# Reimagining a Sixties House

- Into a contemporary house with studio spaces for arts and crafts


**Jarkko Nordlund**

Chalmers School of Architecture

Department of Architecture & Civil Engineering


Building Design and Transformation / 2024

Examiner: Mikael Ekegren

Supervisor: Filip Rem

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CHALMERS
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## Abstract

The construction industry and the existing building stock stands for a large part of all energy used globally. In Finland this is to an extent made up by energy used during production and for heating. In relation to this, a large part of the existing building stock in Finland is made up of detached housing built during the 1960´s or earlier. Housing built during the 60´s has come to be known for flaws in construction and low energy efficiency, often making these in need of renovation. In contrast, the standards and requirements for new buildings in terms of energy usage and living standards have been steadily rising.

As a solution, this thesis explores a possible way to rebuild and transform a 60´s detached house, located in southern Finland, by presenting a design proposal. The selected house is in need of renovation and there is a wish from the owner to transform or rebuild it into a contemporary house with a flexible floor plan that reach the building standards of today and makes room for studio spaces for arts and crafts.

This is done by documenting the selected building by taking simple onsite measurements, photo documentation and collecting old drawings from the municipality collection. Also theory on transformations, renovation, energy usage and structures are presented to further deepen the scope of this thesis. The documentation and theory then stands as a starting point for a design proposal which is presented as drawings, images and physical models.

The design proposal is based on conclusions based on documentation, references and theory. This concludes that saving only the foundations of the existing building and then rebuilding and reusing existing materials in non-load bearing applications is an interesting way forward, especially when considering the age of the building and the high risk of flaws in its load bearing structures.

As a result this thesis presents a building proposal with a renovated foundation and a rebuilt house with a flexible floor plan that includes spaces for arts and crafts. While also showing that rebuilding can be a great opportunity for architectural challenges and yet fulfilling contemporary standards and wishes.

## Keywords

Rebuilding, Transformation, House, Wood, I-joist

## Student Background

| | Studios |
|---|---|
| 2022 | Matter, Space, Structure 1 |
| 2022 | Public Buildings |
| 2022 | Building Climatology for Sustainable Design |
| 2022 | Nordic Architecture |
| 2021 | Material and Detail |
| 2021 | Sustainable Design and the Design Professions |

| | Programs |
|---|---|
| 2021 – 2023 | Architecture and Urban Design, MSc, CTH |
| 2018 – 2021 | Architecture, BSc, CTH |

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Thanks also to providers of cutouts and textures for visualizations.
www.skalgubbar.se – for people cutouts
www.meye.dk – for plants cutouts
www.architextures.org – for textures

One can not create a meaningful thesis alone.



## Table of content

# 1. Introduction



## 1.1 Purpose & Aim

The aim of this thesis is to research, document and design a transformation or rebuilding proposal of an already existing detached housing unit built in 1963 in southern Finland.

In the light of an increasing understanding and interest in the topic of sustainable design within the architectural education, this thesis also aim to contribute to the topic of transformation and rebuilding of the existing building stock of older detached houses.

When considering the amount of older detached housing units within an existing building stock and the constantly rising building requirements and regulations, one can conclude that there is an major contribution not only in terms of sustainable housing, but also in terms of challenges within architectural design during a transformation or rebuilding project.

Hopefully this thesis will contribute by presenting some solutions or ideas within these design challenges.

## 1.2 Research questions

This thesis began with an interest in a possible design solution for a sixties house that was in need of renovation. An interest to find out *how to transform or rebuild it into a contemporary house with spaces for arts and crafts?*

As work progressed more questions came up and became areas of focus during research and design phases. One was to find out *how a building structure based on lightweight I-Joist beams and studs could be used.* The other was *how to correct the existing foundation to create a better starting point for rebuilding and yet saving the character of the old foundation?*

## 1.3 Methodology

This thesis leans on information based on documentation of an existing building and its site. Information and knowledge has been gathered by site visits and copies of original building permits attained from the local municipality.

Majority of documentation has been done by photography, observations and simple measurements taken with a standard metric ruler. Measures were noted on paper and was later combined with other observations and documents into a CAD drawing and a digital model of the foundations which as closely as possible resembles the existing building, this was then used as a starting point for a transformation or rebuilding design proposal.

The proposal has been aided by sketching, physical model making, building references and by 2D/3D digital drawings and models.

Also some literature has been reviewed to further gain knowledge related to 60´s detached houses and transformations, this helped draw conclusions about the condition of the existing house. Literature was found on websites, in books and in academic papers.

An important source of information has also been handbooks provided by manufacturers of building products and construction systems, much of the final proposal is based on these handbooks.

## 1.4 Delimitation

This thesis emphasizes the more common practice of creating an architectural design and proposal, this also being in accord with the thesis direction and its discourse. To aid the design process this thesis uses only a smaller documentation of the existing building and to relate to a wider field, some theory is also introduced.

An early question was whether this thesis should investigate a possible renovation, a complete rebuilding or a comparison of the two for the house in question. The decision was made to focus this thesis on rebuilding and keeping the renovation as a viable idea for a future study.

Although this thesis aims at designing a contemporary house that also reaches contemporary building requirements, it does not aim to reach a certain building certificate or to prove a position trough LCA or other analysis, this thesis rather focuses on the aspects of transformation, rebuilding, building design and the final proposal presented as drawings and physical models.

The selected site for this thesis has two existing buildings, the focus will be on only one of them. There is also an addition of a garage building. The garage building will not be fully designed, but shown only in the site plan and as a simpler volumetric model in a Landscape model to better show relations with the main goal of rebuilding of the existing buildings.

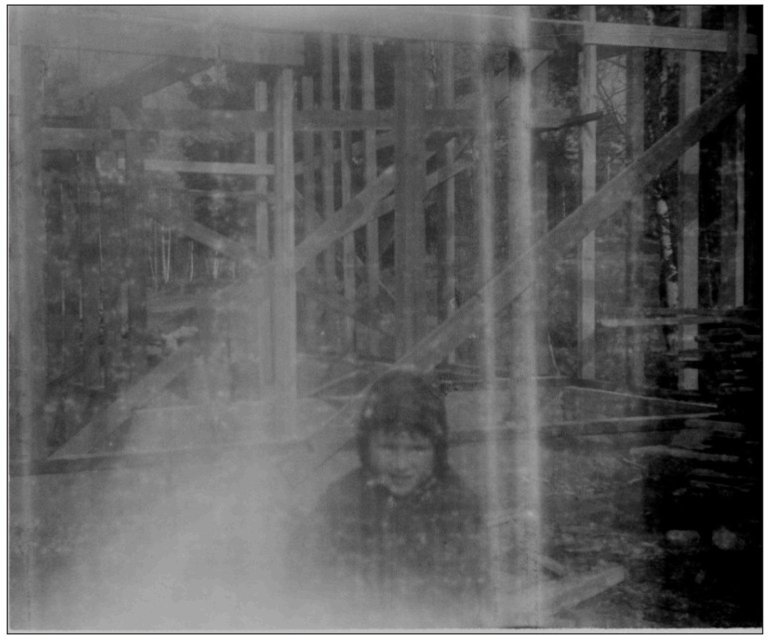


# 2. Background & Site

## 2.1 Background

The house selected for this thesis was originally built in 1963 by the owners Sonia Bäckman and Bruno Bäckman. The house was intended as a simple cottage for an older parent. Back then the house had a simple wood stove for heating and cooking, aided also by some direct electrical radiators. The small budget of the family, DIY type building and the post war style of building in Finland has given a unique character to the house. Over the years multiple renovations and transformations has added to this character and now numerous layers of materials cover most of the surfaces of the house. But in the core one can still find the original timber frame and where it has not yet been removed, the old sawdust and tarpaper. One can only guess what hides under the visible surfaces.

The houses on the plot was some of the first to be built on the area, it has turned from country style to suburb over the years. Much has changed since the start. Nowadays the house is only used during summer from a few weeks or months. The cost for heating during winter is enormous and time combined with some construction flaws has really left the building in a worsening condition. The idea and need of doing something to the old building had been around for some time, but it really became a thesis project idea when Sonia the owner of the house gave an old 6X9 Goldy camera to her grandchild, who happened to be a photographer. The camera was left with the notion “There might still be an old roll of film left in the camera”. To a great surprise there was a roll of film from the 60´s in the camera and it was not completely destroyed by time. After development, the film from the camera showed two photos taken during construction of the buildings extension around 1967. These photos turned out to be the starting point of this masters thesis and they really fueled the interest to dig deeper into the question that had been around for a while, the question of what could be done with that building now? Or what is the next step on its already long journey?

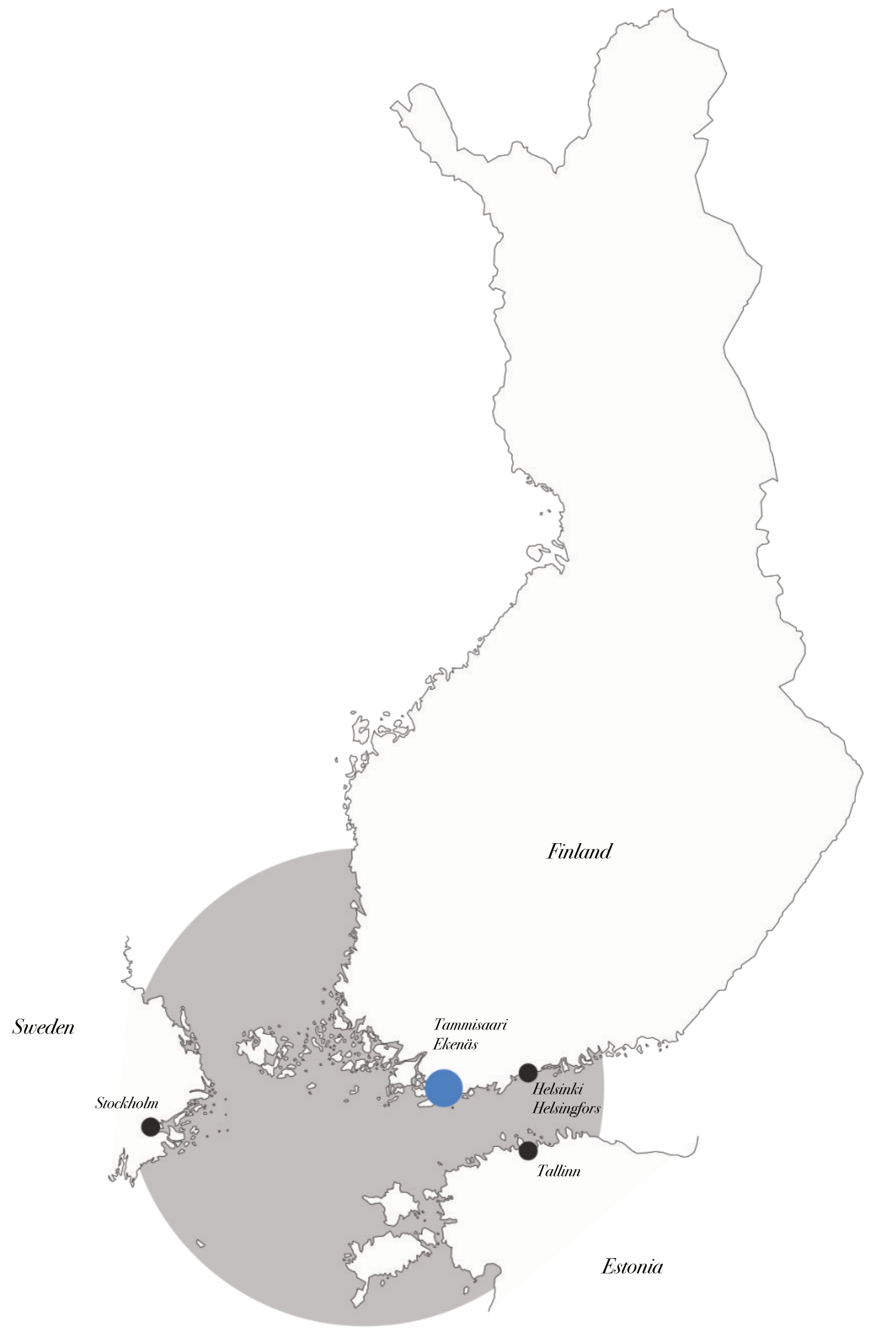


Old photo during construction showing building of the garage in the background.
Photo used with permission by the photographer: Sonia Bäckman



Old photo during construction showing Bruno and his daughter during the building of the garage.
Photo used with permission by the photographer: Sonia Bäckman

## 2.2 Site location




Illustrated map of Finland, Sweden and Estonia showing site location with blue dot.

*Map used for tracing was made by maanmittauslaitos.fi*

The project site is situated in a small village called Trollböle, which is a suburb to the town of Ekenäs. Ekenäs is located not far from the most southern tip of Finland and it is surrounded by the Finnish archipelago sea with its islands and coastal line.

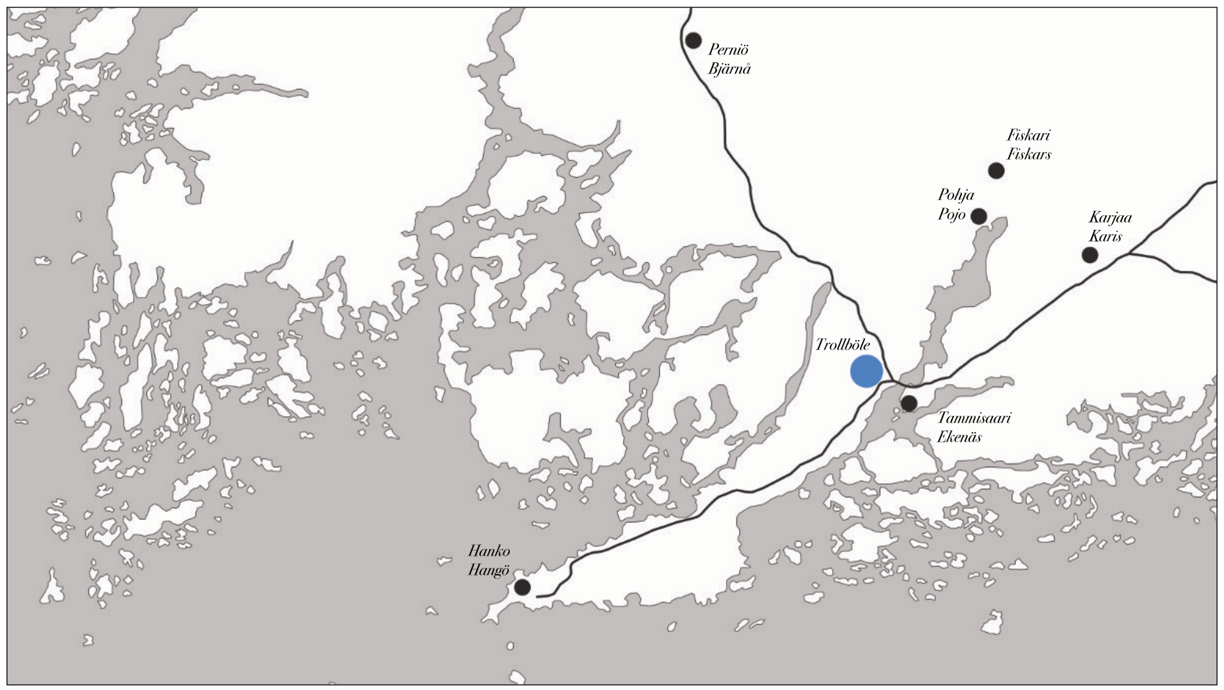
The town of Ekenäs was historically a tiny Fishing village and traces of this can still mostly be seen in the old town parts of Ekenäs. Ekenäs was founded or given city rights in 1546 by the Swedish king Gustav Vasa. Today most of the buildings in the old town parts of Ekenäs is made from timber framing with timber cladding, although originally the housing was of log cabin type.

Trollböle village can be seen as the housing area furthest to the north west from the center of Ekenäs. Communications to city center is within walking distance and the road is also great for biking. The surrounding area of the Trollböle village is generous in terms of closeness to forests, lakes, nature reserves and the ocean. The area being situated right between the forest and the ocean can sometimes mix a very special scent, a blend of forest and ocean.

The Trollböle area is home to multiple leisure activities and sports, like swimming the forest lakes, hiking and skiing. Along the coast line a new nature reserve has been founded where you can visit cows and climb up the local bird tower, from where you can se not only birds but also a large part of the town center.

One negative aspect is the main road passing the village. It is the main road for many trucks going to the harbor in the town of Hangö. The sound can carry all the way to the selected site. In the summer the lush trees and other vegetation help reduce the sound from the road.

Houses in Trollböle village tend to be 1 story detached houses with varying design. Although it is common with a low building height with a rather low sloping ridge roof, a common type for economical and efficiently built houses.




Illustrated map of southern Finland showing major road, closest cities and coastal line. Site is marked with blue dot.

*Map used for tracing was made by maanmittauslaitos.fi*


Illustrated map of site surrounding, site is marked with blue ring.

1. Building site and local village
2. Lake for swimming
3. Nature reserve, animal sanctuary
4. Harbor for smaller boats
5. Forest for activities like hiking, skiing, running and frisbee golf
6. Harbor
7. Waldorf school
8. River connecting to baltic sea
9. Town of Ekenäs
10. Main road and train track in parallel



## 2.3 Site situation

Site plan – 1:1000


Site plan of existing building – 1:1000

The landscape topology is rather flat and what is now built upon was once forest. The area it still very lush with trees. On the plot the ground is only slightly sloping in different directions, but it generally stays within a difference of a meter. The terrain is sloping stronger towards the southwest and the houses on the selected plot are built straight on bedrock. The slightly sloping ground and the bedrock creates a great water runoff and the ground tends to be rather dry around the house.

