MINERVAHAVEN
WATER RESILIENT

A LIVEABLE AND AFFORDABLE
PLACE FOR STARTERS

P5
30th of JUNE 2020

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AR4AD110 DWELLING GRADUATION STUDIO - DUTCH HOUSING

CONTENT

1. TOPIC & TARGET GROUP

MORE EXTREME RAINFALL

Hevige wateroverlast treft Hilversum

Updated 13 jul. 2019 12 jul. 2019 in BINNENLAND

De Telegraaf

KNMI waarschuwt voor hevige regen en onweer

04 sep. 2018 in BINNENLAND

De Telegraaf

Nieuwe buien vanuit zuiden, 114 mm regen in Nieuwkoop

Wateroverlast in westen en midden en er komt nog meer

De Telegraaf

	Neerslagduur				
T [jaar]	**10 min**	**15 min**	**30 min**	**60 min**	**120 min**
0.5	***53 %***	*42 %*	*28 %*	*22 %*	*17 %*
1	*38 %*	*29 %*	*22 %*	17 %	16 %
2	*28 %*	*21 %*	15 %	14 %	15 %
5	20 %	15 %	12 %	12 %	16 %
10	16 %	13 %	11 %	14 %	18 %
20	14 %	12 %	13 %	16 %	*23 %*
25	15 %	12 %	14 %	18 %	*25 %*
50	15 %	15 %	18 %	*24 %*	*32 %*
100	17 %	18 %	*24 %*	*31 %*	*41 %*
200	20 %	*23 %*	*31 %*	*41 %*	***52 %***
250	*21 %*	*25 %*	*34 %*	*45 %*	***56 %***
500	*26 %*	*31 %*	*44 %*	***57 %***	***71 %***
1000	*31 %*	*39 %*	***55 %***	***72 %***	***88 %***
10000	nb	nb	Nb	nb	nb

Figure 1. *Increase of rainfall for each duration and period compared to Buishand & Wijngaard's research in 2007.* (STOWA, 2018).

SUMMARY RESEARCH

EMISSION OF CARBON DIOXIDE BY HUMANS → CLIMATE CHANGES & WE DON'T MEET PARIS CLIMATE AGREEMENT → MORE EXTREME RAINFALL IN SHORT PERIODS OF TIME → SEWAGE SYSTEMS CAN'T HANDLE IT, FLOODS WILL BE THE RESULT

TARGET GROUP

08 apr. | Geld

Starter moet veel eigen geld meenemen voor eerste huis

Wie zijn of haar eerste koophuis wil kopen, moet flink hebben gespaard. Of geld van familieleden krijgen. Een alleenwonende met een modaal salaris (€36.000) moet namelijk gemiddeld €22.590 bijleggen als diegene een huis van 60 vierkante meter wil kopen.

De Telegraaf 08-04-2019

04 apr. | Geld

Starterswoningen razendsnel duurder

Het aantal hypotheekaanvragen voor woningen is in het eerste kwartaal van 2019 met 3,3% gedaald ten opzichte van een jaar eerder. Wel is er sprake van wat herstel ten opzichte van de maanden november en december, zo meldt hypotheekregistratienetwerk HDN.

De Telegraaf 04-04-2019

31 okt. | Geld

'Nieuwe leennormen helpen starter niet'

Volgend jaar zullen huizenkopers iets meer mogen lenen op basis van hetzelfde inkomen. Maar omdat de huizenprijzen zo snel stijgen, schieten starters op de woningmarkt daar niets mee op.

De Telegraaf 31-10-2018

18 okt. | Binnenland

Jongeren worden uitgesloten op de woningmarkt

Als je voor je 35e geen woning hebt gekocht, is de kans groot dat je dat niet meer kunt doen. Daarvoor waarschuwt het Kadaster na onderzoek onder starters op de woningmarkt.

De Telegraaf 18-10-2018

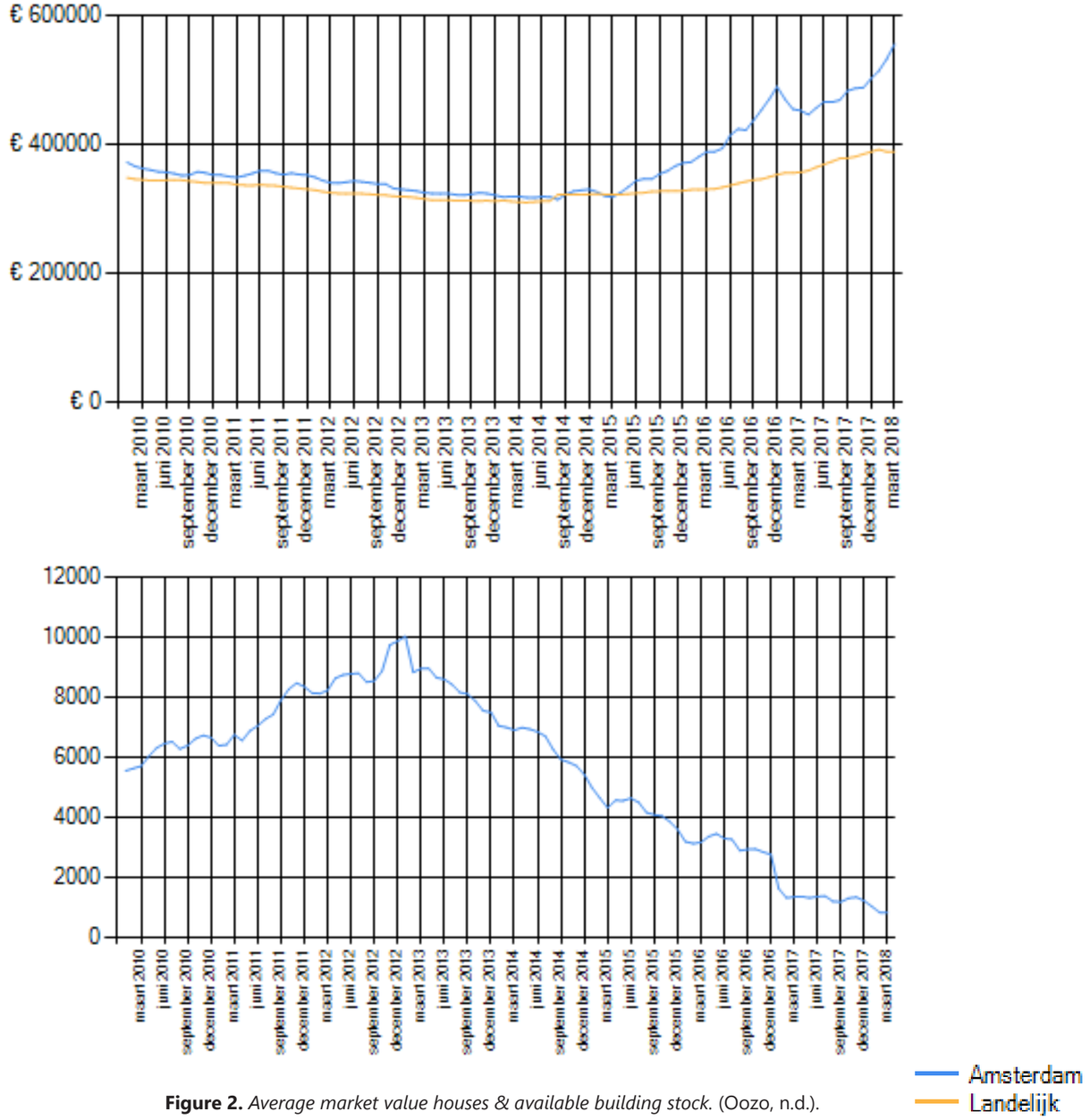


Figure 2. *Average market value houses & available building stock.* (Oozo, n.d.).

Education level
MBO

Monthly income - 0 years of experience		
Source 1	€	1.500
Source 2	€	1.500
Source 3	€	1.800
Source 4	€	1.800
Average	€	1.650

Annual income
€ 19.800

Education level
HBO

Monthly income - 0 years of experience		
Source 1	€	1.800
Source 2	€	1.800
Source 3	€	2.200
Source 4	€	2.200
Source 5	€	2.300
Source 6	€	2.500
Average	€	2.133

Annual income
€ 25.600

Education level
WO

Monthly income - 0 years of experience		
Source 1	€	2.200
Source 2	€	2.500
Source 3	€	2.500
Source 4	€	2.500
Source 5	€	2.800
Source 6	€	2.800
Average	€	2.550

Annual income
€ 30.600

Mortgage	ABN Amro	Moneywise	Rabobank	ING	Average
1x MBO	€ 49.824	€ 51.218	€ 47.049	€ 49.075	**€ 49.292**
2x MBO	€ 155.149	€ 161.366	€ 151.870	€ 158.411	**€ 156.699**
1x HBO	€ 99.789	€ 103.517	€ 94.536	€ 98.607	**€ 99.112**
2x HBO	€ 199.577	€ 207.507	€ 195.296	€ 203.707	**€ 201.522**
1x WO	€ 118.359	€ 121.671	€ 108.322	€ 116.868	**€ 116.305**
2x WO	€ 251.014	€ 258.037	€ 238.966	€ 249.257	**€ 249.319**
MBO + HBO	€ 177.363	€ 184.437	€ 176.584	€ 181.059	**€ 179.861**
MBO + WO	€ 201.820	€ 207.467	€ 191.698	€ 199.954	**€ 200.235**
HBO + WO	€ 224.712	€ 230.999	€ 213.411	€ 223.540	**€ 223.166**

Annual income		Affordable area
1x MBO	€ 49.292	**9,6 m2**
2x MBO	€ 156.699	**30,5 m2**
1x HBO	€ 99.112	**19,3 m2**
2x HBO	€ 201.522	**39,3 m2**
1x WO	€ 116.305	**22,7 m2**
2x WO	€ 249.319	**48,6 m2**
MBO + HBO	€ 179.861	**35,0 m2**
MBO + WO	€ 200.235	**39,0 m2**
HBO + WO	€ 223.166	**43,5 m2**

Market value
€ 5.132 /m2

Figure 3. *Economic research in relation to starters and affordable dwelling size.* (Author).

STARTERS

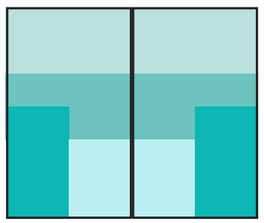
KEYWORDS: AFFORDABLE, COMPACT AND MAINTAINING QUALITY

AGE:	18 - 25 YEARS OLD	PERSONS IN HOUSEHOLDS:	1 OR 2 (SINGLE, FRIENDS AND COUPLES)
EDUCATION:	MBO, HBO OR WO	DWELLING SIZES:	BETWEEN 20 - 45m^2
ANNUAL INCOME:	€19.800 AND €30.600	HOUSING PRICES:	BETWEEN €102.600 AND €230.900
MORTGAGE BETWEEN:	€49.300 AND €249.300	HOUSEHOULD POSSIBILITIES:	1x HBO 1x WO 2x MBO 1x MBO AND 1x HBO 1x MBO AND 1x WO 2x HBO 1x HBO AND 1x WO 2x WO

2. DESIGN STRATEGIES

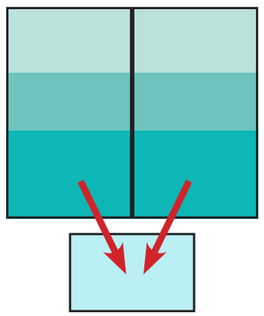
STRATEGY OF ORGANISING DWELLING FUNCTIONS

1) ALL IN ONE



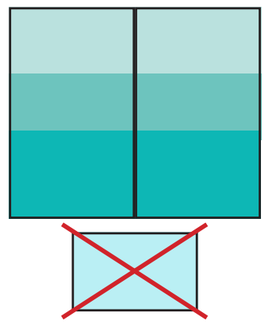
- Every dwelling has all the functions the target group demands.
- Many small spaces
- Negative influence on the quality of the compact floor plan.

2) SHARED



- Less used functions will be removed out of the dwelling
- Function will be transformed from private to shared function
- Interaction will be stimulated
- More quality in dwelling

3) NEGLECTED



- Less used functions will be removed both out of the dwelling and building
- An external company in the neighbourhood will provide the function
- More quality in dwelling

PREFERENCES OF STARTERS

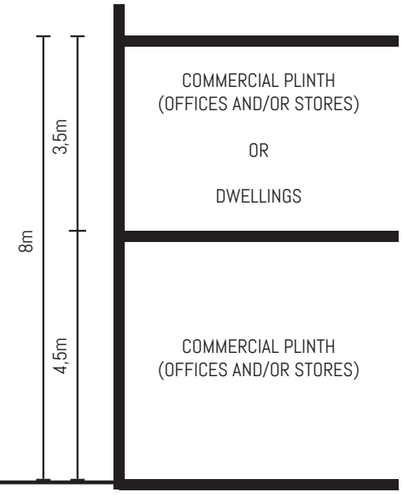
Types in relation to Starters	Student	Single
Where do they want to live	In an atmospheric environment	27% wants to live in a neighbourhood with not much social security
Want to share	Bicycle storage (78%) Terrace/courtyard (75%) Laundry room (40%) Caretaker (40%)	Bicycle storage (73%) Terrace/courtyard (47%) Electrical car (44%) Guesthouse (43%) Lockers (56%)
Neighbourhood of the same age	35% wants the same age	54% wants different age categories
Don't mind living in new buildings	79% doesn't mind living in new buildings	84% doesn't mind living in new buildings
Want to have a terrace on the same floor level as they live	28% wants that	35% wants that
Parking space	39% doesn't want parking space 34% wants 1 spot per dwelling 8% wants 2 spots per dwelling 19% doesn't have an opinion	39% doesn't want parking space 52% wants 1 spot per dwelling 4% wants 2 spots per dwelling 5% doesn't have an opinion
Other	Prefers a square shaped floor plan 75% likes the idea of having a shared courtyard	60% wants a dwelling up to €250.000 34% prefers a balcony

Type of Starter	Climbing Starter	Young Starter
Age	20 - 30 years	18 - 25 years
Education	HBO - WO (Mid to High)	MBO - HBO (Low to Mid)
Income	Mid-income with potential to become high	Low-income
Is looking for...	A house to live on their own or to live with someone together	A house to live on their own
Wants	Freedom, fun, comfort.	Privacy, tranquillity and space
Budget	€125.000 - €150.000 (= +/- 25-30m2)	€125.000 - €150.000 (= +/- 25-30m2)
Environment should be...	A quiet place close from where everything happens	A quiet place close from where everything happens
Living room located at....	Street side	Street side
Living room vs. balcony	Rather big living room than big balcony	Rather big living room than big balcony
Transport	With the bicycle in the neighbourhood and with the car for longer distances	With the bicycle in the neighbourhood and with the car for longer distances
Amenities	Daily stores nearby. Sports, catering industry and cultural events important	Daily stores nearby. Sports is important as well
Other	Price is sometimes more important than atmosphere 44% wants working space Special (shared) laundry room	Prefers a big living room and bedroom Prefers a balcony or garden. Size doesn't matter

Figure 4. *Preferences of different types starters.* (BPD, n.d.; Inbo, 2009).

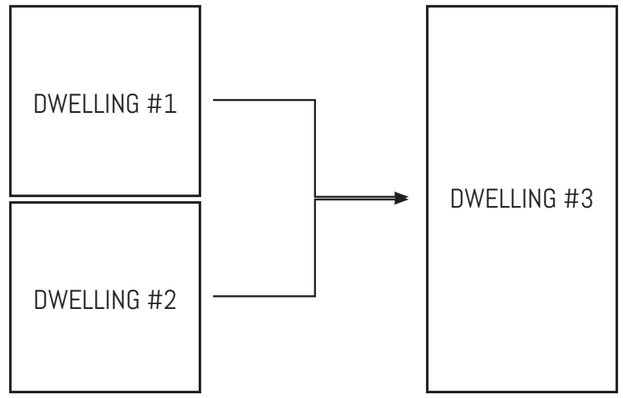
SUSTAINABILITY APPROACHES

PLINTH



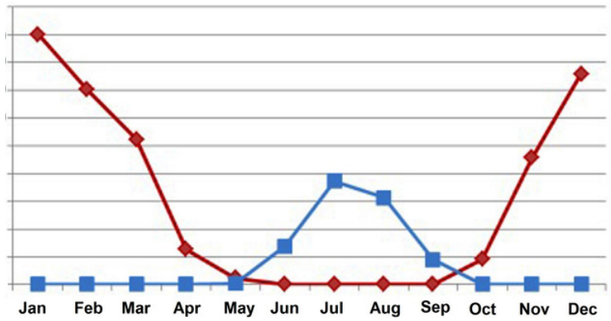
By having a plinth of 8m high it represents the wishes of the municipality of Amsterdam as described in the development strategy of Haven-stad. In the 8m a flexibility is realised where the second floor can partly be removed to change functions through time.

FLEXIBILITY



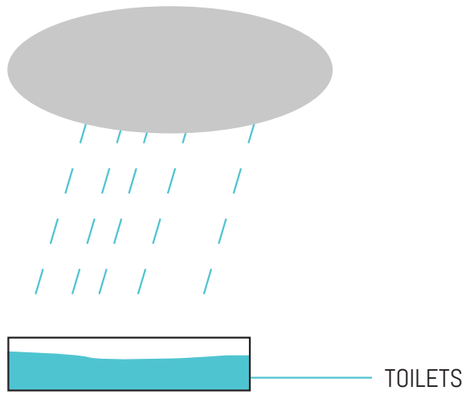
The current economy and housing market values causes that starters are forced to live in compact dwellings when they want to live in Amsterdam. A certain flexibility is needed to make the building/structure future proof to create different dwelling types in case the economy will change drastically.

REDUCE EXTREME ENERGY NEEDS



A lot of energy for heating and cooling will be saved when having a proper climate concept that reduces the extreme values in the winter and summer. It is key to integrate it well in architectural point of view.

ABSORBING RAIN WATER

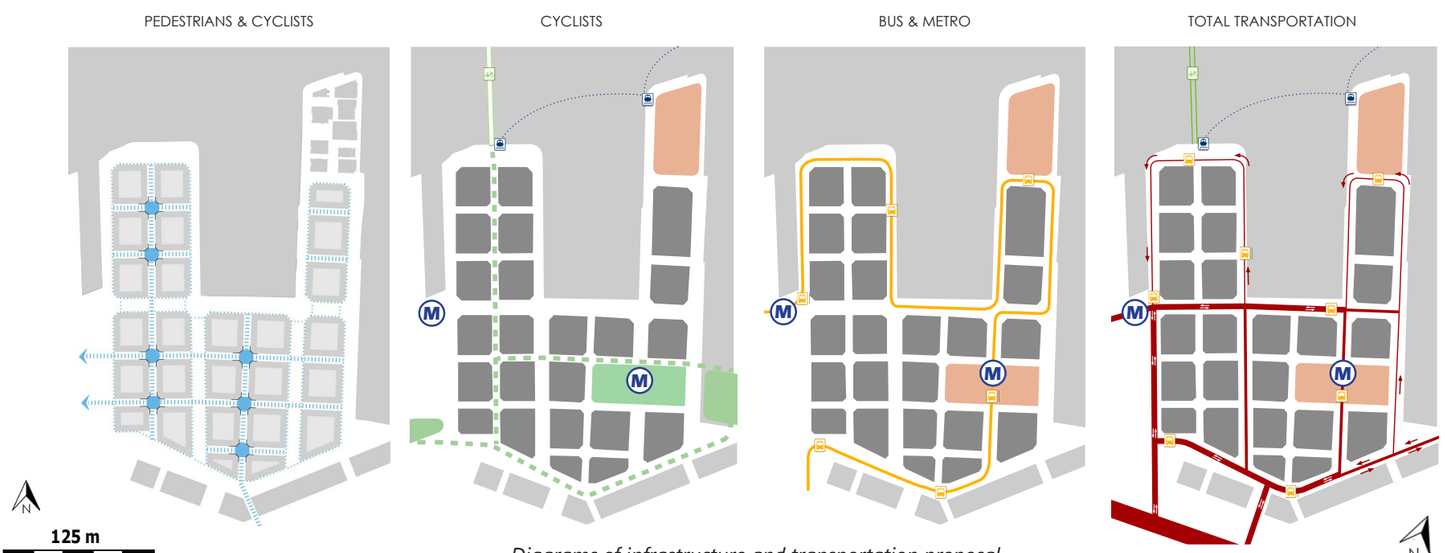


Absorbing rainwater is needed to prevent extreme floods, which will become more problematic through the years. This measurement will have a positive fact in sustainable point of view because it can be used to flush toilets.

3. DESIGN PROPOSAL

OVERVIEW URBAN MASTER PLAN

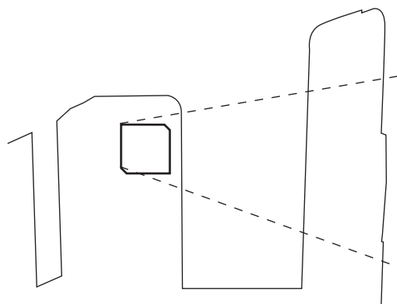
Three types of street profiles, scale 1:1000.



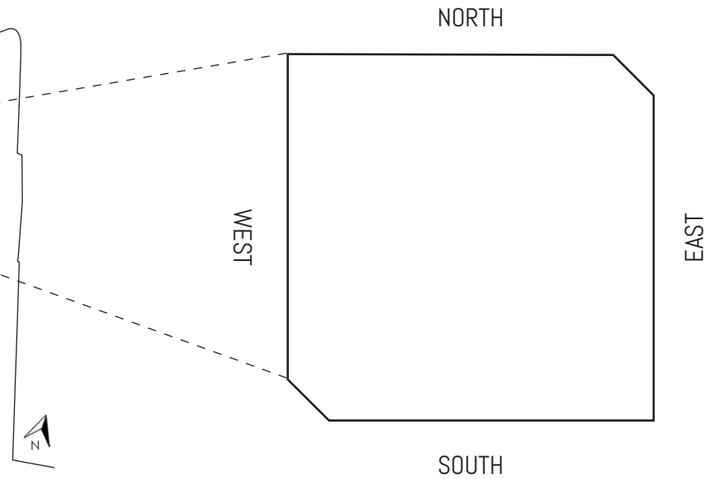
Diagrams of infrastructure and transportation proposal.

