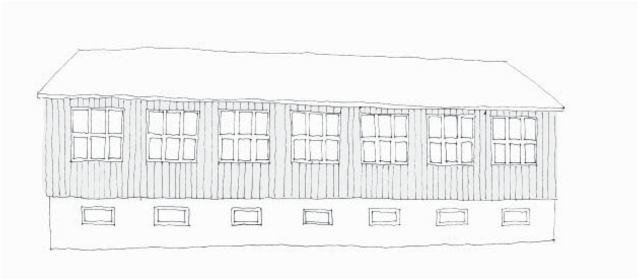
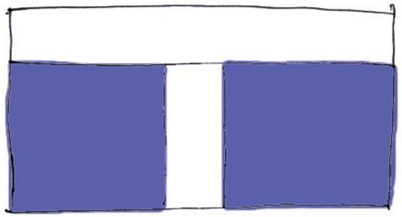
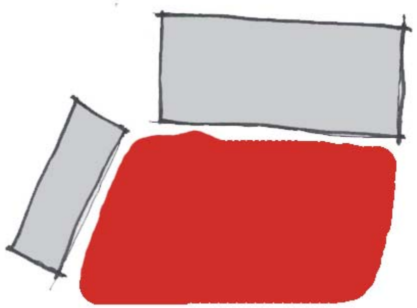
Linesøya Passivhus



