Neighborhood and Community

Connecting the Tangible and the Intangible



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Foreword

This graduation report presents a design solution for the assignment of the graduation studio ‘Addis Ababa Living Lab’, which is a one-year graduation Master’s Program at the faculty of Architecture, Urbanism and the Built Environment at the Technical University of Delft. During this program the lack of social housing in the capital of Ethiopia, Addis Ababa, is discussed. (For more info I refer to my Research Plan, which was produced at the end of MSc 2.)

Index Page

This page presents all the topics to be discussed in consecutive order: The Assignment, The Research, The Location and finally The Design. The first two parts (The Assignment' and 'The Location' are briefly discussed, since the elaborated version is already discussed and presented during the end of the first semester and assessed during the final presentation of that specific semester, the so called P2. For detailed information about these topics, I refer to my Research Plan. The other two parts (The Location and The Design) will extensively be disclosed in this report.

Since 'The Design (Solution)' is the focus of this report the main message is mostly conveyed trough images and drawings. The text is merely a way to put the reader's attention to some specific parts of the images and drawings presented.

This report will finally be enclosed with a short bibliography.

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The Assignment



Concentration of informal settlements Addis Ababa



Distribution of the informal settlements through time

Through the last two decades of rapid growth, Ethiopia's housing shortage increased dramatically. First and foremost, nowadays Ethiopia faces an enormous challenge to deliver housing for the urban poor.

The local government has launched policies to provide more affordable housing. However, these policies are mainly focused on efficiency (building quickly and cheaply), overlooking the resilience of the new communities.

The graduation studio Addis Ababa Living Lab: New Standards for Contemporary Ideals will explore alternative approaches to deal with Addis Ababa's housing issue, in particular the dramatic shortage of affordable housing options.

The images on this page are made by students in the previous years in the graduation studio Addis Ababa: The Living Lab. The first image is a map of Addis Abba showing Concentrations of informal settlements throughout the city. The image below it shows how these informal settlements grew over time.

The Research

The Research is elaborately discussed in the Research Plan, so detailed information can be found there. But the research gives a great input for the design, hence a video is made to summarize the problem statement.

In this video I firstly give a brief introduction into the country of Ethiopia and its capital, and this is done in the context of urbanization. I briefly explain the position of Ethiopia in Africa and then the position of Addis Ababa within Ethiopia and how the rapid population growth and the rapid growth of urban population affects Addis Ababa.

In the video, I then continue explaining the Integrated Housing Development Program (IHDP) implemented by the government of Ethiopia as a reaction to the housing shortage within the country and its capital. The narrative in the video continuous to discuss how this program has been lacking on some design aspects. It has been alienating people form the community and it is not responsive to the needs and activities of everyday life (UN Habitat, 2011). For example, living close to the ground means having a closer connection with the community, because on the ground level people sell their goods, make their foods, dry their goods, and wash their clothes. In multi storied apartments of the IHDP these activities are due to the size, which is needed for these activities, not possible (UN Habitat, 2011).

After this, I present the problem statement in the video: **How to design social housing with a strong connection between the community and the neighborhood in Addis Ababa, Ethiopia?**

The Theoretical Framework/ Bibliography and the methods to provide a solution for the problem statement is also presented in the video.

Finally, I conclude the video with the (scientific) relevance of this topic/ graduation assignment.

Problem Statement



To be able to answer the question: **How to design social housing with a strong connection between the community and the neighborhood in Addis Ababa, Ethiopia?** First the following question needs to be answered: What is a neighborhood and what is a community?

“A neighborhood is a limited territory within a larger urban area where people inhabit dwellings and interact socially.” (Hallman, 1984)

A community is a connection between individuals who will act collectively and share a collective identity, this can be attached to a physical place but also not bound by a physical context (Chaskin, 1997).

In other words, a neighborhood is tangible, and the community is intangible. The ‘Neighborhood’ refers to the physical context and the ‘community’ refers to the non-physical context. The buildings, the streets on the one hand and the history, the culture of the place on the other hand.

The literature on these topics is big and sometimes the explanations of the words (community and neighborhood) described in one piece of literature contradicts the explanation which is given in another piece of literature. (See Research Plan).

But all the literature pieces I revised refer either directly or indirectly to these two terms: ‘connection’ and ‘social spaces’. The community is based on the connection between people and the literature describes how this happens in social spaces and how they look like and or how they should look like and hence be designed. So, the solution to the problem statement was to be found in these two terms.

Connection

+

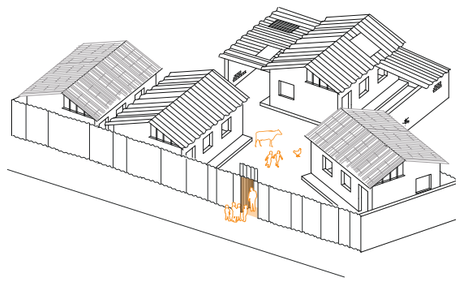
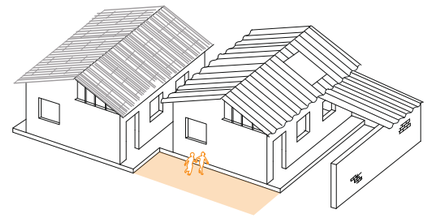
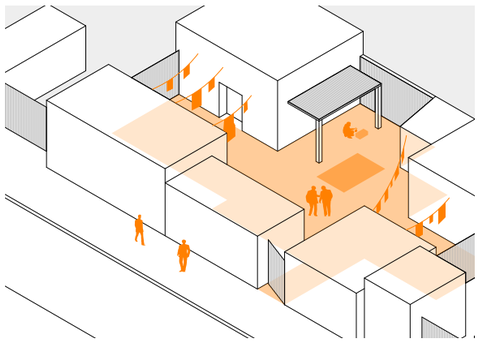
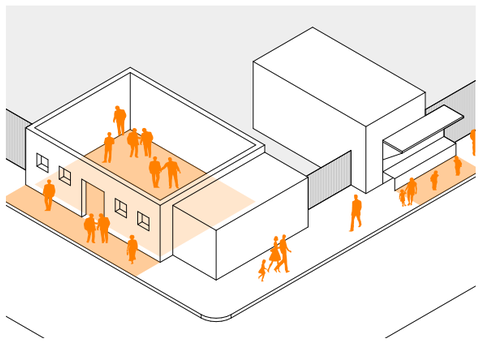
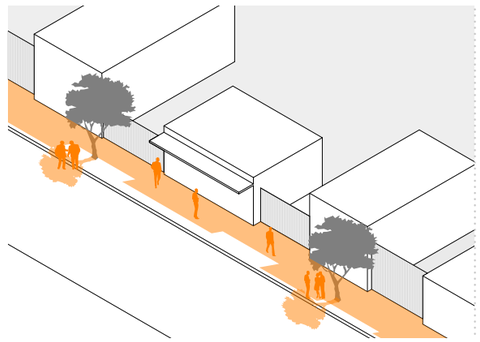
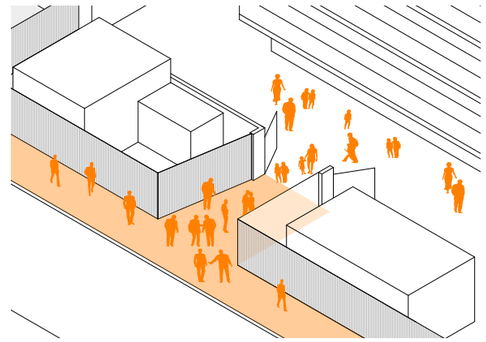
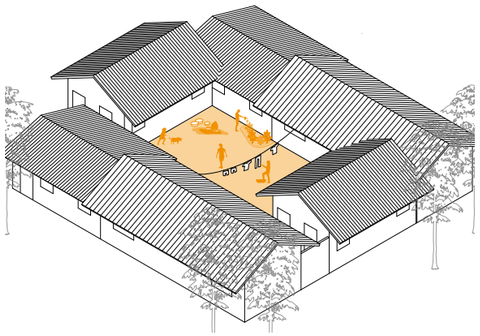
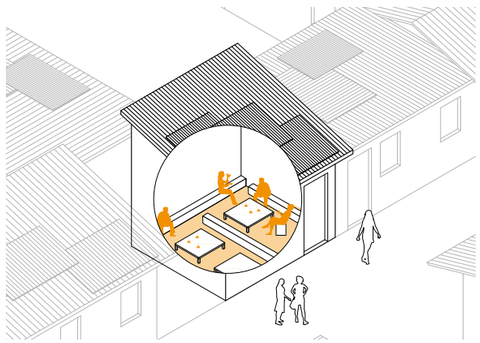
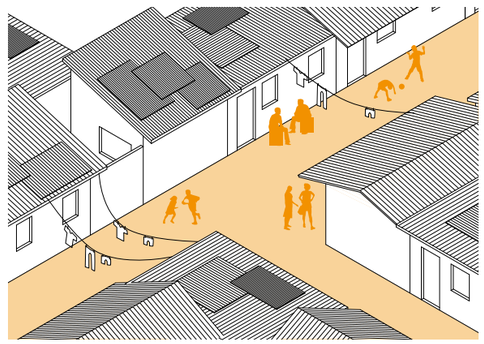
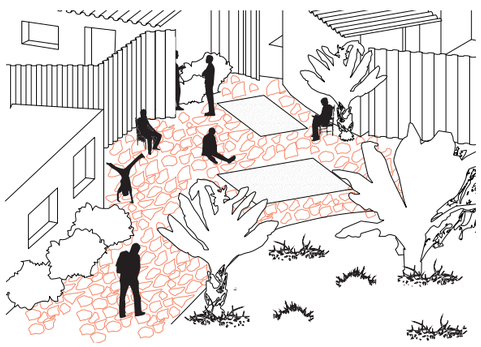
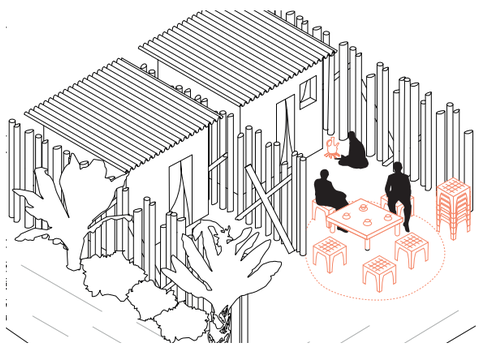
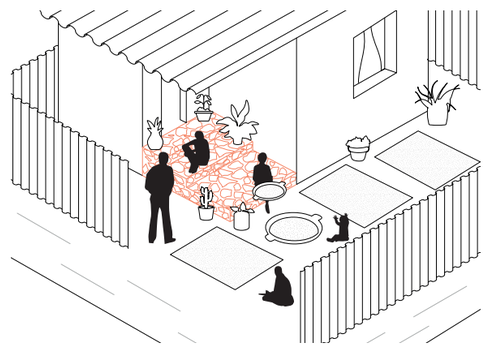
Social Spaces

The question arose after finding the solution to the problem statement was: How did that ‘connection’ look like in the old sefers? Or: Where were these social spaces in the old situation? UN Habitat did and extensive research into the IHDP and presented the results in a report in 2011. In this report UN habitat mentioned how the people living in the IHDP condominium units felt alienated and how the program was not responsive to the needs and activities of everyday life. This suggests that the design of the old sefers did in fact meet the standards of everyday life and that the old sefers were not alienating its inhabitants in contrast to the IHDP. A natural next step was to take a closer look at the sefers, sefers are informal settlements. These are usually demolished and replaced with for example the condominium units of the IHDP. Before designing the new the old must be analyzed.

To take a closer look at the sefers a trip to Addis Ababa, Ethiopia would have been the best option. But unfortunately, this was not possible due to the global pandemic. To be able to answer the question ‘How did that ‘connection’ look like in the old sefers?’ And where were these social spaces in the old situation? I used the work of my colleagues done in the previous years of the graduation studio (2015-2016). They did go to Addis Ababa, and they did field research in which they went to some sefers and analyzed them. Hence, for this part (this page and the coming two pages) all credit and thanks goes to the following students: Maartje Holtslag, Ellen Chang, Monica Lelieveld, Michele Bassi, Fabio Tossutti, Anne Van der Meulen, Margot de Man, Yau Yuet Sun Cherry, Paolo Turconi, Arianna Fornasiero.

In their field research they described roughly four kinds of social spaces: The Courtyard, The Commercial Hot Spot, The Inner Streets and The Left-over Spaces

The Courtyard
The Commercial Hot Spot
The Inner Streets
The Left-over Spaces

	The Courtyard	The Commercial Hot Spot	The Inner Streets	The Left-over Spaces
Basha Wolde Chilot				
Dejach Wube				
Geja Sefer				
Menen				

The images/ figures used on this page are excerpts of their field research report. Here they 'draw' these social spaces and how they are used and by who. They also explain when (times slot) these social places act as places where people can connect.

The Research

In their field research report they also present some images taken in these sefers and these images show perfectly the previous mentioned four social spaces. These images show how these areas are used and they perfectly capture the interaction (connection) between people.















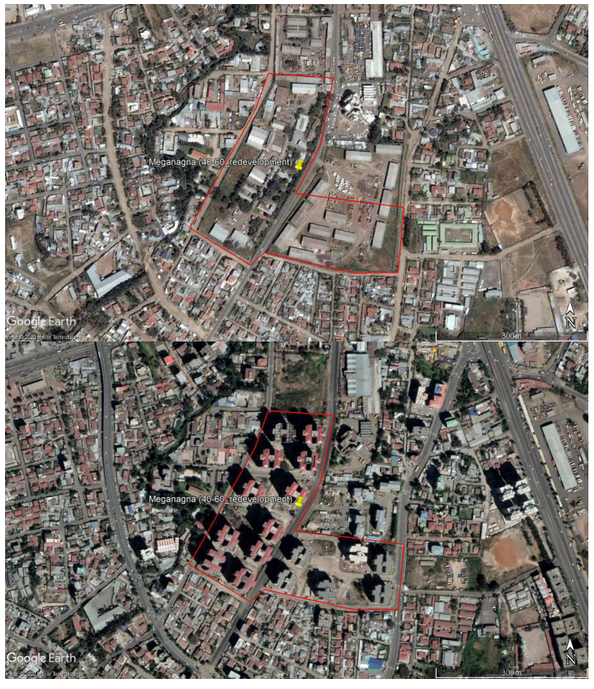




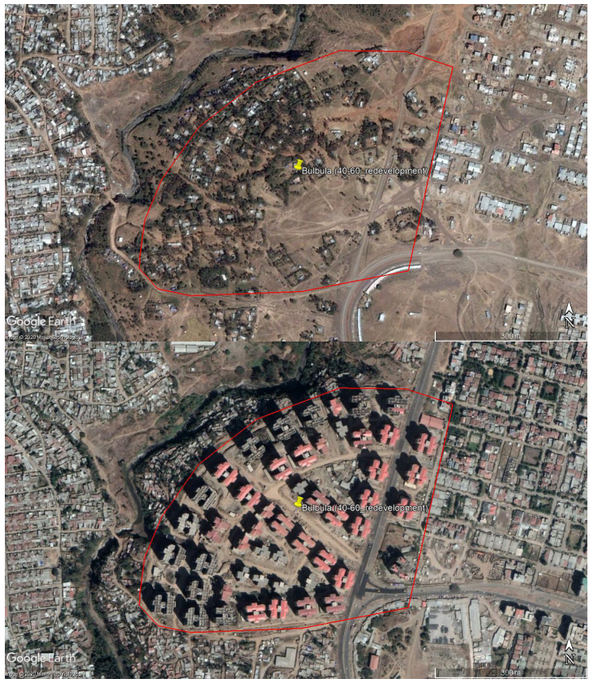


The Research













The solution to the main problem (How to design social housing with a strong connection between the community and the neighborhood in Addis Ababa, Ethiopia.?) Is to be found in the words 'connection' and 'social spaces'. Connection happens in social spaces like the courtyard (of a building), at a commercial hot spot nearby, in the inner streets of your neighborhood and at left over spaces, space like the school playground or the empty paved patio near someone's house. All these elements are of great importance to the design solution, but before I dive deeper into the final design solution, I shortly want to show some of the condominium units of the IHDP. The images on this page show aerial photos of these condominiums and they show how the ground level is completely neglected. This page is a short analysis of the precedents, an extensive analysis of the condominiums is to be found in the booklet 'Addis Ababa as a palimpsest'.

The Location

As is probably clear by now this report presents a design solution for social housing in Ethiopia, a country in the east of Africa. More specifically the capital of Ethiopia: Addis Ababa. The images on this page show respectively Africa, Ethiopia and Addis Ababa.



Africa



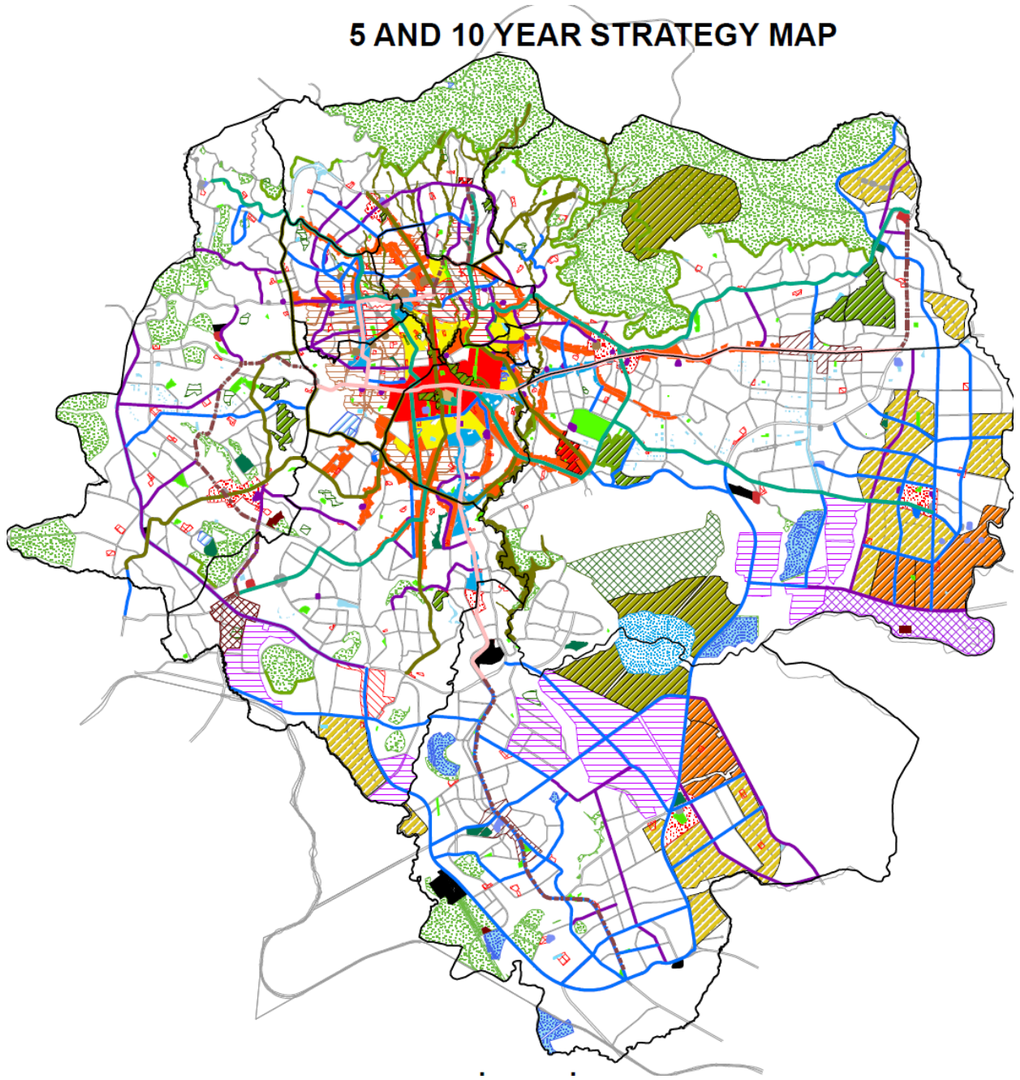
Ethiopia



Addia Ababa

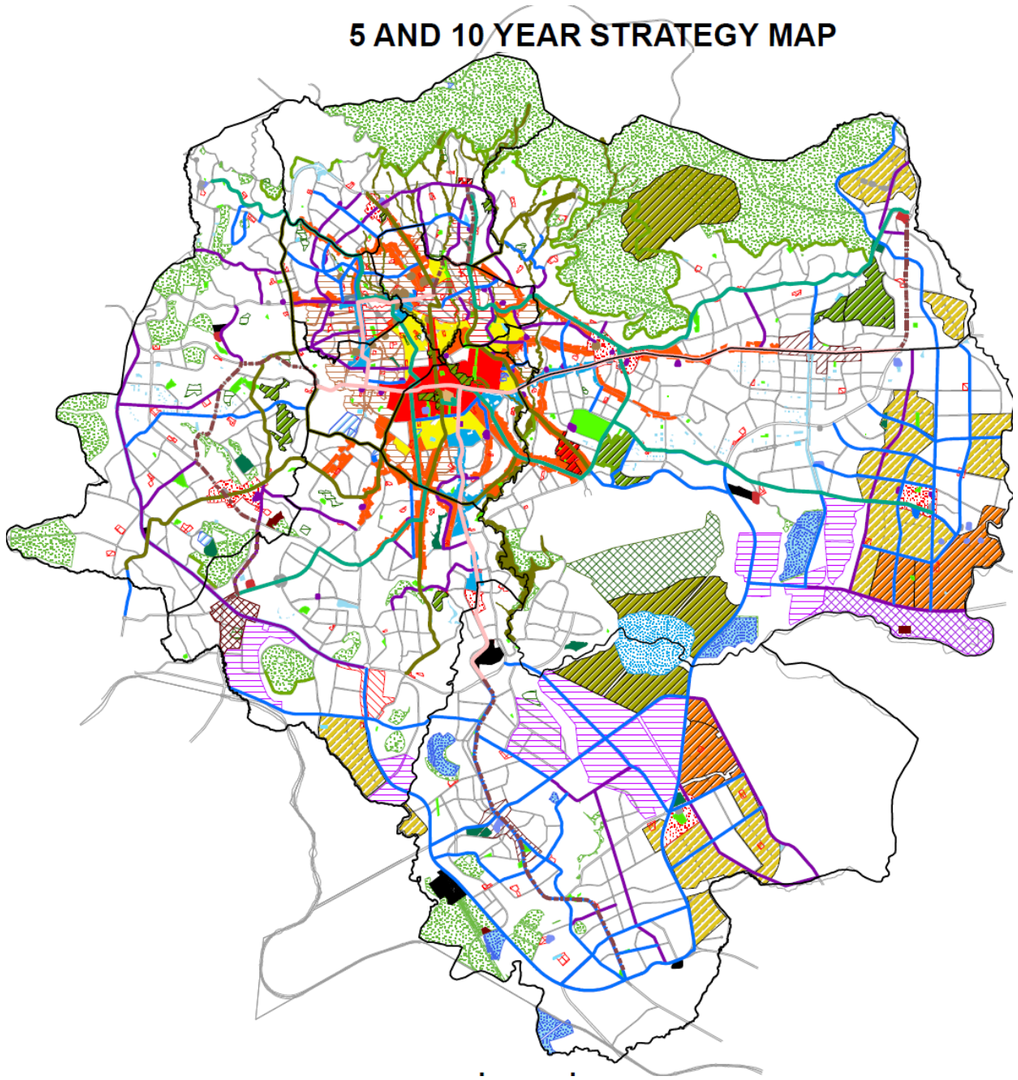


Addia Ababa



Addia Ababa

Addis Abba is divided in 10 sub-cities: Addis Ketema, Akaky Kaliti, Arada, Bole, Gullele, Kirkos, Kolfe Keranio, Lideta, Nifas Silk-Lafto and Yeka. On the grey image of Addis Ababa these cub-cities are divided by the white lines on the image. The exact location of my project is in Kirkos, on the east side of the Light Rial Station named Meshualikiya. (This is shown on the grey image with a black logo in the middle). The reasoning behind this location selection has to do with the 5 and 10 year urban strategy of the municipality of Addis Ababa.



Legend

To be built over the1st five years

Road network and Transport system
- Light rail transit line
- Rapid bus transit line
- Road
- Special street
- Inter-city Terminal
- Intra-city Terminal
- Bus depot
- Parking building
- Freight Terminal
- Surface Parking
- Legehar transport hub

Housing
- Corridor development
- Renewal
- Expansion

Industry
- Industry

Centers
- Main city center
- Secondery center
- Teritery center
- Special center
- Woreda center
- Social welfare
- Five Star Hotel
- International Level Hospital
- National Stadium

Environment
- Woreda park
- Sub_city park
- City park
- Special Park
- Multi Functional Forest
- River buffer
- Artifical water body
- solid waste treatment
- Liqued waste treatment

To be built over the 2nd five years

Road network and Transport system
- Rapid bus transit line
- Road
- Intra-city Terminal
- Parking building

Housing
- Corridor development
- Renewal
- Expansion

Industry
- Industry

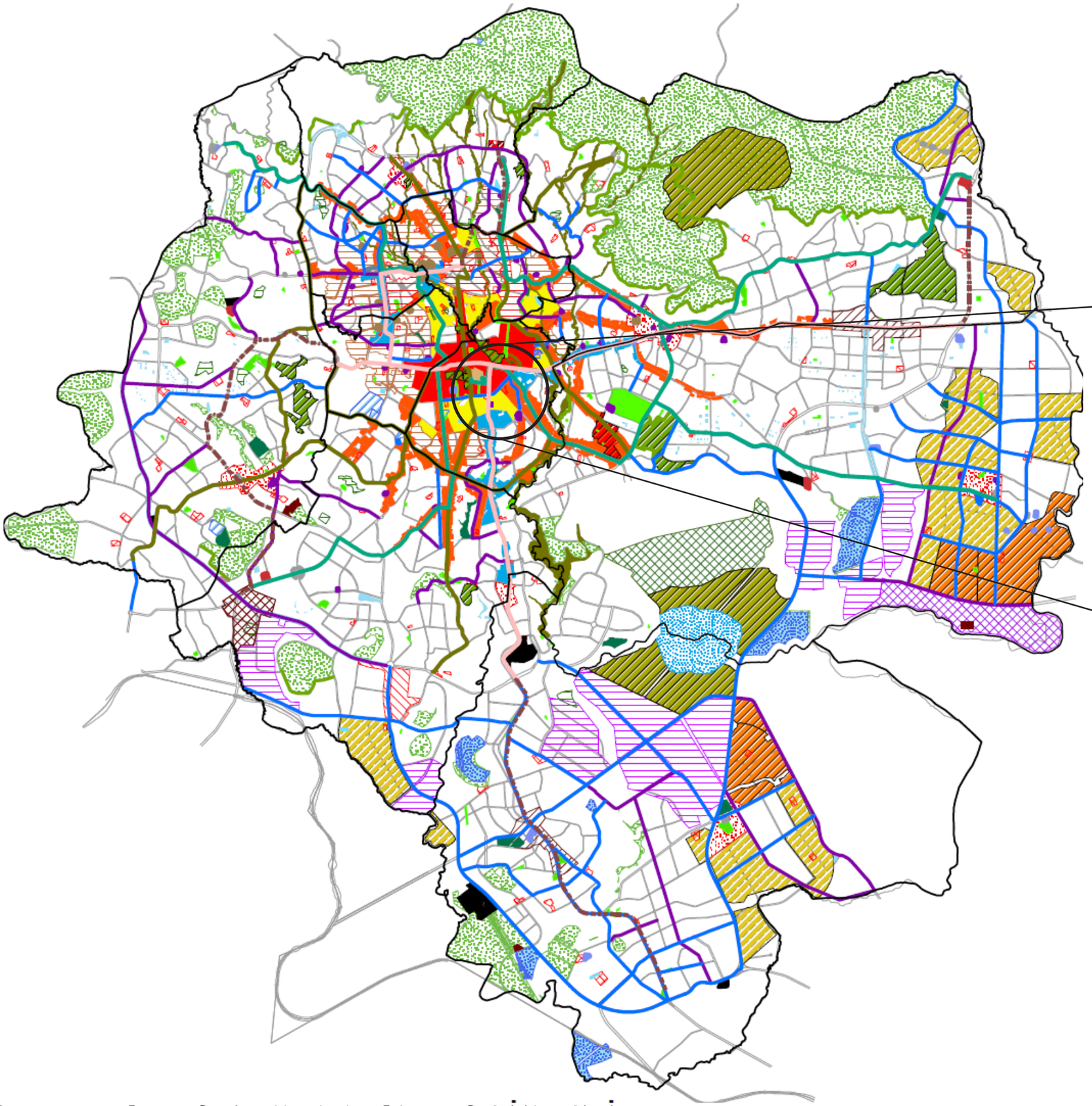
Centers
- Main city center
- Secondery center
- Special center
- Five Star Hotel
- Recreational facilities (Golf Course

Environment
- Woreda park
- Sub_city park
- City park

The municipality of Addis Ababa Described on this strategy map what must change and in which time frame. So, the municipality has two timeframes, in the first step for the coming five years one set of urban changes must be made and after those changes for another 5 years on top of that another set of changes need to be implemented. For housing the municipality pinpointed for the coming 5 years the yellow, the blue and the yellow with diagonally white hatches as the areas to change. The areas with yellow are areas meant for renewal. This means informal settlements are replaced by new buildings. The areas with blue are so called 'corridor development'. These areas are housing areas usually near an important route which leads into the city, which means they are close to a 'corridor' into the city and because of that they are called corridor developments. Finally, the yellow with the white diagonally hatched areas are places where housing is developed on the outer banks of the city. The city is expanded in those areas, that's why these areas are called 'Expansion'. So, these three colors are used for the coming 5 years, for the next 5 years the same terms are being used, but they have other colors linked to them. (It is worthwhile mentioning that the strategy map was introduced in 2017, so in 2022 the first 5 years will come to an end. This is important to notice because with 1 year left there are still lots of places not developed as we will see in the coming pages.)

The Location

Since the topic of this studio is housing, I choose one of those areas meant to be developed as housing as my project location. I choose one of the areas to be developed in the coming 5 years, because there is only one year left and this area is still not changed and I choose a renewal area because of personal interest into changing slum areas and even more specifically this area is the closest to the city center, at the same time it borders an area where corridor (housing) should be implemented on the one side and on the other side it borders an area where renewal strategy should be implemented in next 5 years. In other terms it is an interesting area.





Road network and Transport system

- Light rail transit line
- Rapid bus transit line
- Road

HOUSING

- Corridor development
- Renewal

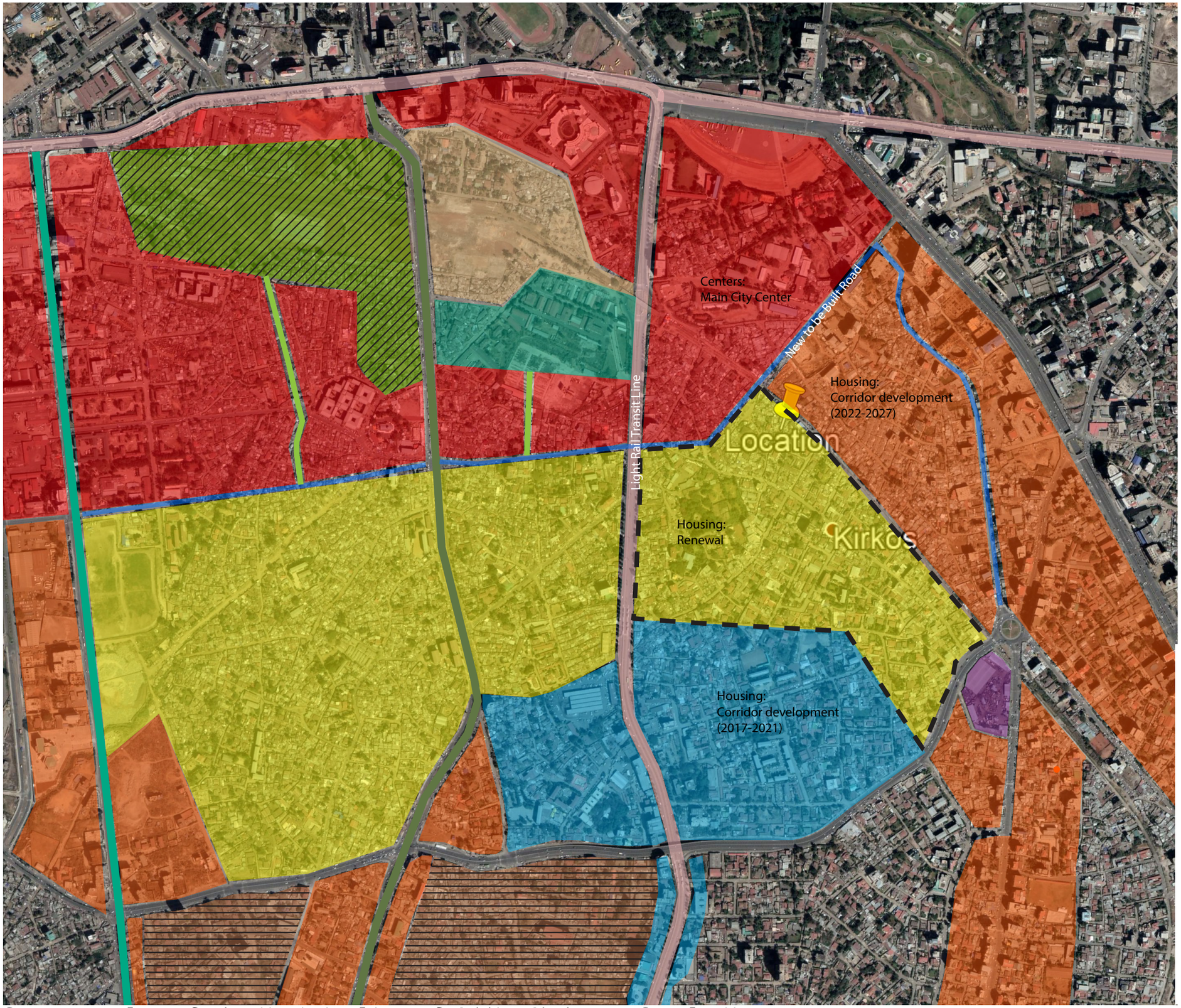
CENTERS

- Main city center

HOUSING

- Corridor development
- Renewal
- Expansion

The Location

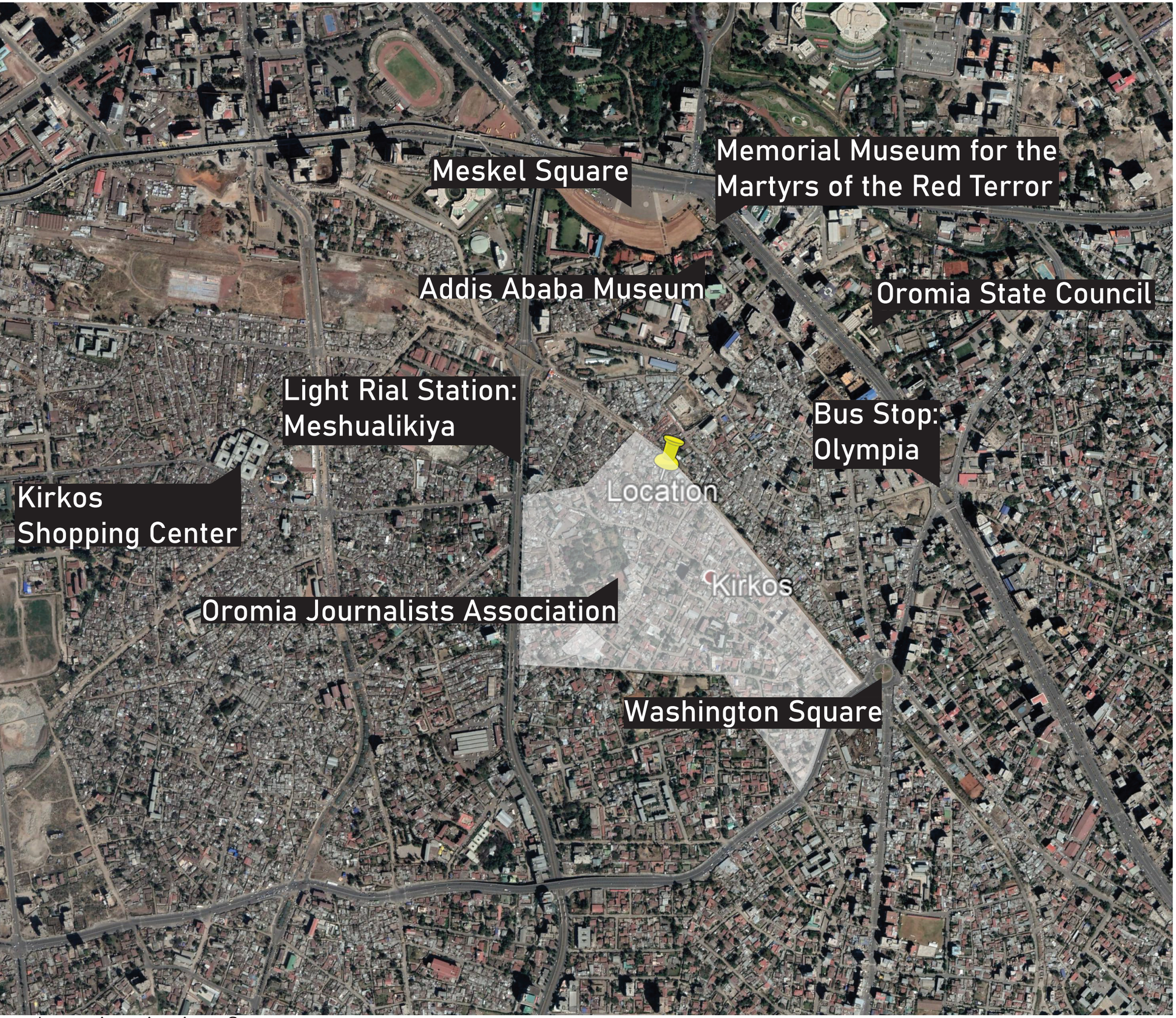


On this map the strategy plan of the municipality of Addis Ababa is yet again shown, but this time on a Google Maps image. The area which has a dashed line around it is the exact project location. For this area I design a masterplan, which will be discussed in a couple of pages.

- Main City Center
- Housing, Renewal 1
- Housing, Renewal 2
- Housing, Corridor Development 1
- Housing, Corridor Development 2
- City Park
- Sub City Park
- Legehar Transport Hub
- Social Welfare Center
- Parking Building
- Road 1
- Rapid Bus Transit Line 1
- Rapid Bus Transit Line 2
- Light Rail Transit Line
- Special Street

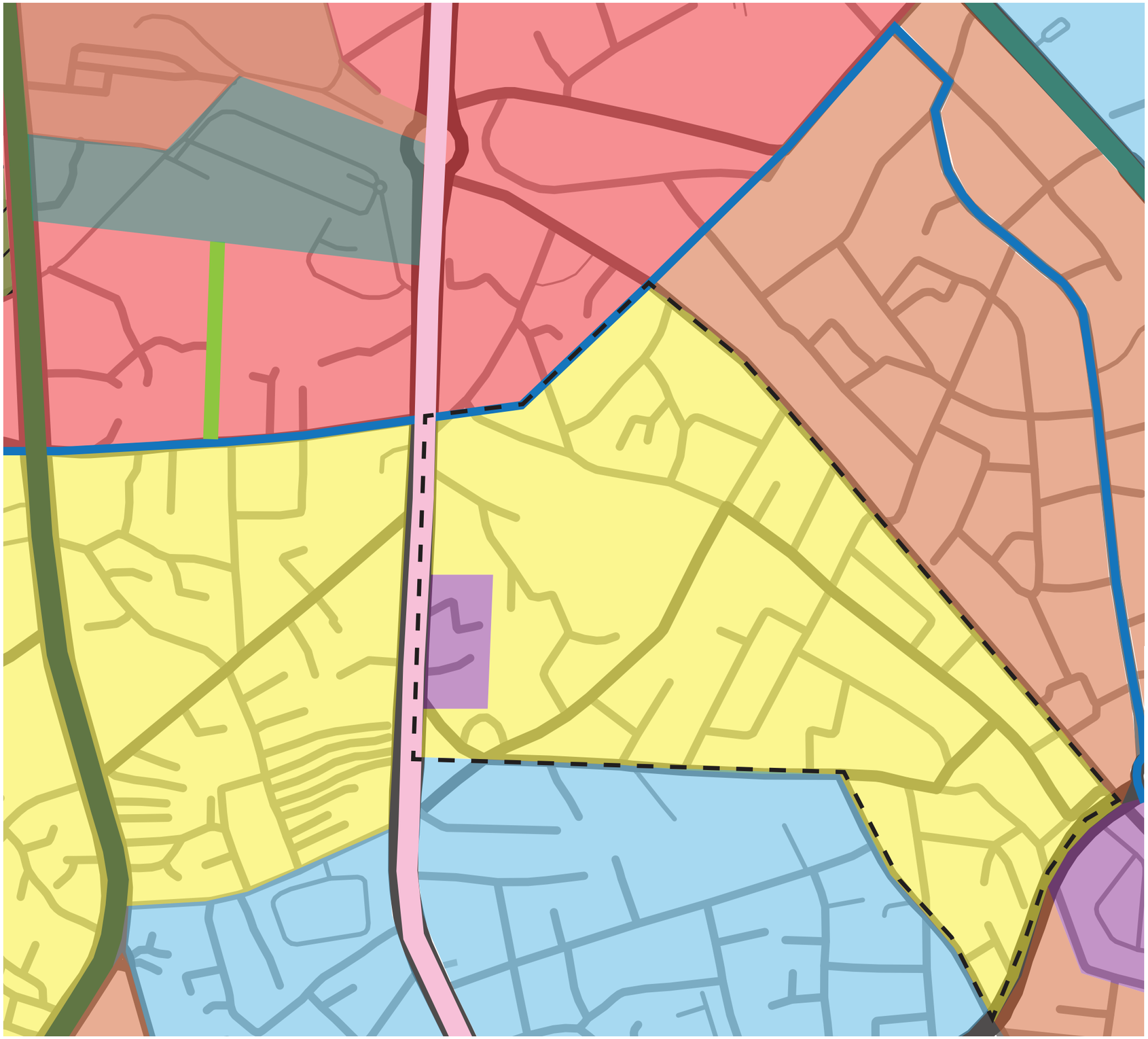
Strategy plan of the Municipality of Addis Ababa on Google Maps

The Location



Location in its Context

The project location is near other important city facilities, of which a couple is shown here. This Google Maps image also show exactly which areas of the project location is already developed and which areas are still informal settlements. Later in this report I will zoom in in those areas and propose a design solution.

