STORA JONSHOLMEN
AN ISLAND WITHIN OUR REACH

Chalmers University of Technology
Department of Architecture and Civil Engineering
Master thesis project 2020
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Abstract

This thesis deals with the citizens of Gothenburg's access to the sea and coastlines and is all about making the unreachable available and open for the public. It can be seen as a response to the shoreline protection law in Sweden that in practice not always functioning as it was intended and our unequal possibilities regarding this.

The municipality owned island of Stora Jonsholmen in the western part of the city truly enables unique possibilities. It is close to the city center both in terms of geographical position and public transport systems but first of all close enough to unite to the mainland with a bridge.

Through an architectural investigation and a number of wood structures this thesis strives to transform Stora Jonsholmen to a seabathing and excursion point easy accessible and welcoming to all. In particular those who otherwise do not reach archipelago settings like this.

The design approach is focusing on simple and rational wood based constructions with standardized materials and well proven methods. The ambition is to combine them into a well thought whole that becomes more than each object itself.

The design proposal includes a pedestrian bridge, changing - and restaurant pavilion, all which are built in wood and reachable through a wheelchair accessible walkway loop.

Keywords: public, sea bath, timber, wood, pedestrian bridge, walkway, archipelago.

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I. Introduction

Background

Gothenburg is located by the seaside. Even though the sea is a great element in the city the access to it is very limited for its residents. The water quality of the port channel Göta Älv does not fulfill the requirements to enable seabathing as in many other cities.

Because of this, during hot summer days, there is a strong movement to the sea and the bathing places located in the western periphery of the city. There are several of them but only very few that is somewhat easy accessible by public transport or a shorter bike ride.

One of the most popular ones are Galejholmen and Aspholmarna which are located in western Gothenburg by the last tram stop Saltholmen. The accessibility and lack of alternatives often makes it really crowded during summer and you have to be out in time to get a spot on the rocks.

Just south of these two islands there is an island called Stora Jonsholmen, an island that is within reach and could be an extension to the other bathing areas of Saltholmen. This both to ensure the coastal availability to all, but also to relieve the crowding on the bating spots closeby.

Why Stora Jonsholmen?

Stora Jonsholmen is accessible both in terms of geographical position but also in terms of public transport systems.

The island is located in the western periphery of the city about 10 km from the city center which makes it a feasible bike distance of about 30 minutes.
A ride that is both navigable and beautiful since depending on routing you can choose to cycle along the water or tram tracks most of the time. It is also connected to to the city by tram and bus services as well as functioning as Gothenburg's junction to the archipelago - the ferry terminal is located here.

The area also have a long history of sea bathing with ancestry reaching back to the 19th century. (Rudolf. K). Up to this day it is well known and popular as a sea bathing excursion point. The fact that people already have a habit to go here for this purpose increases the probability that this place would be found and hopefully also well-attended.

Stora Jonsholmen is among, if not the most accessible point from the city where the sea water is in motion which results in water quality being acceptable for seabathing.

All the reason stated above and also the fact that there is not an abundance of municipality owned islands that is close enough to be made available with a bridge from the mainland.

Why seabath?

One can think that we in the richer part of the world have had a far from sustainable lifestyle in the last decades. This is obviously from several collaborative reasons where one of them is our excessive travelling around the globe.

My belief is that if we succeed in offering interesting and high-quality excursion points close to our cities we can reduce that need considerably and thereby do our planet a great favour.

Worth mentioning is also that excessive traveling to far off places also is not conceivable for all social groups even in our rich part of the world. A sea bath like this, that is welcoming for all and without any charges could therefore create equal possibilities to reach out to the coast regardless income level.

During my work with this thesis COVID-19 broke out worldwide. A sequence of events that not only have changed our view of the world in a matter of weeks but also very much how we live our lives in general.
At the time this is written Swedish public health authorites have introduced traveling restrictions by car for a maximum of two hours.

This upcoming summer will be different than previous with many more residents spending their summer holiday within the city which leads to an increasing demand for summer activities in close proximity to our cities than ever before.

Why wood?

Because wood is a sustainable and renewable material that stores carbon dioxide. The production process is also less energy consuming than concrete or brick (Ekobyggportalen, 2020). Wood is moreover a local material that we have large assets of in our elongated land of Sweden.

Wood would be the typical material choice for a sea bath in the nordic countries and choosing something else would almost be seen as boldly. This may depend on its natural materiality that many desire when being so close to the nature elements that seabathing entails. The material also have a beautiful ability to turn grey and blend into the archipelago cliffs if treated right.

Since this thesis strives to simple and affordable solutions wood is a good choice. This because of its attainability and our great experience of working with the material for most of our smaller housing projects.

Also for personal reasons. When working as a apprentice carpenter for almost a year I realized that im loving the material and how it is shaped into architectural spaces.

Aim

The wider aim of this thesis is to launch a discussion regarding the availability to the sea for the residents of Gothenburg.

The purpose is to create an extension of the sea bathing places of Saltholmen open and welcoming for all, however the target group is above all the people without other convenient alternatives to reach the sea and archipelago environments like the one on Stora Jonsholmen.

It is important to understand that this thesis principally deals with the challenge of making an inaccessible place serviceable and open to the public and therefore could be seen as a project with a considerable focus on landscaping and urban design. My wish is still that the building additions enabling this to be well represented in every detail and come as close to realisation as possible.

My architectural strive is to learn more about the design of outdoor facilities in general and sea baths in particular. I want to develop my knowledge regarding wood based constructions and how they can be implemented in a archipelago context like the one on Stora Jonsholmen.

Method

The method of this thesis is heavily focused on research through design. Two parallel investigations will be executed, one theoretical driven and one design driven. The two investigations will inform each other back and forth in an iterative process throughout the whole project.

The theoretical driven investigation will consist of information gathering of different kinds and site visits both to Stora Jonsholmen and other places that will inform the work. My personal information gathering process tend to be more concentrated towards interacting and real life experiences rather than written resources in books.

Simultaneously to this, the design driven investigation will proceed and consist of a process of sketches, models and drawings.

The two parallel investigations will together inform the project and bring it forward and will eventually result in an architectural proposal for a new sea bath and excursion point on Stora Jonsholmen.

Delimitations

Stora Jonsholmen is owned by the municipality and there are two existing holiday cottages placed on the island that are being leased out. The starting point for this project is that there are no buildings on Stora Jonsholmen and the island instead is made accessible for all.

The complexity of the terrain will be represented by height curves and will be accepted as a basis of reality because it will otherwise become too complex to manage. However in realisation of the project I am well aware that the terrain is far more detailed than this but in this matter the project aims to contribute with the main ideas and principles.

In Sweden there is a law regarding shoreline protection with the purpose to ensure public accessibility to water as well as protect animal- and plant life. The law protects an area of 100 meters from the shoreline where no new buildings are allowed to be erected. Since the law is constructed to ensure public accessibility and that is also the main reason for the project i have chosen to overlook this law.

Research questions

How can Stora Jonsholmen through wood based building additions be transformed into an island for sea bathing and day trip destination unique to Gothenburg and accessible to all?

II. Theoretical investigation

Glulams

The glulam technique was first developed in Germany and came to Sweden in the beginning of the 20th century. Our first domestic glulam construction was built in Töreboda 1918. The material have many benefits such as renewability, high strength relative to its weight and low assembly costs.

The material consist of a number of planks glued together with its fiber direction in the longitudinal direction of the element. The glued seams are in general on the wider side of the planks and the longitudinal joints are finger jointed to desired lengths. The wood type is almost exclusively fir in the nordic countries (O. Carling, 2001).

There are two types of commonly occurring glulams, a combined and one homogeneous. In the combined the planks forming the glulam are made out of different wood quality. The zone in the top- and lower edge of the glulam is in that case made of wood with better solidity grading. The reason for this is that it enables a better utilization of the material. The homogeneous glulam is instead structured with high quality planks all the way. (Svenskt trä, 2020).

Straight glulams are made in a number of widths and heights that is all based on the sawmill's standard range and the sizing of wood in general. O. Carling, 2001).

Structural systems

The author argue that in shorter spans it is usually favorable with beams of uniform height. On the contrary, when spanning longer distances it is often more economic to differentiate the height of the beam depending on the different load forces along its way. It is clarified that it is often the demands regarding deformation and not actual carrying capacity that determines the height of the beam .

In most buildings the pillars can be fixed in the top in a natural way in connection with the roof construction. When building lower, such as 3-4 meters (O. Carling) mean that it is enough to do this in combination with fixing in the foundation. In higher buildings it is instead more beneficial to cross brace or stabilize the construction with some sort of truss. (O. Carling, 2001).

A number of glulam load bearing structural systems is presented in the chapter. There is a wide range of possible solutions depending on demands on solidity as well as appearance. Im looking for a structural system not only for my buildings but a method that can be extended also outside for the wooden decks surrounding them.

A system that caught my attention was a grid structure of glulams, the benefits of using a system like this is that it is possible to vary the load bearing direction and therefore enables to cantilever the construction in four directions.

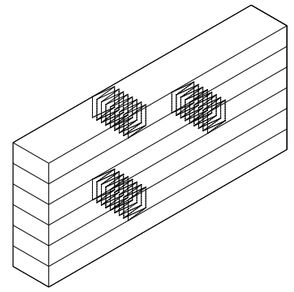
Joinery

In a later chapter (O.Carling) demonstrates ways of joinery between glulams in the structural system but also methods on how to transfer the load forces down into the ground. The structural points brought up in the chapter are mainly the ones between pillar-ground, pillar-beam, primary-secondary beam systems and splicing. (O. Carling, 2001).

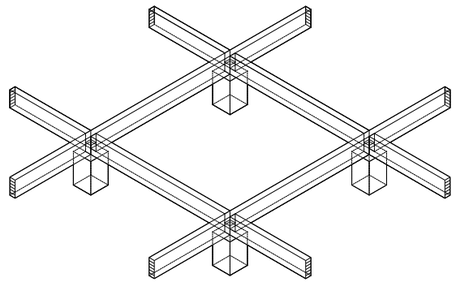
Regarding my project the structural points that will become visible will be the most important regarding execution and appearance. They become part of the architecture in a different way than those that are hidden under a wooden deck or in a wall. Some points are pretty straight-forward to solve with convenient methods but other structural points are complex and therefor need special attention to be able to function as intended.

Because of this the connection between pillar-ground as well as the one between pillar-beam becomes particularly interesting. Regarding pillar-ground several methods are being presented, nail plates, angled profilesto mention a few.
Regarding pillar-beam many of the fitting are principles the same except post anchor that is exclusively a method for ground fixing.
(O. Carling, 2001).

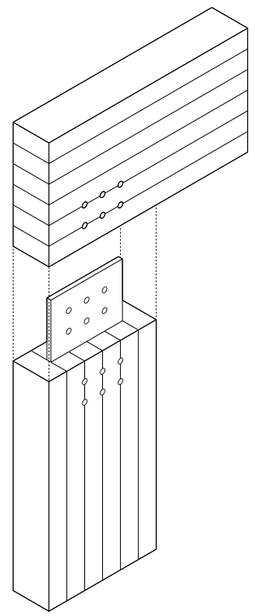
On the homepage of Setra group a very interesting method is being presented for pillar-beam connection, namely inserted steel plates.
(Setra, 2020)



A glulam is formed by stacked lamellas that is fingerjointed into desired lengths.



Glulams formed in a structural square grid with cantilever in the outer perimeter.



Pillar-beam connection with inserted steel plates.

Pedestrian bridges

In my opinion the bridge truly is an iconic structure that figuratively demonstrates the challenges of construction by connecting two otherwise inaccessible places. However they can do more than that as Andreas Keil stated in the foreword of DETAIL Pedestrian Bridges 2013:

“Pedestrian bridges are primarily functional, but they should also respond to the special features of their sites, route trajectories, topography and contexts. Their presence in public spaces offers an opportunity not only to connect separate areas with each other, but also confer a unique identity on the immediate environment”. (Keil, A, 2013).

A bridge usually consists of two main components, a superstructure and a substructure. The superstructure consist of the route trajectory as well as any primary beams or arcs that span over an obstacle. The substructure consist of the abutments that in different ways absorbs loads from the superstructure and transfer them to the ground. (Keil, A, 2013).

The diversity of bridges is countless with a wide range of different structural systems and therefor it would be an impossible task to describe all of these configurations and combinations. However pedestrian bridges can be divided into a range of common types depending on their basic structural principles.

In my investigating work have come across six common bridge construction types. These are: arch bridges, beam and slab bridges, truss bridges, suspension bridges, cable stayed bridges and stress ribbon bridges.

Only a few of these bridge types lived up to my desires regarding appearance. I was looking for a minimalistic and simple design with a straight superstructure in elevation view. Because of this it was only truss- and beam and slab bridges that caught my attention and I wanted to try out and evaluate in my further work.

In “Träbroar, konstruktion och dimensionering” i could read more about these specific bridge types of interest and their design principles in wood.

In the book a glulam slab bridge is being presented which consist of several glulams horizontally stacked and compelled across with metal rods.
It is claimed that the bridge type can manage longer spans if the cross section is being T- or box-shaped.