Original Fassade



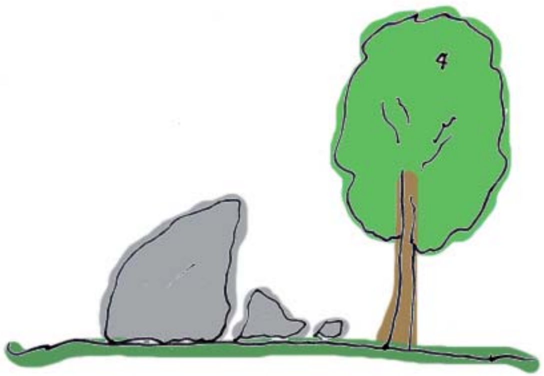
Classrooms



Courtyard

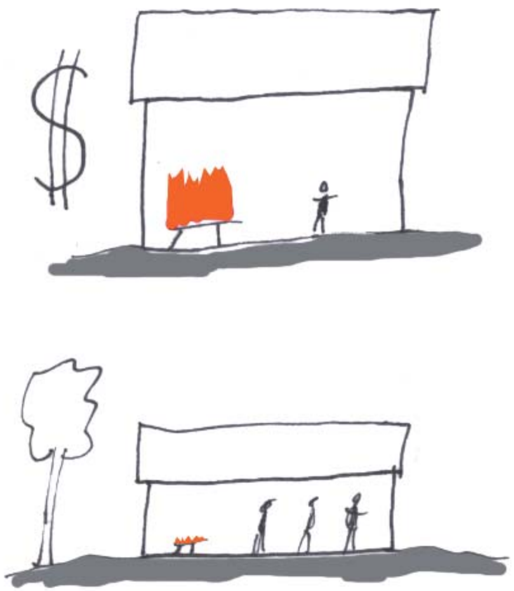
Historical Context

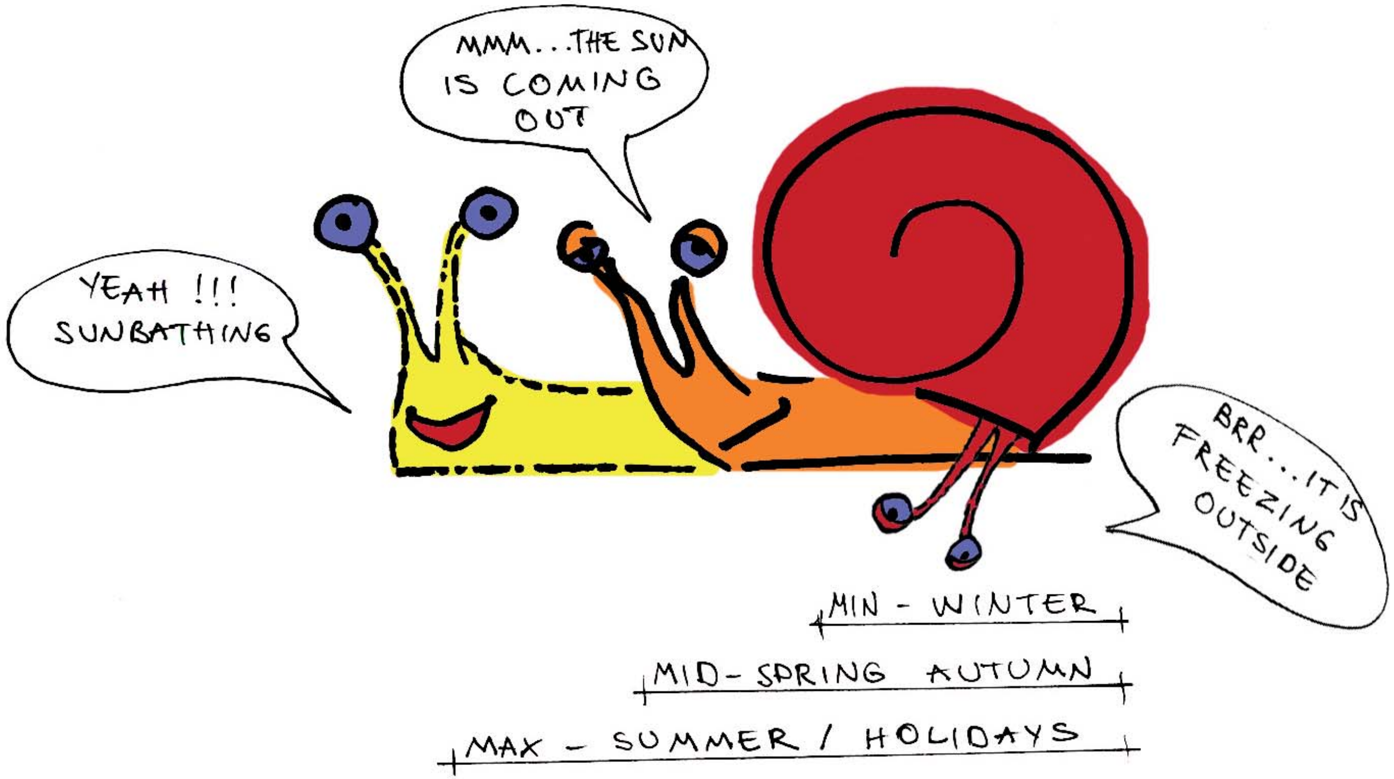
Hiding from the Elements



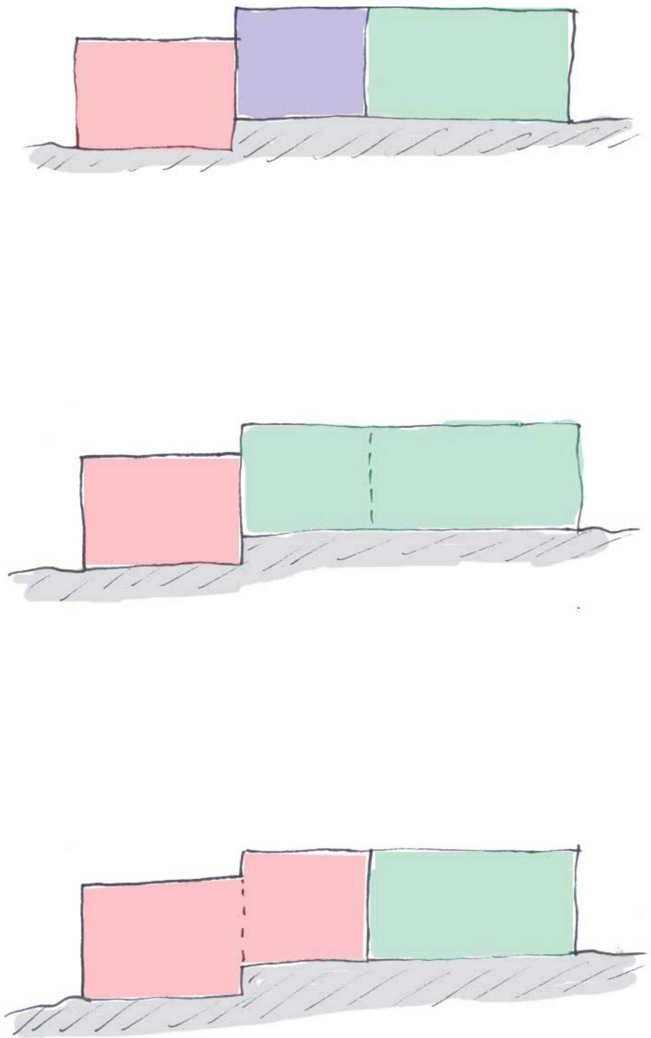
Using local Materials

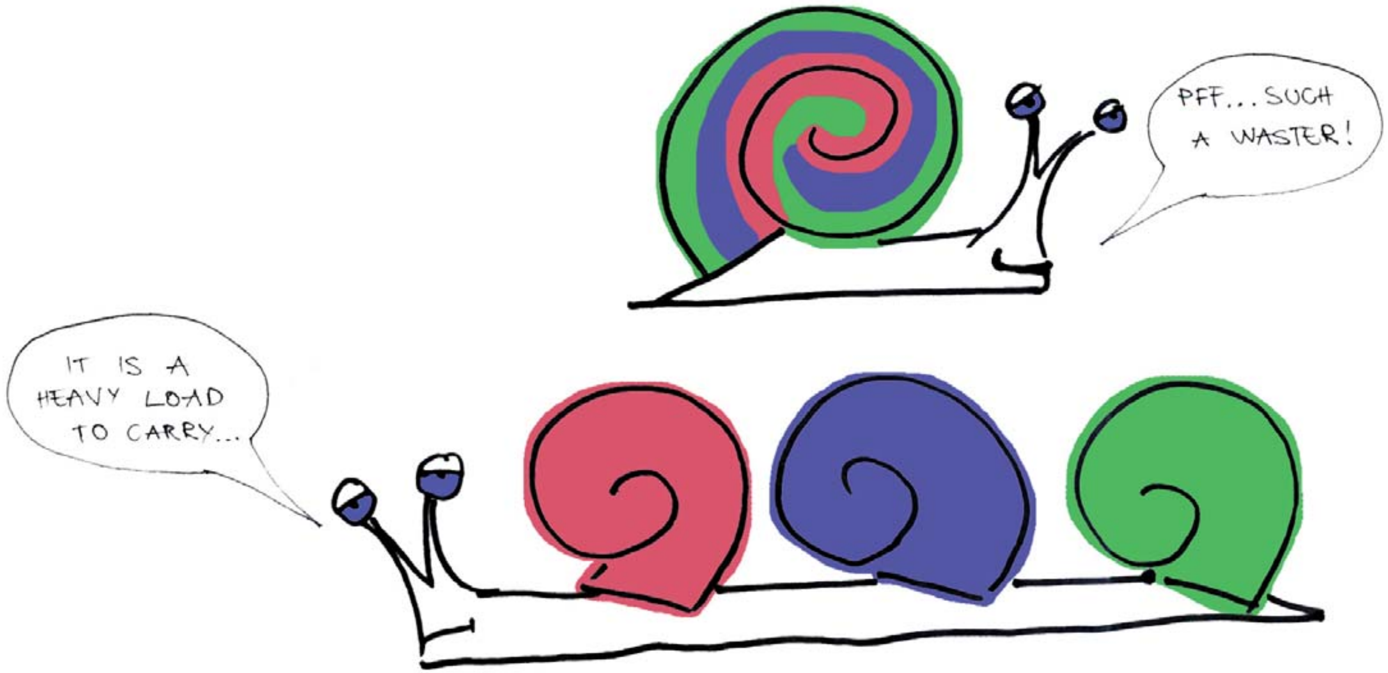
Local Identity

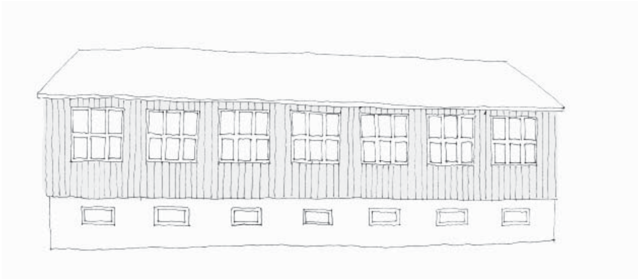


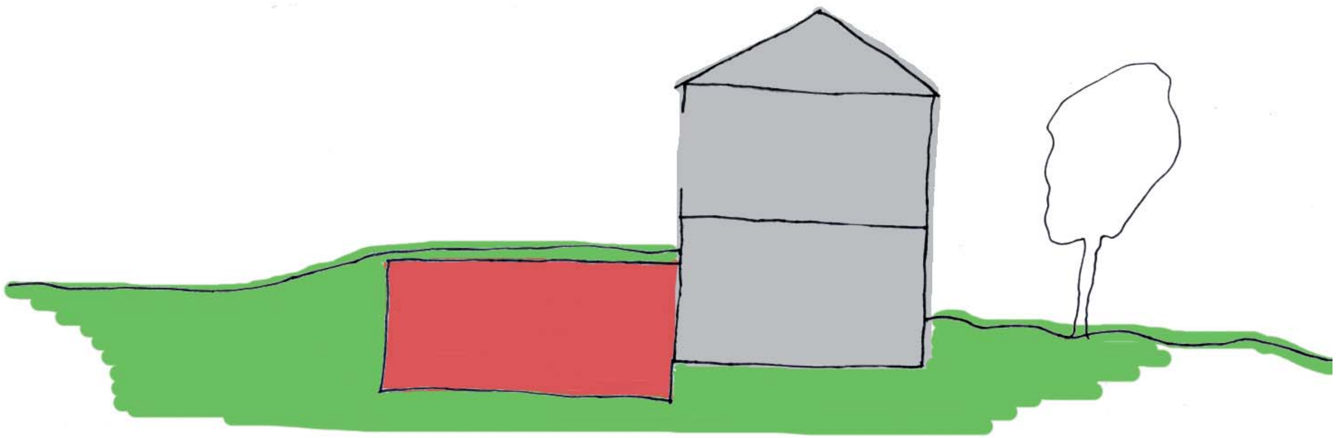


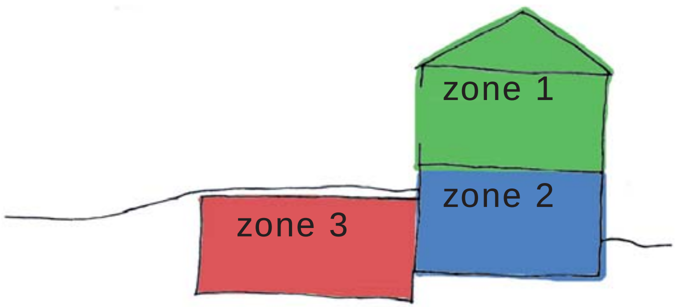
YEAH !!! SUNBATHING
MMM...THE SUN IS COMING OUT
BRR...IT IS FREEZING OUTSIDE
MIN - WINTER
MID - SPRING AUTUMN
MAX - SUMMER / HOLIDAYS




PFF... SUCH A WASTER!
IT IS A HEAVY LOAD TO CARRY...







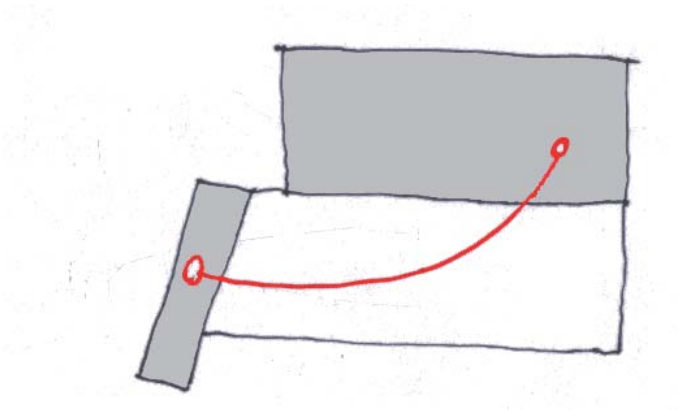
Benefits Underground

- Flexibility of floor plan and room usages allows for the buildings size to adapt adapt to its usage, thereby always providing a compact, easily heated shape

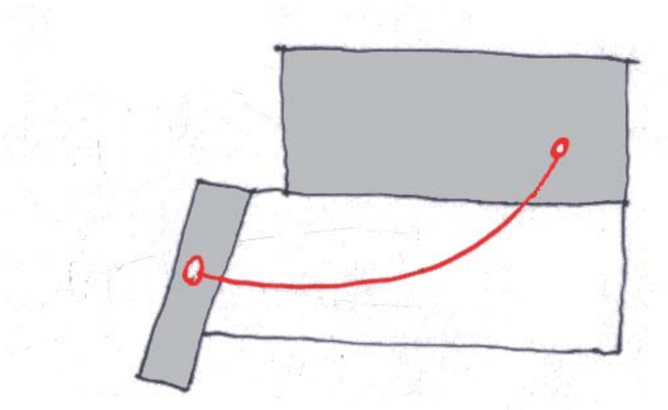
- Earths temperature keeps outside walls and floors at a constant temperature making these rooms easier to heat/ insulate

- Earth regulates the buildings temperature keeping it warm in the winter, and cool in the summer

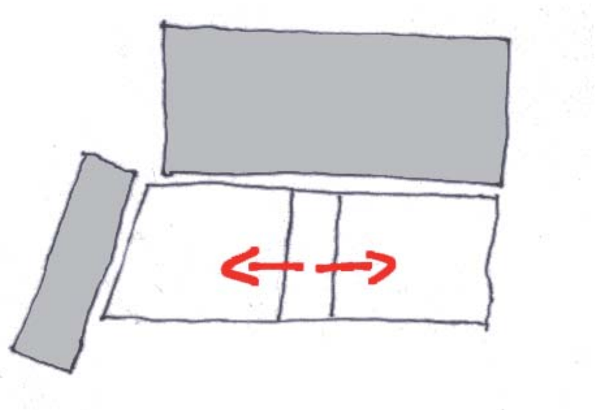
- Use of passiv solar and active solar heating.



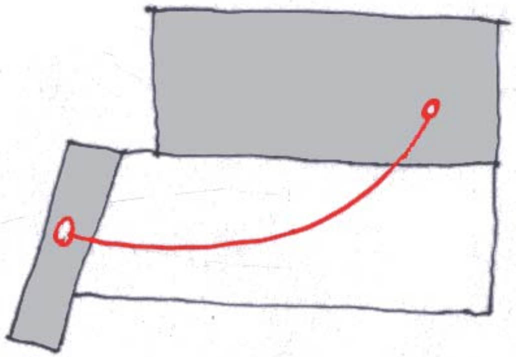
Connecting two buildings...



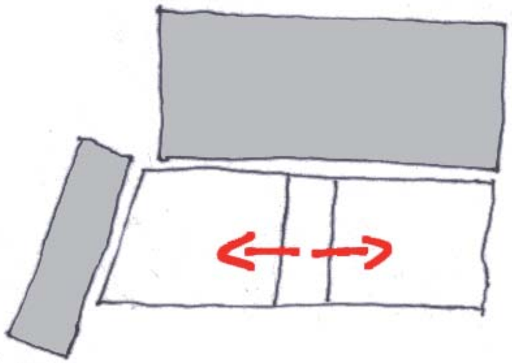
Connecting two buildings...



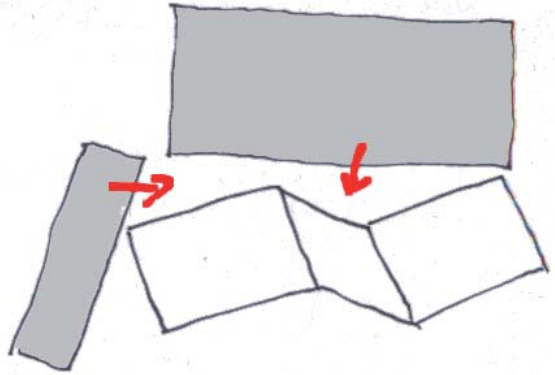
...flexible room use...