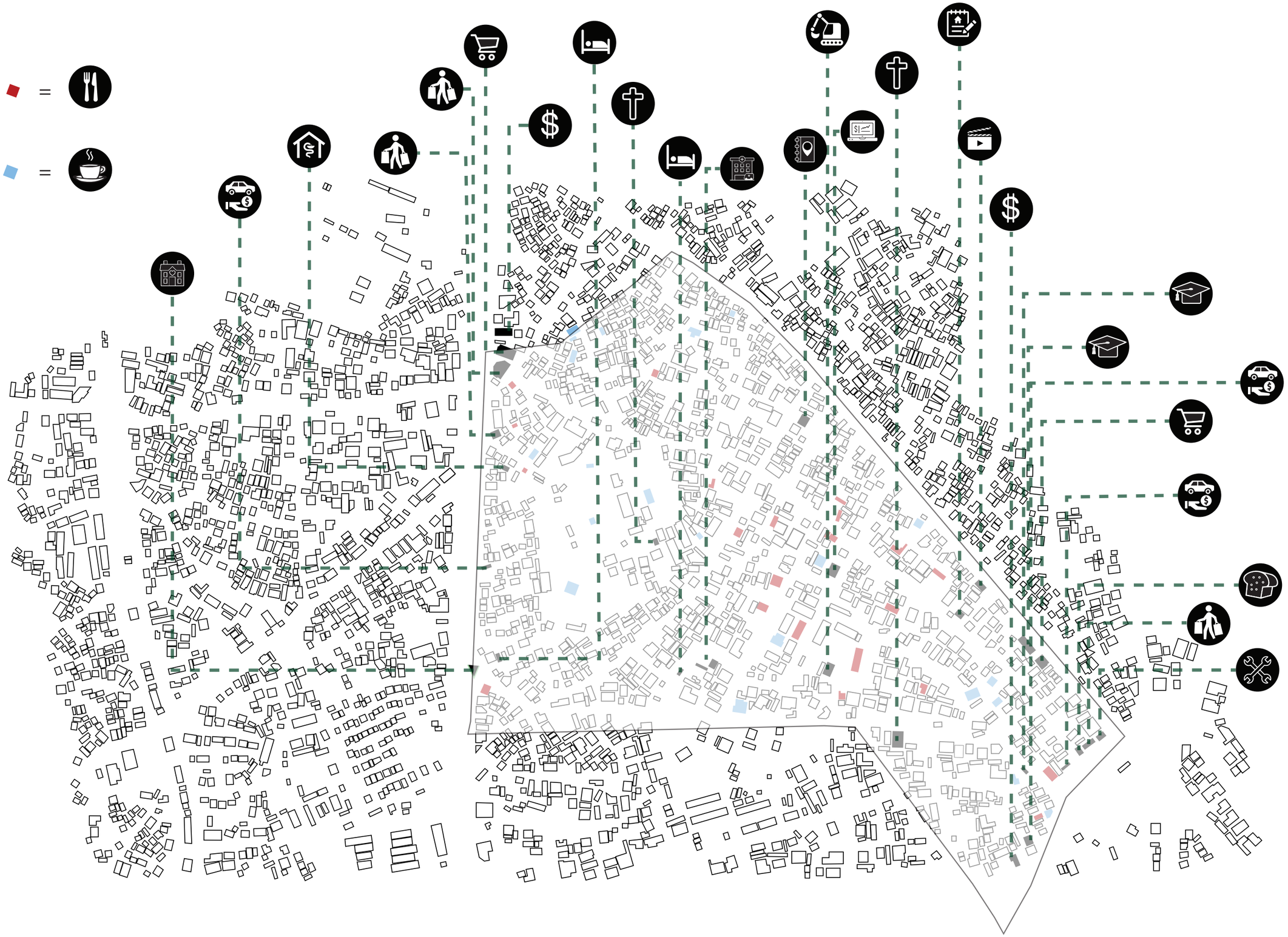


This page shows again the Strategy plan of the municipality of Addis Ababa, but this time it is more zoomed in. The project location is shown with a black dashed line around it. This drawing perfectly shows the roads in the project location up close.

- Main City Center
- Housing, Renewal 1
- Housing, Renewal 2
- Housing, Corridor Development 1
- Housing, Corridor Development 2
- City Park
- Sub City Park
- Legehar Transport Hub
- Social Welfare Center
- Parking Building
- Road 1
- Rapid Bus Transit Line 1
- Rapid Bus Transit Line 2
- Light Rail Transit Line
- Special Street

Strategy plan of the Municipality of Addis Ababa, scale 1:5000

The Location



Location facilities



Residents/ Dwellers



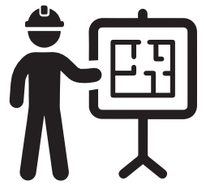
Contractor



Advisors



Supplier



Architect



Media



Financier



Constructor



Government
(= The rule/ law maker)



Neighborhood
(= People living at the border of the site)



Non-Governmental Organizations
(To help the workers with specific information for example with building techniques.)



Client
(=Ministery of Works and Urban Development Addis Ababa City Administeration)



Workers



Bamboo Workers



CEB Workers

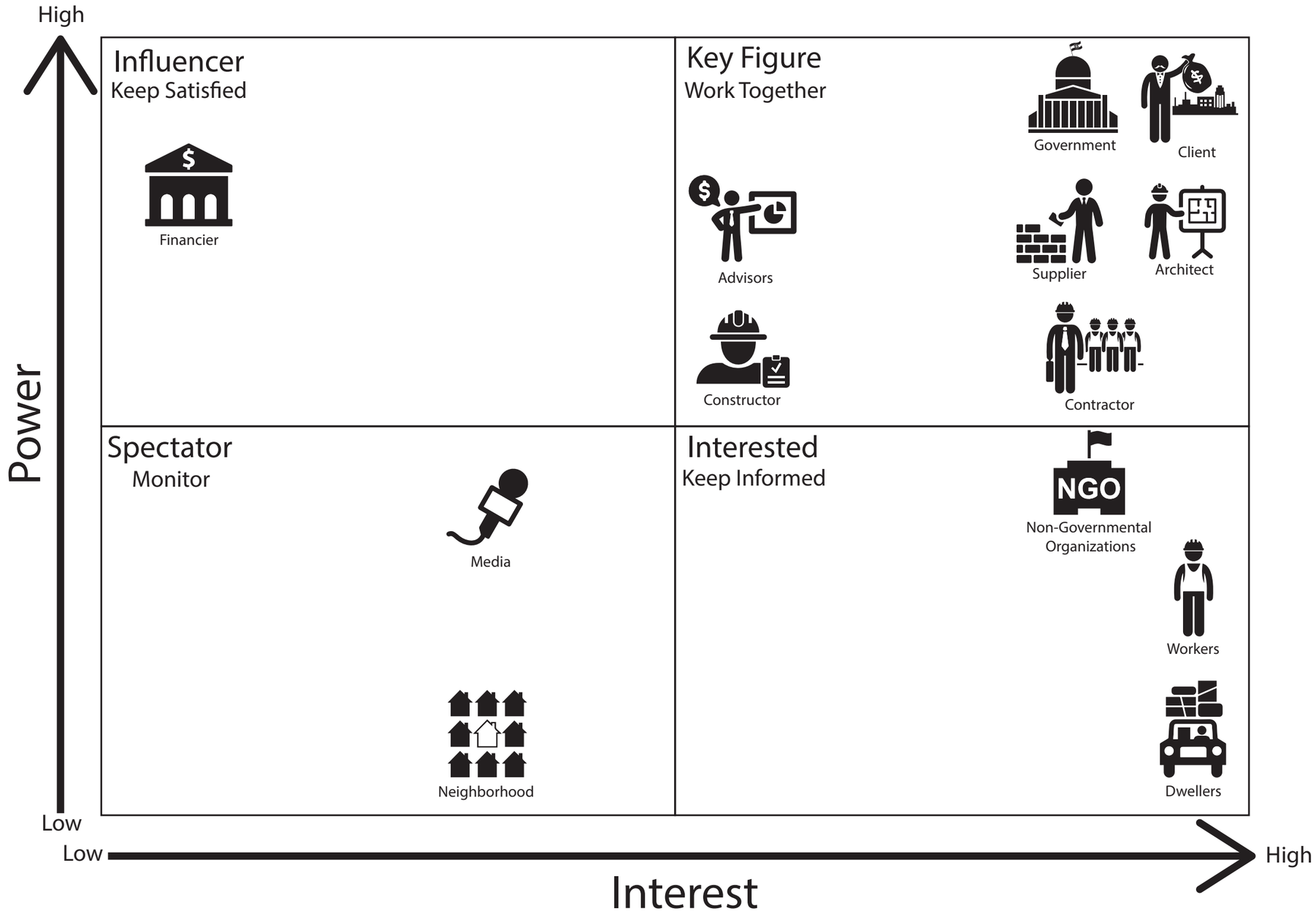


Construction

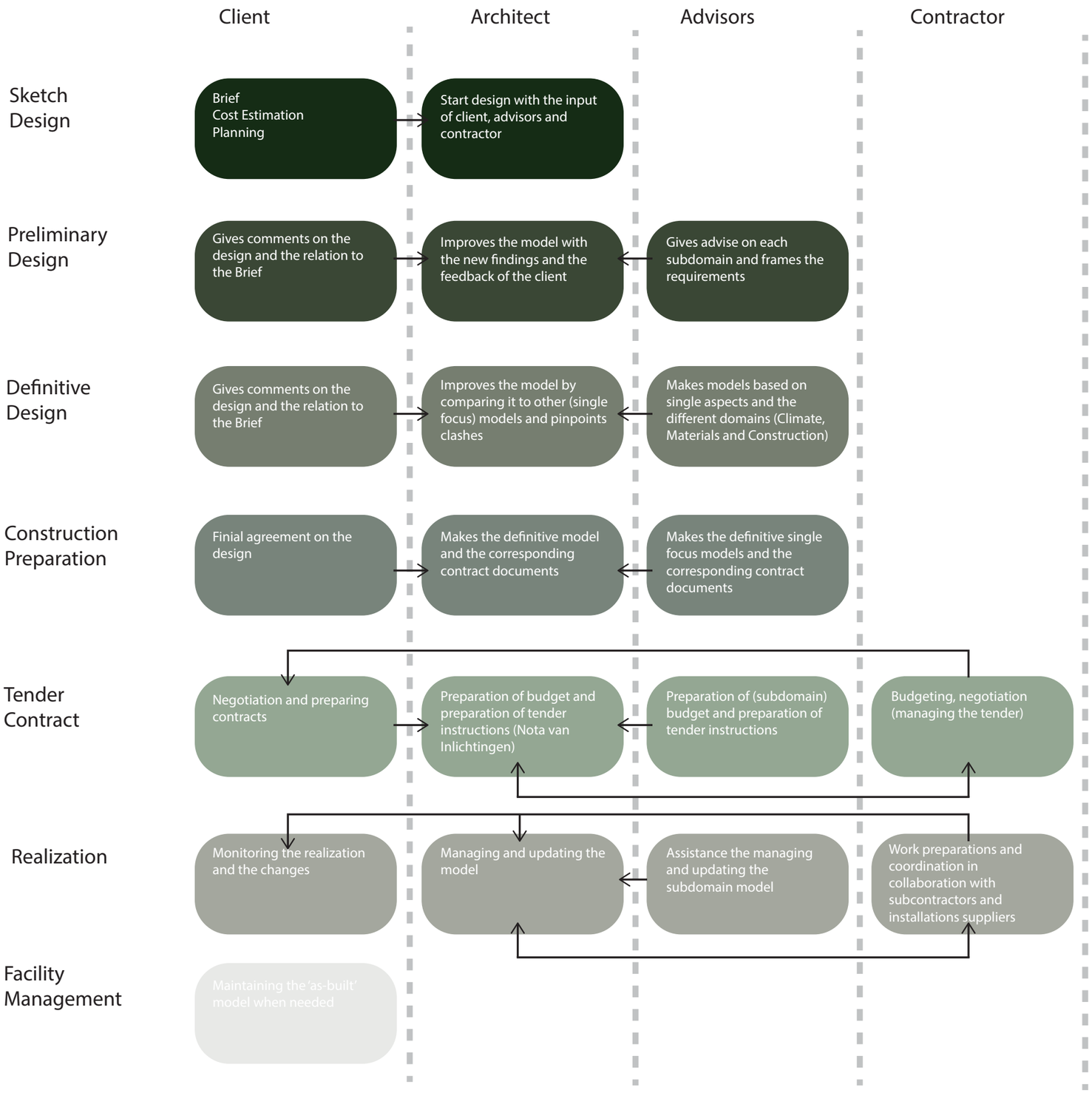


Planning

Before introducing the master plan some practical research was needed to set the non-physical context. One type of research which will affect the master plan is a stakeholder's analysis. Whereas the Google Maps image shows the physical context of the project location, this page shows all the different important stakeholders who may have an influence on the project = the non-physical context.



On this page the earlier mentioned stakeholders are set out on a diagram. On this diagram the power versus the interest of each stakeholder is shown. As would be expected, the client, the architect, the contractor, and the advisors have a bigger power and more interest in the (success of the) project. But what was maybe less expected is that the government and the supplier in my project specifically have a bigger power and more interest in the project/ design of the project then maybe in other architectural urban projects. This is because I expect the project to be developed in partnership with the government and the suppliers are important to my project/ design because I expect them to also have a significant role in the project. To reduce even more the costs of affordable housing alternative materials must be considered. The UN Habitat (2011) wrote that the cost of materials was high with the build of the condominiums and that this could be of the major topics to be reconsidered to reduce the costs. Another group of stakeholders to be noticed are the so called 'workers', since my project is designed to increase the employment rates, these workers play an important role, hence their position in the diagram (all the way to the right). More specifically, the CEB workers who are the inhabitants of the old sefers of my project location are important to the project. These people can sign up voluntarily to help built the project, once they are hired, they can either choose to get a monthly salary or have a reduction on their house price.



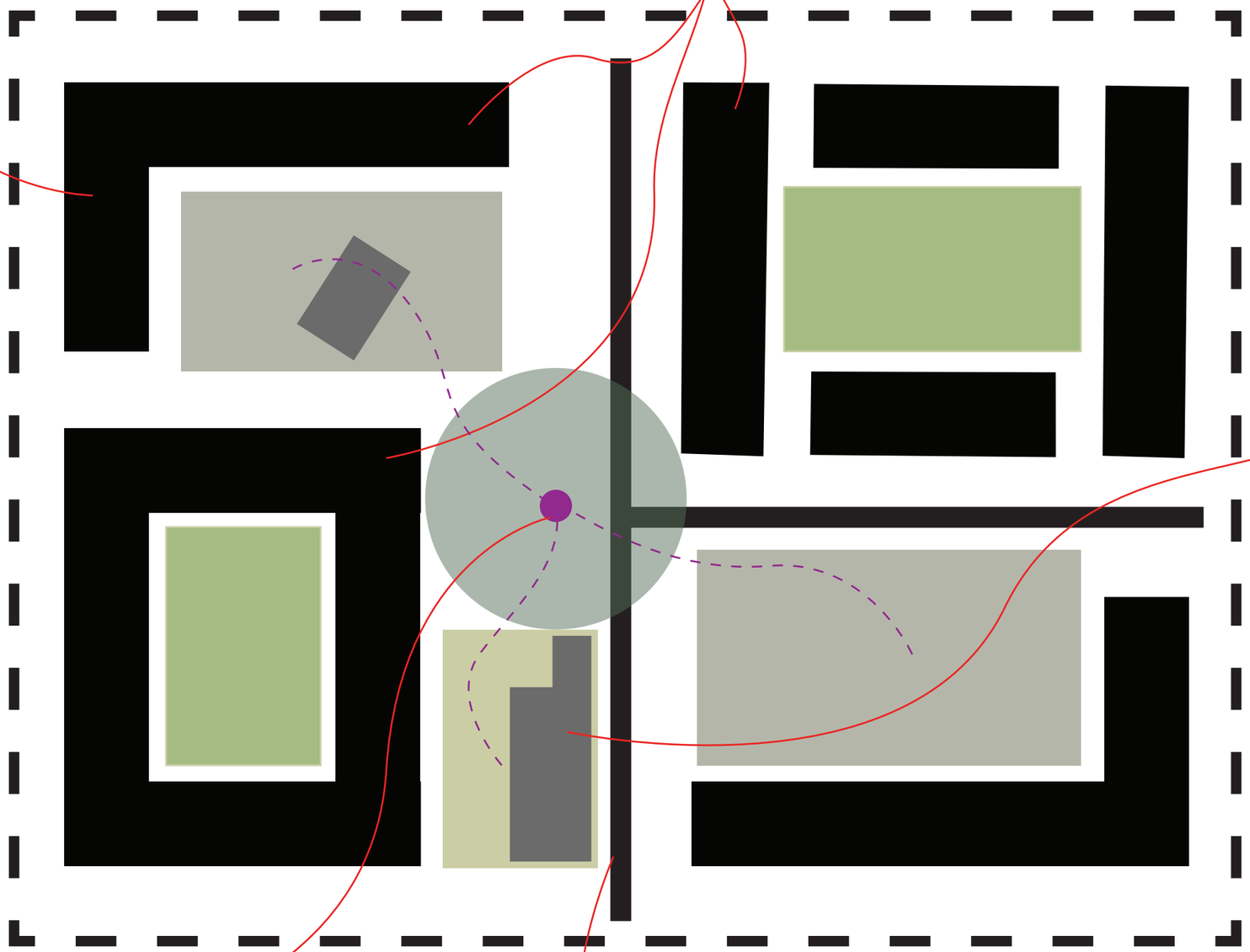
This diagram shows at which phase which stakeholder is involved in the process of the project. To keep the diagram simple and to convey the main message only the four main stakeholders are present in the diagram. The conclusion of the diagram is that the more the project evolves the more the stakeholders are dependent on each other and the more the interest in the project raises. In other words: the power and the interest balance of each stakeholder is also dependent on the phasing of the project.

The master plan for the afore mentioned location is designed according to 5 set of basic principles which are shown here in this diagram.

3. Introduce urban typological mix and combine different housing types.

4. Use the different urban types to define the neighborhood scale. On difficult road intersections use the open-block for framing the neighborhood.

2. Preserve the collective memory: keep existing buildings which are in good condition.



5. Connect the non-private communal areas. (By putting them along side the road or alongside each-other.)

1. Preserve the collective memory: keep existing roads + improve them.

'Centrally' located communal area Private communal areas Semi-private communal areas

The Masterplan for the afore mentioned location is designed according to 5 set of basic principles which are shown here in this diagram.

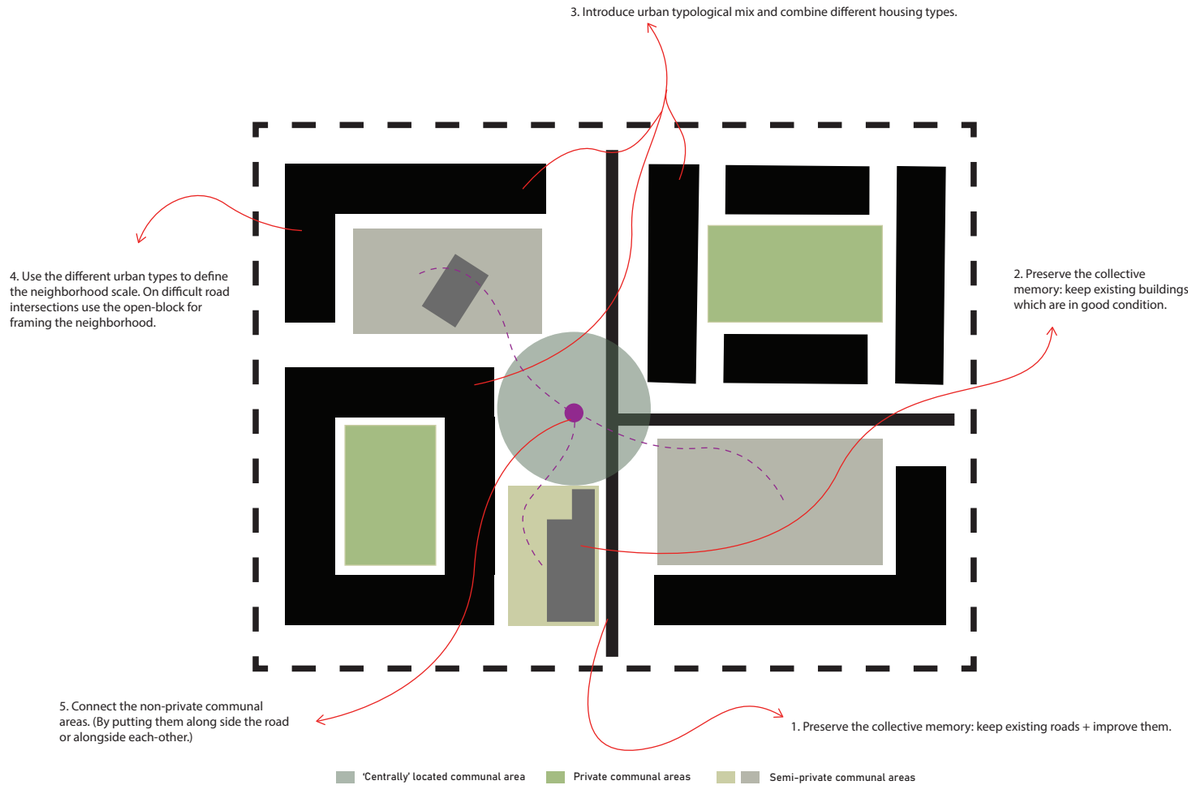
First principle: Preserve the collective memory: keep existing roads and improve them. This principle is based on the research I did in the first semester of this graduation studio, in my Research Plan I discuss how a community is a connection between individuals who will act collectively and share a collective identity and how this can be attached to a physical place (Chaskin, 1997). One of the places where this collective identity takes a physical shape are the streets of the city. The research of my colleagues done in the previous years of the graduation studio (2015-2016) show how the inner streets are social spaces. By simple erasing these streets and building new roads this collective identity will be erased, which is not desirable and can cause the lost feeling of identity.

The same way of thinking applies to the second principle: Preserve the collective memory and keep exciting buildings which are in good condition.

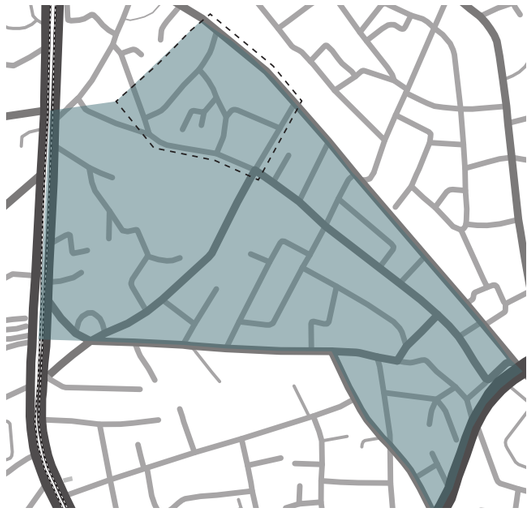
The third principle is also based on the research in the first semester. After doing extensive research on the condominiums, one conclusion that fallowed was that within the IHDP there was no urban typological mix. The same building was copied and pasted all over Addis Ababa. This third design principle is a simple solution to a more sustainable design in the future. The urban blocks shown in the diagram are based on the social spaces described by my colleagues in the previous years. The most important place where social interaction could happen was the courtyard of the old sefers and to reintroduce this social space these three urban types are introduced with each their own courtyard. Each urban type is meant for a different income group. The enclosed courtyard for the lower income group, the semi open courtyard for the middle-income group and the open urban courtyard block for the high-income group. This is done because of the different daily activities of each group. The lower income groups are more likely to spent time on the ground level due to their way of income generating (drying seeds, cooking and both to produce goods which on their terms can be sold), whereas the higher income groups are less likely to earn their money by selling dried seeds or self-made food which is produced in the open spaces in the courtyard. So, their courtyard is less enclosed, and their courtyard is meant as a less 'active' courtyard, a place where people can linger for relaxing activities (where as the courtyard of the lower income groups is a place where people can also socially interact by at the same time doing work.)

The fourth design principle is based on the practicality of the masterplan. The design proposed in the graduation studio should be a solution to mass housing, like the IHDP. The idea is that this masterplan/ design can be implemented all over Addis Ababa to different locations with the same characteristics as the location I choose to develop. Hence to make the masterplan more practical and easier to implement elsewhere the fourth principle was introduced: Use the different urban types to define the neighborhood scale and use on difficult road intersections the open urban block for framing the neighborhood. (When old roads are kept, this can cause challenging intersections.) The neighborhood scale should be defined because if the neighborhoods are too big, interaction is less likely to happen (Sullivan & Chang, 2011).

The fifth principle is also based on findings of Sullivan & Chang (2011). They give the example of a walkable green area to be a great place to promote face to face contact and this on its term to promote a strong connection between the community and the neighborhood (Sullivan & Chang, 2011).



The basic principles of the concept



As mentioned earlier the old streets are kept and improved. The process is described on this page.

The first drawing shows the current state of the location with its current roads.



The second drawing shows in black which roads are kept.



The third drawing shows which dead-end roads are demolished.



The fourth drawing shows how the old roads are improved.



The fifth drawing shows how new roads are introduced based on fire safety. (The buildings on the master plan are at least on one side facing a road, for it be reachable by a car/ ambulance.)

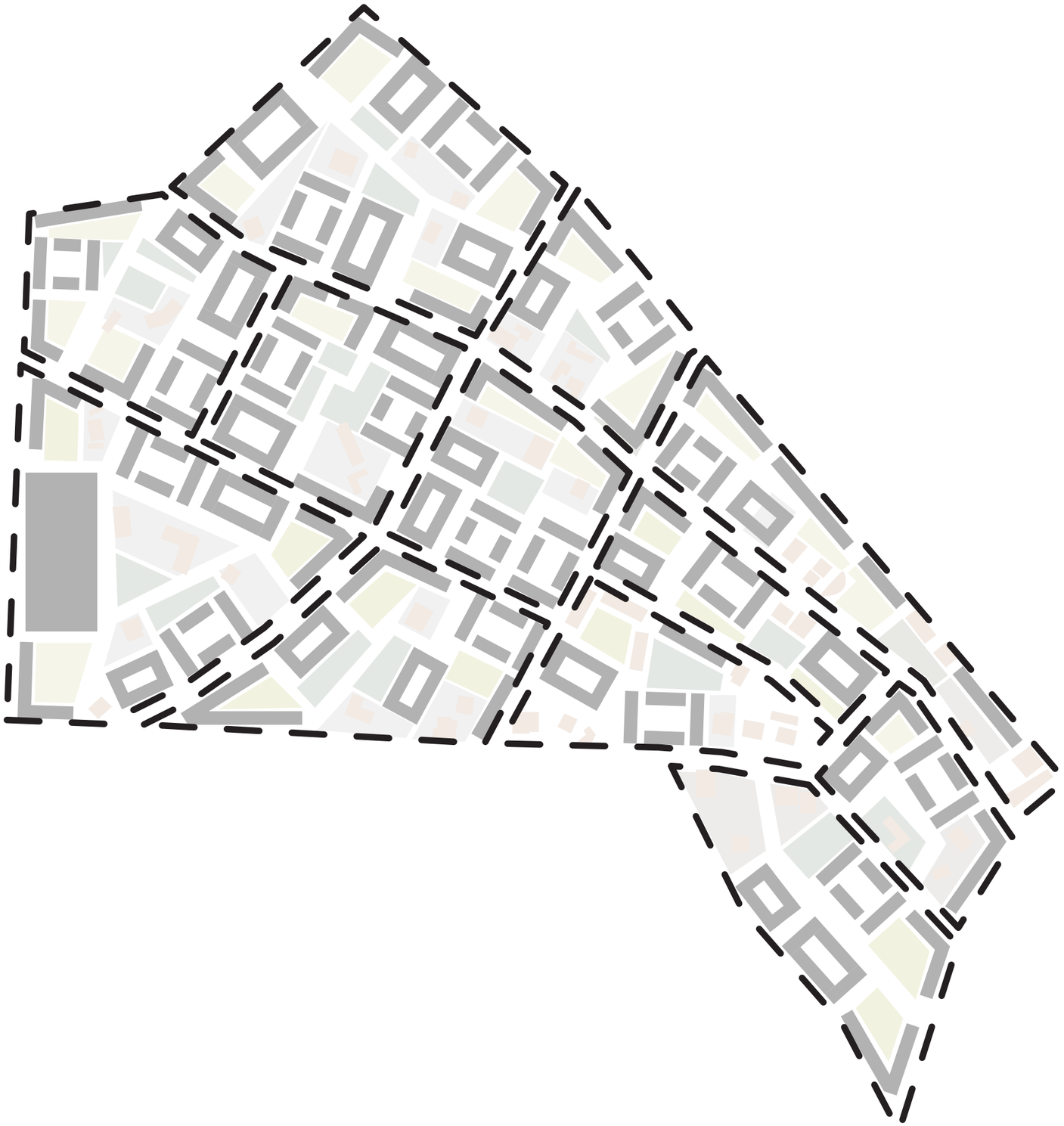


The sixth and the final drawing shows the master plan.

All the streets on or bordering to the project location are design to be according to a hierarchy. The hierarchy is shown on this page with Type 1 being a very buzzy street to Type 4 being a small road within a neighborhood. In the coming four pages these four types are being discussed elaborately. Based on these four types the building height will be explained later.



The Main and Sub Roads scale 1:5000



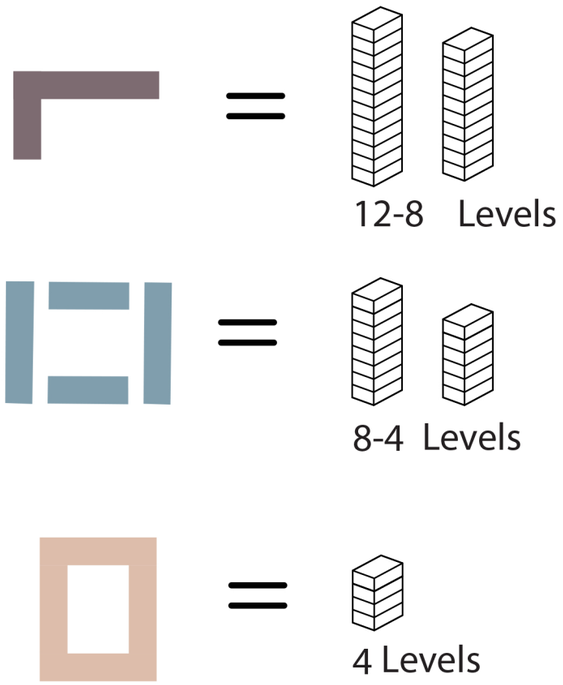
The 5 principles result in a design for the project location as is shown on this page. By preserving the collective memory and keeping exciting roads and physically improving them, the location is organically defined in clusters or sectors. Within each sector there are different urban typologies to be found: the old building(s) and the other three new introduced types and with each type having its own courtyard. Al these different urban types are connected to a (close and centrally located) communal green area.

The Stamps of the Concept (The Residential Scale).



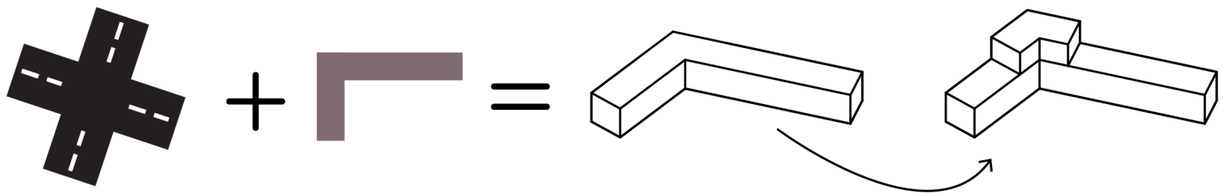
This is the final master plan. The master plan shows the basic principles as described previously. (The purple dashed lines indicate the connection between the ‘centrally’ located green communal areas and the semi-private communal areas.)

The Design



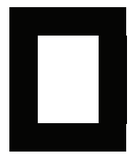
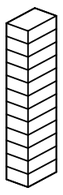
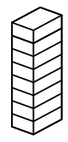
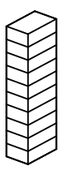
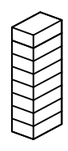
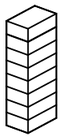
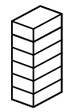
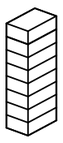
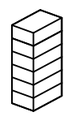
This page shows the masterplan in 3D. As can be noticed the building height differs. For the lower income groups (the enclosed courtyard block) the building height is maximum 4 stories, this because then there is no lift needed and this is more affordable. For the other two typologies height is dependent on the street it is located at, this will be explained later.

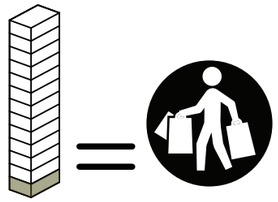
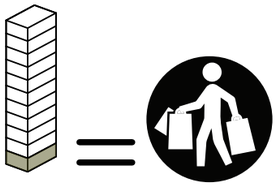
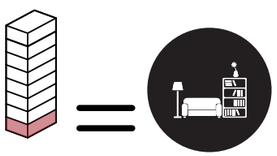
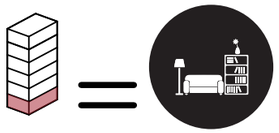
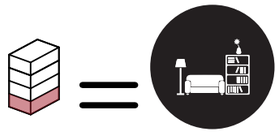






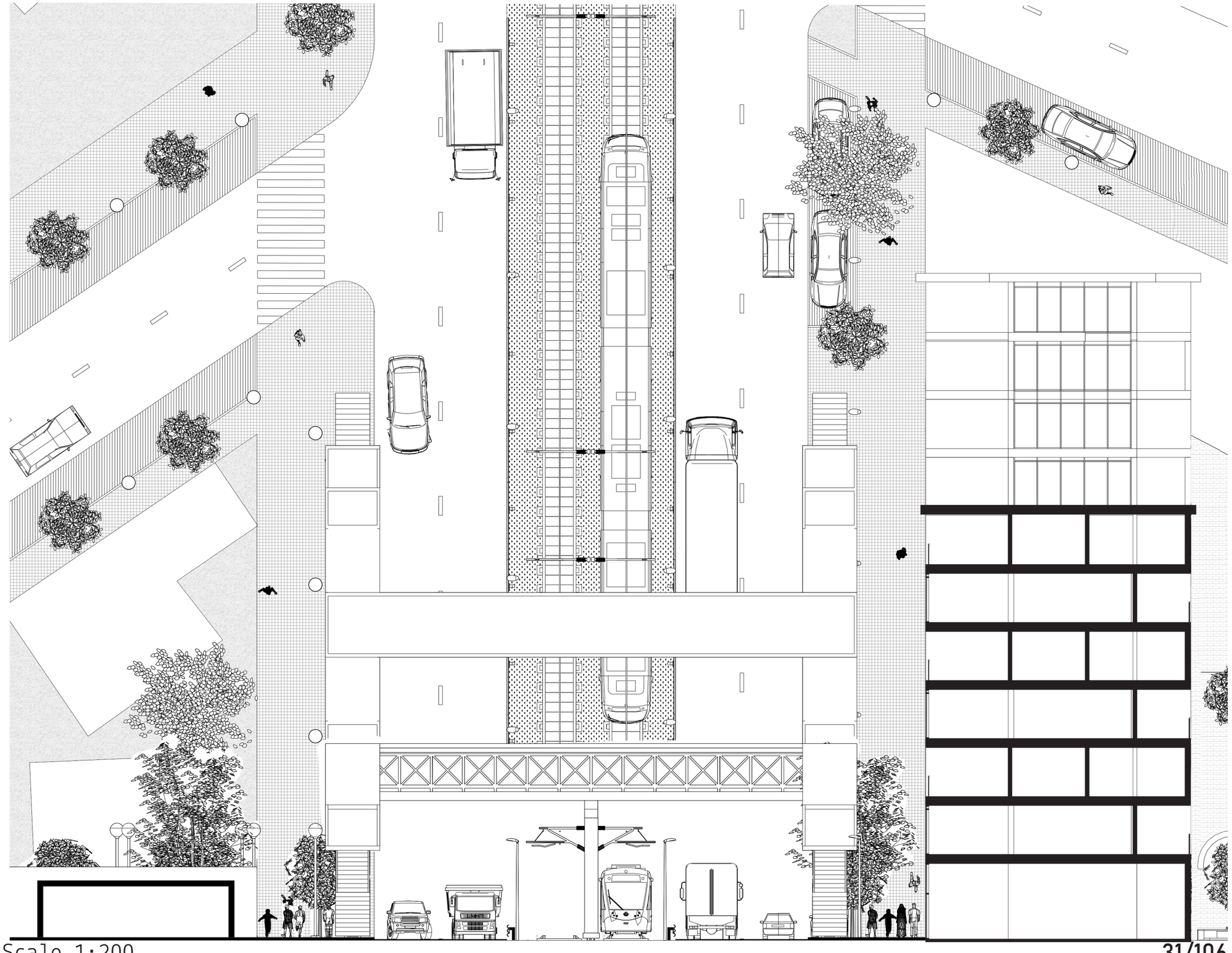
The Masterplan in 3D

				
T1		 12-10 levels (highest part) The lower part is always 1-4 levels lower.	 8-6 levels	 4 levels
T2		 10-8 levels (highest part)	 8-6 levels	 4 levels
T3		 8-6 levels (highest part)	 6-4 levels	 4 levels
T4		 8-6 levels (highest part)	 6-4 levels	 4 levels

T1		 12-10 levels +1	 8-6 levels +1	 4 levels
T2		 10-8 levels +1	 8-6 levels +1	 4 levels
T3		 8 levels	 6-4 levels	 4 levels
T4		 8 levels	 6-4 levels	 4 levels

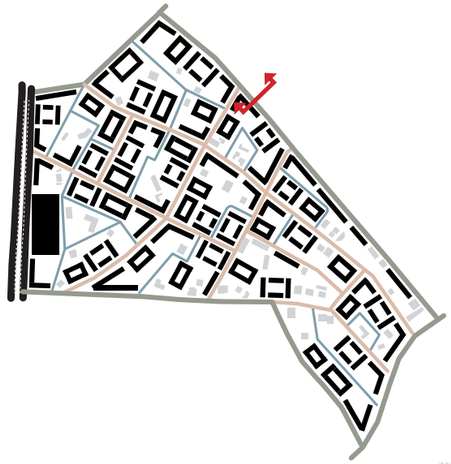
Matrix Explaining the Relation between Ground Level and Type of Street it is Facing

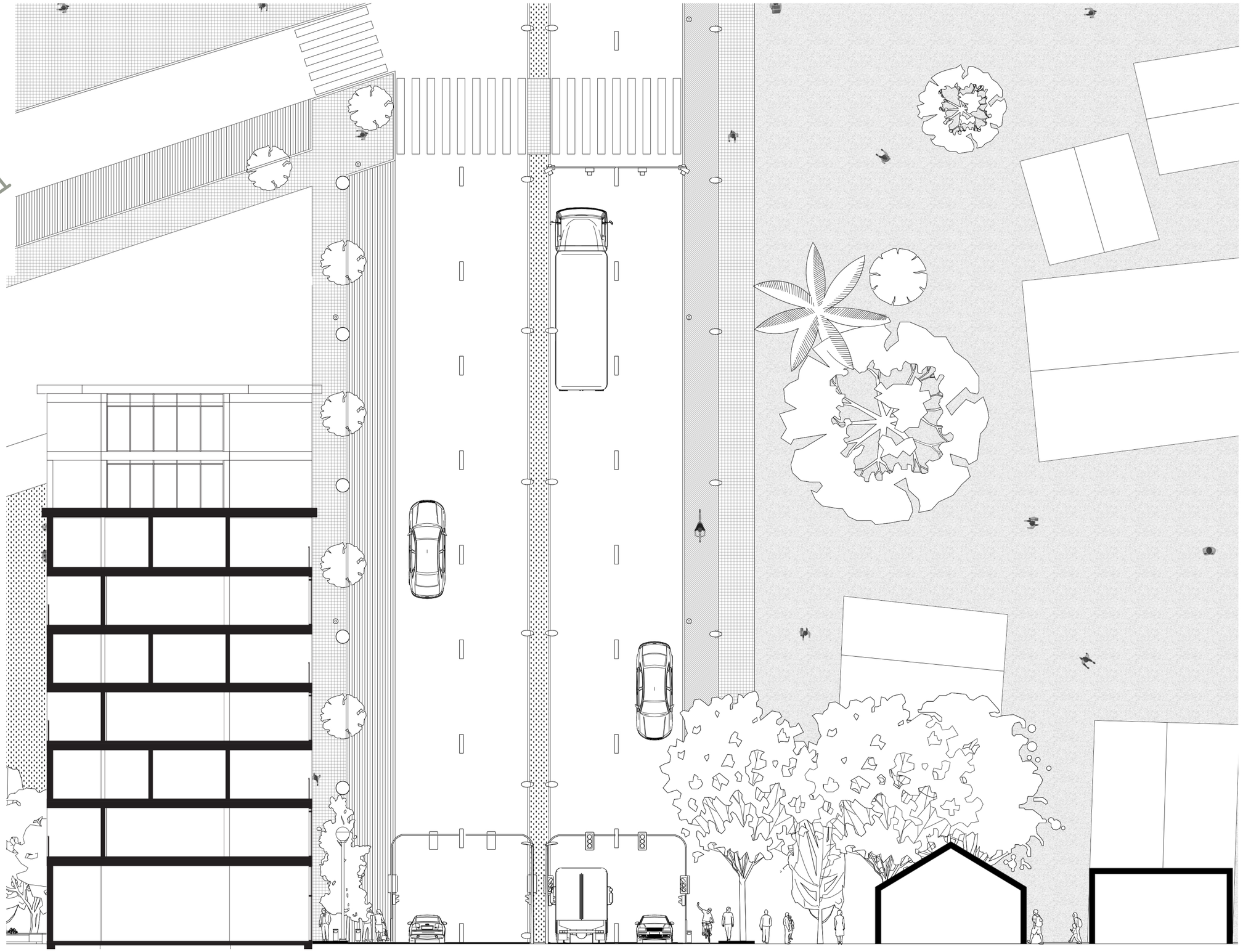




This page shows type 1 road. This street is an important street to the city of Addis Ababa, and it has high density of traffic. The drawing on this page indicates the ambiance of these types of streets. The street is a fast paste street and because of that less intimate.

