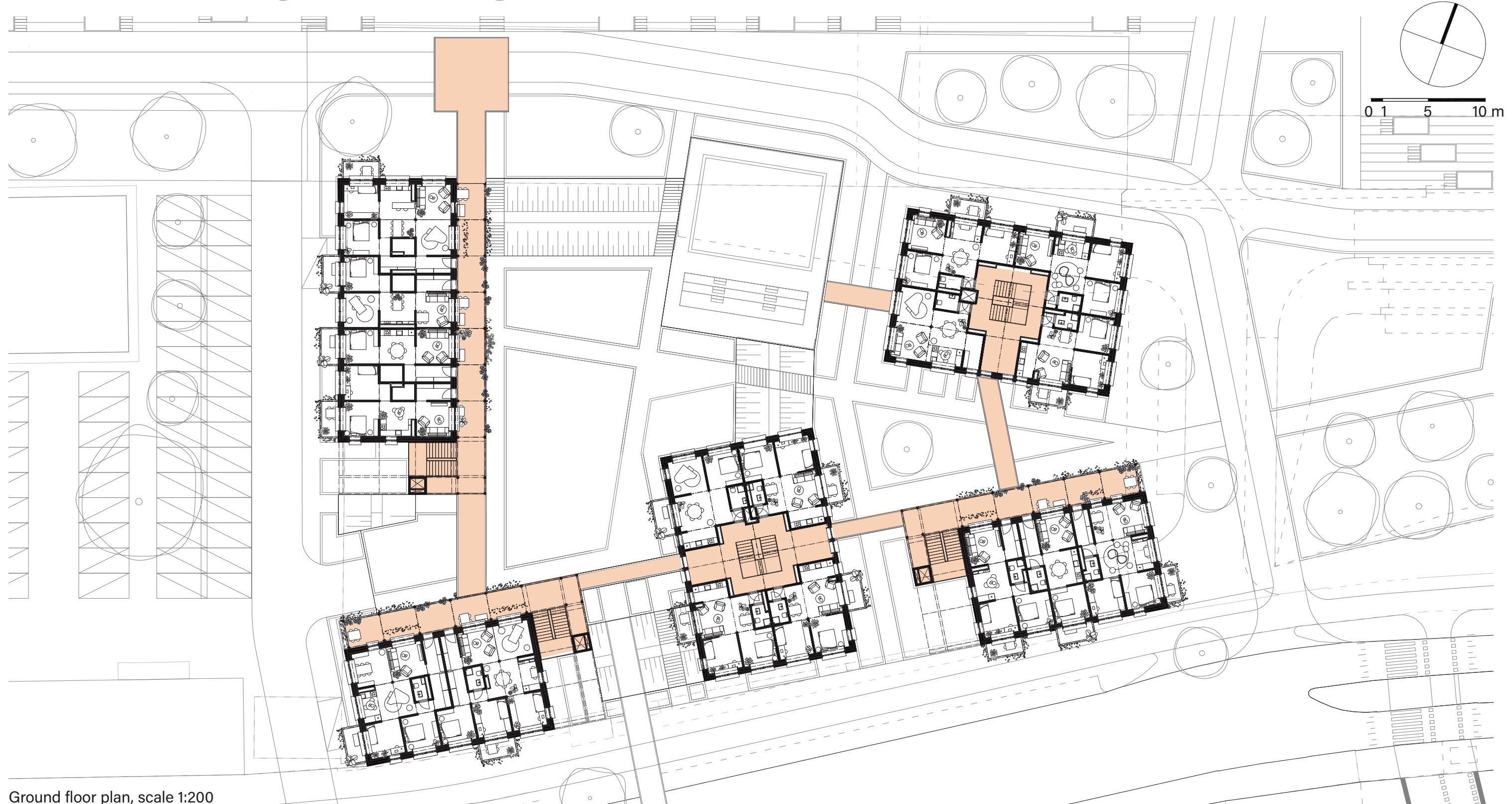
Gallery access -  
one main activated side