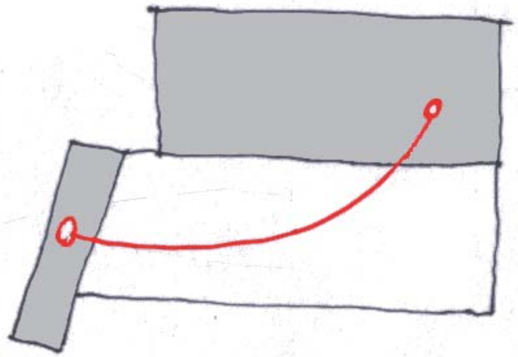
Connecting two buildings...



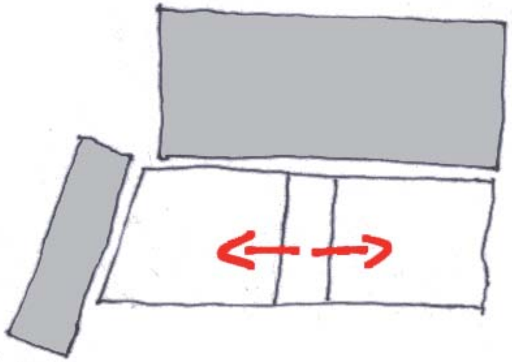
...flexible room use...



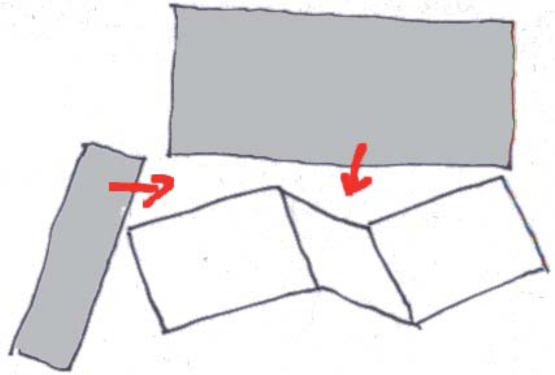
...entrances...



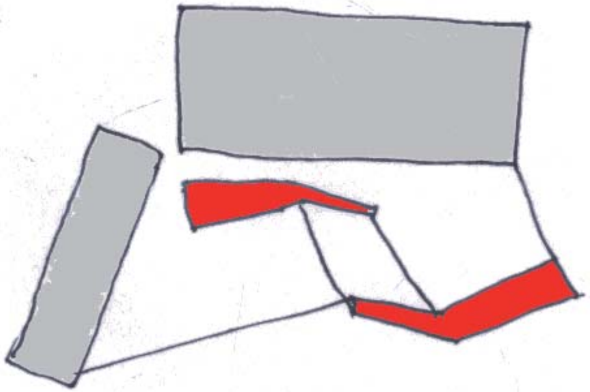
Connecting two buildings...



...flexible room use...

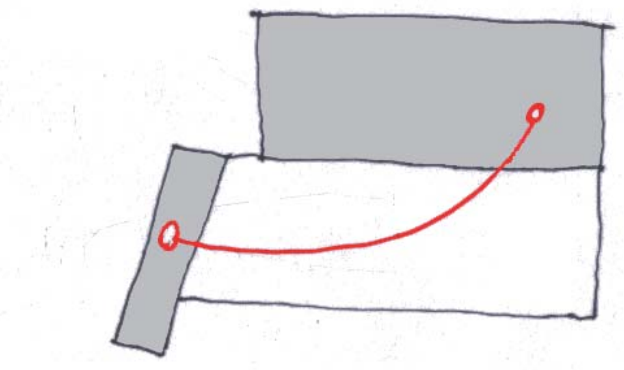


...entrances...

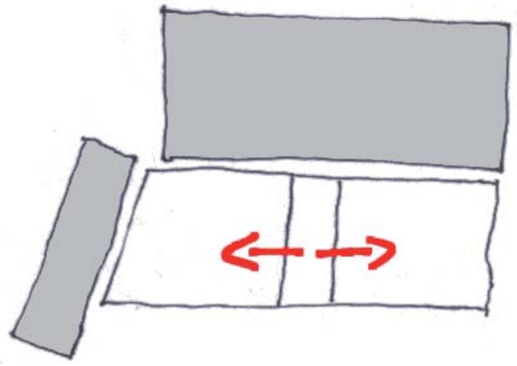


...thermal mass...

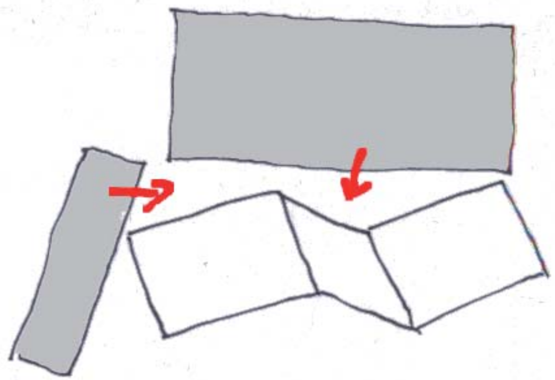
Concept



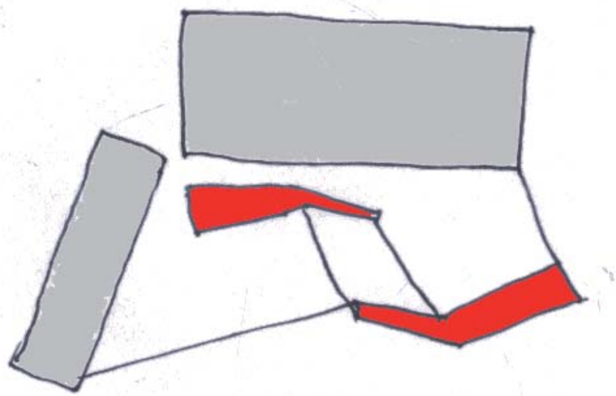
Connecting two buildings...



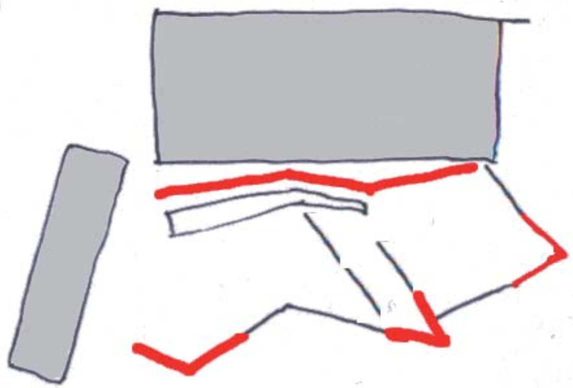
...flexible room use...



...entrances...

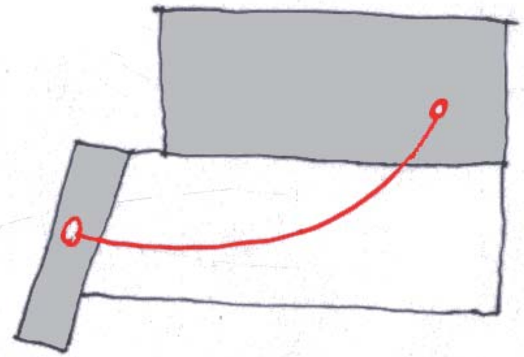


...thermal mass...

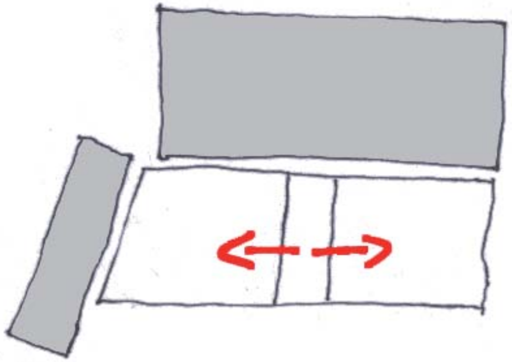


...light...

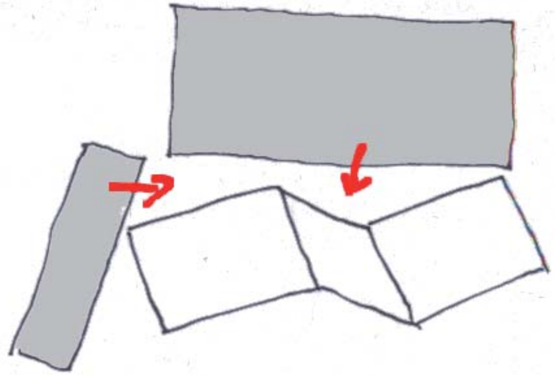
Concept



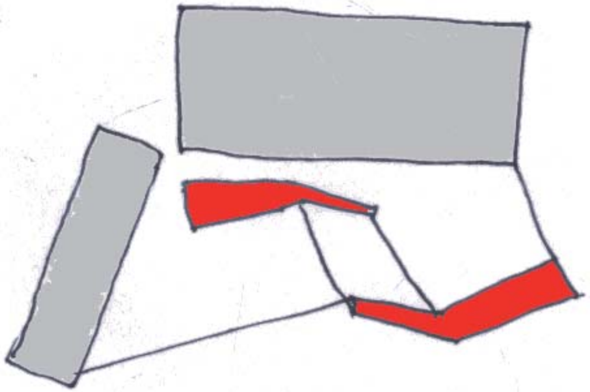
Connecting two buildings...



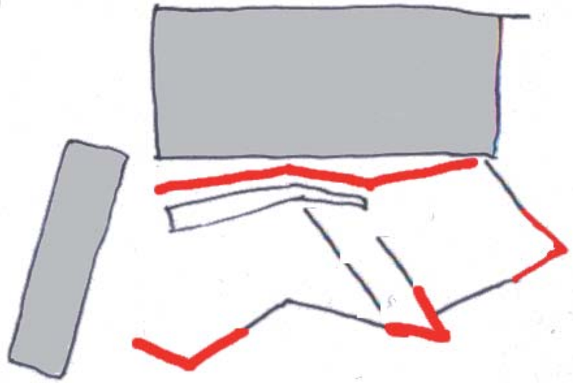
...flexible room use...



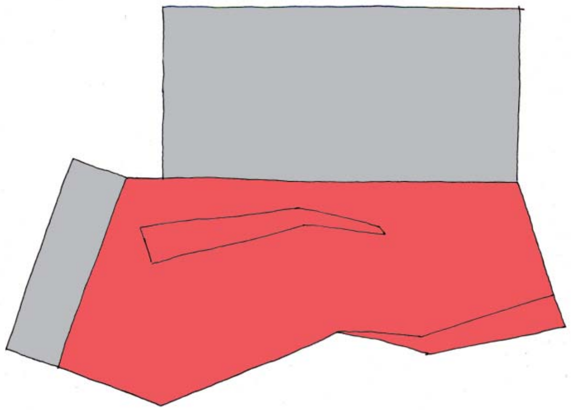
...entrances...