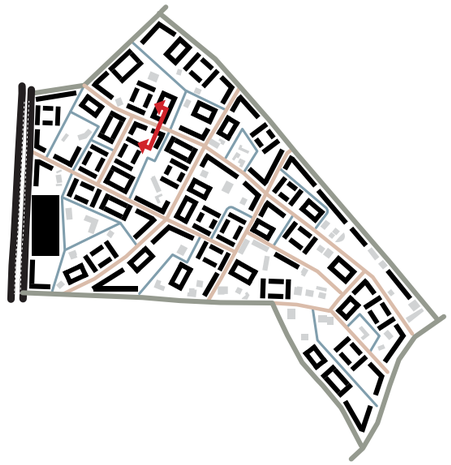
T1 Important City Road. Scale 1:200



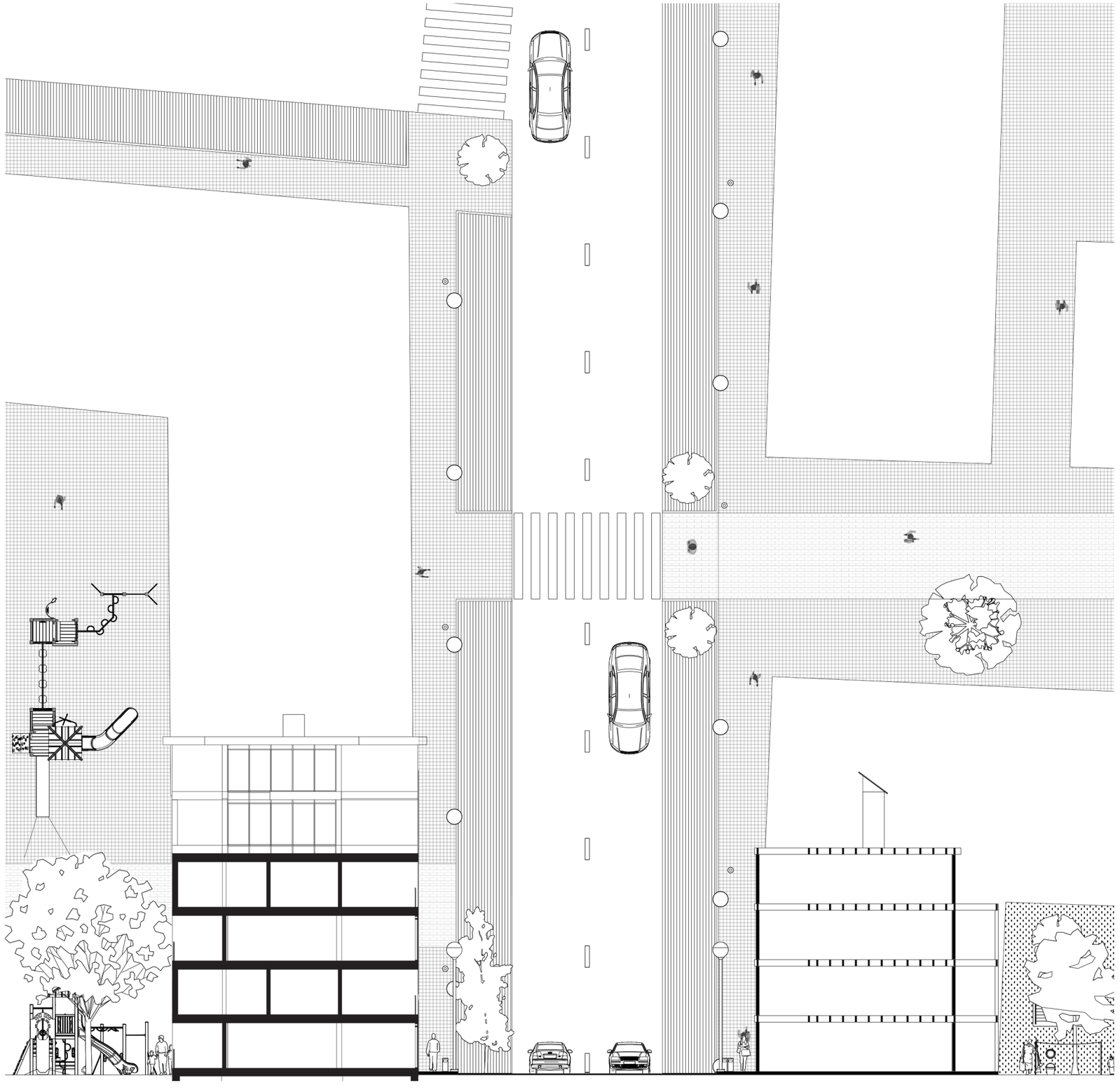


This page shows type 2 road. This road is an important sub-city road. The street has still daily lots of traffic, but the ambiance is less majestic than the type 1 street. This street is mostly used to move from one part of the sub-city to another. This street is, like street T1, not a place to linger for socializing.

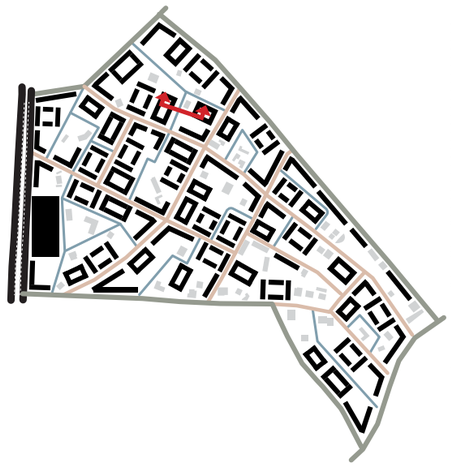
T2 Important Sub-City Road. Scale 1:200

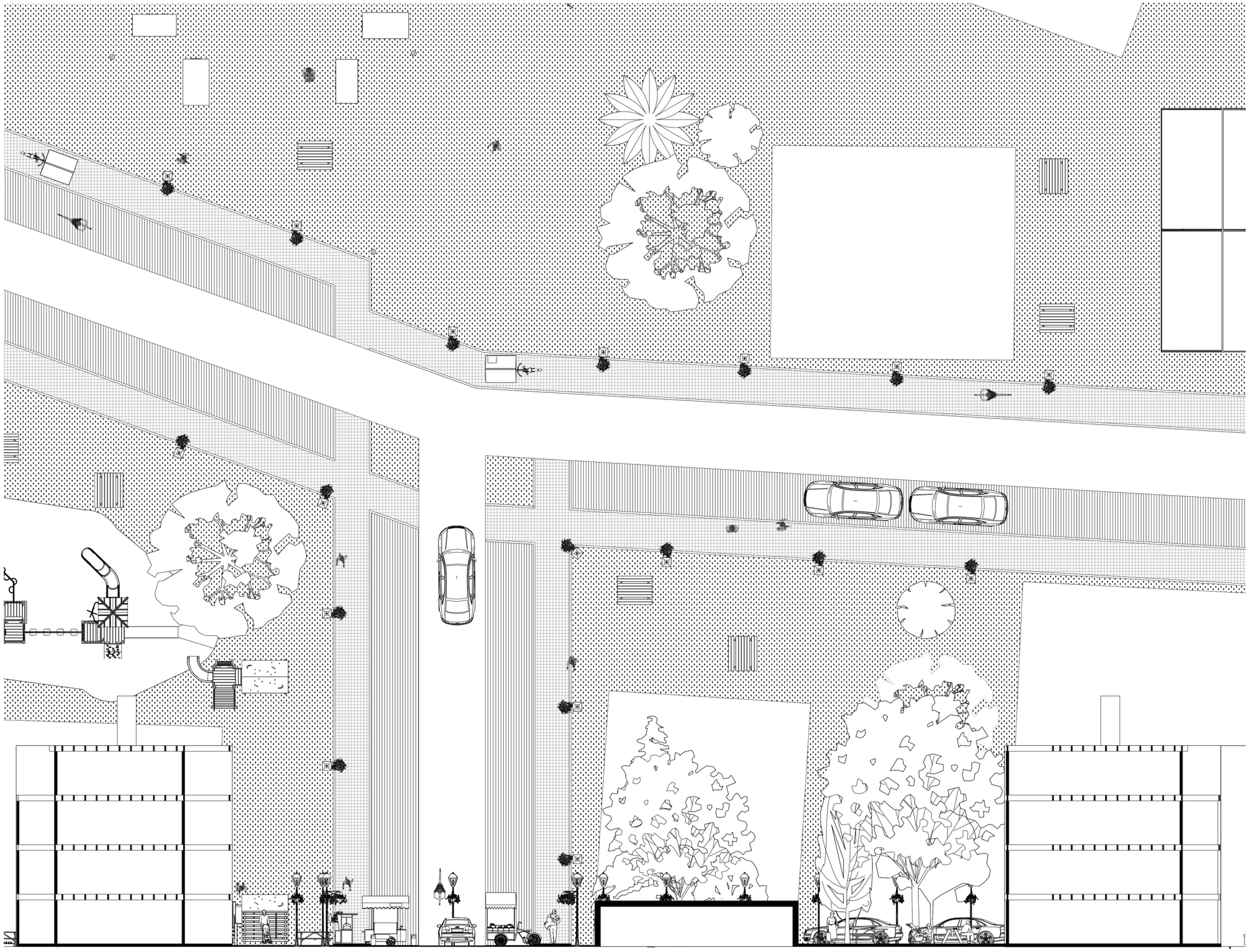


This page shows type 3 road. This road is an important road for connecting the neighborhood, it shows how more intimate the streets is compared to street type 2. This street is more likely to be used by the people of the project location (by the people whole live in one of the sectors indicated on the master plan). This street is slow paste and because of that the opportunity to have eye contact is bigger. Which on its turn can increase social contact.



T3 Important Road to Conect the Neighborhoods. Scale 1:200





This page shows type 4 road. It indicates the small scale of the road and the ambiance of the setting in which these roads can be found. It is the lowest in the hierarchy of the streets. This street can be used by cars, bikes, and pedestrians. It has no zebra crossovers like the other three streets because the past of this street is slow. This street is subject to its surrounding.

T4 Small Road within a Neighborhood. Scale 1:200



The Design

Up until this far the design has been on the level of the master plan. Form this point onward I will zoom in and focus on one of the sectors of the master plan and I will present the actual design proposal.


Location
Kirkos

The Design



The Cluster/ Neighborhood which is Developed.

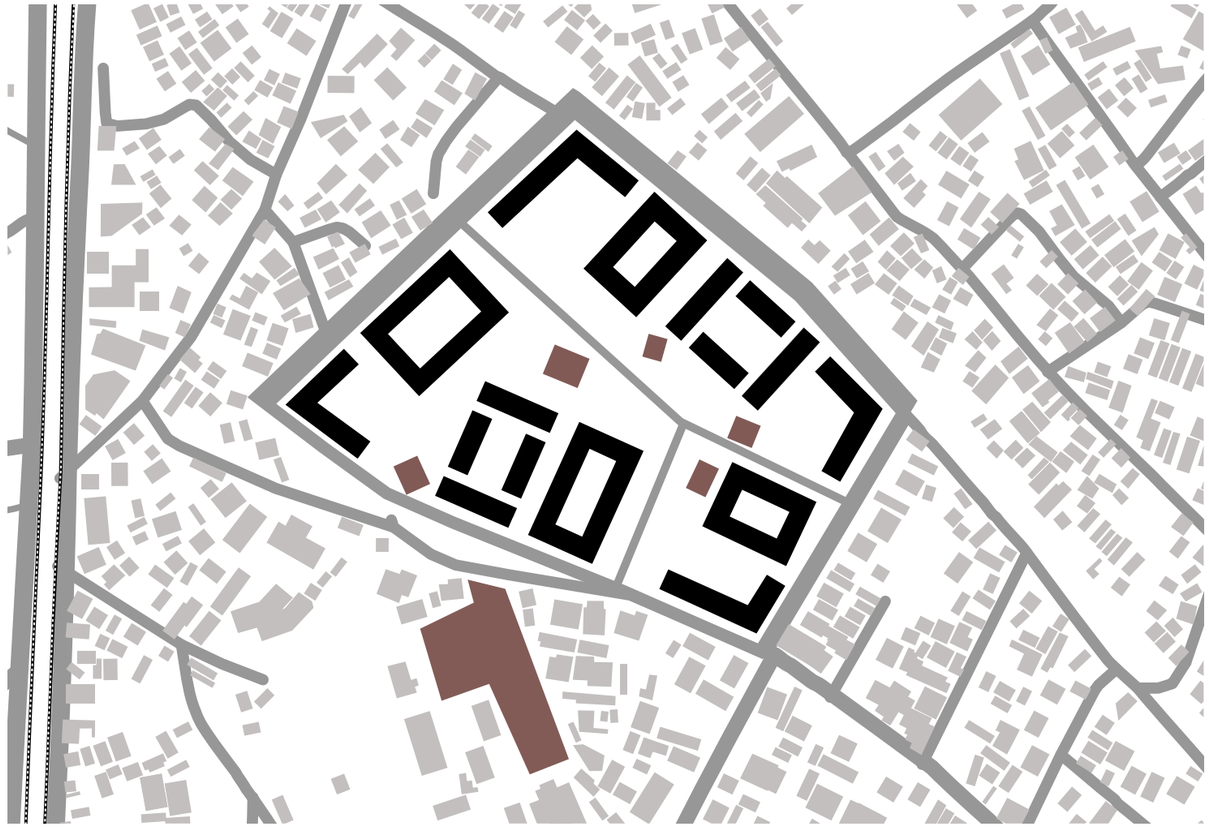
The sector I zoomed in on is a sector close to the city center and borders on one of the other sides an area which is a corridor development housing area. My interest went to this sector because it is on the verge of these two areas, it is an interesting intersection. Another reason to focus on this area was because the number of informal settlements, based on Google Maps images this sector has more informal settlements then the others. I find this more interesting to develop then the other sectors which are more or less already being developed.

Project Social Housing Addis Ababa. Ethiopia

| | Week: | Jan | | | | | Feb | | | | | Mr. | | | | | Apr | | | | | May | | | | | June | | | | | July | | | | | Aug | | | | | Sep | | | | | Oct. | | | | | Nov | | | | | Dec | | | | | Jan | | | | | Feb | | | | | Mr. | | | | | Apr | | | | | Mei | | | | | June | | | | | July | | | | | Aug | | |
|---|---|---

These next three pages show when the different urban typologies are built step by step. The images speak for themselves, but what is important to notice is that there is an empty area needed where the inhabitants of the old sefers can be evacuated to while their new dwelling is being built. The density (dwelling per hectare) increases, this is an important part of the master plan, to provide for the extreme housing shortage. This means once one sector is built. The density of one sector is high enough to provide housing for the original inhabitants of that sector and plus housing for inhabitants of another sector or a part of another sector. To conclude, the empty area near the sector which is indicated with red and to where the original inhabitants are evacuated to will only be needed for the first sector.

The same principle as is implemented with the first sector can also be implemented to the other sectors, but what is important is that the next sector which is going to be redeveloped needs to be close to the first sector so that the dwellers don't have to move to the other end of the project location. Which can cause frustration and a sense of detachment because the dwellers are removed from their original location.





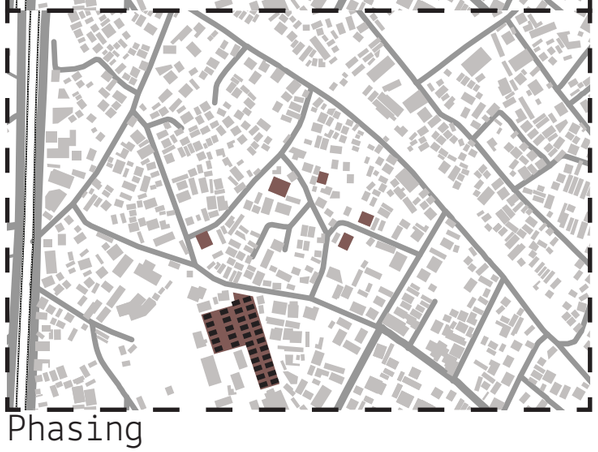
1. The sector in its original state



2.These existing buildings are kept because they are in good condition



3. An empty plot nearby is leased. The empty plot shown in this drawing is within the masterplan and it most likely belongs to a restaurant called 'Sosna Emamay Friends Cafand Brean Fast Serves Part'. In return for leasing this plot a fee can be offered to the owners of the plot in the form of money or in the form of a dwelling for the owners of the plot within the sector, which they can buy for less or rent for less.



4. The next step is to build on this piece of land temporary units.



5. People living in the sefers shown in black move to the temporary units built nearby.



6. The sefers are demolished.



7. New urban typologies are introduced: on building for the higher income groups (the building with a L-shape) and one building for the lower income groups (the enclosed courtyard block). The building for the higher income groups is built firstly or at the same time as the other building because this building will create revenue to kick-start the project. (The luxurious apartments within the high income-building are sold for a higher prize.)



8. The evacuated people move back to their original place, but this time they live in an enclosed courtyard block instead of in an informal settlement.



9. Then the dwellers living in these slums (buildings shown in black) move to the temporary houses and at the same time units for the higher income groups are being sold.



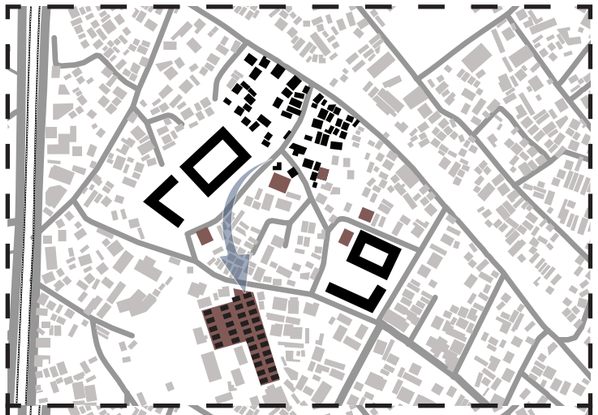
10. The sefers are demolished.



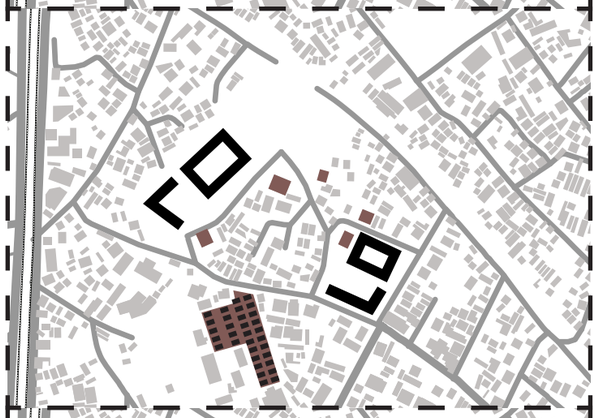
11. Another building for the higher income group and another building for the lower income group is built, but this time on the other side of the sector to reduce the construction noise.



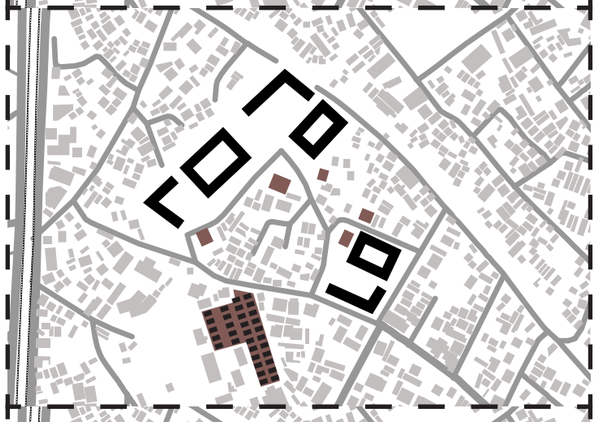
12. The dwellers move back from their temporary home back to the sector and at the same time units for the higher income groups are being sold.



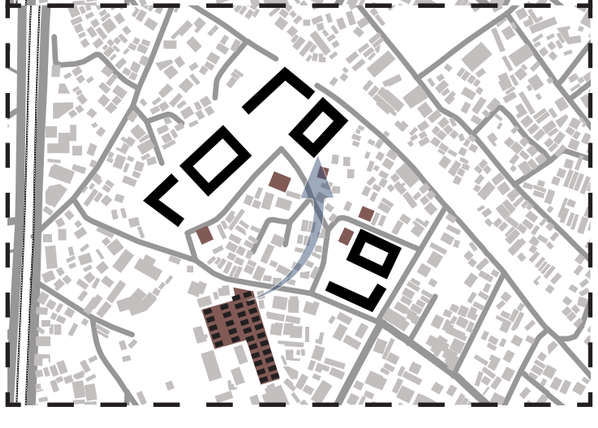
13. Then the dwellers living in these slums (buildings shown in black) move to the temporary houses.



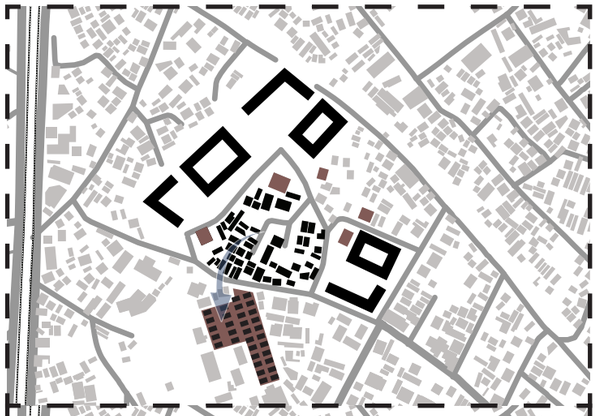
14. The sefers are demolished.



15. Another building for the higher income group and another building for the lower income group is built.



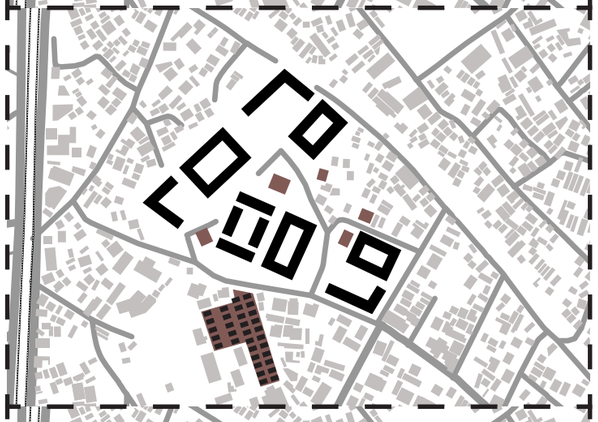
16. The dwellers move back from their temporary home to the sector and at the same time units for the higher income groups are being sold.



17. Then the dwellers living in these slums (buildings shown in black) move to the temporary houses.



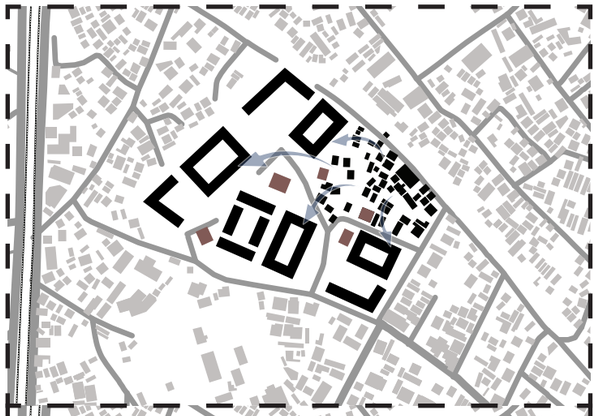
18. The sefers are demolished.



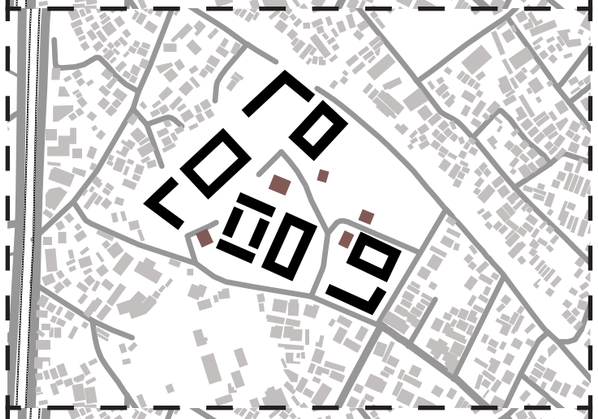
19. Then another building for the lower income group and a building for the middle-income group is being built.



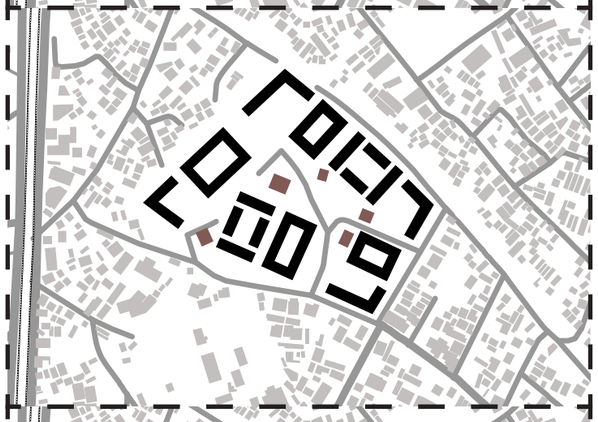
20. The dwellers move back from their temporary home to the sector and at the same time units for the higher income groups are being sold.



21. Then the dwellers living in these slums (buildings shown in black) move to one of the courtyard blocks which have already been built.



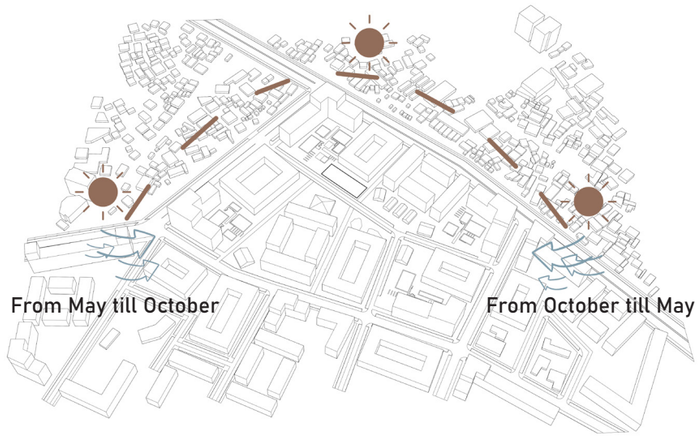
22. The sefers are demolished. (The land which was leased is not needed anymore and hence given back to its owners.)



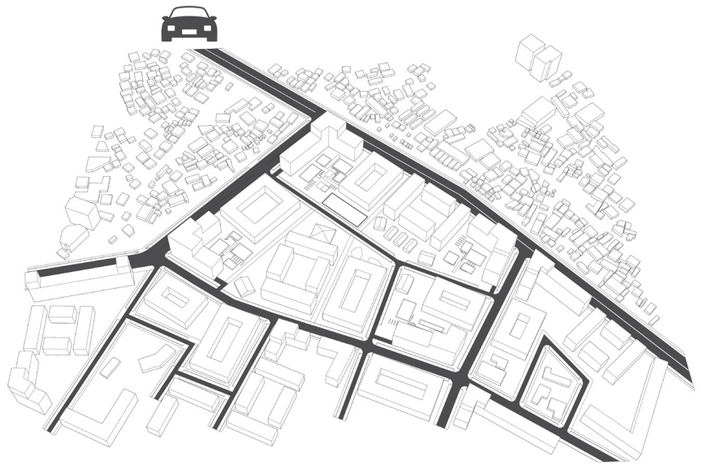
23. Then finally another building for the higher income group and another building for the middle-income group is built.



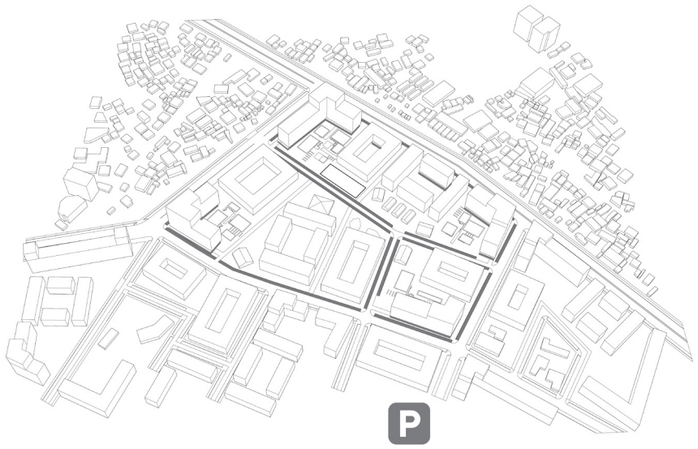
24. Then the start of building one of the other neighboring sectors can start.



The orientation of the sector and the wind direction.



The roads which are accessible by car in this sector.



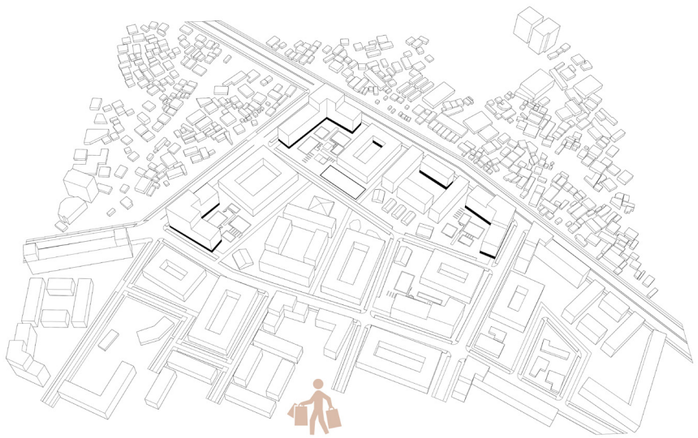
The above ground parking facilities in the sector. The buildings for the higher income groups have also underground private parking.



Paving/ sidewalk

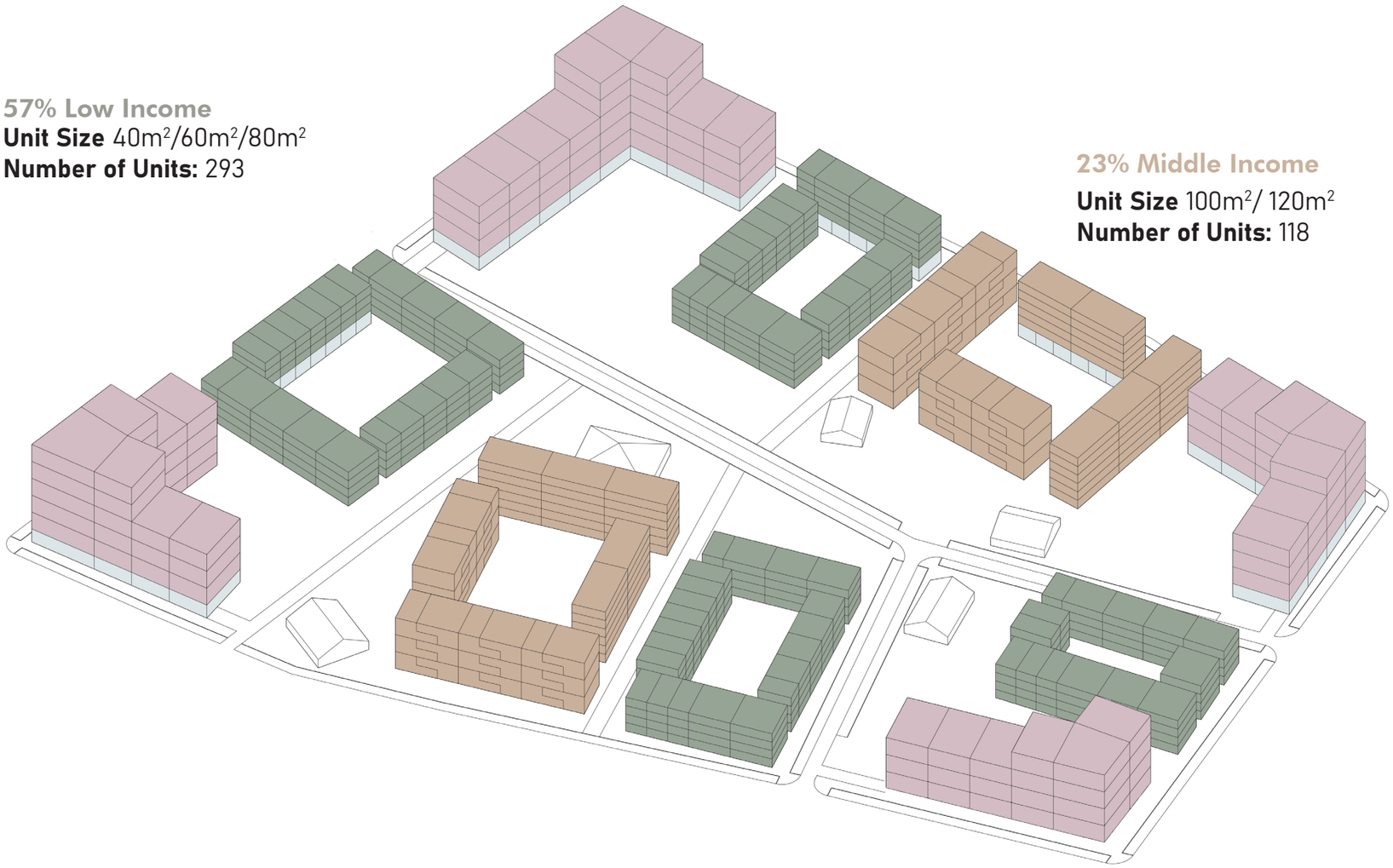


The green and relaxing areas within the sector, these areas are also buffer areas for heavy rainfall. (Later in this report this will be explained more.)



The retail locations within the sector (usually the ground level of buildings facing eighter a T1 or T2 street.)

57% Low Income
Unit Size 40m²/60m²/80m²
Number of Units: 293

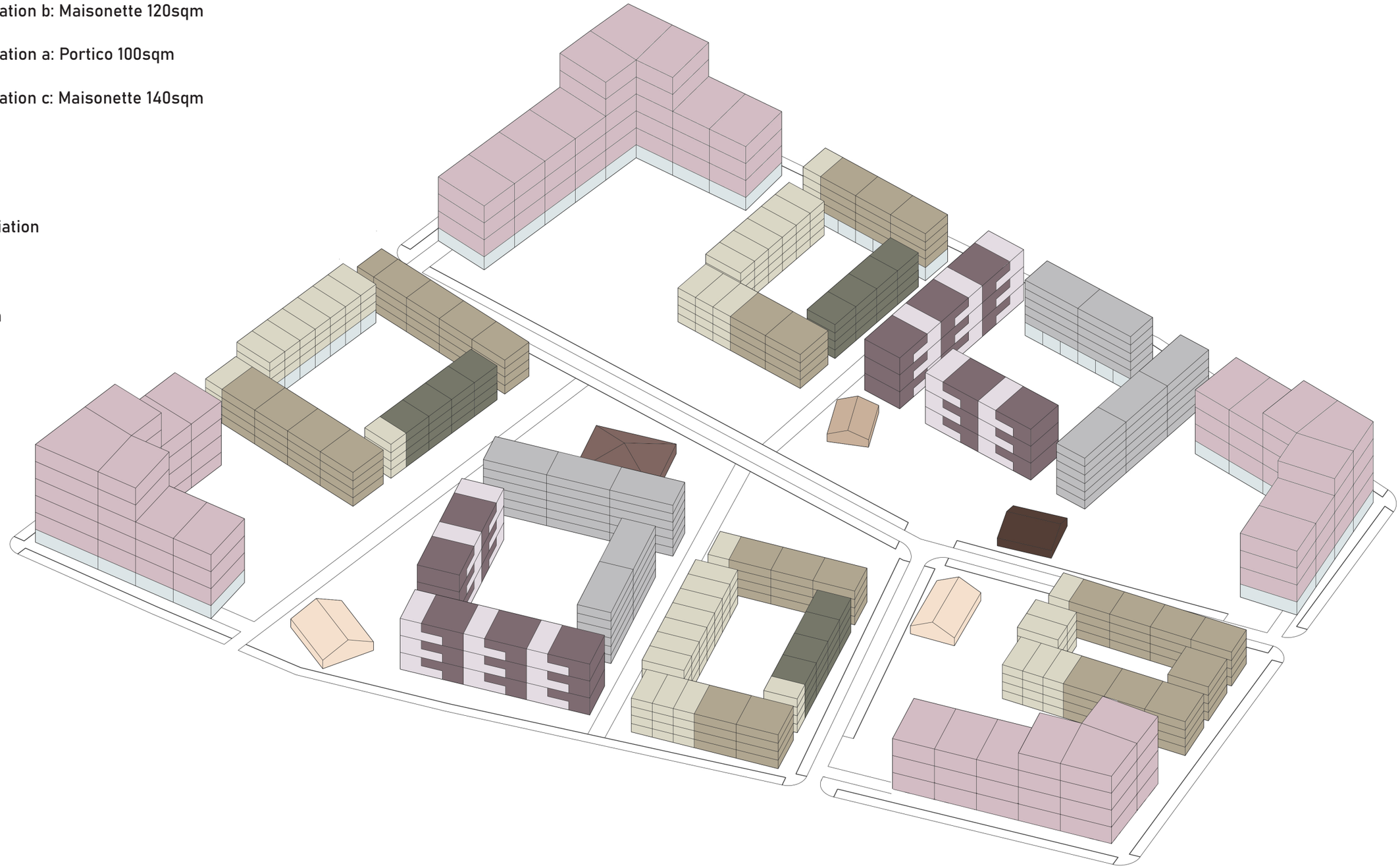


23% Middle Income
Unit Size 100m²/ 120m²
Number of Units: 118

20% High Income
Unit Size 140m²
Number of Units: 105

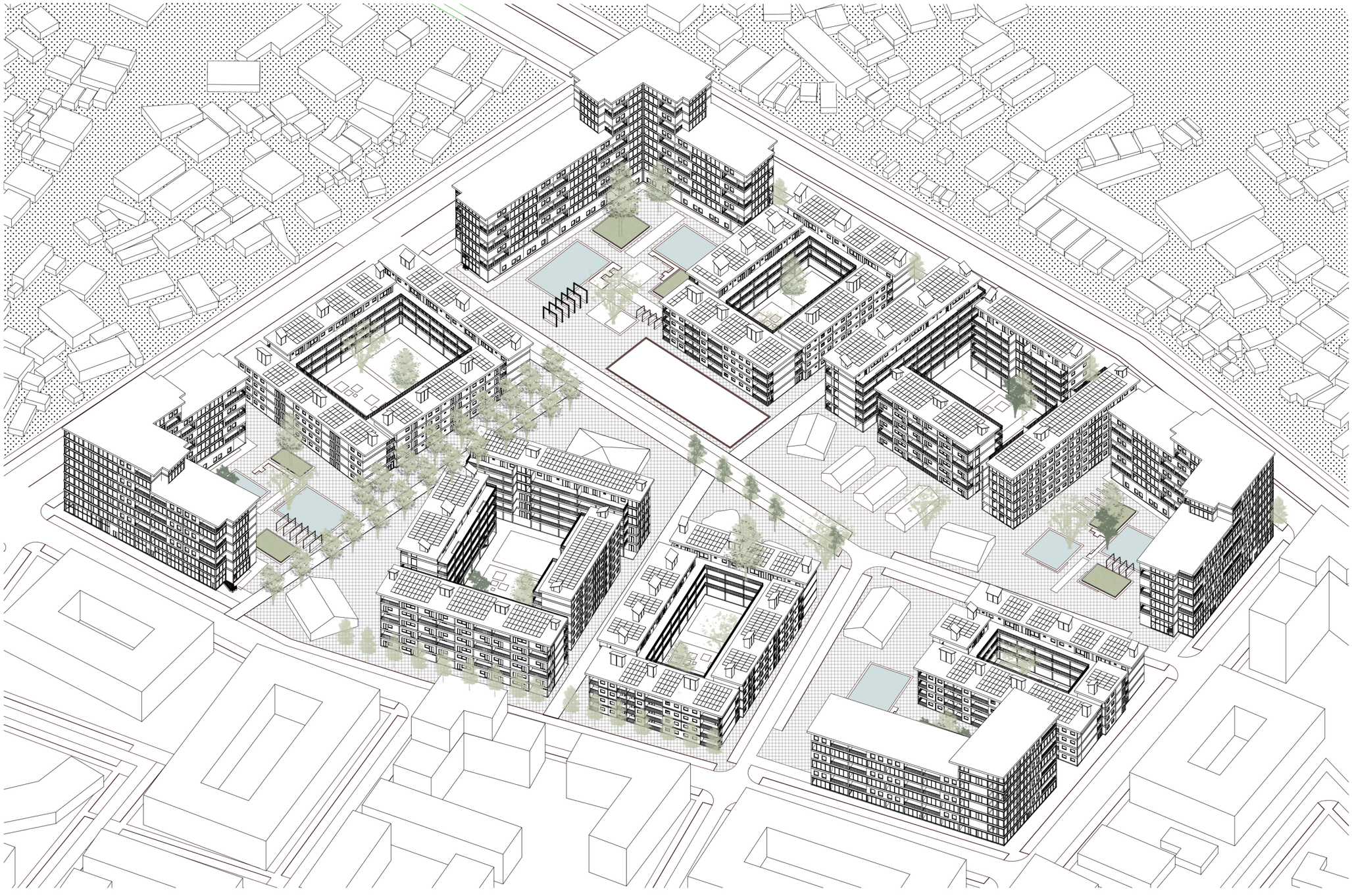
Plot 4.07 ha
Number of Dwellings 516
Density 126 dw/ha

- Dwelling Type 1 variation a: Apartment 40sqm
- Dwelling Type 1 variation b: Apartment 60sqm
- Dwelling Type 1 variation c: Apartment 80sqm
- Dwelling Type 2 variation a: Maisonette 120sqm
- Dwelling Type 2 variation b: Maisonette 120sqm
- Dwelling Type 3 variation a: Portico 100sqm
- Dwelling Type 2 variation c: Maisonette 140sqm
- Retail
- Sports Facility
- Homeowners association
- Community Building
- Daycare for childern

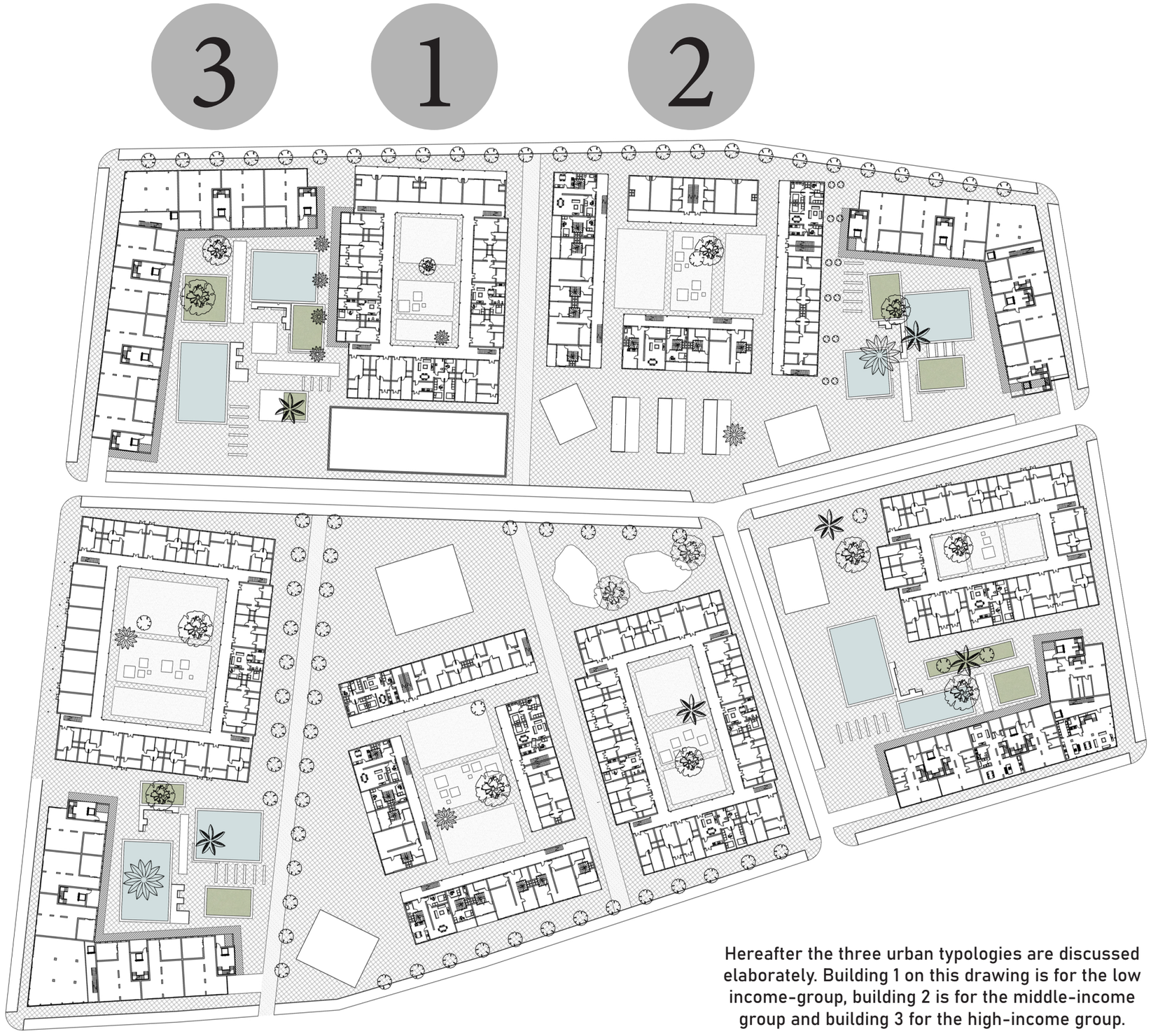


Distribution Dwelling Types and Variations

Ground Level Floor Plan within its Context Scale 1:1000

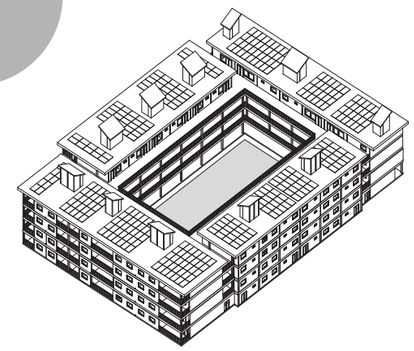


3D of The Sector

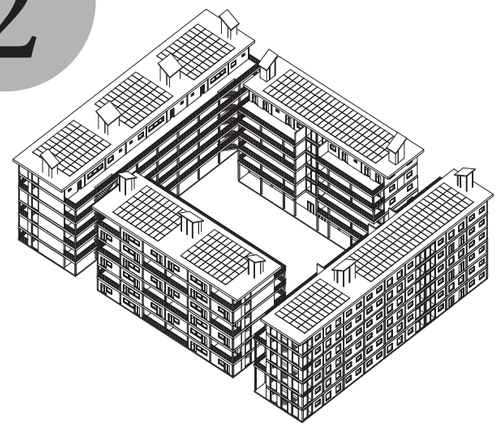


Hereafter the three urban typologies are discussed elaborately. Building 1 on this drawing is for the low income-group, building 2 is for the middle-income group and building 3 for the high-income group.