Central staircase access -  
two activated sides

# Connecting buildings

Additional structure on levels +1 and +2



Ground floor plan, scale 1:200

CONNECTIONS

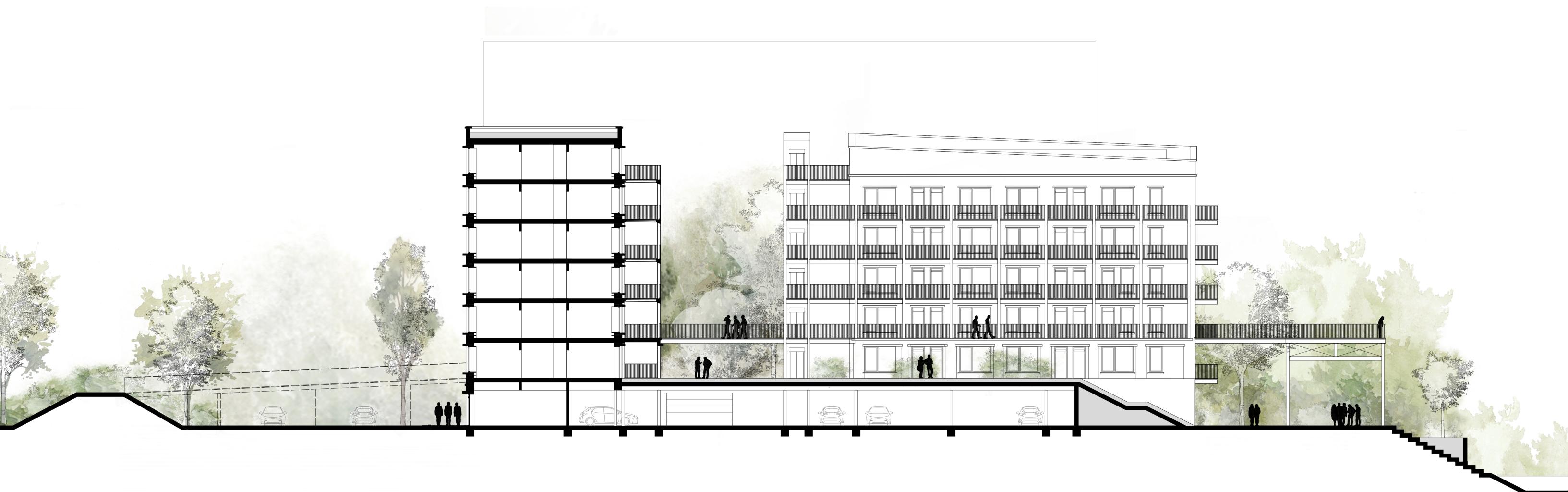
SLIDE NR 52/78



View from gallery

# Section

Vertical movement topography



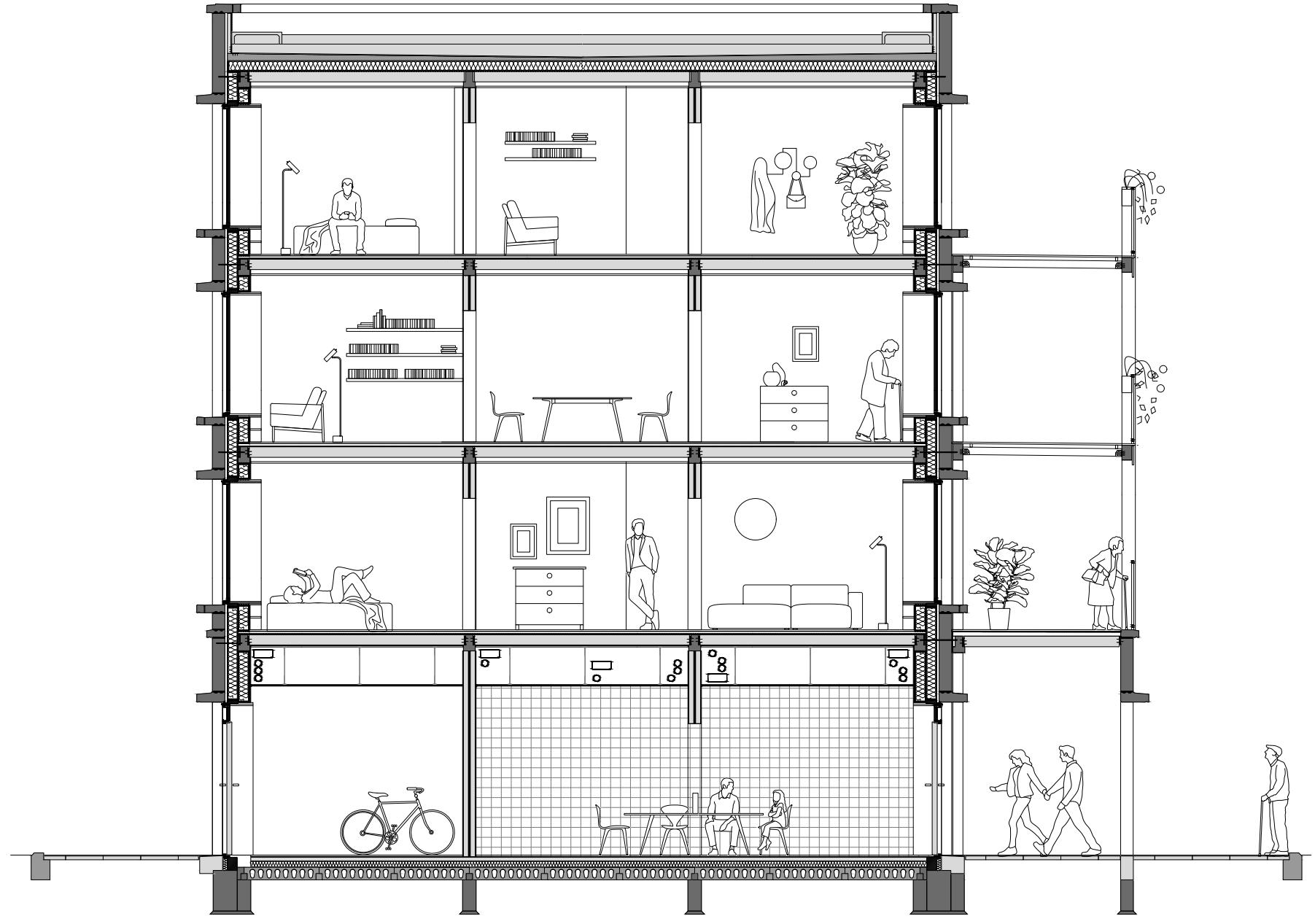
# Facade design



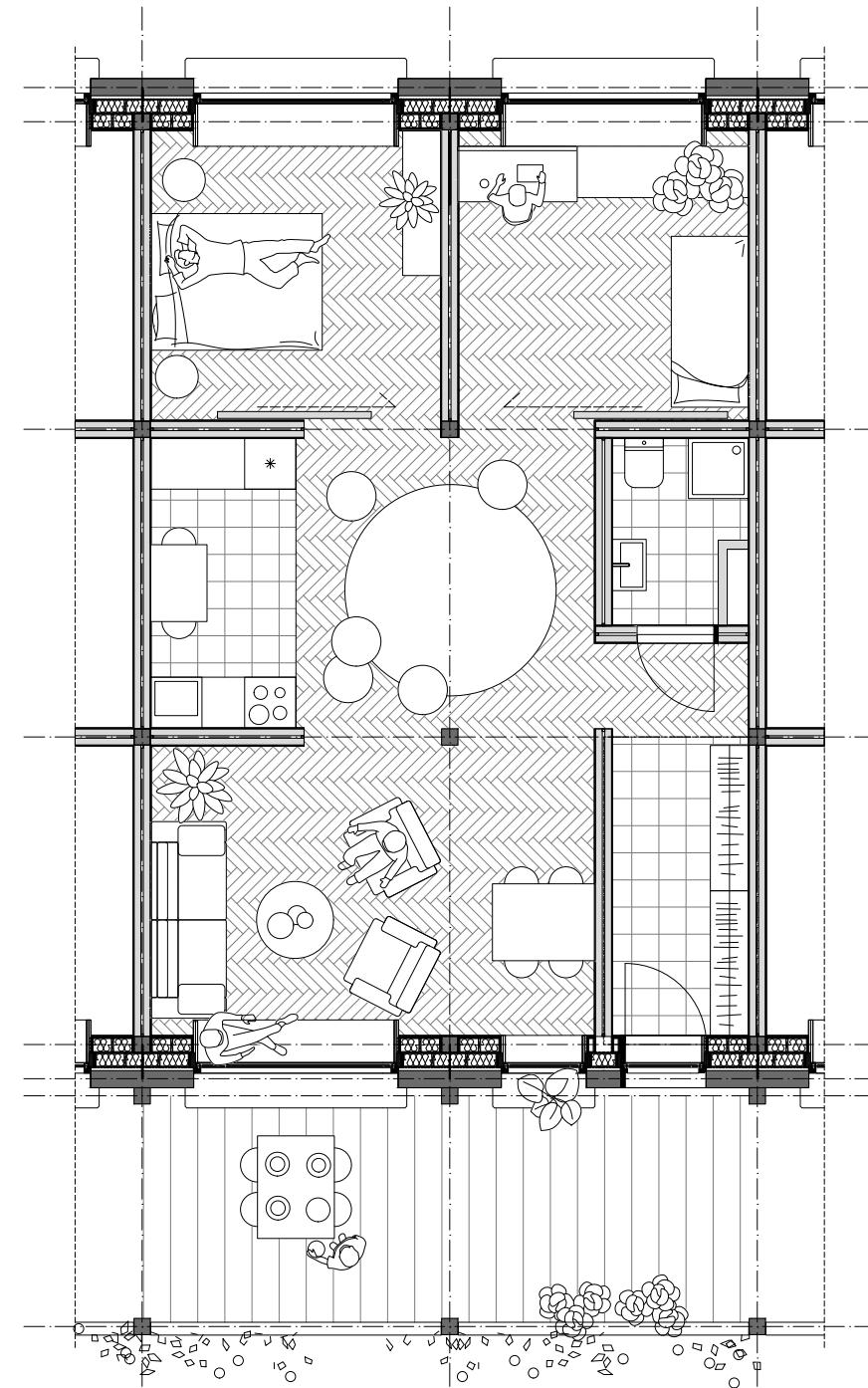
# Facades



# Fragment



Habits in the dwellings and on the galleries



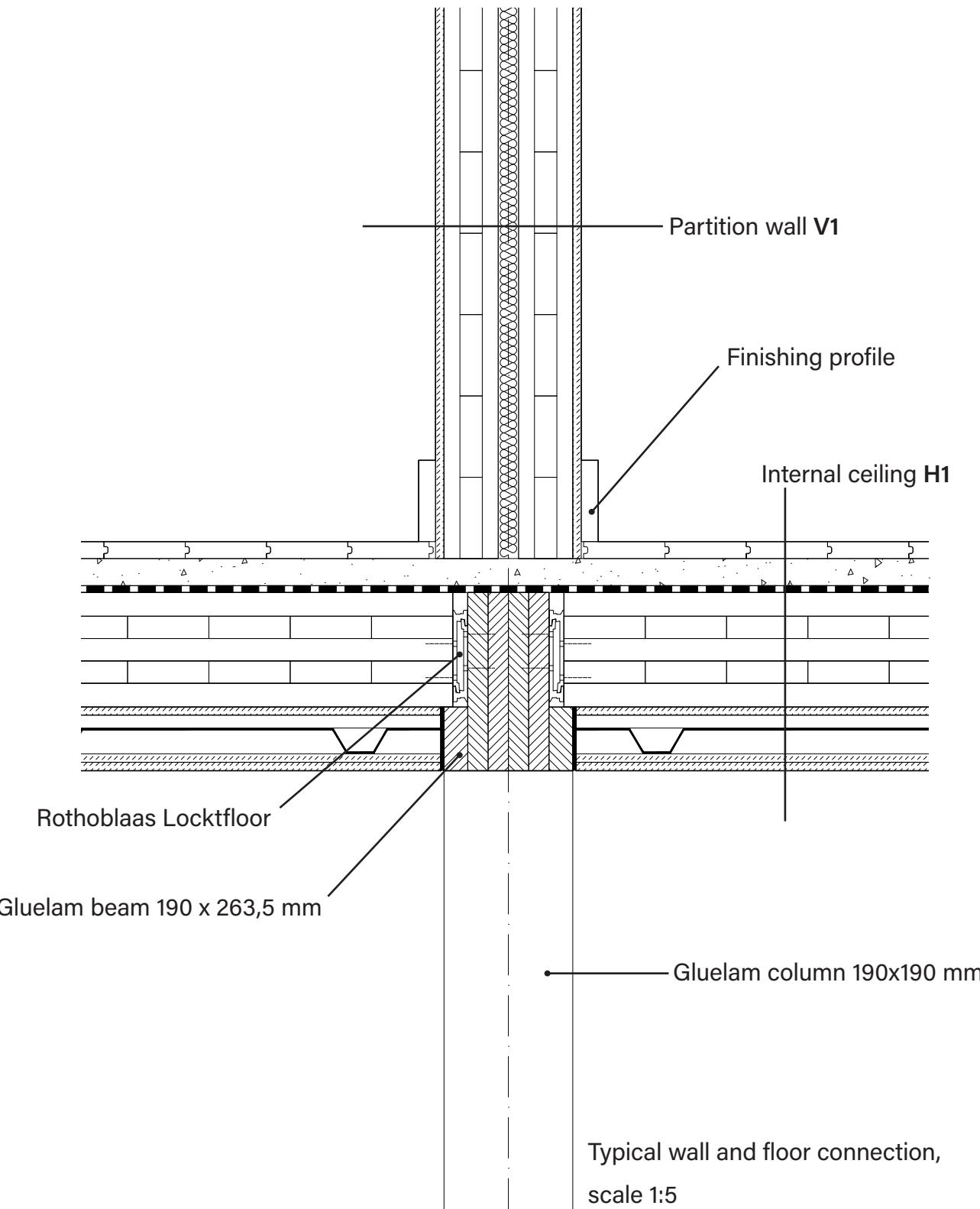


Public spaces in relation to dwellings

# DETAILS

*in a habit-based design*