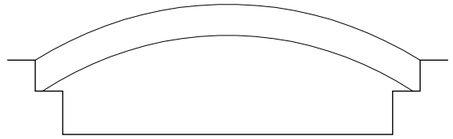
(Pousette, A) also clarifies that the bridge type have a small amount of exposed wood compared to the total volume which results in small moisture content variations and therefore also shrinkage and swelling. (Pousette, A 2008).

In the same book a wood truss bridge is presented which consist of interconnected rods that are being compounded in a large beam form. The author means that the super- and subframe often are being cladded with wainscot but the oblique strives are often are being exposed. For this reason she underlines the importance of the lower nodes to be carefully planned to divert water from the construction. (Pousette, A 2008).

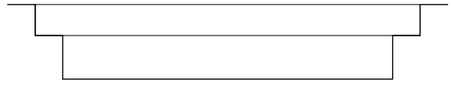
My interpretation looking at common pedestrian bridge types built in wood is that the more refined and sophisticated structural system the slender the route trajectory becomes and the longer you can span.

However, If one do not want a bridge that takes a lot of attention. Perhaps, as in my case because the context is so beautiful in itself and you do not want to disturb the horizon view, the structural systems enabling this low route trajectory height often disturbs more than they add in my personal opinion.

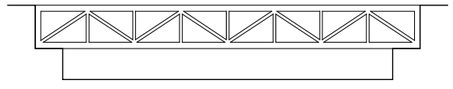
The truth is that the horizon view will always be disturbed at one particular height so choosing that height might be a crucial factor as well as choosing a material that in a good way will blend in with the context and surroundings.



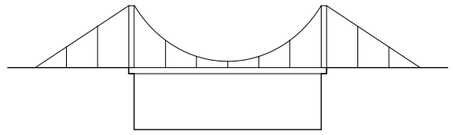
Arch bridge



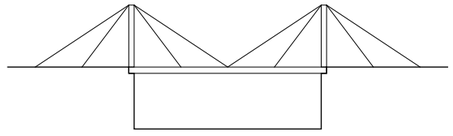
Slab / beam bridge



Truss bridge



Suspension bridge



Cable-stayed bridge

Stress ribbon bridge

Meeting Olof Wängborg 5th of March

On the 5th of march im having a telephone meeting with Olof Wängborg. He works for Västkuststiftelsen where he is project manager for the walking trail Bohusleden. The trail is located on the swedish west coast and reaches from Lindome in the south to Strömstad in the north.

The aim of the meeting is to get feedback and input regarding the project as a whole but the pathway in particular. Since Västkuststiftelsens engagement in many ways are related to my work.

We have a great call and Olof have a lot of good input, at first we talk about the quality of being able to sit in different sun directions as well as the possibility to find shelter from the wind. We also have a discussion about accessibility and different ways to approach the water for different type of bathers.

He also stresses the importance of easy maintenance since someone have to take care of everything.

He shares that Västkuststiftelsen build all their footbridges in a silicon impregnated wood which is environmentally classified. Wood below ground such as poles are still made with copper salt impregnated wood because of its exposure to decomposition.

Figure 1, Olof Wängborg

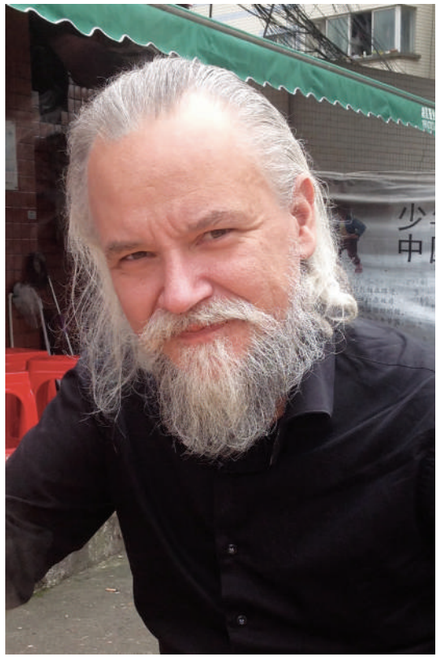


Figure 2, Roberto Crocetti

Meeting Roberto Crocetti 13th of March

On the 13th of march I visit Roberto Crocetti, engineer and professor at KTH: Royal Institute of Technology with a long expertise within timber structures.

I give him a brief introduction to the project and I have the opportunity to show my sketches and we have a discussion regarding my project in general and the pedestrian bridge in particular.

At this time in the process I was working on a wooden bridge where the handrailing was formed as a truss and thereby was the primary load bearing element.

I was not content with the appearance because it was too intruding on the view towards the horizon and wanted something more minimalistic. A bridge that did not make a big claim but just lied quietly in the terrain. On the same time i wanted something that was rational and economically feasible.

We discuss the bridge design and the fact that that I was not very happy with the outcome. Roberto considers timber truss bridges to be rather complex to solve in our wet climate since there is so much end grain that has to be protected from moisture. He means that if this is not done right problems will occur or even worse - the lifespan of the bridge significantly shorter than planned.

Roberto suggests me to look more into wooden slab bridges, a bridge type mentioned before where the walkway is made of several glulams horizontally stacked and compelled together with metal rods.

He explains this is an advantageous bridge type for my wishes since the construction height becomes much less than separates beams because of its ability to cooperate to load bearing stress. The bridge type is also well proven, rational and economic feasible.

Roberto takes his time to explain the wooden slab bridge so that i can understand the overall principles as well as proportioning of its elements and suitable span distances. He also clarifies the weak links of the construction and that both the glulams and fixings for the metal rods have to be protected from moisture.

Towards the end of our meeting he agrees to do a follow up with some tutoring regarding the bridge design when I am approaching a final design.

About a month later from our initial meeting I have a video call with Roberto to show my more developed drawings of a wooden slab bridge. At this point he comes with feedback regarding sizing and metal rod placements to refine the design further.

Excursion Moelven Töreboda 13th of March

On the 13th of march I took the train from Gothenburg to Töreboda to visit Moelven glulam factory that is located there.

In the office department i meet up with Thomas Johansson which is head of research and development at the facility. Thomas and I put on safety equipment necessary before we can initiate our walking tour in the factory's different divisions.

It is a cold day with snowy rain pouring down as we start our walk on the big factory grounds. Outdoor we are surrounded with industrial halls, steel shelves and forklifts transporting enormous glulams criss-cross over the enormous asphalt surfaces.

Thomas has been working for Moelven for twelve years but the company is over 100 years old. As we go pass an old barn-like building he points and says "This is where it all started 100 years ago. The geographical position was very strategic since here in Töreboda the factory was located were the railway and Göta kanal intersects".

As we enter the first industrial hall Thomas explains that the timber planks arrives here by truck transports. Moelven mainly use spruce which also is the dominated type of wood in Sweden and most of the timber is felled in 60 years cycles.

Forklift loading glulams on the factory grounds.

"Where it all started 100 years ago."

One of the many industrial production halls.

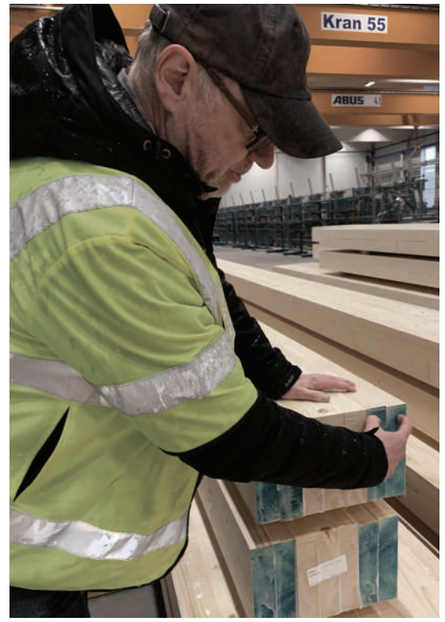
We move up to a cross section of a glulam and Thomas shows me the different lamellas that are being combined into a glulam. The outer lamellas are made of more high quality wood than the central lamellas for a better performance during load bearing stress.

A enormous automated machine performs the first quality check on the incoming timber planks and sort out the pieces of deficient quality. The same machine also performs longitudinal finger joints to merge the planks to desired length.

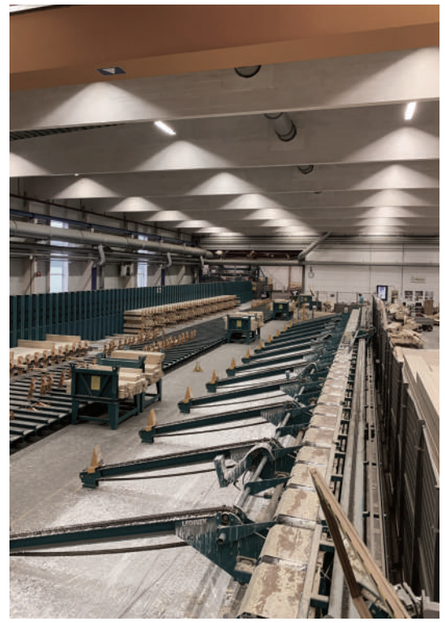
After this the planks are transported on a conveyor trough an automated machine that is spreading two component glue evenly. In the next step the planks are being lifted into a massive robot controlled clamp that can interlink planks with complex shapes and spans up to 50 meters.

It takes four hours for the glue to harden and then the glulam is being planned to remove glue rests and create a smooth surface.

Thomas explains that the factory have two different type of production lines for glulam timber. The standardized glulam timber that can be ordered "off the shelf" by customers or resellers and a more refined production line that is project and often involve a lot more processing.



Thomas explains the cross section of a glulam, blue marked lamellas are of better wood quality.



The conveyor where the glue is applied.

Robot controlled clamp that can interlink lamellas into complex shaped glulams.

Thomas clarifies: “If it is a standardized glulam the product is finished after planing here and will be moved to a storage hall. If it is a project specific glulam it will be transported to next hall for further processing”.

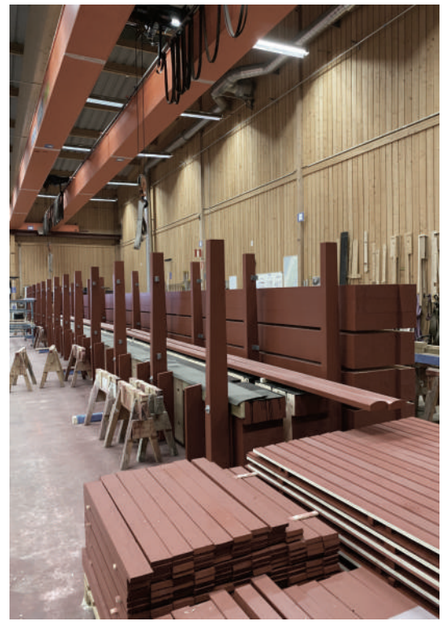
As we enter the next hall we move up to the biggest CNC-milling machine I have seen. Thomas explains that most of the project specific glulams pass through this computer controlled machine to perform different cuts, sockets or holes.

As we walk further in the hall we arrive at a large area with glulam beams on trestles. Here, skillful carpenters do the last manual refinement with electrical hand tools before the project specific glulams are finished and ready for transport.

After this we move on to another hall that is filled with glulams Thomas clarifies that this is the storage for standardized glulams. The storage have a very sophisticated computer system that knows the stock balance at all times and can therefor optimize dependent on request.

In the end of the hall we walk up to a red shape and Thomas point at it and says “We also make bridges”. The red shape turns out to be a group of components for a timber pedestrian bridge ready for transport. After this I have seen all divisions and we start our walk back to the office building again.

Manual working station for project specific glulams (coffe break at the time).



Construction kit for a pedestrian bridge.

III. Site

Figure 3, Stora Jonsholmen in the city of Gothenburg

Figure 4, Stora Jonsholmen in the area of Långedrag

Site visit 9th of January

On the 9th of January me and my father rowed out from the rowing club located at Saltskär out to Stora Jonsholmen for my first site visit. It was a calm and clear day but the season still does its imprint and thoughts on sea bathing is still far away during this time of year.

We anchored the boat in the inlet southwest of the island and started our investigation of the terrain. This is the most narrow point with inlets both from southwest and northeast leaving a small landstrip that connects the two rock forms that Stora Jonsholmen consist of.

Quite early when we got ashore we understood that large parts of the terrain is challenging because of two higher rock peaks in the central part of the island with steep ledges but also because of a rather hilly rock configuration overall.

It was clear to us that the topography is not optimal regarding availability nor sunbathing and the nature will not offer this by itself. This makes well thought out additions, both in terms of placement and design inevitable to transform Stora Jonsholmen into the sea bathing island i visualized in my mind.

To access the eastern part of the island we decided to anchor the boat at the southeastern shore of the island close to one of the holiday cottages that is located there. This to avoid climbing in the steep slippery rock peak in the central part of the island which would be a bad idea consider i had recent knee surgery and falling would be a disaster.

From the southeastern part of the island we could survey the access point i had in mind for the pedestrian bridge leading from the southern part of Saltholmen to the northeastern part of Stora Jonsholmen. We could also start to grasp how the overall movement could be configured to enable access throughout the island.