...thermal mass...



...light...

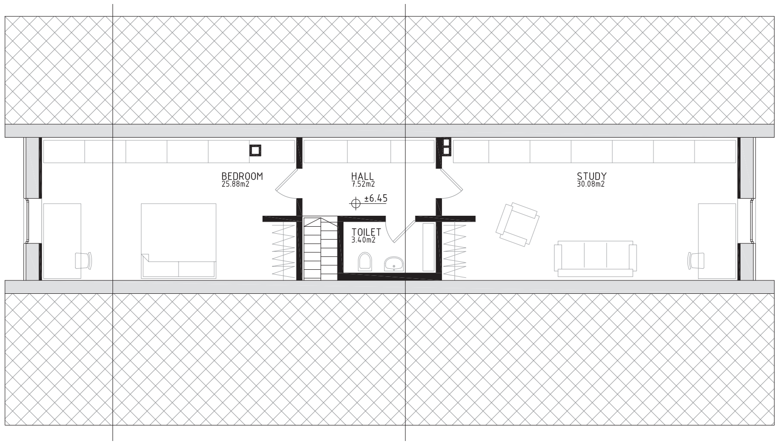


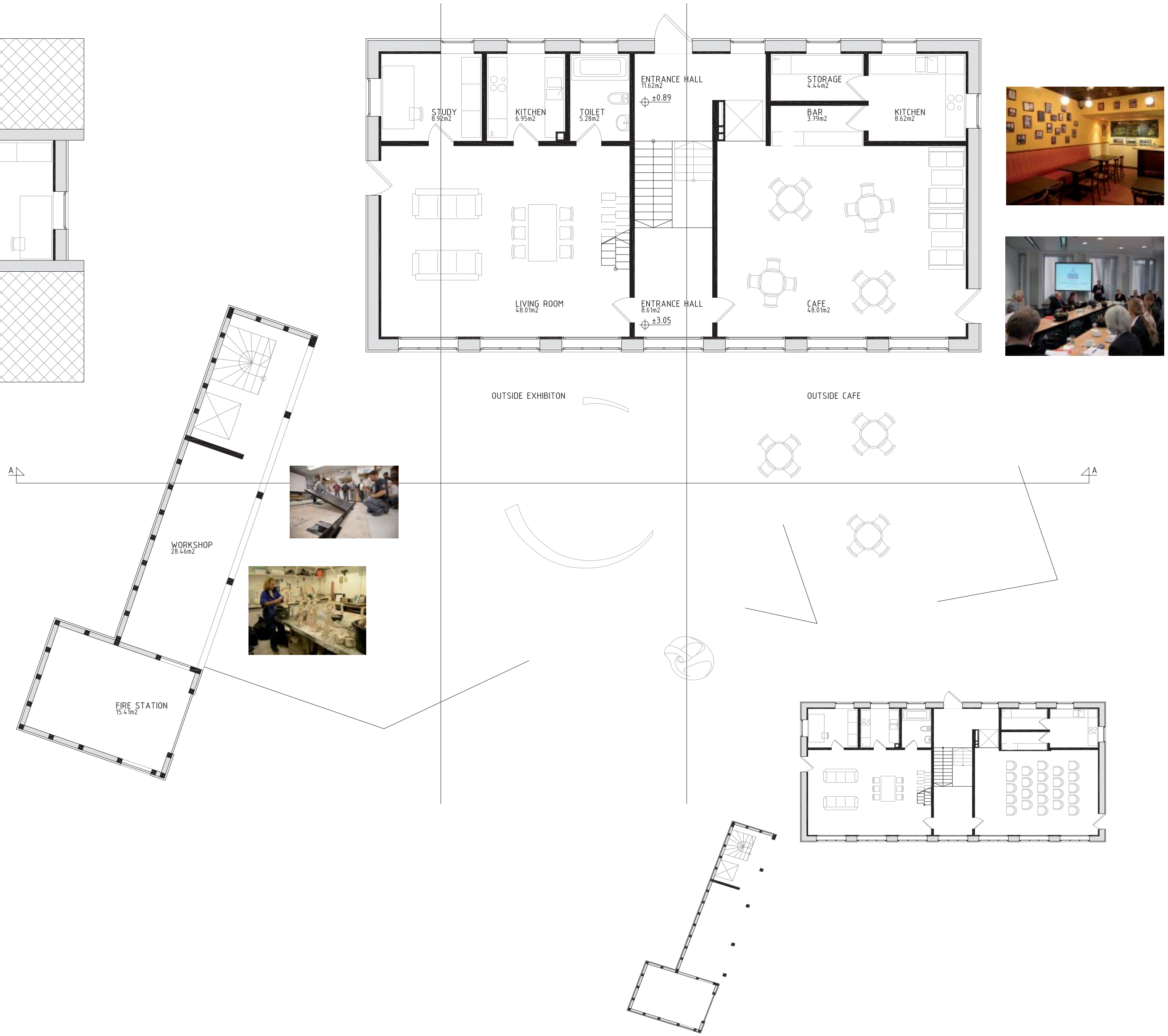
...result.

Concept

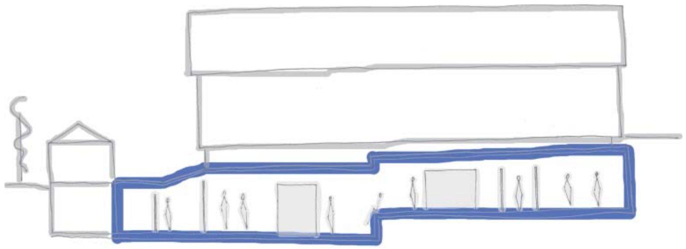

B
C
GYM
47.34m2
CAFE
36.66m2
HALL
19.14m2
±0.00
CHANGING ROOM
8.55m2
CHANGING ROOM
8.55m2
TOILET
3.76m2
TOILET
3.84m2
TOILET
3.84m2
STORAGE
5.55m2
HALL
24.01m2
ENTRANCE HALL
11.62m2
ROOM
49.32m2
STORAGE ROOMS
6.70m2
TOILET
7.23m2
ROOM
109.99m2
STORAGE ROOMS
6.10m2
STORAGE
9.15m2

