

Set of Drawings

Stimulate movement and interaction in a comfortable residential building

The ACTIVE Stairs

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Empty nesters

The average age of becoming an empty nest household in the Netherlands is around 58 years old (median in 2017).¹ Since these often still active and outgoing people have already a certain age, they have already had a career on the housing market. 83% of them lives in a family house. About one hundred thousand new empty nesters are added every year.¹

Active and outgoing

Empty nesters are often still full participating in the society. This phase in their lives offers freedom and possibilities to change their life style. It gives them the opportunity to use the available resources to choose for quality and entertainment.

Many senior citizens remain physically active⁴. Independency is a very important value for them. Physical activity prevents physical impossibilities, so that they can survive independently for longer². The feeling of safety in the street network is even more important for seniors than for other groups of the society. Unsafe or unpleasant environments can cause older adults to go out less and isolate themselves, resulting in less physical activity with all its consequences⁴.

According to the World Health Organisation⁵, older adults should exercise at least 150 minutes a week doing activities on moderate intensity or 75 minutes on powerful intensity. To keep the muscles vital, muscle-strengthening activities should be done at least twice a week.

When, after retirement, the daily contacts with colleagues are gone, it is crucial to stay social active. Coming together in (sport) clubs can be a way to keep connected with others.² When these activities are in the neighbourhood, these contacts will probably live in the same neighbourhood as well and meetings can also stand apart from the (sport) activities.

Income

The average income of people belonging to this age group is significantly higher than the average income of younger age groups, as can be found in figure T.12. This can be explained by raised experience and promotions during the career.

Accumulated fortune

In the Netherlands, 67% of this target group has a house in property,³ that is often (largely) paid off already. They also have accumulated fortune in other ways, like savings or capital for their retirement.⁹ The schemes below show the average income of empty nesters, their maximal mortgage and their accumulated fortune.

* Data form the research report

Education level	ABN AMRO	ASN Bank	ING Bank	Mortgage range
Low + low	240.821	248.087	245.621	240.821 - 248.087
Low + middle	280.352	289.584	286.326	280.352 - 289.584
Low + high	429.262	446.444	438.837	429.262 - 446.444
Middle + iddle	337.237	349.621	344.757	337.237 - 349.621
Middle + high	447.790	486.339	488.444	447.790 - 488.444
High + high	599.461	611.055	625.596	599.461 - 625.596

Figure T.14. Maximum mortgage comparison between different banks. Based on data from ABN AMRO¹, ASN Bank² and ING Bank¹⁰ (2019). Made by author.



Distribution of accumulated fortune

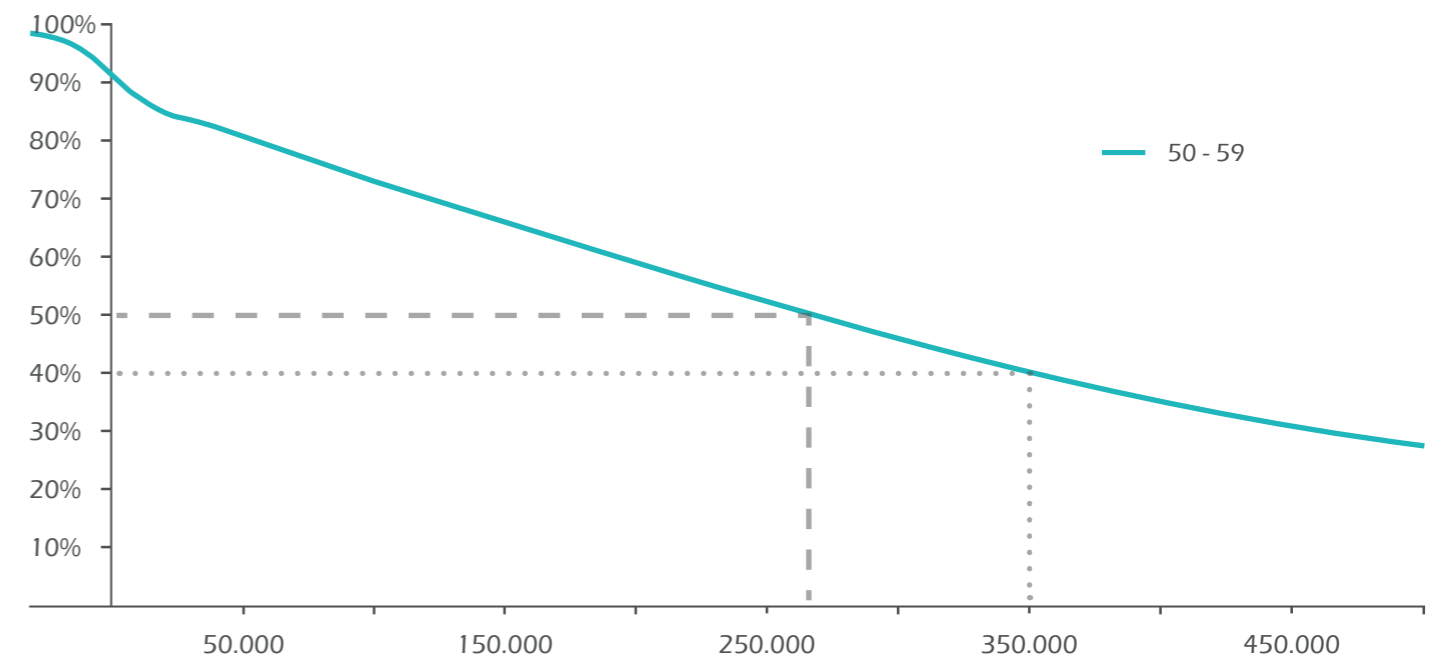


Figure T.13. Distribution of accumulated fortune [€] for people having an age between 50 and 59 years. Made by author, based on data form CPB (2018).

Families

More empty nesters continue to live longer in their family house. This influences the supply on the housing market, because than fewer homes are available for (young) families who are looking for a family house. Research shows that families feel more at home in a family house outside the big city,¹ exactly the houses where the empty nesters live now. The problem is that there are fewer and fewer family houses available for these families, while the demand for family homes among this target group will grow in the coming years.

Current Mismatch

Nowadays, mainly family homes are being built, following the demand on the housing market.⁴ Looking at demographic developments, it is visible that the share of empty nesters among the baby boom generation is increasing.¹ The largest part of this group continues to live at the same place until care is suddenly needed at an old age. By the time those empty nesters are forced to look for a new home, there will be a surplus of single-family homes and a huge demand for apartments suitable for empty nesters. By investing in houses for empty nesters right now, the housing market will be much better balanced by that time.⁴

De need of building for empty nesters

The realisation of houses that will seduce empty nesters to move, will contribute in various ways to the flow on the housing market.³

1. Empty nesters will get a house which fits better to the new phase of their lives.
2. There will be more houses available suitable for new families.
3. The housing market will be much better balanced and matching the future demands.
4. Realizing houses for empty nesters requires less ground surface than would be needed for new family houses.

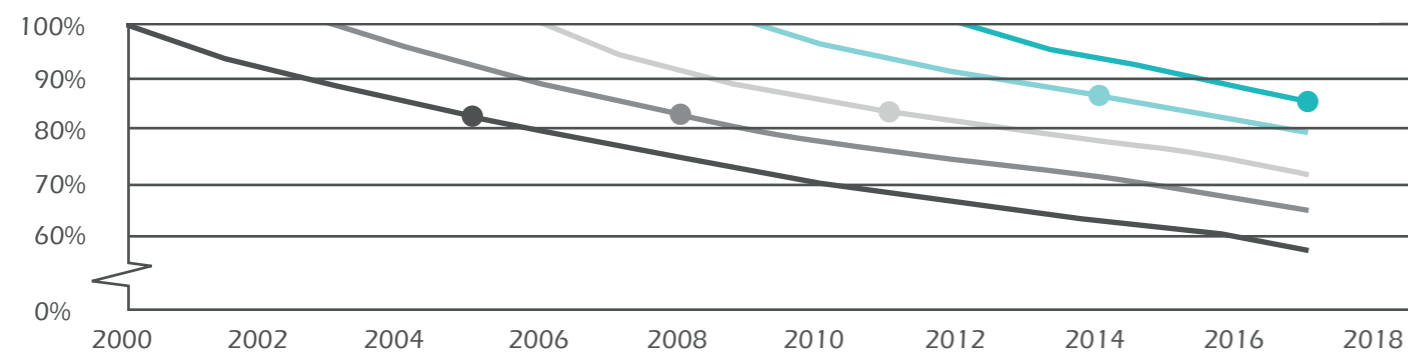


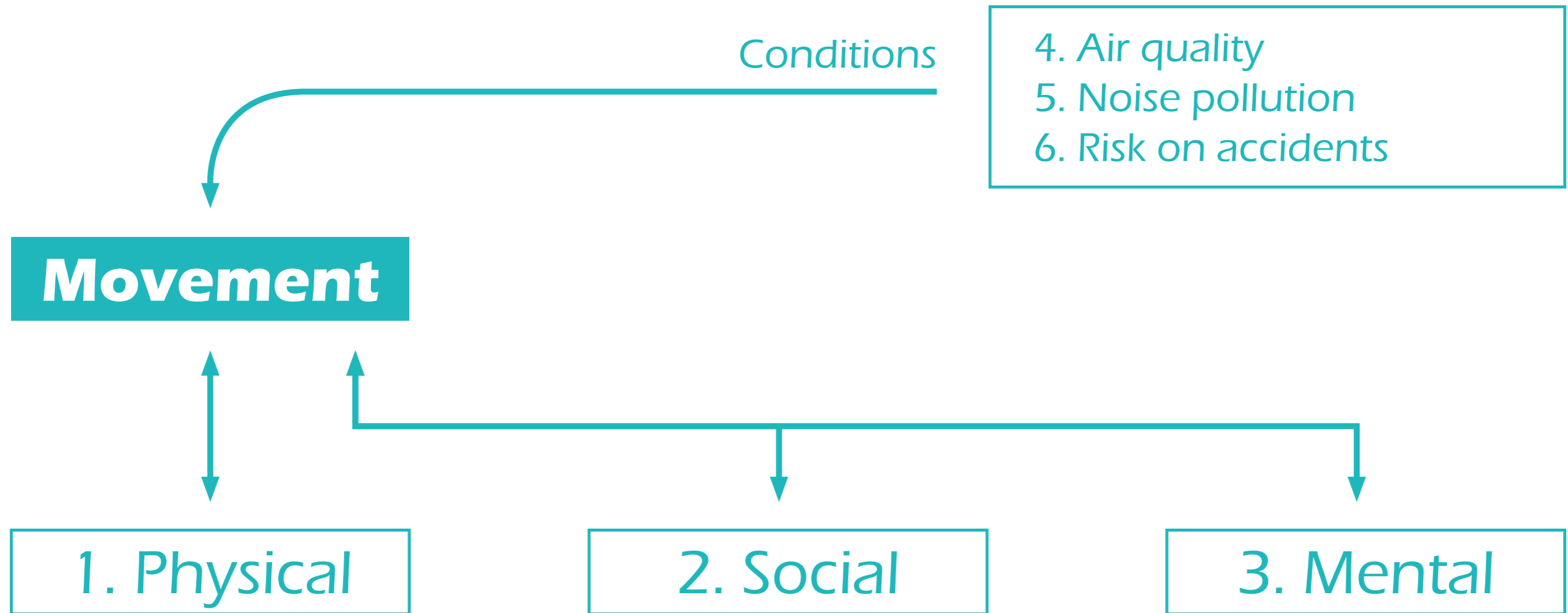
Figure T.11. Portion of empty nest households that still live in the house they used to live in with their family, over time (Buys & Hu, 2018). Edited by author.

An empty nester can be defined as “someone whose children have grown up and no longer live at home”.

- Cambridge Dictionary, 2019



Figure T.19. Many senior citizens remain physically active. (Health hub, 2019).



Scheme made by author, based on six key elements mentioned in research of Braubach & Grant (2010)

Starting points: Stimulate movement and interaction in a comfortable residential building

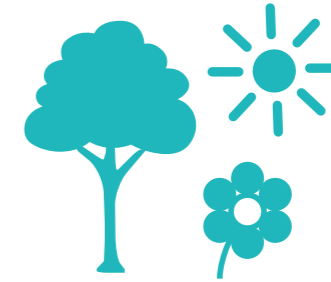
1



Stimulate movement



Visible



Attractive

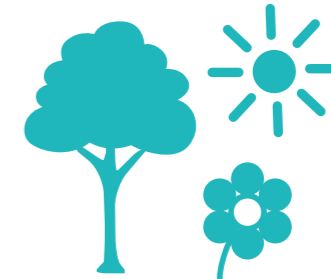
2



Stimulate interaction



Different scale levels



Attractive

3



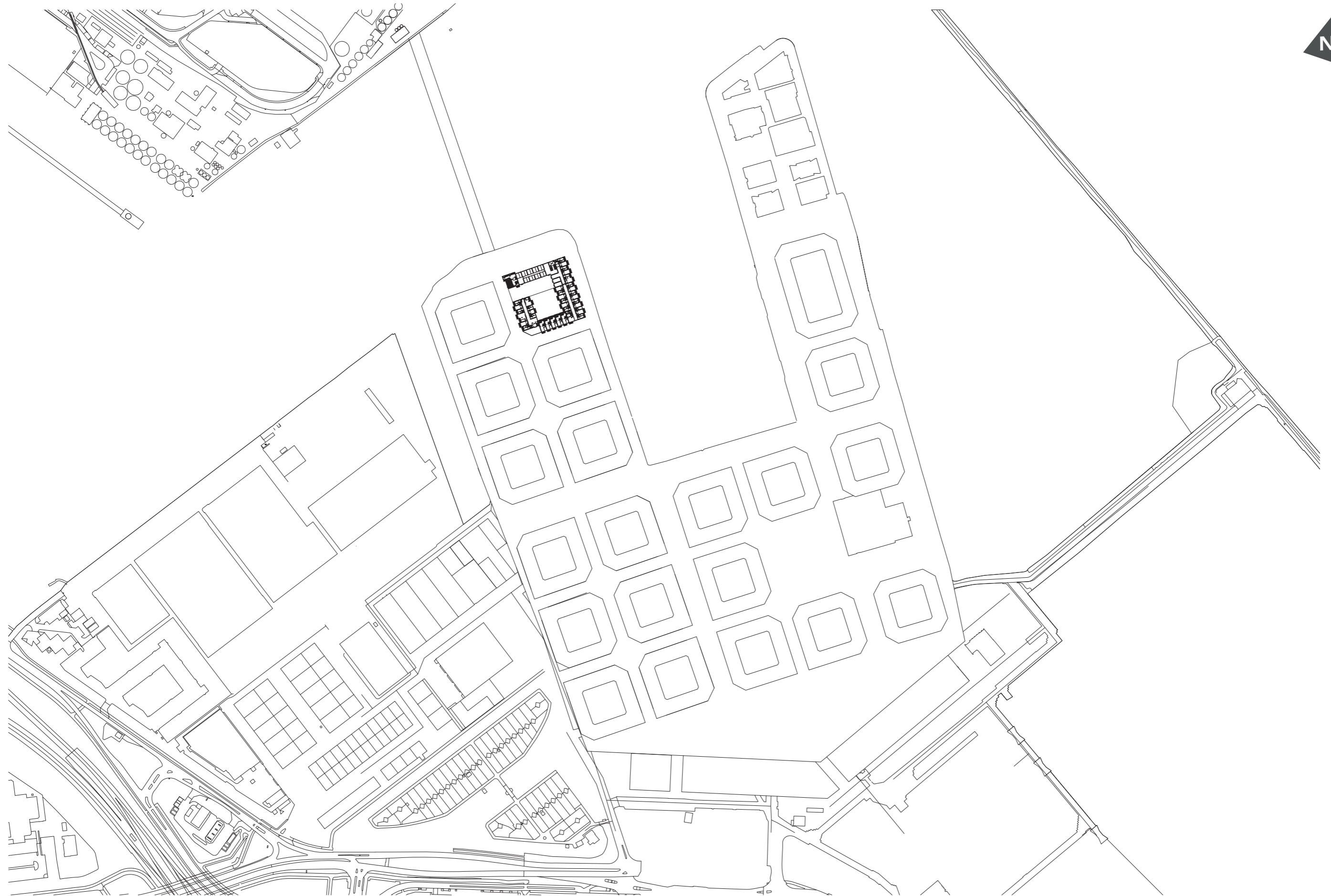
Comfortable building



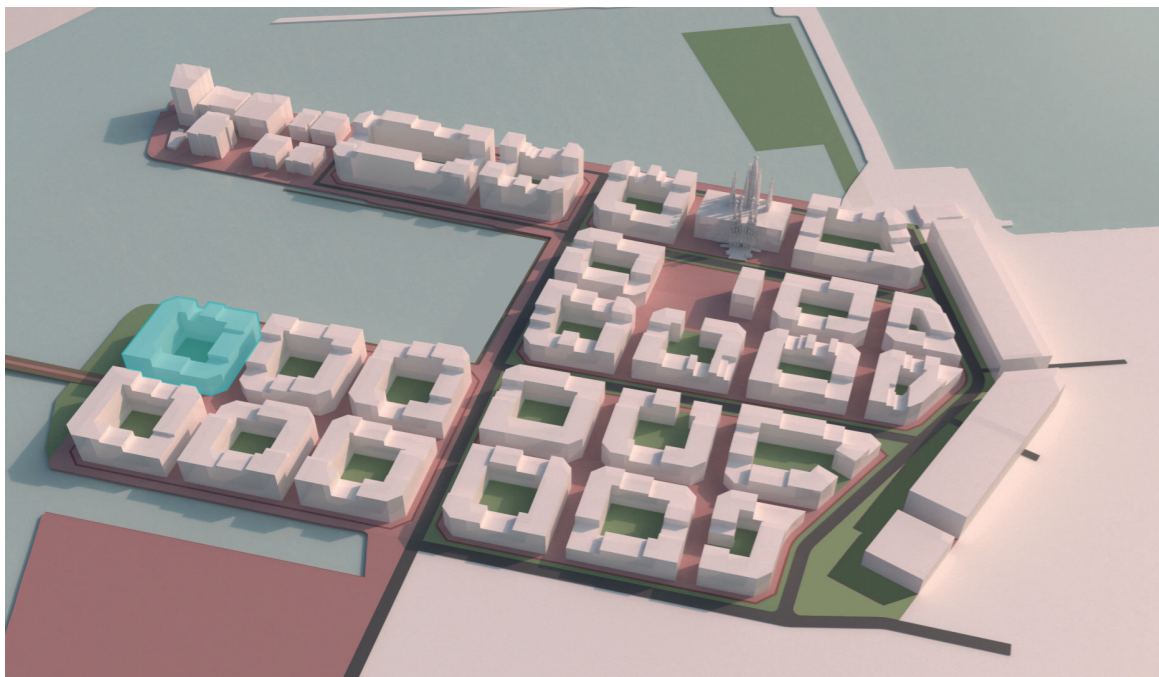
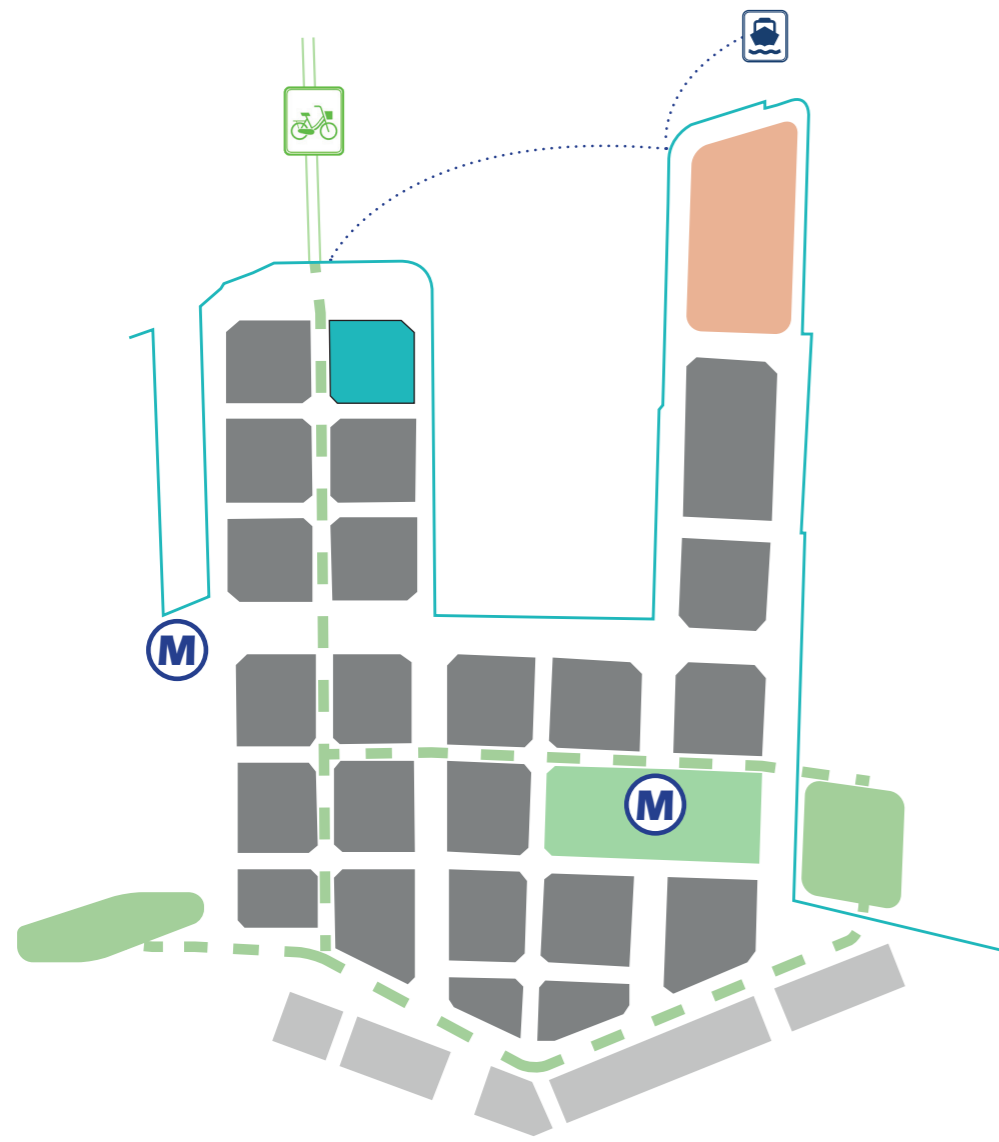
Experience luxury



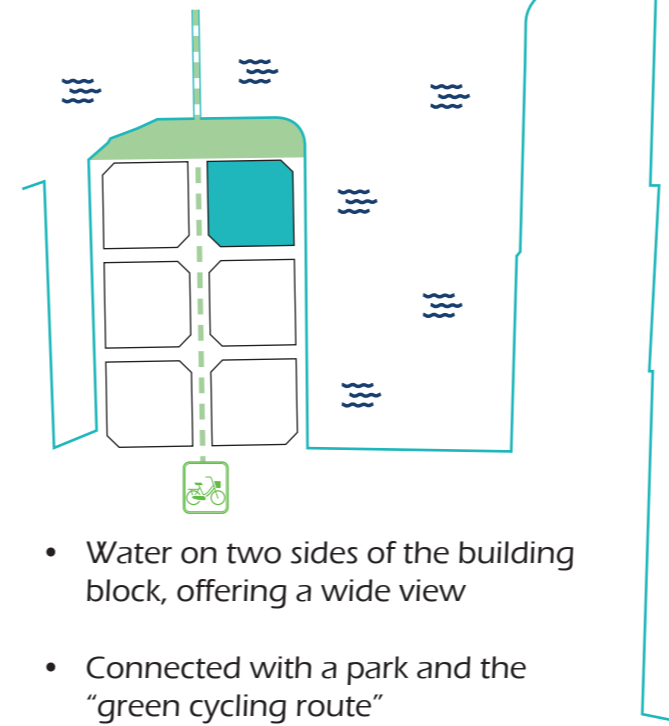
Feeling of safety



Uniqueness of the location

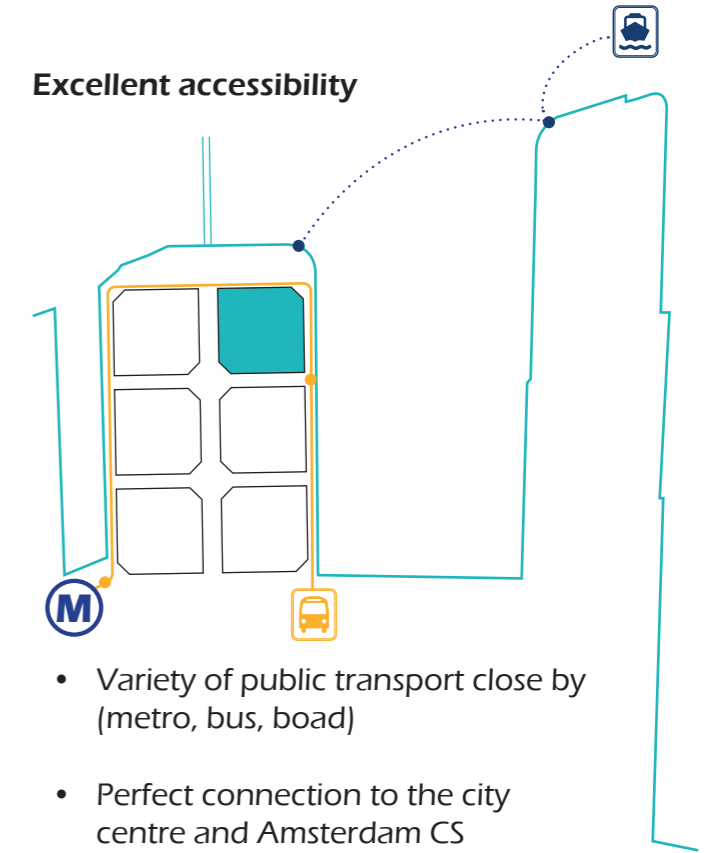


Unique location



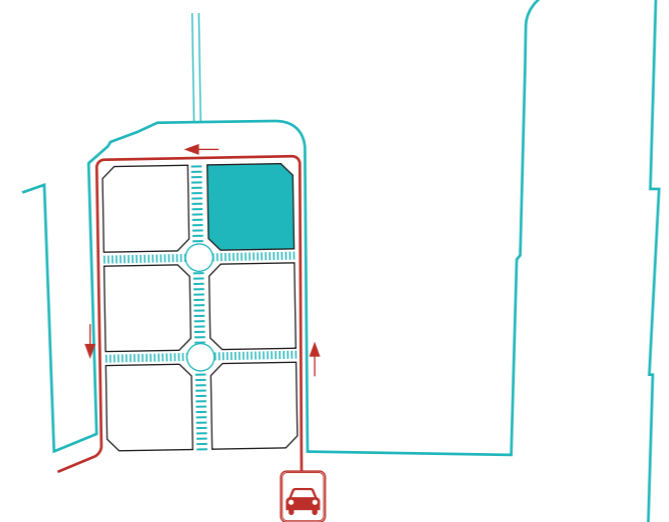
- Water on two sides of the building block, offering a wide view
- Connected with a park and the "green cycling route"

Excellent accessibility



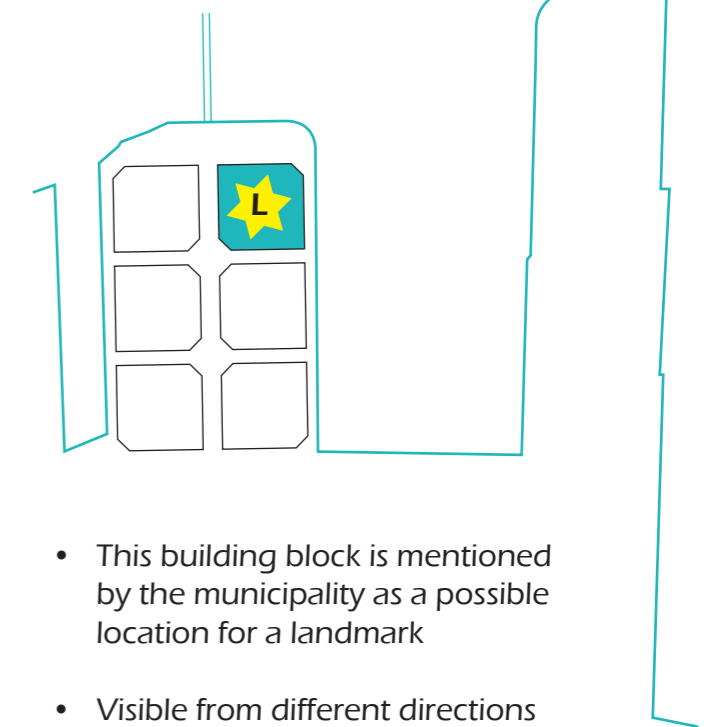
- Variety of public transport close by (metro, bus, boat)
- Perfect connection to the city centre and Amsterdam CS

Super block



- Six blocks together form a superblock, surrounded by a quiet one direction road
- The area between the blocks becomes a pedestrian zone with two squares

Landmark

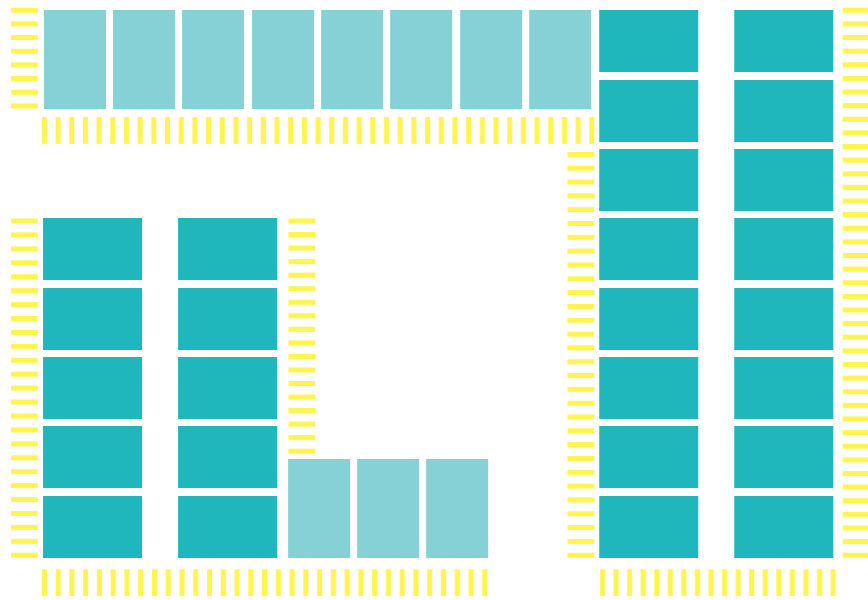


- This building block is mentioned by the municipality as a possible location for a landmark
- Visible from different directions

Schematic diagrams explaining the design strategy

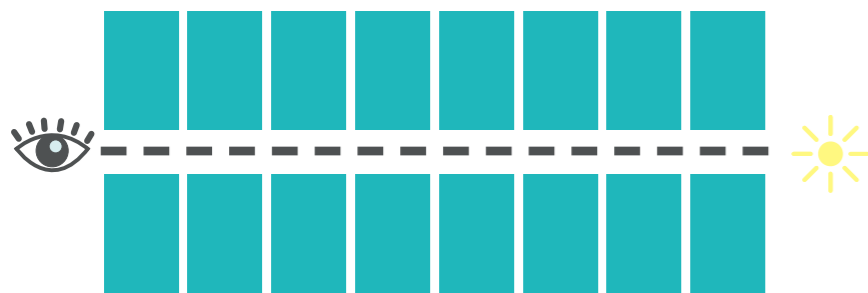
Orientation

Sunny sides of the building



Orientation in the corridor

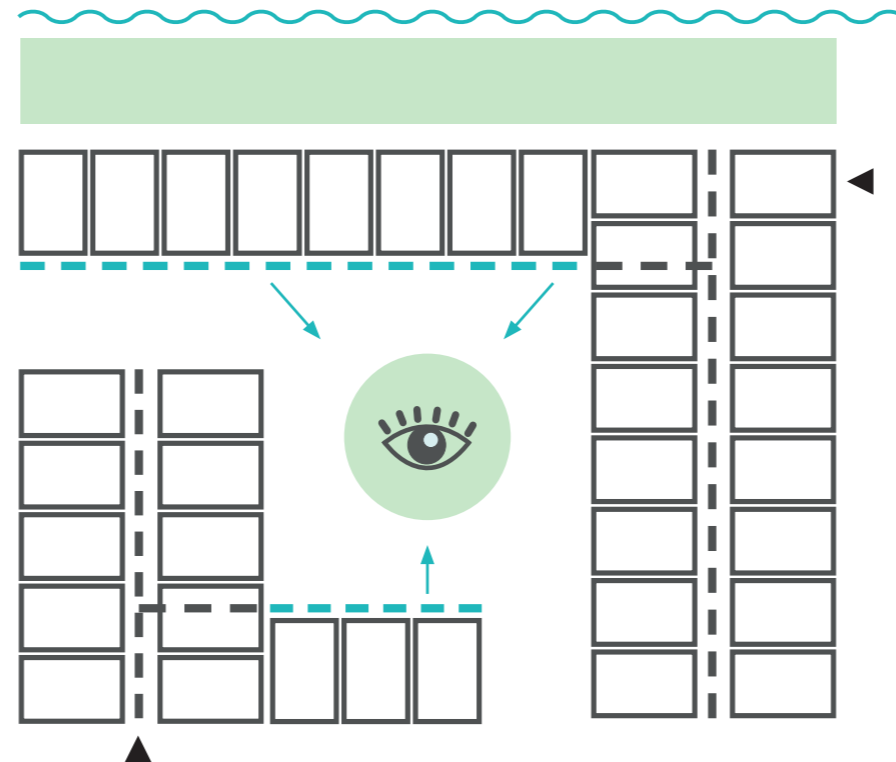
Always light and a view from the corridor



- All dwellings have a sunny side for a balcony
- Open corridors offering light, a view and orientation

Organisation of the block

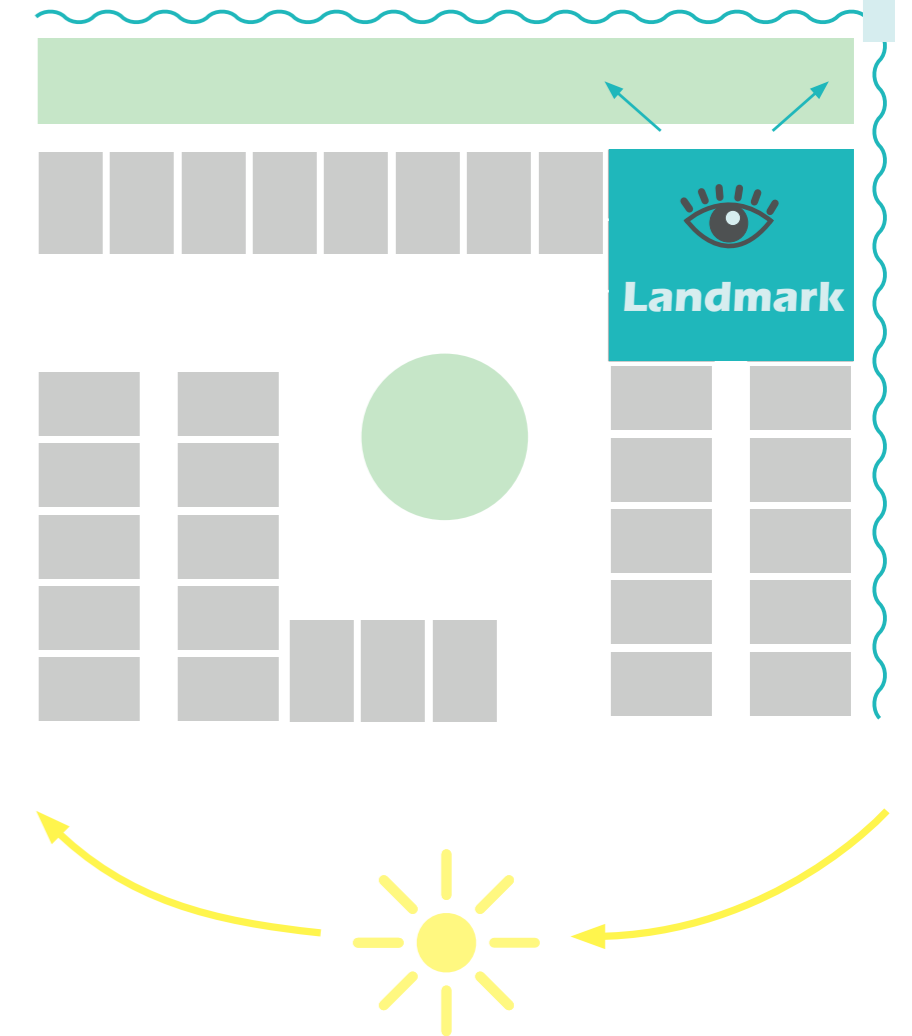
View on the water and on the inner square



- Two main entrances to enter the two different buildings
- Combination of gallery and corridor typology
- A view on the inner square from the galleries
- Much apartments having a view on the inner square

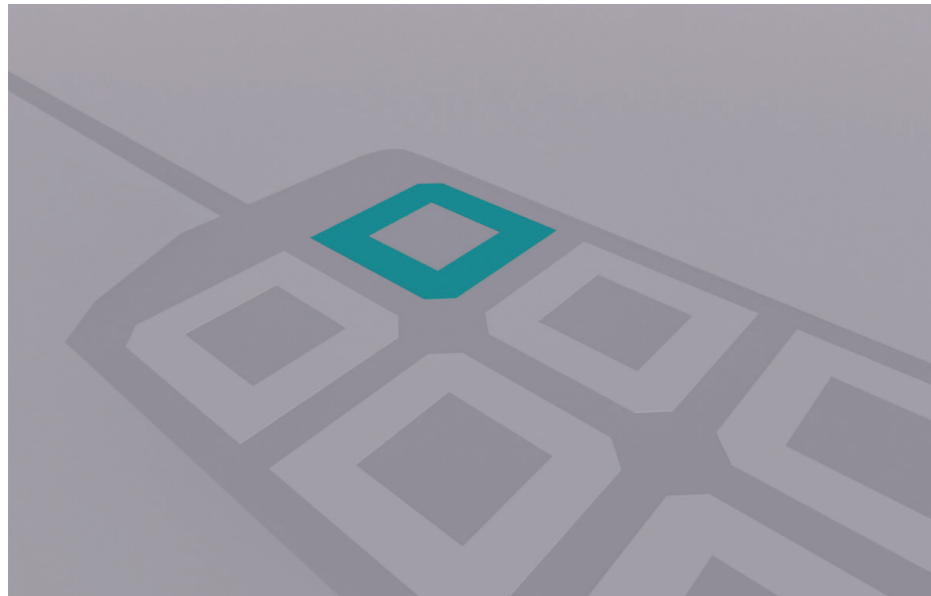
High density and landmark

Position by sun orientation and view

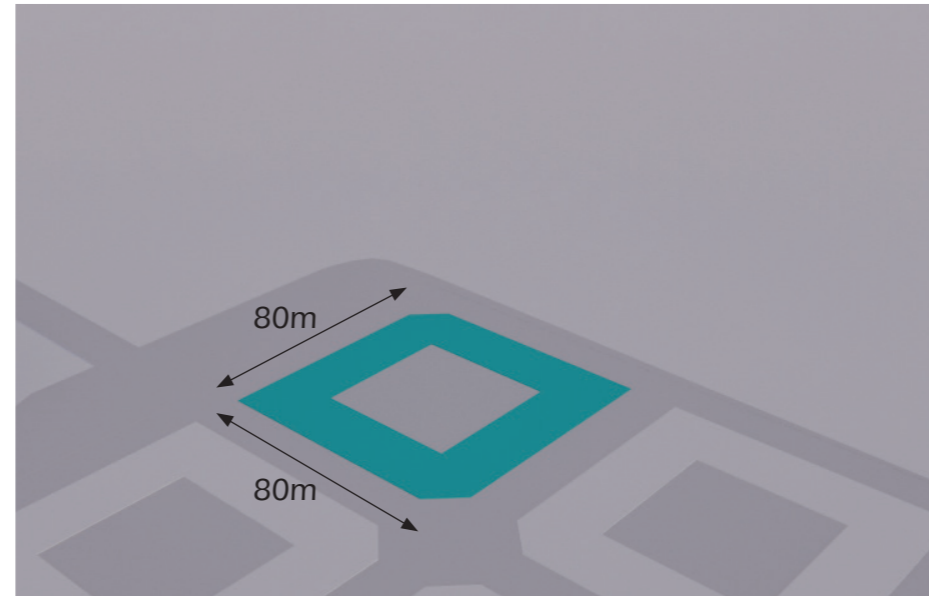


- All apartments in the tower have a view on the water or the inner square
- Barely shadow of the tower in the inner square
- Landmark is visible from the water sides and the bridge
- Sun light in the inner square thanks to lower buildings on the south and west side