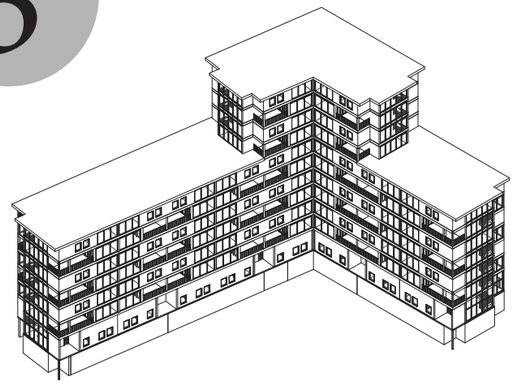
1



2

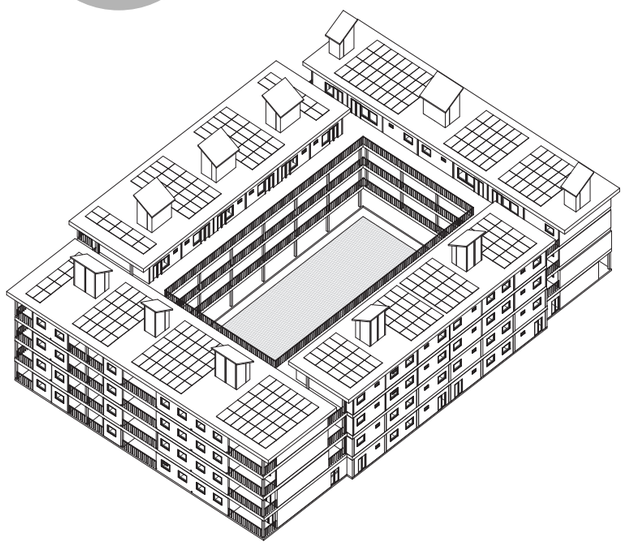


3

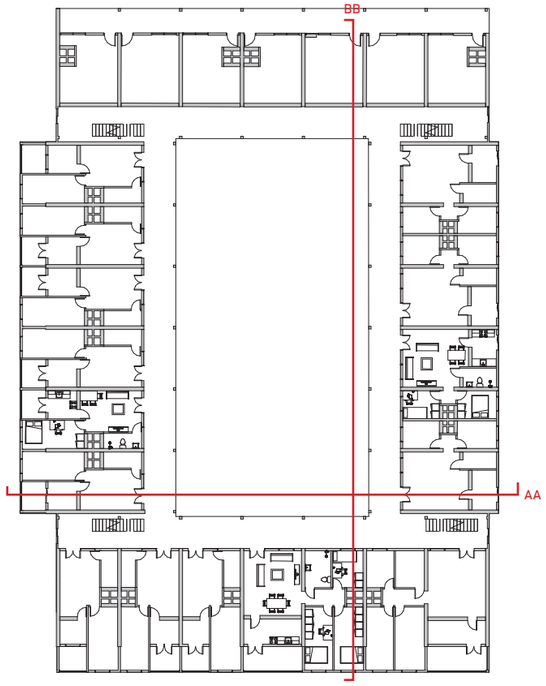


Ground Level Floorplan within its Context Scale 1:1000

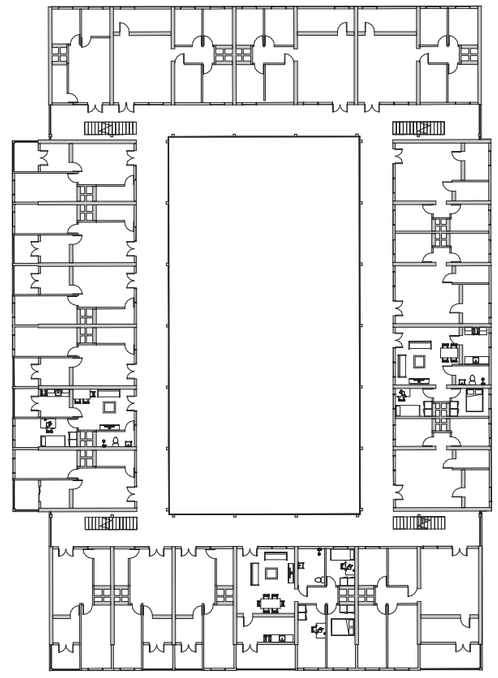
1



These are the floor plans of building 1. These buildings don't have parking garages and the units are reached via a gallery. The building is only four stories high and on the ground level of the northern part of the building is meant for retail (empty floor plan.)

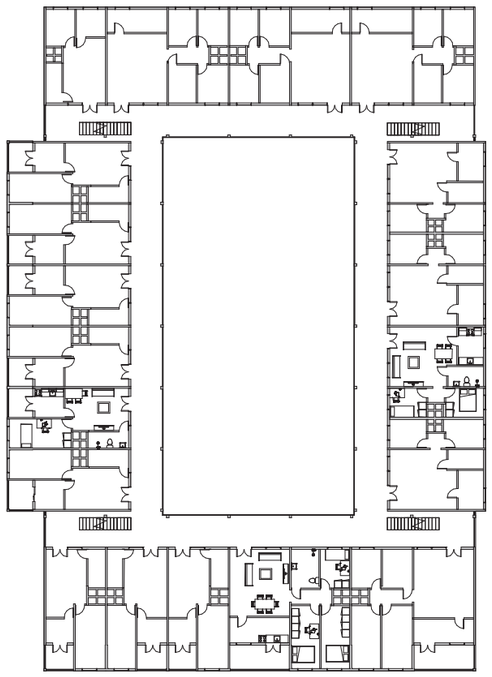


Floor plan level 0.

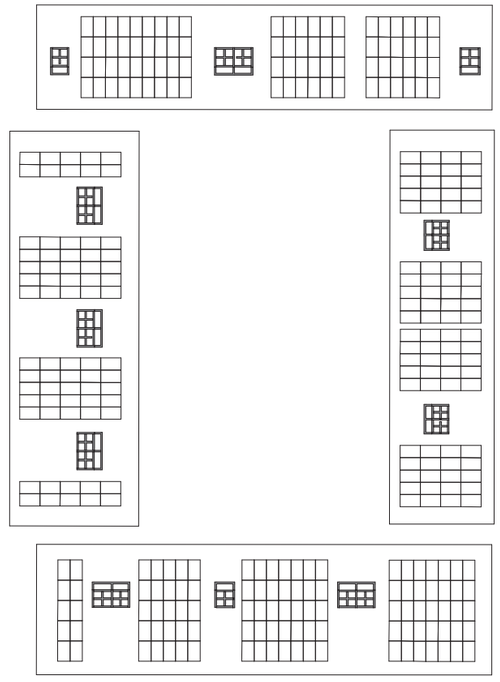


Floor plan level 1.





Floor plan level 2-3.



Floor plan roof.





Building Low Income Group North and East Facade 1 to 200





Building Low Income Group South and West Facade 1 to 200



1 Section AA

1 : 200



2 Section BB

1 : 200

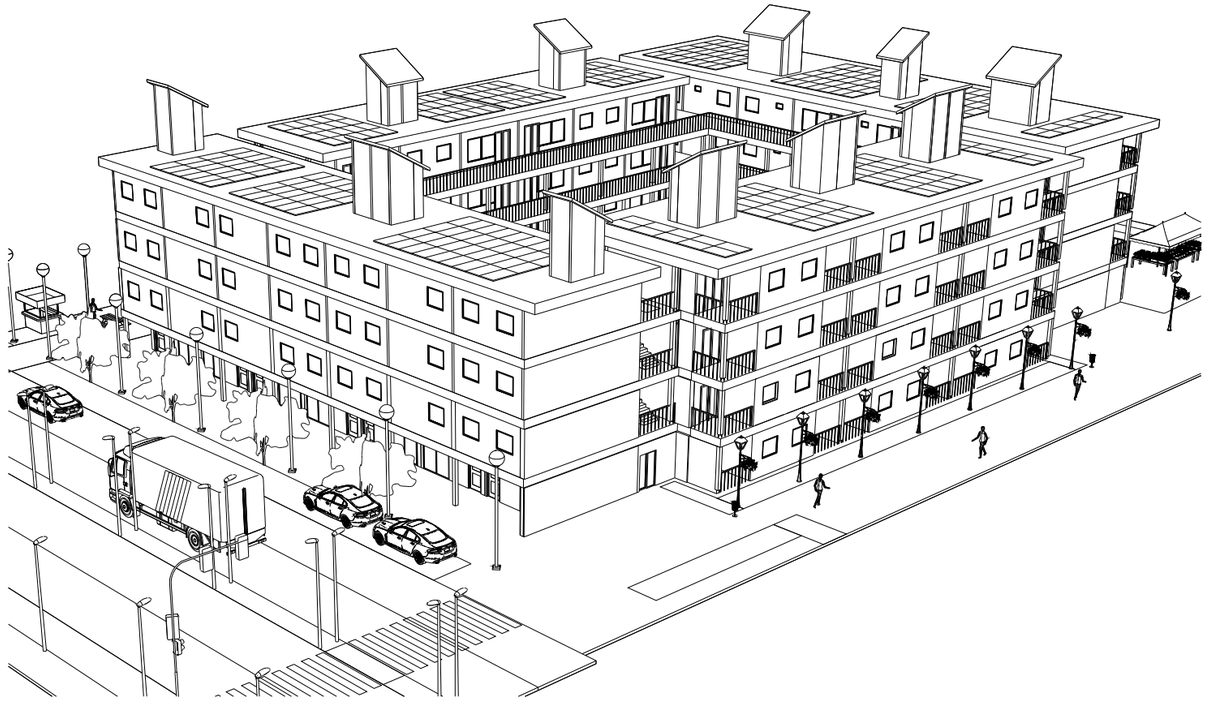


These perspectives show the ‘faces’ of building 1: building for the lower income group.

Building 1 has loadbearing CEB walls with small windows to reduce the expanses. The second main material is bamboo, which is a local material and because of that cheap and environmentally friendly. This material is used as timber columns and beams in the floors.

This drawing shows the relation of the East façade and the street. This street is designed to house local dwellers to sell their food to each other and to other people in the neighborhood. The food that they cooked within their enclosed courtyard can be sold here, the atmosphere is more intimate and small scale which encourages social interacting.

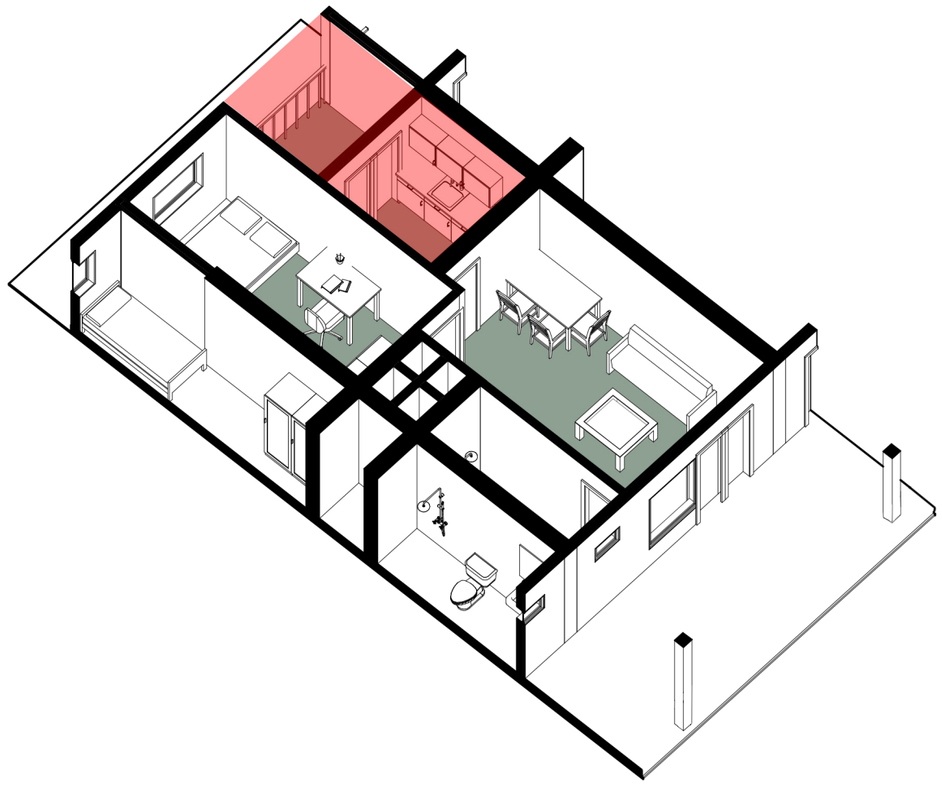
This drawing also shows the relation between the South façade and the street. The tents shown here are farmers markets, these are owned by the people of the sector and the greens and vegetables which are sold here are dried and or planted in the buildings enclosed courtyard or in the communal areas with the green houses (which is shown on the floorplan of the ground level with the context). This façade faces the communal area.

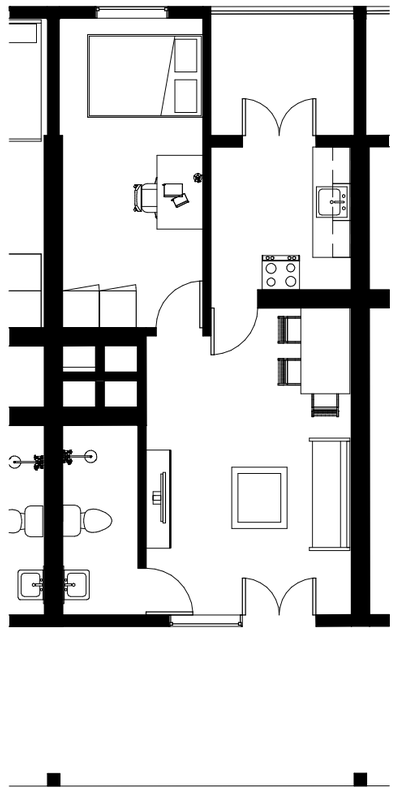


This drawing shows the narrow-paved road between this building and the building for the higher income group (only accessible for pedestrians). I would call this street the access street, which is solely meant for transportation.

This drawing shows also the relation between the North façade and the T2 street. As described earlier this street is a buzzy street and the past of this street is fast and because of that les intimate and less of a social space.

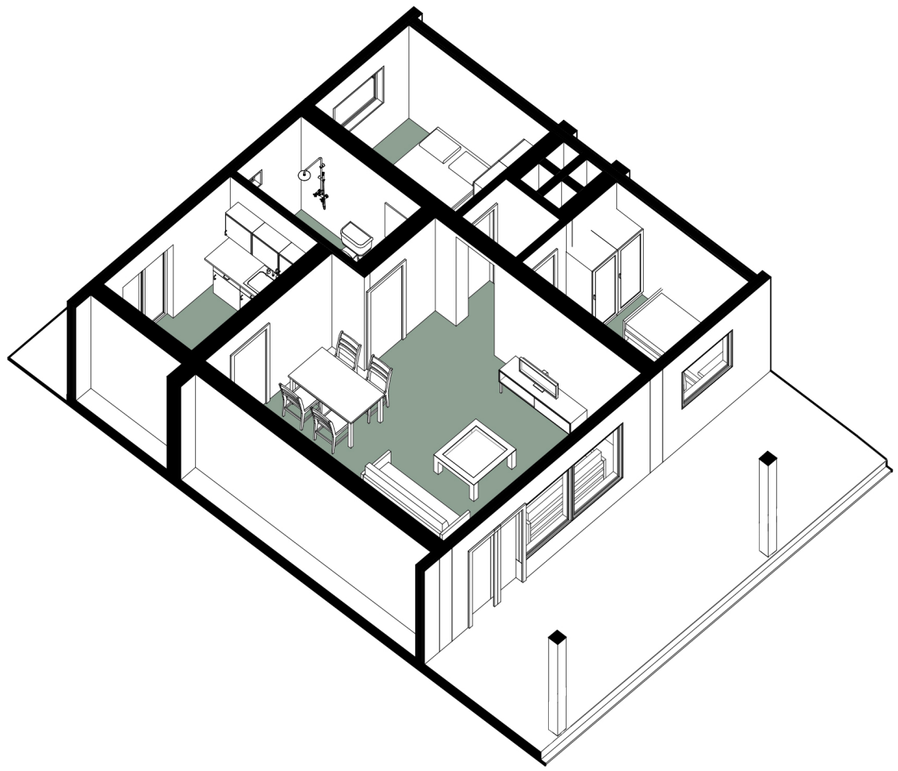


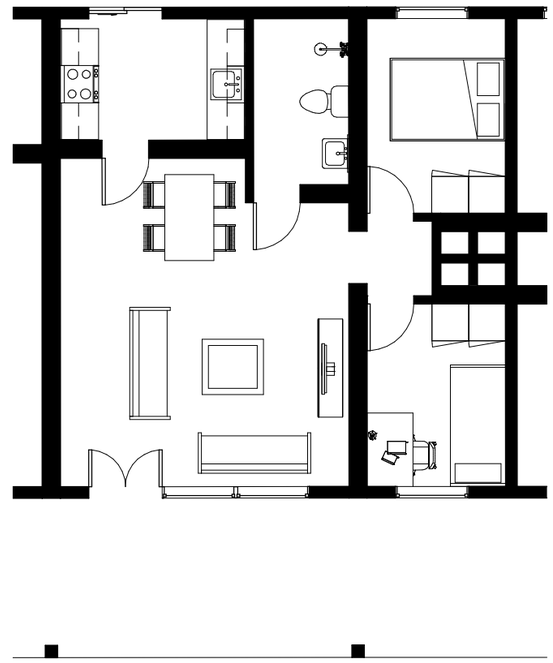




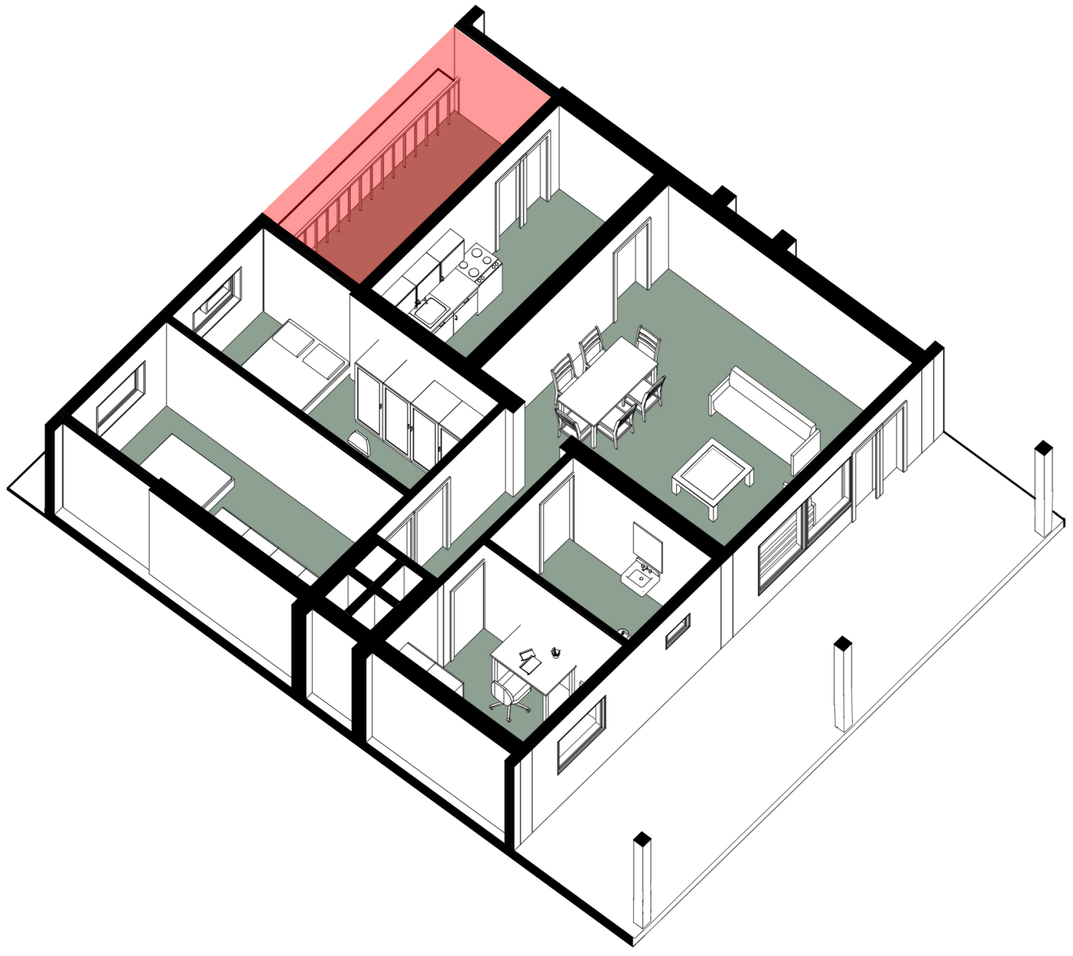
Zoomed in into the three versions of the units in building 1.
These units are apartments and they have only one level. The three versions are made to cater for different household sizes (of the lower income groups). The other two versions can be found on the next two pages. The floor plans are minimal and basic, although the West and the South façade does give the dwellers the option to extend their dwelling into the private balcony. The interaction with the courtyard is bigger due to limitations in dwelling size and due to the height of the building. The courtyard is designed to be a place of social interaction while cooking, drying seeds and washing/ hanging cloths (extension of the dwelling).

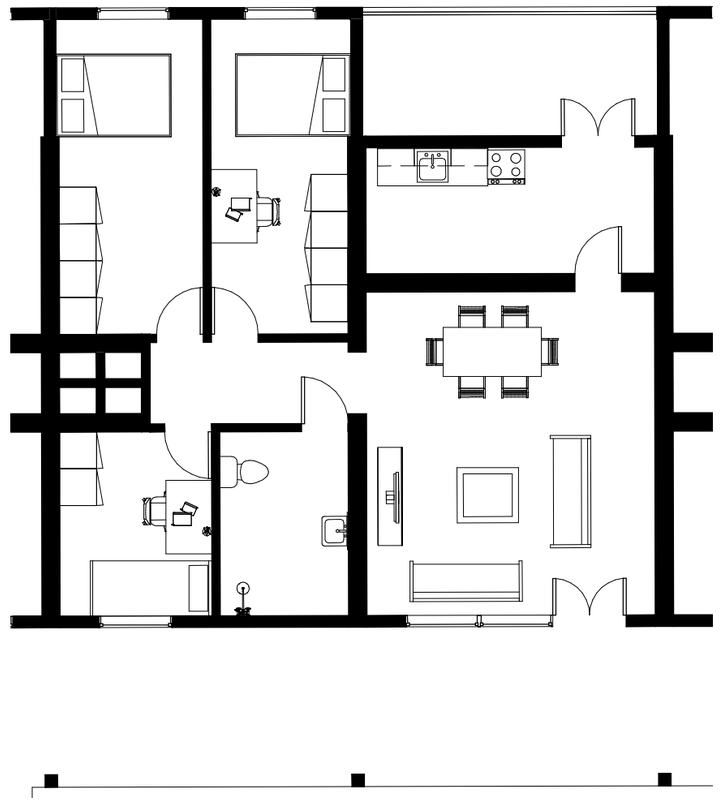
Floor Plan Dwelling Type 1 variation A: Apartment Scale 1:100





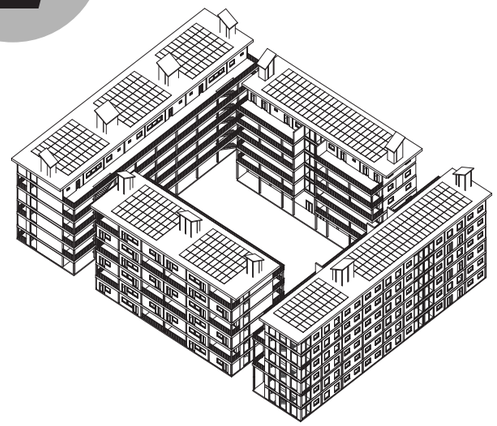
Floor Plan Dwelling Type 1 variation B: Apartment Scale 1:100





Floor Plan Dwelling Type 1 variation C: Apartment Scale 1:100

2



These are the floor plans of building 2. These buildings don't have parking garages and the units are reached via a gallery or a portico. This building is usually higher than building 1 but lower than building 3. This building does have elevators, but only four elevators and used by more household compared to the elevators in building 1. This building has also on the North side of the building stores in the ground level. Two types of dwellings are to be found in this building: the maisonette (version A and B) and the portico dwellings.





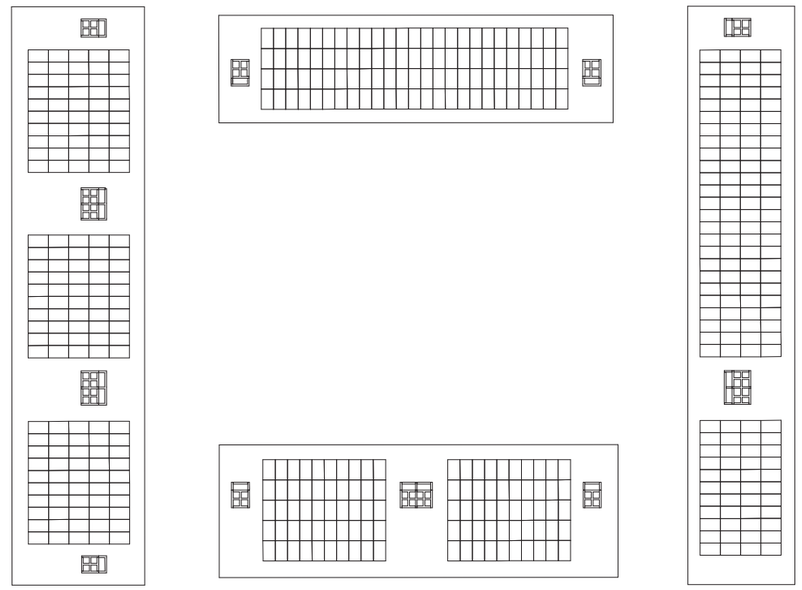
Floor plan level 0.



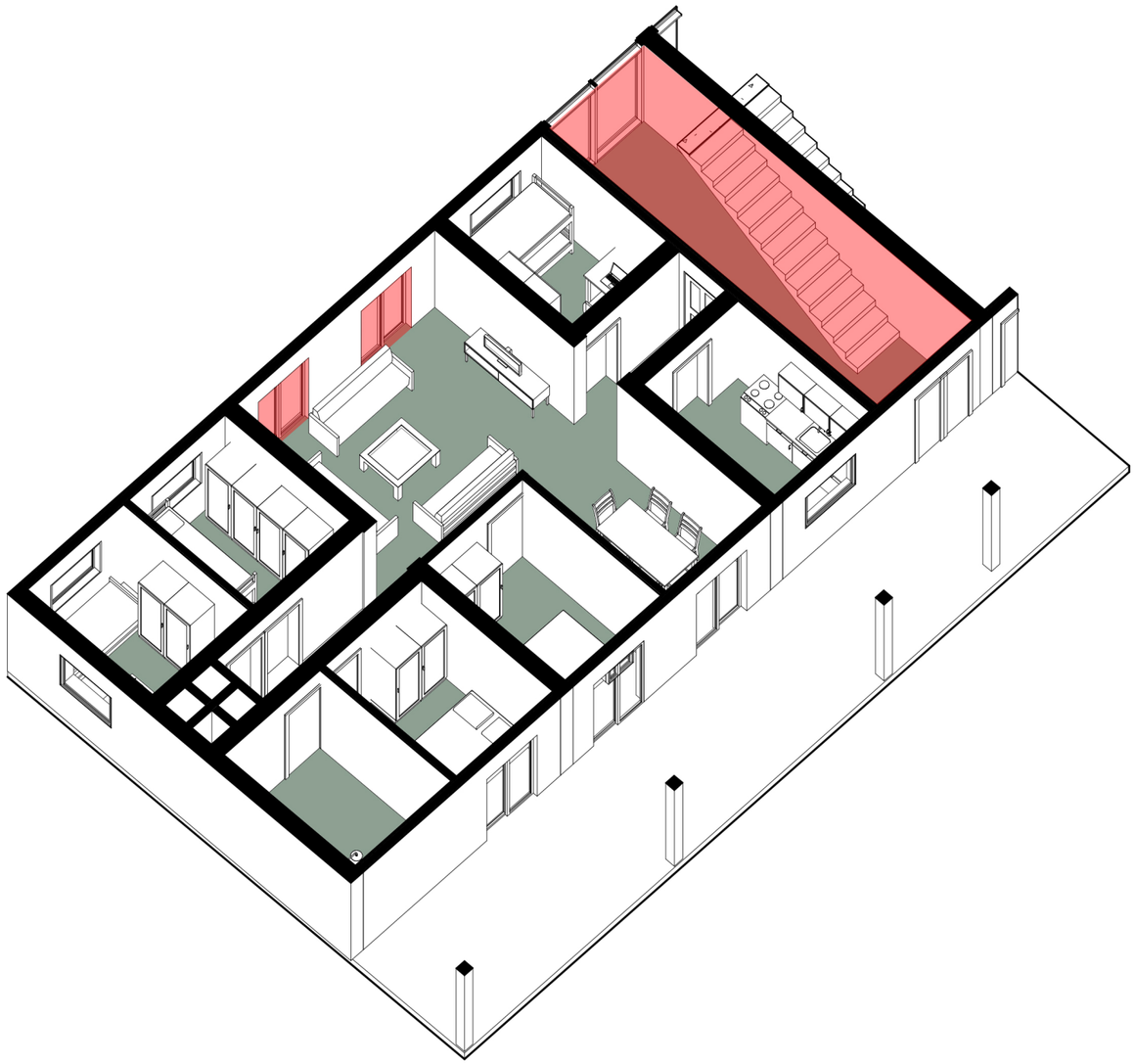
Floor plan level 1.



Floor plan level 2-5.



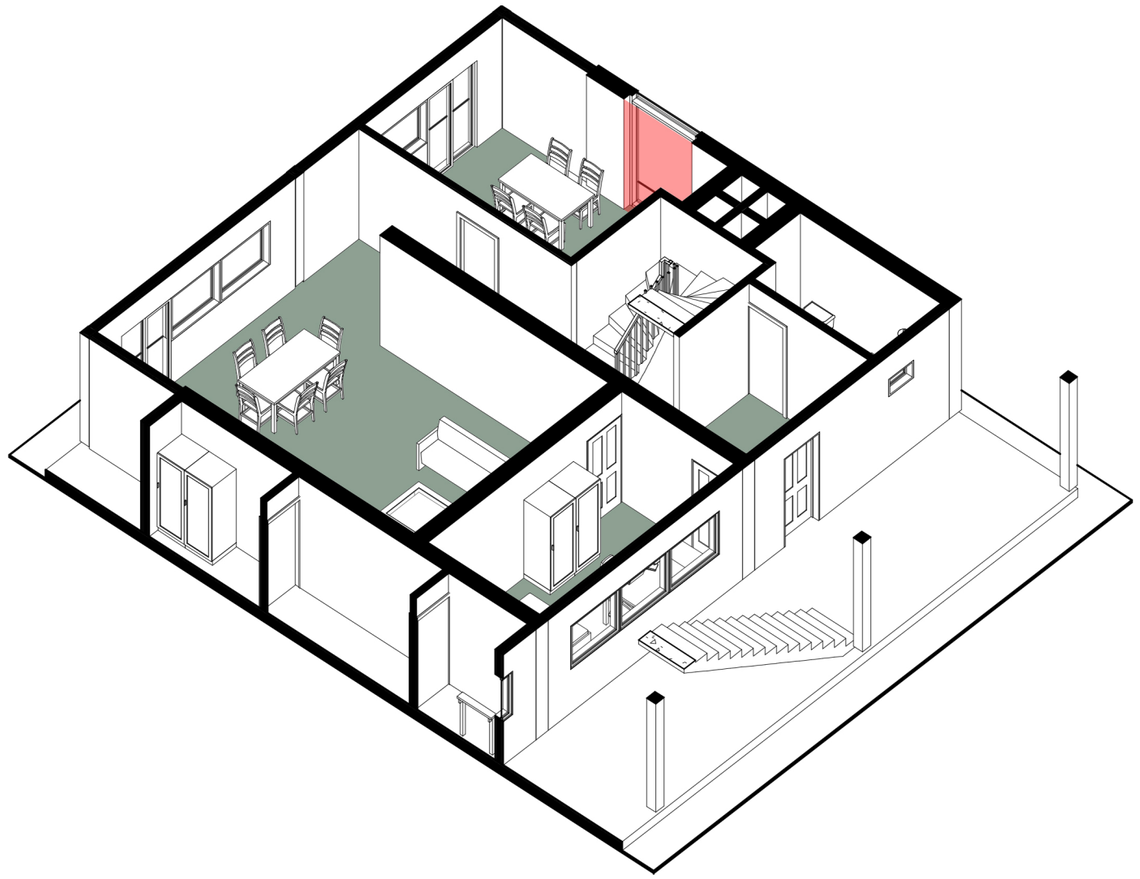
Floor plan roof.

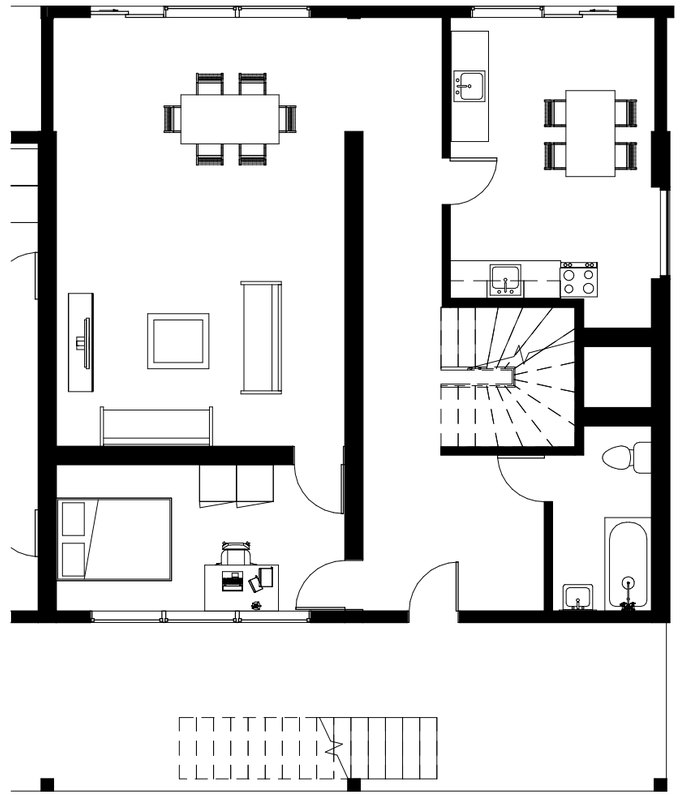




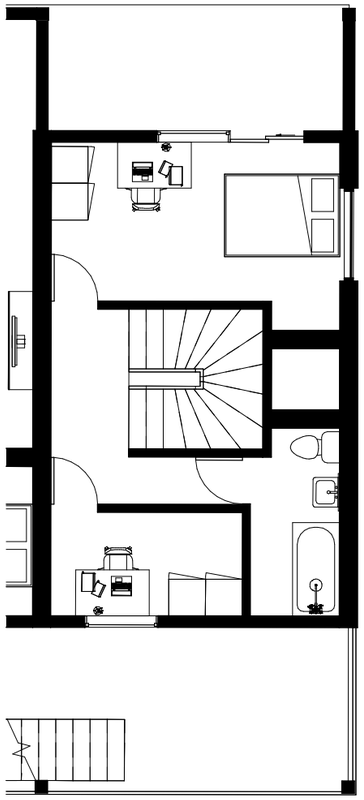
Zoomed in into the dwelling of building 2.
The dwellings of building 2 are more spacious compared to the dwellings of building 1 and less luxurious compared to the dwelling of building 3. With less luxurious is meant that these dwelling do not have walk-in closets and on suits, they don't have kitchen islands and huge private outdoor areas. The other two dwelling within building 2 can be found on the next four pages.

