Aesthetics of sustainable architecture

Minimalistic house

"A house with a minimalistic footprint and material use, taking into account the minimal necessities to maintain itself"

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Msc 2 elective

Aesthetics of sustainable architecture

Design Statement

In my opinion all architects have the obligation to take sustainability seriously and to motivate and enlighten as many people as possible during and before he design process to take proper measures in order to be sustainable. Sang Lee addresses Reyner Banham in his work 'Aesthetics of sustainable architecture' and states out that ecological thinking has much to do with conservation, efficiency and regeneration. (Lee, 2011 pp. 15) I think this is a good starting point regarding the measures that need to be taken for the design of a (more) sustainable house. In short it means we have to reduce the ecological footprint and therefore also the material usage, maximising the output of quality and quantity of products produces necessary to build and return as much as possible that we have taken from the earth.

To minimise the footprint I take action regarding two points: I literally use minimum measurements to decrease the footprint and material usage. Secondly I take ecological measures to decrease the CO2 footprint on the planet. According to CBS more and more people in The Netherlands will become single, meaning the demand for single-person housing will increase. Now, many people take up more space than necessary. (CBS, 2017, Huishoudens; samenstelling, grootte, regio, 1 januari)

Besides less usage of space per person, I am going to use highly durable materials that can be reused or used for different purposes after the lifespan of the building. Minimising the amount of different materials should make it easier to reuse as much as possible. The most important aspects are: no usage of glass since this is not recyclable, usage of polycarbonate for walls and windows, since this minimises the amount of different materials and because it's highly durable and reusable, and smart usage of the roof so that the material used actually has a second function. This way I want to give something back to the earth prior to what we have taken from it.

To contemplate on the roof I would like to address the following: another important aspect is the relationship to it's environment (Lee, 2011, p. 7) and water concerns (Lee, 2011, p. 15). I see the relationship to it's environment in two different ways: first of all, I took the Dutch climate into consideration regarding drainage problems. Secondly it takes into regards what Ralph L. Knowles states out: "Rituals of human habitation match rhythmic changes in the formal order of the dwelling".

Meaning that during seasons human behaviour changes and the interaction between people and the building changes accordingly. (Knowles, 2011, pp. 59) There is a certain interaction between season, building and people. I think that this phenomenon of interaction should be implemented into dwellings.

During heavy rainfall, my roof will hold the water and use it for flushing the toilet or cleaning water. During winter, a mutual green house will help warm up the building, while during summer it will help cooling it down. Big windows can be opened in the house looking at the greenhouse, creating an interaction between inhabits of the city and the person living in the house, with respect for privacy.

CBS. (2017). Huishoudens; samenstelling, grootte, regio, 1 januari. Retrieved 06-11-2017, from CBS
Lee (Ed.), Aesthetics of sustainable architecture (pp. 7 - 25). Rotterdam: 010.
Lee (Ed.), Aesthetics of sustainable architecture (pp. 50 - 65). Rotterdam: 010.
Lee (Ed.), Aesthetics of sustainable architecture (pp. 80 - 96). Rotterdam: 010.

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Needs

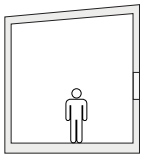
What does a single person living in a city need to live comfortabely, considering changes in overall lifestyle necessary for all human beings in order to live more sustainable.

Starting points

One person
Location: dens city
No car (public transport)
Low meet consumption
Tolerate minor temperature changes throughout the year
Minimal space requirements
Accept that we are part of a community

Grow (partly) own food
Generate (partly) own energy
Harvest warmth as much as possible in winter
Cool down ventilation air naturally in summer
Use water in a smart way; distinguish gray and black water
Give something back for the city
Lower the overall footprint of living

Goals	Before	After
Water	Rain water is wasted	Rain water is used
Energy	Requires energy	Energy is generated
Heat	Heat is extraveted / made	Heat is gained
Cooling	Costs energy or overheating	Natural (free)
Structure	Changes or replaced / maintaned	Durable (infinite)
Social	Isolates	Connects
Space	Takes up space, nothing in return	Gives back quality space
Specified	Random purpose	Specified for single household
Food	Bought at supermarket	Vegetables grown near house