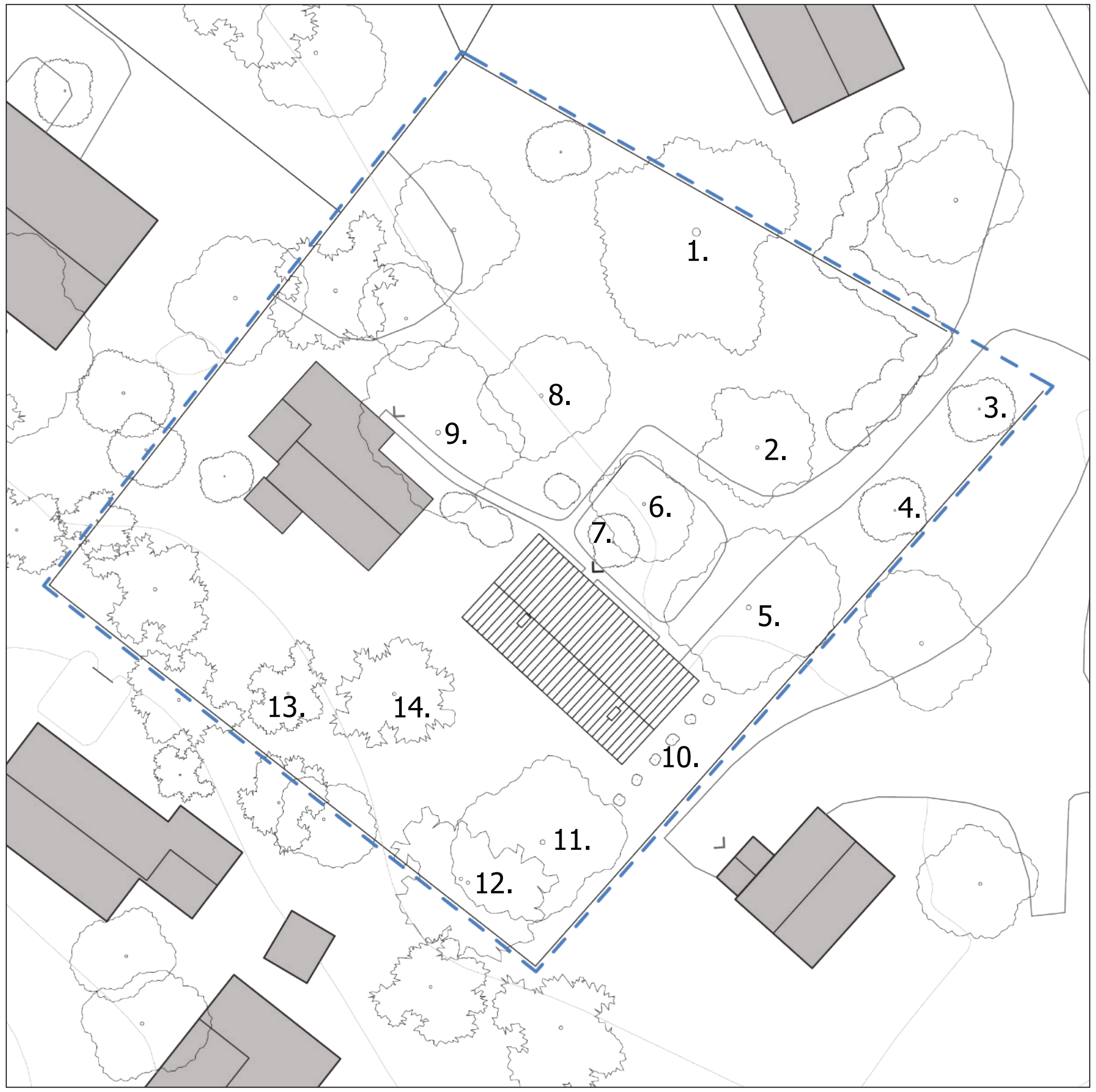
## 2.4 Existing building

Existing building, view from northwest.

- Building year: 1963 and approximately 1967
- Exterior area: 102 m2
- Interior area: 94 m2
- Ventilation: Stack ventilation.
- Heating: Originally f rewood and later direct electricity radiators.
- Water: Originally from own well, later municipality water and electrical boiler for hot water.
- Sewerage: Municipality connected.
- Foundation: Is built on granite bedrock. Concrete foundation with sawdust insulation in original part of building, unknown in building additions. Concrete foundation is painted externally.
- Walls: Timber with tarpaper and sawdust insulation. Sawdust in walls switched to mineral wool during renovation in some parts of the building. Exterior cladding is horizontal on the oldest part of the building and vertical on the extension.
- Roof: Timber trusses with sawdust insulation and sheet metal as covering.
- Windows: Two non connected single glass sashes. Interior sash opens inward and exterior sash open outwards.



Site plan – 1:500




Site plan of existing building – 1:500 1 12,5m

The buildings and plot is one of the first to be built on. Therefore the plot at around 2500 m2 is rather large in comparison. There is currently two detached houses on the plot. The one furthest to the northwest was built first and it is the only one currently in use full time. A path connects both houses and when both houses are in use during summer then there is generally extensive walking between the houses. It is lush area with many different species of trees, animals and insects. The houses in the area are generally low in height, small in sizes and built as traditionally with a small budget.

1. Large oak tree.
2. Very Old Apple tree.
3. Young oak tree.
4. Young Chestnut tree.
5. Birch tree.
6. Birch tree.
7. Young Hazelnut tree.
8. Birch tree.
9. Largest Birch tree.
10. Berries.
11. Birch tree.
12. Maple trees.
13. Pine tree.
14. Rowan tree, traditionally planted near house as protection and to give good luck. It can never be taken down without bad luck. Branches from the Rowan tree has also been used when searching for the right spot for a well.

# 3. Theory



## 3.1 Transformation, rebuilding & sustainable development

We now live in an era known as the Anthropocene where human actions are the main driver of environmental change. After thousands of years of a relatively stable environment, known as the Holocene, human actions can now push the earths systems out of balance with catastrophic consequences (Rockström et al., 2023).

In 2015, the United Nations General Assembly created 17 global goals know as the Sustainable Development Goals, also known as the SDG´s. These goals are part of a resolution known as the Agenda 2030, which 193 member countries have agreed on. The agreement and the different goals has been explained to serve as a “shared blueprint for peace and prosperity for people and the planet, now and into the future.” (Sustainable development goals, 2023).

One of the goals, number 13, is to urgently combat climate change by reducing green house gas emissions by 43% by 2030 and then to a net zero by 2050 (United Nations, 2023).

A large part of global green house gases comes from the buildings and constructions sector, which stands for about 30,7% of global operational energy and process related CO2 emissions (United Nations Environment Programme, 2022).

The buildings and constructions sector in Finland stands for about 40% of their total energy use, of which 76% can be appointed to operational energy usage by the existing building stock, this is to an extent made up by energy used for heating.

In 2020, 58% of housing in Finland was made up of detached housing built during the 70´s or later (Suomen virallinen tilasto, 2020), now this should leave, give or take more, than 490 000 detached houses build during the 60´s or earlier. Now with a growing building stock of old buildings and an expanding requirement to meet sustainability goals the value of building transformation or rebuilding is expanding.

In contrast to this, Sweden has set a aim or goal to reduce their total energy use per heated floor area by 50% until 2050 (Ekström et al., 2017).

The largest energy losses  in houses built during the 60´s in Sweden has been found to be ventilation, cold bridges, heat transmissions and hot water. Out of these, heat transmissions and hot water stands for the largest part. It has also been found that the most cost effective measures for reduced energy losses would be water saving and regulating techniques, changing windows and the addition of roof insulation (Roth & Stålheim, 2011).

One approach when renovating or transforming older detached houses, would be to look at contemporary building certificates and their standards as guidelines during a renovation or transformation as a means to not only be satisfied with a reduction in costs and use of resources. But to aim at renovations and transformations that actually reach too or beyond contemporary standards.

One certificate, the passive house standard, has been found to reduce energy usage by at least 65% in a cost effective way , specially if the house in question is need of renovation. The benefit is largest if the house in question uses direct electric heating. The same study also found that the single most cost effective measure was to install a ground source heat pump and in contrary to a study mentioned earlier they found that the least cost effective measure was to install new windows (Ekström et al., 2017, p. 100-101).

But it is not only about energy efficiency during the operational phase of buildings. Swedish research has shown that the actual construction phase stands for more than 50% of a buildings carbon footprint over a 50 year period (Stigell, 2021).

This really poses the question of which is the most reasonable thing to do, renovation or rebuilding.

Multiple studies has shown that renovation is more sustainable than rebuilding as long as the carrying structure is intact. Alltough it is important to judge each project individually as multiple factors like building condition, economy, wishes, aspirations and so on has a major impact when considering different solutions (Kjellström & Törnebohm, 2021, p. 41).

In this thesis project, the timber structure has been standing since the 60´s and it has clear flaws when it comes to protecting against moisture from the ground and foundations. This is also visible in the color of the bottom sole plate and in some wall studs as well. Most likely, in the case of this thesis, it would be better to save and correct the foundation only. And then rebuild an entirely new timber structure, making faster, more predictable and more likely to reach a higher building standard.

If an intact structure is a key aspect of sustainable renovation, then looking at the structure of older buildings is deeply related to knowledge about common building flaws in particular building typologies, construction methods and year of building. But also knowledge about local building regulations and building traditions becomes vital. As for this thesis, one can only predict and use the information available.

Another aspect related to structures in older buildings is the lack of standardized building materials and knowledge about the quality of used building materials, making it hard to predict challenges during renovation or a larger transformation. As an example, what is the capacity to add another floor or two?

Research on reused spruce and pine timber by (Ghaznawi & Ali, 2022) showed that 49% of all tested pieces had some sort of defect. Common defects was skewness and flat bend. Their research also showed that 87,9% of the reused timber reached a strength of 24MPa, enough to be used in load bearing structures. Most of the breaks during tests happen around branches. They also point out that there is no system for grading used timber, making it hard to use. In the building selected for this thesis, it seems like most of the carrying structure is non standardized timber with rather large branches as seen in figure 29. Making it hard to predict or prove what the quality actually is.

The fact that reused timber is hard to grade in combination with transformations of older buildings with older building regulations or no regulations at all is a major aspect when considering the scope when transforming a timber framed building.

One way to approach this would be to reuse wood in non carrying situations as flooring, paneling or non load bearing structures or custom interiors. As an example, in this thesis design proposal the vertical timber boards in the facade could be reused as backing boards under a new timber facade, making them useful yet covering possible the errors in them.

Another two of the SDG´s that is of i particular interest for this thesis, is number 7 that involves clean energy and energy efficiency and number 12 that focuses on sustainable consumption and production patterns. One can contribute to this by selecting construction methods and materials that save resources during production and during operation.

An interesting construction would be to use light weight I-joist studs and beams, which saves resources and allows for thicker building envelope. This being key aspects when trying to reach somewhat close to a passive house standard in a cold climate, where one needs to aim at having windows with a u-value of under 0,65 and walls and roofs with a u-value of under 0,12. On top of this the recommendation is a heat recovery ventilation system with an efficiency of 80% according to Passivhuscentrum.se (www.passivhuscentrum.se).

This could also be easier to accomplish by rebuilding most of the structure and building systems. Specially when walls, roofs and floors are thin with poor insulation, windows are old, direct electrical heating and stack ventilation is used. As is the case in this thesis project. To rebuild, rethink or "reimagine" most of the house could be the most sustainable thing in the long run.

## 3.2 I-Joist studs & beams

The I-Joist is an engineered wood product that is comprised of two flanges with a web in between. These are used as both studs and beams in a similar manner as traditional timber for structural frames of buildings. The flanges can be made of solid timber or LVL and the web material is commonly consisting of OSB, particleboard or plywood. The I-Joist are resource effective using about 80% of the woods volume and due to its shape packaging is very effective. The I-joist are 44.4% stronger than steel in proportion to weight and it uses 47% less raw materials compared to traditional wooden frames. Which means you could build two houses instead of one compared to a traditional wooden frame (Masonite Beams AB, 2022, p. 6-8). Using I-Joists also have positive effect on heat losses compared to traditional wooden structures by reducing heat loss trough thermal bridges up to 57% and by offering a U-value which is 15% lower on average (Masonite Beams AB, 2022, p. 136). The I-Joist beams are reusable and recyclable by use in bioenergy and as wood chips in productions of new I-Joists (Masonite Beams AB, 2022, p. 34). Using a construction system based on I-Joists would be resource effective and emissions reducing choice, so at the moment it seems a good choice for a more environmentally friendly building. A larger difference between using a solid timber structure and an I-joist structure is the many reinforcements that is needed at various points of connections when using I-joists, as seen in the figure on page 22.


Illustration showing examples of the use of Masonite Beams AB version of I-joists.



Image above from handbook:
https://handbok.masonitebeams.se/dimensionera



## 3.3 The 1960´s detached houses, their f aws & solutions

It is common for the 1960´s detached housing in Finland to have a varying degree of influence from the common post war type house from the 40´s and 50´s. These where typically timber frames with sawdust as insulation. By the end of the 60´s this became less common and a standard of timber or brick based detached houses with a low building height emerged, also a growing industrialization of the constructions sector brought new but untested solutions, among these changes was larger windows and new insulation materials that replaced the sawdust insulation.

During the 60´s an interest for flexible floor plans emerged opposed to the 50´s that generally praised more, but smaller rooms. Due to the rather large amount of houses built and the amount of new solutions, the 1960´s has come to be known as an era that left us with buildings that have flaws in construction and low energy efficiency. (Marjaniemi, 2023)

Common flaws found in Finnish detached houses from the 60´s (Käyhkö, 2023) are:

- Poor ground drainage.
- Foundations insulated from above with mineral wool or sawdust, small difference in height between interior floor and exterior ground.
- Interior walls made from timber that rests below floor surface.
- Brick walls without ventilated cavity.
- Wooden fibre board sandwich between two layers of concrete as floor.
- Exterior timber walls without vapor barrier and ventilated cavity and more.

One of the flaws listed above that is out of particular interest for this thesis is the flooring type where a concrete foundation that has been poured straight on sand or gravel without a barrier, on top of which a timber structure with mineral wool or sawdust insulation in between was built to support the interior flooring. This being a typical structure that lead to high moisture content and with that a high risk for microbial growth (Käyhkö, 2023).

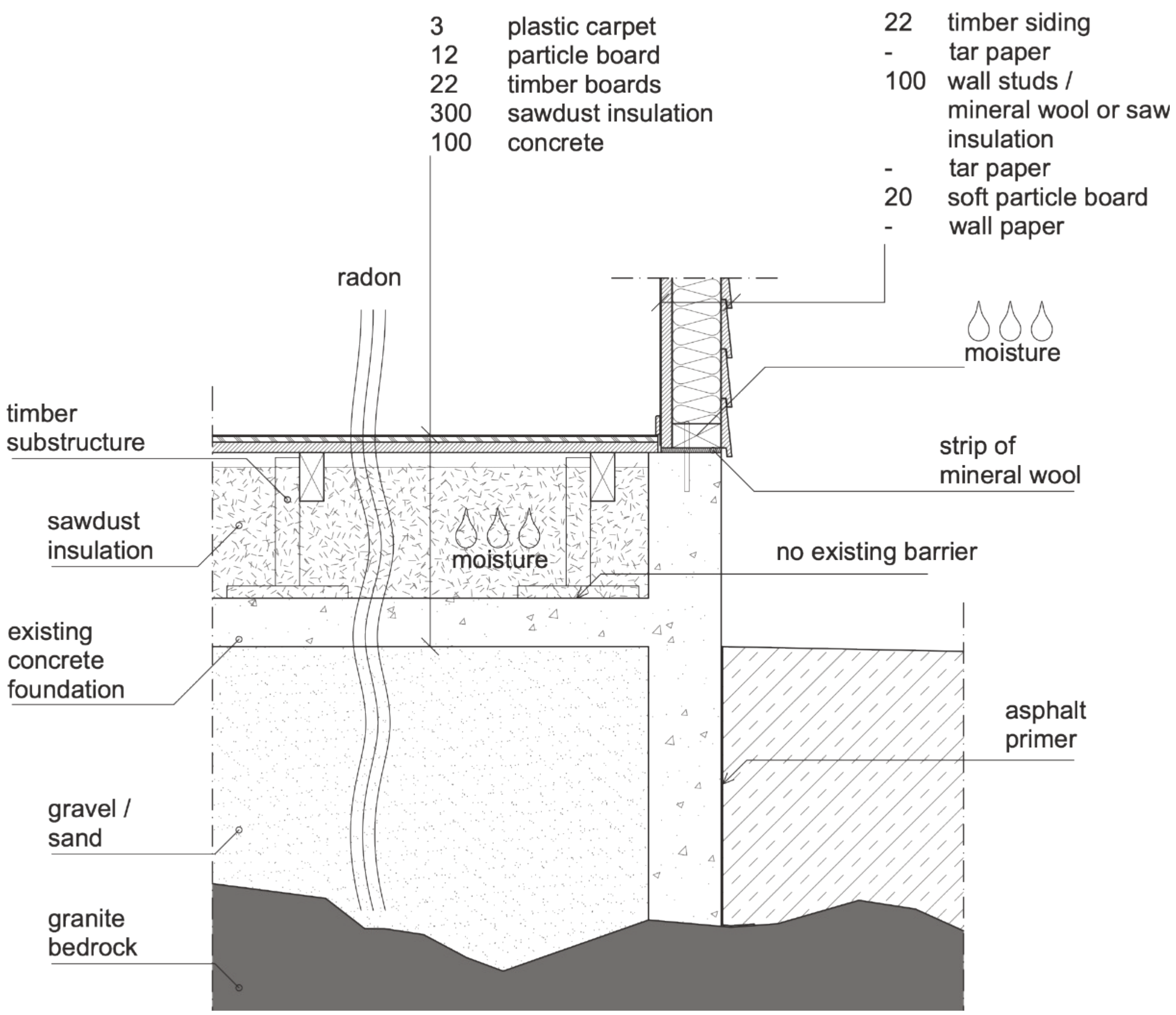
The most damaged components are the ground constructions, the attic or the outer walls. This is often due to inaccurate building materials or insulation and flaws in ventilation. Many of the small houses built in the 1960's suffers from problems and damages due to moisture.