We had coffee and packed lunch in the shelter of the southeastern holiday cottage and talked about how this place can be so close to the mainland yet so inaccessible and unvisited. Especially when people on a sunny day are flooded on the islets just some hundred meters south.

We packed our stuff and jumped into the boat again, now it was my turn to row and i slowly saw Stora Jonsholmen disappear in the horizon.

When we came ashore i cycled out to Saltholmen yacht harbour and took a walk out to the other islets Galejholmen and Aspholmen that is located there. These two are the main islands for sea bathing in the area today. From there i could overview Stora Jonsholmen from the western side.

Approaching Stora Jonsholmen outside Hinsholmen harbor.

Steep ledges towards the peak in the central part of the island.

Cliffs on the western side.

Inlet towards southwest.

Inlet towards north.

View south over Lilla Jonsholmen

View towards Hinsholmen harbour.

View towards Saltholmen.

Walkway from Saltholmen tram stop, Stora Jonsholmen is glimpsed in the upper right.

End of walkway on Saltholmen south side, Stora Jonsholmen seen ahead.

Aspholmen south shore with a view over the gap between Saltholmen and Stora Jonsholmen.

From Galejholmen viewing over Aspholmen and Stora Jonsholmen.

Site visit 5th of May

On the 5th of january I took the boat from Saltskär out to Stora Jonsholmen once again. This time in considerably better weather than back in january.

The objective this time is not so much to get a grasp of the overall terrain but instead look closer into the building placement on the island as well as take photographs on point of interest as a base for rendered images.

On my way out I realize the water level is very low this particular day since you can clearly see a drawn line above the current water level on all the island and islets around me.

Initially i go ashore close to the bridge ledge on Saltholmen to take pictures of that situation as well as overview pictures of Stora Jonsholmen.

I go ashore on the southern side of Stora Jonsholmen to take pictures of the building context situation. I jump around the islets to try to take pictures from every angle since it is hard to know what perspectives i will need at this point.

I sit down on a cliffside and have my packed lunch and capture my surroundings. It is quite remarkable how different the impression of the archipelago is this time of year since last time i was out in january. Back then great imagination was required to see the possibilites but now it is just lovely out here.

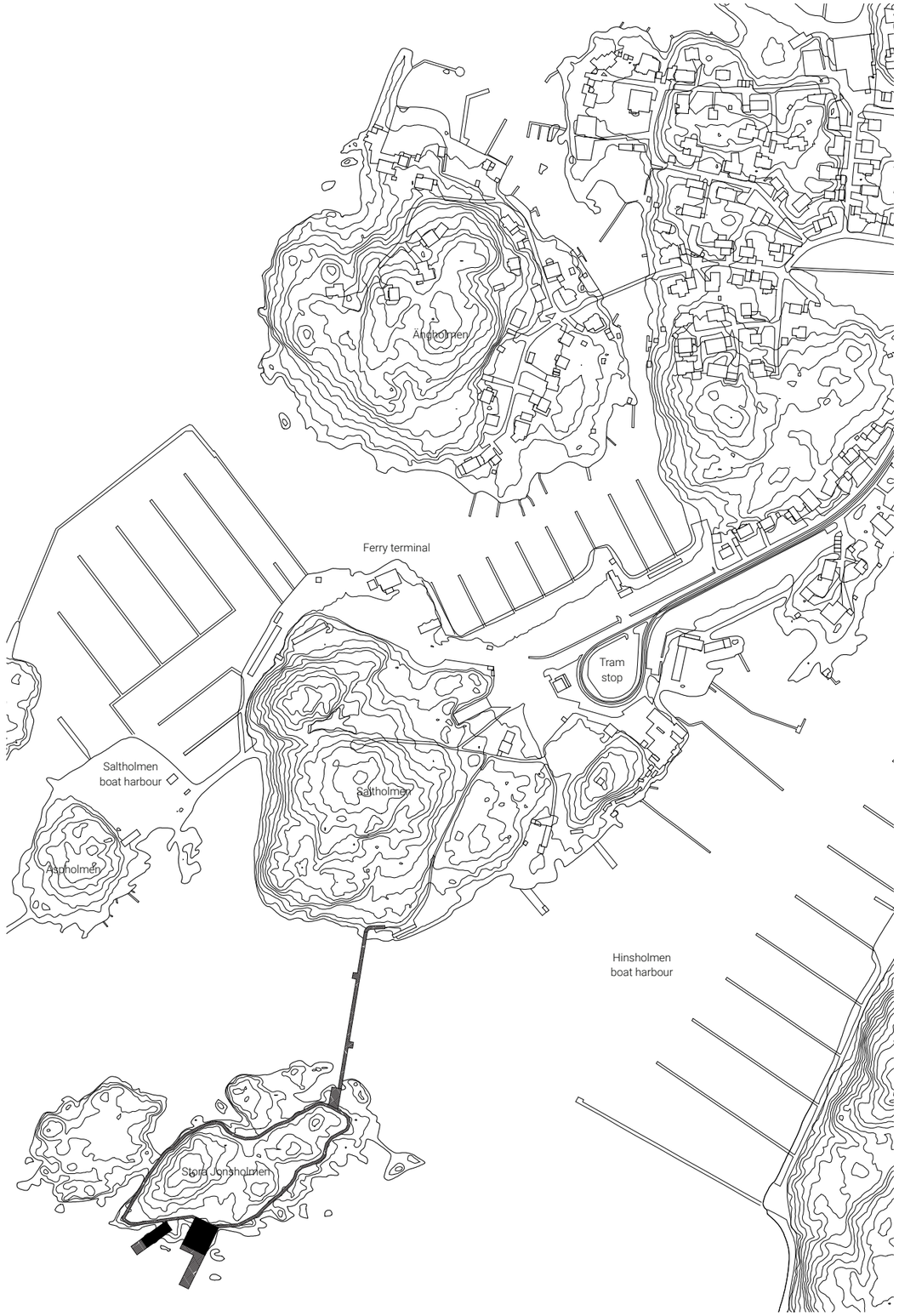
Rock solid.

Narrow opening.

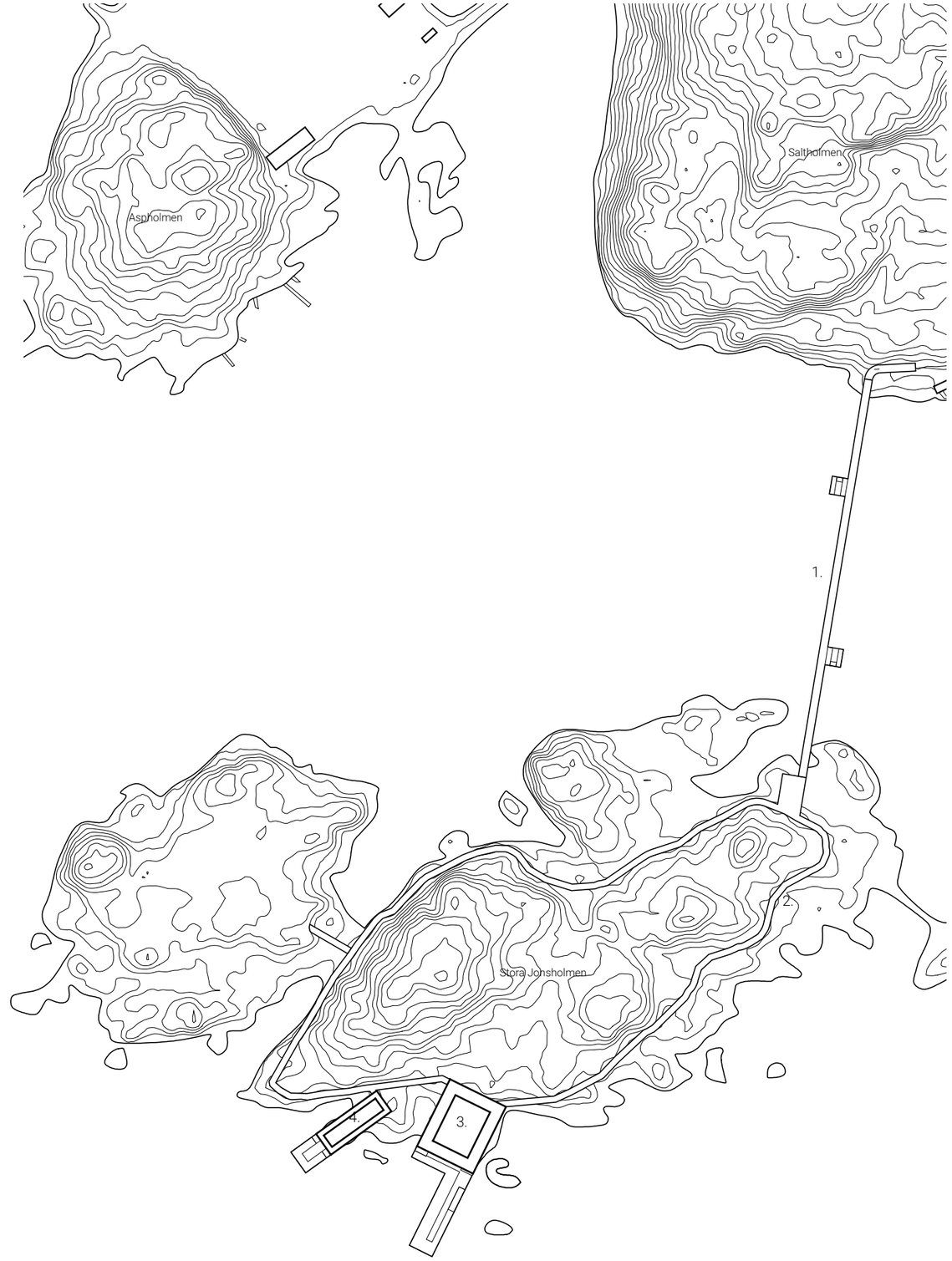
Overview of Stora Jonsholmen from Saltholmen cliffside.

Pavilion site location towards Hinsholmen harbour.

IV. Proposal

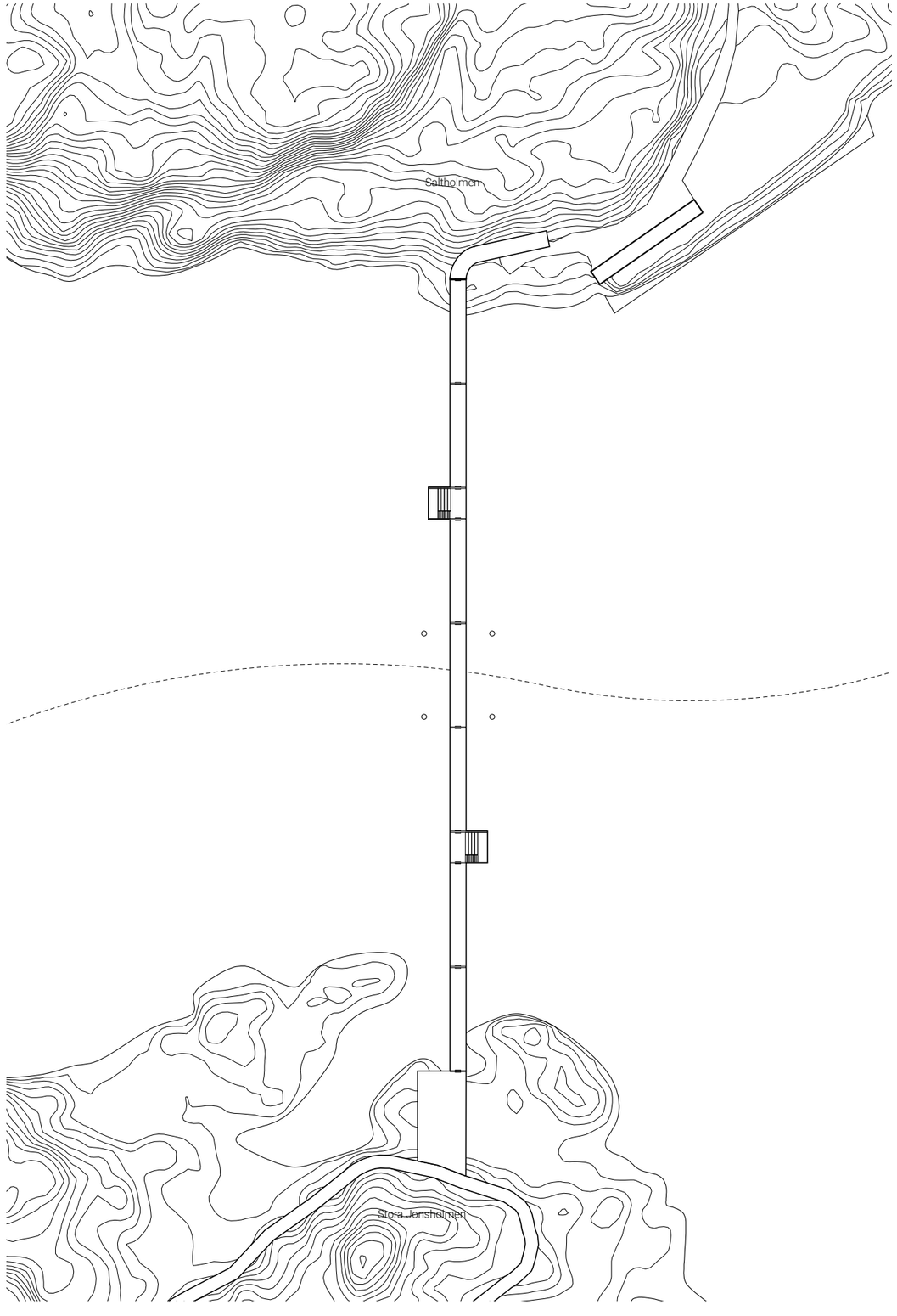


Context | Site plan 1:5000



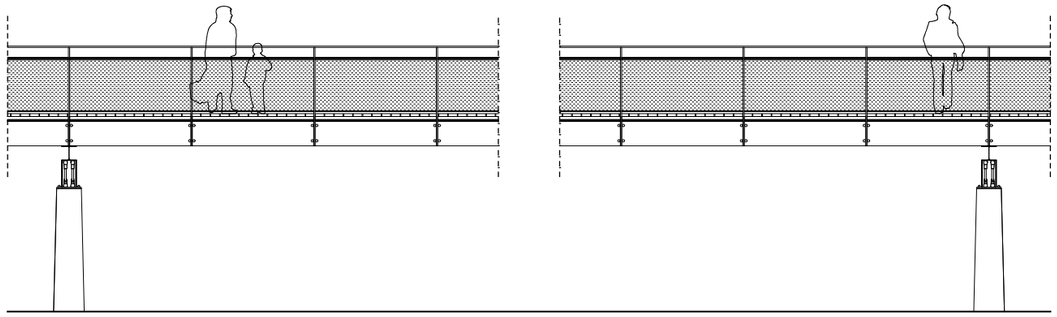
1. Pedestrian bridge
2. Walkway loop
3. Restaurant pavilion
4. Changing pavilion