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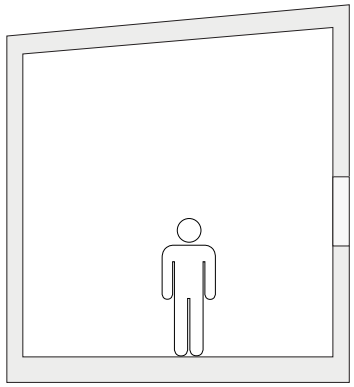
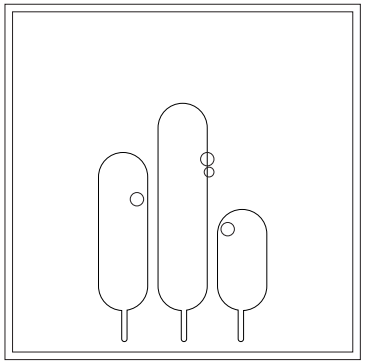
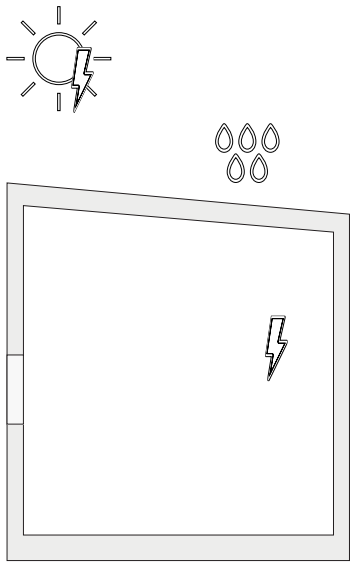


Living
(house)



Providing
(greenhouse)



Utilising
(water and energy)