# Typical connection



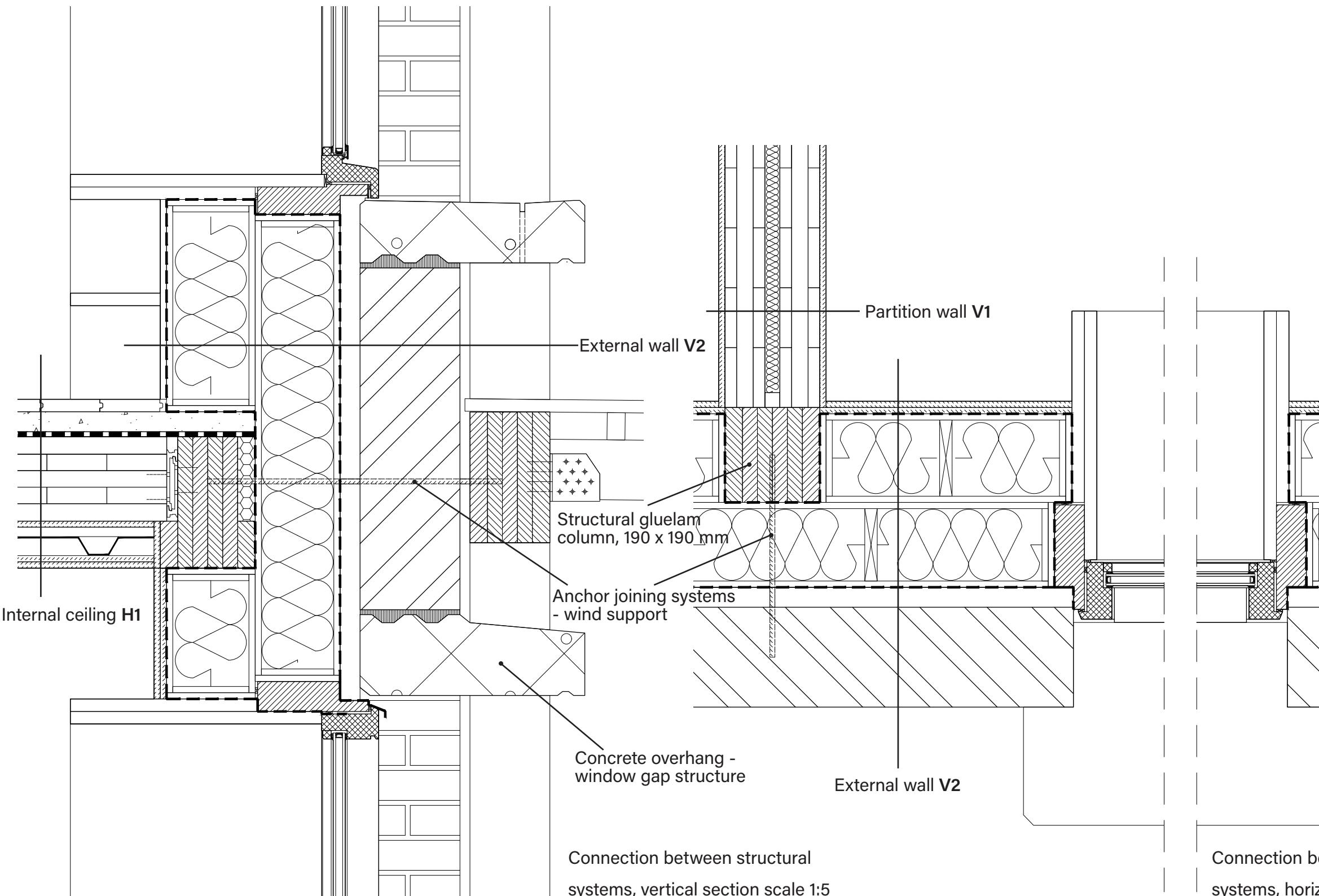
## PARTITION WALL V1

Sound insulation - 56 dB  
Fireproof REI 60  
Finishing paint  
Plaster board 12,5 mm  
CLT panel 80 mm  
Insulation 30 mm  
CLT panel 80 mm  
Plaster board 12,5 mm  
Finishing paint

## INTERNAL CEILING H1

Finishing - wooden floor 25 mm  
Screed 40 mm  
Sound insulation 10 mm  
CLT panel 169 mm  
Anti-humidity plaster board 12,5 mm  
Ceiling substructure 19 mm  
Technical void 38 mm  
2x plaster board 12,5 mm  
Finishing paint

# Connection between systems



## PARTITION WALL V1

According to typical floor and wall connection, see slide nr 32.