Conext | Site plan 1:2000

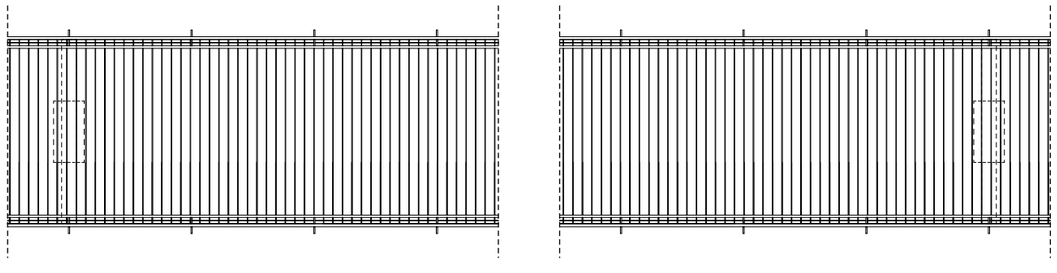


Entire bridge seen from east.

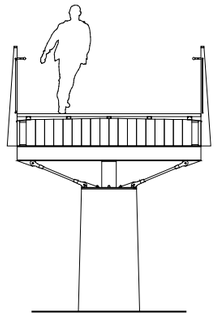
Bridge take-off from the cliffs of Saltholmen.



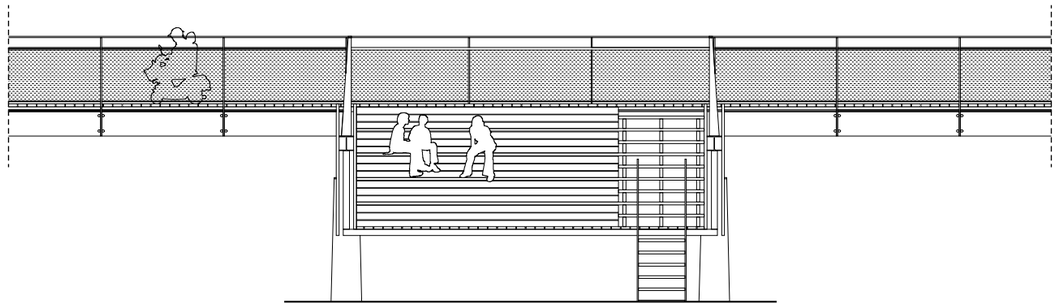
Elevation



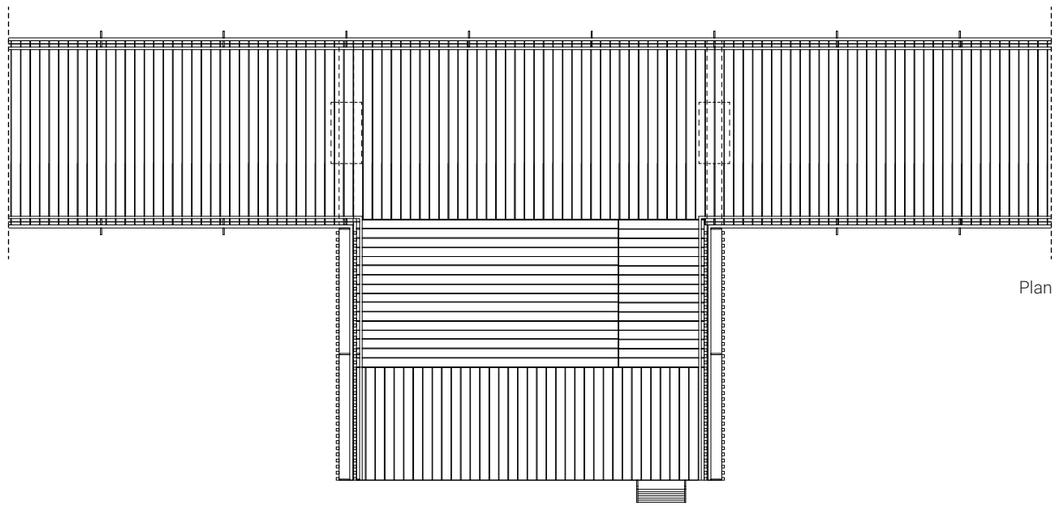
Plan



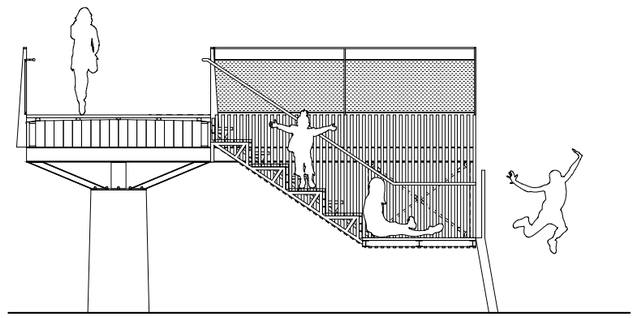
Section



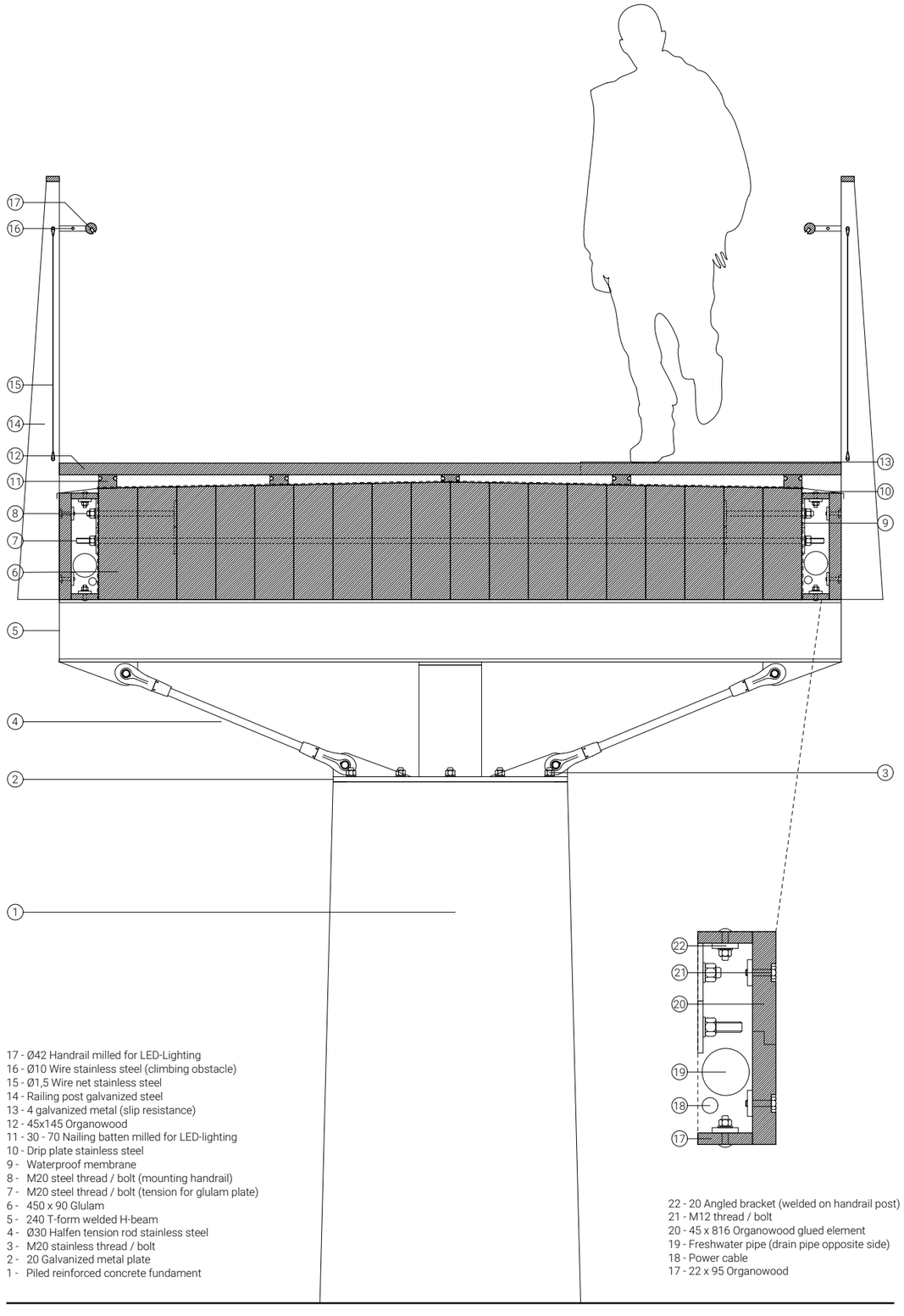
Elevation



Plan



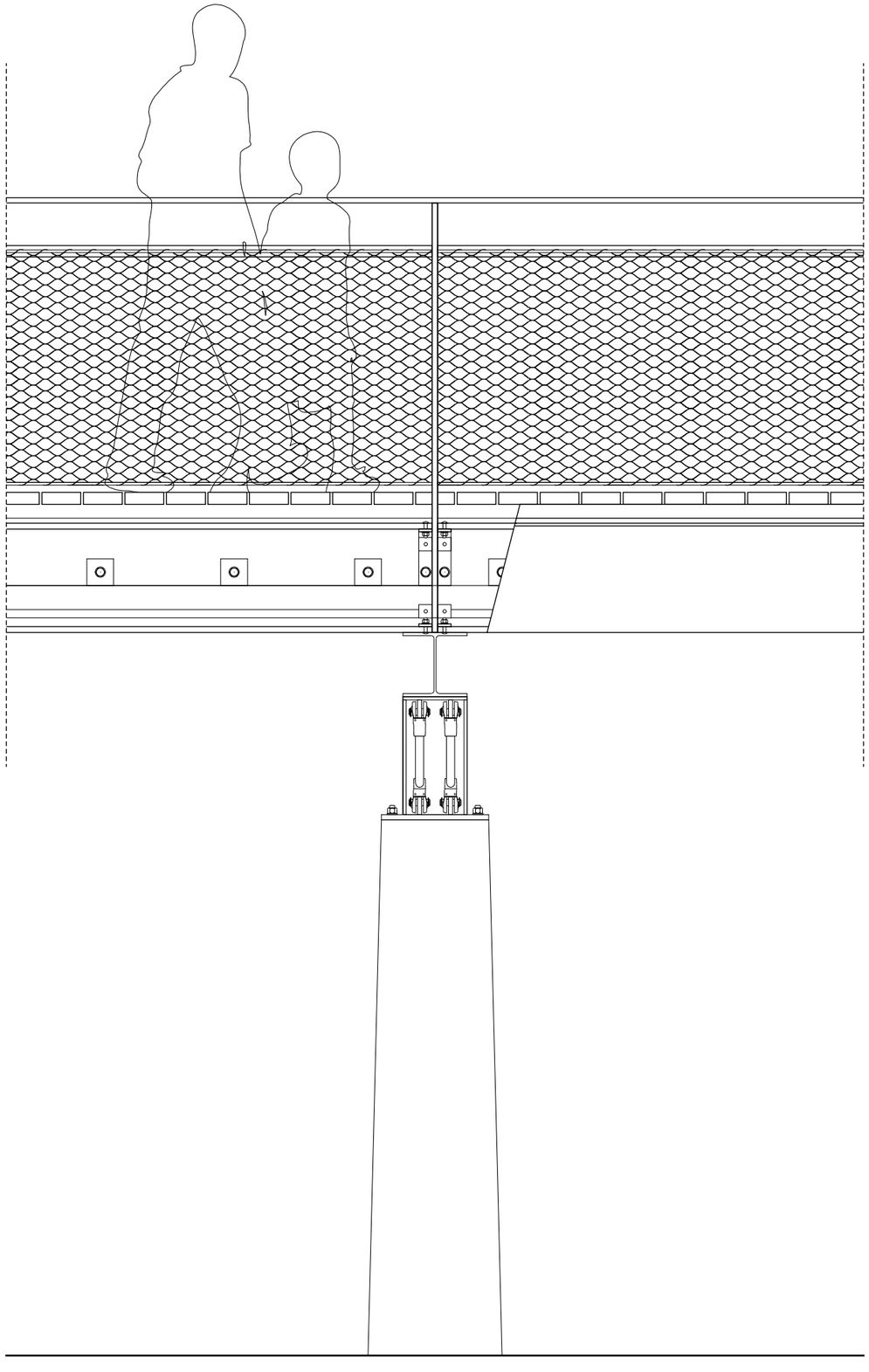
Section



17 - Ø42 Handrail milled for LED-Lighting
16 - Ø10 Wire stainless steel (climbing obstacle)
15 - Ø1,5 Wire net stainless steel
14 - Railing post galvanized steel
13 - 4 galvanized metal (slip resistance)
12 - 45x145 Organowood
11 - 30 - 70 Nailing batten milled for LED-lighting
10 - Drip plate stainless steel
9 - Waterproof membrane
8 - M20 steel thread / bolt (mounting handrail)
7 - M20 steel thread / bolt (tension for glulam plate)
6 - 450 x 90 Glulam
5 - 240 T-form welded H-beam
4 - Ø30 Halfen tension rod stainless steel
3 - M20 stainless thread / bolt
2 - 20 Galvanized metal plate
1 - Piled reinforced concrete fundament