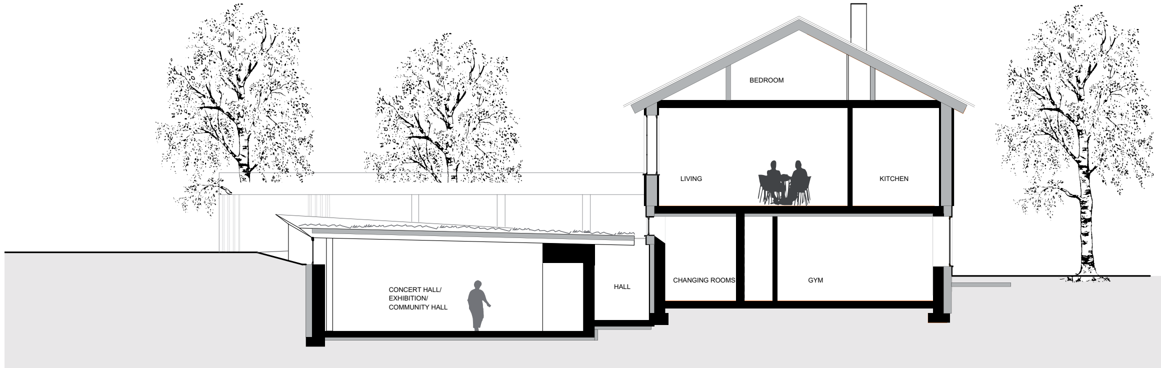
Basement



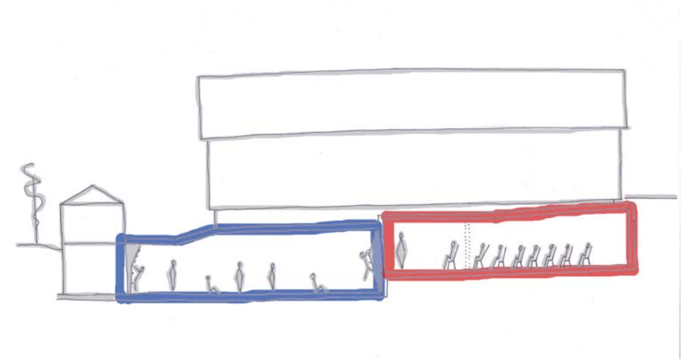


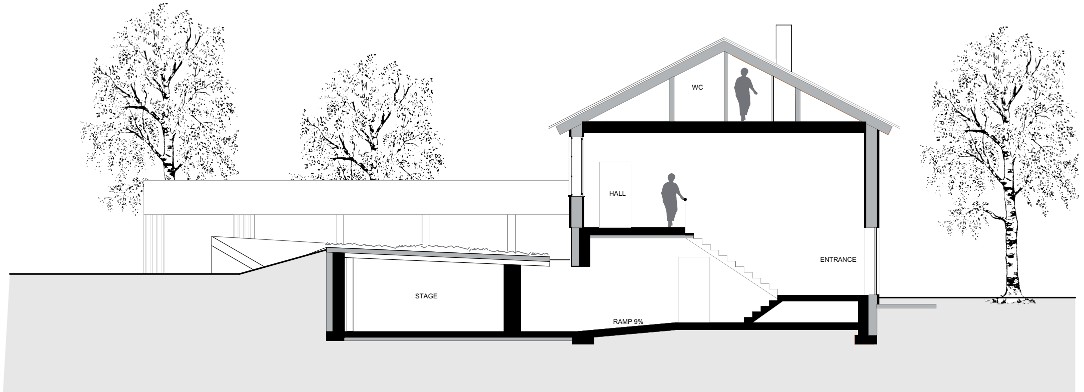
First Floor / Attic



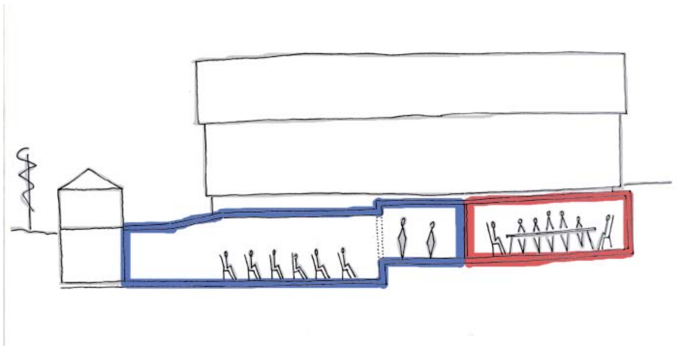


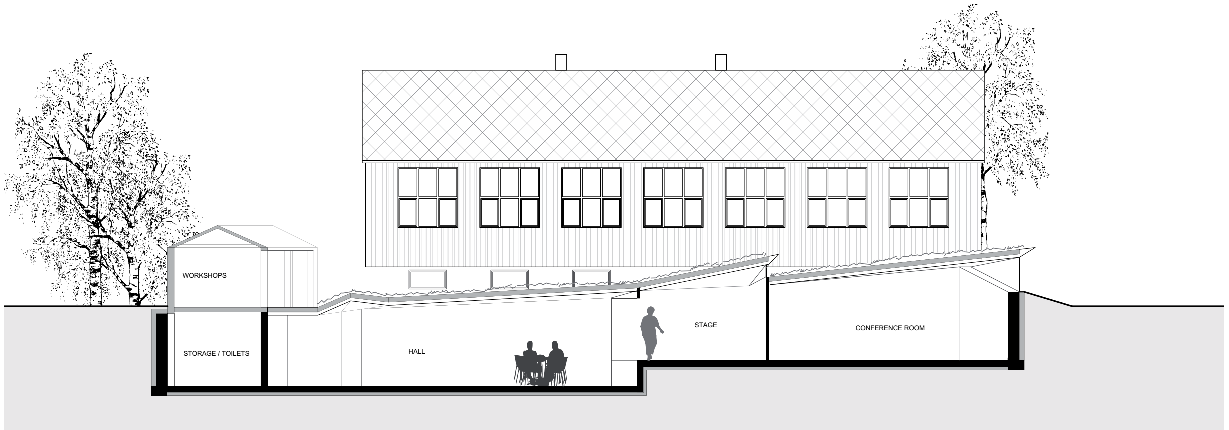
Section A





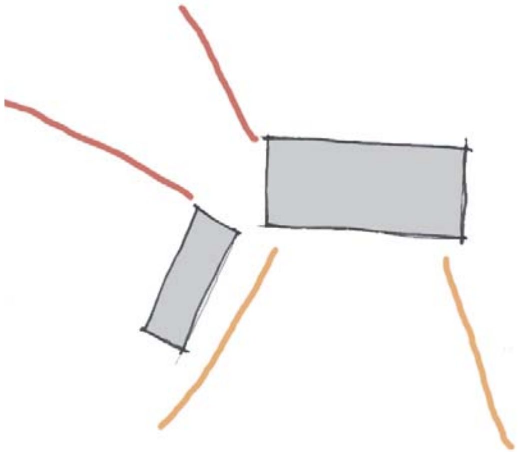
Section B



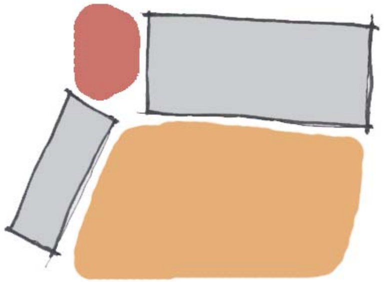


Section C

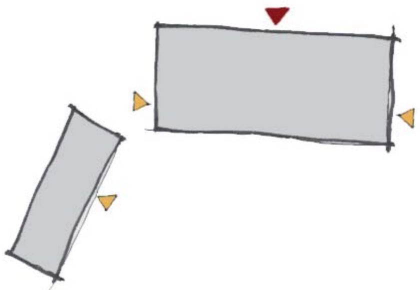
Sections



views

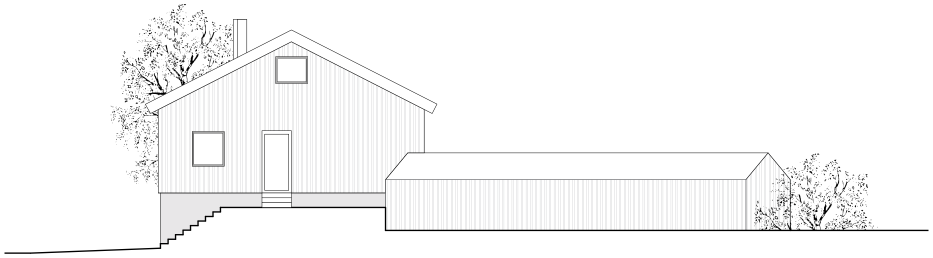


courtyards

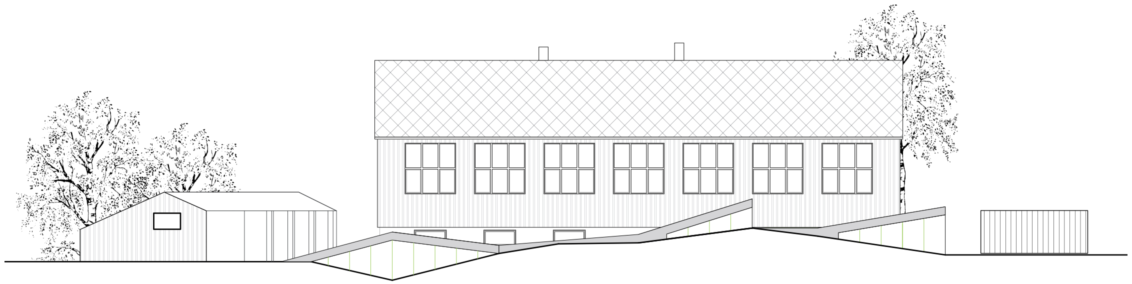


Access

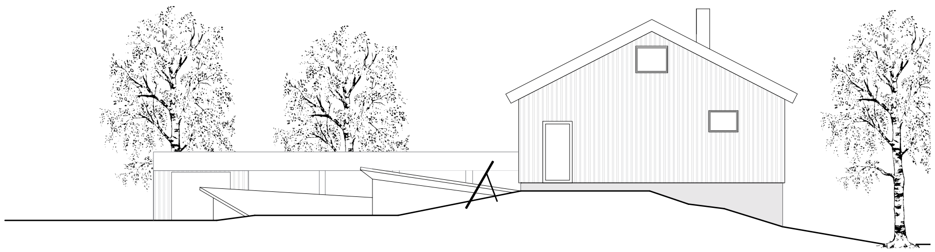
Masterplan



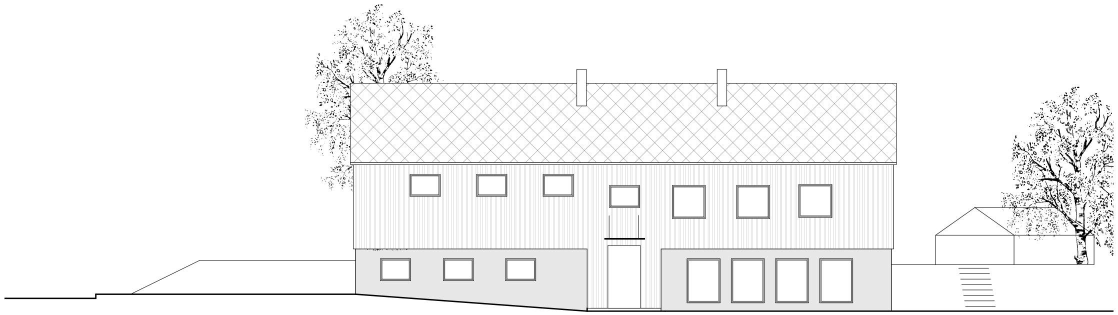
West Elevation



South Elevation

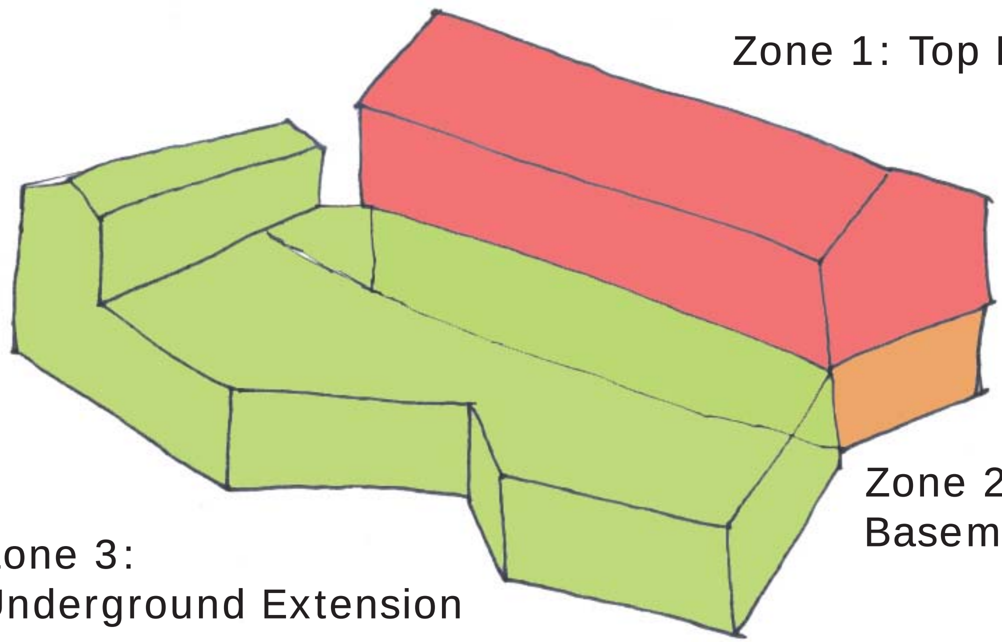


East Elevation



North Elevation

Elevations



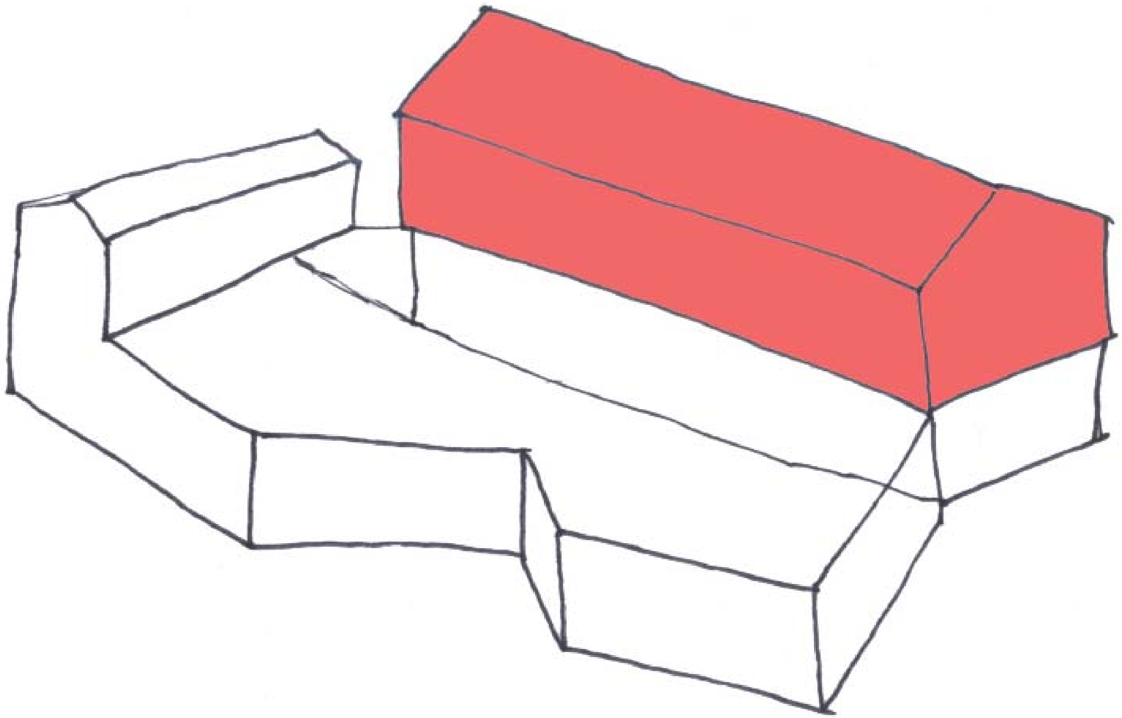
- The building is divided into 3 thermal zones, allowing us to threat each zone differently

- By minimizing the use of the building to one zone in winter large amounts of heating energy will be saved

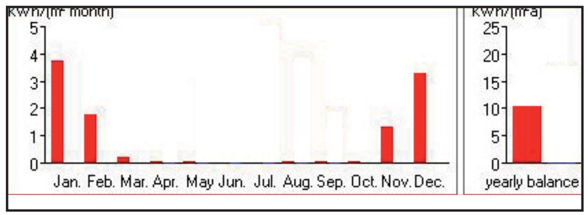
- Thermal zones of lesser importance need less materials, meaning a lower environmental impact of he building

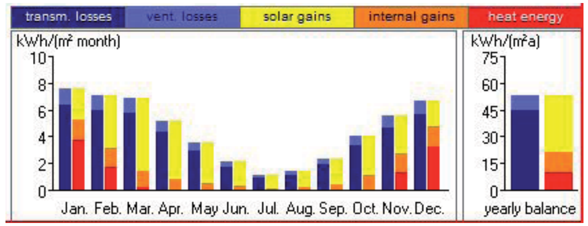