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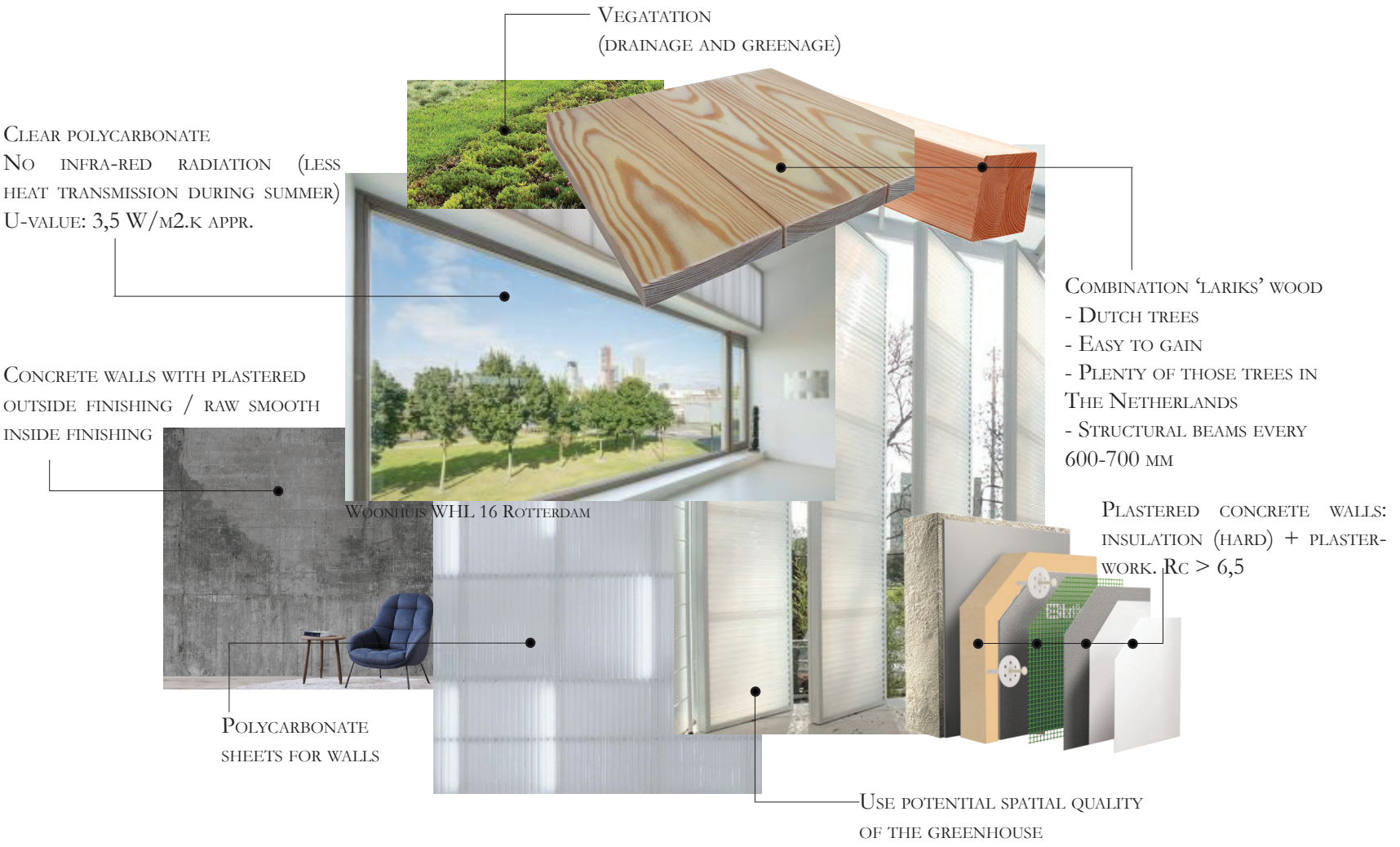
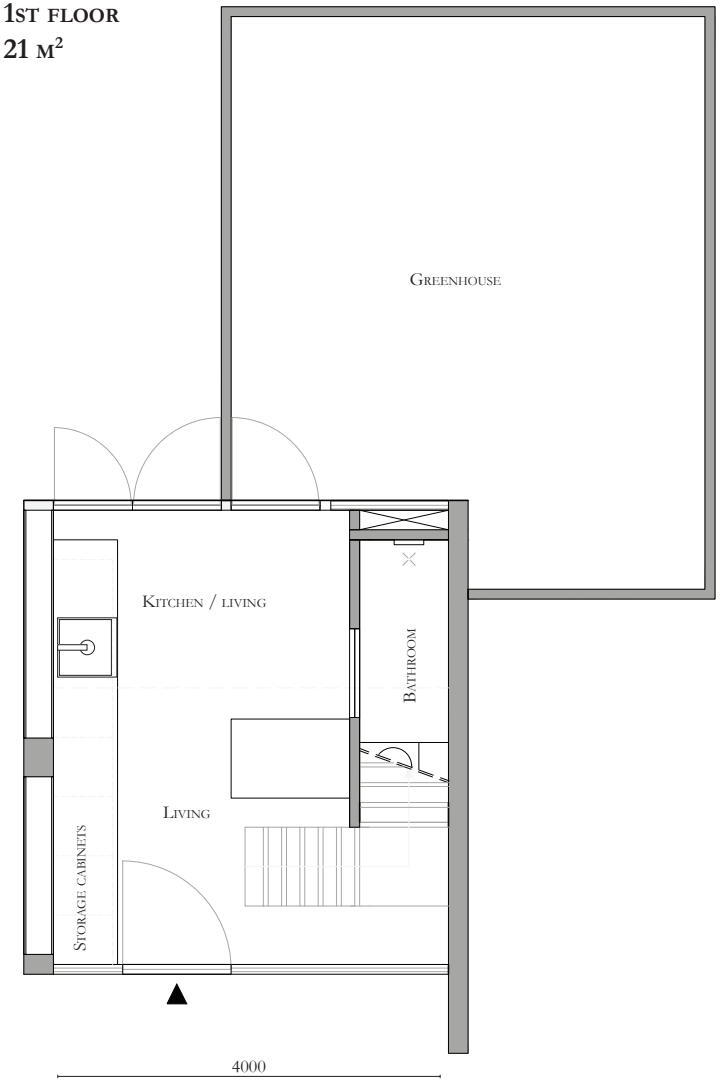
Sample board

