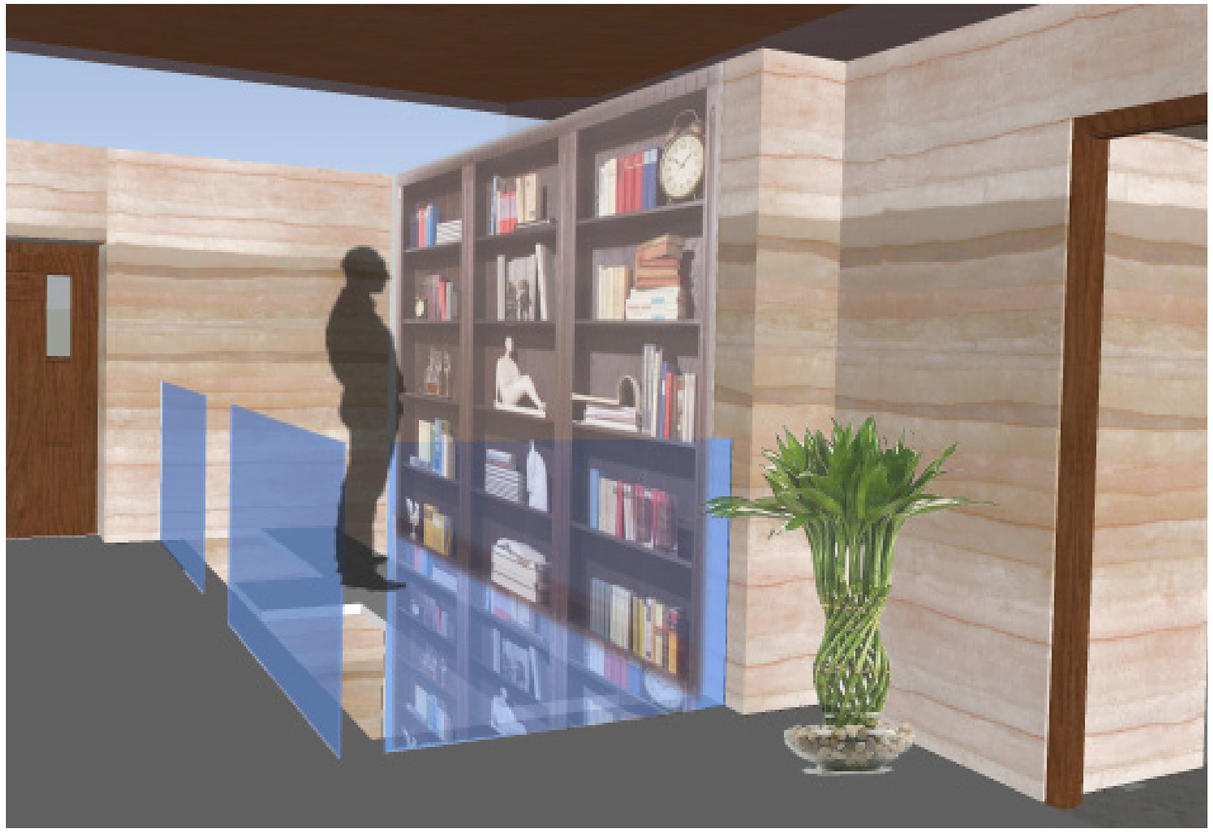


# NEXT GENERATION

Master Thesis

Enaam Jarjis

Chalmers Architecture

Fall Term 2011/2012

# Abstract

I do my master thesis first of all for myself, for developing my knowledge and trying something new. With it I have the possibility to prove and improve what I have learned during my study.

My Idea for the master thesis is to learn from past generations, develop their knowledge in the present and built for future generations. Because of this idea I have chosen the topic “traditional materials” like clay, rammed earth and straw bale.

# Concept of the work

The concept for the housebuilding briefly described is about” connecting the past with the present to make a good  future”. This means that I want to ”excavate” an old material ”rammed earth”, learn from the past and use the past generations knowledge about it, develop it in the present to built a futural building with the requirements of sutsainability. Improving that an old material like ”rammed earth” does not has  to look oldfashioned at all but that we actually can use it for building modern and sustainable and intepretating an old material into a modern context is a very important point of this thesis.
Futheron it is about multigenerational living as the family`s house is planed next to the parents house. The life between the houses and between the familys is an interesting and important point in this work. In fact that the familys grew up between different cultures, the middle eastern and the western culture, the plan of the house is defined by many different cultural aspects. The plans are also defined by the possibilitys and difficulties are given by building in rammed earth.
As sustainability is not only about efficiency and how it looks like but even more about how architecture is experienced , it is the next important point of this thesis to try to make feelable what you can not see with eyes.

> ” There is a certian magic one feels inside a house with thick earthen walls. It is hard to describe, but easy to notice. Just take a step inside one on a hot summerday and you will feel it immediatly. It is cool, of course- everyone knows rammed earth houses are warm in the winter and cool in the summer- but there is something else to the feeling that is harder to name. It is quiet, the house feels solid and sturdy, calming, comfortable, timeless....”

It is our responsibility as a professionals/ being architects to show and prove that sustainable architecture can be as beautiful as functional and efficient and that sustainability actually can make a building more attractive and interesting.

# Inspiration and examples

## The Chapel of Reconciliation

The architects Peter Sass Roth and Rudolf horseman drew an unusual church. Calyartist Martin Rauch built an oval room in rammed earth on the foundations of the church choir. The room is coated with wood rods on the outside. It was the first official buiding in rammed earth in Germany for more than 100 years ago. As far as possible materials of the Church of Reconciliation were processed in the building. Parts of the building rubble were crushed and additive added to the mixture.

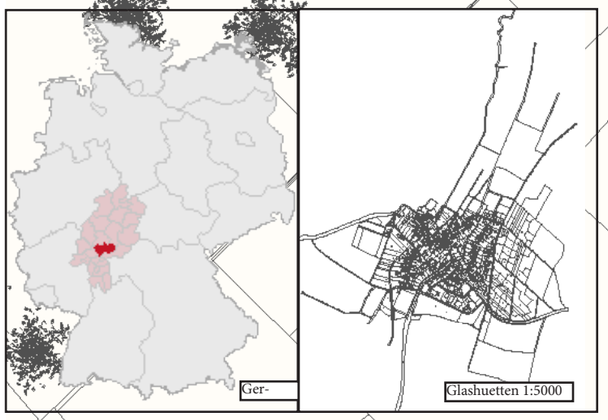
## The damascus house

inspired me with its open and very welcomning inside area. The typical damascus house is an atrium house with a garden trees and a fountaine in the middle. Public rooms like the livingroom, kitchen, and so on on the first floor are situated all around the inside garden and the more private rooms are on the second floor. It does not have any cellar and no windows are directed to the outside but all windows are directed to the inside of the house. No looks are allowed from the outside to the indside or from the inside to the outside.

It seem to be very closed but however it is very open to invited visitors.

# Village and Place description

The small village Glashuetten lies in Hirzenhain in Hessen and is part of the Wetteraukreis. It consists of one zip code area: 63 697 and has about 2994 inhabitants. The center of Glashuetten is situated 3km west and 0.1km north of Hirzenhain center. The total distance is 2.99km.




Situationplan 1:500

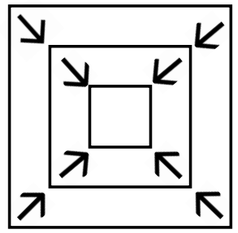
view from the garden on the parents house

view from the parents house to the street

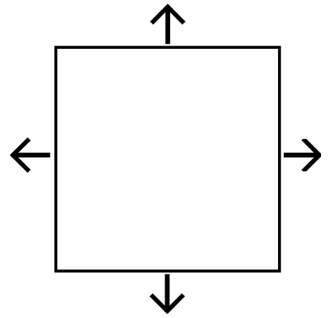
# Concept

parents and three children
living in the house

”Damascus house” - introvert

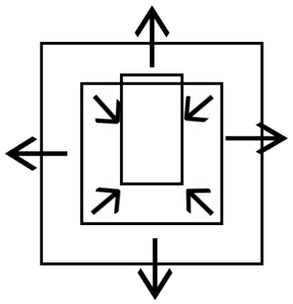


Modern western house - extrovert



cousins and their children,
uncles and aunts visiting
and staying over.

My house - combination of
introspection and extrospection



## Maxi house

It is a big house for a big family. It is not only about the five members of the family living in the house but also all the other members of the family like the cousins, their children uncles and aunts a.s.o.

We are a big family and its normal that we visit eachother and stay over night. Family use to come from far away and even stay over for weeks.

In this big house there will never be a placeproblem

## Multi-culti

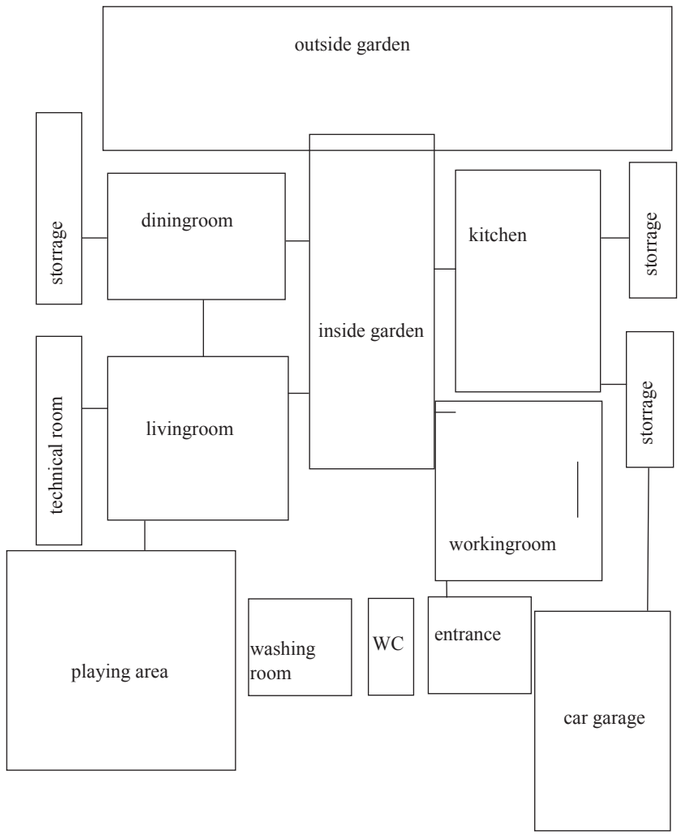
I grew up between two different cultures,  two almost opposite worlds and that is why I can call myself a multicultural girl. As this is a strong property of my personality it is meant to be the concept of my house.

### Inspiration

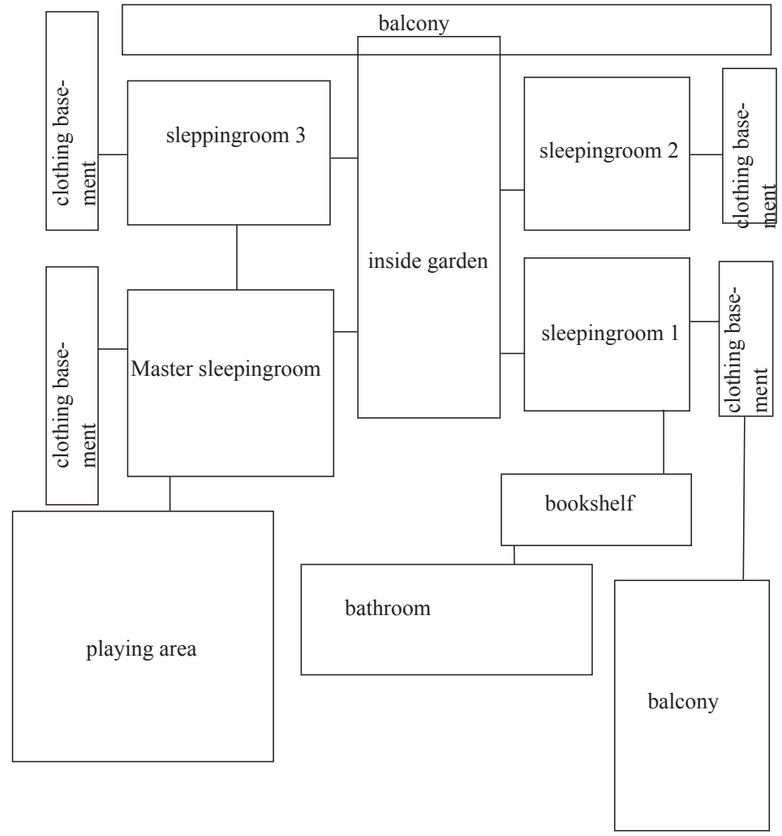
The concept was inspired both by the ”Damascus house” with its introspective form and by the modern western house with its extrospective  form.

# Program

Plan 1




Plan 2



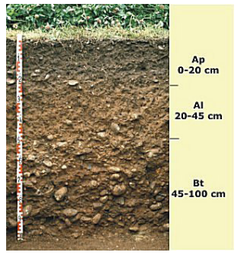

The house is a combination of old and new, of east and west, of tradition and modernity, and of open and closed.
It is on two plans and it combines livingrooms - the more ”official” rooms - downstairs and sleeping rooms - the more ”private” rooms - upstairs. All around the main rooms there are clothing basements to each sleepingroom, there are  storrages, toilets, technicroom and the washingroom situated. These rooms covered by the ”protection wall” protect the mainwall from rain, snow, wind and so on. and they are working as isolation.

Under the ground there is a watertank situated where we can store rainwater in it to use it for pouring, toilet, washing a.s.o. We would like to have the tank big enough to collect enough water for our house and for  my parents house.

The openings between plan 1 and plan 2 allows communication between up and down. The two balconys allows contact between outside and inside.

# The material rammed earth

Earth is available, can be processed with little energy and emits no pollutants. It is healthy.The walls regulate the humidity in the room, save water and steam to give it up again when the air is dry. It is also recyclable and toxin-free - which is good for all residential well-being. Also it is durable, applicable to any style of building and resistant to wind, fire, rain, and termites. Furtheron it stores the heat from the sun during winter months and blocks it during the summer months- so it is always warm in the winter and cool in the sommer in a rammed earth house.