22 - 20 Angled bracket (welded on handrail post)
21 - M12 thread / bolt
20 - 45 x 816 Organowood glued element
19 - Freshwater pipe (drain pipe opposite side)
18 - Power cable
17 - 22 x 95 Organowood

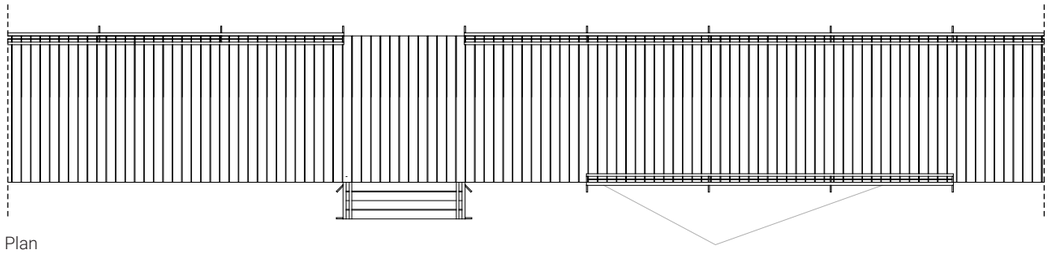
Pedestrian bridge | Detail section 1:20



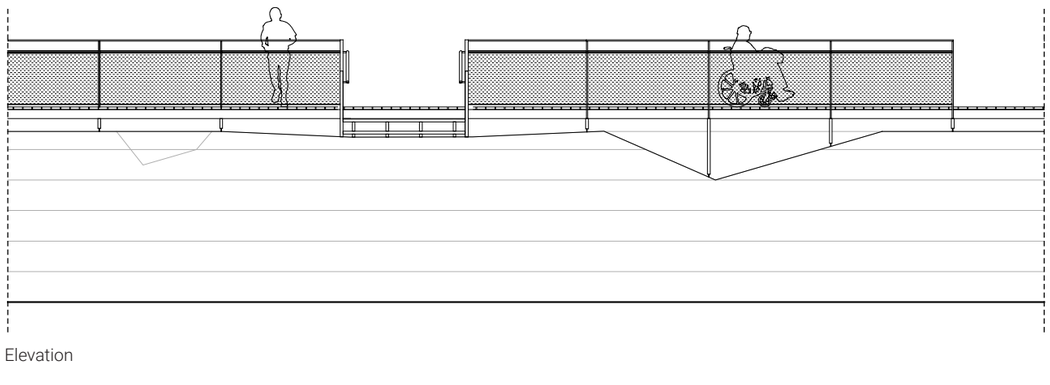
Pedestrian bridge | Detail elevation 1:20

Pedestrian bridge | Perspective

Towards Stora Jonsholmen.