DESIGN SITE ANALYSIS

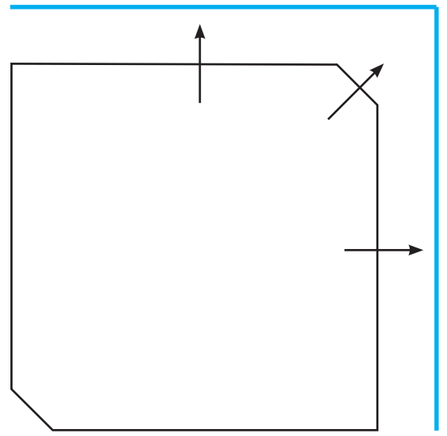
LOCATION



ORIENTATION

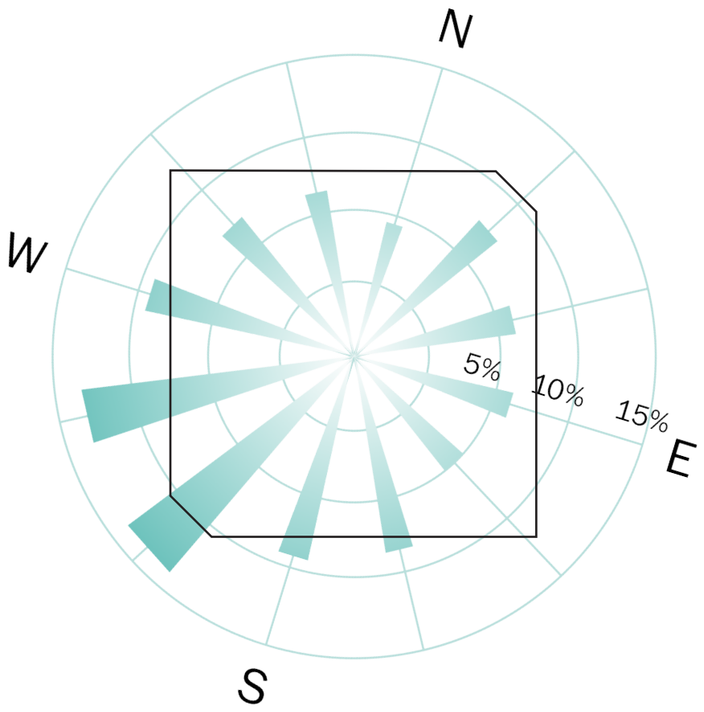


WATERFRONT



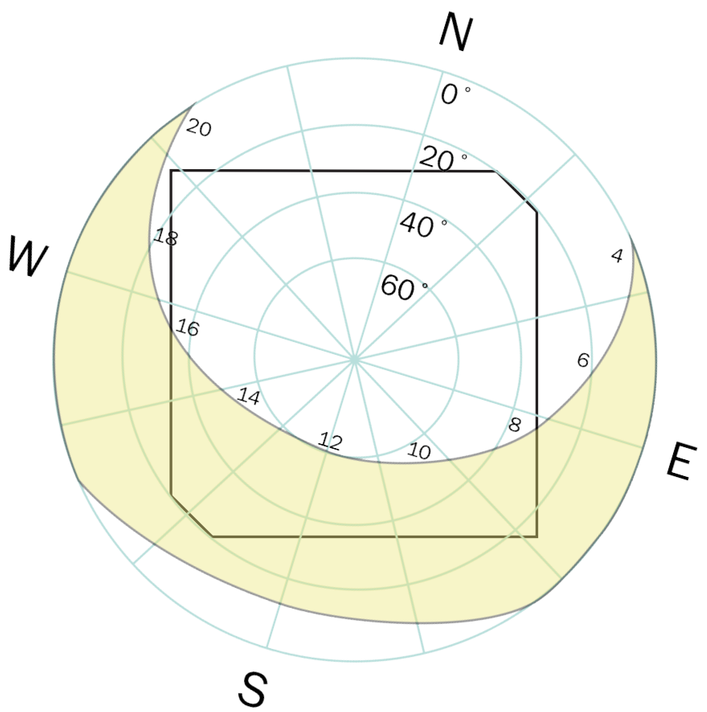
With the views orientated north and east from the design site, the question that will arise is in what way these sides are qualitative in relation to the sun path.

WIND DIRECTIONS



The wind in is mainly coming from southwest direction. This is perpendicular on the chamfered corner of the design site. Building blocks in the environment will protect the building from the wind most of the time. However, wind can also come more from north and east direction because the site is located at the waterfront and is open from character.

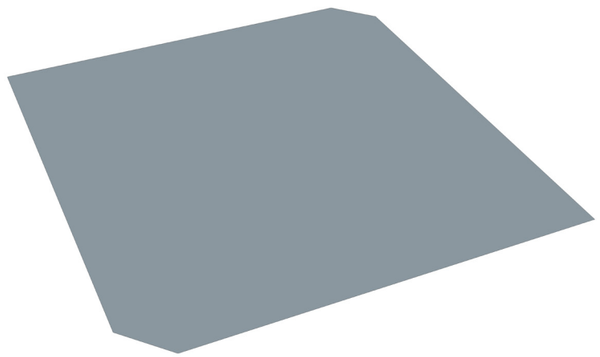
SUN PATH



With the sunrise coming from the east and the sunset west, the design site will have a decent orientation. The north facade will be a challenge. The dwellings located at that facade should somehow have incoming sunlight.

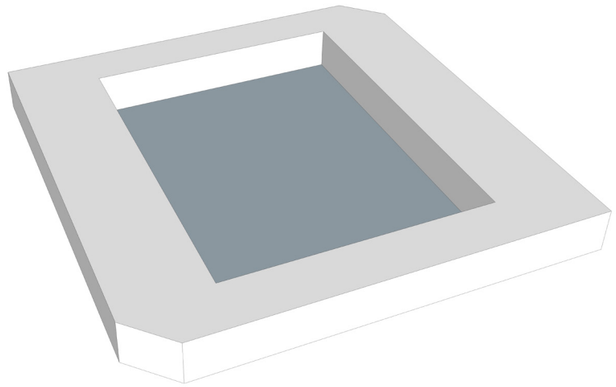
DEFINING MASSING

BUILDING AREA



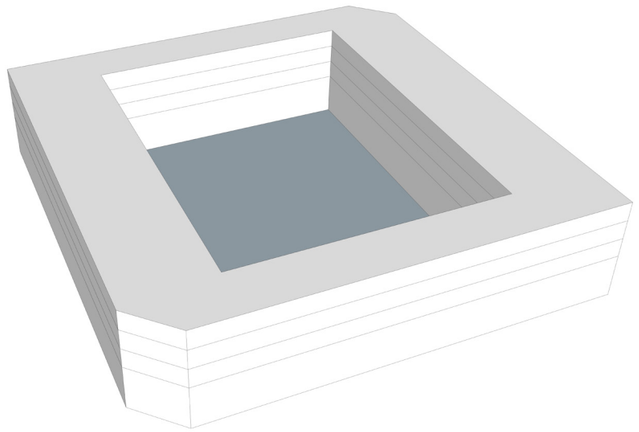
The building area is a square shape of 80x80 meters. Two chamfered corners are present in order to integrate the building well with the other building blocks to form a superblock as mentioned in the urban master plan.

PLINTH



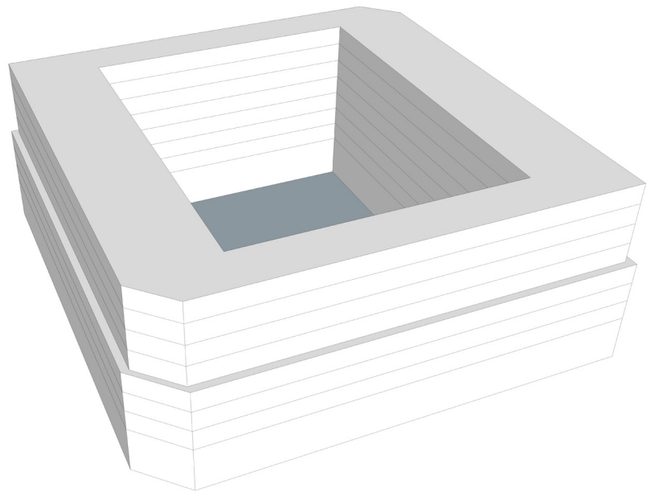
The plinth will be all around the building line in order to both meet the building regulations that are defined in the urban master plan and to have a continuous facade.

DWELLINGS



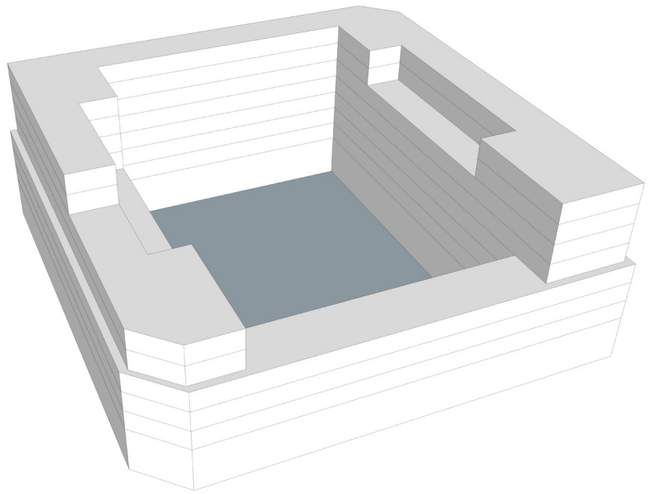
The shape of the plinth will be extended with minimal three floors, which will be used for dwellings.

SETBACKS



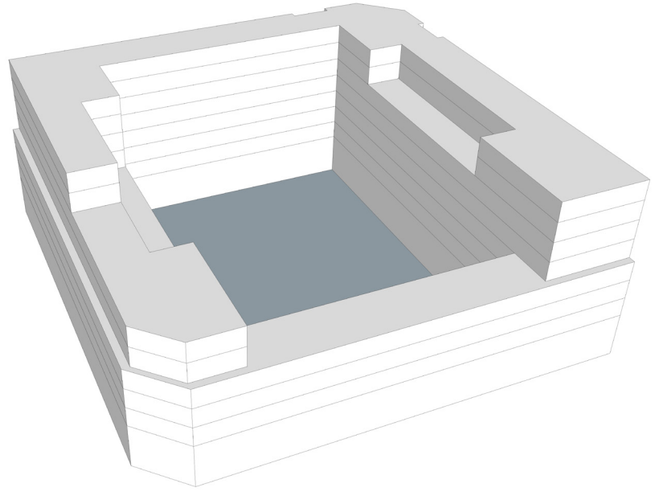
Setbacks are used to reduce the oppressiveness of the building while walking in the streets and at the same time the plinth is more emphasised.

ADAPTING TO SUN PATH



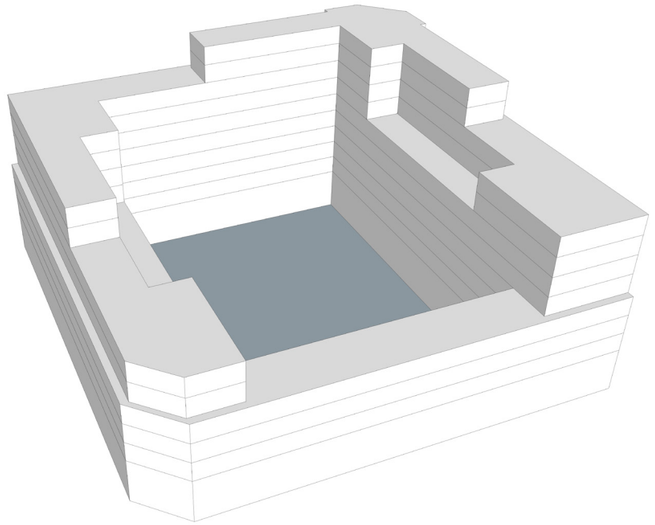
Voids have been applied in combination with lowering the south facade in order to reduce the amount of shadow in the courtyard. The voids will be used as collective outdoor spaces.

DYNAMIC CHARACTER



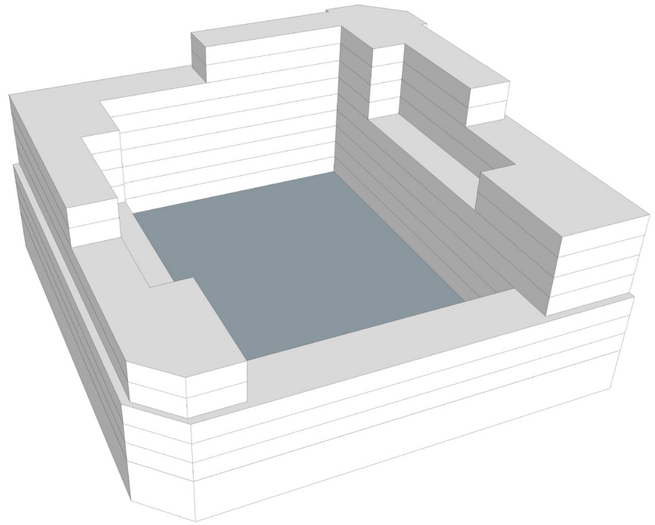
Aligned and setback facades will come together at the corners which creates a dynamic character. At the south chamfered corner only a setback is used to create a more comfortable street impression at the square.

INCREASING DENSITY



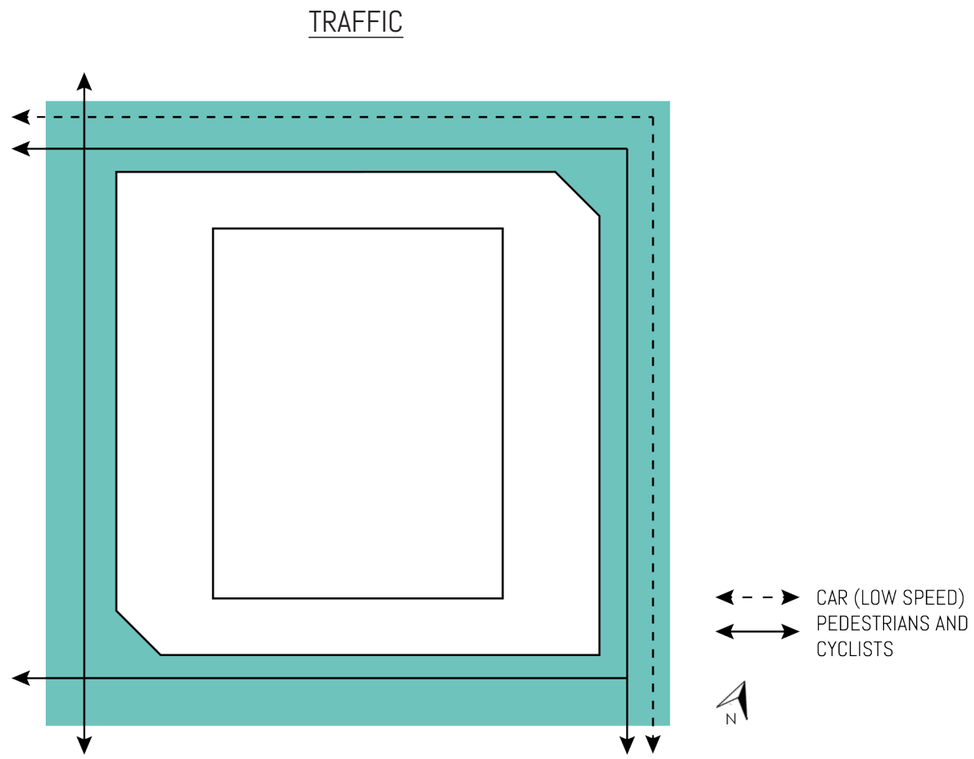
Extra floor levels have been added to both increase the density and to have a smoother transition between the lowest and highest chamfered corner.

RAISING COURTYARD



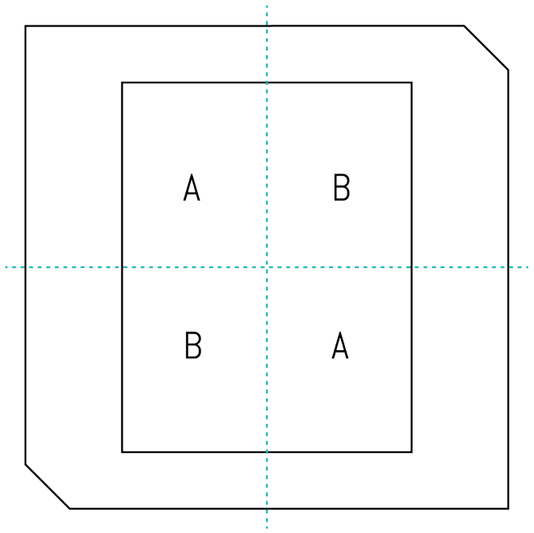
The final step is raising the courtyard. A better interaction between the first floor of the dwellings can be realised and less shadow will occur. Oppressiveness will be reduced as well when being in the courtyard.

DIAGRAMS



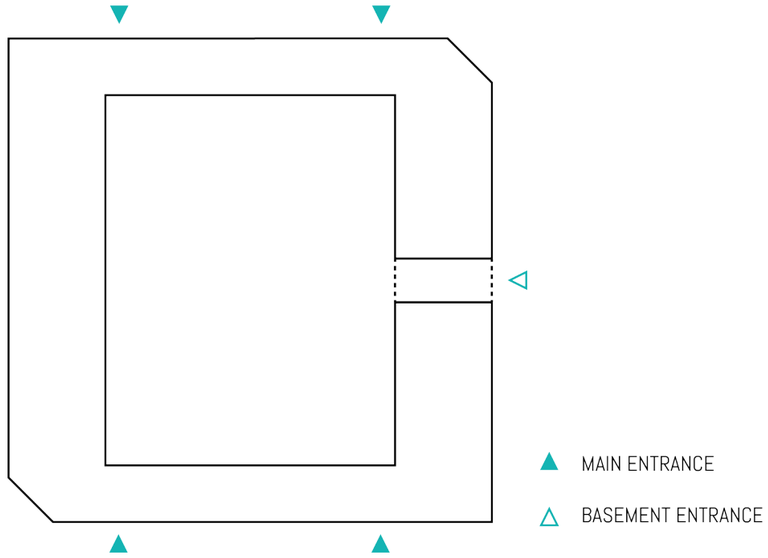
Pedestrians and cyclists will have the priority as described in the urban masterplan. Cars have to go around the building block where the pedestrians and cyclists still have the priority. The streets where no cars are allowed will become quieter and more qualitative to stay.

SEGMENTATION



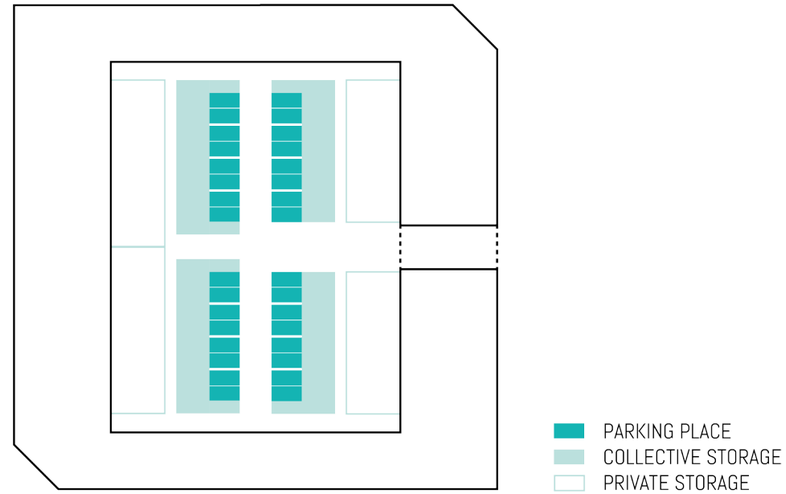
The building block is divided in two times two parts. This creates rhythm in all the floor plans and will have a lot of benefits during construction.

ENTRANCES



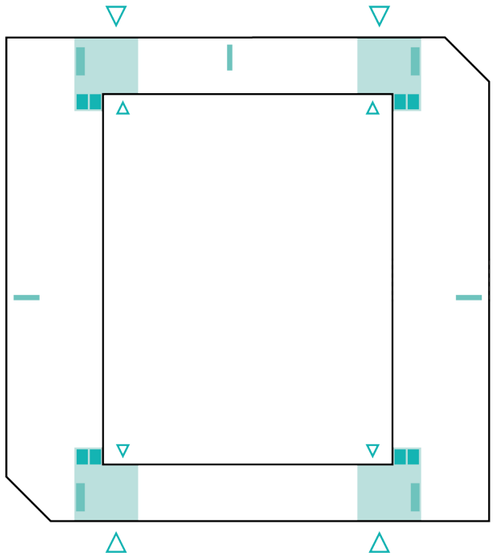
Four main entrances are located close to the corners. The entrances direct you to the vertical circulation points. The basement entrance is located a side where cars are allowed to come.

BASEMENT - PARKING & STORAGE



The segmentation is good visible by the four zones that have been realised. A shared electrical car principle will be used. Research showed that 32 parking spots will be sufficient. Private storage space will add value to the dwellings starters can buy.

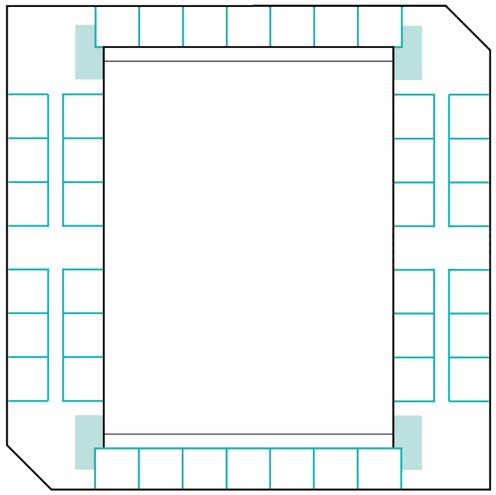
VERTICAL CIRCULATION



MAIN ENTRANCE
BASEMENT ENTRANCE
MAIN HALL
ELEVATOR
(EMERGENCY) STAIR

The vertical circulation can be entered from both the outside and the basement to make the walking distance for the residents shorter. Emergency stairs are needed to reduce the walking distance and because of the shape of the building on the top floors.

DWELLING ORIENTATION

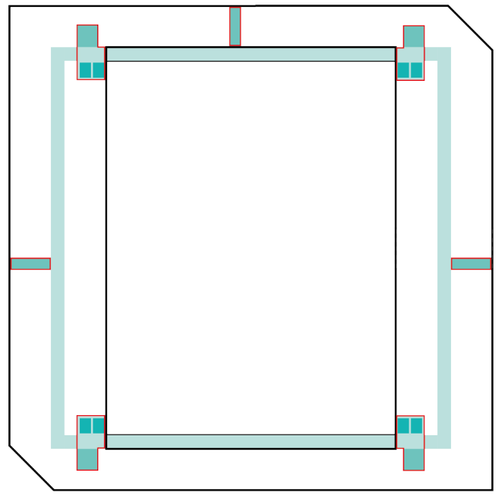


N

VERTICAL CIRCULATION
DWELLING

Based on the sun path a distinction is realised in north and south and east and west. This is done to prevent that some dwellings won't have any incoming sunlight over the entire day.

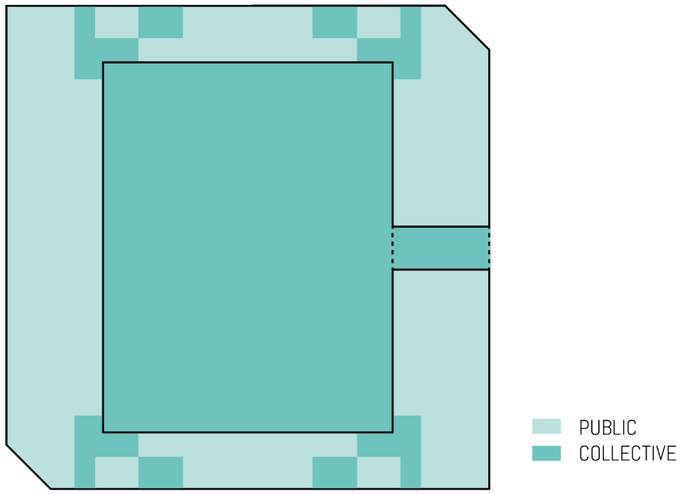
HORIZONTAL CIRCULATION



CIRCULATION
ELEVATOR
(EMERGENCY) STAIR
FIRE SAFETY COMPARTMENT

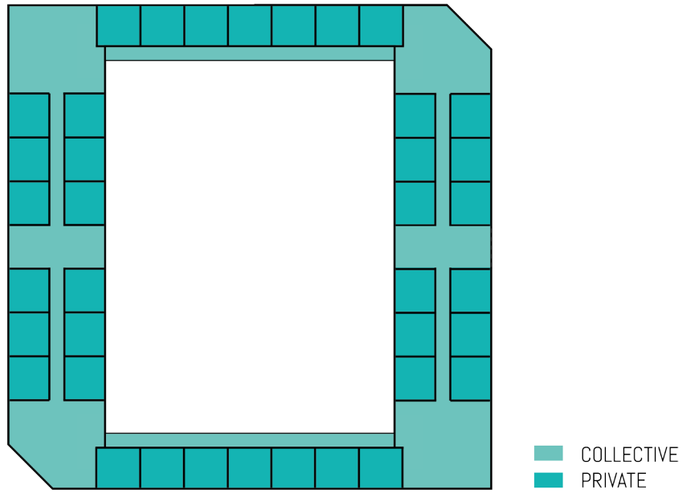
The dwelling orientation is key in the horizontal circulation. The shift from a corridor to a gallery typology becomes visible in this diagram where the gallery will be outside.

