



ROBUS

‘As strong as oak’

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2020

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CHALMERS
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How can a robustly constructed hiking hut be easy
and fast to both transport and assemble on site?

ABSTRACT

In Sweden buildings stands for more than 20% of all greenhouse gas emissions from a life cycle perspective. At the same time 40% of all the energy usage in Sweden comes from electricity and heating the buildings we live in.¹

How we produce, use and maintain them have to change. An extract, make, use and waste methodology is out of date. Raw materials have to be treated as carefully as possible while the already used and refined materials have to be treated not with an expiration date but as something just as valuable.

Therefore renewable materials should be used as frequently as possible when designing and planning new projects. They should also be considered to be reused or modified in the future when the needs of the user will change.

The result of the thesis is a new established hiking hut village, consisting of three units, by the foot of Sweden's highest mountain peak Kebnekaise next to a famous attraction in the valley called Lisa's Hut where a lot of hikers pass throughout the year.

The cabins includes facilities such as beds, toilet, shower, kitchen and living room for a large family or group of eight people with the possibility to accommodate a few extra people if needed. The function of the cabins are similar to the already existing network in the Swedish mountains and are therefore attached to the booking and renting sites that exists.²

The focus on the modular cabins is to be fast and easily mantled, designed to be placed off grid and to give a perception of a robust feeling even though it is modules combined together.

This modular building system with a robust wooden material and an engineered joinery construction will merge into a durable and long lasting hiking cabin to be shared by hikers visiting the area.

CONTENT

Question
2

Abstract
4

Experience
8

Aim
9

Introduction
10

Robust
11

Program
12

Site
14

Proposal
22

Site plan & Section
29

The Cross
36

The U
50

The Ess
64

References
78



EXPERIENCE

Chalmers University of Technology, Gothenburg Master's thesis in architecture	2020, spr
EPFL – École polytechnique fédérale de Lausanne, Lausanne Exchange: Studio Job Floris: Monumental Matters Building design in the circular economy Comfort & Architecture : Sustainable strategies Experience Design Technological innovation	2019, aut
Wingårdhs , Gothenburg Architect trainee: Project planning phase - Hotel program	2018 - 2019
Chalmers University of Technology, Gothenburg Master's program in architecture: Studio Housing Studio Matter, Space & Structure Architectural competition Light & Colour Theory	2017 - 2018
Chalmers University of Technology, Gothenburg Bachelor's program in architecture	2014 - 2017
Skåne, Höganäs Born & raised	1995

AIM

The goal of this investigation is to see what it is that gives a sensation of a robust building. Is it the actual perceived space, the materiality or the way how it is built? Or could it be a mix of all these three parameters? Most important, to design a robust building that will last for a long period of time.

Also the intention to use a rational structural system that have the ability to be moved fast to the desired site and to be easily mantled during a short period of time.

INTRODUCTION

As the world of today with an urgent crisis of rising temperatures, nature catastrophes and a global degradation of the environment we have to think differently. It is not the time to follow all the earlier mistakes our precursors did. It is time for the human kind to adapt, not forcing the surroundings to follow our lead but the other way around.

In Sweden buildings stands for more than 20% of all greenhouse gas emissions from a life cycle perspective. At the same time 40% of all the energy usage in Sweden comes from electricity and heating the buildings we live in.¹

How we produce buildings and maintain them have to change. An extract, make, use and waste methodology is out of date. Raw materials have to be treated as carefully as possible while the already used and refined materials have to be treated not with an expiration date but as something just as valuable.

When building with renewable resources, e.g. wood, it gives you not only the possibility to create something long lasting but also it have a great impact on the environment compared to limited resources, e.g. concrete. It takes more energy to produce concrete and also larger amounts of greenhouse gases are emitted to the atmosphere. Wood on the other hand is not only renewable but also a local material in Sweden since 70% of the land surface is covered with trees and the distance of transporting the material is shorter than importing building materials from other countries.³

Choosing wood as a building material in Sweden will therefore provide the opportunity to both decrease the environmental footprint, energy usage and emissions, of the building industry but also, when used in the correct manners, last for a long period of time which is another part of how to think of a sustainable building.

Except from the material itself there is also a discussion of how to build with the given resources in each project. The less amount of time that energy consuming machines have to be used the better which gives a challenge of how to be as effective as possible when building. Also the challenge to build in a way that it decreases limited resources but maintaining the desired properties.

Therefore as much wood as possible is chosen as a building material when trying to design a robust and climate friendly building that is fast to both move and assemble on site.

ROBUST

“Strongly formed or constructed”

“Requiring strength or vigor”

“Suited to”

“Strong and effective in all or most situations and conditions”

“Unlikely to break”

“Sturdy and strong in form, constitution and construction”

PROGRAM

By walking in the mountains you are totally exposed to the nature, earth itself. Human made paths and untouched landscapes are your surroundings. By moving further you are invited to new views, new discoveries and new moments where you encounter our shifting environment and climate.

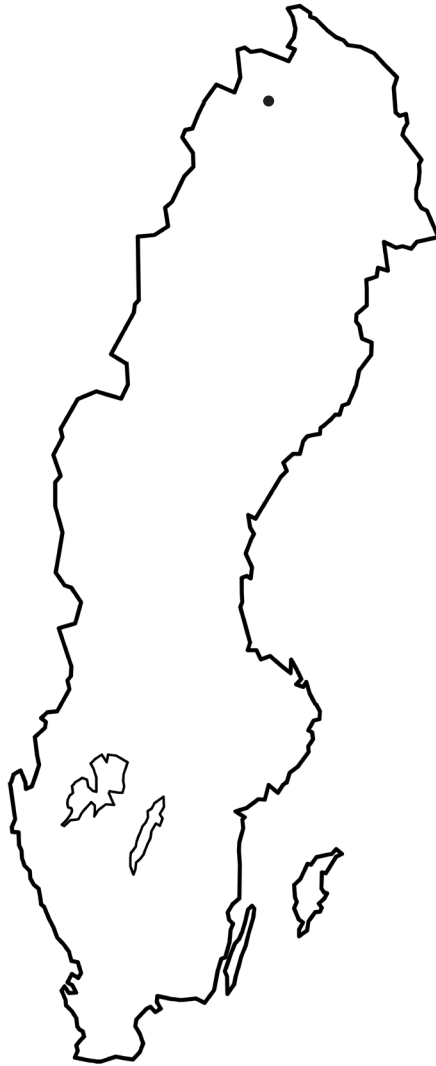
Along this path you may at some point settle down, rest for a moment and contemplate over what you just have experienced. Sun is setting down behind the mountain peaks and it is getting dark, really quick.

Instead of carrying your plastic one person tent your backpack is lighter. Along the hiking path three cabins for over night stay are placed to accommodate daily hikers throughout the year.

Those three cabins are build to be used during maybe one or a few nights for people that still want to stay out in the nature, wake up by the sunrise in the morning and drink their coffee while watching the sun rays move along the scarps of the surrounding mountains.

Inside one of the cabins you find only the most necessary accommodative things like beds, a place to wash yourself, kitchen and storage for your hiking gear. Also a cosy place in front of the main heater of a cabin, the fireplace. Except from the heat from the fireplace the building is provided by electricity from photovoltaic panels on the roof which both gives the possibility to have electric lighting but also to cook for dinner. Batteries to store the electricity is placed in each cabin to get a proof of energy throughout the day and night. The water to wash hands and to take a shower is pumped from the nearby river the floats through the valley.

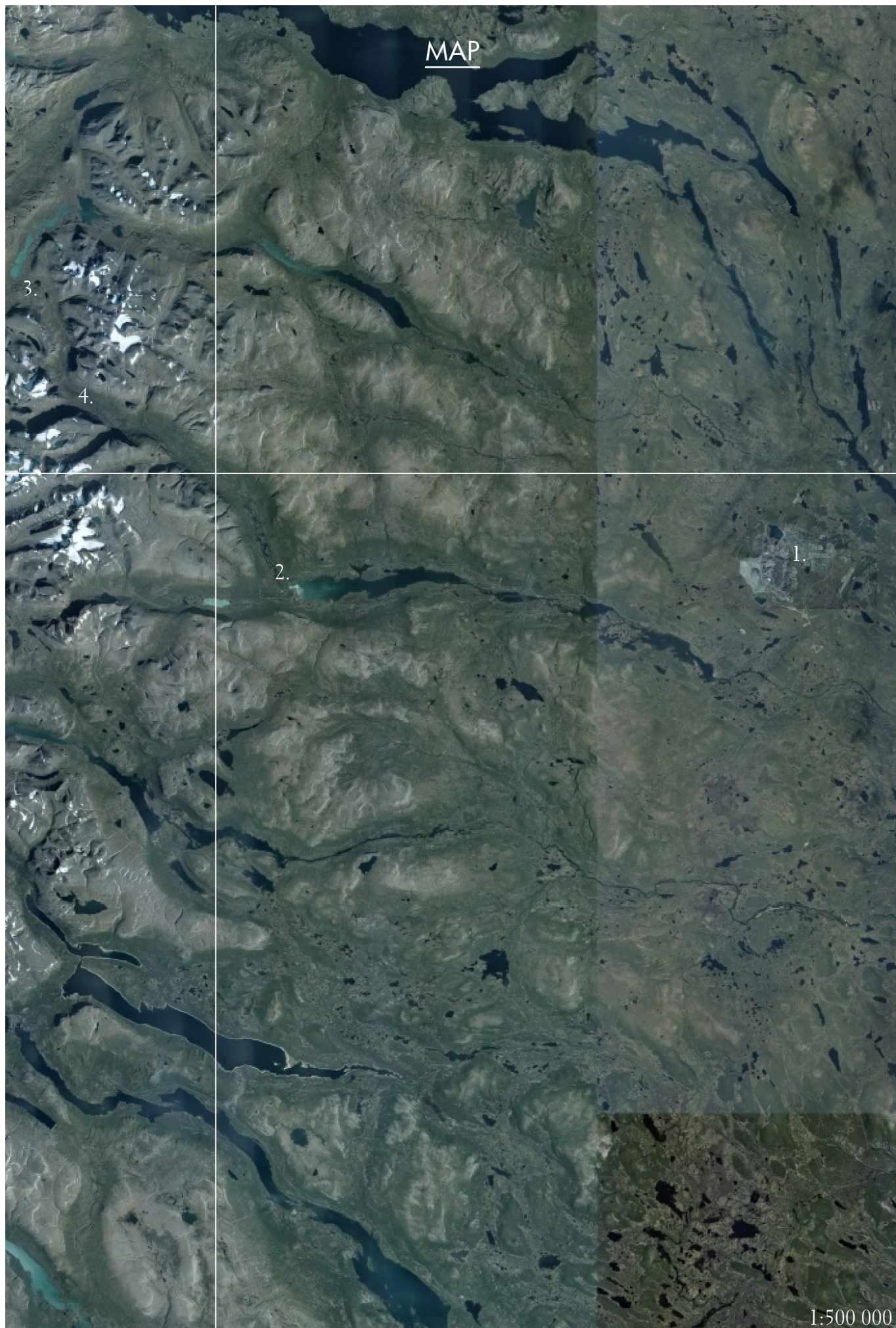
To the cabin you bring your own food and drinks except water. By the dining table you all gather around to eat together, either by dinner made in the kitchen or uncooked sandwiches from your backpack. Later in the evening when the views to the outside are no longer existing the fireplace is the only main source of light and warmth. Until bedtime you can watch your own type of northern light but in the sense of golden silk dancing in the fireplace heating not only your body but also your soul.



Nikkaluokta, Sweden

67°58'54.0"N 18°47'52.9"E

SITE



ANALYSIS

In the far north of Sweden where the closest larger neighbouring city is Kiruna (1) a valley between two mountain peaks is found. The valley is called Vistasjohka and is situated in the bottom of the most famous mountain in Sweden, Kebnekaise, with the highest peak in the country.

Vistasjohka is reaching from the lake Paittasjärvi (2) outside of the town Nikkaluokta in the southeast and extends towards the northwest ending up at Alesjaure (3), which is a place with cabins for overnight stay.

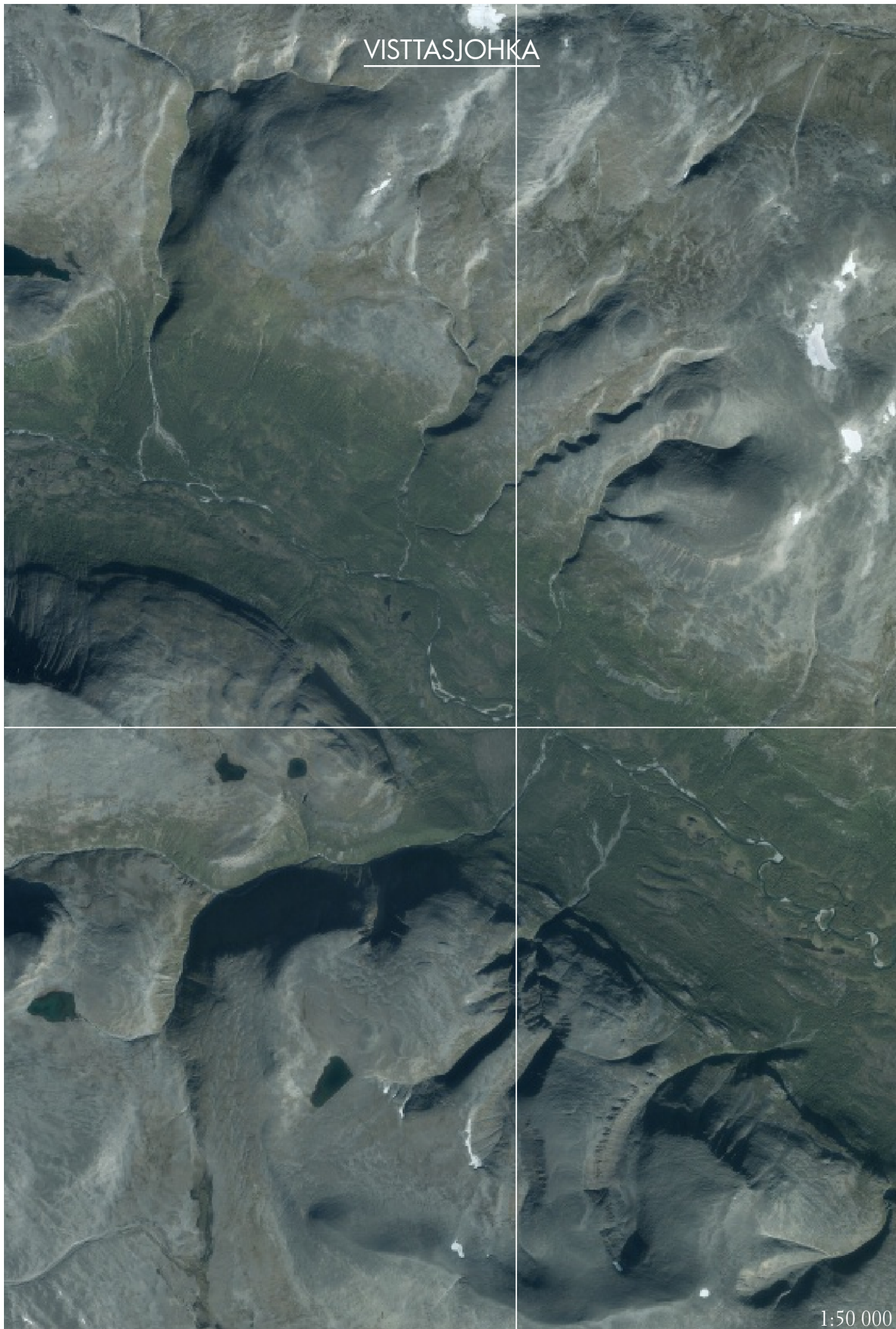
The Swedish Tourist Association owns and facilitates several different cabins in the northern part of Sweden where hikers can meet, sleep and eat. Another of those groups of cabins (4) are placed further up the valley, approximately 10km away. The new addition of three cabins will be attached to them administration wise for booking etc.

The valley itself is isolated from human made tracks except from hiking paths and snowmobile trails. People from all different nationalities are visiting the area to explore, hike and climb to the top of the different peaks in the surroundings. Apart from all the nature there is one thing in the nature that sticks out from the otherwise untamed environment.

Lisas Hut is an old cabin made for and by a mountain lover called Anna Elisabeth Zetterström. Born in Dalarna, in the north of Sweden but worked as a nurse in the far south, more precise in Hörby, she wanted to get closer to nature and to be more by herself. In 1932 she wrote a letter to the Swedish king asking for permission to build her own hut in the valley of Vistasjohka. She wanted to build a cabin as a base for daily hikes but with a promise to not hunt or fish more than for her own needs.

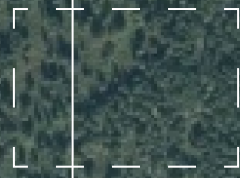
The permission was granted by the king and she took help from a carpenter in Nikkaluokta called Per Sarri which built the cabin for her. Later on when the snow had fallen and the river had frozen the hut, dismantled, was dragged by horses to the actual site of where it stands today. In the permission it was also stated that she was not allowed to sell it or give it away to someone else. Since Anna Elisabeth Zetterström no longer used the hut after the 1950s it is today empty with no one owning or maintaining it. The hut is placed on state owned land and function today just as a landmark and tourist attraction.

VISTASJOHKA



1:50 000

LISA'S HUT

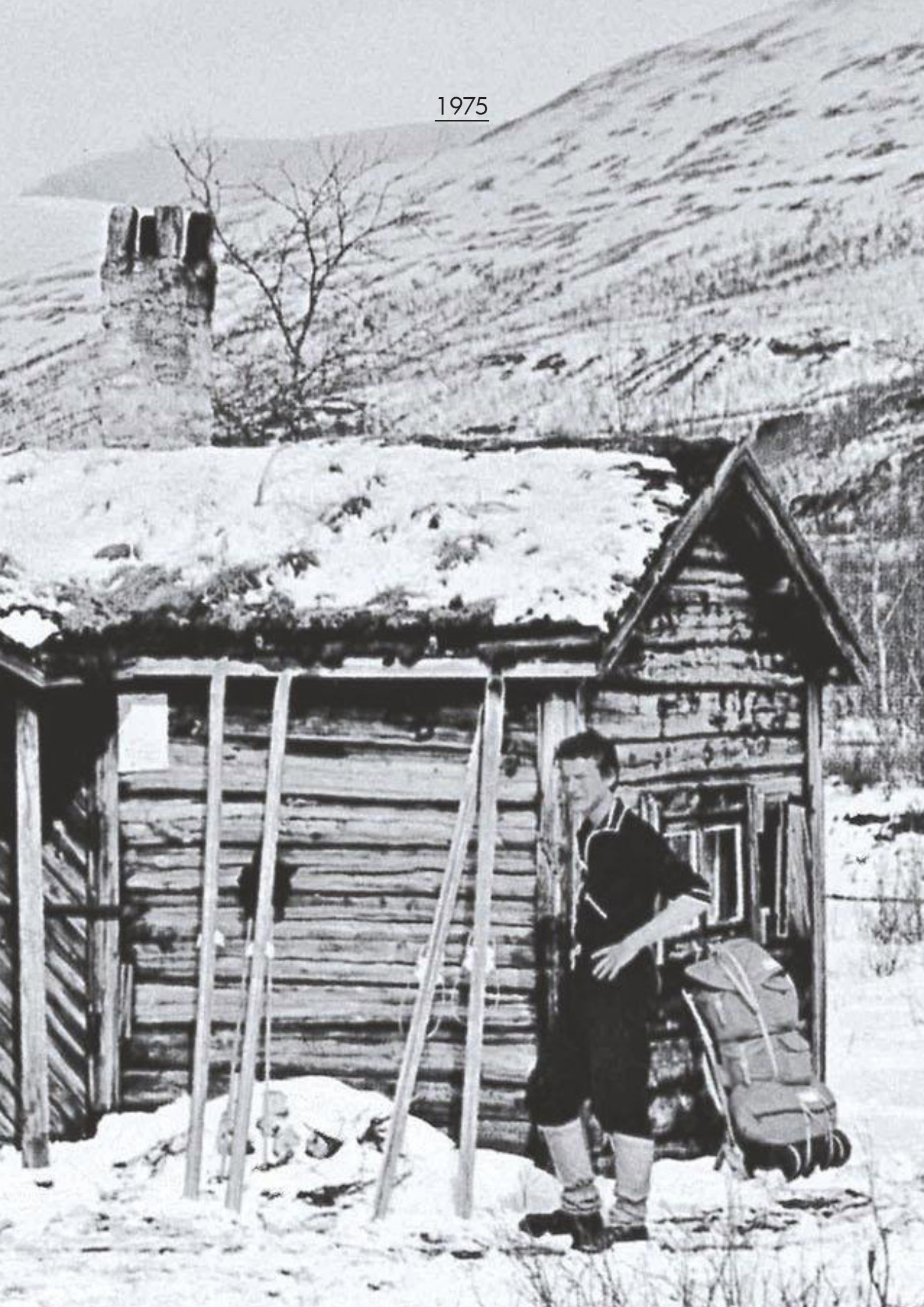


Project site

LISA'S HUT

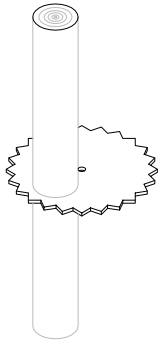


1975

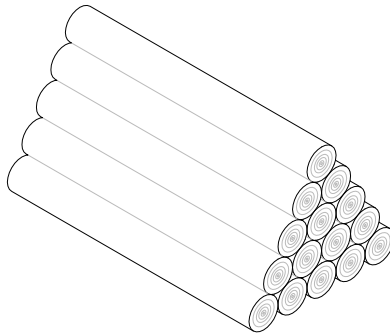


THE PROPOSAL

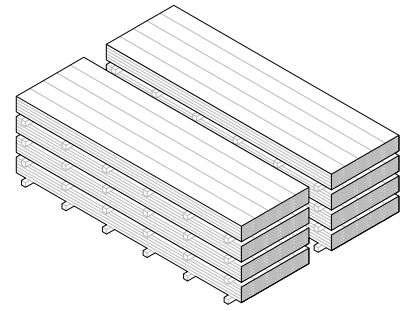
PROCEDURE



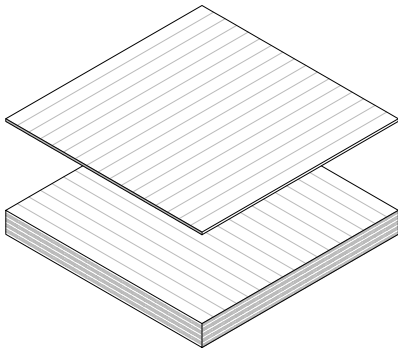
1.
Wood from the northern part of Sweden is used and cut down as a renewable resource.