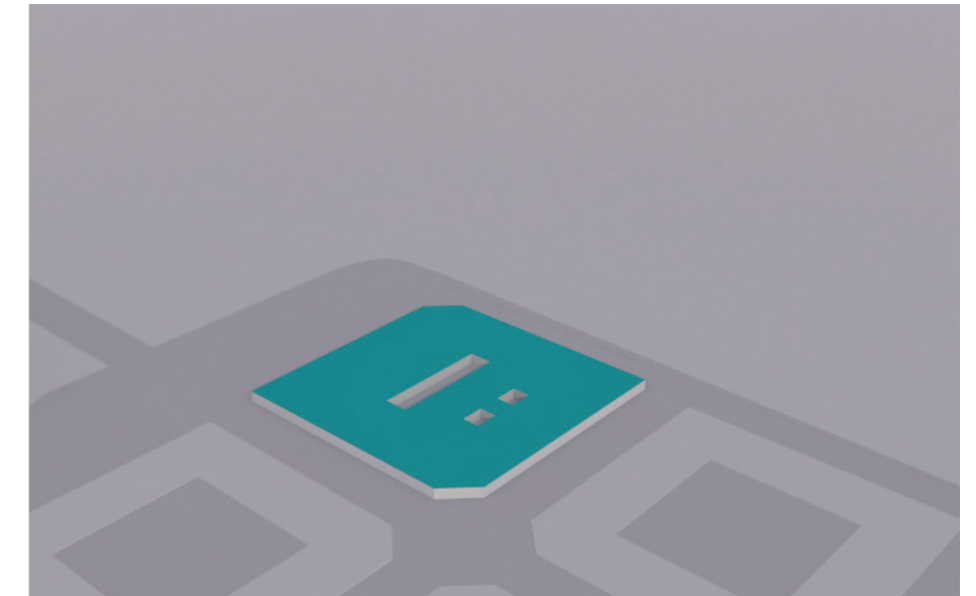




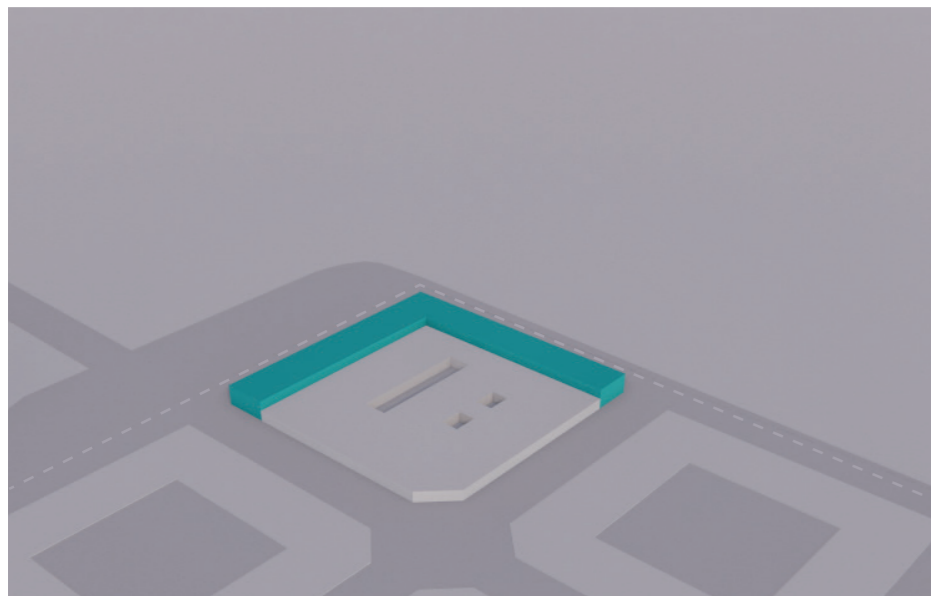
1. Position of the block



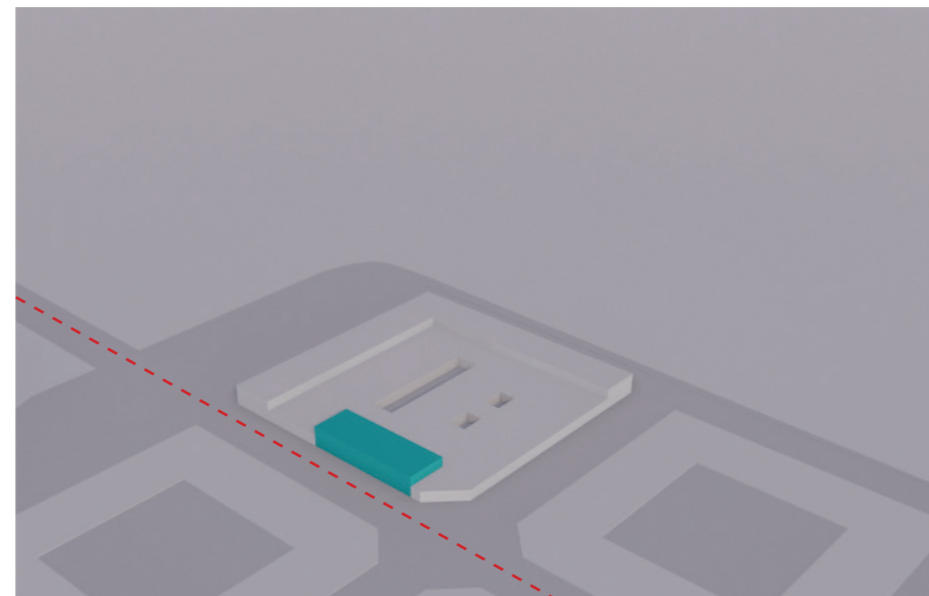
2. Dimensions



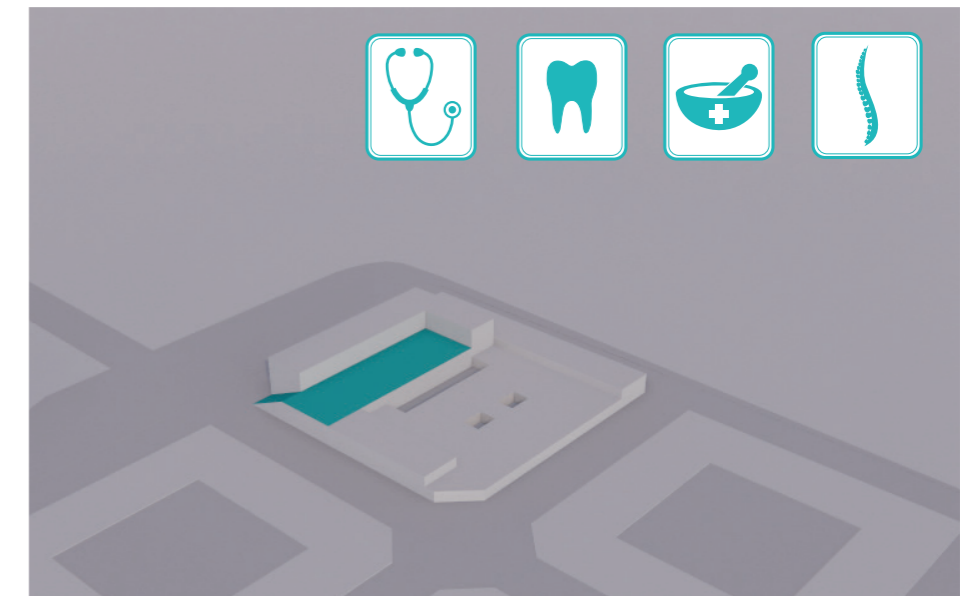
3. Raised floor for parking and storage with openings for daylight



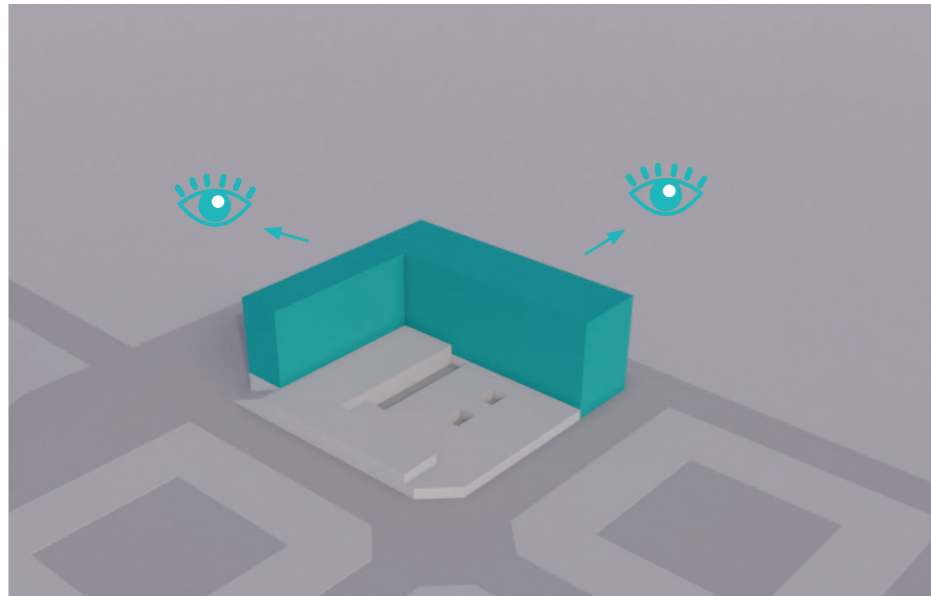
4. Fitness centre and shops at the side of the street



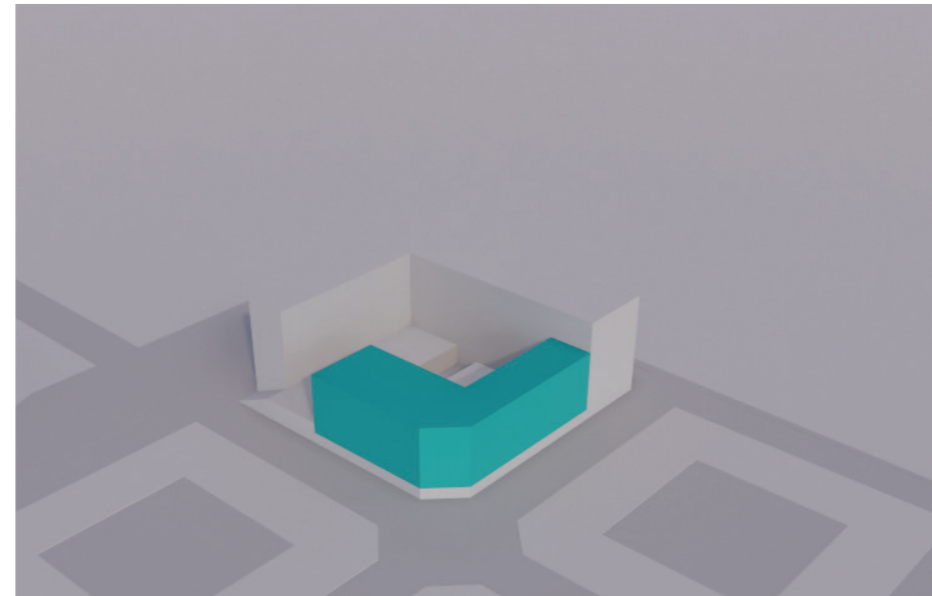
5. Bike storage at the side of the cycling route



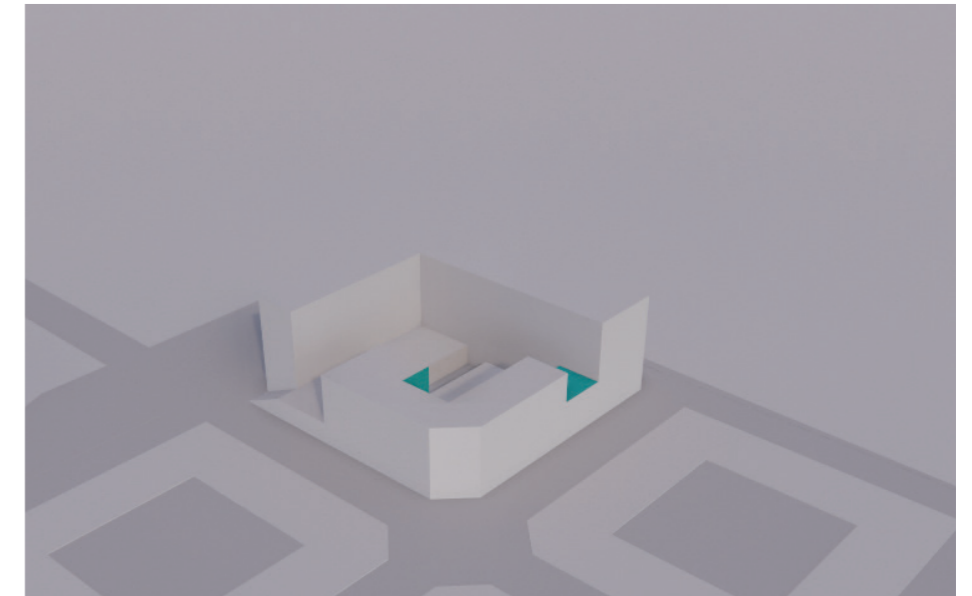
6. "Public Health Square" surrounded by medical facilities and fitness centre



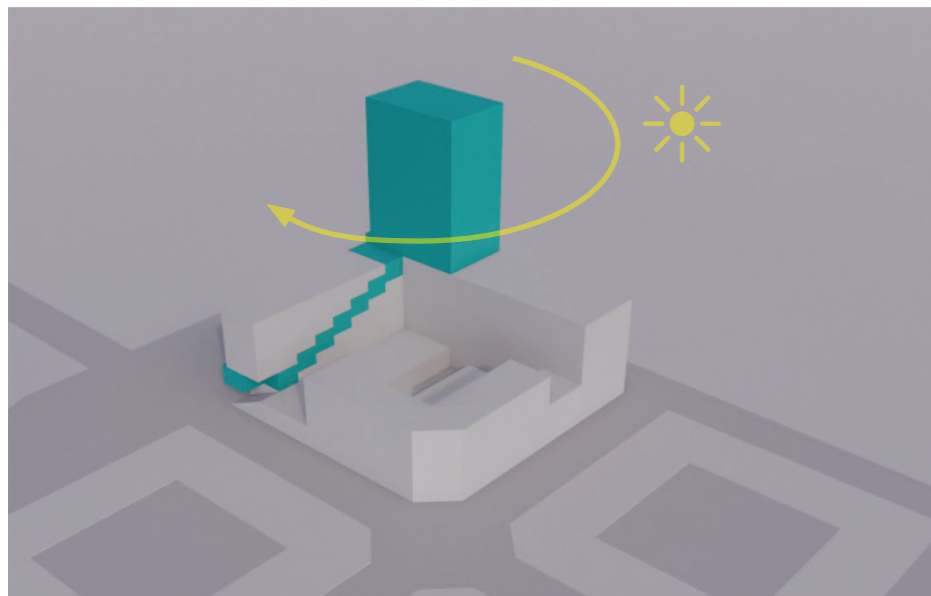
7. High rise buildings at the water side



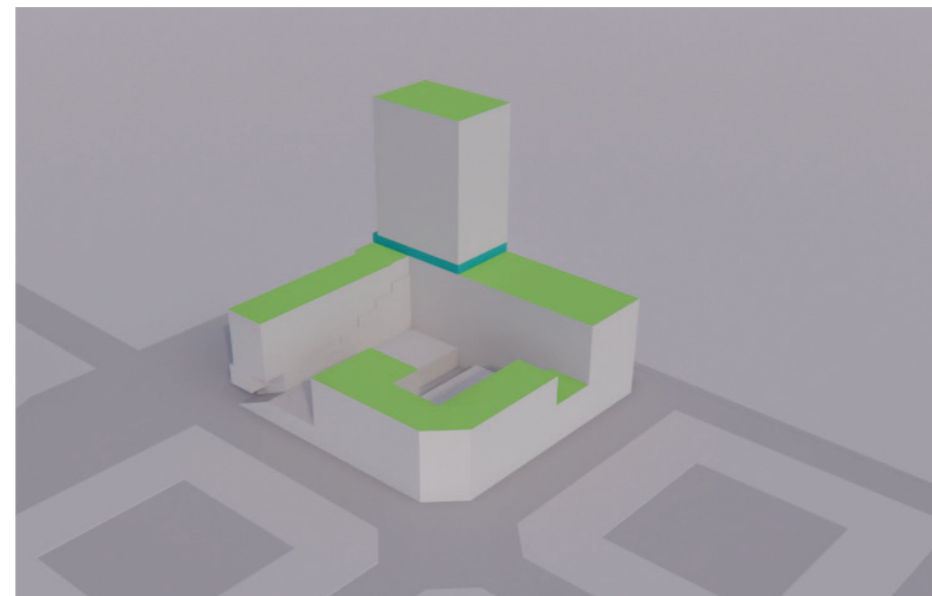
8. Middle high rise buildings at the inner streets



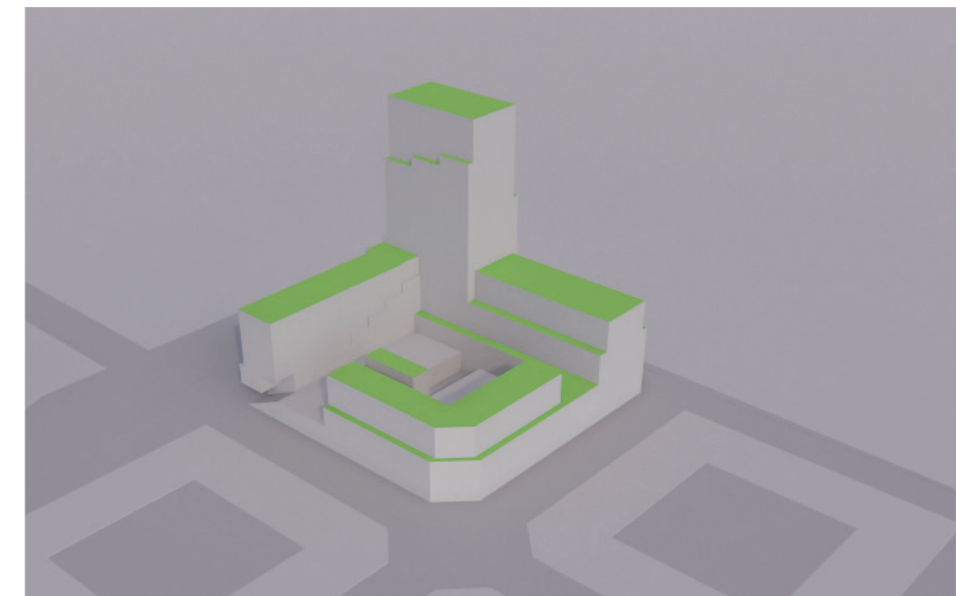
9. Openings between the blocks



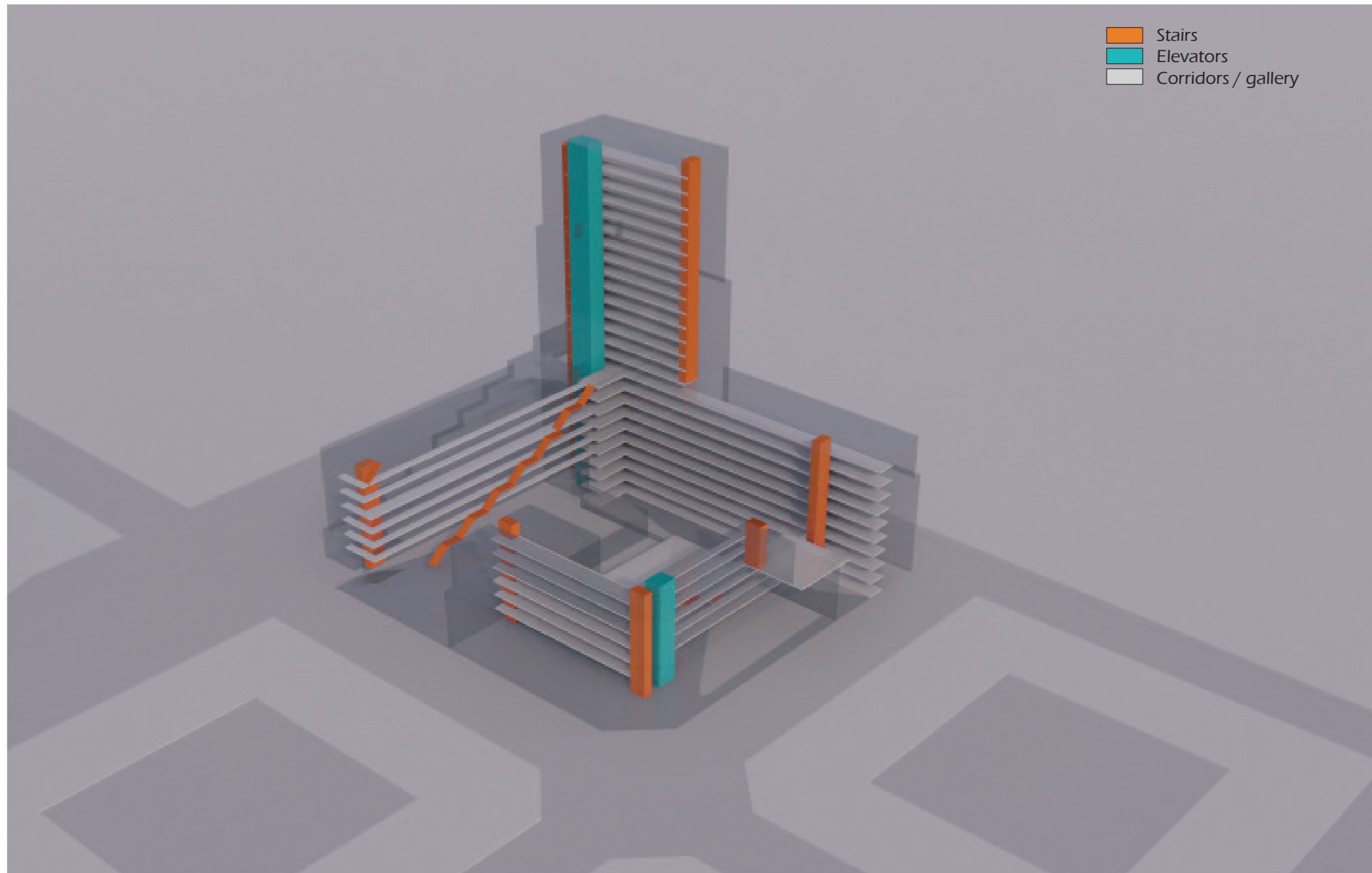
10. Landmark



11. Green roofs and sky restaurant in the middle



12. Setbacks with green





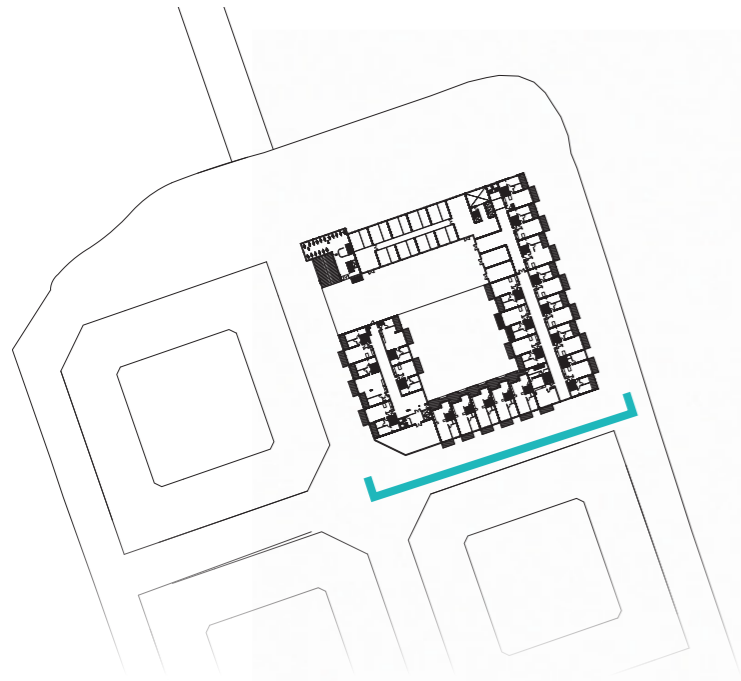
Elevation north façade



Elevation east façade



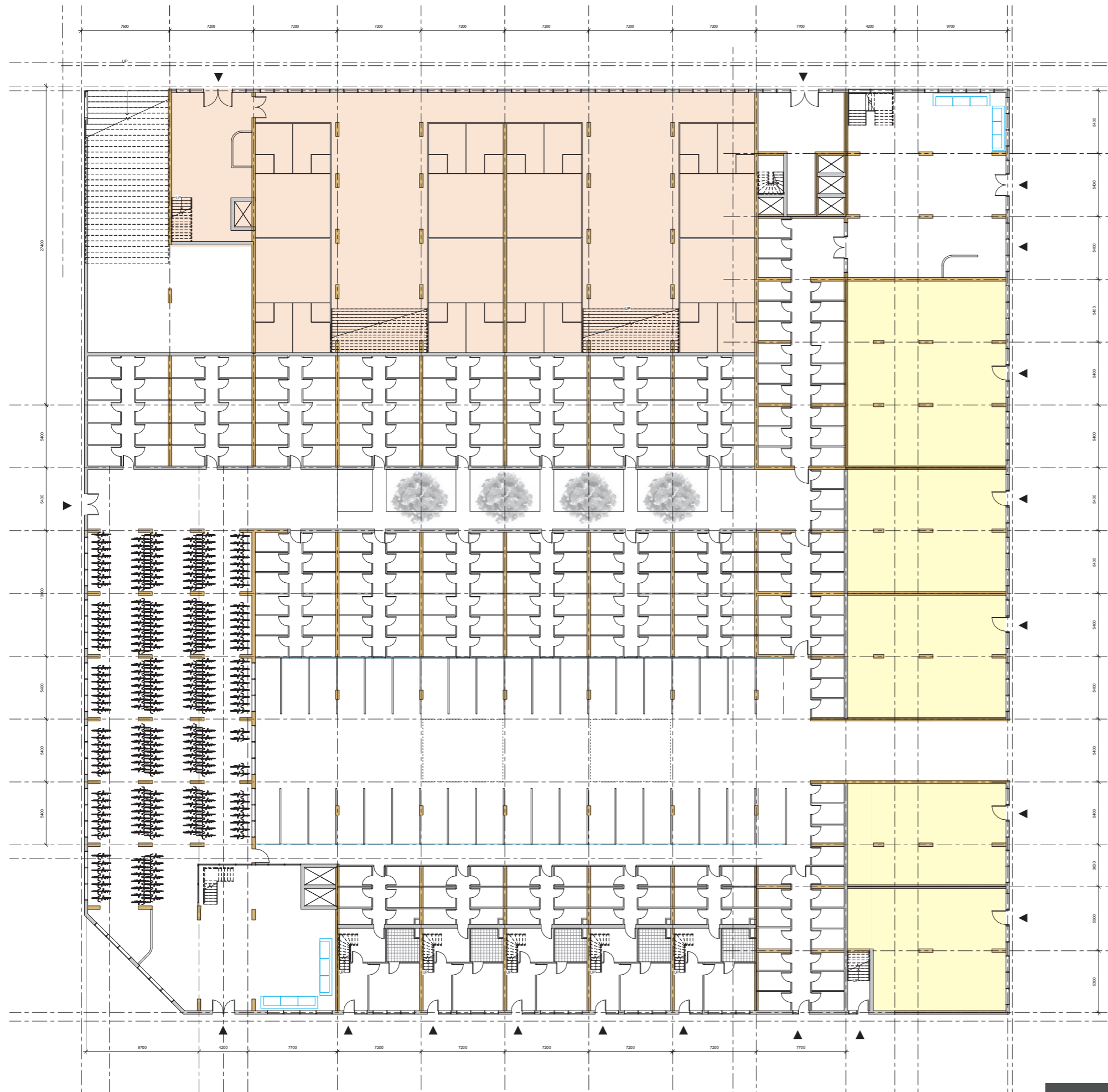
Elevation south façade



Elevation west façade



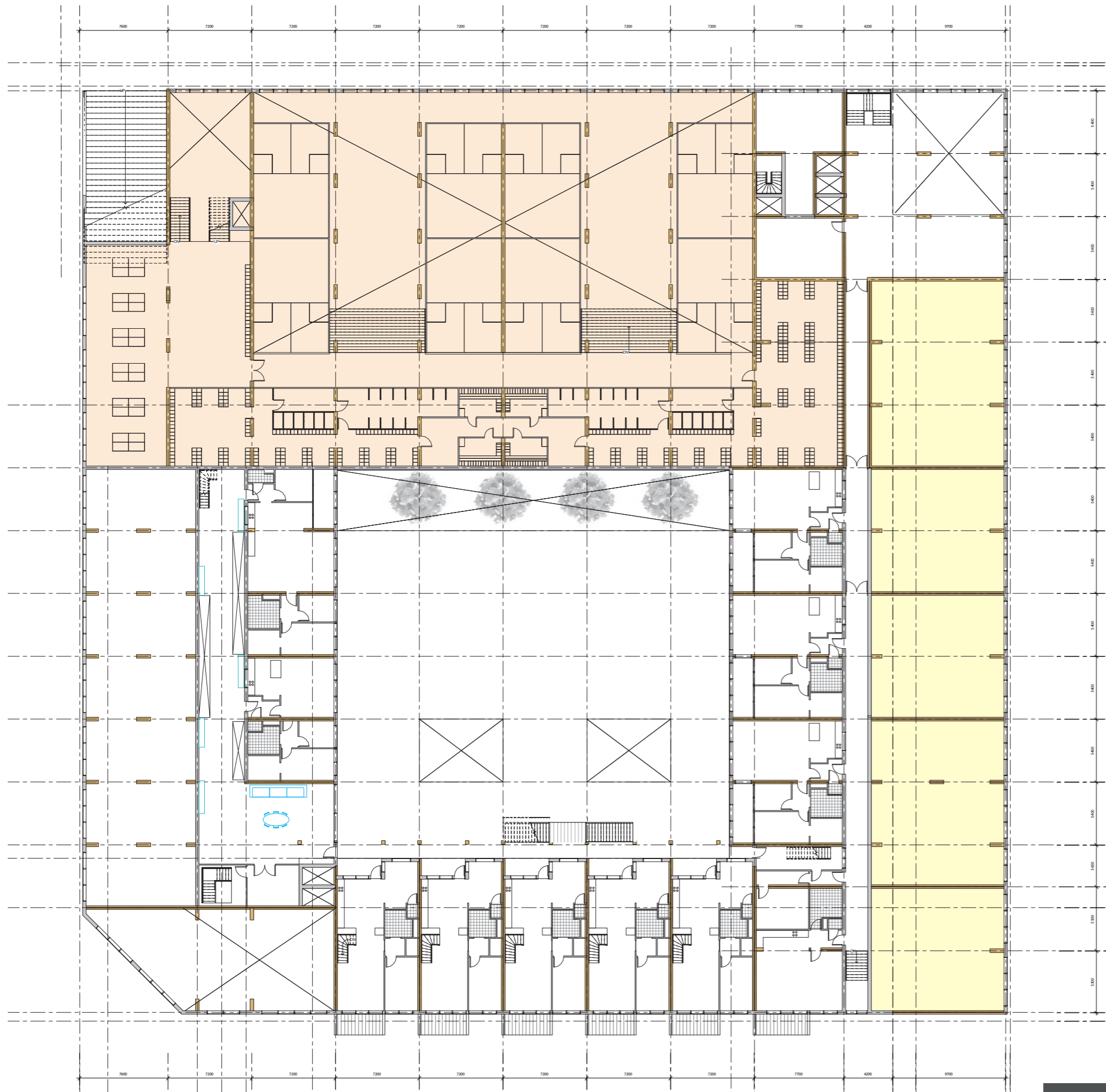
Floorplan street level - 1:400



- Shops
- Sports centre (squash)



Floorplan inner square level - 1:400



- Shops
- Sports centre



Floorplan 1st floor - 1:400



- Sports centre
- Medical facilities



Floorplan 2nd floor - 1:400



- Sports centre
- Medical facilities



Floorplan 3rd floor - 1:400



Sports centre

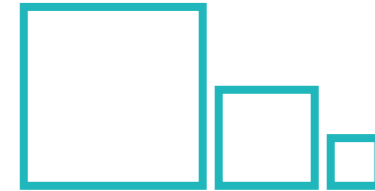


Floorplan 4th floor - 1:400



 Sports centre

Collective space and interaction on different scales



Direct neighbours

Dwellings connected to a shared corridor



People living on the same floor

Open space for all dwellings on the corridor



People living in the same building

Central inner square for the inhabitants

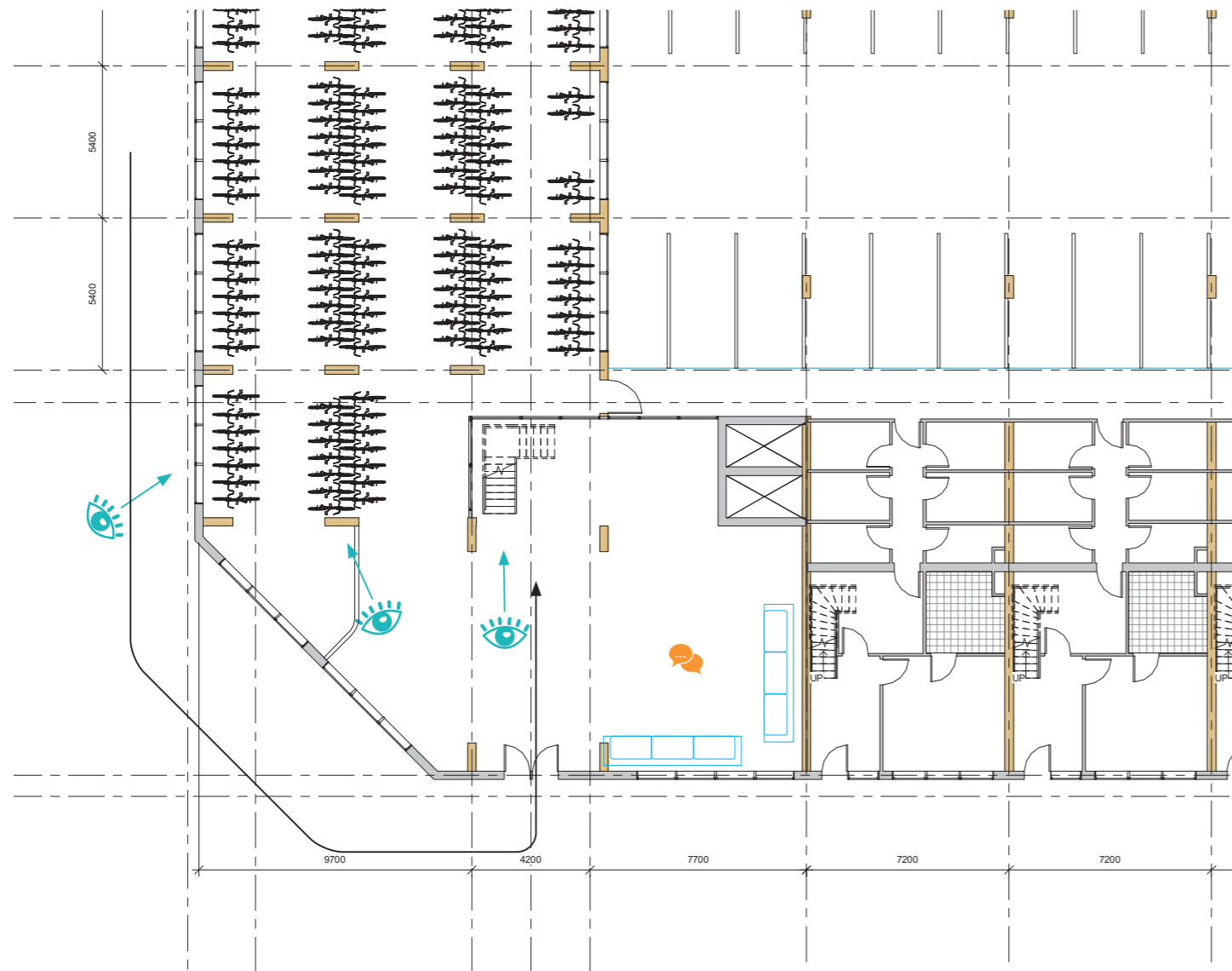
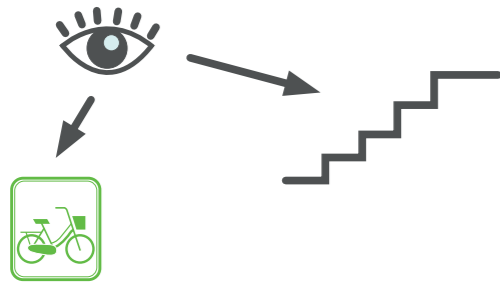


Stimulate people to use the stairs

The bikes are visible when entering the building.

Make activity visible

In order to stimulate movement



The stairs are visible for people walking (from each direction) to the elevator or waiting in front of the elevators. The visibility could be a trigger for them to use the stairs and stay physically active.

De stairs are designed as 'lazy stairs' and thanks to the direction of the routing, the view on the skyline can be enjoyed during this walk, whether people go up or down.

From the meeting place, the skyline and the stairs are visible as well, making the meeting place a pleasant and light place.