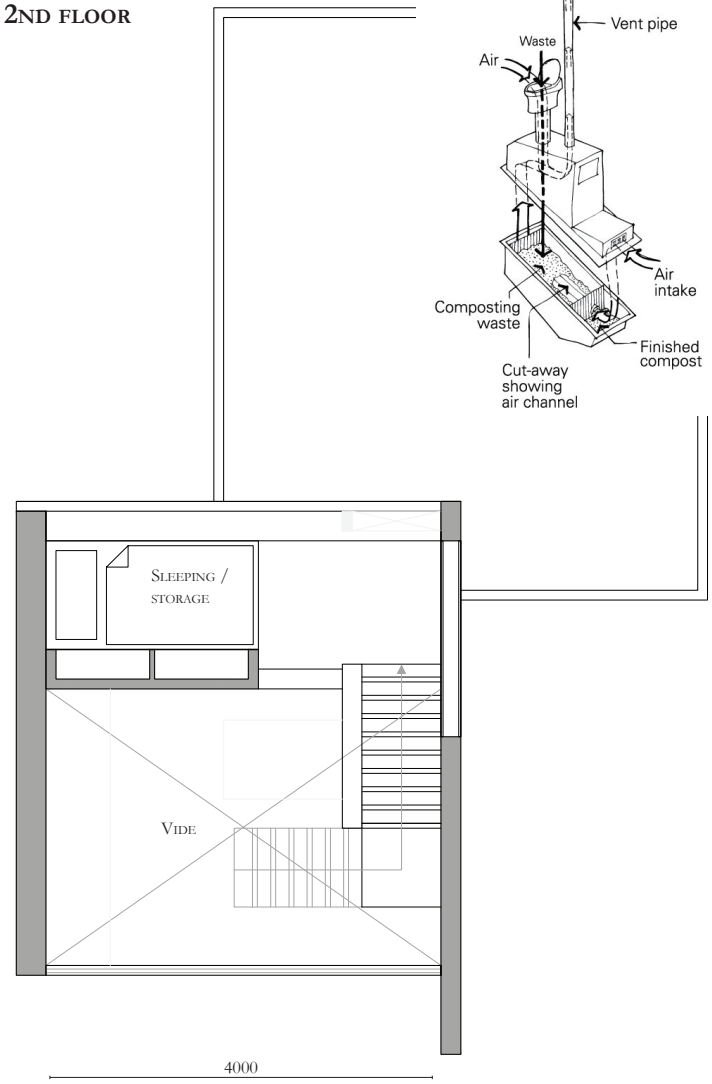


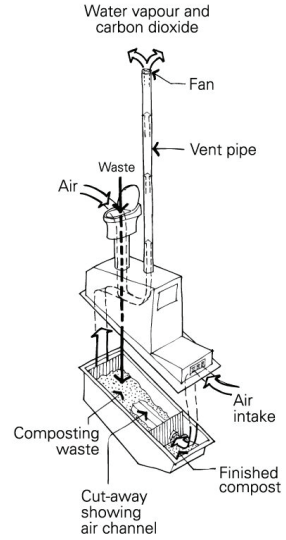
LIVING

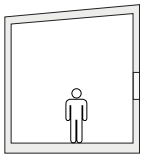
1ST FLOOR
21 M²



2ND FLOOR







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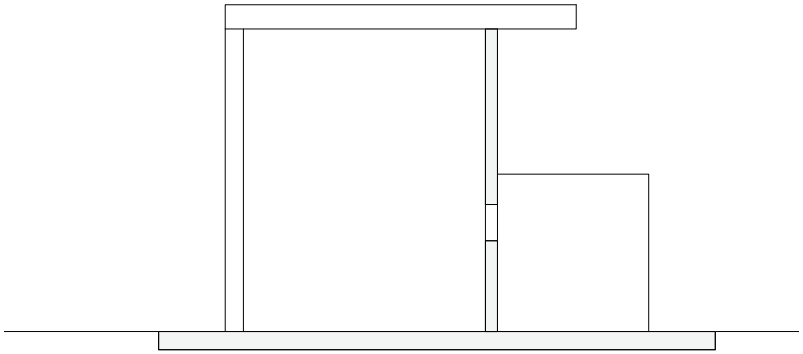