- Heating demand for the existing building will be reduced from 190 kW/m^2a to $10kW/m^2a$

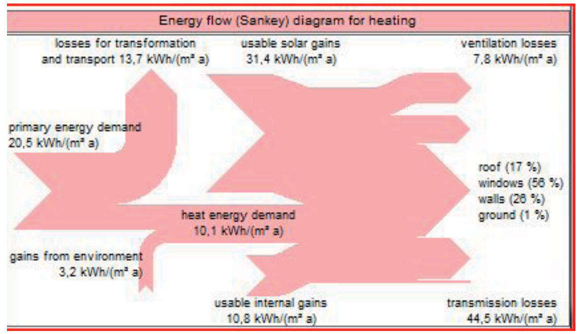
- There will, on average, be no heating demand for the underground extension.



yearly balance:	absolute in kWh/a	specific in kWh/(m² a)
transmission losses:	5859	44,5
ventilation losses:	1024	7,8
usable solar gains:	4133	31,4
usable internal gains:	1424	10,8
heat energy demand:	1327	10,1

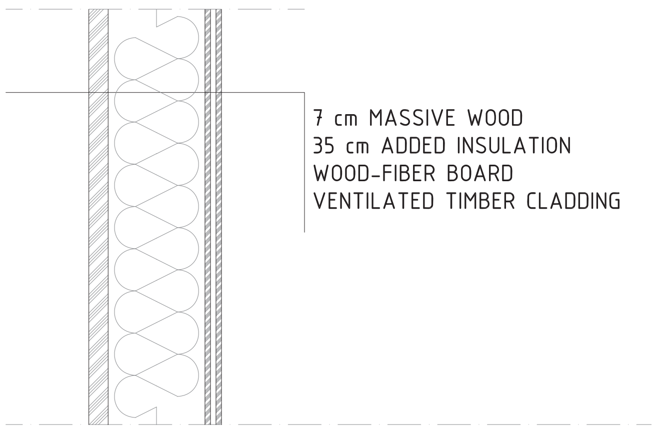






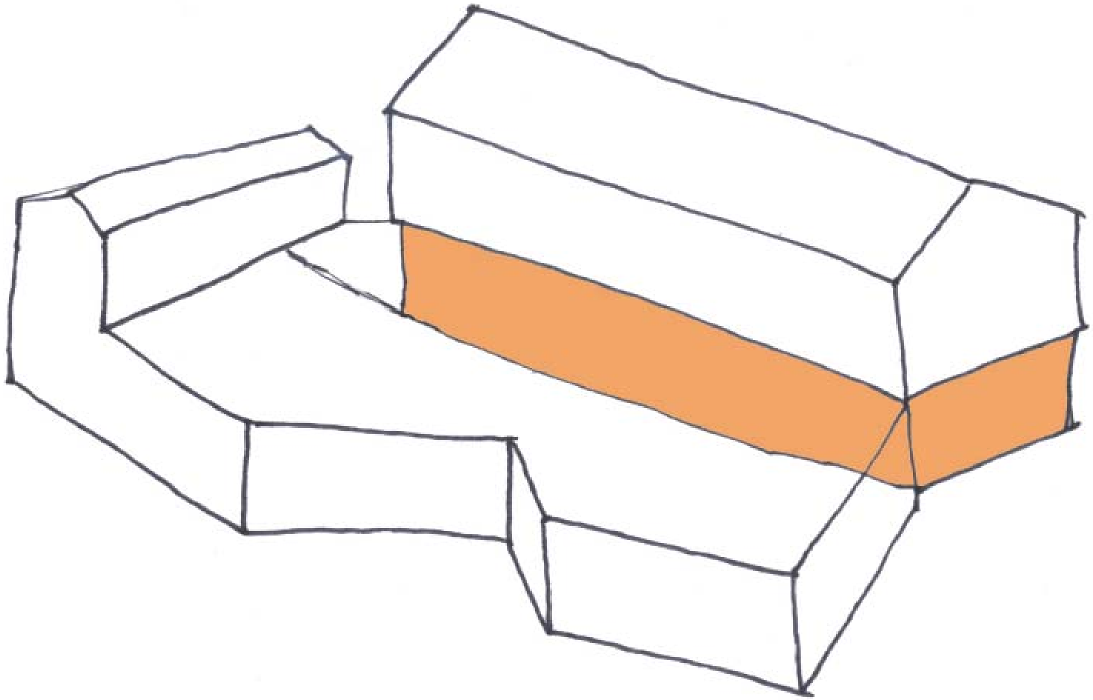
Top Floor

- Continious year round use
- Excelent building envelope
- Existing construction and windows reused
- Mean U- Value 0,12
- Heating energy Demand of 10,1 W/m²a

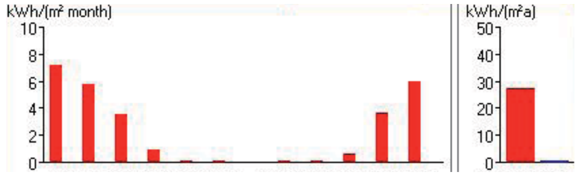


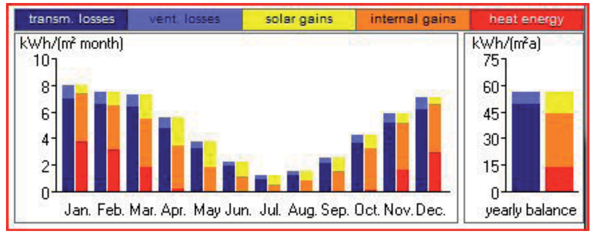
TOP FLOOR (THERMAL ZONE 1)
U-VALUE = 0.10

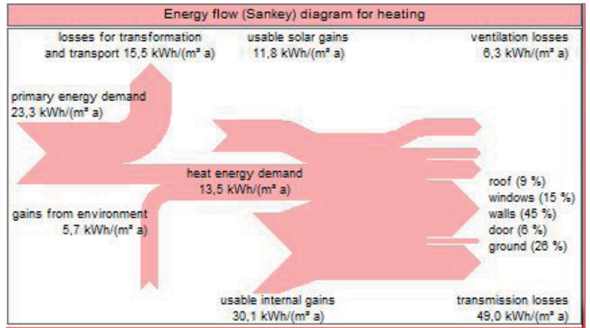
Thermal Zones



yearly balance:	absolute in kWh/a	specific in kWh/(m² a)
transmission losses:	6600	50,1
ventilation losses:	832	6,3
usable solar gains:	1568	11,9
usable internal gains:	3986	30,3
heat energy demand:	1878	14,3







Basement

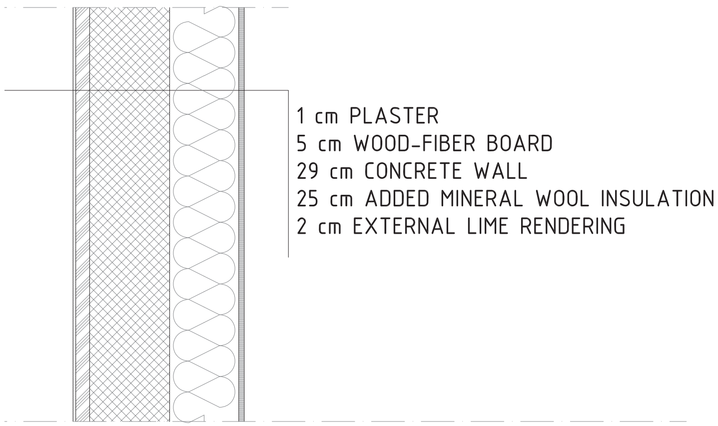
- Spontanious year round use

- Good building envelope

- Building mass kept to cope with high levels of use (Gym)