One survey consisting of 15000 houses in Finland, found that 15% of detached houses had certain damage due to moisture and 40% had damage in need of further investigation. 20% of houses in the survey was built between 1960-79 and out of these about 22% had damage due to moisture and more was in need of further investigation. Common structures subdued to damage that relates to this thesis were found to be wooden subfloor on top of concrete and external walls with not enough ventilation (Salmela, 2021)

A somewhat common structure used in 60´s detached houses is the slab foundation. The concrete slab foundation has been a common construction type since the 50´s. But in buildings built between1965 to 1985 this type of structure has relatively often been found to have problems related to moisture, where as a result flooring has been found to buckle, miscolor or detach. In severe cases there is also rot and mold. This is particularly common in slab structures insulated from above combined with a wooden subfloor resting against the concrete or where light expanded clay aggregate has been used (Nevander & Elmarsson, 2006, p. 172-173).

Today it is standard practice to do the opposite, which is to insulate and protect against ground conditions underneath the concrete. This seems to be the least risky solution, although insulating from above or below are both viable solutions as long a moisture is kept low where it can cause problems, this is especially true in a situation where both high moisture and organic material is present.
Essentially there are three major factors to account for to avoid moisture problems, these are capillary suction, diffusing moisture and initial moisture content during production (Nevander & Elmarsson, 2006, p. 177).

The existing foundation in this thesis project is precisely like the one described earlier, one where the concrete slab is resting on poorly drained ground and is insulated from above with sawdust combined with a wooden subfloor resting against the concrete as seen in drawing below. There is no chance to install new insulation underneath the existing foundation, but with the correct approach where the timber substructure is removed and new protection against moisture is installed one can get a good solution. This is shown in a design proposal in chapter 6.




Section D3–D3

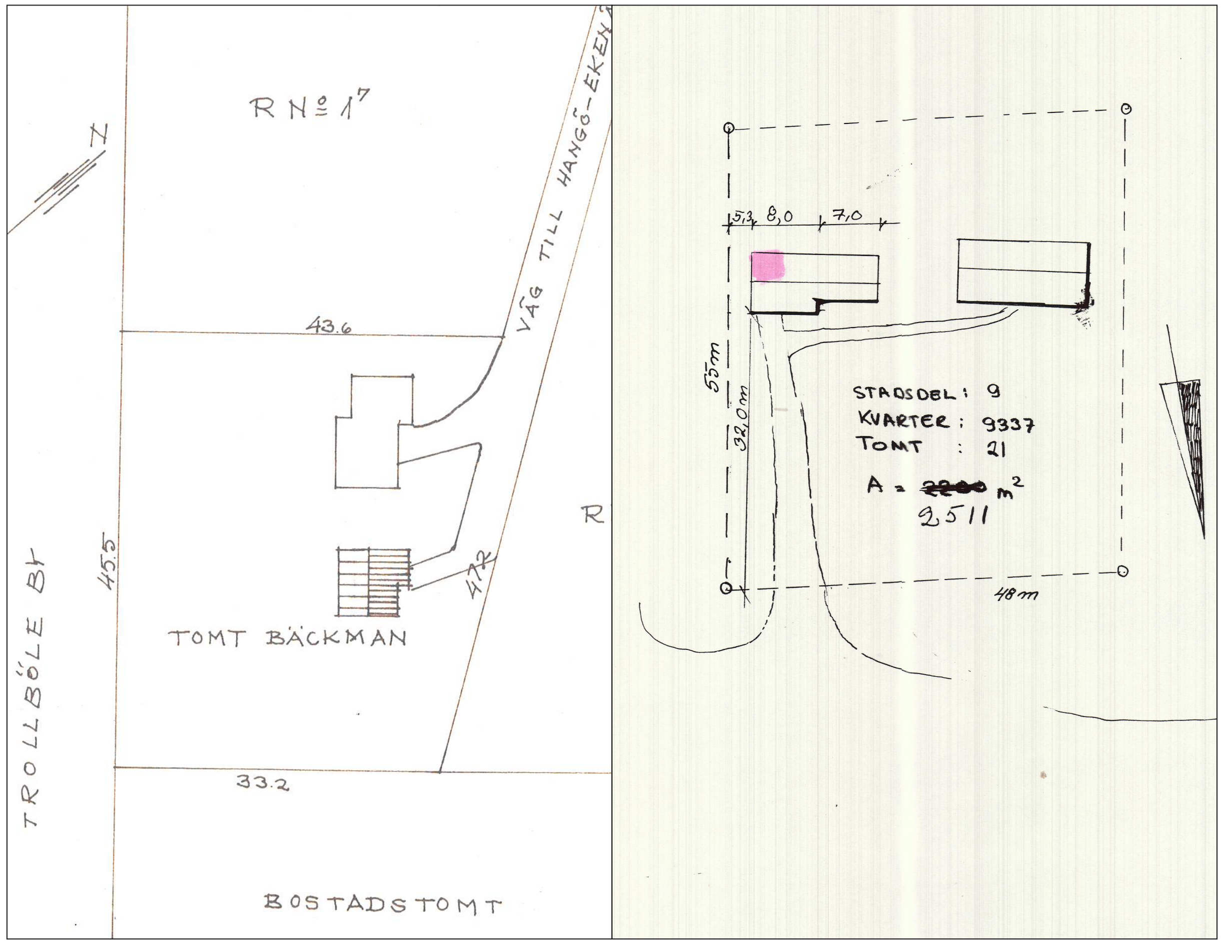
Section D3–D3 of existing foundation, showing some of the flaws in need of solutions.



# 4. Building documentation

## 4.1 Original drawings

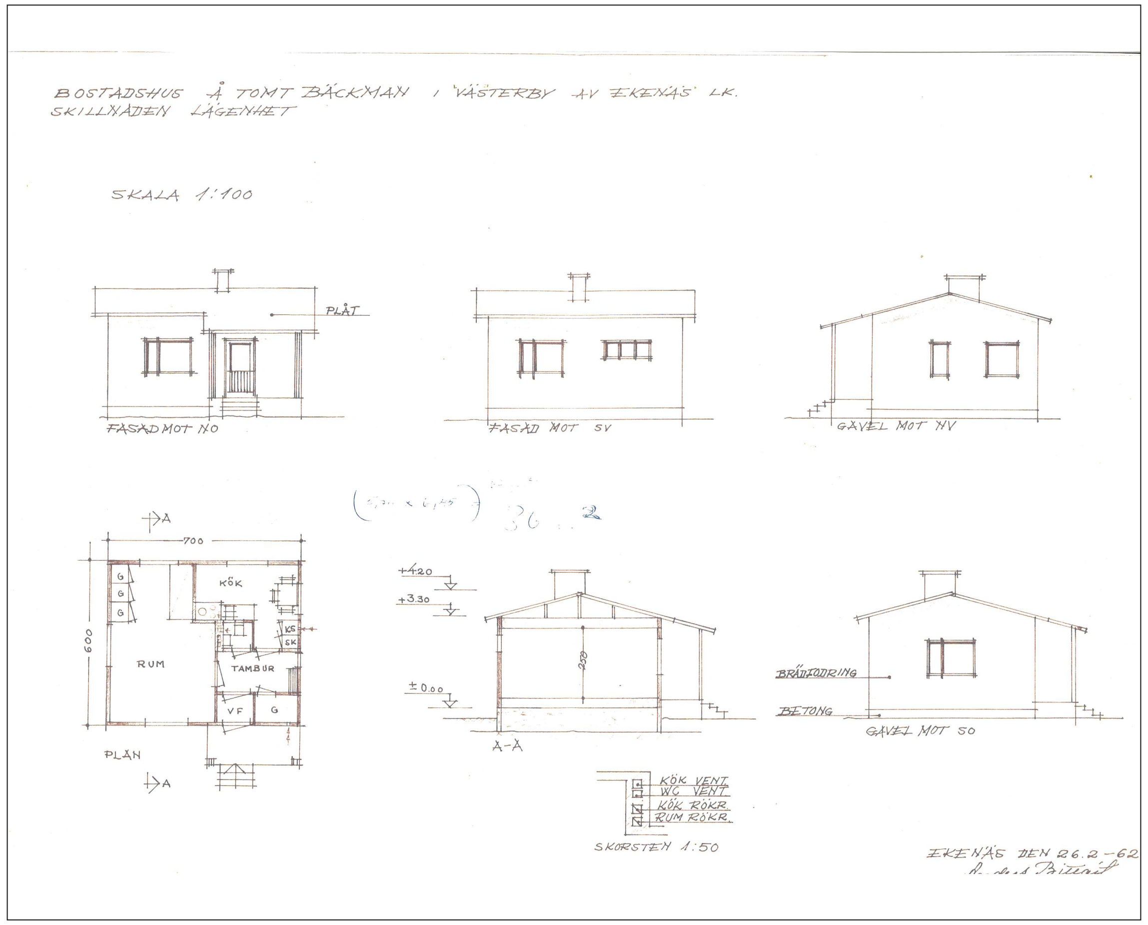
1963 1967



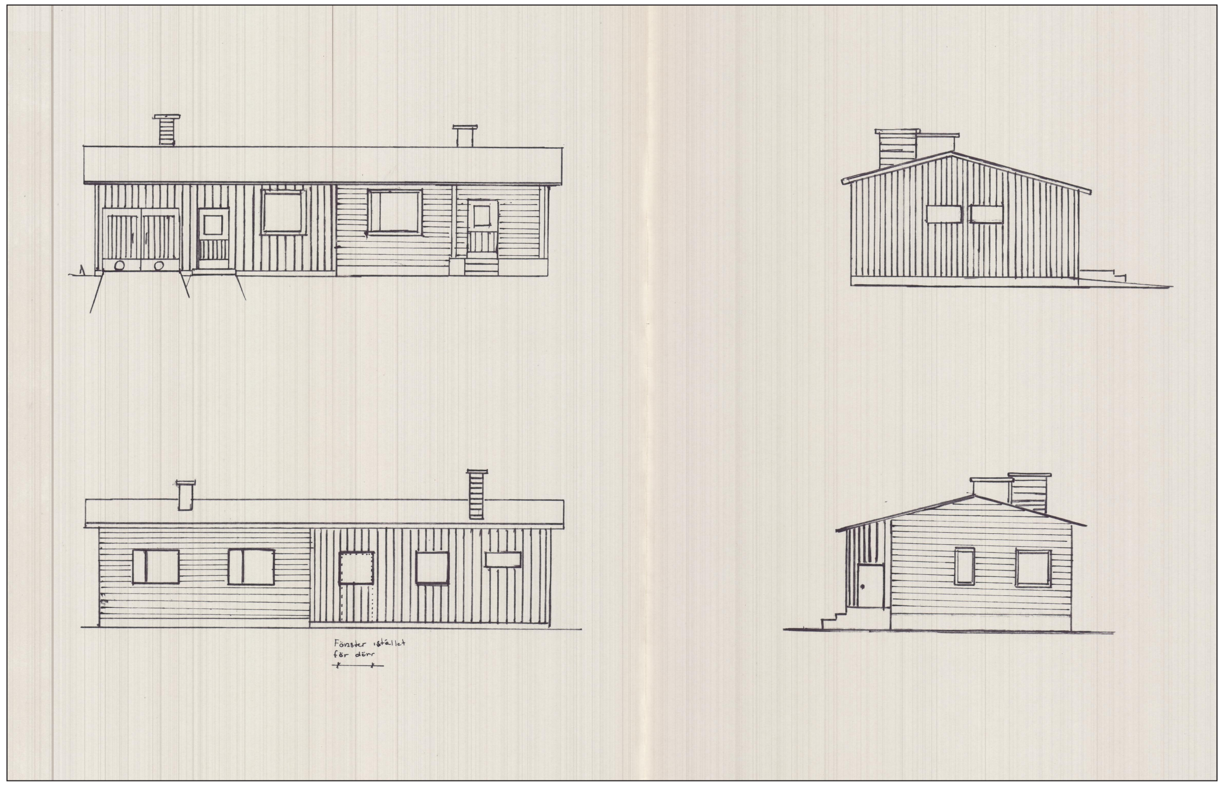

Site plan of the original building and the second transformation. Not in scale.

The plot size is about 2500 m2 and is rectangular in shape. The original house was just a tiny cottage. Built to house an elderly parent. At first a wooden stove was the only heat source. The concrete foundation was poured straight on the bedrock. Walls are thin and window arches almost match the depth of the walls, a character hard to preserve or rebuild when having to meet contemporary standards of building. Ceiling height was 2500 mm and height from ground to roof gutter about 3600 mm. The rooms are rather small and have quiet big windows in comparison.






Drawings of the original building from 1963. Not in scale.

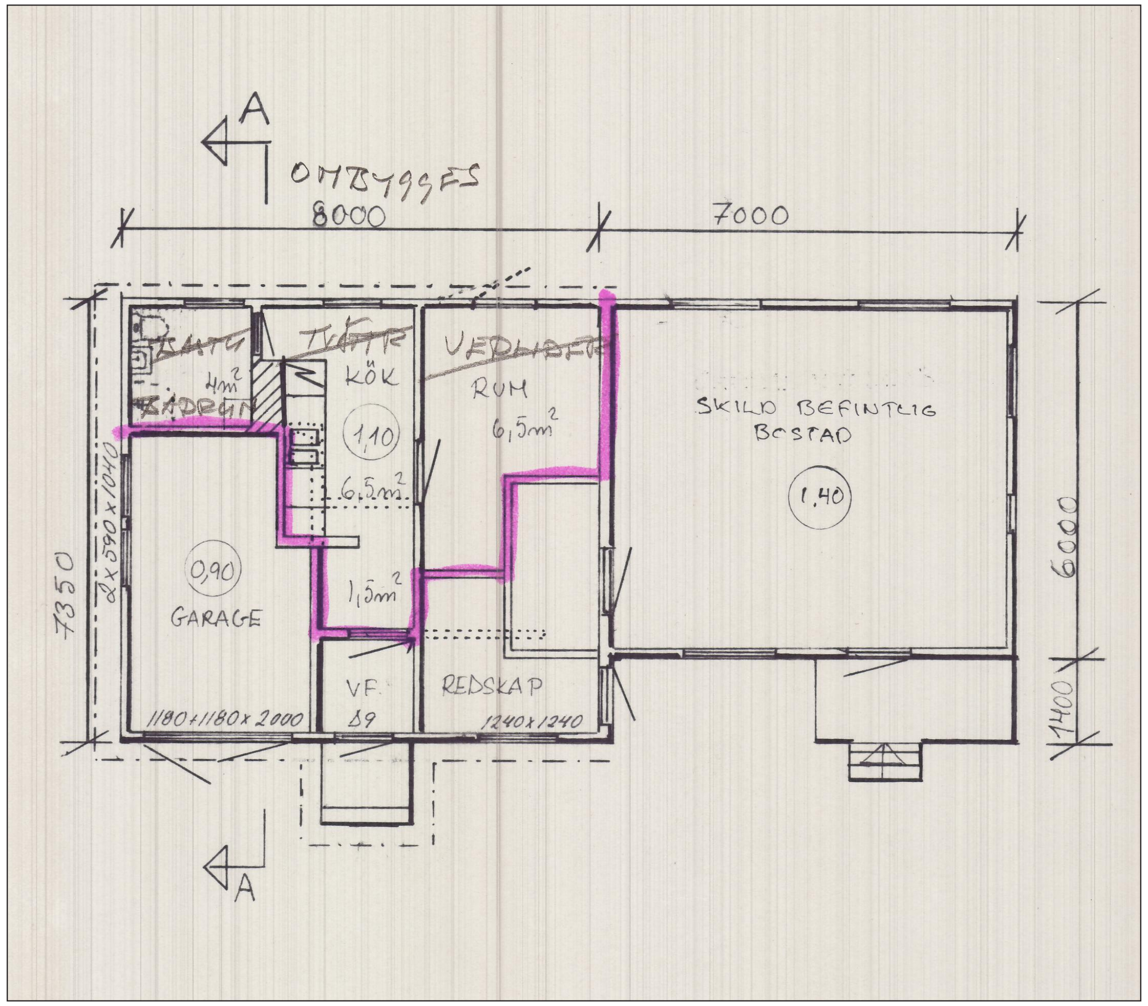


Drawings of first transformation in 1967. Not in scale.

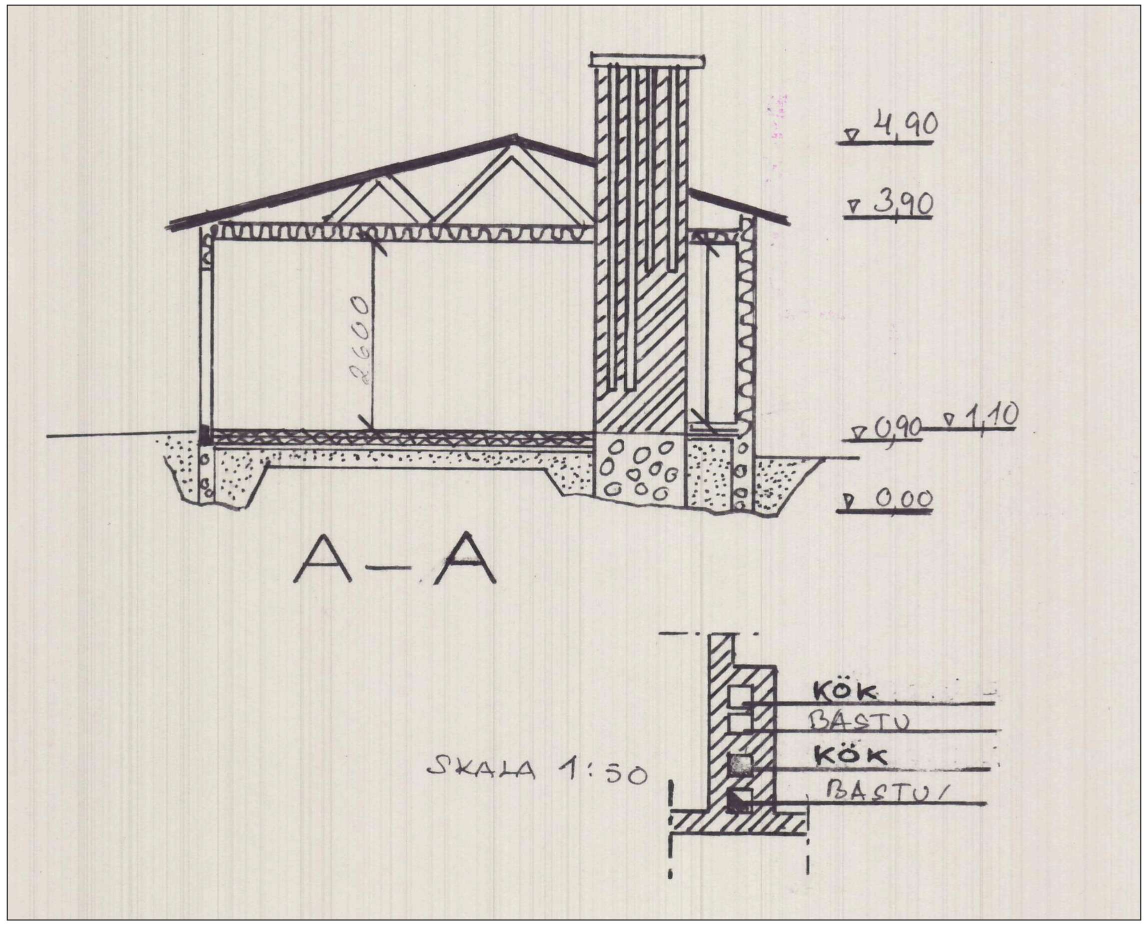
The different directions of the timber siding, the many different sized windows and doors clearly shows that building additions have been made. It is not a uniform look. The brick from both chimneys can be reused and the vertical facade panel can be reused as backing boards in a new timber siding. The house has a typical 60´s inserted facade and plan which creates a natural roof extension over the entrance, this feature could be saved. Also the addition that was built later was much wider than the original house which shifts and off centers the ridge of the roof, this could be changed to a centered ridge beam. Together with windows and uniform wooden siding, this could be turned into a more coherent building.

