

SCENIC PRESENCE

Three architectural investigations in the Archipelago of Gothenburg



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Master Thesis 2021
Chalmers School of Architecture
Department of Architecture and Civil Engineering

Examiner: Björn Gross
Supervisor: Mikael Ekegren

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drone photogrammetry
semi-outdoor space / drawings



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Abstract

Understanding of place is a fundamental aspect of the architectural practice. It is a versatile subject of countless layers. The purpose of this thesis is to investigate a part of those layers.

Focus is put upon how one can work with the natural prerequisites of a location, and in turn, how an architectural design may answer to the attributes of a landscape. Within the topic, a question is raised regarding what tools could be used to improve the connection towards immediate surroundings and topography in the design process.

The investigation takes place at a scenic location in the Gothenburg archipelago. Three situations along the hiking trail of Galterö are explored through addition of structures. These situations represent different typologies of landscapes, where a discussion can be held by comparing how

one can answer to different situations within one geographic location. To work with the topography of each situation consciously, the technique of drones and photogrammetry is implemented as a method to achieve highly detailed 3D models, along with on-site investigations. Parallel to this, literature and reference projects on the subject of architecture concerning landscape and identity are studied.

Within the direction of building tectonics, the task has been to produce a design that ties the three structures together through a structural concept that suits its purpose, while still offering enough freedom to tailor each piece to the specific situation. In summary, this thesis aims to find strategies and knowledge on how to create thoughtful and qualitative spaces, by gaining an understanding of the given prerequisites of a location.

*“Building is a brutal confrontation
between nature and culture, and in
that confrontation one can find
balance and beauty.”*

Sverre Fehn
(Lauri, 2013, p.15)

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Victor & Ola
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Friends & family

Student Background

Education		Internships	
19-21	M.Sc Architecture and Urban Design Chalmers University of Technology <i>Studios:</i> <i>Matter, Space, Structure 3</i> <i>Architectural Heritage & Transformation</i> <i>Material & Detail</i>	19	Kengo Kuma & Associates Tokyo, Japan
		18	White Arkitekter Gothenburg
14-17	B.Sc Architecture and Engineering Chalmers University of Technology	17-18	Kjellgren Kaminsky Architecture Gothenburg

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1. Introduction

Thesis Question

Thesis Structure

Discourse

Thesis Question

Research question:

*How can architecture enhance,
and adapt to, the presence of scenery?*

Sub-question:

*How can detailed landscape models,
achieved by drones and photogrammetry,
be implemented in the design process?*

Thesis Structure

Purpose & Aim

The purpose of this master thesis is to explore how architects can answer to the given conditions of a site, in this case at a scenic location typical for the Gothenburg region. Focus is put upon place identity regarding nature and different approaches to how architecture relates to its surroundings. The aim is to find strategies and knowledge on how to create thoughtful, sustainable, and qualitative spaces by gaining an understanding of given prerequisites of a location.

Method

This thesis is carried out through research by design, where the questions are explored and manifested through a design project. It is performed through three situations at Galterö with varying landscape attributes. The sub-question is explored by using the technique of drones and photogrammetry as a tool, which is further explained in chapter 2. To situate the project at a site that is easy to reach is a conscious choice, which allows for frequent visits throughout the project, and the ability to perform on-site analysis.

Delimitations

The project’s focus is put upon where structures are placed in the studied topography, and how the design relates to the landscape. It does not consider current development plans or regulations regarding shoreline protection, although structures by the shoreline have been designated to public and semi-public functions. The structures do not follow regular accessibility standards. Instead, the level of accessibility has been kept in coherence with the hiking route of where the structures are located.

Reading Instructions

The booklet is divided into four sections. Chapter 1 gives an introduction to the discourse of the thesis and its structure. Chapter 2 contains investigations and analyzes that have been carried out within the thesis work, as well as the program. Chapter 3 presents a speculative design of three structures, where the tools and knowledge presented in chapters 1 & 2 have been implemented. Chapter 4 discusses the implementation and overall outcome of the thesis.

Discourse

On sense of place

In *Nightlands*, Norberg-Schulz (1996) states that “it is architecture’s task to enable dwelling, and this task is satisfied by building in resonance with the given place. Understanding of the place is consequently architecture’s basis.” Norberg-Schulz is a recognized theorist within the subject, who introduced the term ‘genius loci’ to the architectural field with a publication in 1979. ‘Genius loci’ can be understood as an intangible phenomenon, which comprises the identity of the place. In his book *Nightlands*, Norberg-Schulz elaborates on how this is expressed in a Nordic context, with a focus on the relation between built structures and the attributes of landscapes. He advocates that structures are missioned to make visible what is given within the context they are situated in. Buildings that compose ‘genius loci’ should not be seen as isolated objects, but as elements in the context they are part of.

According to Norberg-Schulz, visualization of place can be made in two ways: either in representing the given or by complementing it. Representation occurs in a corresponding architecture, while complementation results in a contrast, by adding something that the environment lacks.

He argues that these two approaches always operate together in varying scales, but typically, the Nordic landscapes require contrasting complementation.

Understanding of place does not appear by entirely focusing on ‘near-sighted’ local phenomena. Imported objects and aspects can serve as a measure, with the possibility to achieve a better understanding of domestic values. (Norberg-Schulz, 1996)

Nordic architecture is traditionally and internationally claimed to show authenticity and sensitivity towards local and natural conditions. It is said to represent its context, with concepts and materials sprung from nature and the soil it stands on. In *NEW NORDIC*, Mari Hvattum questions if this is accurate today since she sees a new tendency amongst young Nordic architects. The understanding of place has been reinterpreted to a broader perspective. She claims that some of the most prominent Nordic architects of today show a many-layered artificiality, which visualizes its context by complementation. Still inspired by nature, but to describe the design as mimicry of topographical form and usage of “natural” materials, would be underestimating.



Rivö, November 2020

On technical advancement

“The untutored builders in space and time [...]demonstrate an admirable talent for fitting their buildings into the natural surroundings. Instead of “conquering” nature, as we do, they welcome the vagaries of climate and the challenge of topography.”

(Rudofsky, 1965)

Architecture without architects

There is a lot to learn from vernacular architecture on how to adapt structures to prevailing topography. One could of course argue that the “conquering” way of building that Rudofsky points to was enabled through modern technical advancement, which has only been an option for so long. However, the modern movement has been widely accused of the decline in sense of place, where the International Style, efficiency, and one-fits-all solutions have been labeled as projects of placelessness.

These issues were addressed in the ‘80s through critical regionalism, where its advocates seek to provide an architecture that is modern, while also tied to its geographical and cultural context. (Lefaivre, 2003)

In *6 Points Towards a Critical Regionalism*, Frampton (1983) argues that the specific culture of a region, both in a geological and agricultural sense, becomes inscribed into the form when it is adapted to its topography. When adapting a building into a site, the specific and peculiar attributes of the place find their expression without falling into sentimentality.

Technical advancement is also accused of a loss in sense of place by architects since the transition from physical drawings to computerized linework made it possible to exclude tedious architectural work to represent landscapes. This used to be where the architects got to know the terrain; by tracing and retracing it, it became ingrained in one’s mind. It is said that when a computer regenerates the terrain, the study on topography goes missing. (Sennnett, 2008)

Technology needs to be used to the architect’s advantage, to achieve a higher sense of place and more accurate design. It needs to be developed to a modern way of working, where the architect can be more involved with the terrain, and where structures are adapted according to the topography instead of the other way around.



Paper Model, scale 1:10.

*Conversation piece showcasing the possibility
to communicate texture and intricate shapes in
detailed physical landscape models.
Made of cut 0.33 mm paper.*

2. Investigation

Drone photogrammetry

Reference project

Site analysis

Program

Drone photogrammetry

[m]

definition. **Photogrammetry**
/ˌfəʊtə(ʊ)ˈɡræmɪtri/
noun

the use of photography in surveying
and mapping to ascertain measurements
between objects. (OxfordLanguages)

Capture of landscapes

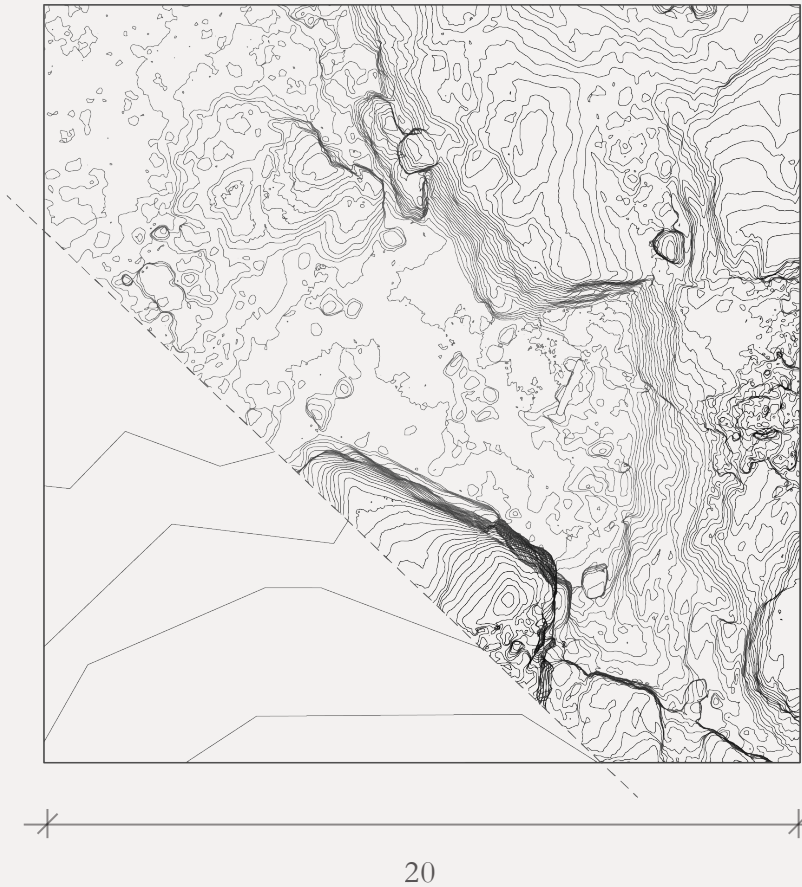
With the architectural practice being based around 3D modeling, it is relevant to search for a better representation of landscape models than what is commonly found today.

The technique of drones and photogrammetry makes it possible to capture a site with high accuracy of the topography and its actual texture. The drone captures geotagged photos of the site with a 70% overlap, and with the help of photogrammetry software, the photos are puzzled together in space to reproduce a 3D model. Depending on the size of the site and the altitude of the drone, different scales of resolution can be produced, although the result overall exceeds the accuracy of general height curves.

Permissions

The drone industry is developing at a high pace, with an increased number of regulations to follow. In January 2021, laws concerning drone operators within the European Union were implemented. These regulations classify drones according to weight and technical capabilities and requires anyone who wish to operate a drone to obtain a license according to their respective classification. Additionally, the area in question needs to be checked for allowance.

Flight sessions performed within this thesis have been conducted by the author who has obtained a pilot license from Transportstyrelsen. Additional correspondence has been made with Luftfartsverket, Naturvårdsverket and Länsstyrelsen to grant permission for drone activity at Galterö.



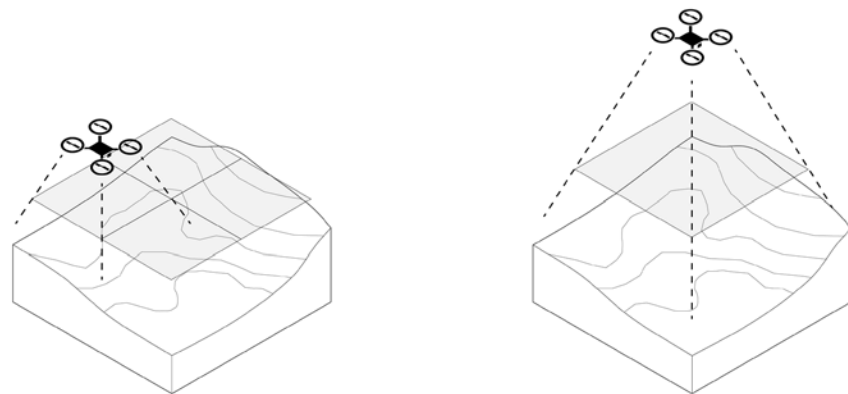
Comparison of general 2 m height curves to
achieved photogrammetry in 0.1 m height curves.
The interval can be alternated to fit varying scales.

Limitations

Area, altitude & battery

The level of detail in the extracted 3D model is linked to the altitude at which the drone operates. High altitude equals fast capture, although with a lower resolution of the 3D model. Lower altitudes requires more photos for sufficient overlap, which results in a slower capture, but higher resolution.

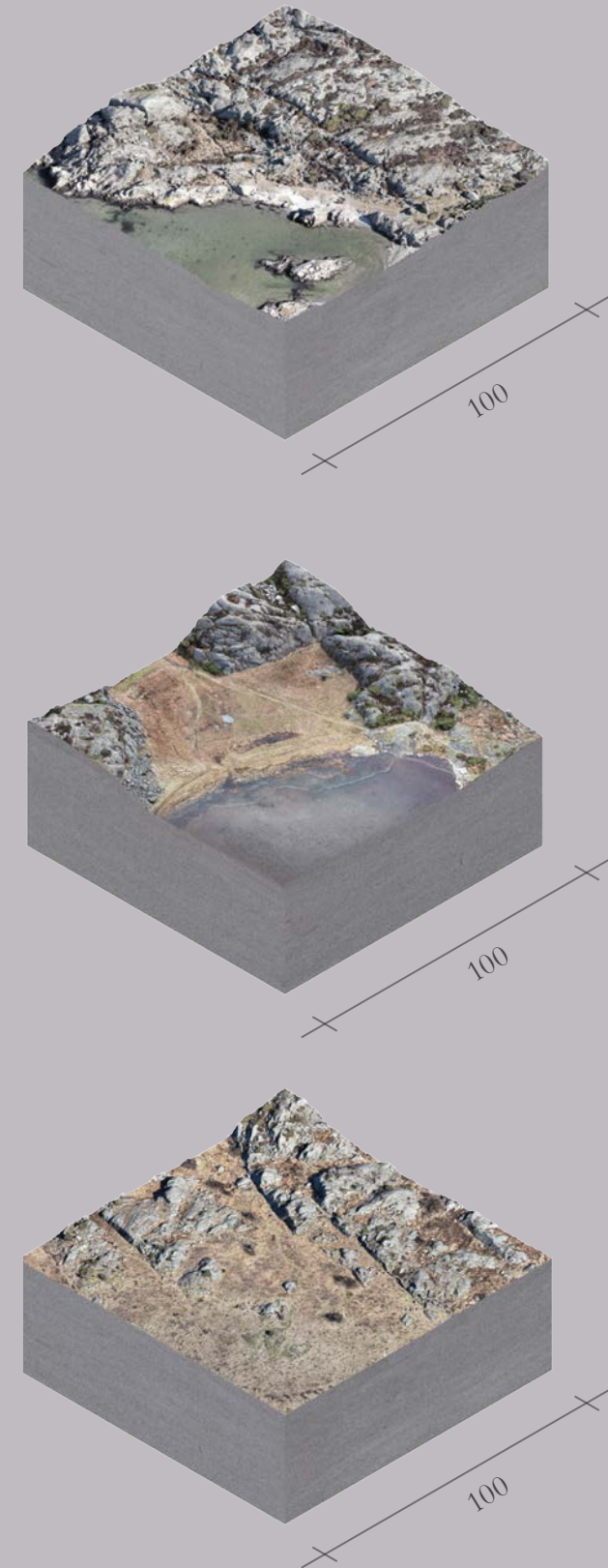
The altitude is thus linked to the speed of the capture. This is affected by the battery capacity, which determines how much time the session can allow. Parameters to adjust are then the size of the area and altitude, to find values that match the battery capacity. One battery typically lasts for 15-20 minutes.



Workflow

- Examine the area of interest, check for permissions, and suitable location for take-off/landing.
- Capture photos through the drone with software applications set to sufficient overlap and angles.
- Perform photogrammetry through photogrammetry software with captured photos to extract 3D mesh.
- Scale and set coordinates of the 3D-mesh according to maps, geotags or indicators.

[m]



Achieved 3D models from Galterö, depicting varying situations which are used as testbeds for further investigation.

Reference project

Fogo Island by Saunders Architecture

2010-2013 // Newfoundland, Canada

“Strange and familiar”

The architecture has been labeled strange and familiar - which is also the title of a documentary picturing the project and its connection to the community of the island, situated in a harsh archipelagic landscape. The architect grew up on an island nearby, and within this project, he has collected a lot of inspiration and references from local building tradition.

Saunders states that the project is about *finding new ways with old things*. Everything that could be produced locally was, and the rest were collected with the nearest possible distance. If you look closely at the buildings, the composition of materials is very familiar. Once you zoom out, the shape of the structures may appear strange and unknown, but still with a familiar scale and humble way of touching the ground. Saunders describes his own approach towards the landscape as to either enhance its qualities or give it a quality that it's missing. (Knight & Connolly, 2014)

Quotes from the architect

“Newfoundland has a different, very rough kind of beauty. The landscape appears harsh, but it is also fragile. Architecture has to sit lightly on the land, yet also become a part of it.” (p.39)

“An abstract and modern architectural response to the landscape can be made strongly sympathetic through the use of natural materials and the way the structure meets the ground.” (p.87)

“Wood has always been there. It has a human quality and it also has a flexibility, an elasticity. You can mould it and turn it and twist it, but it will always be warm and inviting, part of the landscape.” (p.99)

(Stathaki & Bell, 2016)



Image 1-3.



Site analysis

Galterö



Galterö, September 2020.

A nature reserve and a military area

Galterö is located in the northwest of Gothenburg's southern archipelago. There are only a few buildings present, making it an appreciated location for people to enjoy the archipelago.

The island can be reached by public transport, although it does not have a ferry stop of its own. Passengers can catch the ferry from Saltholmen to Brännö Rödsten, which takes about 18 minutes, and then walk for another 30 minutes across Brännö before reaching Galterö by a small stone bridge.

The island is divided into a military area in the west, and a nature reserve in the east which was established in 2014. The military facilities were dismantled at the turn of the millennium, and visitors are now allowed to move around also in the west part.

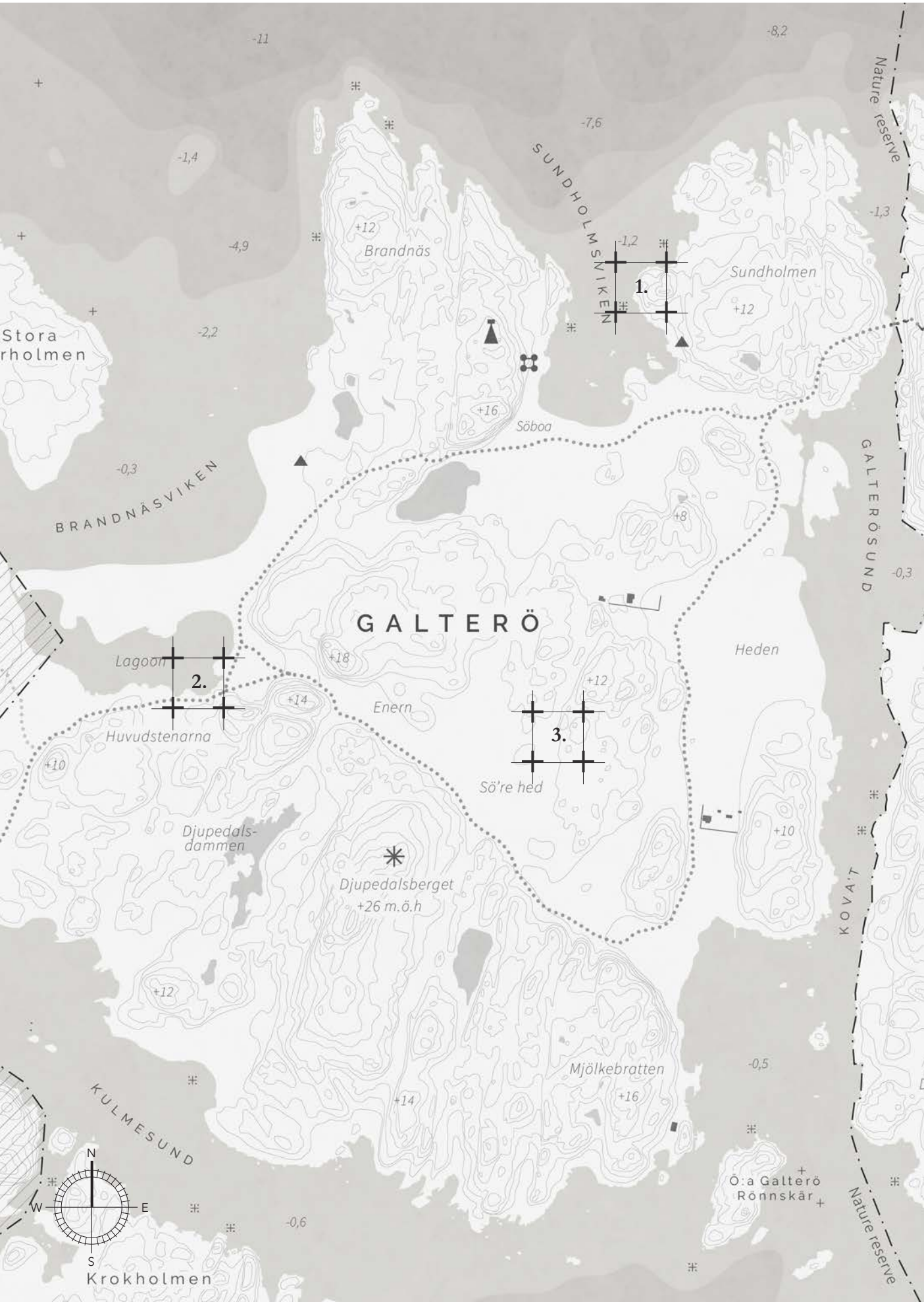
A rich biotope in a cultivated land

The island has a long history of cultivation, where farmers from Brännö have used the island for grazing animals since the 1800s. Visitors are likely to encounter sheep who roam freely around the island from March to December.