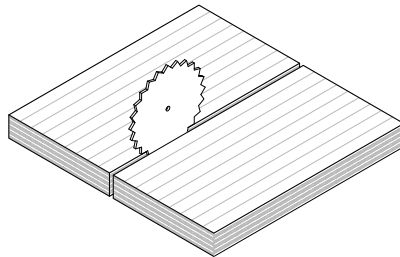
2.
The correct measurements of each tree trunk is estimated for the slabs, walls and roof.



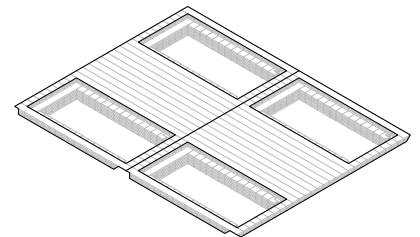
3.
From the solid trunks the core of the tree is chosen to extract the hardest part of the wood for further treatment.



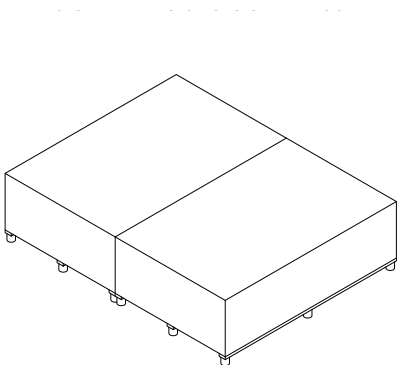
4.
After sorting out the best core wood the CLT-boards are glued together with 90 degrees difference between each layer.



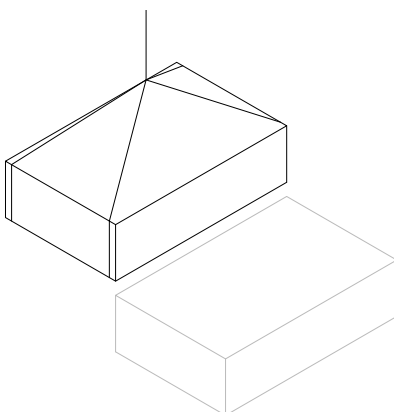
5.
After drying the boards are sawn in the right measurements for each building part.



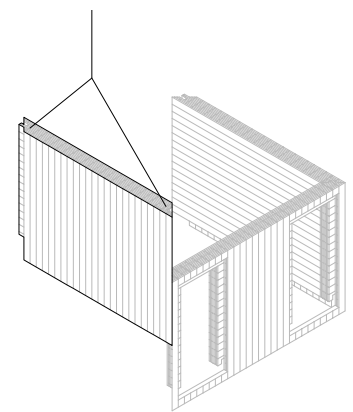
6.
Then the process of carving out the final pieces starts to reach the final product.



7.
Afterwards the CLT-boards are packaged together and driven by a truck from the factory to Nikkaluokta, approx. 600 km.

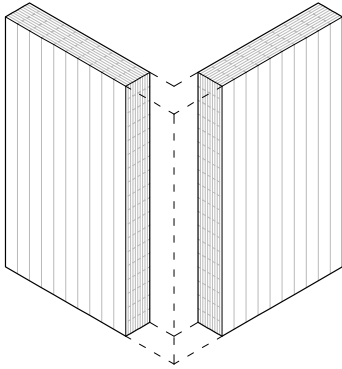


8.
In Nikkaluokta the packages are taken over by helicopter and flown to the site, which takes around 10 minutes.

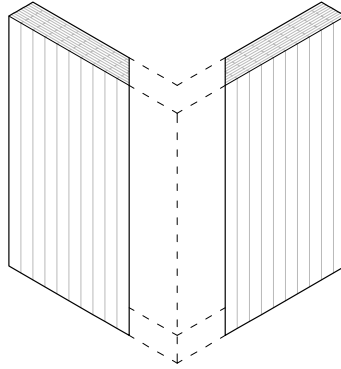


9.
Arriving at the site the helicopter grabs each element and puts it in place with help from staff on the ground.

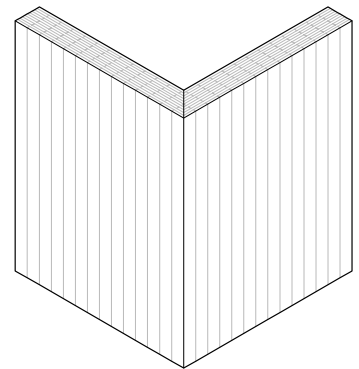
JOINERY



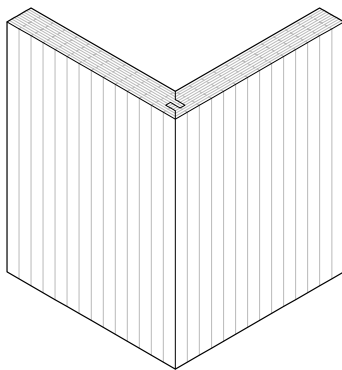
1.
When joining two CLT - elements together there are several different possibilities. One of the most common is to just put them in an angle like this and nail them together.



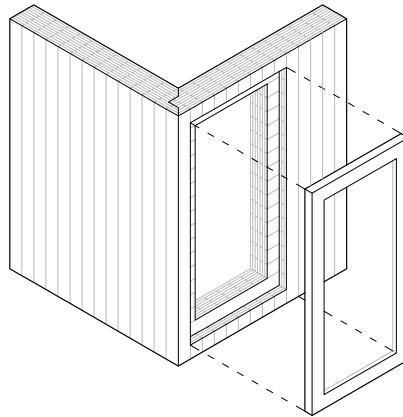
2.
Another way is to angle the end pieces in 45 degrees to make them fit together. In this way the angle of the whole building is adjusted by those angles and makes the whole structure more precise.



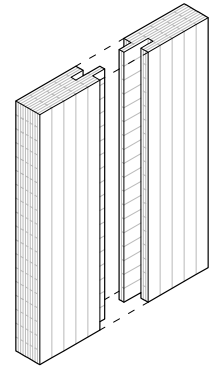
3.
When joining the elements like this it is easy to apply a rubber strip in between to create some friction and a soft connection which gives the structure an airtight connection between the elements.



4.
By combining the first two options together both an angled fixation is made but also a straight part where the rubber strip could be applied at two places for an even more air tight construction. The outdoor air will thereby have a long way reaching the inside.



5.
Where windows will be placed the wall is hollowed to fit the frame. This excavation gives an opportunity to hide the screws that holds the two elements together. From the inside no frames will thereby be visible for the occupant.



6.
When instead looking at a straight wall joint where two pieces are joined together it is carried out by pushing two of the layers in the CLT-board in and out. This move makes the outdoor air even in this case have a longer way to enter the interior.

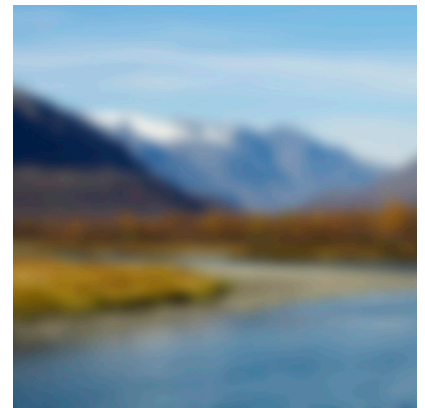
ELEMENTS



1.
Towards the inside of the building all structural elements are made of untreated fir (CLT), with horizontal facing planks, which lets the user touch and feel the real structure as a raw and living material just like they would touch a tree trunk out in the nature.

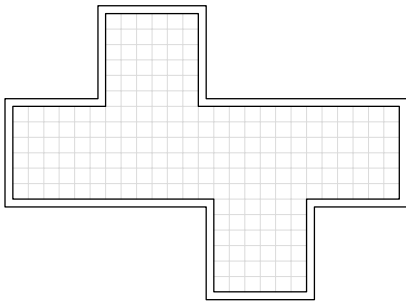


2.
Towards the outside of the building the structural CLT-panels are painted with tar to preserve the wood as good as possible while at the same time give it a dark and burned contrasting look compared to the inside. The planks towards the outside are vertical to decrease moisture damage.

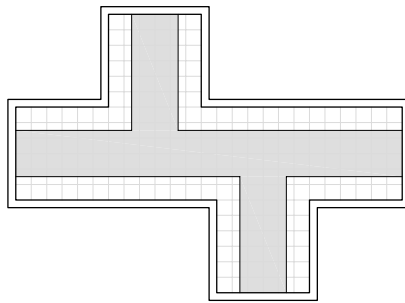


3.
The last material to fulfil the building is the windows glossy and transparent properties that bridges the feeling of the light and untreated inside to the robust and dark outside while giving the inside a tease from outside and vice versa. The frames are hidden to enhance that feeling even more.

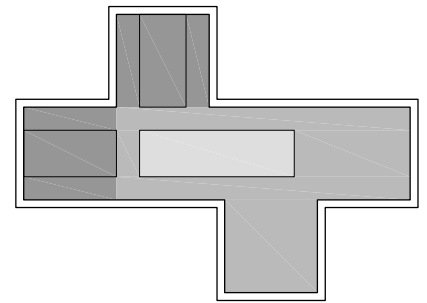
CONCEPT



1.
The basic planning of the hut starts with a grid (600x600mm). At a larger scale the grid creates six equally sized squares containing 36 smaller ones (600x600mm). Those six larger squares are then placed in different constellations to create different plan layouts.



2.
The core of the hut with all the functions is placed as a spine through the building leaving a much space as possible for lit up passages along the facades. Those corridors creates great visibility which gives the hiker an easy overview and orientability through the hut.

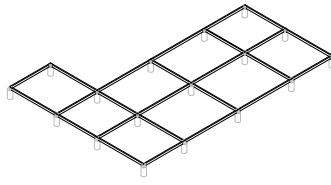


3.
At last the building is divided in two different zones. Social and private where the dark grey, private zone, contains beds and personal storage while the medium grey, social zone, fits living room and dining area. Separating the two zones is the core, light grey, including kitchen and WC.