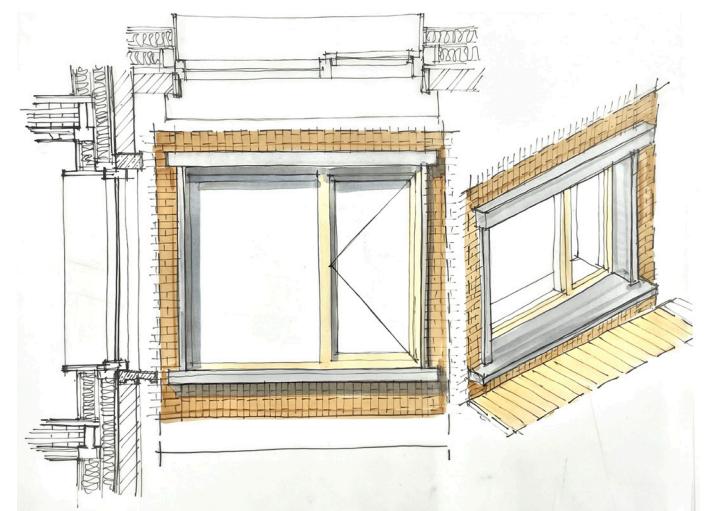
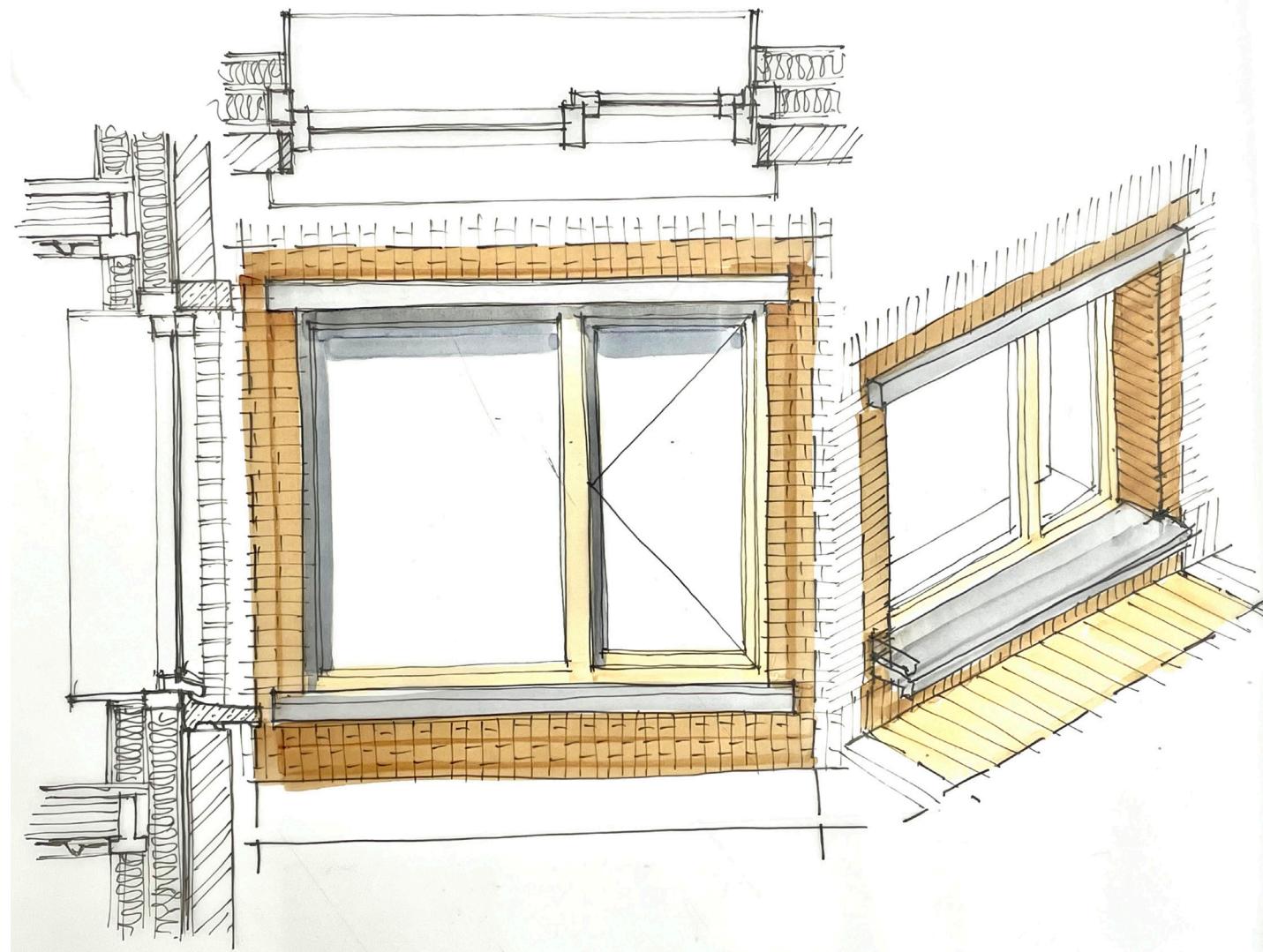
## INTERNAL CEILING H1

According to typical floor and wall connection, see slide nr 32.

## EXTERNAL WALL V2

Internal finishing paint  
2x plaster board 12,5 mm  
vapor barrier  
**internal insulation wall panel**  
OSB board 12,5 mm  
insulation 152,5 mm  
OSB board 12,5 mm  
**external insulation wall panel**  
OSB board 12,5 mm  
insulation 145 mm  
OSB board 12,5 mm  
water barrier  
ventilation void 40 mm  
structural brickwork 200 mm