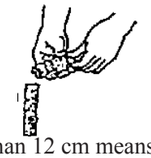



The earth walls seem to be growing out of the ground as they constist of the same material and are build in the same way. Both are growing in layers step by step.

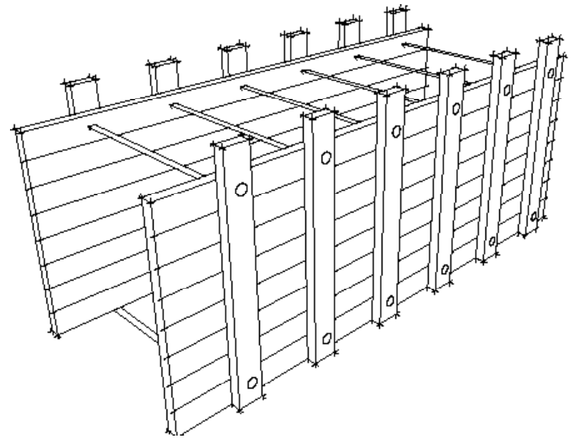
making a 20 cm soil cigar

optimal mix between 8-12 cm

less than 8 cm means to much sand → add clay



more than 12 cm means to much clay → add sand



## Soil

The most appropriate soil for rammed earth construction contains: 50 to 75 % fine gravel and sand; 15 to 30 % silt (pulverized sand) and 10 to 20 % clay (cohesive particles).

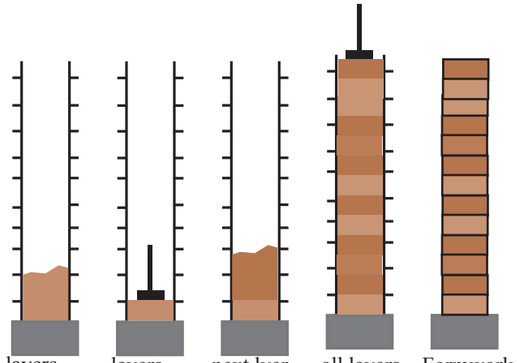
## Formwork

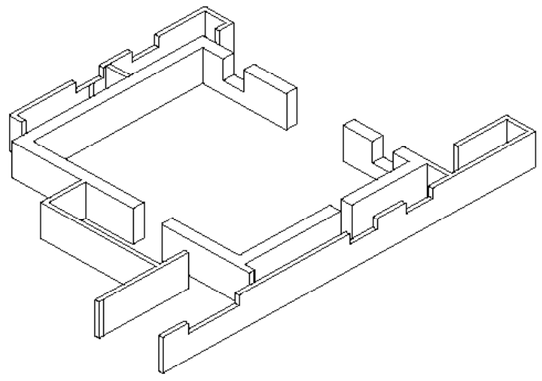
• The formwork must be more rigid than standard concrete shuttering, because of the high outward pressure of compacted earth;

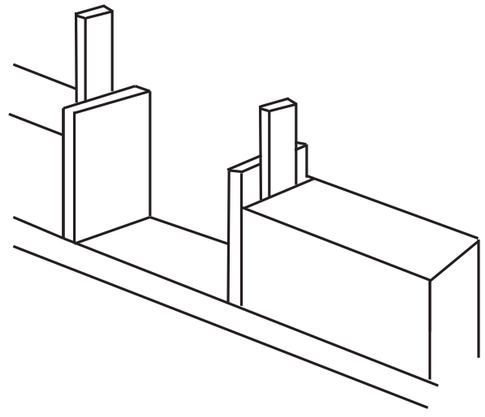
• it must be light and easy to dismantle and assemble, so that the work does not become too tiring and time-consuming;

• it should be the largest size that can be reasonably handled, in order to reduce the number of moves;

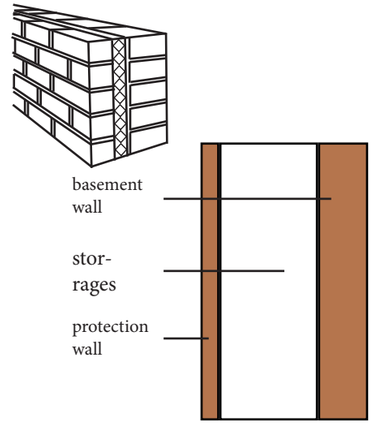
• and it should permit the wall thickness to be varied.





door frame anchored in wall




The structure of the walls in this case is remainding and working like a core insulation of a mansory wall.

## Construction

A fundament and base course is situated 30 cm above ground level and about 60 cm under and exactly as wide as the 30 cm protection wall and the 80 cm basementwall. A damp proof course is to be put between the footing and wall.
The sides of the formwork has to overlap the wall section below by at least 10 cm to stand firmly. The work should always begin at a corner.
The soil is filled in the formwork in layers of about10 cm. It will be rammed by a person with a manual or a pneumatic rammer and ”the operation is completed, when the sound of each stroke of the rammer changes from a dull to a solid clear sound”. After the formwork is moved to the next section, the previous section should be covered with cloth or  plastic sheets for protection against rain, wind or direct sunshine.

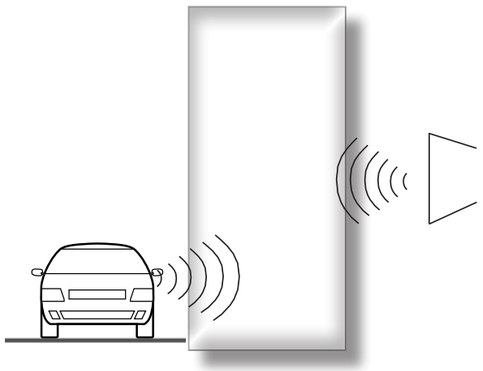
## Surface Treatment

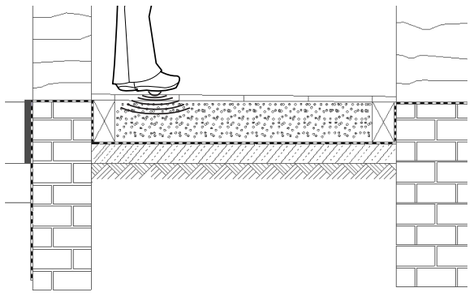
It is important for the durability of the wall that broken edges, cracks and holes are filled and compacted, immediately after removing the formwork, as the patching material does not bond with partially dried up walls.

## Openings

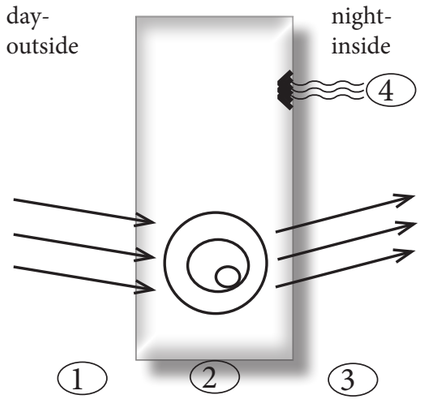
These should be well planned so that their sides correspond to the ends of formwork sections, their height is in line with the top of the last layer, and the ring beam substitutes the lintel. Small openings, letters or any other art work can also be easily cut into the finished wall by means of a pise saw. This is very important for this projekt as I would like to have every helpers handprint on and in the north-east facade wall next to the mainentrance.

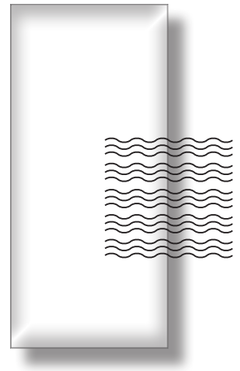
# The walls





Floor detail 1:20



## Sound absorption

The Sound insulation is very important in this case because the house is very close to the mainstreet of the village. I know from my own experiences from the parents house, which also is very close to the street, how much a good sound insulation is needed here.

The thickness and the density of the walls give me a very good sound insulation and contributes to the well known calmness of a rammed earth house.

## Impact sound insulation

Rammed earth can even be used for the floor and works like a impact sound insulation.

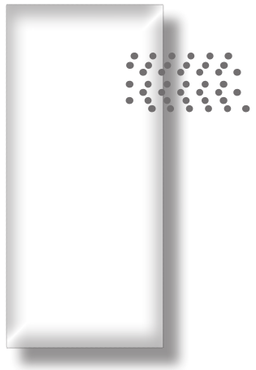
Rammed earth is easy to install, durable and an ecological floor solution.

1 taking the heat of the sun
2 saving the heat
3 emiting the heat
4 isolating the heat

## Regulating humidity

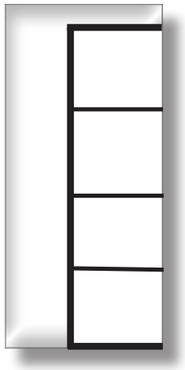
I am quite aware about the humidity problems I get with leading the rainwater into the house. My thick rammed earth walls are the solution even for that, as rammed earth has the special capacity to save and regulate humidity.

Is the wall too thin it would not be able to save enough and there will be risk for mold.



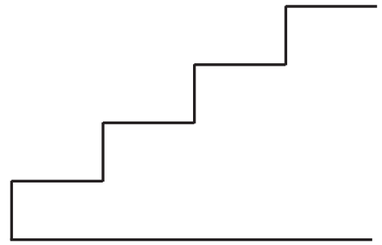
## Preventing odors and pollutants

Clay has the unique property to prevent odors and pollutants from the air. This contributes to a fresher and healthier indoor climate.



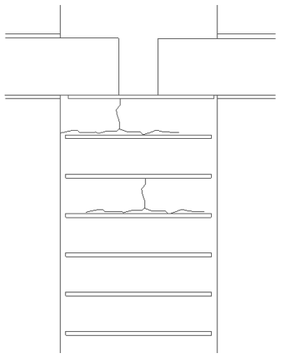
## Compatibility with natural materials

The thickness of the wall and the good compatibility of rammed earth with natural materials like wood gives me the opportunity to incorporate certain furniture directly into the wall.



## Stairs

with building the 80 cm thick wall into stairs i do not need to install any stairs, as the is exactly as wide as a stair should be.



## Controlled cracking

in order to control and minimize the inevitable cracking in a rammed earth wall I built in 2 cm thin brick panels at intervals of 20 cm into the wall.
These brick panels also offer a good protection against rising damp.