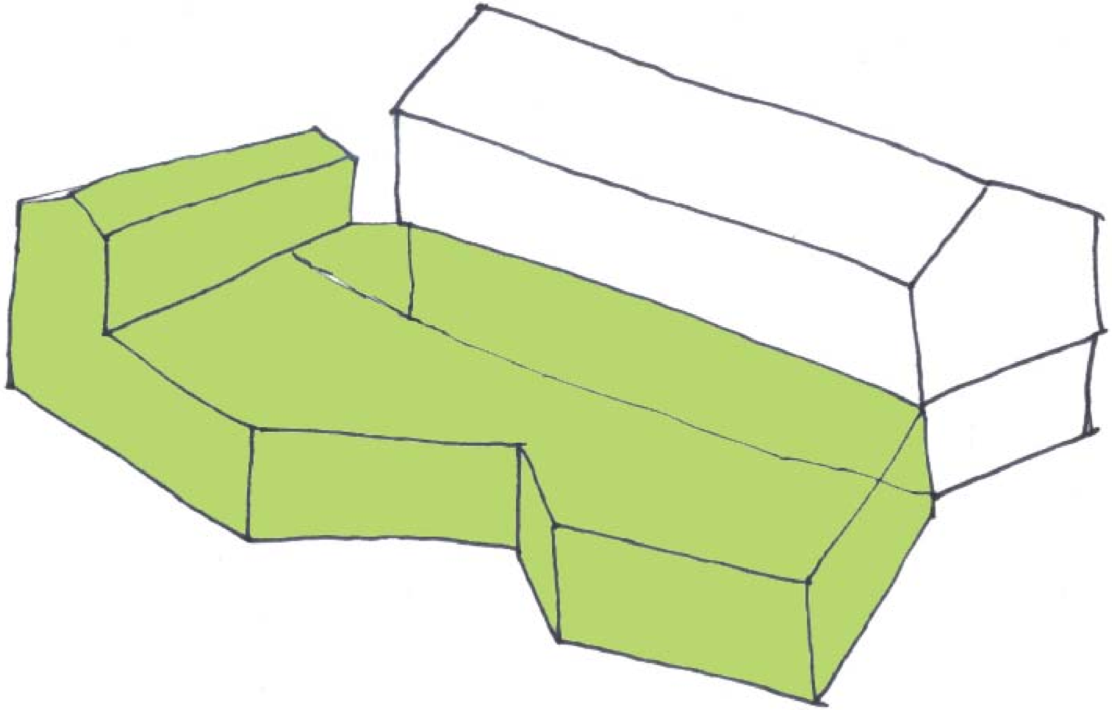
- Mean U- Value 0,24

- Heating energy Demand of 14,3 W/m²a



BASEMENT (THERMAL ZONE 2)
U-VALUE = 0.15

Thermal Zones



Underground Extension

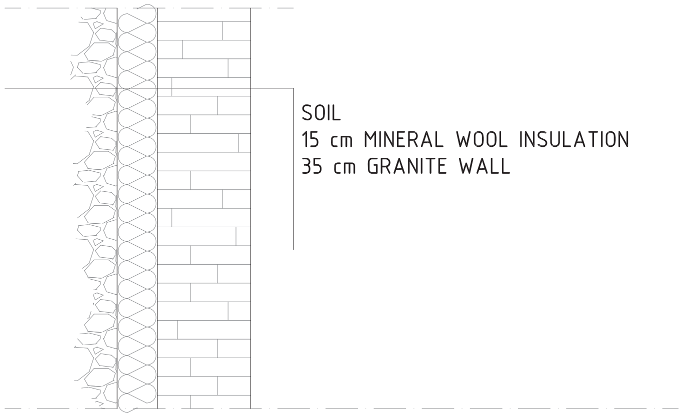
- Spontanious summer use

- minumum building envelope

- High building mass to cope with high levels of use (dancing hall, conferences)

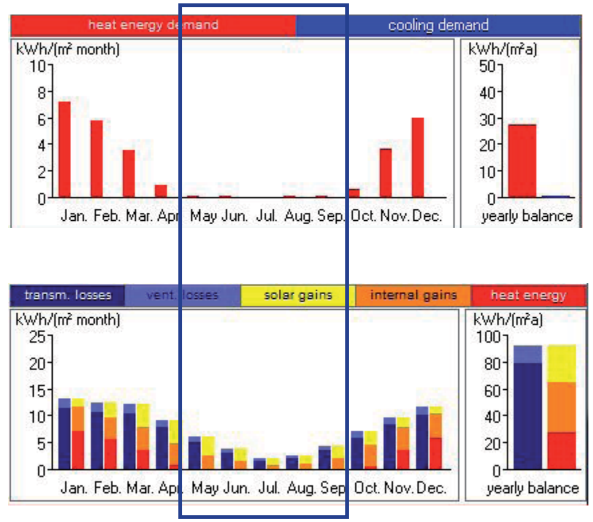
- Mean U- Value 0,29

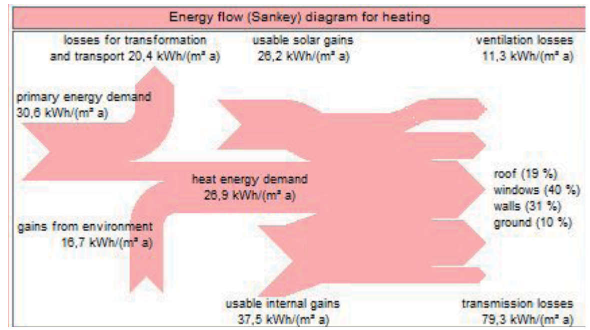
- Heating energy demand of 00 W/m²a (May - September)

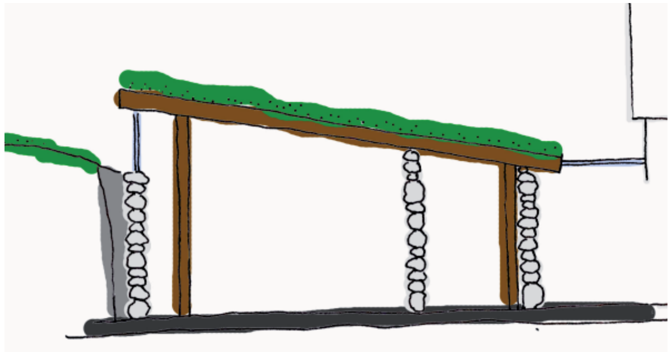


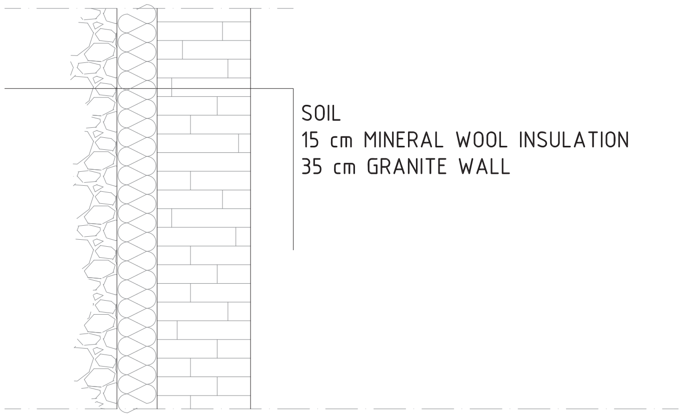
EXTENSION (THERMAL ZONE 3)
U-VALUE = 0.25 (0.22 UNDER EARTH)

yearly balance:	absolute in kWh/a	specific in kWh/(m² a)
transmission losses:	14274	79,3
ventilation losses:	2041	11,3
usable solar gains:	4722	26,2
usable internal gains:	6747	37,5
heat energy demand:	4846	26,9

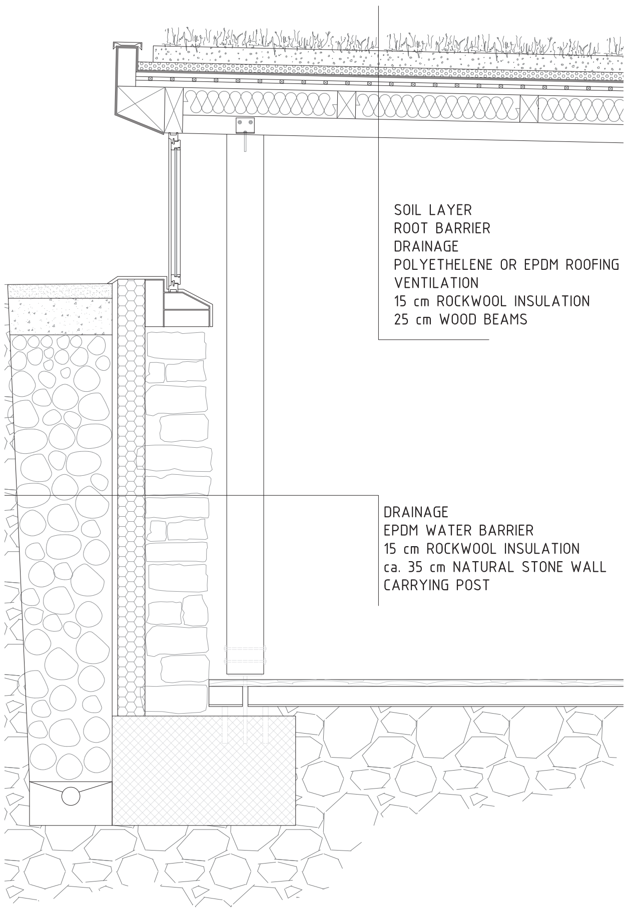








EXTENSION (THERMAL ZONE 3)
U-VALUE = 0.25 (0.22 UNDER EARTH)



- Timber roof construction allowing a faster assembly, faster disassembly, and easier reuse and recycling of material.