PUBLIC, COLLECTIVE & PRIVATE SPACES - GROUND FLOOR



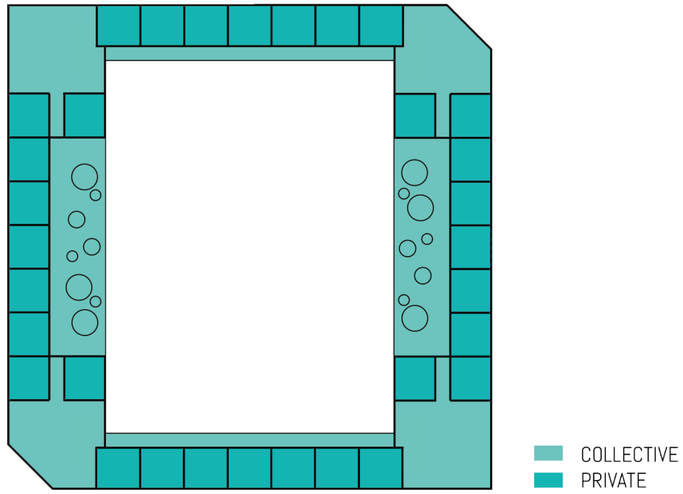
The ground floor is characterised by the commercial plinth. This is good visible in the amount of public space in this diagram. The collective spaces are the hallways, vertical circulation, basement and a room for the waste bins.

PUBLIC, COLLECTIVE & PRIVATE SPACES - DWELLING FLOOR



On this typical dwelling floor a coherent diagram is realised. The galleries and corridors are connected to the collective spaces where residents eventually can come together with a nice view over the neighbourhood and/or courtyard.

PUBLIC, COLLECTIVE & PRIVATE SPACES - DWELLING FLOOR WITH ROOF GARDENS

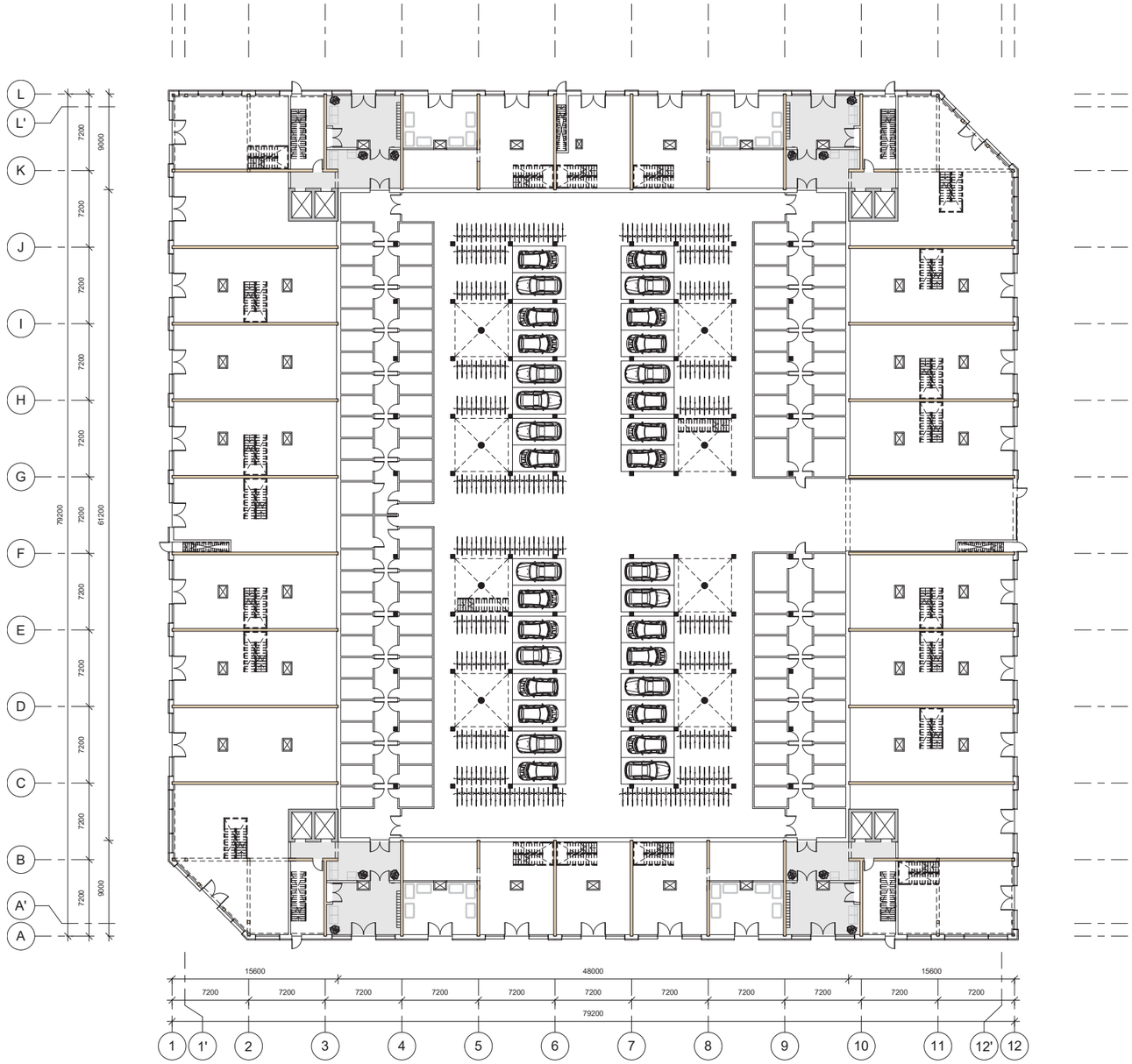


Key in my design proposal is the collective spaces on different floor levels. It will stimulate residents to use these spaces to eventually create a community where everybody recognises each other. This makes it easier to be willing to share functions with others.

FLOOR PLANS

GROUND FLOOR P = 0

- Characterised by the basement, entrances to the circulation and a commercial plinth by having stores, offices and a café on the chamfered south corner.
- Two stairs in the basement reduce the walking distance to the courtyard.
- A room for waste bins is located next to the main entrances.



Ground Floor P = 0

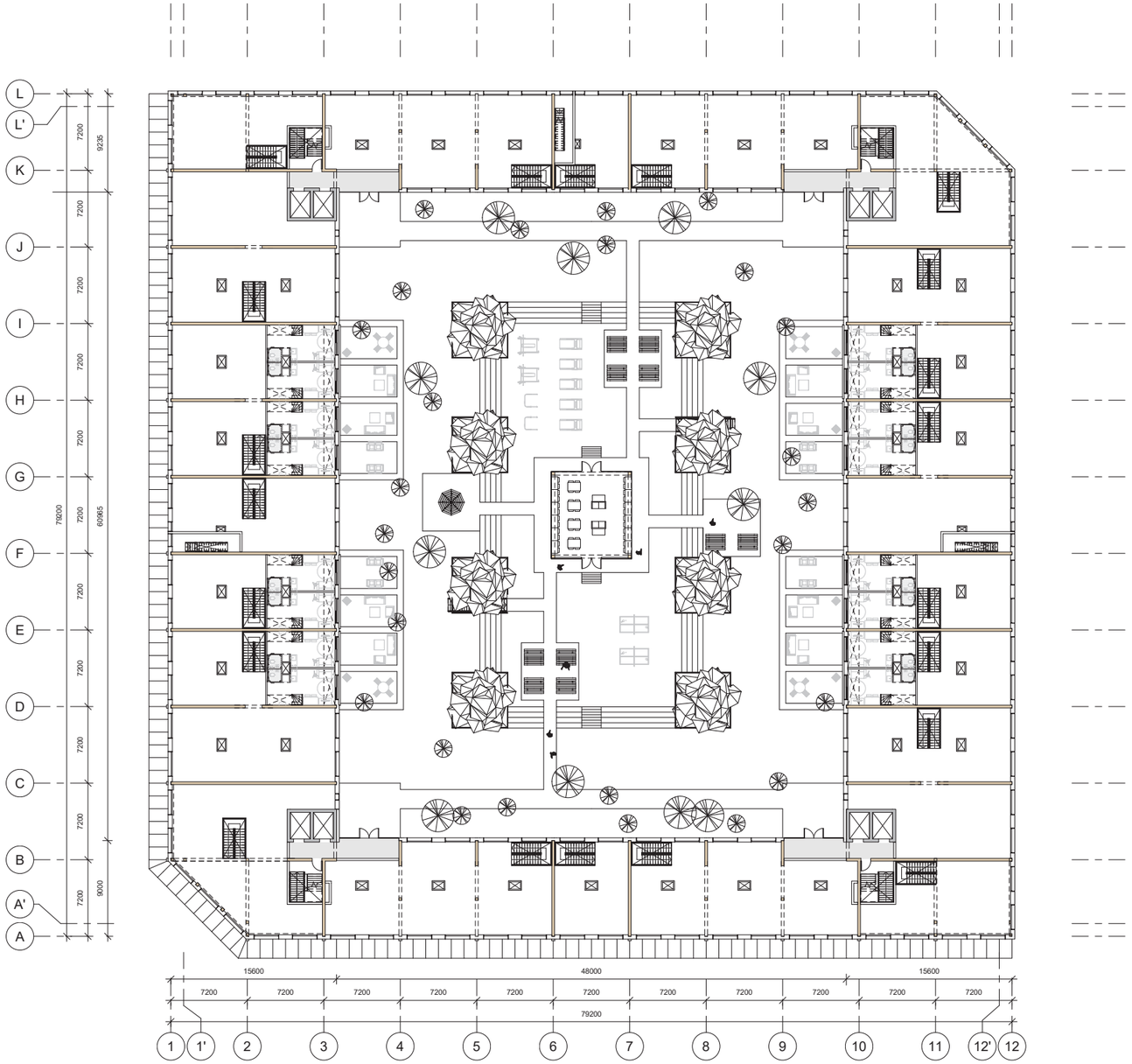
N

12.5 m

1 : 500

COURTYARD P = +4.500

- Main entrances are connected to the raised courtyard.
- Commercial plinth will be partly used for the lowest floor of the maisonette dwellings.
- A pavilion in the centre of the courtyard will be collective place where people can work and relax.
- The focus of the courtyard will be to absorb water. That will be realised by high dense vegetation and a water square that can be used when it is not raining. The rainwater problems we face become visible by having introduced the water square.



Courtyard P = +4.500

N

12.5 m

1 : 500

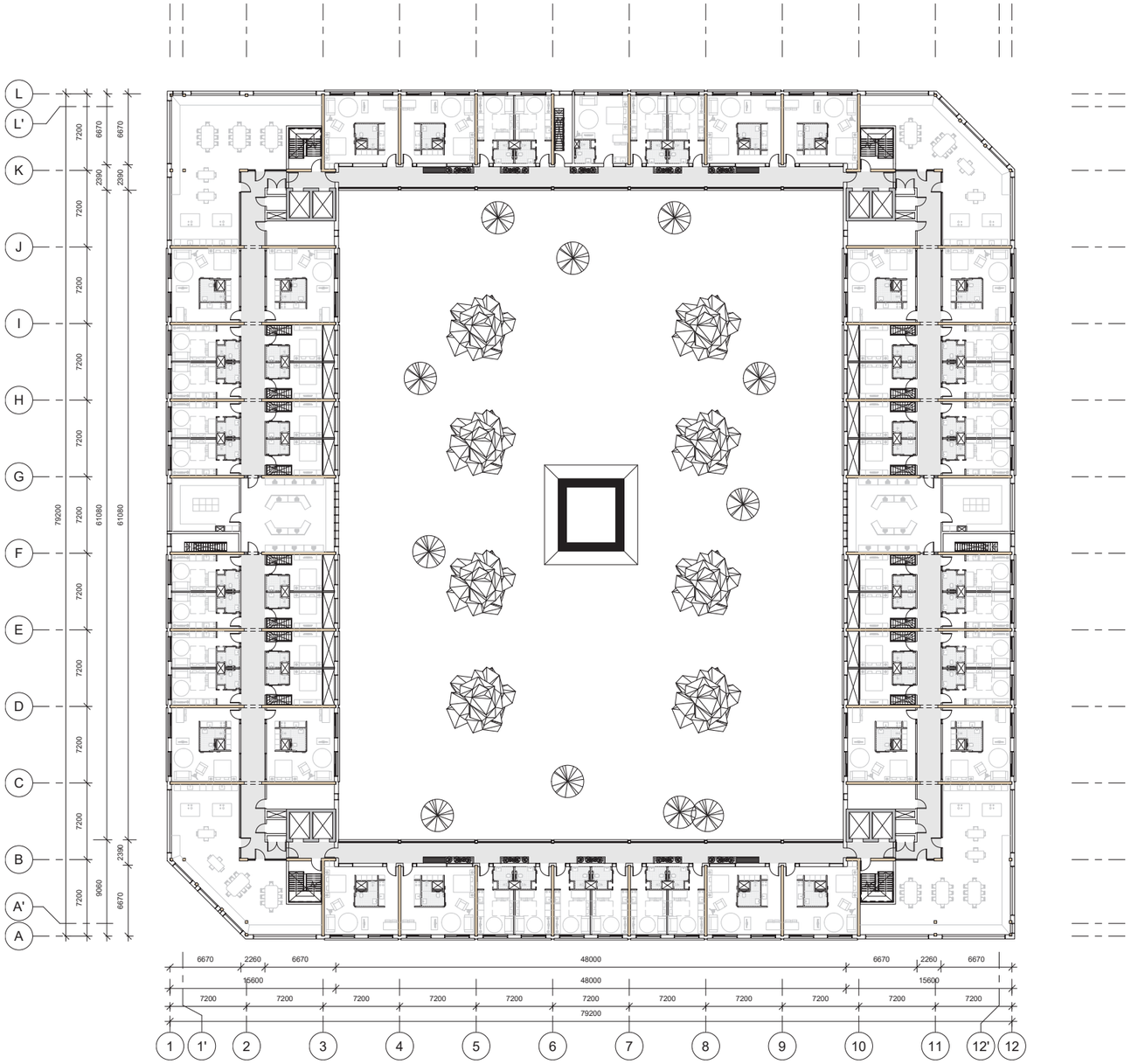
1st FLOOR P = +8.000

- The difference in dwelling orientation by using different circulation systems becomes visible.
- Collective spaces are located at central places and will enhance the quality of the corridor. Kitchen will be placed at the corners. Laundry rooms and working space in the middle of the corridor.

DWELLINGS:

- Apartment Type A: 16
- Apartment Type B: 26
- Apartment Type C: 0
- Apartment Type D: 1
- Apartment Type E: 0
- Maisonette Type A: 16

Total dwellings: 59



1st Floor P = +8.000

N

12.5 m

1 : 500

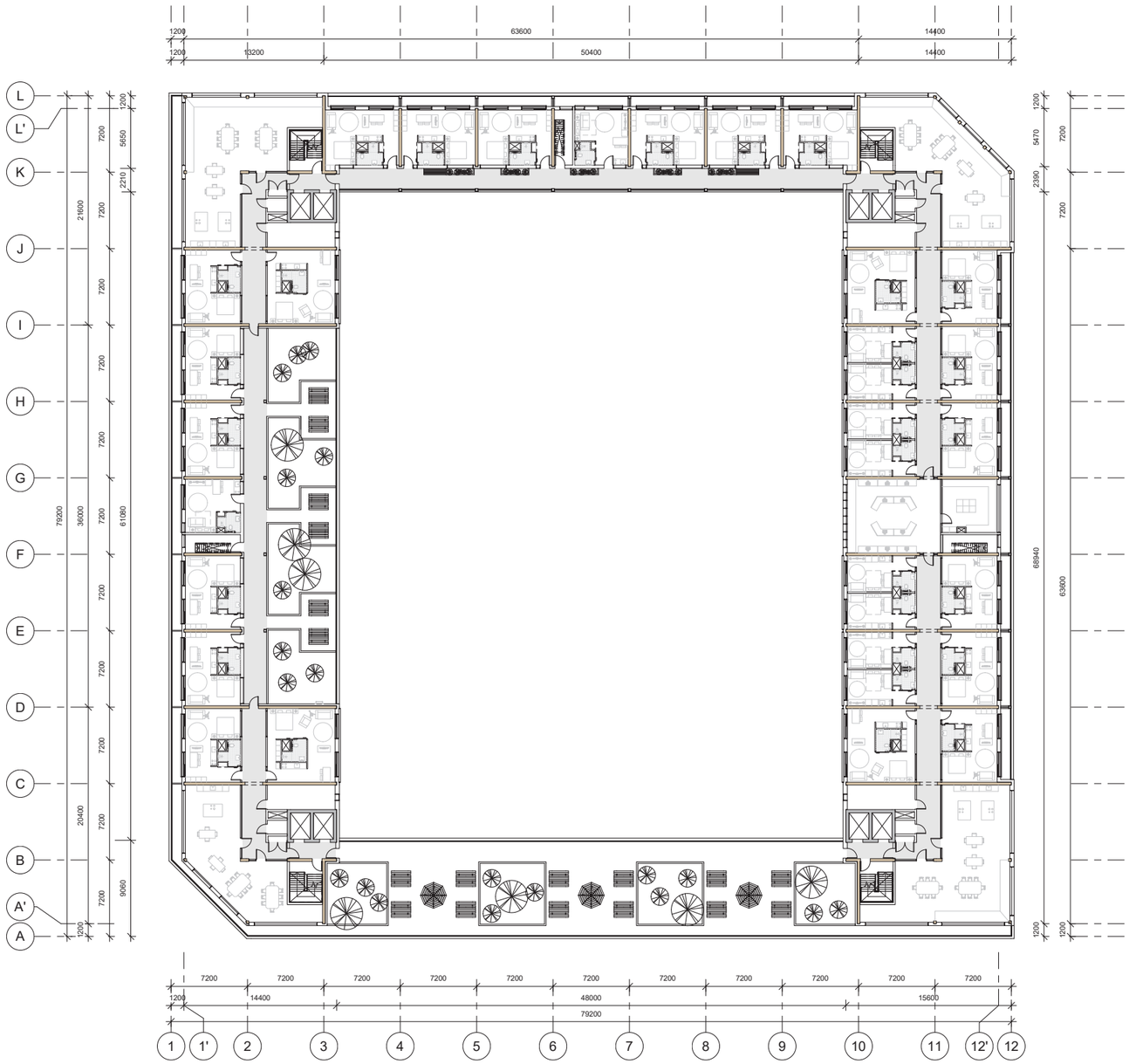
4th FLOOR P = +18.500

- The fourth floor is characterised by the setback everywhere except the north chamfered corner. This makes a distinction with the plinth (the lower floors) and the floors on the higher levels.
- Massing south and west are removed to create outdoor collective spaces which also improves the amount of sunlight at courtyard level.

DWELLINGS:

- Apartment Type A: 4
- Apartment Type B: 8
- Apartment Type C: 18
- Apartment Type D: 0
- Apartment Type E: 2
- Maisonette Type A: 0

Total dwellings: 32



4th Floor P = +18.500

12.5 m
1 : 500

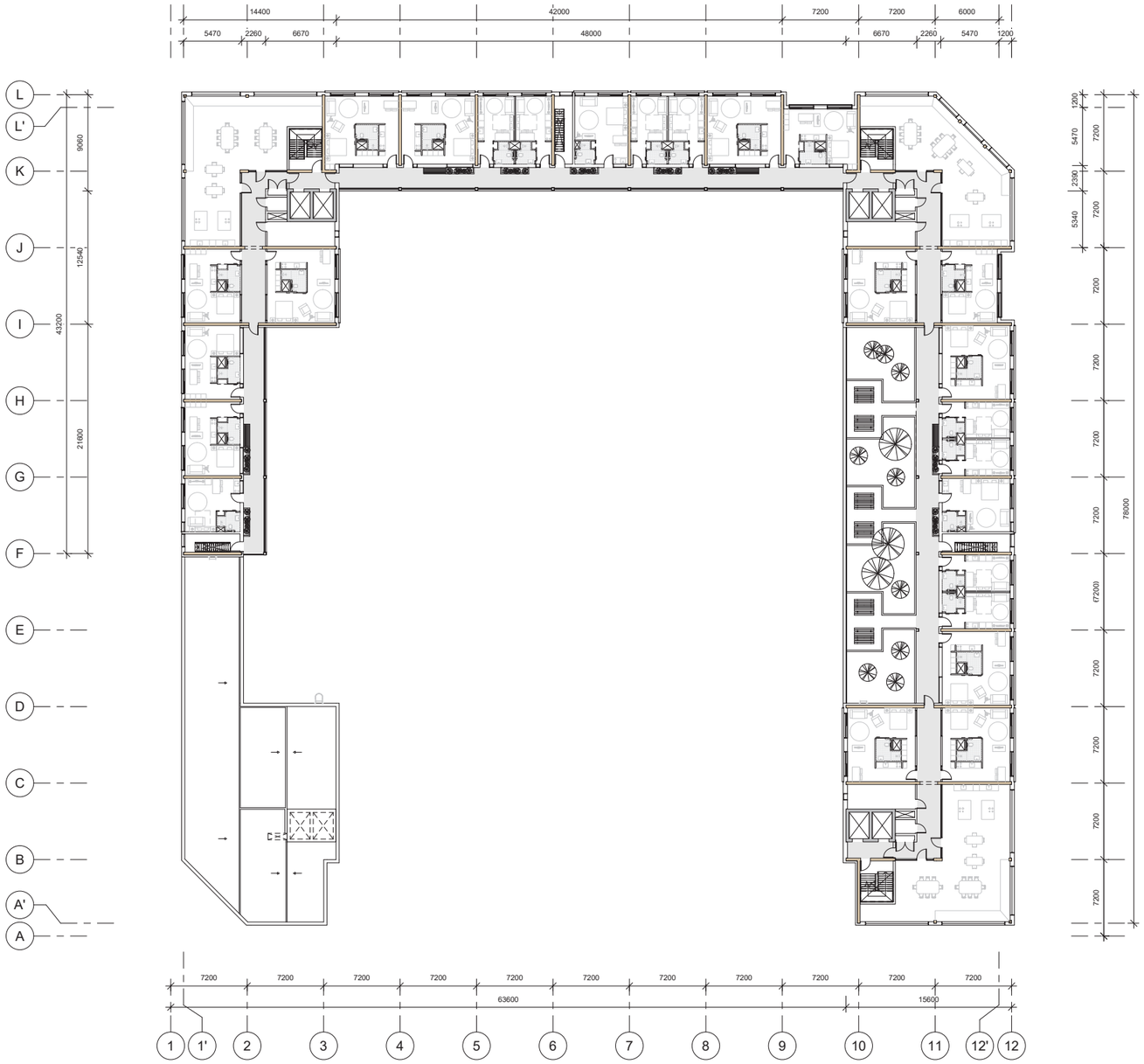
6th FLOOR P = +25.500

- More massing will be removed to reduce the oppressiveness and to create a smooth transition between the lowest and highest chamfered corner.
- A collective outdoor space is just like on the fourth floor realised but now on the right side of the building.