When the addition was built, it was made to follow the topography on the plot. This created differences in floor height between the garage, new apartment and the original building. A total difference of about 500 mm. This also created a tiny souterrain wall on the additions southern wall, a bit problematic in terms of moisture and window placement compared to the original building as can be seen in photos taken during documentation on pages 32–36. This difference can be evened out and by that creating an easier connection to the exterior garden along the entire southern facade.






Floor plan of changes for second transformation. Not in scale.



Sections of second transformation. Not in scale.

The concrete foundation seems to be poured straight on top the bedrock. Sand or gravel fills the ditches to support the concrete slab and to prevent capillary suction. Brick from chimney could be reused.
If correct this drawing shows that it would be possible to reinforce the slab in the middle of the room right down to bedrock to support additional pillars.



## 4.2 Surrounding buildings


Neighboring building to the northwest.


Second neighboring building to the northwest.


Neighboring building to the north.


Neighboring building to the southeast.


Neighboring building to the southwest.


Neighboring building to the southwest.

## 4.3 Building documentation

Facade to the northeast.

Facade to the south.

Facade to the southwest.

Facade to the west.



Cover boarding was used on the facade after the latest transformation.

Feather edge timber cladding with visible marks from circular saw during production was used on the original building. Under the yellow acrylate paint there is signs that the facade use to be brown.

Timber formwork was use as mould for the reinforced concrete foundation. The boards used are still saved as flooring in the attic, as seen in figure ?.

Painted sheet metal was used as roof covering. Spots of rust is visible all over the roof. Sunlight has made an impact on the paint during the years.

Soft wooden fibre boards painted in white was used as interior roof covering.

Bricks of concrete was used to lay the chimneys.

Roof beams was placed side by side and nailed together. No ridge beam was used. To support the roof two beams with studs running parallel on both sides along the ridge was used. Roof angel is about 12 degrees.

Simple support of the roof beams, sawn where necessary to make room for the chimneys.

Sawdust was used as primary insulation. Over time some fireproofing insulation and cellulose insulation has been added. The sawdust layer is about 300 mm thick and the roof beams has a 65X130 mm dimension.

Boards to support the sheet metal roofing was placed sparingly with varying distance.

Everything was used. The timber from the formwork was used as flooring on the attic. Traces of concrete is clearly visible. These could be reused in future formwork.

Exterior wall is made up of 100x50 mm studs, clad with bituminous paper and timber boards. Space between studs was filled with sawdust insulation which later was replaced with mineral wool, particularly under windows.



95mm wide raw cut timber floorboards was found under linoleum carpet. Underneath there is sawdust used as insulation.

The timber sole plate is anchored to the concrete foundation with a bent 10 mm rebar.

There is no vapor barrier between the concrete foundation and the timber sole plate. Only a strip of mineral wool  was used to separate the the timber structure from the foundation.

At some points there seem to be nothing separating the timber sole plate som from the foundation..

Parts of the foundation has been covered in sheetmetal to create a barrier to the ground at parts where the building turns to a souterrain type, no one knows what can be found behind it.

Window arches are almost as deep the external wall and is made up of two single sashes.

All windows are of a traditional double glass type where the exterior frame opens outwards and the interior one opens to the interior. There is a metal sill above and under the window.

The building has been fitted with a square type water drainage and the distance between the roof beams is around 920 mm.

The corners are covered with timber, organic growth is evident on most parts of the building that has been painted in white.

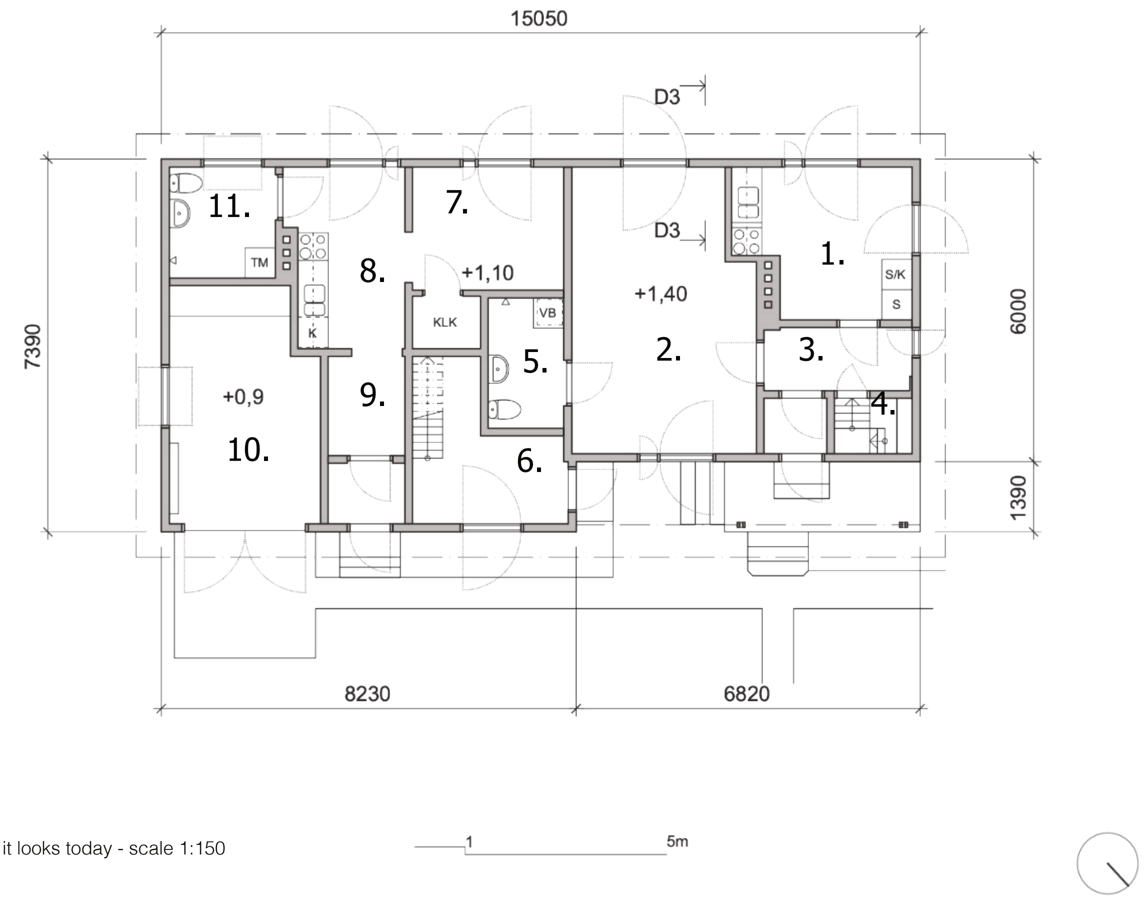
When the house got an expansion somewhere between 1962 and 1992 the existing facade was kept next to the new one. The paint on the old facade is pealing off.

When the house got an expansion somewhere between 1962 and 1992 the existing roof beams simply got extended.

The columns holding up the roof above the entrance is raised from the foundation by a metal footing.



## 4.4 Conclusion based on documentation

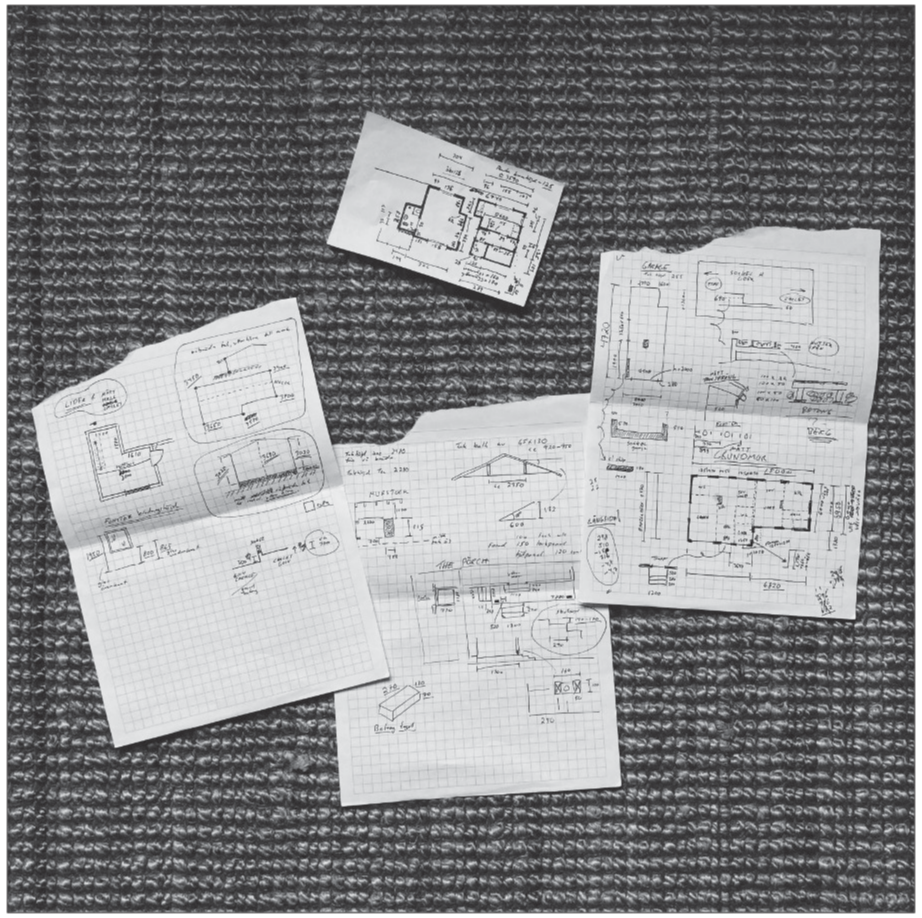



Plan as it looks today - scale 1:150

After many transformations, renovations and years of standing the test of time, the building currently looks as shown above. In large terms the building is divided into two smaller apartments which are used only as summer housing. The rooms are generally small with clear functions and this maybe where you se the traces of a 50´s plan or earlier still showing in a building built in the 60´s. In the coming proposal it would be great to open it all up, creating more useful rooms and a better connection to the lush exterior garden.

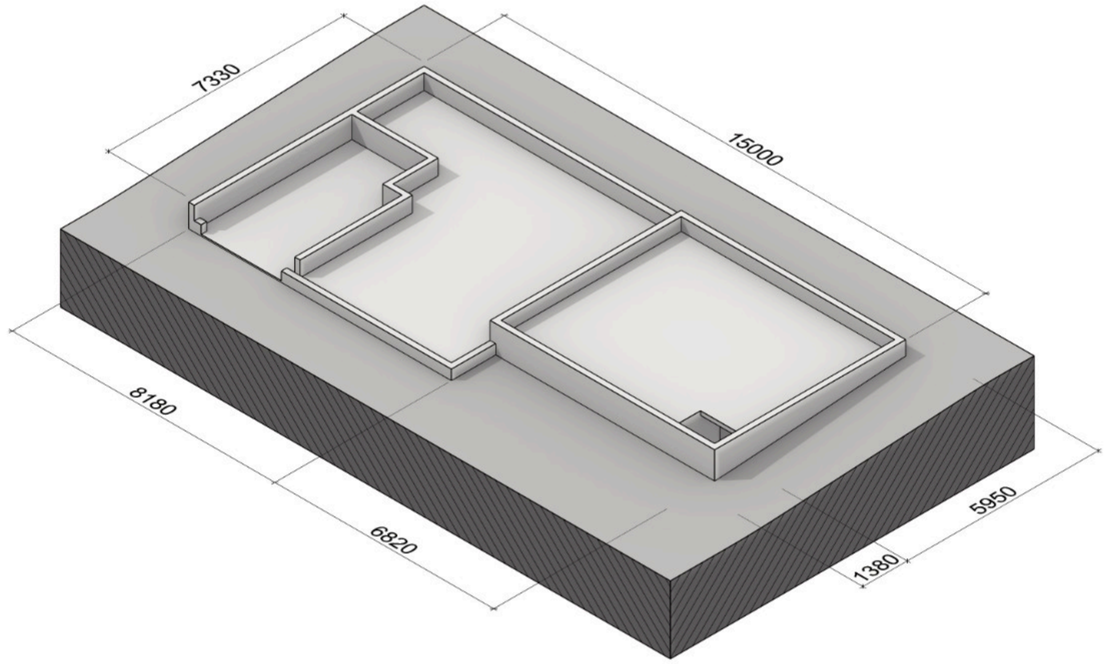
1. Kitchen
2. Living room
3. Hallway
4. Cellar
5. Bathroom
6. Cold storage and passage to attic
7. Living room (has been connected to room Nr 2.)
8. Kitchen
9. Hallway
10. Garage
11. Bathroom (used to be a sauna)

KLK = Closet
VB = Water boiler
TM = Laundry machine
S/K = Cabinet and refrigerator
K = refrigerator
S = Cabinet



Documentation with sketches and measurements.






Foundation as it looks today. Isometric 1:200

After reviewing the gathered documentation as shown in earlier chapters, a conclusion was taken that only the foundation would be saved and then corrected to fit an entirely new house. Since concrete is rather co2 intensive, this solution should still saves some resources and emissions even if the house is not entirely saved. Although labor intensive, parts of the wooden structure and facade could be reused in parts of the new building, for example as backing board in the facade siding or custom furniture, flooring or wall covering in the studio spaces. The image above shows the concrete foundation of the existing building which will be the starting point for a design proposal in chapter 6.

# 5. Built references



## 5.1 Svensboda

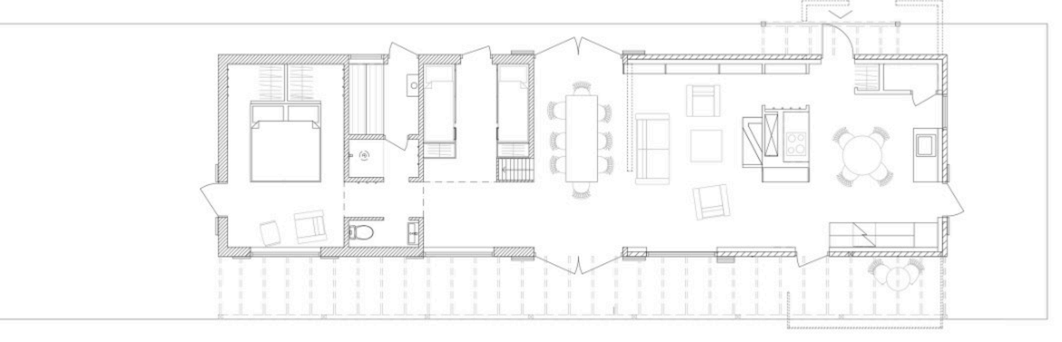
Architecture: Lowén Widman Arkitekter
Drawings and images: Lowén Widman Arkitekter

This project starts with an old cabin, although smaller than the house that this thesis starts from, the project is a good example of an transformation, extension and rebuilding project that has multiple aspects that this thesis project can lean on and make reference to. Some of the major aspects that this thesis tries to accomplice in the final proposal can be seen in the reference images on this page.

The original cabin and the surrounding landscape is ultimately a starting point for inspiration but also a boundary or restriction for the building project. What would you save? Change? Reuse? Rebuild? It really is an interesting starting point compared to a clear plate.

Even in the final result there is an cabin like feeling to the interiors. Timber siding in varying sizes and directions give direction to the rooms both in floor, wall and roof. One large passage that connects all rooms has been accentuated by the direction of the timber siding and large glass doors on both ends. The original fireplace and stove has been saved in the center of the room, preserving not only history, memories and materials. But It also spreads heat and becomes an object to gather around.

Not much of the original cabin is left to be seen in the final building. The transformation can be seen as one from cabin to a contemporary building style where the timber of the facade and the metal sheeting of the roofing are in a uniform tone of color. Double glass doors are place to match the intended interior program and plan.



The rather narrow width of the original cabin translates into rooms that really must be uniquely planned to function well well fitting the limited space. Most rooms are placed in line after each other.

References used with permission from Lowén Widman Arkitekter.

## 5.2 Villa Valda

Architecture: FABEL arkitektur

Photos: FABEL arkitektur

Varying sizes and versions of glass doors is placed along the facade. Uniform colors tie the different elements of the building together.

A long corridor with and glass door at its end gives direction to interior space while also connecting interior rooms not only to each other but also to the exterior. Wood covers most surfaces creating a light atmosphere with a connection to forests and nature.

An other project used as a reference, although not a transformation or rebuilding project, is Villa Valda. Not only is the Villa Valda building in similar size as the building selected for this thesis project, it also shows great example of a contemporary style with its placement and sizes of openings in the facade, the uniform coloring and the timber interiors. It also features a long corridor or passage that connects the interior rooms to each other and also to the exterior spaces.