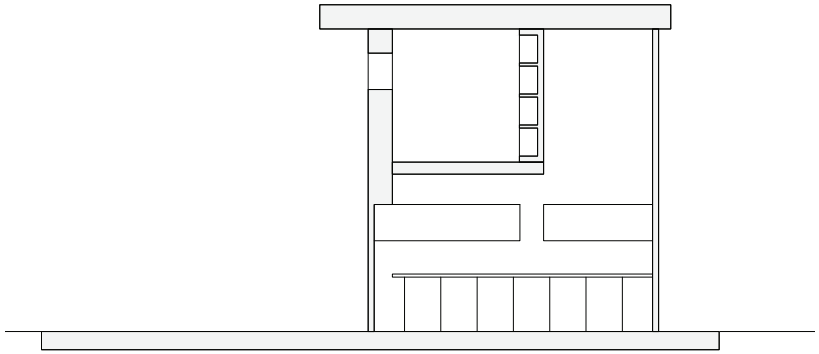

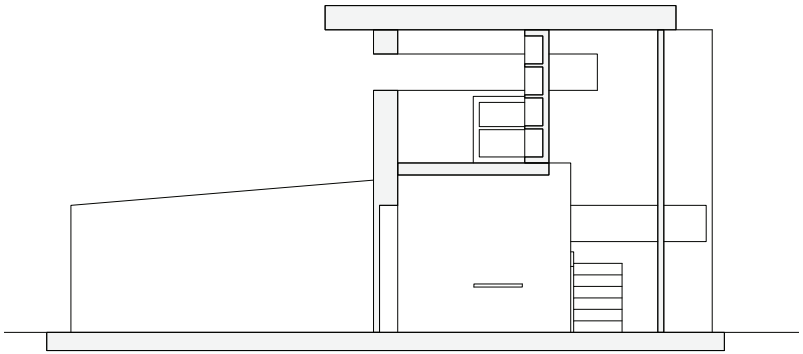

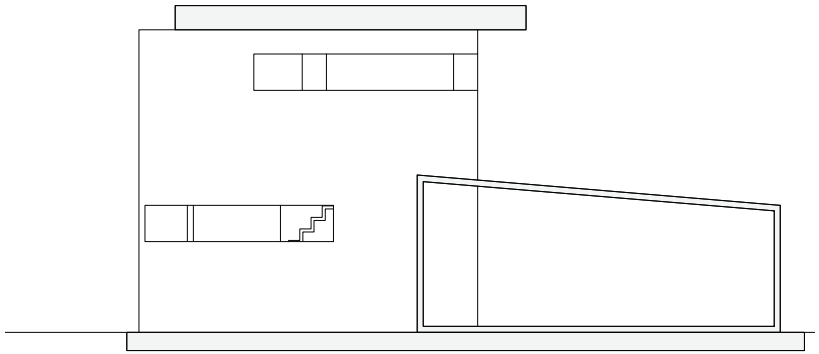

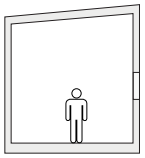

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Providing

Hydroponic urban farming 25 m²

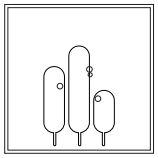
- Crops are less depedent of seasons
- Mixed used of crops to have different sort of vegetables troughout the year
- No soil is used; substrate is water or inert medium therefore it's possible to grow crops throughout the year
- No (or very little) pestisides needed
- Spatial quality: enhancement of life
- Shared ground: feeling of community











Human habitat

Conventional farming

Human Habitat concept Impact Farm Copenhagen

Hydroponic vegetables nasa

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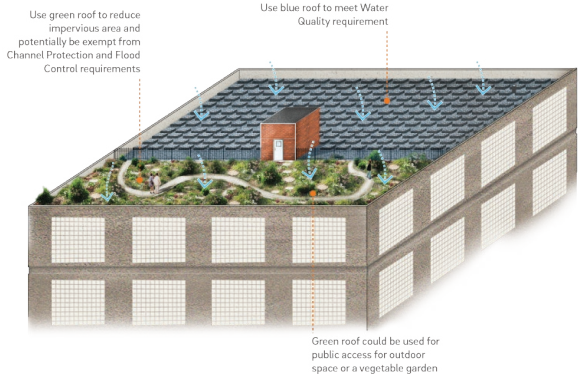
Material properties

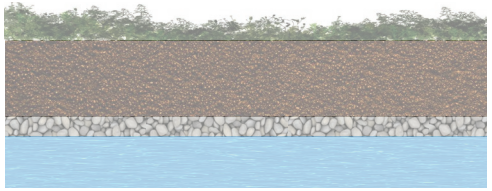
Material	Weight	λ	U
Concrete	800 kg/m^3	0,129*	0,256w/m^{2}k
Glass	30 kg/m^2	-	1,1 w/m^{2}k
Aluminium	2800 kg/m^3	(200)	0,7 w/m^{2}k **
Water	998 kg/m^3	-	-
Soil roof	1800 kg/m^3	-	-
Polycarbonate	4 kg/m^2	-	1,1 w/m^{2}k

*if d = 500 mm
** when used as window frame

Hull

'Warm concrete' meaning an insulative concrete structure is used combined with heating and cooling





Roof

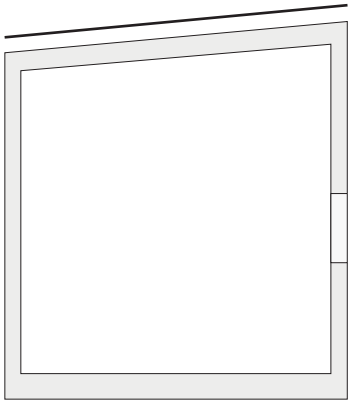
Green-blue principle to absorb water when necessary. Vegatation combined with water management.