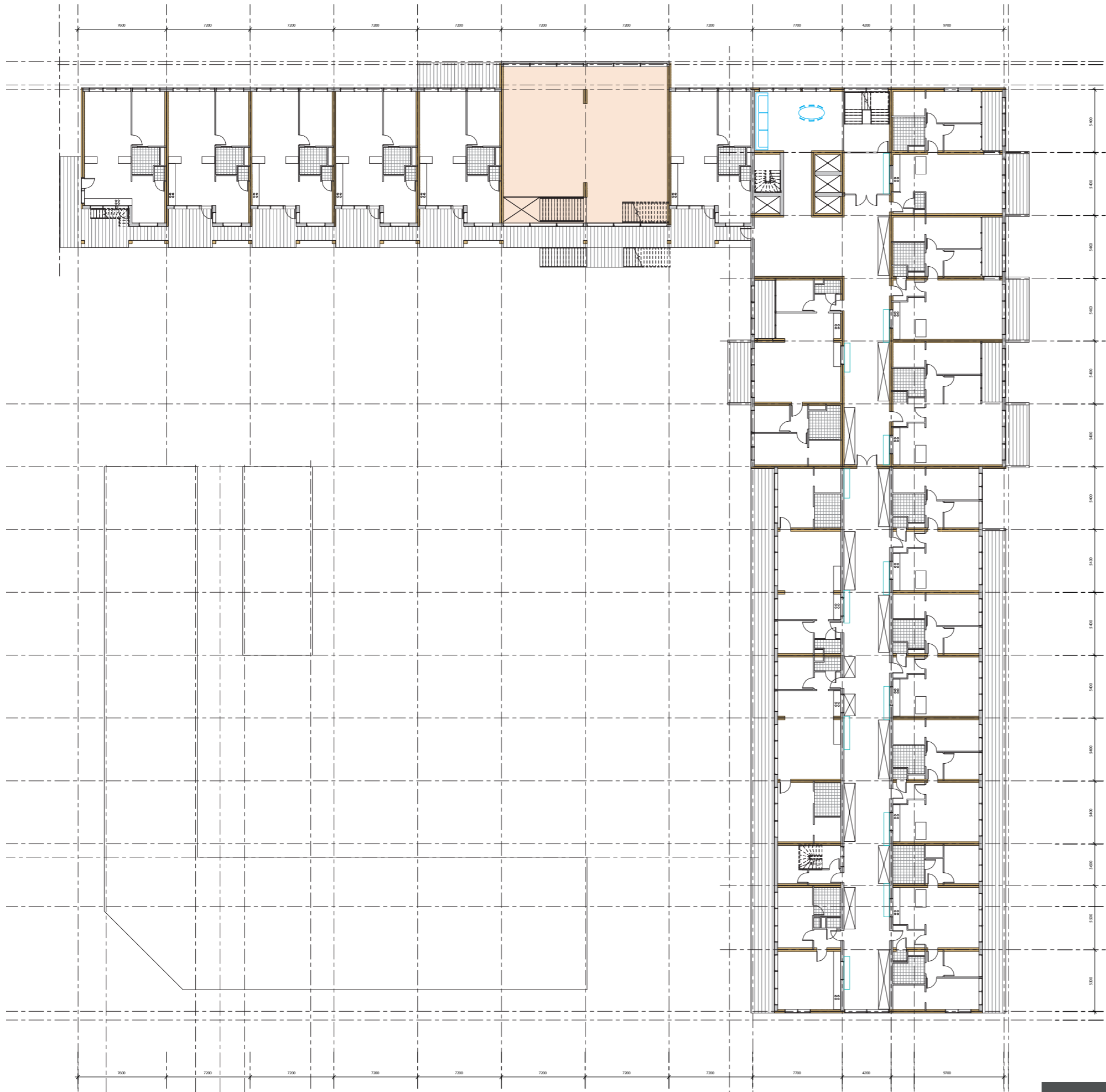


Floorplan 5th floor - 1:400



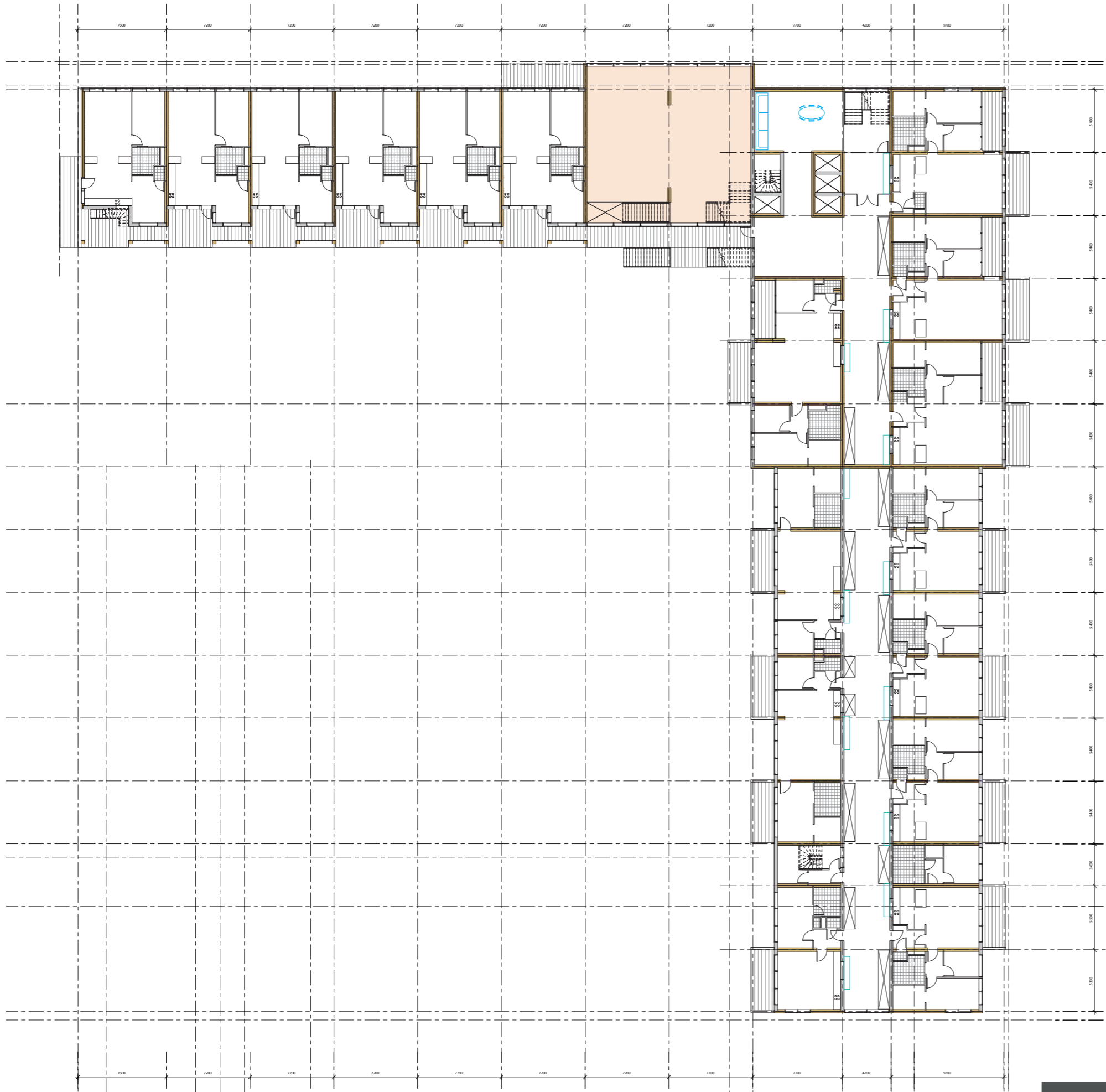
Sports centre

Floorplan 6th floor - 1:400

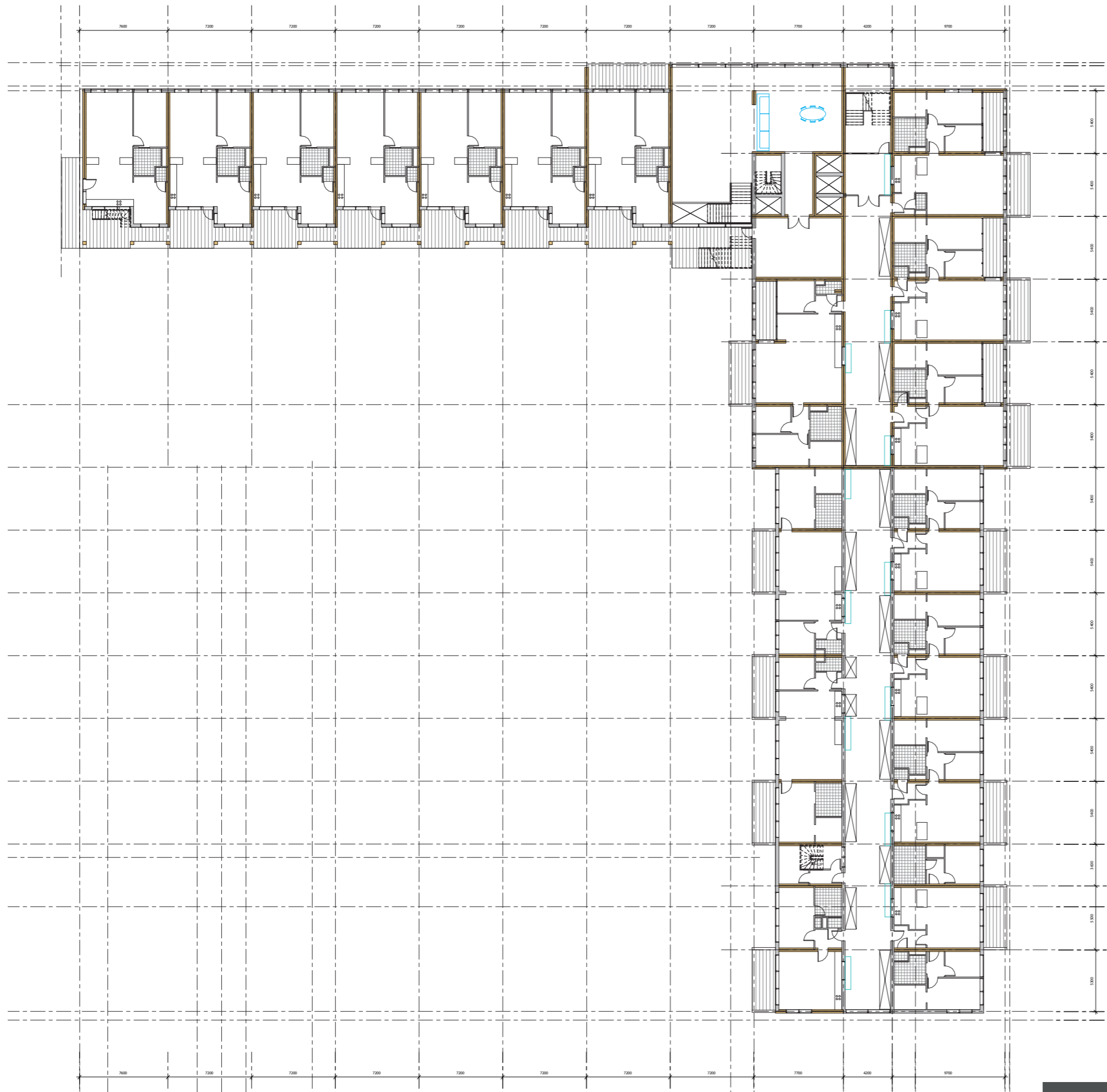


Sports centre

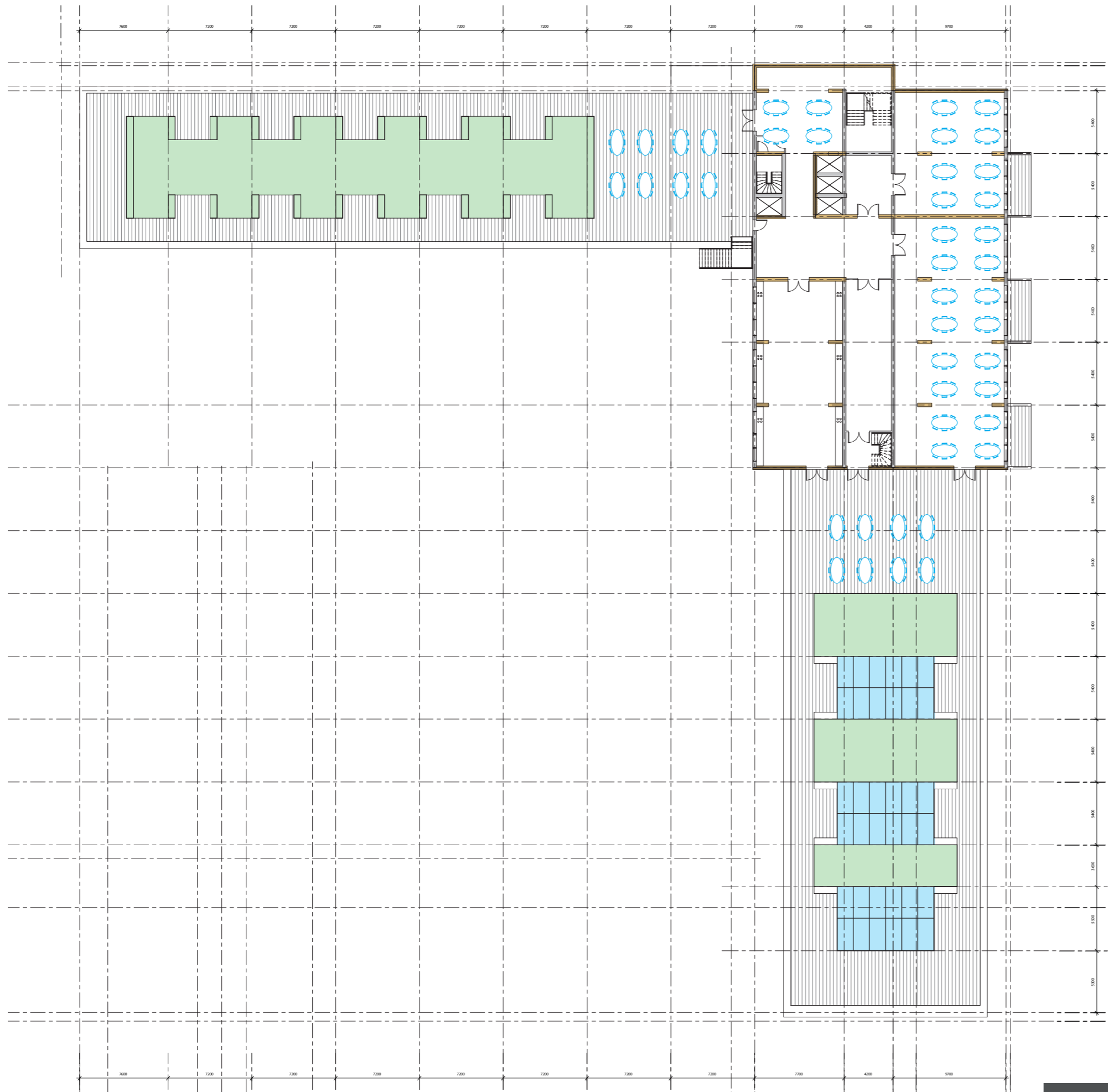
Floorplan 7th floor - 1:400

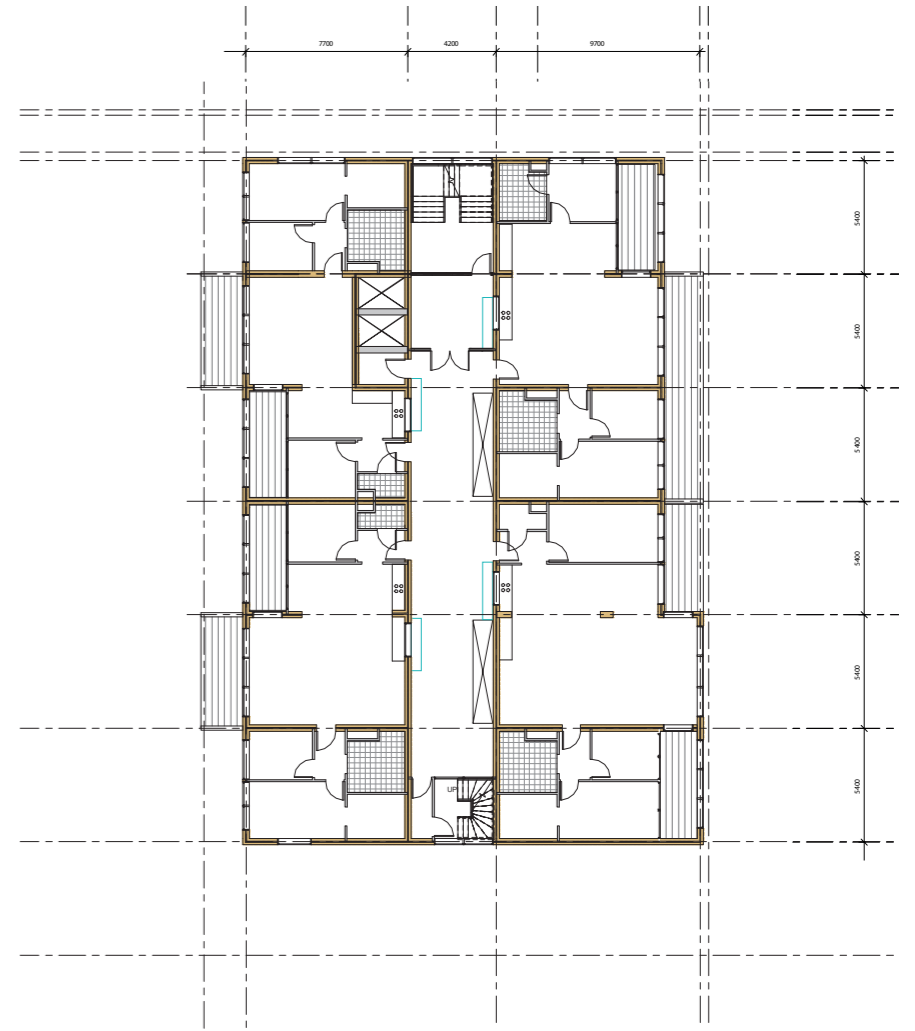
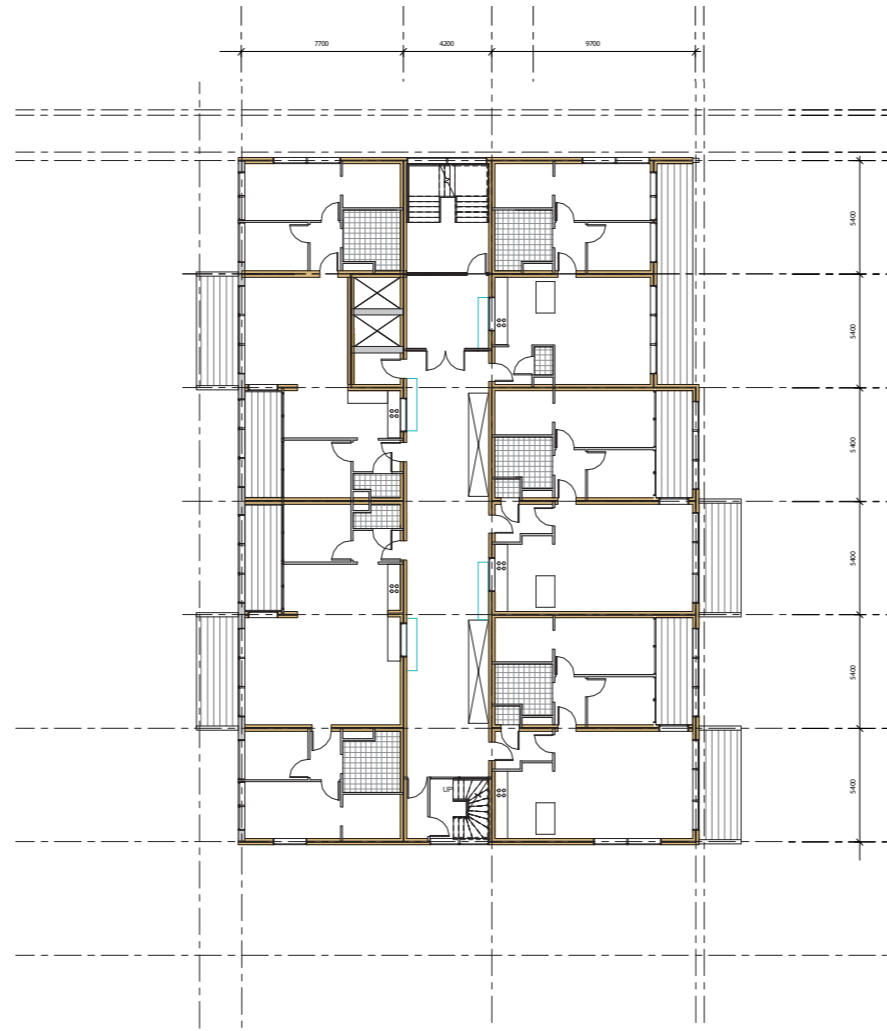
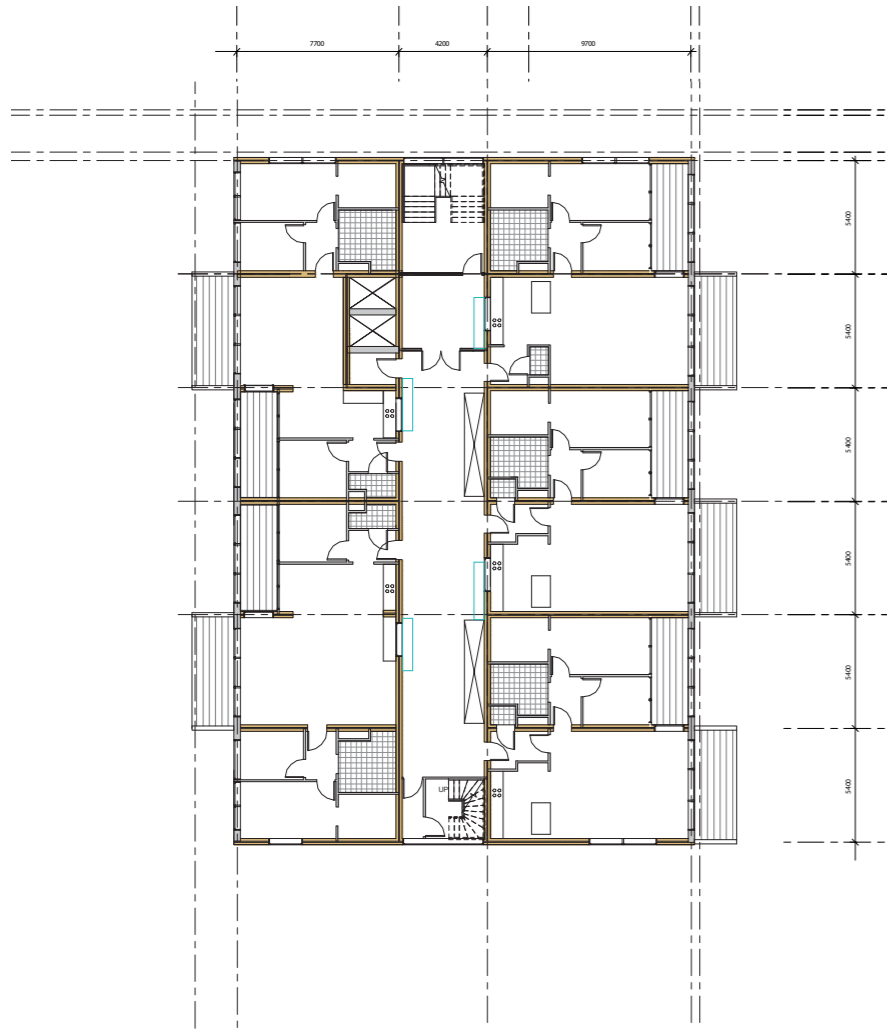


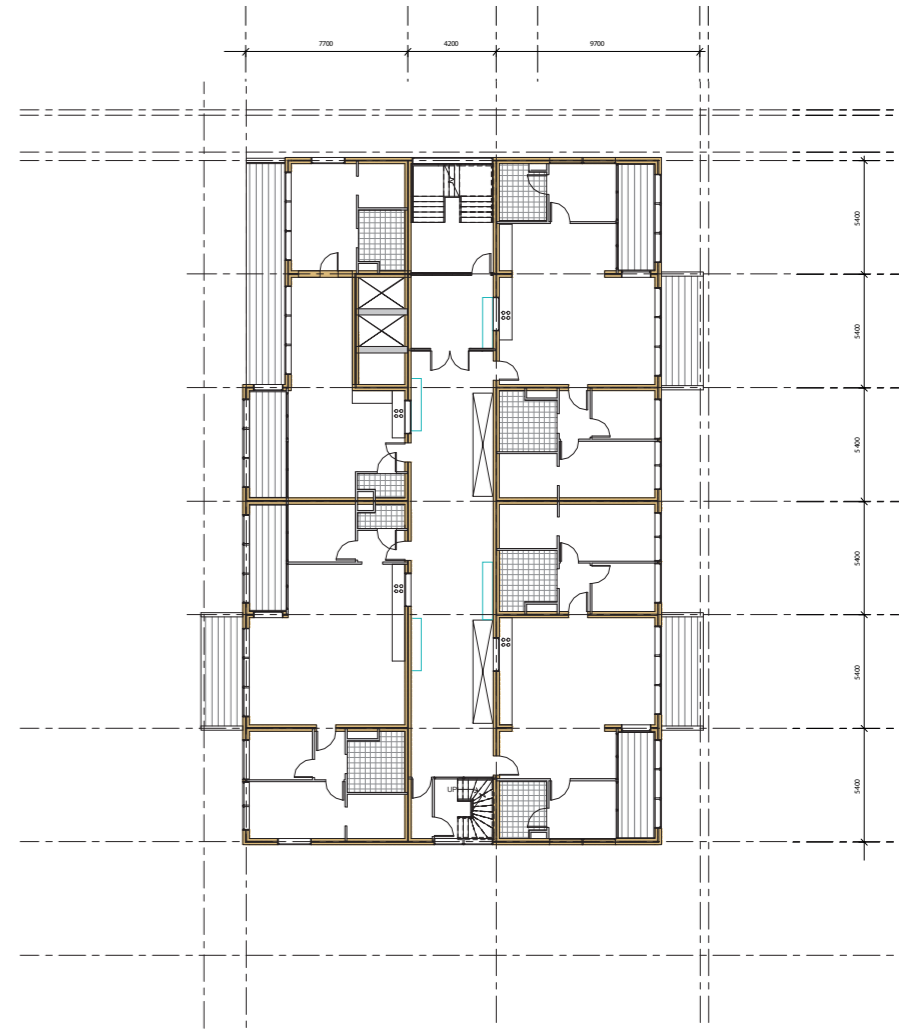
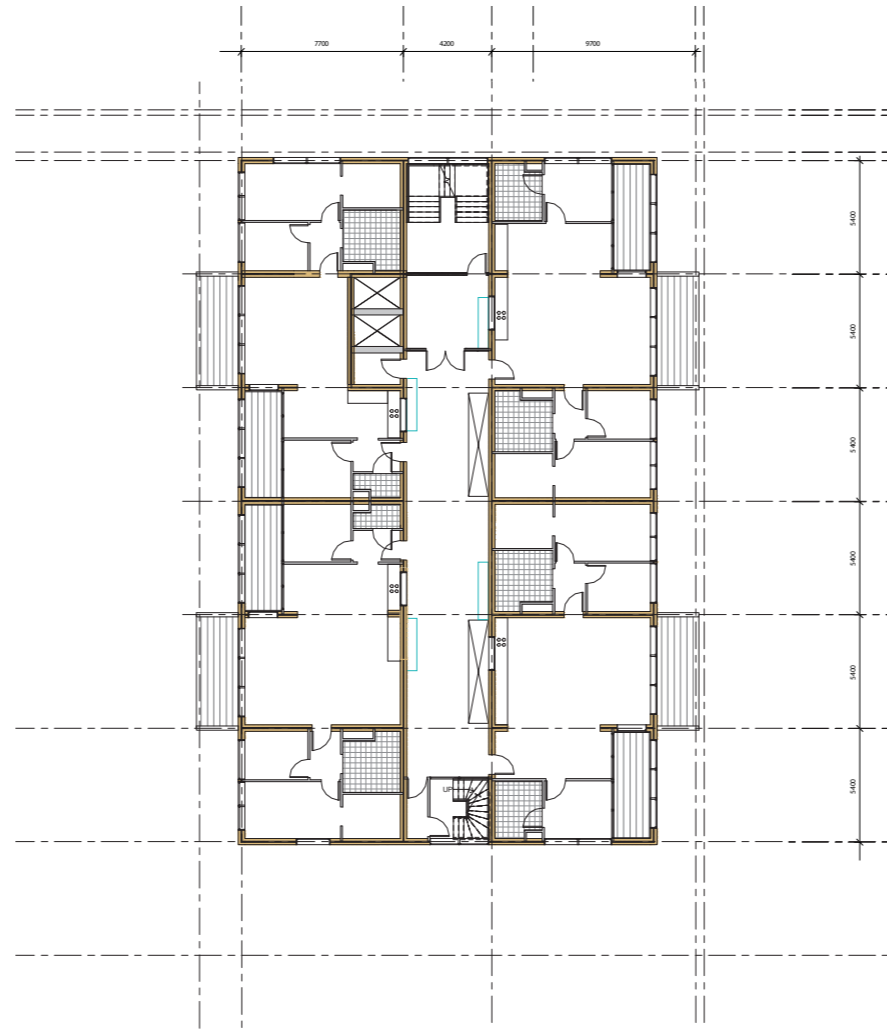
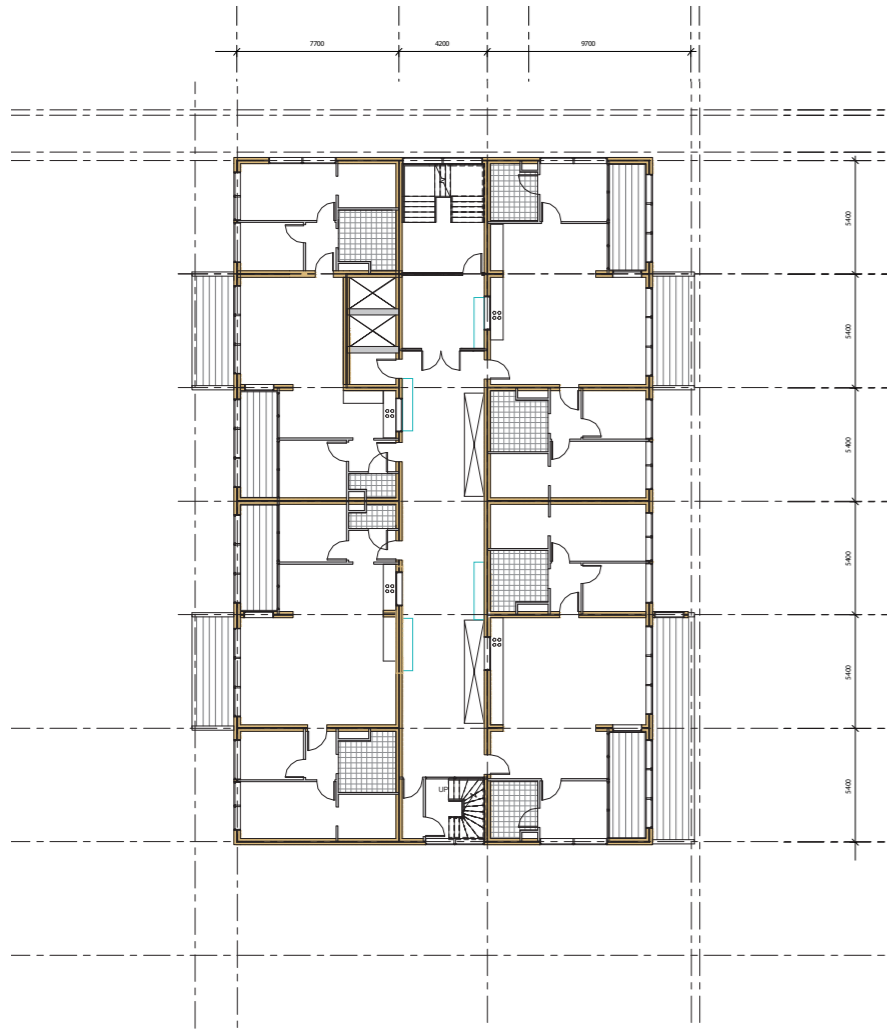
Sports centre

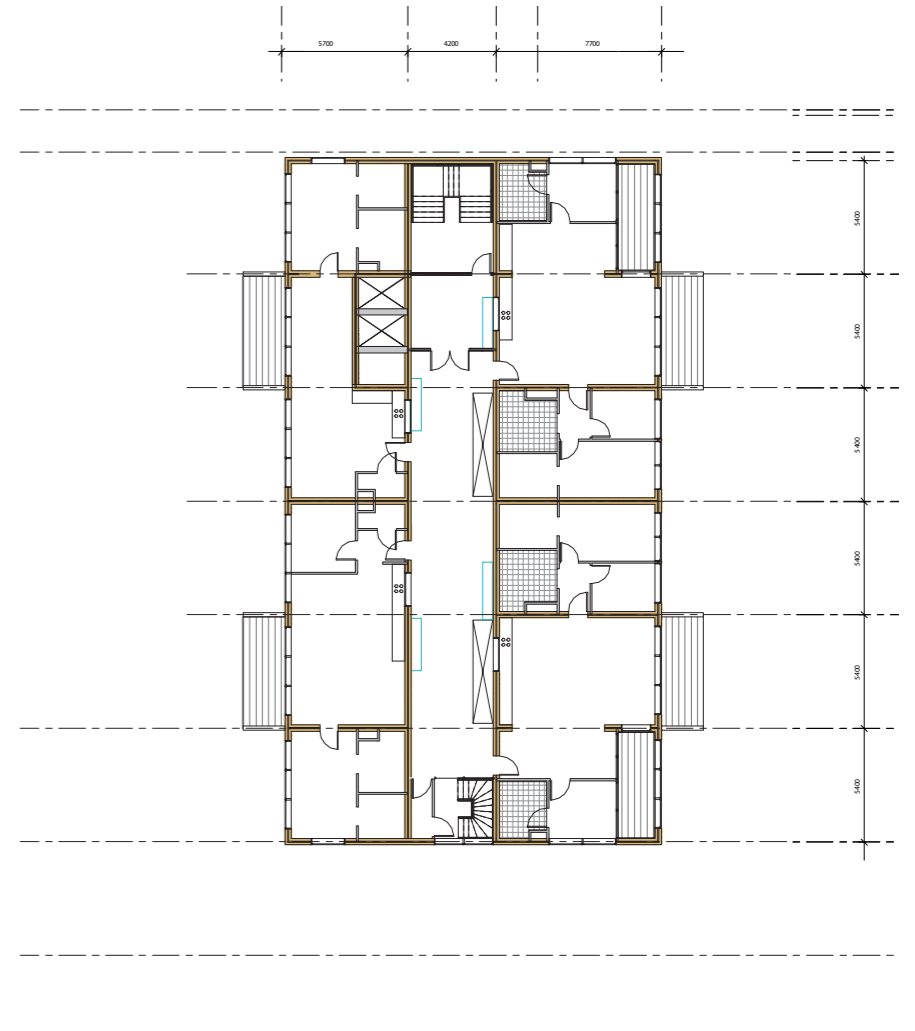
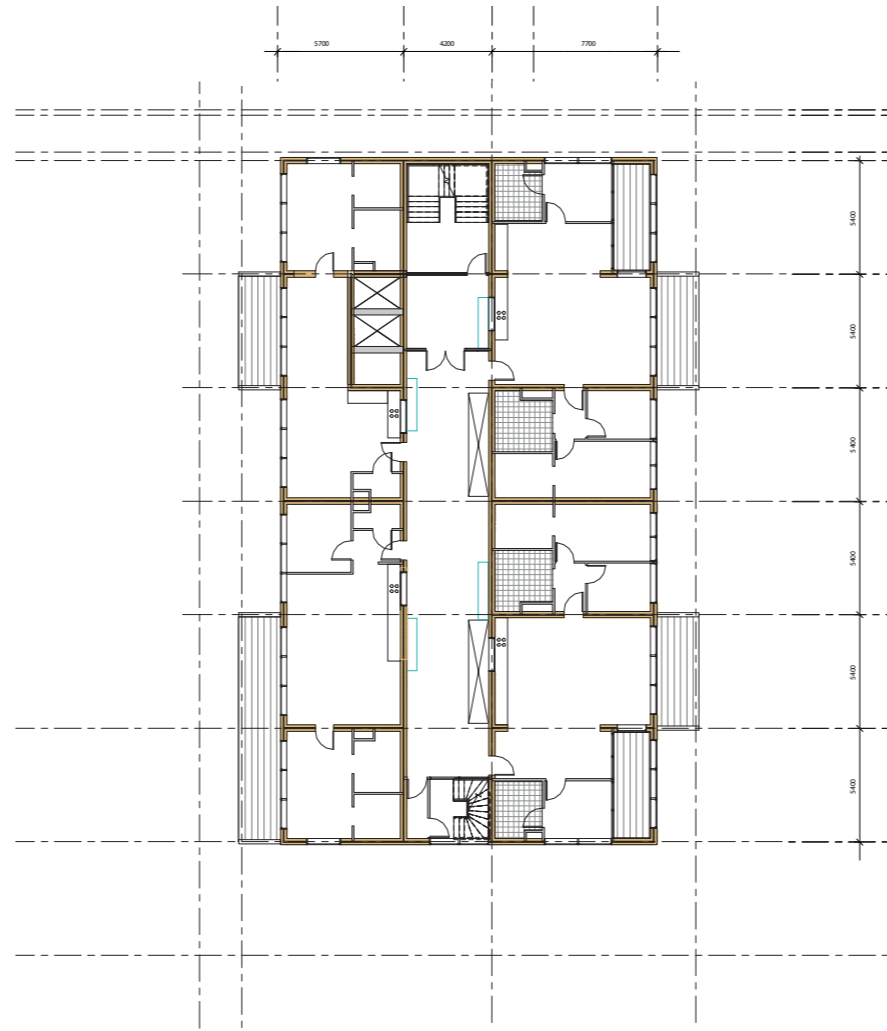
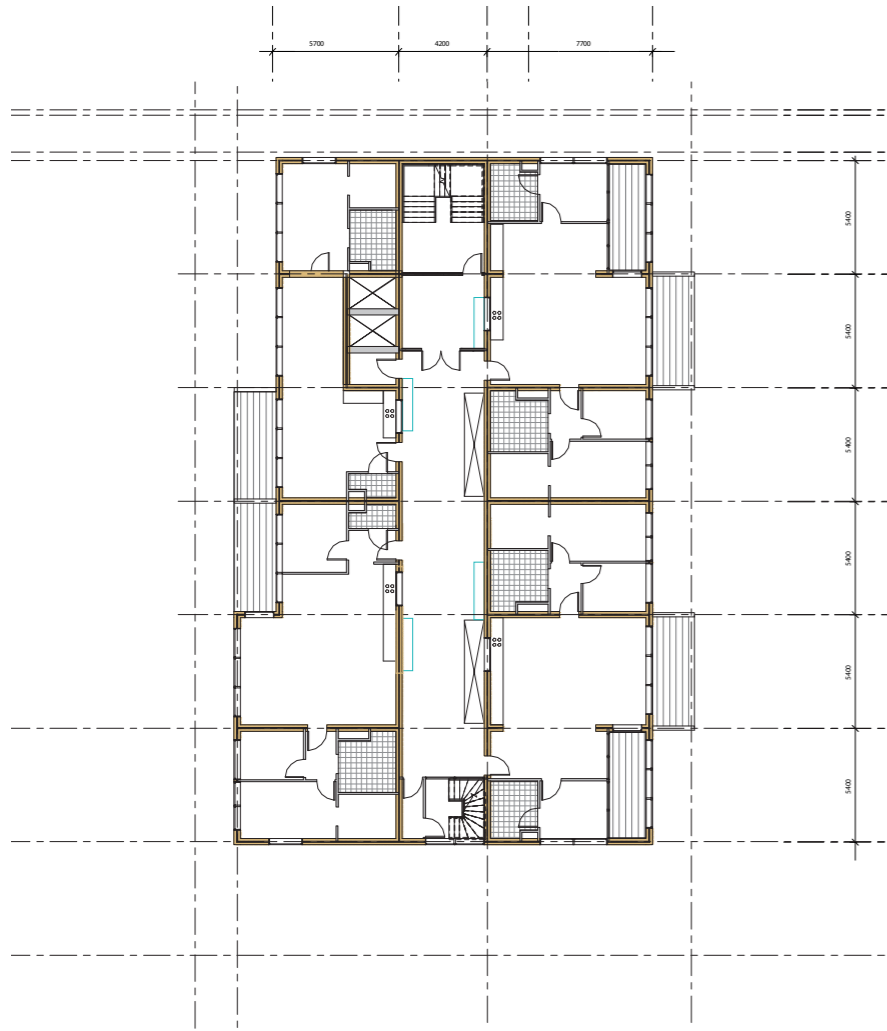


Floorplan 9th floor, self sufficient restaurant - 1:400



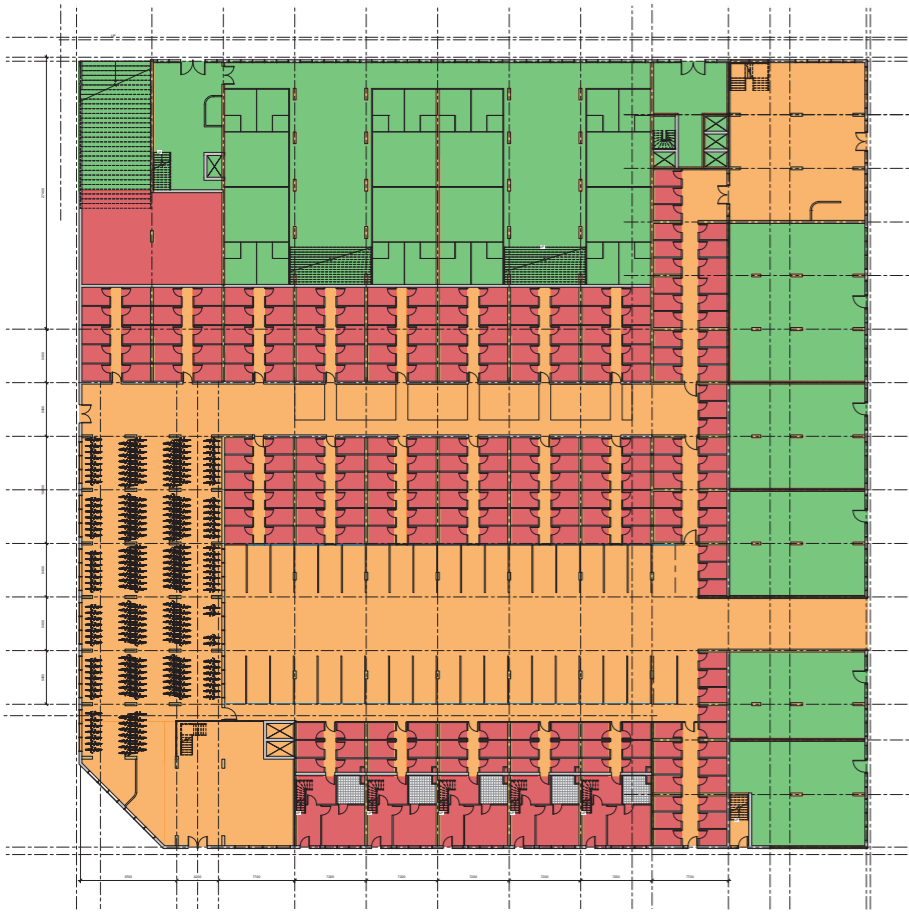




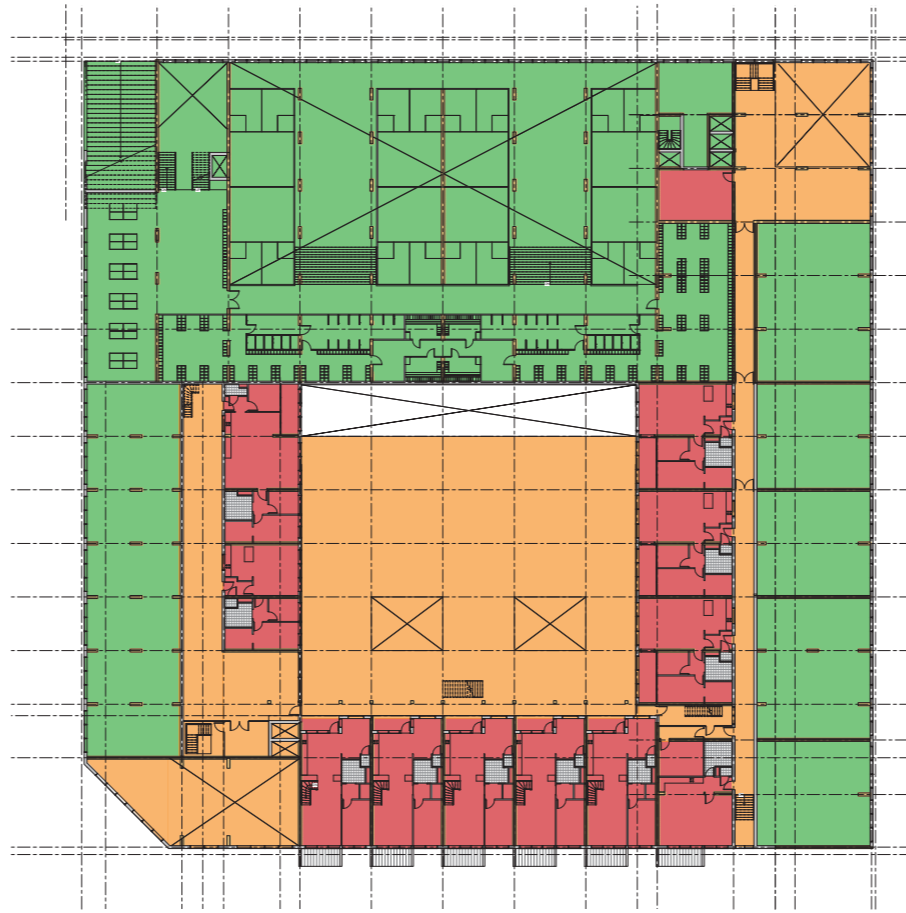


Public space, collective space and private space

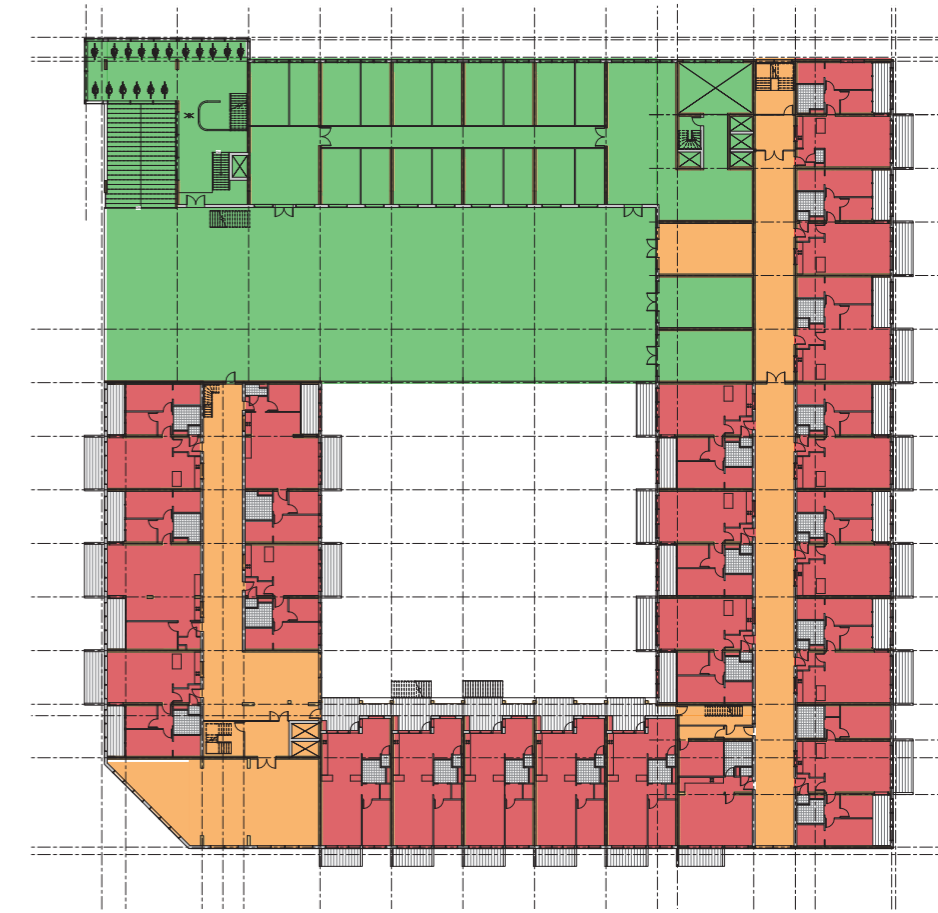
Floorplan street level







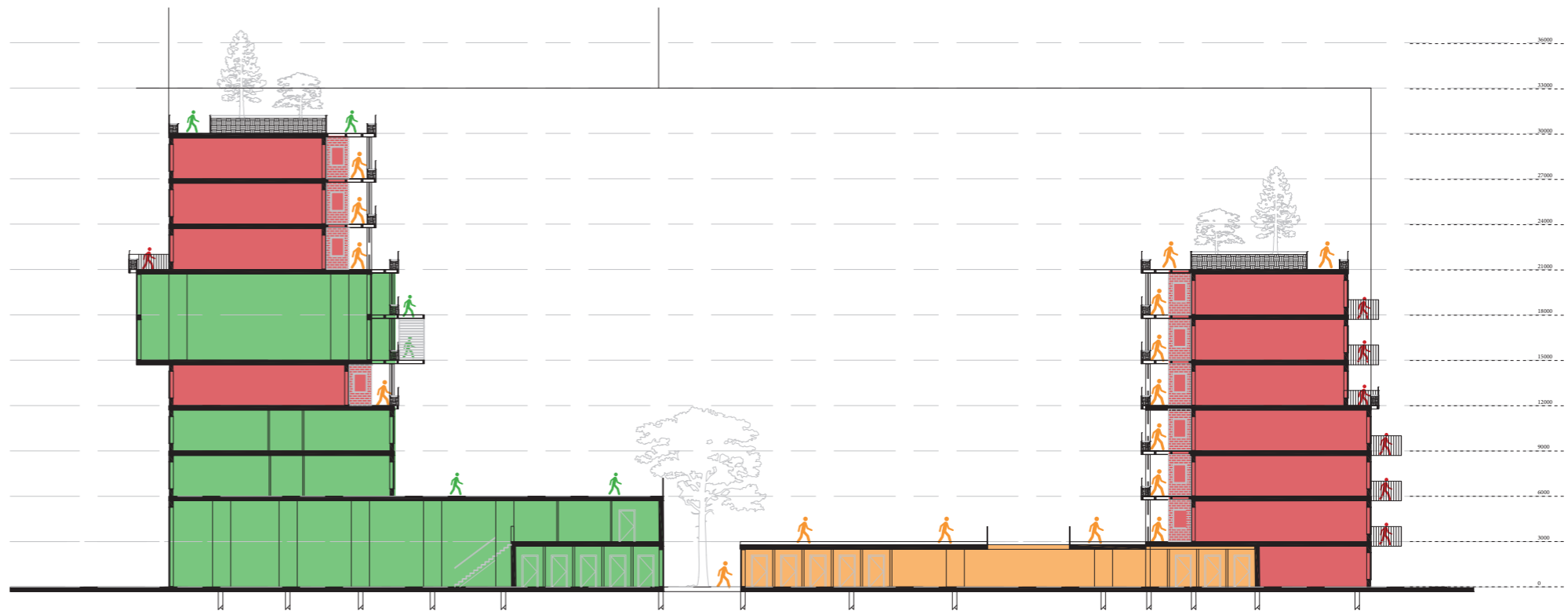
Floorplan inner square



Floorplan first floor



- Public space 
- Collective space 
- Private space 
- Outdoor space 



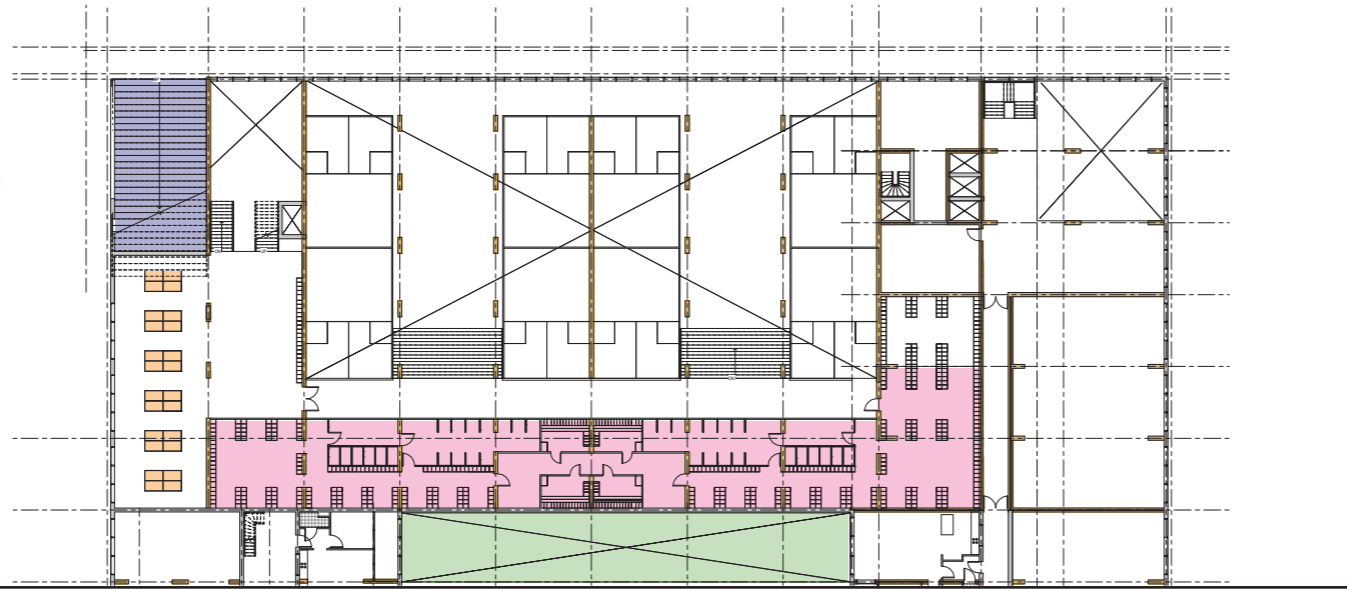
Organisation sports and movement centre

- ▼ Entrance
- Reception
- Squash
- ↓ Stairs to changing rooms
- Stairs to public health terrace