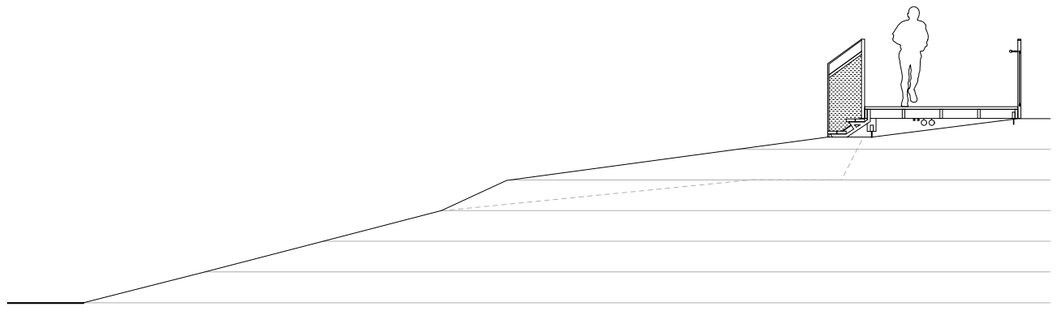


Plan

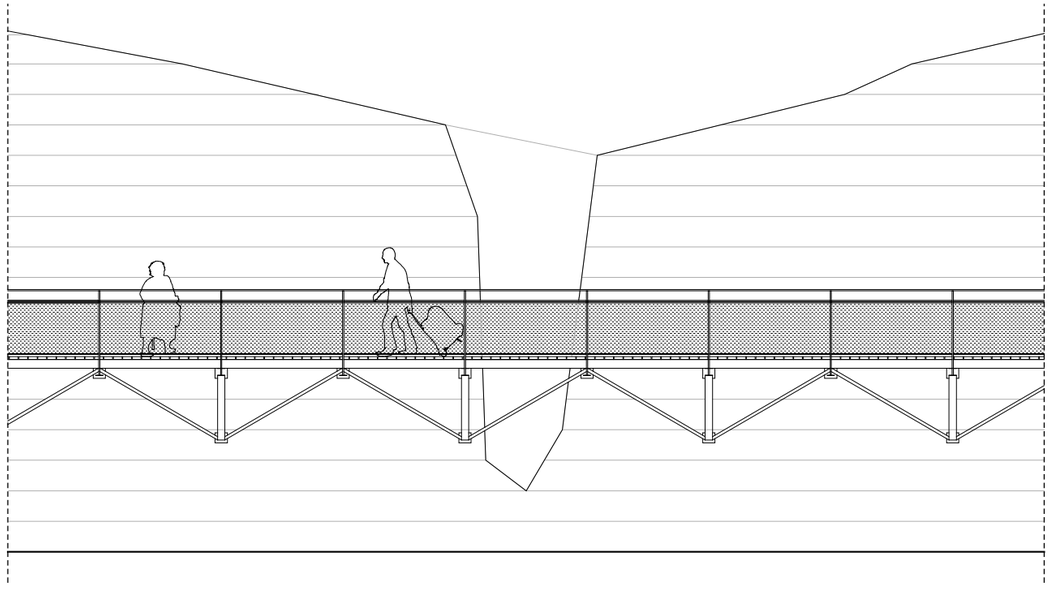


Elevation

Flat terrain

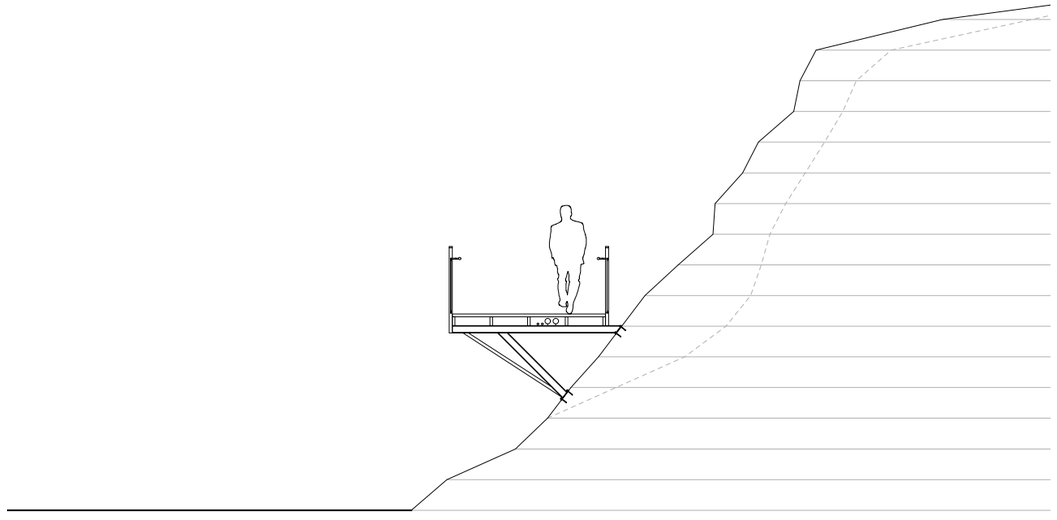


Section

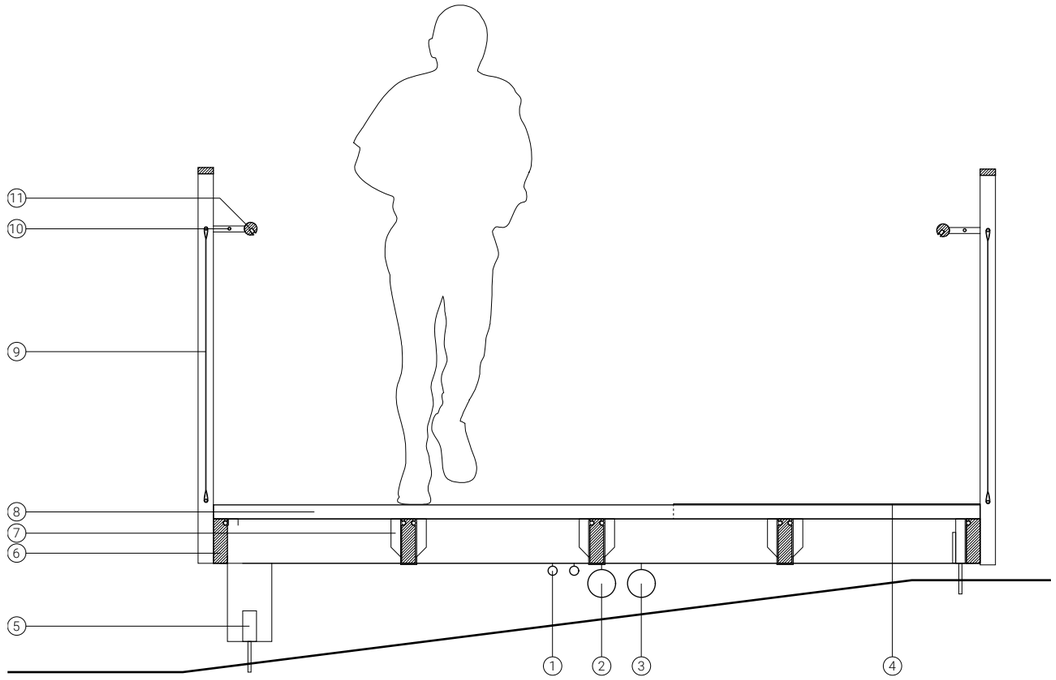


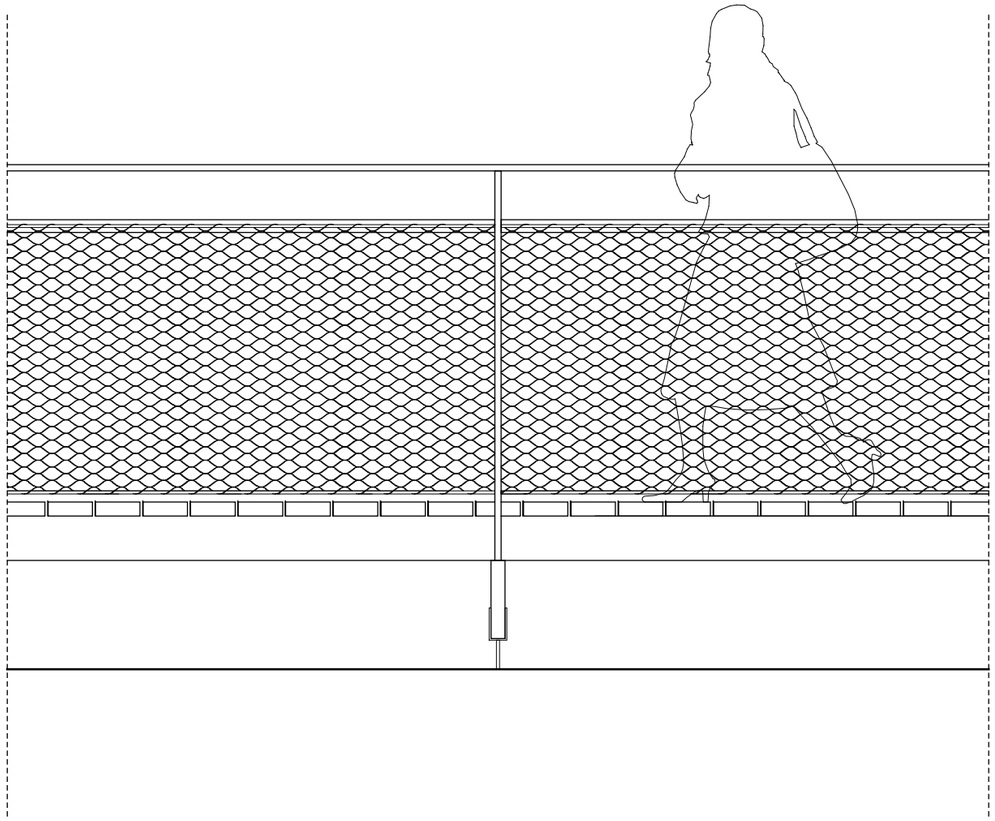
Elevation

Steep terrain



Section





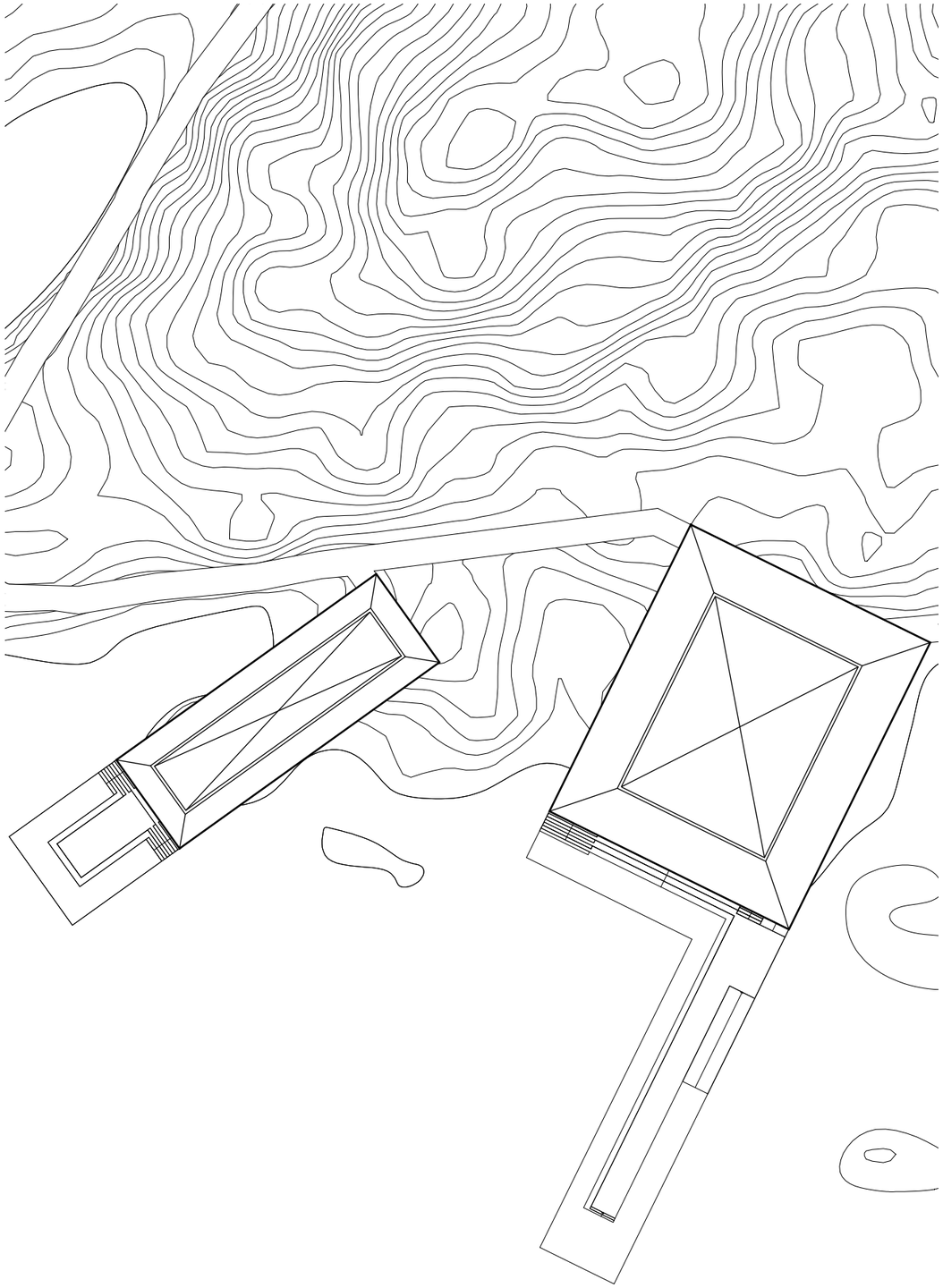
11 - Ø42 Handrail milled for LED-Lighting
10 - Ø10 Wire stainless steel (climbing obstacle)
9 - Ø1,5 Wire net stainless steel
8 - 45 x 145 Organowood
7 - Joist hanger galvanized steel
6 - 145 Construction timber milled for LED-lighting
5 - Post anchor galvanized steel
4 - 4 galvanized metal (slip resistance)
3 - Drain pipe
2 - Freshwater pipe
1 - Power cable

Walkway | Detail section 1:20

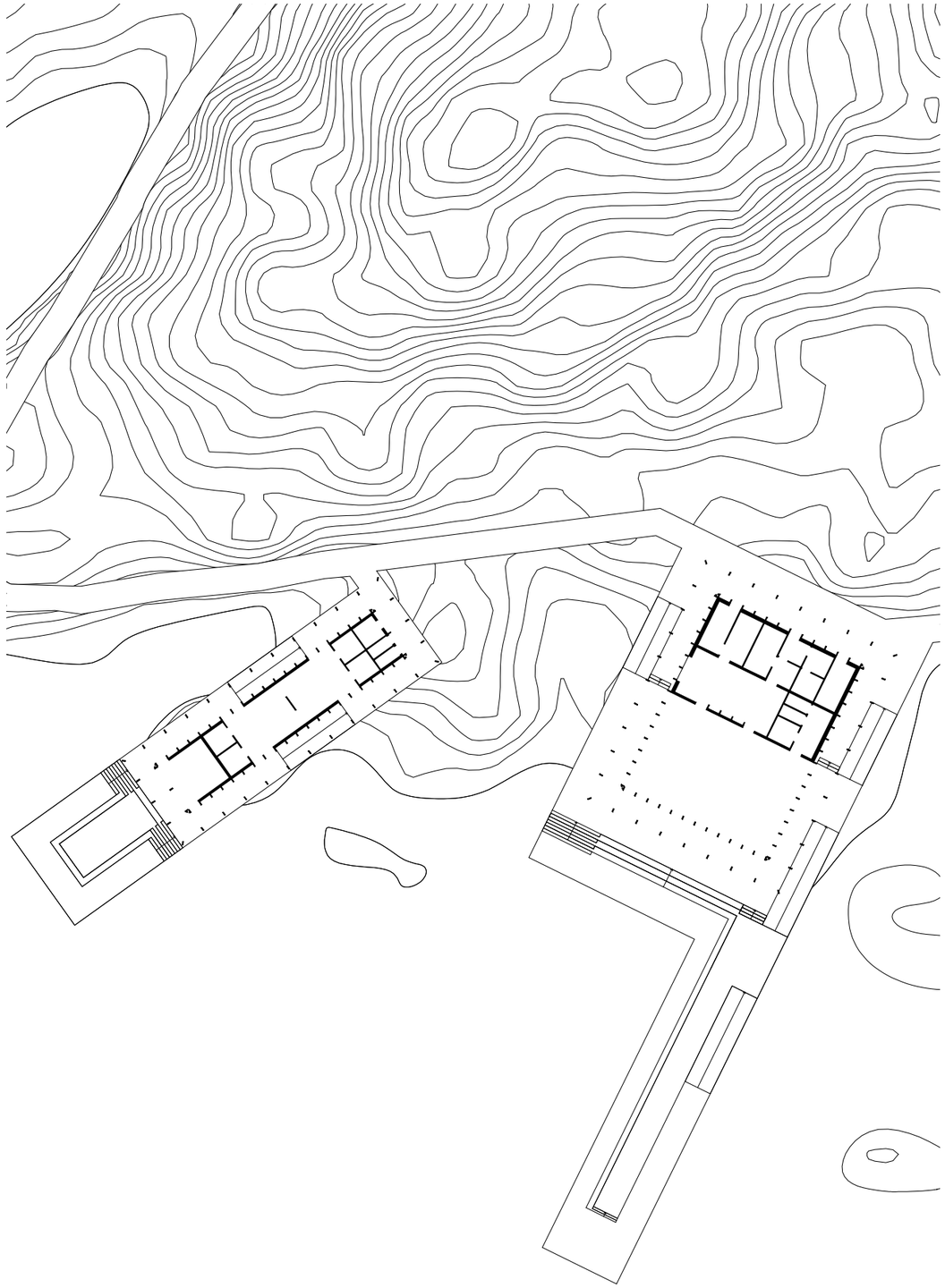
Walkway | Detail elevation 1:20

Walkway | Perspective

Approaching the restaurant pavilion.

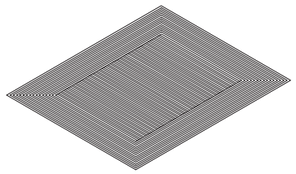


Pavilion context | Roof plan 1:500

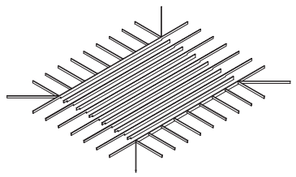


Pavilion context | Plan 1:500

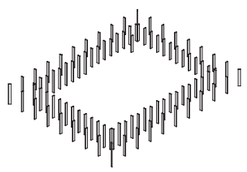
6. Framework
Planed wood 120 - 250 x 45



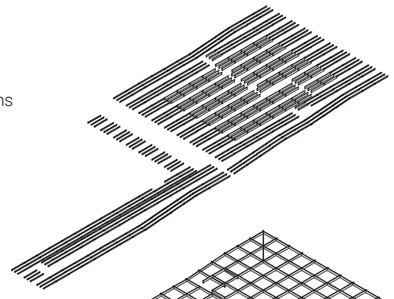
5. Roof beams
Glulams 480 - 315 x 90



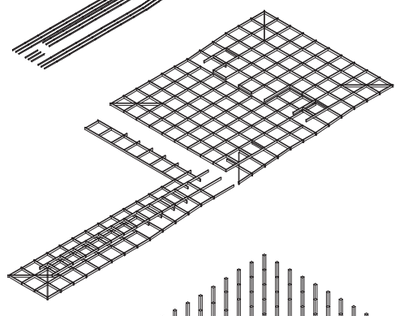
4. Pillars
Glulams 315 x 90



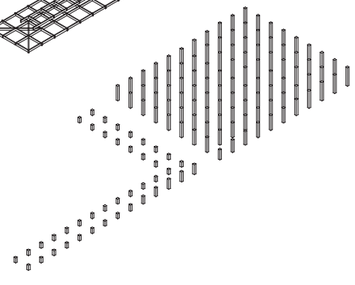
3. Secondary beams
Construction wood
145 - 315 x 45