# Window design



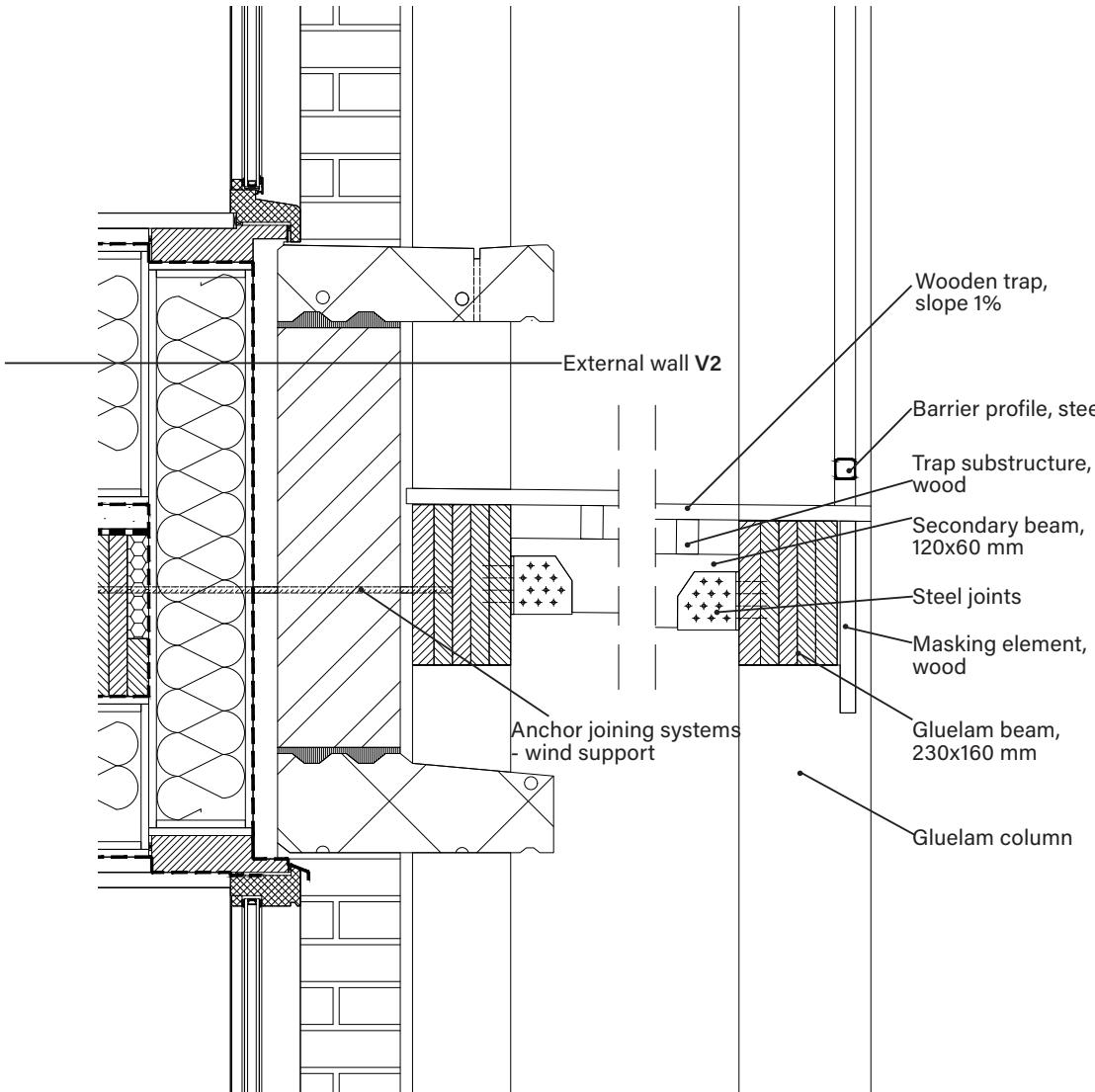
# A habit-based detail



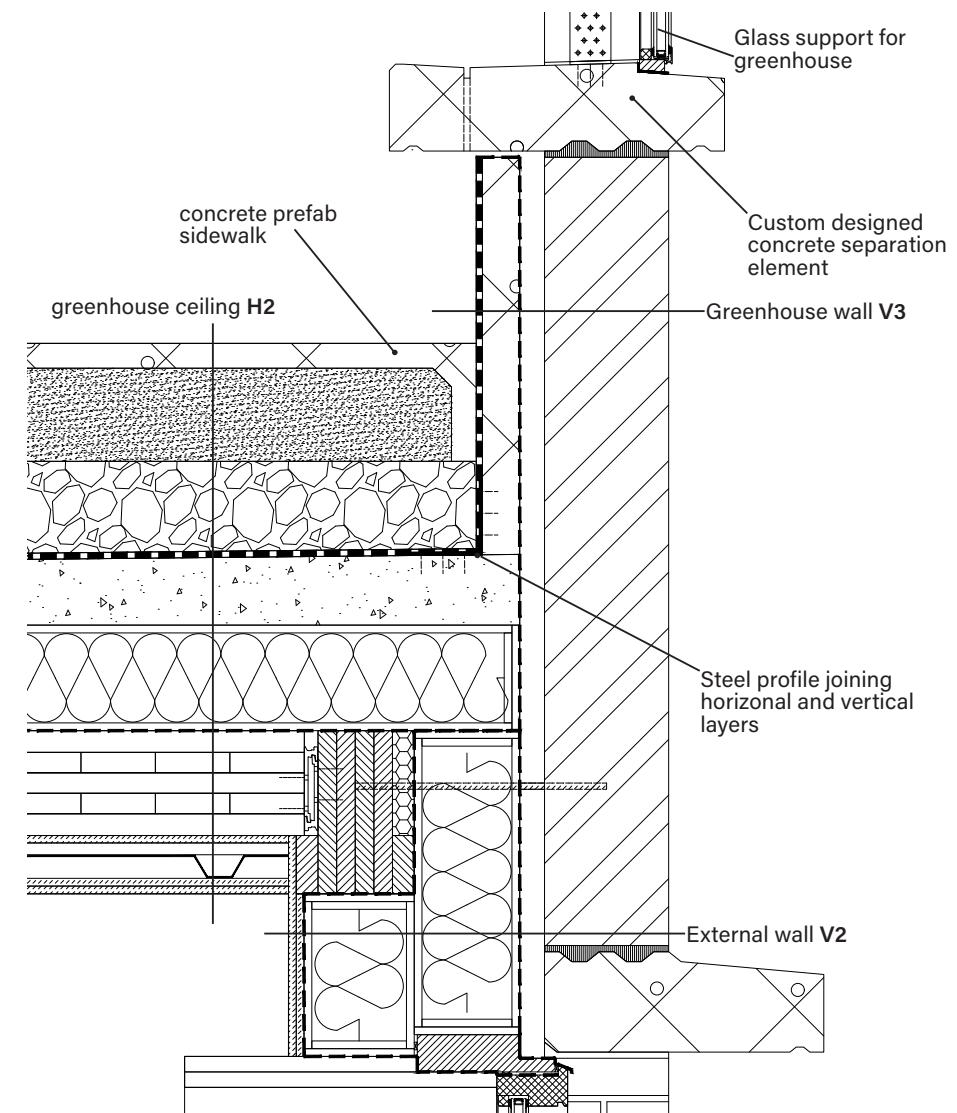
# A habit-based detail



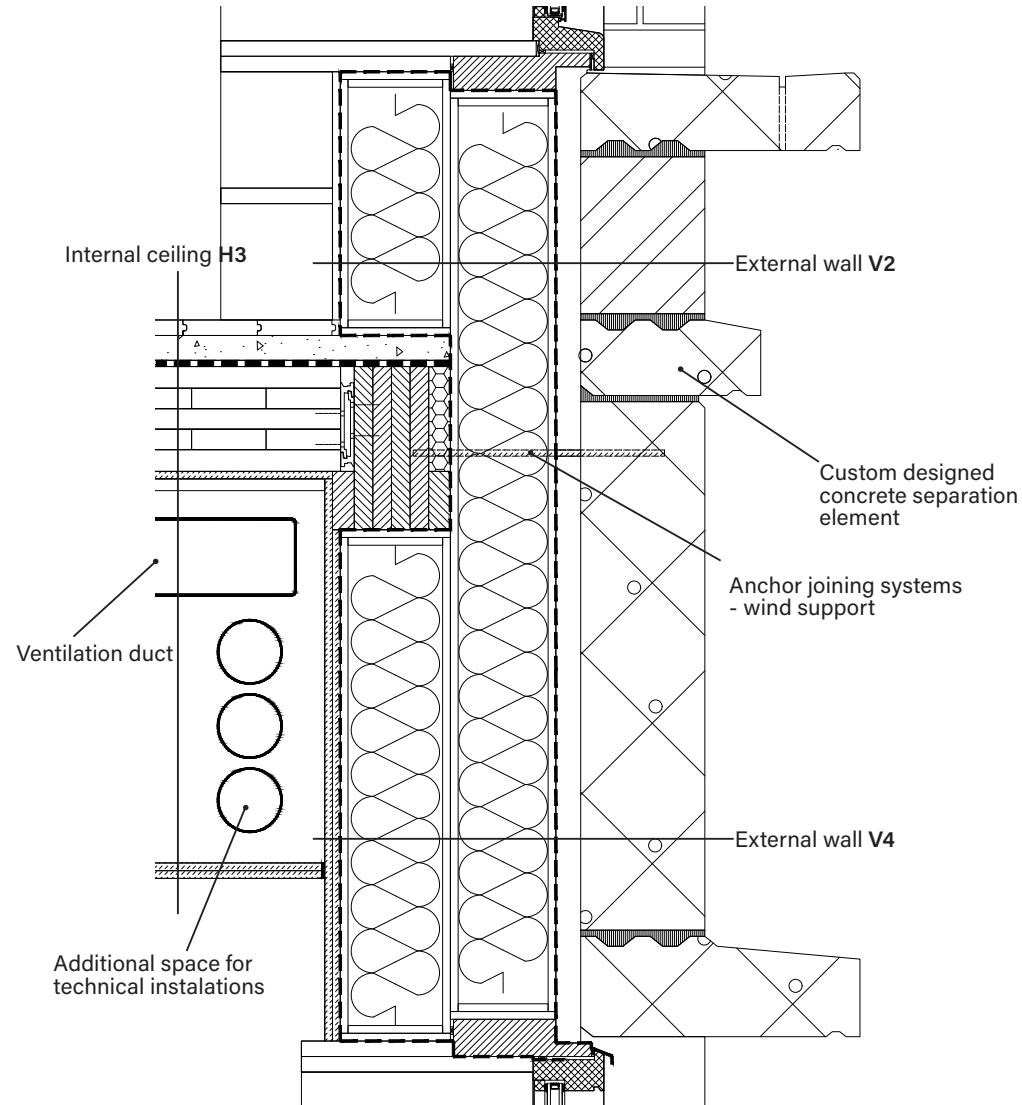
# Complimentary details



Connection with external gallery,  
vertical section scale 1:5



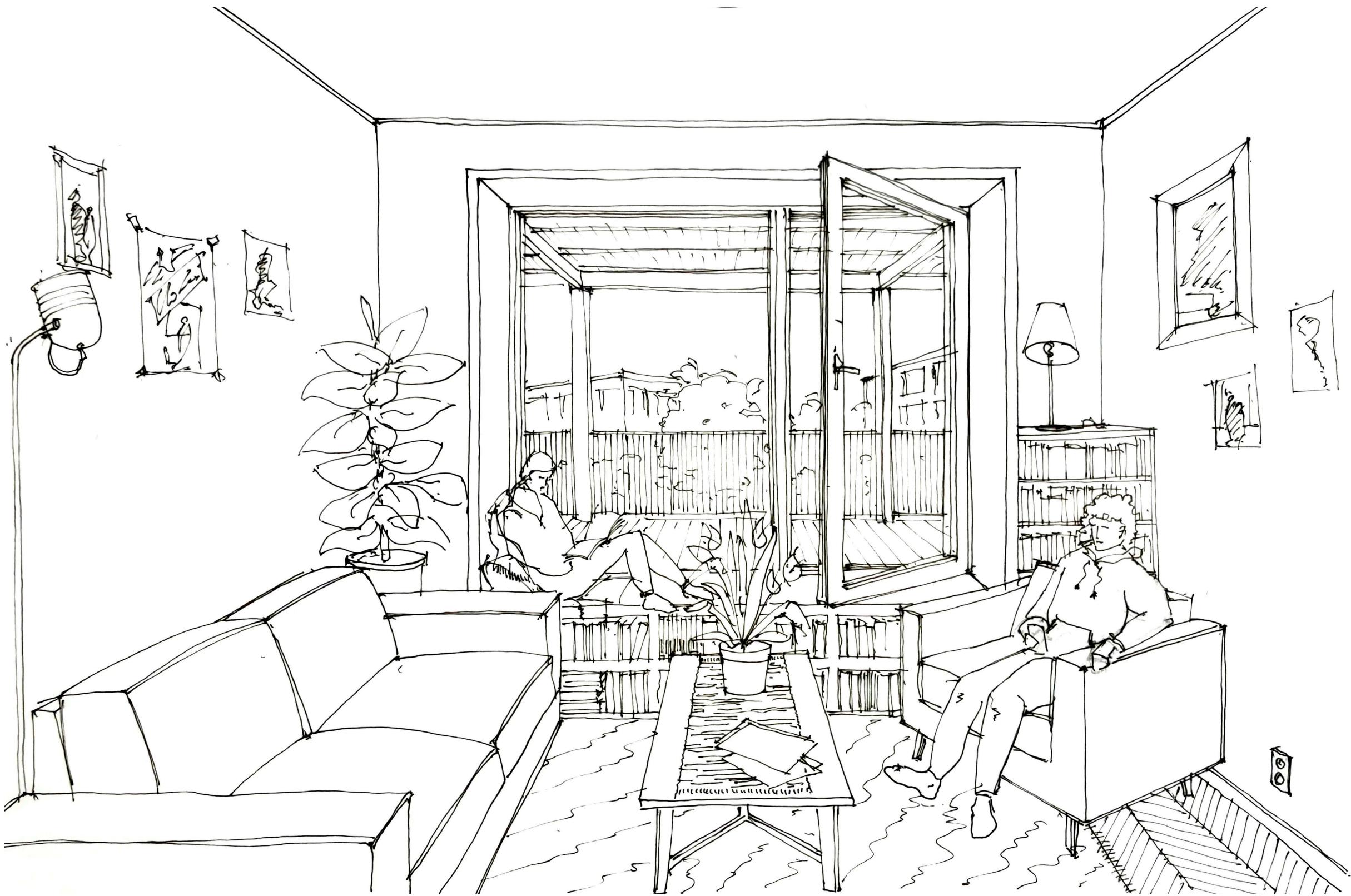
Connection with greenhouse on public  
rooftop, vertical section scale 1:5