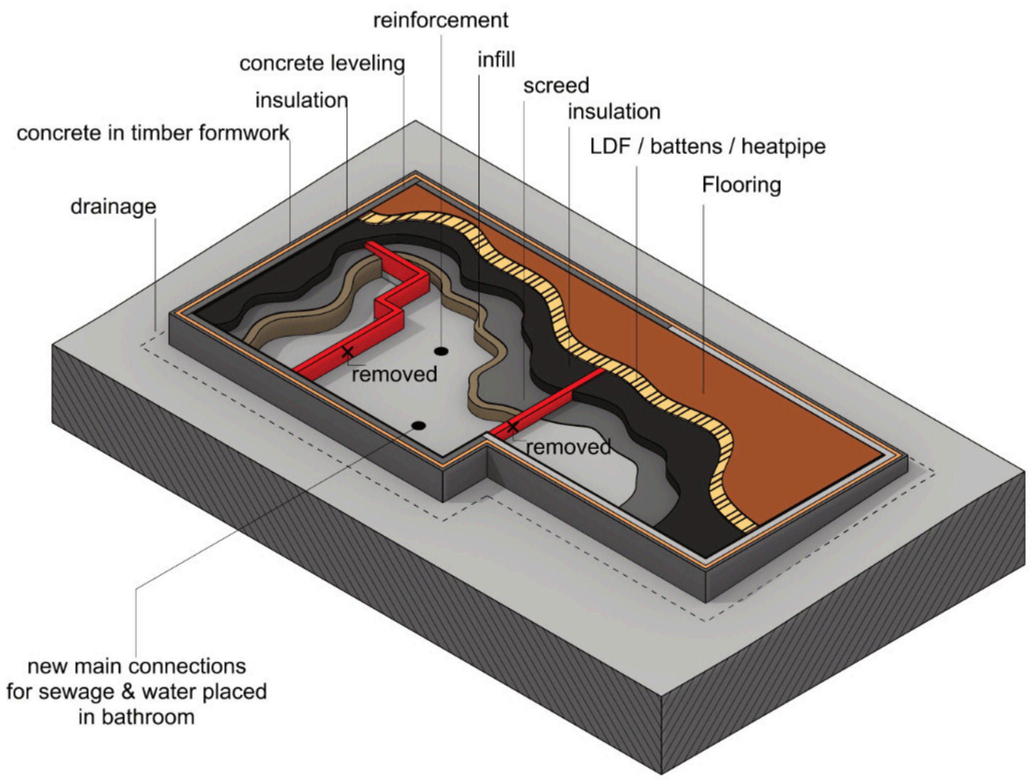
A rather narrow room still makes a great bedroom. The narrow room is likely a feature that will be seen in the design proposal, since the foundation is set and there is limited space for the interiors.

References used with permission from FABEL arkitektur.



# 6. Design proposal

## 6.1 The old foundation as starting point

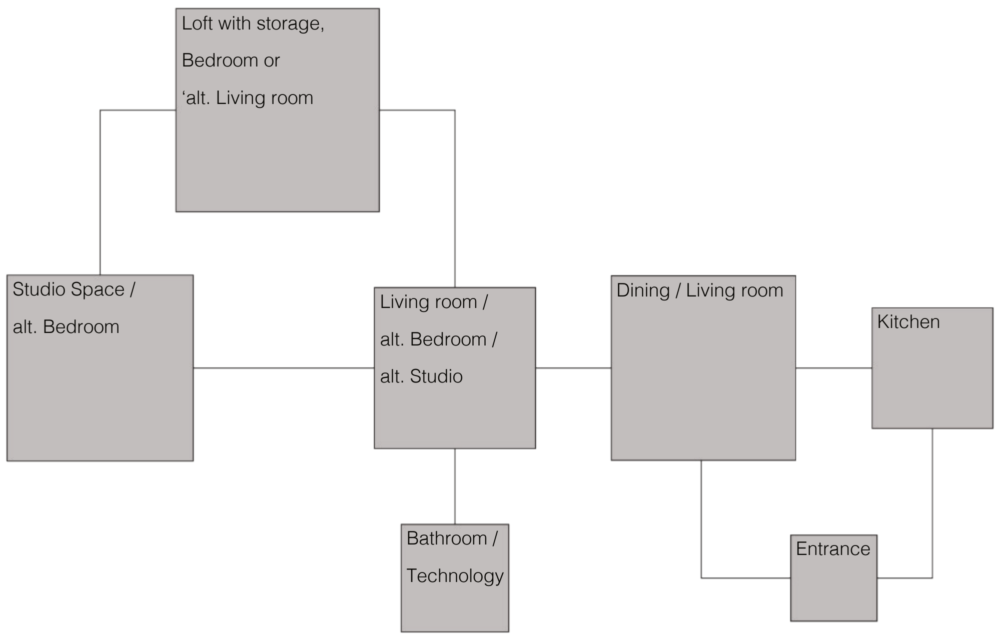



Transformation of the existing foundation. Isometric 1:200

Image above illustrates the multiple changes that could be done to the foundations to better fit the new building. The changes involves removing some parts and casting some new to the old foundation to get a good level to attach the new wall structures to. Externally the foundation is insulated and an additional concrete cast is made to create a sandwich like structure. The form works for this can be made from the same timber boards that was used in original cast in the 60´s since some of the boards have been saved as flooring in the attic as seen on page 34. Drainage is installed around the house and the ground is set to the right levels. In the middle of one of the rooms, an reinforcement needs to be done to carry the load of the ridge beam and roof trough a pillar. This could be avoided if the dimension of the ridge beam and pillars were to be larger. The lowest part is then infilled with Light extruded clay aggregate (LECA) or other material with similar function and a screed is cast to level the entire floor surface which is then insulated with foam glass, creating the base for a floating floor that holds the heating pipes and also the timber floor boards. Water and sewage pipe can be fitted in the insulation. Fortunately there is an inspection spot for the existing sewage right where the new bathroom will be. The foam glass is a sustainable insulation made from recycled glass and it is also not moisture permeable, making good for stopping radon gas. An other less expensive option would be recycled EPS foam combined with a membrane for vapor and radon proofing or a version with foam glass granulate.



## 6.2 Program and functions



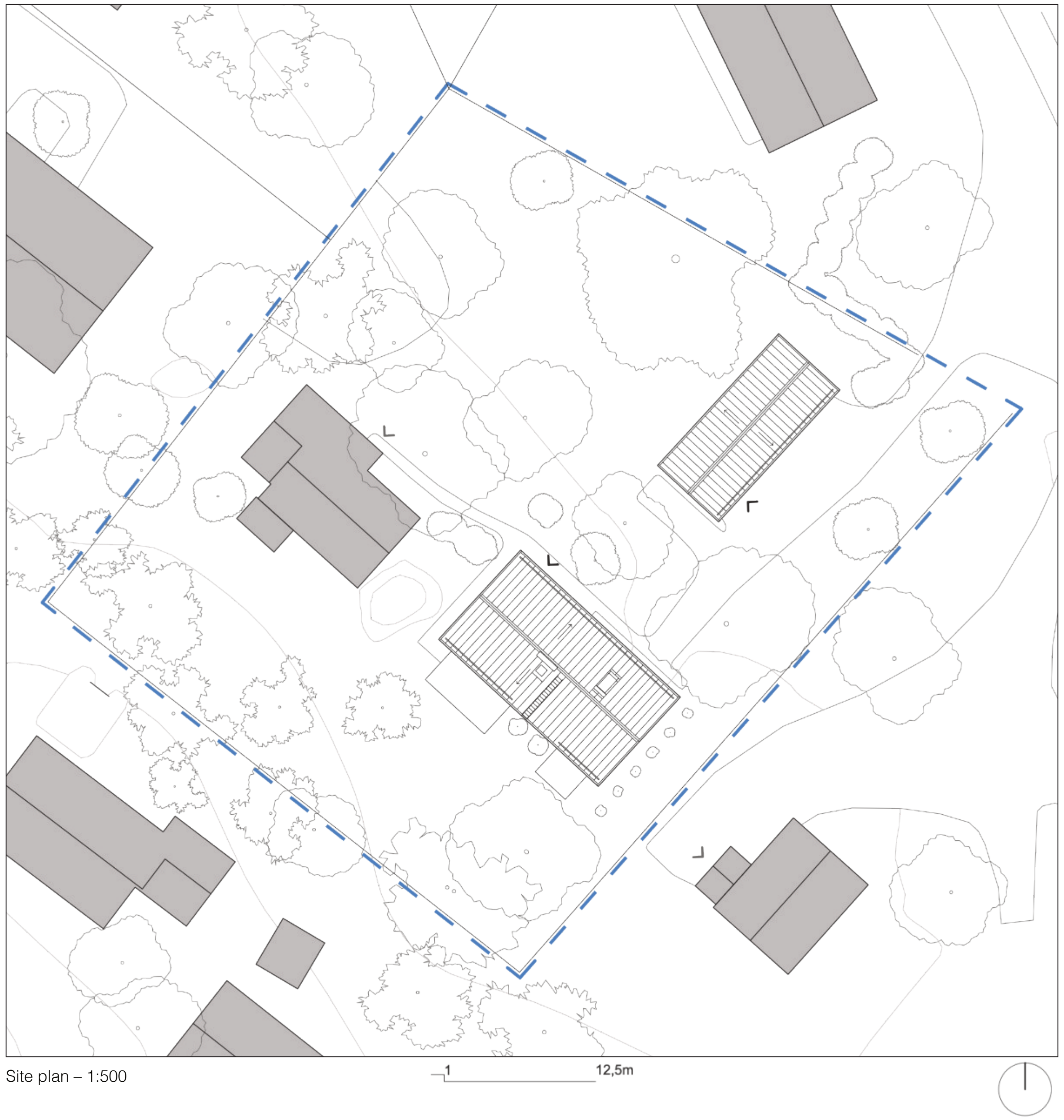

Spatial diagram.

| | |
|---|---|
| -Entrance | 5,2 m² |
| -Kitchen | 10,2 m² |
| -Dining / Living room | 21,5 m² |
| -Living room / Bedroom / Extended Studio | 18,9 m² |
| Studio Space / alt. Bedroom | 24,5 m² |
| -Bathroom / Technology | 8,1 m² |
| -Loft as Storage, Bedroom or alt. Living room | 28,9 m² |
| -Storage | 9,6 m² |
| Area GIA | 126,9 m² |
| Area GFA | 113,3 m² |

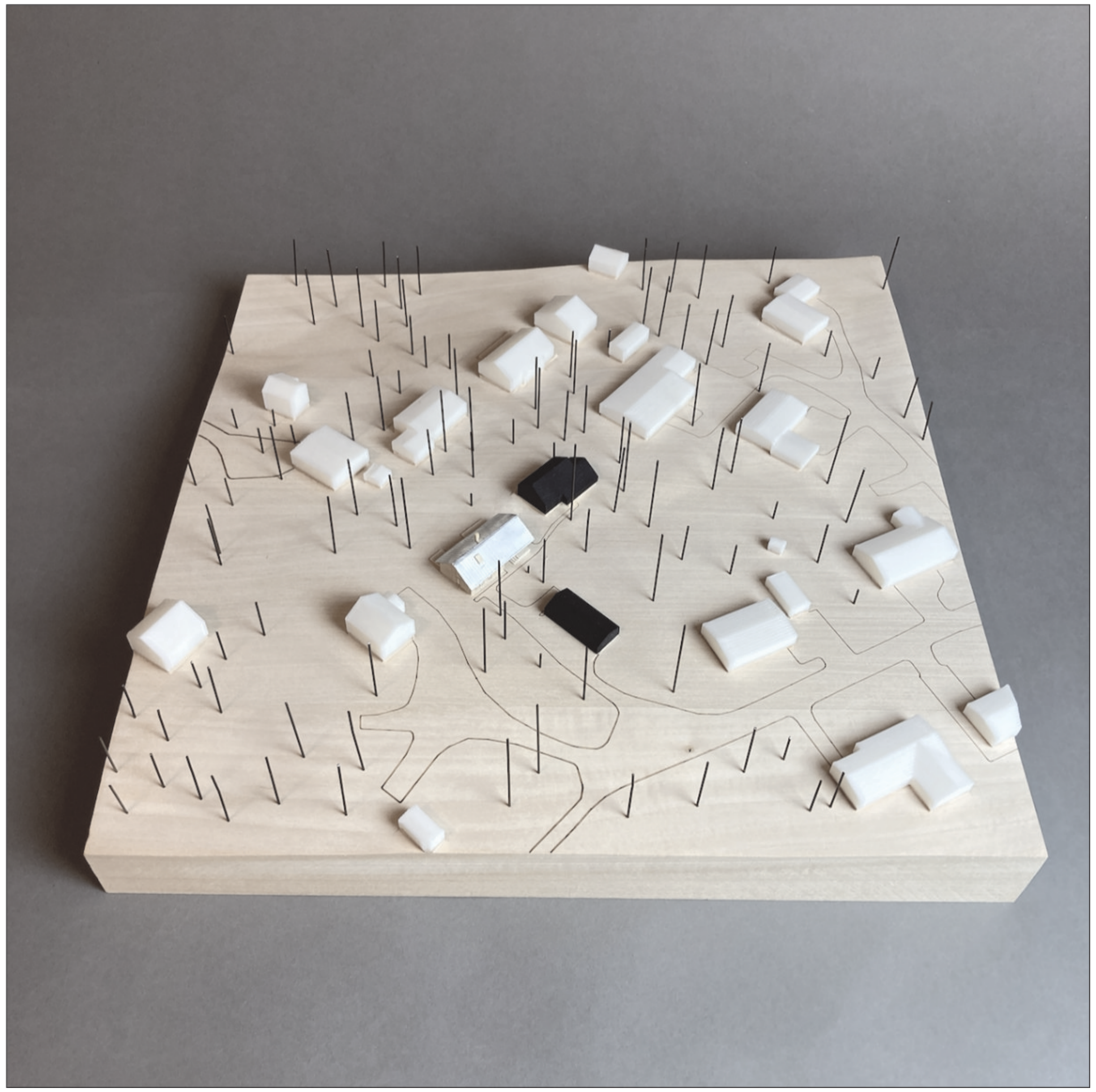
Areas of original building:

| | |
|---|---|
| Area GIA | 94,0 m² |
| Area GFA | 101,7 m² |

## 6.3 Site plan & landscape model

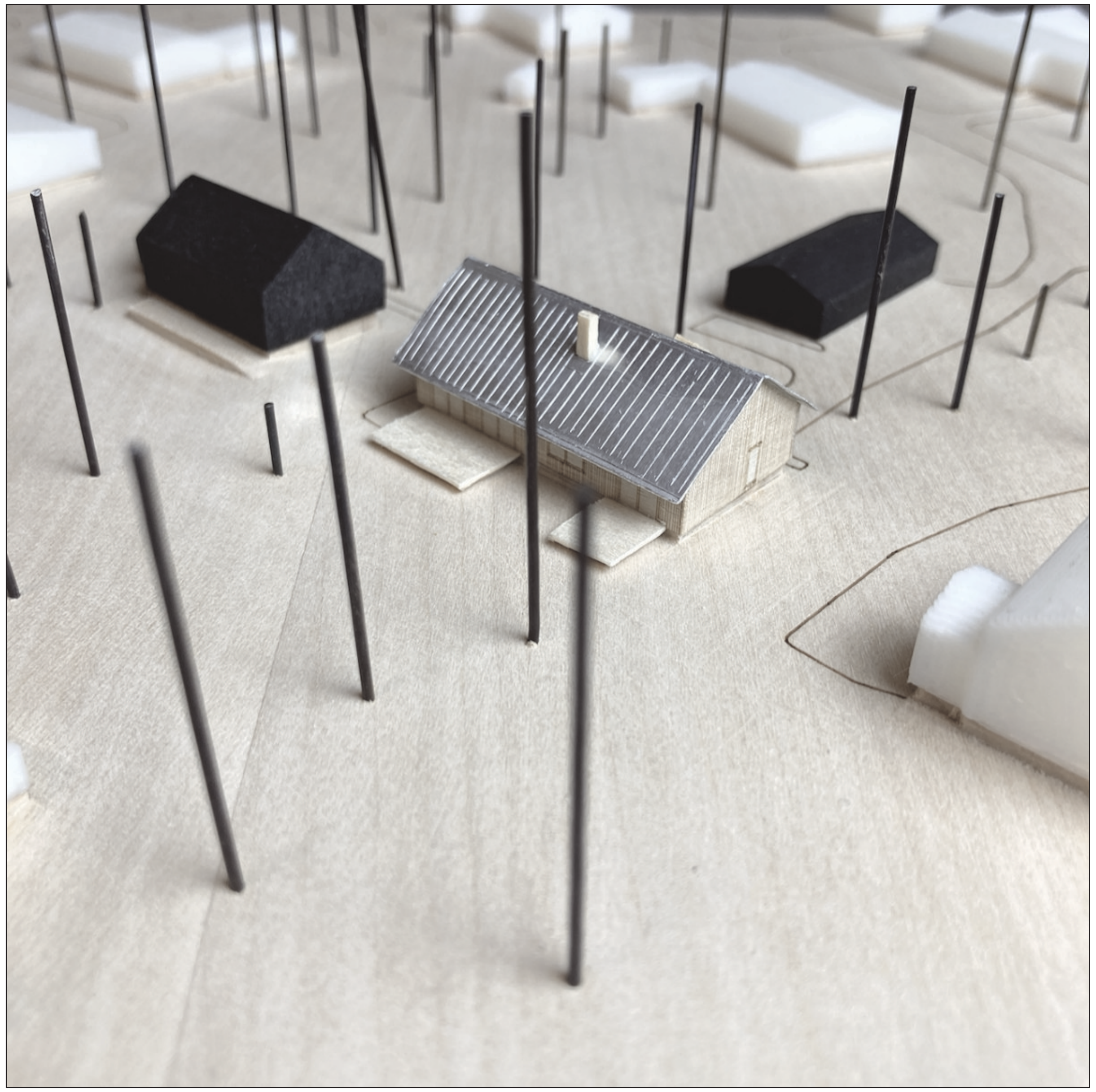


Site plan – 1:500


Landscape model – 1:400

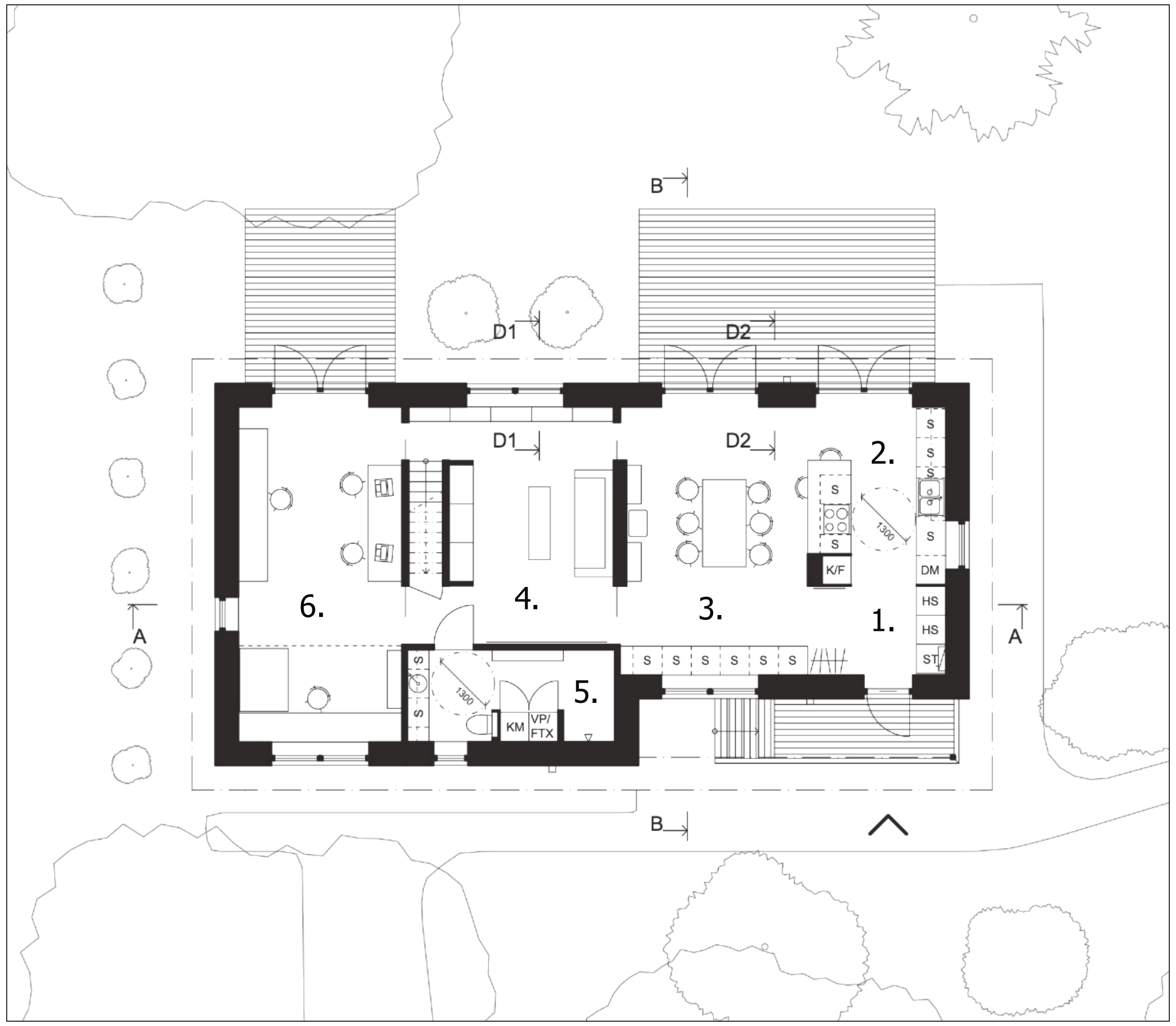
The building has grown some in volume due to the increased thickness of the external walls and the steepening of the roof. Most trees on the plot has been saved and some new are also added. The outside paths connecting the houses is left as they where, the aim is to preserve the lush vegetation surrounding the plot. There is a larger addition of two terraces on the southwest side of the building, these help extend the the buildings relation and use to the gardens. Outside the studio the terrace allows an extended working space. There is an addition of a garage building to the northeast right at the plot entry, this is only shown in landscape model and site plan to show it's relation to the building. The garage is also where the main electricity central would be moved from its current placement in the existing garage.

Materials:
Linden wood, pigmented MDF, PLA, metal rods & sheet.



Landscape model, close up – 1:400

## 6.4 Floor plans

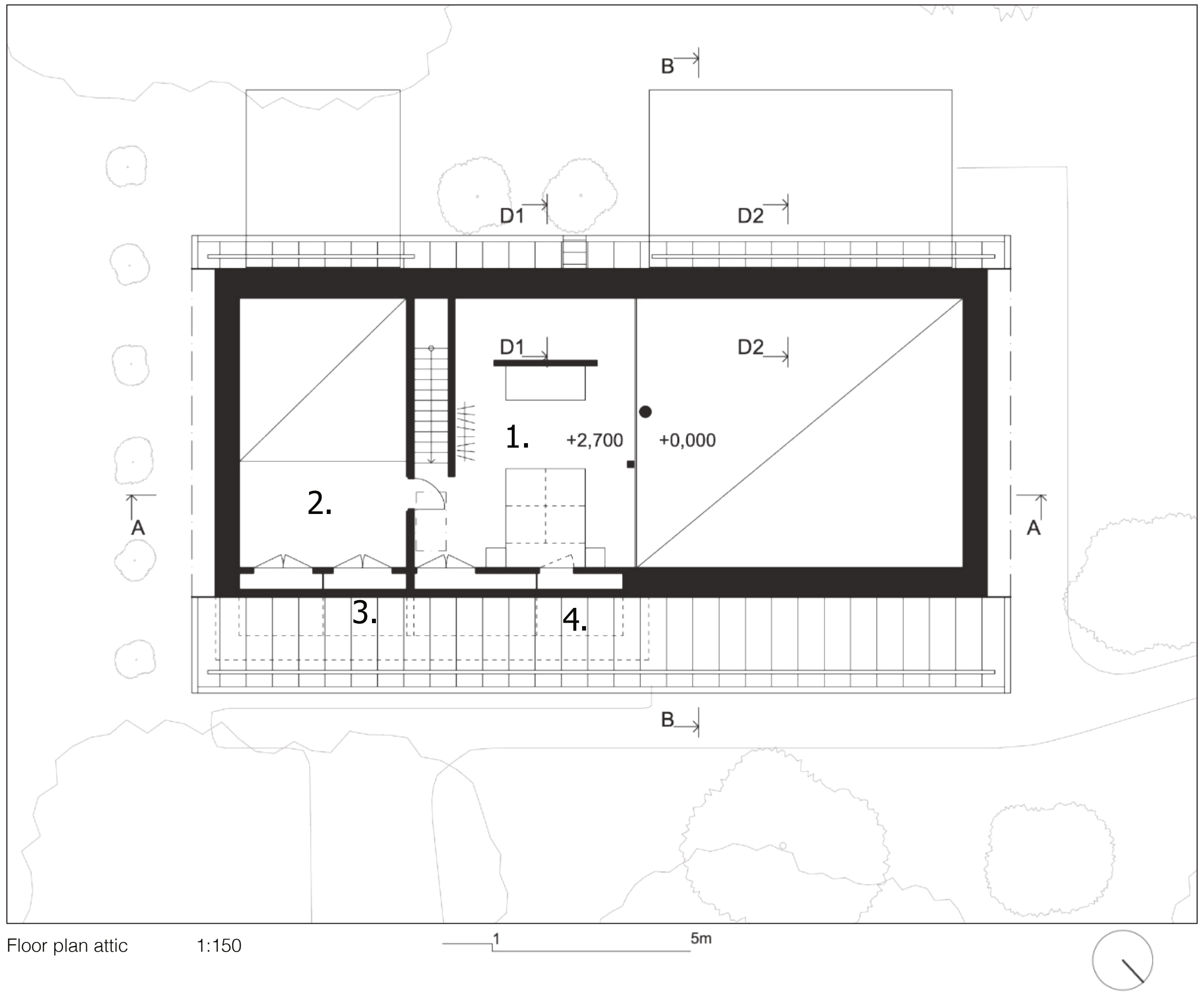



Floor plan 1:150

The floor plan is intended to be flexible, where rooms can extend into one another or room program just switch places. In the version shown above the kitchen and dining room takes up the part of the building where the ceiling height ends at the ridge beam, making this the social area where a fireplace creates a gathering point. From the entrance a corridor passes a row of cabinets which merges with the bathroom wall, creating a passage to the studio space while passing the bathroom and a living room. The plan turns with its social areas and larger windows and doors towards the southwest for sunlight and connections to the garden. A stair can be reached both from the studio and the living room.

1. Entrance / Hallway – 5,2 $m^2$
2. Kitchen – 10,2 $m^2$
3. Dining / Living room – 21,5 $m^2$
4. Living room / Guest room / Extended studio – 18,9 $m^2$
5. Bathroom – 8,1 $m^2$
6. Studio space – 24,5 $m^2$

VP/FTX = Heat pump & ventilation combination unit
KM = Laundry machine / Combination machine
K = Refrigerator
F = Freezer
S = Cabinet
HS = Higher cabinet
ST = Cleaning cabinet with electricity central.




Floor plan attic 1:150

A rather narrow stair leads up to the loft, this was a way to save space for the rooms on the first floor. A roof window is placed above the stair for daylight. The loft can be used in many ways, in the drawing above it is used as a bed space and as storage for the studio. From the studio one can climb up to the loft by a tiny ladder. Cabinets for storage are placed along and behind a non load carrying wall on the northeast side, channels from ventilation is also hidden behind the same wall and can be reached for maintenance. From the loft one can se down to the kitchen and entrance. The chimney from the fireplace passes next to the railing, heat from the chimney and fireplace can spread up to the loft.

1. Bed space
2. Studio loft / Storage
3. Storage
4. Ventilation connections



## 6.5 Design logic & reasoning

Many of the windows and doors are placed opposing each other to create views and directions. This also creates daylight intake from two sides. A long corridor from the entrance is directed towards a window to the southeast, this corridor connects most rooms on the first floor.

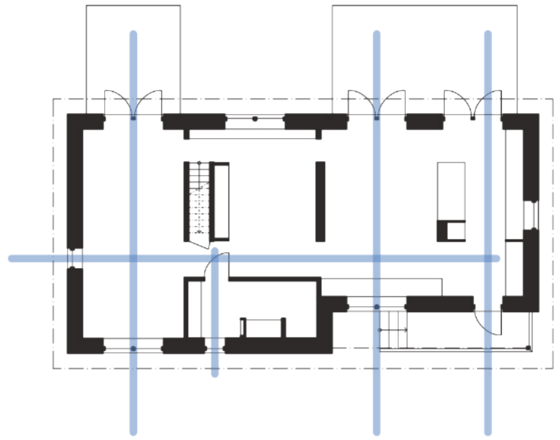


Illustration showing directions and views.

The plan emphasizes movement by creating multiple paths to move between rooms. The connection to outdoor terraces extends the movements to the outside and makes a connection between the exterior and the interior.

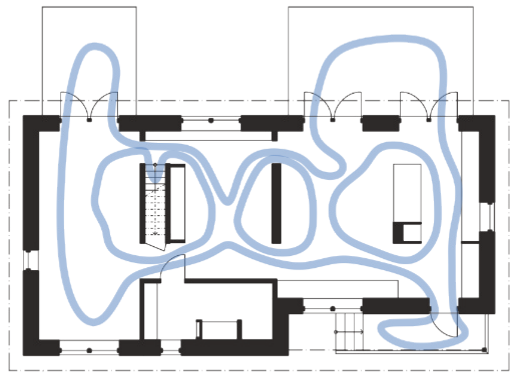


Illustration showing paths and movement.

Placement of larger doors and windows are located towards the southwest for solar gain and this is also where the more private garden is located. Smaller doors and windows are selected and placed towards the northeast to create more privacy from the roads.

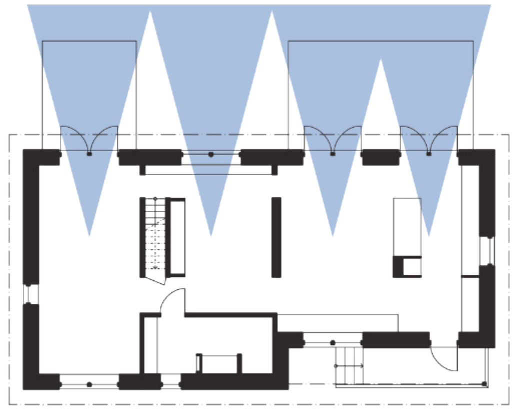
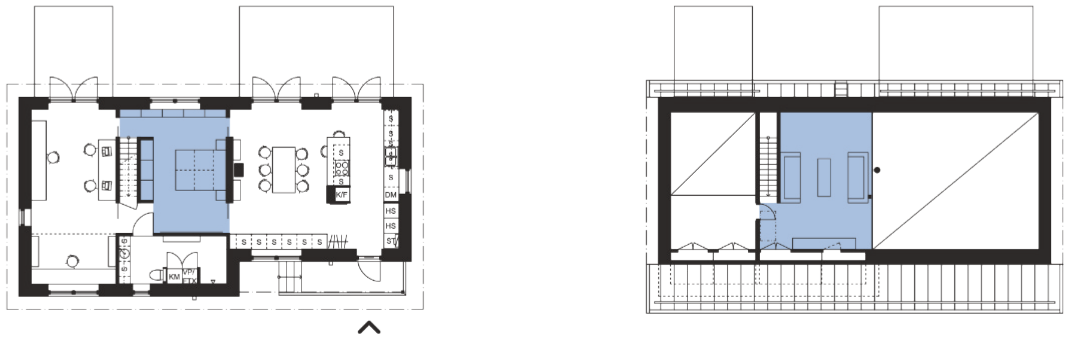
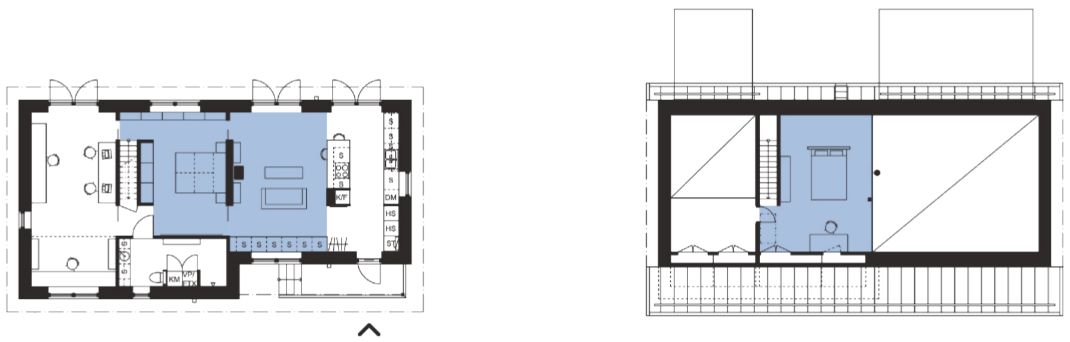


Illustration showing connections to exterior.

# 6.6 Alternative plans

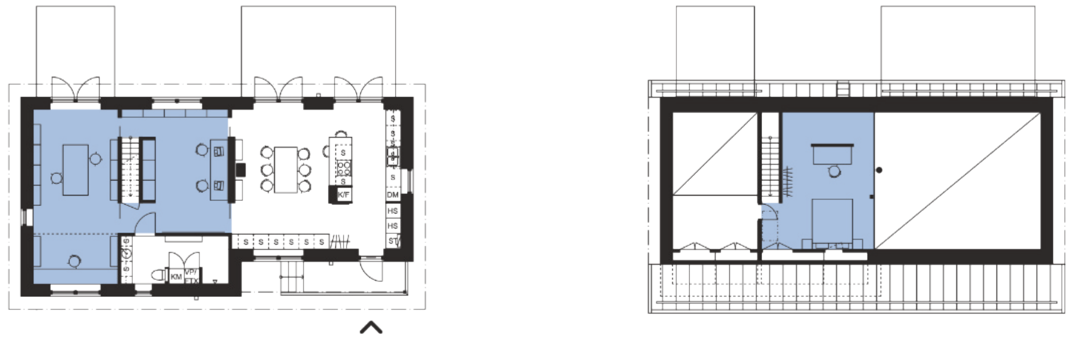


Floor plans, showing alternative bedroom placement.

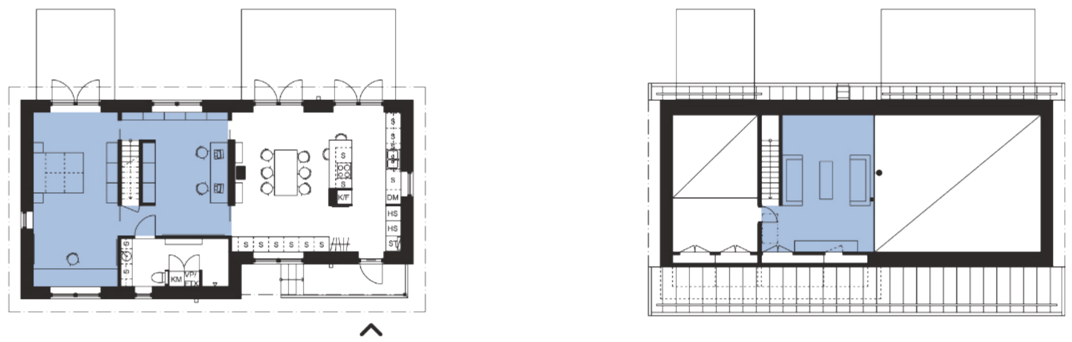


Floor plans, showing alternative living room placement.





Floor plans, showing extended studio and bedroom moved to loft.



Floor plans, showing alternative without studio space.

## 6.7 Elevations

Facades towards southwest – 1:150

Facades towards northwest – 1:150

Facades towards northeast – 1:150

Facades towards southeast – 1:150

1 5m

1 5m

## 6.8 Sections & interior perspectives

Section A – A, showing room sequence – 1:150   1   5m

Studio space is located furthest to the southeast and kitchen furthest to the southwest. In between are spaces for dining and gathering, these are also intended to be rather flexible spaces, making them useful in many different ways. Along the facade facing to the southwest larger windows and doors are placed evenly. The space underneath the stair is used as a closet. The wooden cladding covering the interior walls has a variation in widths. The wooden panel has a brushed surface that is waxed in a white color. One of the openings in the southwest facade is smaller than the rest to make room for a lower shelf and to create a more private or closed room.