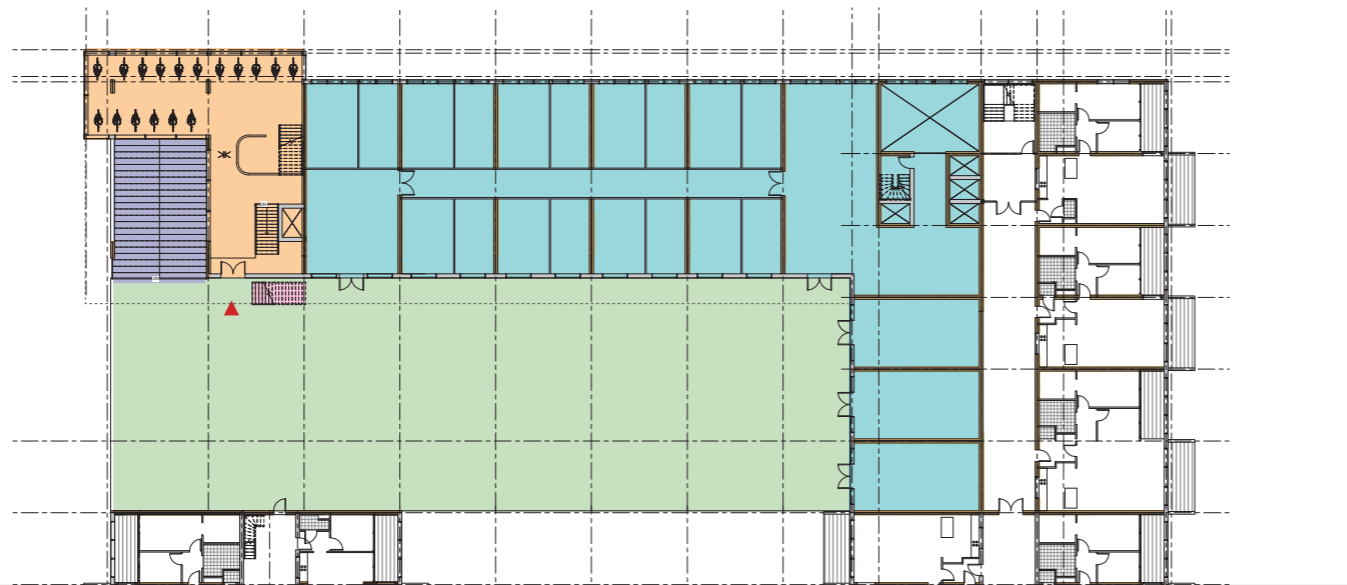
Street level

- Changing rooms
- Stairs to public health terrace
- Pingpong
- Void for trees



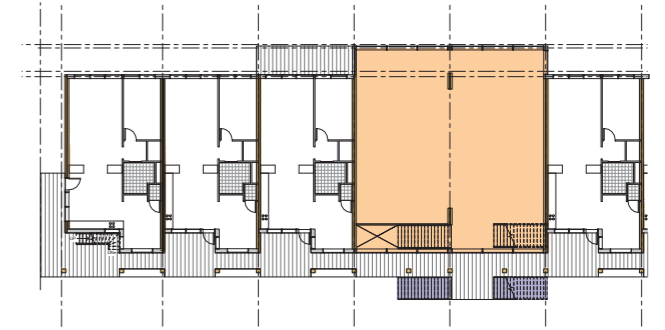
Inner square

- Fitness
- ▲ Entrance fitness
- Medical facilities
- Stairs to the restaurant and galleries
- Sports terrace

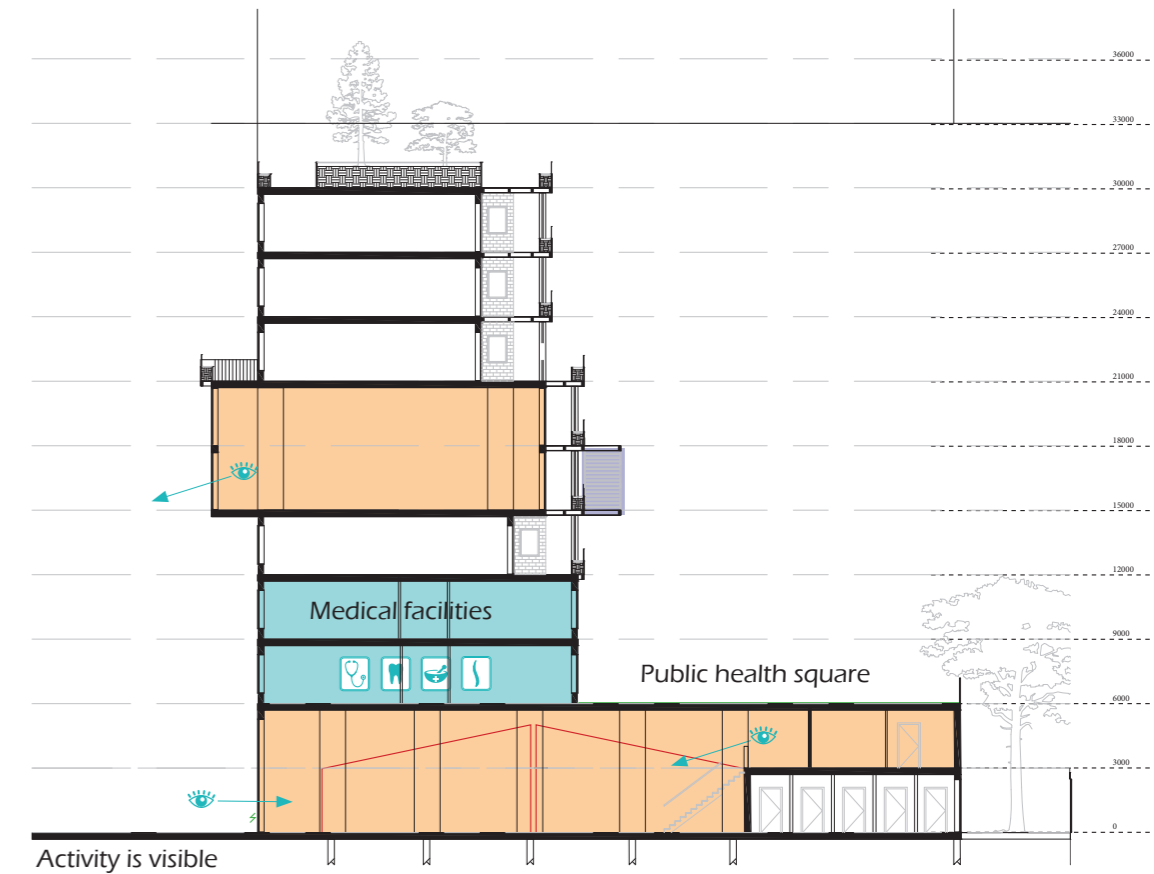


1st floor

- Fitness
- Stairs to the restaurant and dwellings

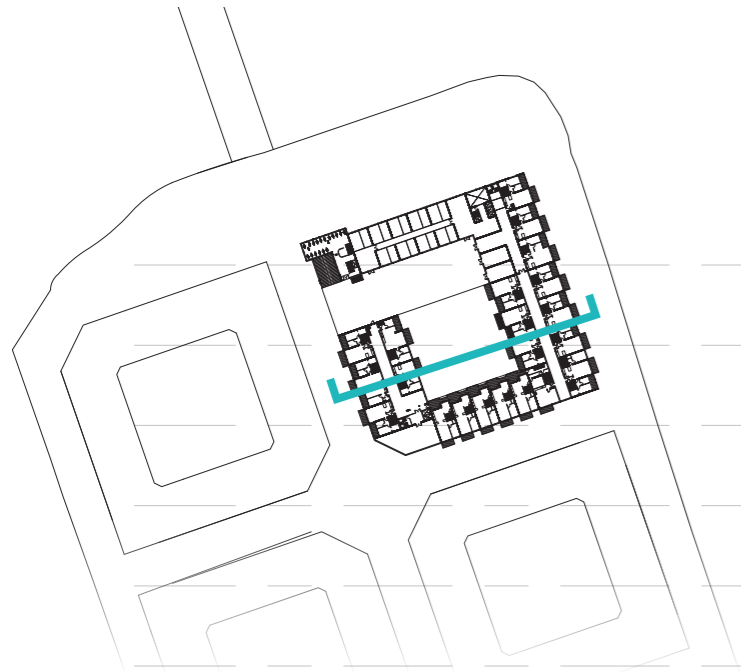


4th floor

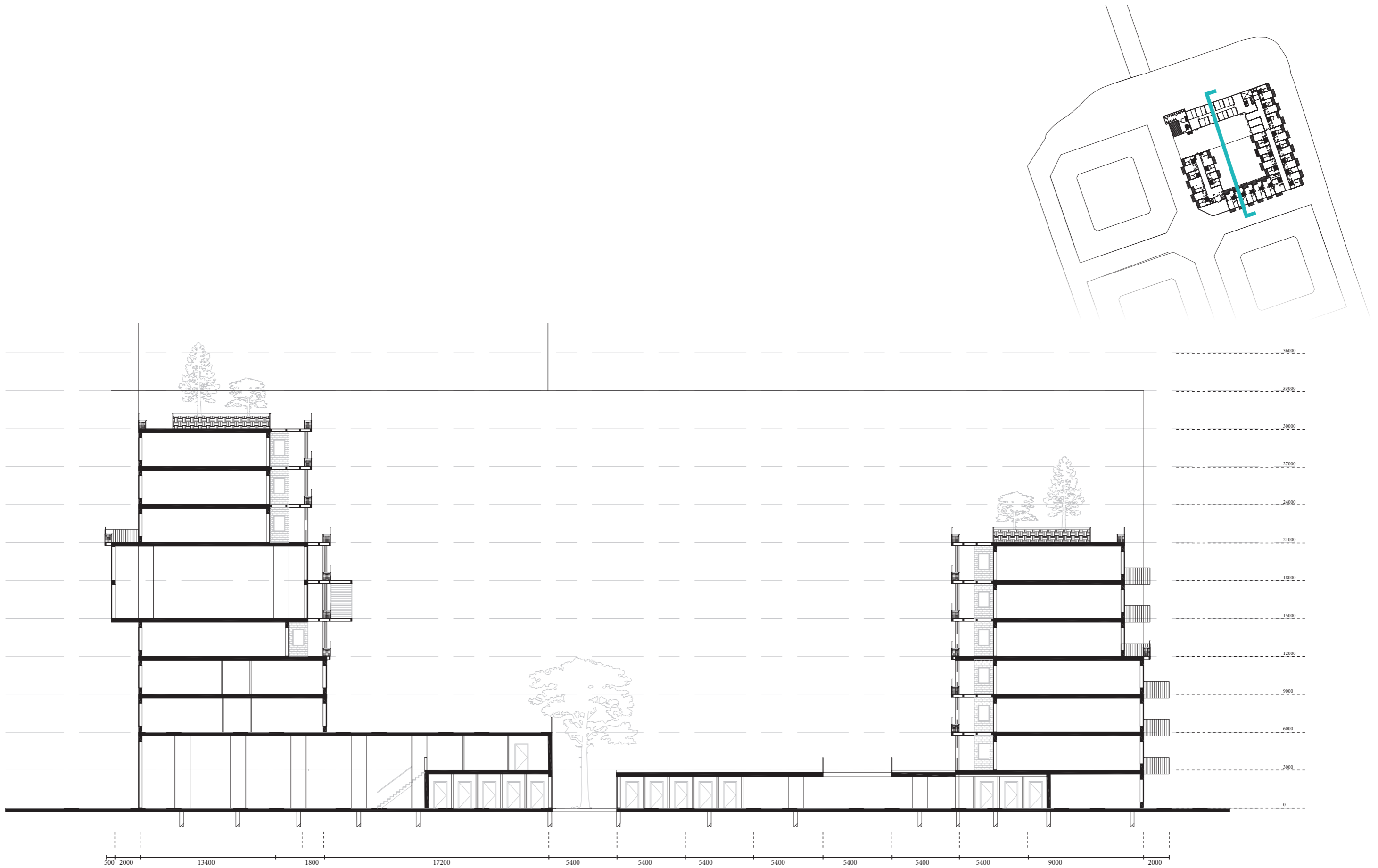


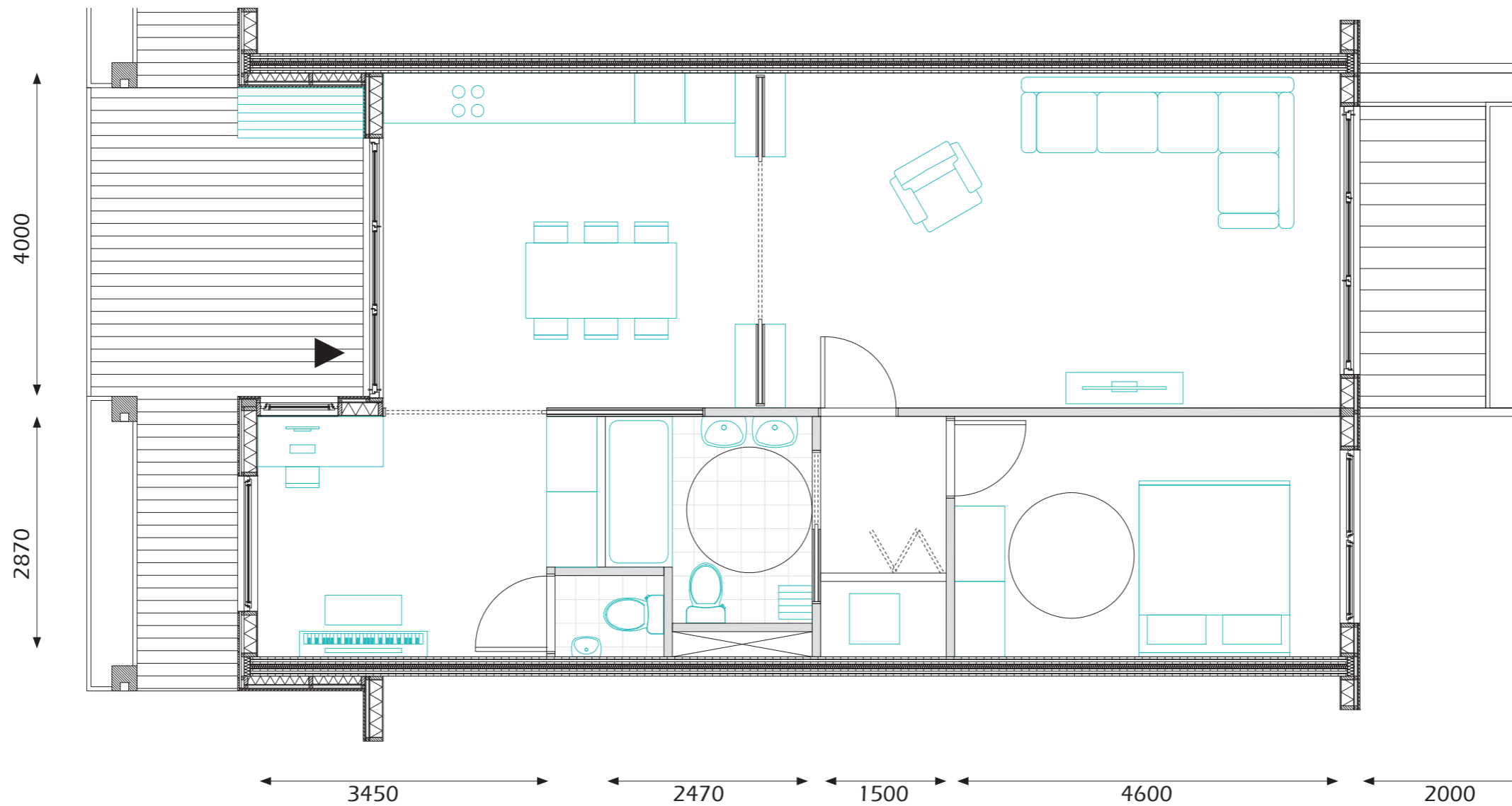


Section facing the north



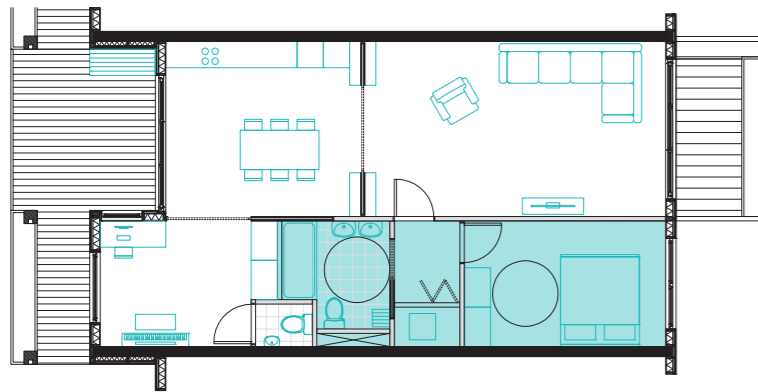
Section facing the east



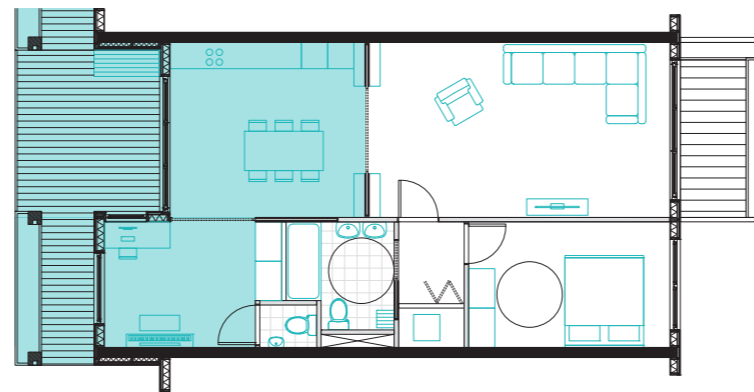




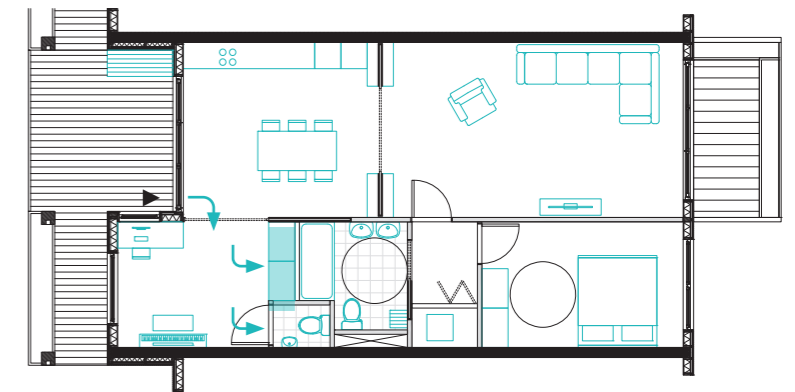
Diagrams dwelling type A.13.4



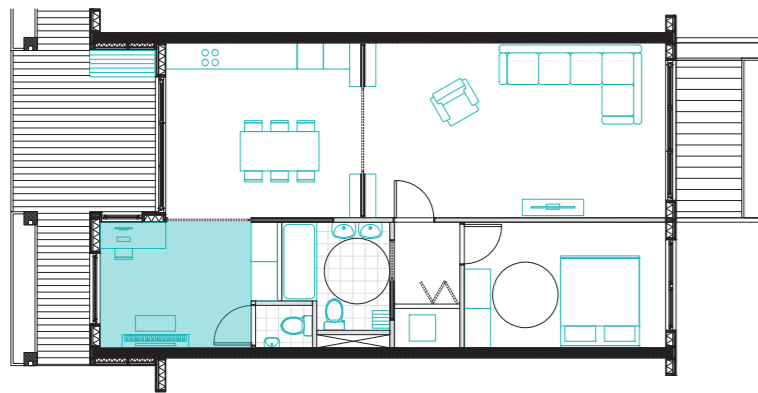
Visitors / owners



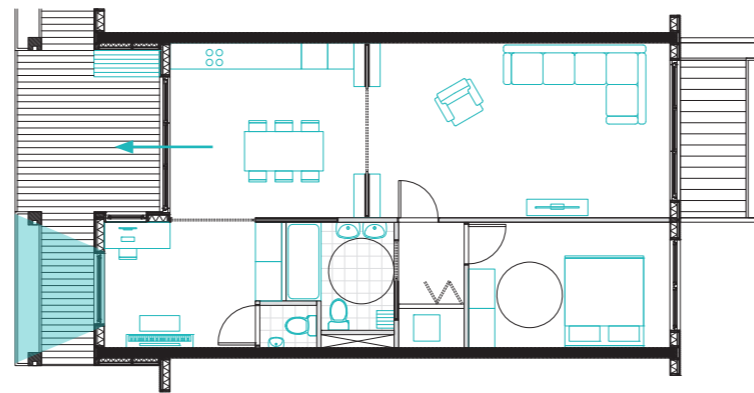
Privacy / interaction



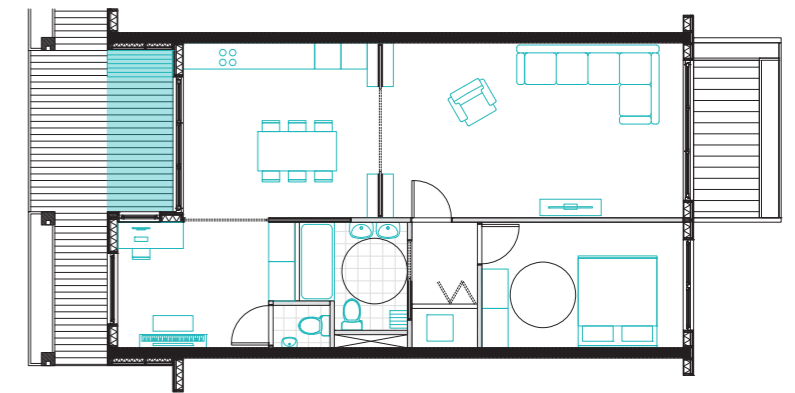
entrance / route



Extra room, that can be connected or separated by sliding door

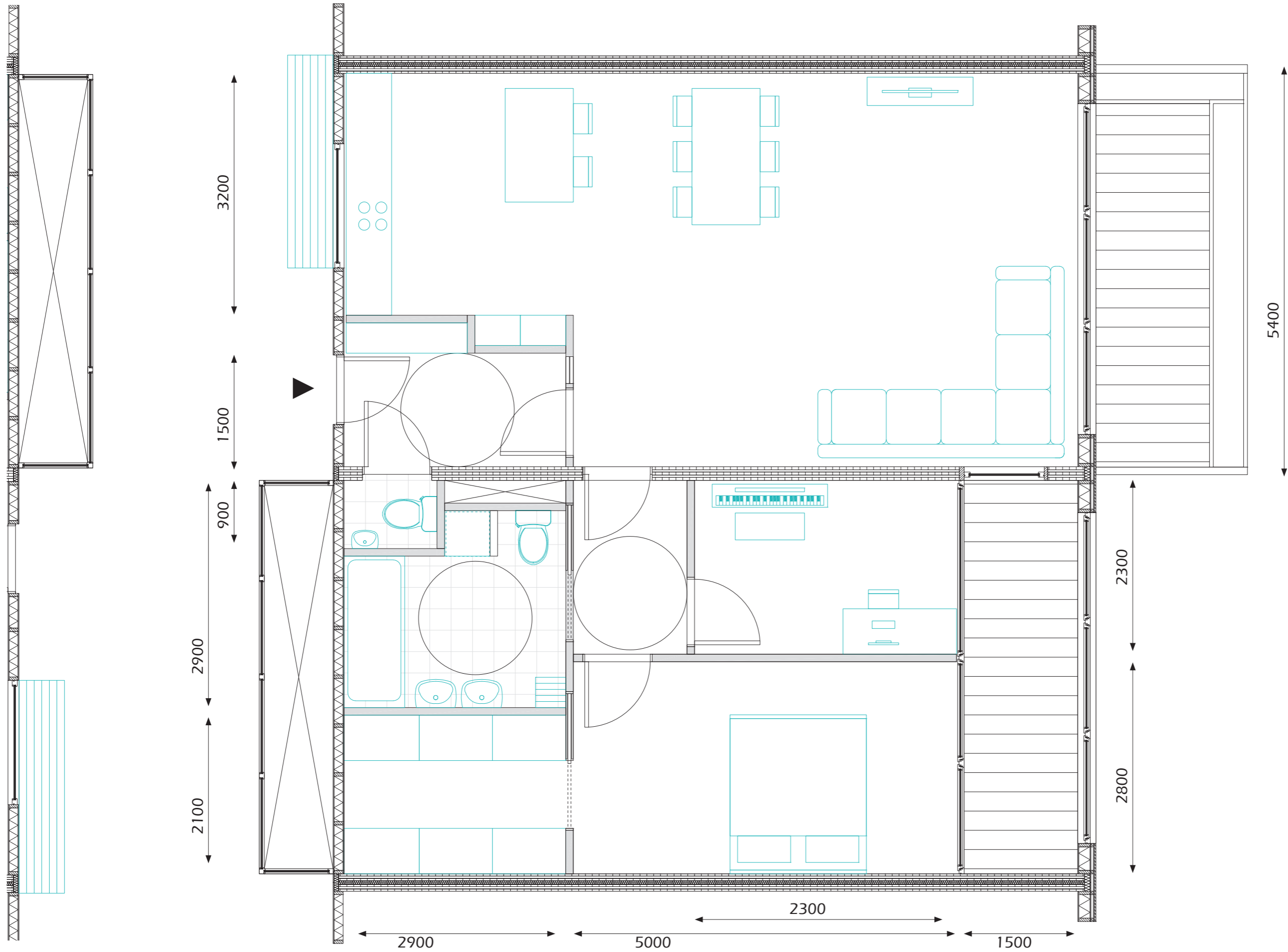


View on the plants and extension of the dining room/kitchen



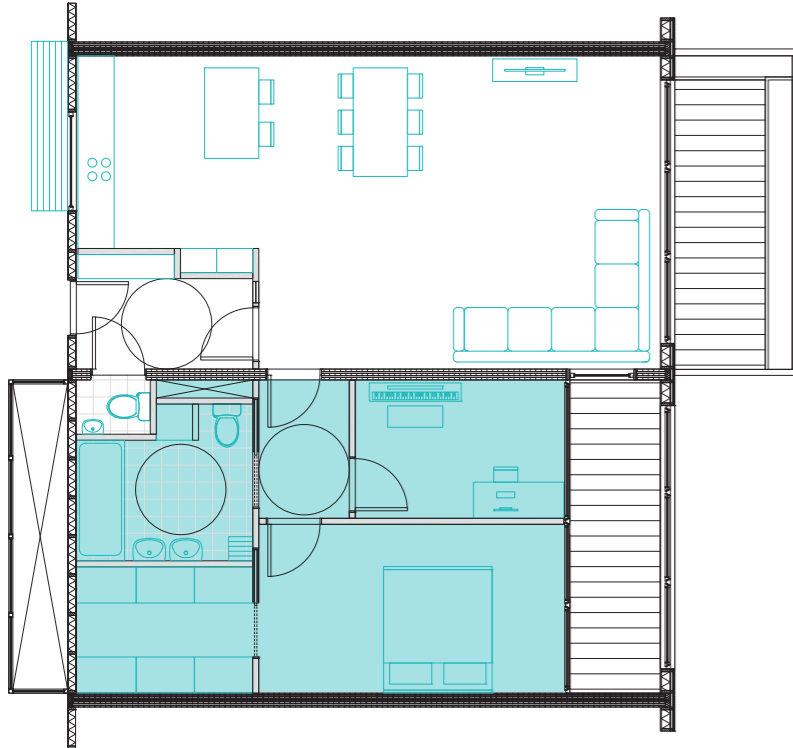
Transition zone between apartment and collective space



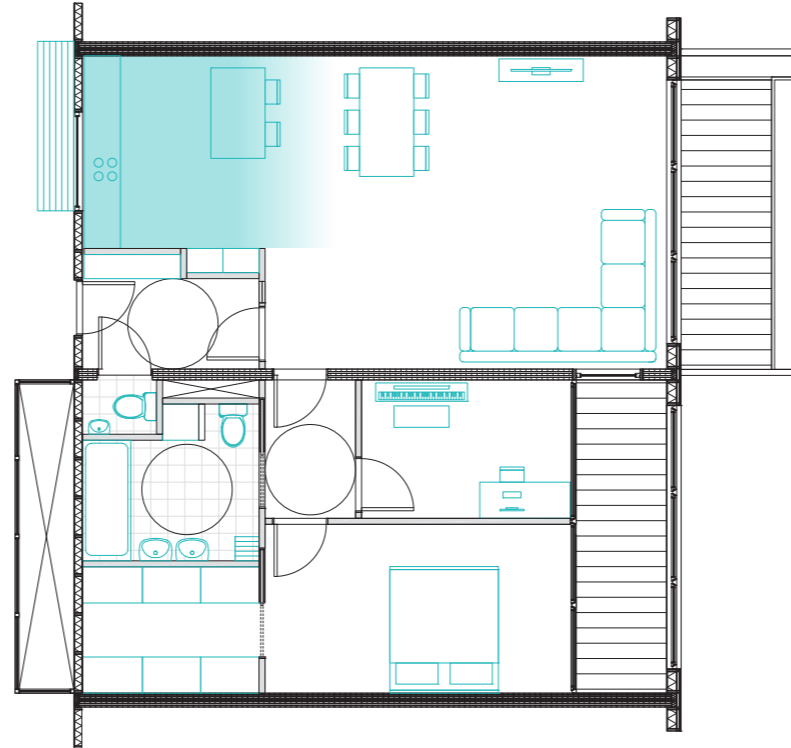




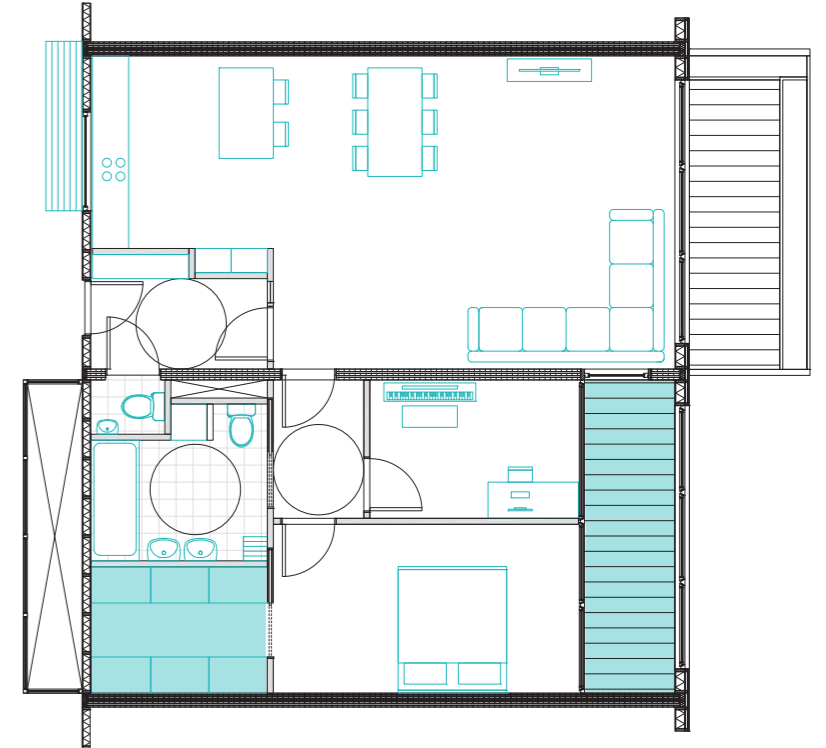
Diagrams dwelling type B.10



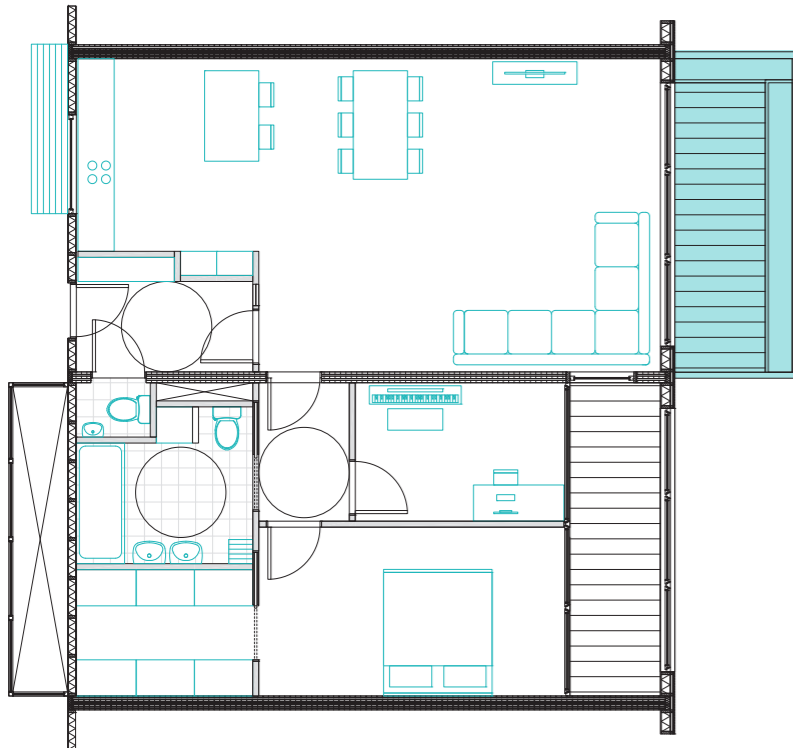
Visitors / owners



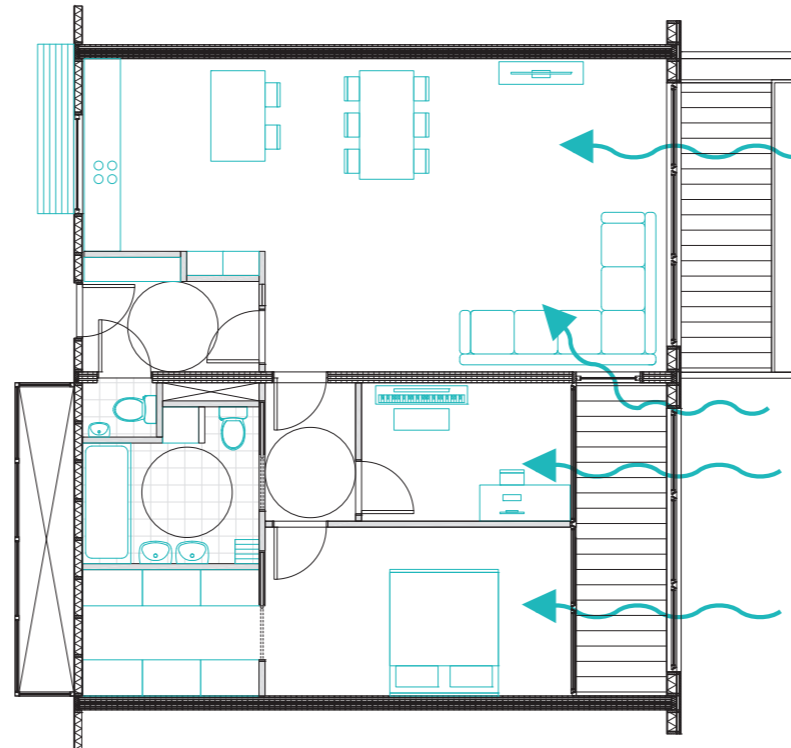
Privacy / interaction



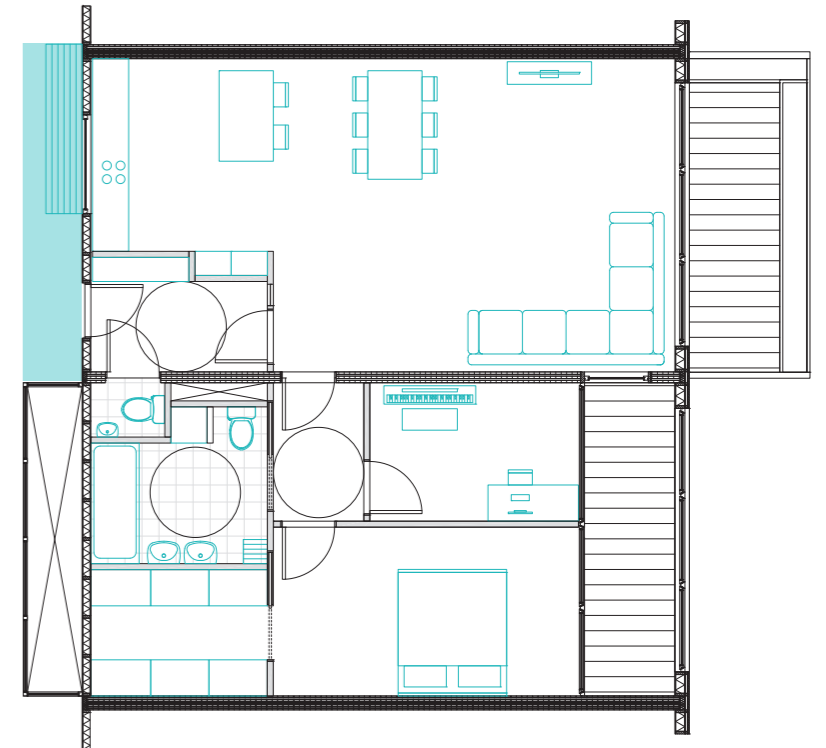
Extra comfort by a walk in closet, winter garden and extra toilet