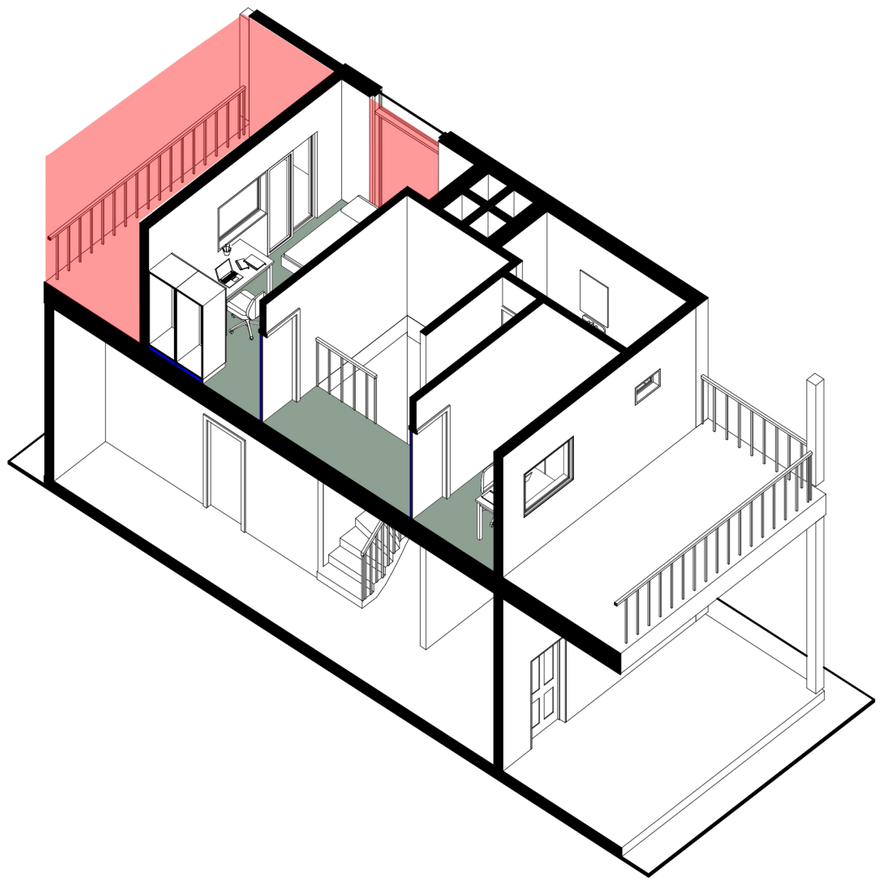
Floor Plan Dwelling Type 3 variation A: Portico Scale 1:100



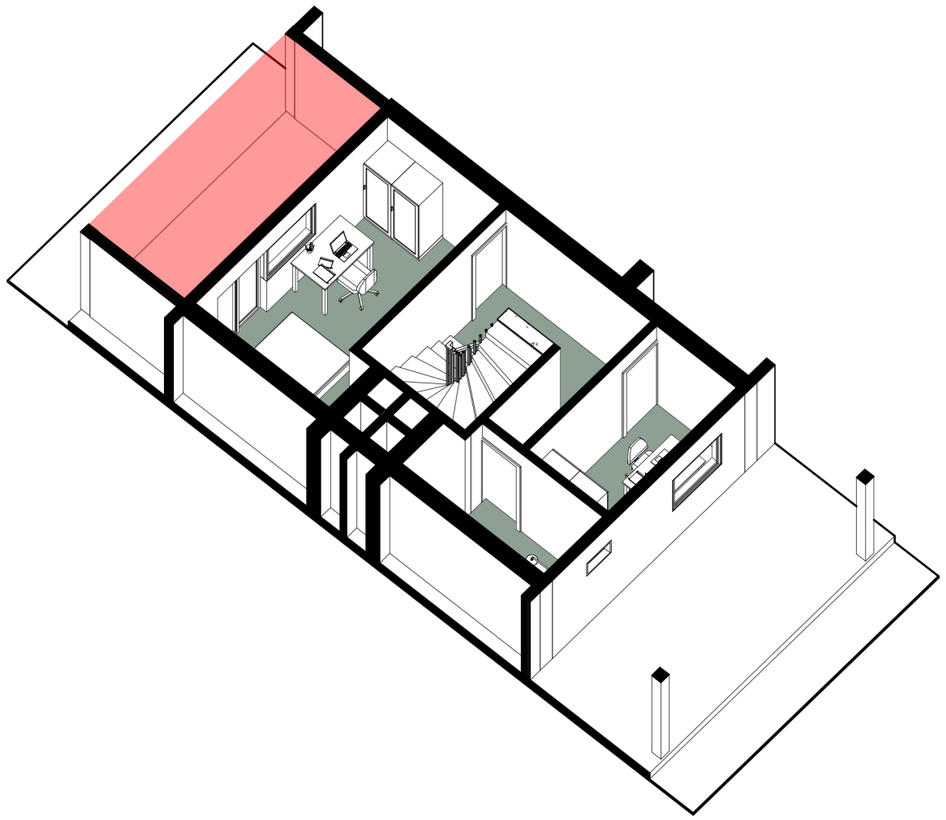


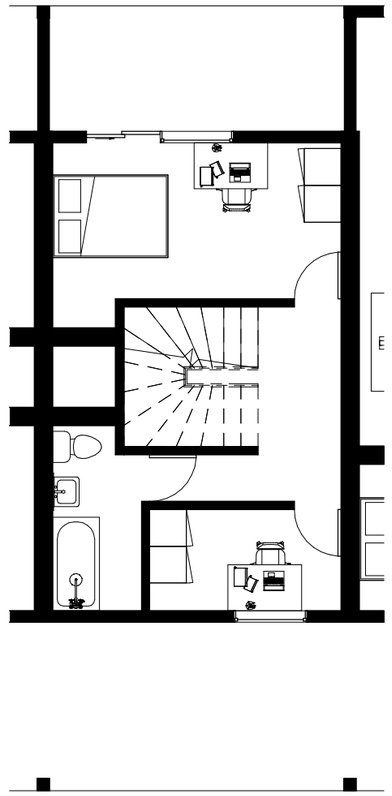
Floor Plan Dwelling Type 2 variation B: Maisonette Scale 1:100



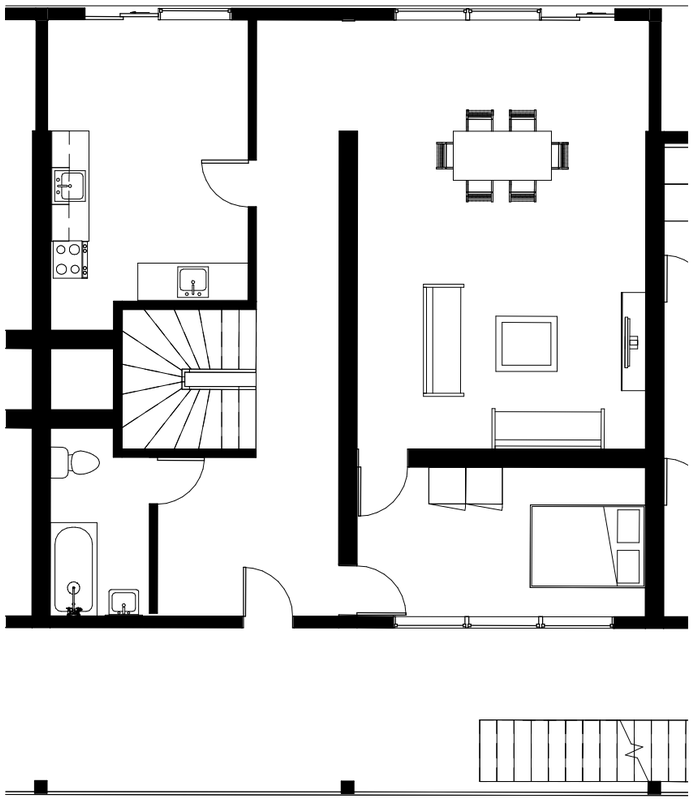


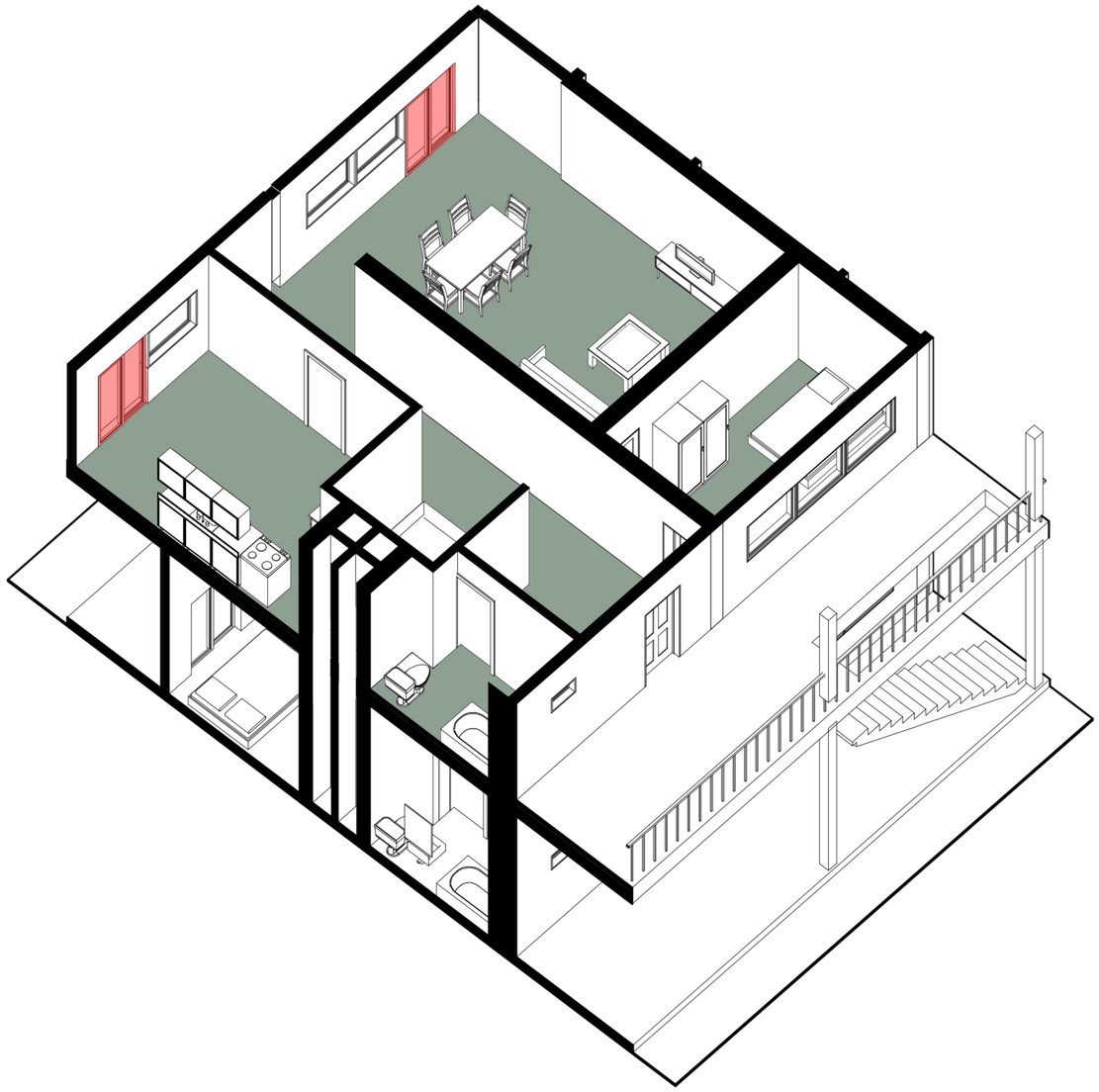
Floor Plan Dwelling Type 2 variation B: Maisonette Scale 1:100





Floor Plan Dwelling Type 2 variation C: Maisonette Scale 1:100





Floor Plan Dwelling Type 2 variation C: Maisonette Scale 1:100



This drawing shows the East façade, this façade faces a building for the higher income group and its (open, semi-private) courtyard. The dwellers of this building can also use this courtyard to relax, which is different to their own semi-enclosed courtyard, where people can do the same activities as people in building 2 in their courtyard: cooking, drying seeds, and doing the laundry.

This drawing also shows the South façade of building 2. The glass green houses are the places where people of the sector can plant their vegetables and greens. These glass green houses are maintained by whoever rents it and each courtyard is maintained by homeowners' association of the building it is meant for. This façade faces the communal areas which are maintained by the homeowners' association of the whole sector.

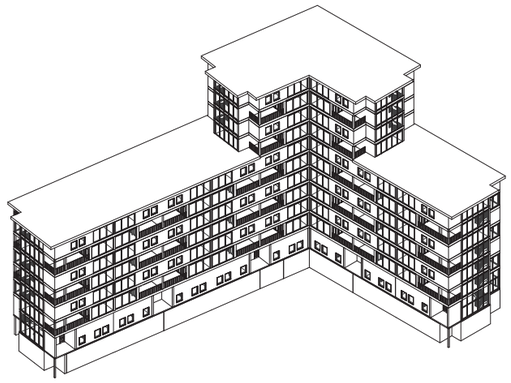


This drawing shows the North façade and yet again the buzzy street. The façade of this building has more glass compared to building 1 (the windows are bigger), since there is more budget for this building and the ideas is to create windows in such a way to connect the dweller within the dwelling with the city, which is seen through the windows of this façade.

This drawing also shows the West façade which faces the building for the lower income groups and the street shown here is the food selling street. This street can also be used by the dwellers of building 3 and again the food, which is made in the semi-enclosed courtyard, in this case, of building 3 can be sold here. This facade, the south facade and the east façade are facing intimate places/ streets which are designed to encourage social contact.



3

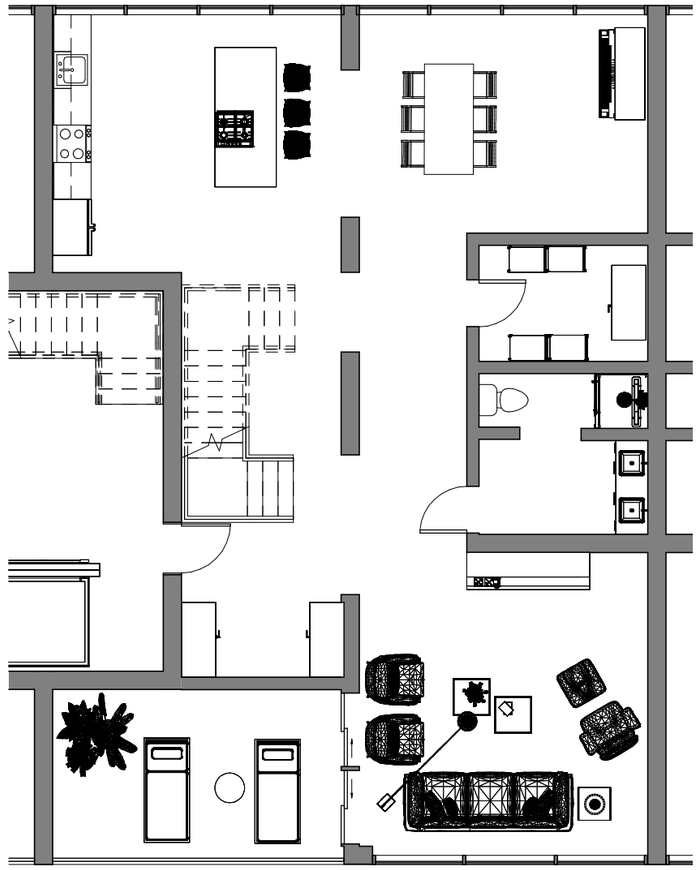


These are the floor plans of building 3. The parking garage is on level -1 and on the ground level are stores/ retail possibilities. The entrance of each unit is via the garage, the garage is reachable by car and by foot via the ground level on the courtyard side.



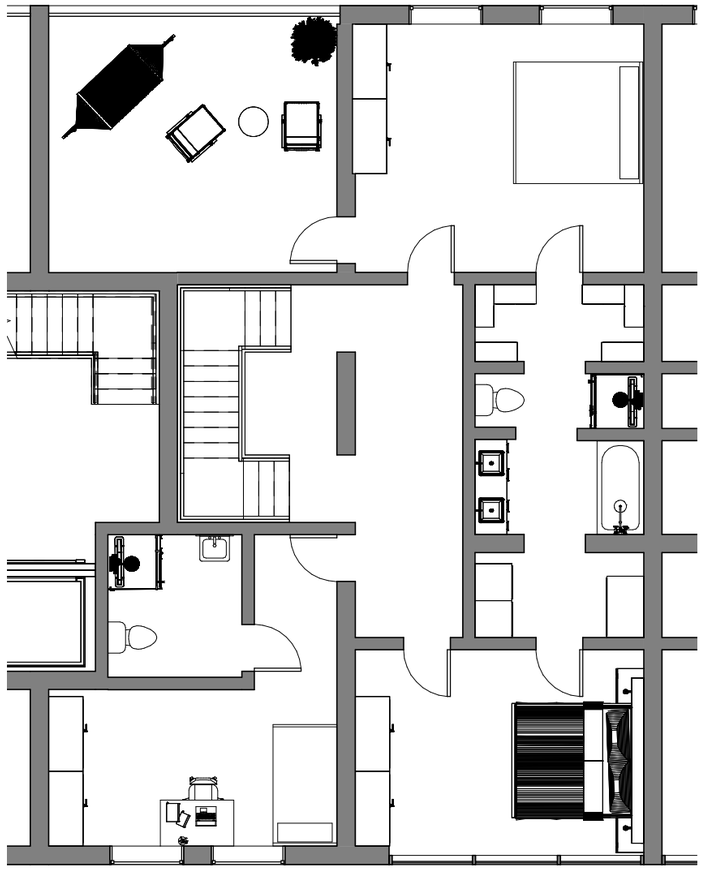


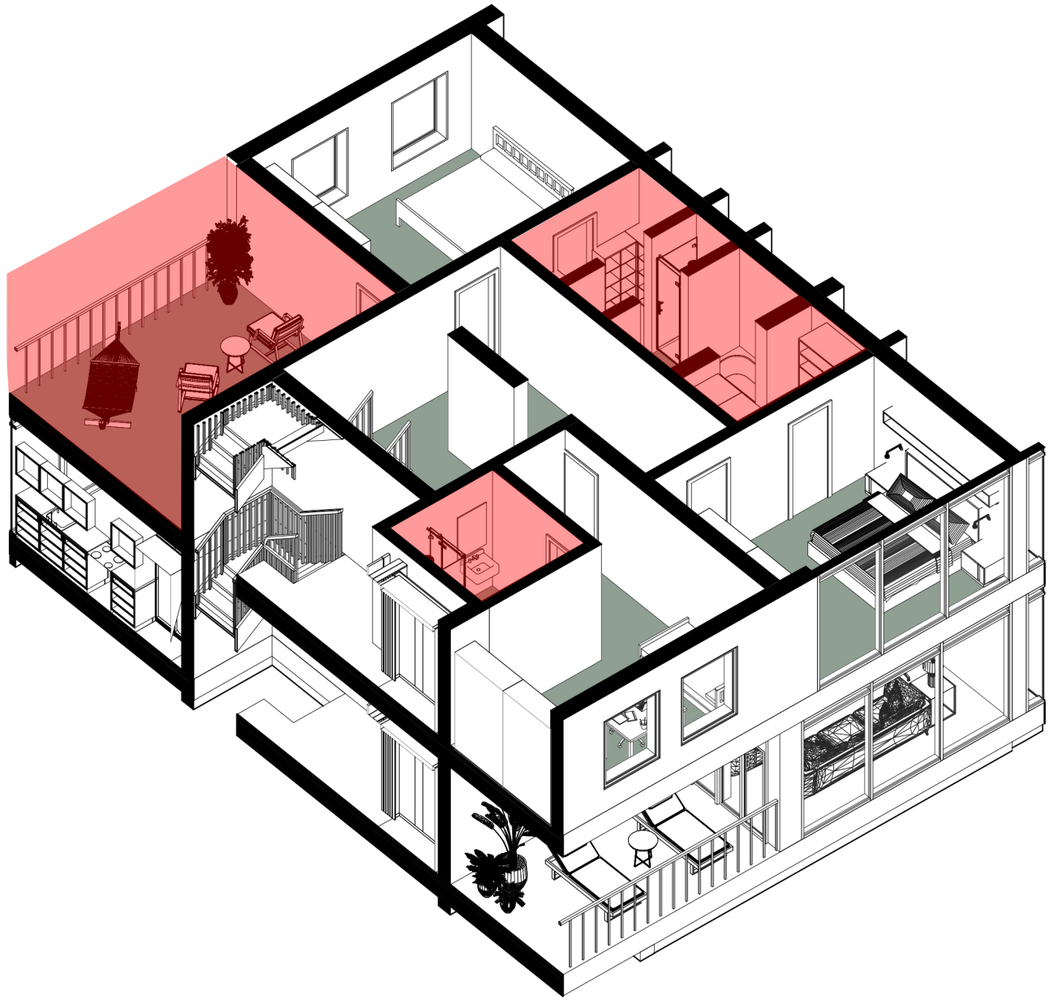




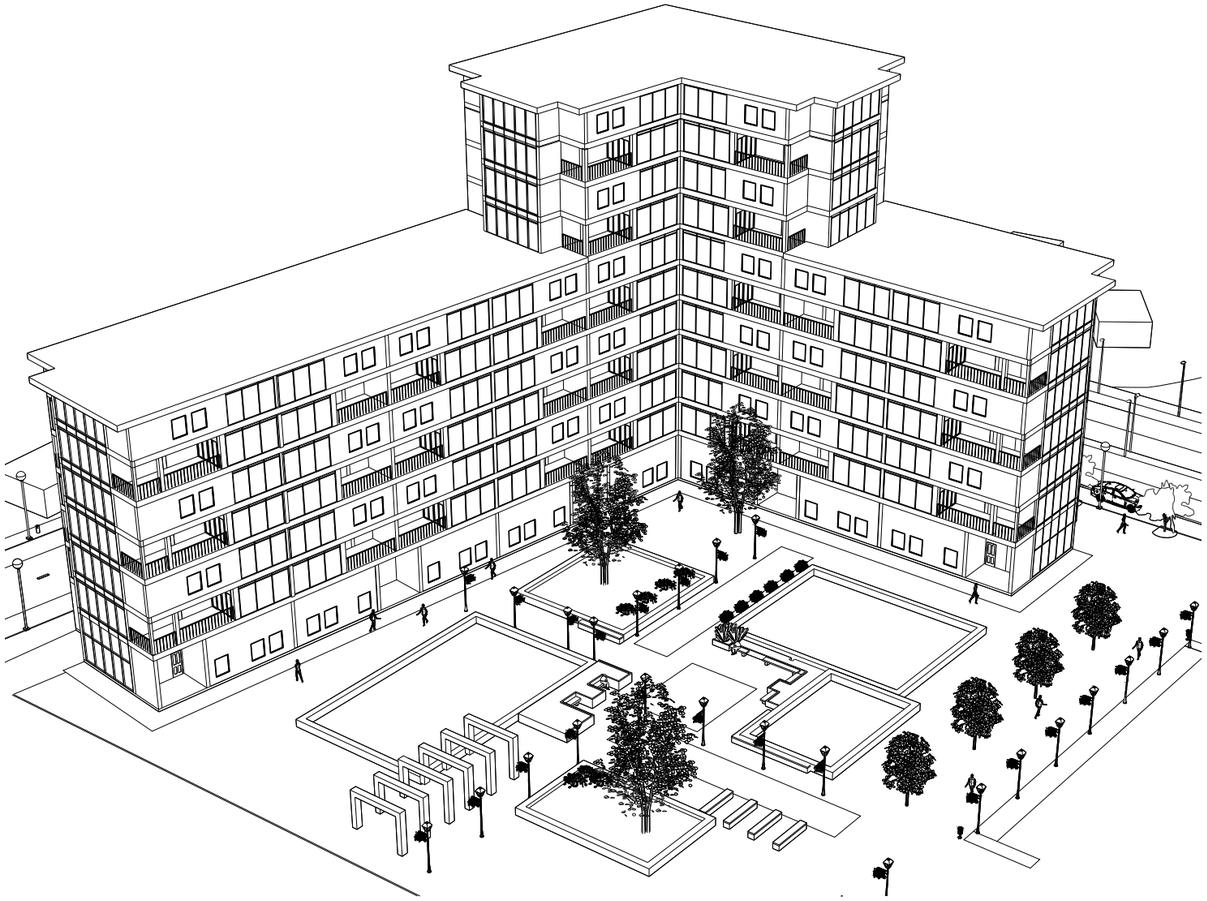
Zoomed in into one of the units in building 3. This building as discussed earlier contains maisonette, with on the first level the kitchen, dining area and the living area and on the second level the bedrooms.
-As can been seen the kitchen is equipped with a pantry and a luxurious kitchen island and close to the dining area.
-The living area is equipped with a big outdoor private area, which faces the courtyard.
-The two big bedrooms have walk-in closets and all of them have on-suits.

Floor Plan Dwelling Type 2 variation C: Maisonette Scale 1:100





Floor Plan Dwelling Type 2 variation C: Maisonette Scale 1:100



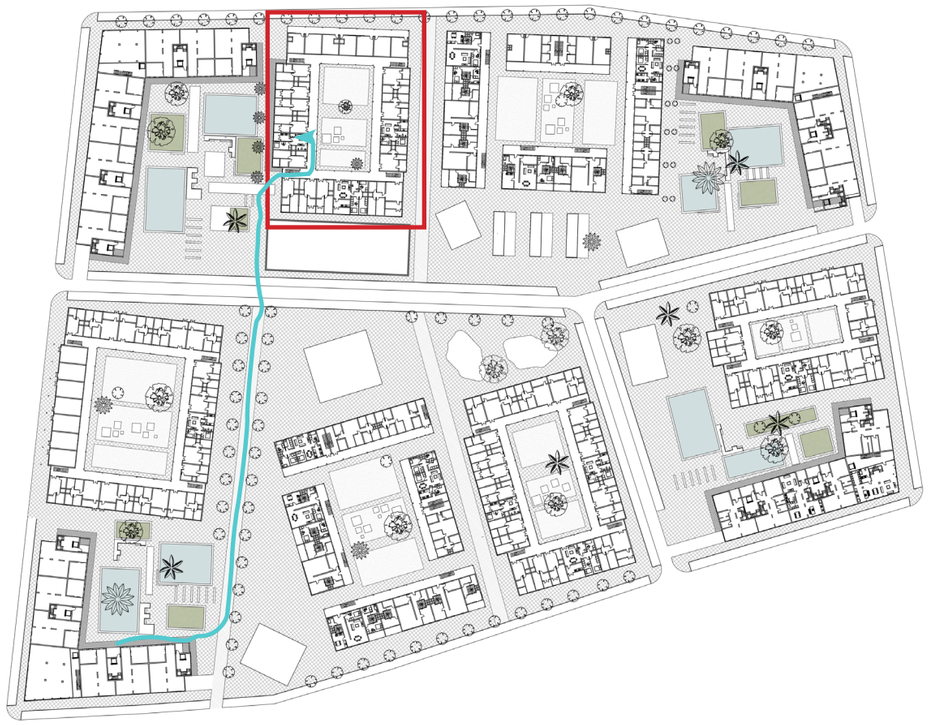
These perspectives show the relation between the façade and the street/ courtyard. On these two drawings the two faces of the building for the higher income groups show the ambiance difference. The courtyard side of the building is a place of tranquility, a place where people can relax, read a book close to the green outdoor sitting areas and or socialize while sitting close to the water buffers.



The street side of the building is buzzier and mostly used for transportation of people and goods from one side of the sub-city to the other part of the sub-city. The past is much faster. For this building the budget was bigger and that's why more glass is used in the façade of this building. This is mainly done to make the dwelling more interesting: if the dwelling has floor-to-ceiling windows, the dwelling has a wide view over the city, this connects the dweller to the city. The construction materials are slightly different: the load bearing material is made from concrete with infill made from CEB. This building has also several lifts because of the height of the building (ground level + 10) and the availability of budget.

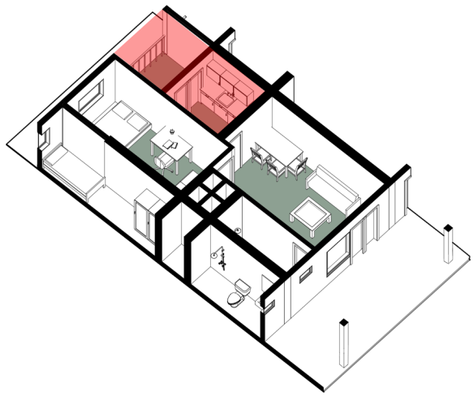


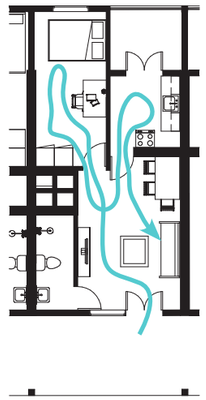
The Design

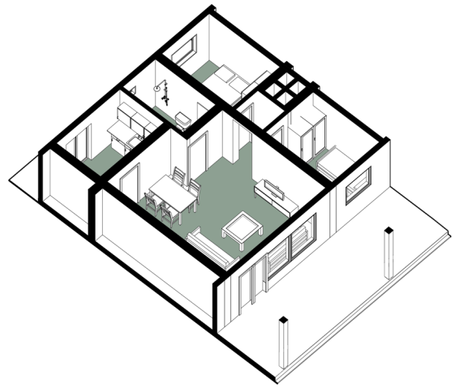


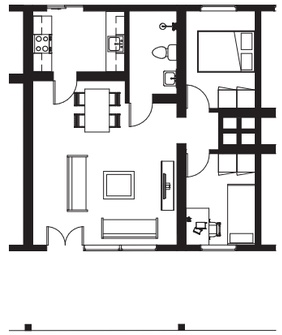


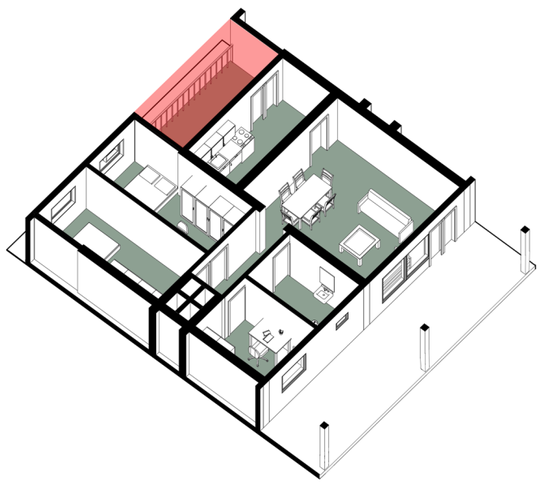
Name: Zala
Gender: Female
Age: 50
Job: Clening Lady

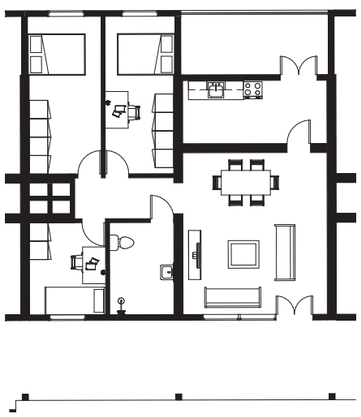










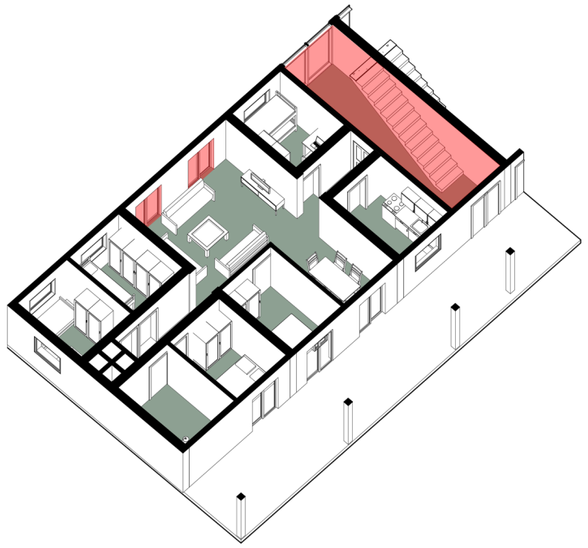


The Design

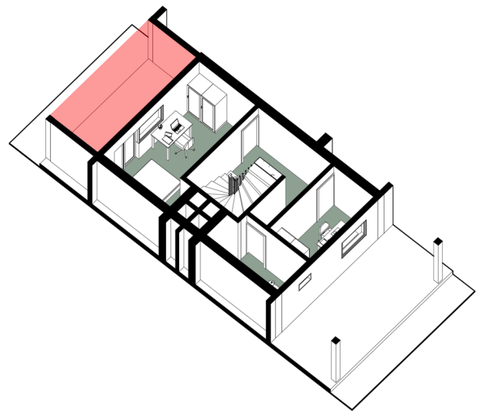


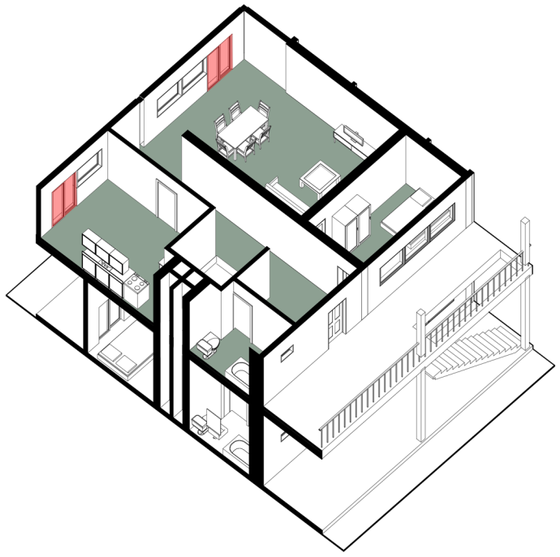


Name: Ife
Gender: Female
Age: 40
Job: shop owner

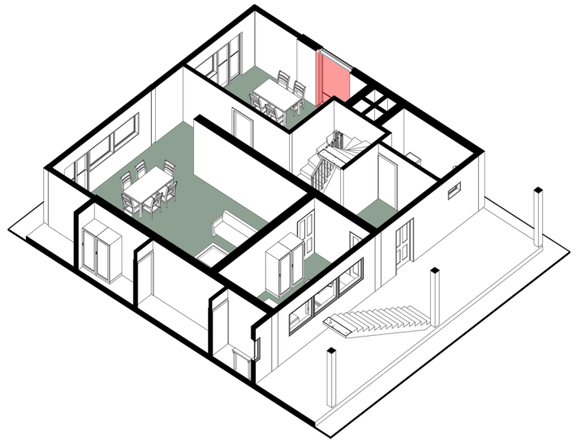


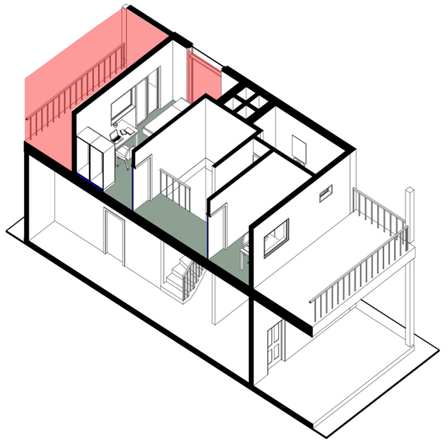








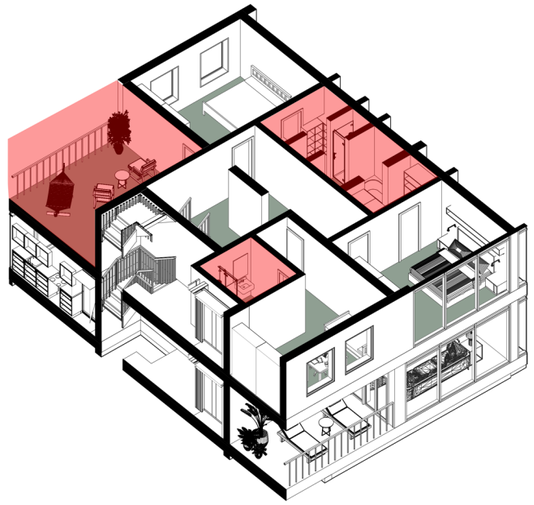


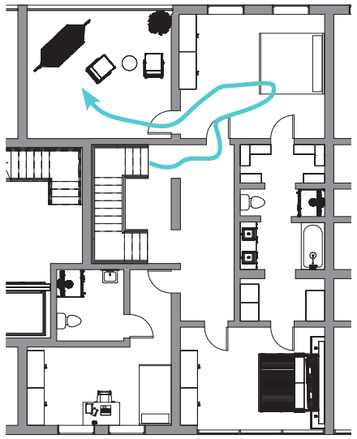


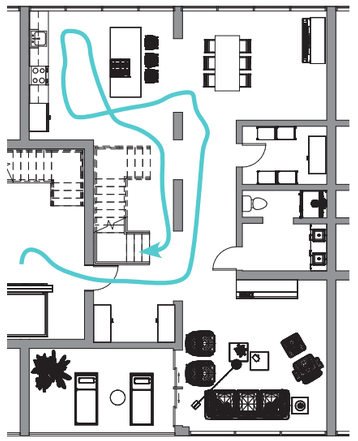


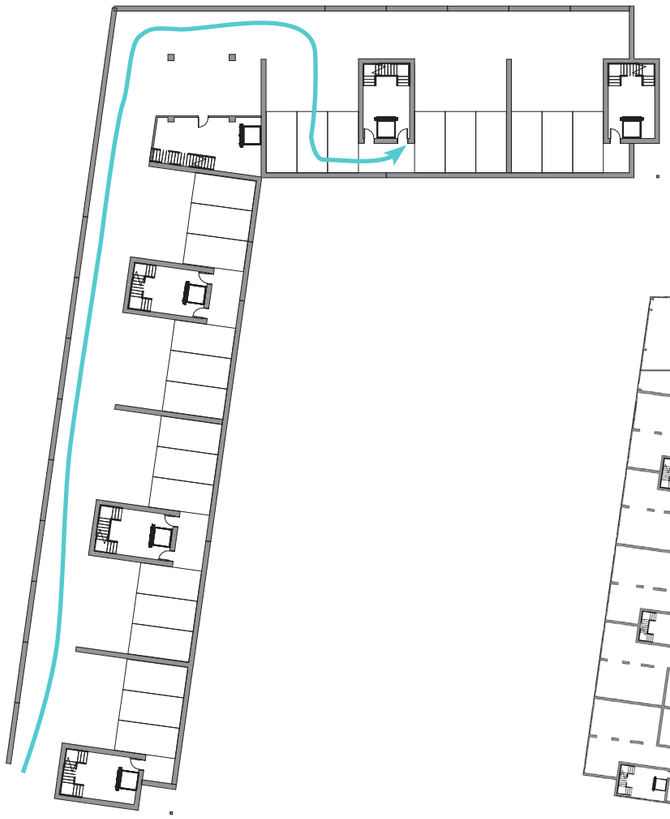


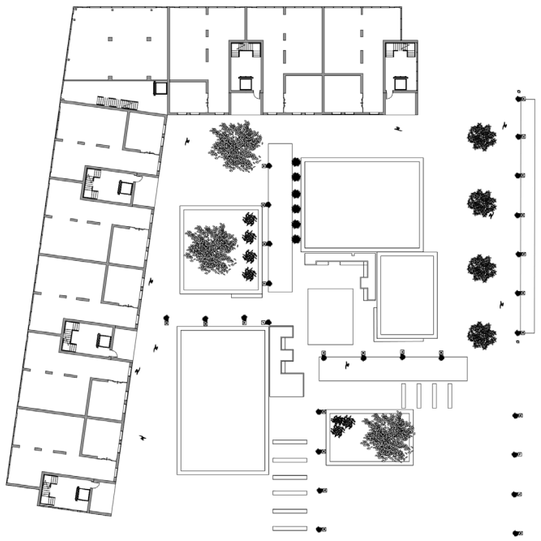
Name: Zoya
Gender: Female
Age: 30
Job: bank employee

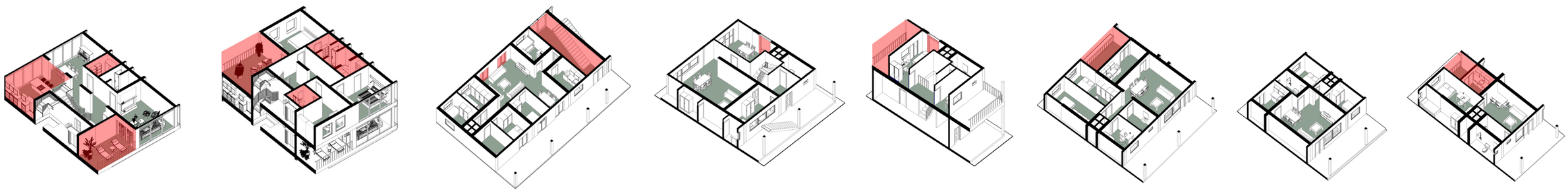












This drawing shows all the different dwellings and how they are designed to cater for different income-groups and their aspiration.

The dwelling for higher higher-income group has
1. A more private entrance to the dwelling: an elevator brings the dweller from the private garage to the dwelling. This elevator is only accessible by six households at the maximum. This households have also a private stair entering from the courtyard into the garage if in case the dweller is by foot and not by car. (These stairs can only be reached by a cey.)
2. The bedrooms have all an on-suite, and the bigger ones also have a walk-in closet.
3. The living area is connected to a spacious private outdoor area, facing the courtyard.
4. The kitchen has a spacious pantry and a kitchen island, which is connecting the dining area with the kitchen.
5. To draw the attention of the people living in these units to the communal areas and to encourage interaction with the other income groups, there is a sauna/ gym located in one of the perceived buildings in the communal area. This pool or gym is only accessible by members who pay the yearly contribution.
6. The materials of the facades of the dwellings are more expansive/ luxurious and give a wide few into the city >> Floor to ceiling windows. (Connects the dweller with the city.)

The dwellings for the middle-income group have
1. The dwellings with the porticos have a private entrance to the dwelling (the hallway is only used be a few households and the entrance is inside of the building).
2. The dwelling has bigger private outdoor areas (not as big as the ones for the higher income groups).
3. The dwellings have bigger windows which give a wider view to the dweller into the city. (Connects the dweller with the city.)

The dwellings for the low-income groups have
1. A kitchen which is bigger than usual and or a kitchen connected to a private balcony. (The balcony can be renovated into an extension of the kitchen, if there is no need for a private outdoor cooking area.)