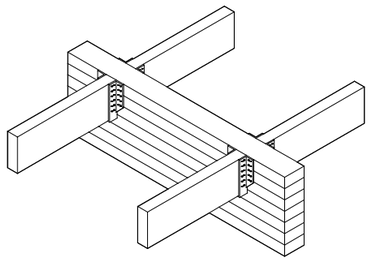


2. Primary beam
Glulams 315 x 90

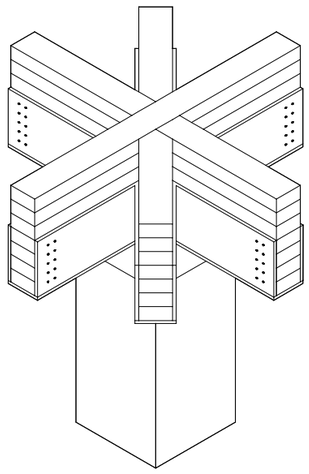


1. Plinths 2,4m C - C
Concrete 300 x 300

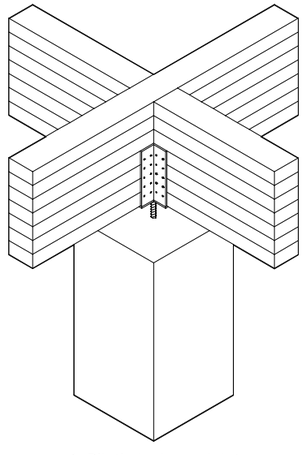




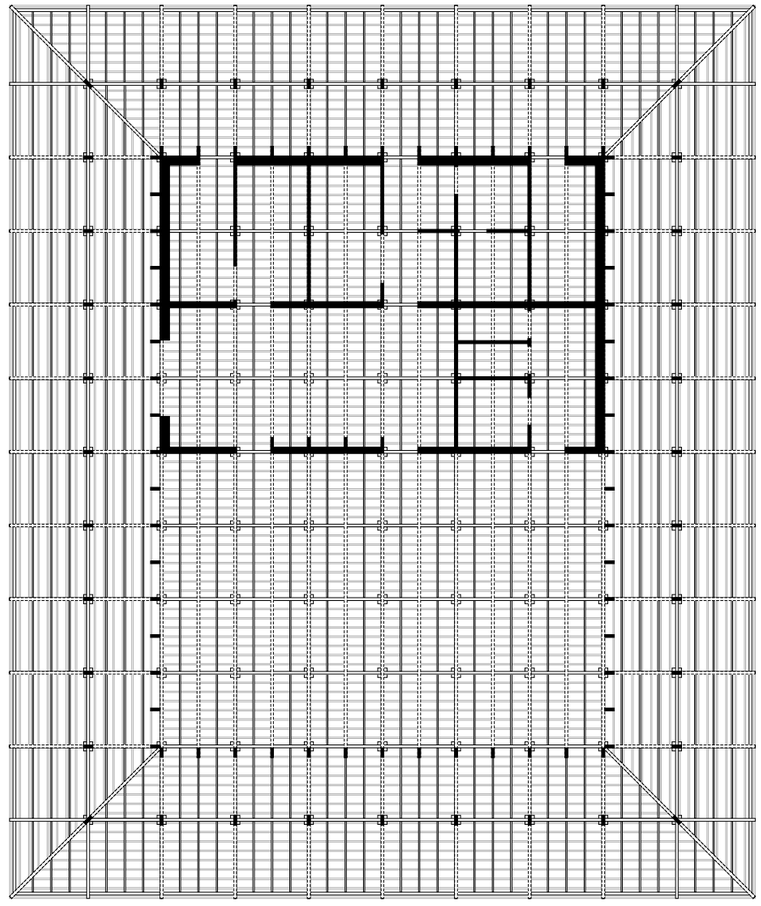
3. Primary / secondary beam joint
Joist hanger galvanized steel

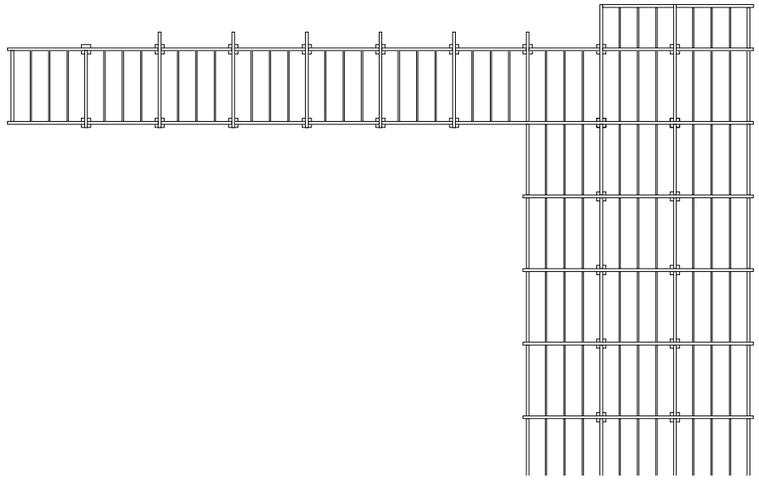


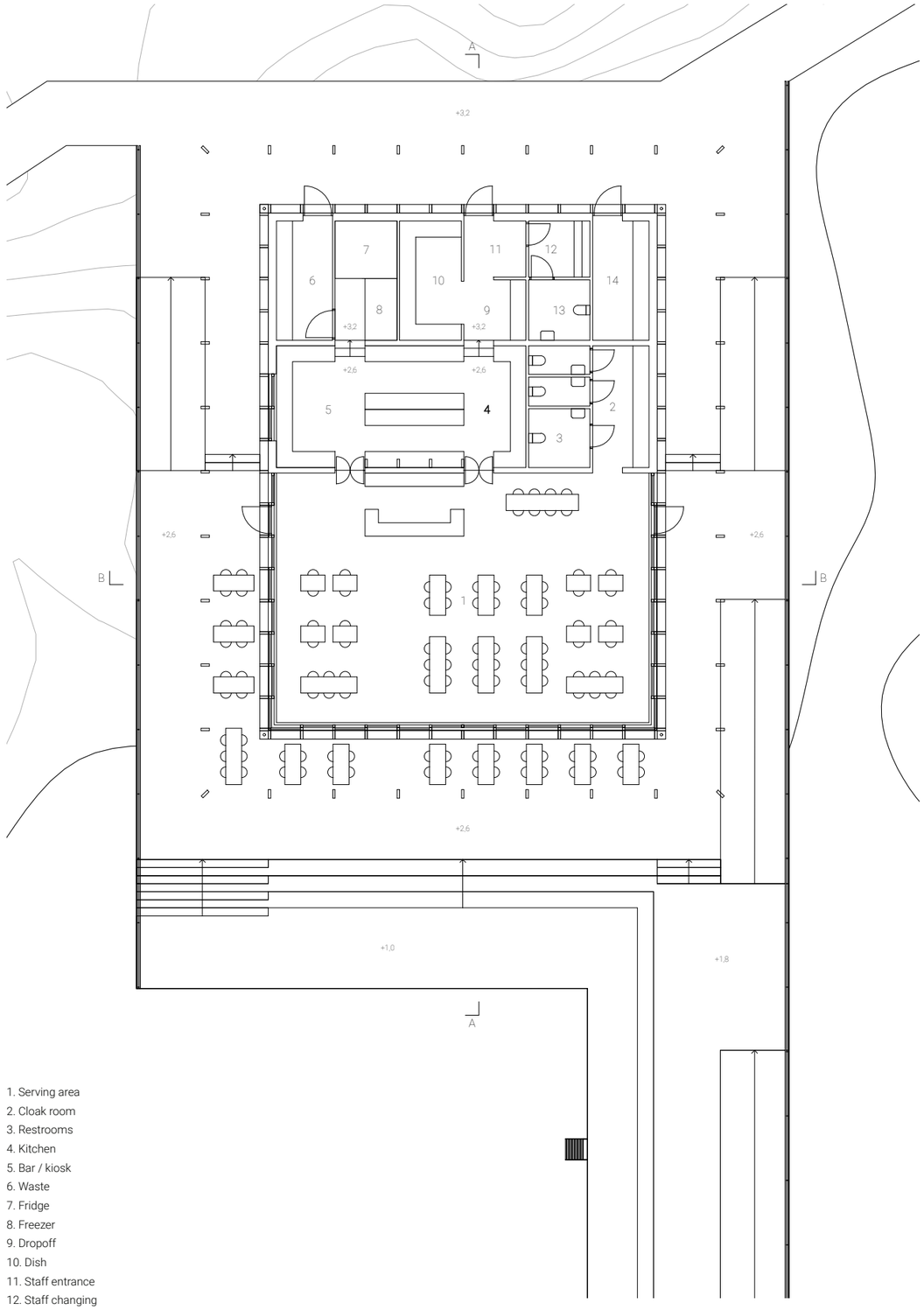
2. Crossing primary beams joint
Stiffenening bracket galvanized steel



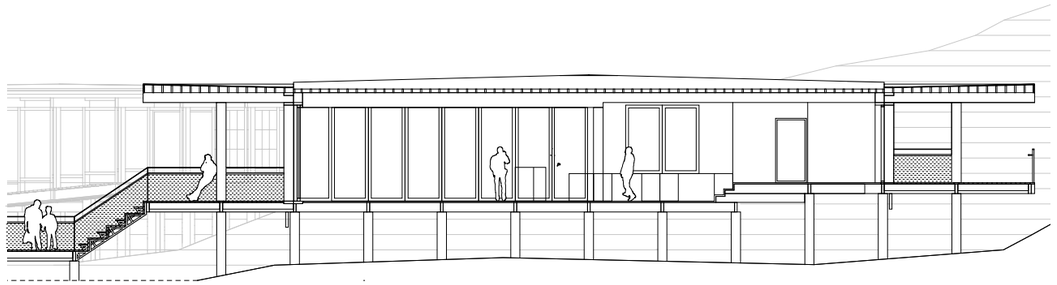
1. Plinth / primary joint
Square shaped post anchor galvanized steel



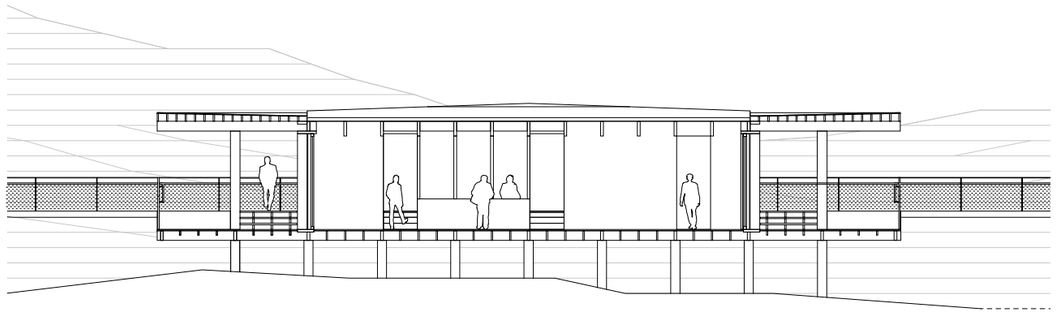




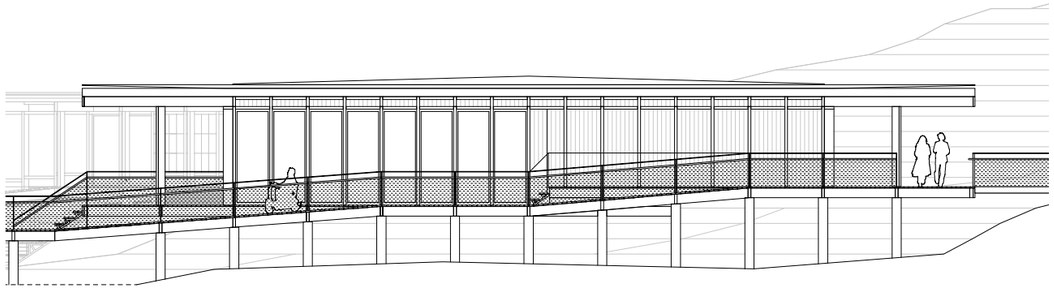
1. Serving area
2. Cloak room
3. Restrooms
4. Kitchen
5. Bar / kiosk
6. Waste
7. Fridge
8. Freezer
9. Dropoff
10. Dish
11. Staff entrance
12. Staff changing
13. Staff restroom
14. Technic