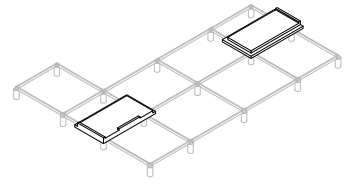
ASSEMBLY



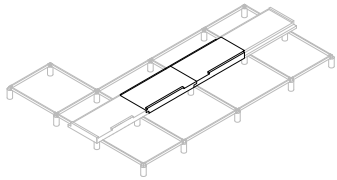
1.
Plinth foundation



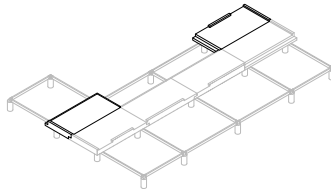
2.
Supporting structure



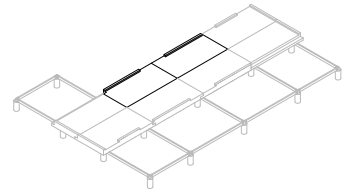
3.
First floor modules



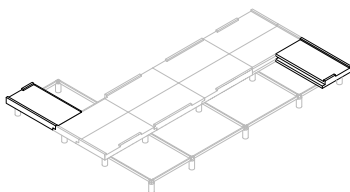
4.
Second floor modules



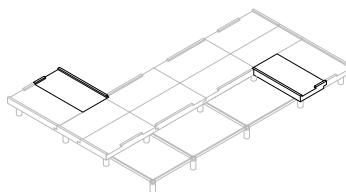
5.
Third floor modules



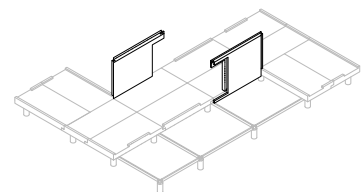
6.
Fourth floor modules



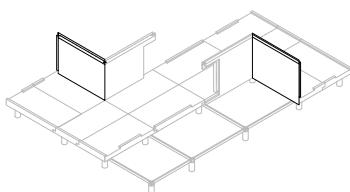
7.
Fifth floor modules



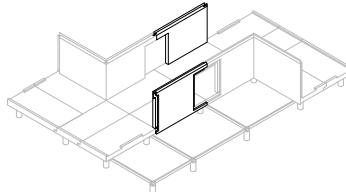
8.
Sixth floor modules



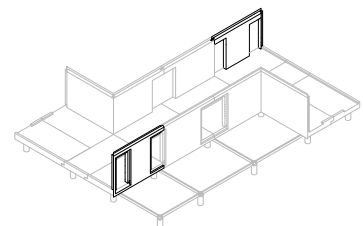
9.
First wall modules



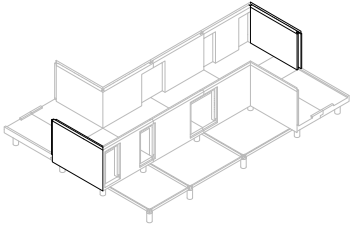
10.
Second wall modules



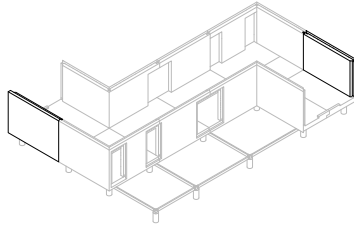
11.
Third wall modules



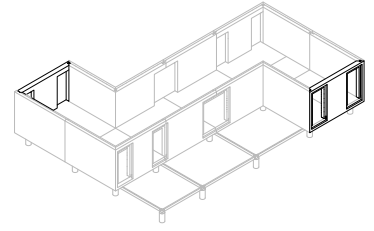
12.
Fourth wall modules



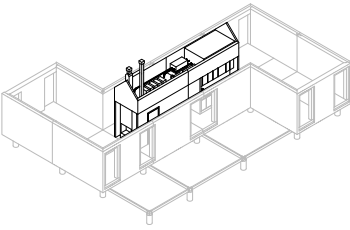
13.
Fifth wall modules



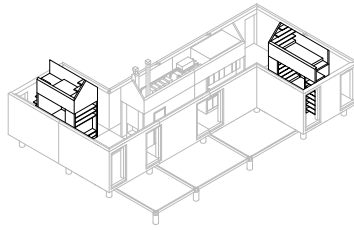
14.
Sixth wall modules



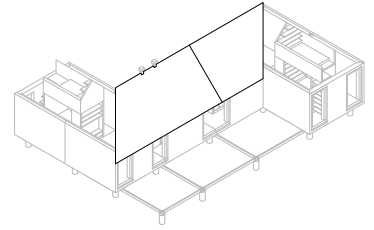
15.
Seventh wall modules



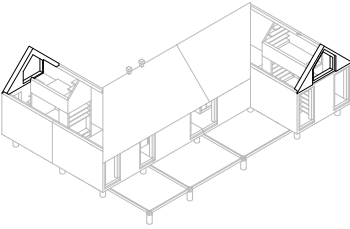
16.
Core module



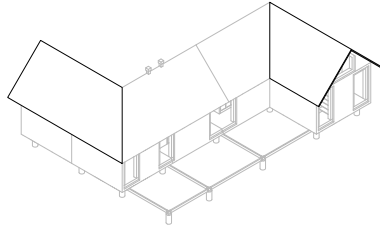
17.
Bed modules



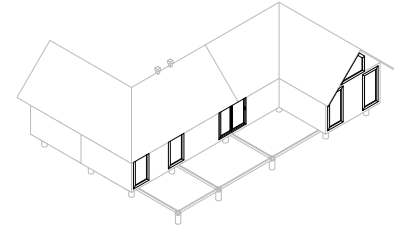
18.
First roof modules



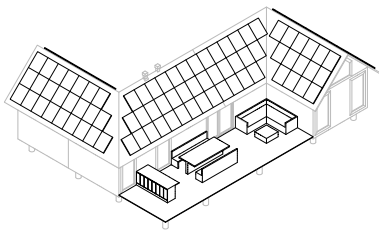
19.
Gable modules



20.
Second roof modules

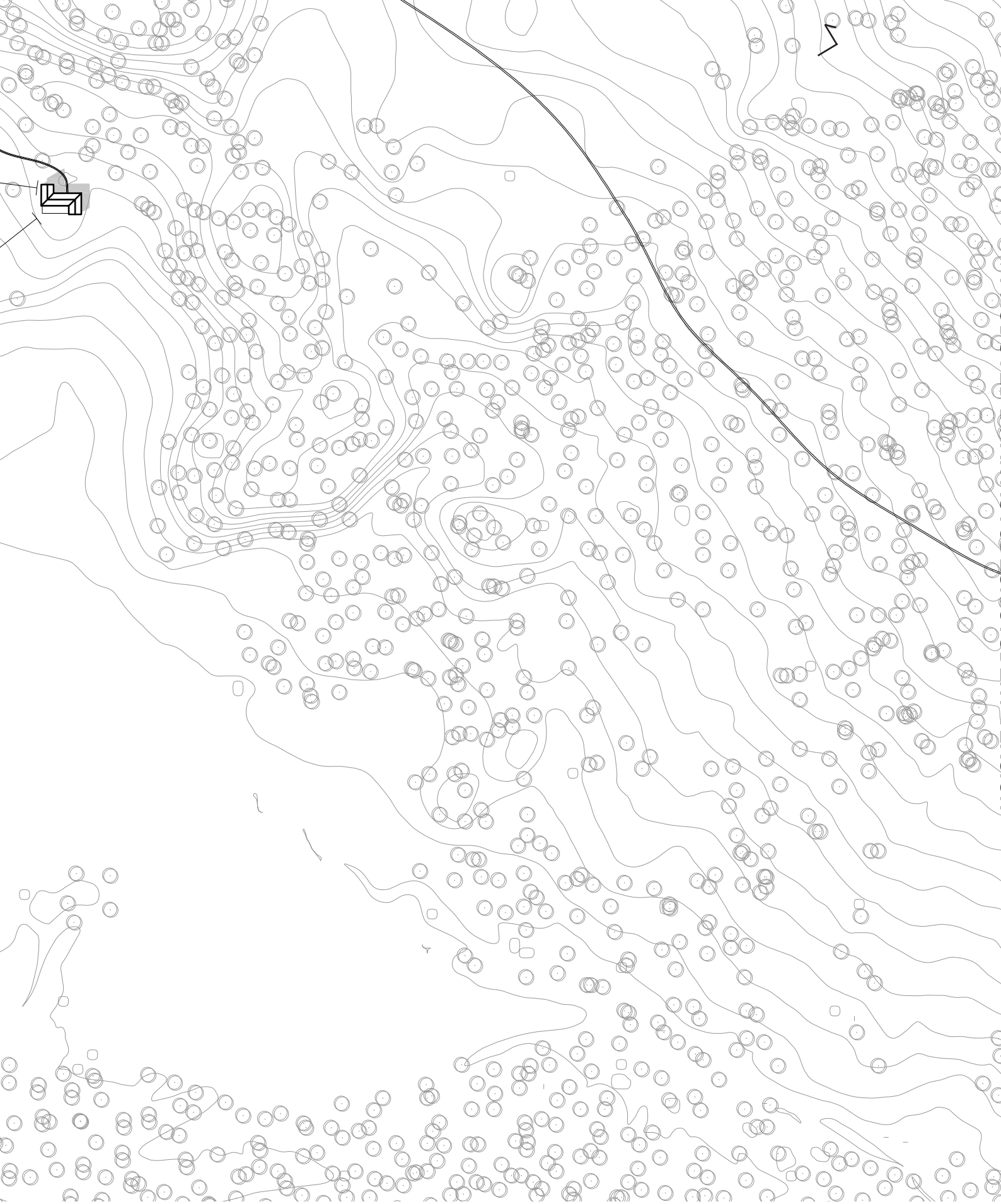


21.
Windows



22.
Porch & PV's

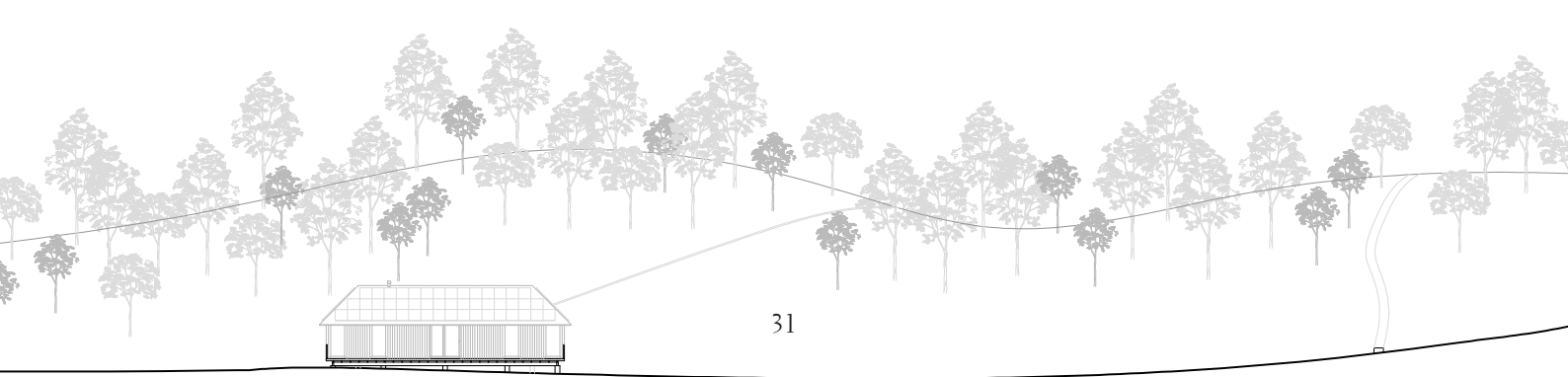
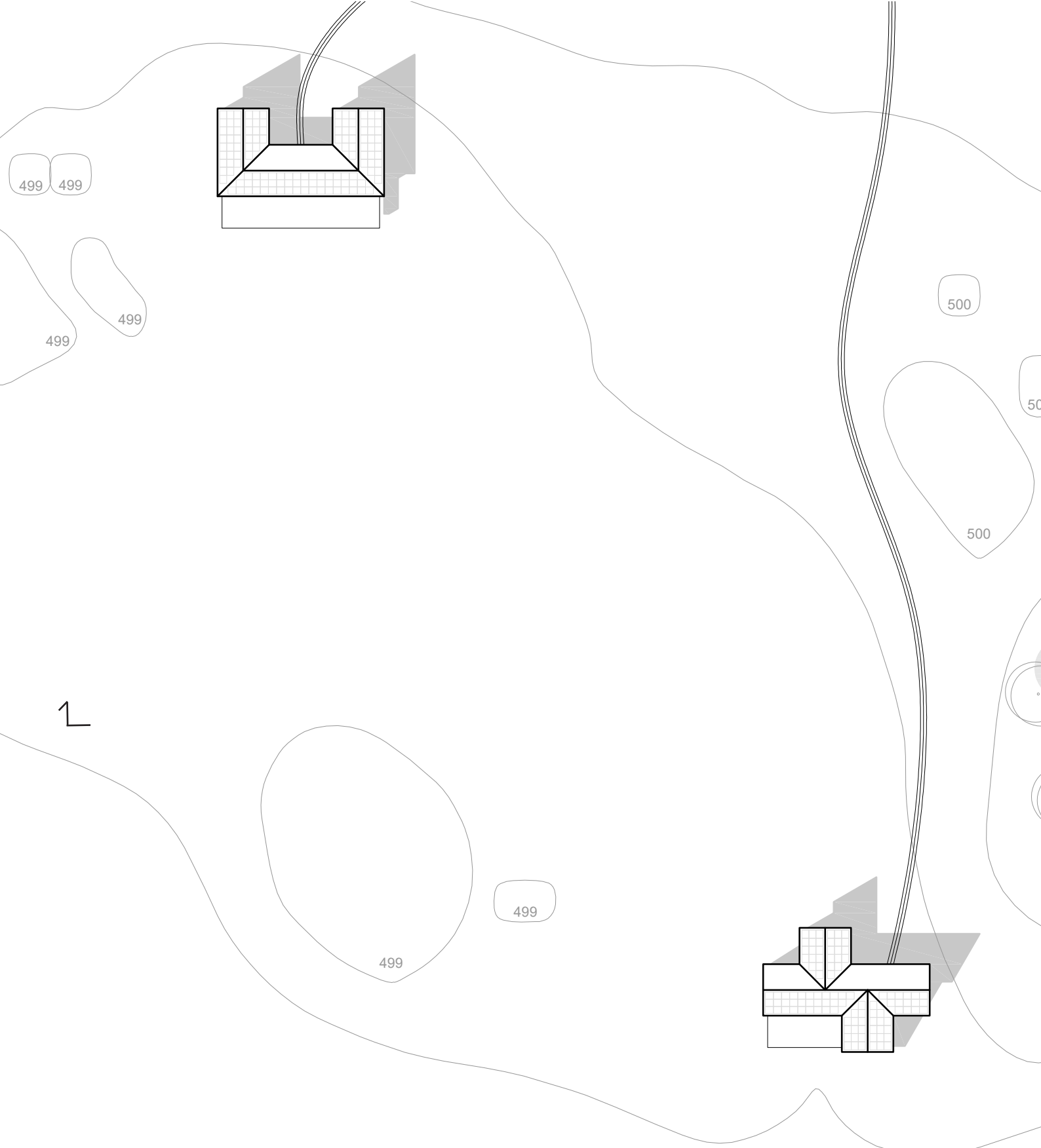