DWELLINGS:

- Apartment Type A: 9
- Apartment Type B: 8
- Apartment Type C: 5
- Apartment Type D: 2
- Apartment Type E: 1
- Maisonette Type A: 0

Total dwellings: 25



6th Floor P = +25.500

N

12.5 m

1 : 500

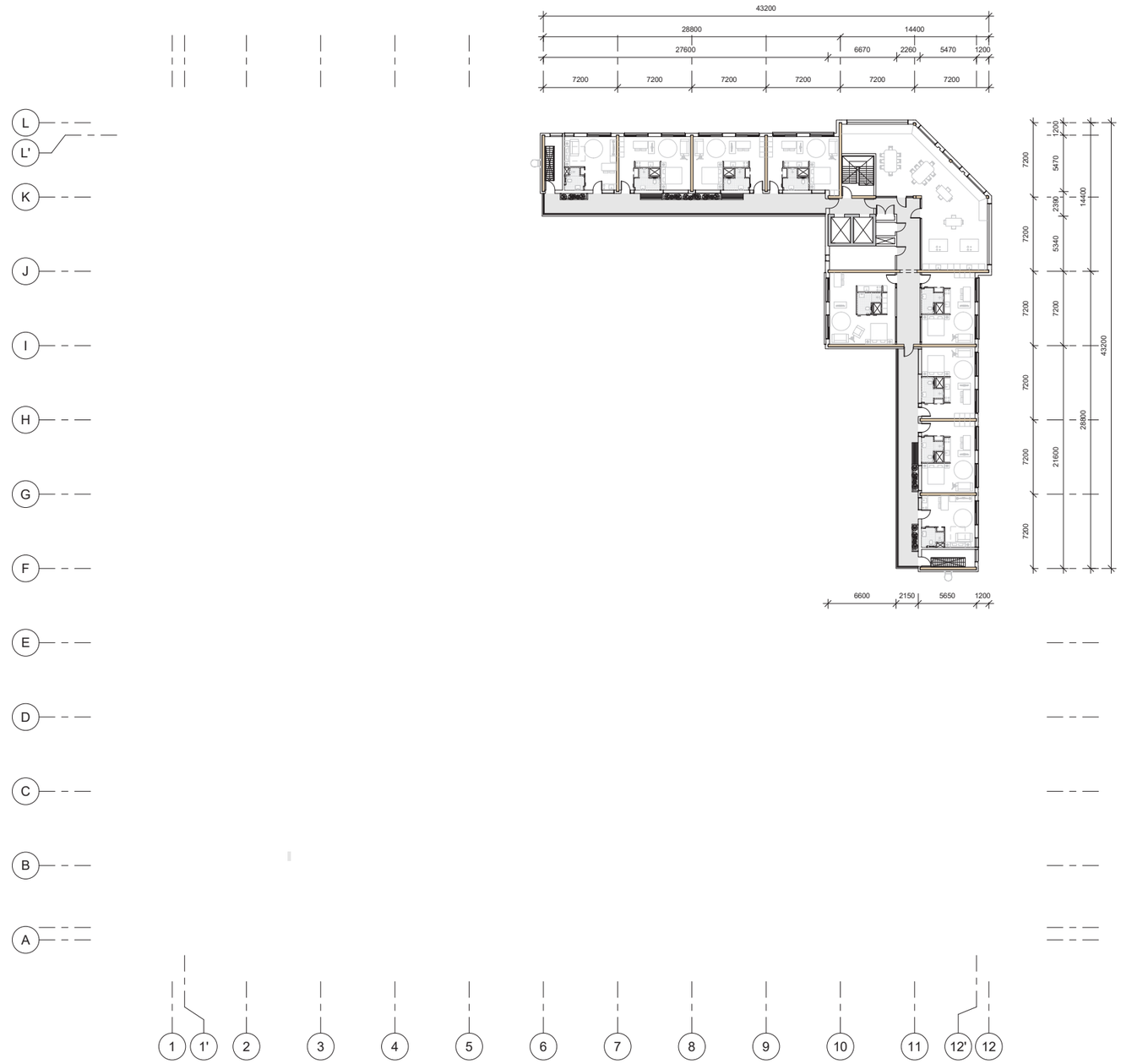
9th FLOOR P = +36.000

- From this floor the chamfered corner with two wings will continue which is good visible in the elevations.
- The apartments are mainly accessible by a gallery circulation. This makes it possible to have windows on both facades of the dwelling. In that way enough day- and sunlight enters in the north orientated dwellings.

DWELLINGS:

- Apartment Type A: 1
- Apartment Type B: 0
- Apartment Type C: 6
- Apartment Type D: 0
- Apartment Type E: 2
- Maisonette Type A: 0

Total dwellings: 9

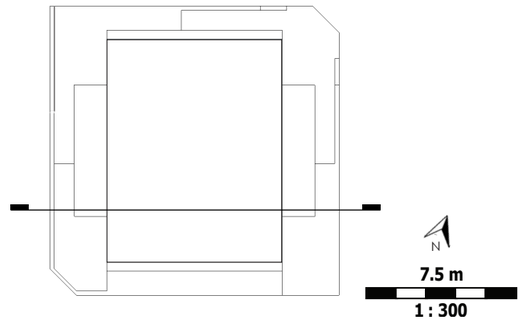


9th Floor P = +36.000

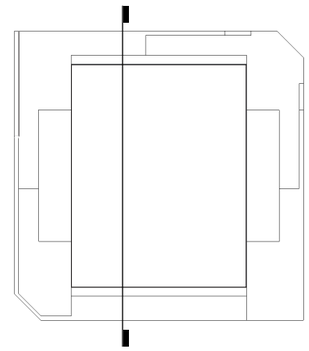
12.5 m
1 : 500

SECTIONS

EAST - WEST SECTION



NORTH - SOUTH SECTION



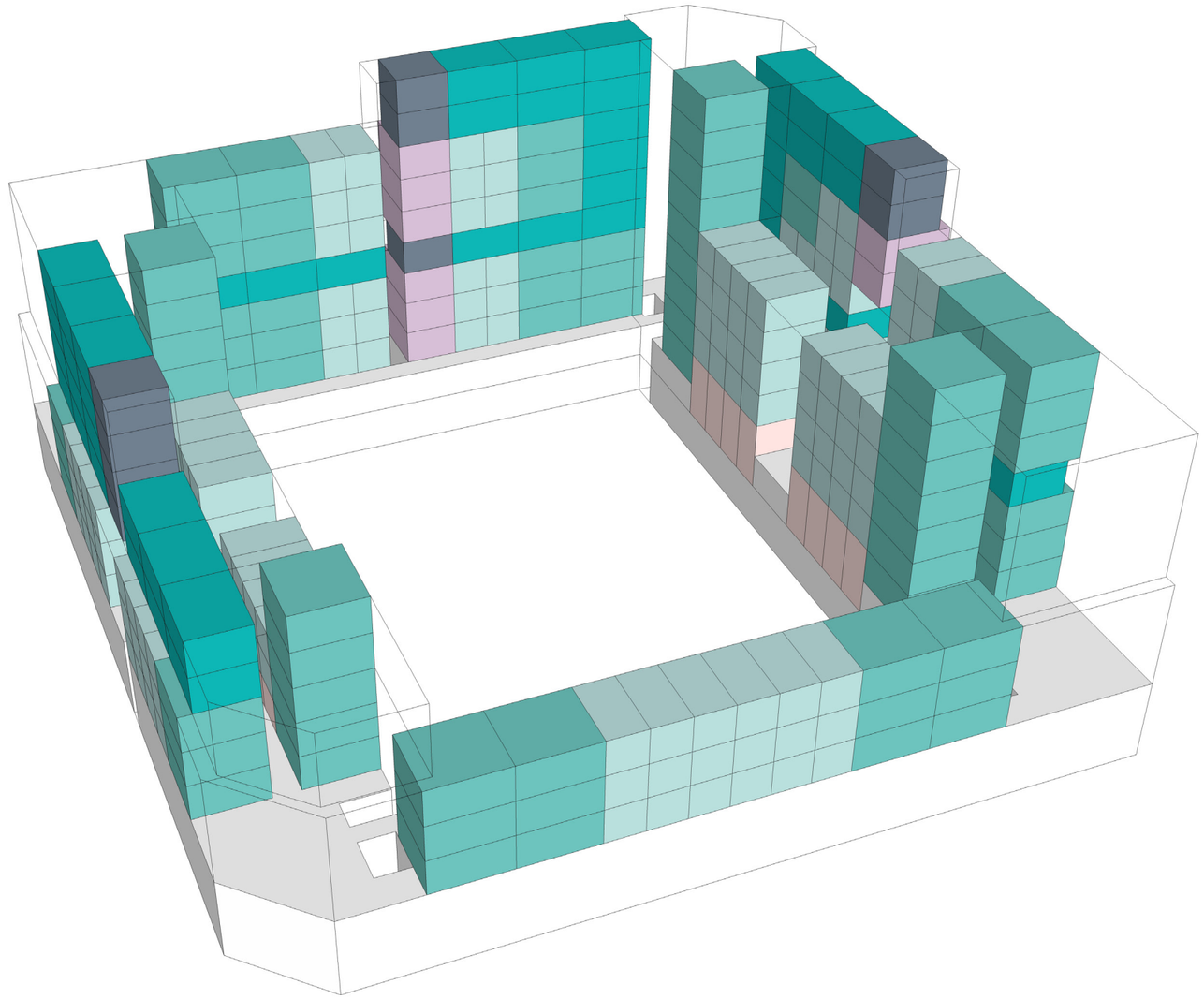
N

7.5 m

1 : 300

DWELLINGS

OVERVIEW BUILDING

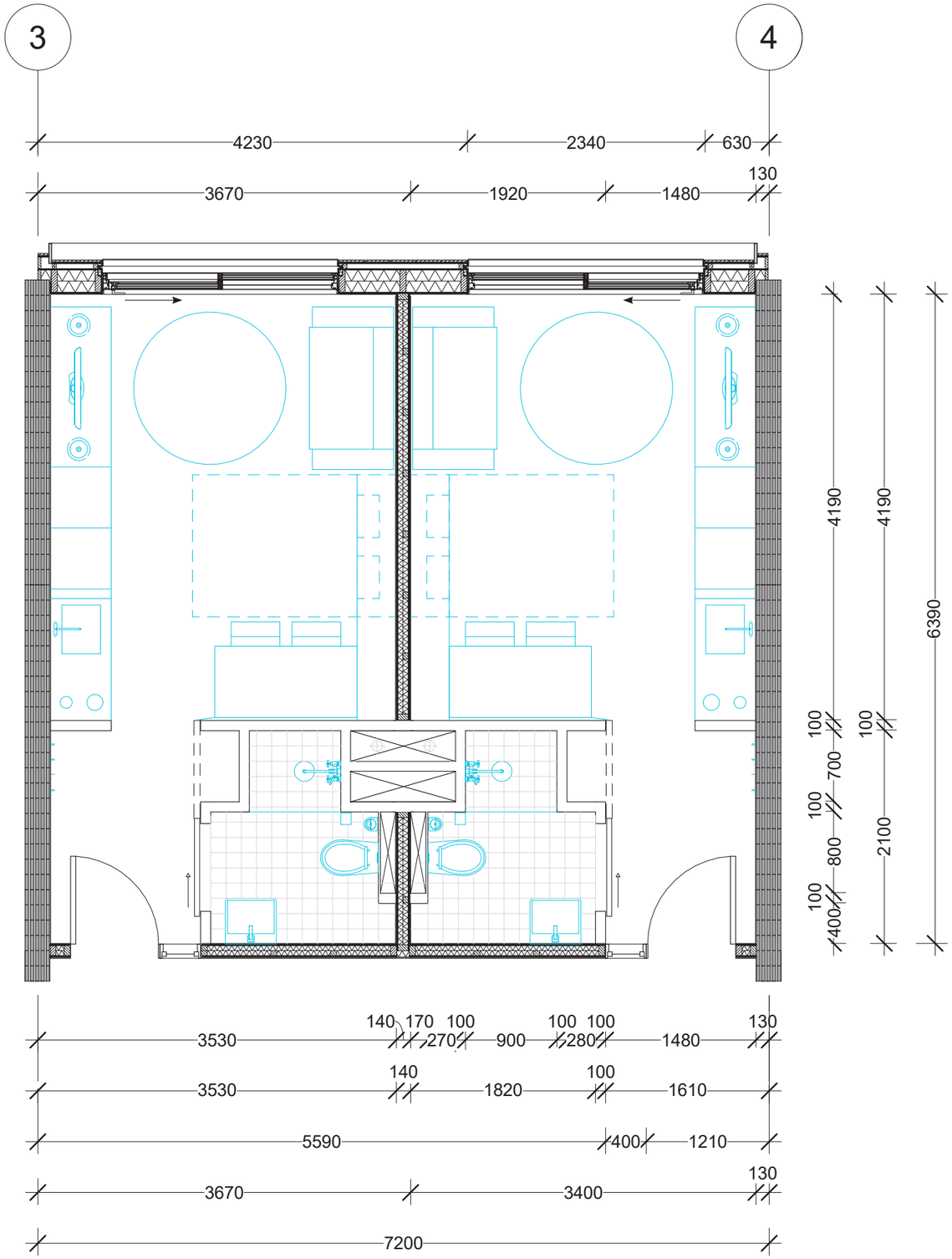


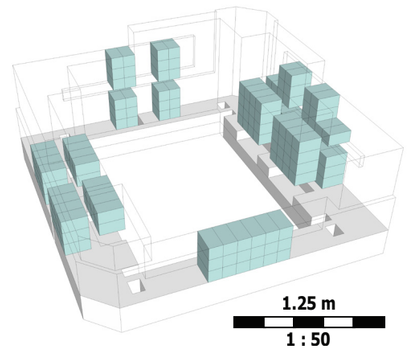
APARTMENT TYPE A
APARTMENT TYPE B
APARTMENT TYPE C
APARTMENT TYPE D
APARTMENT TYPE E
MAISONETTE TYPE A

HOUSEHOLD CONFIGURATION

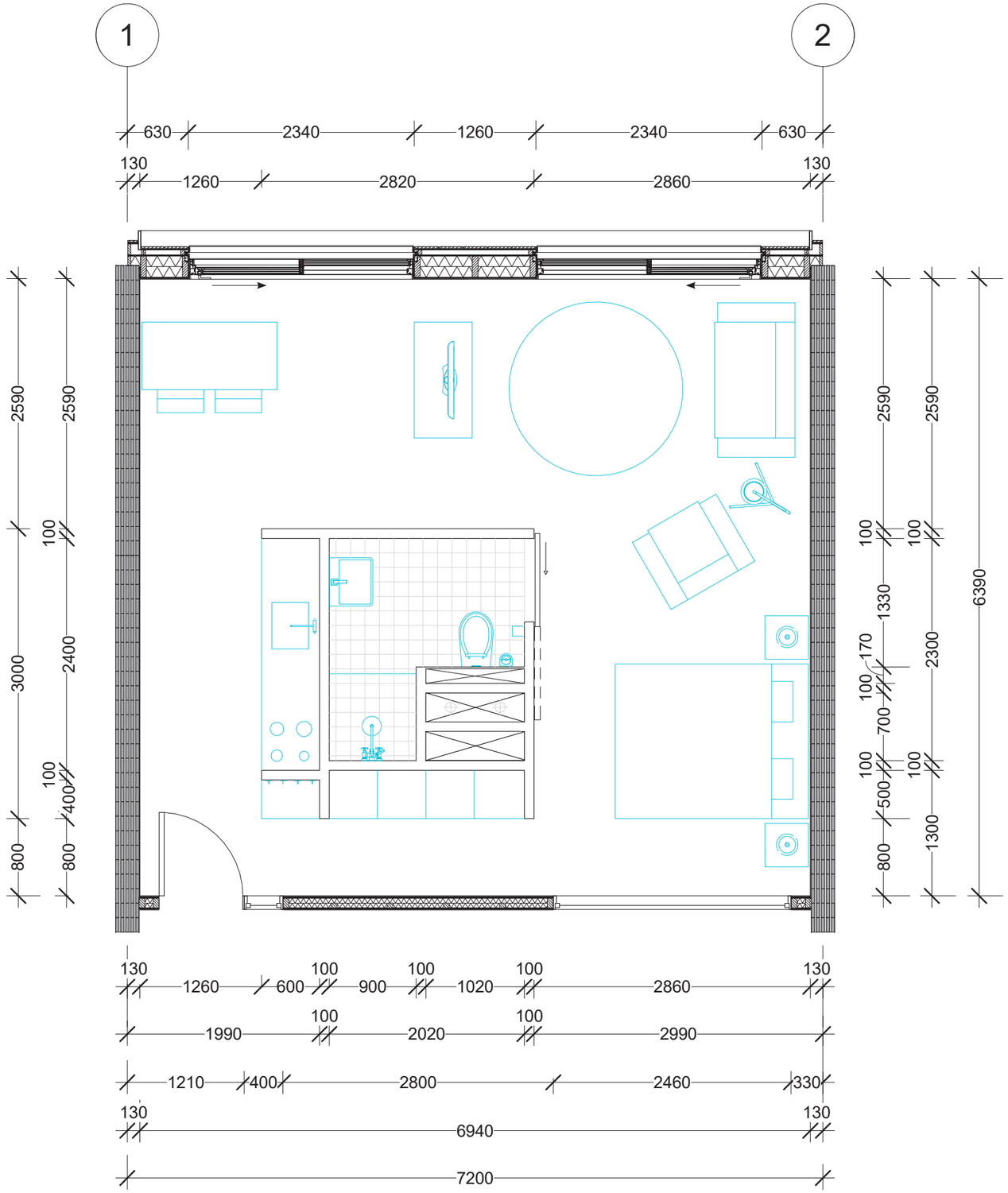
			1x MBO	1x HBO	1x WO	2x MBO	1x MBO + 1x HBO	1x MBO + 1x WO	2x HBO	1x HBO + 1x WO	2x WO
APARTMENT TYPE A	43,2 m^2	€221.620								X	X
APARTMENT TYPE B	21,3 m^2	€109.270		X	X						
APARTMENT TYPE C	34,9 m^2	€179.040					X	X	X	X	X
APARTMENT TYPE D	31,2 m^2	€160.160				X	X	X	X	X	X
APARTMENT TYPE E	25,6 m^2	€131.330			X	X	X	X	X	X	X
MAISONETTE TYPE A	36,7 m^2	€188.270						X	X	X	X

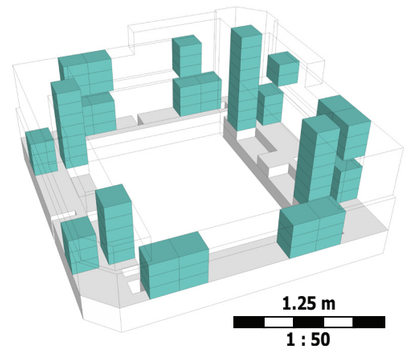
APARTMENT TYPE B: 21,3 m²



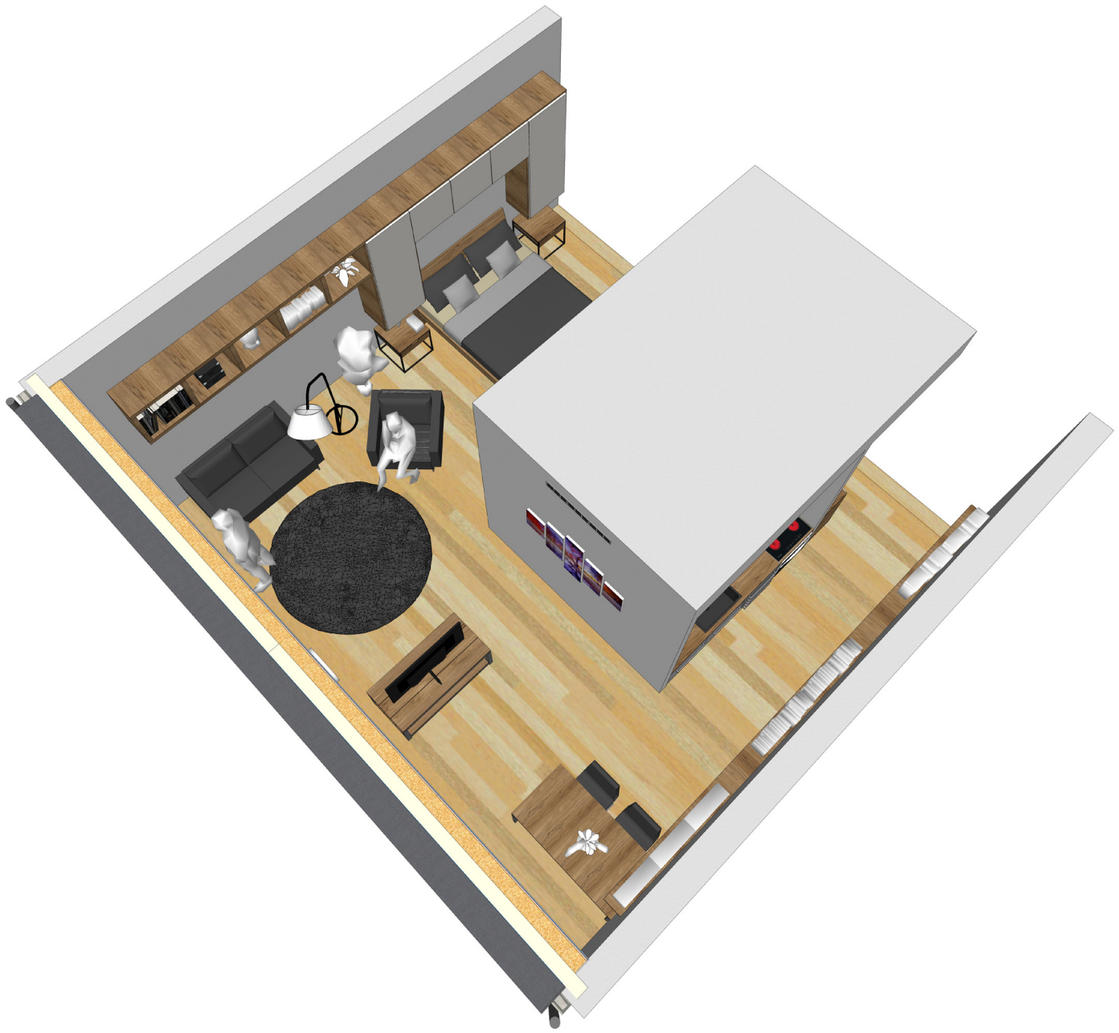


APARTMENT TYPE A: 43,2 m²





APARTMENT TYPE A: 43,2 m^2



The organisation is focused on creating quality in the compact floor plan. This is done by having one central core, sliding doors, extended ceiling height, limited number of colour variations etc.