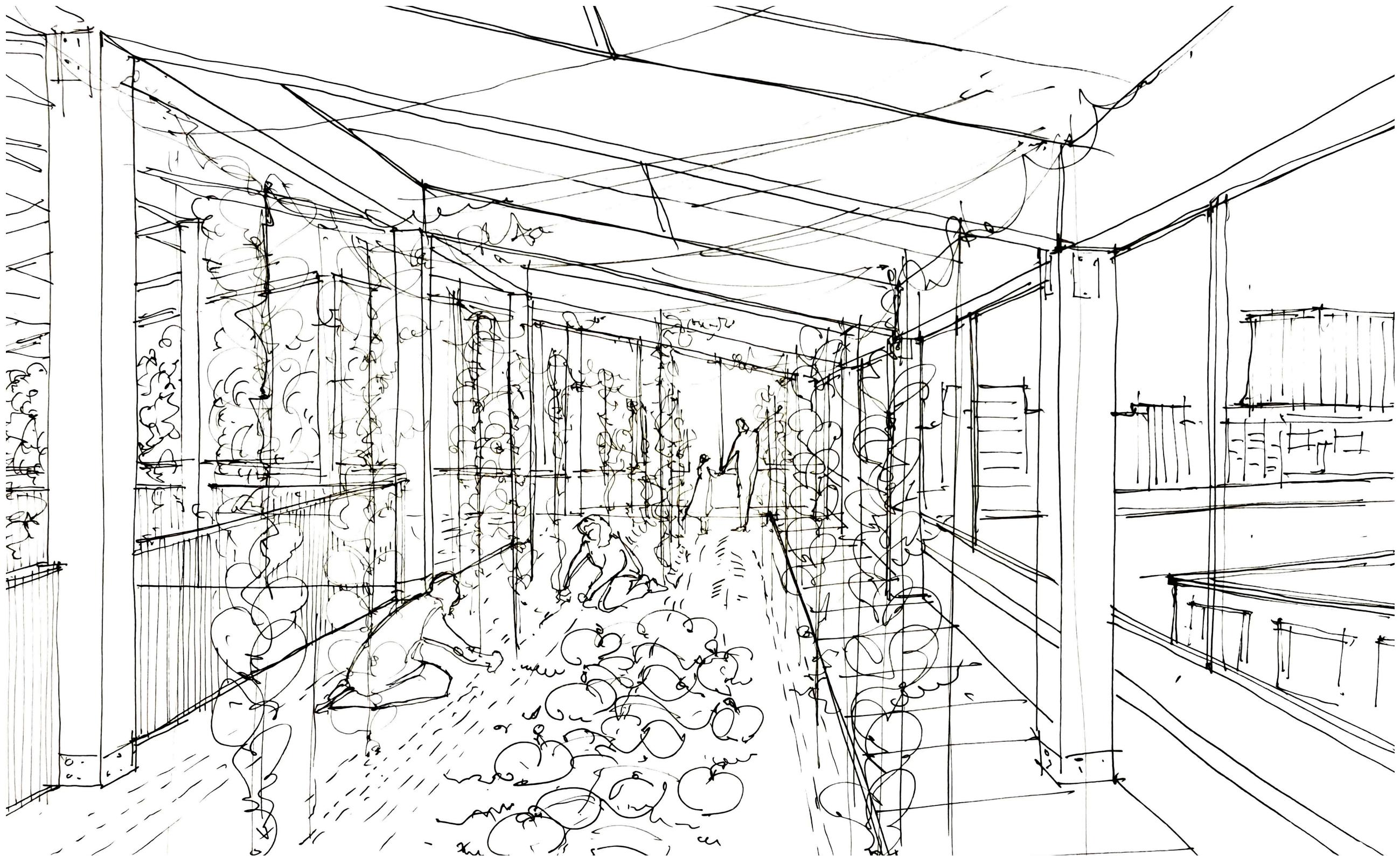
External material change - public/private  
transition, vertical section scale 1:5