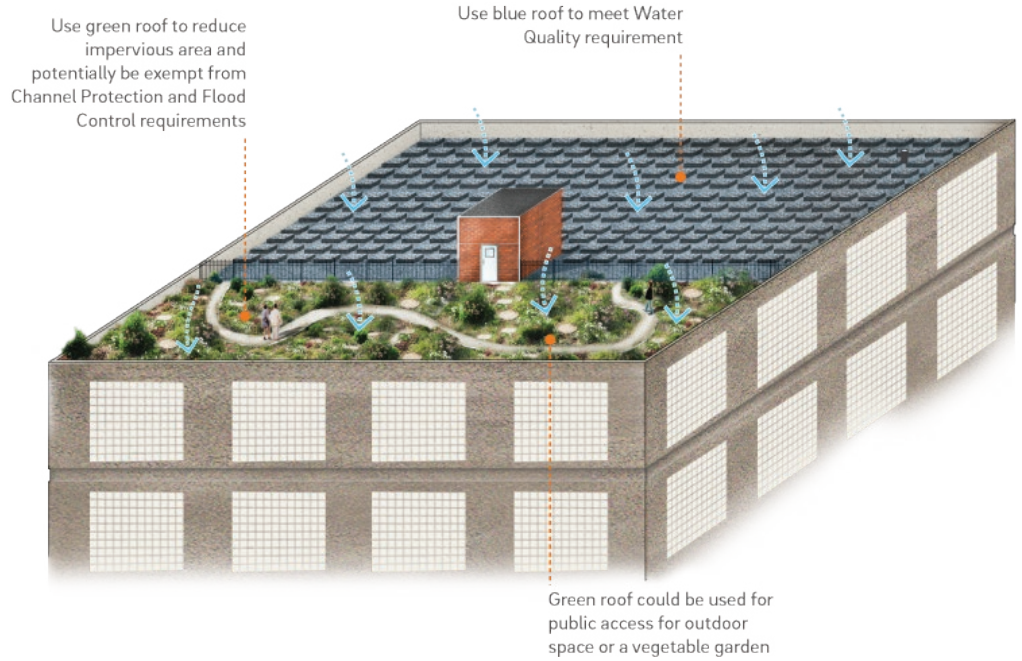
Greenhouse

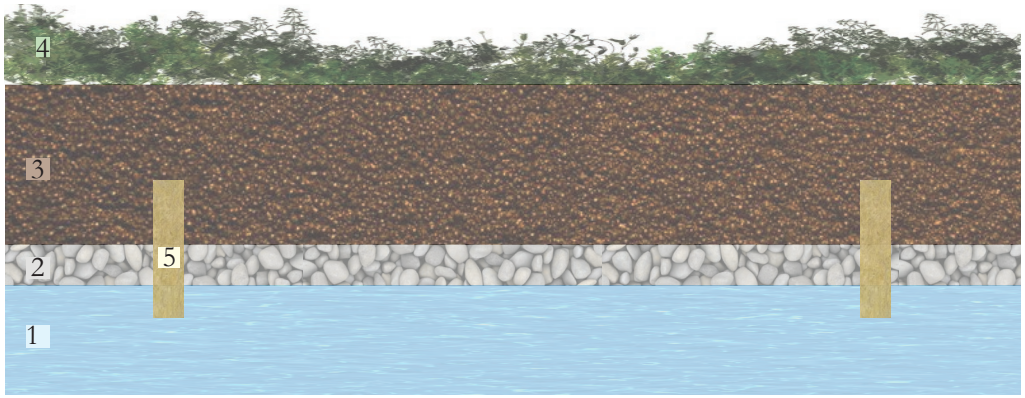
Polycarbonate sheets 32 mm thick. Solar blocking properties and U-value comparable with glass; highly durable