# Plans

- Situationplan

- Groundplans
- Description - groundplans

- Views
- Description - views

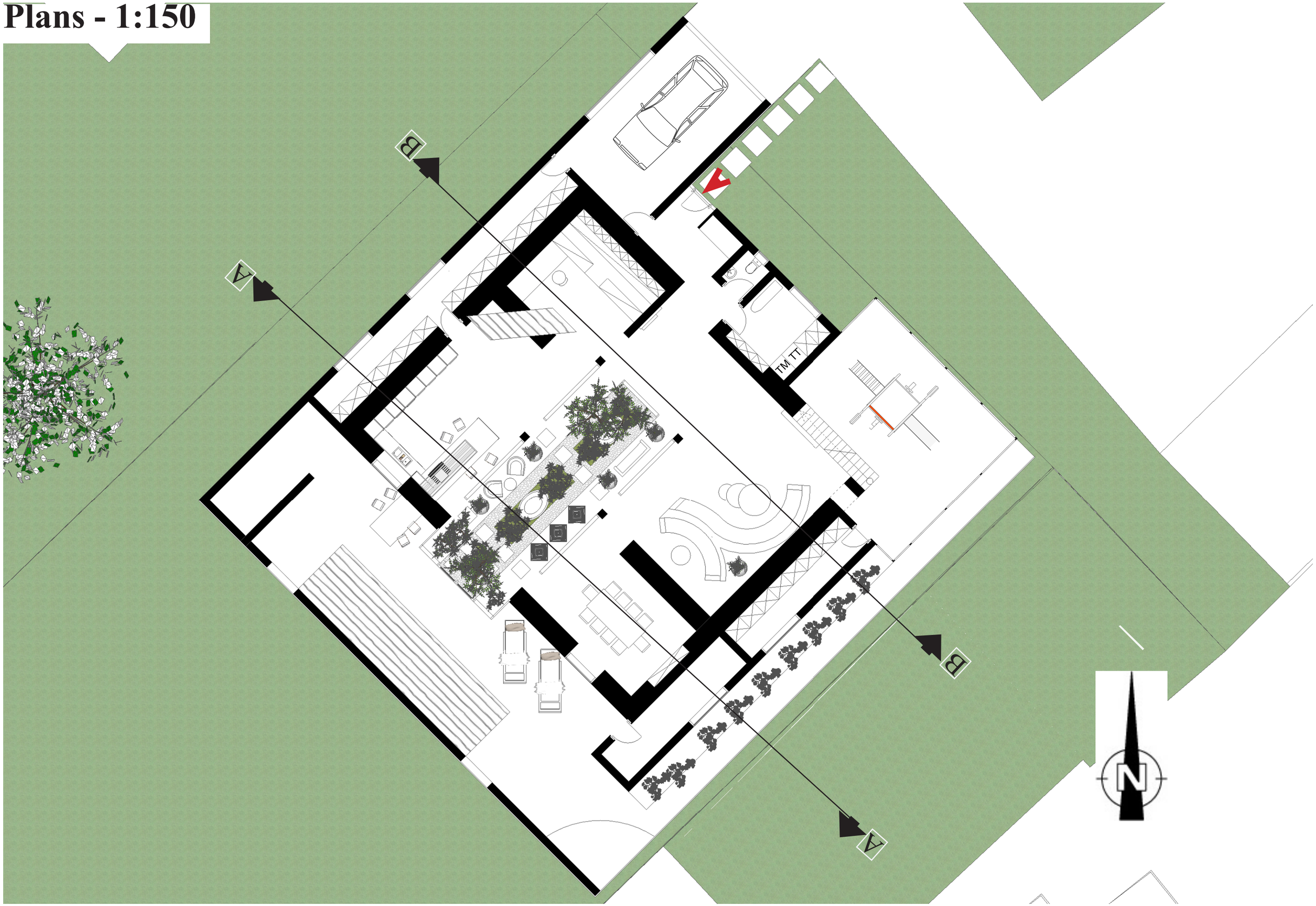
- Sitesection

- Sections
- Description - sections

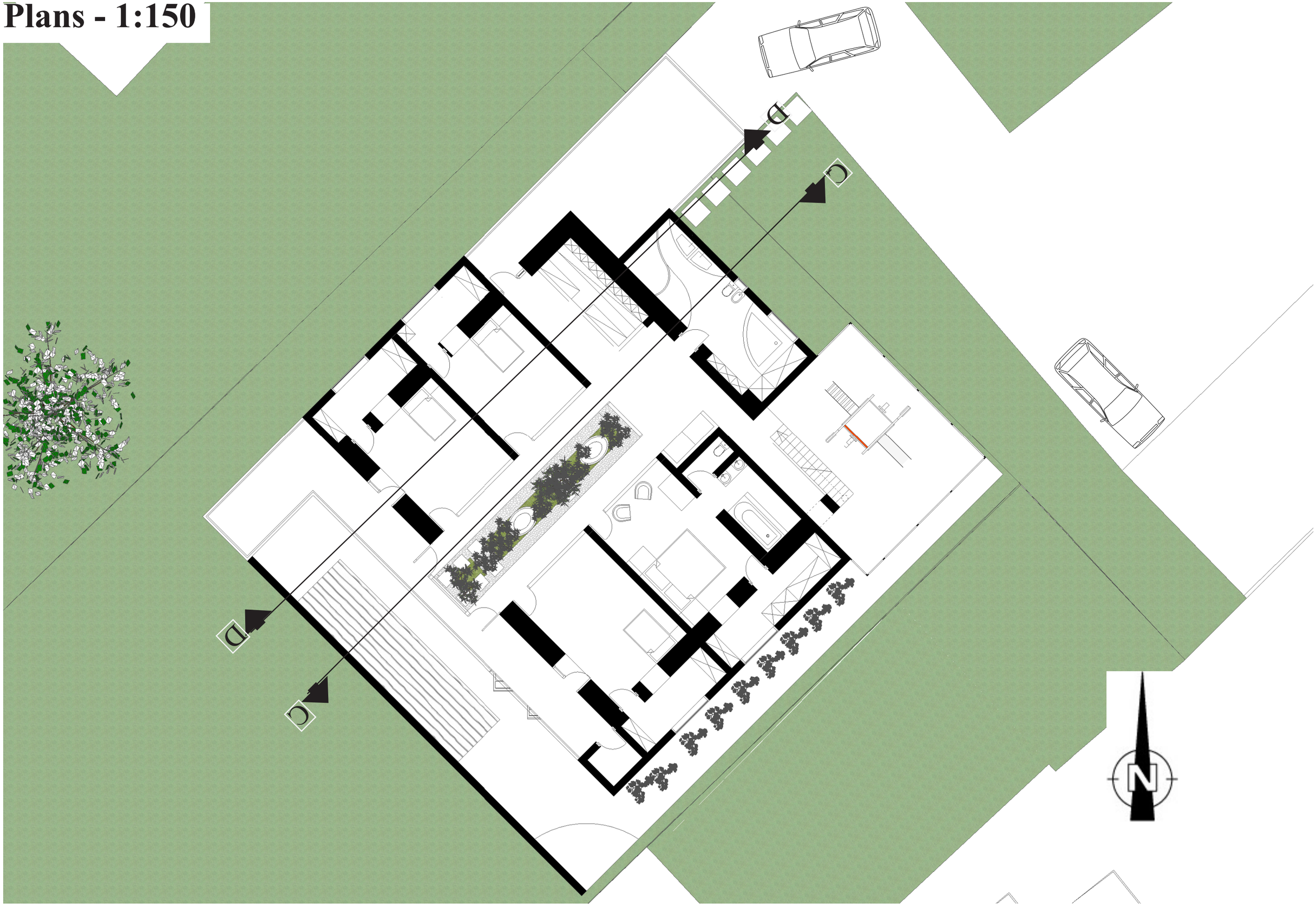
- Description - Site


Situationplan 1:200

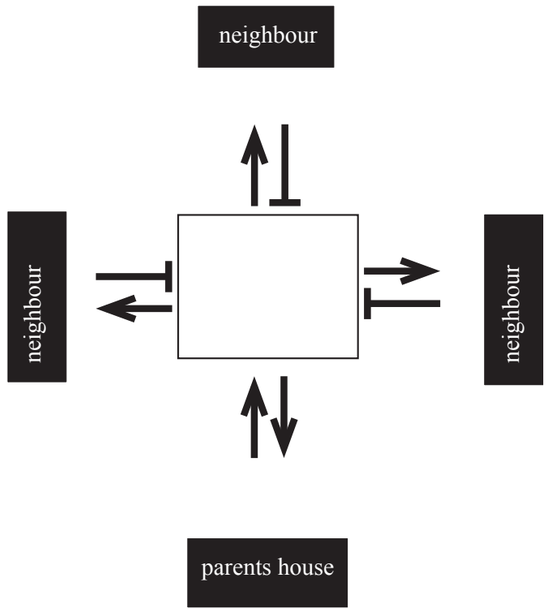
# Plans - 1:150

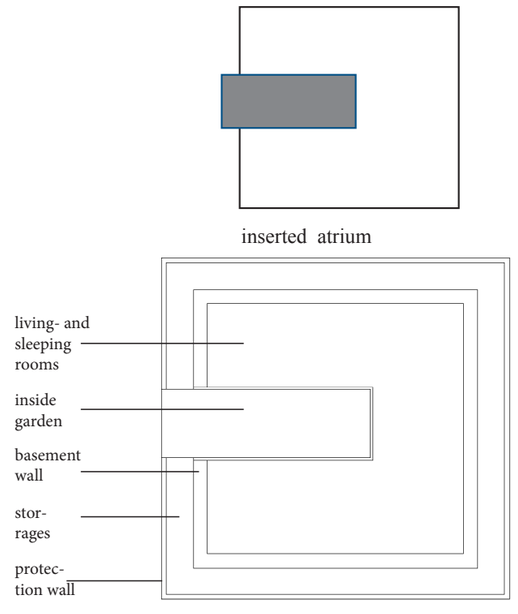


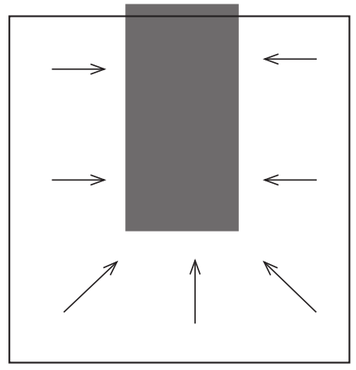
# Plans - 1:150



# Description - Groundplans



## Open/closed

The facades are relativly closed to the neighbours just as the damascus house is very closed to the neighbours but this house is howe-ver very open to the parents garden and their house.

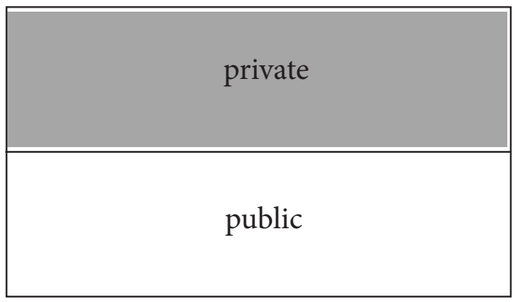
## Structure

In the middle of the house there is the core situated which is an inside garden growing toward outside. The core is inglased and surrounded by the living- and sleepingrooms. These are wraped by the strong basement, massive wall. All around the basement wall there are storrages, toilets and so on situated wraped by the protection wall which in itself meant to protect the massive only with clay stabilized basement wall.

## Plans

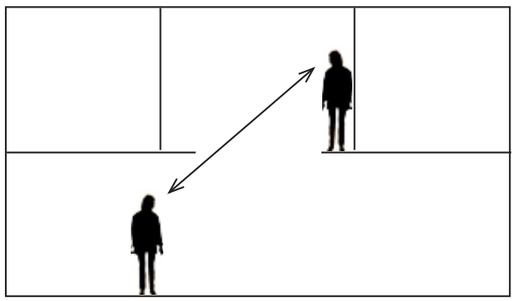
In order to emphasize the openness in my house I have chosen the open floor plan, which is a very typical western solution.

The direction of all rooms to the inside garden keeps the touch of a damascus house.



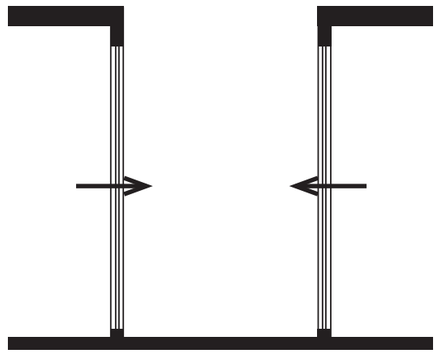

## private/public

Just like in a typical damascus house with the seperation of private and public, I put my private rooms - such as sleepingrooms - upstairs and all public roms - like livingroom, kitchen, workingroom a.s.o.- downstairs. None uninvited has the possibility to go upstairs.



## contact

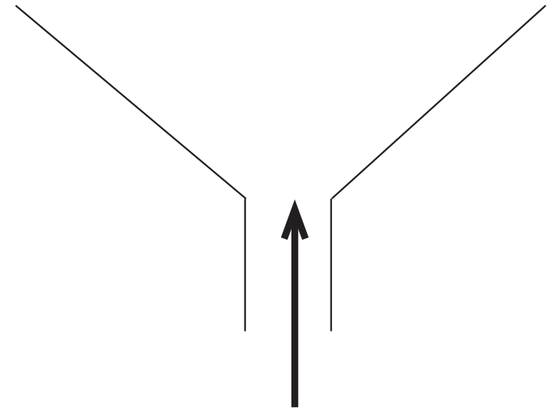
Inspite of that I am still keeping the eyecontact between the two floors through the indoor garden.
Both the indoor garden and the possibility to have an eyecontact between the two  floors are typical aspects in a damascus house.



## Windows

The large windows are directed to the inside of the house just like in a typical damascus house. The large glassurfaces are however very typical for the modern western house

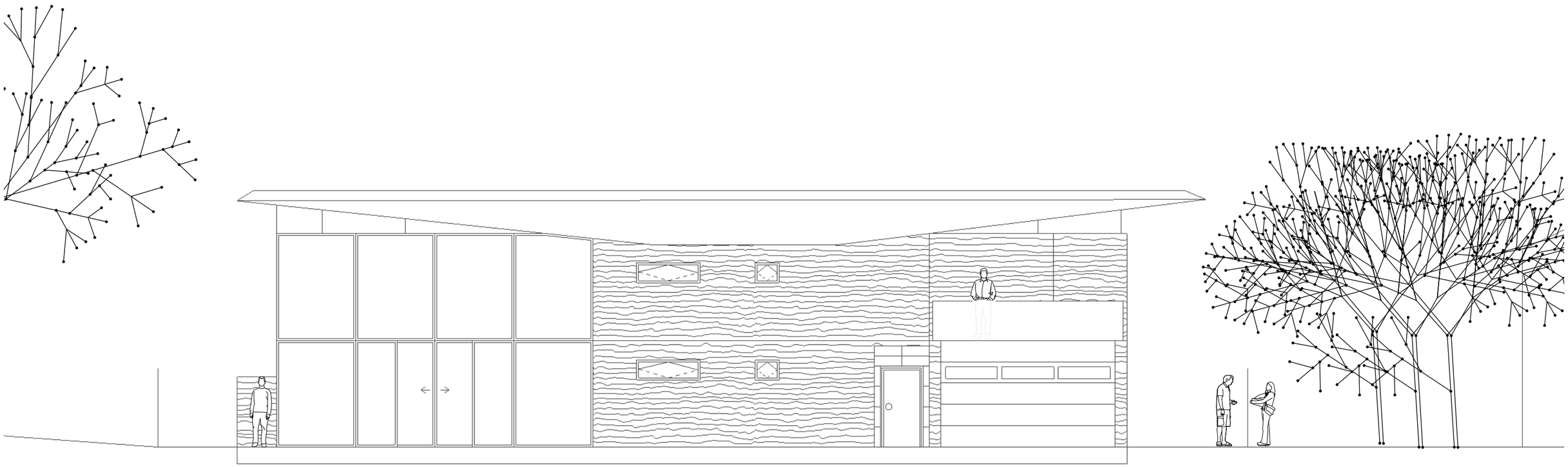
The windows on the outside wall of the house does not allow a look to the inside as they are very small and high. They are rather intended for ventilation.