The livestock keeps the vegetation low, which has created a rich biotope of birdlife and vascular plants, with high nature values. It is important that the landscape is kept open, with low vegetation, in order to protect the reserve and its species.

In recent years, the grazing animals have been too few to ensure an open landscape, causing the community of Brännö to regularly burn and clear parts of the landscape in order to preserve the unique biotope of Galterö. (Hellman et al., 2020).





Program

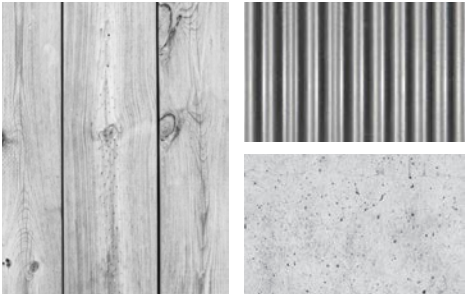
	3 typologies		
	1. The sauna	2. The shelter	3. The cabins
Prevailing landscape:	Cliffs Ocean	Lagoon Reed	Moorland Rocks
Size:	~30 m²	~20 m²	~10 m²
Availability:	Semi-public	Public	Semi-private
	A wood stove sauna facility which can hold a group of 8 people, with changing room, incinerating toilet, showers, and ocean bathing.	A sheltered space that offers protection from the wind and weather, as well as different qualities throughout the day. A place for visitors to rest, with the possibility for multiple groups to gather.	A set of three compact rentable cabins where 1-4 people can stay the night. Equipped with a wood stove for heating, space for simple cooking, table, and bunkbeds. Bathroom facilities in a separate structure.

Design Criteria

The criteria summon key concepts developed with the location of Galterö in mind. Following the theories presented in the discourse, they are meant to house the capability to represent as well as complement that which is given within the landscape. References are therefore mainly found within the geographical context of the archipelago, but with room for some imported concepts.

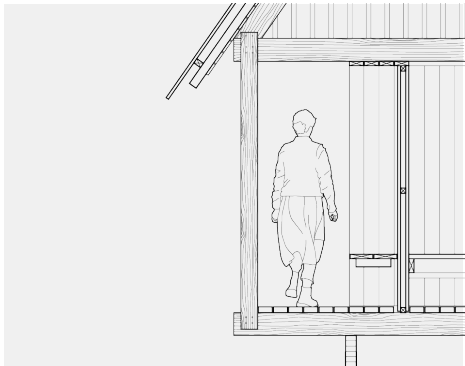
Materials

The buildings are to be mainly designed in wood, due to aesthetical as well as contextual and practical reasons. The absence of infrastructure requires light materials that can be transported to the site. Steel and concrete are to be added in small amounts where needed, in order to protect the wood and create a durable design in an exposed location.



Transitional space

Focus is put upon spaces that can dissolve the transition from the sheltered inside to the exposed outside. With the archipelagic climate in mind, semi-exterior protected spaces are sought after. Inspiration is found in the verandas of the archipelago, as well as the Japanese engawa.



Foundation

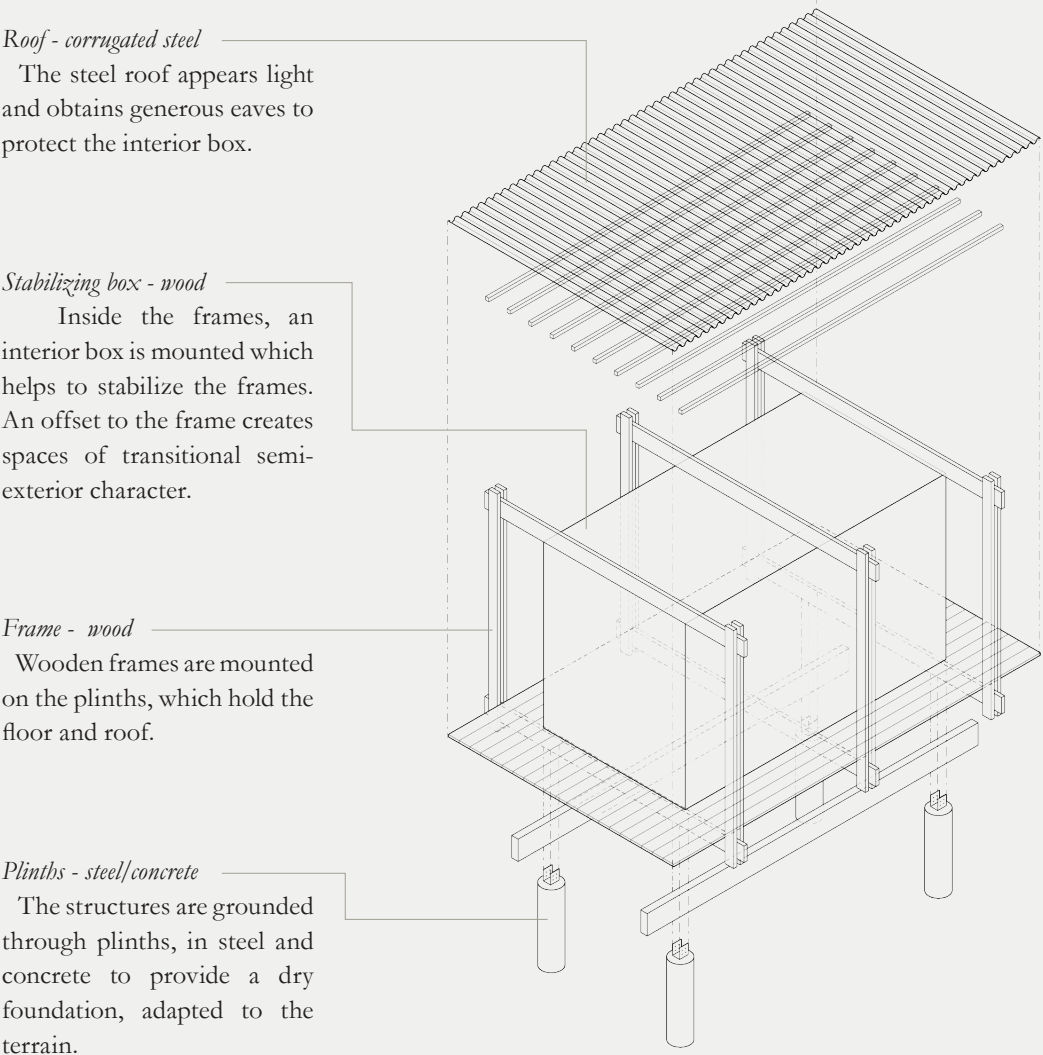
The structures are to be designed with minimum impact to the landscape, thus a plinth foundation is preferable, to level the structures from the intricate topography. Inspiration, as well as arguments, are found around the archipelago, where leveling through rocks have been done for centuries.

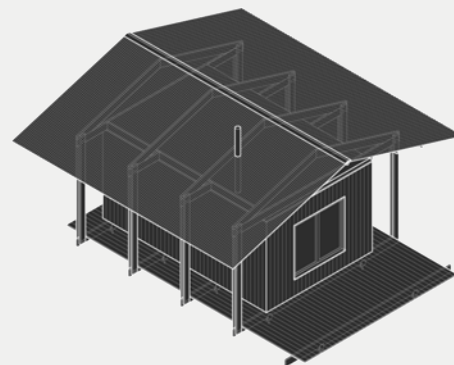
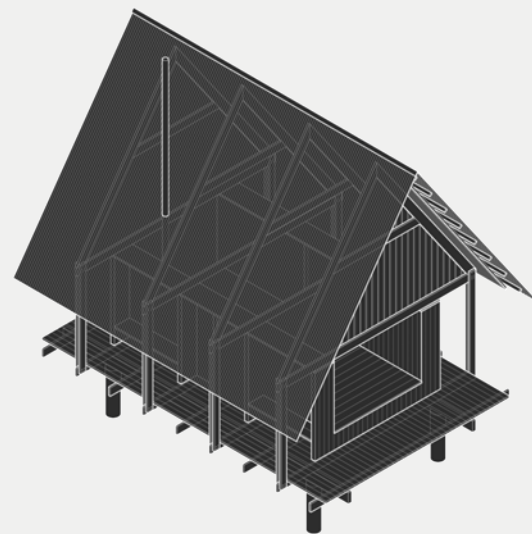
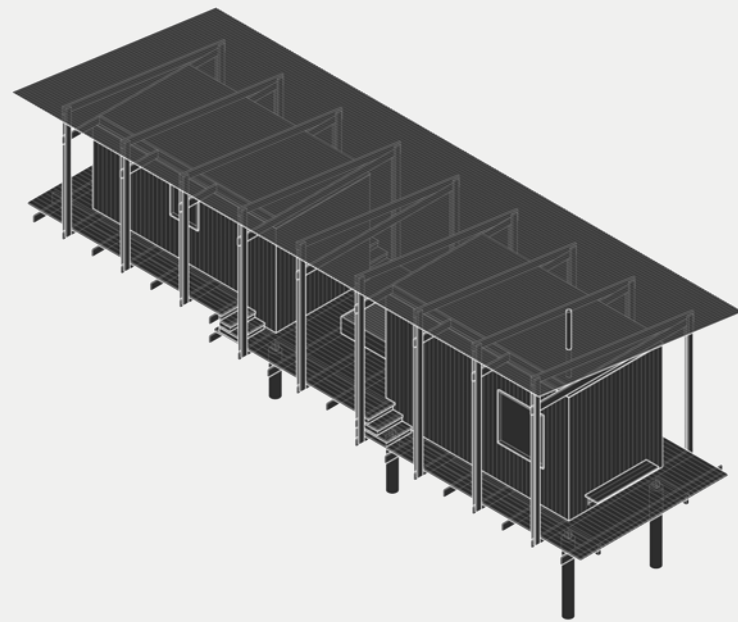


Boat house at Källö, November 2020

Structural Concept

In order to tie the structures together, a structural concept has been developed according to the design criteria. Within this concept, dimensions and angles are allowed to differ, to tailor each structure to the given situation.





3. Implementation

The Sauna

The Shelter

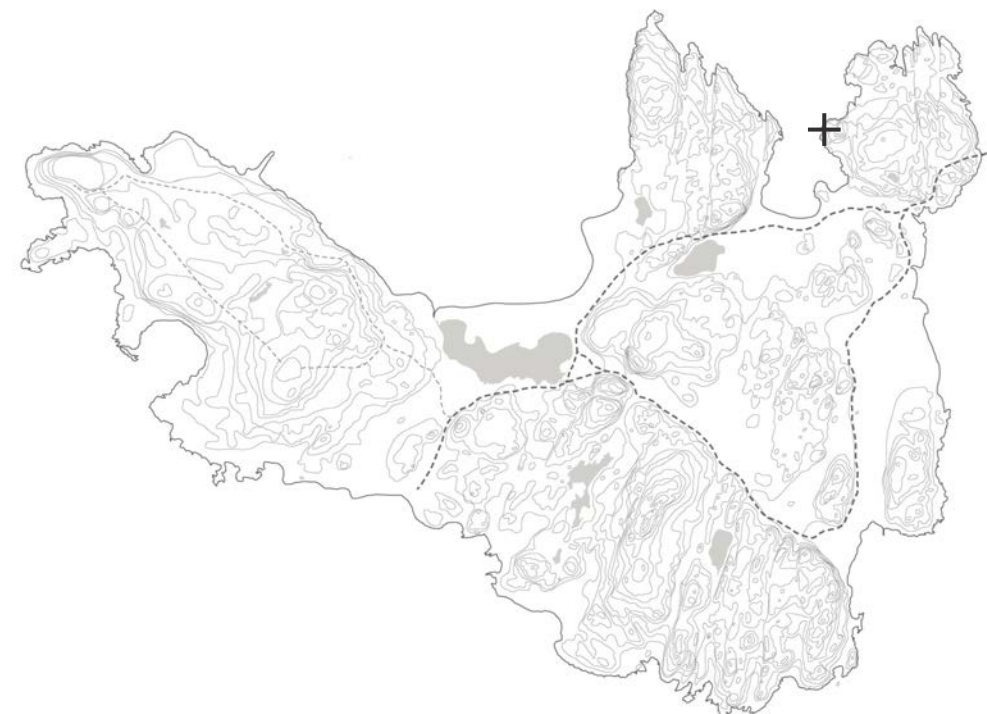
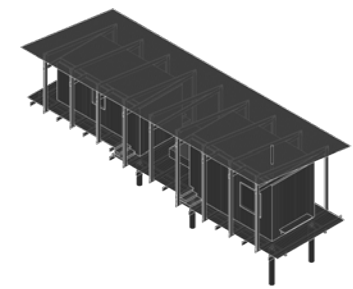
The Cabins



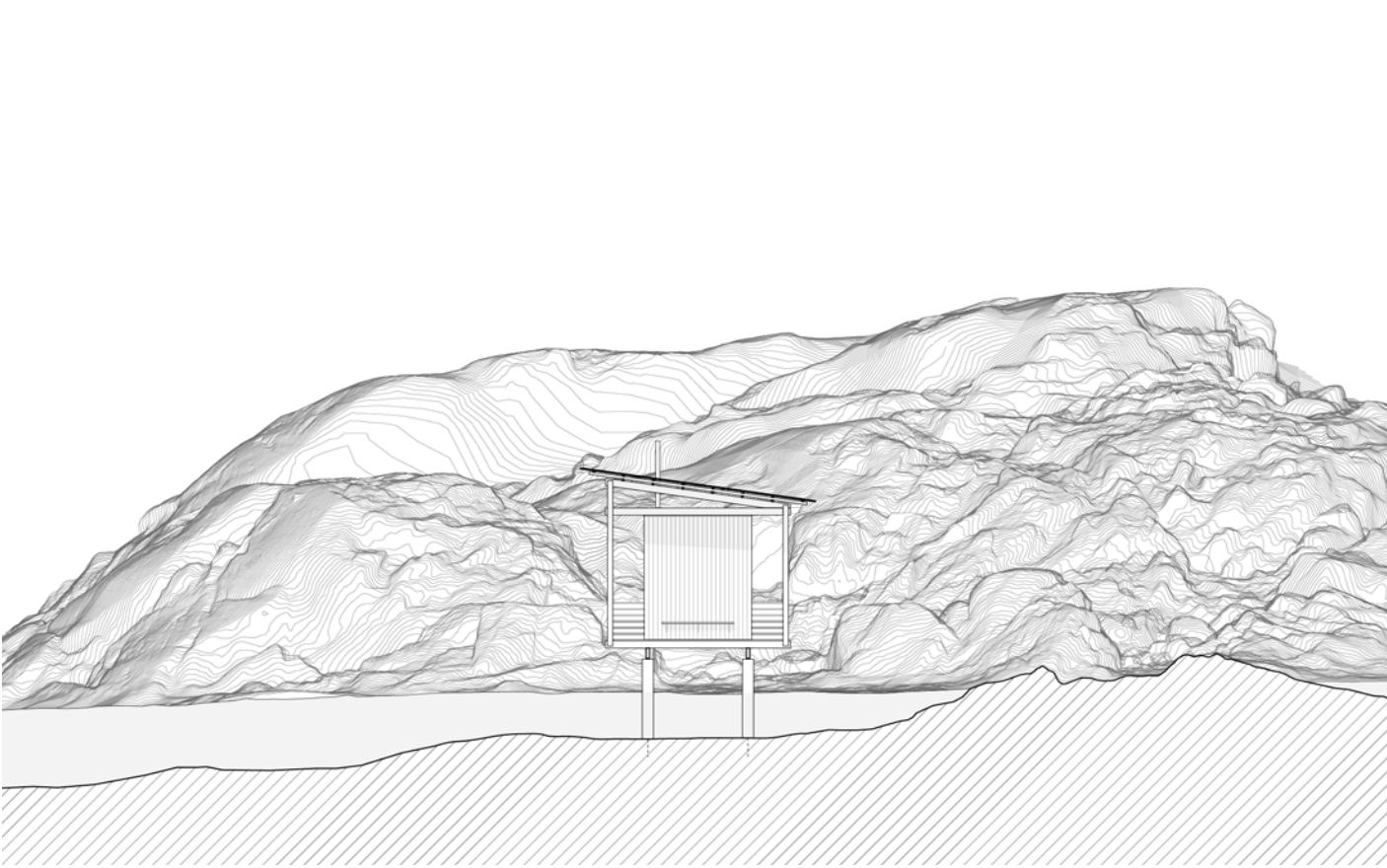
The sauna

The cliff & the ocean

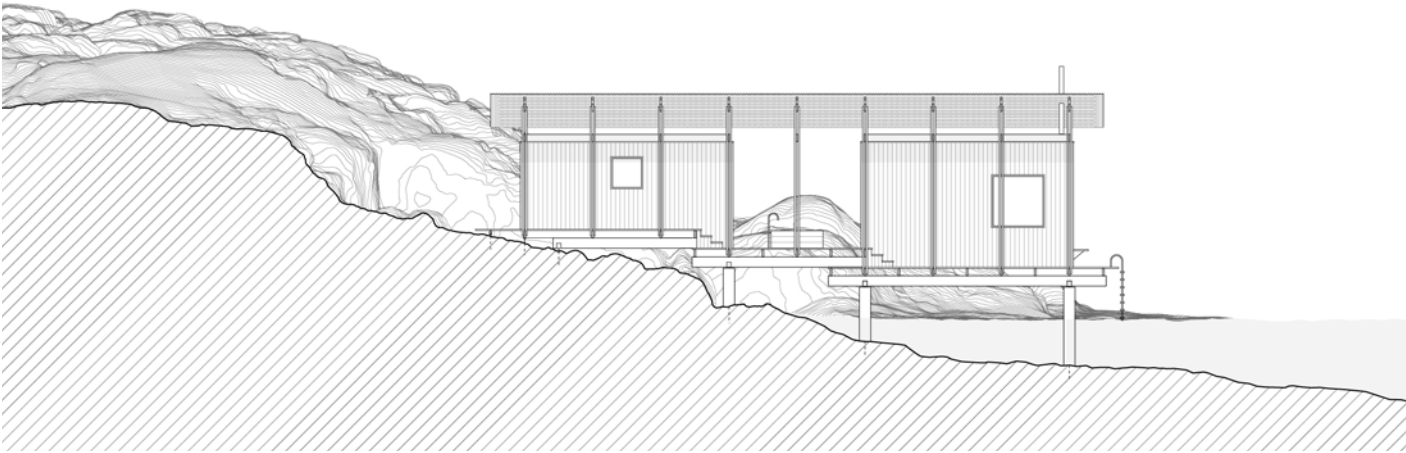
In order to reach cliffs in direct connection to the ocean, it is necessary to part from the trail. In the intersection of these elements, a sauna is to be placed. It is carefully fitted to the situation, finding its place in a narrow crevice. This allows the structure to peak out from the crevice onto the ocean, which makes it partly visible from the trail. A mindful treatment of the structure's height makes it subordinate to the steep and exposed cliff formations.