Perspective showing dining room and loft.

Section B – B, showing kitchen and entrance – 1:150

The entrance and the kitchen is next to each other. The roof extends above the entrance door and its stairs as it did in the original building. The roof is open all the way to the ridge beam in the kitchen, entrance and dining room. This together with larger windows and doors towards the southwest creates a spacious and light space. A non-load carrying column in the middle of the room hides the refrigerator and freezer. The column also creates divisions in the open space and can as an example hold a mirror used in the entrance. The column can also hide ventilation channels which can be brought lower down from the ceiling making it easier to maintain.

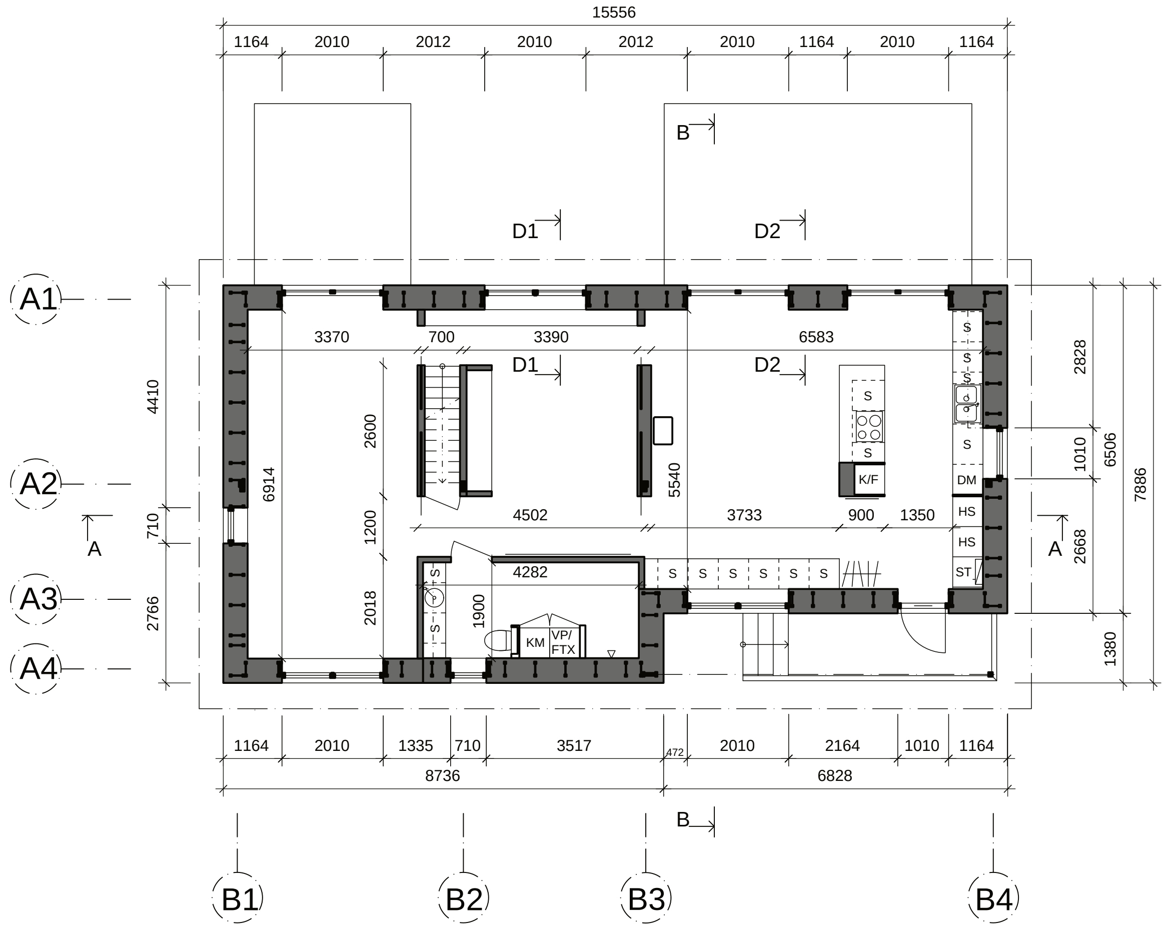



Perspective showing kitchen.

Perspective showing studio space.



## 6.10 Construction, details & physical models




Construction plan, showing basic measures and load carrying structure – 1:150

1 5m

The aim was to use as much as possible of the already existing foundation to carry the new structure. After a renovation of the foundation, most of the structural loads can be taken down by the walls into the foundation. To carry the ridge beam and to reduce its dimensions, a reinforcement for a pillar needs to made at the intersection between A2 and B3. The majority of the structure is based on a lightweight I-joist structure. Where structure is visible, like the ridge beam, laminated timber is used. The wall structure is based on a 600 mm cc measure, with a full length standing LVL top plate to carry roof beams over all the windows and doors. This also allows for some freedom when distributing even distances between the roof beams. I-joist studs in corners and distance between wall studs is placed to allow for insulation to be blown in place from the interior side. The rest of the pillars could rest on the existing foundation. Interior walls are non load carrying and rest directly on top of the floating floor.

Structural model with interior volumes added - 1:25

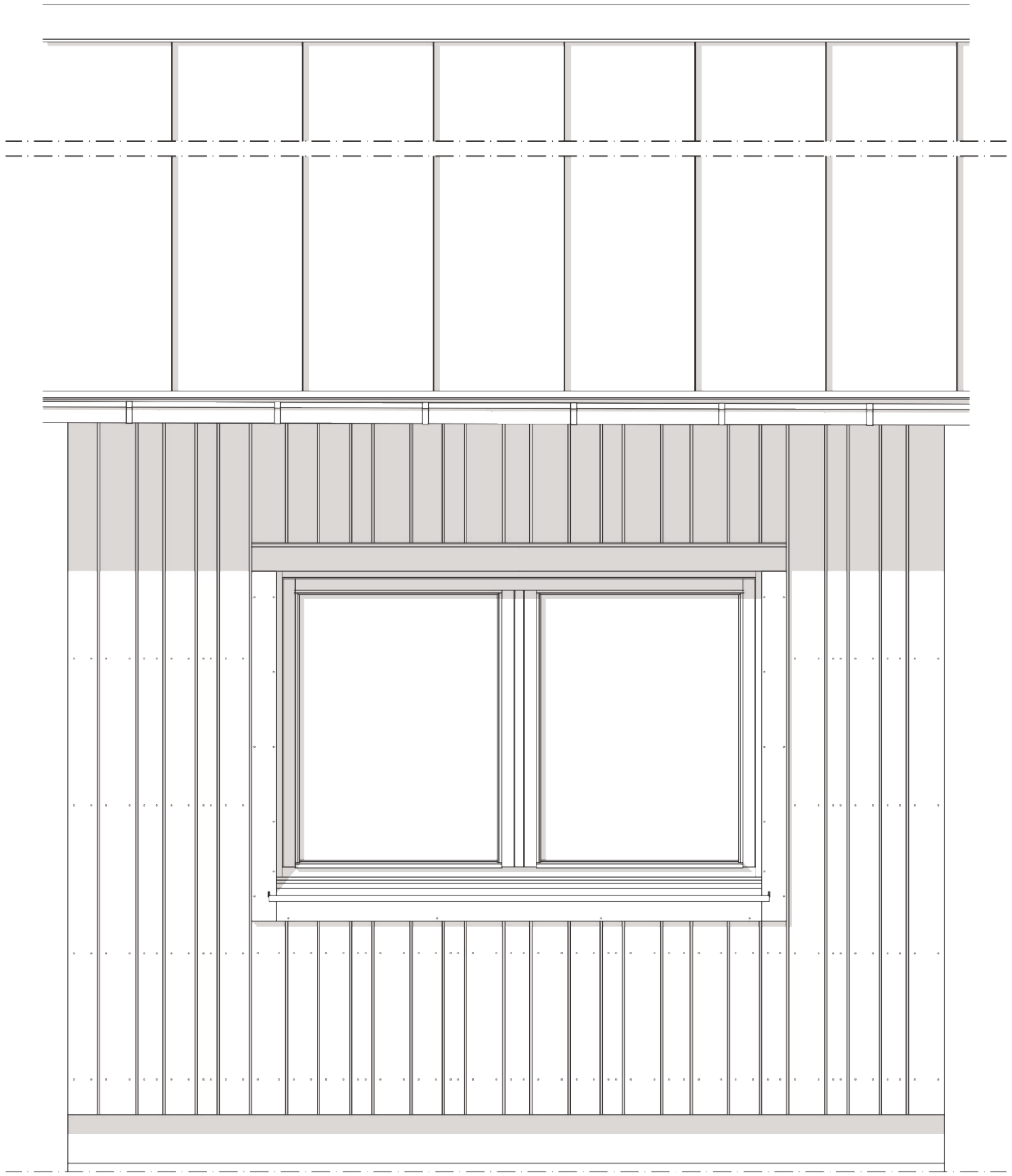
300 mm I-joists is the primary load carrying part of the structure, both in the walls and the roof. On top of the roof beams, there are 45X145 mm timber to strengthen the beam and to create the overhanging roof. The roof beams are carried by a 115X495 mm ridge beam and 115X115 mm pillars. The loft is made up by 200 mm I-joists as secondary beams which are resting on a centered primary beam made of laminated timber. The loft structure has a 200 mm veneer beam to rest on along the exterior wall to allow it to be built after the building envelope has been erected. Instead of having header beams above windows to carry roof beams over the window openings, there is a standing veneer beam along the entire top plate to allow for easier construction, a more stable wall and the possibility to make changes in the openings later. The structure uses strap bracing for stability.

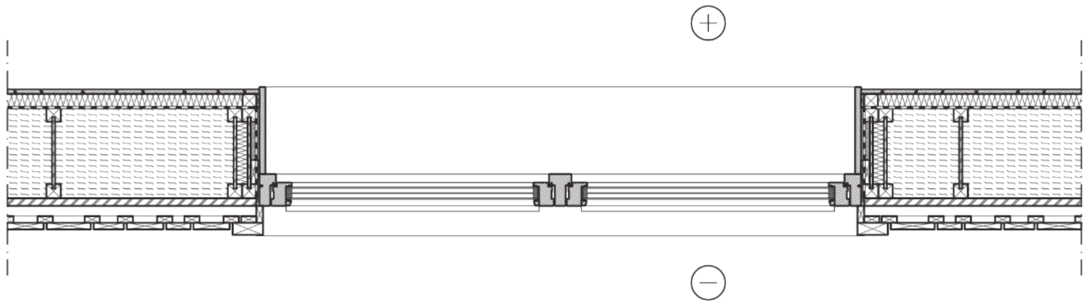
Materials:
Linden wood, Poplar plywood, HDF board, PVA & isocyanate glue.



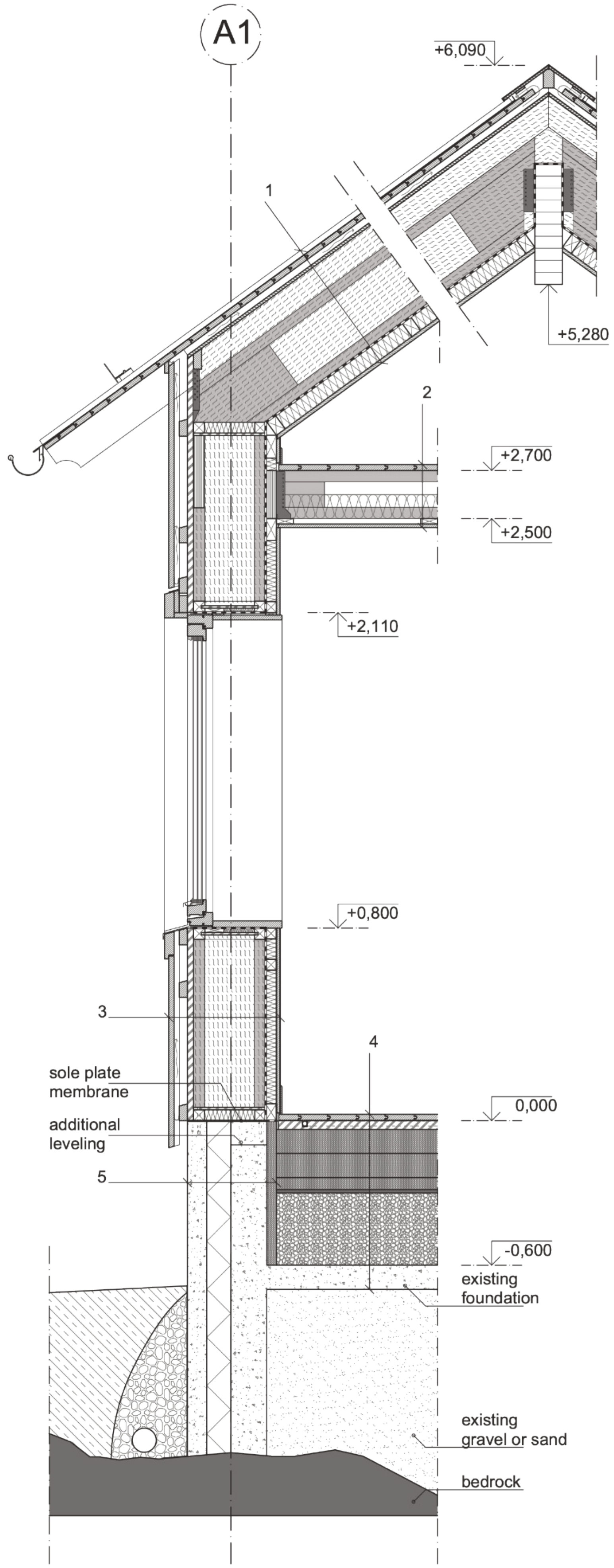
Structural model - 1:25

Structural model - 1:25





Elevation & horizontal section – 1:25




## Section D1 – D1

**1.**

| | |
|---|---|
| 0,8 | titanium-zinc sheet metal / single seam |
| 1.5 | bituminous membrane |
| 28 | roof decking |
| 145 | timber rafters |
| 28 | battens / ventilated cavity |
| 12 | coated f berboard |
| 405 | cellulose insulation |
| 300 | I-Joist rafters |
| 0,3 | air barrier sheet |
| 70 | battens / 70 cellulose insulation |
| 15 | timber cladding / sawn panels / 4 different widths / untreated |
| 555 total | |

**2.**

| | |
|---|---|
| 25 | timber f oor boards / coated with hardwax oil |
| 200 | f oor joists |
| 70 | cellulose insulation |
| 22 | battens |
| 15 | timber panels / 4 different widths / waxed in white |
| 262 total | |

**3.**

| | |
|---|---|
| 22 | vertical timber cladding |
| 22 | vertical battens / ventilated cavity |
| 34 | horizontal battens |
| 25 | coated f berboard |
| 300 | I-joists / cellulose insulation |
| 0,3 | air barrier sheet |
| 45 | horizontal battens / insulated service cavity |
| 15 | vertical timber panels / 4 different widths / waxed in white |
| 463 total | |

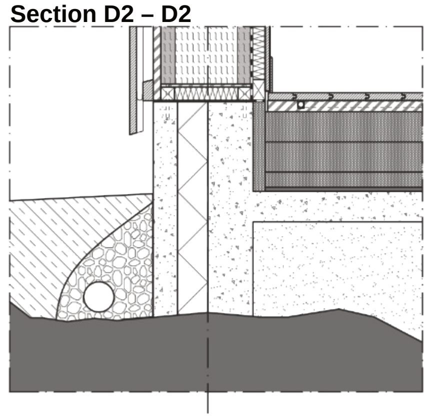
**4.**

| | |
|---|---|
| 25 | timber f oor boards / coated with hardwax oil |
| 0,6 | heat distribution plate |
| 36 | f berboard / heating pipes |
| 250 | foam glass insulation |
| 20 | screed |
| 300 | LECA inf ll |
| 100 | existing concrete structure |
| 726 total | |

**5.**

| | |
|---|---|
| 80 | reinforced concrete |
| 100 | phenolic foam insulation |
| 150 | reinforced concrete |
| 40 | foam glass insulation |
| 370 total | |

## Section D2 – D2



Construction section – 1:25

Detail section, showing exterior side of wall - 1:10

Detail section, showing interior side of wall - 1:10

The original foundation has been insulated and a new concrete wall has been cast to create a kind of sandwich construction to support the external wall. The new cast is poured in wooden formwork made from horizontal boards that are reused from the original formwork. Luckily some of the boards have been saved as they make up the attic floor boards on the existing building. The external wall is made from 300 mm I-Joists as studs and beams. The wall studs are resting on a light weight sole plate, this reduces the cold bridge between wall and foundation. The same type of beam used as sole plate is also used as top plate. On the external side of the wall studs a 25 mm wind protective fiber board is used on top of which the rest of the facade is built. On the internal side there is an addition of an air and vapor barrier before an insulated installation space on top of which the rest of the interior panel is set. The new timber floor boards are screwed to a wooden battens that are placed between the wooden fiber boards made for holding the water heating pipes. The new flooring and insulation is made as a floating type on top of the original concrete foundation to reduce the use of concrete and to avoid water pipes that is cast inside concrete. This is of course a loss of thermal mass, but a win in cost and easiness during future recycling. The roof beams are reinforced at their point of rest. Underneath the roof beams, after the air and vapor barrier, there are 70 mm cross battens which creates an insulated space for installations. This is also to increase roof thickness. On the external side a ventilated cavity is made by placing fiber boards from the inside against battens. The roof is finished with a protective layer of bituminous sheeting and finally with titanium-zinc sheets. Roof beams that make up the overhang has got their ends shaped to make a softer feeling and appearance.

Materials:
Linden wood, pigmented MDF sheet, EPS foam, HDF board, birch plywood, sheet metal, hardwaxoil, colored paper, ink pen and PVA glue.

Exterior perspective, showing window, casing, sill and timber siding.