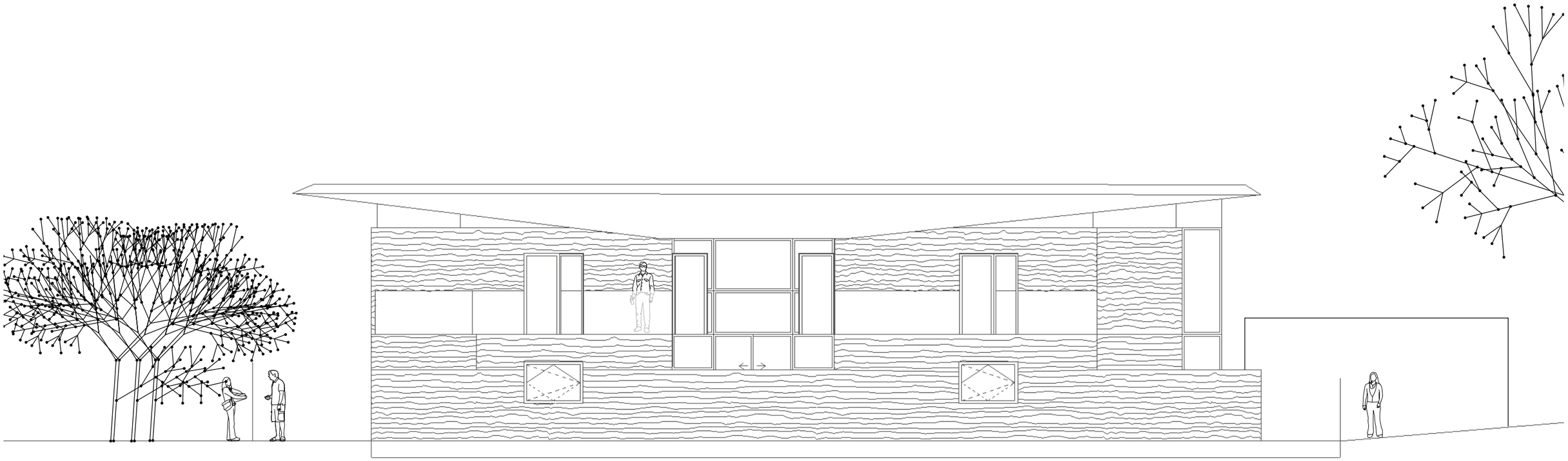
## The Mainentrance

Typical for the damascus house is the narrow entrance which blocks uninvited visitors and welcome invited visitors by leading them to the large and very welcomnings inside area.

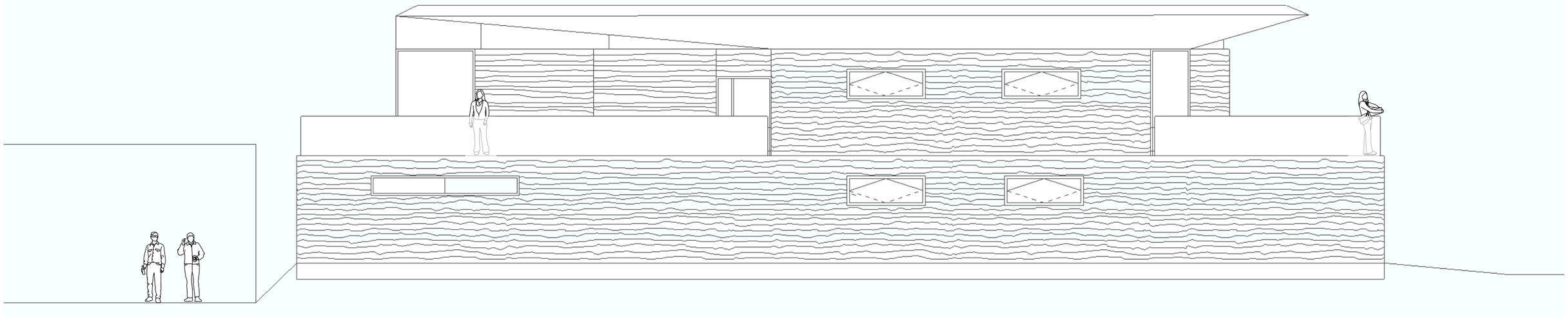
# View - 1:100



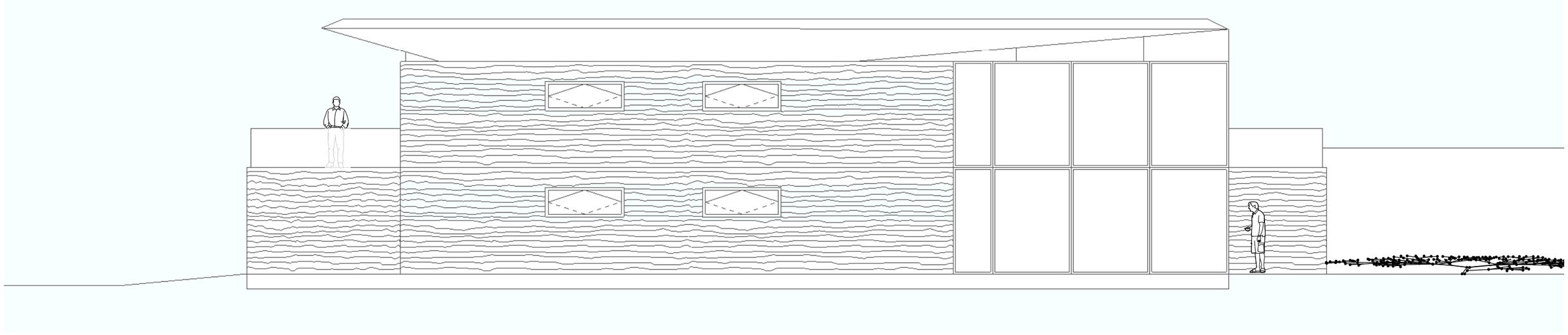
North-east 1:100



South-west 1:100

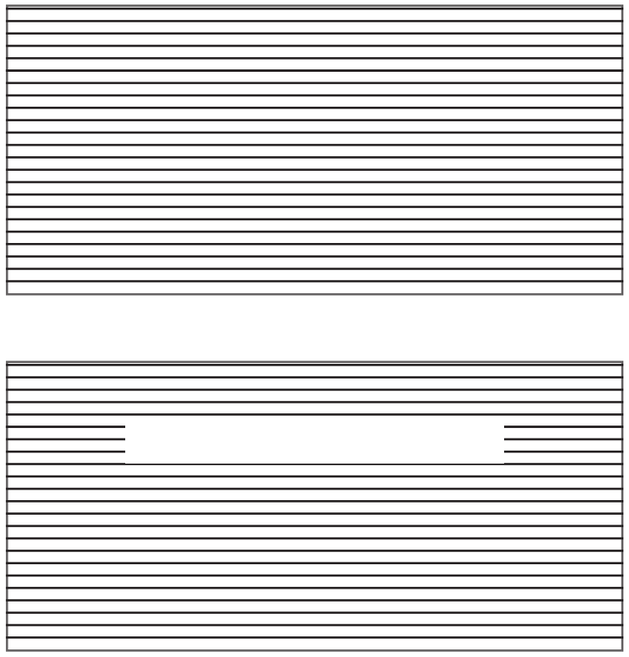


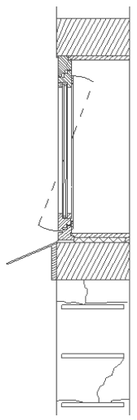
North-west 1:100



South-east 1:100

# Description - Views





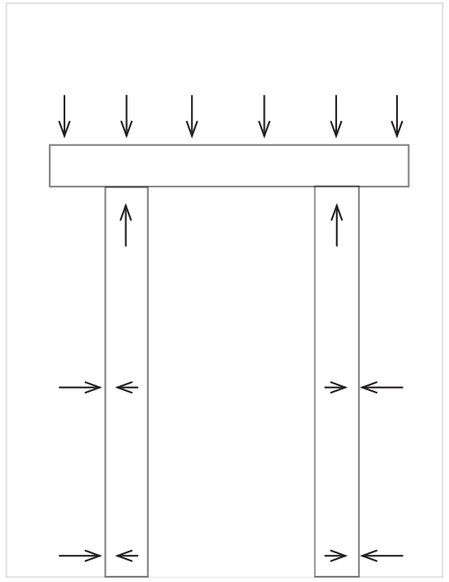
## Windows

Long narrow windows that adapt to the thin layers of rammed earth.

30 cm thin rammed earth exterior walls are not plastered and stabilized with only 5% of cement vs. 30% cement for concrete walls.  (The 80 cm thick load-bearing innerwalls are only stabilized with clay as they are not exposed to the weather.) Too much rainfall can lead to "easy controlled errosion" of the surface. This attitude has its expression in the permanent change of all things. It is a special property of rammed earth, which gives it its uniqueness.

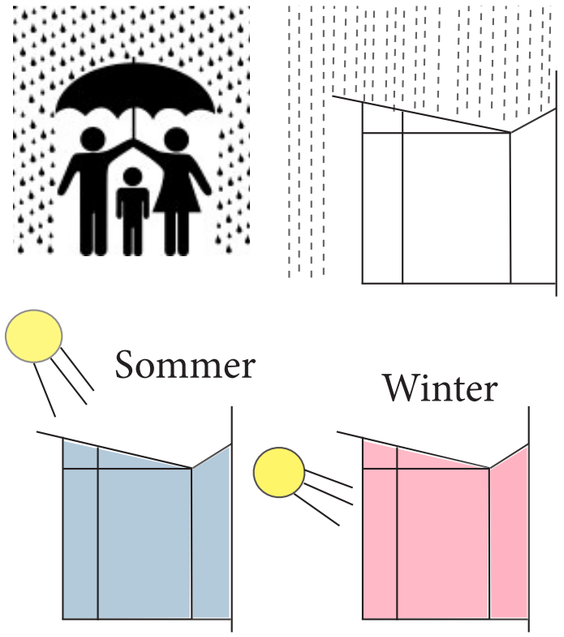
## Detail - window

In order to protect the walls from falling rain we need to install extra long water drainage on the windows



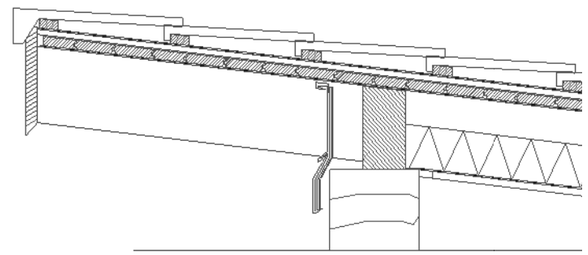
## Lintel and frames

Wooden frame and lintel around openings, like doors and windows provides a stable hold against the pressure of the massive walls.



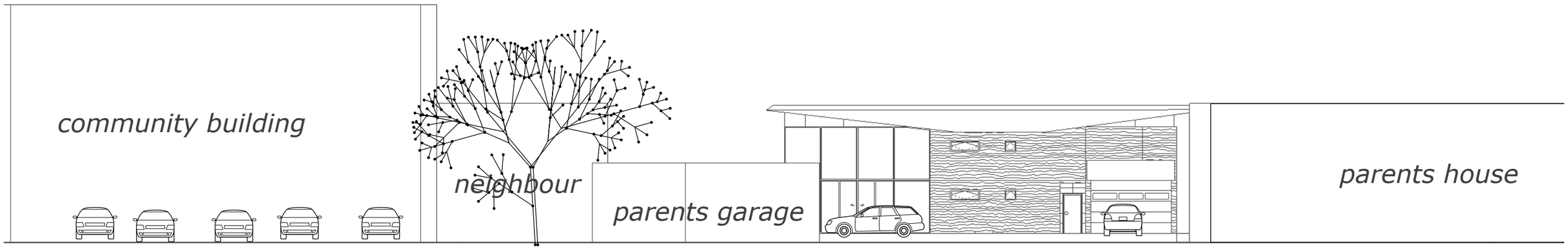

## The roof

The unloading roof overhang protects against rain and snow but also shields the strong solar radiation in the sommer.