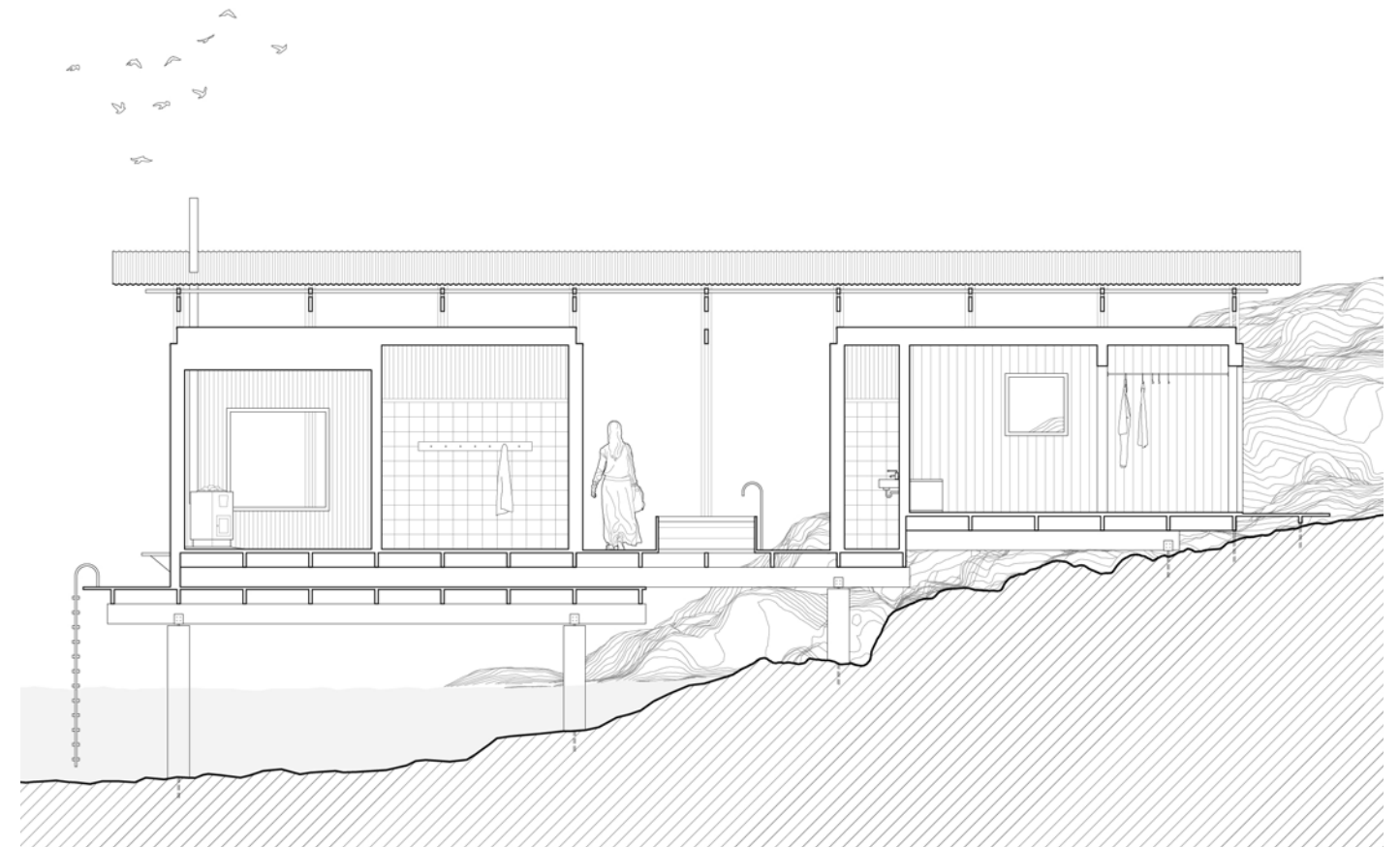
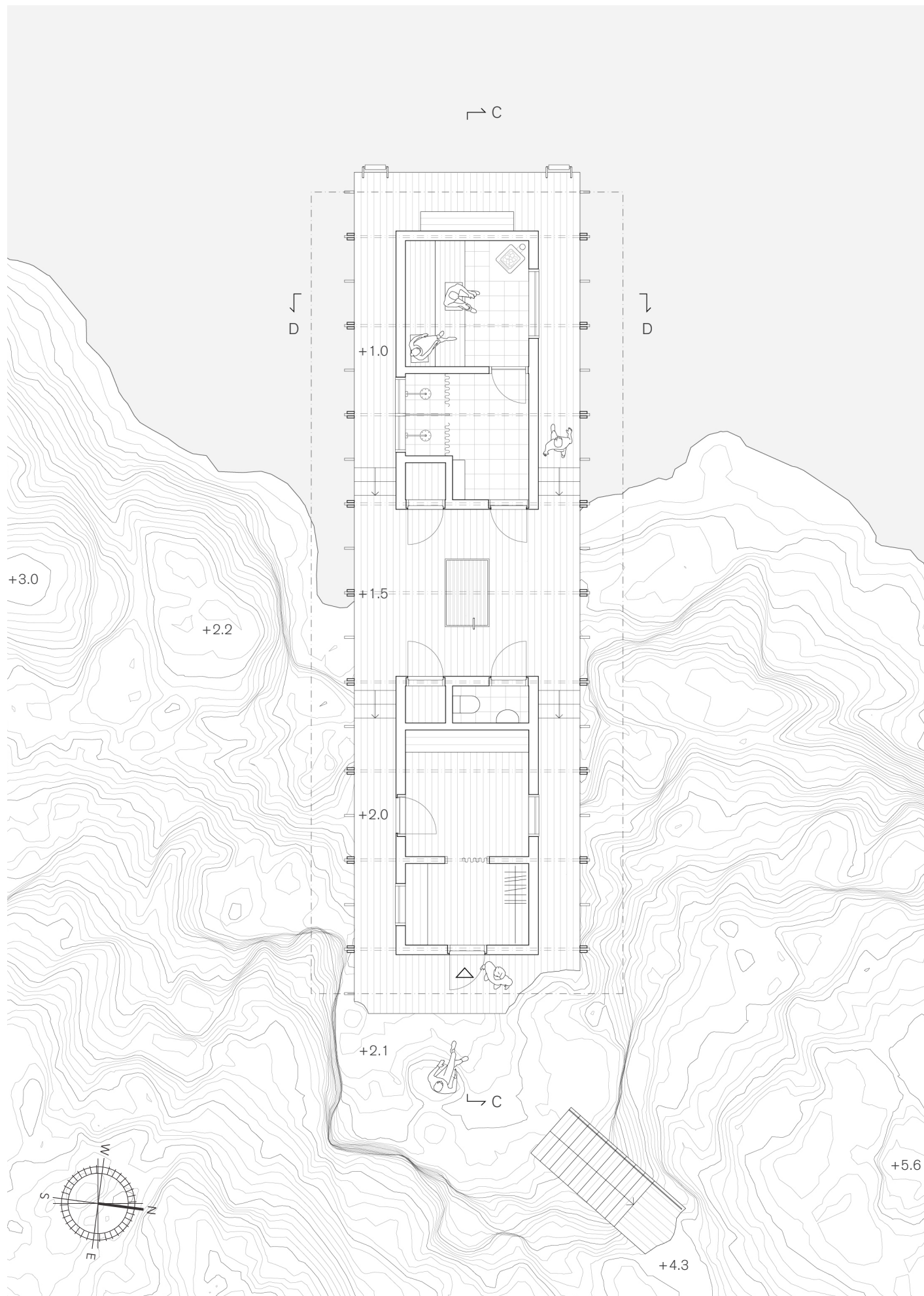