FACADE

STARTING POINTS FACADE DESIGN

DIFFERENTIATION

PLINTH, SETBACKS AND HIGHER PART ARE DISTINGUISHABLE BUT COHERENT

COMMERCIAL PLINTH

TRANSPARENT FROM CHARACTER TO SHOW THAT IT IS ACCESSIBLE FOR PUBLIC

GRID

REPETITION WITH EXCEPTIONS TO CREATE A DYNAMIC FACADE

CORNER & SETBACK

CONTINUATION OF GRID AND MATERIALS AT THE CORNERS. REDUCED OPPRESSIVENESS BY APPLYING SETBACKS

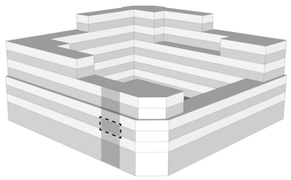
EAST FACADE

7.5 m
1 : 300

SOUTH FACADE

7.5 m
1 : 300

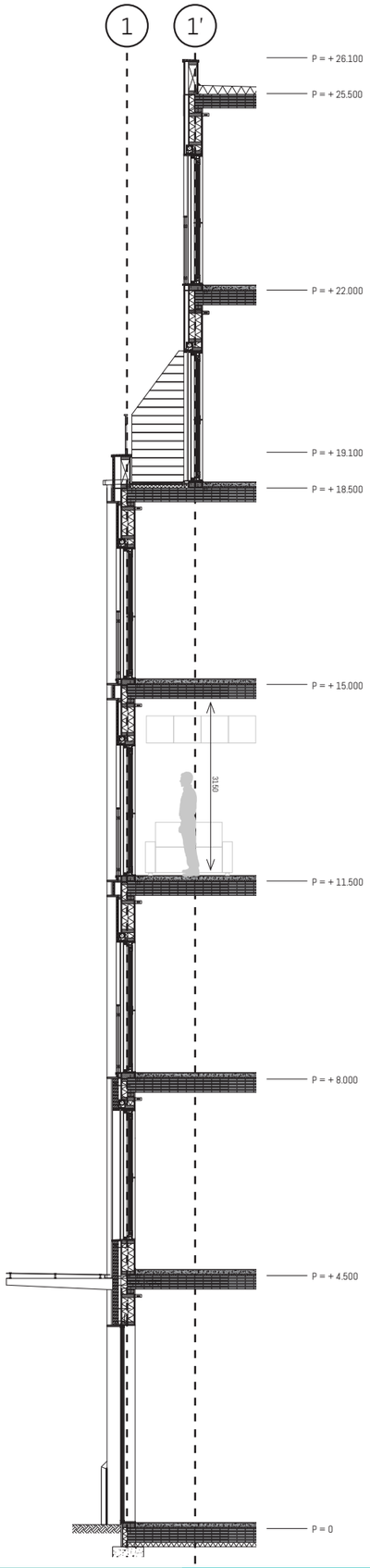
FACADE FRAGMENT



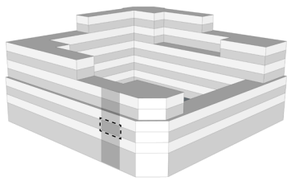
DWELLINGS HAVING
A SETBACK

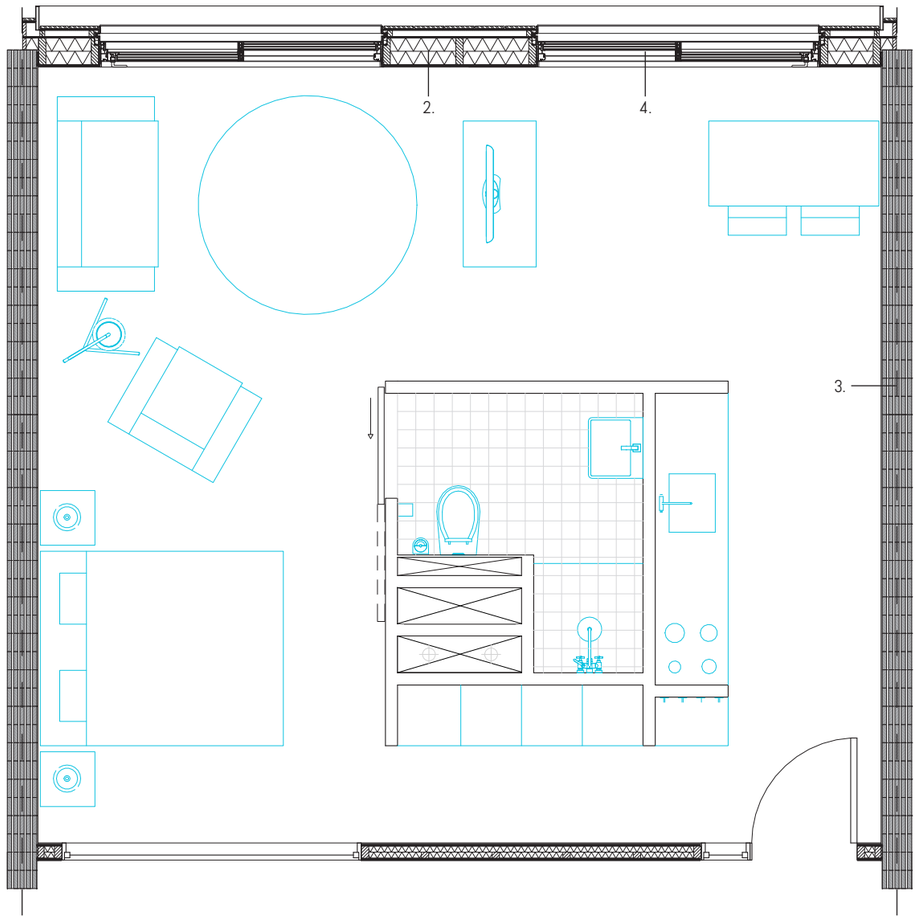
DWELLINGS ALIGNED
TO THE PLINTH

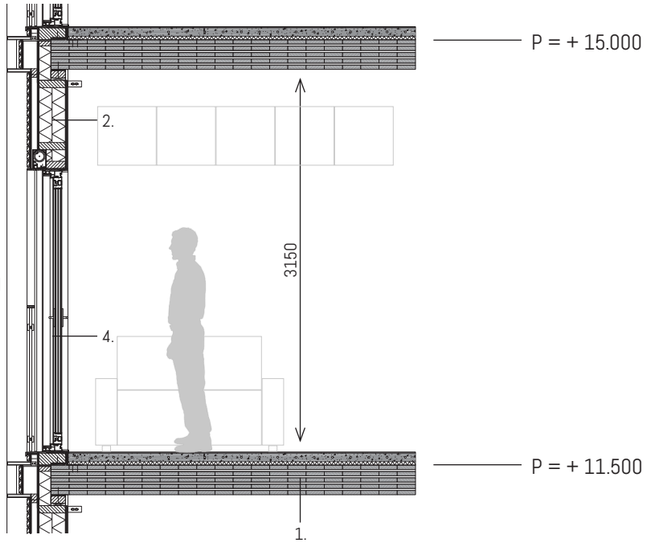
COMMERCIAL PLINTH



2.5 m
1 : 100







1. FLOOR (350mm) FROM TOP TO BOTTOM
- 10mm parquet floor (interior finishing)
- 70mm concrete in situ with floor heating system with a distance in between of 150mm
- 30mm Kooltherm K3 high pressure floor insulation to prevent noise contact transport
- CLT 243E from Structurlam

2. MODULAR FACADE (500mm) FROM EXTERIOR TO INTERIOR
- 245mm aluminium frame that is sticking out 100mm from the bricks and 165mm from the stone strips
- 20mm stone strips
- 5mm space for mortar
- 10mm Siniat Bluclad panels for connecting the stone strips
- 50mm wooden bars
- Water repellent layer
- 12mm multiplex
- 220mm wooden framework with insulation that has reduced thermal leakage due to the combination of vertical and horizontal bars. Rc = 5.4 to compensate the thermal leakage at the windows
- 12mm multiplex
- Moisture prevention layer
- 8mm white plaster (interior finishing)

3. LOAD BEARING WALL (259mm) FROM LEFT TO RIGHT
- 8mm white plaster
- CLT 243E from Structurlam. Thick enough to function as noise transport barrier
- 8mm white plaster

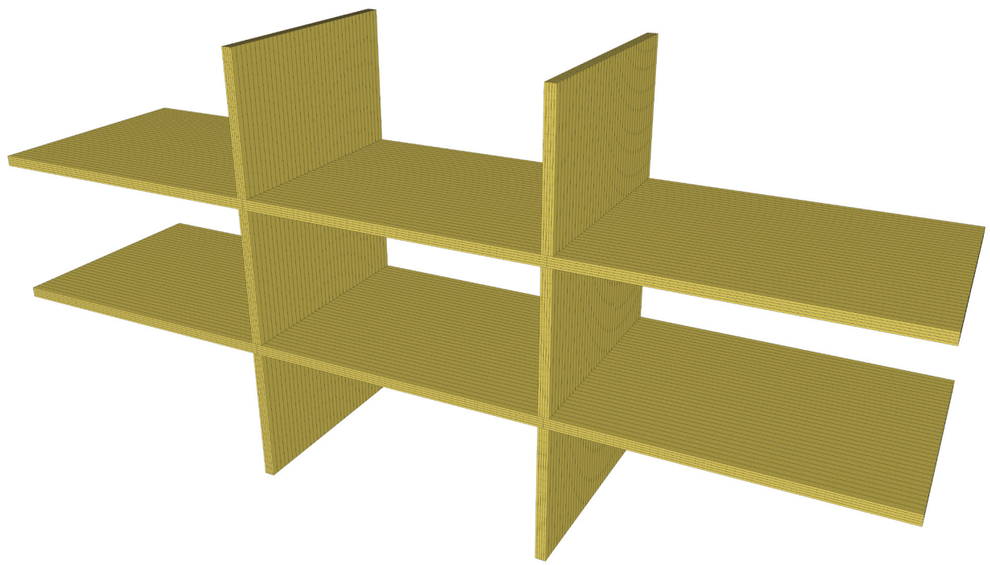
4. WINDOW
- Aluminium CP 155 Reynaers window frame adapted to triple glazing U = 0,6. Triple glazing is divided in 4 - 16 - 4 - 16 - 4mm and has a coating in the 16 mm cavity to lower the U-value
- French balcony with the railing set on 1200mm high
- DucoScreen Front 150 with grey screen that can be controlled electronically for each dwelling
- 12mm window frame is used as finishing

1.25 m
1 : 50

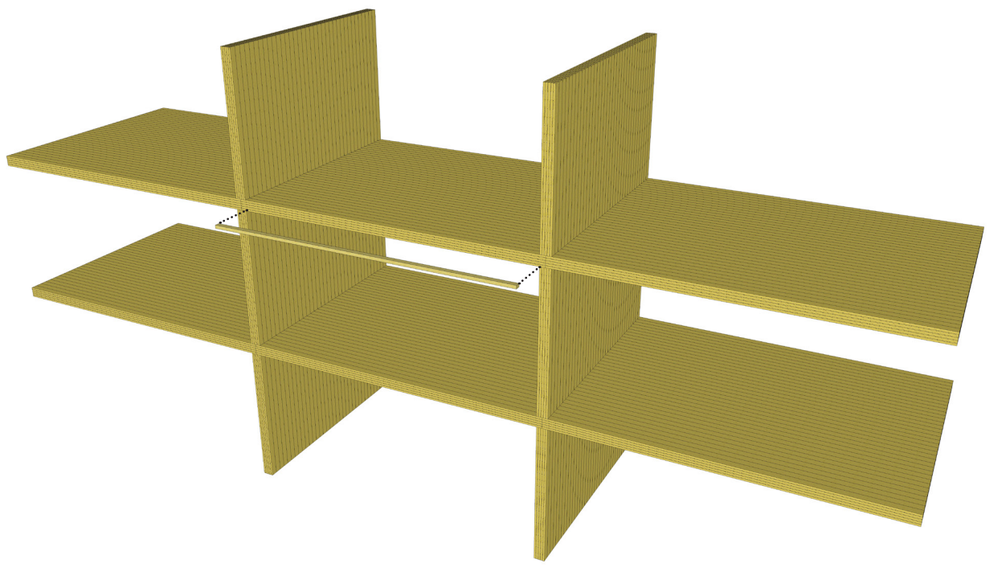
FACADE ASSEMBLY

CONNECTION WITH PRIMARY STRUCTURE

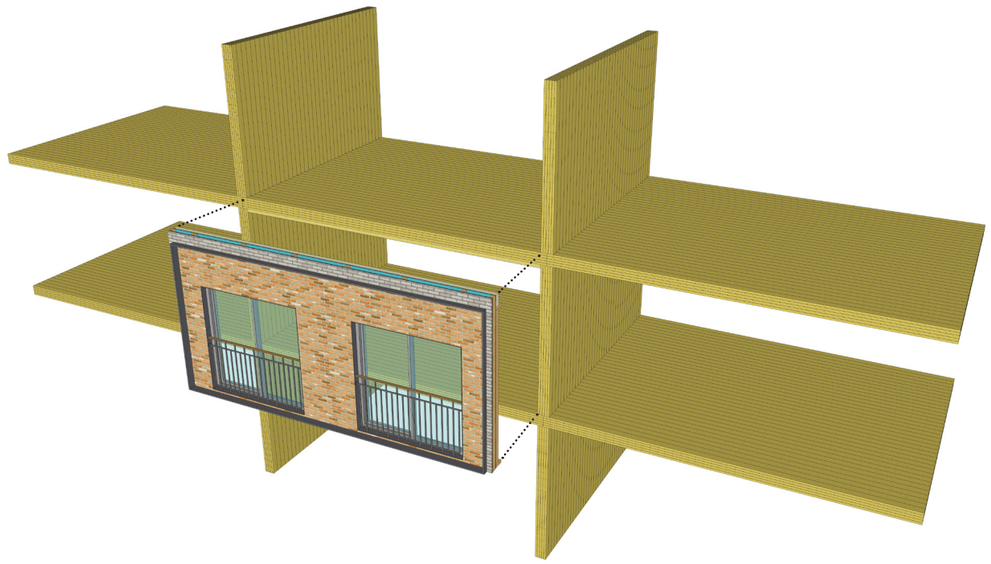
1) LOAD BEARING CLT STRUCTURE



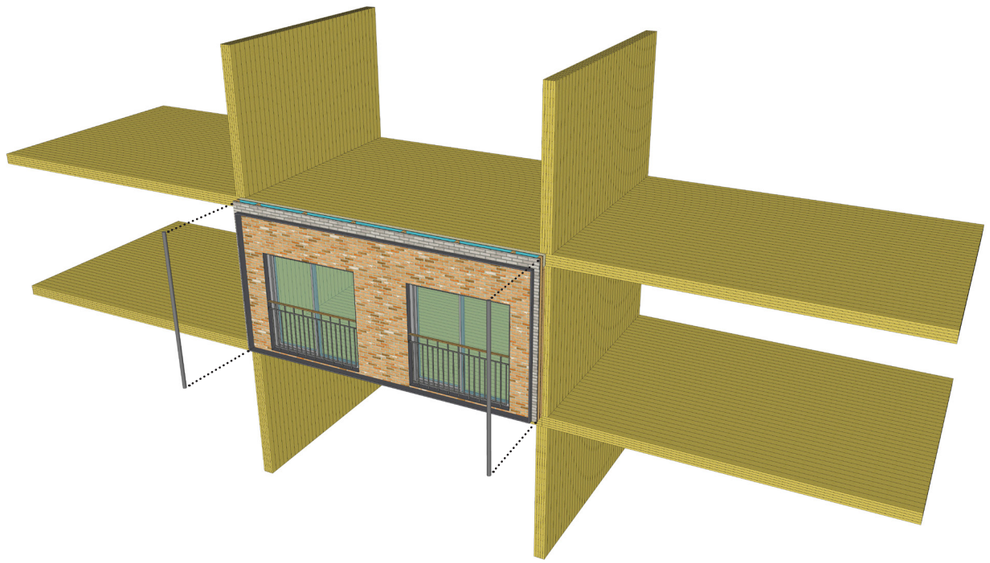
2) WOODEN BAR CONNECTED TO THE PRIMARY STRUCTURE. THE BAR IS NEEDED TO HAVE A CERTAIN TOLERANCE AND TO PLACE THE MODULE CORRECTLY.