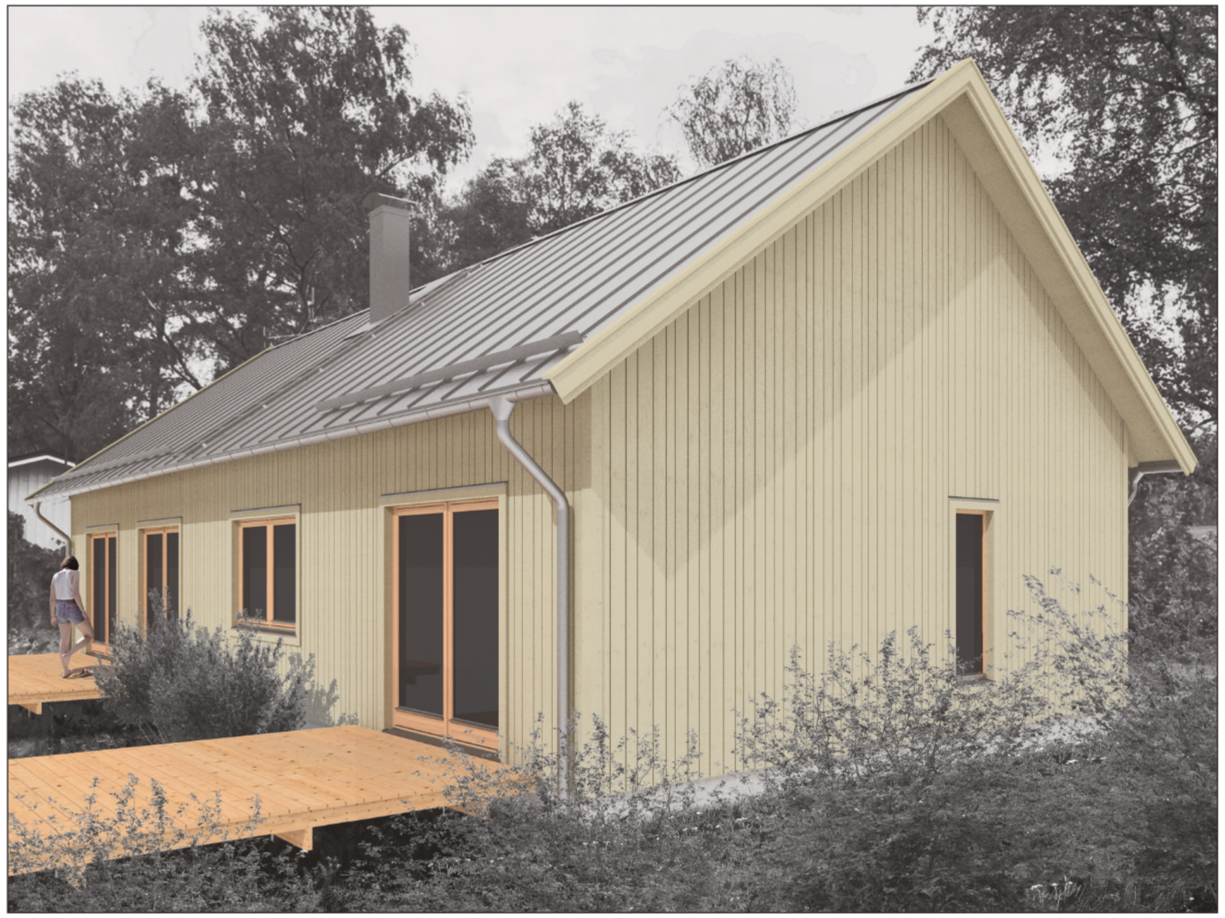
The window casing is lightly extending from the facade timber cladding to emphasize it and to give some varying depth to the facade. The titanium-zinc sill ends evenly with the casing instead of sticking out. The top sill ends above the window casing to protect against precipitation, but also to keep the casing uniform around the entire window. The timber cladding has varying board widths to create a variation and also by varying the width one can match the window casing and yet keeping the same spacing between boards. The narrow spacing between the boards also make the facade seem flat when viewed from the side, the spacing is also enough for maintenance and paint jobs. The backing boars could be made from recycled wood from the old facade, minor flaws in the recycled wood would not be that visible because of the narrow spacing between cover boards. The facade and the window casing is painted with linseed oil based paint with a NCS code of S 6020-Y10R. The window is oiled pine wood.



Interior perspective, showing window, casing, timber siding.

The window casing is lightly extending from the interior wall timber panels. The casing is coated with hardwax oil to better match the window and to protect the wood. The wall timber panels are made from brushed  pine wood in four different widths and they are waxed white, the texture of the wood should be lightly visible. The floor boards are coated with hardwax oil. The wall meets the floor boards with a high but narrow wooden baseboard which is waxed just like the wall panels.

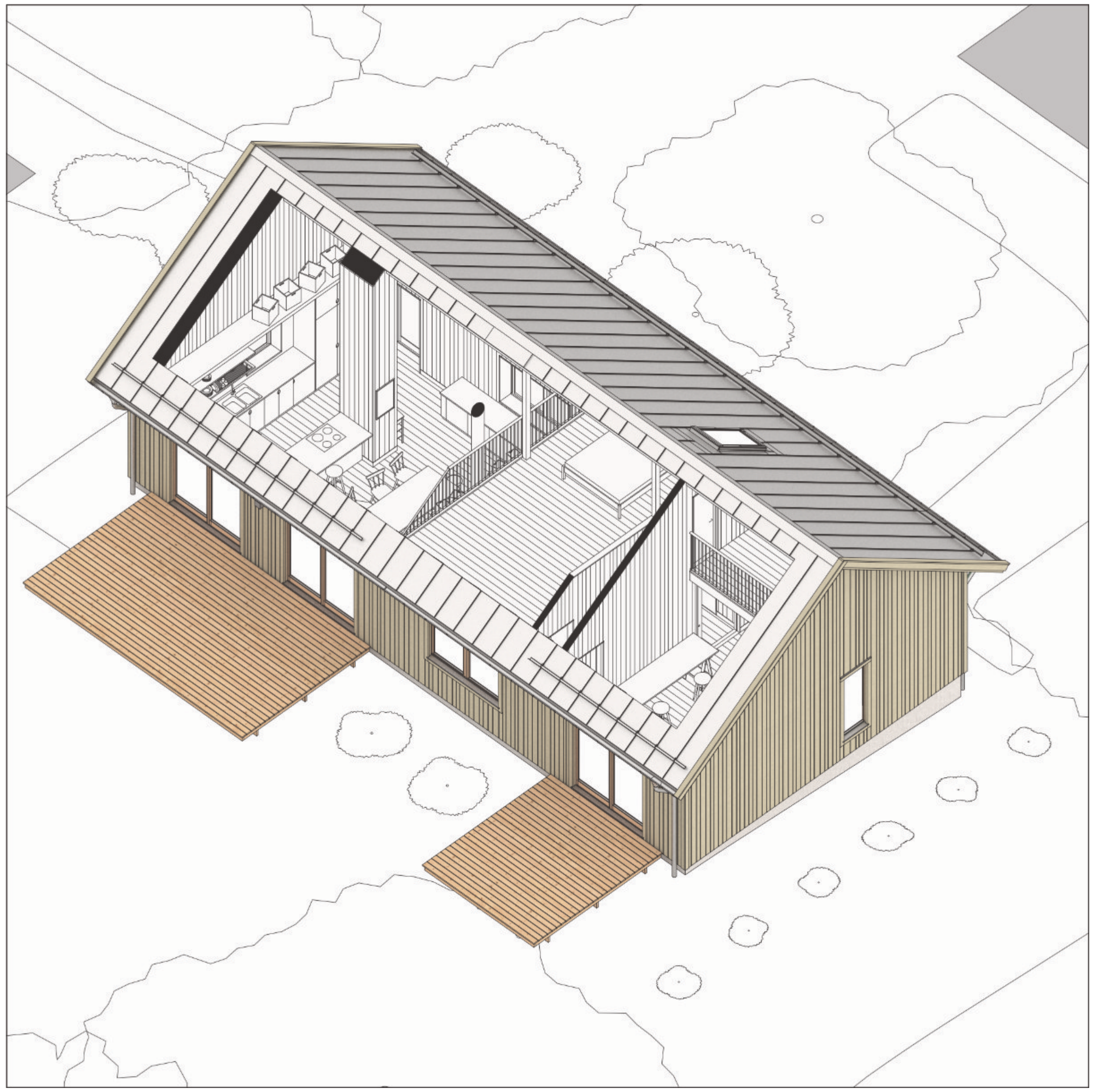
## 6.11 Exterior perspectives & overview model



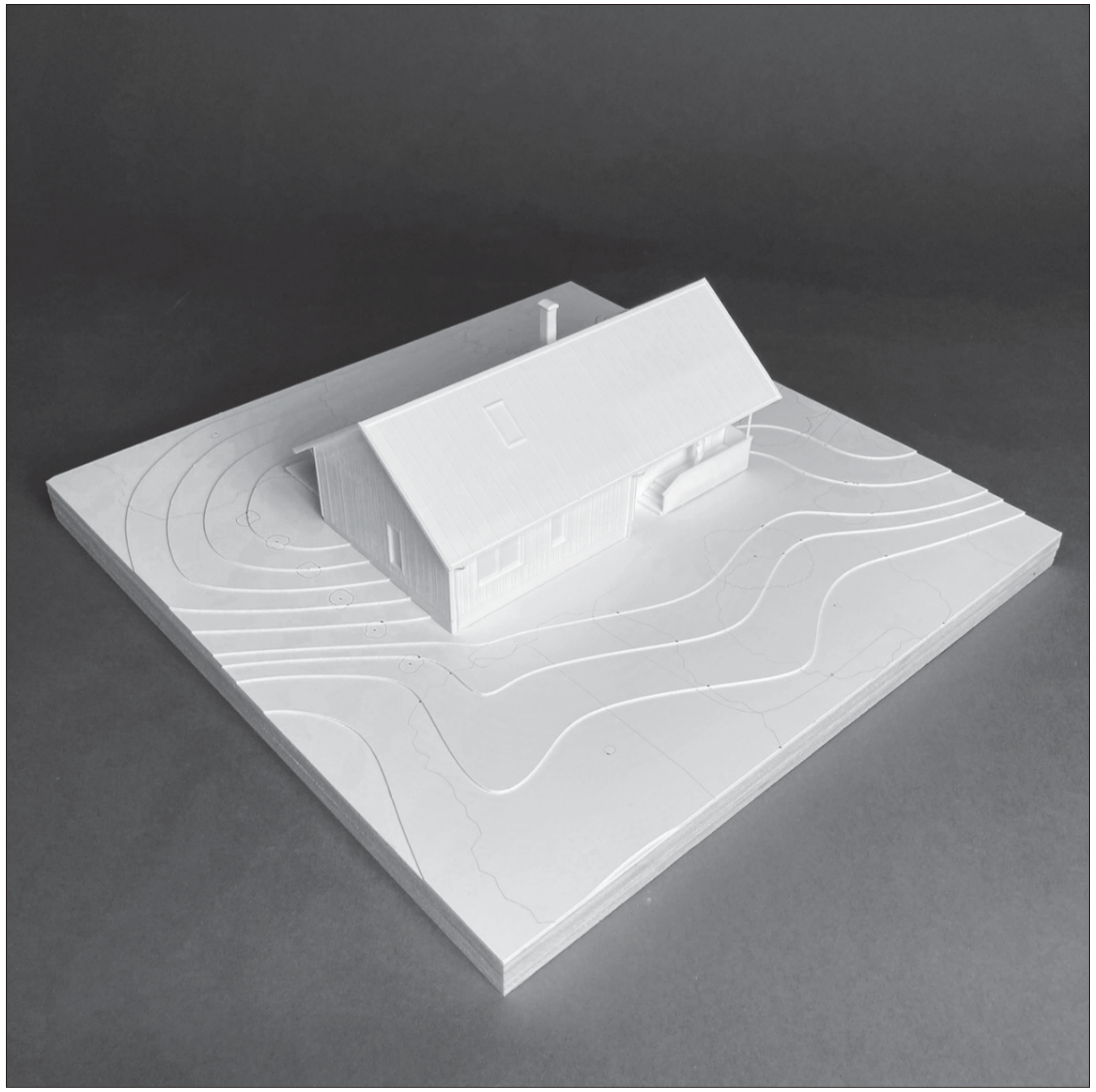
Perspective from southeast.

Perspective from northwest.

The facade cladding, overhangs and window / door casings are painted in a uniform manner with a green linseed oil based paint, as described earlier. The roof covering and other related metal parts are made from titanium-zinc. The garden is left lush with vegetation and the grass is left to grow against the concrete foundation as in the original building. The terraces are kept simple as the garden is left to grow wild during summer, letting the plants as close as possible. A pergola could be added if needed. At the entrance a wooden fence hides the stair and creates a little bit of privacy around the entrance door. The roof also extends above the stair and entrance to protect from snow and precipitation. Unfortunately also reducing the amount of light that can enter from the northern side.



Axonometric drawing from the south, 1:150



Overview model, perspective from  the east - 1:80

Materials:
PLA f lament, white cardboard, ink pen, PVA & isocyanate glue.

Overview model, perspective from the northeast - 1:80

Overview model, perspective from the southwest - 1:80

# 7. Conclusion



## 7.1 Ref ection

This thesis started out searching for a possible way to renovate, transformation or rebuild an old detached house from 1963. Early questions that became evident during the documentation phase was whether a house with some evident building flaws was worth renovating or transforming. Maybe it would be better to just rebuild and reuse what ever seemed fitting. Quickly this thesis took the stance of rebuilding and saving only the existing foundations, which lead to extensive research and work on how to transform the existing foundation to better fit a rebuilding project.

The existing foundation had many problems, most evident was the lack of proper insulation and protection against moisture. This can be seen in the documentation photos and drawings presented in chapter 4. The decision to rebuild made it easier to design a house that reaches contemporary building regulations and it also made a good chance to research lightweight I-Joist structures. And even if not doing a renovation project that is generally considered a sustainable and economical option, taking this rebuilding direction makes it easier to evade flaws and possible problems hidden in the existing building, hopefully making it more sustainable and affordable in the long run.

As for the methods used during the documentation of the existing building one could have had good use of a laser measurer or 3d scanner. But for this project the most simple tools like tape measure and photography worked just fine, it actually created a greater connection to the building when having to crawl and climb when trying to access every corner of the building. The methods used for the design phase can be simplified as concept, sketch, CAD drawing and physical model making. Where the most important but also the most challenging and time consuming part was to manage a combination of making CAD drawings and physical models in parallel. Many of the final models have been partially rebuilt multiple times and some have been discarded and rebuilt entirely when larger changes have been made to the overall project. Working in parallel with CAD and physical models made it possible to spend half day on computer and half day on model making, creating variable working environment. Seeing a physical model also boosts interest and confidence.

The aim and the discourse of the master thesis direction was to design a proposal presented in drawings and physical models. But if ever done again, a comparison between a renovated and a rebuilding version in terms of cost and resources would have been a great addition or a future study.

As a result this thesis shows one way of transforming an older detached house by presenting a design proposal where the existing foundation from the original building has been transformed to better meet contemporary standards and to better fit with a rebuilt house. The correction of the foundation gives better insulation, load carrying capacity for new a structure, floor heating, corrects moisture problems and protects against radon.

The rebuilt house changes the plan and program, from a house divided into two apartments with multiple smaller rooms which have been shaped more or less sporadically over the years, into a contemporary house with a more or less open plan that invites to movement and flexible use of spaces. The rebuilt house also has a greater connection to the exterior garden by adding larger windows and doors towards the south that gives more daylight and beautiful views to better ones mood. The interior materiality has also changed from a mixture of more or less sporadic surfaces to a somewhat uniform feeling or atmosphere of wooden surfaces that hopefully gives a softness and a cottage like feeling. An aspect that effects the spaces both in end result and during design stages is the already set boundary defined by the original foundation. In other words, room sizes have to adapt to what is available. This turned out to be a good way to stay away from standardized measures and to keep some of the sporadic character that was a strong identity of the original building.

In terms of sustainability the rebuilt building also reduces costs and resource use during its operational time. The thicker building envelope made from lightweight I-Joists reduces heat loss by reducing cold bridges. This combined with a new heating & ftx ventilation system should put the rebuilt house somewhere between a low energy house and a passive house. The thicker walls of the new building creates deep window niches which reduces the daylight intake, but on the other hand creating space for objects. The thicker walls of the new building is also a rather large change in comparison to the old building where the wall thickness is almost the same as the window frame, a feature which is hard to achieve with contemporary building regulations. The thicker walls of the new building also changes the proportions of the buildings exterior volume, a factor which was important when considering wall thickness and how much walls could reduce interior space. Unfortunately, the thicker walls is a loss of the buildings original character even if the overall design of the building has changed. In terms of reducing heat loss one could question if the use of many glass doors on the south side of the building, a nice feature for the few weeks of good weather and maybe a problem or less useful during winter. Maybe fixed windows and fewer doors would be a better option for the climate. An other aspect of the many larger glass doors and also the many passages between rooms is the reduction in useful wall space or just he effective use of room spaces. The flexible floor plan and structure of the building makes it possible to close some of the passages if more closed rooms are more desirable and openings in facade can be reduced, enlarged or removed if need be. If life conditions were to change, new rooms can be added up on the loft or new divisions be made on the first floor, hopefully making this 1,5 floor house ready for future changes, just like the existing house has changed over its more than 60 year journey.

In the beginning of this thesis there was a general feeling or questioning about the scope of this thesis. Does the selected building and site pose enough of a challenge to produce a good quality of work? As documentation of the building evolved and some of the first hand sketches where made, it was quiet clear that even the simplest buildings poses great architectural challenges. Maybe even more when it comes to renovation, transformation and rebuilding. In the end this masters thesis turned out to be a great opportunity for an architectural challenge, while at the same time also trying to fulfill many dreams and wishes.

The house was first built in 1963, an addition was built in around 1967 and over the years layers from multiple renovations and the lives lived have left its traces. Hopefully this thesis brings a glimpse of one possible future out of many. A reimagined building to inspire when deciding if one should renovate or rebuild. One can not help to think if Sonia and Bruno ever thought that their building would end up in a masters thesis. To an extent, they also made this thesis possible.



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