Large terrace with integrated planters as an extension of the living room

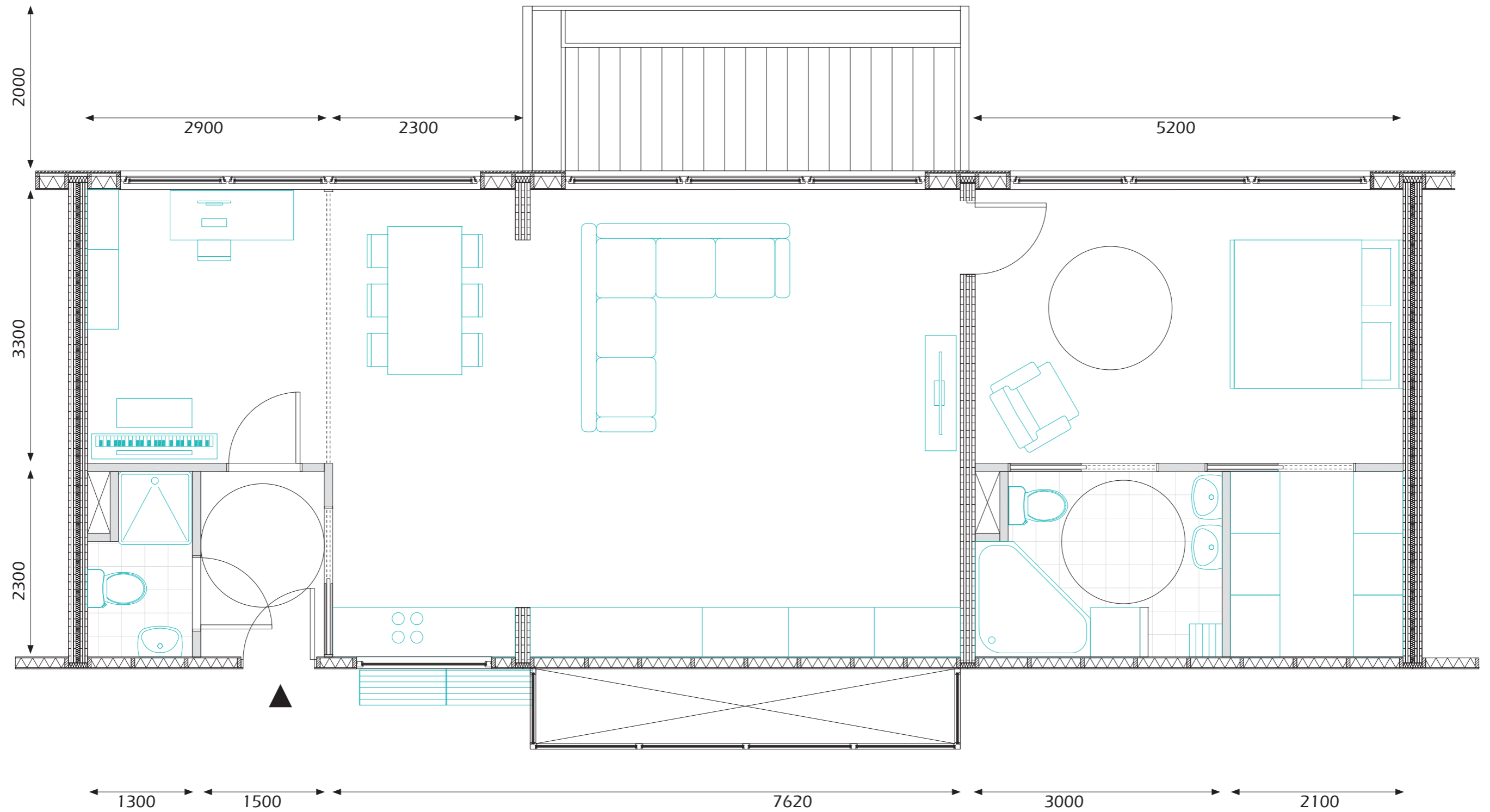


Get lots of light in the apartment



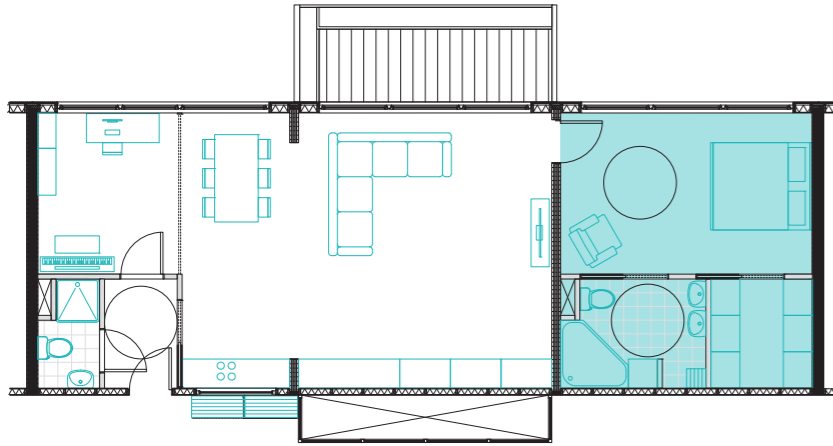
Transition zone between apartment and collective space



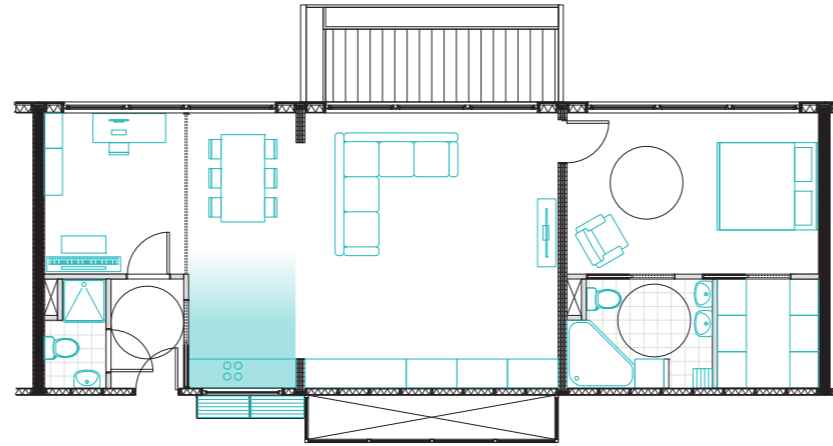




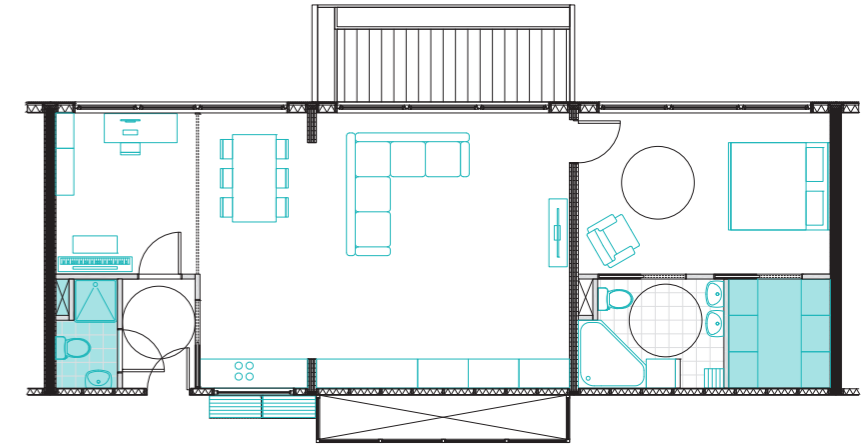
Diagrams dwelling type C.6



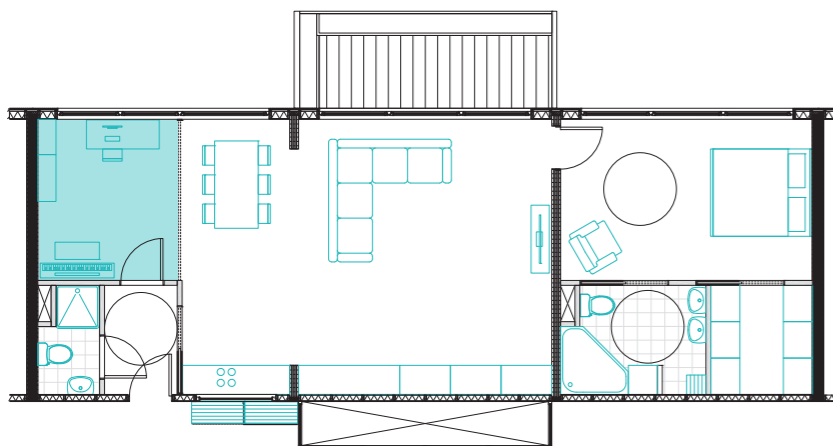
Visitors / owners



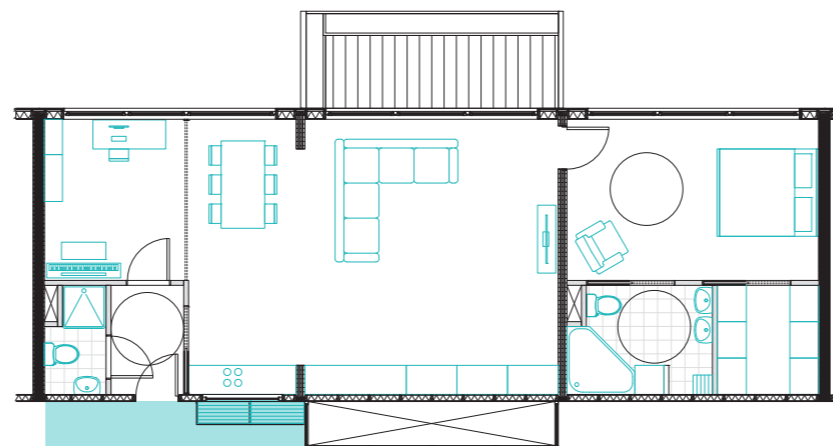
Privacy / interaction



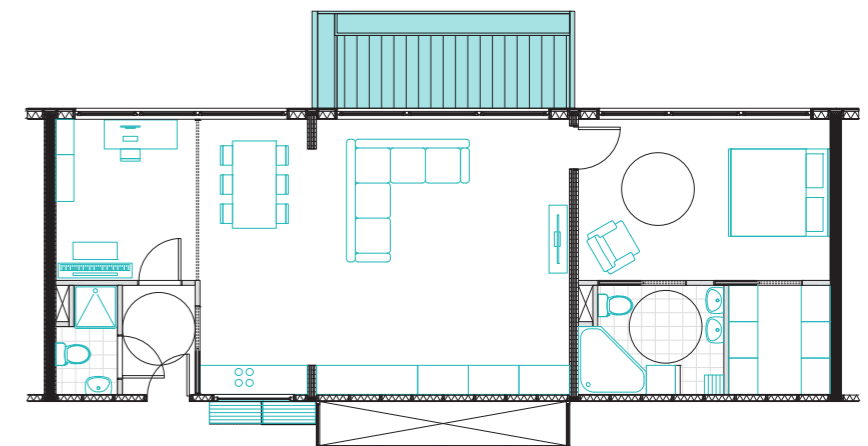
Extra comfort by a walk in closet and second bathroom



Extra room, only when needed



Transition zone between apartment and collective space



Large terrace with integrated planters as an extension of the living room



Corridor typology

View from the kitchen window

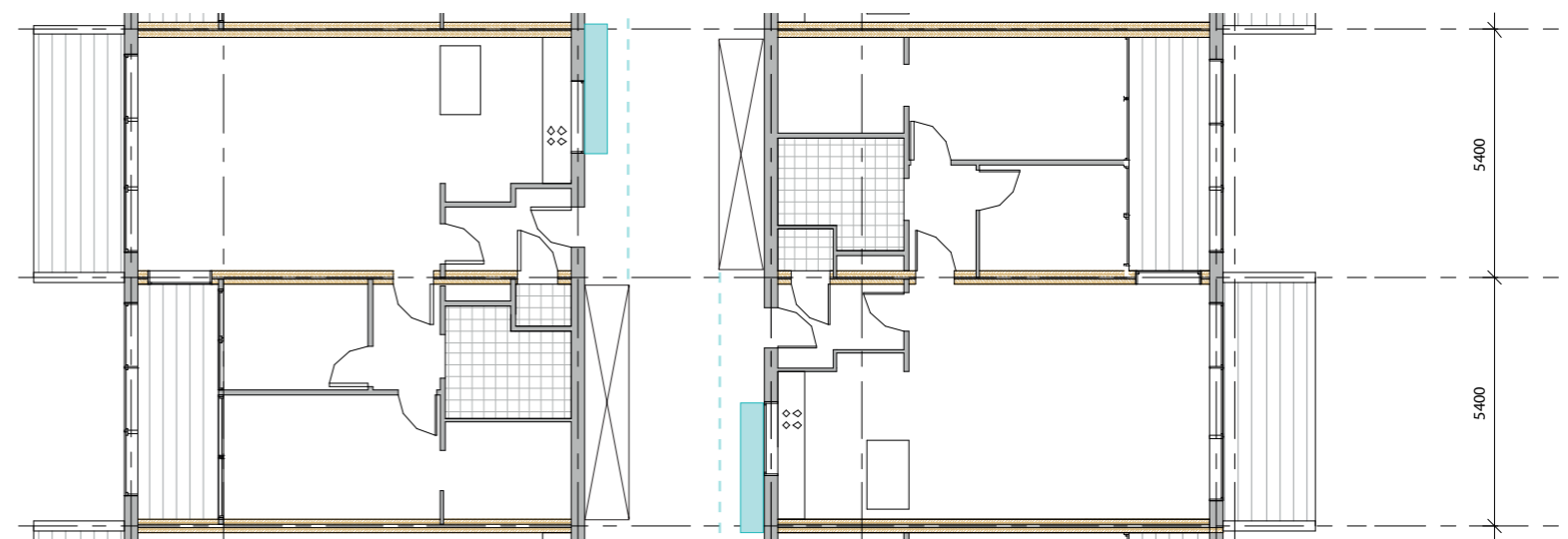
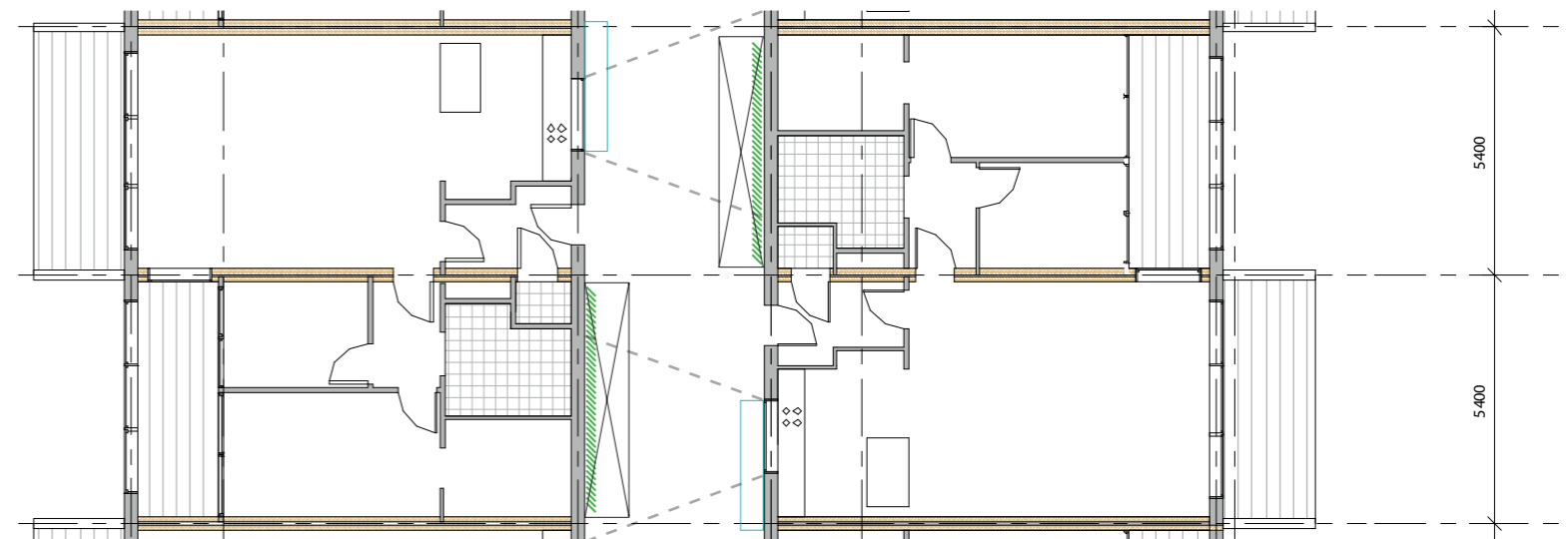
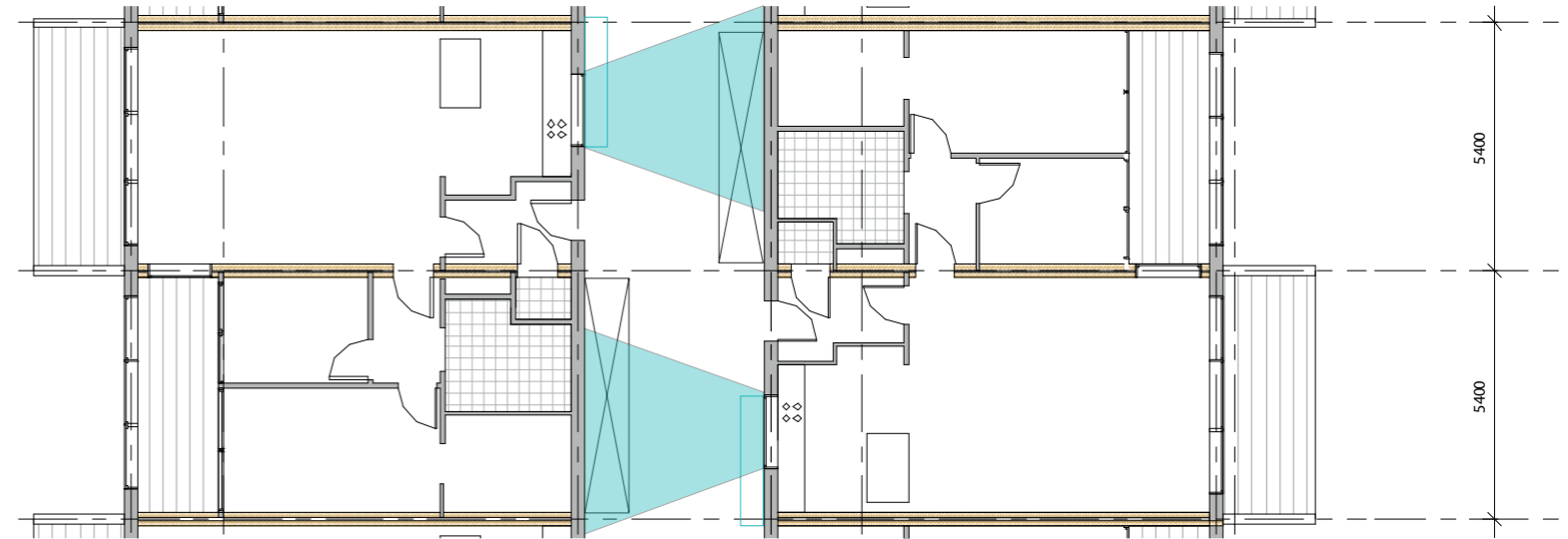
- Visual relation inviting for interaction
- No view into another apartment

Voids in the corridor

- Visual relation between different levels
- Offer a green view from the window
- Create a transition zone in front of the apartment

Multifunctionl integrated furniture

- Sit in front of the apartment
- Place objects to give the apartment its own identity



Maintenance of the vegetation

Owners association

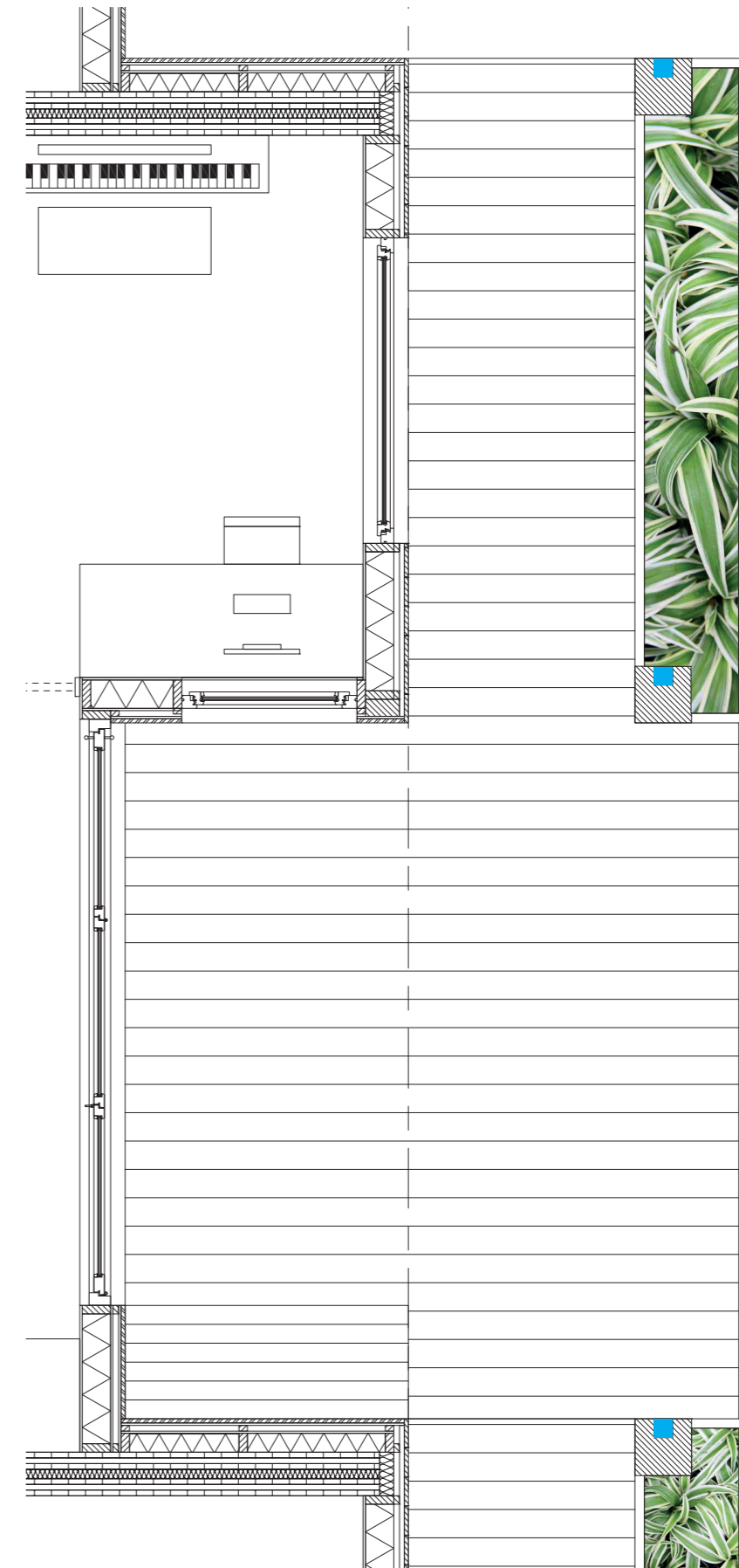
The owners association will take care of the natural vegetation in the corridor voids. These spaces are accessible for gardeners and visible for all inhabitants. This vegetation can be enjoyed by all inhabitants of the building and this way of maintenance makes sure that they can influence the appearance of the natural vegetation. It also enables a unity in the building's green. This owners association will also be responsible for the vegetation in the planters on the galleries and the trees and vegetation on the roof gardens and the green inner square, which is accessible and visible for the inhabitants.

Watering

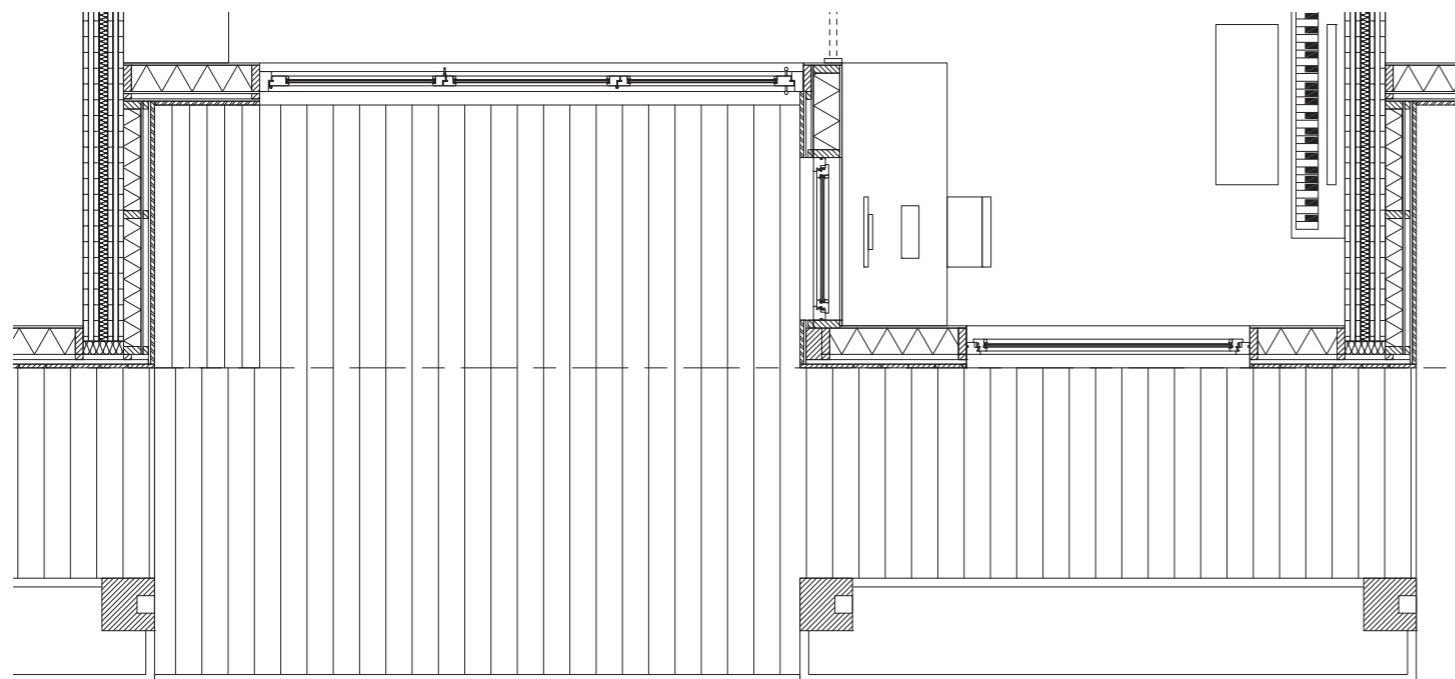
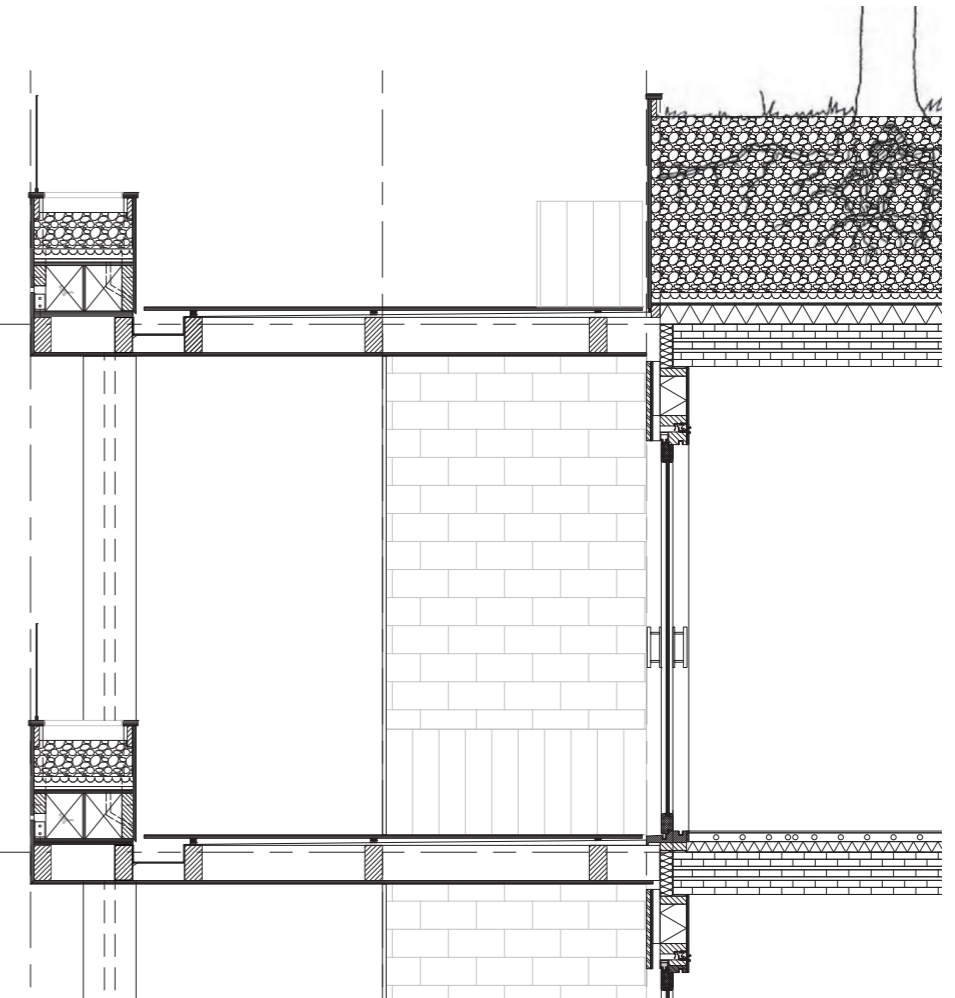
All the planters and green roofs in the building have a drainage system to drain the water gradually. Next to that, the water and the green in the building will be watered by an automatic system. In rainy periods the surplus of water will be stored in a large water reservoir on the street level. This water can be used in dry periods to keep the plants blooming the whole year. In the planters the water requirement is measured, so the surplus is transported to the water reservoir and when water is needed it is pumped up. Currently there are systems available that do this by means of a small solar panel that can be integrated on the balcony. The water pipes to enable this, will be integrated in the façade and in the columns of the galleries.

Owners responsibility

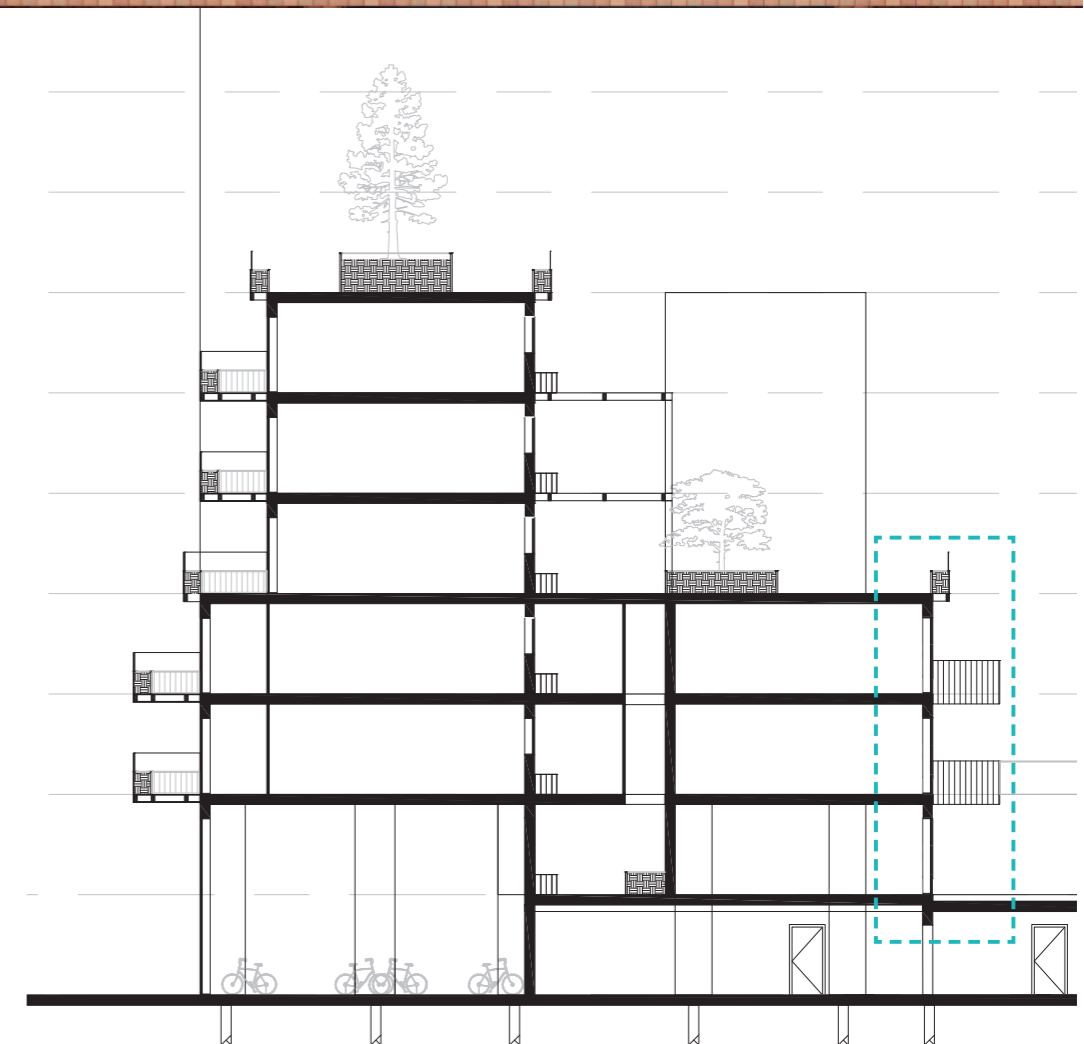
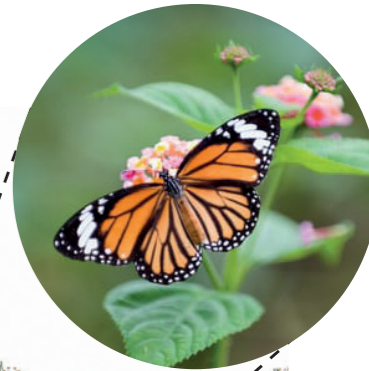
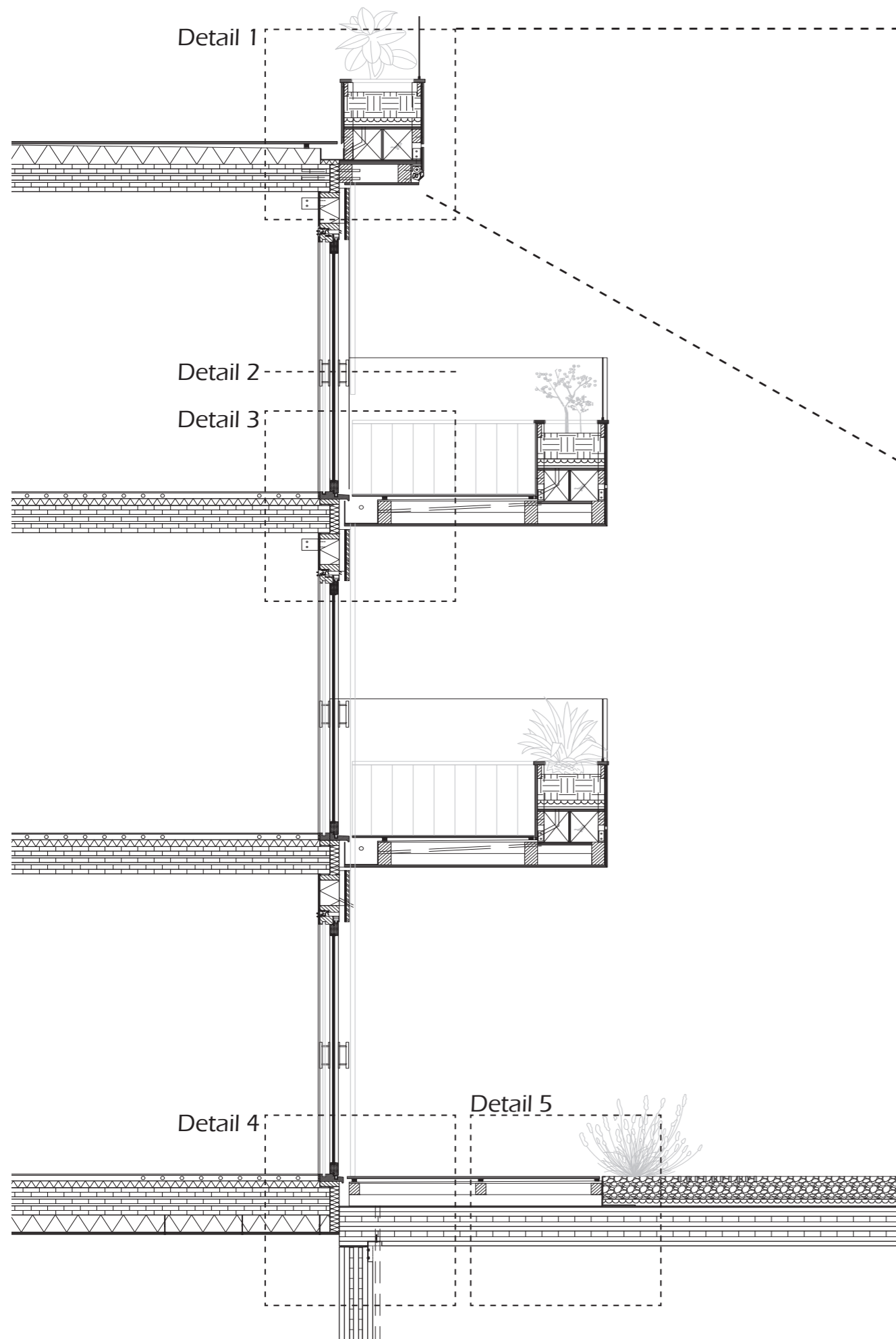
On the balconies, planters are integrated in the design to give the building its characteristic appearance. It contributes to the biodiversity and makes the vegetation part of the interior of the apartments as well. Because this green is an important part of the appearance of the building, rules are set in the purchase contract of the apartments to keep and maintain green in the planters. This makes it the owners responsibility. When people are not able to or do not want to take care for the plants, they can hire a gardener to do it for them. This prevents that a tower wagon is needed by the gardener to maintain all the balconies and this gives owners the freedom to choose the vegetation for the planters by themselves. As mentioned before, it is a part of the interior of the apartments, so it is very reasonable if they can arrange it to their own taste.