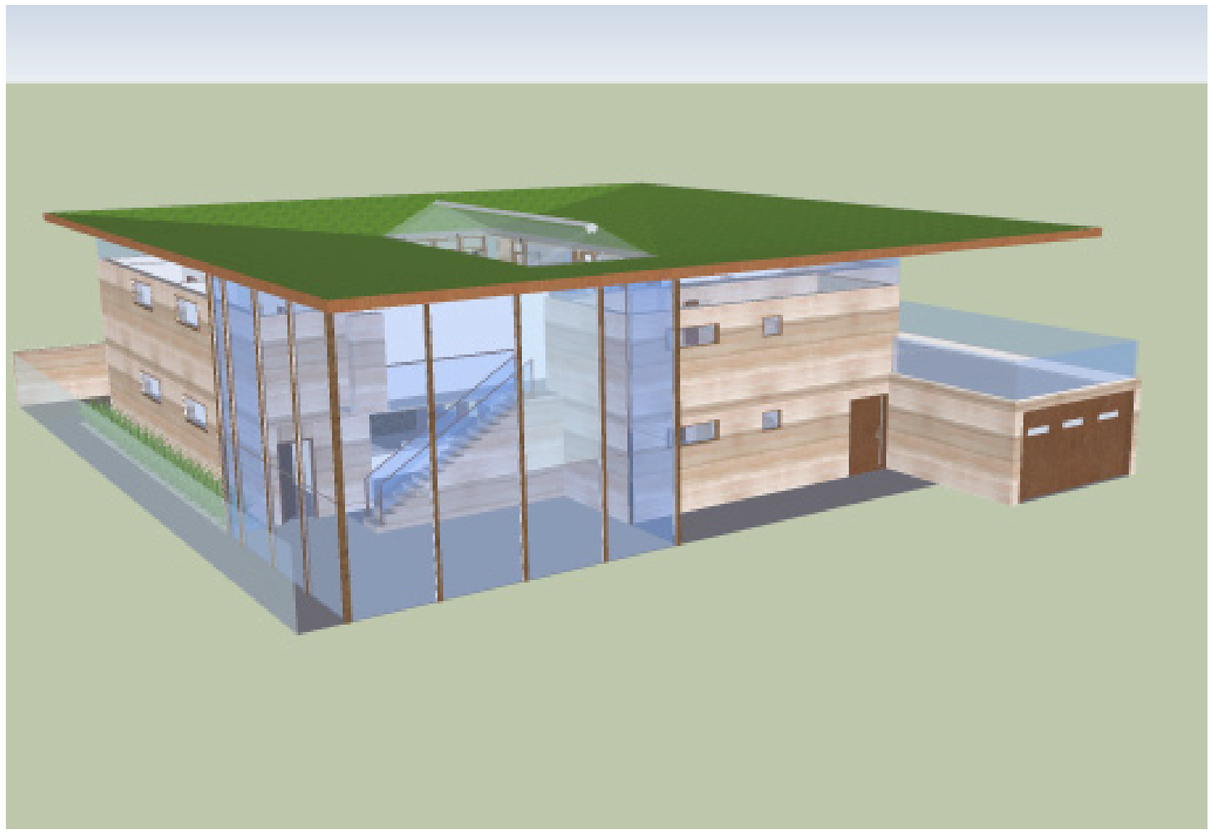


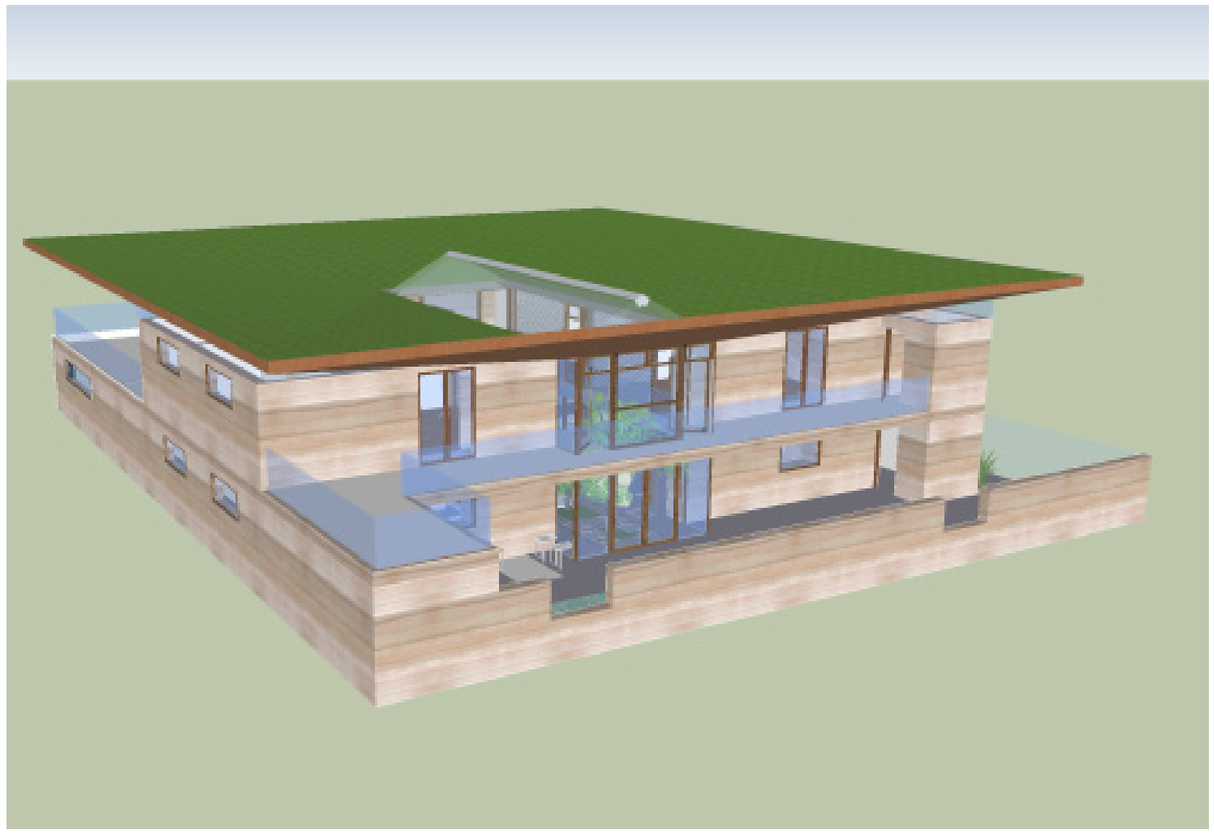
## Detail - roof

# Sitesection

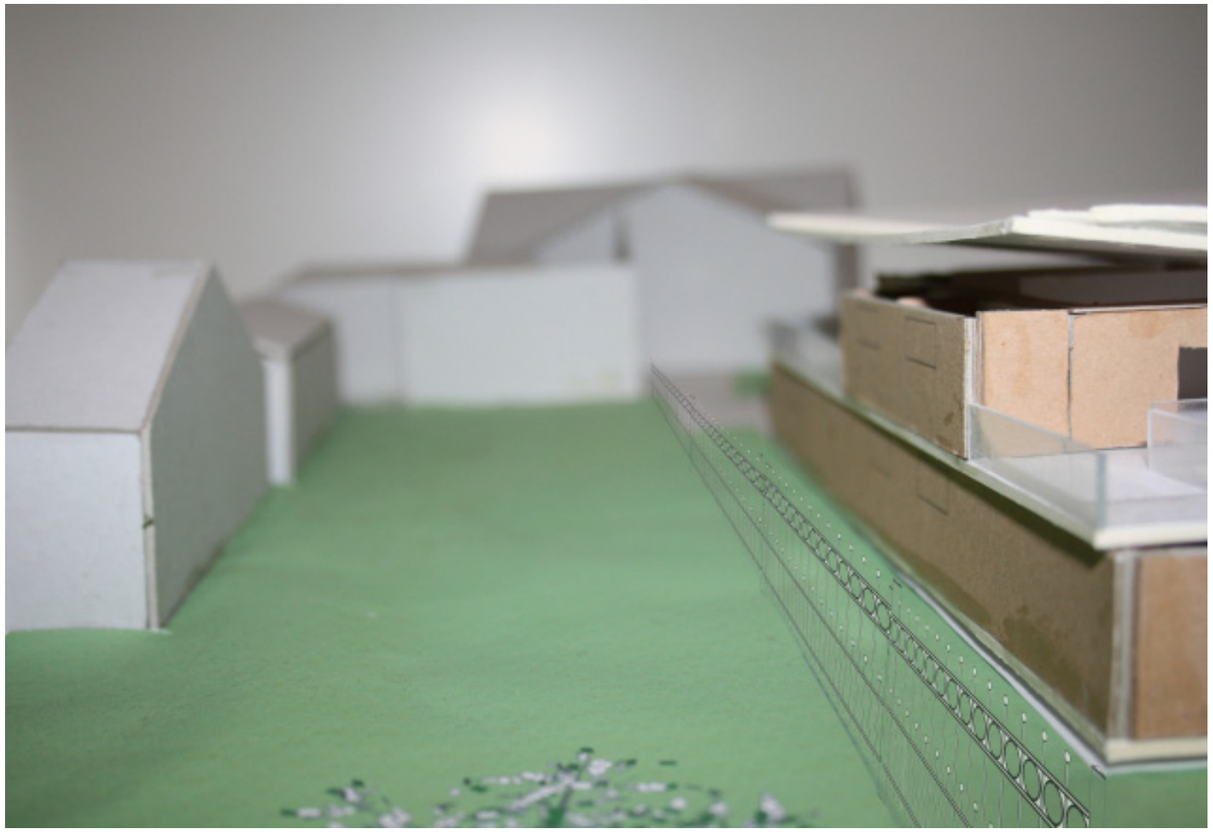


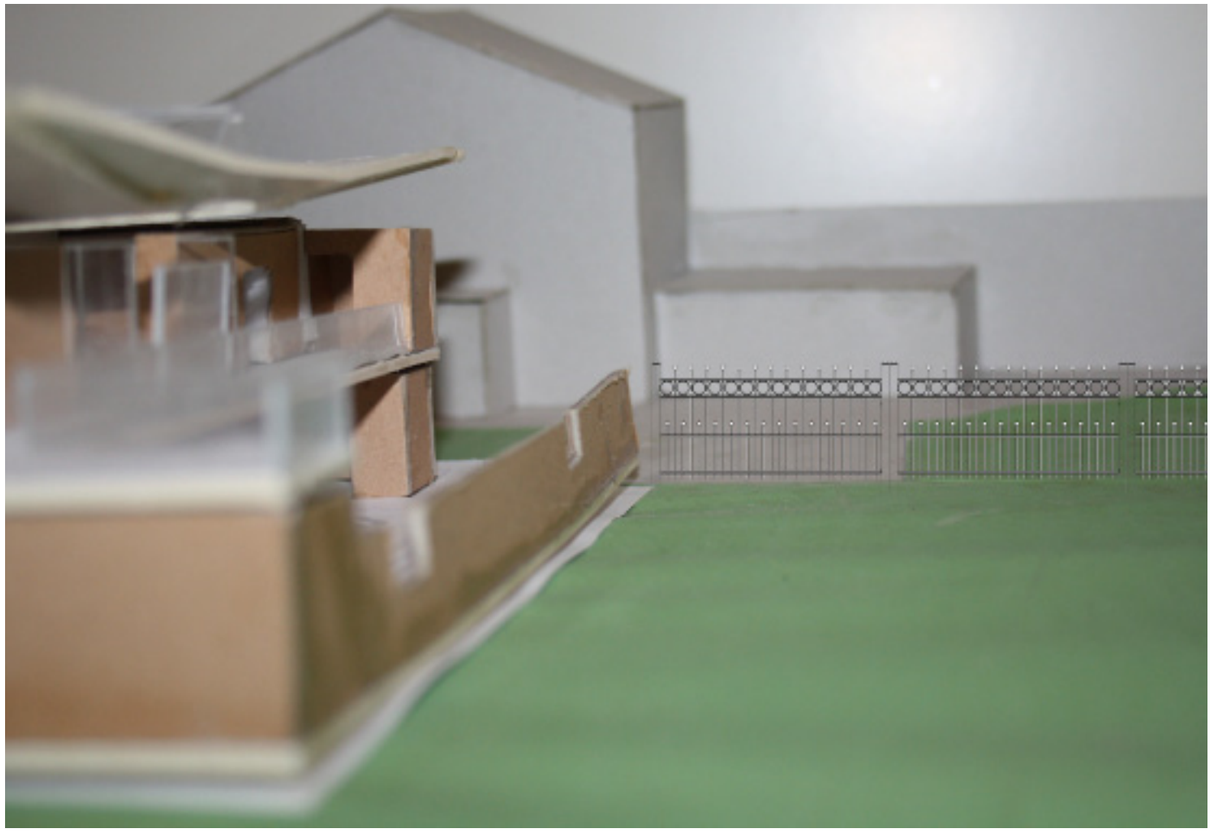

Sitesection 1:200

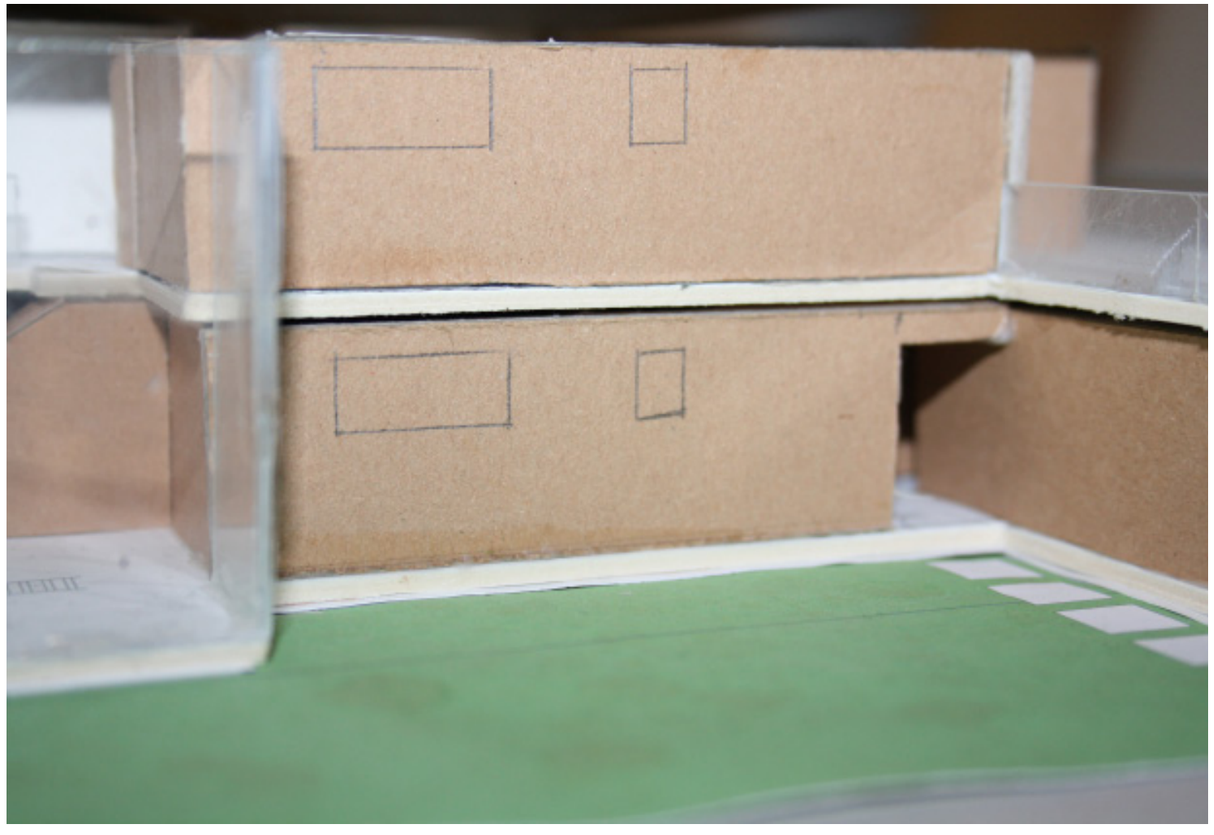




# Site views

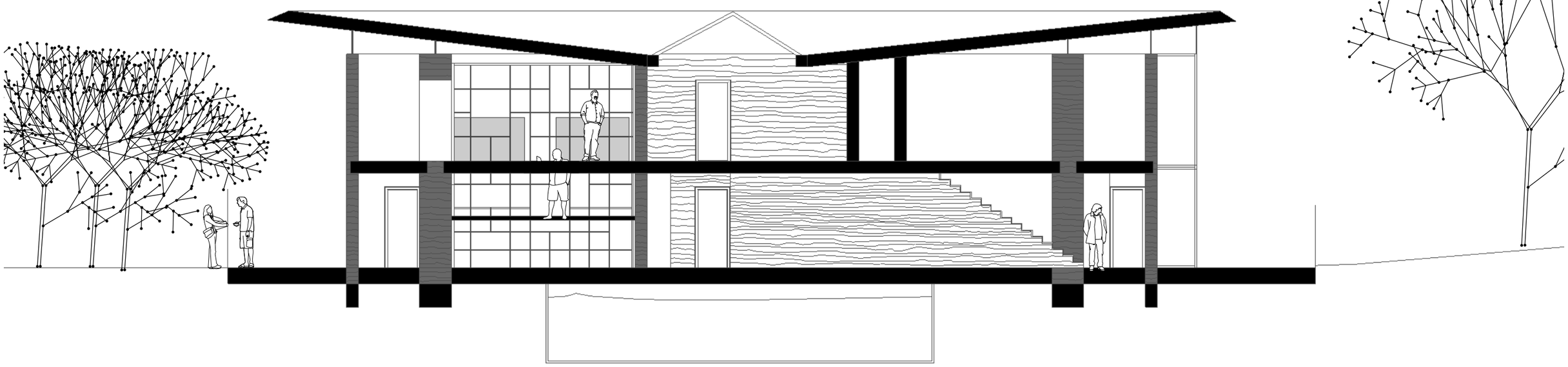






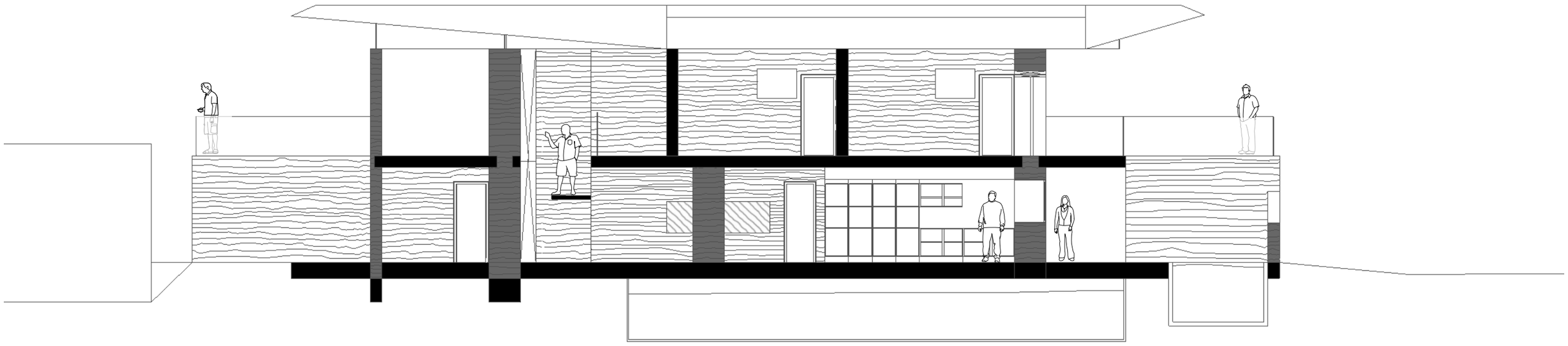
# Sections - 1:100

Section AA 1:100



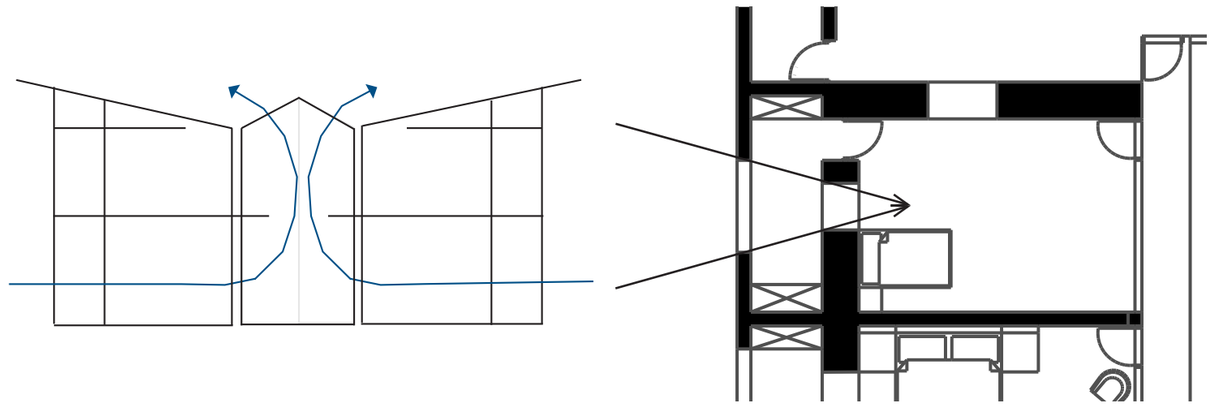
Section BB 1:100

Section CC 1:100



Section DD 1:100

# Description - Sections

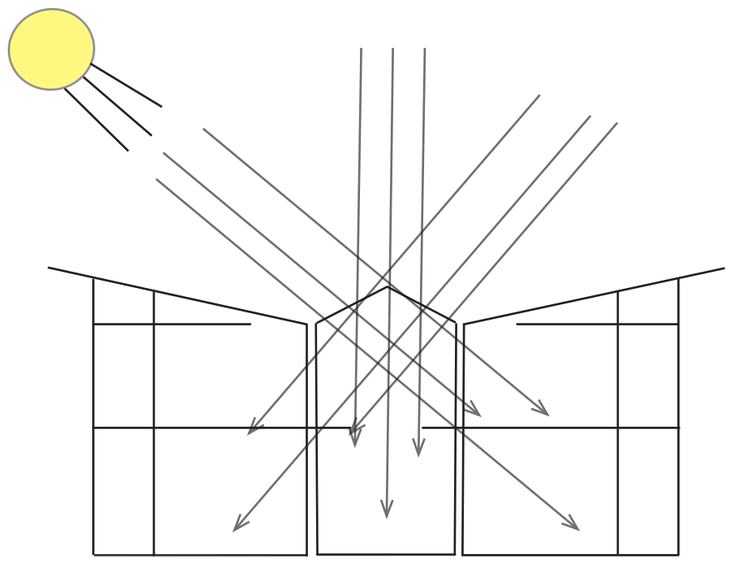