ROOF: GREEN-BLUE ROOF

PRECIPITATION: 800 L/M²/YEAR
USAGE 1 PERS: 40.000 L/YEAR
GAINED WATER: +- 35.000 L/YEAR

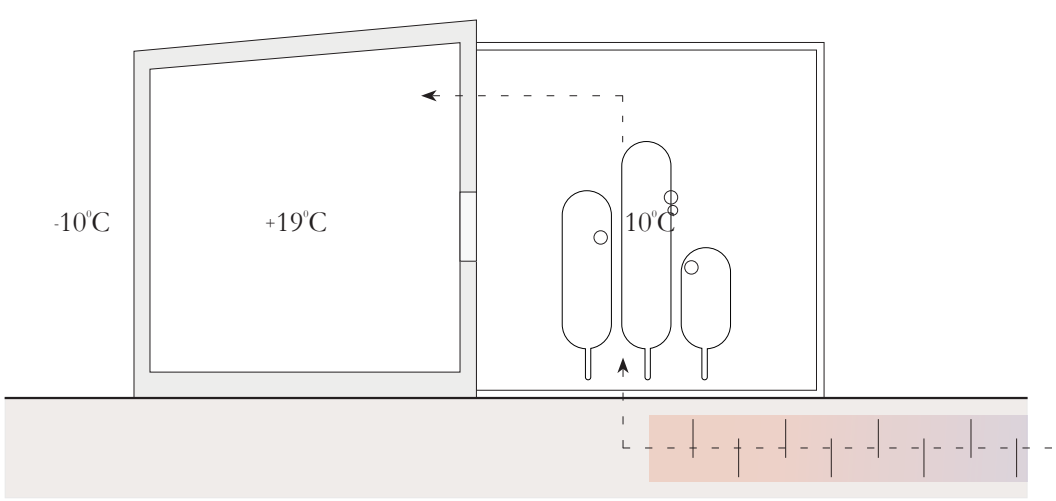


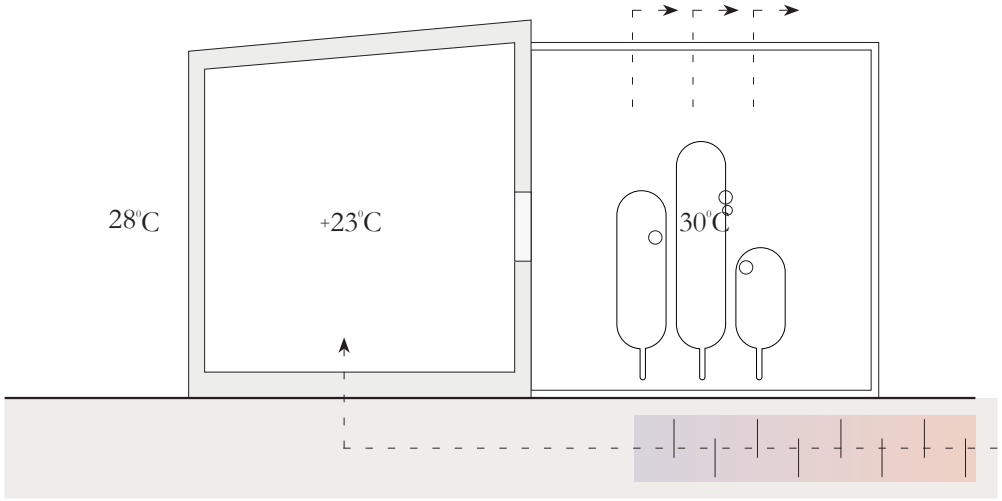


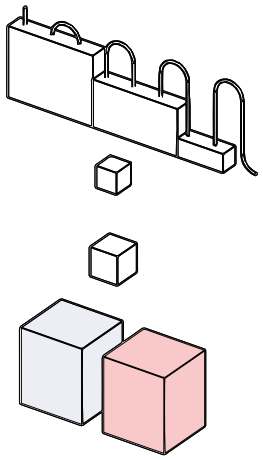


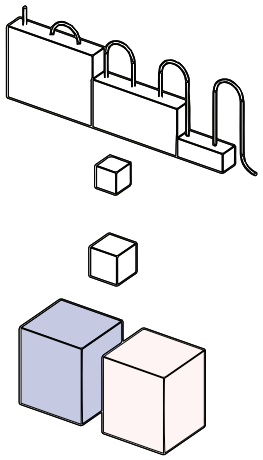
1: WATER
2: GRAVEL
3: SOIL (FILTERING)
4: VEGATATION
5: ROCKWOOL PIPES
6: OVERFLOW / REFILL PIPE