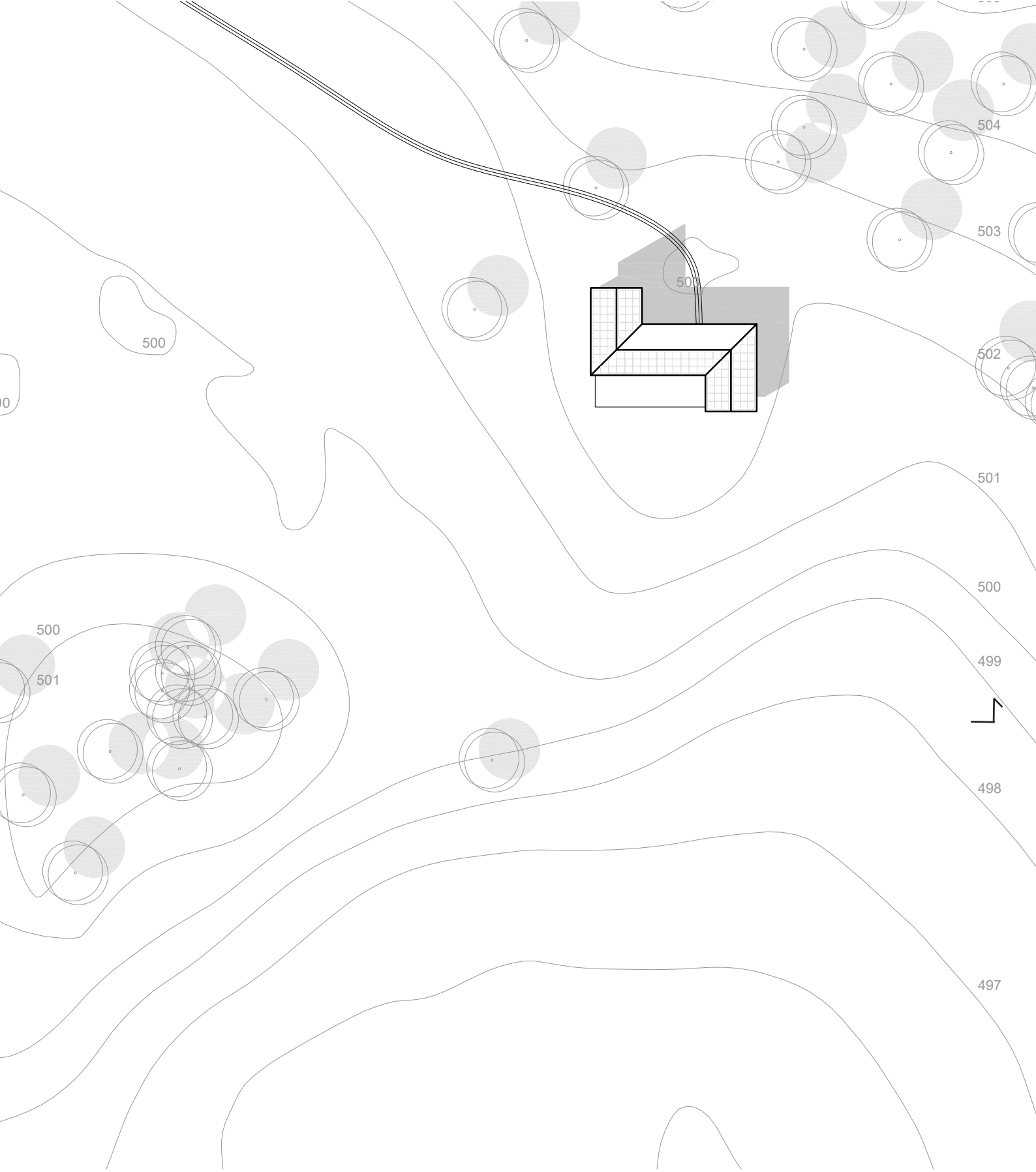


Site plan | 1:2000



Site section | 1:2000





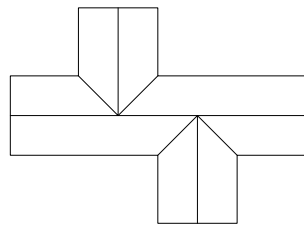
Site plan | 1:500



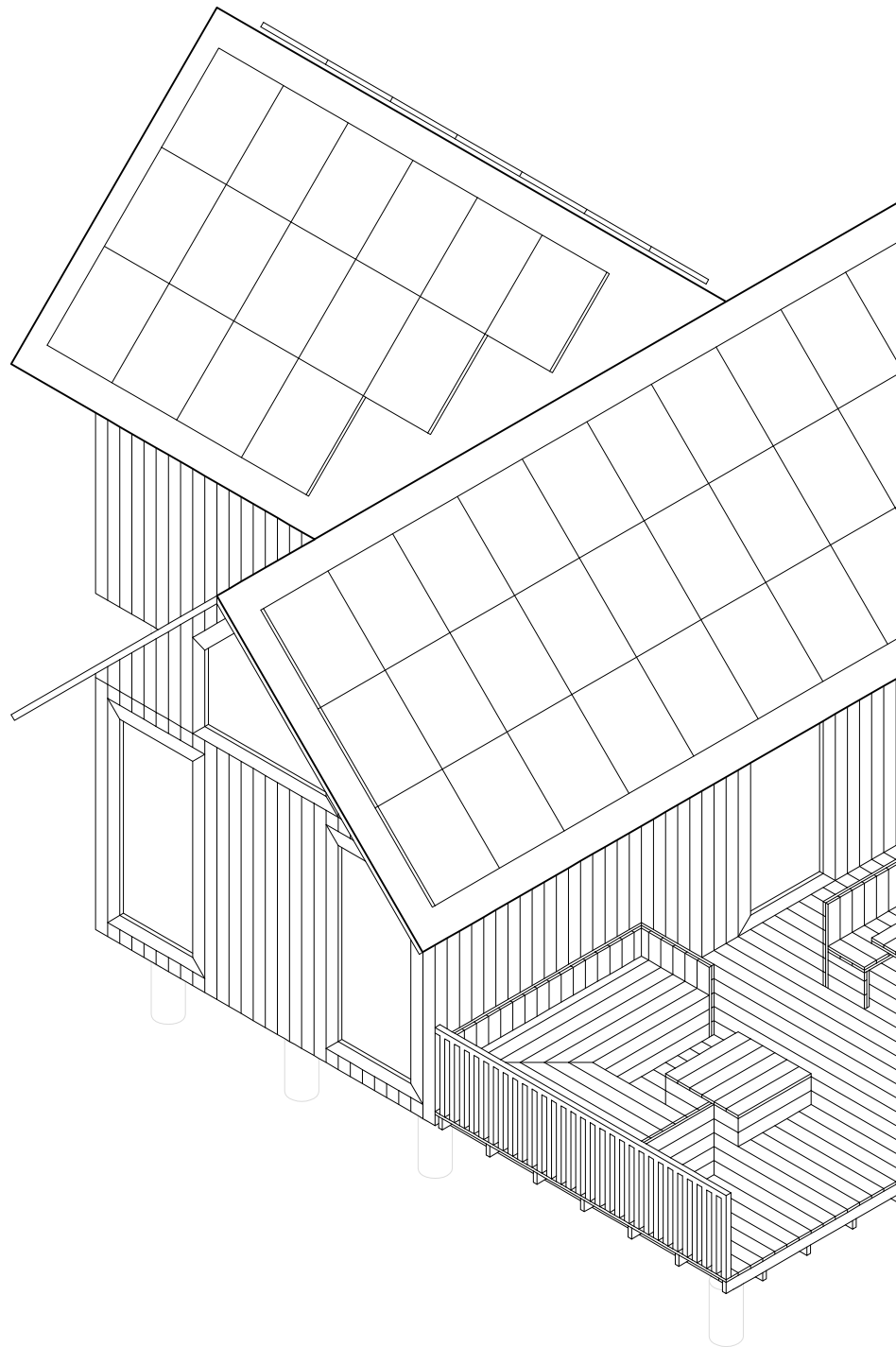
Site section | 1:500

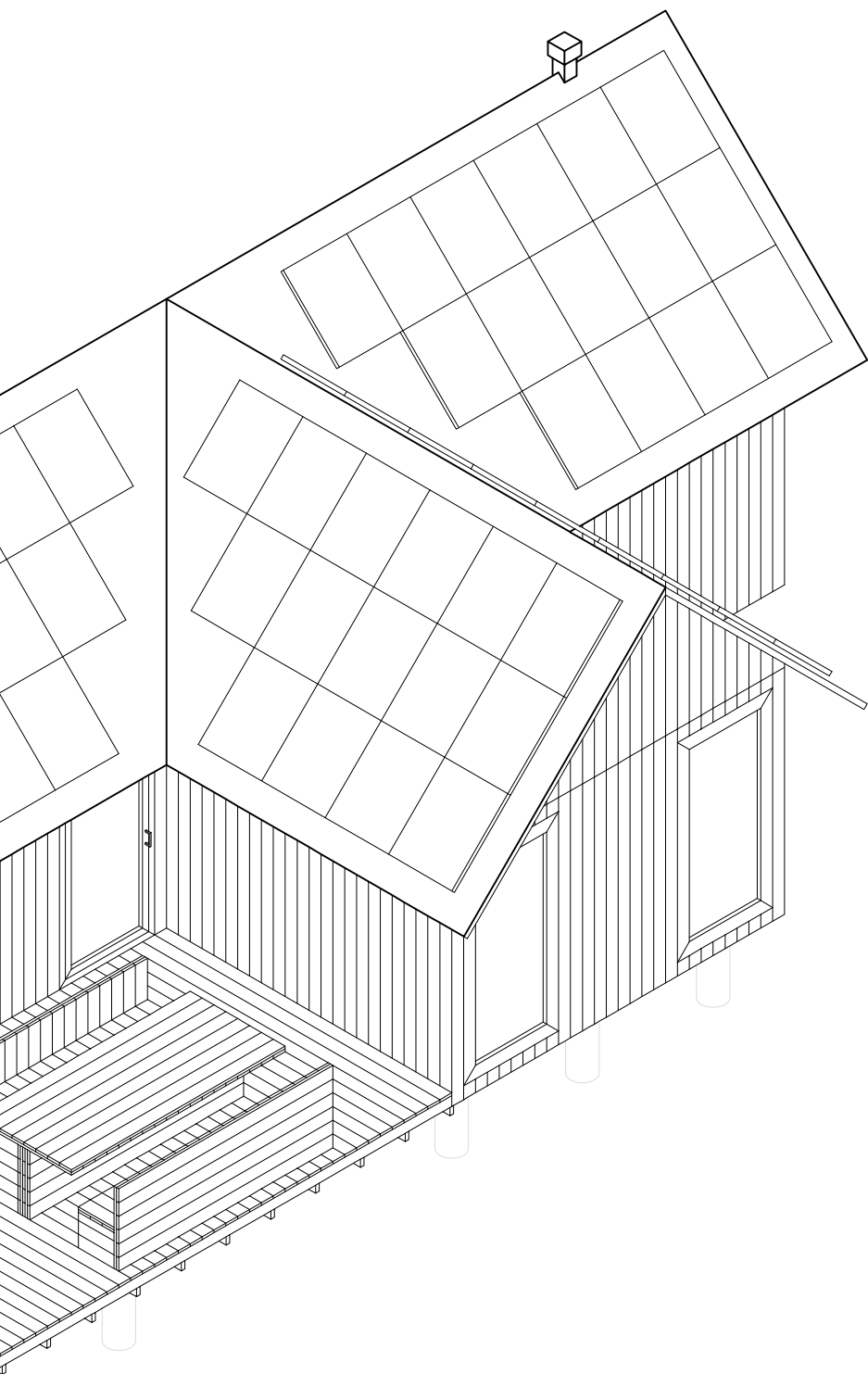


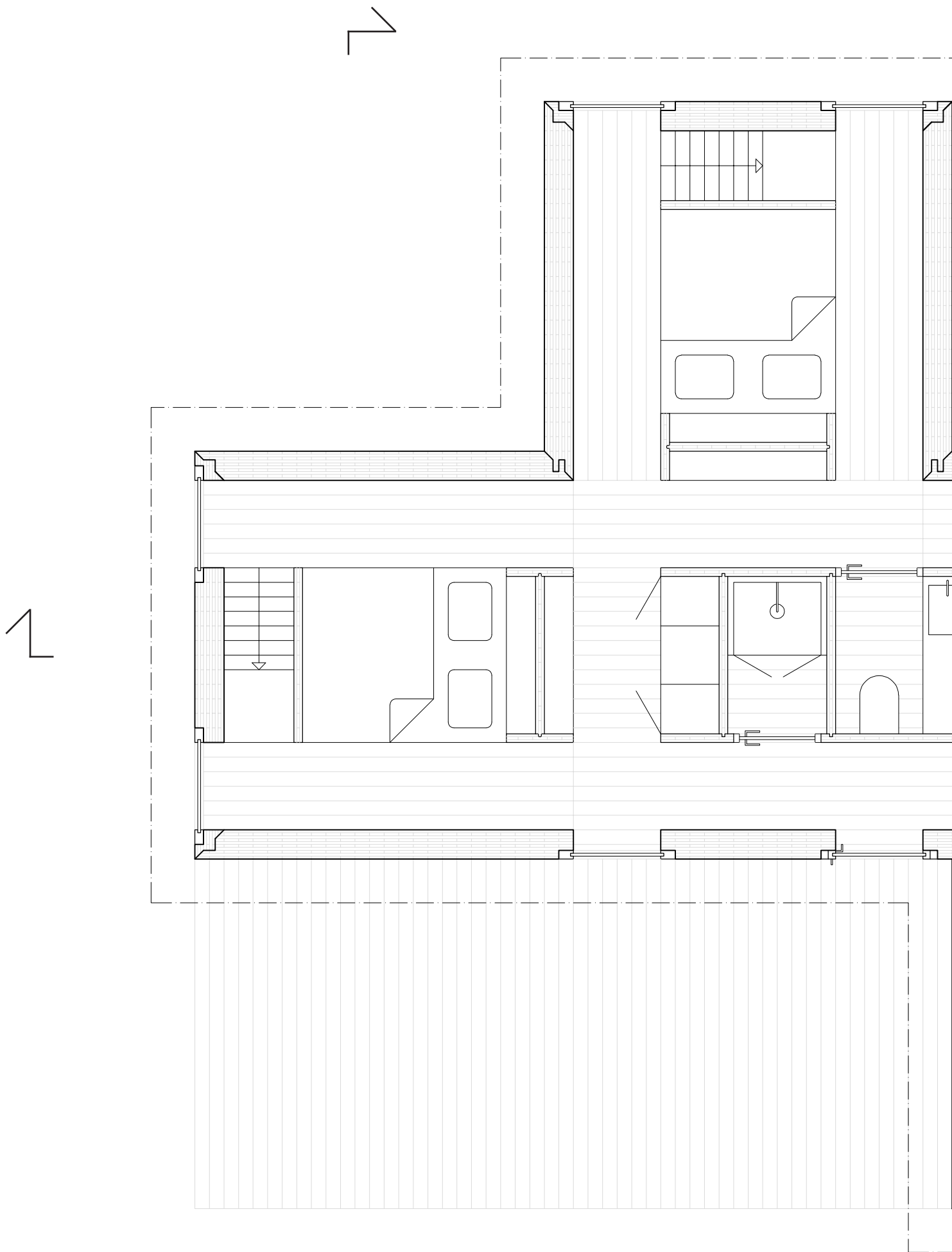


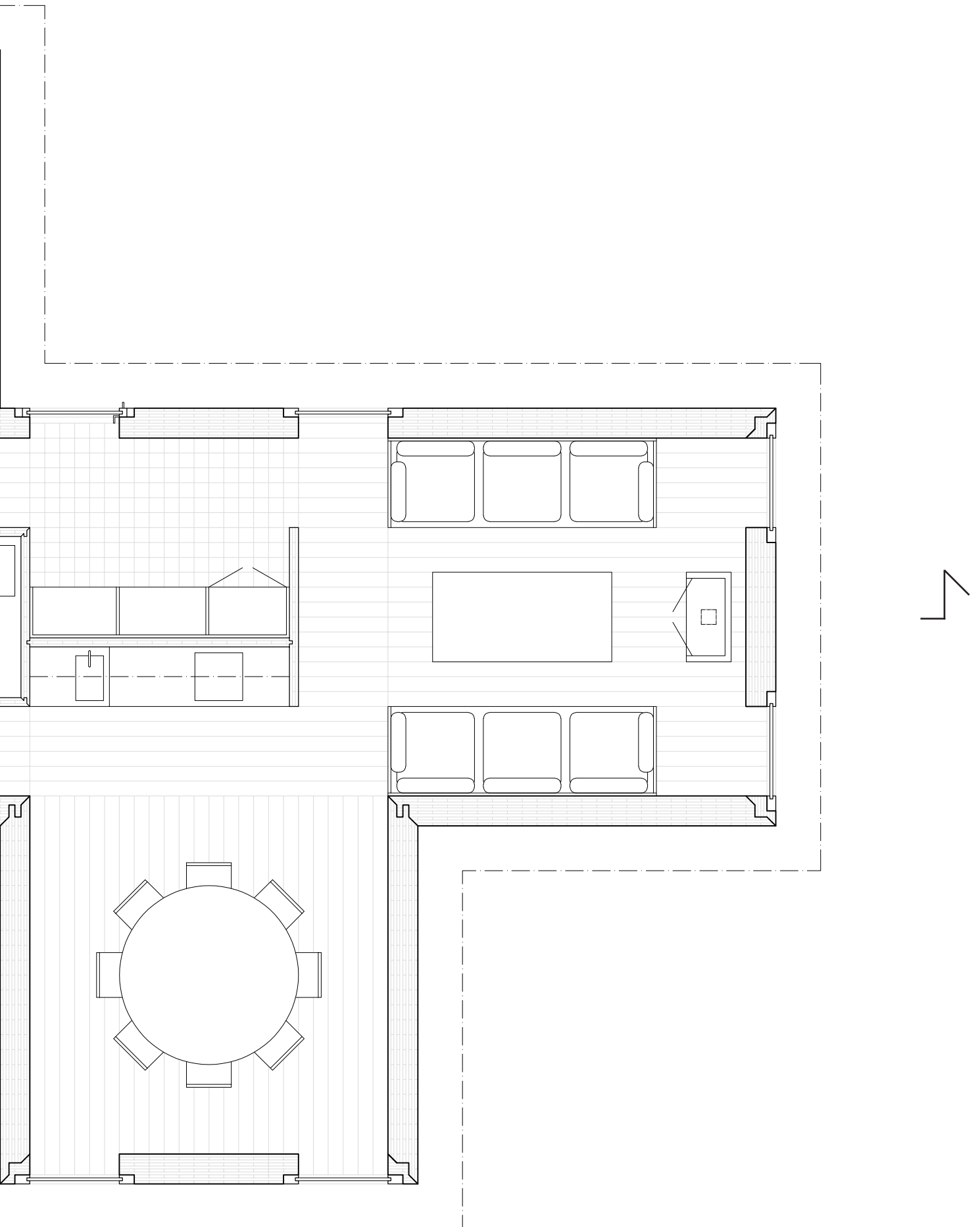


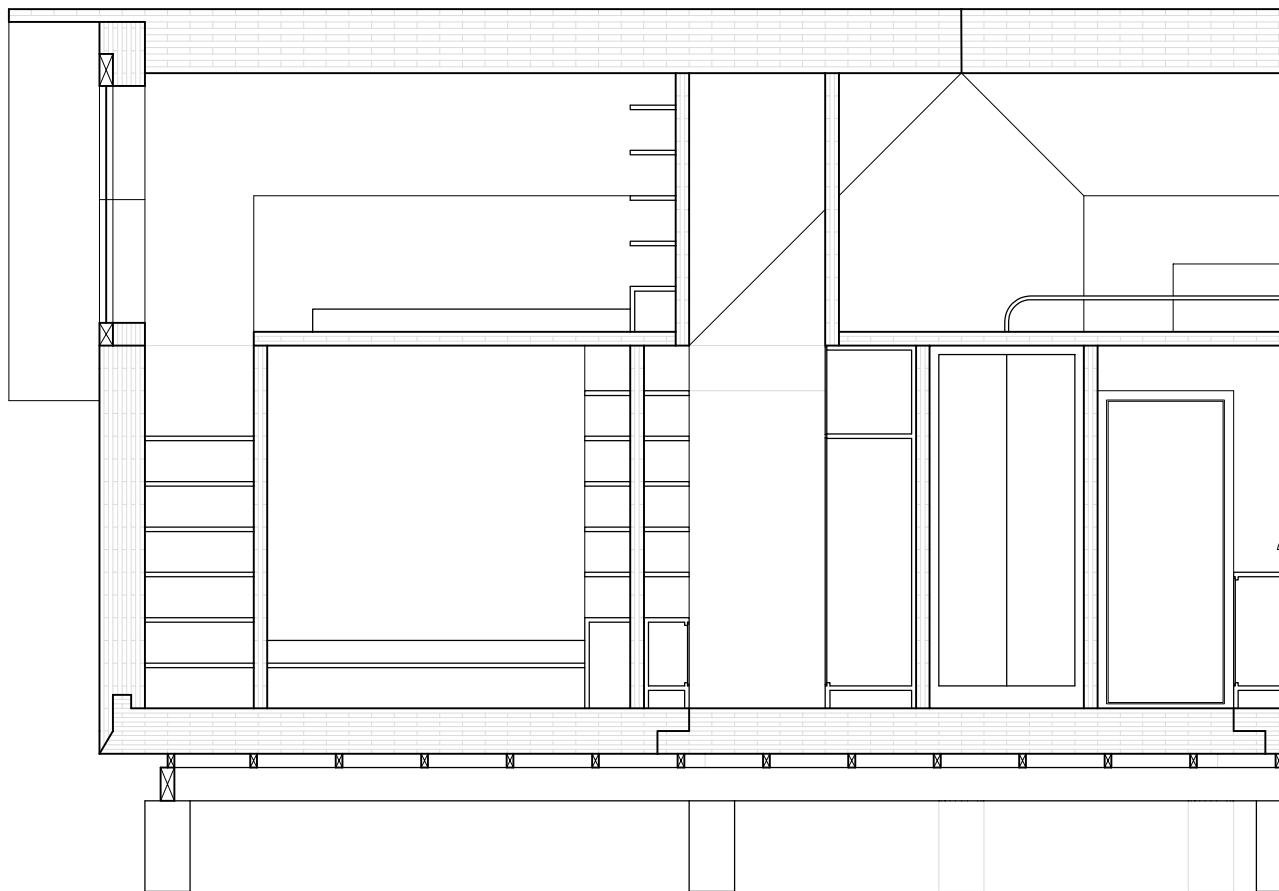