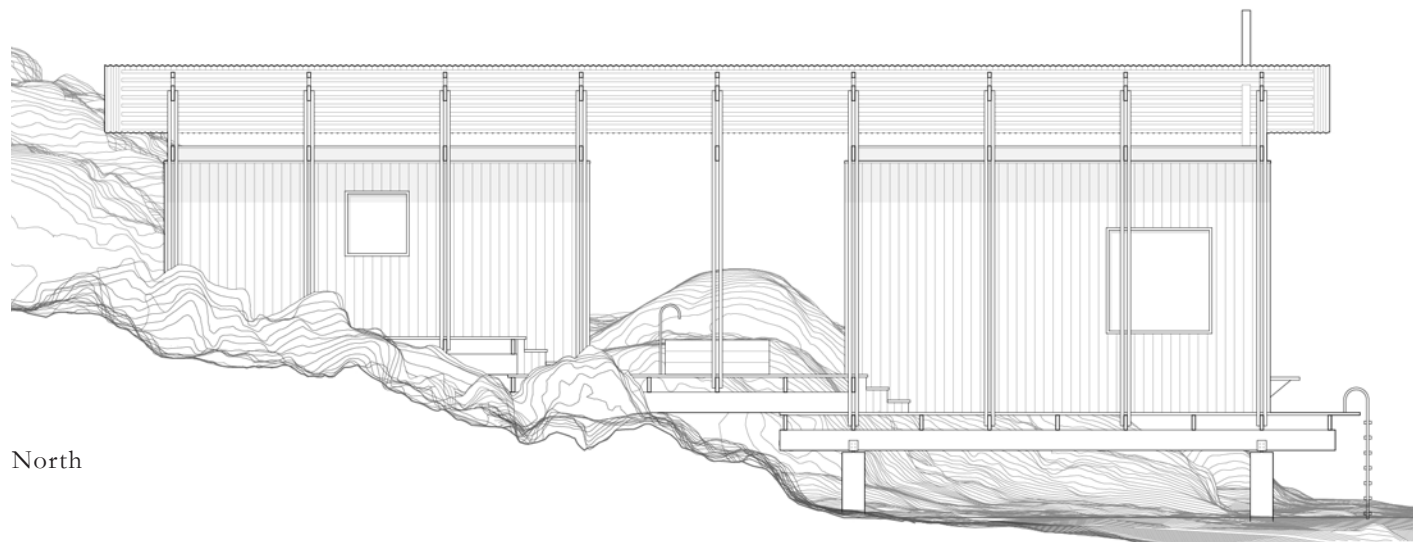
Section A-A



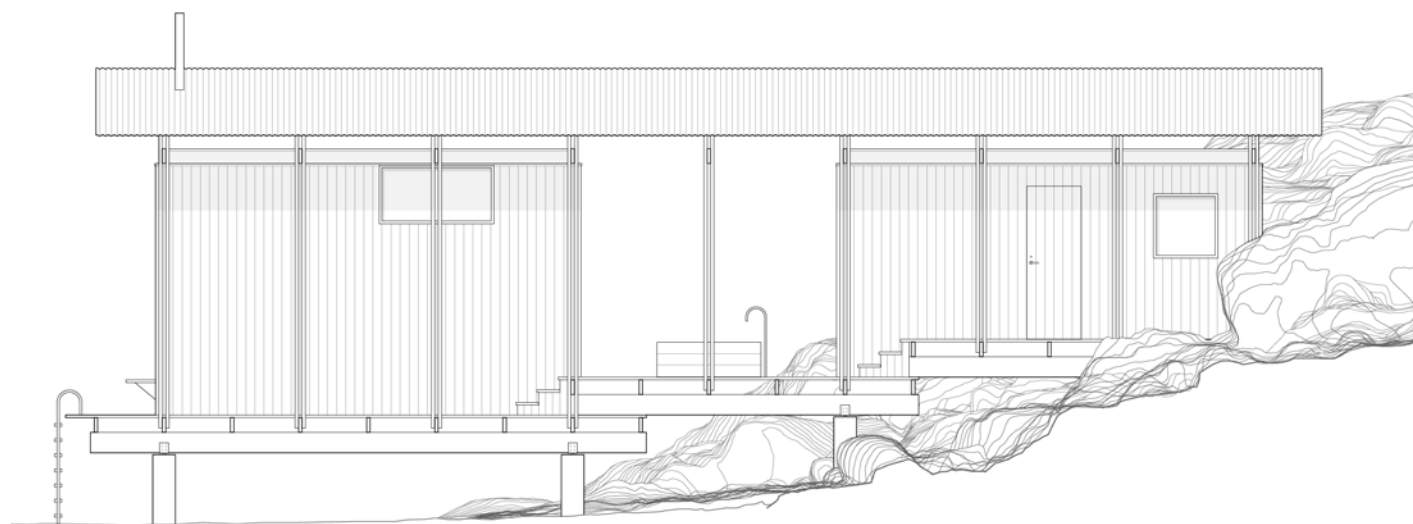
Section B-B





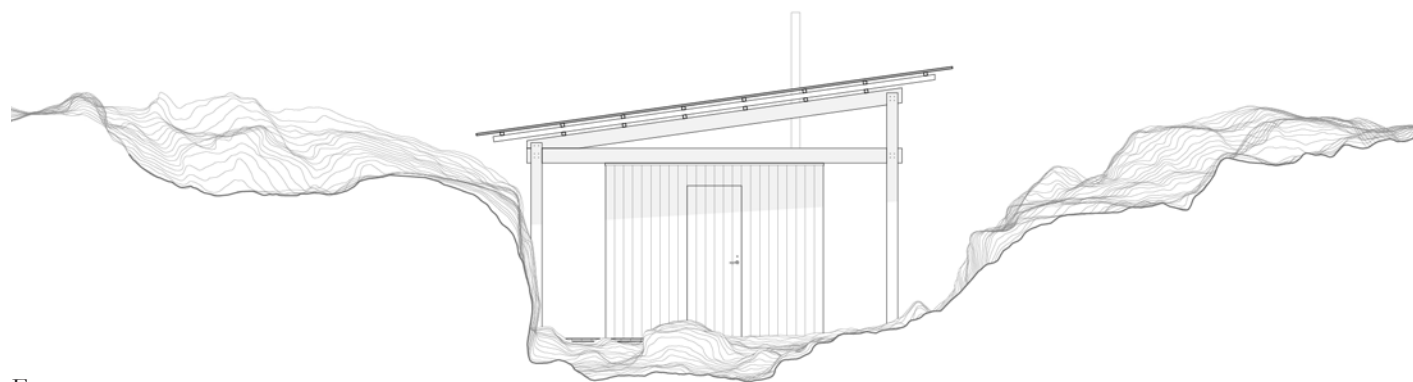


North

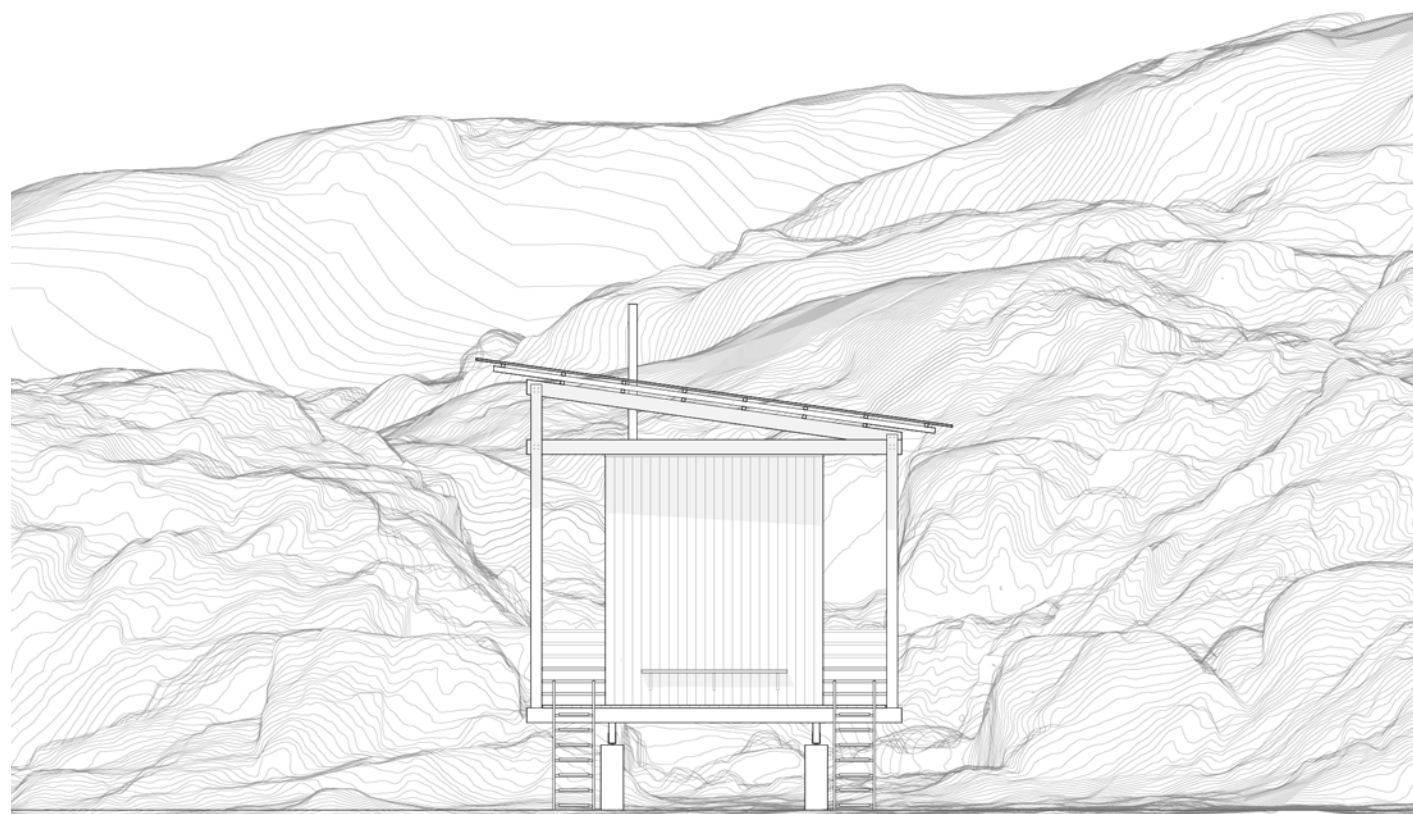


South



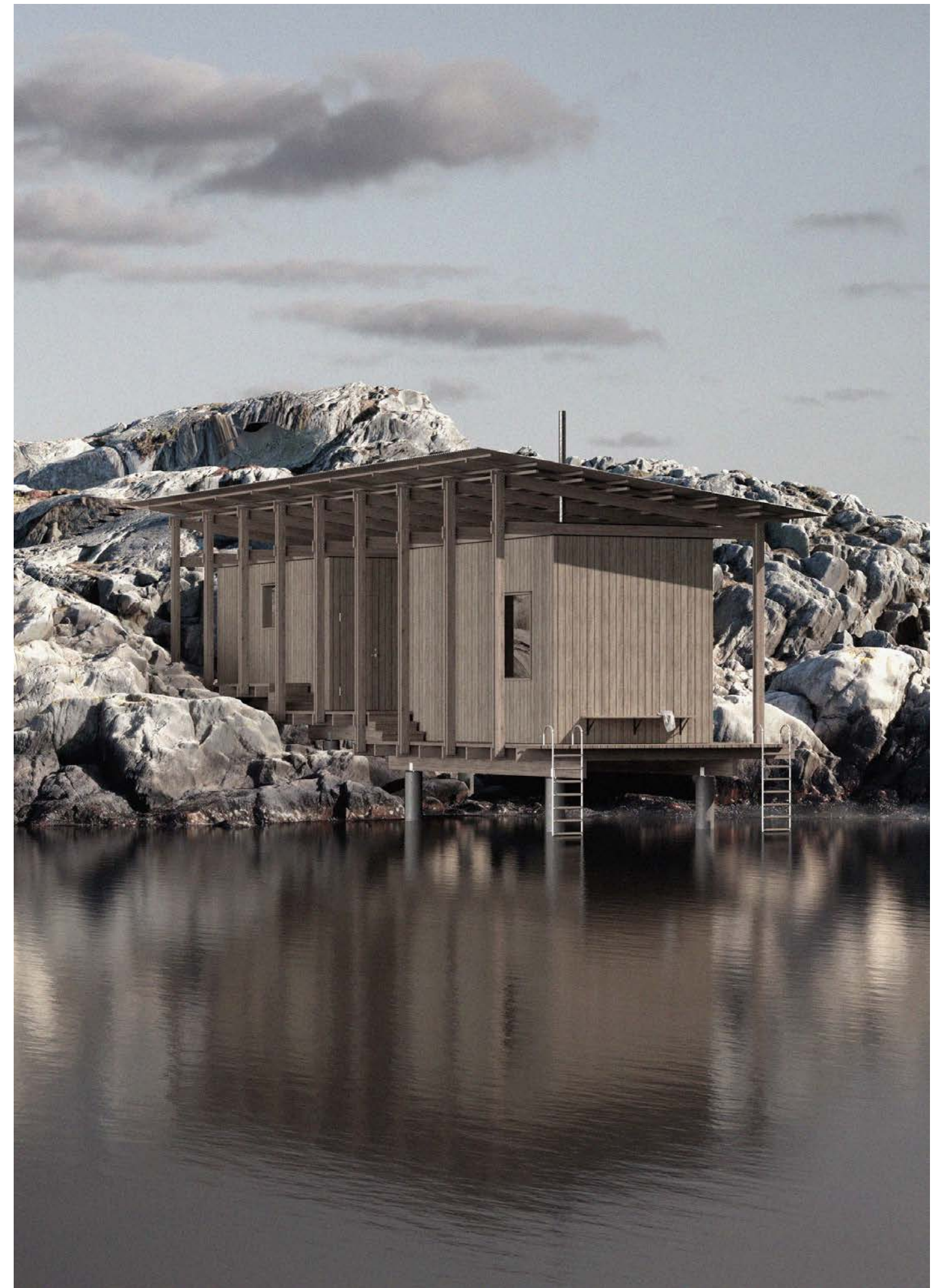
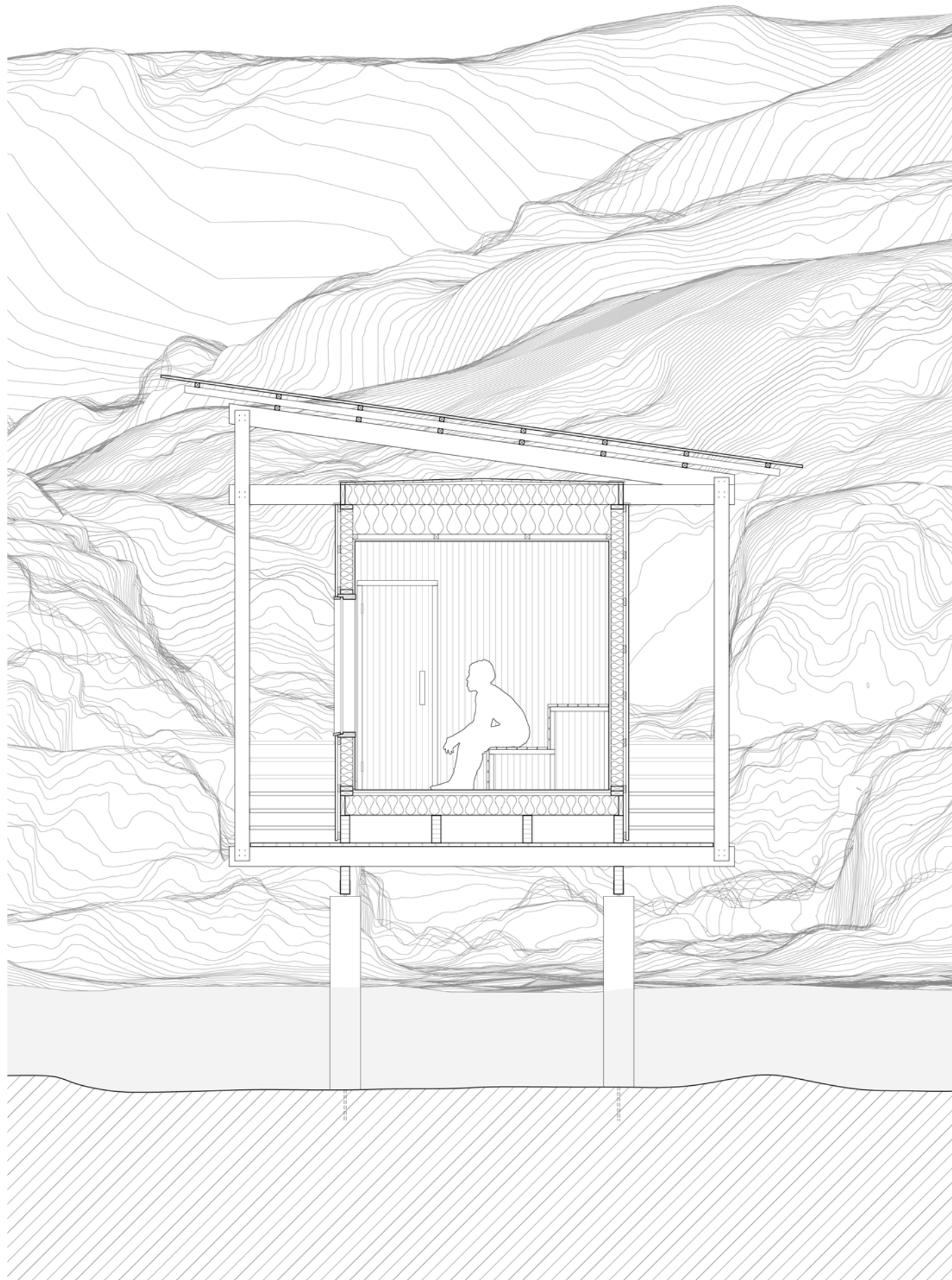


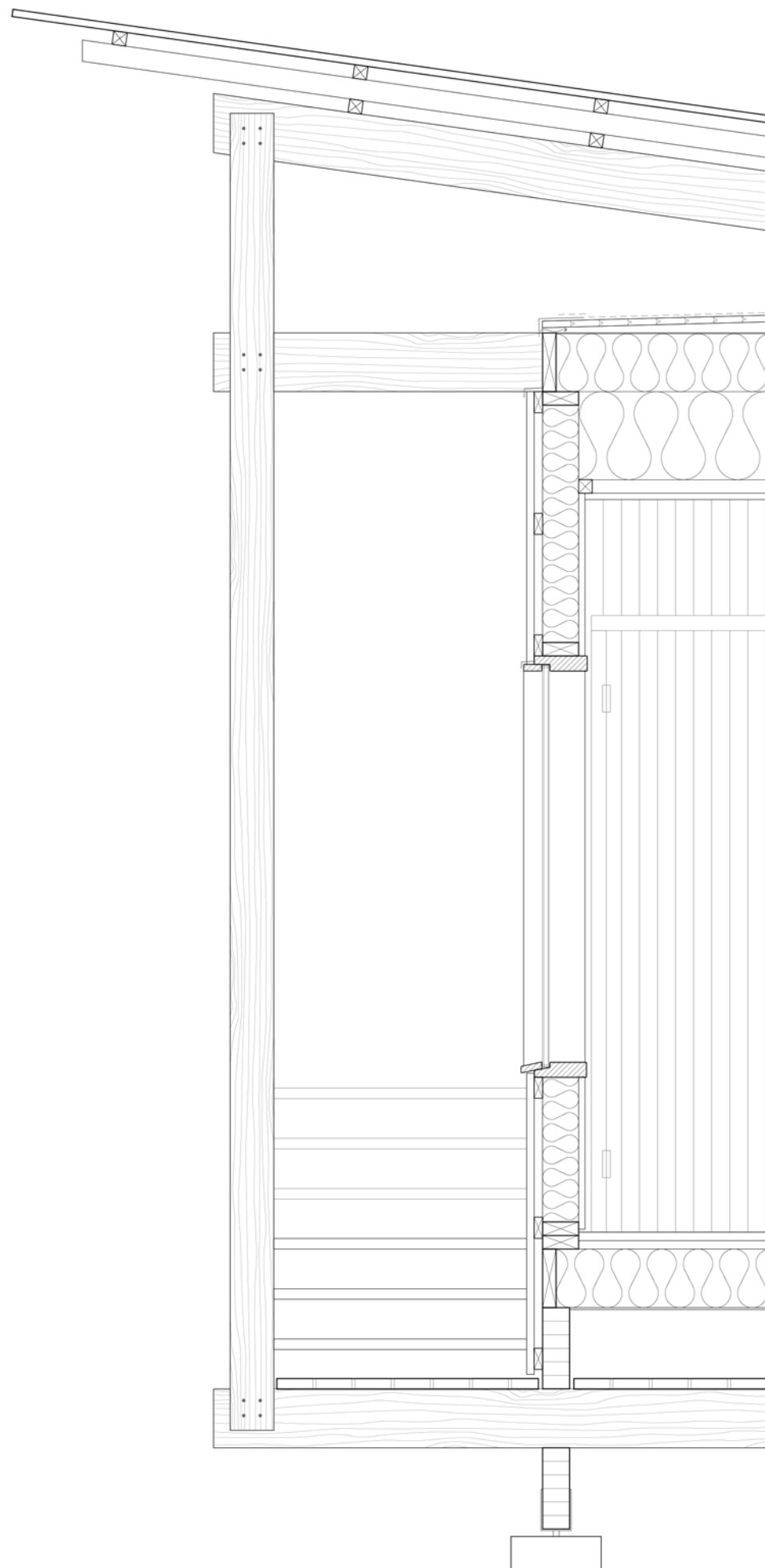
East



West

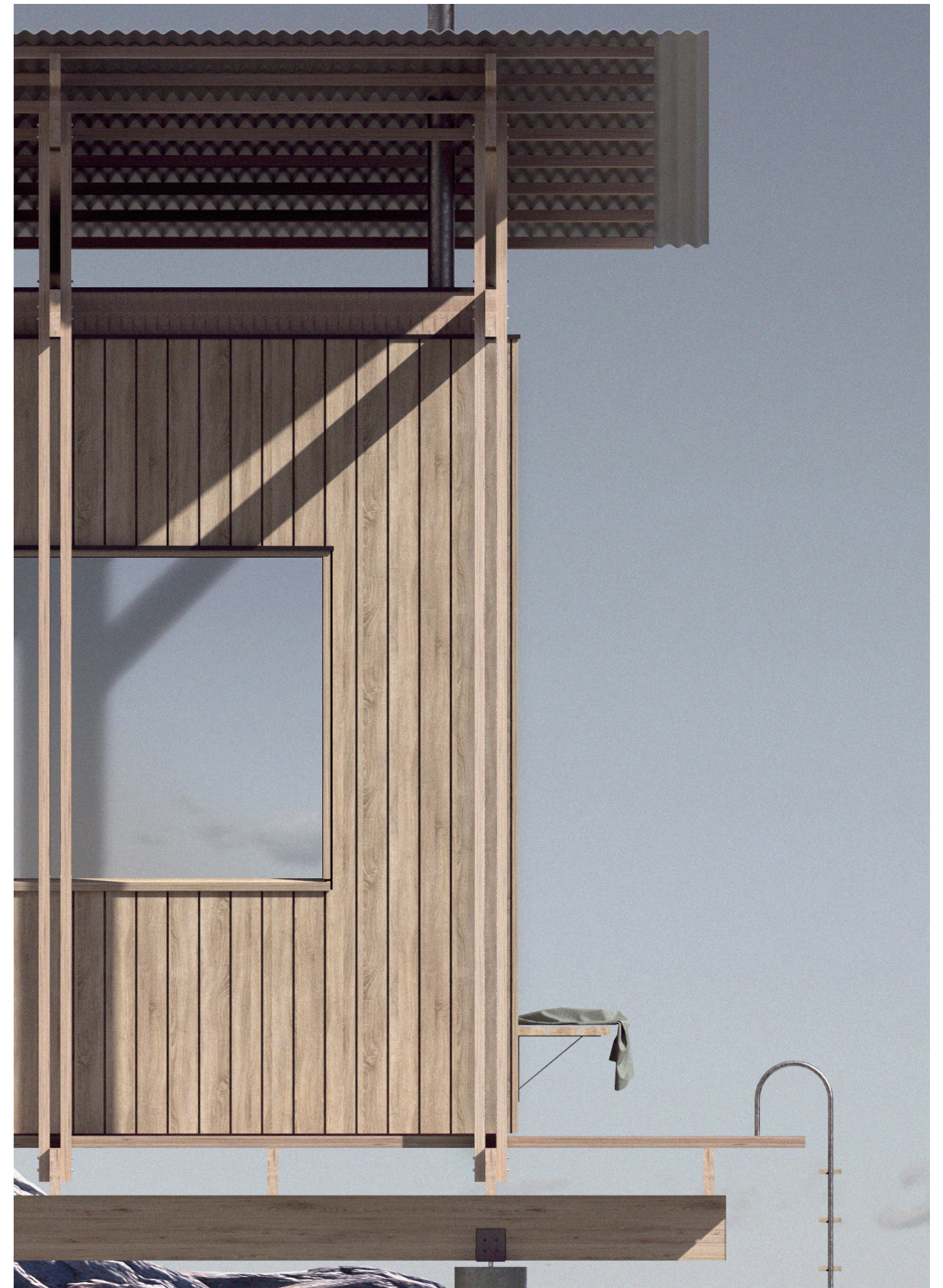






Detail, scale 1:20

0 0,1 0,5 m



The Sauna // Implementation | 47

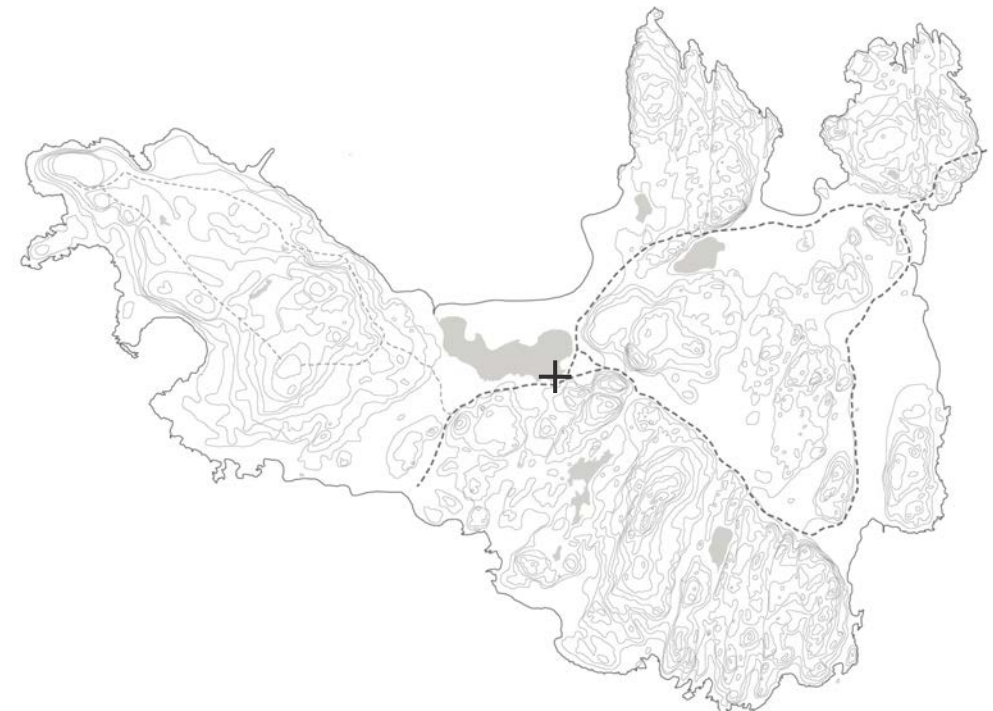
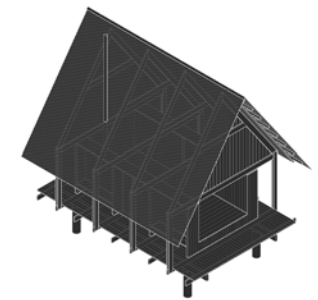


The Shelter

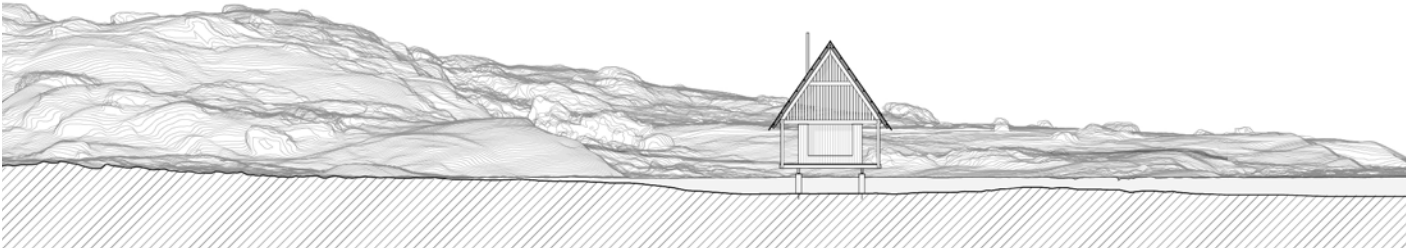
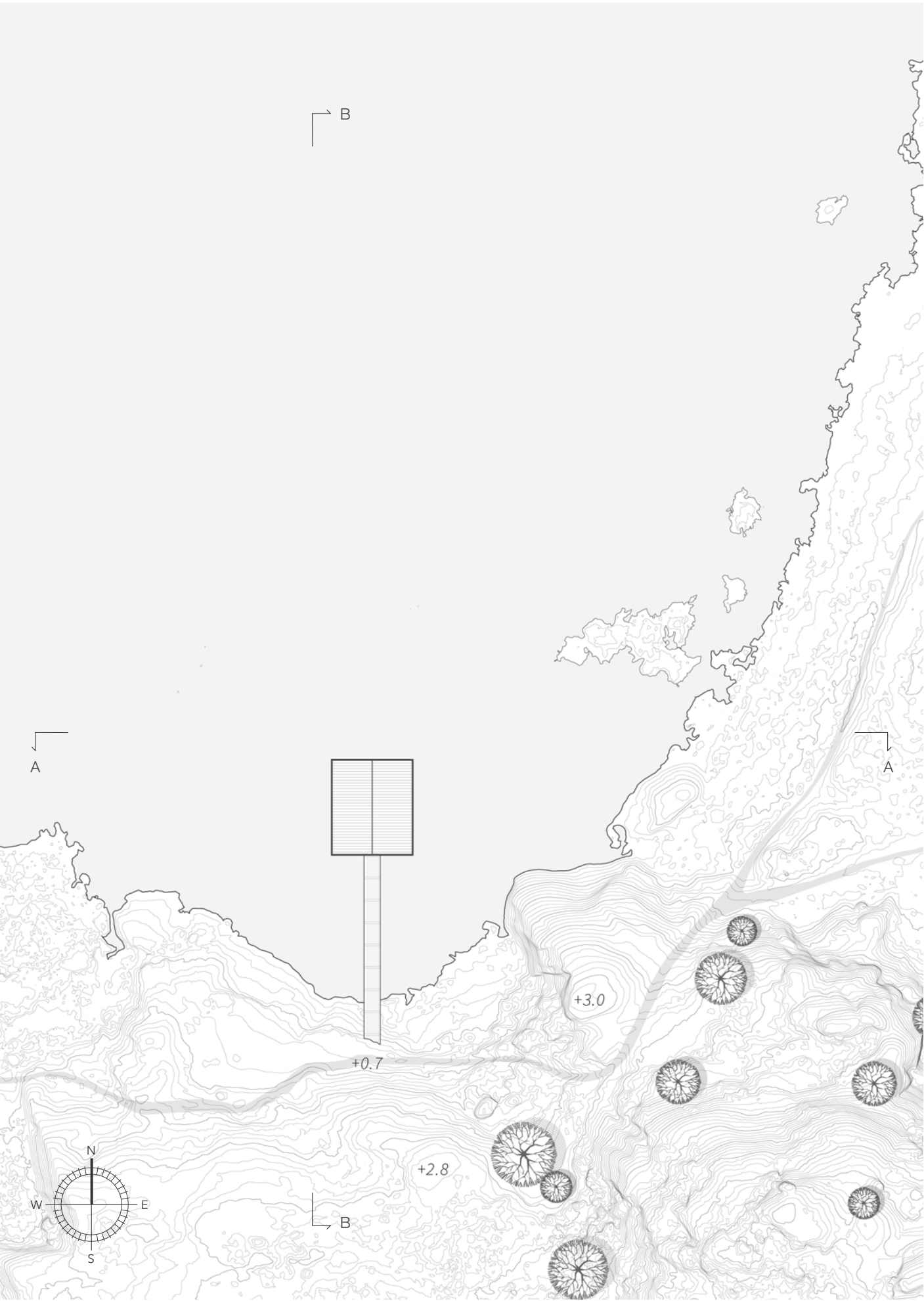
The reed & the lagoon

In the middle of the island, the trail intersects with further pathways to the military area and the turning point of the trail which loops back to Brännö.