GREENHOUSE: COOLING & HEATING









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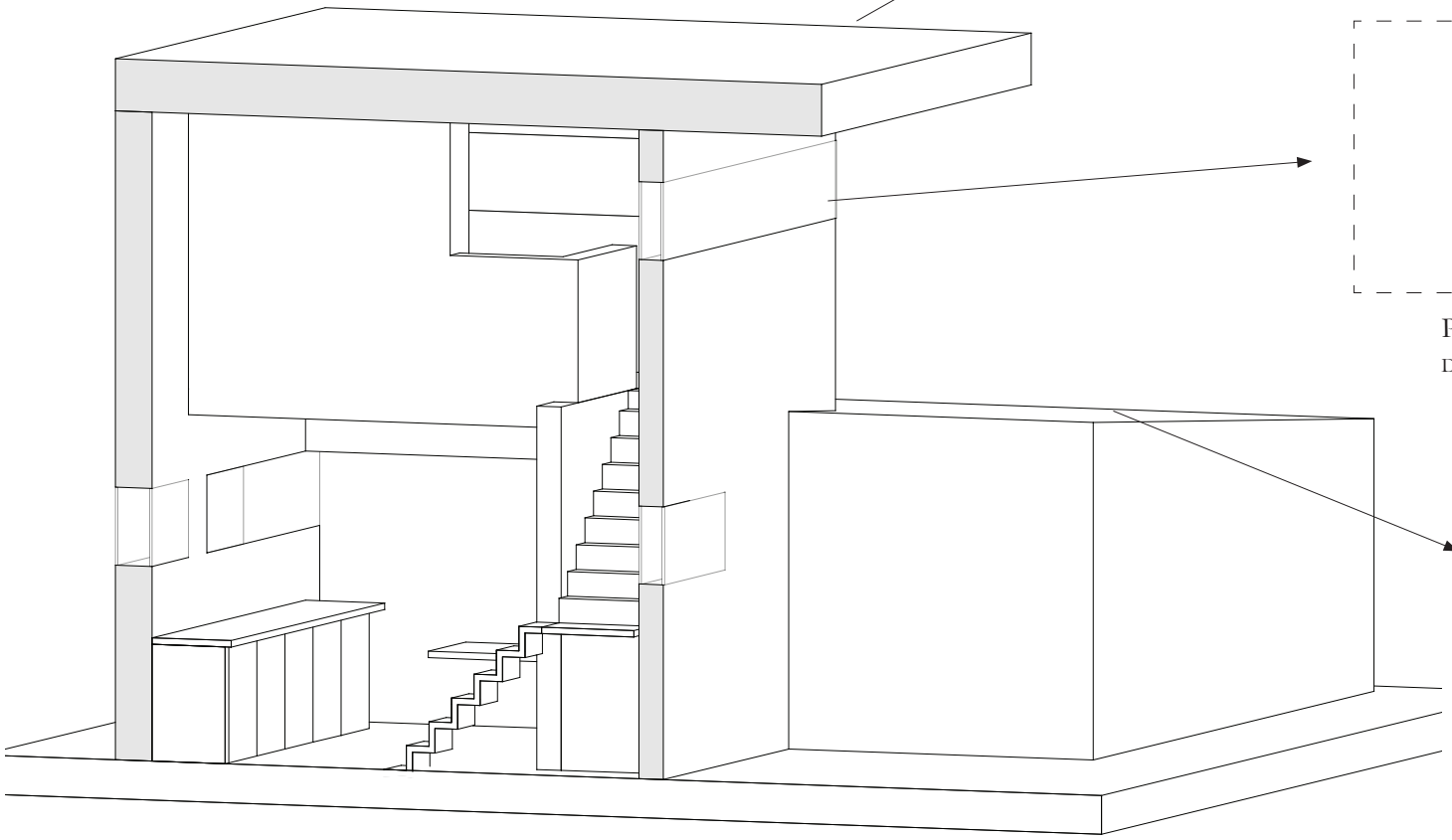

INTEGRATED PV CELLS PROVIDE ENOUGH ENERGY DURING SUNNY DAYS TO PROVIDE THE HOUSE

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Starting points

asdkfjaksljfalsdjf alsdjflk asjd;kf jals;dkjf alsjdkf asd

	Before	After	Measures
Water	Rain water is wasted	Rain water is used	Green-blue roof Water saving measures
Energy	Requires energy	Energy is generated	Water PV-cells (integrated)
Heat	Heat is extraveted / made	Heat is gained	Heat-cold storage Greenhouse
Cooling	Costs energy or overheating	Natural (free)	Natural ventilation Cooling by ground
Struc-ture	Changes or replaced / main-taned	Durable (infinite)	Insulating concrete Simplicity
Social	Isolates	Connects	Common interest in green-house
Space	Takes up space, nothing in return	Gives back quality space	Space is used in multiple ways, not 'just' living
Specified	Random purpose	Specified for single house-hold	Looking closely at the needs of comfortable mini-mal living