## Ventilation

Fresh air comes into the house through the windows and goes out through the dormer windows of the indoorgarden.

## Windows

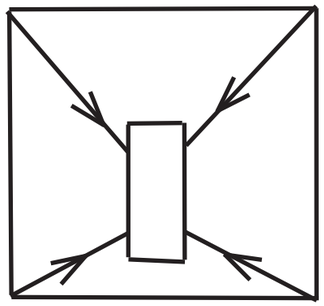
Behind the Windows on the second floor there are openings on the thick basement wall allowing the sunlight to penetrate into the sleepingrooms.

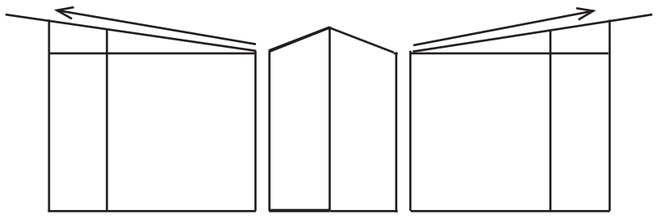


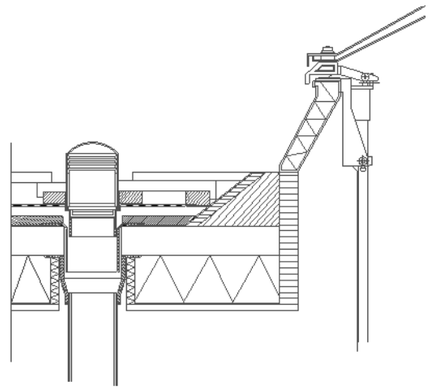
## Light

The upward glazed indoor garden with skylight allows plenty of sunlight to penetrate into the house.