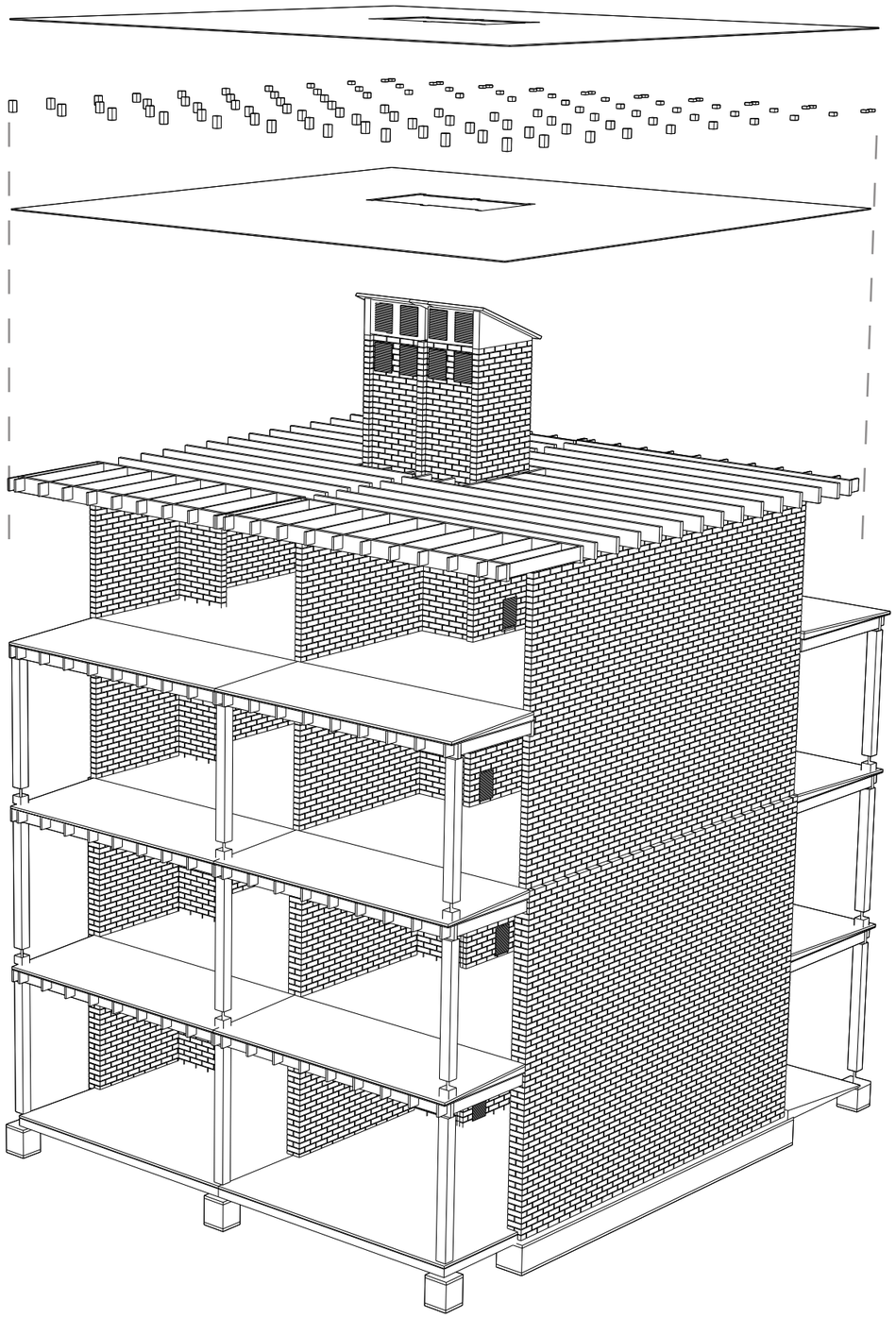
Building Technology

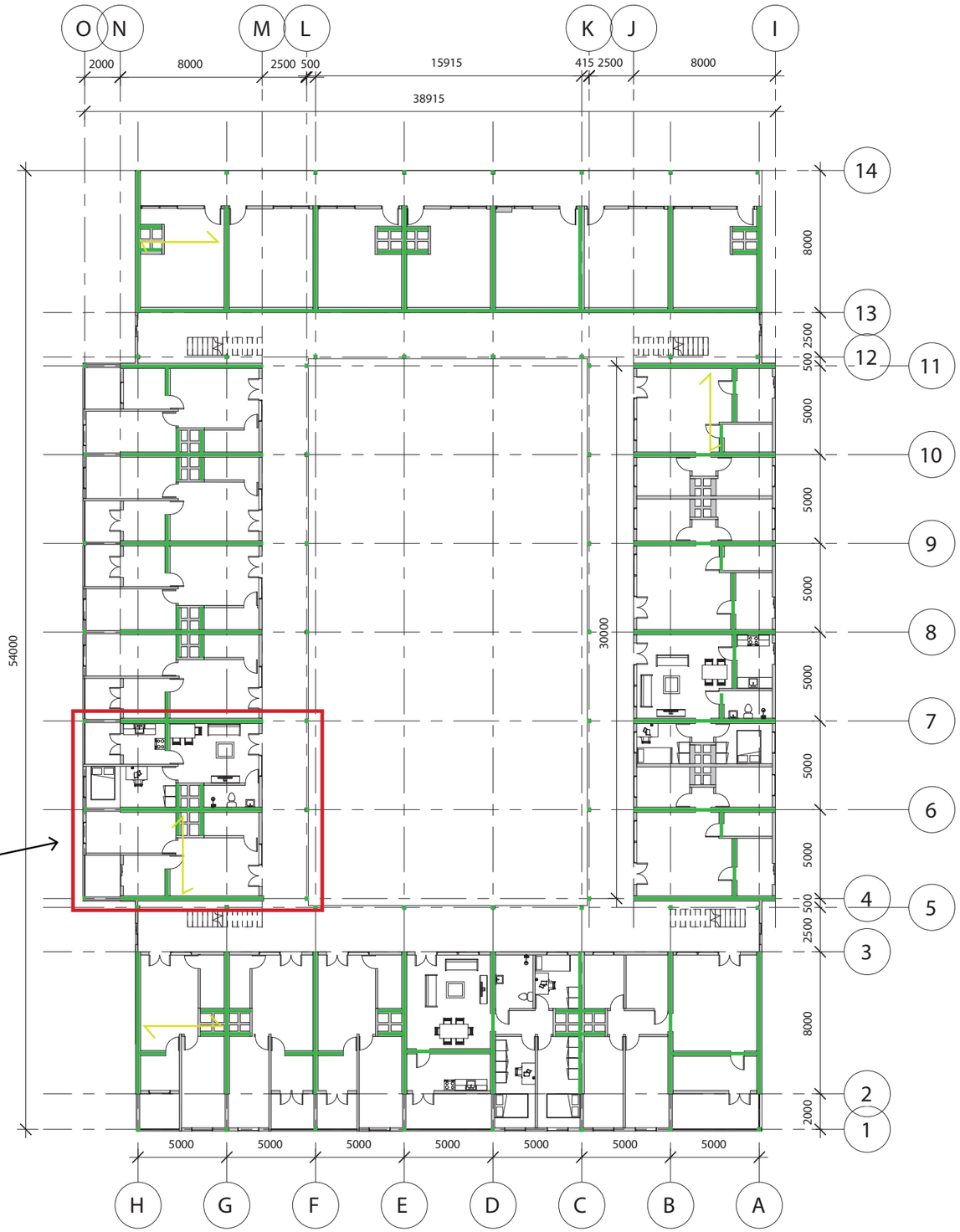
In the coming few pages the building technology part of the project is discussed. The building of the lower-income groups is detailed and chosen as the building of interest.



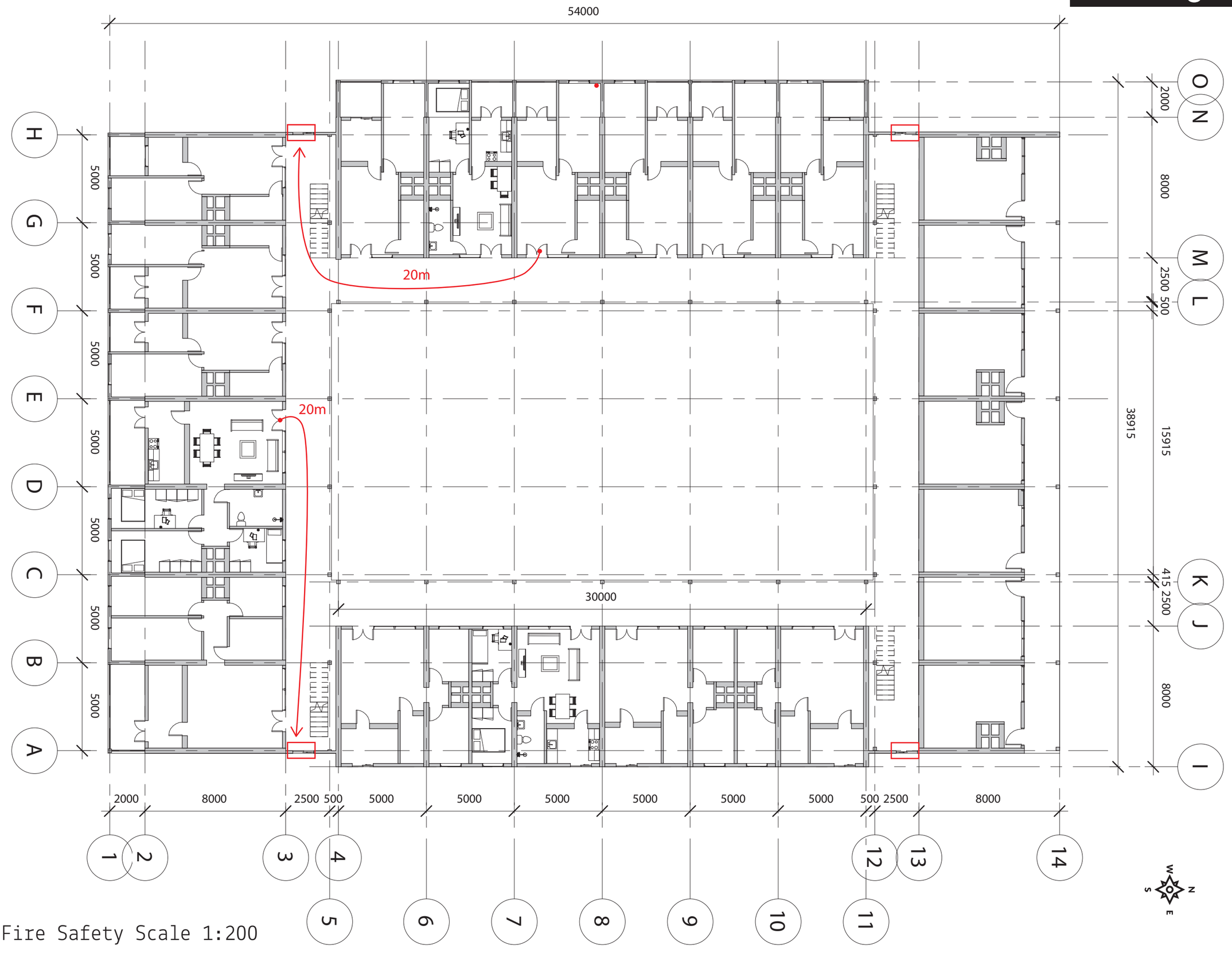


These floor plans show the grid according to which foundation is laid and on which the load bearing walls are to be found. The remittance of the horizontal and vertical forces is carried by these load bearing walls.



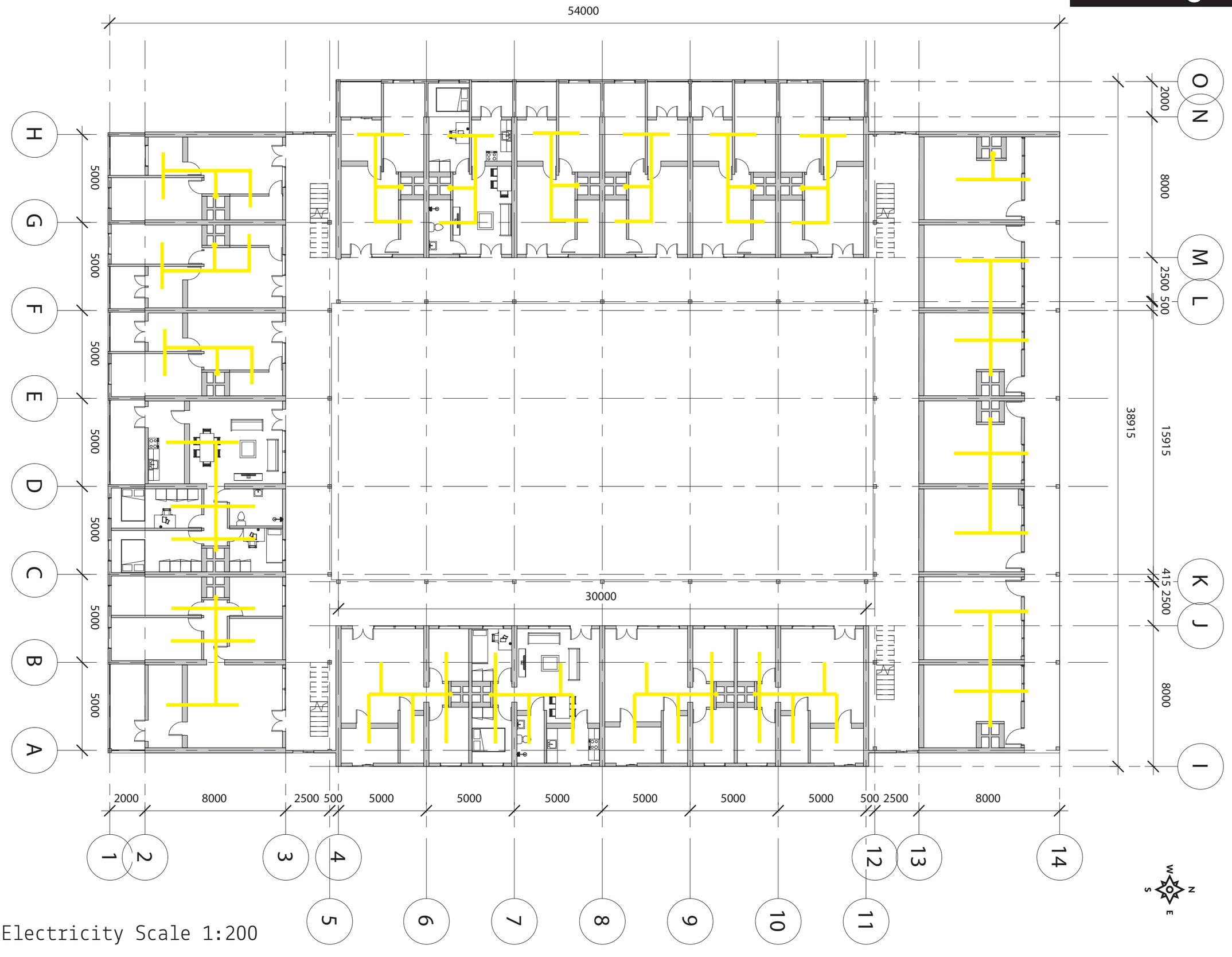


Load Bearing Structure



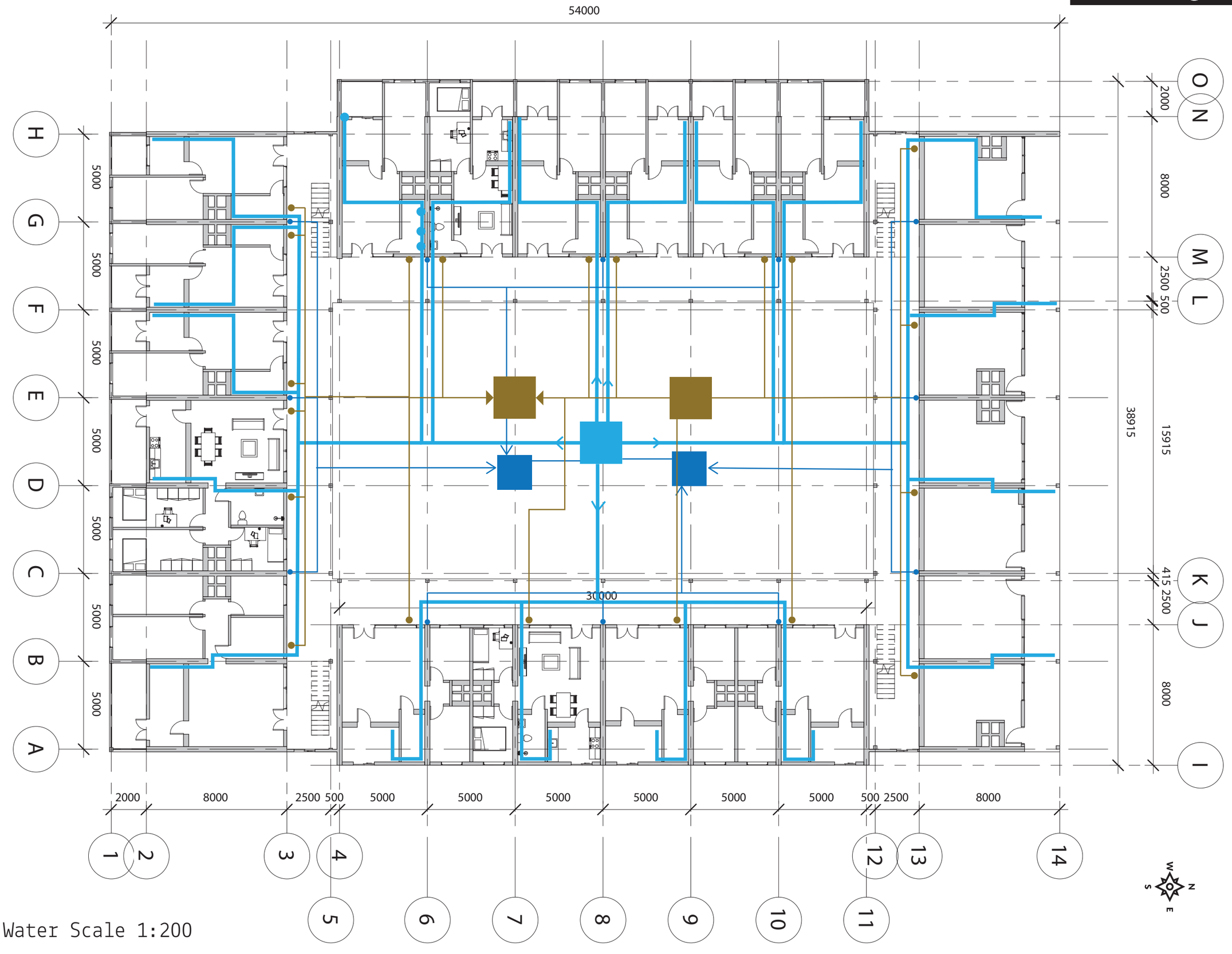
Fire Safety Scale 1:200

On this drawing the fires safety escape routes are shown. (This drawing explains why there are 4 stairs needed.)



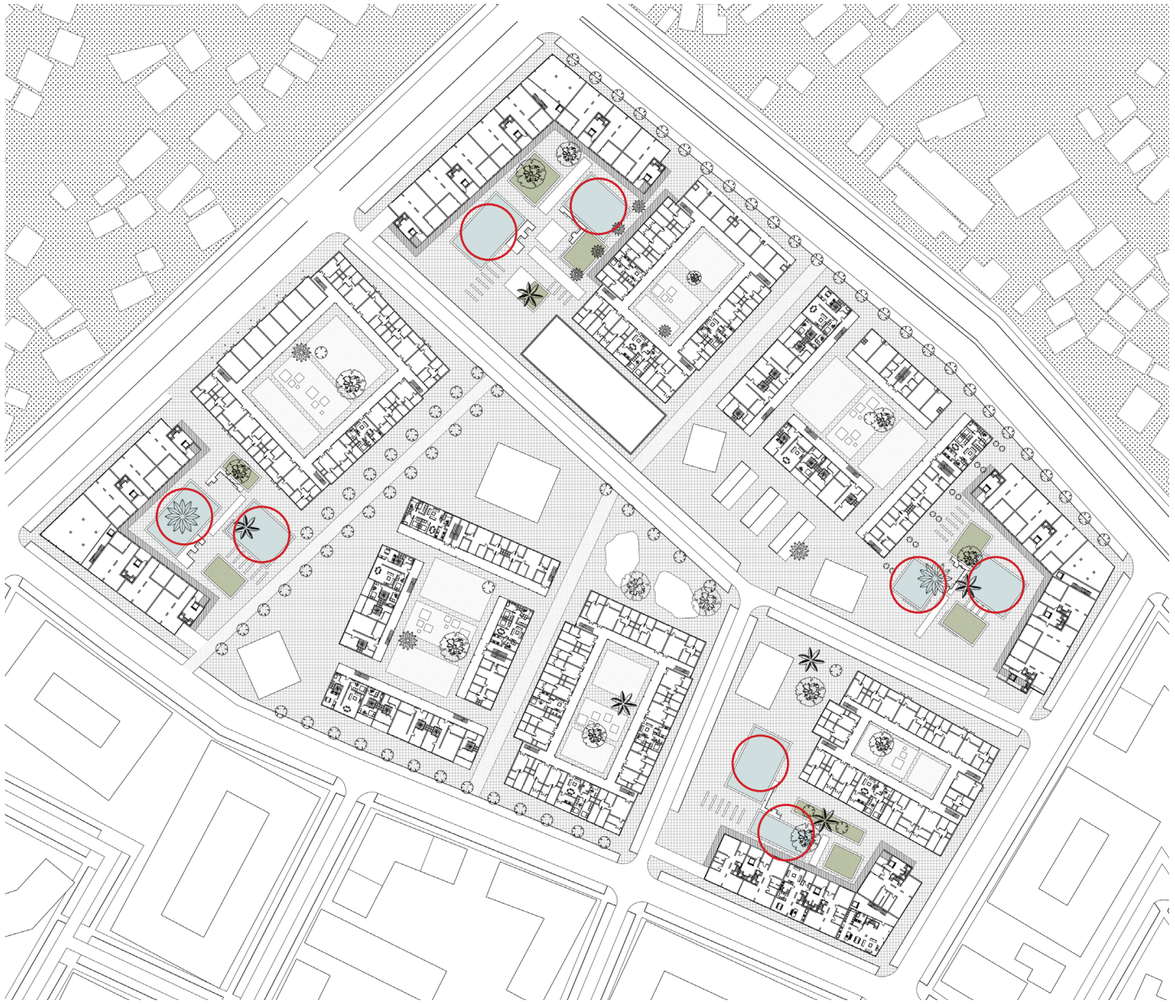
The yellow lines represent the electricity cables, which come from the solar cells on the roof. The excess of energy gained by the solar panels is given to the city net.

Electricity Scale 1:200

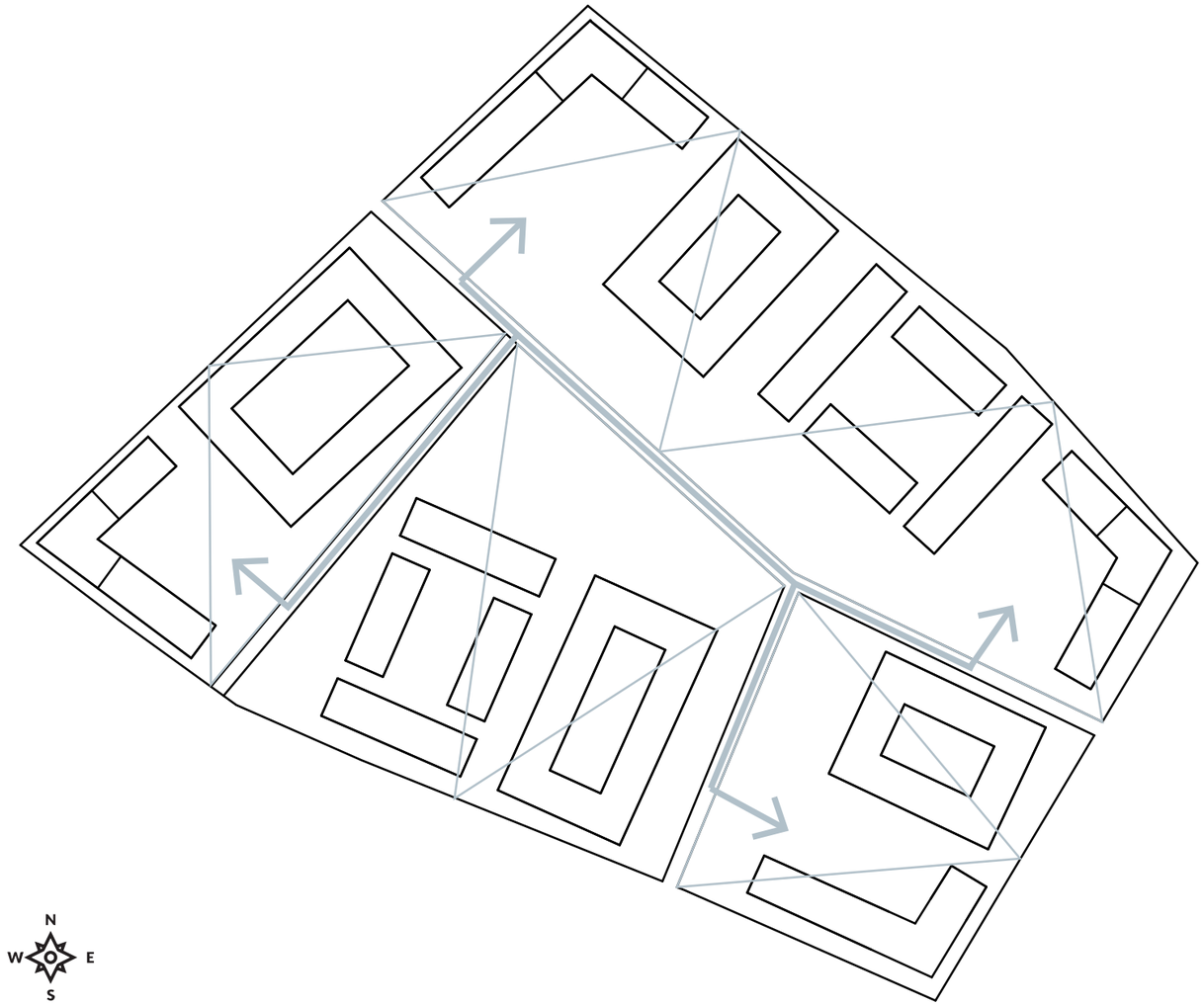


The light blue represents clean water supply by the municipality. The dark blue represents the rainwater which is collected and used to flush the toilets and to water the courtyard of the building. This water is first cleaned and then stored for future use and goes to the toilets via a similar route as the clean water. The waist water is regulated via a septic tank system and the tanks are stored in the courtyard.

Water Scale 1:200

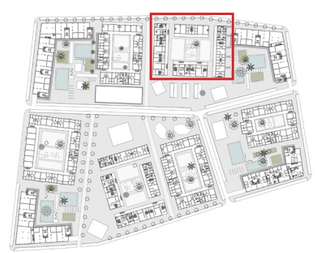


The water buffers shown in the red circles.



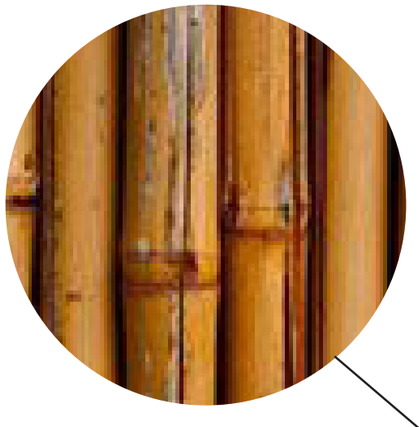
This drawing shows how the rainwater is collected and drained to the water buffers in the courtyards of the building for the high-income groups. The floor ground of the sector is design in such a way that it is steeped towards the roads. In the roads the water is collected and drained via an underground drainage system to the water buffers. (The inlet of the drainage system is on the sides of the roads.)

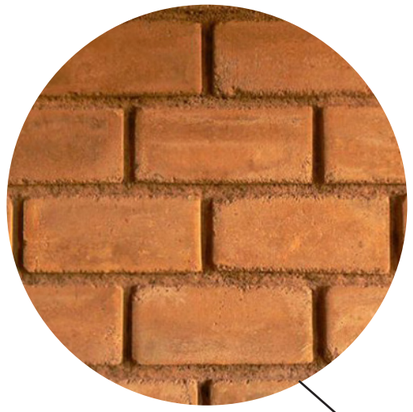


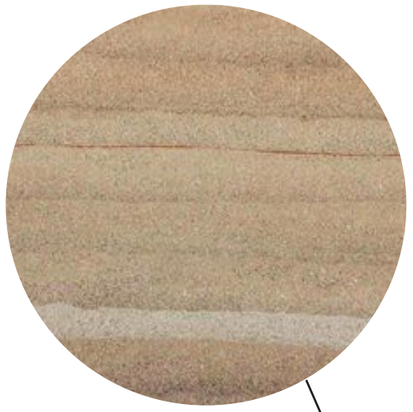


Load Bearing Structure Building 2

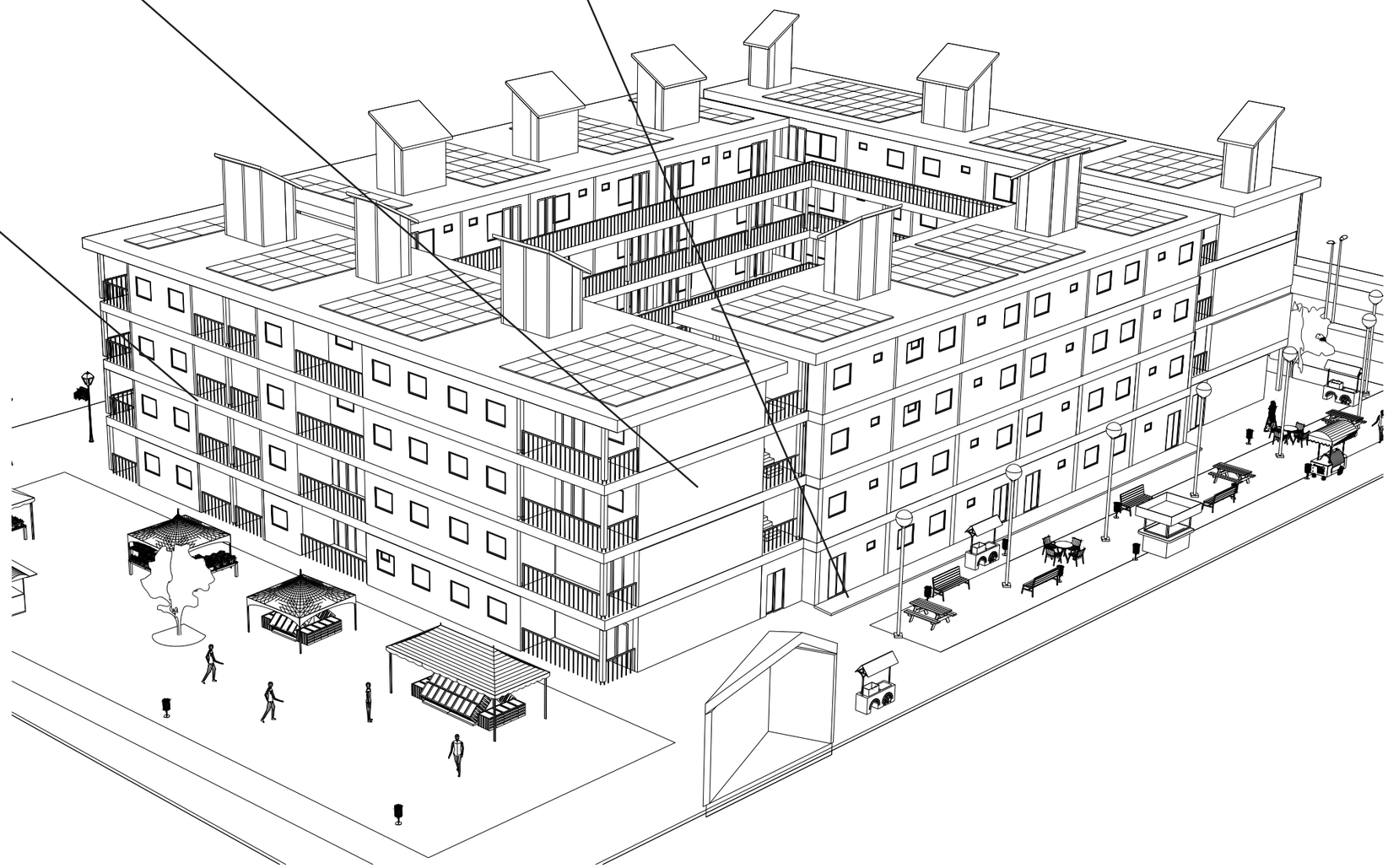

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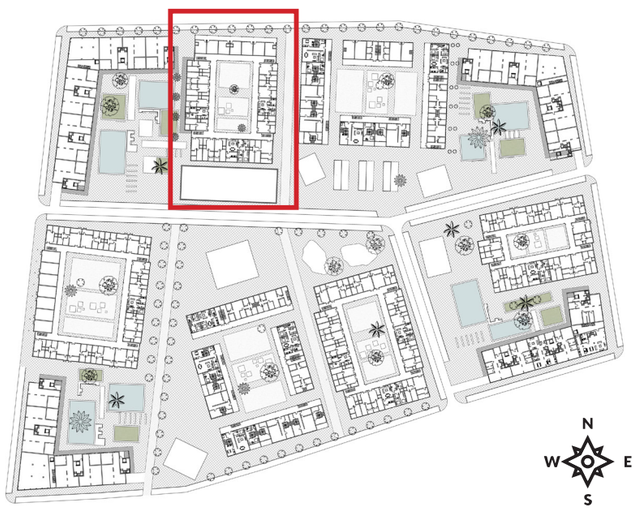






These are the main used materials in the building. The most important reason for the usage of these materials is because of locality of these materials, and because they are cheap and environmentally friendly.

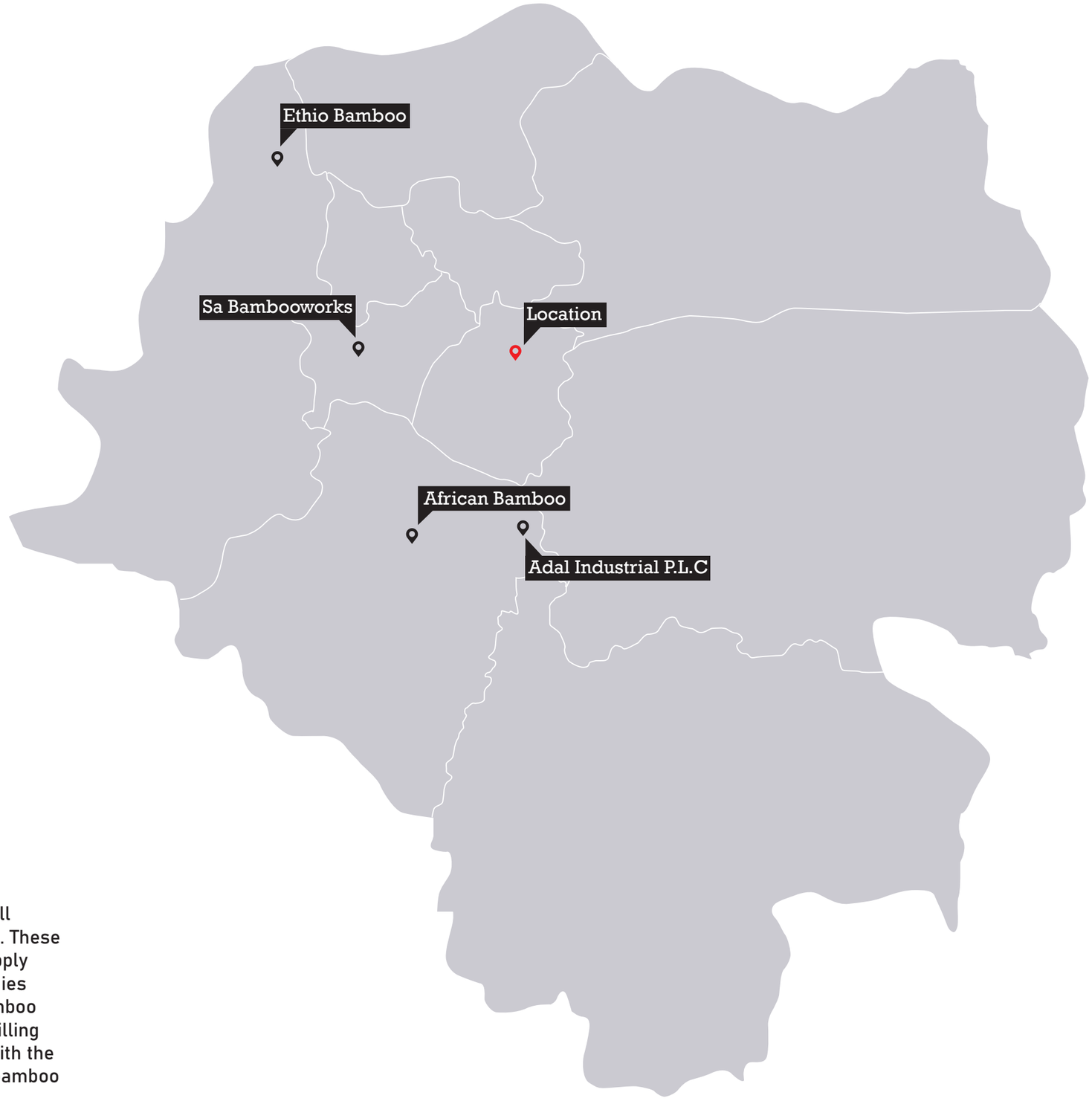




Three Main Materials

The bamboo type which is usable for making lumber/ timber is found in this area of Ethiopia and transported to Addis Ababa. Bamboo is a grass plant which grows very fast (within 5 years it is full grown and ready to be used) and it can easily be planted in the soil of Ethiopia. (Mulatu, Alemayehu & Tadesse, 2016)

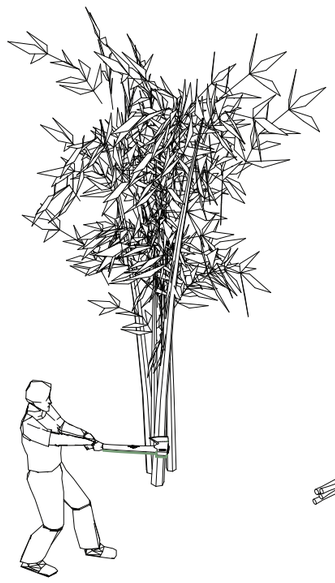


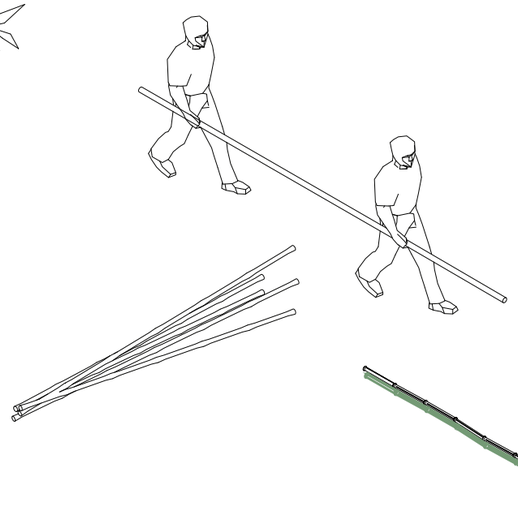


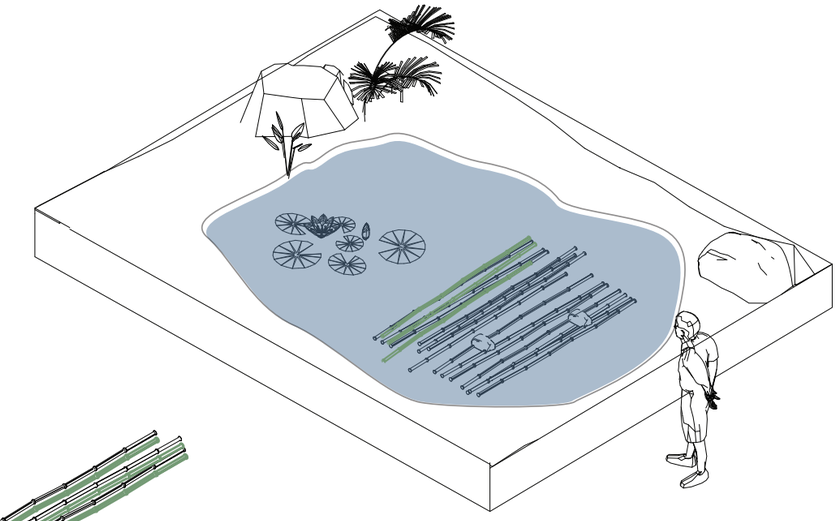
Once in Addis Ababa, these companies will make timber columns and beams out of it. These companies can be approached for the supply of bamboo timber/ lumber. These companies state on their website that they make bamboo lumber and timber and or that they are willing to cooperate to find solutions (together with the government) for the mass production of bamboo timber/ lumber.

Bamboo Suppliers in Addis Ababa

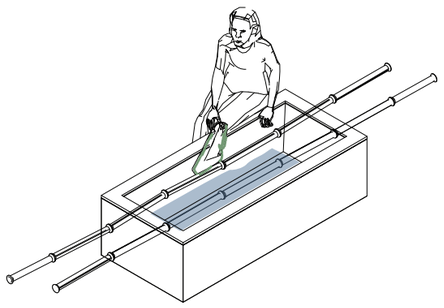


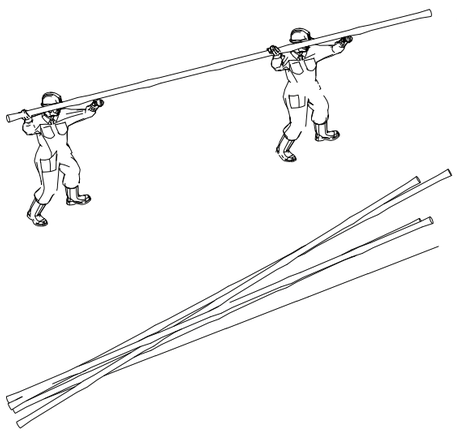


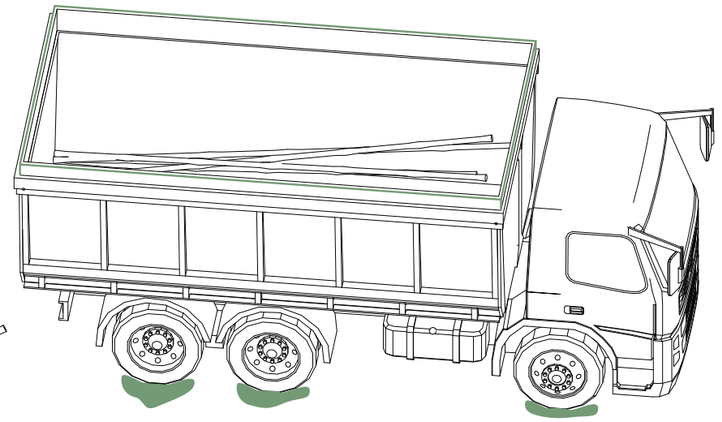


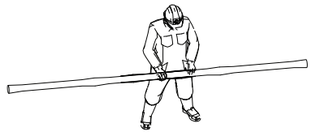


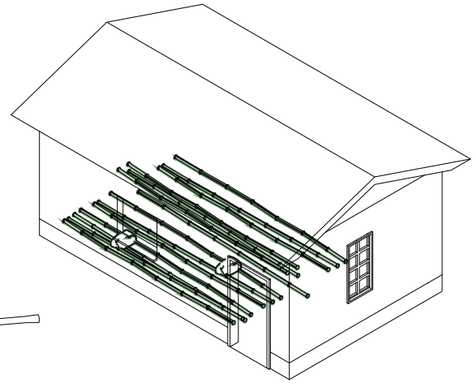
This drawing shows the production process of bamboo. The right bamboo is first selected, then cut and sorted (which both can be done by hand and by one single person since bamboo is light and easy to saw). After that the bamboo is welled to kill small animals and insects on or in the bamboo. Then the bamboo is rinsed with slaked lime to increase the lifespan of the bamboo (Bamboo Treatment and Preservation, n.d.). Finally, it is transported to Addis Ababa and stored in the warehouses of the afore mentioned companies.