# STORIES

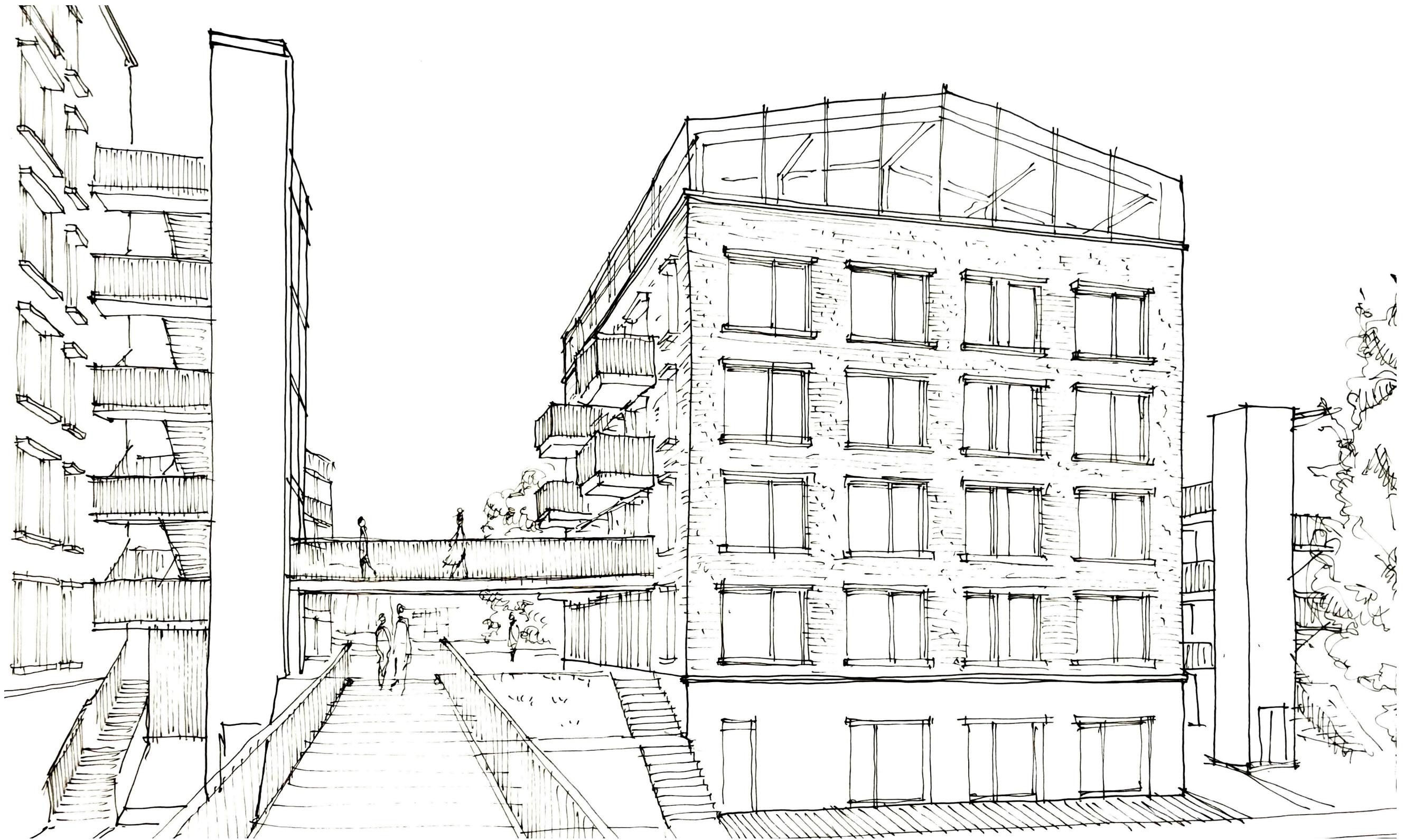
*life in the buildings*



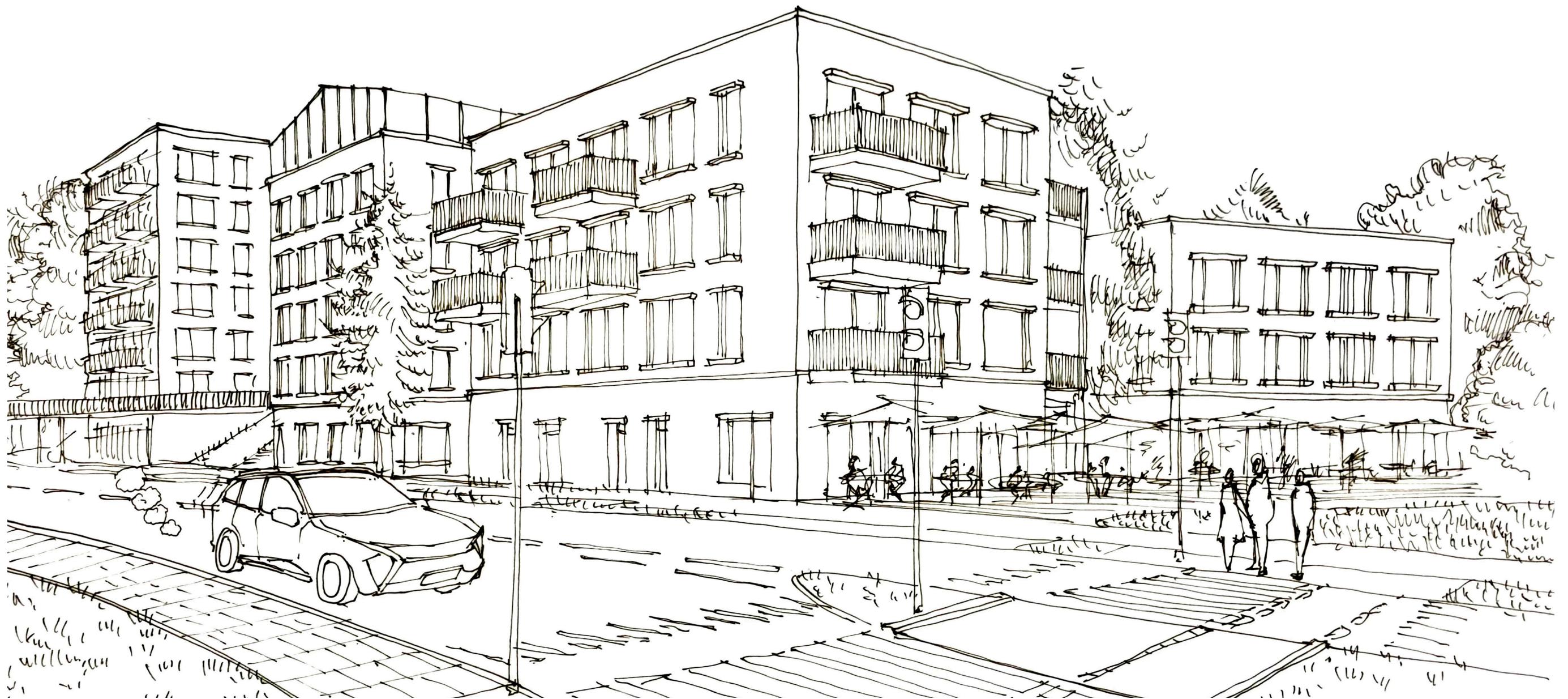
Sitting at the edge between interior and exterior