# Rainwater

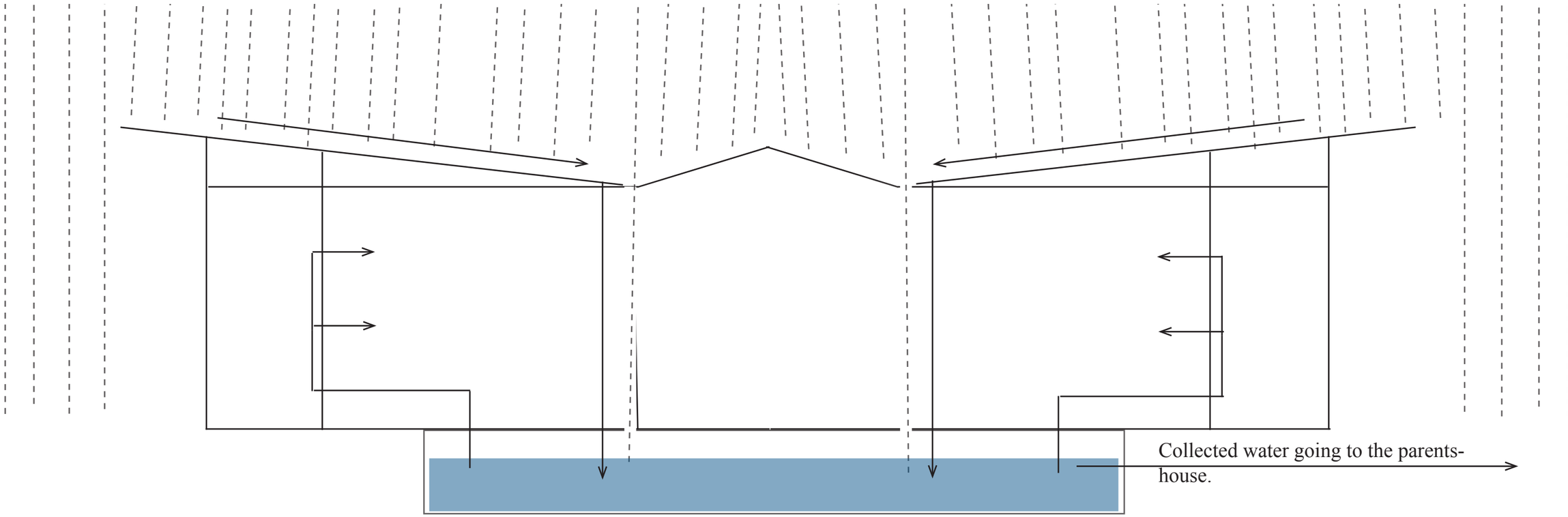




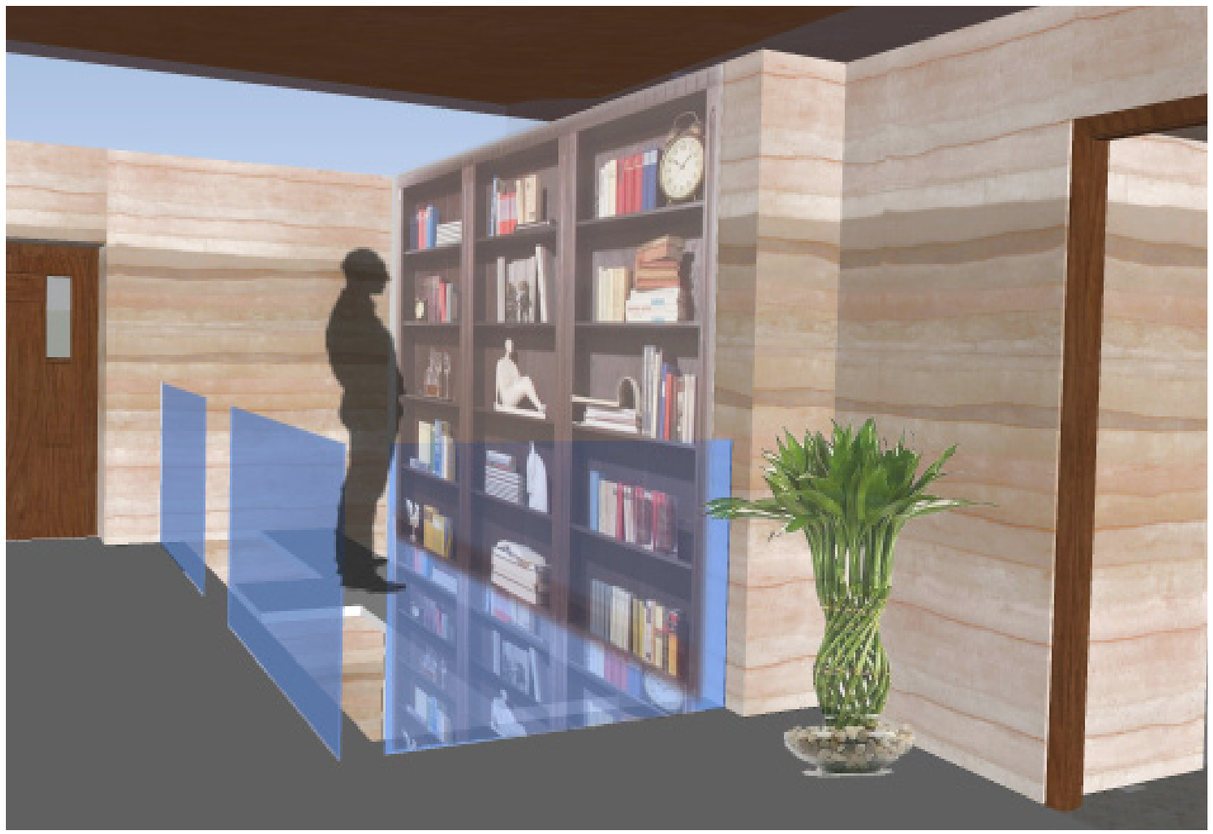


Detail - drainage

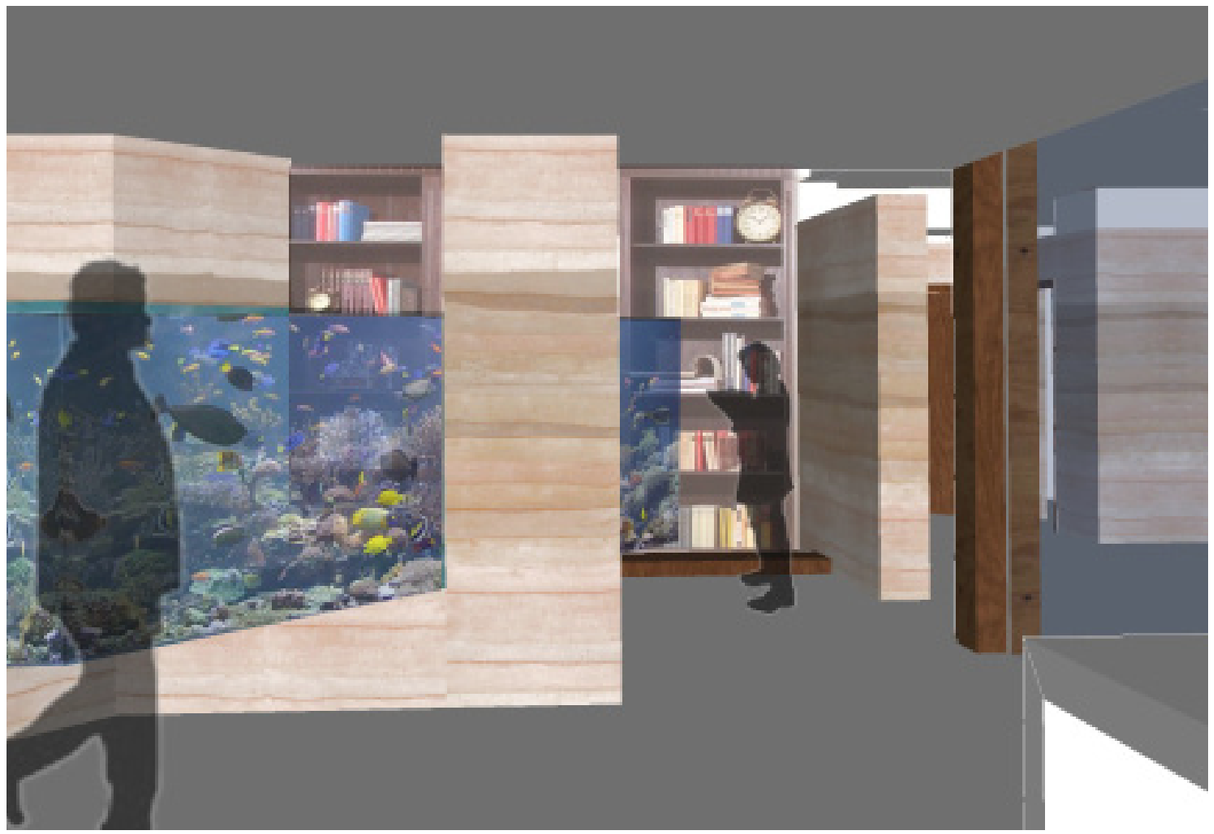
As rammed earth walls are very sensitive to rain, I am keeping it away from the fasade by pulling apart the roof to protect the fasade and let the rain fall through the house down to the watertank under the ground.
Rainwater is collected on the roof and runs through the two glas panes of the glass wall of the interior garden and stores under the ground. The water can be used for toilet, washing and watering.
The collected water can even be provided to the parentshouse.


Collected water going to the parents-house.

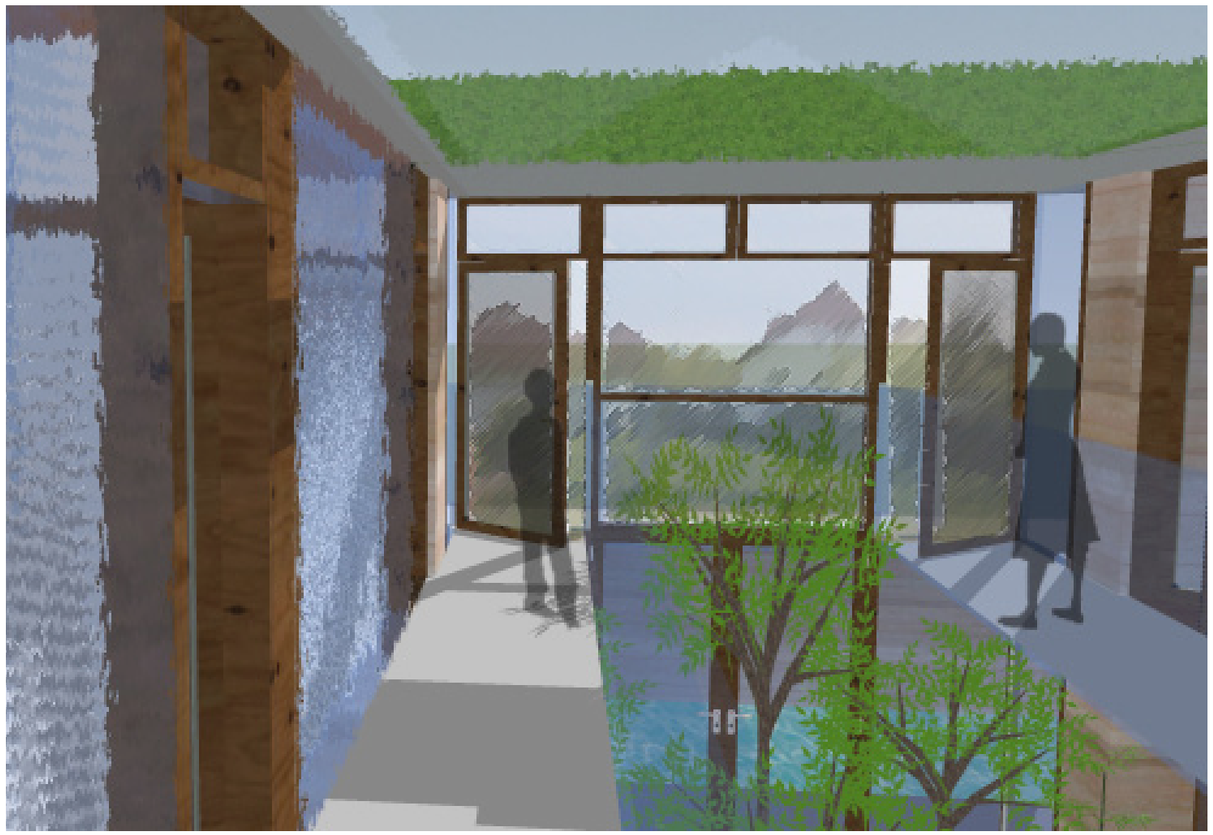
# Views



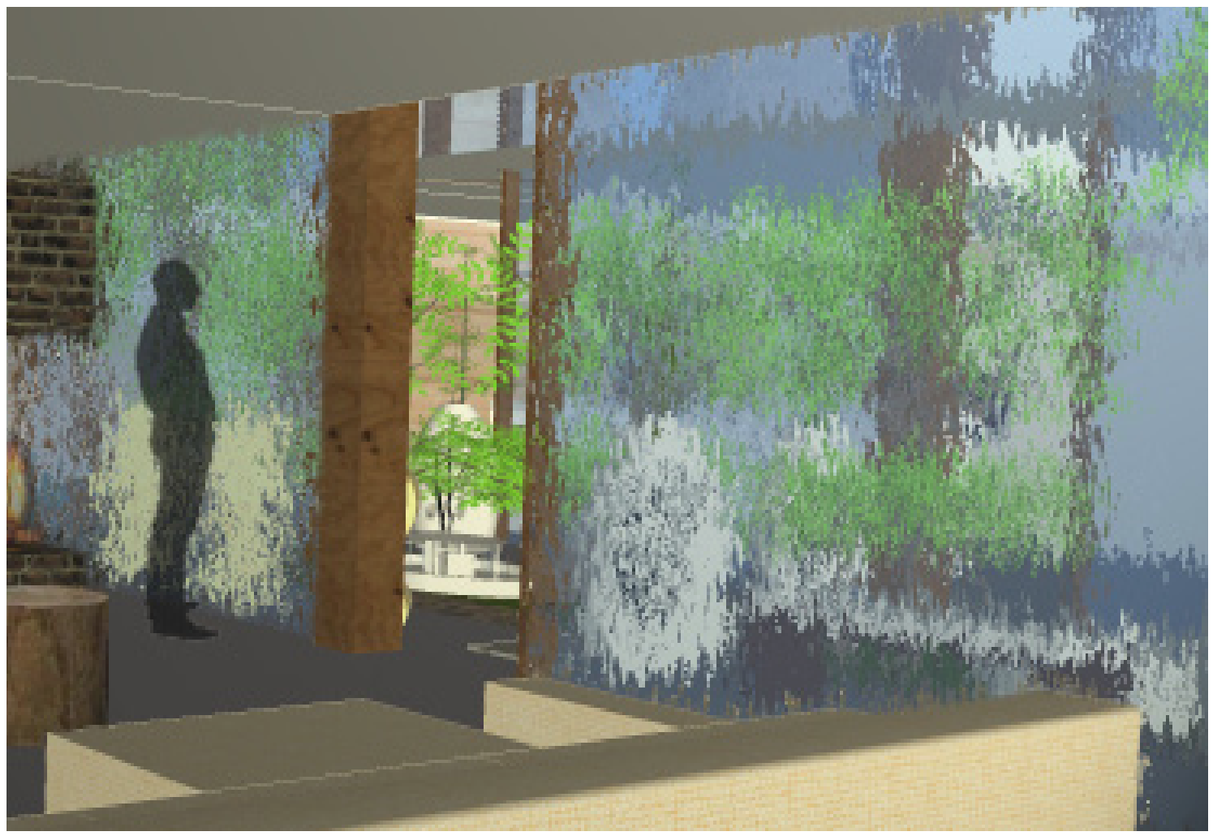
View from the hallway to the bookshelf - upstairs