3) PREFAB MODULE WILL BE CONNECTED TO THE PRIMARY STRUCTURE AND THE WOODEN BAR

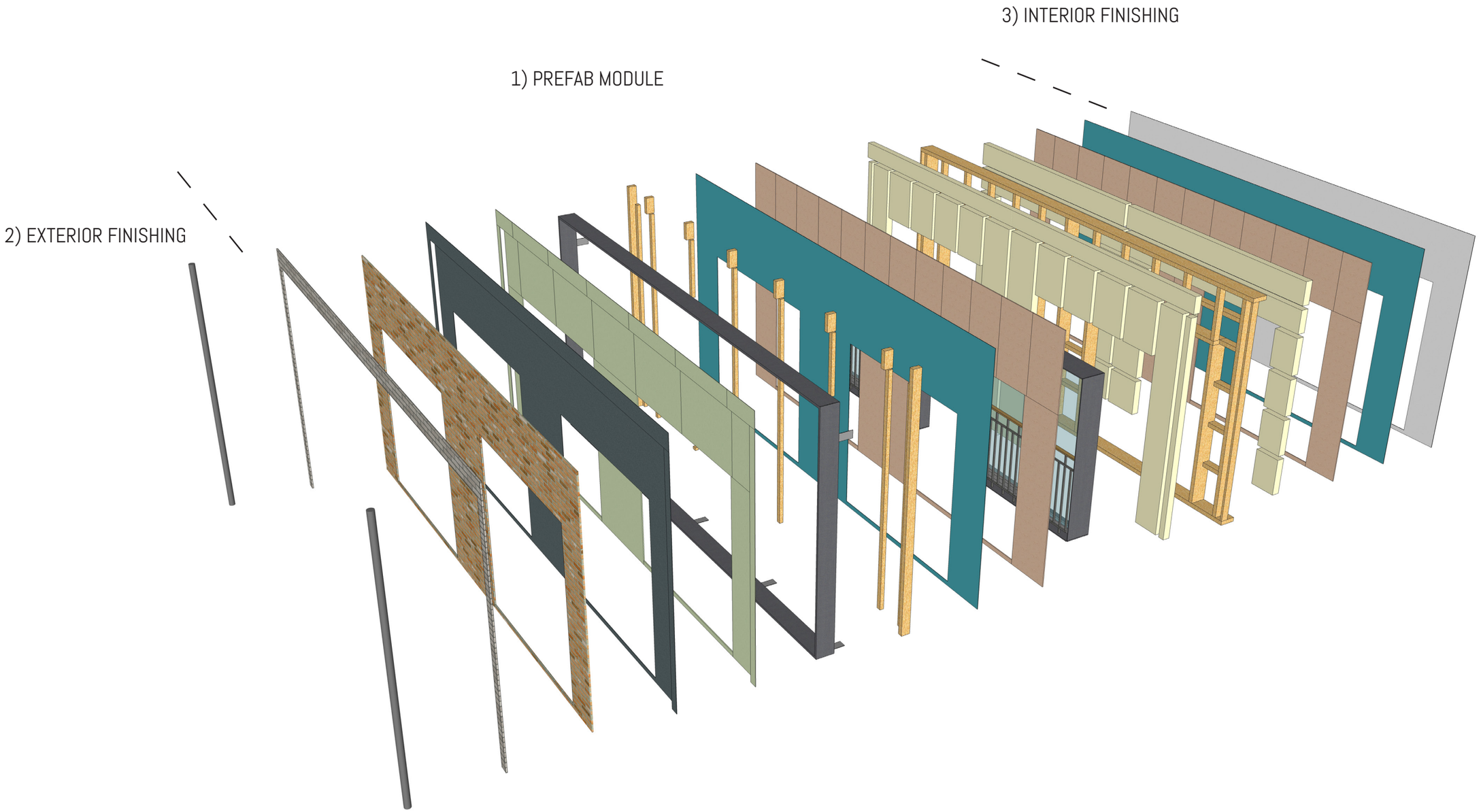


4) AFTER CONNECTING (ALL) THE PREFAB MODULE(S), THE REMAINING (FINISHING) WILL BE APPLIED



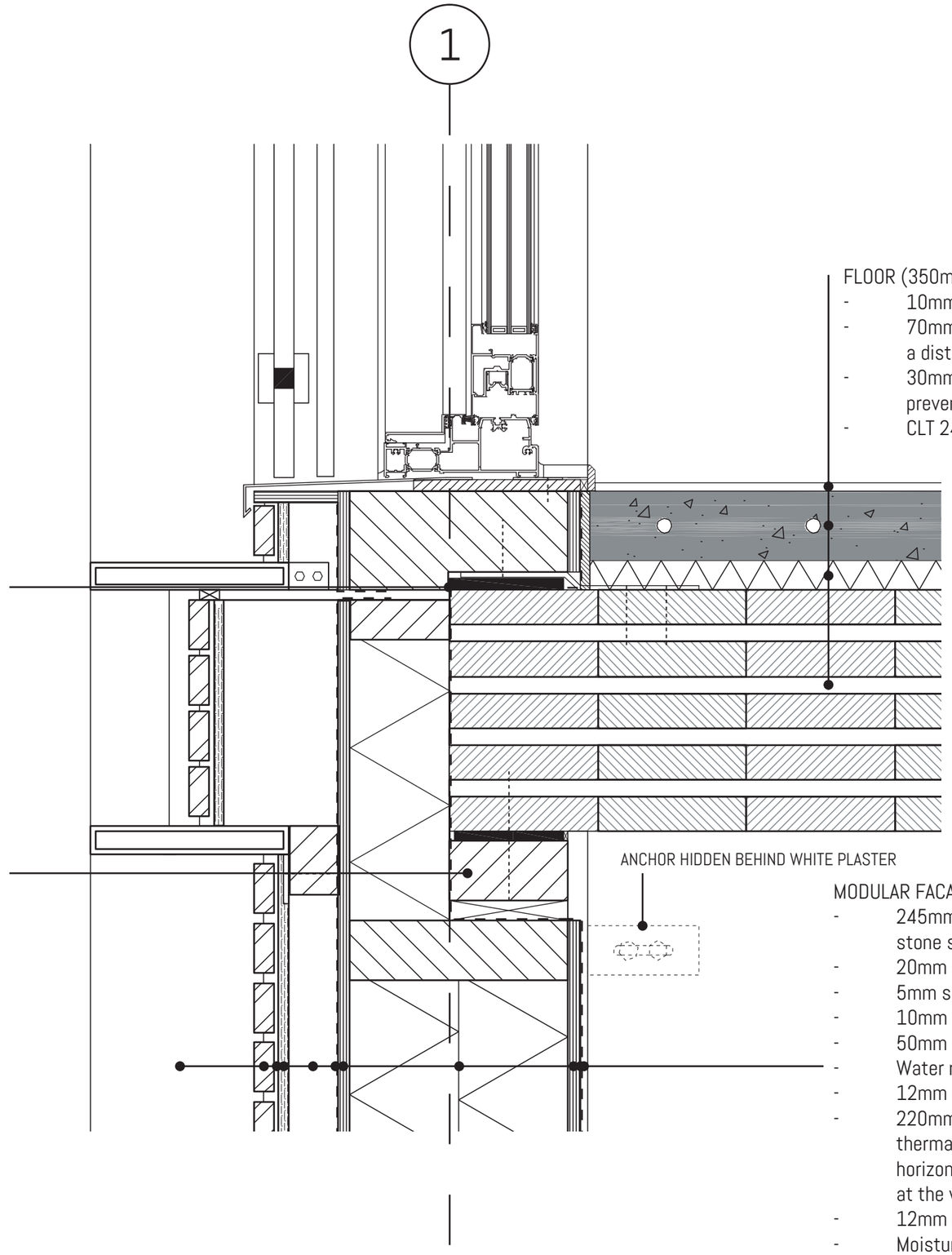
FACADE IMPRESSION

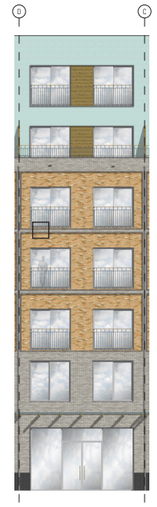
SUMMARY FACADE ASSEMBLY



DETAILS

FACADE - FLOOR CONNECTION





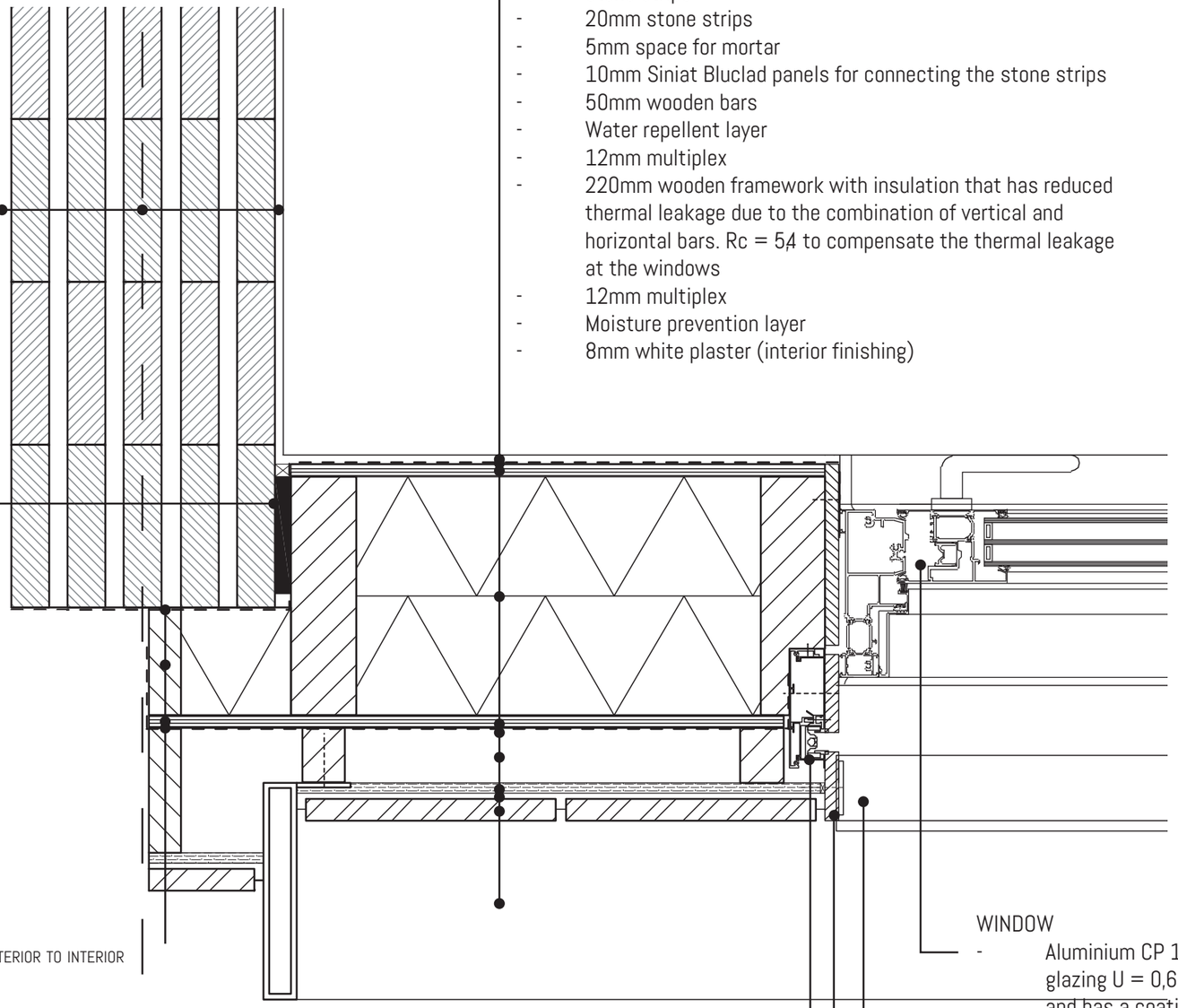
FLOOR (350mm) FROM TOP TO BOTTOM
- 10mm parquet floor (interior finishing)
- 70mm concrete in situ and floor heating system with a distance in between of 150mm
- 30mm Kooltherm K3 high pressure floor insulation to prevent noise contact transport
- CLT 243E from Structurlam

MODULAR FACADE (500mm) FROM EXTERIOR TO INTERIOR
- 245mm aluminium frame that is sticking out 165mm from the stone strips
- 20mm stone strips
- 5mm space for mortar
- 10mm Siniat Bluclad panels for connecting the stone strips
- 50mm wooden bars
- Water repellent layer
- 12mm multiplex
- 220mm wooden framework with insulation that has reduced thermal leakage due to the combination of vertical and horizontal bars. Rc = 5,4 to compensate the thermal leakage at the windows
- 12mm multiplex
- Moisture prevention layer
- 8mm white plaster (interior finishing)

0.125 m
1 : 5

FACADE - WALL CONNECTION

D



LOAD BEARING WALL (259mm) FROM LEFT TO RIGHT
- 8mm white plaster
- CLT 243E from Structurlam. Thick enough to function as noise transport barrier
- 8mm white plaster

NEOPREEN RUBBER TO REDUCE CONTACT NOISE TRANSPORT

MODULAR FACADE (500mm) FROM EXTERIOR TO INTERIOR
- 245mm aluminium frame that is sticking 165mm from the stone strips
- 20mm stone strips
- 5mm space for mortar
- 10mm Siniat Bluclad panels for connecting the stone strips
- 50mm wooden bars
- Water repellent layer
- 12mm multiplex
- 220mm wooden framework with insulation that has reduced thermal leakage due to the combination of vertical and horizontal bars. Rc = 5,4 to compensate the thermal leakage at the windows
- 12mm multiplex
- Moisture prevention layer
- 8mm white plaster (interior finishing)

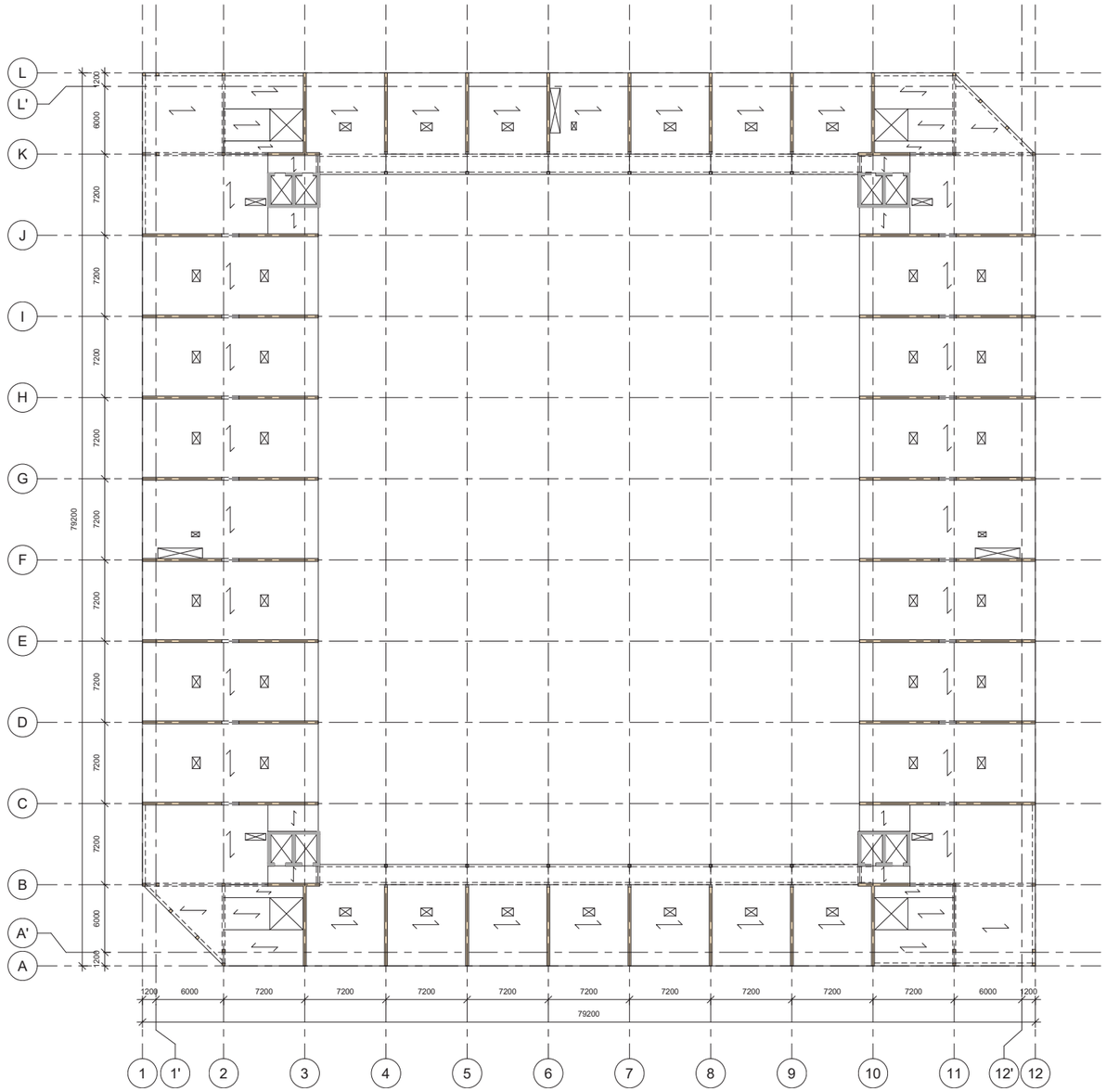
STONE STRIP FACADE (262mm) FROM EXTERIOR TO INTERIOR
- 20mm stone strips
- 5mm space for mortar
- 10mm Siniat Bluclad panels for connecting the stone strips
- 115mm wooden bars
- Water repellent layer
- 12mm multiplex
- 100mm wooden bar with insulation
- Moisture prevention layer

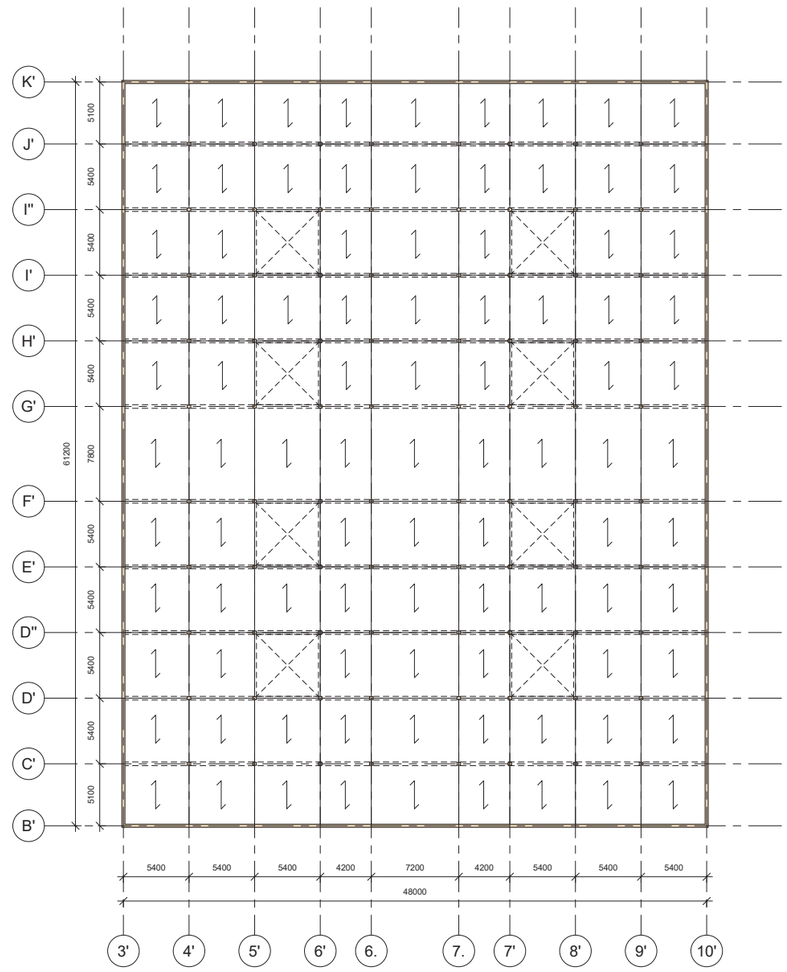
WINDOW
- Aluminium CP 155 Reynaers window frame adapted to triple glazing U = 0,6. Triple glazing is divided in 4 - 16 - 4 - 16 - 4 mm and has a coating in the 16 mm cavity to lower the U-value
- French balcony with the railing set on 1200mm high
- 12mm window frame is used as finishing
- DucoScreen Front 150 with grey screen that can be controlled electronically for each dwelling

0.125 m
1 : 5

CONSTRUCTION

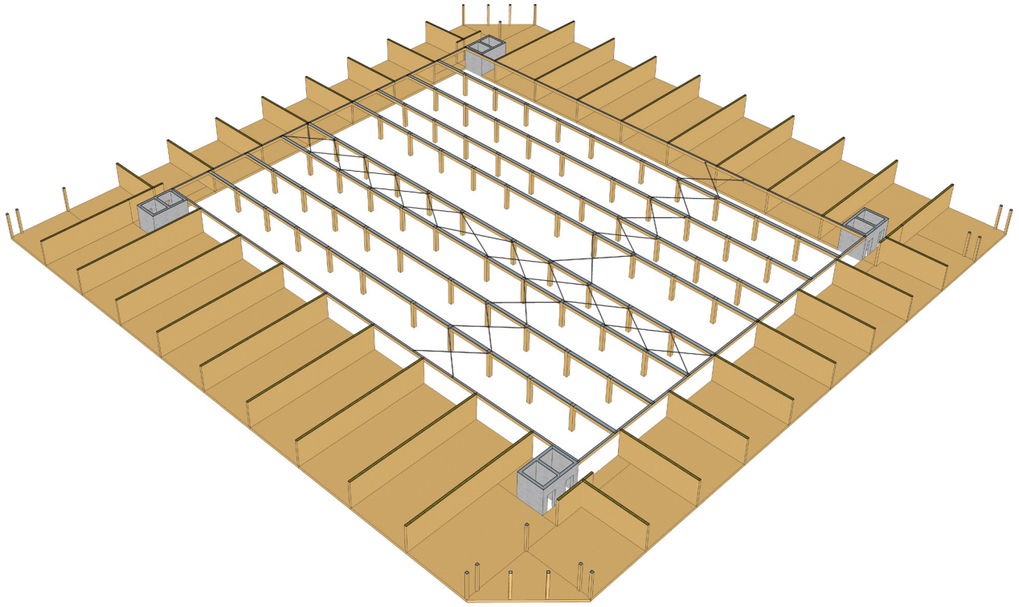
TWO GRID SYSTEMS - CONSTRUCTION SCHEME OF TYPICAL FLOOR PLAN & BASEMENT





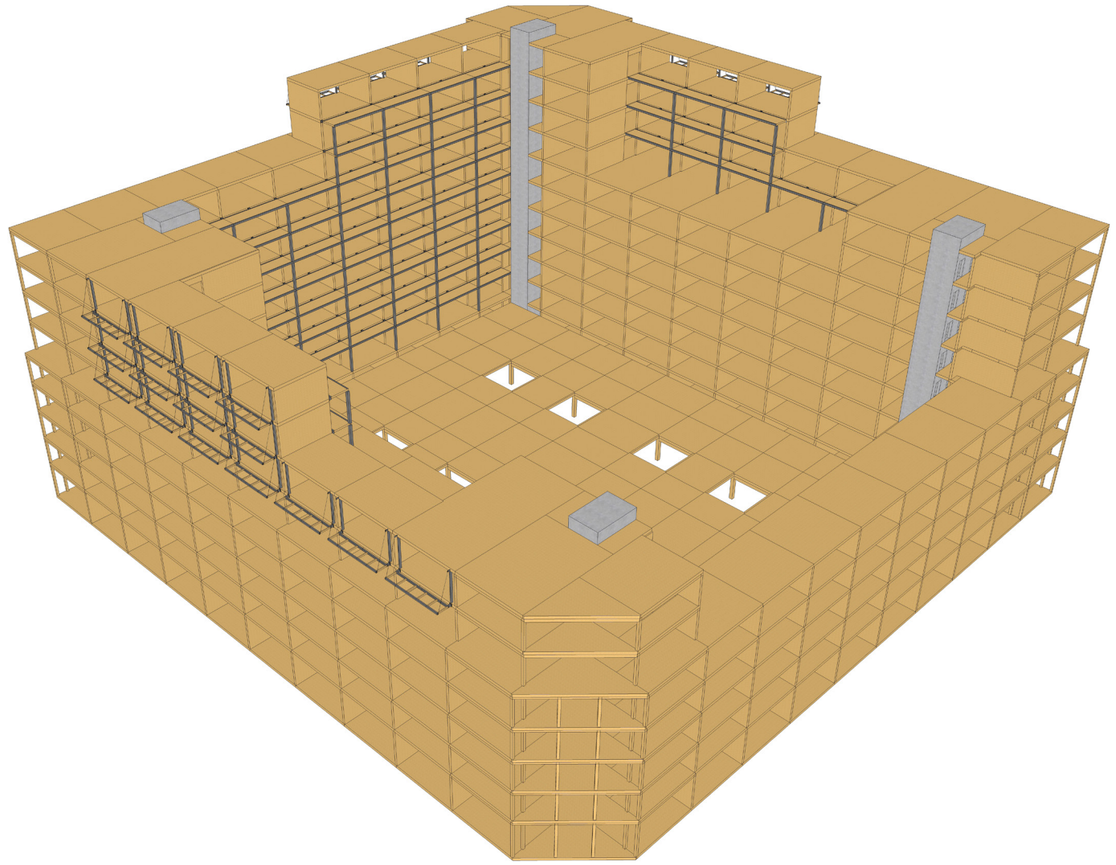
12.5 m
1 : 500

3D CONSTRUCTION MODEL



GROUND FLOOR AND BASEMENT ORGANISATION

A belt is used which connects the basement structure with the load bearing structure of the building to create stability. When needed the network of columns and beams can become more stable if steel tensile rods will be used.

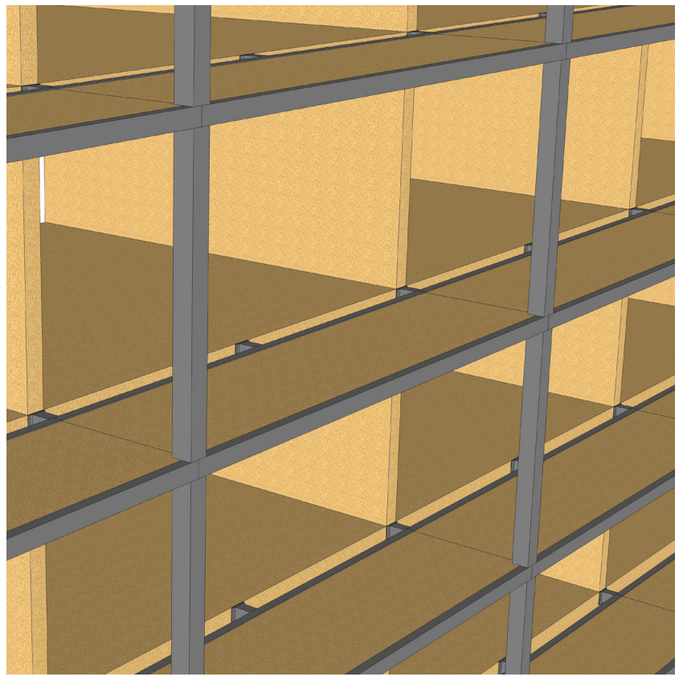


OVERVIEW

The primary CLT structure will be supported by the concrete elevator shafts for stability and a steel secondary construction to realise balconies, galleries and the cantilevers. Eventually, a hybrid construction is realised.

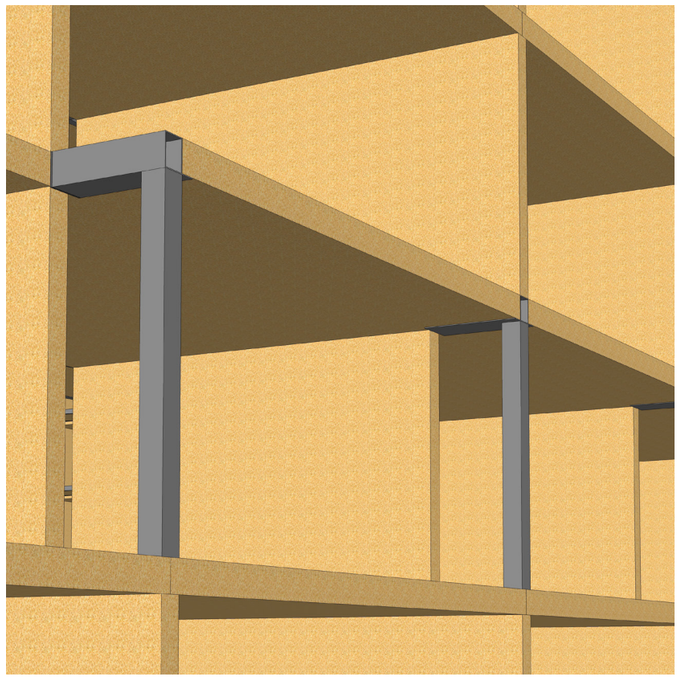
SECONDARY STRUCTURE - CONNECTION DETAILS

GALLERY



Just like the balcony I have chosen for a secondary structure with u-shaped steel beams. A difference is that the structure is outside which means that no steel columns are needed aligned to the CLT walls. The gallery is at some places connected to the load bearing structure with steel beams that are separated with a rubber to prevent thermal leakage. This connection is needed for stability reasons.