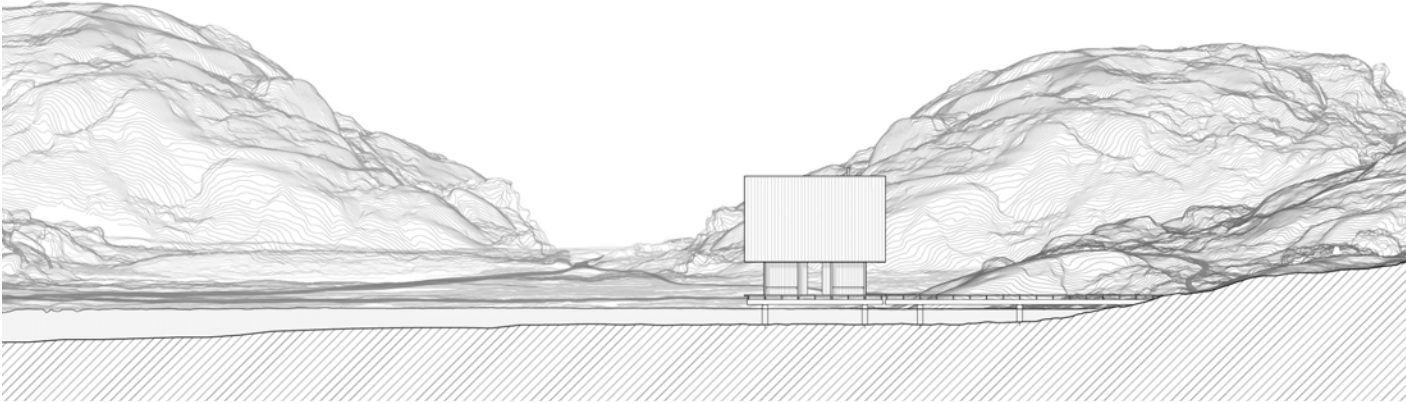
Here lies a tranquil body of water, closed off from the ocean by a sandbank with high reeds. Out in the water, a shelter is carefully placed as to not break the sightline traveling across the surface when encountering the lagoon from the east. The structure stands alone, as an island in its own. It aims to emphasize its surroundings by being in contrast, while gaining support for its height by surrounding rock formations.