- Retaining walls to be built up with natural stone dug up on-site

- These construction measures saving 75% embodied energy compared to typical concrete wall and roof construction (246,000 Mj to 53,640 MJ)

- Embodied Energy for Watertight membranes lies below that of concrete structure (Epdm ~ 150Mj/m² = 400m² ~ 60,000 Mj)

- High absorbtion coefficient of green roof

- Polyethelene and EPDM sheetings can be recycled

Material Use

Heat Pump
- As Linesøya is poor in resources, wood and other energy sources would have to be imported from the mainland
- We therefor propose to use the existing infrastructure on site; electricity.

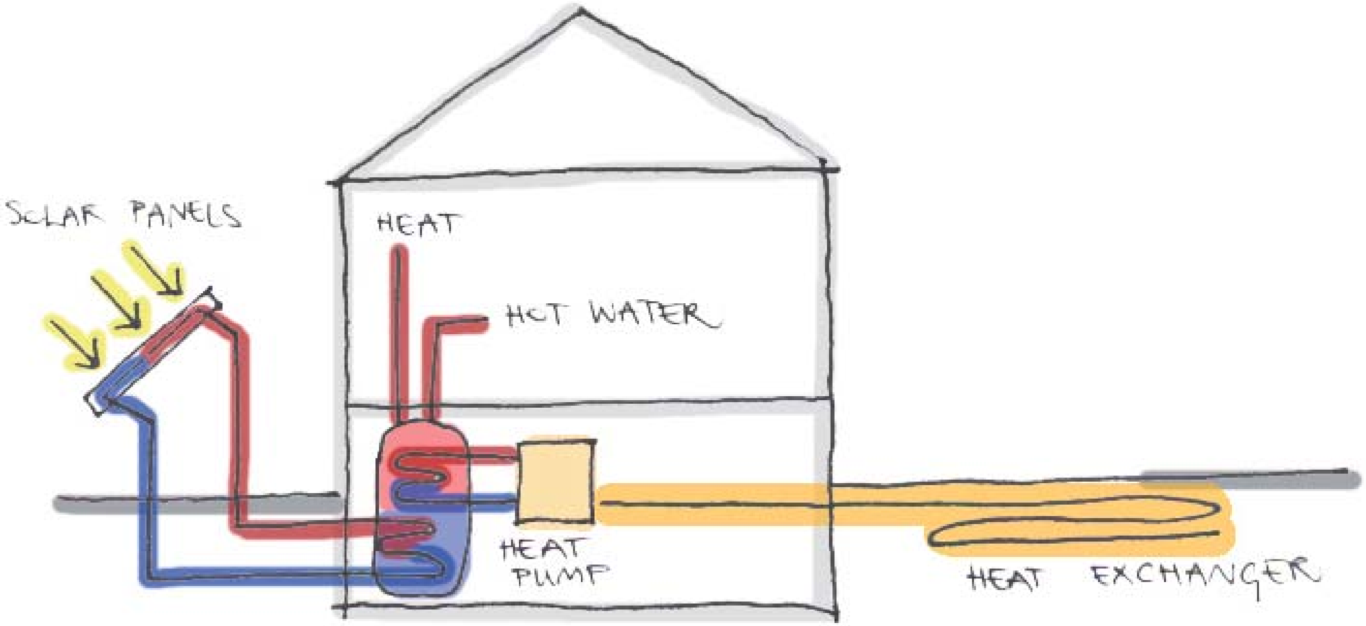
- By reducing the buildings energy demand by 93%, and instaling a heat pump with a COP of 4,5 we reduce the electricity usage for heating to 2% of present.

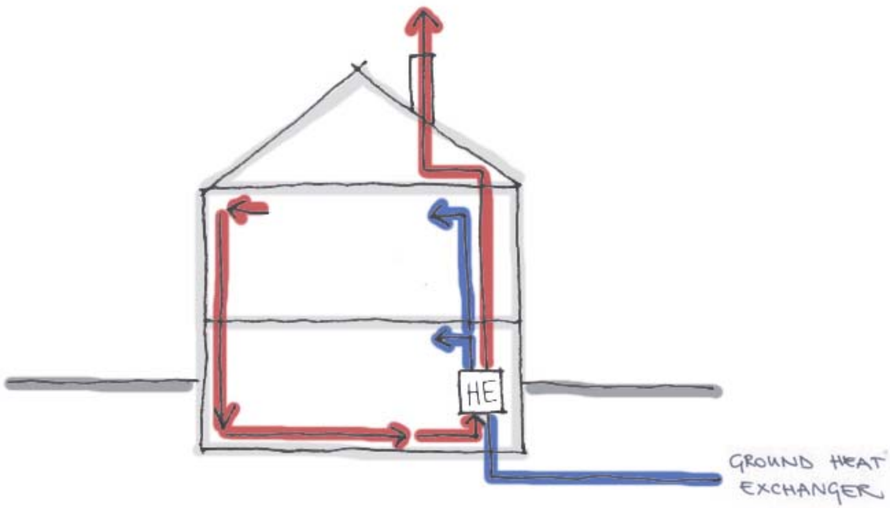
- If taking into account the good primary energy source of Norwegian grid power an overall extremly good environmental resultis achieved.

- Reduced construction costs.

Solar
- To provide hot water for family and visitors in the summer months, substituting heating in Summer
- Demonstration object to attract visitors, and promote use of solar energy in Norway

Ground Heat Exchanger
- To pre-warm incoming air in winter, and precool summer ventilation.





Heating Concept

Ventilation and Cooling

- The building is fitted with a ventilation system with heat exchanger.

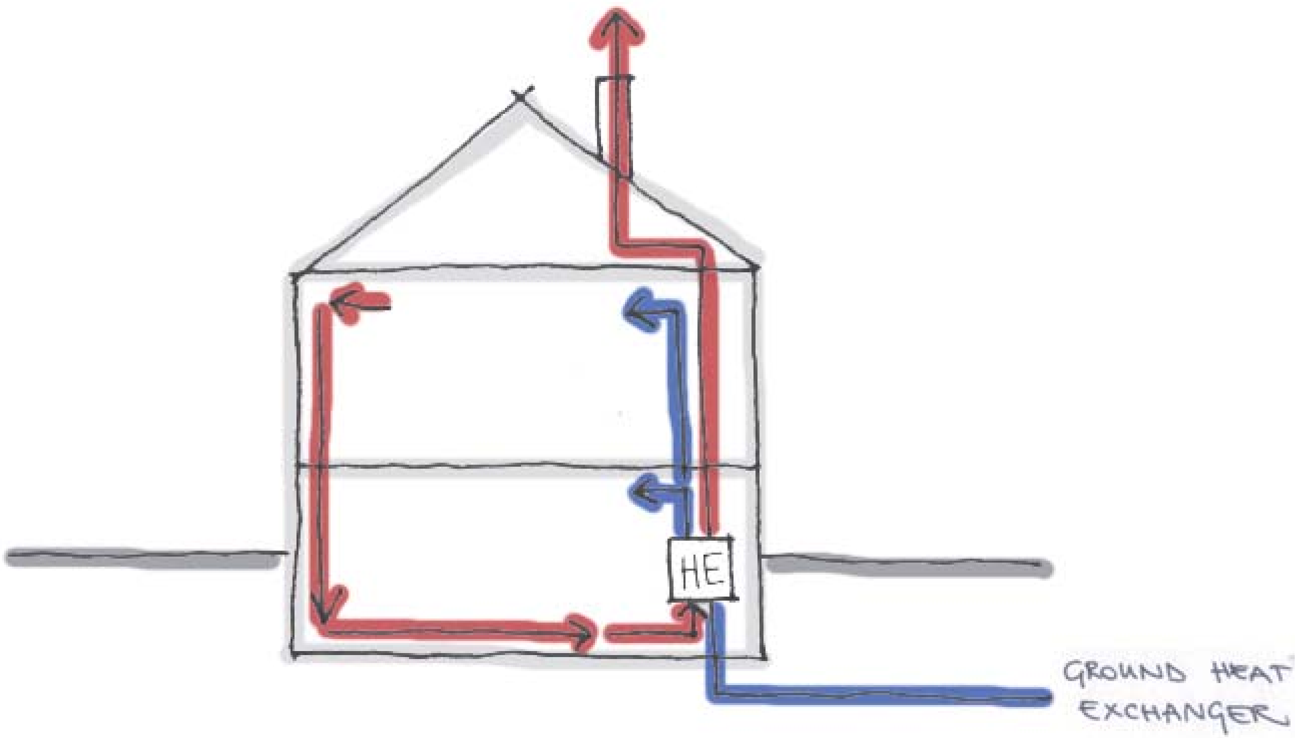
- A considerable cooling demand has arisen in Zone 1

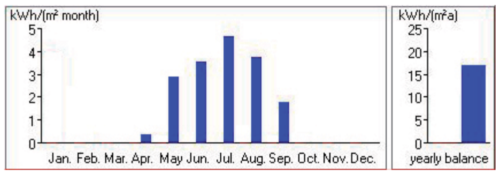
- In order to combat this problem a ground heat exchanger will be installed pre cooling the air in summer before bypassing the heat exchanger into the rooms.

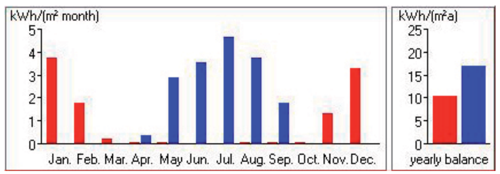
- Natural ventilation through the building can also be used, drawing cold air out from the underground extension, and distributing it throughout the building

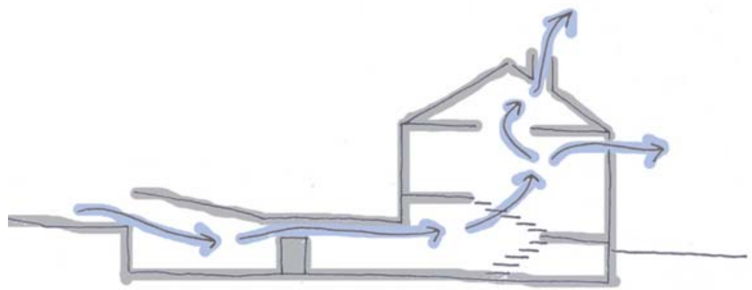
- Interior textil shading can be applied to the inside of the old south-facing windows.

- If problems of overheating should still occur, the heat pump can also be used to activly cool.









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