THE CROSS

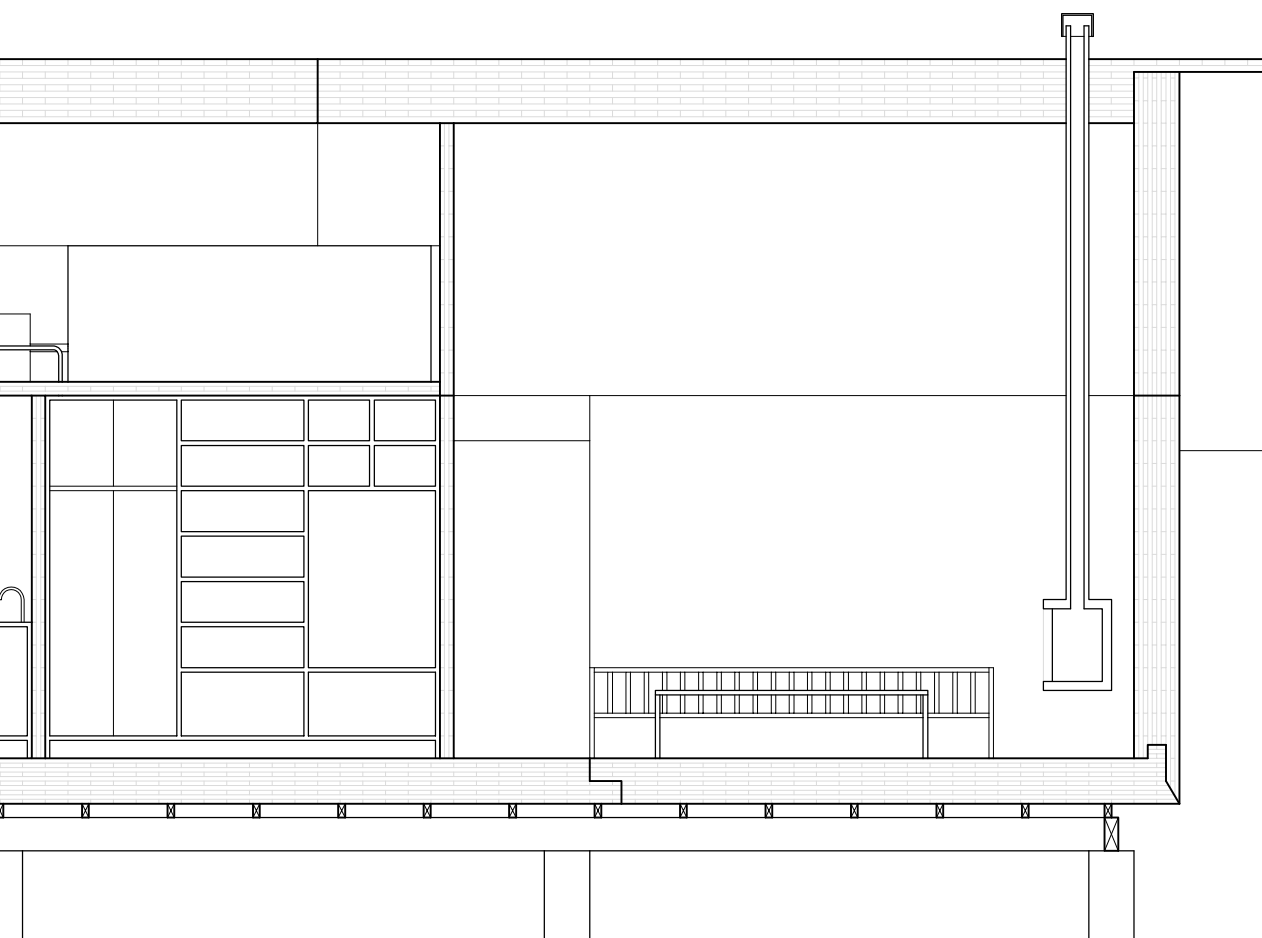


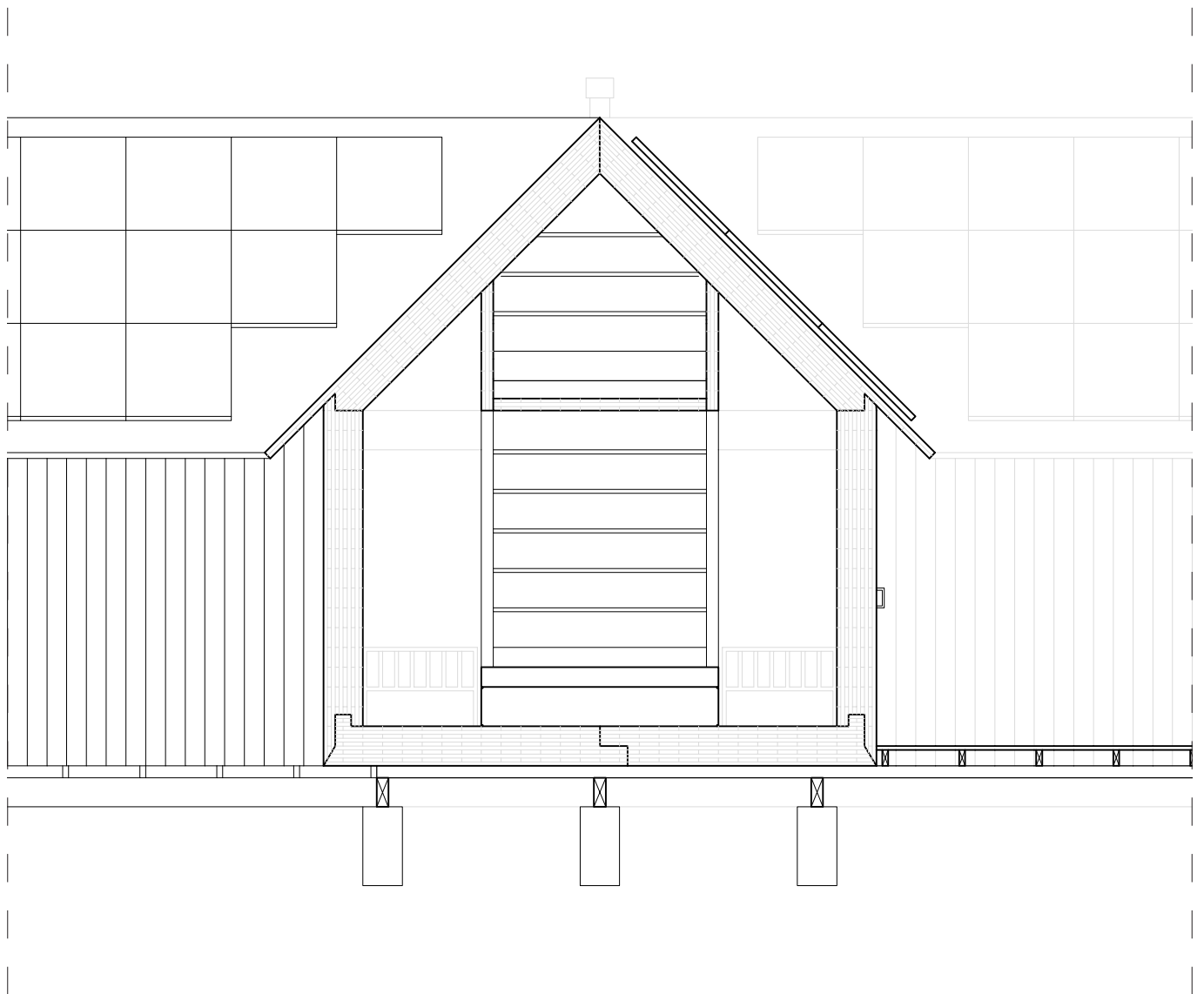




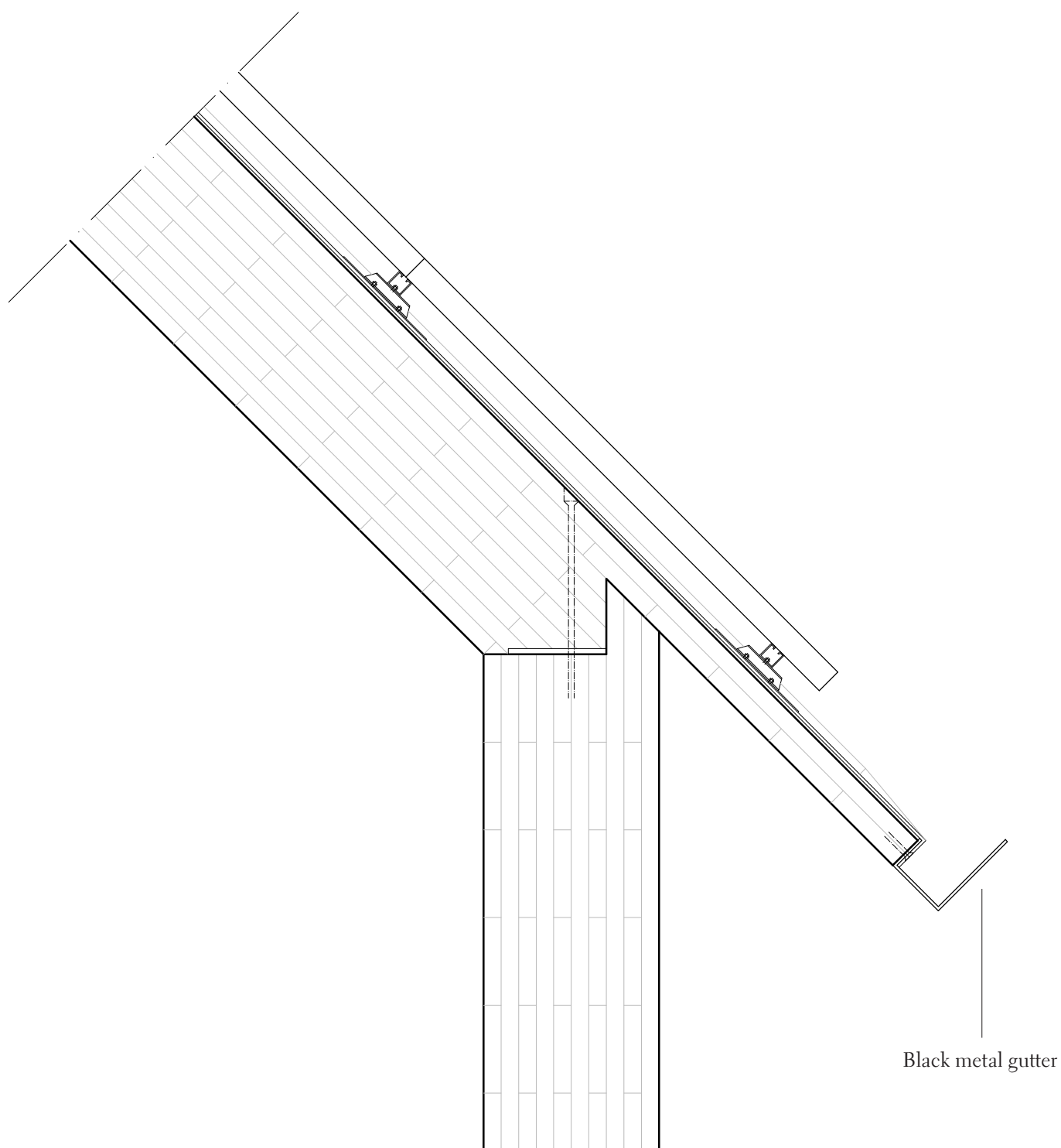


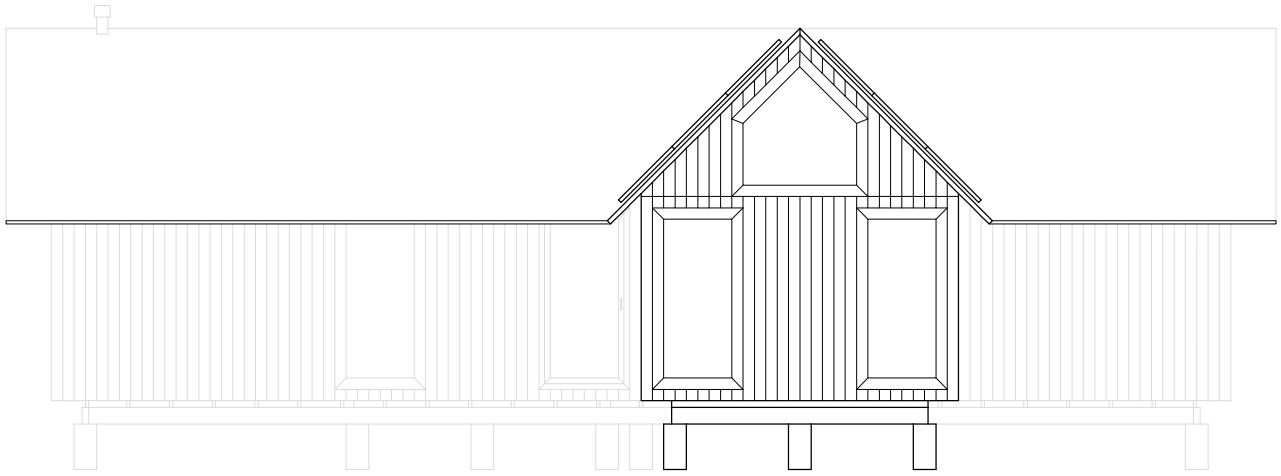




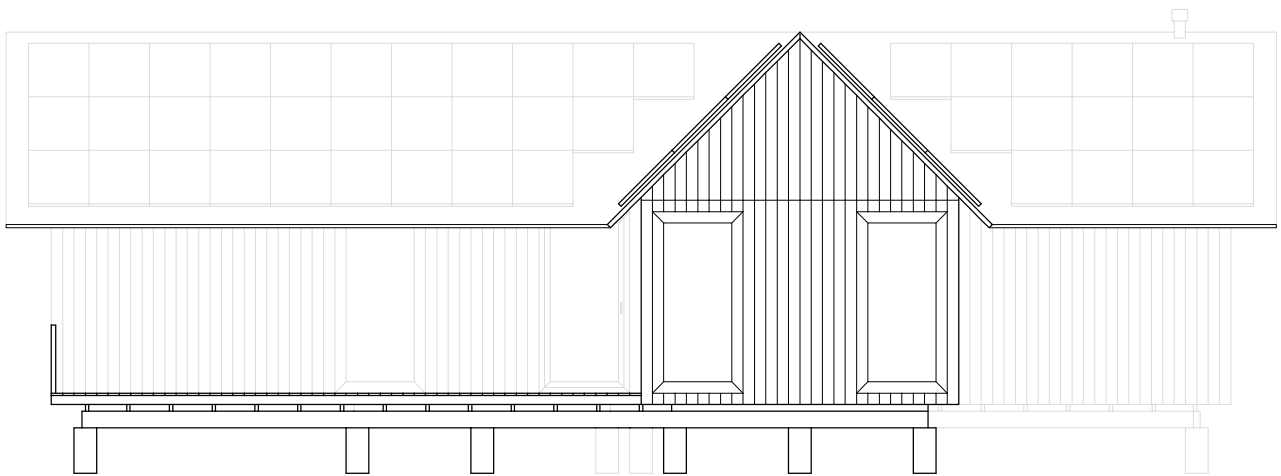


1. PV solar system	45
2. Solar system mounting	45
3. Black folded sheet metal	5
4. Roof wrapping cover	5
5. CLT-board	300