CANTILEVER

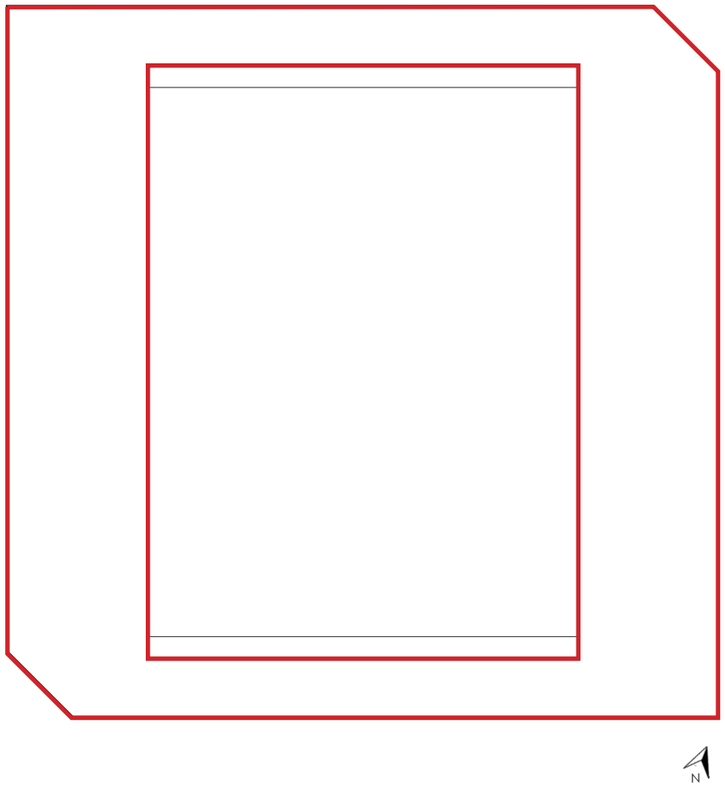


To make the 1,2m cantilevers work, I continued with applying a secondary structure. The CLT floor spans in the other direction compared to the balcony and gallery. Therefore, no beam is needed that is connected to both steel columns. The steel beams used are called “hoedliggers” and “petliggers” to reduce the construction height. Also, rubbers are here needed to prevent thermal leakage.

CLIMATE

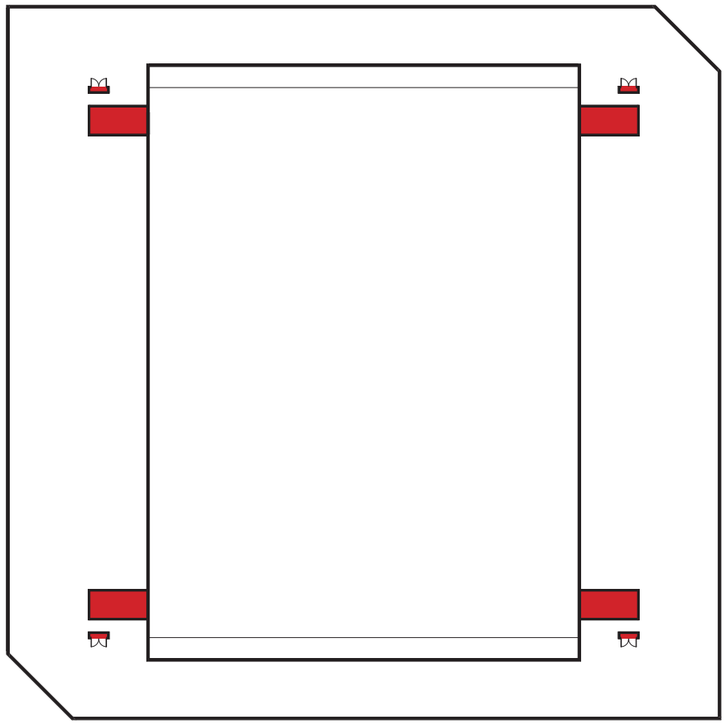
DIAGRAMS

THERMAL LINE



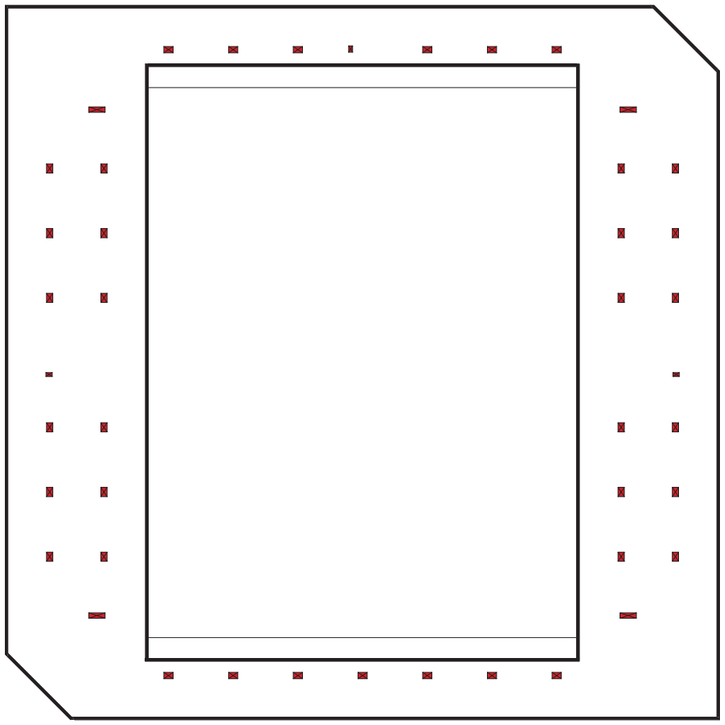
Galleries will be outside to have sunlight entering the dwelling from south direction

TECHNICAL & ELECTRICAL SERVICE ROOMS



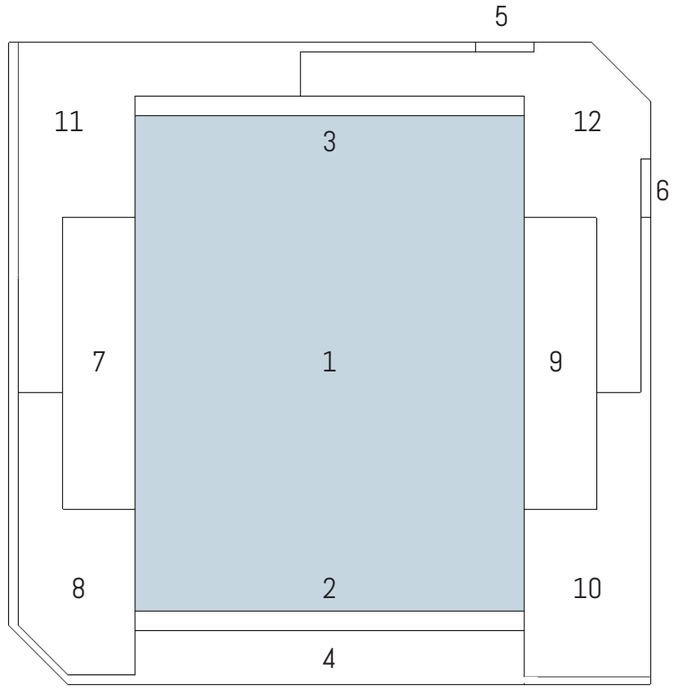
Located at vertical circulation to have a central place from where everything can be controlled

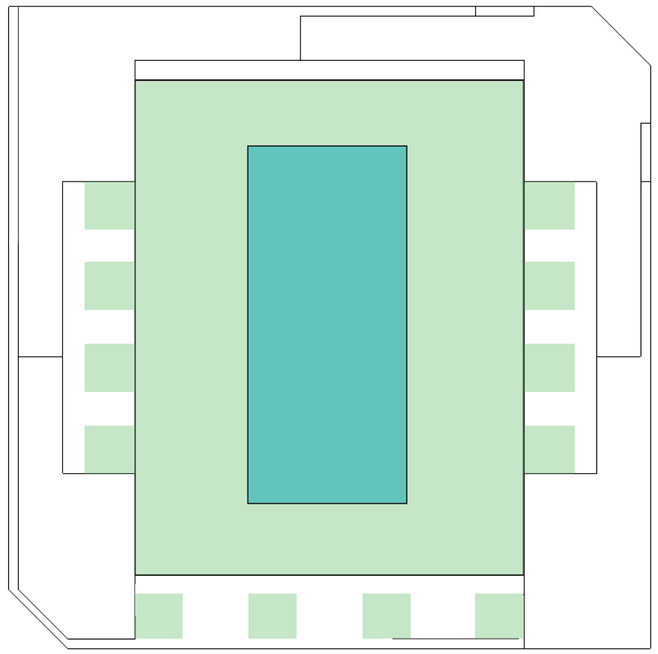
SHAFTS



Dwelling shafts will be used for plumbing related to (sewage) water. Ventilation pipes will be horizontally organised to the big shafts close to every technical room

COLLECTING RAINWATER - SUMMARY OF THE RESEARCH

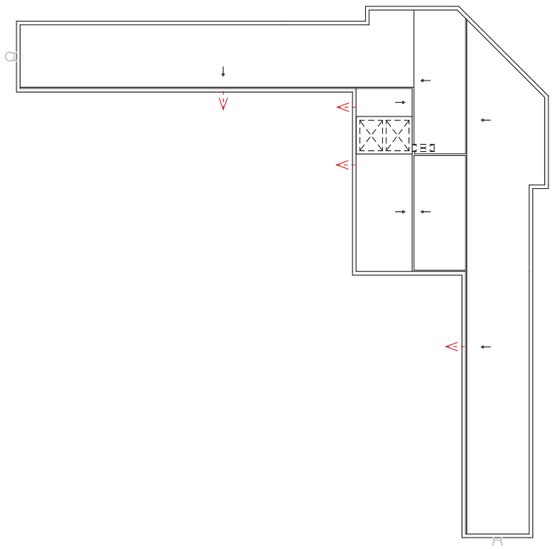




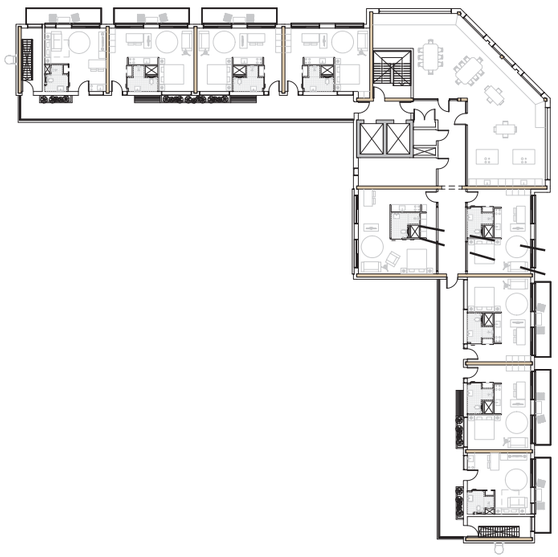
800 m2 surface area used for the water square.

Vegetation and soil can retain water with a capacity of 45 L/m2 (70% water retention)

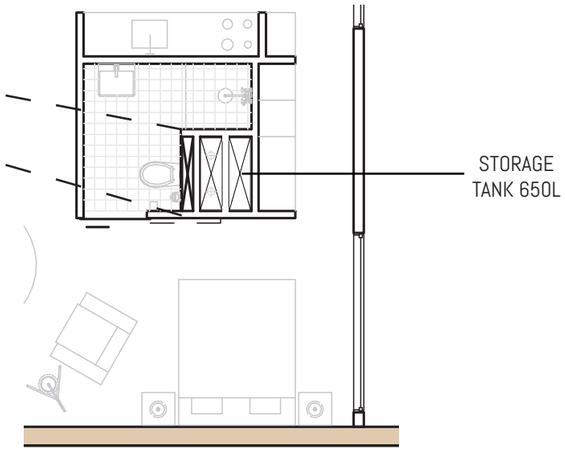
COLLECTING RAINWATER ON THE ROOFTOPS TO FLUSH THE TOILETS



ROOF P = +39.500



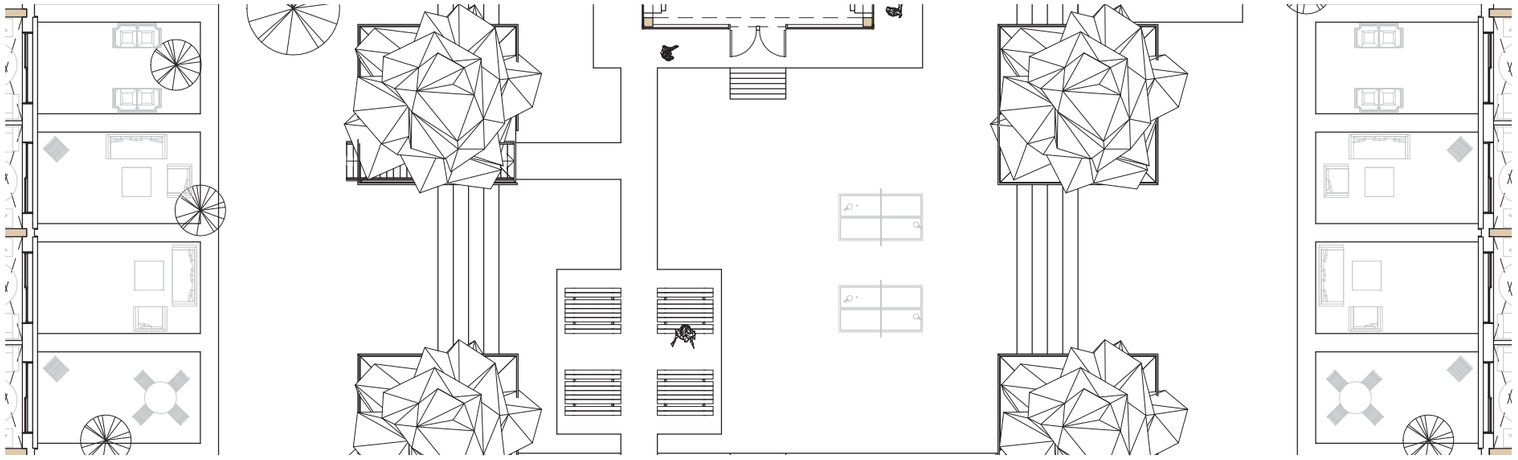
9th Floor P = +36.000

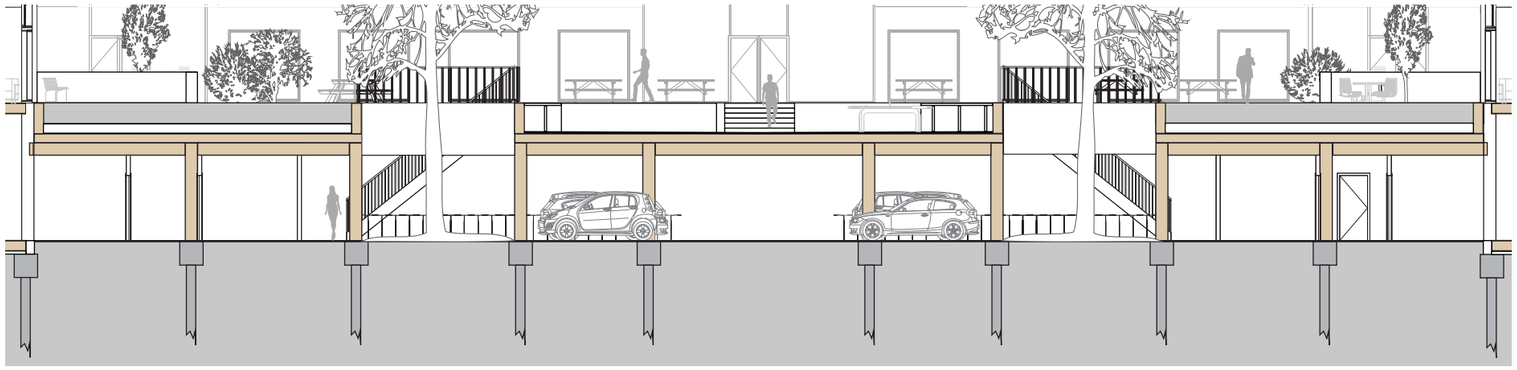


STRATEGY 1:

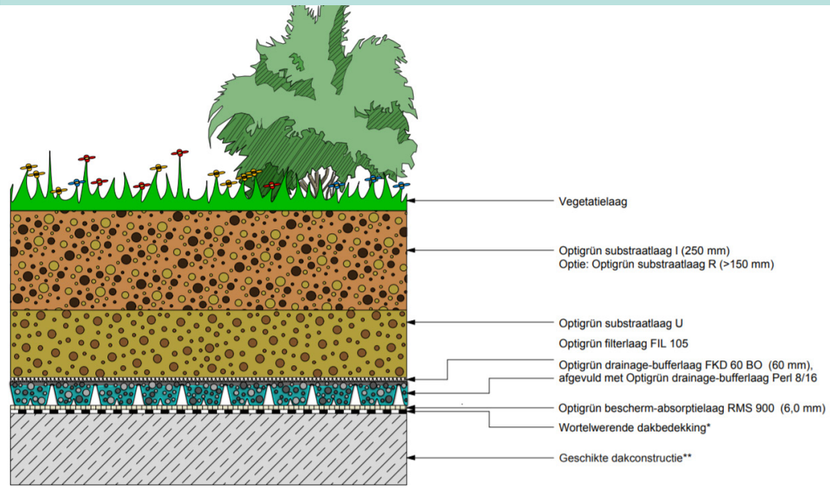
- 43,3% of the rain falls on the roofs
- A network with sloped insulation makes it possible to transport the rainwater
- Every dwelling has its own storage tank
- 75,0% of the annual toilet usage can be covered by having toilets with a special coating and limited water usage.

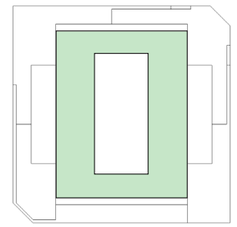
ABSORBING WATER BY USING VEGETATION



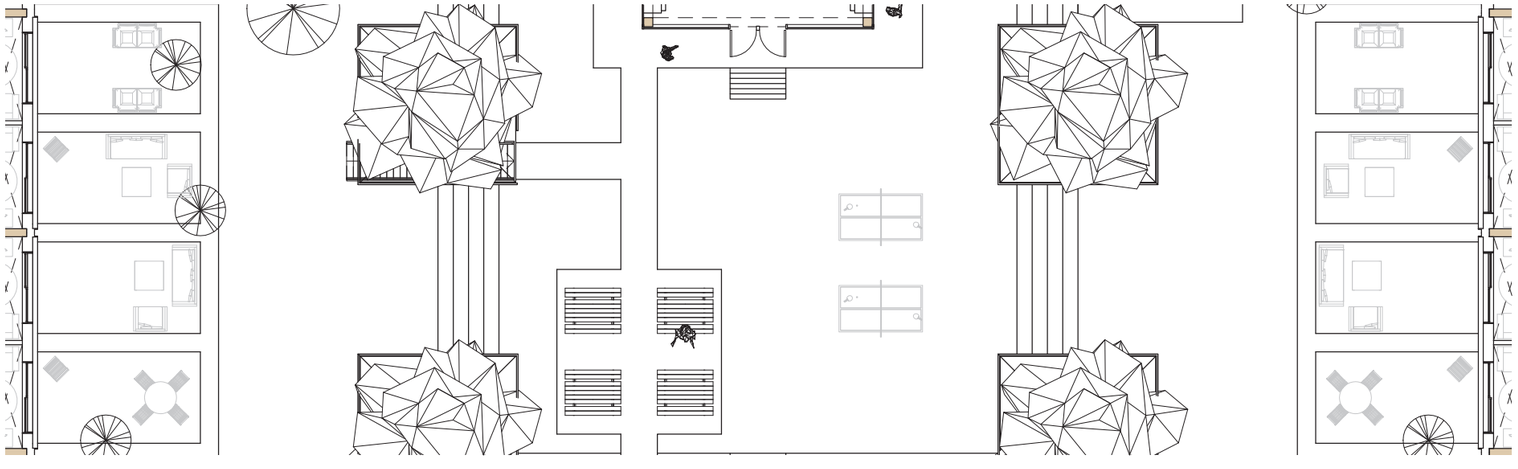


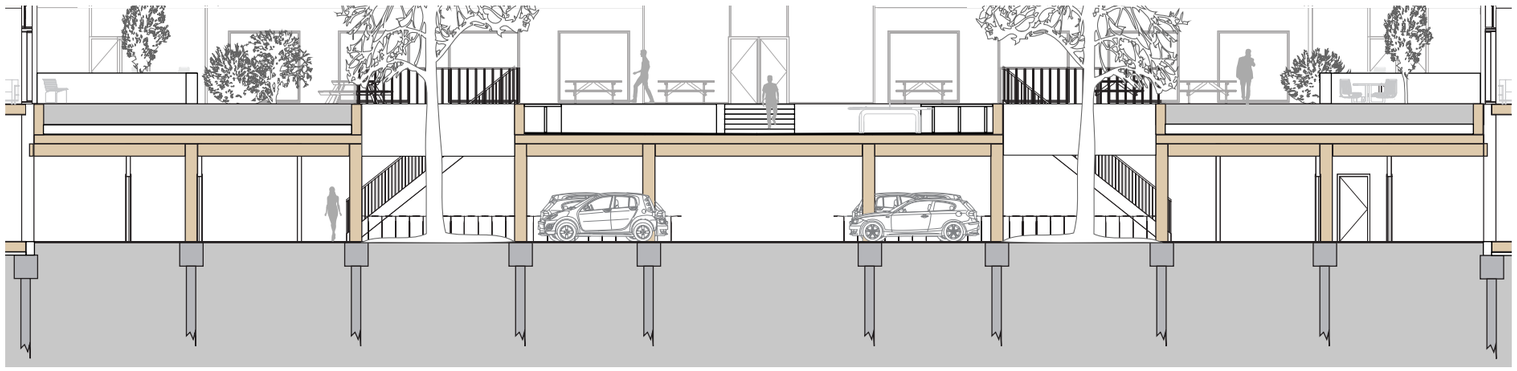
STRATEGY 2:
- 43,9% of the rain falls on the vegetation
- 70%-99% water absorption by Optigroen system
- The remaining 1% - 30% will transported to the water square
- Enough height is realised in the courtyard structure to make this happen





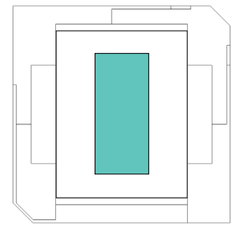
WATER BUFFER IN THE FORM OF A USEABLE WATER SQUARE





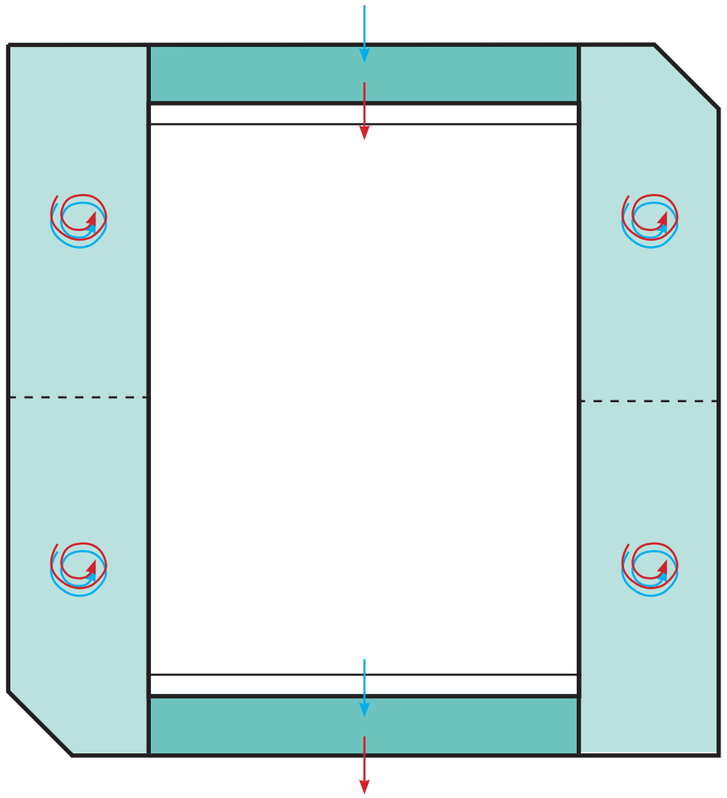
STRATEGY 3:

- 12,8% of the rain falls directly in the square
- Inspired by the famous Benthemplein water square in Rotterdam
- An overcapcity makes sure that during extreme dry periods the vegetation will be hydrated by a sprinkler system that uses the collected rainwater
- When it is dry, the square has a collective character where residents can interact



VENTILATION - DIAGRAMS & CALCULATIONS

ZONES

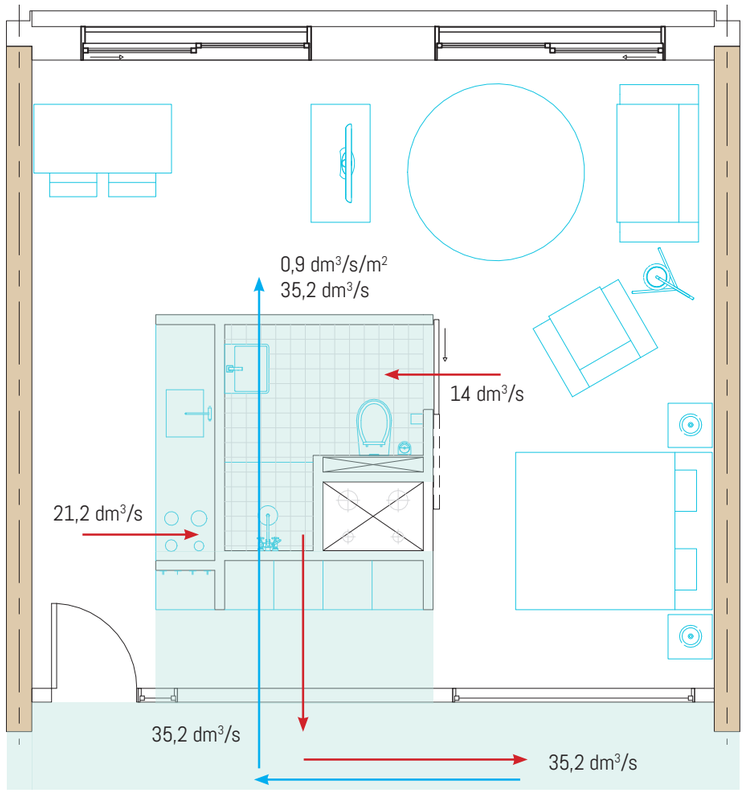


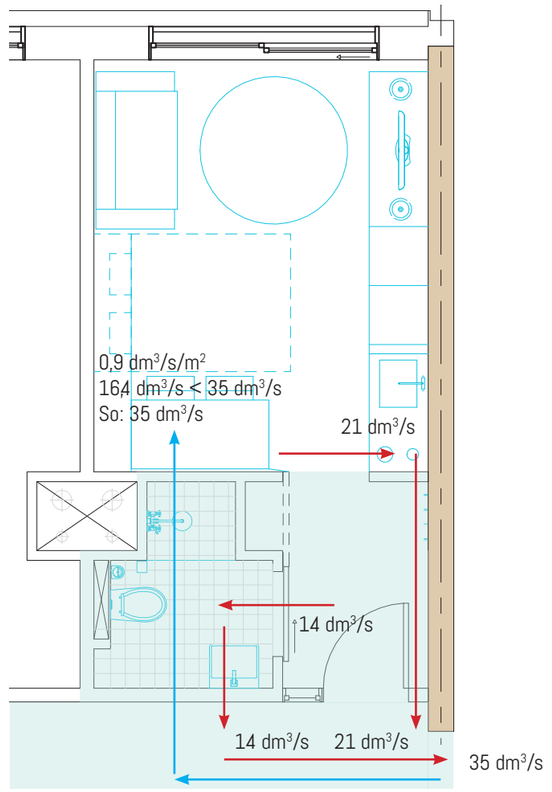
Balanced mechanical ventilation (Type D)

Natural ventilation (Type A)

Separation of two of the same ventilation systems to create smaller zones

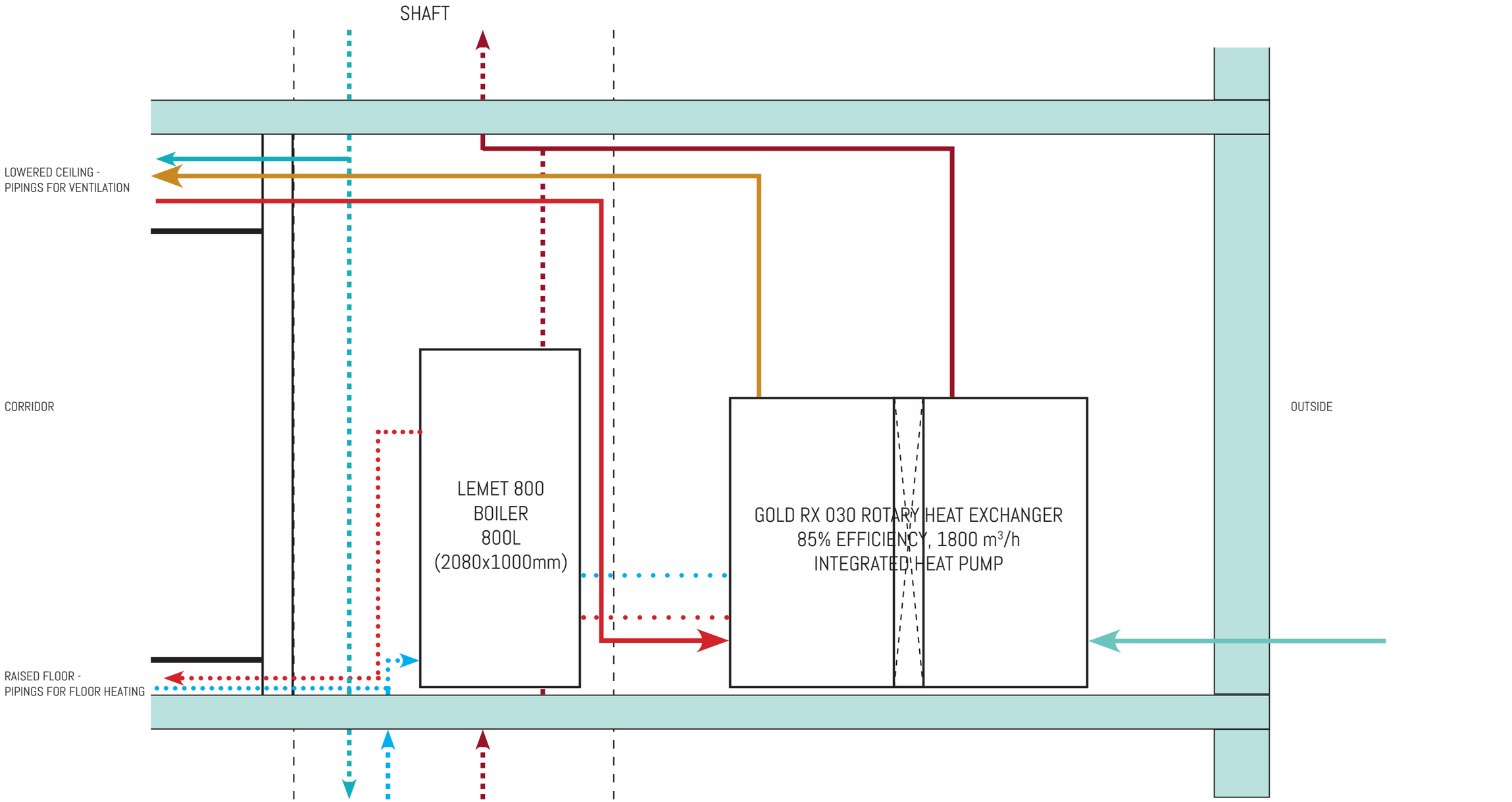
CAPACITY (FOR THE MOST COMMON DWELLING TYPES A AND B)



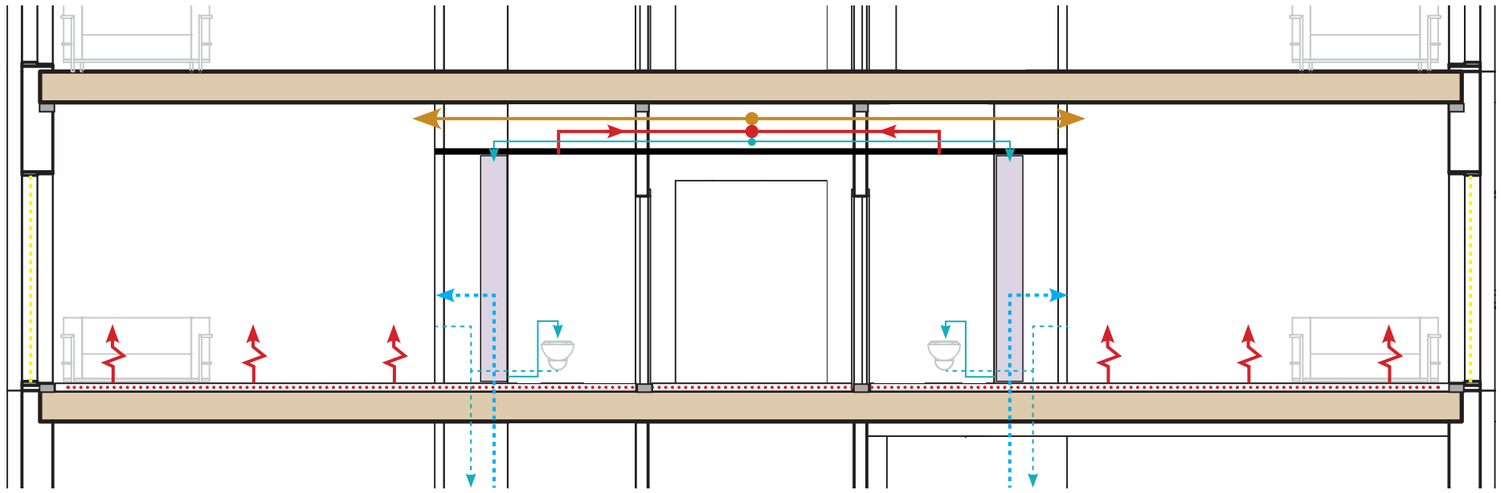


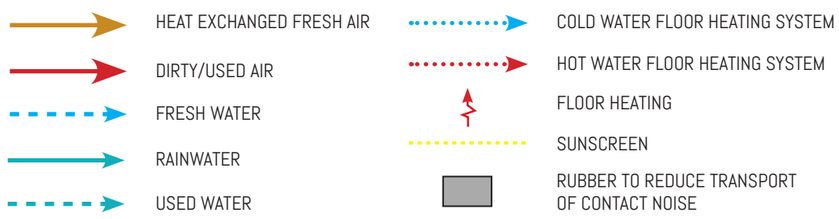
Lowered ceiling for horizontal piping network

ORGANISATION TECHNICAL ROOM



CLIMATE CONCEPT OVERVIEW





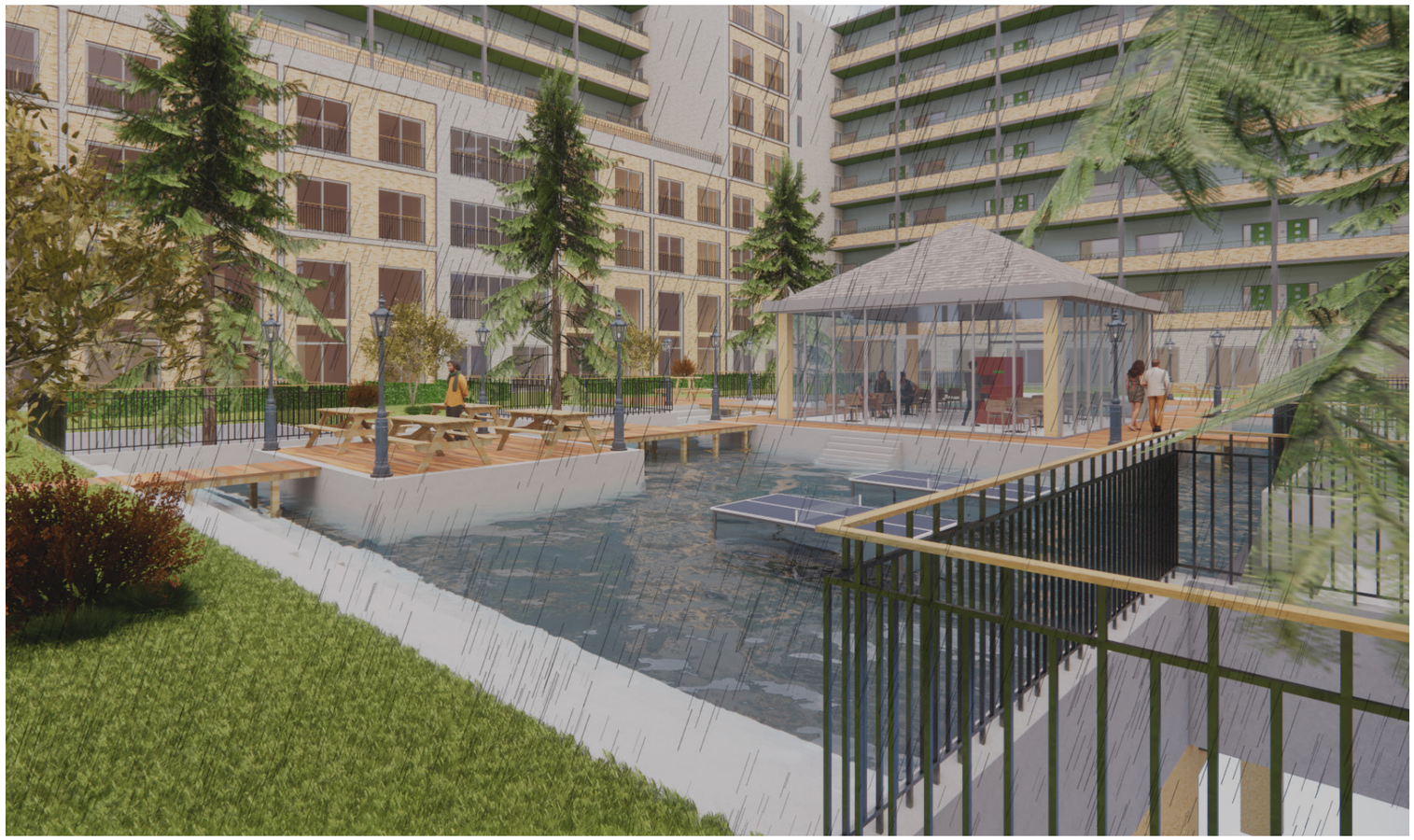
EXPERIENCING DESIGN PROPOSAL

NORTH CHAMFERED CORNER

SOUTH CHAMFERED CORNER - CAFÉ

COURTYARD - DRY

COURTYARD - RAIN



GALLERY

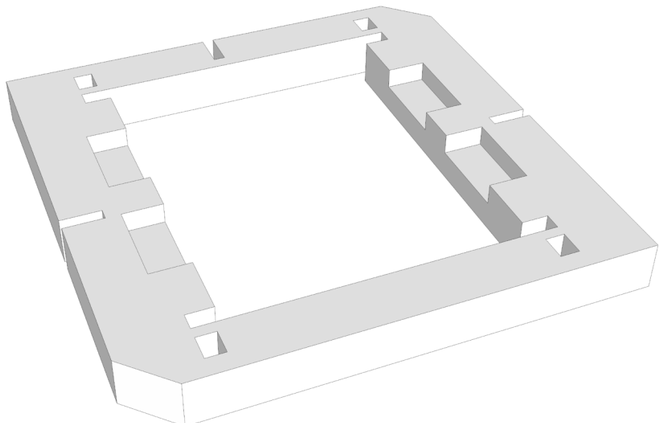
CORRIDOR

DWELLING STUDIO (TYPE A)

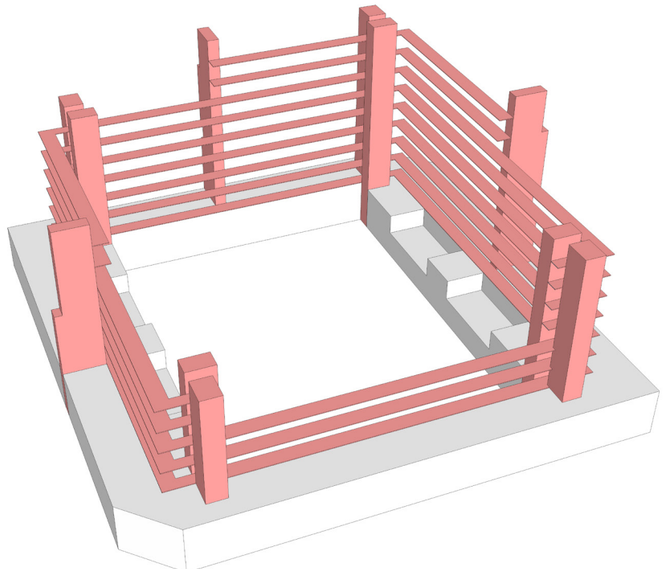
4. OVERVIEW

OVERVIEW BUILDING

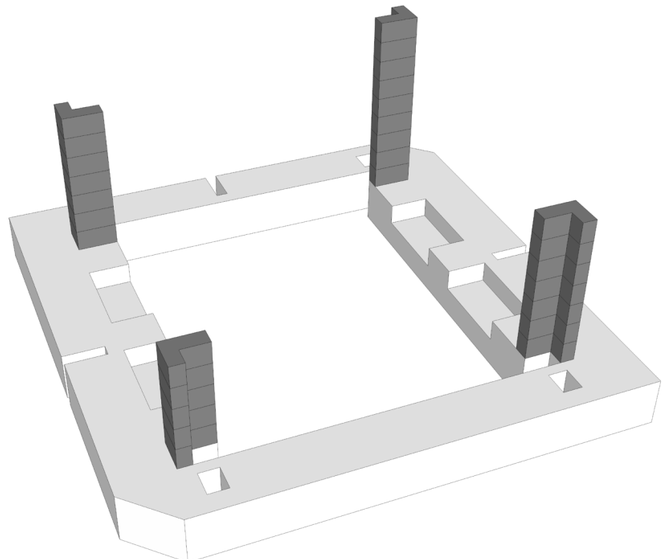
COMMERCIAL PLINTH



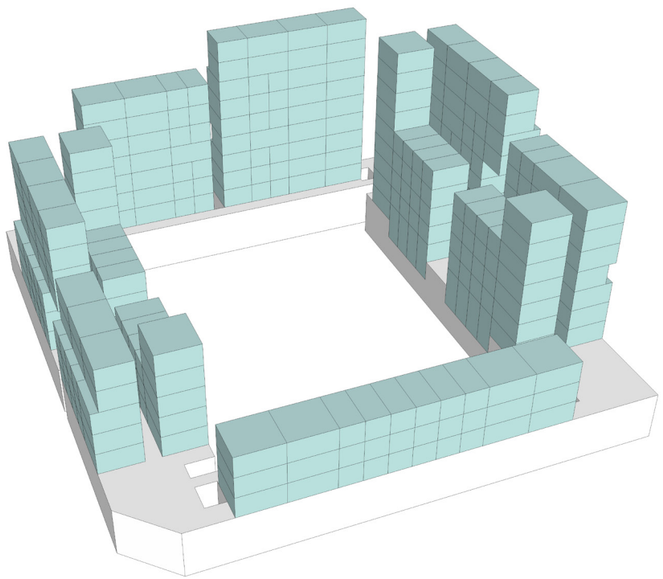
CIRCULATION



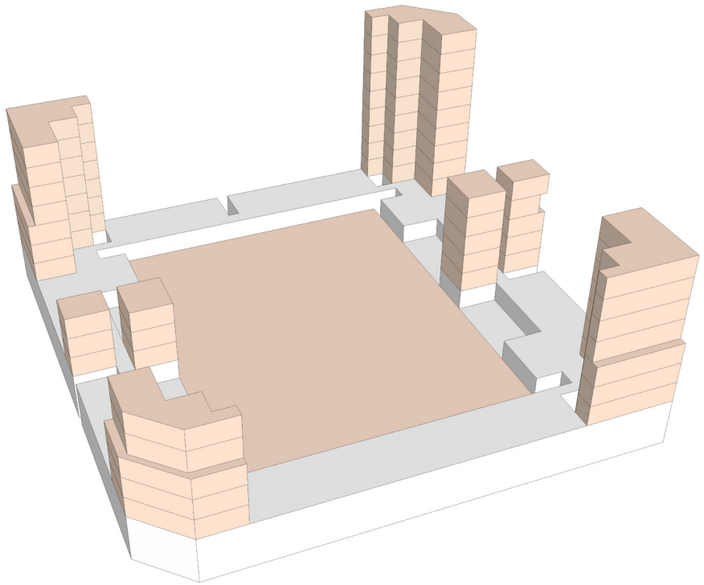
TECHNICAL ROOMS



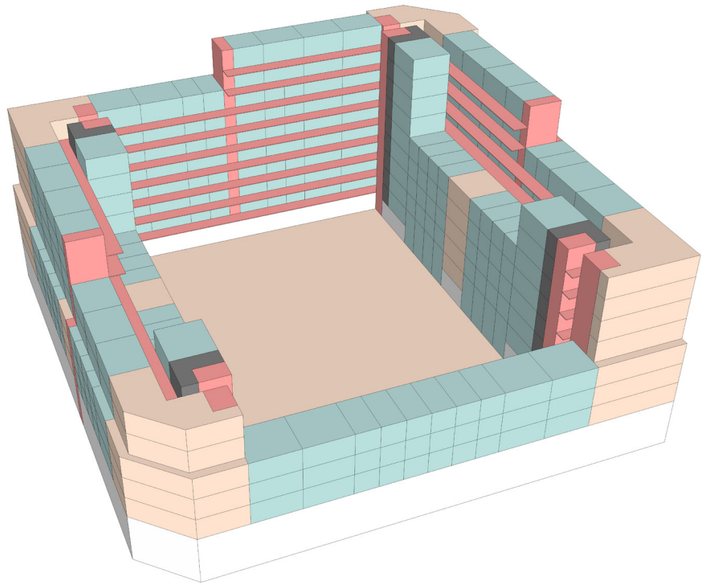
DWELLINGS



COLLECTIVE SPACES



TOTAL OVERVIEW



REFERENCE LIST →

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BPD. (n.d.). *Consumentenonderzoek woonwensen Amsterdam.* https://bpdwoonwensenonderzoek.nl/. Visited on 24-10-2019.

Inbo. (2009). Klaar voor de starter.... The Netherlands, Rotterdam.

Oozo. (n.d.). *Wetenswaardigheden, cijfers en statistieken over Amsterdam.* https://www.oozo.nl/cijfers/amsterdam. Visited on 19-10-2019.

STOWA. (2018). *Nieuwe neerslagstatistieken voor korte tijdsduren.* Rapport 12.