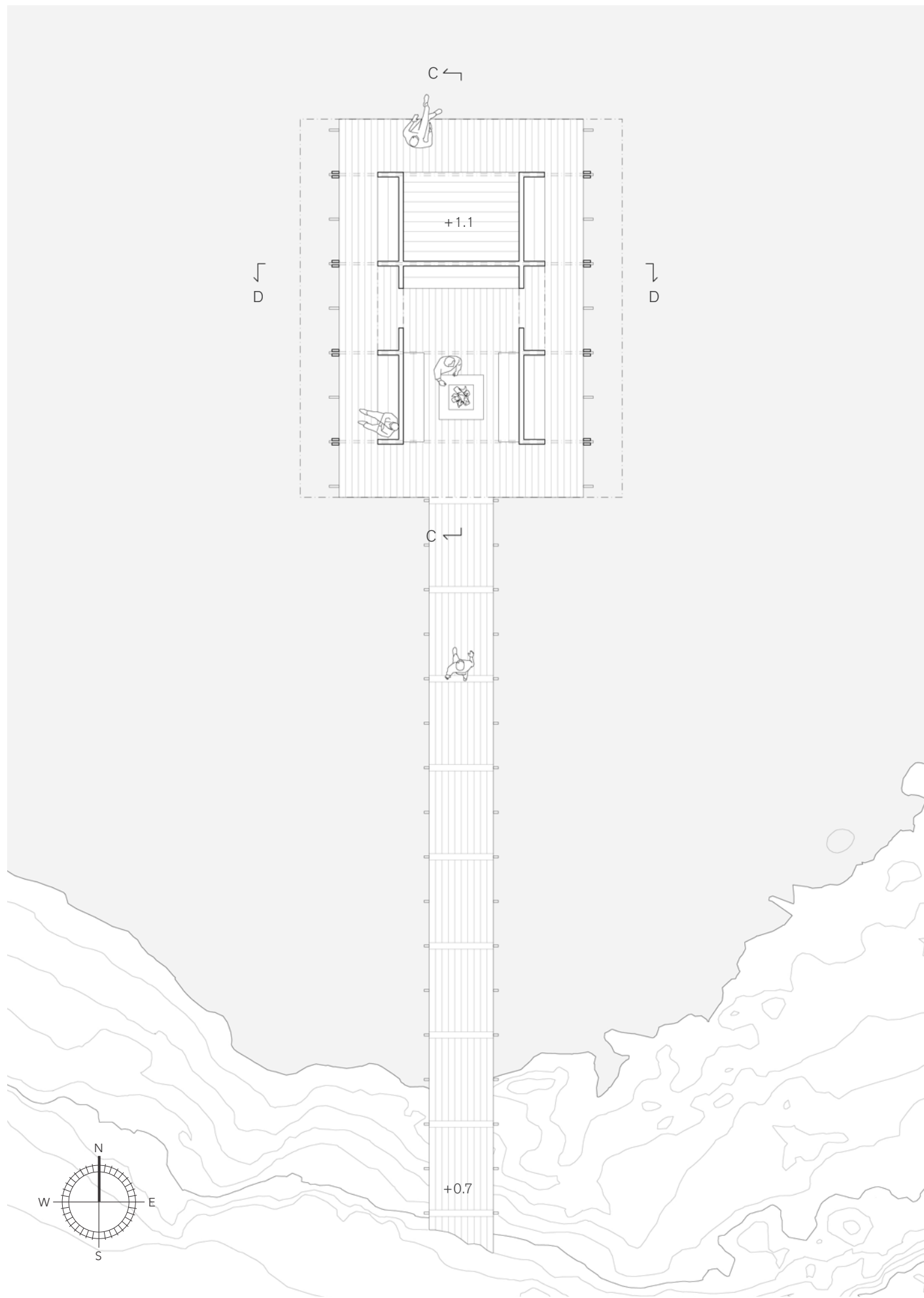


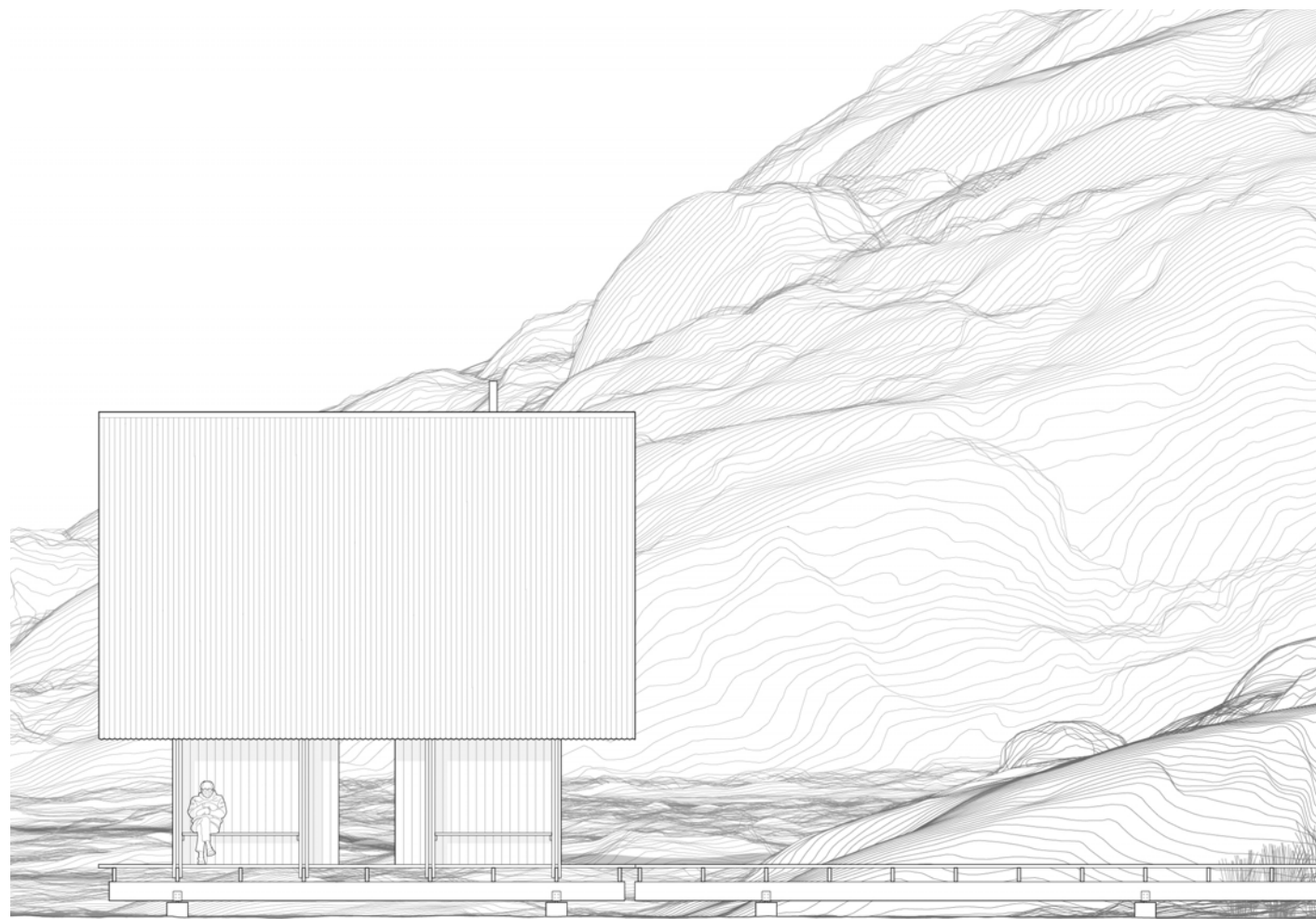


Section A-A

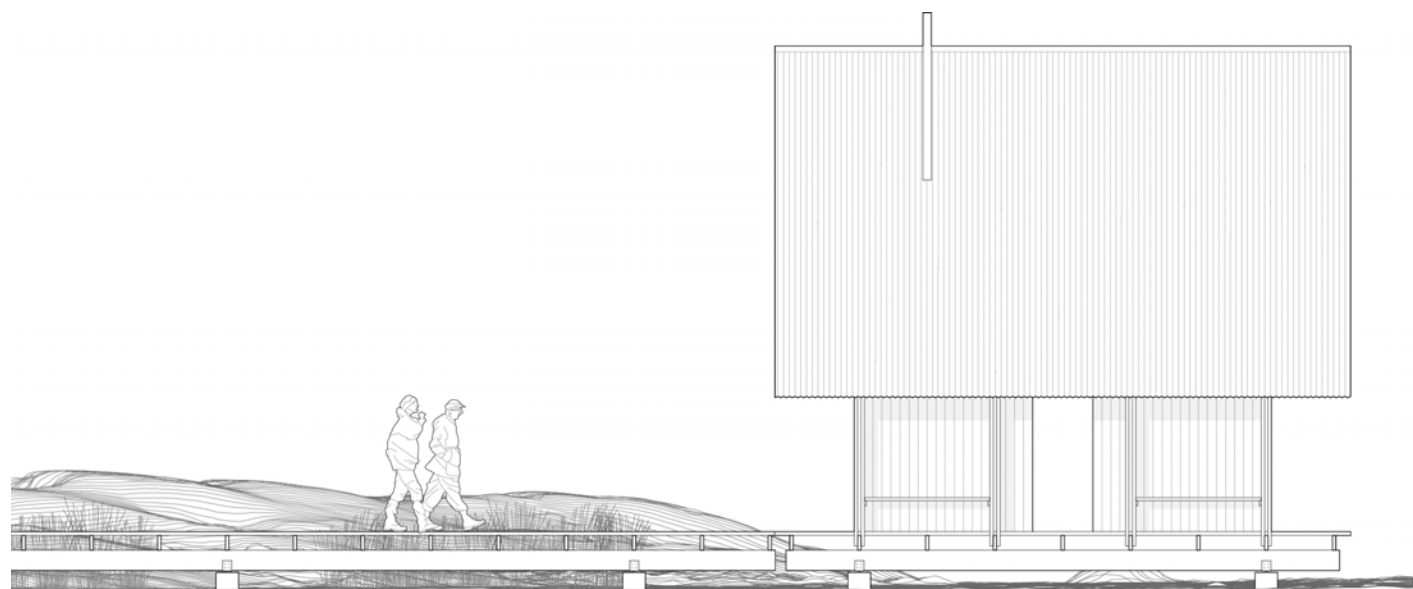


Section B-B

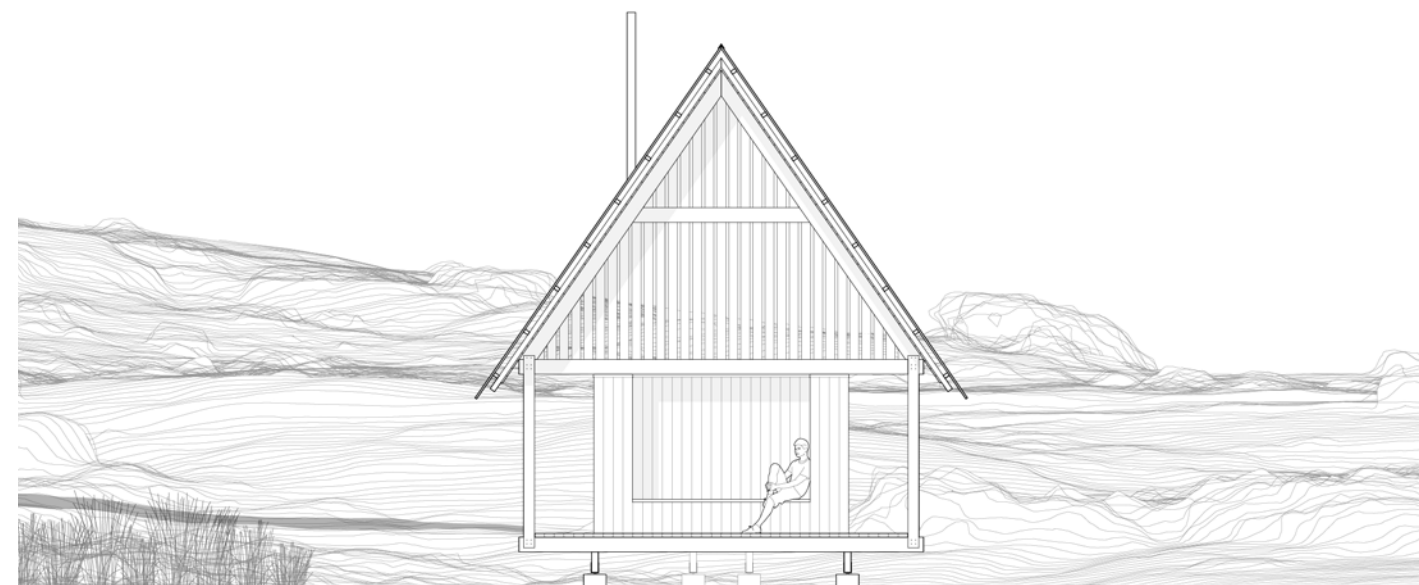




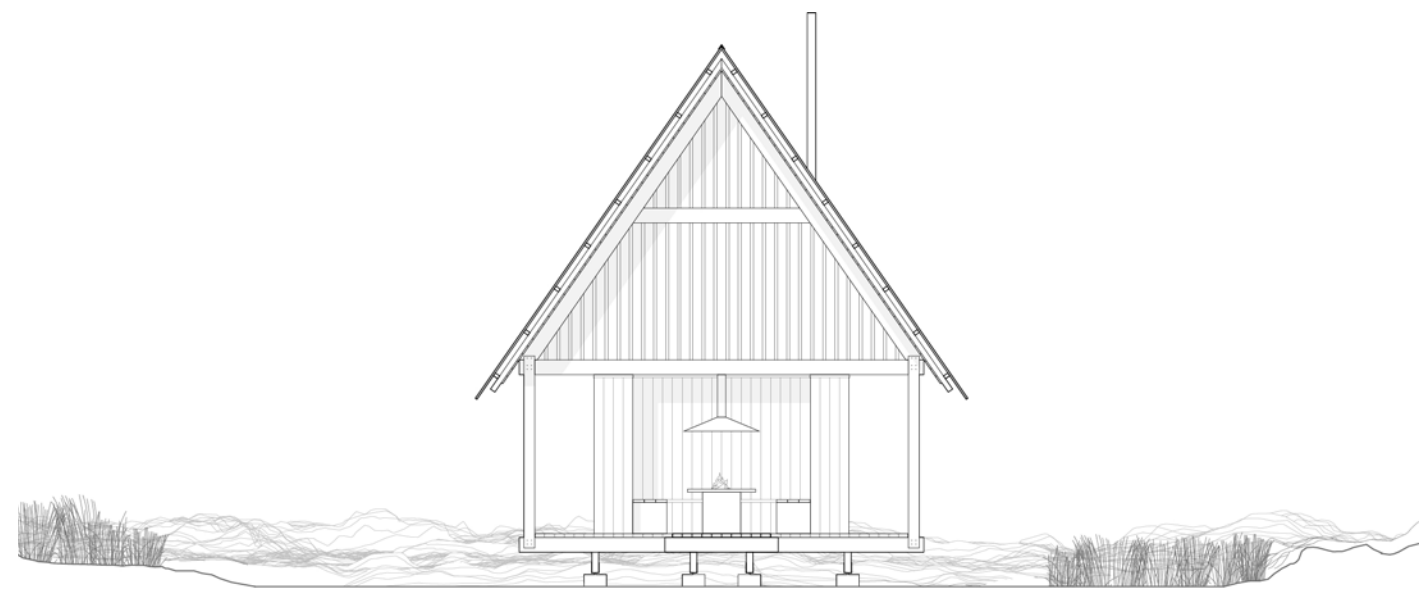
West



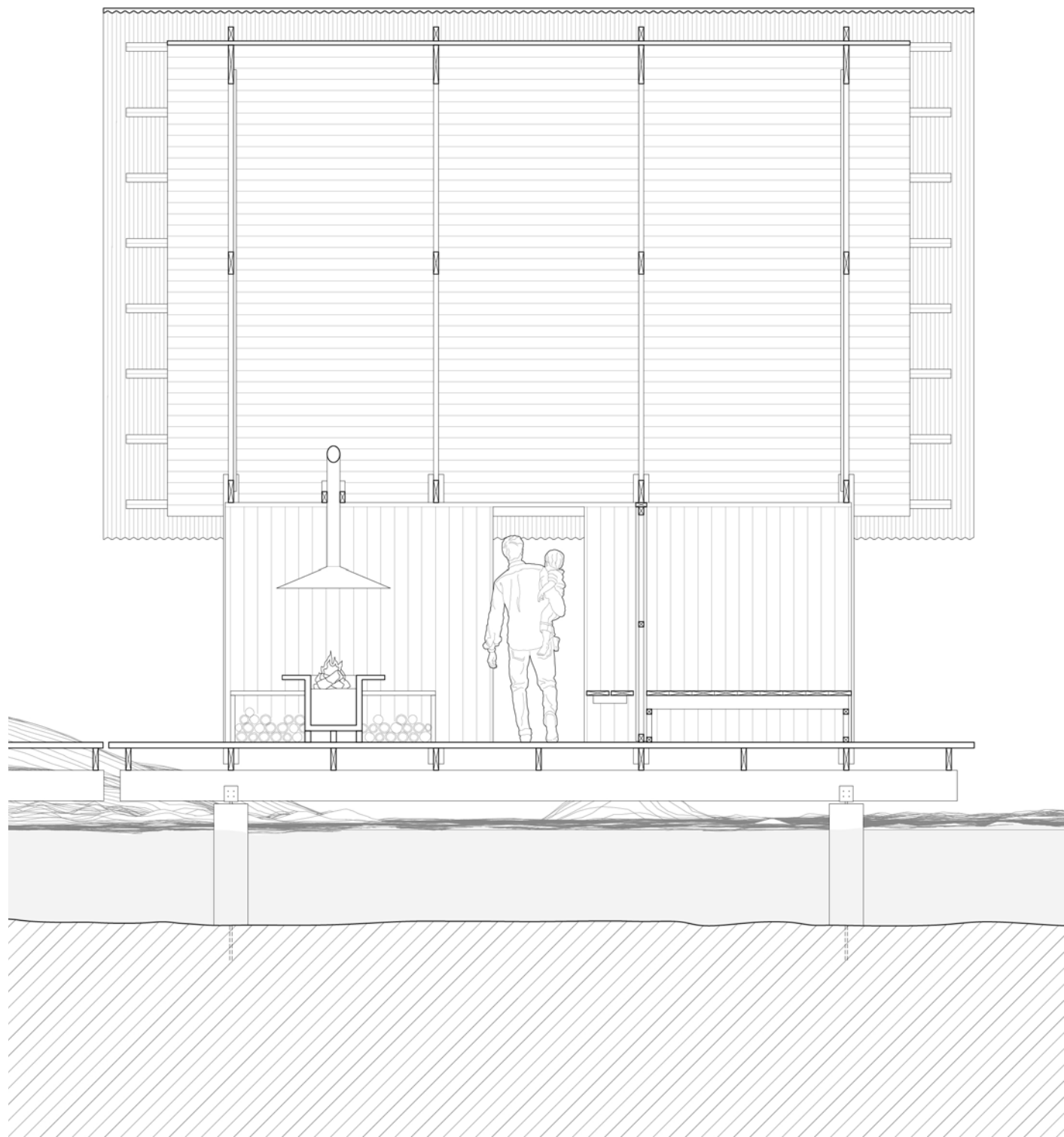
East

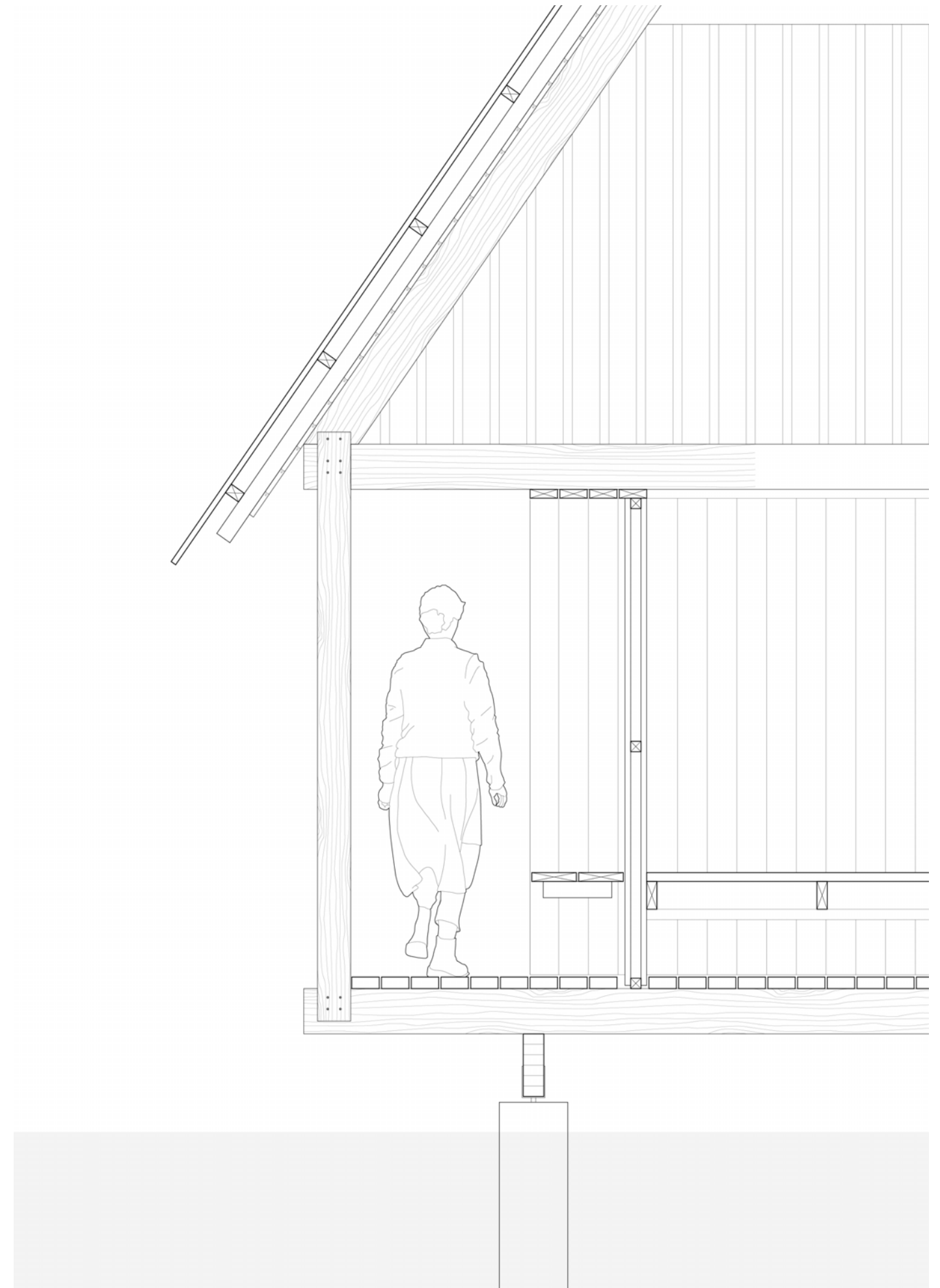
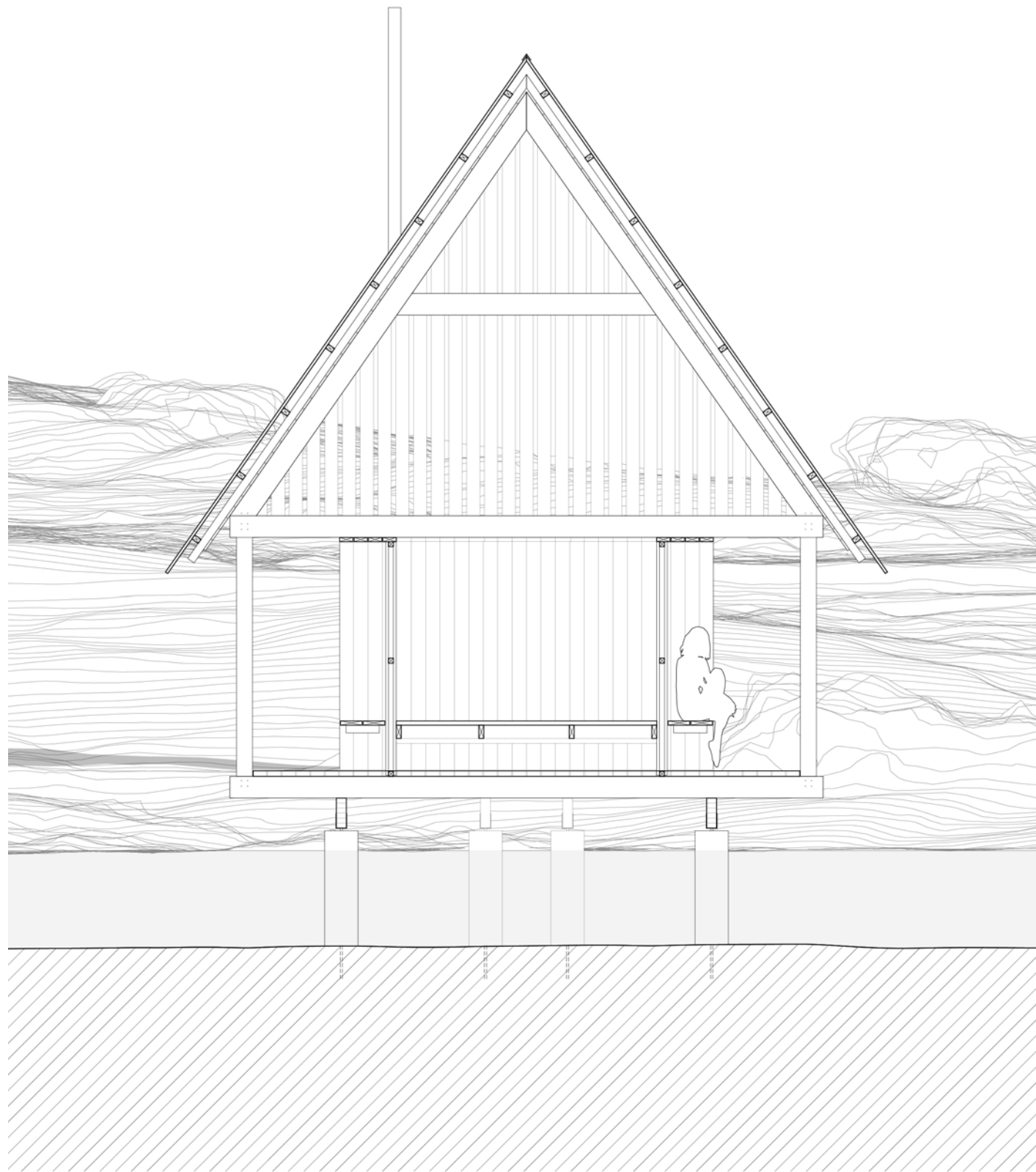


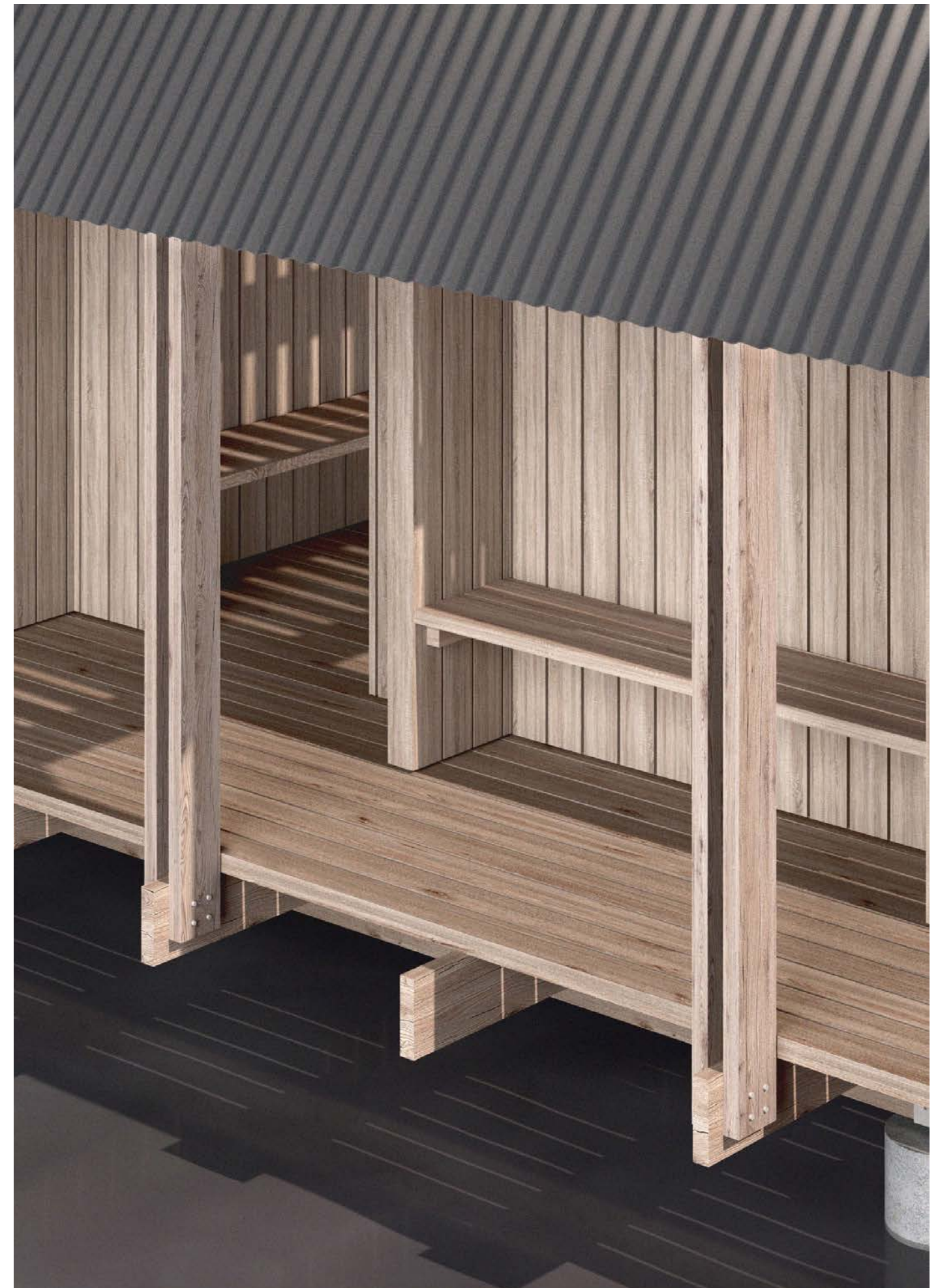
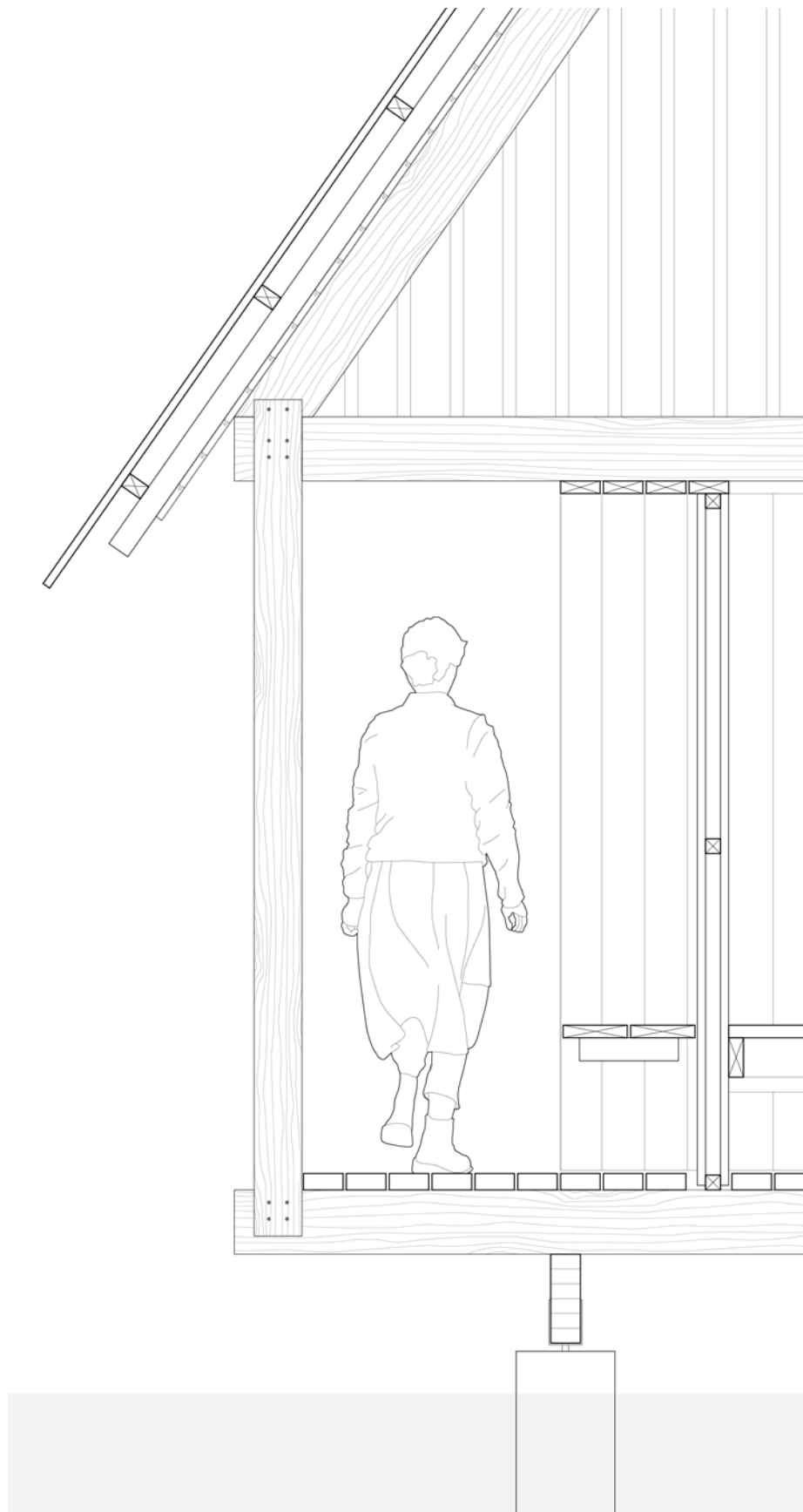
North

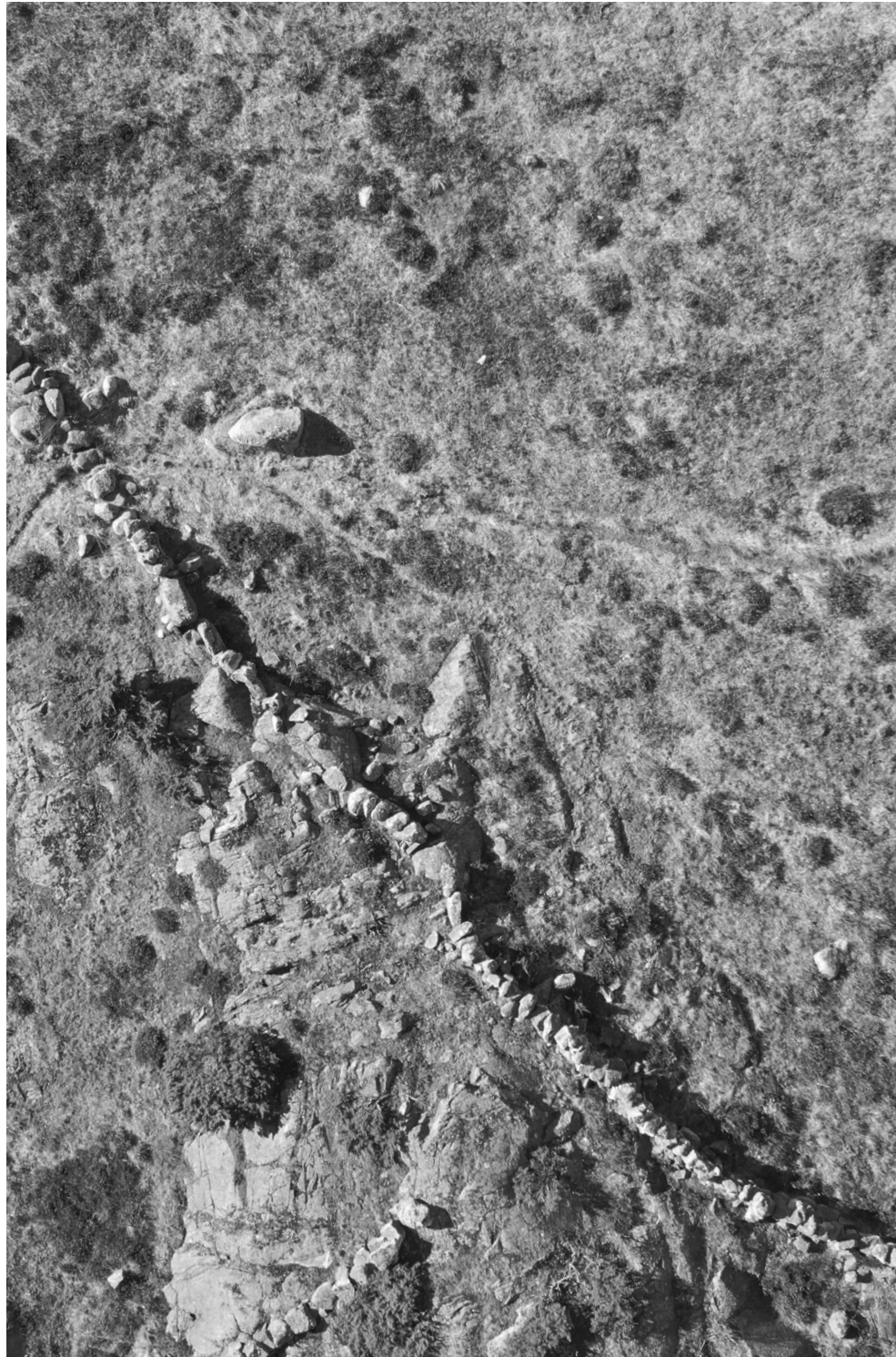


South





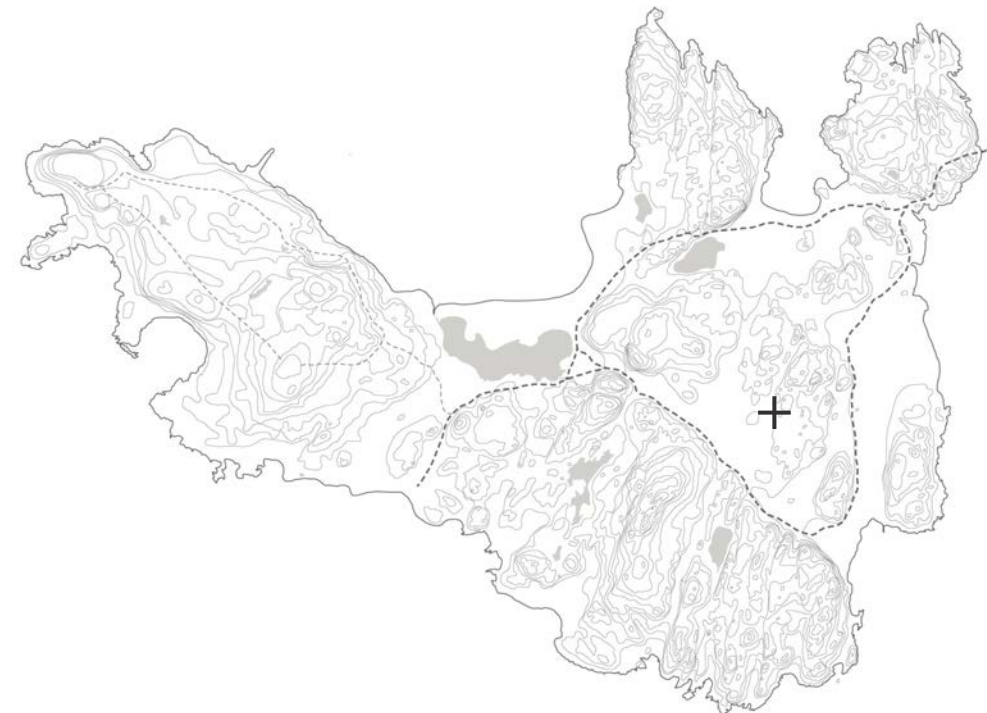
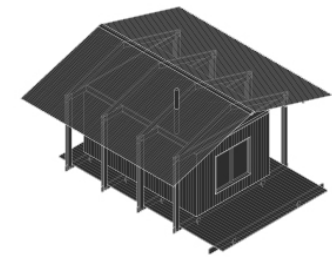