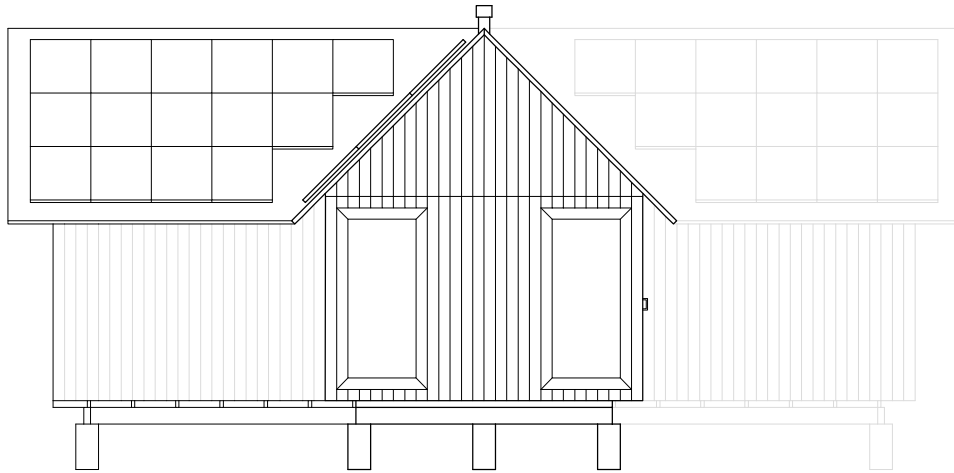




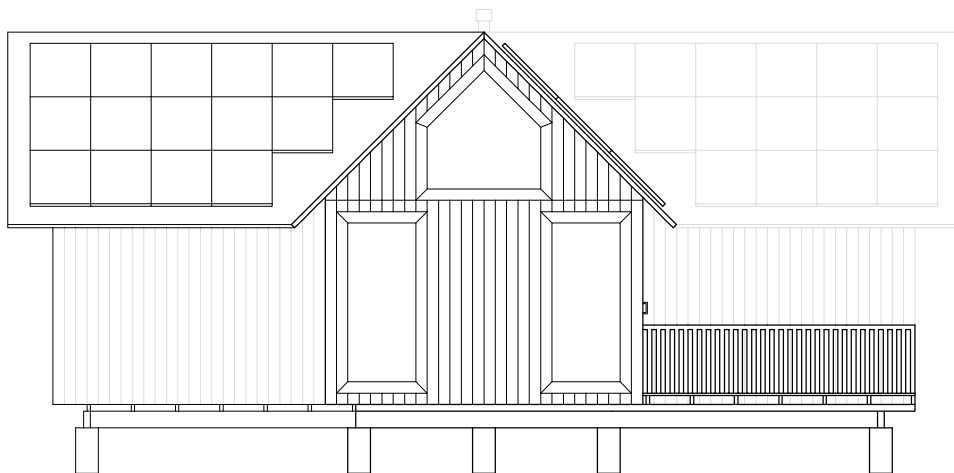
North elevation | 1:100



South elevation | 1:100



East elevation | 1:100

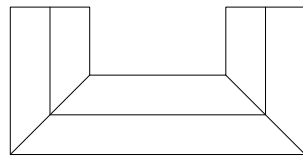


West elevation | 1:100

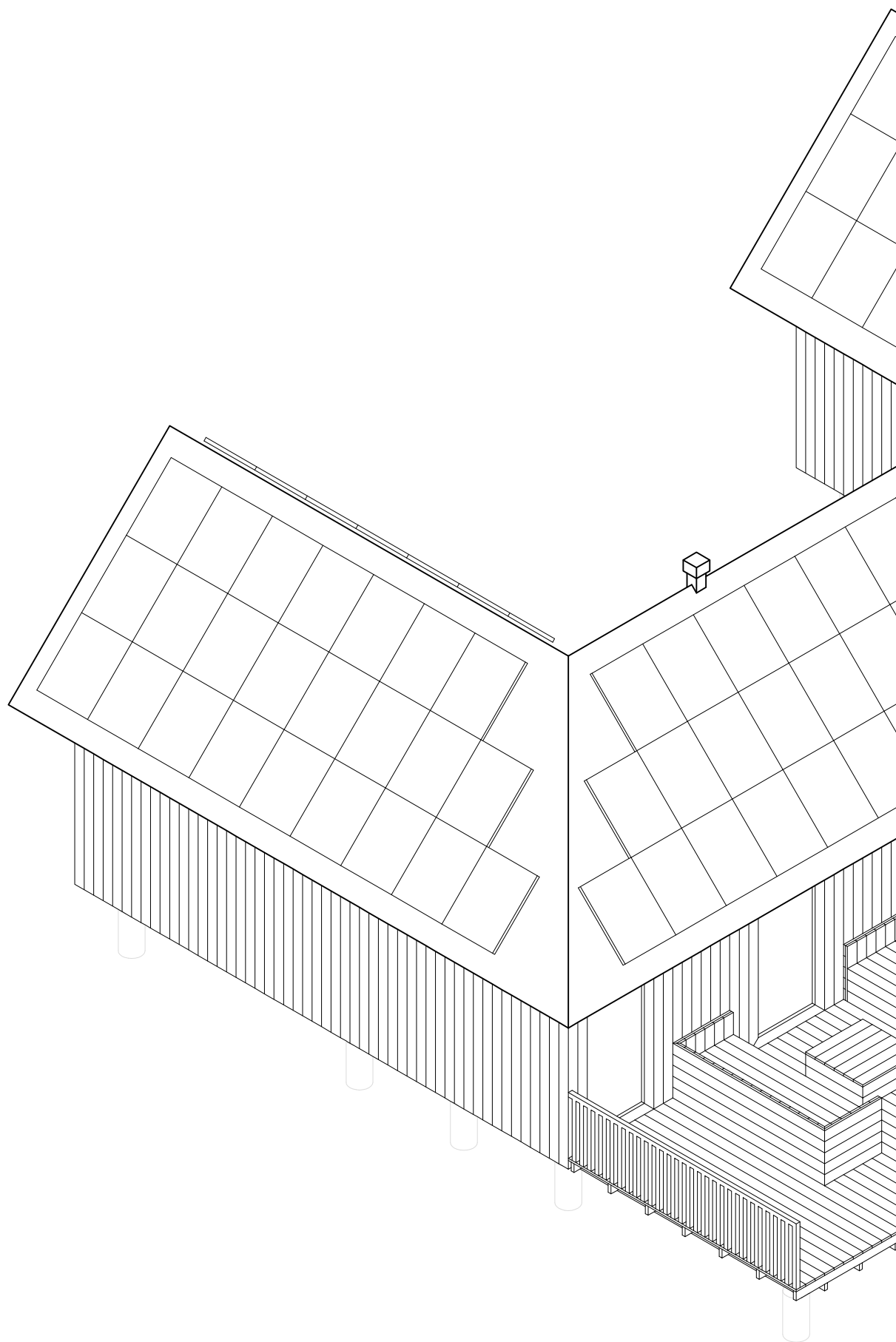


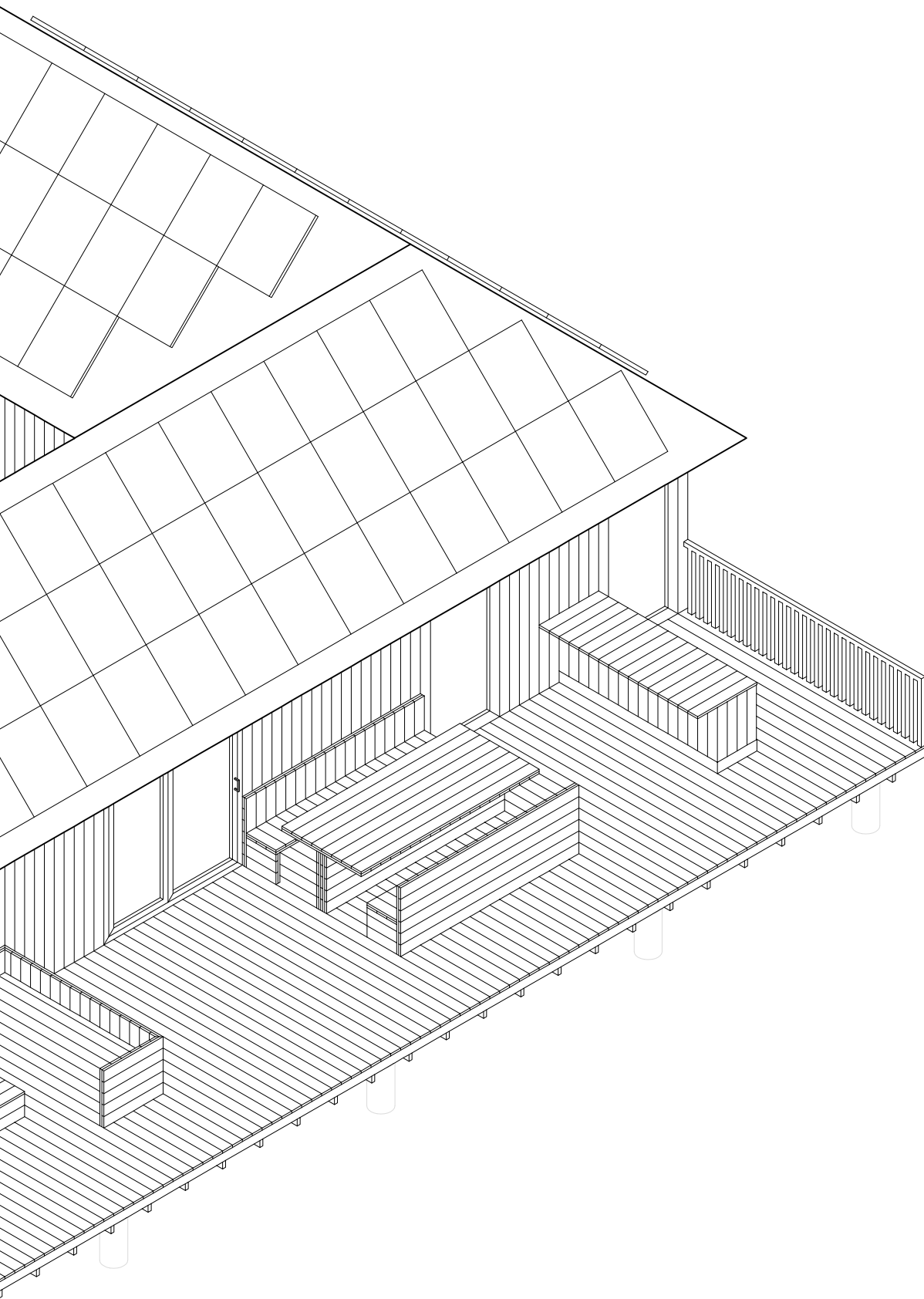


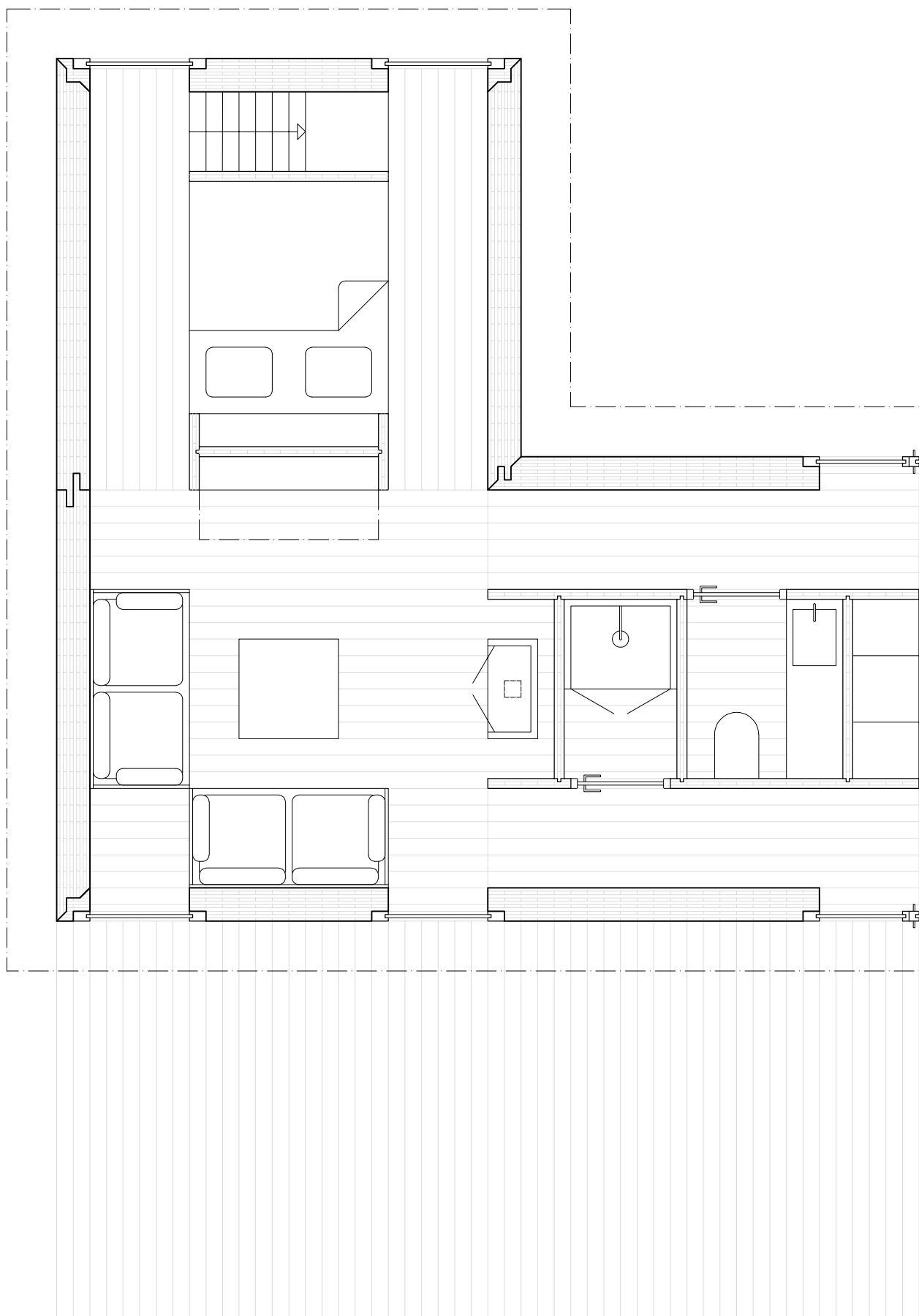
Interior perspective | The Cross

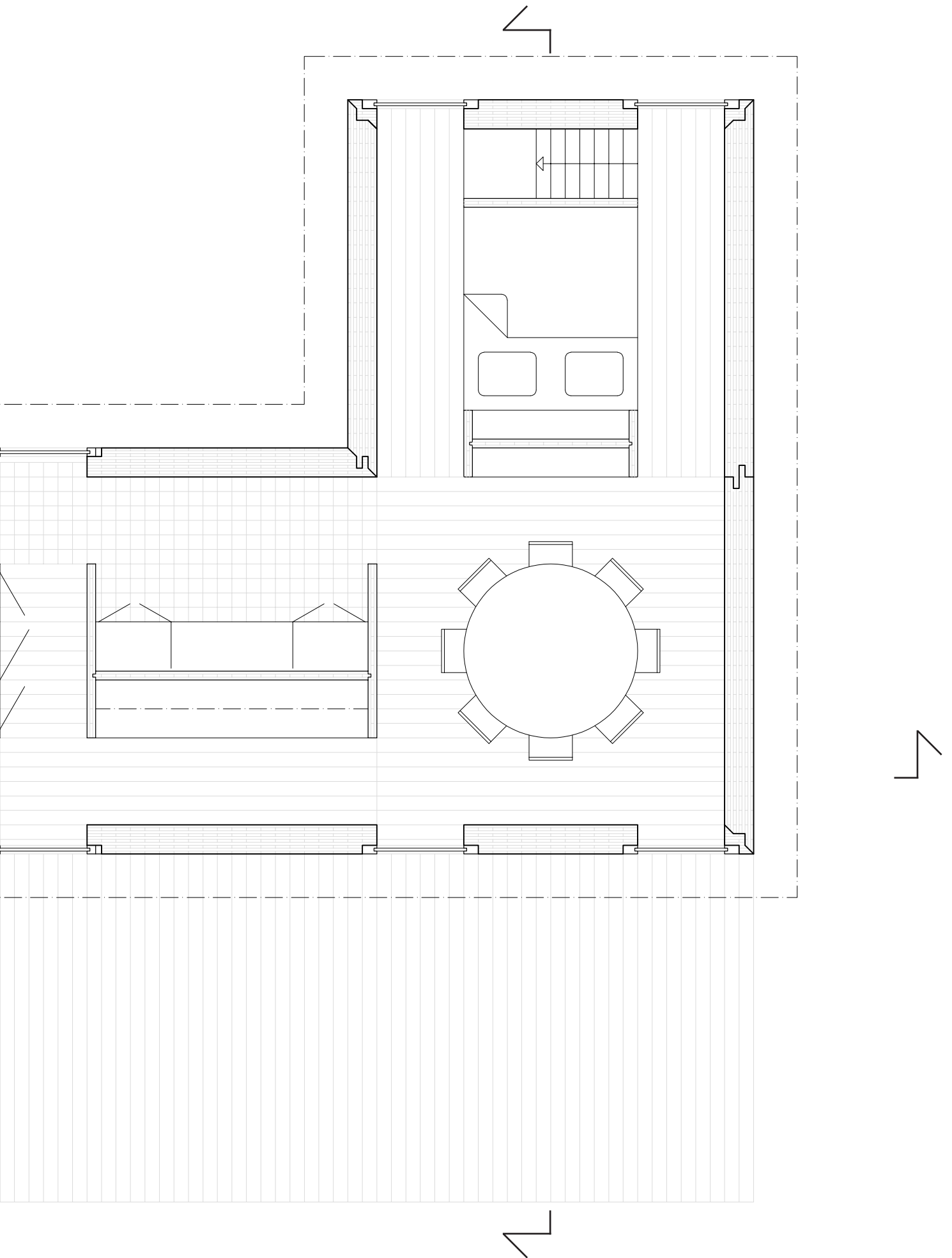


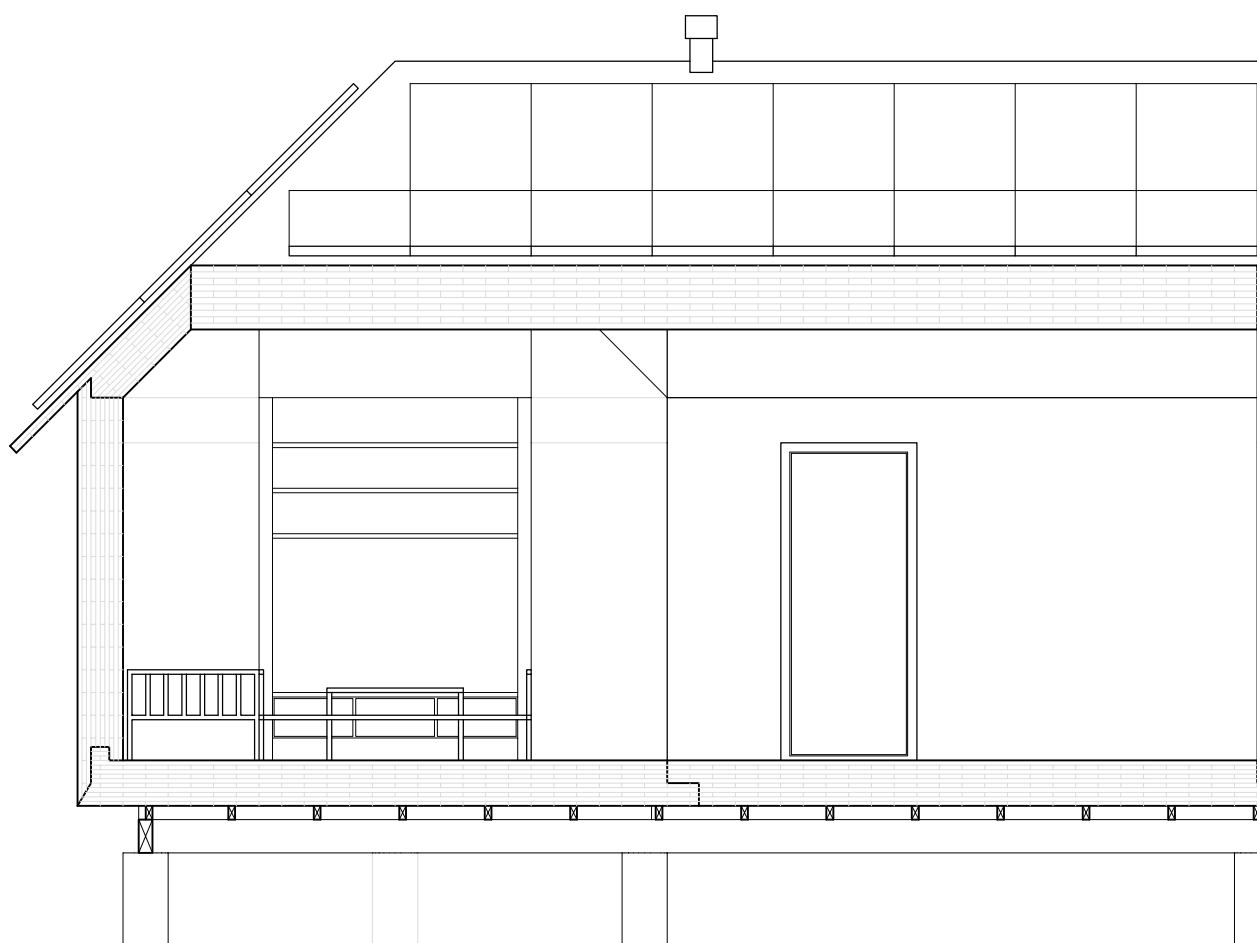
THE U

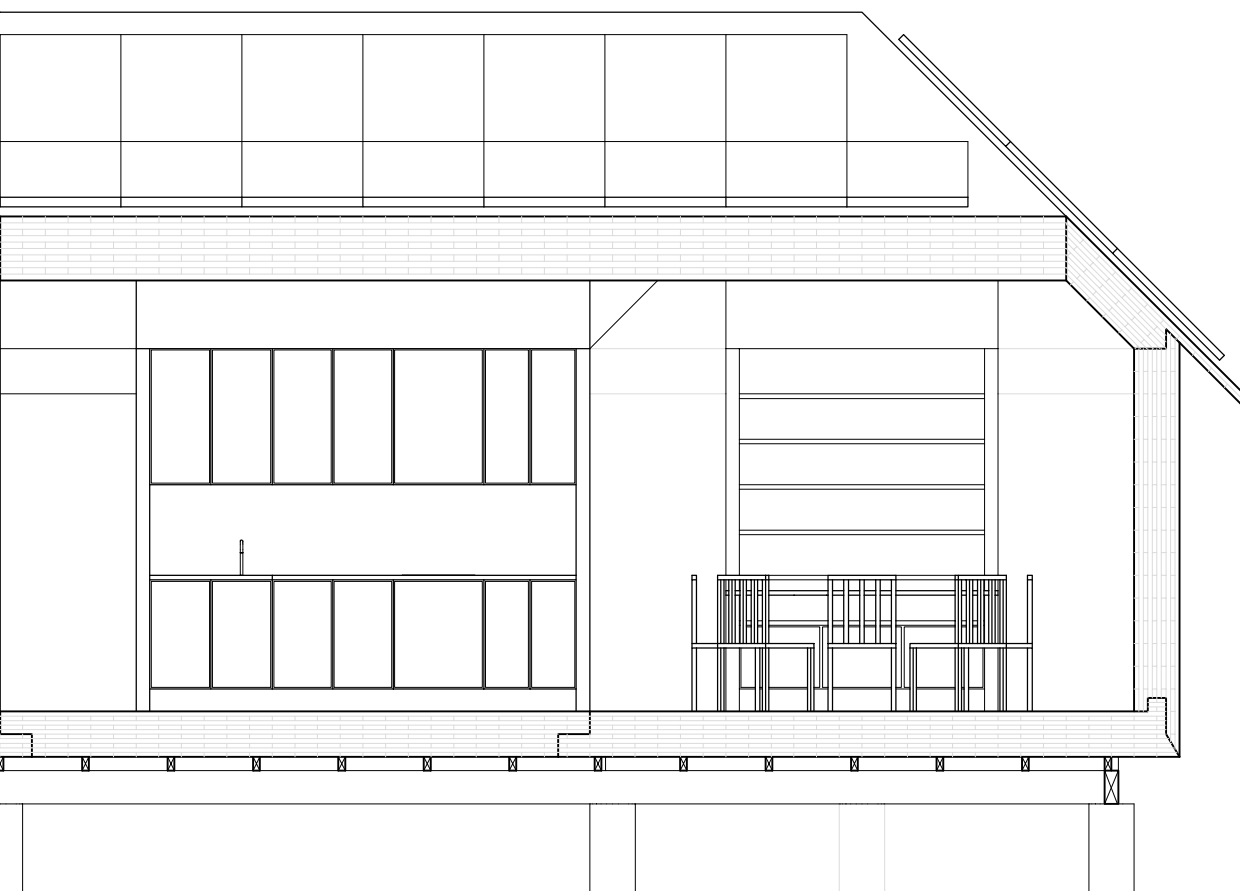


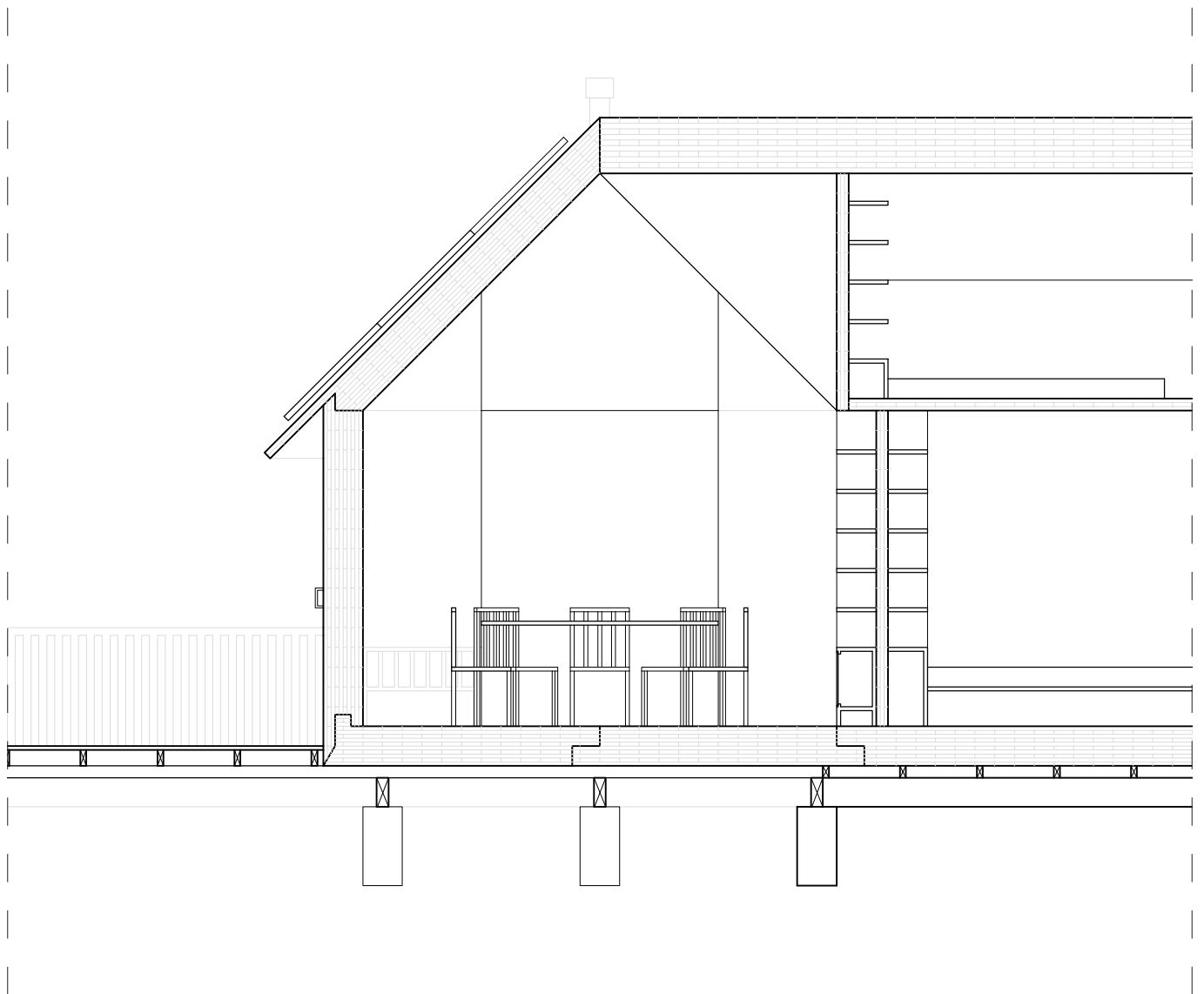




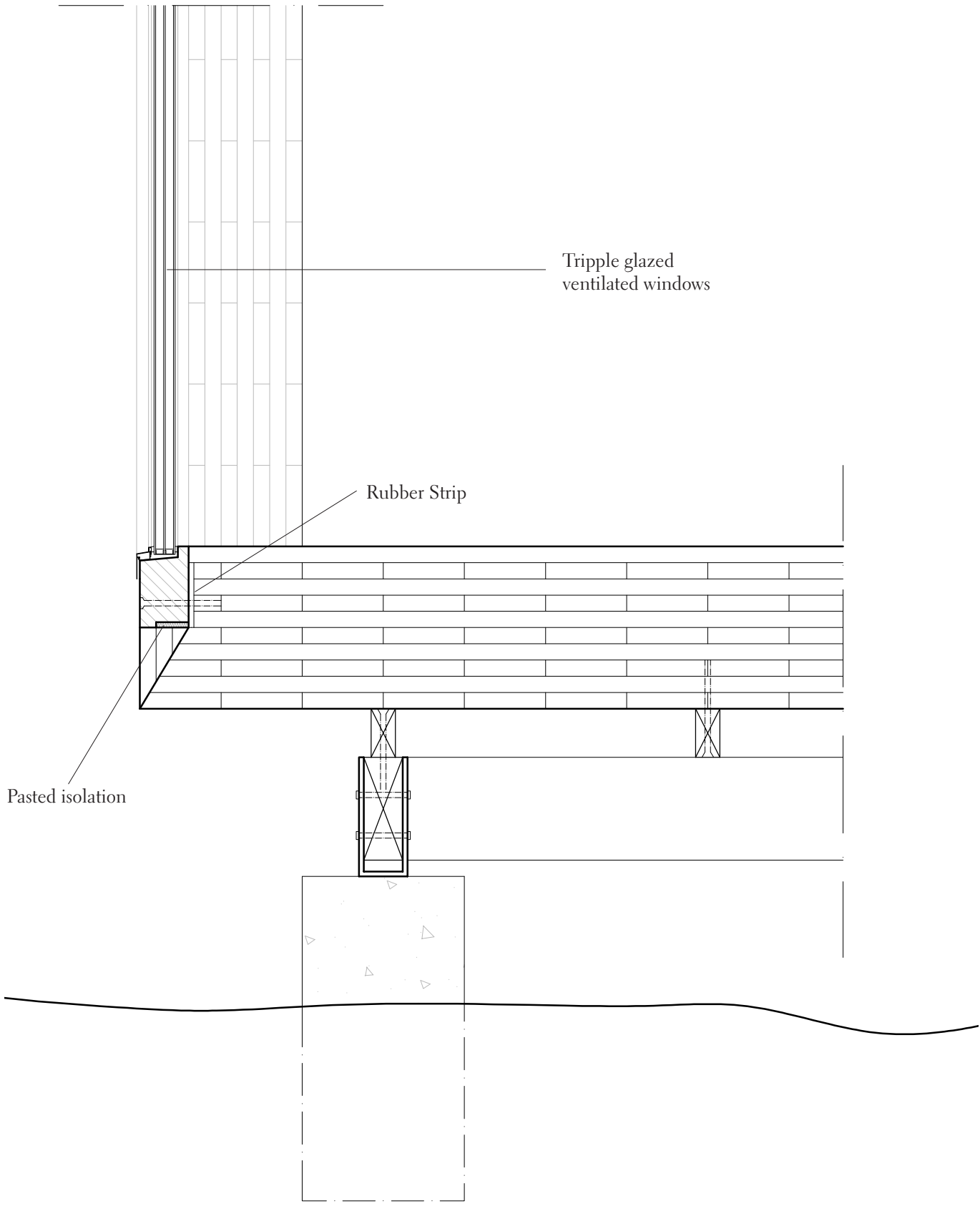


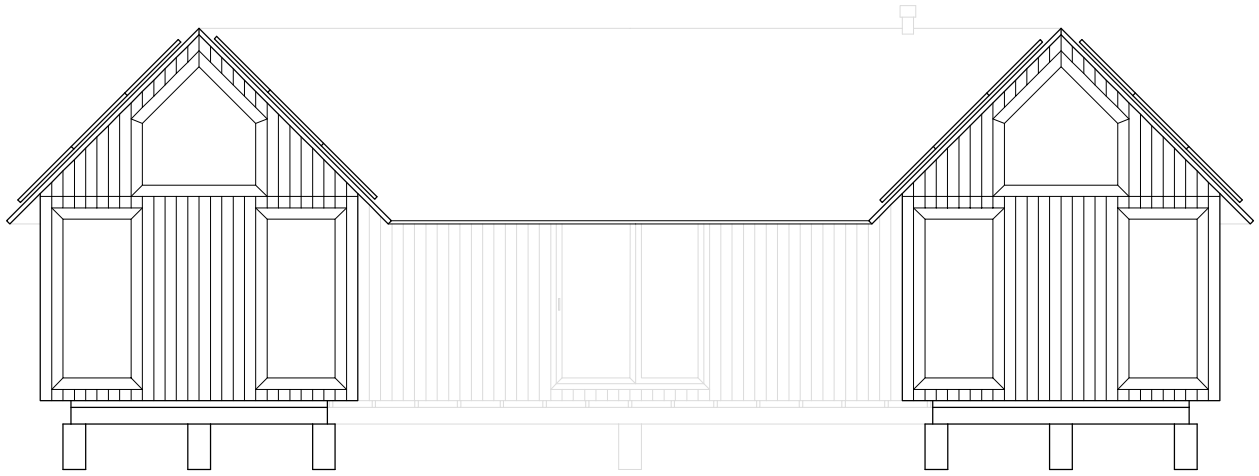




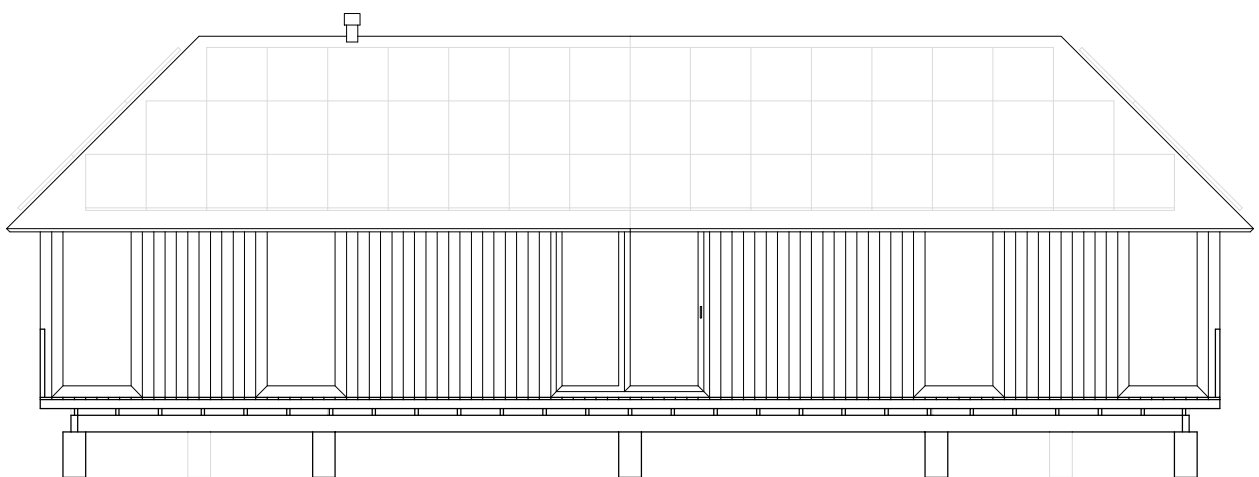


- | | |
|------------------------|-----------|
| 1. CLT-board | 300 |
| 2. Wood laths c/c 600 | 90 x 60 |
| 3. Main wood laths | 220 x 90 |
| 4. Concrete foundation | 600 x 300 |