Iconic façade fragment 1:20 (elevation, horizontal and vertical section)



Façade fragment 1:20 showing the positions of the details



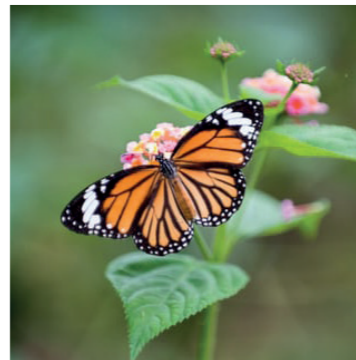
Bee

- Pollinating flowers and blossom



Butterfly

- Loved for its colorful wings
- Food source for birds



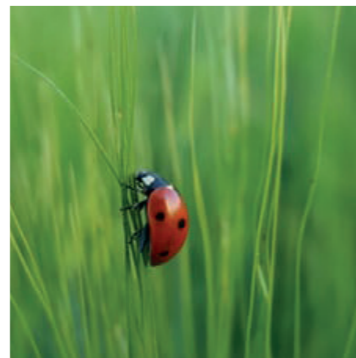
Lacewing

- Eats aphids and is used as a natural pesticide



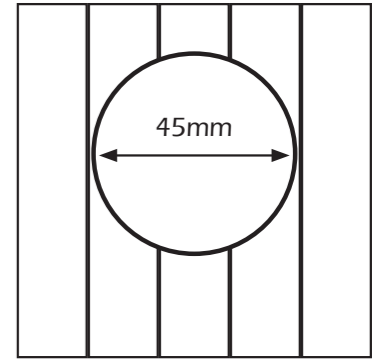
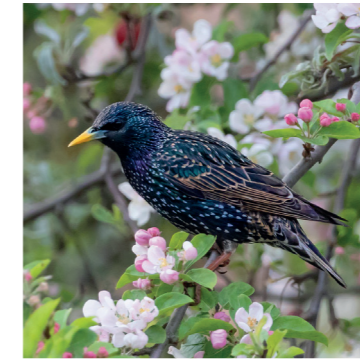
Ladybug

- Eats aphids and is used as a natural pesticide
- Popular insect



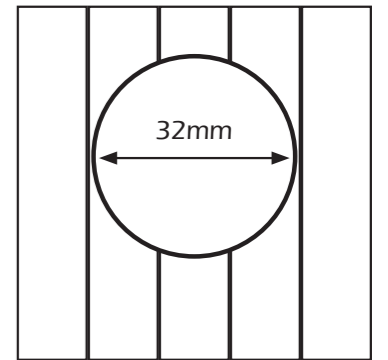
Common starling

- Songbird



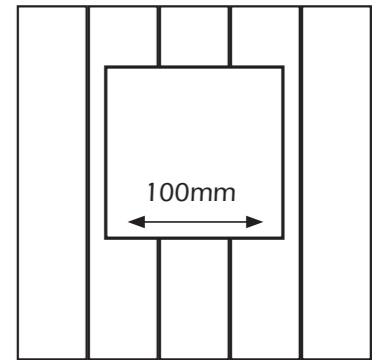
Great tit

- Eats processionary
- Songbird



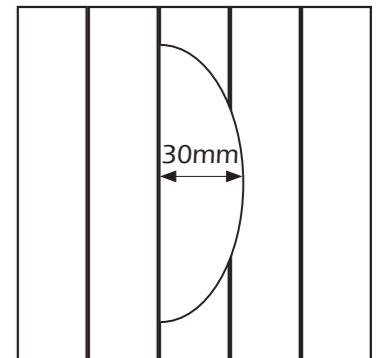
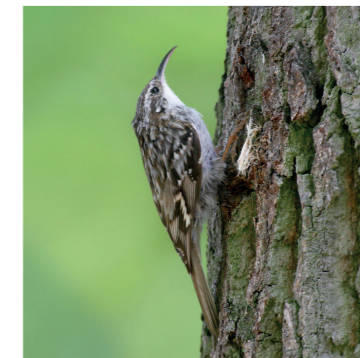
Spotted flycatcher

- Protected bird

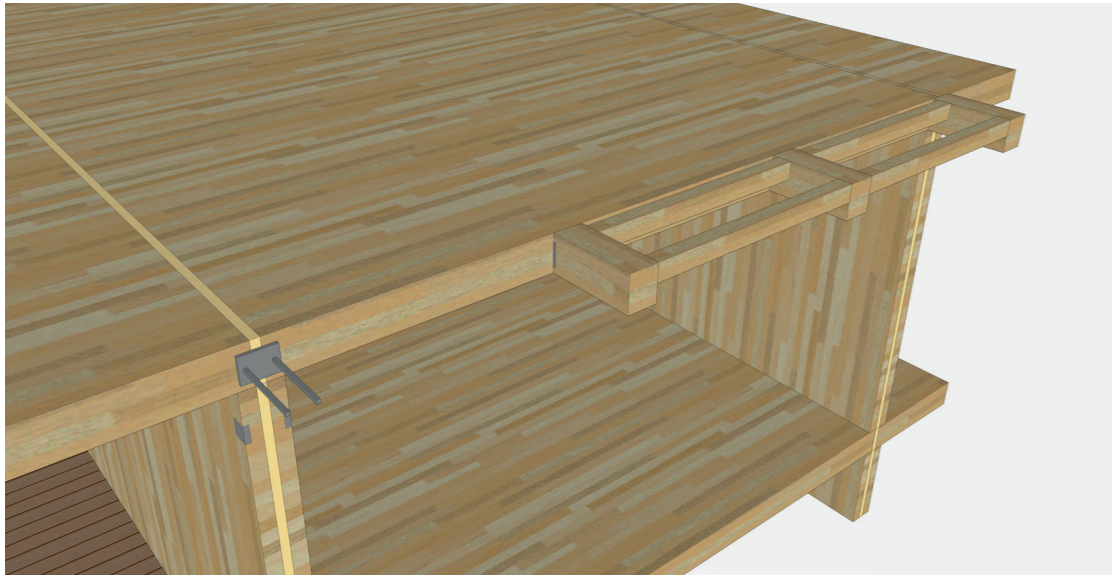


Treecreeper

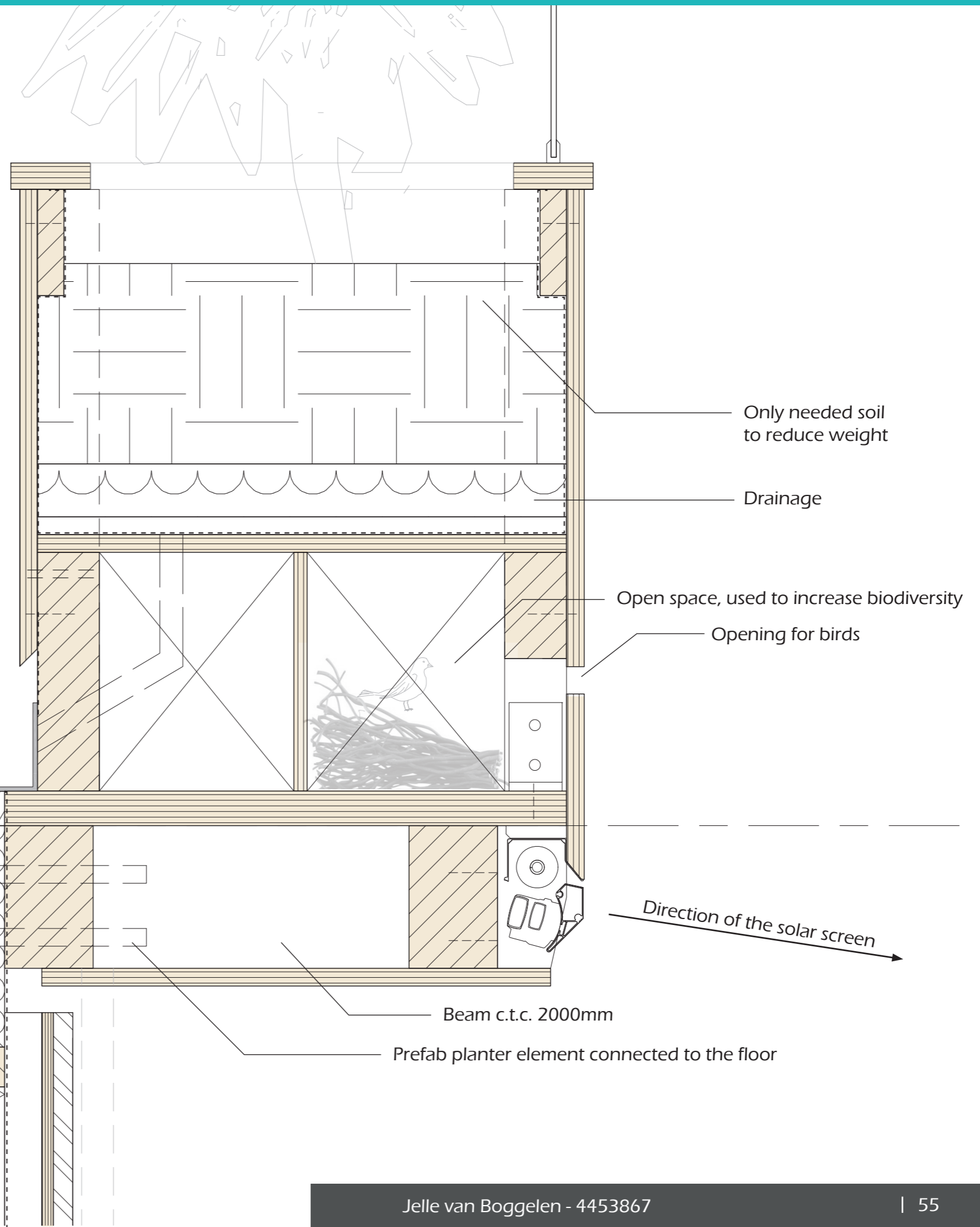
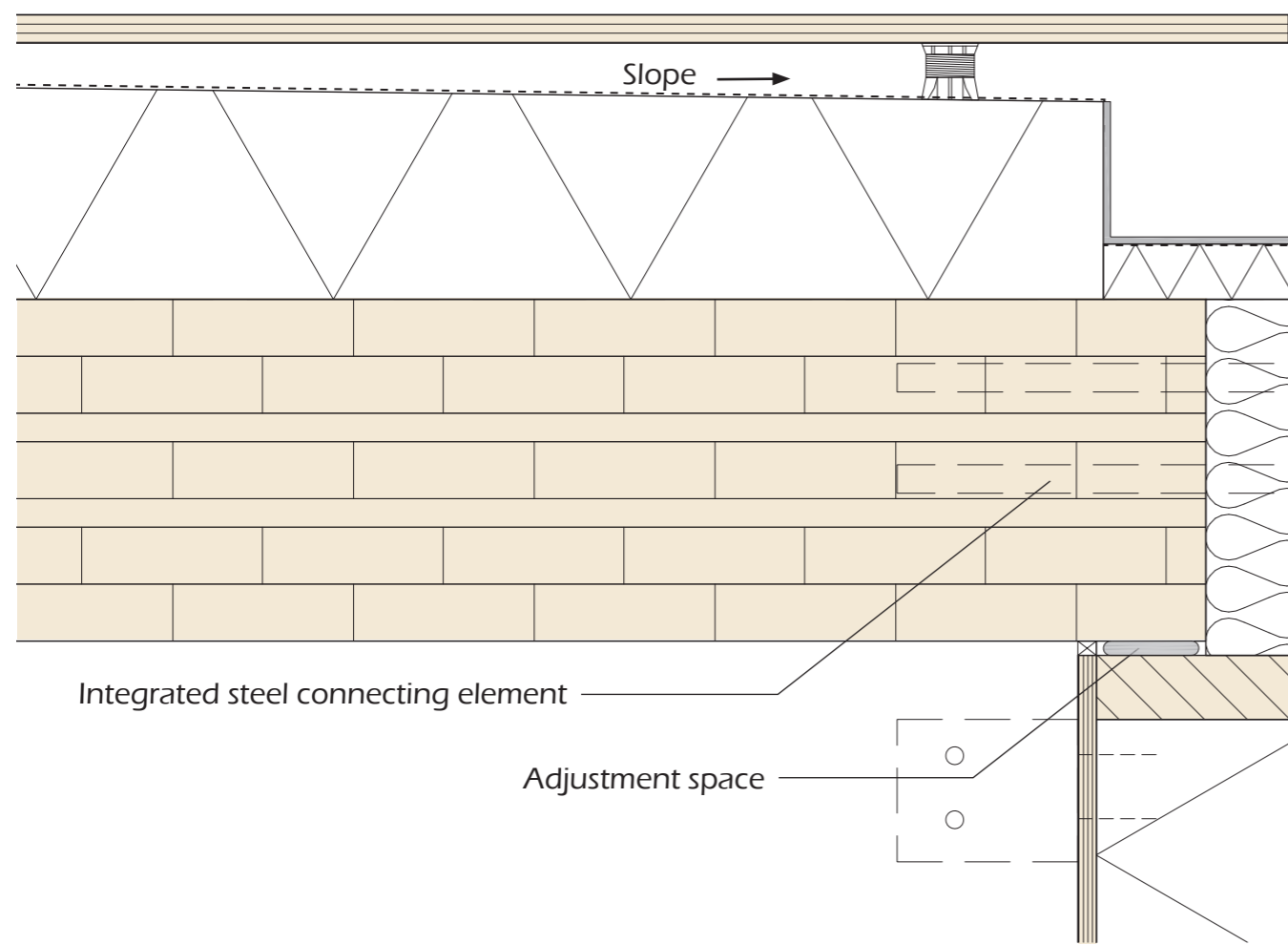
- All year in the Netherlands



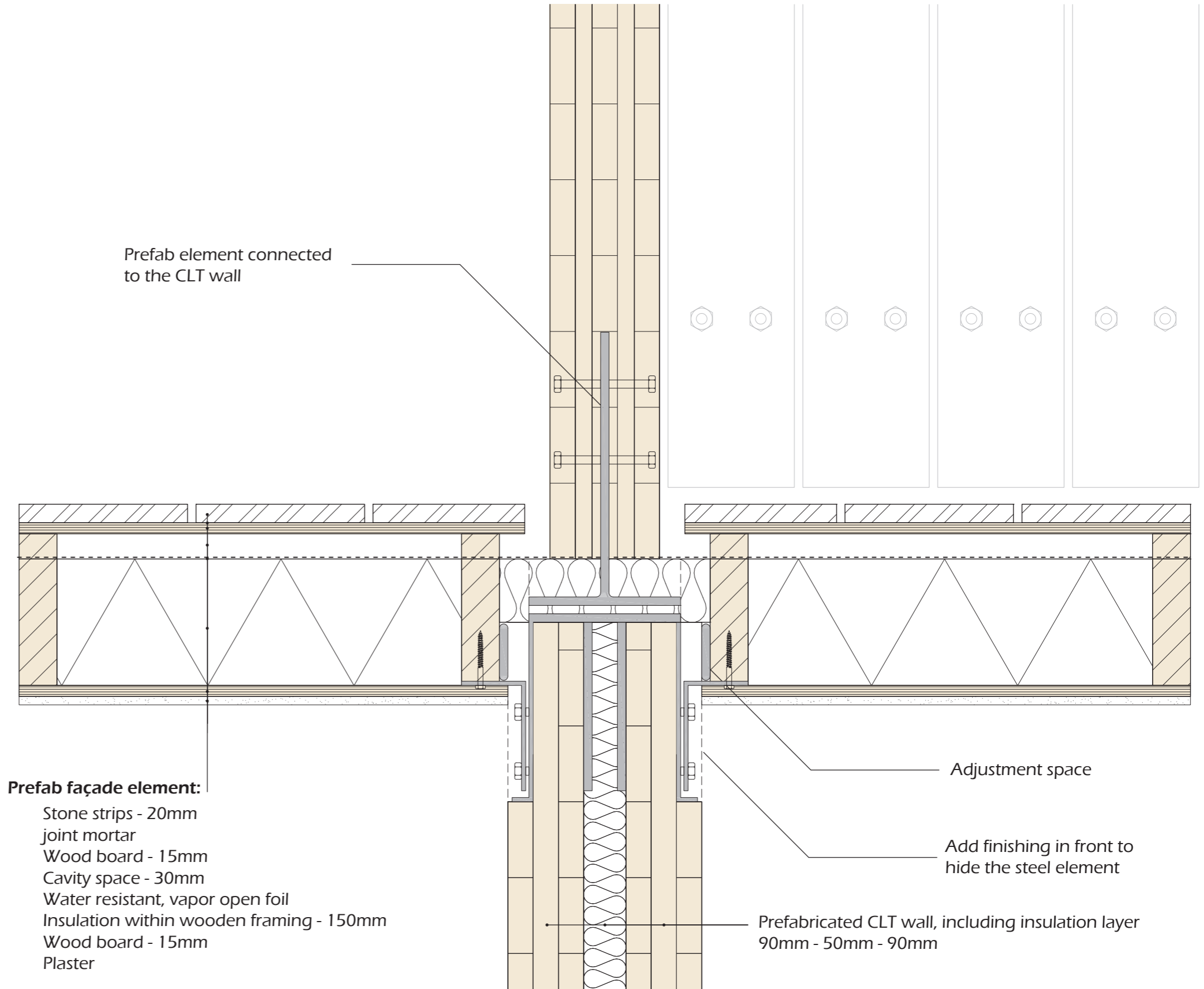
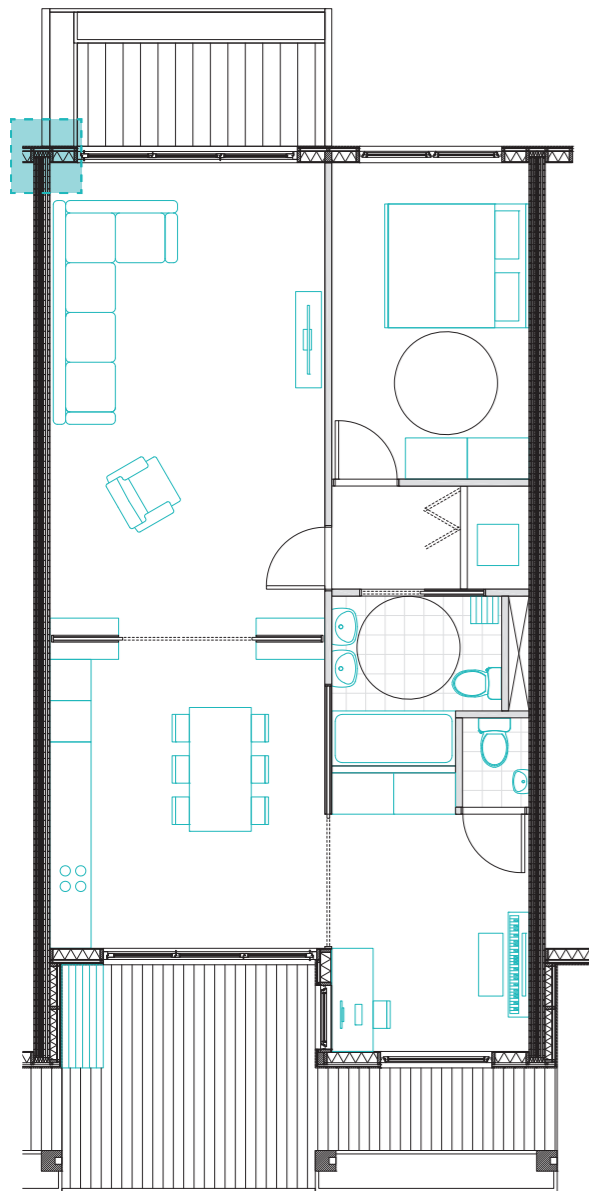
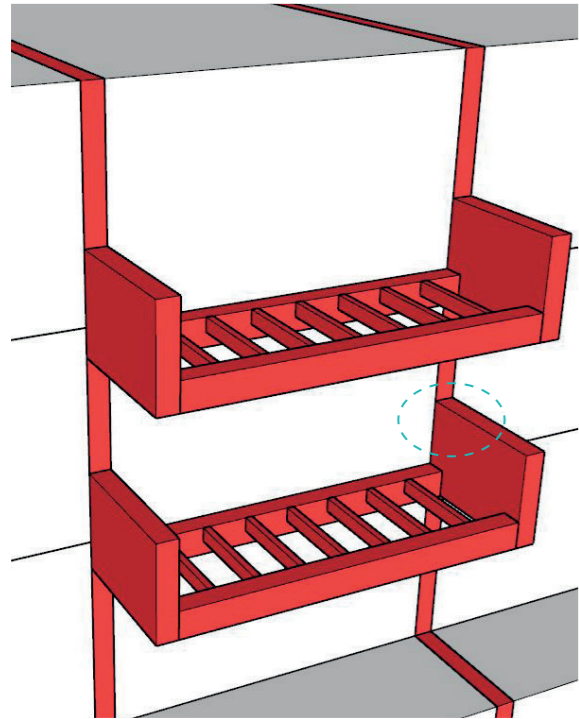
Detail 1 - vertical - 1:5



Construction principle using integrated steel connecting elements



Detail 2 - horizontal - 1:5



- Prefab façade element:**
- Stone strips - 20mm
 - joint mortar
 - Wood board - 15mm
 - Cavity space - 30mm
 - Water resistant, vapor open foil
 - Insulation within wooden framing - 150mm
 - Wood board - 15mm
 - Plaster

*The construction order is explained on the next pages

Detail 3 - vertical - 1:5

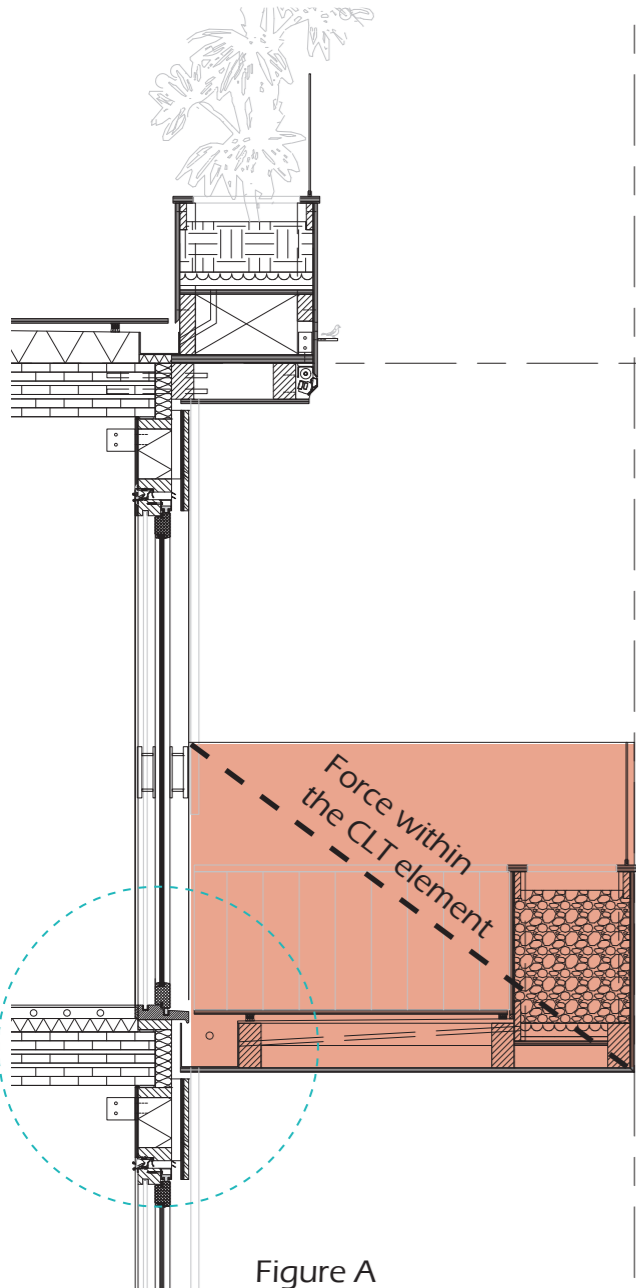
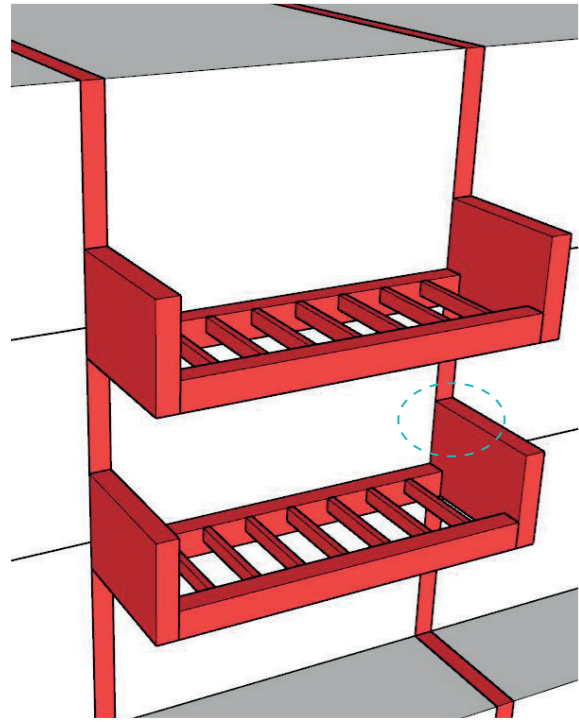
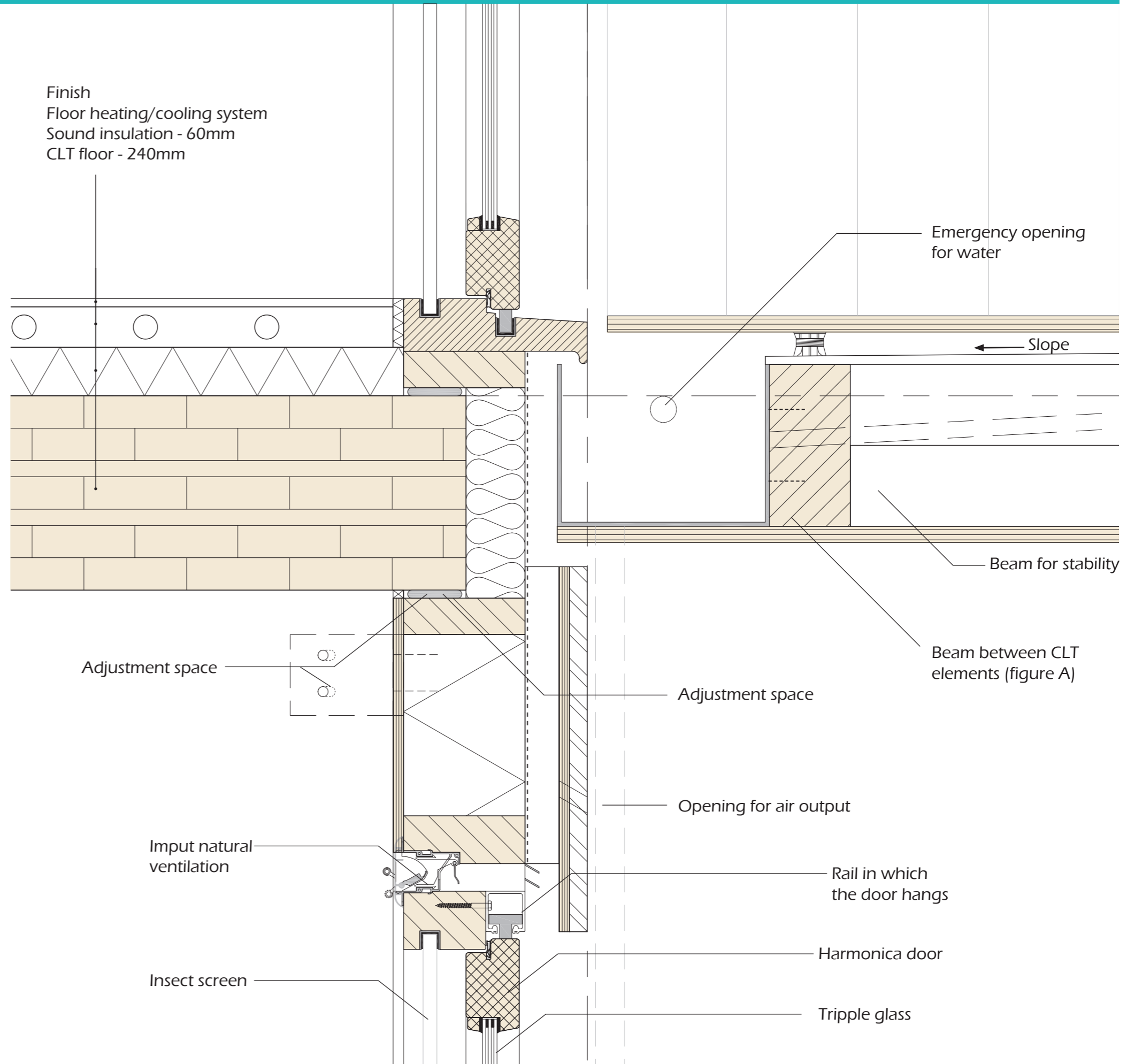
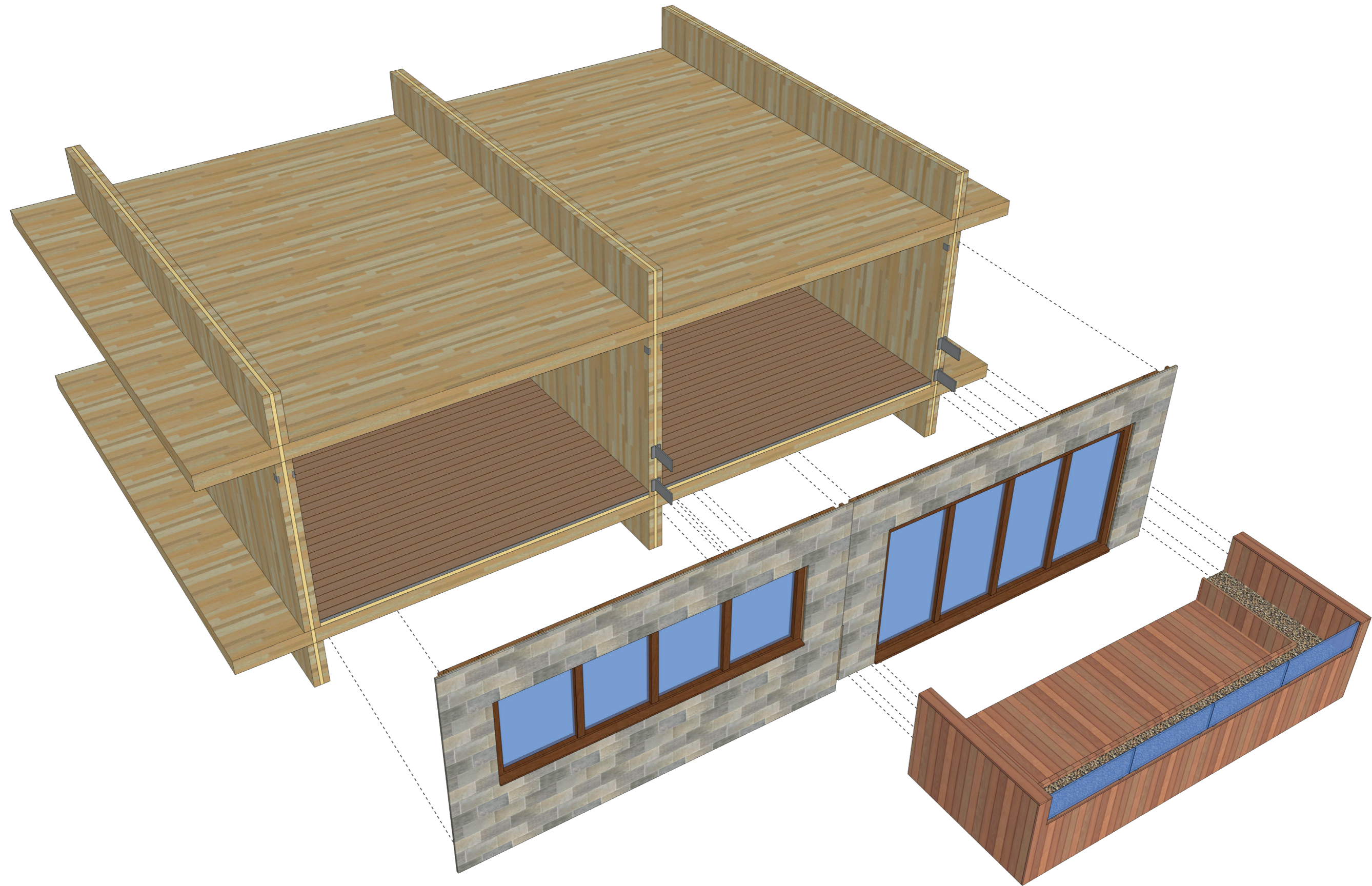
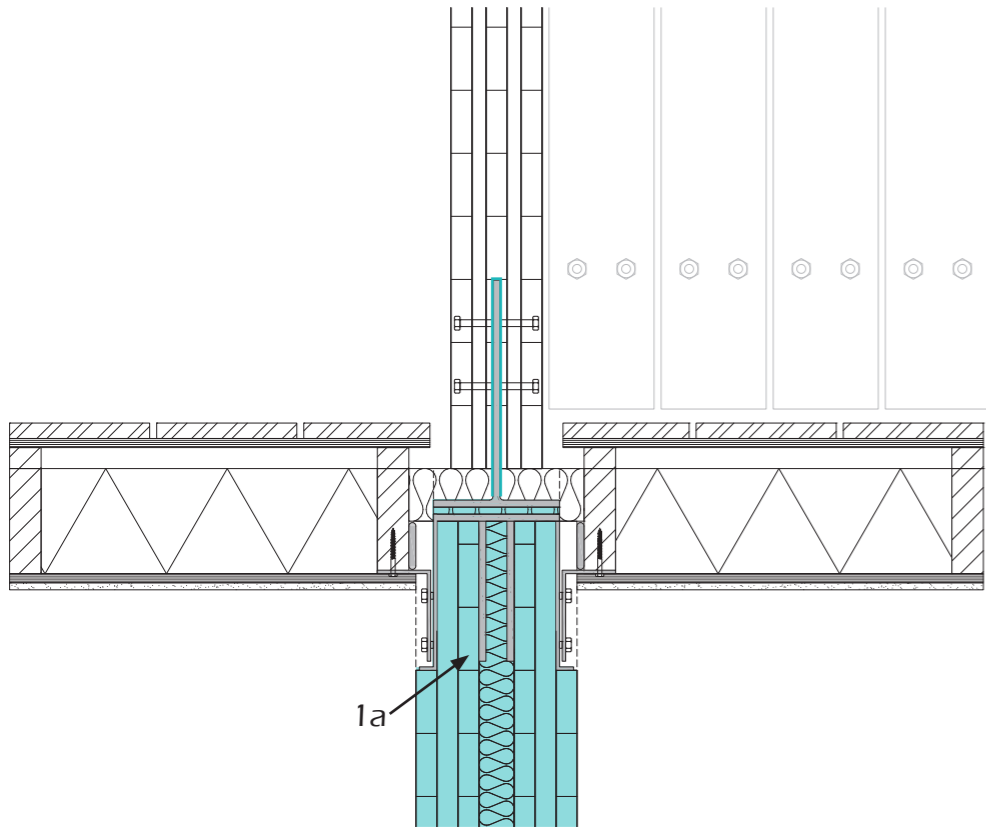


Figure A





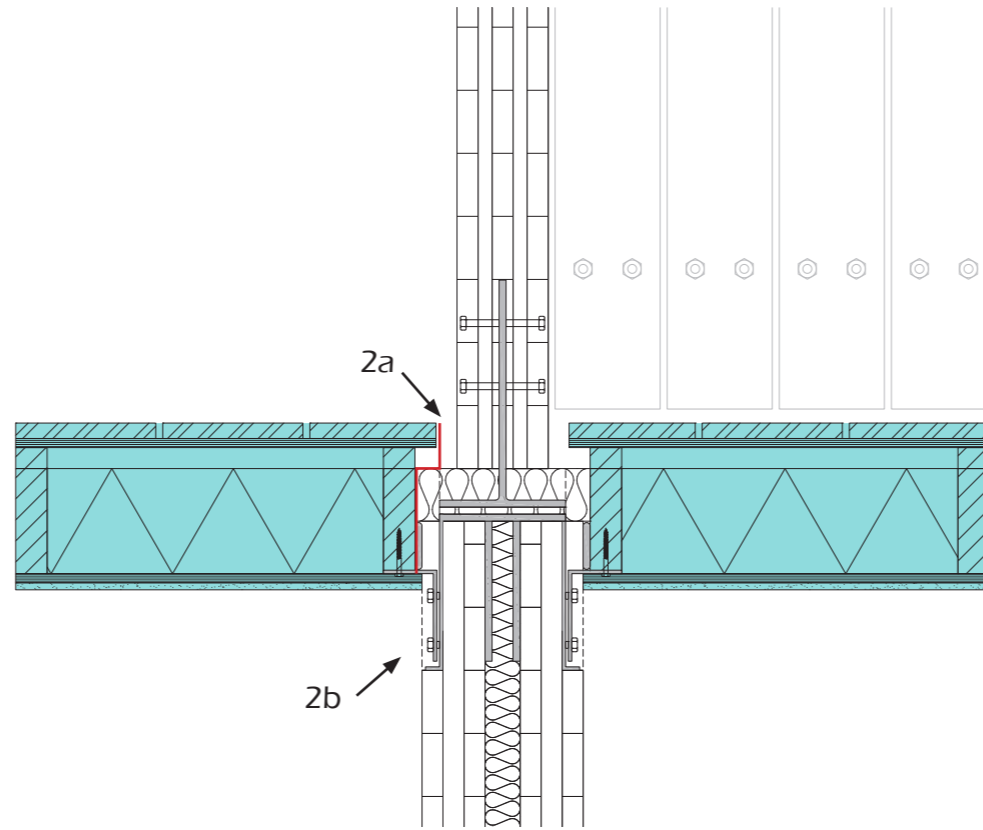
Assembly of a façade fragment



1. CLT floor and load bearing wall are placed. The CLT wall has a prefab integrated steel connecting element (1a).

All façade elements are prefabricated and can be assembled to the CLT floors and walls. A crane lifts the elements to the correct height.

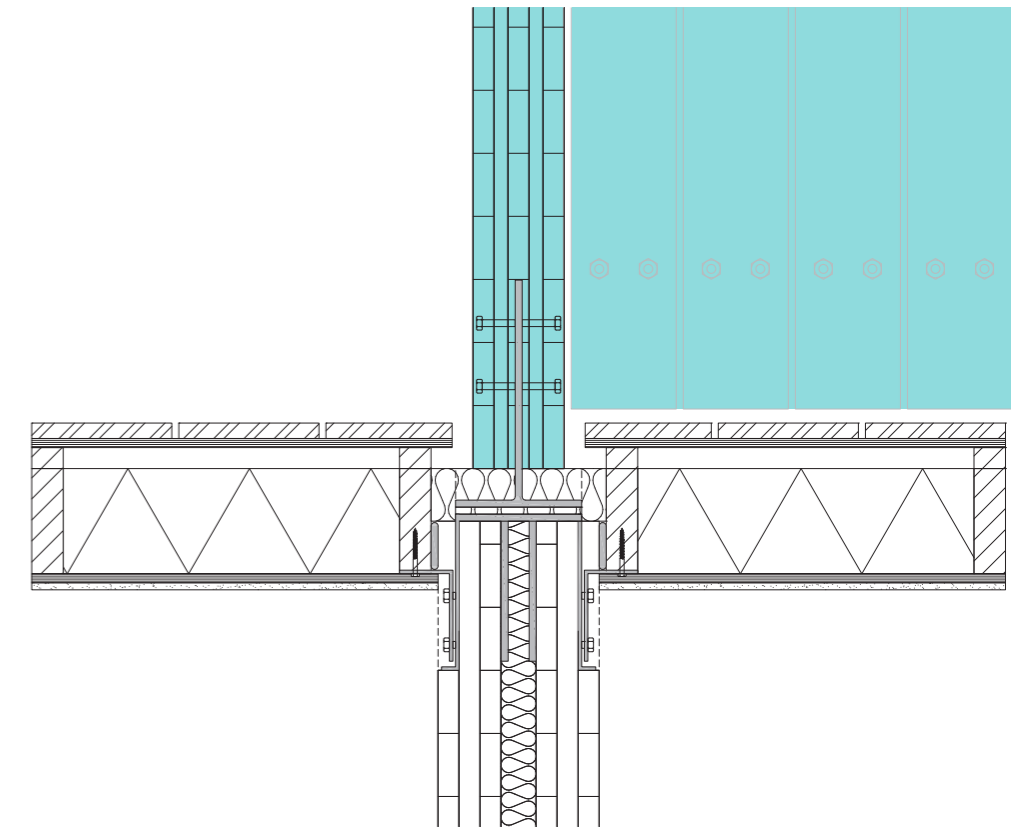
By using prefab elements, the façade can fastly be built up.



2. The façade element (not load bearing) is assembled between the floors and the CLT walls.

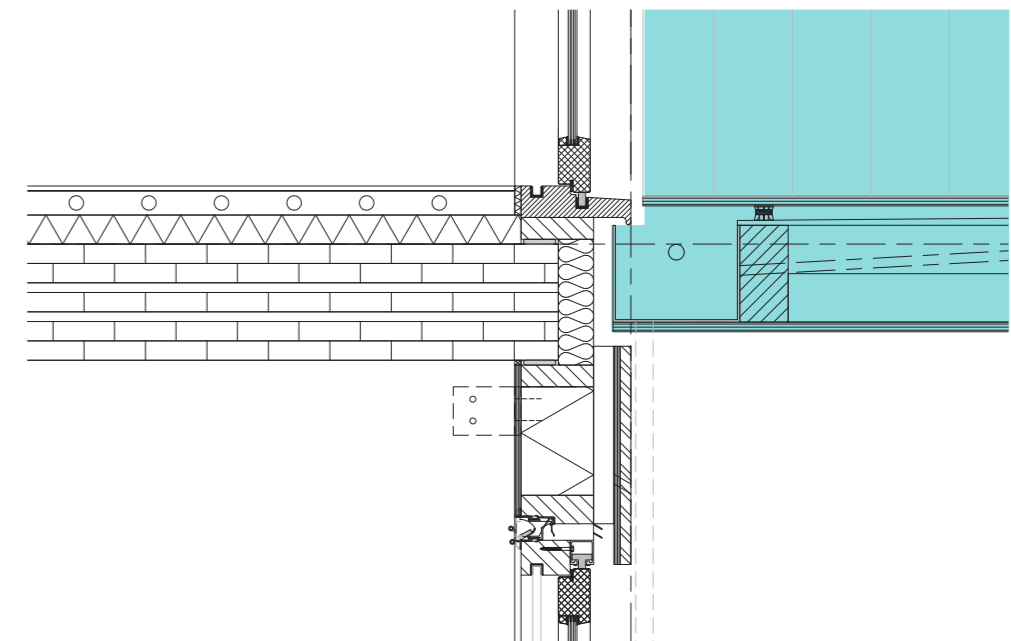
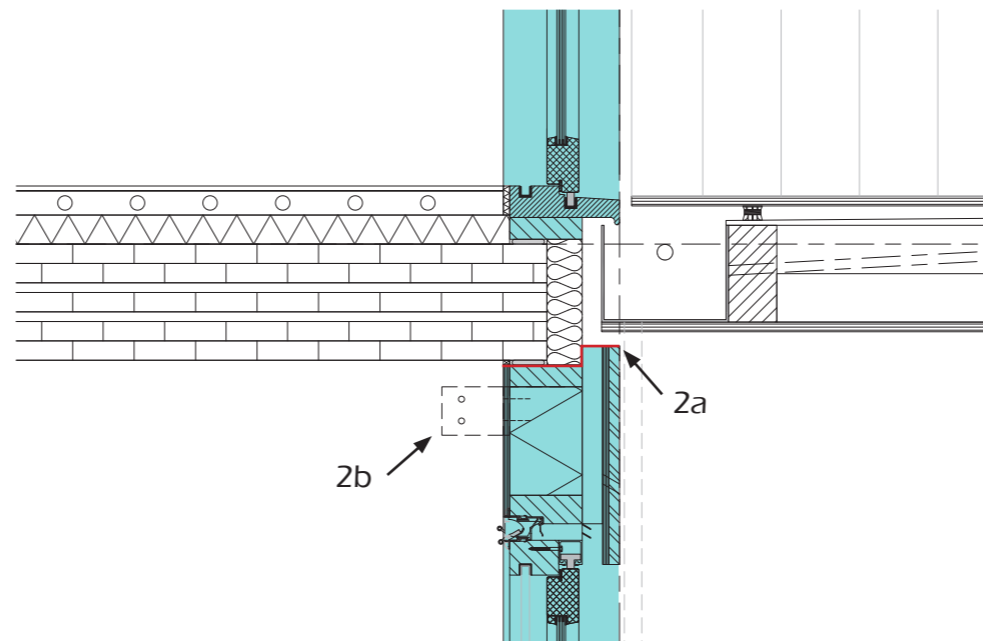
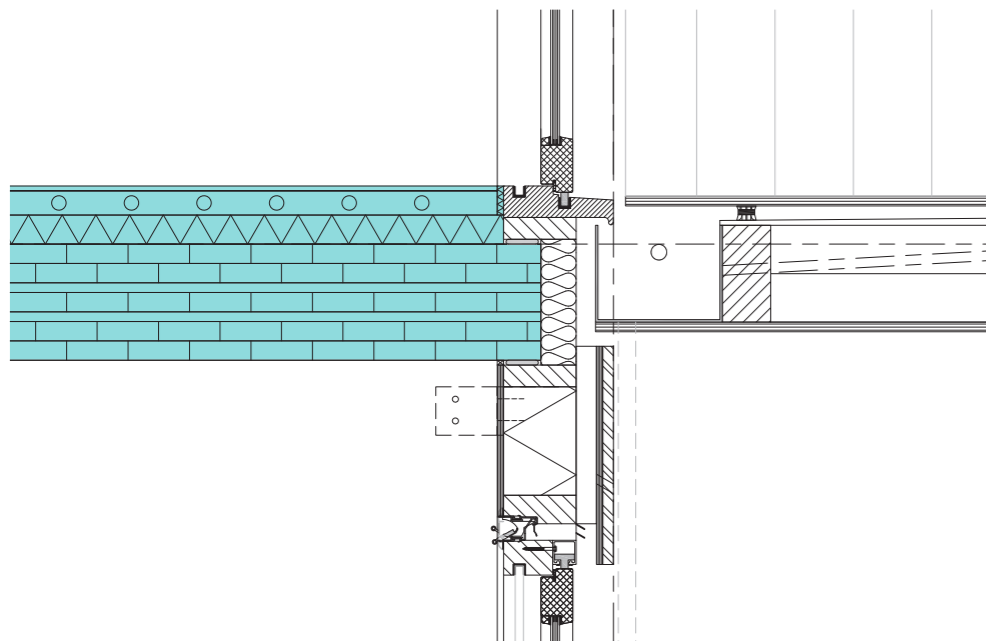
The interior side fits exactly between the wall and the floors, while the exterior side covers them. So falling in is prevented and the façade element can be slid in (2a).