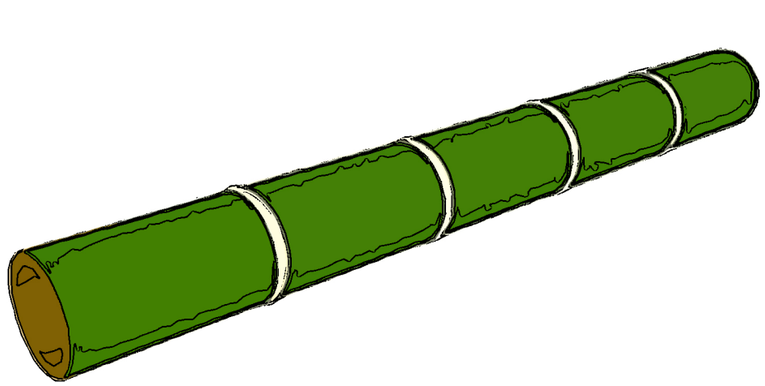


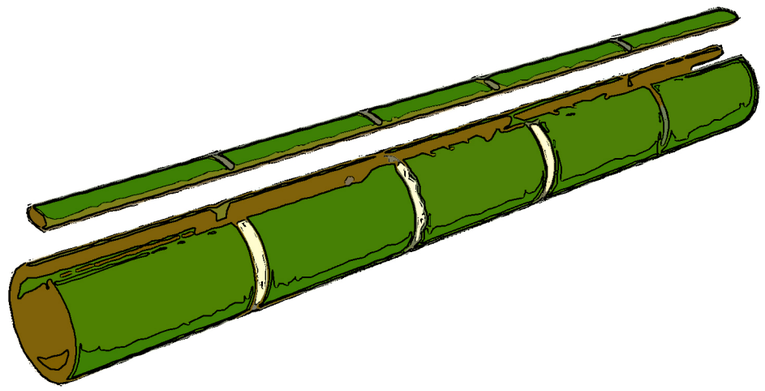


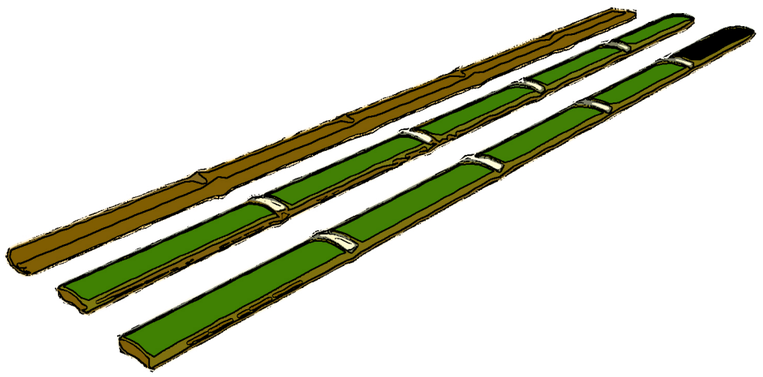


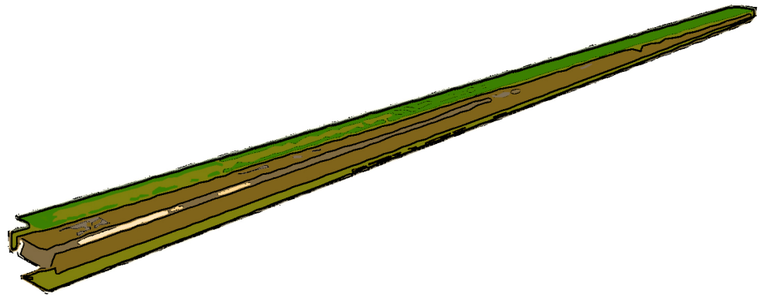


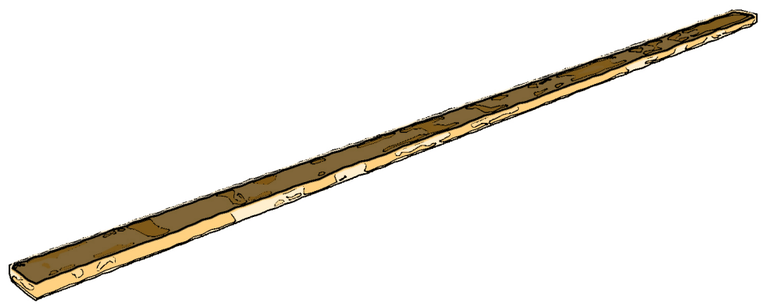
This image shows how a bamboo is turned into a timber/ lumber column/ beam.

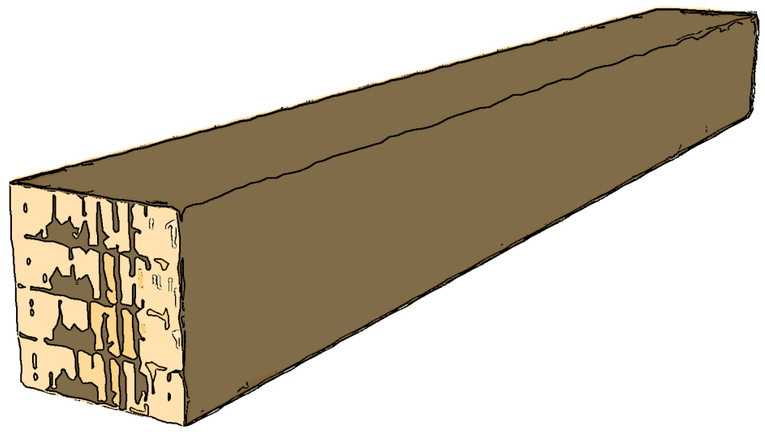


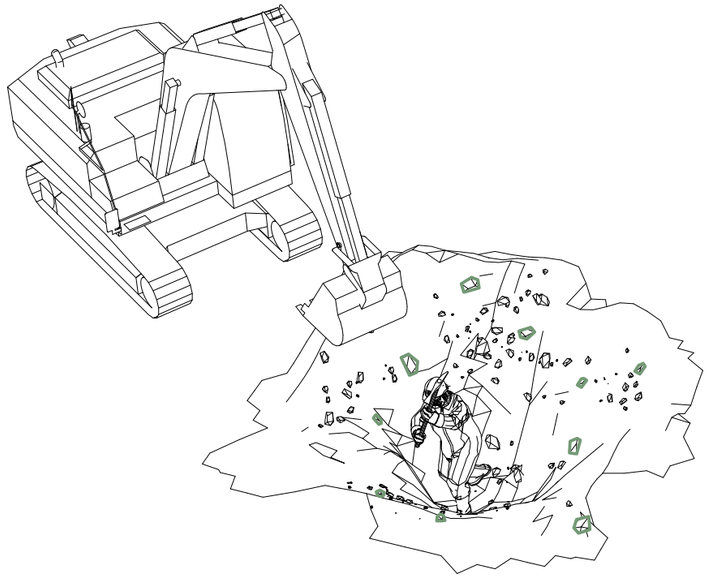




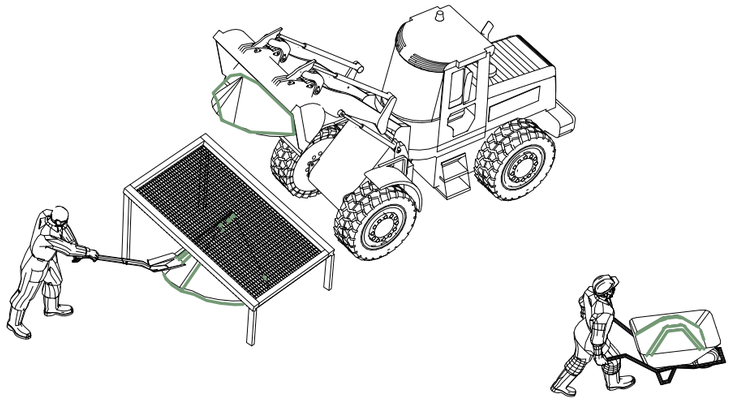




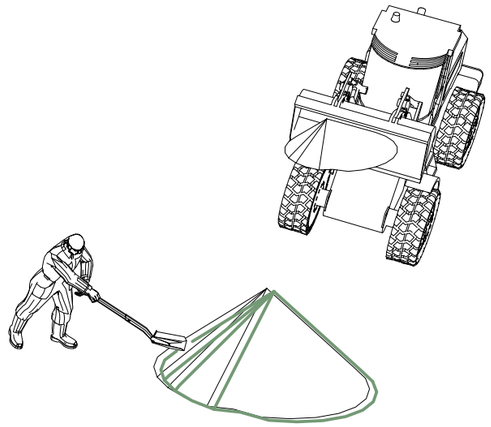




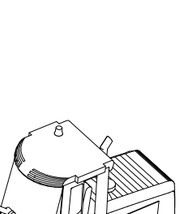
This image shows how CEB is made. First the soil which is dug out for the garage of the building of the higher income groups are collected. If there is not enough soil the it is brought to the site from elsewhere. (Soil companies.)



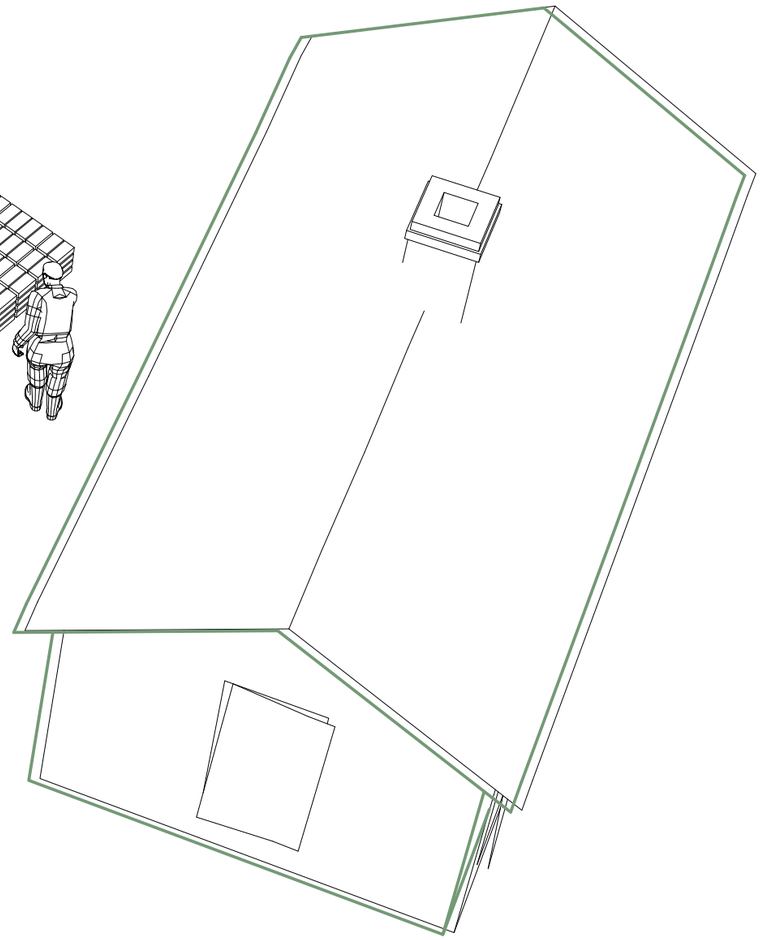
The soil is sieved.

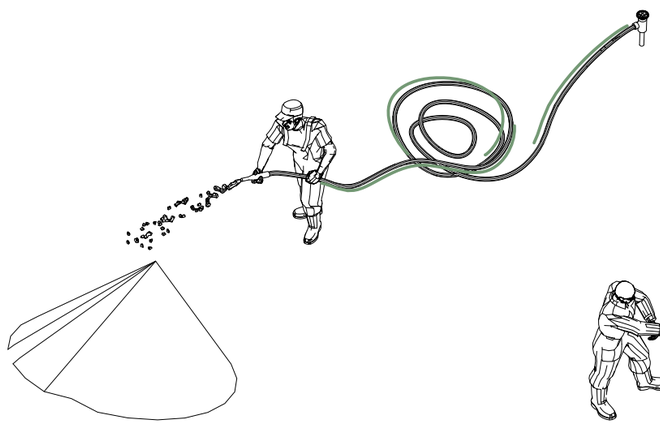


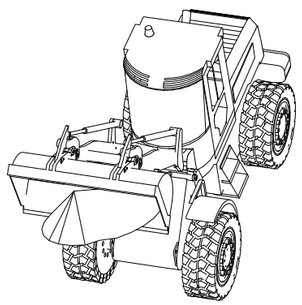
Then it is mixed with 5 to 10% Portland cement.

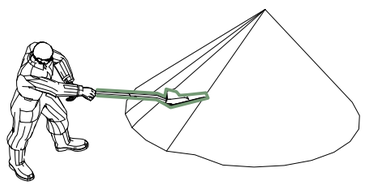


The soil is compressed.









Then the mixture is weted and mixed again by either a shovel or a machine.

Stored wet and out of the sun in the old buildings which will later function as community buildings.



As shown in this drawing the process of CEB making can easily be done by only human labor. For my managerial aspect this is desirable because this increases employment. (The drawing is made by me and the information on this page is from YouTube: Thinking Outside The Grid. (2018, March 23). How to make compressed earth blocks (CEB) [Video]. YouTube. https://www.youtube.com/watch?v=iV5btBPssxM)

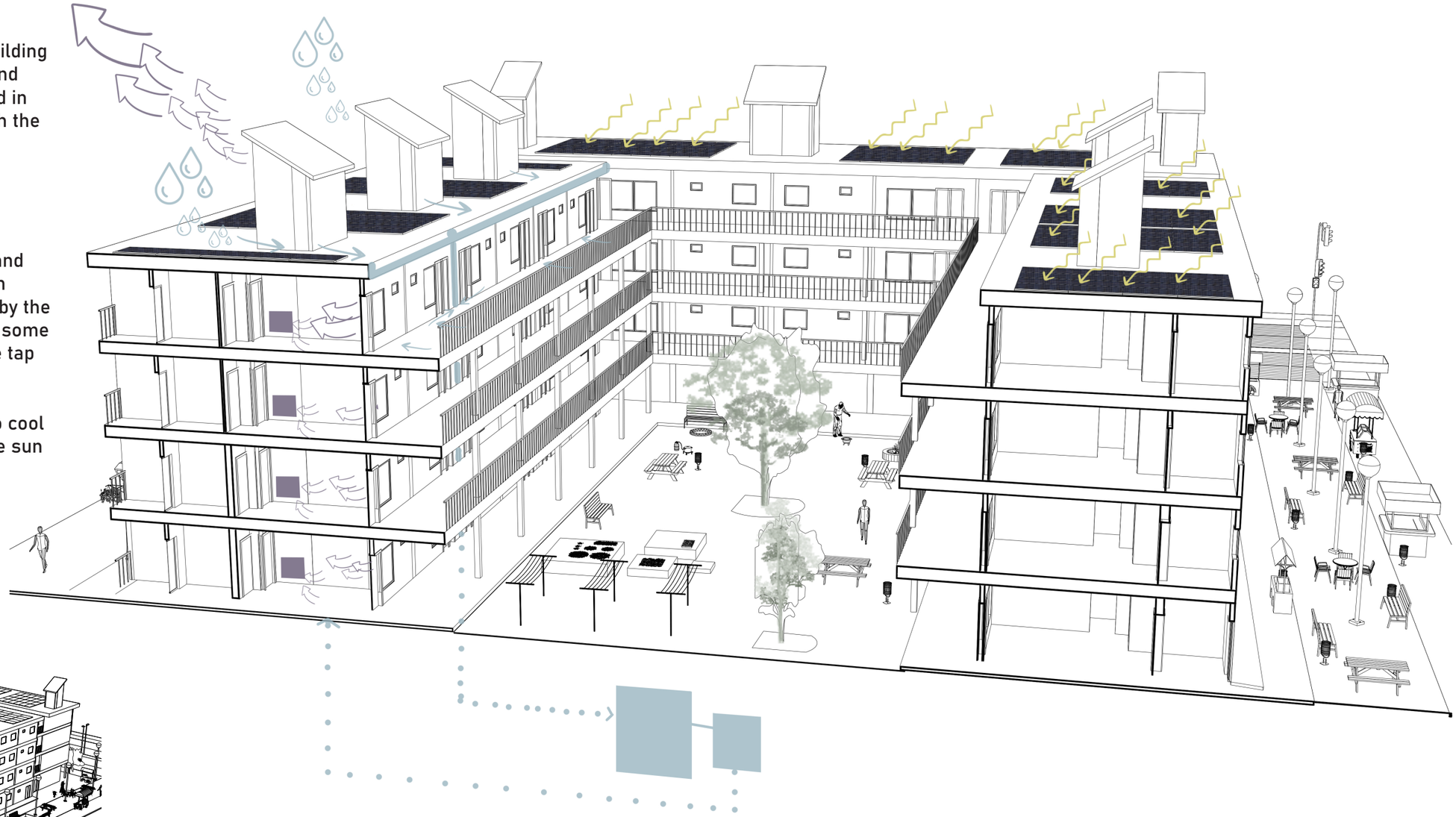
This drawing shows the courtyard of building 1. The courtyard is designed to be used as an extension of the dwellings, where people can wash and dry their cloths, where people can cook food for sale or for own consumption and where people can dry their seeds for sale or for own consumption.

This page shows the climate concept of the building for the lower income group. This building is naturally ventilated via a solar chimney and by windows in the dwelling which are placed in such a way the wind can easily pass through the dwelling.

As mentioned earlier the building has solar panels on top of the roof for electricity.

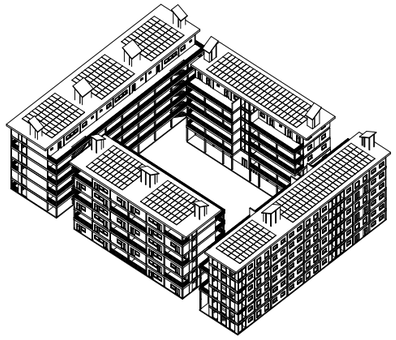
The rainwater is collected, filtered, stored, and used to flush the toilets and water the green areas of the building. Al of this is regulated by the homeowner's association which consists of some of the dwellers who live in the building. (The tap water is from the city.)

Green areas around the building are used to cool down the temperature inside by blocking the sun and evaporation.



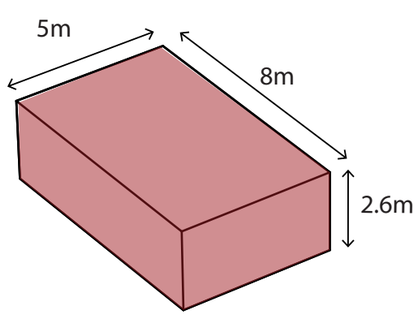


Climate Concept

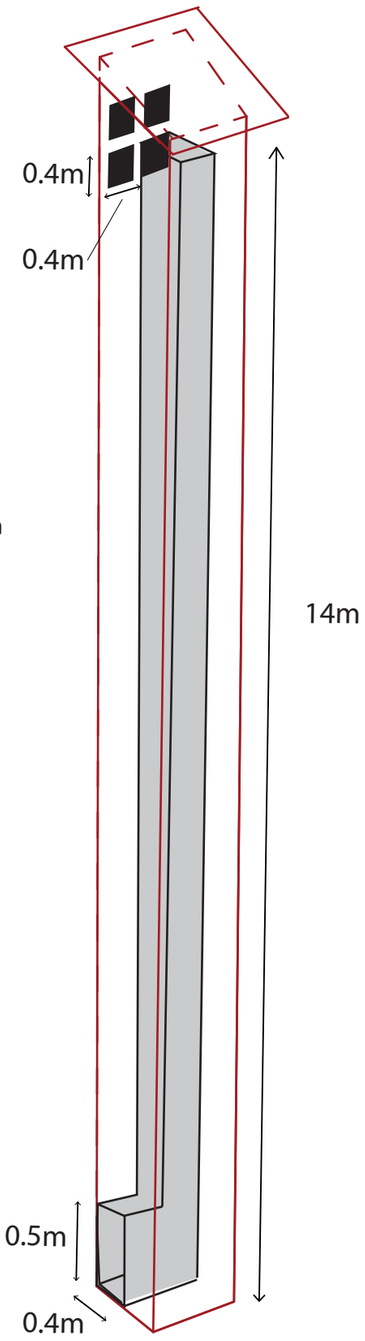


This drawing shows the courtyard of building 1. The courtyard is designed to be used as an extension of the dwellings, where people can wash and dry their cloths, where people can cook food for sale or for own consumption and where people can dry their seeds for sale or for own consumption.

Cross Section 3D of Building 2



5x8x2.6=104m³



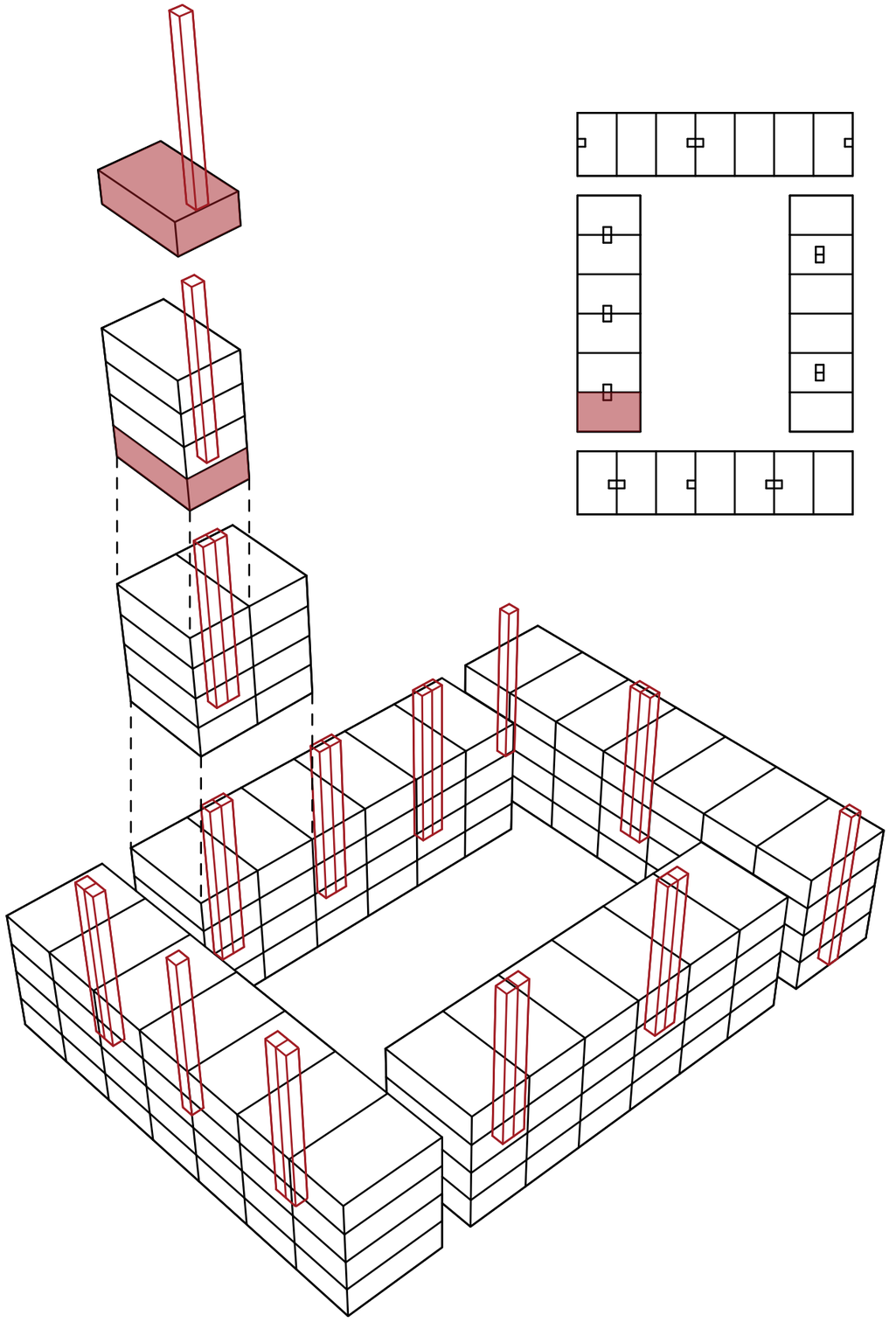
0.4x0.4x14=2.24m³

These drawings show once again the solar chimney. The calculation for ventilation is shown on this page and the next page.

For the amount of fresh air needed I used Dutch standards, which are set by the Dutch Government: 25m3 fresh air per hour per person

On average a household in Addis Ababa consists of 5 persons (Hoddinott & Mekasha, 2020).

This means that there is 25m3x5= 125m3 per hour needed.



Gravitational constant	g	9,8	-	
Height difference	h	2,6	m	
Atmospheric pressure at groun	P_0	100000	Pa	
Gas constant of air	R	287	J/kgK	
Outside temperature	T_0	20	°C	
Temperature in solar chimney	T_1	21	°C	
Pressure difference	**ΔP**	**0,10**	**Pa**	$\Delta P(h) = \frac{ghP_0}{R}\left(\frac{1}{T_0} - \frac{1}{T_1}\right)$
Discharge coefficient	C_d	0,8	-	
Inlet opening size	A	0,2	m^2	
Density of air	ρ	1,2	kg/m^3	
Airflow rate	**Q**	**337,6**	**m^3/h**	$Q = C_d A_{eff}\sqrt{\frac{2\Delta P}{\rho}}$
Room volume	V	104	m^3	
Air change rate per hour	**vv**	**3**	**x / h**	

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	22°C	23°C	23°C	23°C	23°C	22°C	19°C	19°C	20°C	22°C	22°C	22°C
Temp.	16°C	17°C	18°C	18°C	18°C	17°C	15°C	15°C	16°C	16°C	16°C	15°C
Low	10°C	11°C	12°C	13°C	13°C	12°C	12°C	12°C	12°C	11°C	9°C	9°C

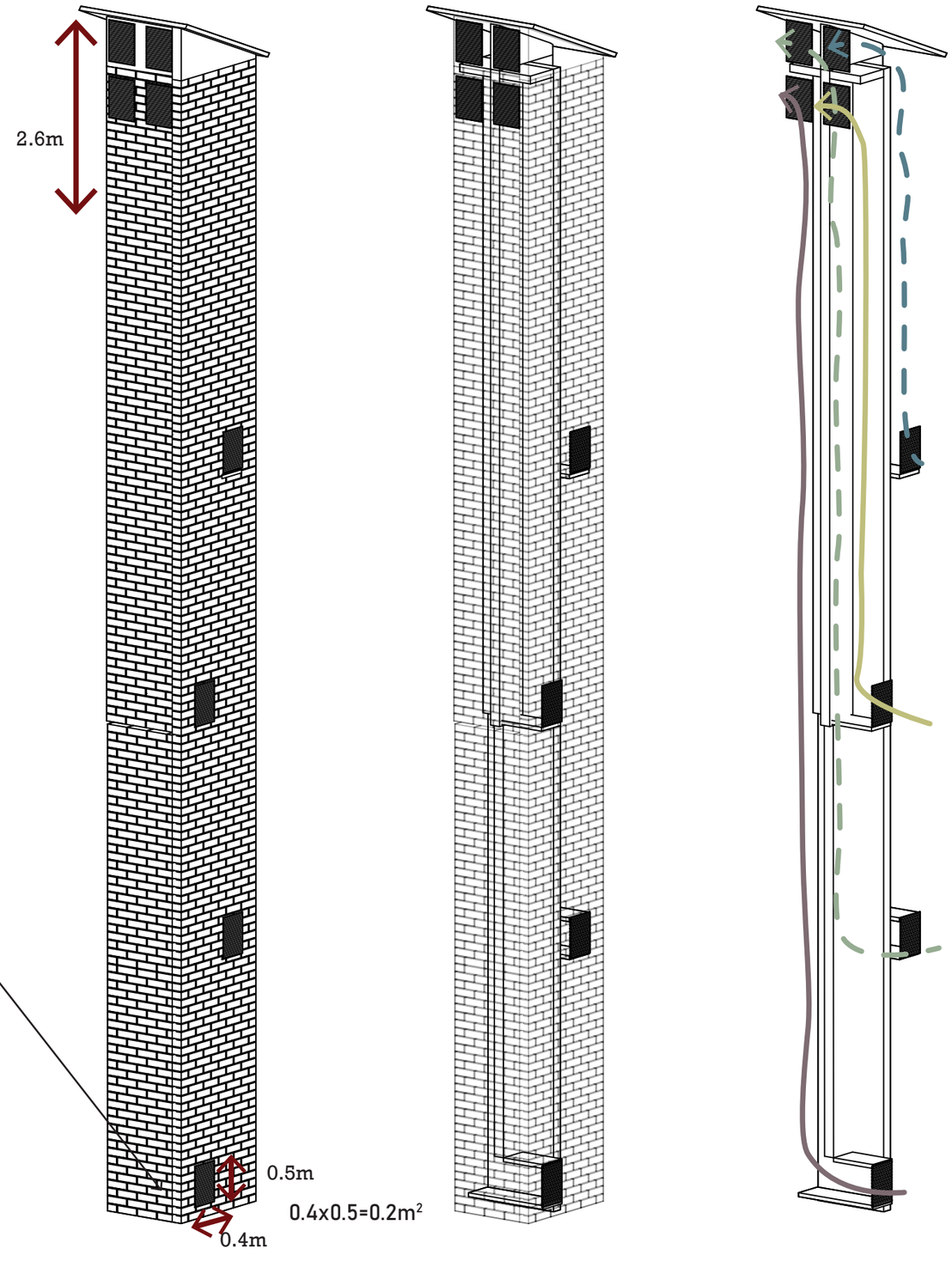
Source: https://weatherspark.com/y/100668/Average-Weather-in-Addis-Ababa-Ethiopia-Year-Round#Sections-Temperature

These are the final calculations (this excel sheet is made by an old TU Delft student named Jesse Bakker who presented this excel sheet during a MSc 2 course called EXTREME-Covid-19 Treatment Center DRC in 2020). The drawing next to it and the text below explains where the numbers in this excel sheet come from.

For the temperature outside this table is used. This table shows the average temperature in Addis Ababa (Weatherspark, n.d.) Throughout the day the solar chimney gets heated by the sun and based on this table the average temperature throughout the day is ≈22 °C.

For the temperature inside this number is used: 20. On average the temperature inside is 20 °C (Vaillant Group, n.d.).

The conclusion is that according to the calculations on the excel sheet the measurement of the solar chimney is enough for minimal ventilation: 1755,6 m3/h>125m3per hour.



This page shows a calculation of the gain of the solar cells to show why the use of solar cells is very much desirable.

On average a household (in the Netherlands) uses 3000 kWh on a yearly basis (Van der Wilt, 2021). One solar panel has on average the following measurements 1m x 1.65m and on average a yield of one panel is 370 Wp (Van der Wilt, 2021). On average 90% of the maximum capacity of one panel is yielded. So, this means, on average the yield of one solar panel is 370Wpx90%= 333kWh (Van der Wilt, 2021).

My building has 72 units, so 72 households.

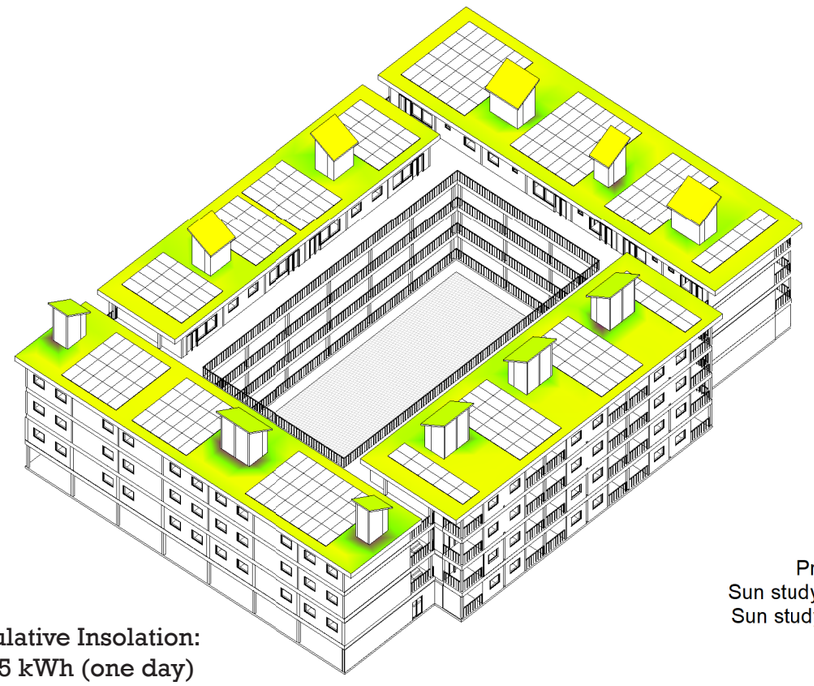
The total amount of kWh needed is:
72x3000= 216 000 kWh.

The total amount of panels needed is:
216 000 kWh/ 333 kWh ≈ 649 panels.

The total amount of area needed on the roof is:
649 panels x (1m x 1.65m) ≈ 1071 m2.

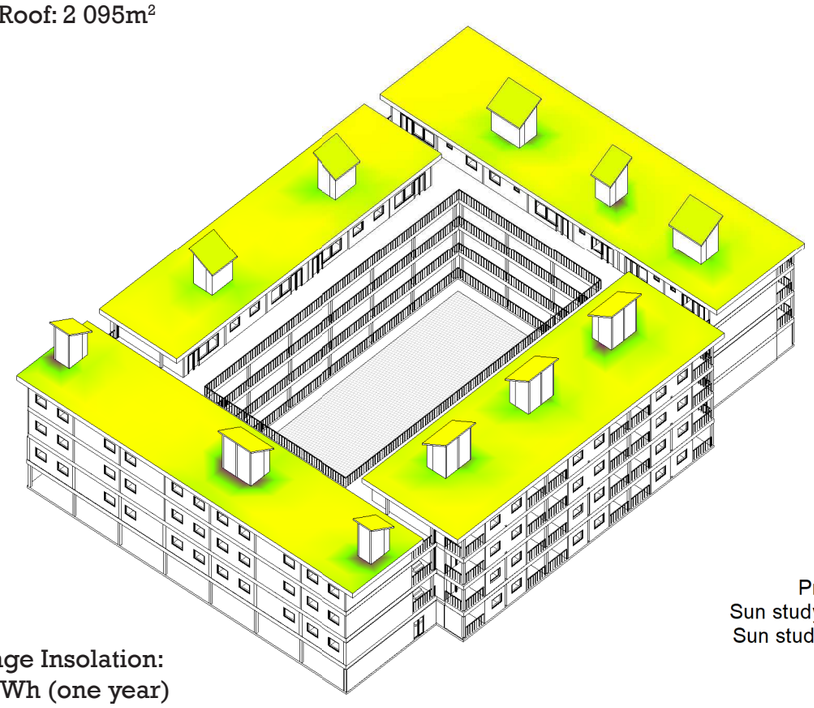
The available roof area on my building is 2096m2. (See image on the right.)

Area Roof: 2 095m²



Cumulative Insolation:
11 925 kWh (one day)
5,69 kWh/m² (one day)

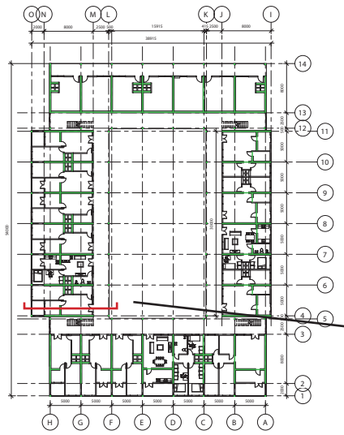
Area Roof: 2 095m²

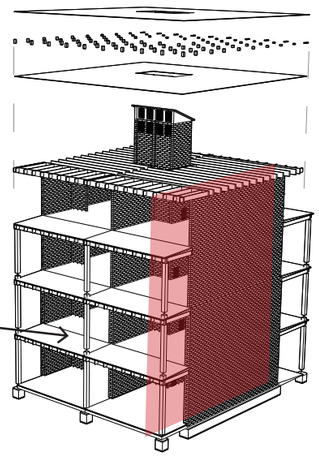


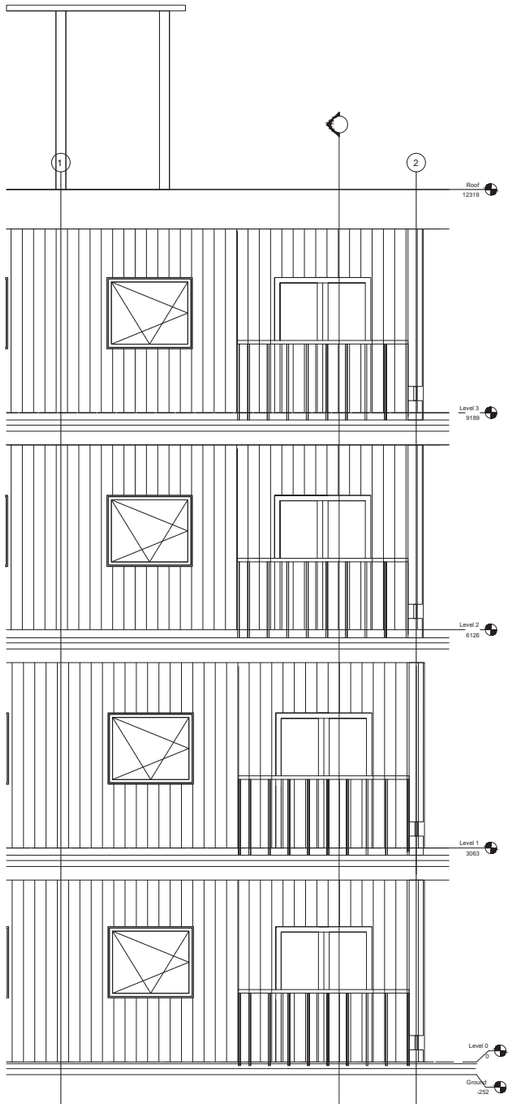
Average Insolation:
956 KWh (one year)
0,46 kWh/m² (one year)

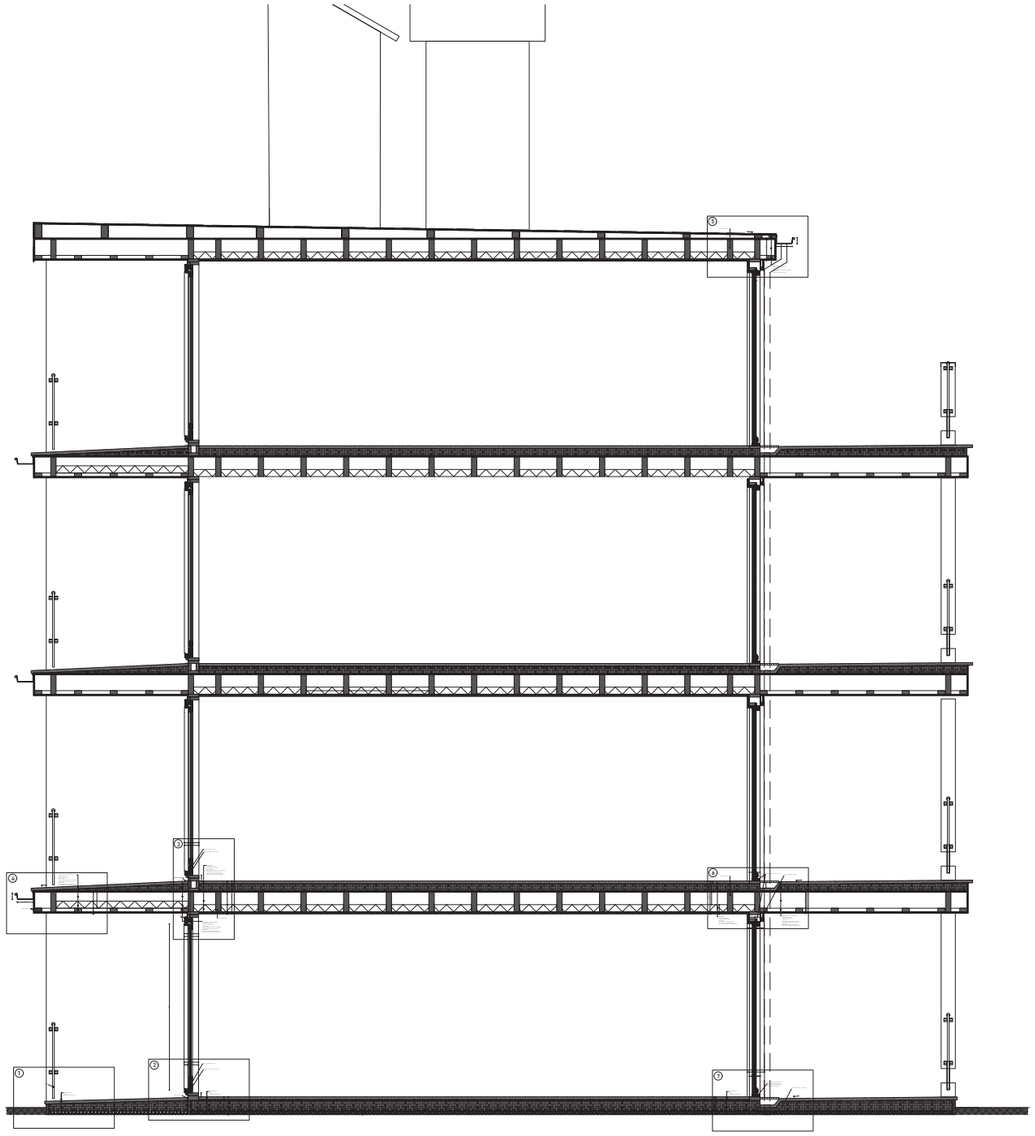
Technical details. On this page a fragment of the West façade is shown. (This fragment is the same as the part of the building for which the solar chimney is calculated.) In the cross section some connections of the building are highlighted and numbered. In the pages to come these details will be presented one by one.