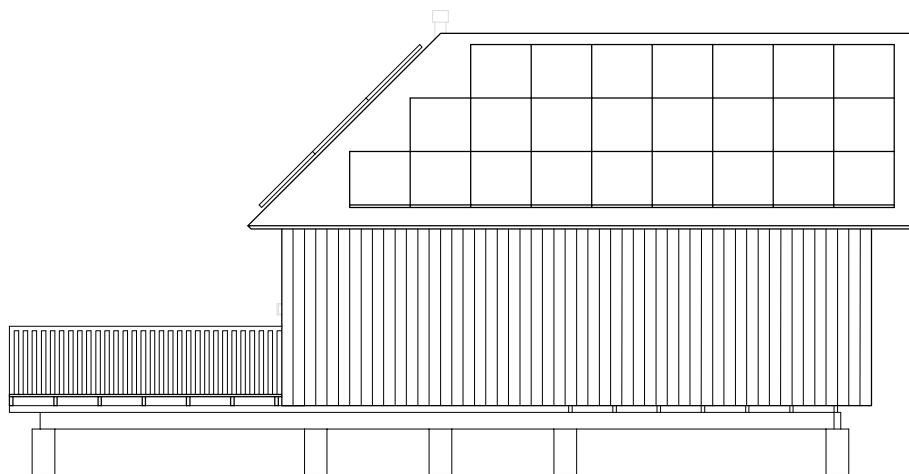




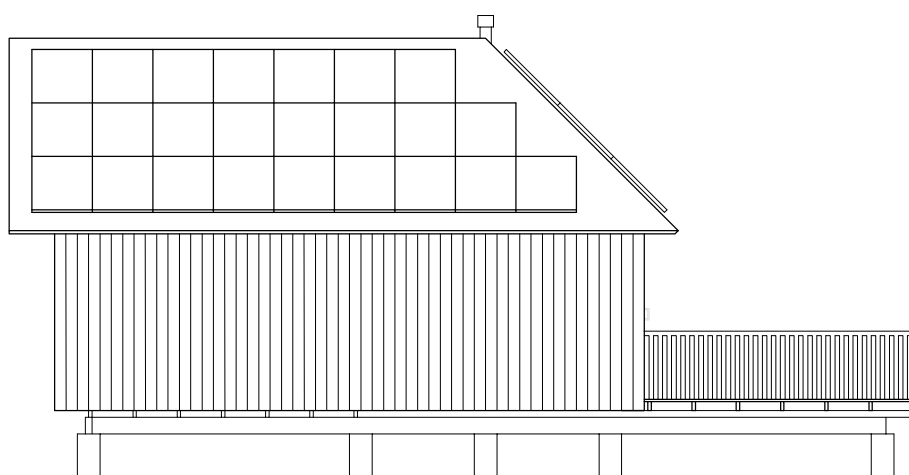
North elevation | 1:100



South elevation | 1:100



East elevation | 1:100

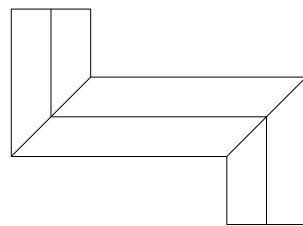


West elevation | 1:100

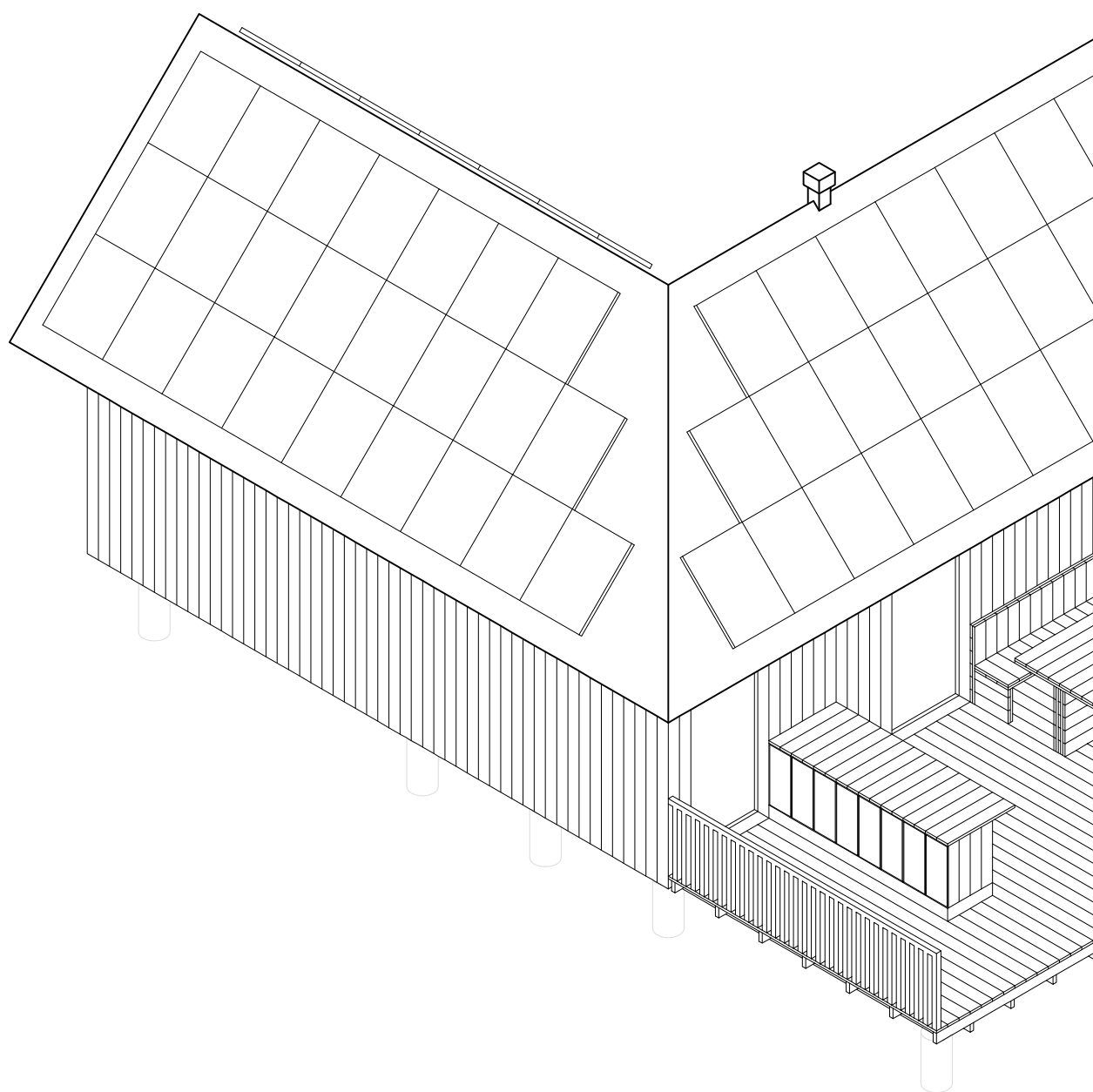


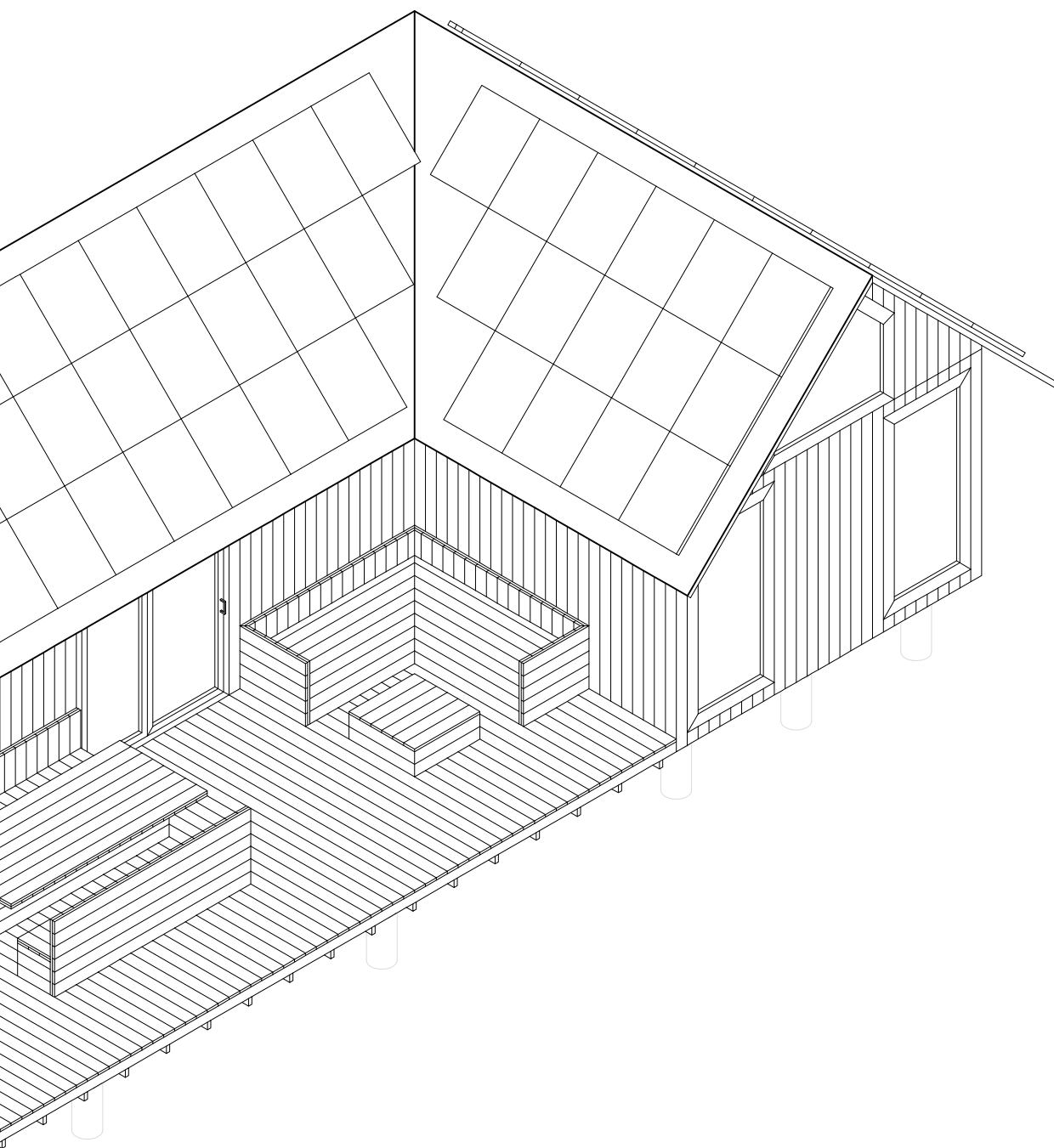


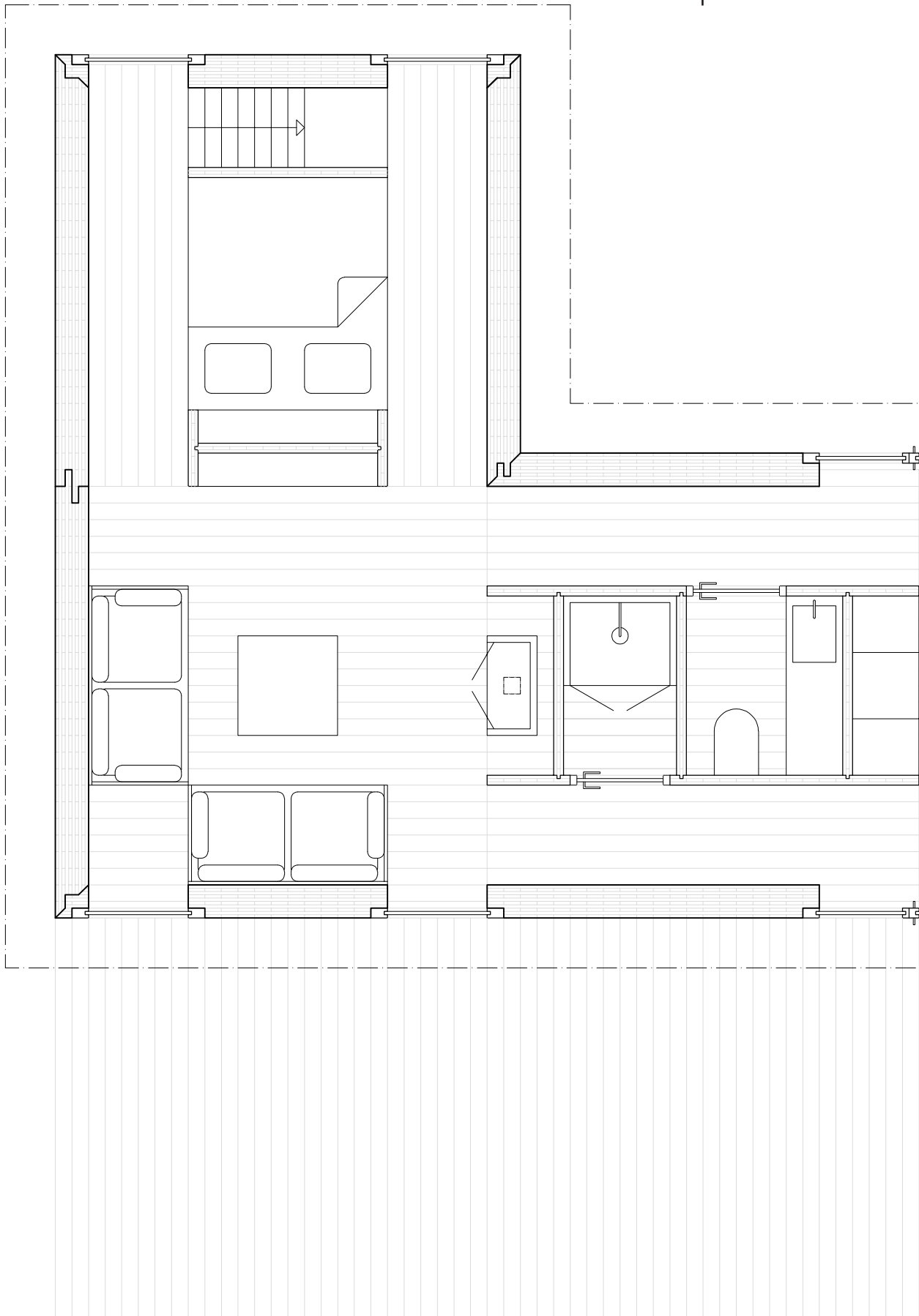
Interior perspective | The U

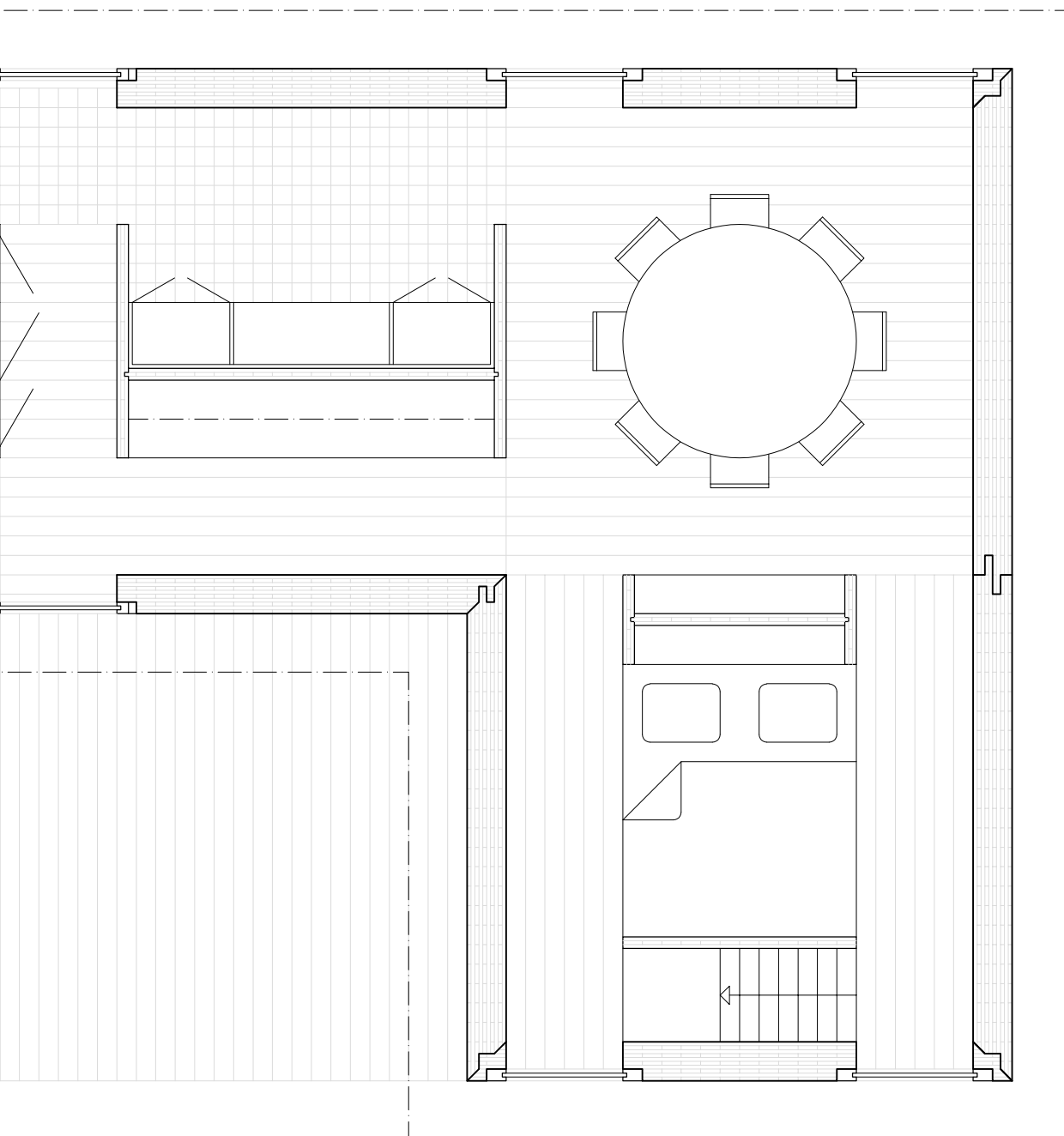


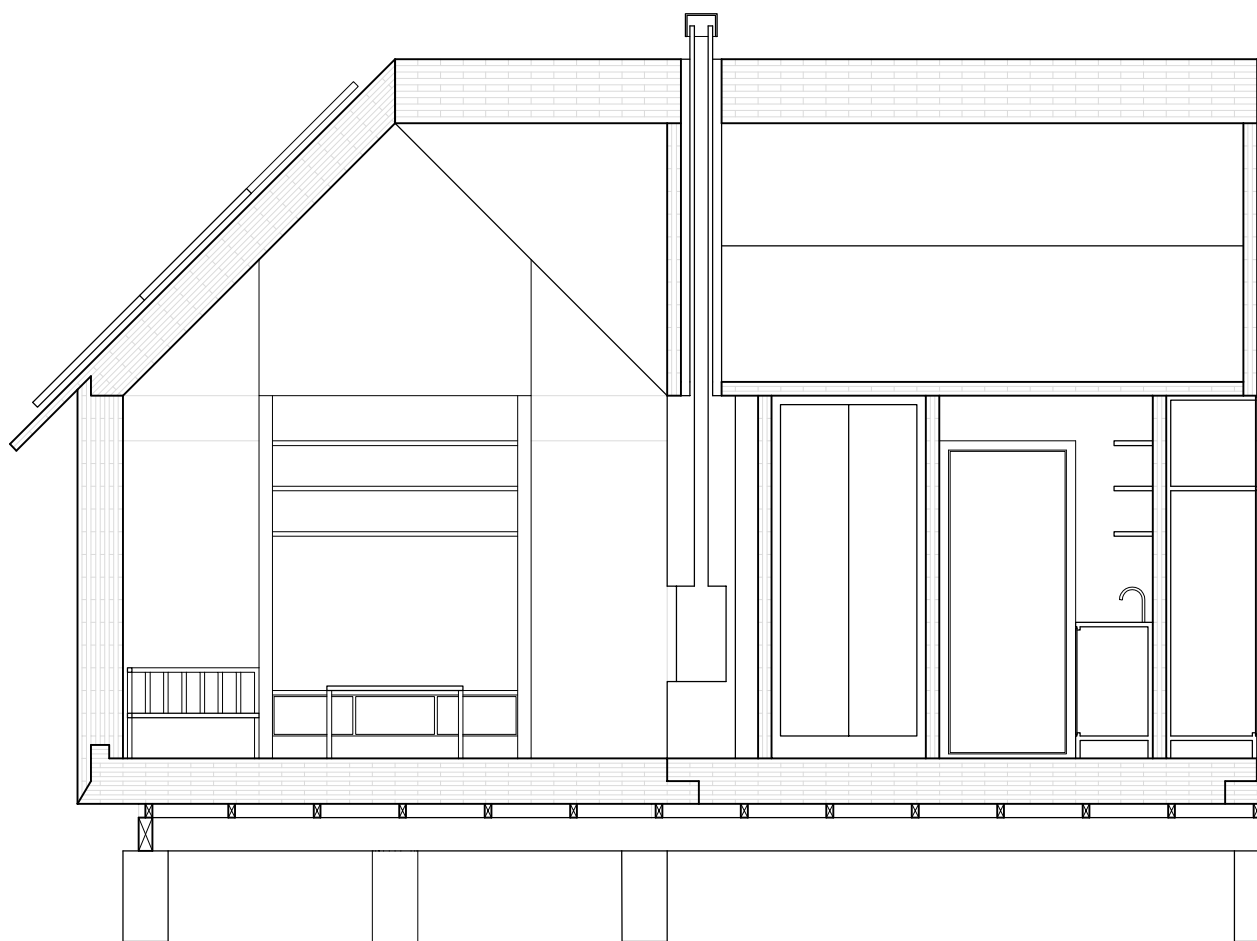
THE ESS

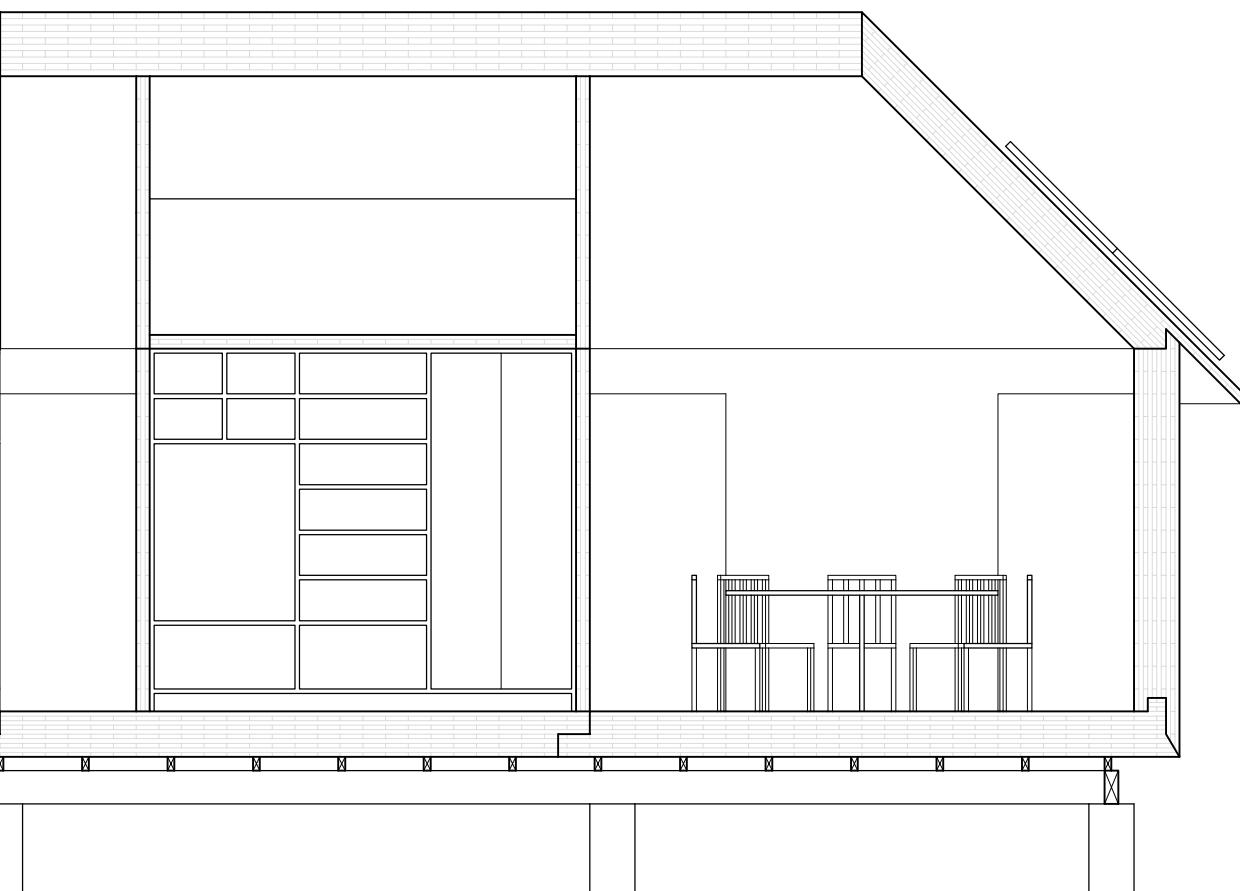


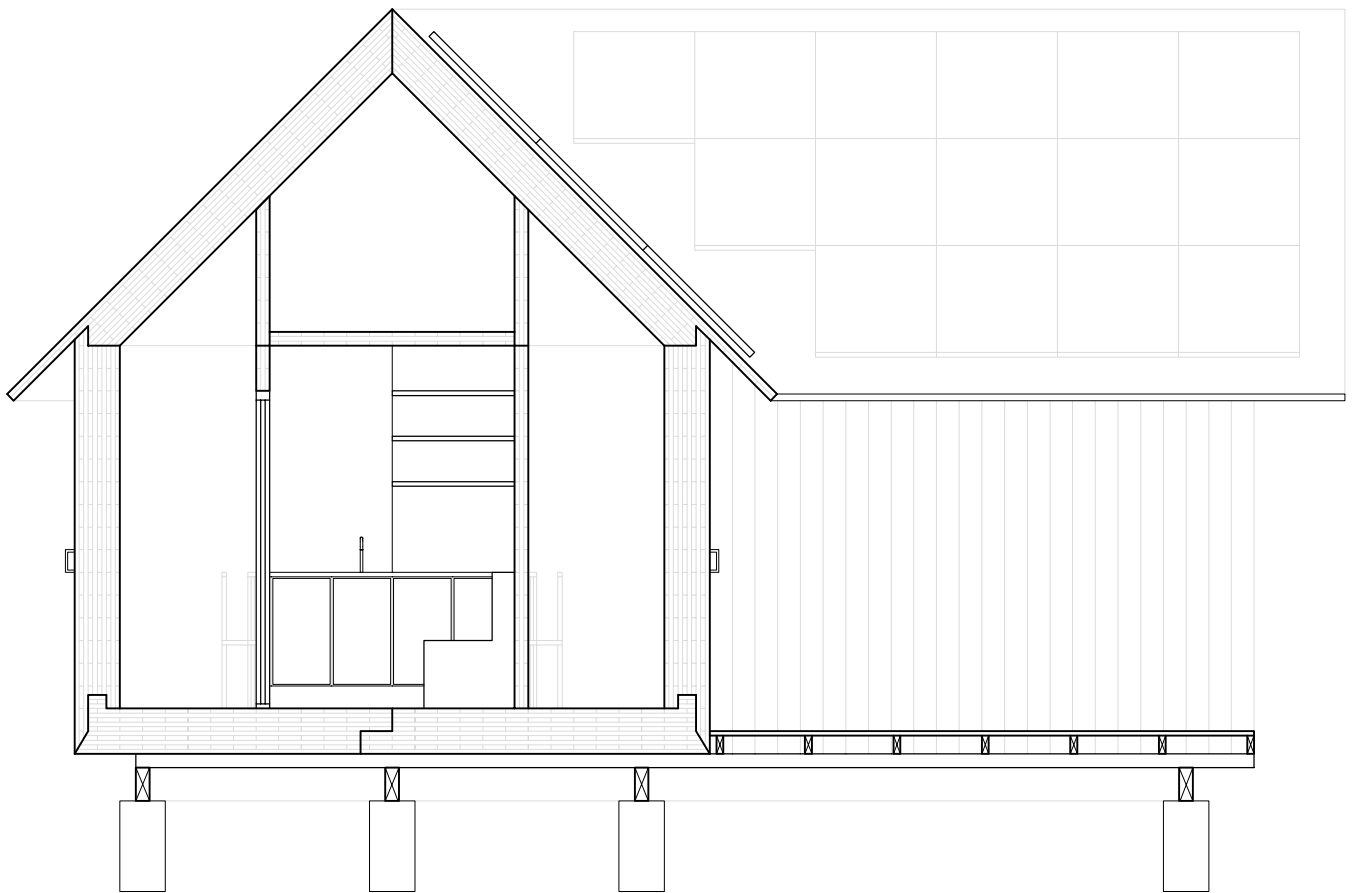




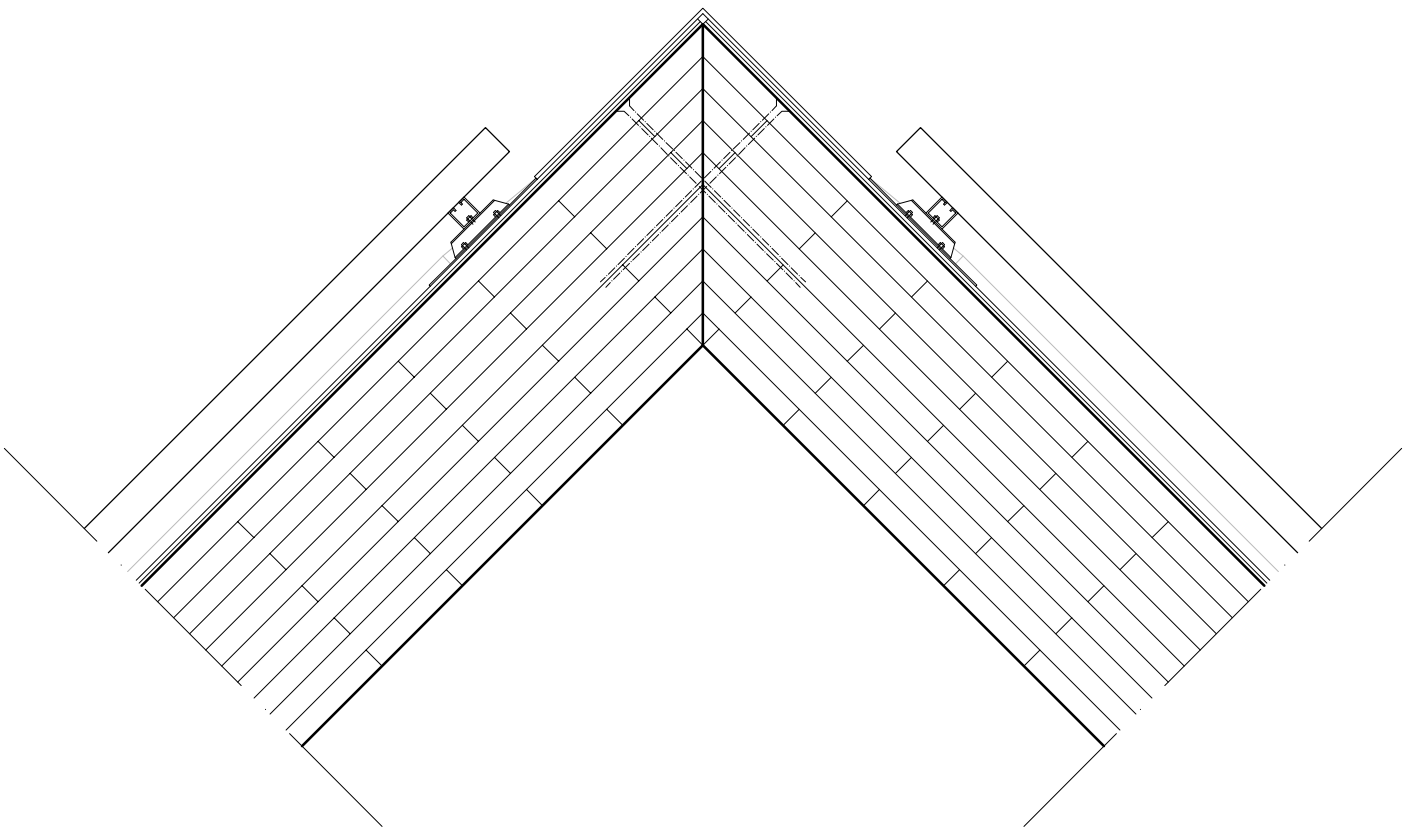