Falling out is prevented by a steel connecting element assabled to the CLT wall (2b).

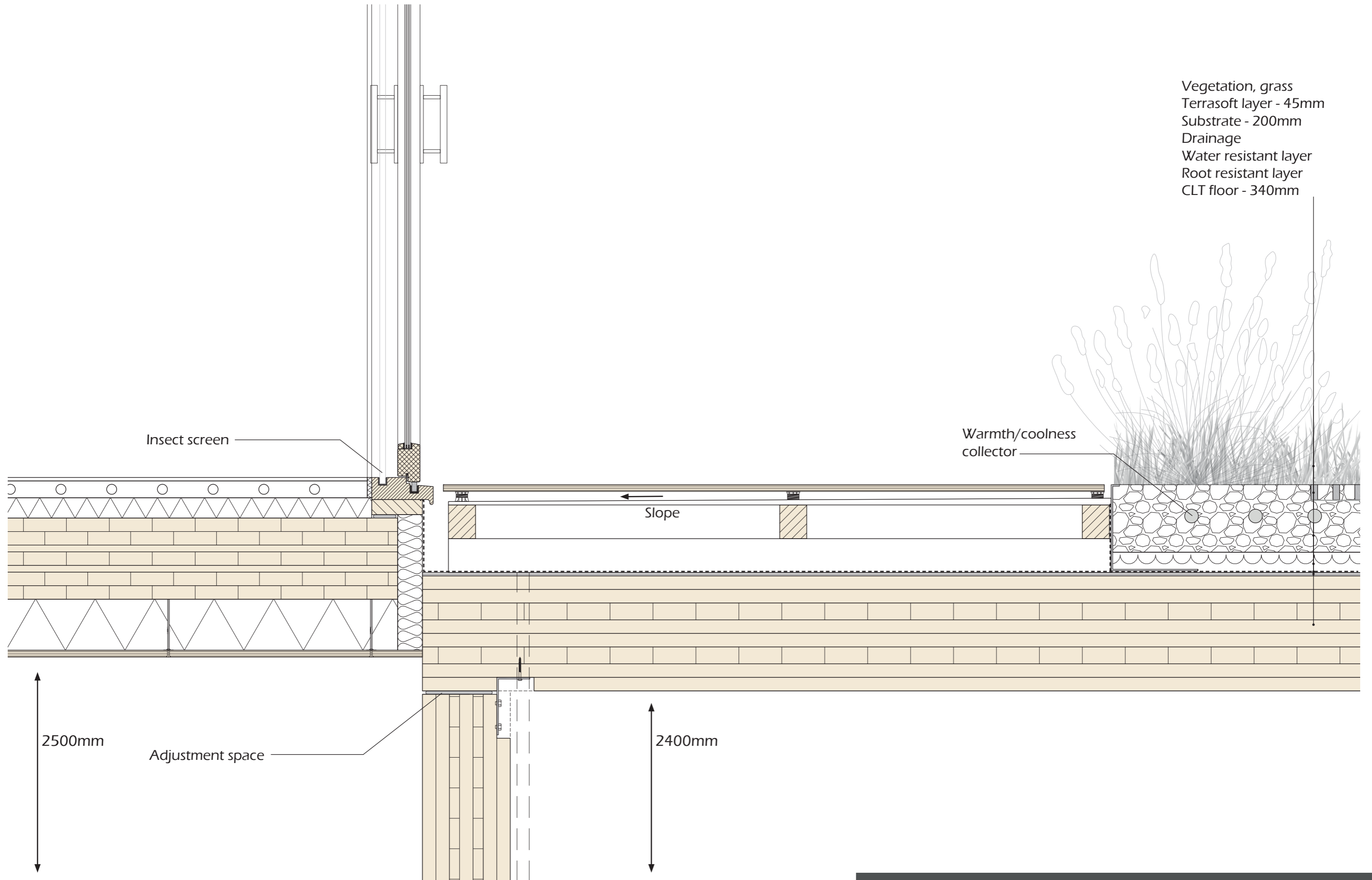


3. The balcony is assembled to the steel connecting element which sticks out of the façade.

Thanks to a cut out opening in the CLT of the balcony, the balcony can be slided over the steel element and fixed to it.



Details 4 and 5 - vertical - 1:10





Stone strips

Pietra di Cembra

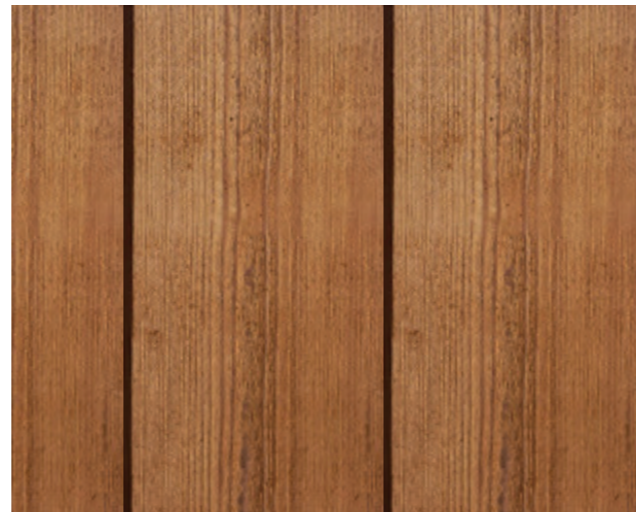
- Natural resources
- No chemical additives
- Made in Italy



Ecowood

Lunawood Thermowood

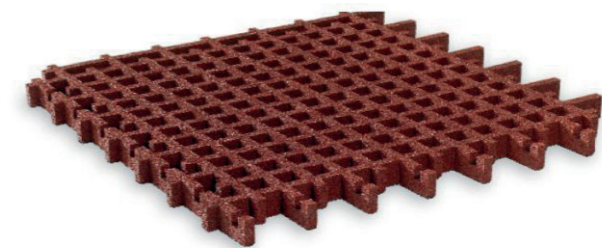
- Treated at 200°C to extend service life
- Insensitive to bacteria and fungi
- Uniform aging and low maintenance
- Made in the Netherlands



Terrasoft

Lawn Grating

- Soft surface and anti slip for fall protection
- Reinforcement and protection of the grass
- Requires little maintenance
- Made in Germany



On the roof

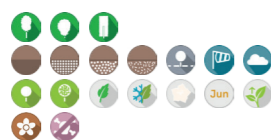
- Suitable for roof gardens
- Evergreen
- Maximum height of 6m
- Low risk on branch break



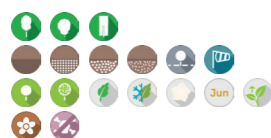
Aquifoliaceae Ilex
Ilex 'Nellie R. Stevens'



Rosaceae Prunus
Prunus lusitanica
Portugese laurierkers



Rosaceae Prunus
Prunus lusitanica 'Angustifolia'



Oleaceae Olea
Olea europaea
olijf

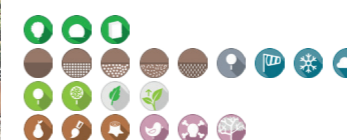


In the planters on the balconies and the galleries

- Varied in colour throughout the year
- Shade tolerant and evergreen
- Little maintainance



Eucommiaceae Eucommia
Euonymus alatus
Kardinaalsmuts



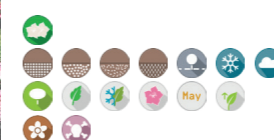
Rhamnaceae Frangula
Frangula alnus 'Aspleniifolia'



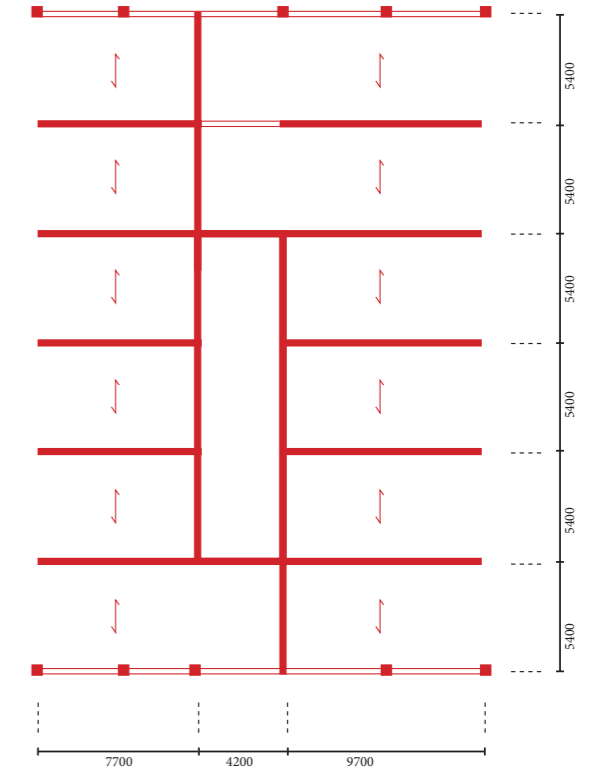
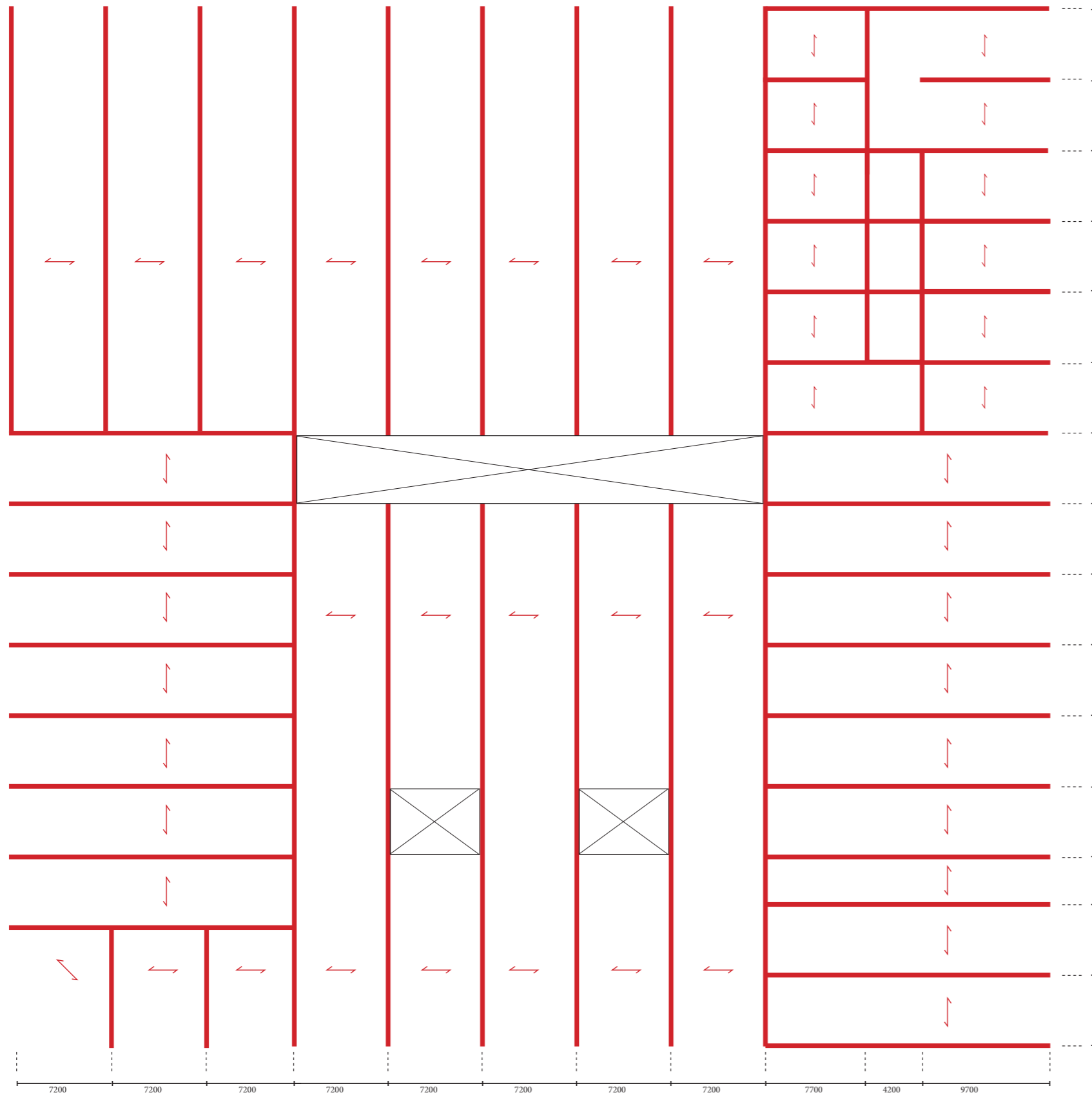
Aquifoliaceae Ilex
Ilex meserveae 'Blue Prince'



Rhododendron 'Nicoletta'

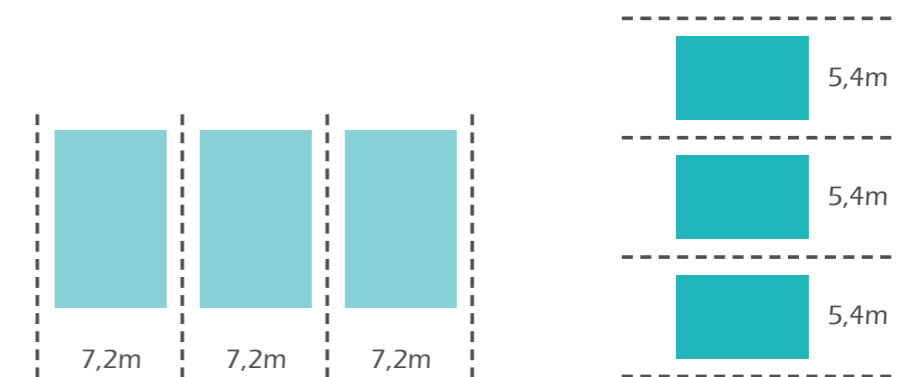


Construction scheme



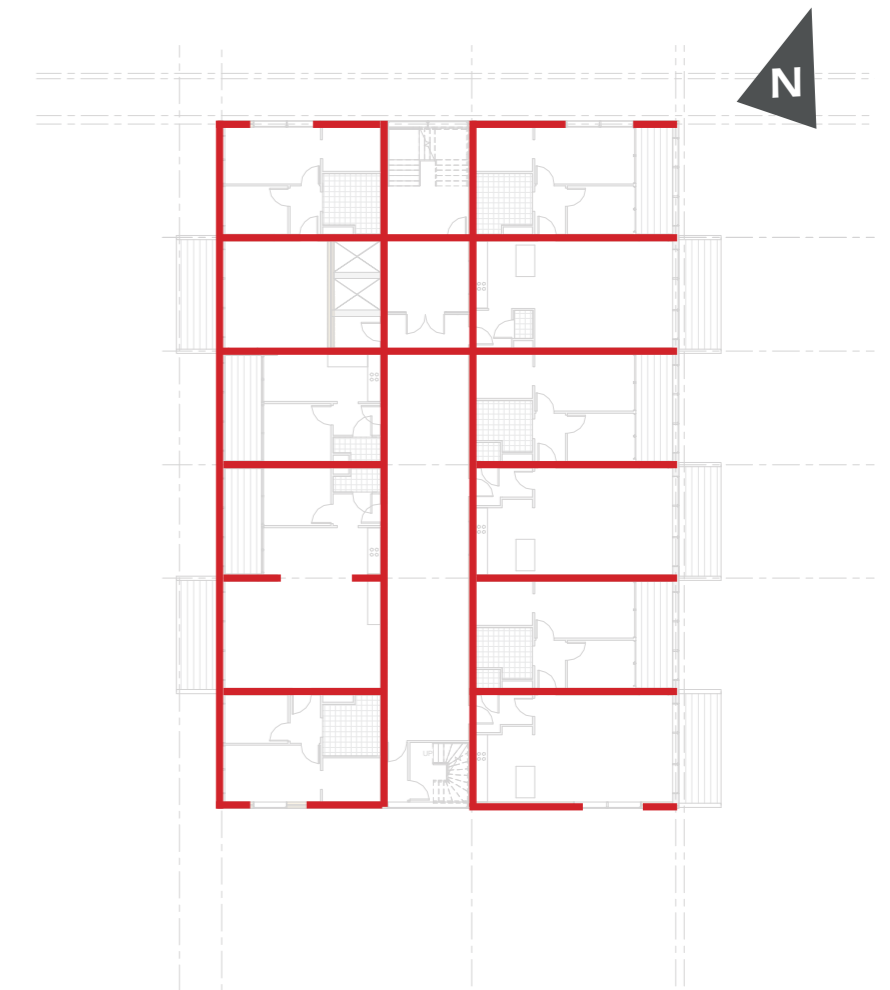
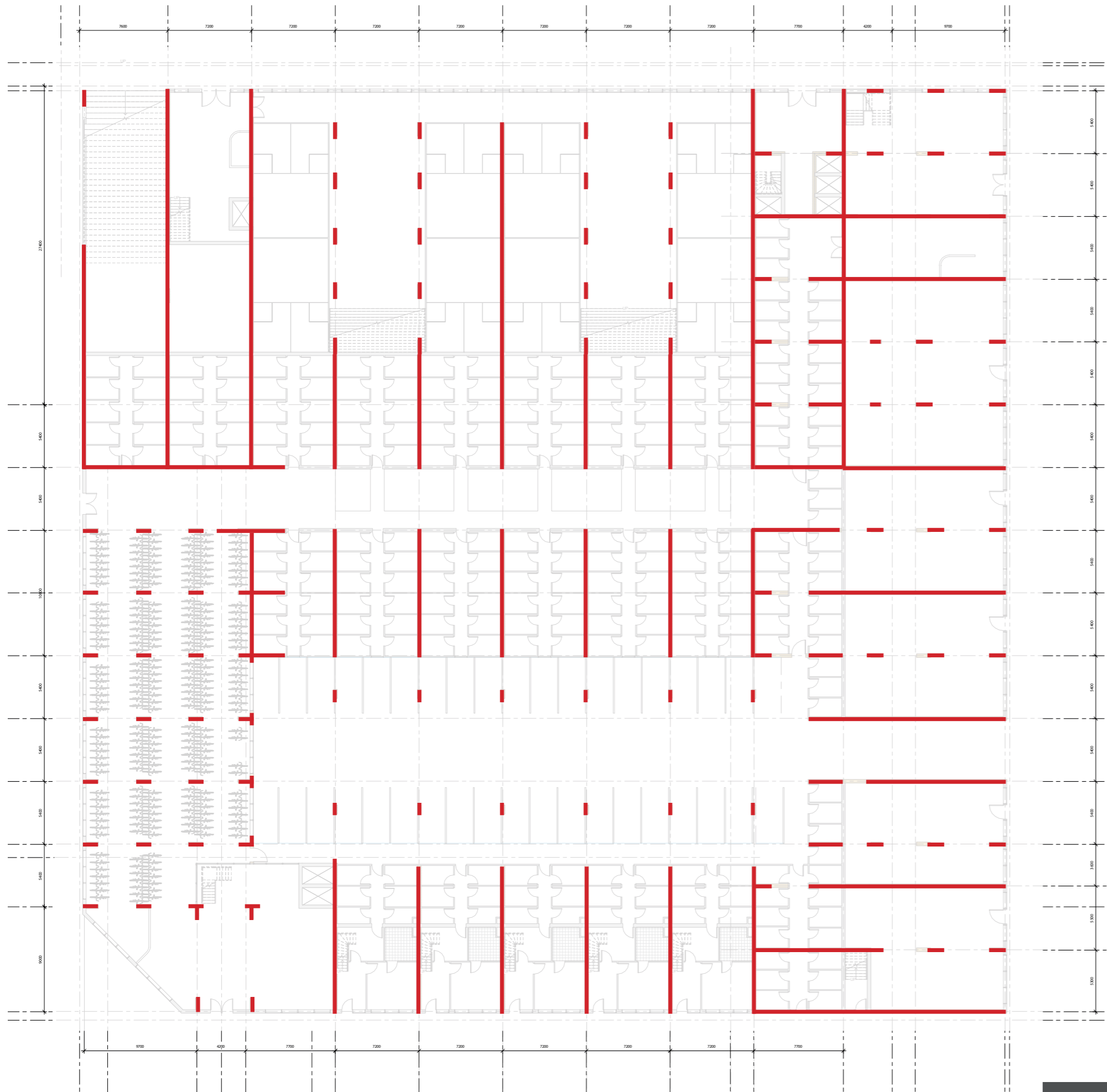
Construction size

Always 5,4m for corridor and 7,2m for gallery

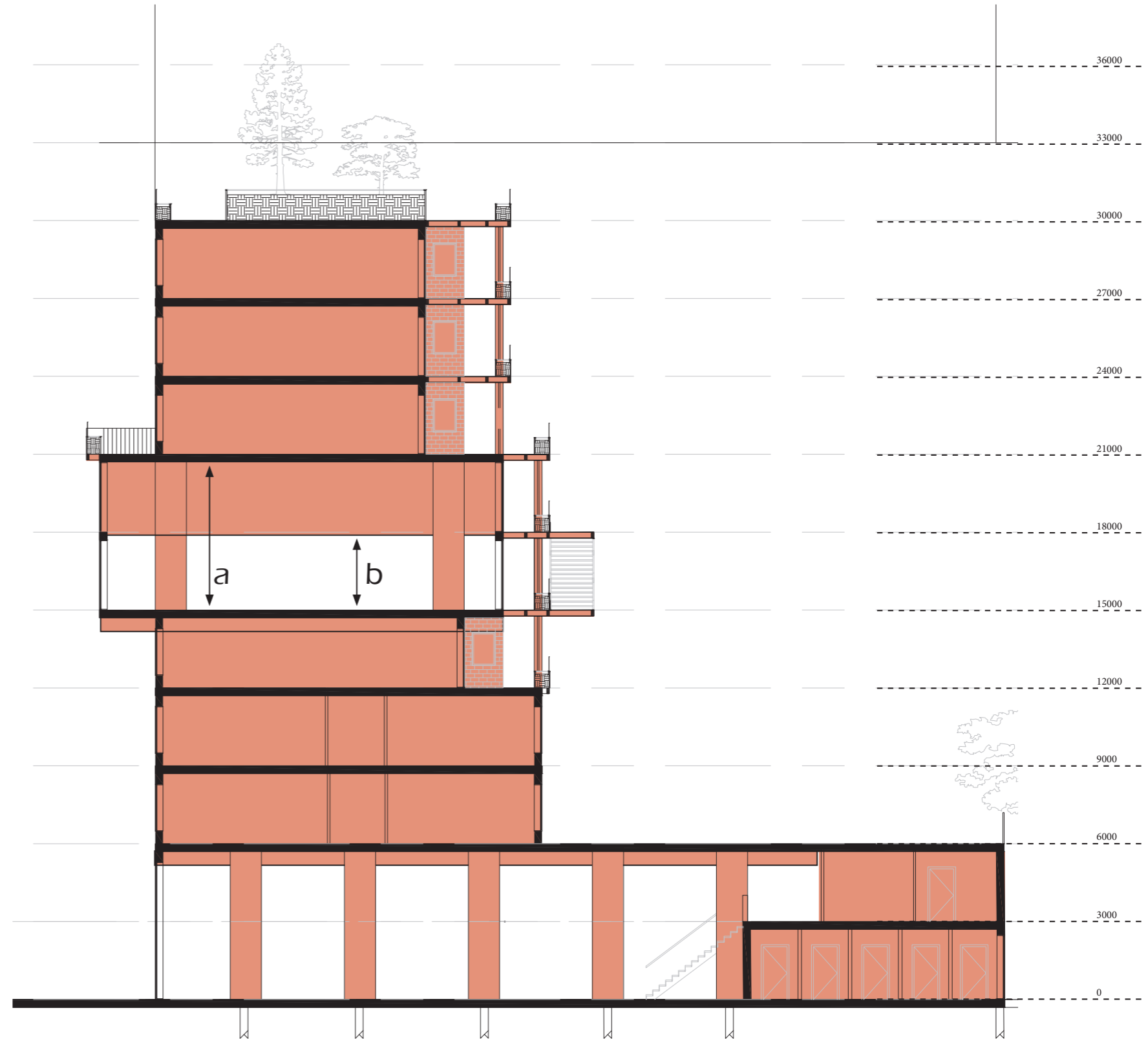
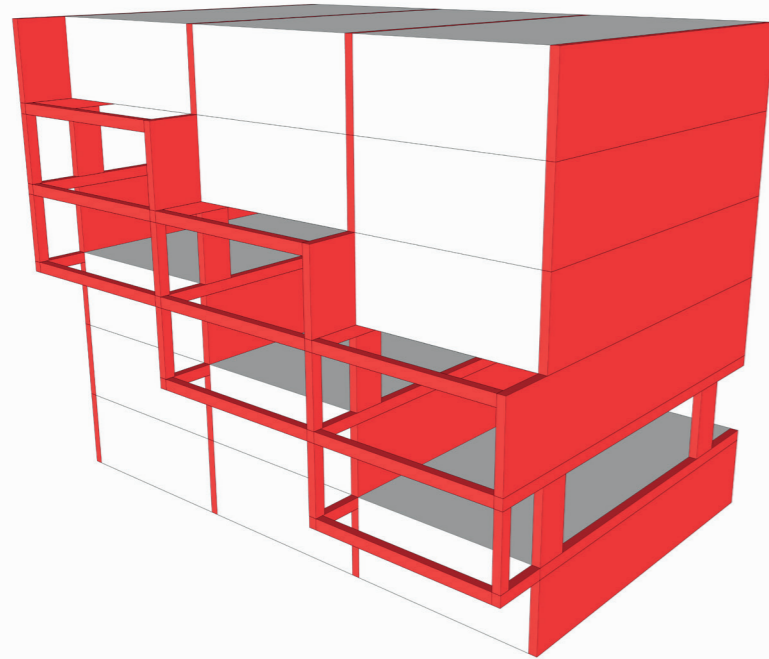
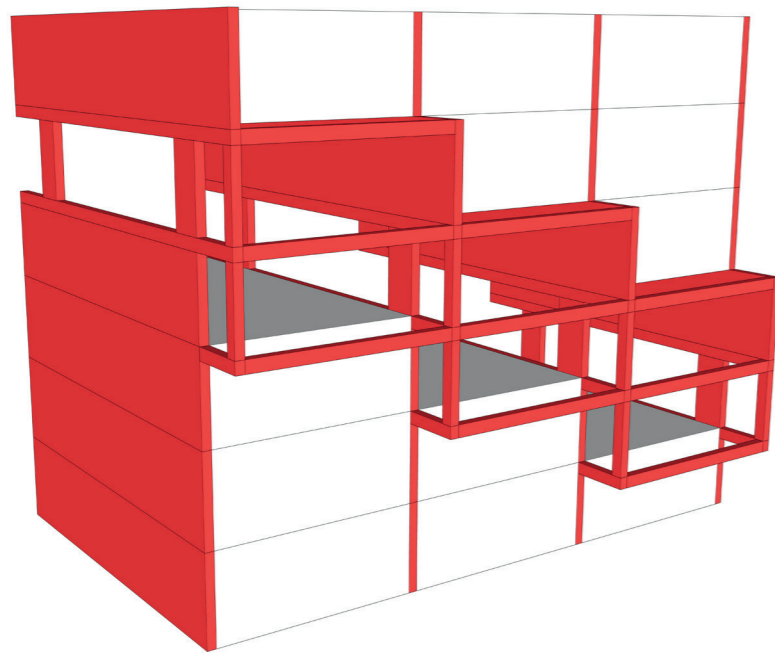
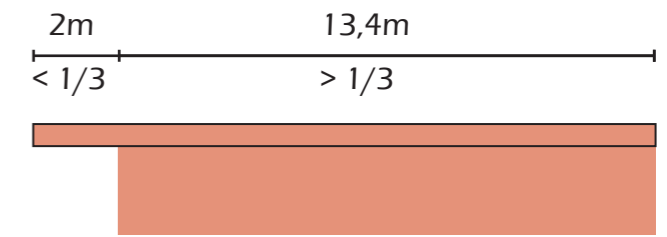


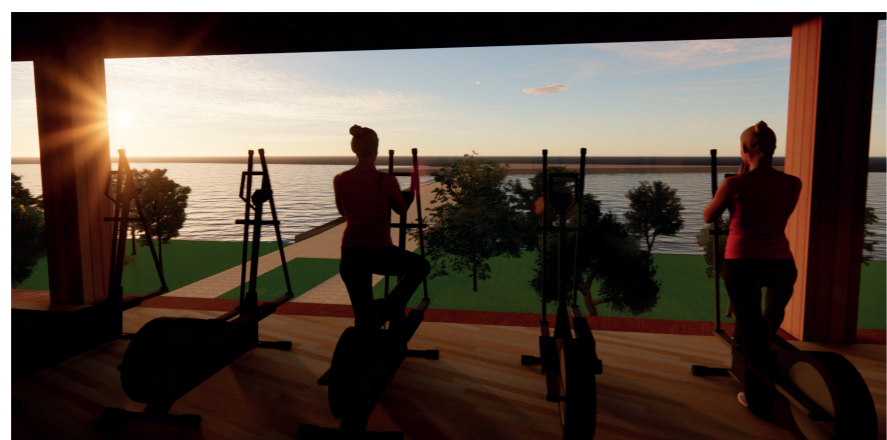
- Gallery dwellings have a construction size of 7,2m
- Corridor dwellings have a construction size of 5,4m

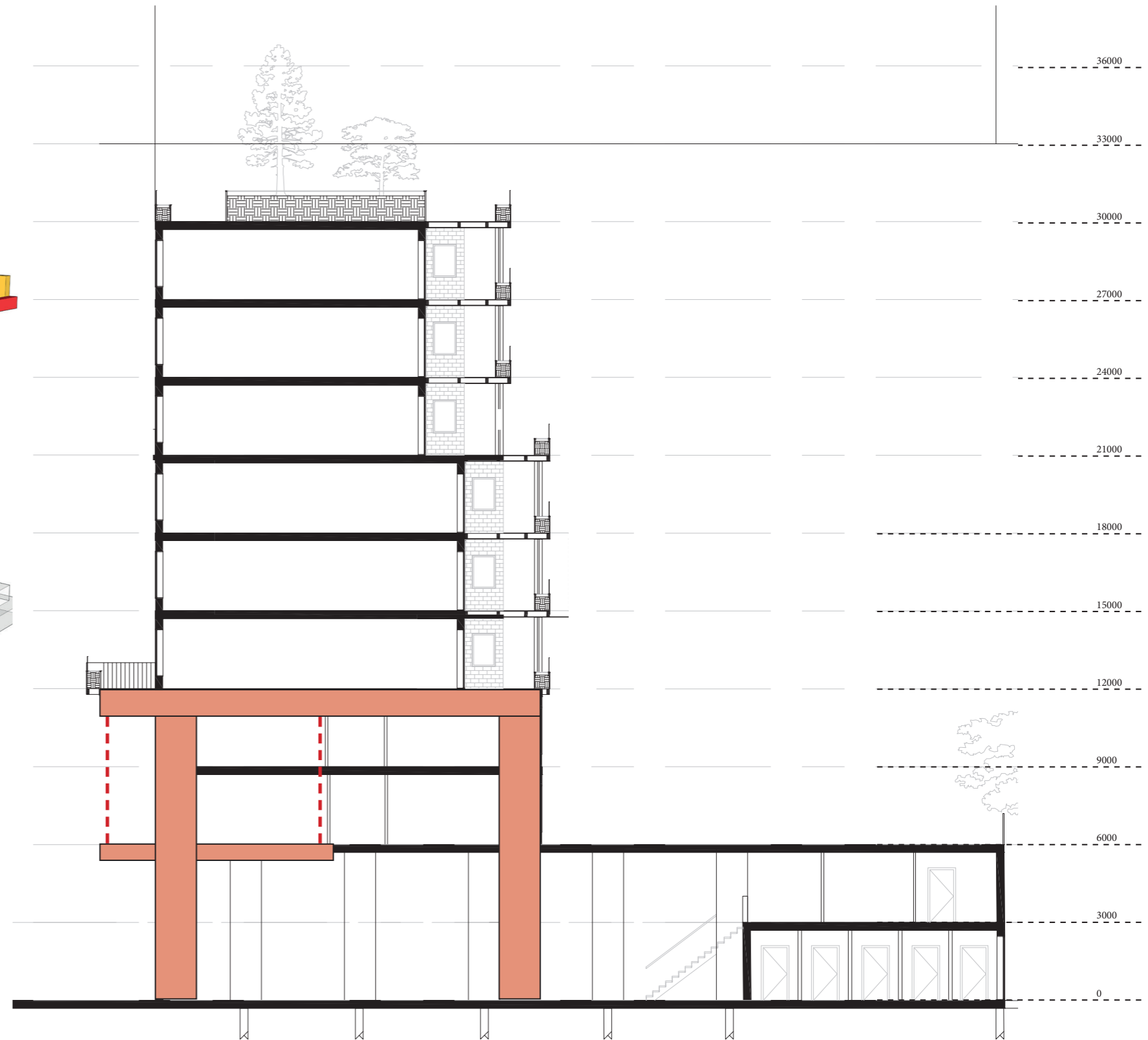
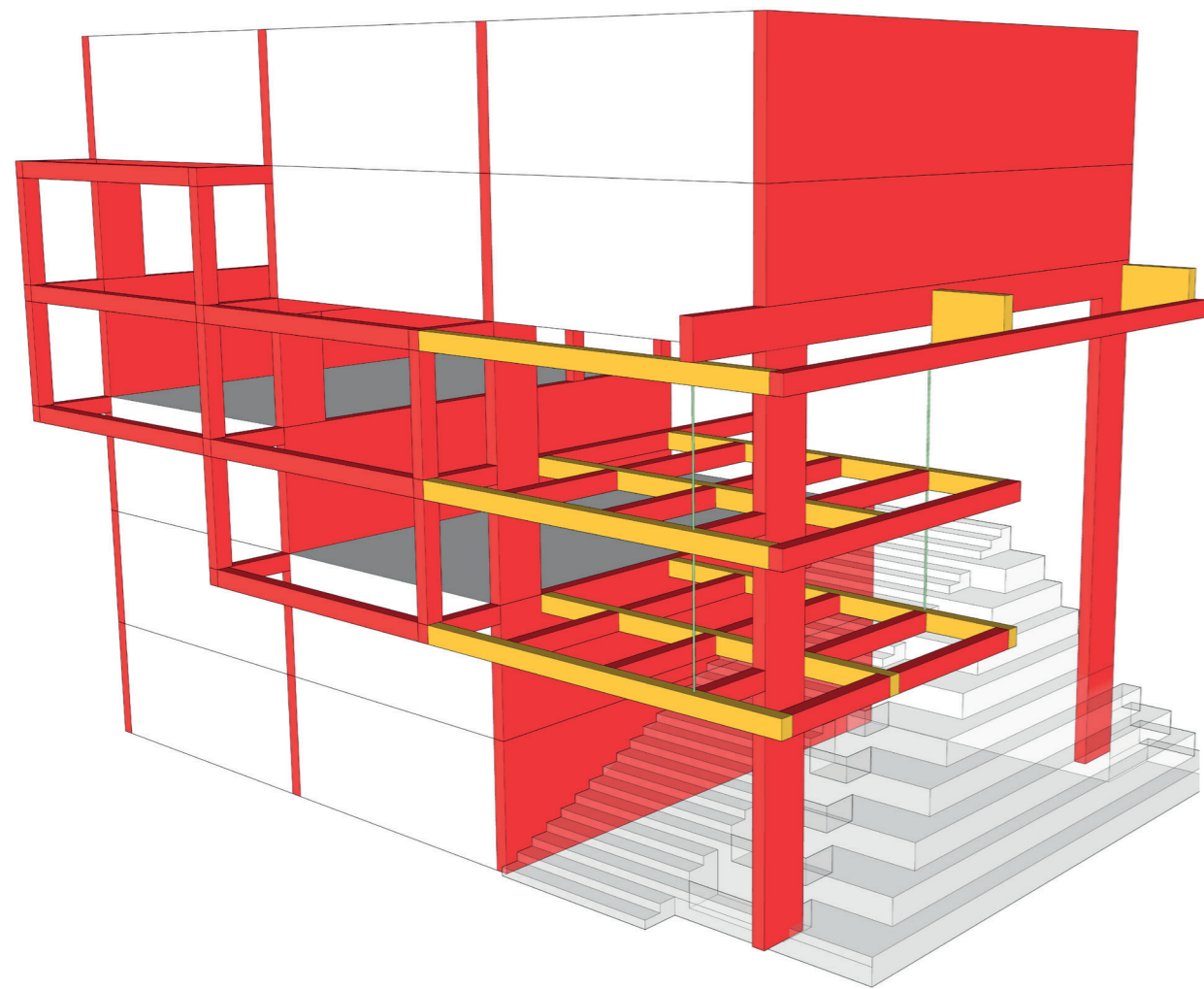
Construction floorplan - 1:400



The space is two levels high (a), but thanks to the stair shape, the construction opening is one level high (b).



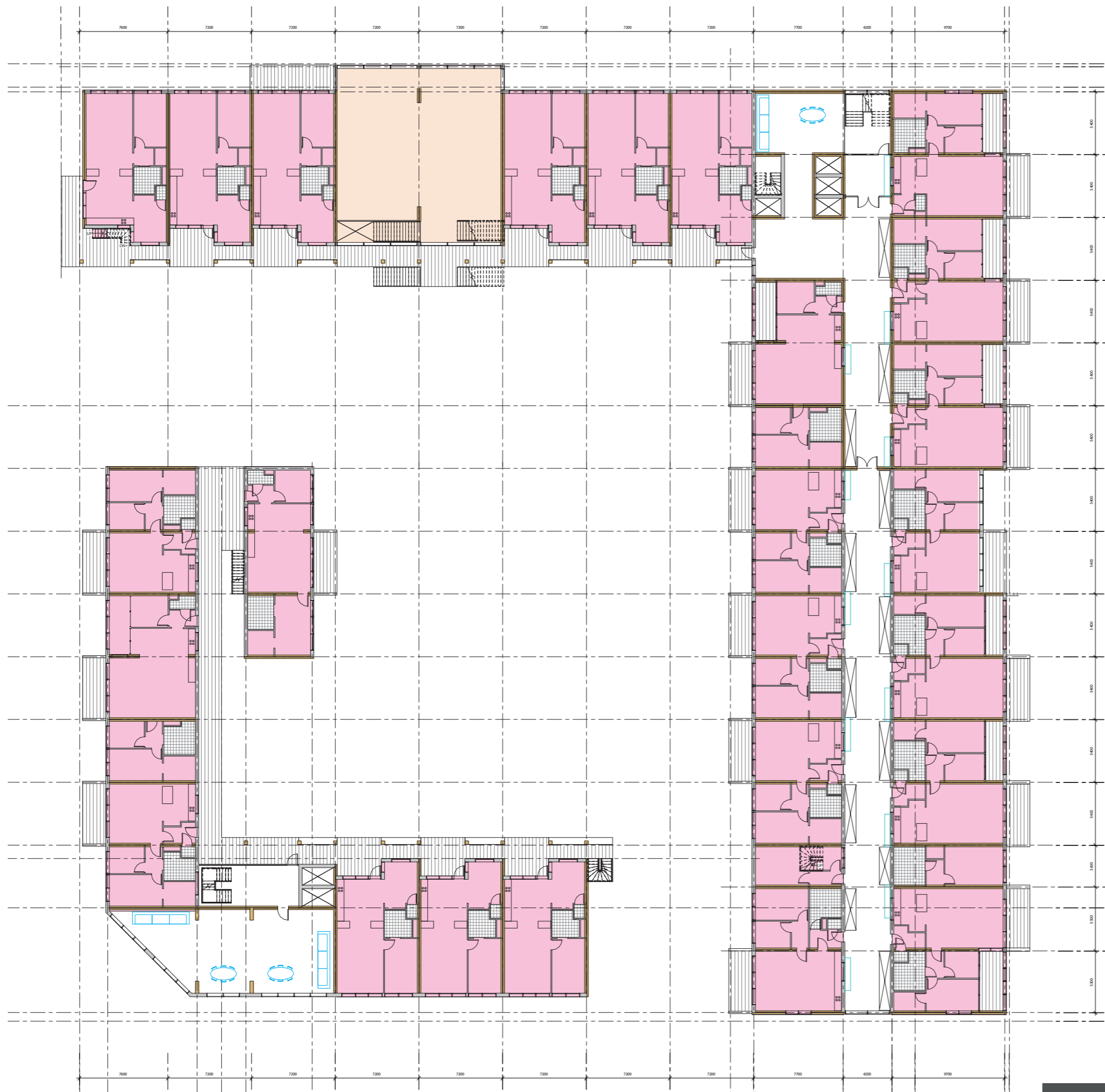




Impression: stairs to the public health square



Efficiency of rentable space



These calculations are based on the floorplan showed on the left. The rentable space is commercial space (the fitness centre) and the apartments. This was then taken as a percentage of the entire floor area (excluding the voids).

Rentable space	83%
Commercial space	200m ²
Apartments	280m ²
	280m ²
	760m ²
	484m ²
	292m ²
	250m ²
	<u>92m²</u>
	2638m²
Collective space	
Meeting space	161m ²
	125m ²
Corridor	<u>240m²</u>
	526m²

Movement

Technological developments of the last decades are often focused on making human daily life easier and easier. 'Making daily life easier' seems to be translated in the fact that people worldwide are making less and less physical efforts, while exercise and movement have a positive influence on human health.

This building helps people to make healthy choices in their daily life, by stimulating movement. Exercising is made attractive, accessible, visible and inviting. This concept of stimulating movement should be used in all future buildings. Of course, not all buildings need to contain a fitness centre, but by making the stairs inviting, the bikes visible and the routes through and surrounding the building accessible and attractive, people will be stimulated to move more in their daily routine. This helps them to stay fit, healthy and independent, providing a better quality of life.