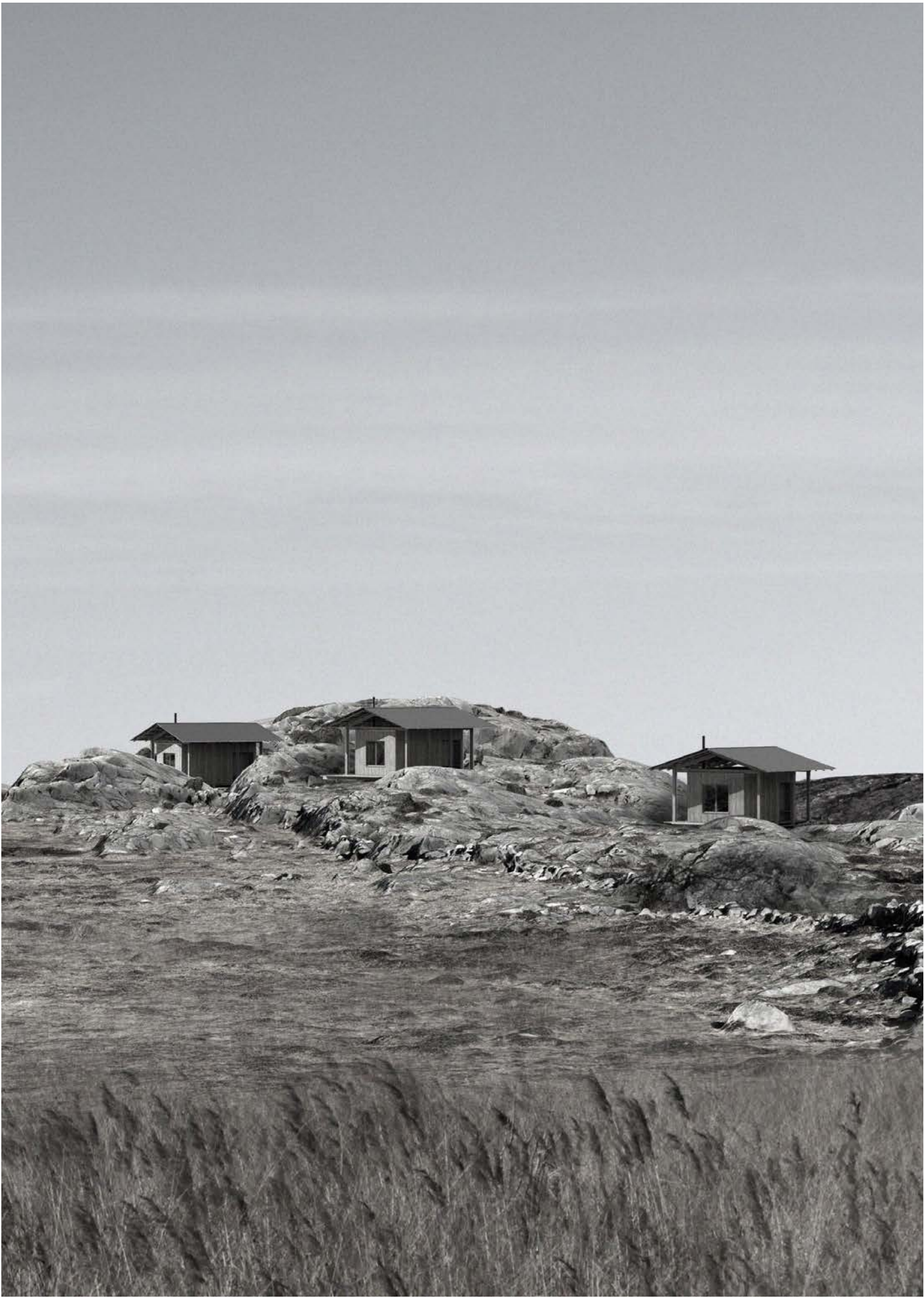
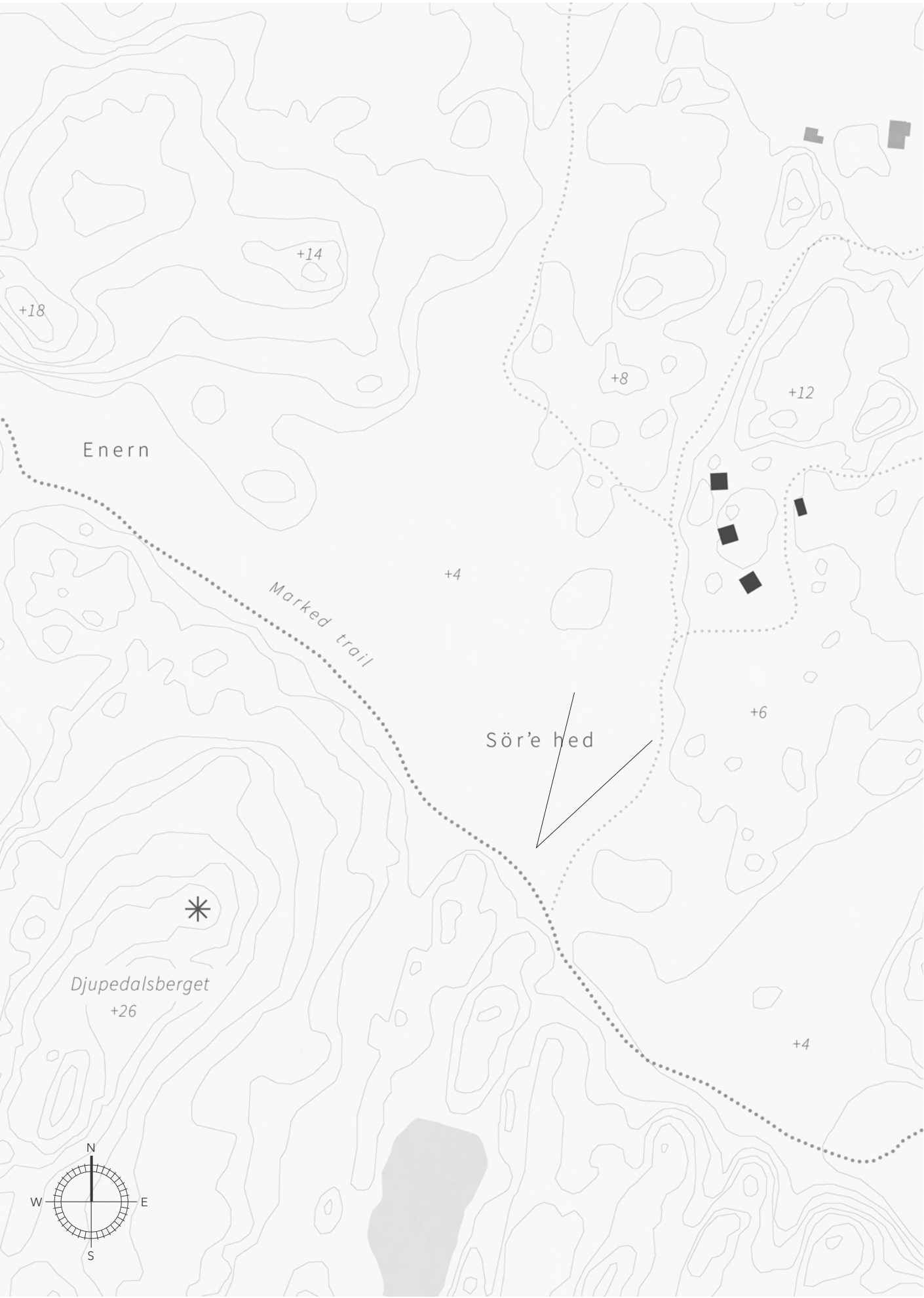


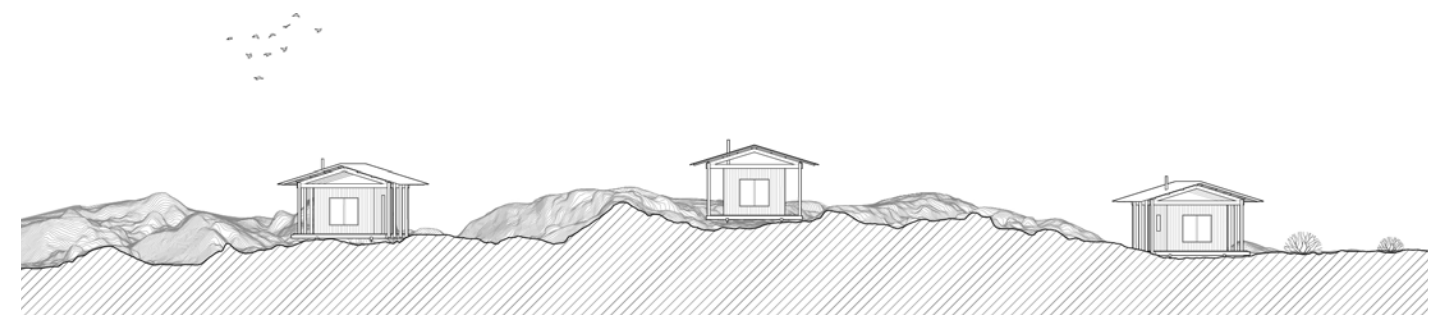
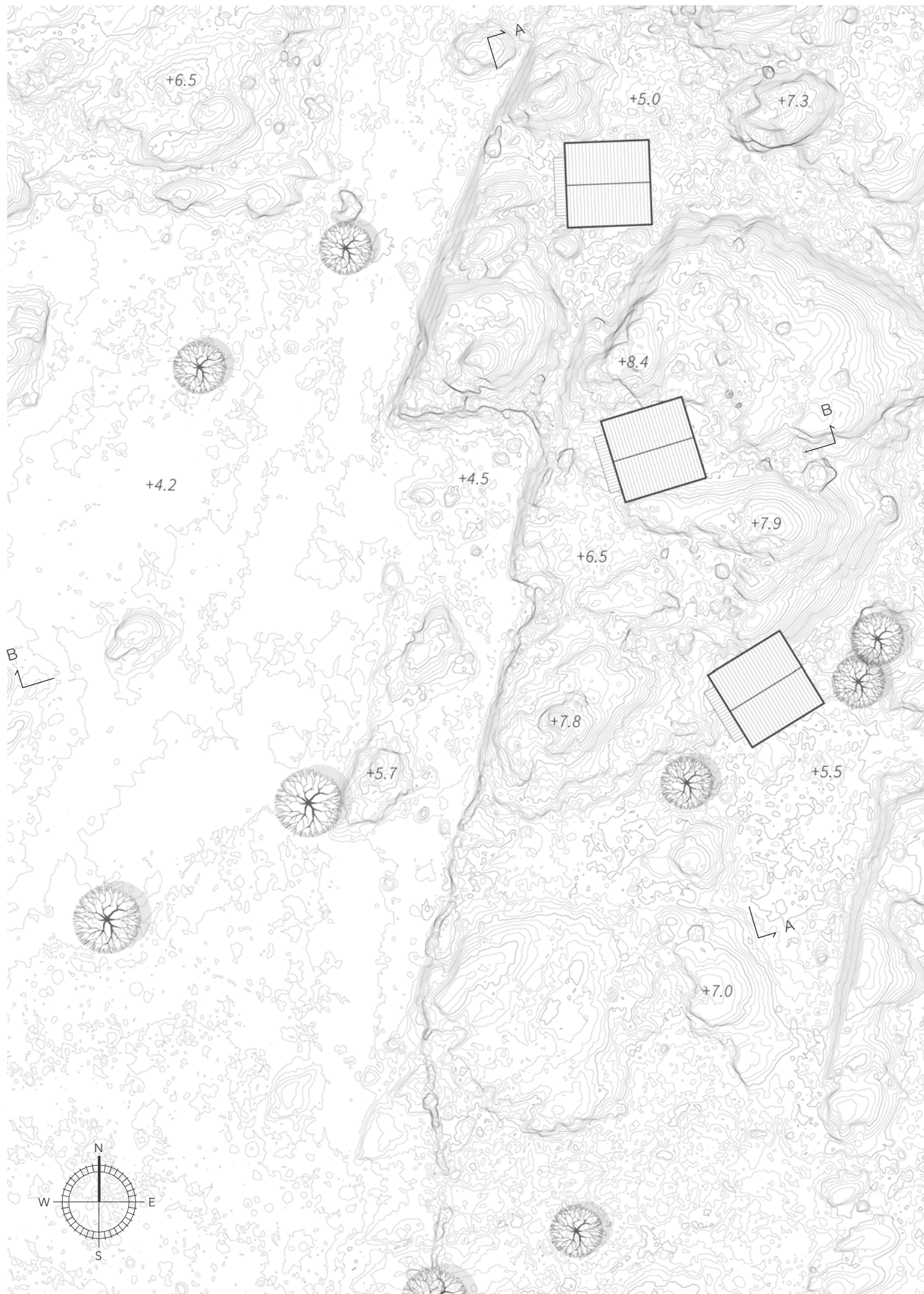
The cabins

The rocks & the moorland

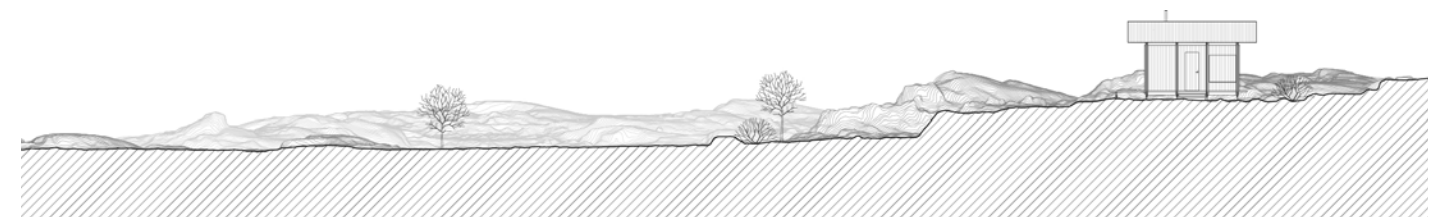
Between the lagoon and the southeast bay, the trail crosses a vast and open moorland. Surrounding rock formations makes it an enclosed and calm place, where old mounts of stone mark former barriers of agriculture. At the ridge of the moorland, where smooth and low outcrops of rock appear, a set of three rentable cabins for 1-4 people to stay the night are to be placed in interplay with the rock formations. The trail and the cabins are situated on opposite sides of the moor, creating a visible connection with sufficient distance.