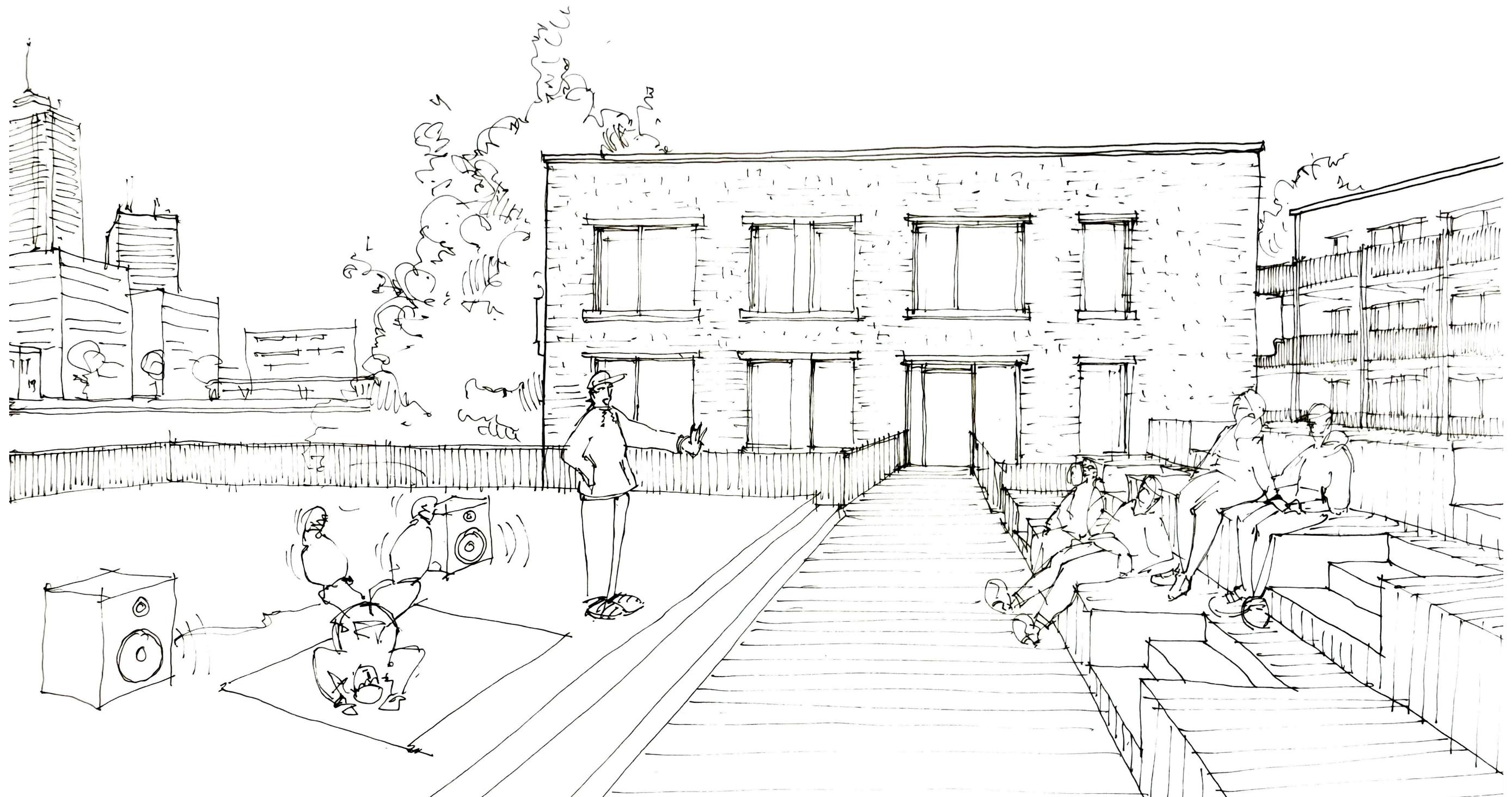
Working together on organic crops



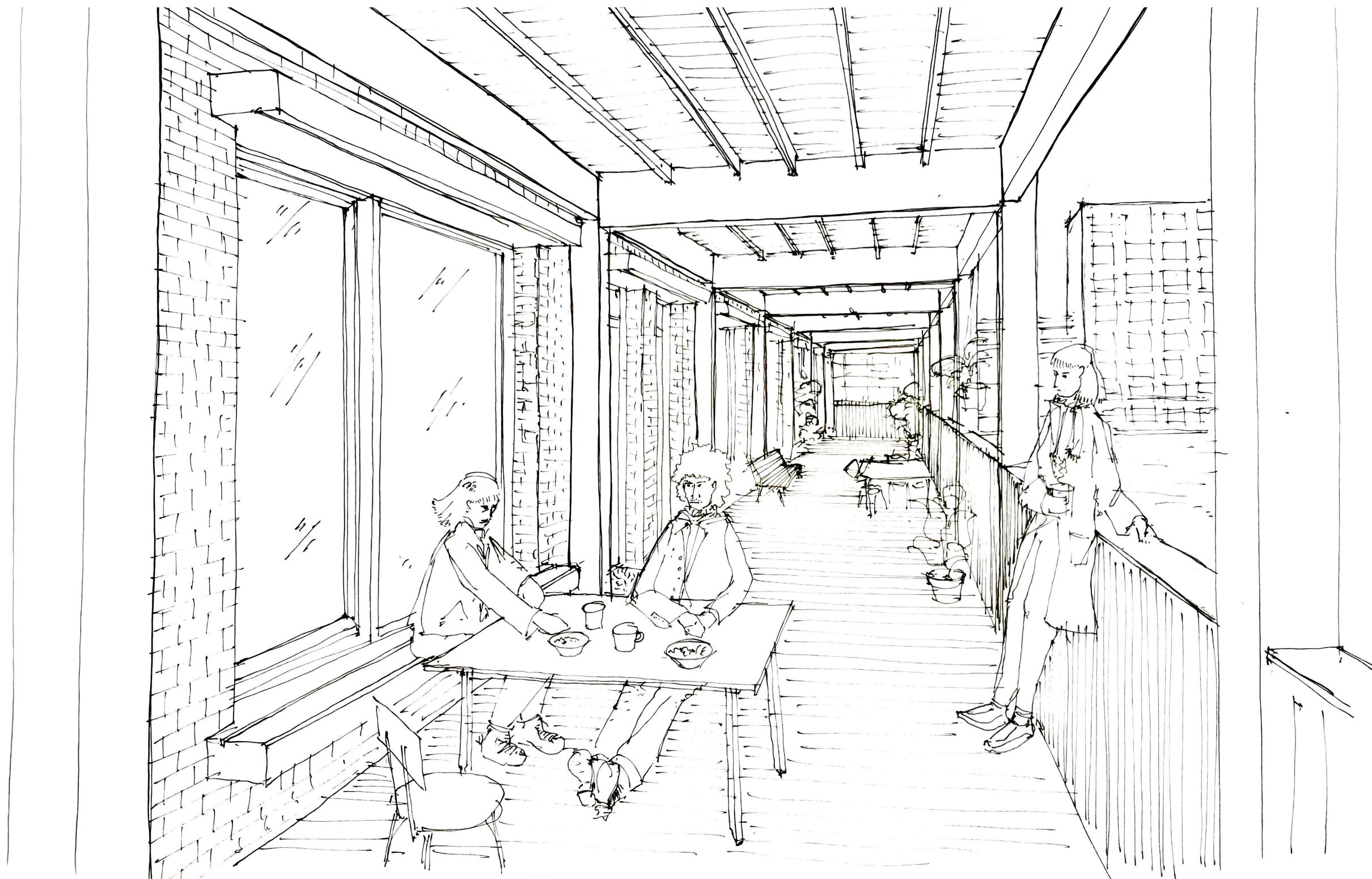
Enjoying a walk towards Tarwewijk



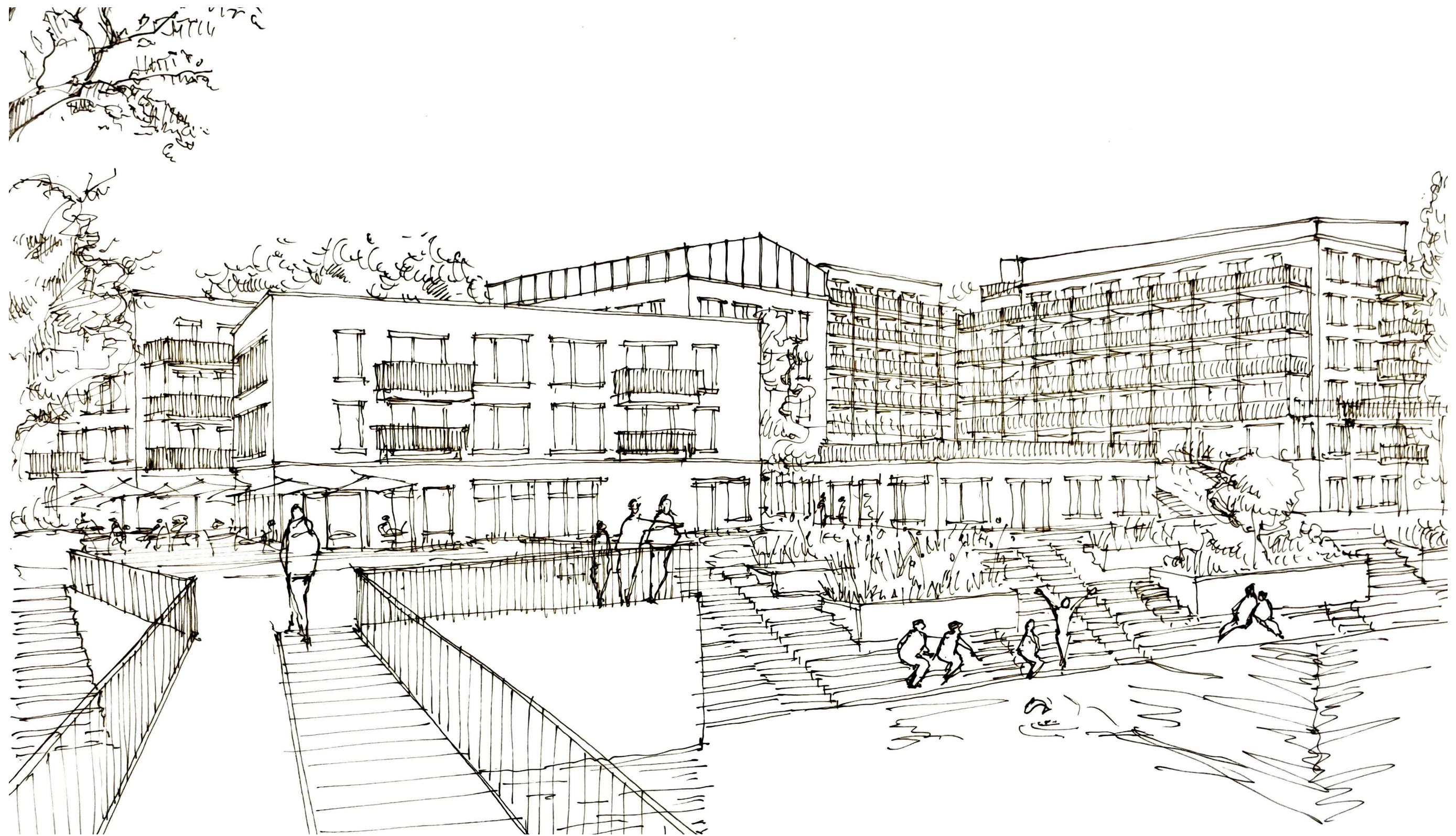
Coming from Tarwewijk without disturbance



Social gatherings in semi programmed spaces



Chiling at a friend's place in the afternoon



Coming directly from Katendrecht



Doing groceries in a market



Enjoying the view - as always

# Personal experience

A break in a cycling trip



# REFLECTION

# A HABIT-BASED DESIGN FOR HEALTHY LIVING



Jarema Kozielewski, 6050034  
TU Delft, Faculty of Architecture and the Built Environment,  
Dwelling Department

AR3AD110 Dwelling Graduation Studio: Designing for  
Care in an Inclusive Environment 2024/2025

Birgit Jurgenhake, Kobe Macco, Birgitte Hansen,  
Annemarie Eijkelenboom  
02.07.2025