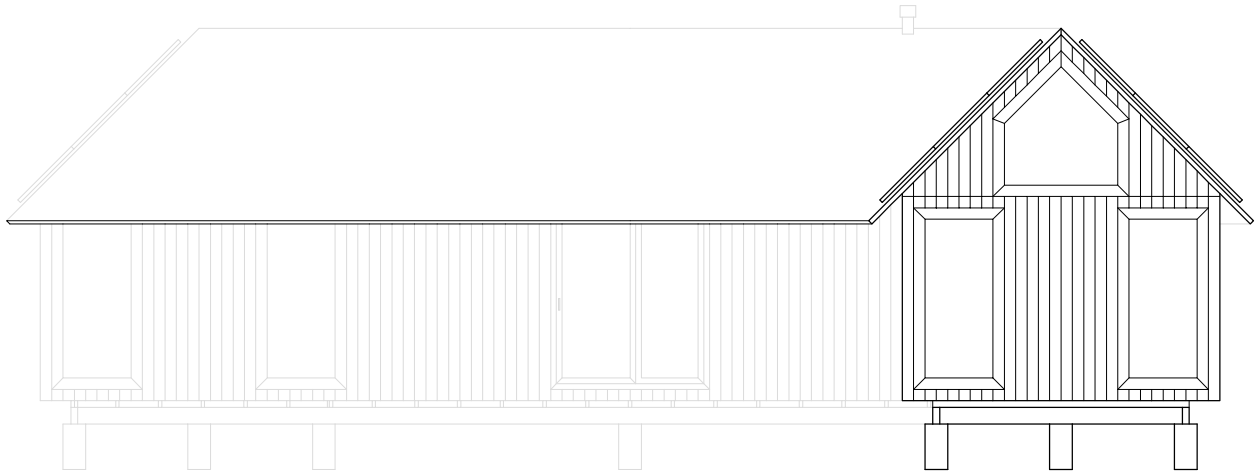




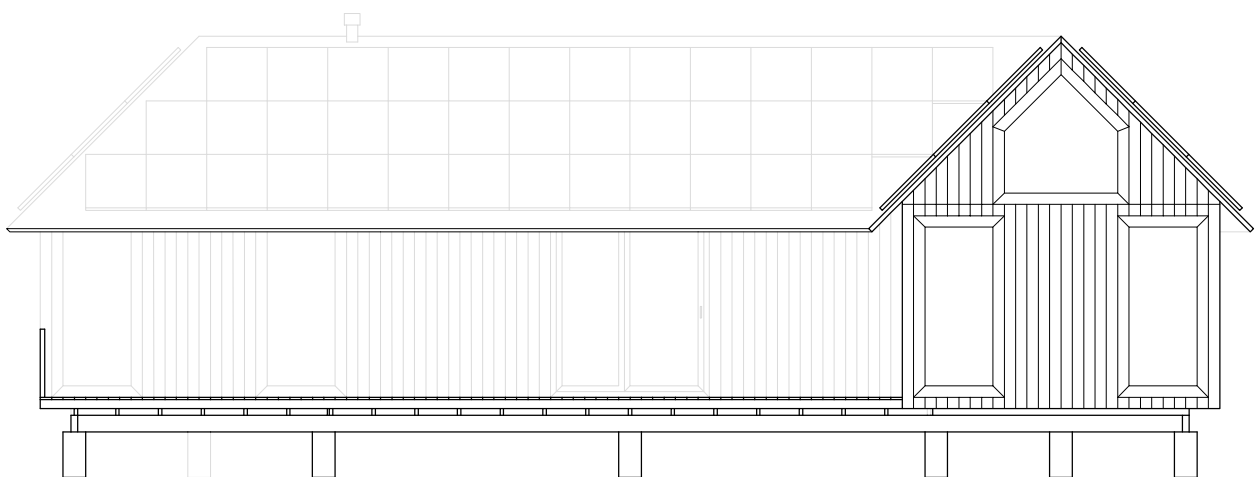


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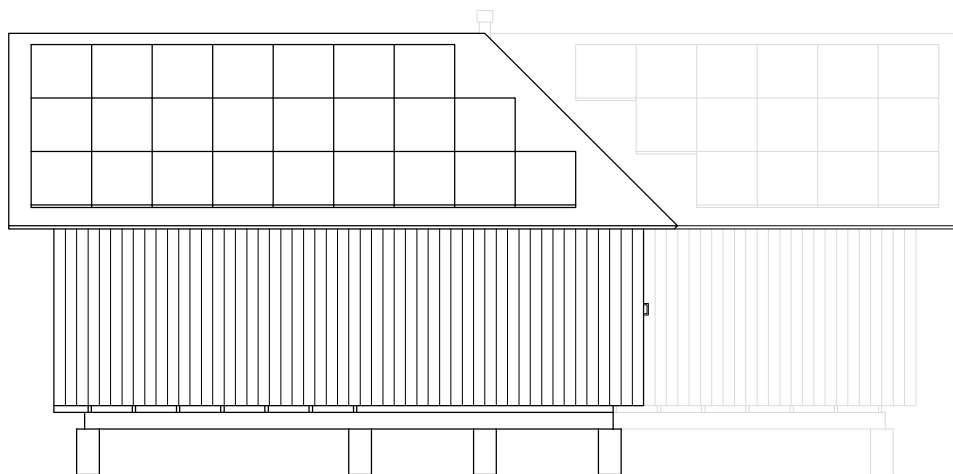




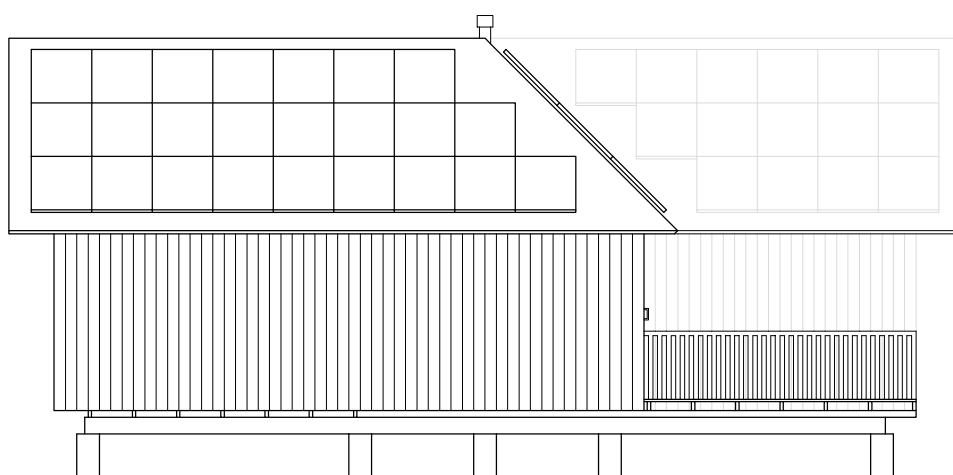
North elevation | 1:100



South elevation | 1:100



East elevation | 1:100



West elevation | 1:100





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https://fjallklubben.se/images/fjallet/SFK_Tipsar_Fjalletartiklar/lisas1.jpg
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INSPIRATION

Kyly Sauna - Avanto, 2009
Mountain cabin in Lisetra - Pushak, 2014
Zumthor Vacation Homes - Leis, 2009