Interaction

The use of social media, such as WhatsApp, Facebook and Skype, can no longer be ignored in everyday life, which means that people have to go outside less often to meet other people. Online games make it easy for people to get in touch with others without leaving their seat. Nevertheless, these types of conversating is not the same as meeting others face to face.

This building makes it easy for people to get in touch with each other. A large variety of spaces is created where poeple with common interests can meet each other. A vegetable garden, a yoga room, a pingpong table or a kitchen to cook for the restaurant.

Places to meet are created on different scale levels. A wide corridor which connects some front doors, a small roof square which connects galleries of different levels and the large inner square which forms a collective meeting space for the whole building block. These spaces are made attractive and people are invited for interaction. In future buildings, social interaction should be promoted as well. When people know their neighbours, it increases the feeling of safety and acceptance.

Vegetation

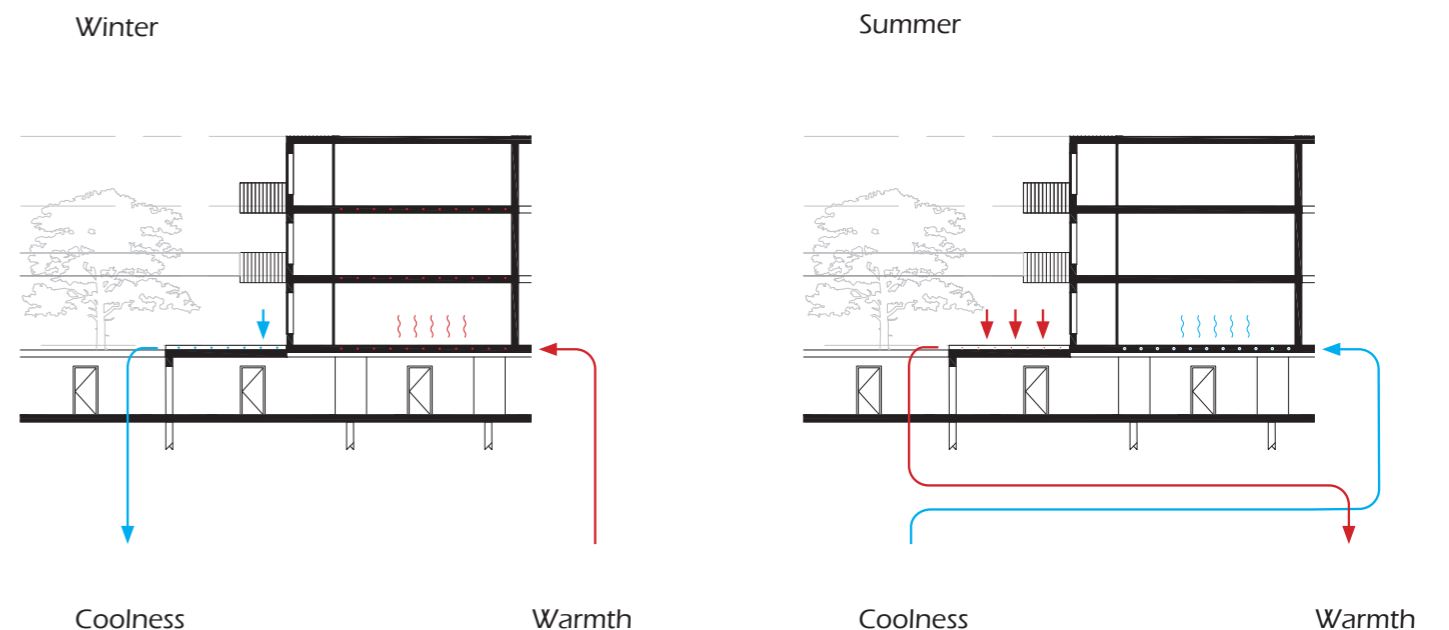
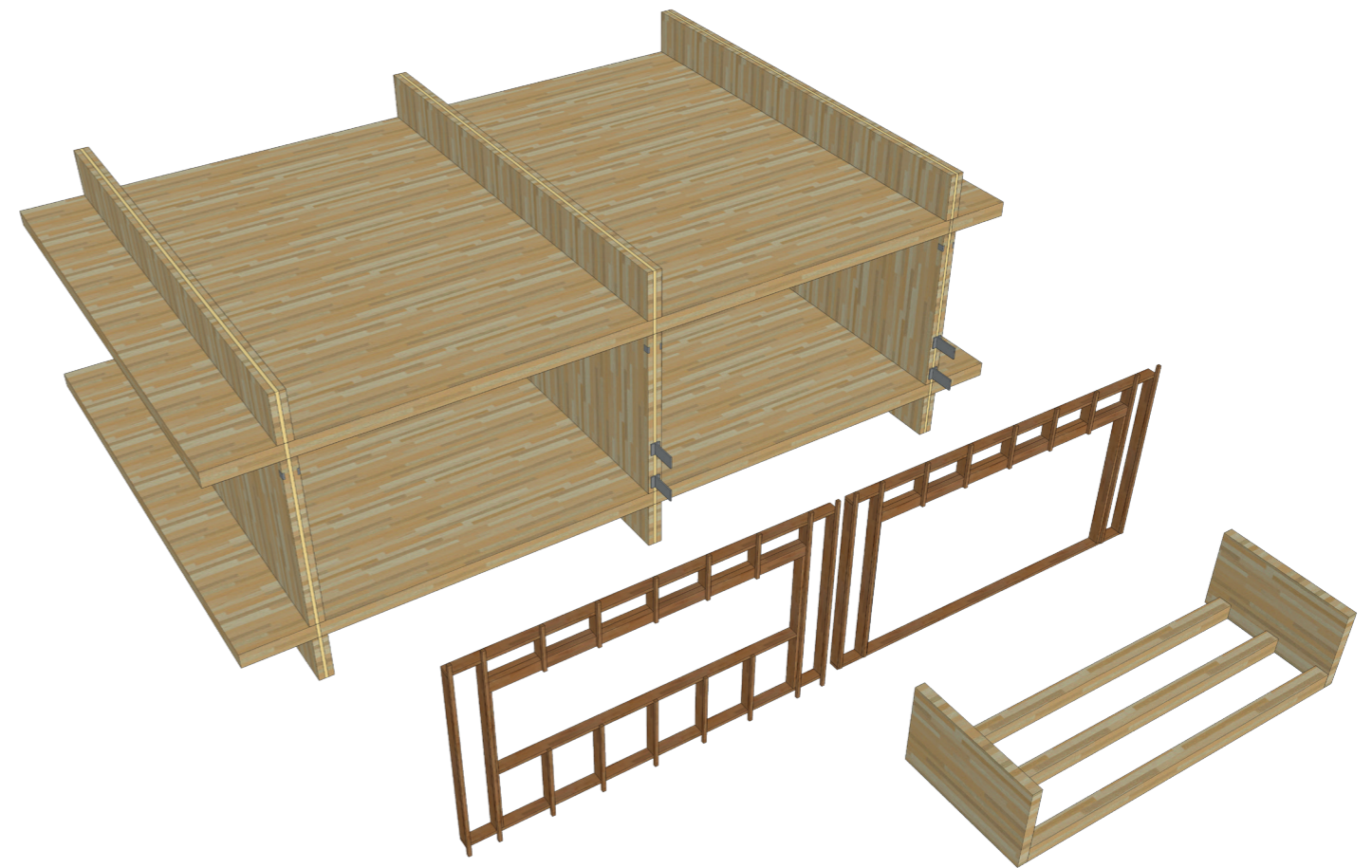
Green buildings are associated with a healthy life style, but a green building offers a lot on the city scale as well. It prevents the urban heat island effectheating and creates a living environment for different types of plants and animals offering space for biodiversity. Future buildings should integrate vegetation to reduce the difference between the city and its surroundings and offer space for the ecosystem.

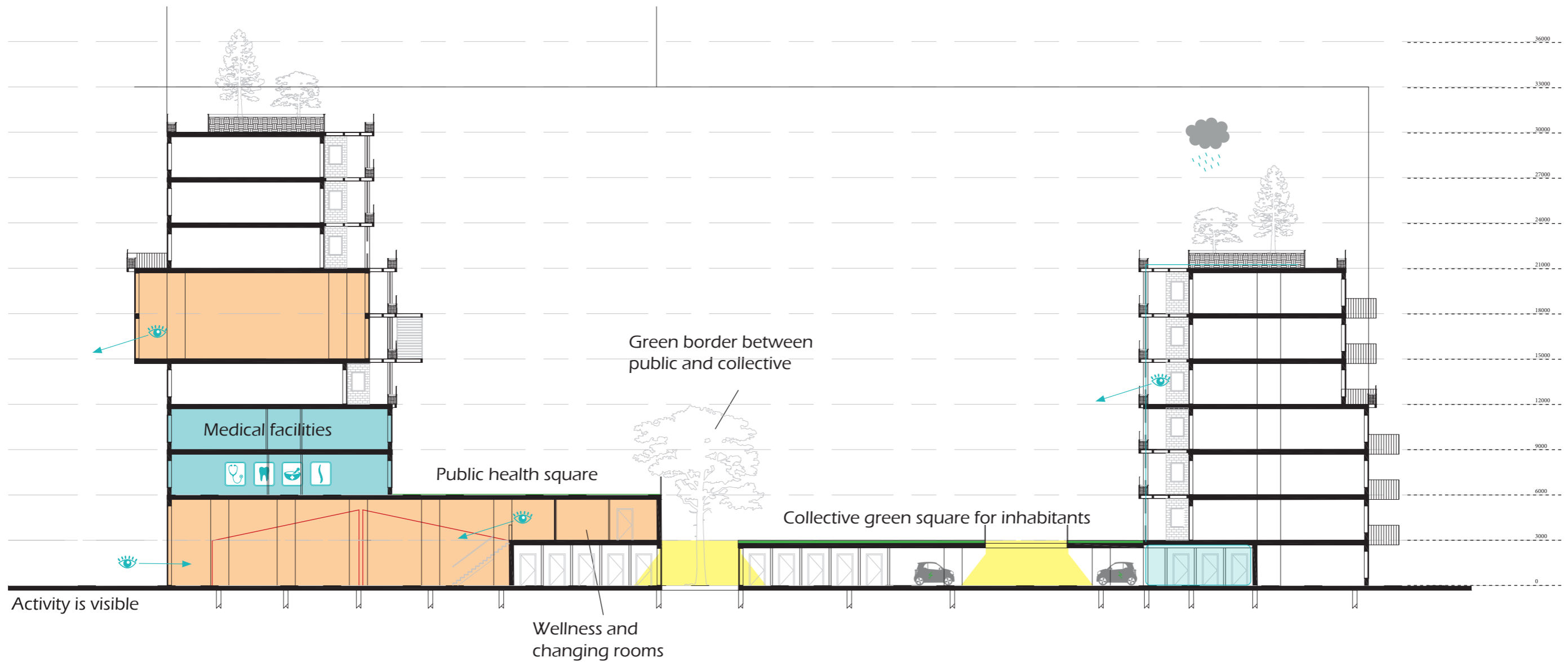
Cradle to cradle

The façade of the building is made out of prefab elements which can be placed by a crane. Thanks to the unity of these elements, the building costs will be lower and the building process will be faster than in other cases. The prefab elements are demountable, which makes it possible to reuse or replace the the elements in an easy and sustainable way without any waste.

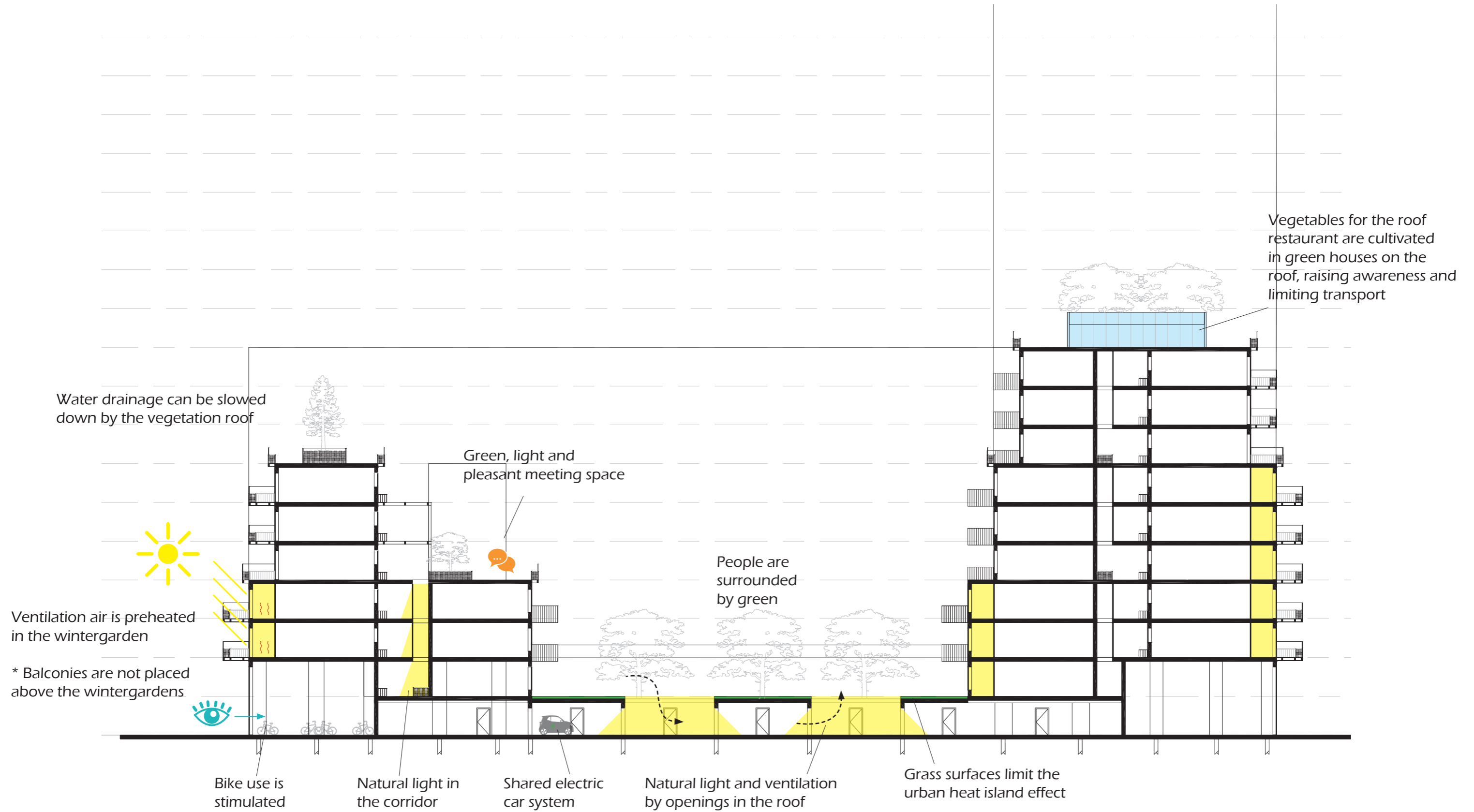
Warmth and coolness storage

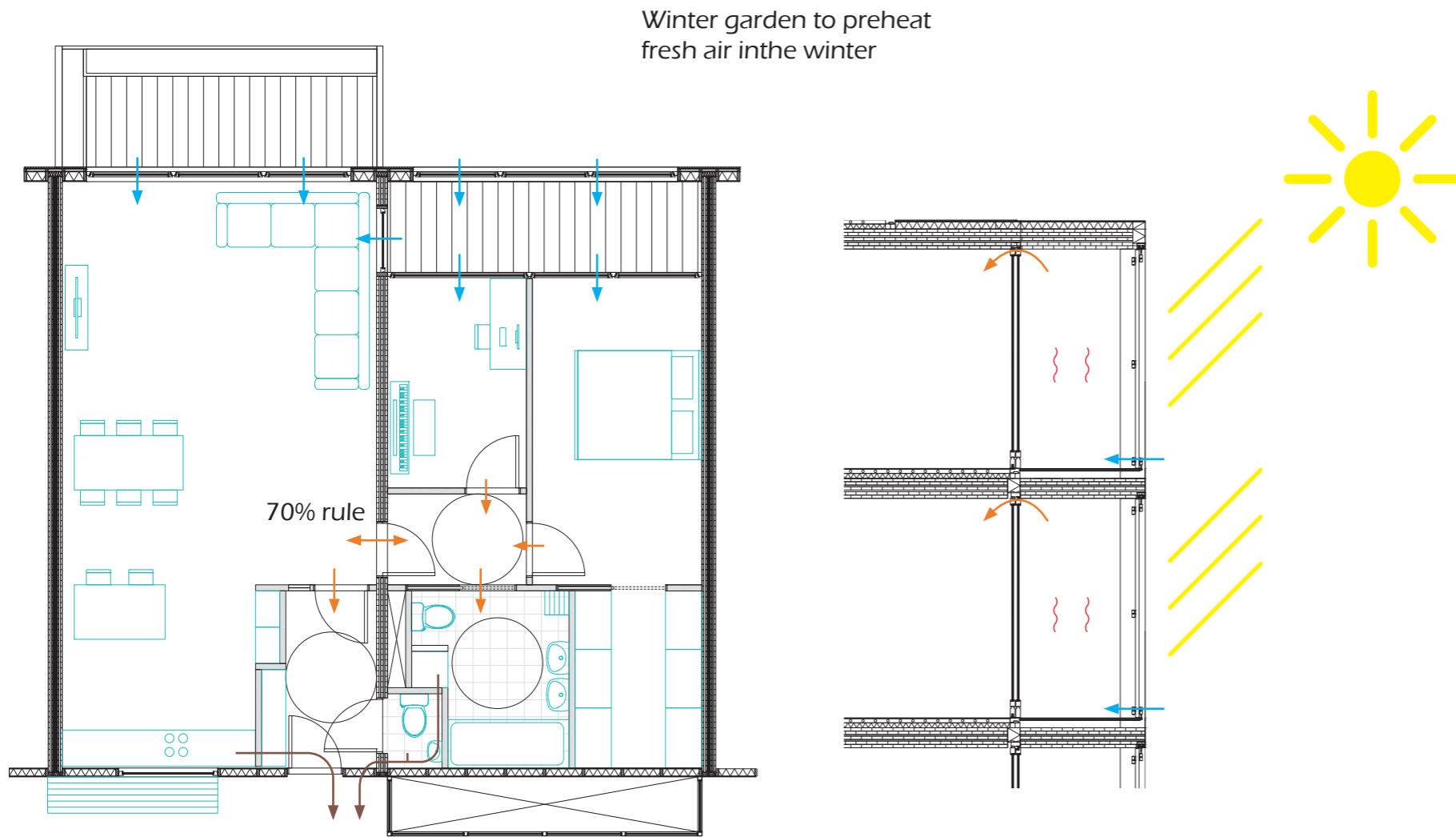
In this building, floor heating and cooling is used to get the apartments on the right temperature. For floor heating, a temperature of 35°C is needed which is much less than for a central heating system. From the apartments the system flows water to the collectors that are integrated under the grass of the inner squares, where warmth is collected in the summer and coolness is collected in the winter. The warmth of the summer is stored in the ground and used to warm the apartments during the winter and vice versa. So, a lot of energy can be saved.



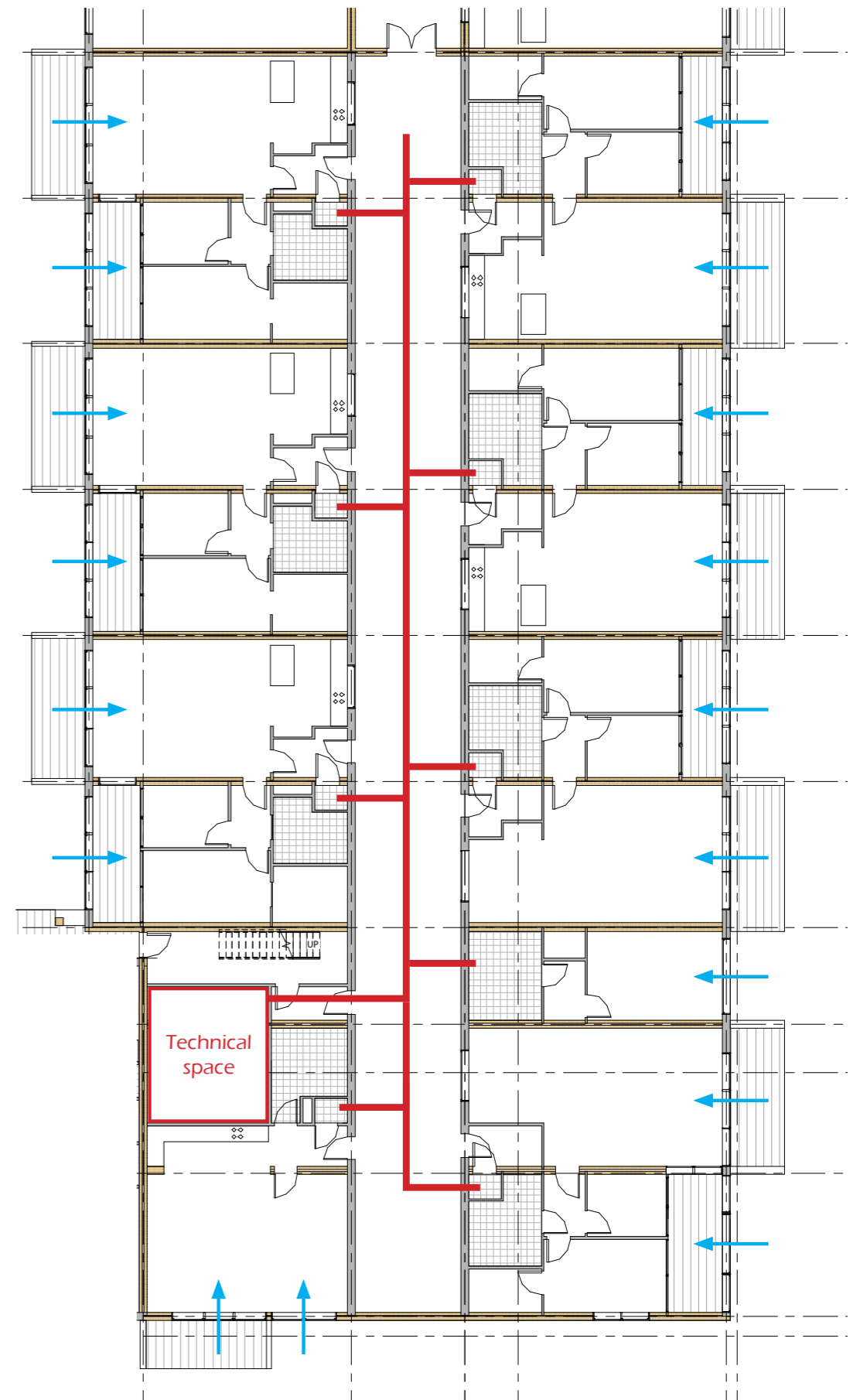


Future proof building

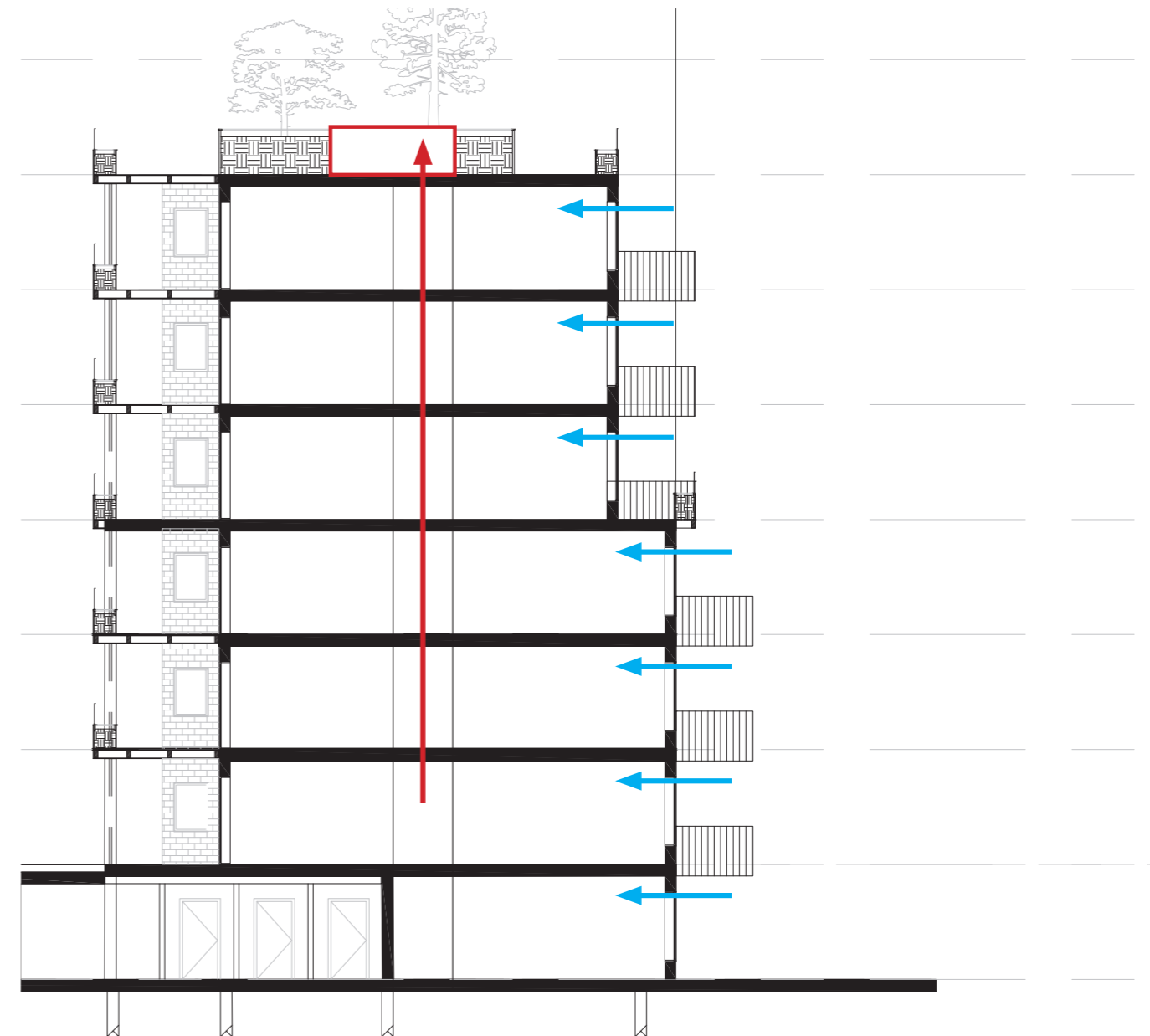
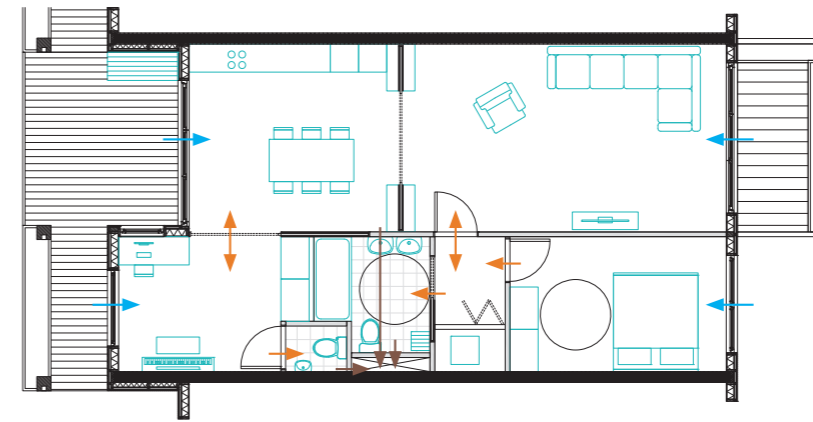
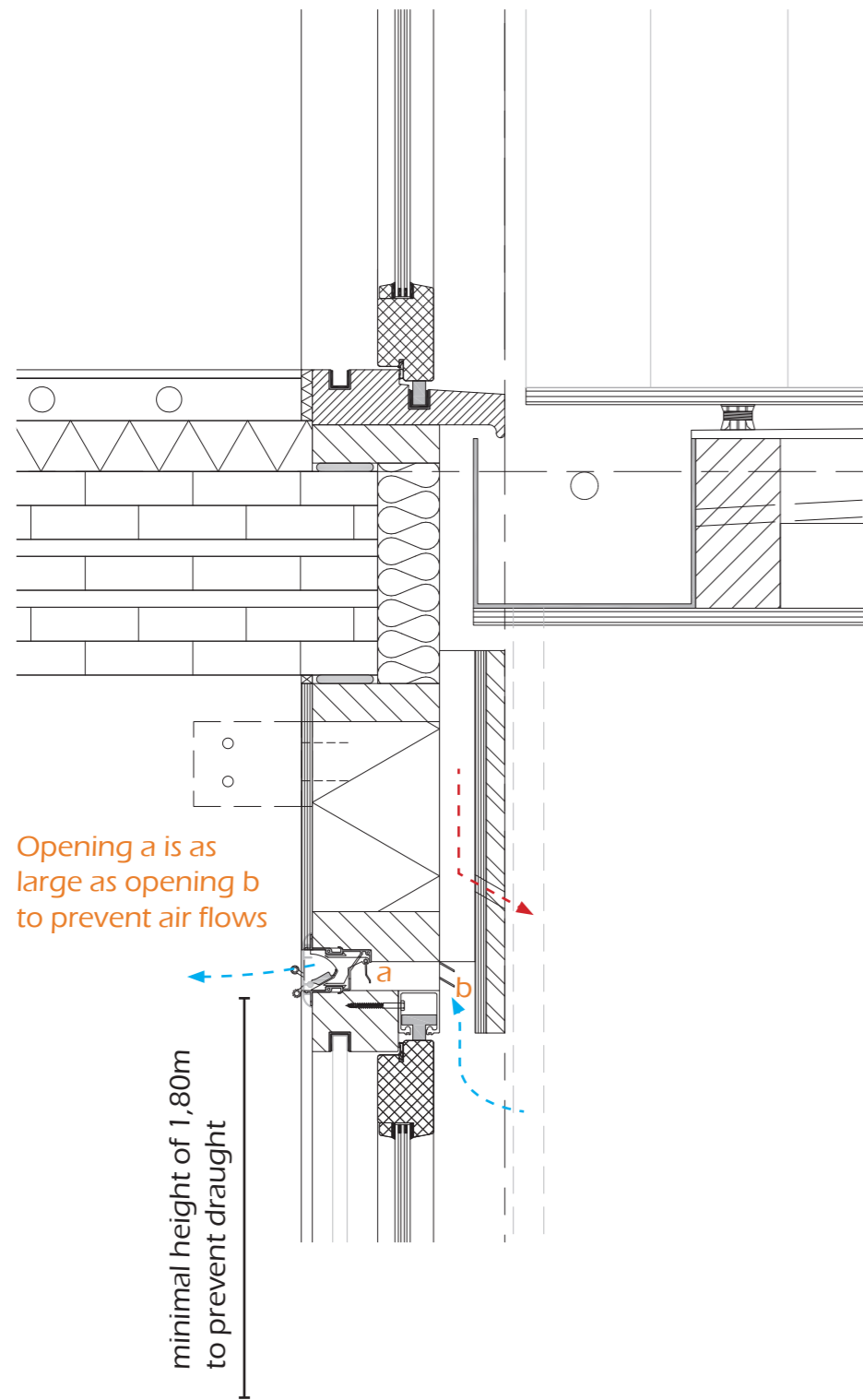




Ventilation type C - Natural input and mechanical output



Ventilation type C - Natural input and mechanical output

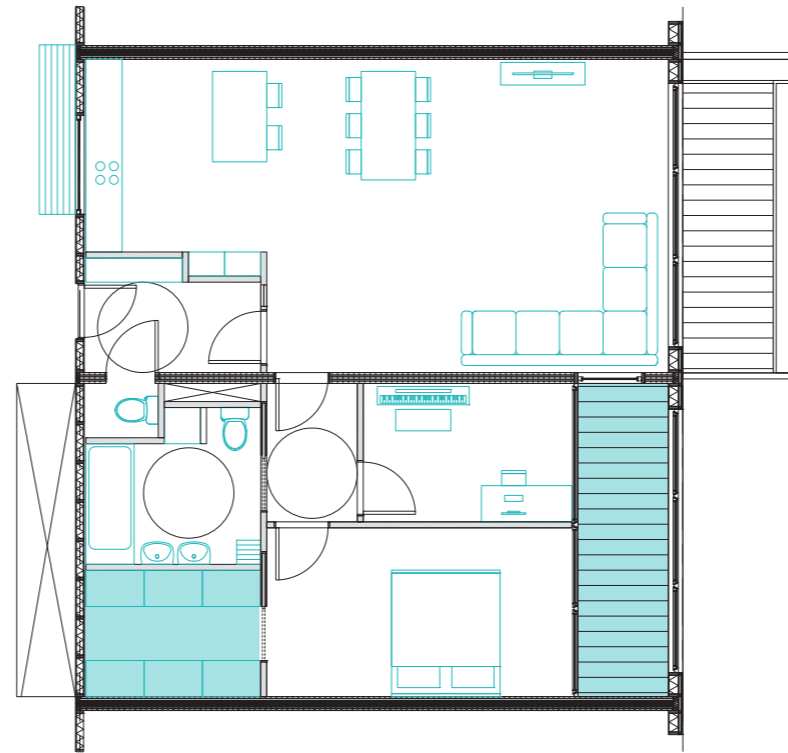




Luxury

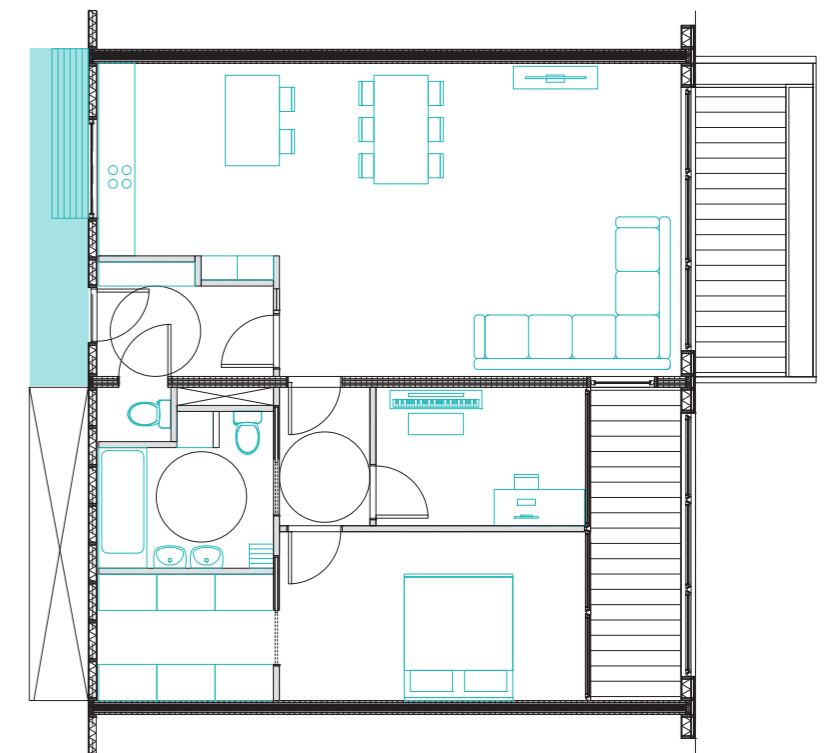


Luxury materials

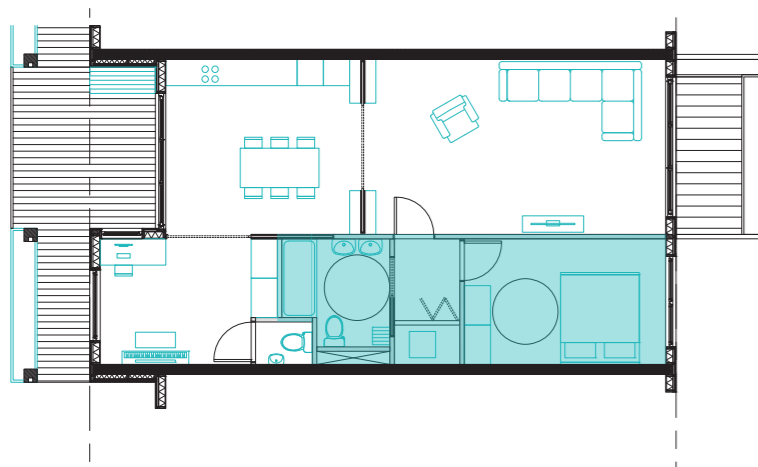


Extra comfort, by:

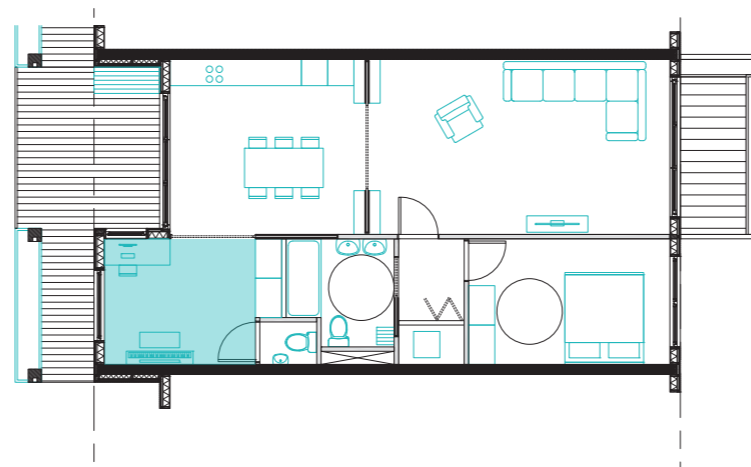
- Walk in closet
- Winter garden
- Large living room (>29m²)
- Sunny terrace



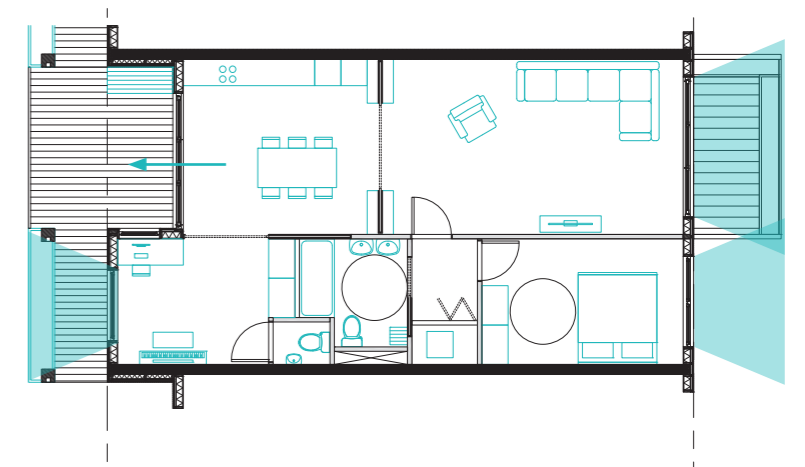
Transition zone to create distance and give the apartment its own identity



Distinction between the owners and visitors
2nd toilet



Extra room, for hobby or health care



View on the plants in combination with light
and a view on the skyline

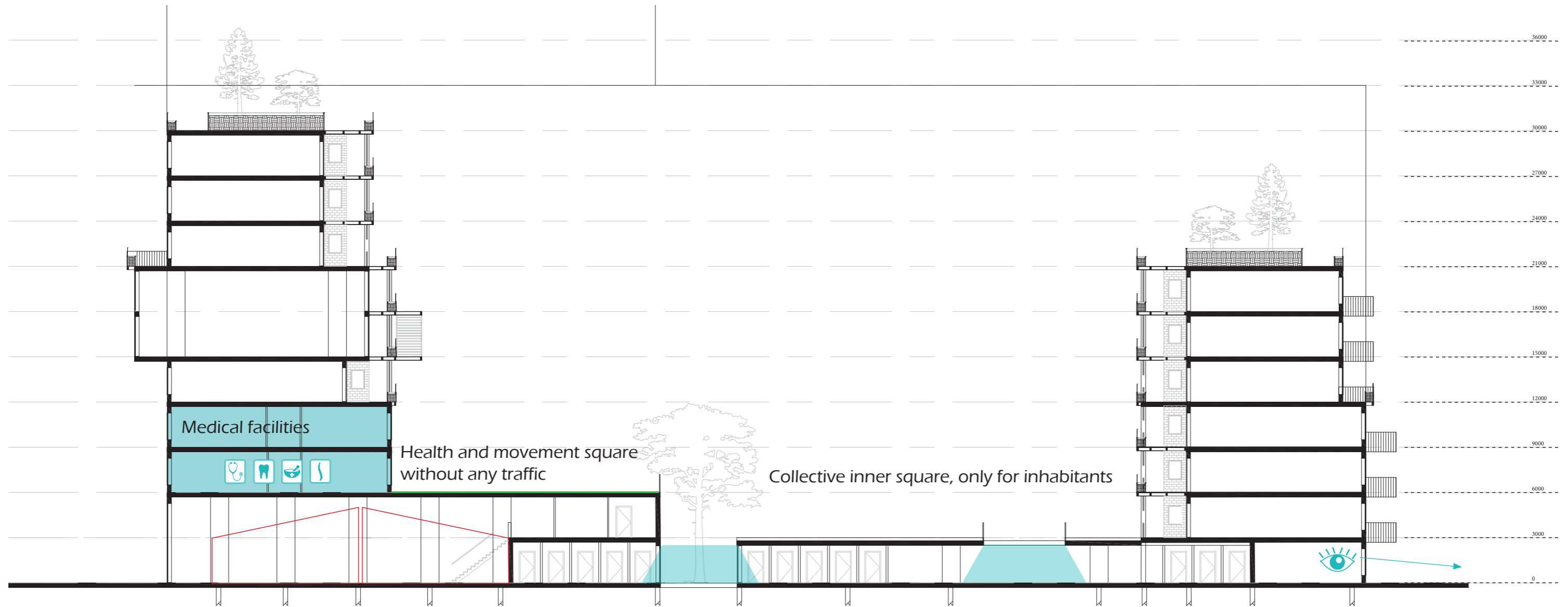
Feeling of safety

Extra feeling of safety by:

- Presence of medical facilities
- Health and movement square, closed at night and no traffic
- Social control on the street
- Storage space is light and clear organised
- Collective inner square, only for inhabitants



Experience safety









Stimulate movement and interaction in a comfortable residential building

The ACTIVE Stairs

Set of Drawings - June 2020
Jelle van Boggelen - 4453867 TU Delft
Tutors: F. Adema, T. W. Kupers & P. S. van der Putt