View from the kitchen to the workingroom - dowstairs

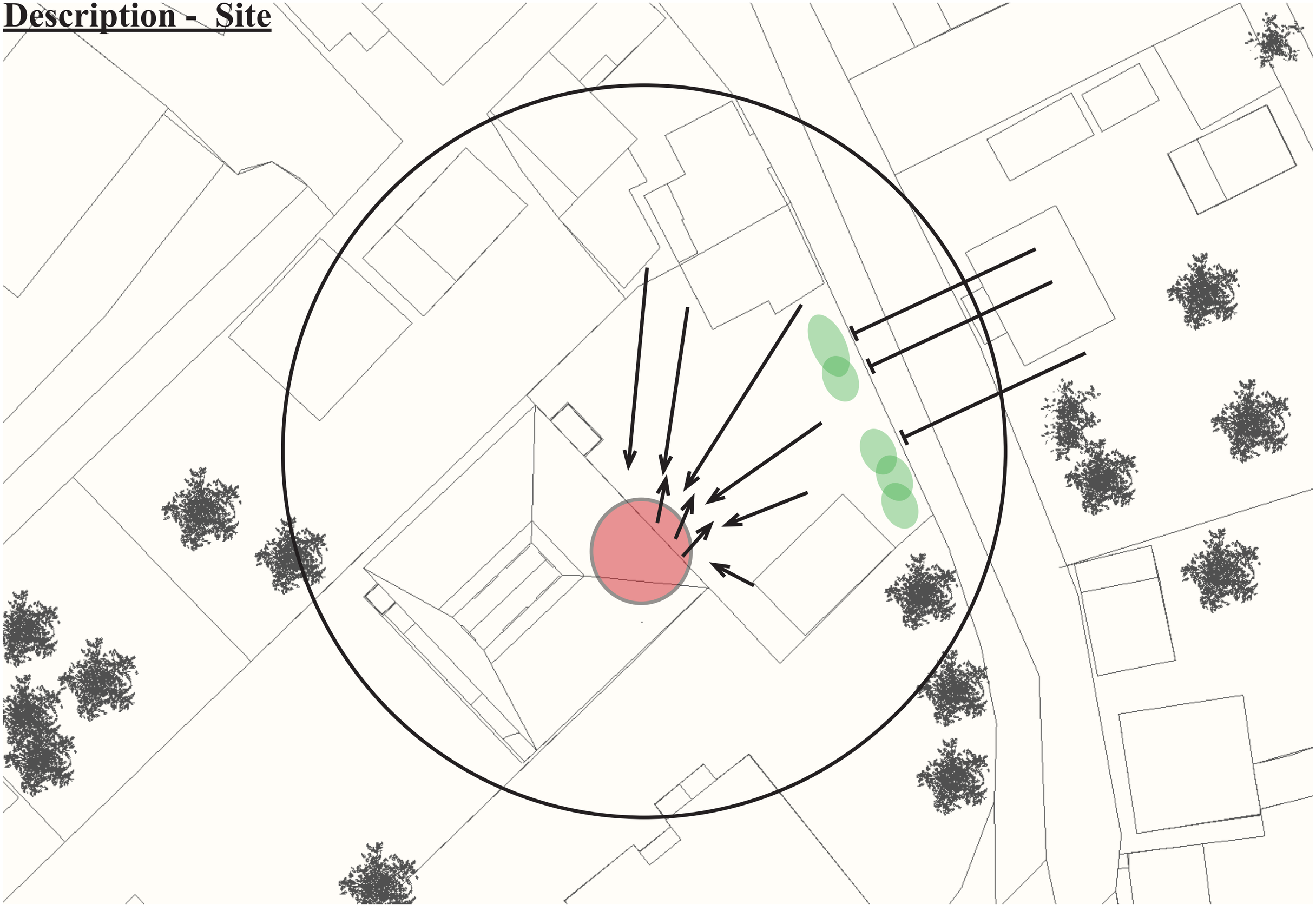


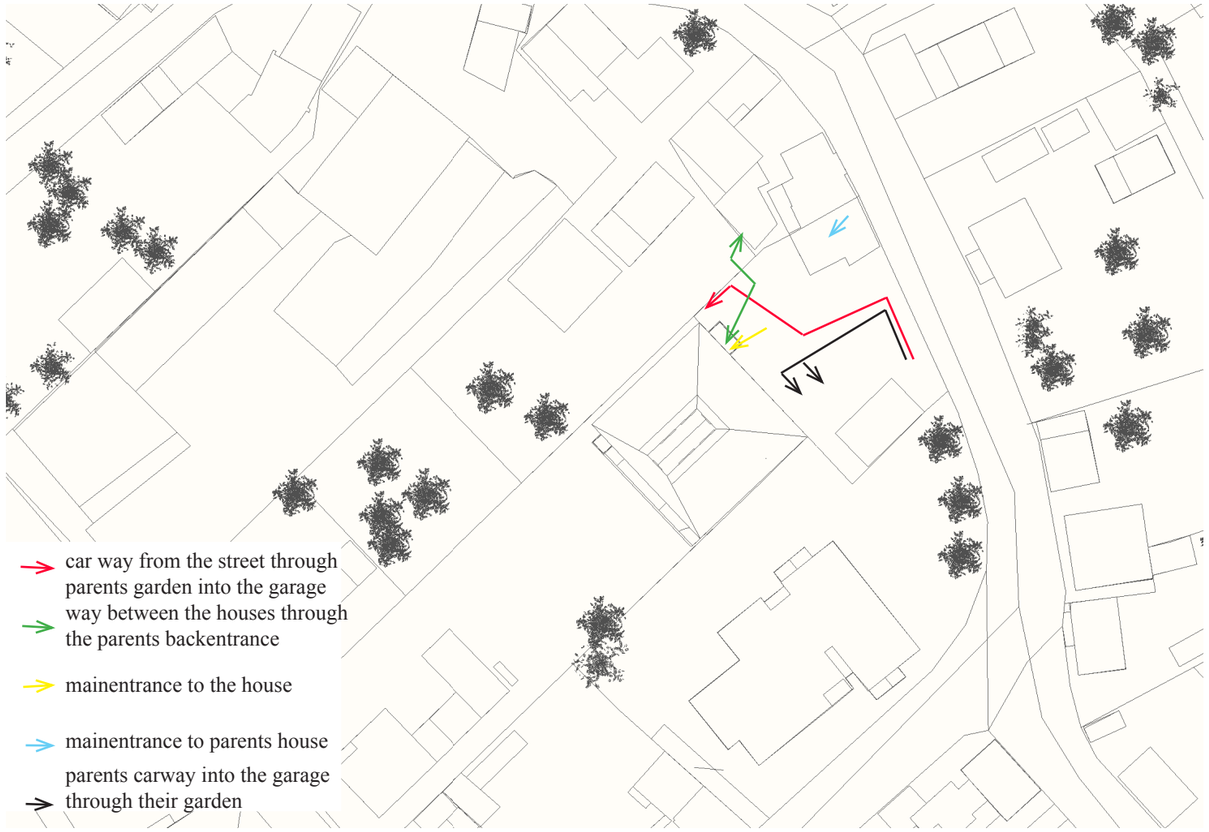
View from the second floor showing the inside garden

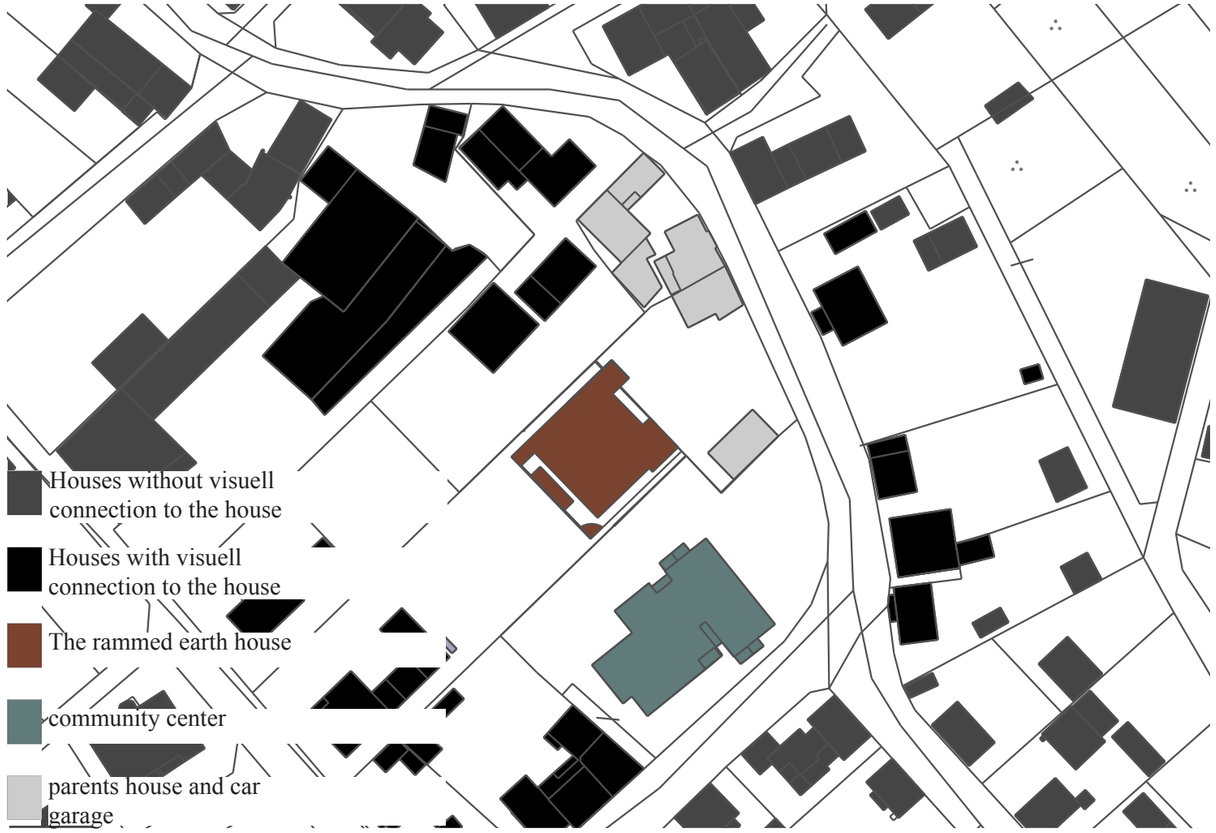


View from the livingroom showing rain falling between the glas panes

# Description - Site






## Children in the garden

The children are the most important part in the family and their beeing and their contact to the parents house is playing a big role in the design of the house.

In order to be able to always have an eye on them I am putting them in the middle of everything while they are playing.

Are their parents to busy to have their eyes on them their grandparents can do that from their backyard, windows, garden and when they are working in the garden.

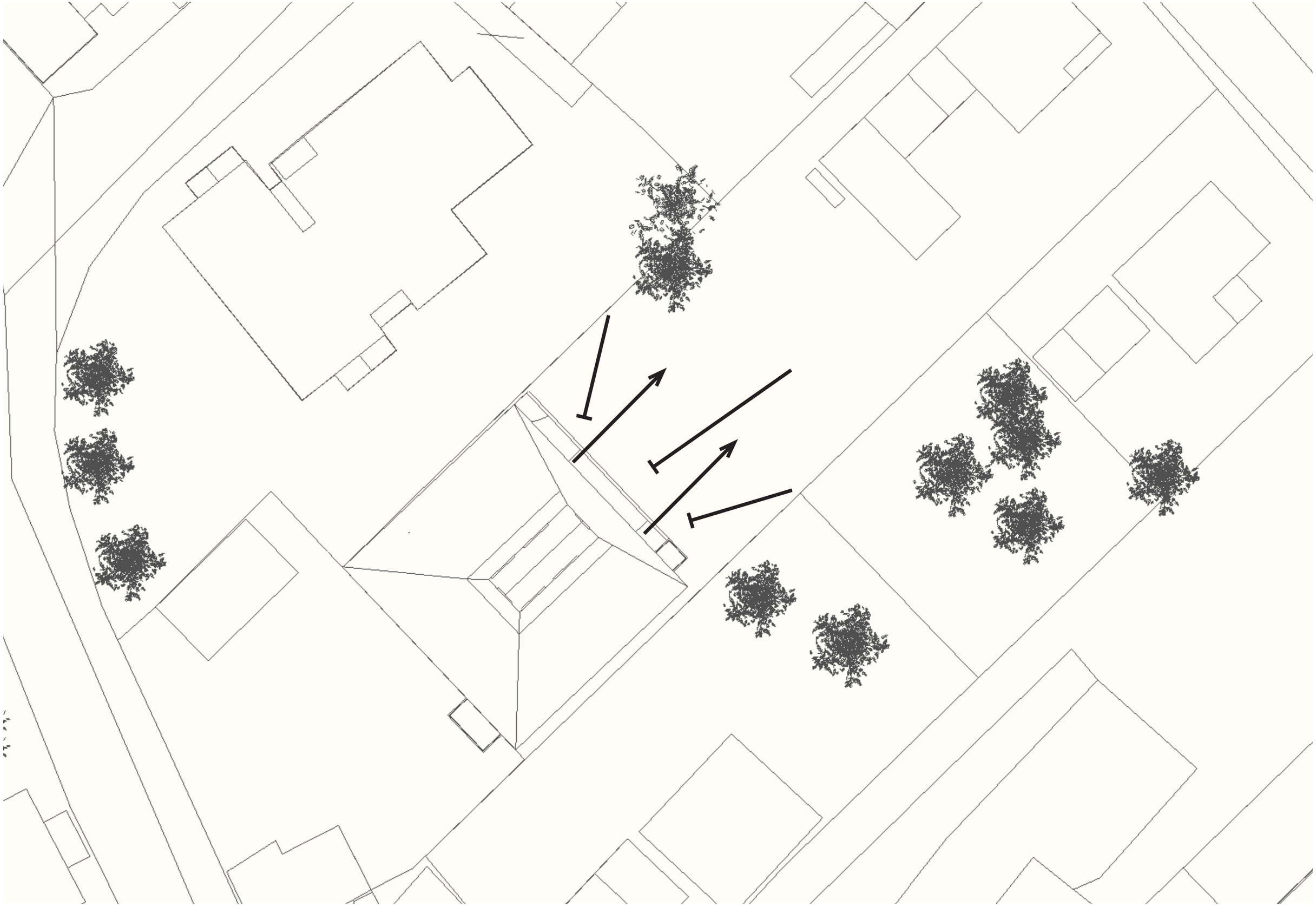
Thinking about the situation that me and my husband are going to work, we do not need to wake up the children to drive them to their grandparents. They can keep sleeping in their beds and their grandparents can see them as soon as they wake up and go down the stairs. This is very practical for all parts of the family.
The children can even go to their grandparents by their own as they do not need to cross any streets. They just go through the garden.

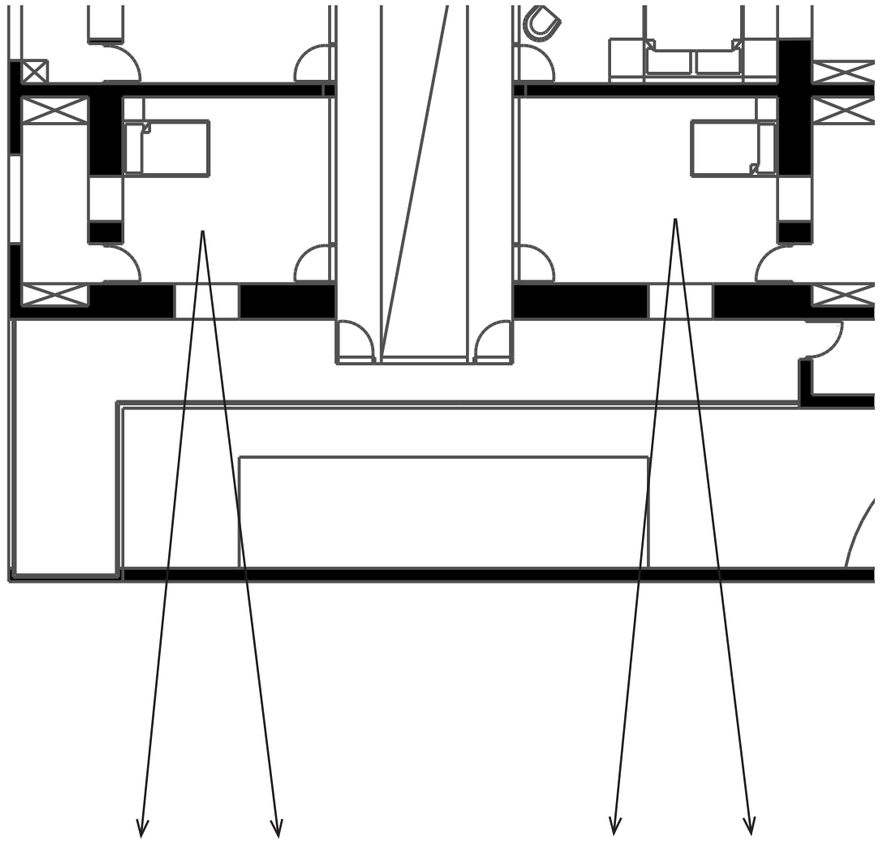
The open playing corner with its typical western large galssurfaces becomes part of the outside living with its open contact to the parents house. To still keep the privacy the contact to the street and the neighbours is blocked by plants.

# Views

View from the parents livingroom to the playingcorner

View from the playing corner to the parents house





## Children in the backyard

In contrast to the garden, that shares with the parents, the bacyard with its pool becomes a more private space for the family and an even  more secure area for the children.

The backyard is very closed and all looks from the neighbours are blocked by a rammed earth wall. The rammed earth wall has however two openings on the same level as the kitchen and diningroom windows and allows the look from inside the house to the neighbours house behind the wall.

Thinking about the situation when I am working in the kitchen I can let the children playing outside while keeping my eyes on them through the big window of the kitchen.

# View

View showing the backyard