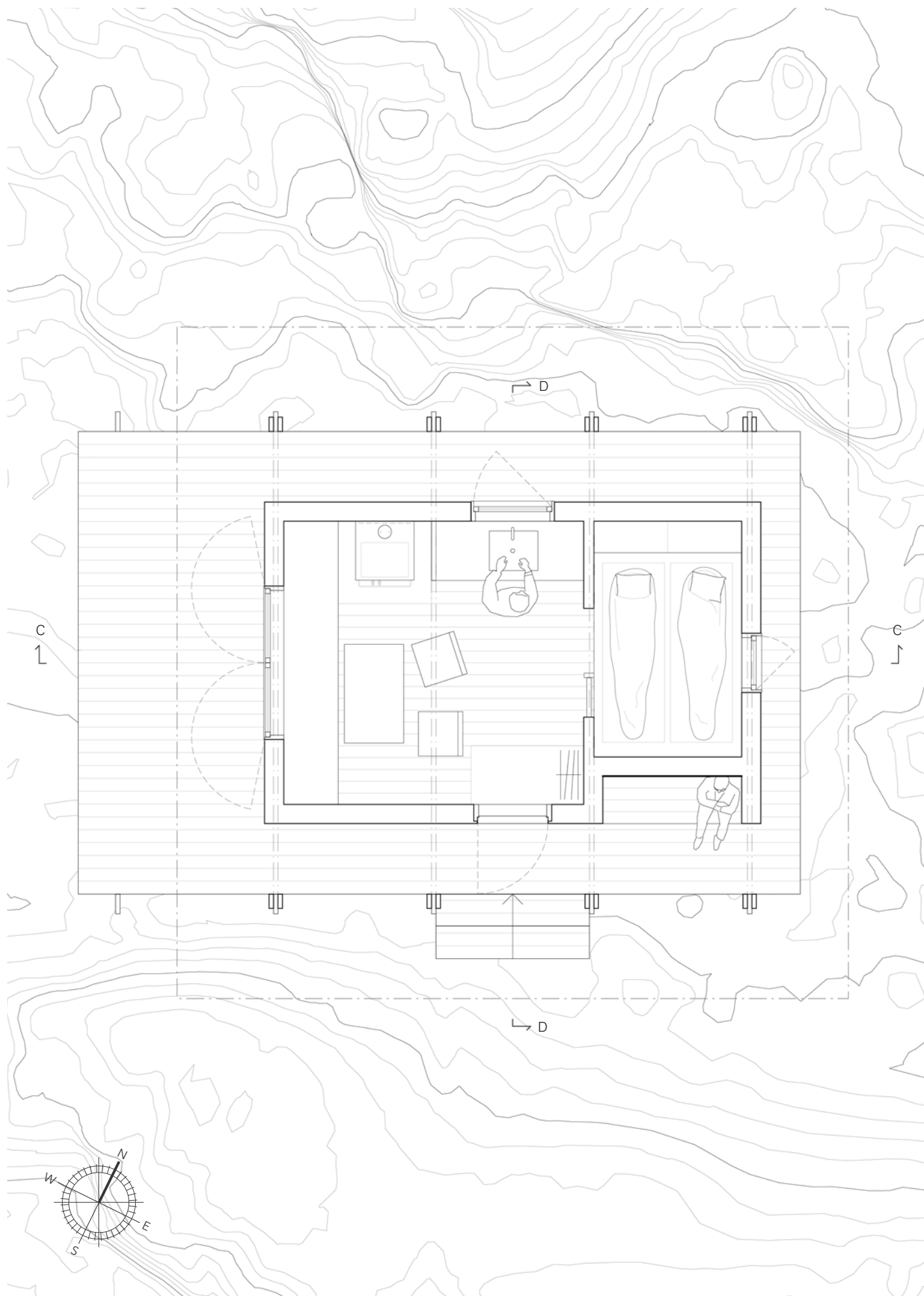


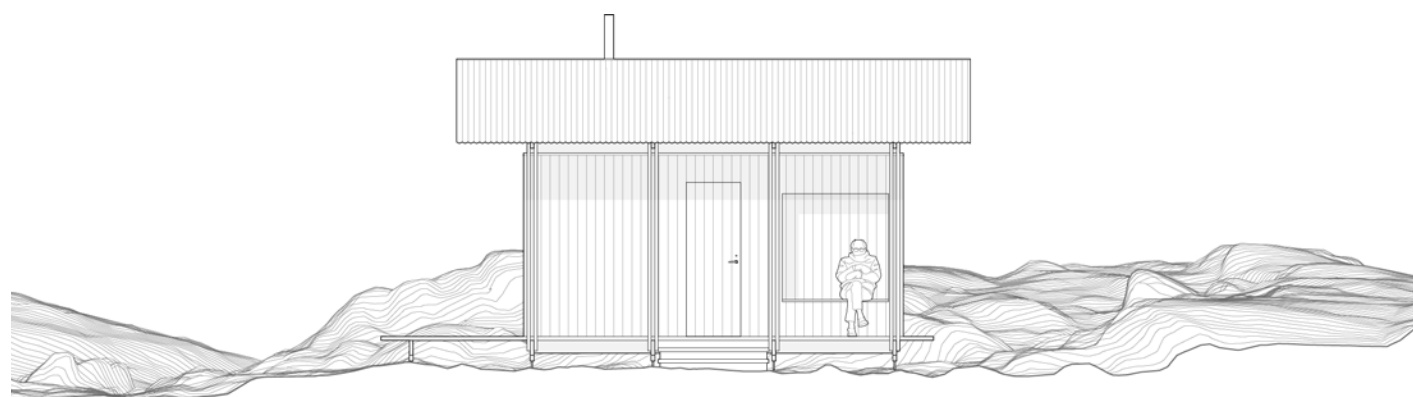


Section A-A

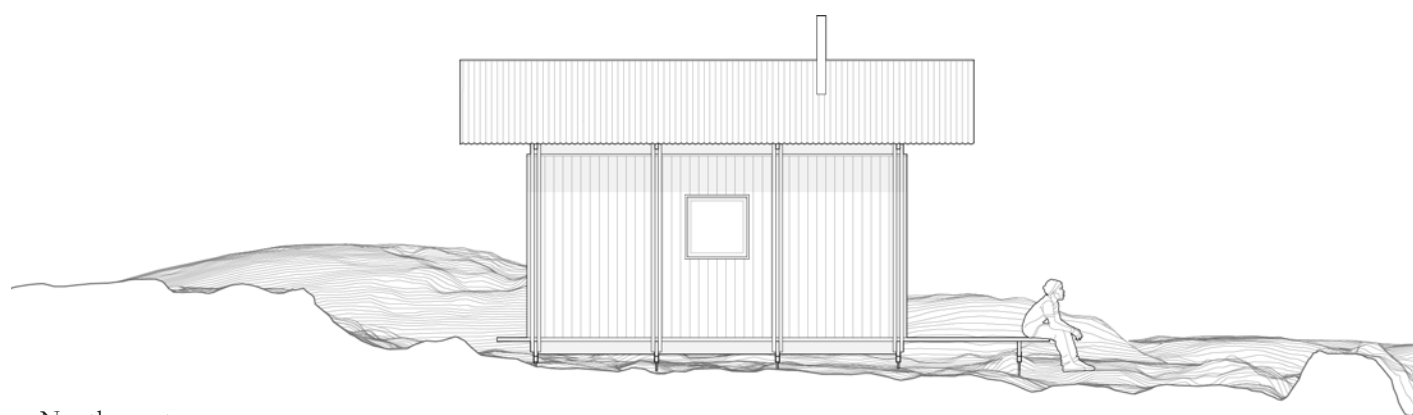


Section B-B

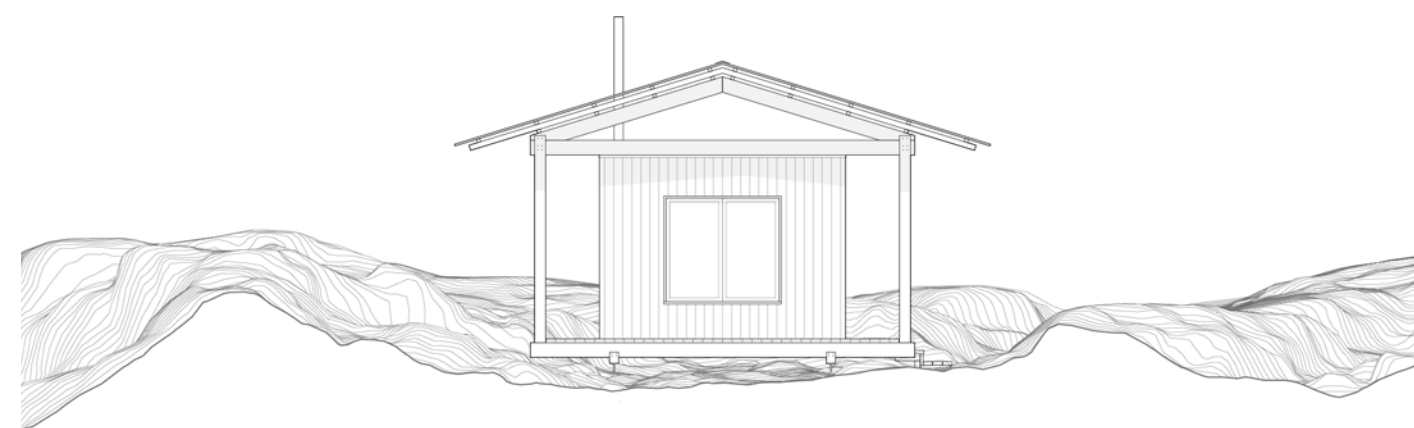




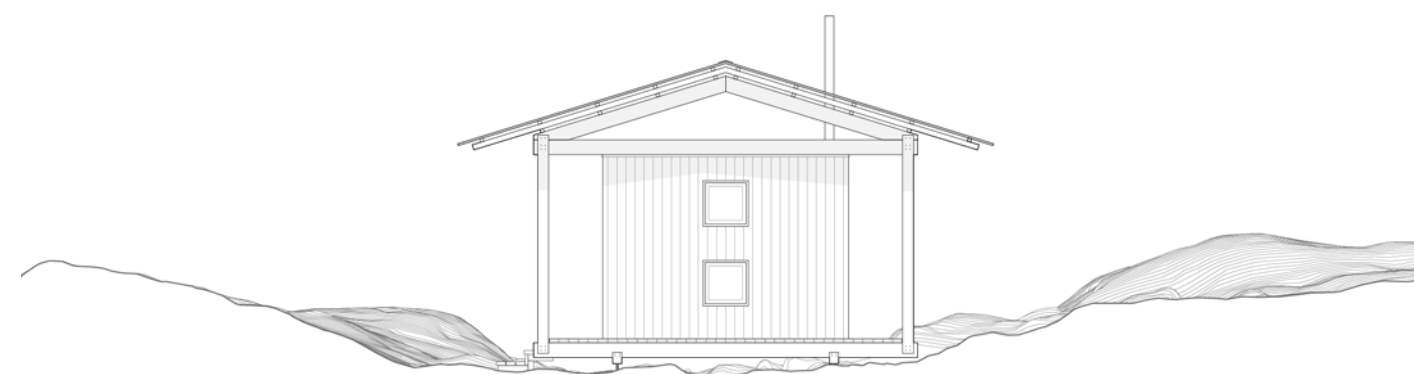
South-east



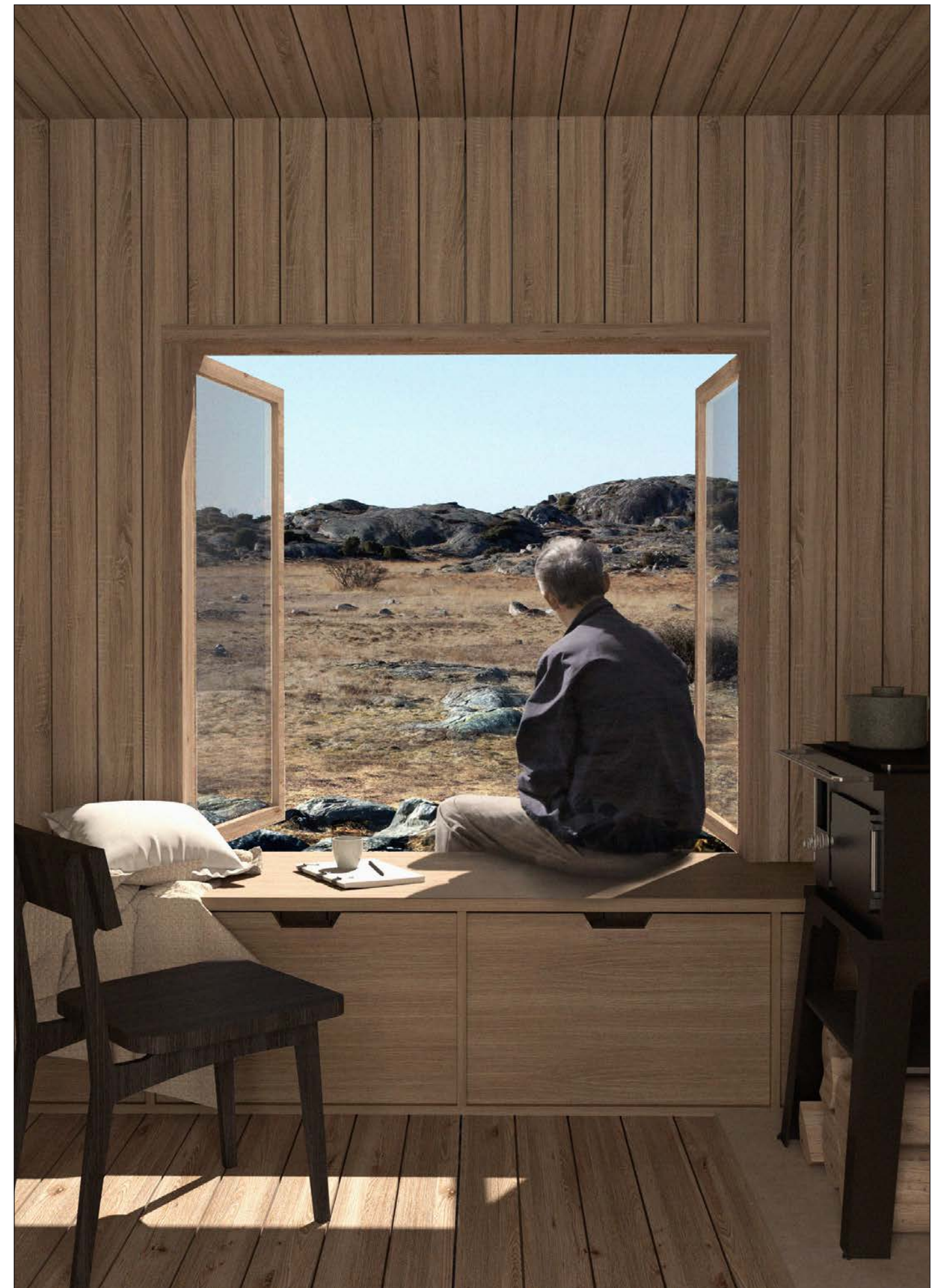
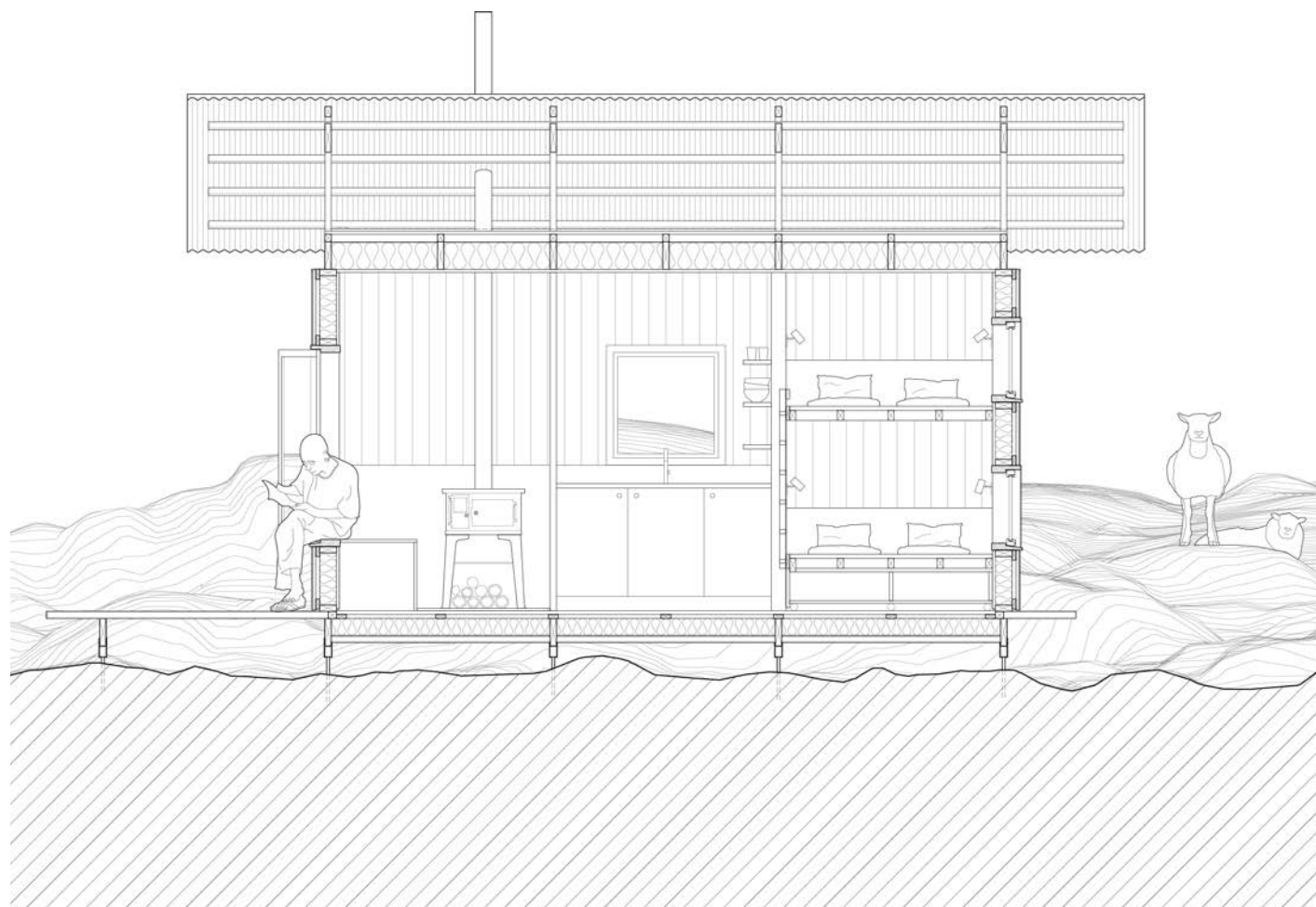
North-west

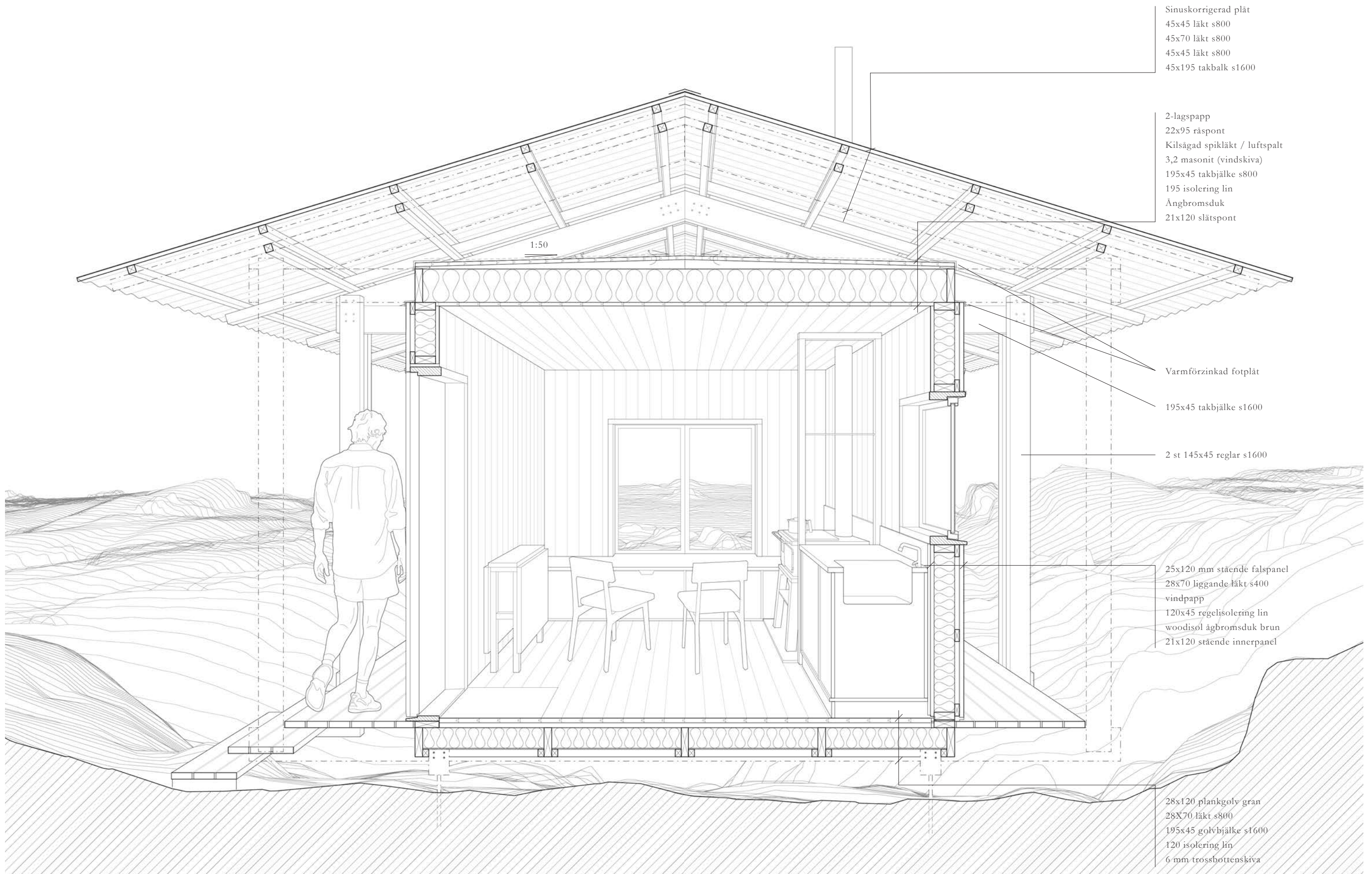


South-west



North-east





Sinuskorrigerad plåt
45x45 läkt s800
45x70 läkt s800
45x45 läkt s800
45x195 takbalk s1600

2-lagspapp
22x95 räspont
Kilsågad spikläkt / luftspalt
3,2 masonit (vindskiva)
195x45 takbjälke s800
195 isolering lin
Ångbromsduk
21x120 slätspont

Varmförzinkad fotplåt

195x45 takbjälke s1600

2 st 145x45 reglar s1600

25x120 mm stående falspanel
28x70 liggande läkt s400
vindpapp
120x45 regelisolering lin
woodisol ågbromsduk brun
21x120 stående innerpanel

28x120 plankgolv gran
28x70 läkt s800
195x45 golvbjälke s1600
120 isolering lin
6 mm trossbottenskiva



4. Conclusion

Discussion

The aim of this thesis has been to investigate how architecture can enhance and adapt to the presence of scenery. The greater part of what has been explored, stems from the tool photogrammetry in relation to landscape and what this does for an architectural design.

Although it is difficult to point to exactly where the greatest impact lies, I find it a useful tool which brings the presence of immediate surroundings to mind at an early design phase.

What I found most fruitful in my work was when the scanned topography were translated into 2D linework, which made it easy to design according to the situation. The 3D-models of the landscape were great for testing designs, as well as presentation, but in some ways too detailed and rich while designing. A lot of work has gone into finding the right level of detail and abstraction for the current phase of the project.

In the discourse, I bring up a fear of technical advancement where architects have claimed that the introduction of computational drawings has excluded the study on topography drawn by hand.

I believe tools such as drones and photogrammetry have the ability to reintroduce the general study on topography, since it enables the architect to work more actively with this aspect, and in turn, an increased opportunity of conscious site-specific design.

To build will always be an action of impact, but there is a scale of how extensive that has to be. To blast irregular topography to achieve flat surfaces due to efficiency, is an irreversible action which deletes a part of the richness and given natural qualities of the location. Technical tools can be used to our advantage to avoid such unnecessary impact.

As stated in the discourse: buildings should not be seen as isolated objects, but as elements in the context they are part of. By incorporating more information regarding context, the work of this thesis presents structures tailored to the specific situation.

*“Building is a brutal confrontation
between nature and culture, and in
that confrontation one can find
balance and beauty.”*

Sverre Fehn
(Lauri, 2013, p.15)

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Images:

Image 1-3 - from Stathaki, E. & Bell, J (Ed.). (2016). *Todd Saunders: Architecture in Northern Landscapes* (p. 26, 57, 114) [photos]. Basel: Birkhäuser.

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CHALMERS

Master Thesis 2021

Scenic Presence. Three architectural investigations
in the Archipelago of Gothenburg.