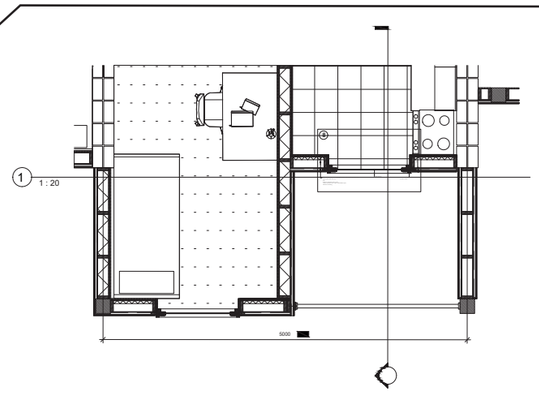


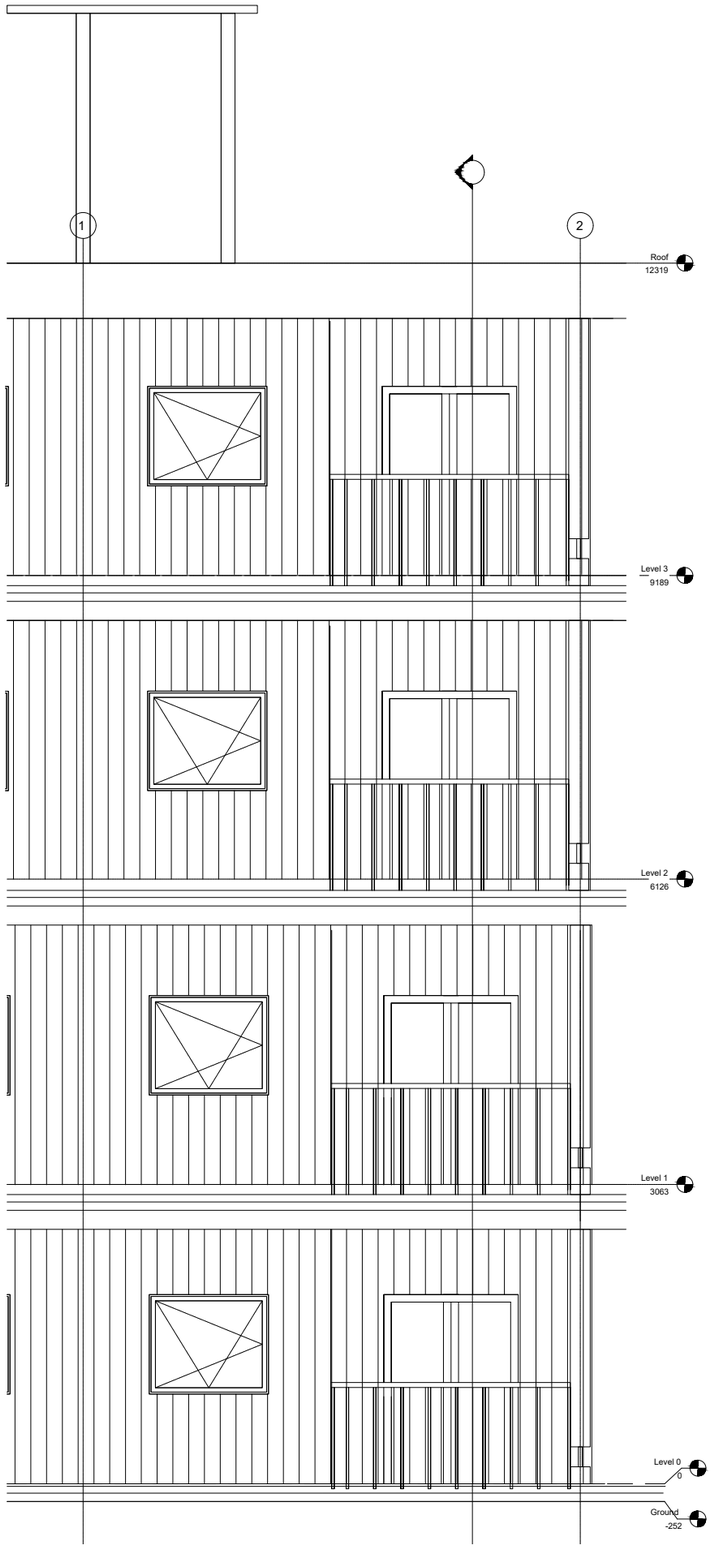


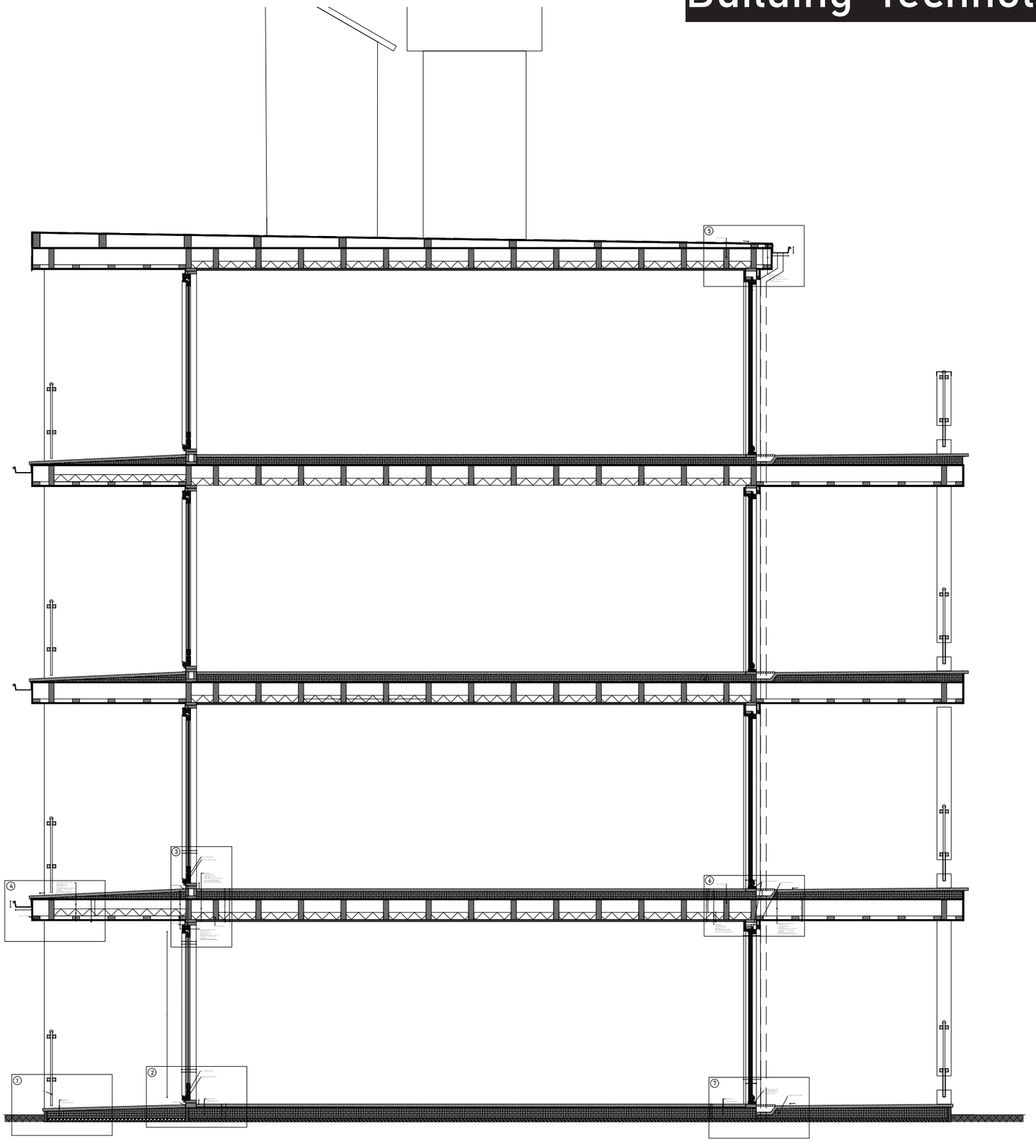




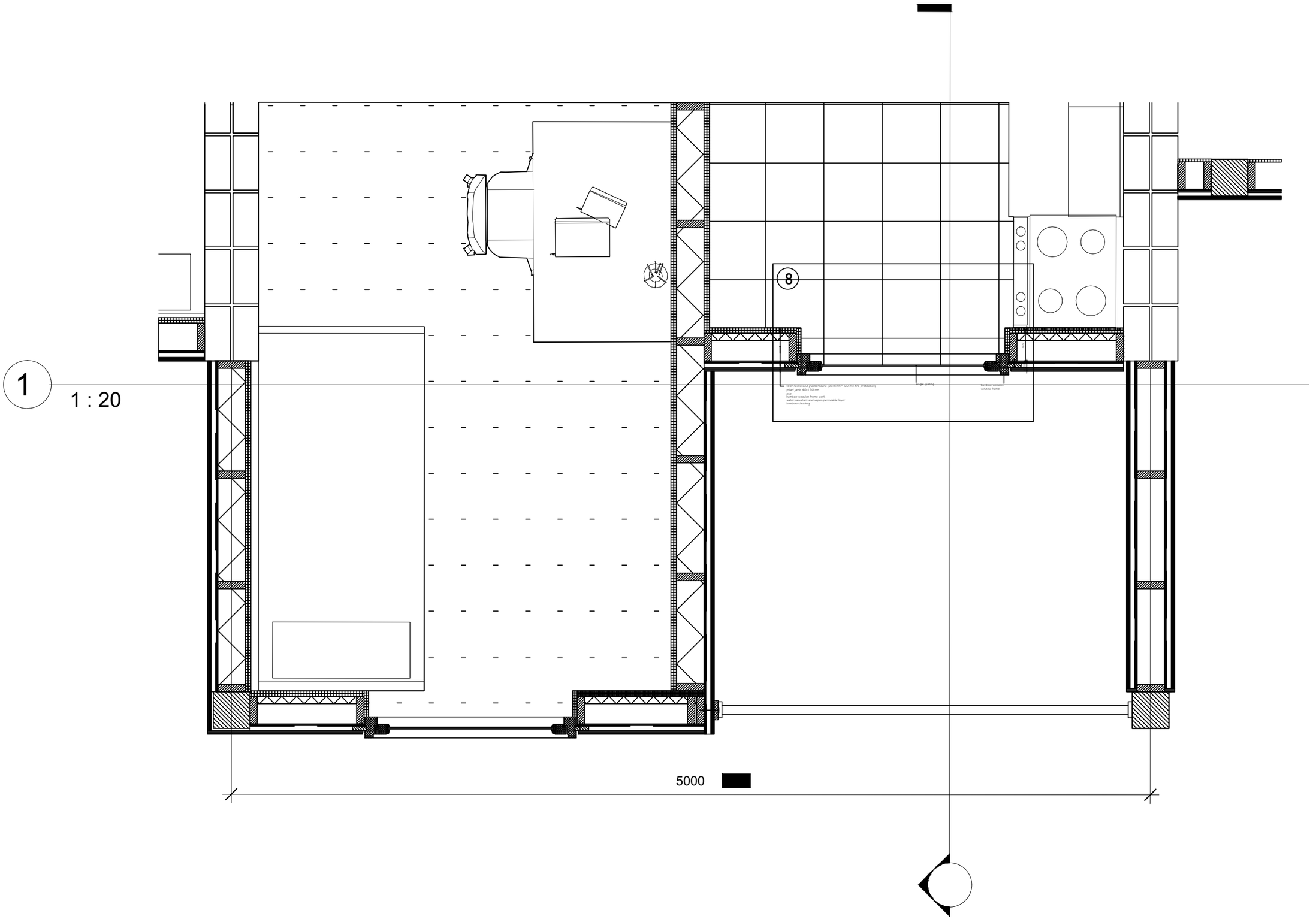





1
2
Roof
12319
Level 3
9189
Level 2
6126
Level 1
3063
Level 0
0
Ground
-252


5
3
4
6
1
2
7

Fragment

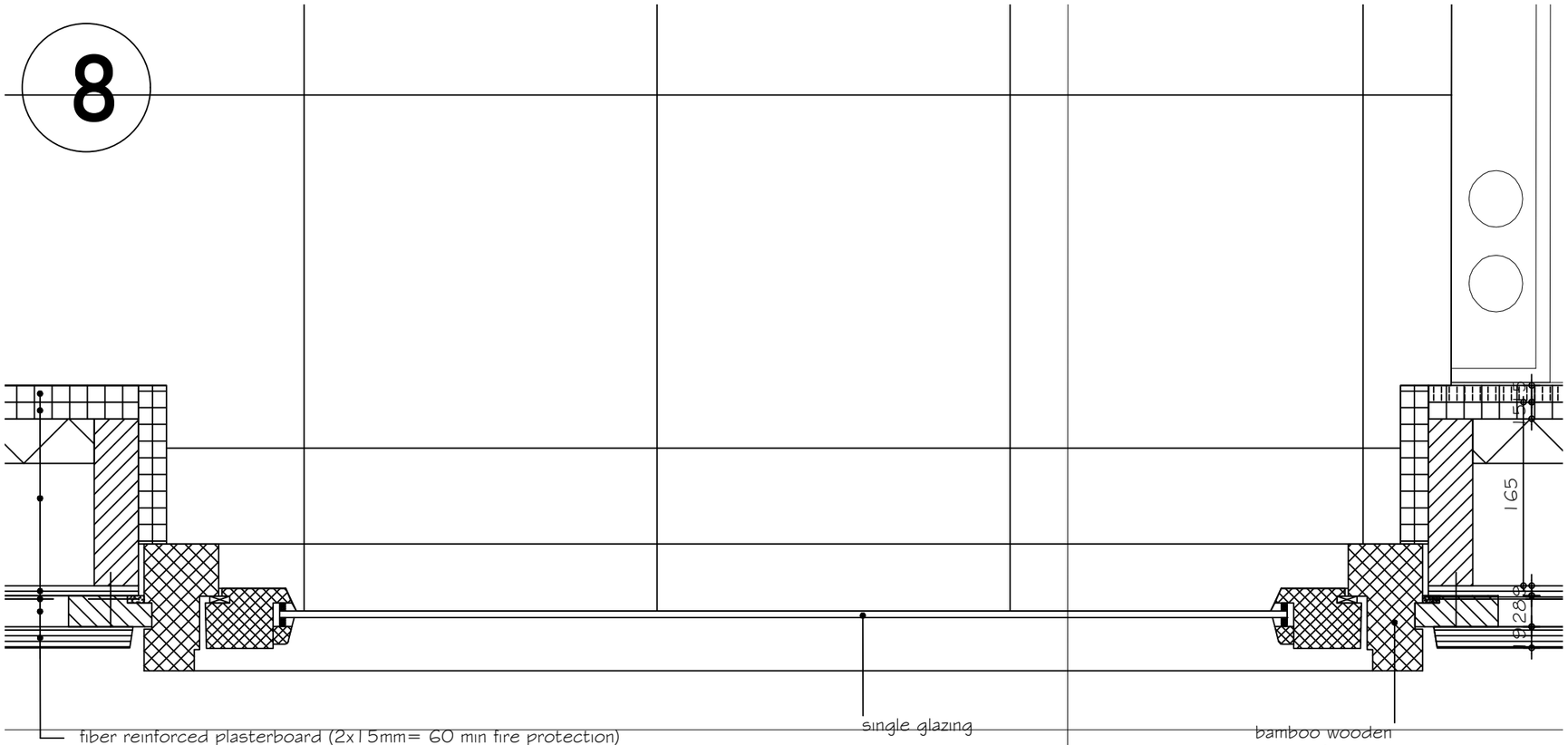


1

1 : 20

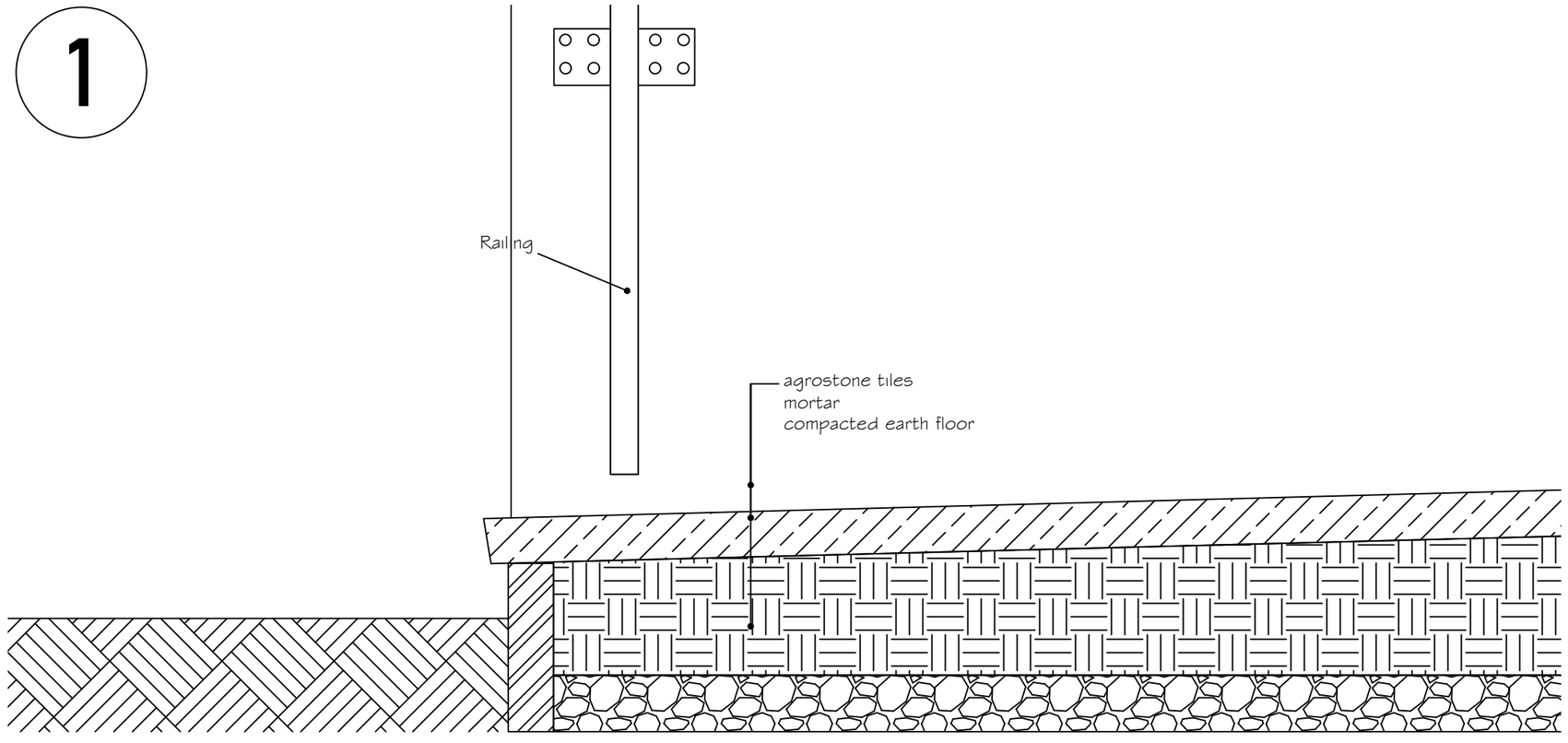
Fragment Scale 1:20

8



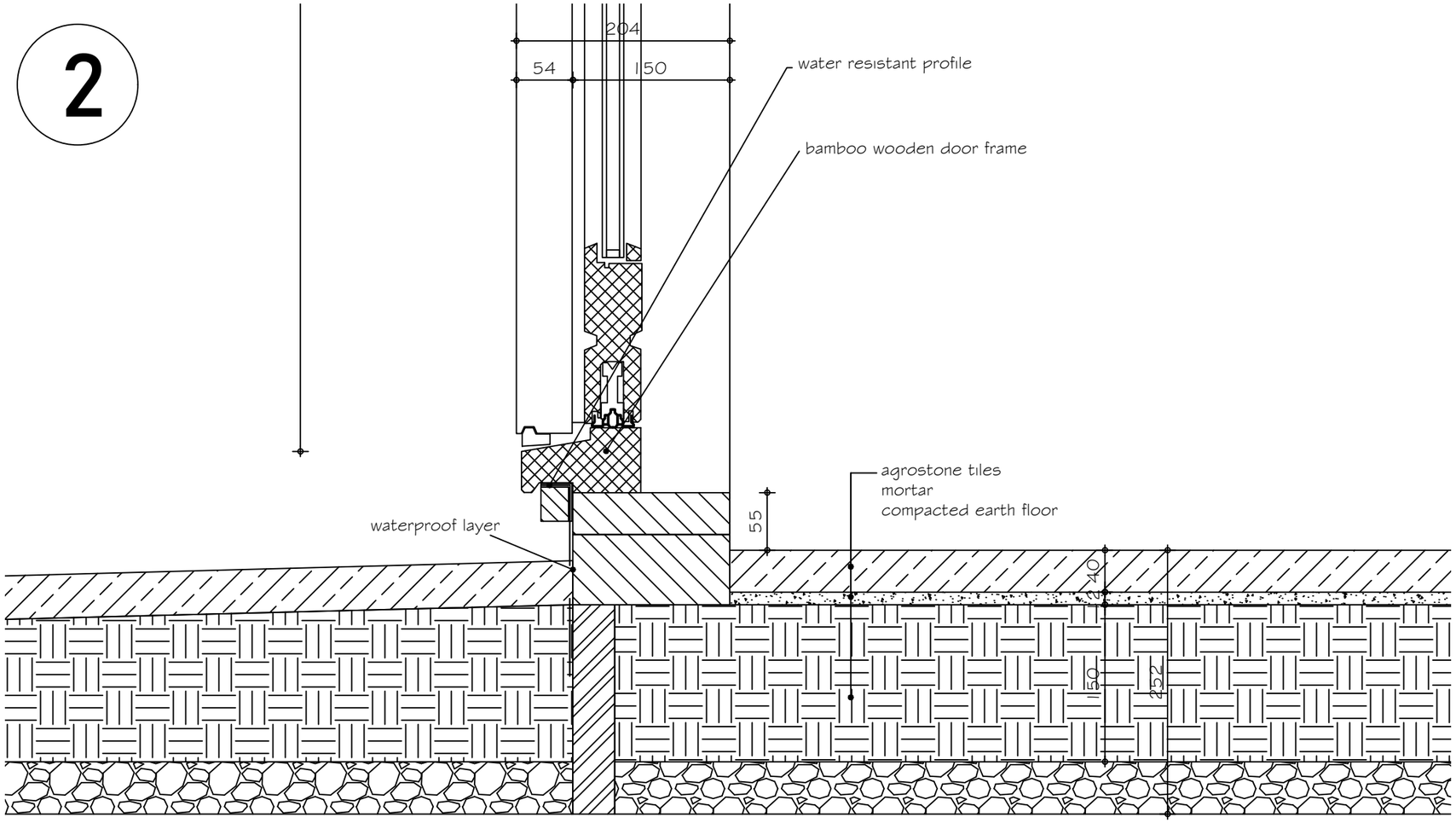
Detail 8 Scale 1:5

1



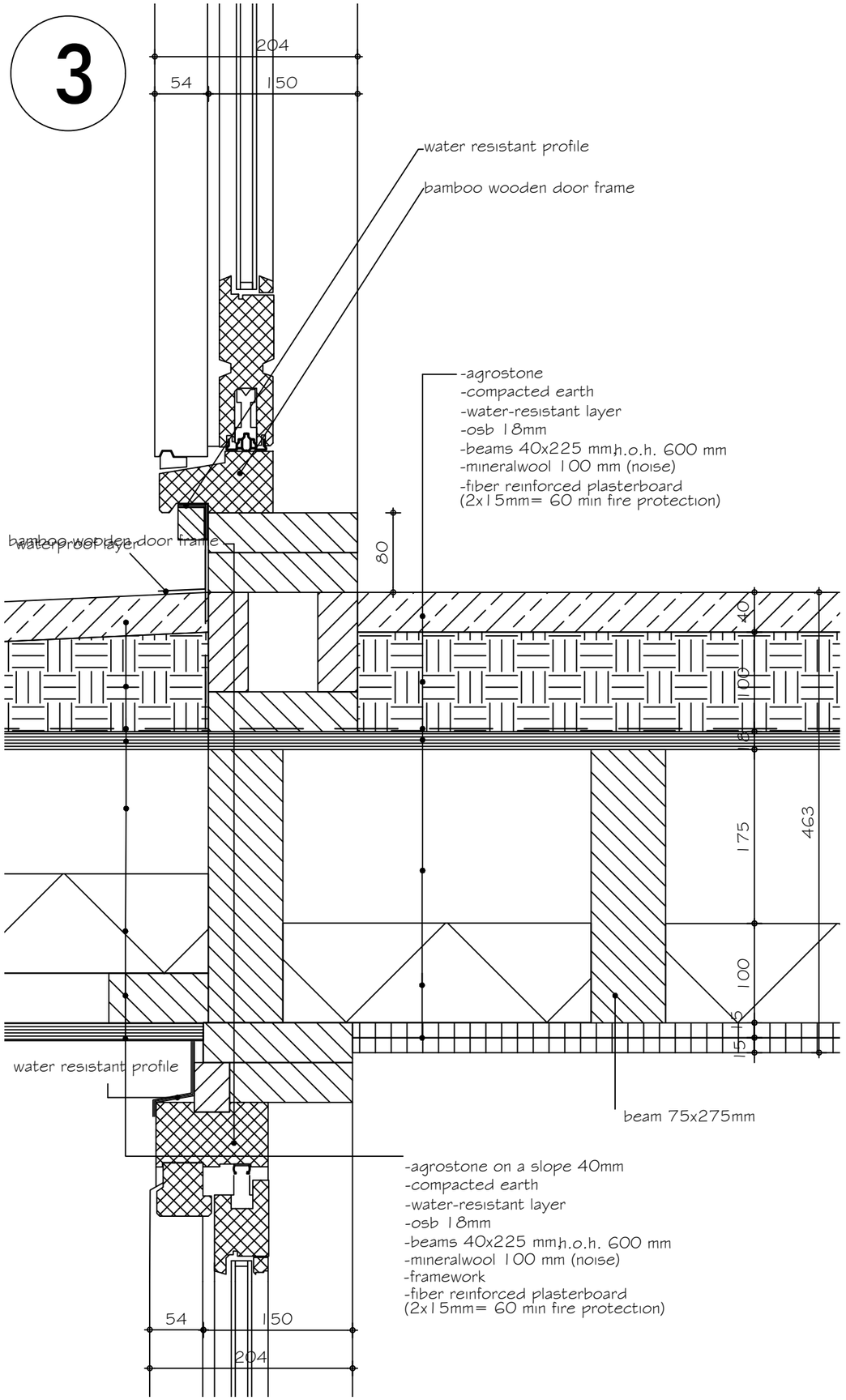
Detail 1 Scale 1:5

2



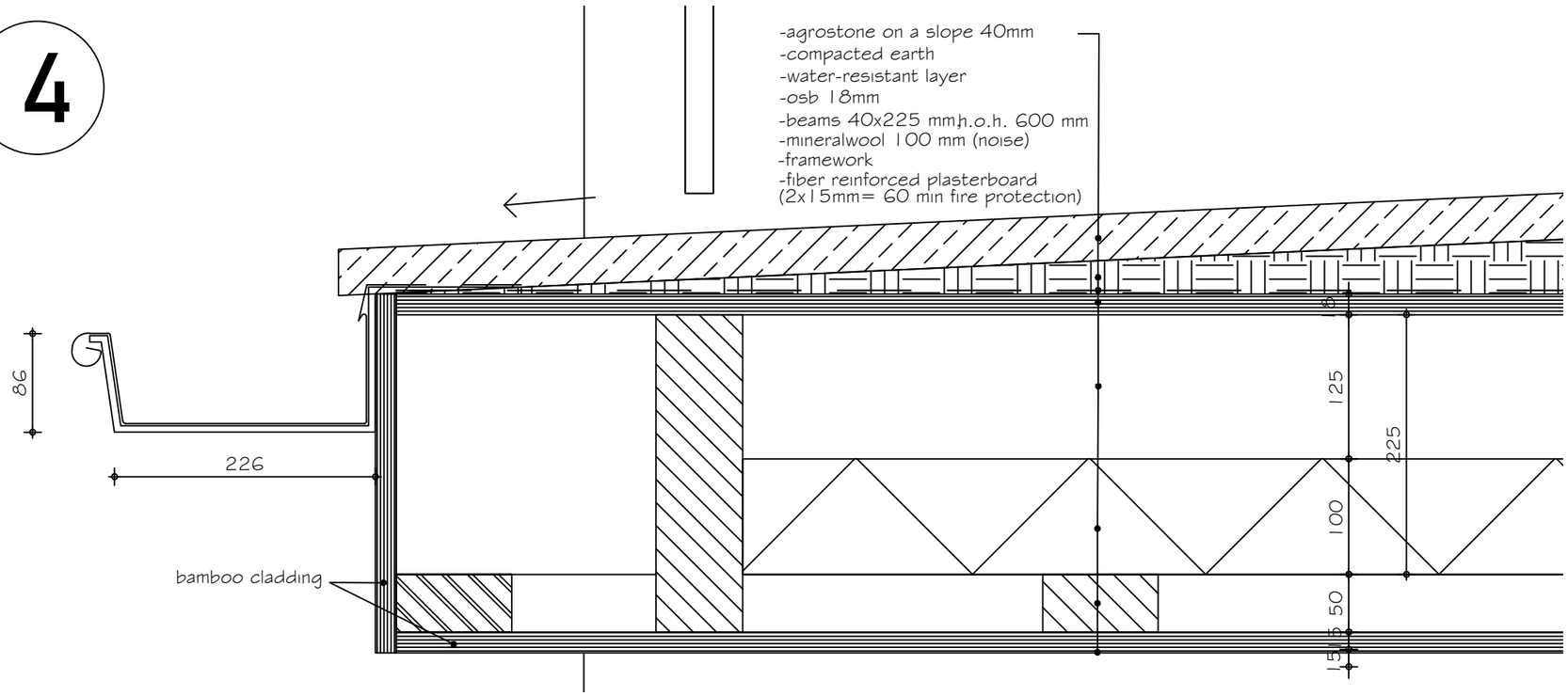
Detail 2 Scale 1:5

3



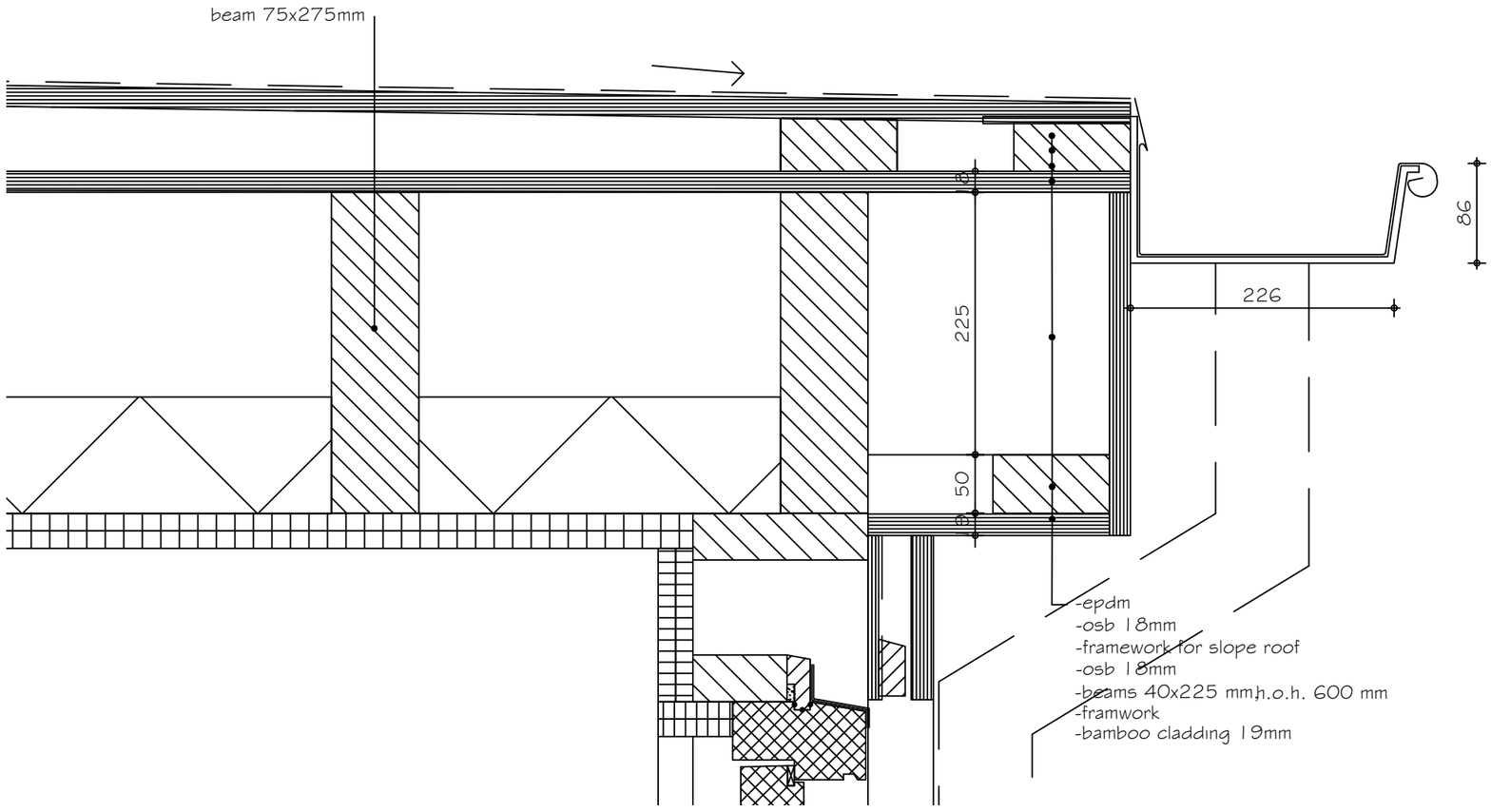
Detail 3 Scale 1:5

4

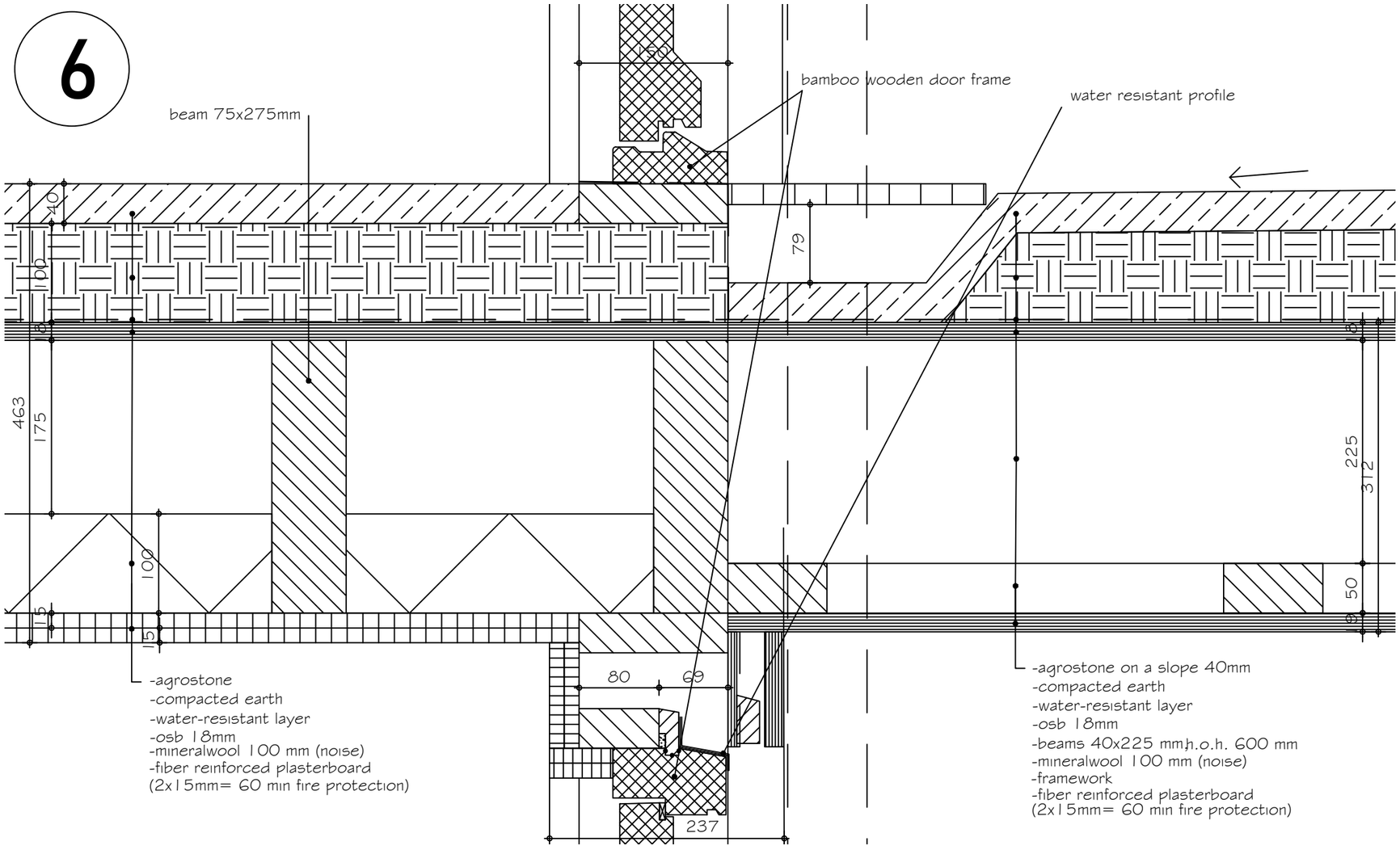


Detail 4 Scale 1:5

5

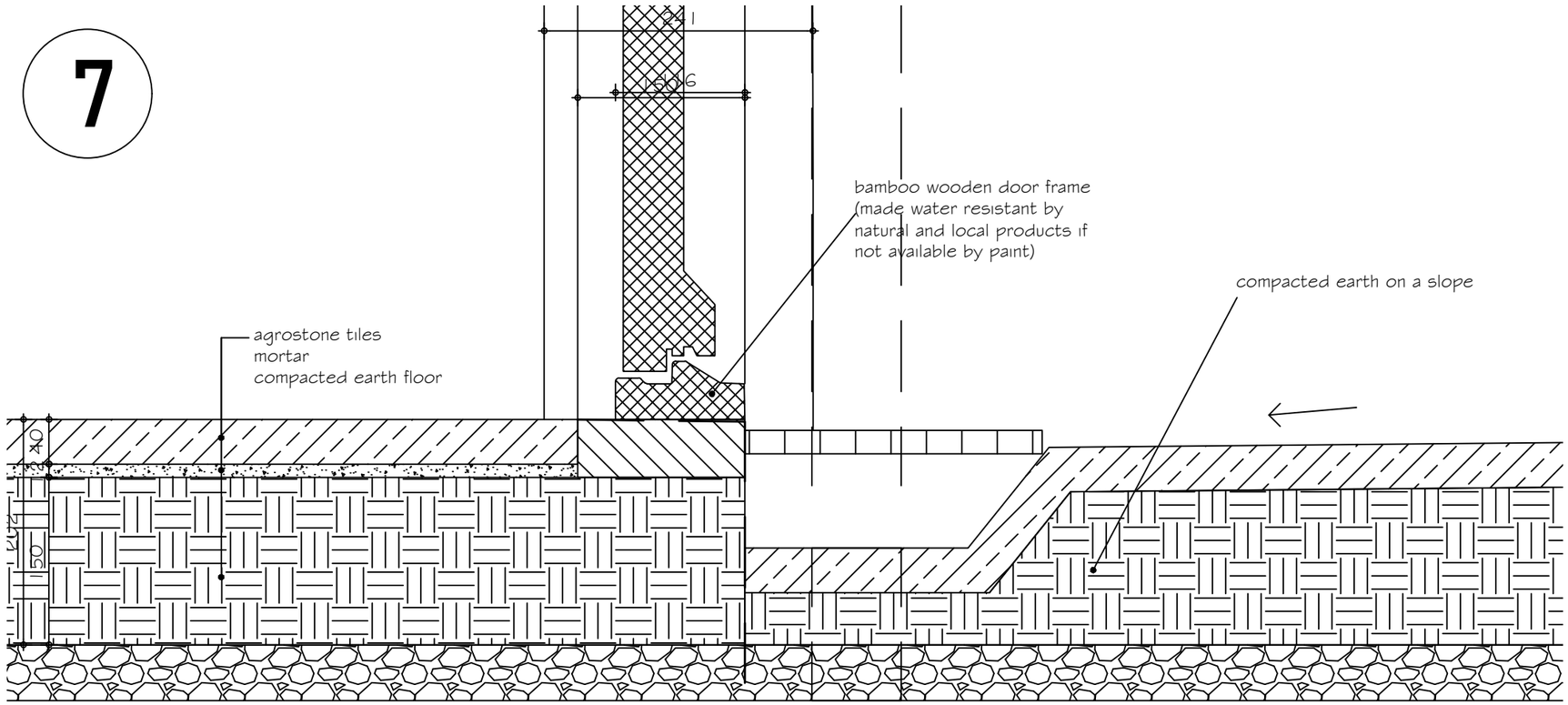


Detail 5 Scale 1:5



Detail 6 Scale 1:5

7



Detail 7 Scale 1:5

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