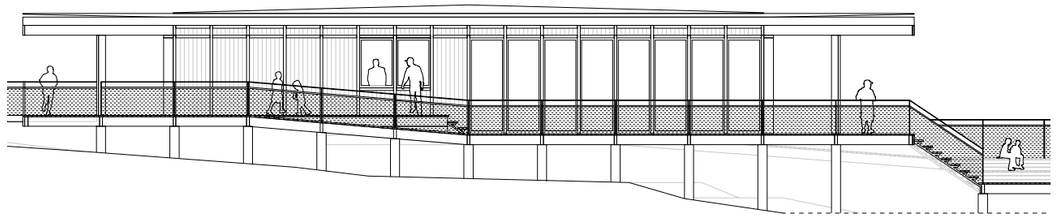
A-A



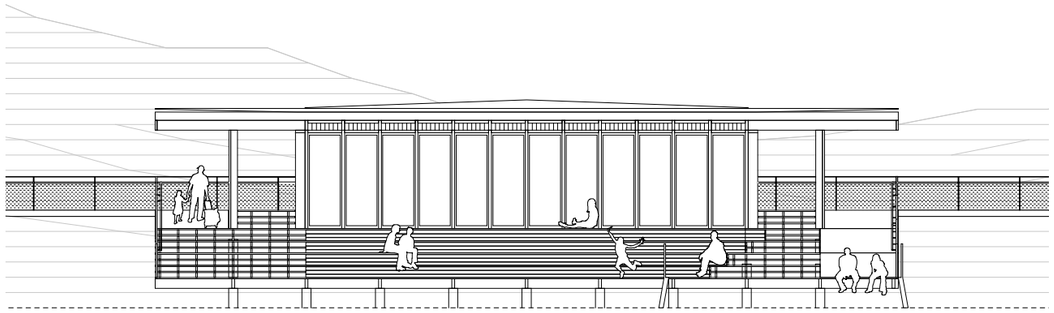
B-B



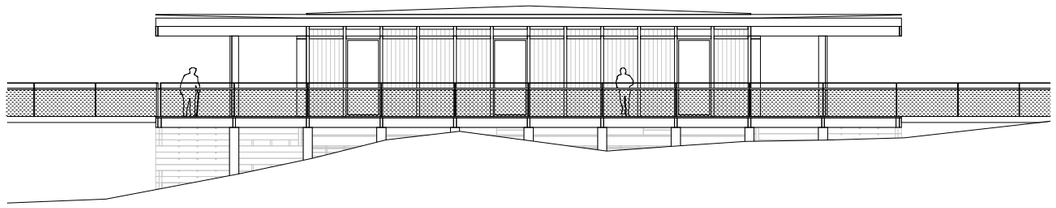
East



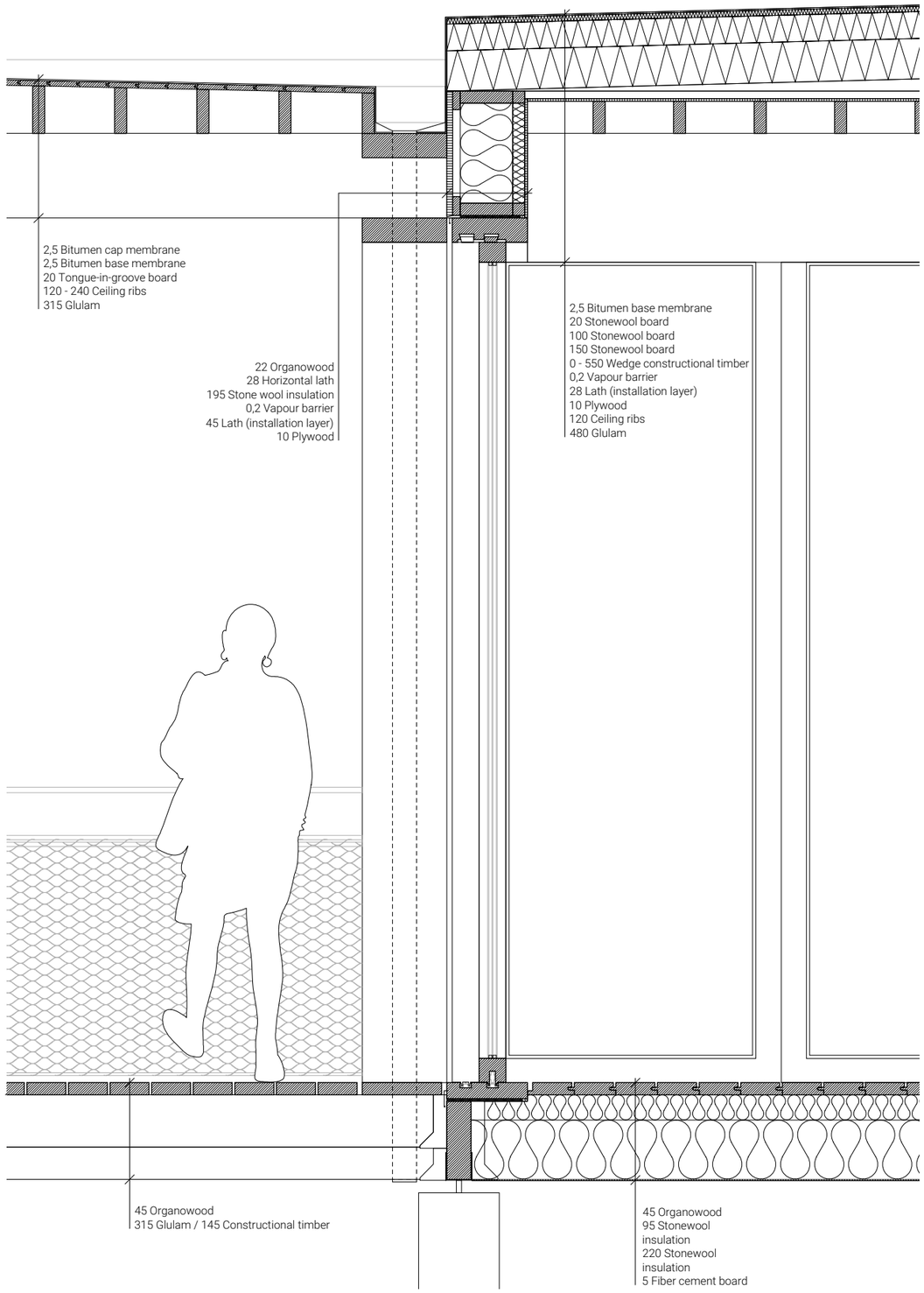
West

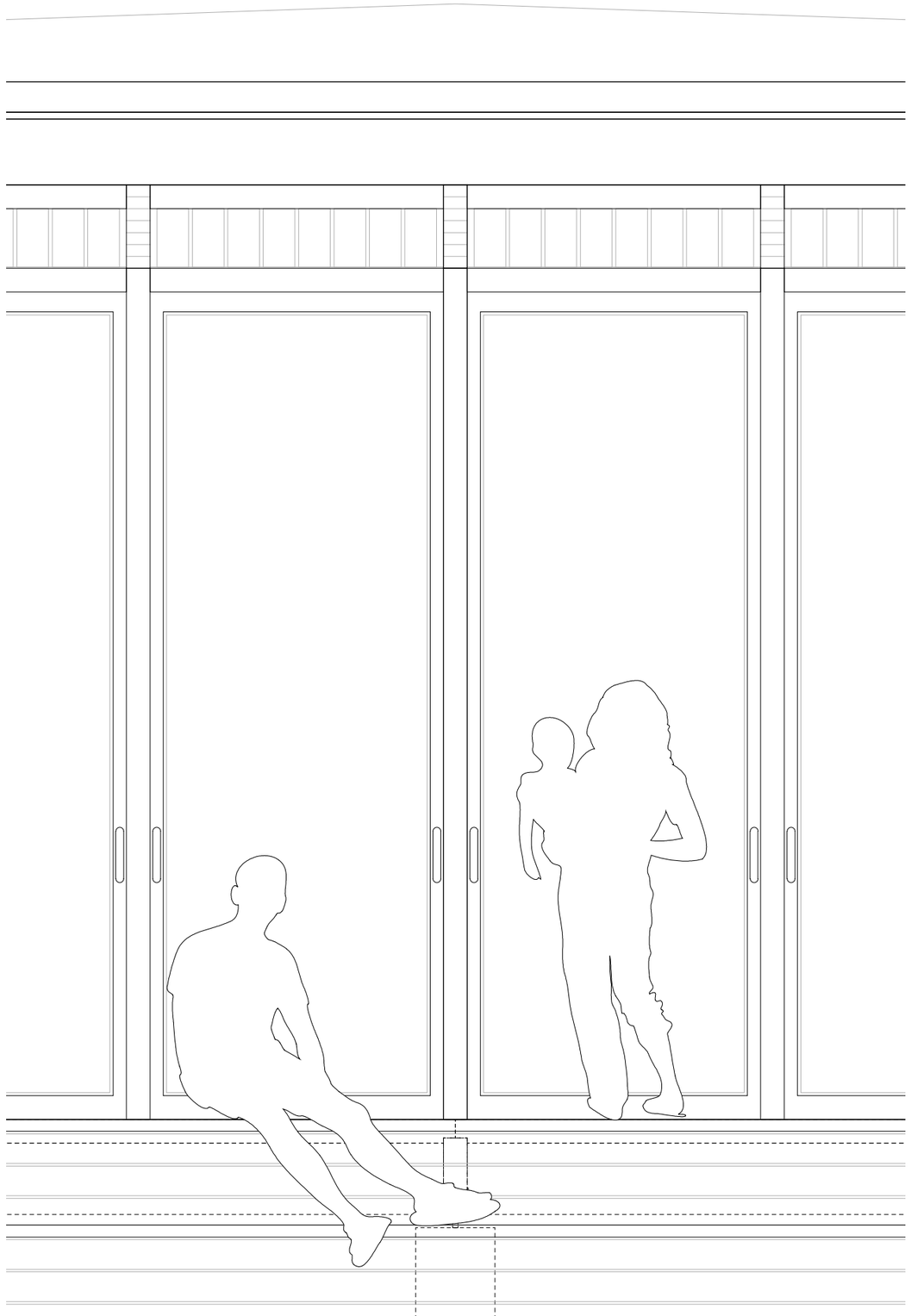


South



North


2,5 Bitumen cap membrane
2,5 Bitumen base membrane
20 Tongue-in-groove board
120 - 240 Ceiling ribs
315 Glulam
22 Organowood
28 Horizontal lath
195 Stone wool insulation
0,2 Vapour barrier
45 Lath (installation layer)
10 Plywood
2,5 Bitumen base membrane
20 Stonewool board
100 Stonewool board
150 Stonewool board
0 - 550 Wedge constructional timber
0,2 Vapour barrier
28 Lath (installation layer)
10 Plywood
120 Ceiling ribs
480 Glulam
45 Organowood
315 Glulam / 145 Constructional timber
45 Organowood
95 Stonewool
insulation
220 Stonewool
insulation
5 Fiber cement board



East arcade with pier ahead.

Structural layers.

Outdoor serving area towards south.

South side.

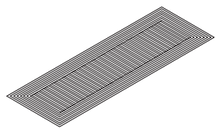
West arcade.

Serving area towards east and the mainland.

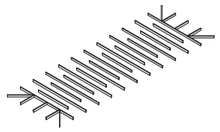
Restaurant pavilion | Perspective

Serving area towards Lilla Jonsholmen.

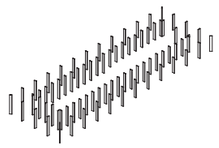
6. Framework
Planed wood 120-250 x 45



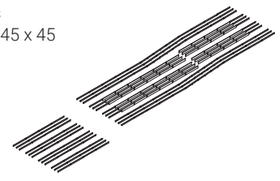
5. Roof beams
Glulams 480-315 x 90



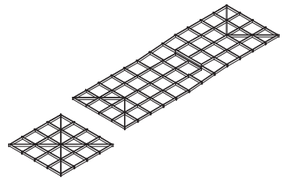
4. Pillars
Glulams 315 x 90



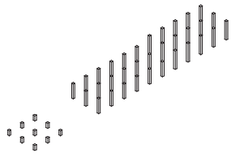
3. Secondary beams
Construction wood 145 x 45

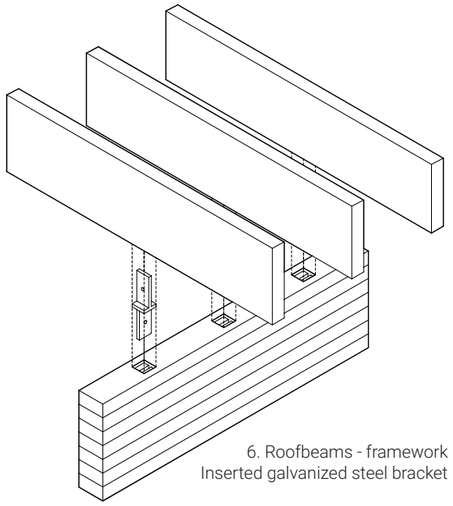


2. Primary beam
Glulams 315 x 90

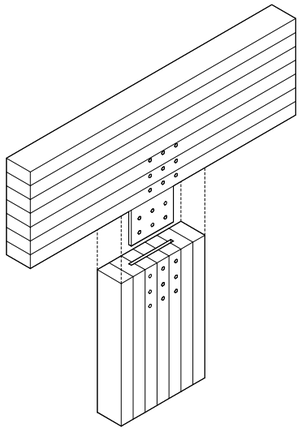


1. Plinths 2,4m c-c
Concrete 300 x 300

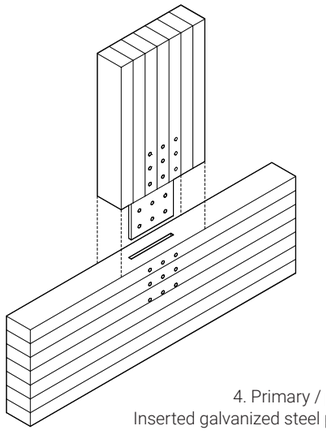




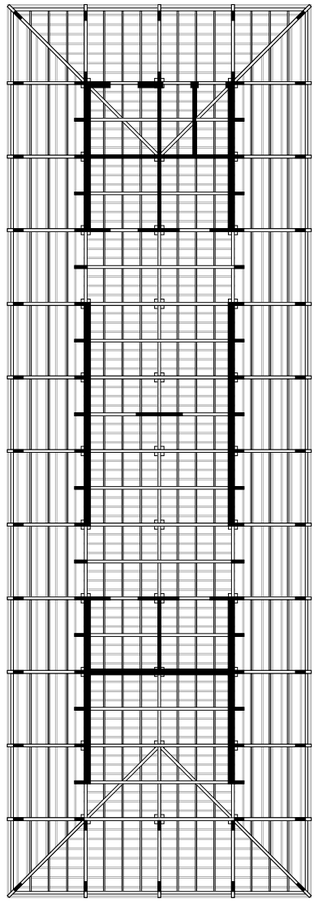
6. Roofbeams - framework
Inserted galvanized steel bracket

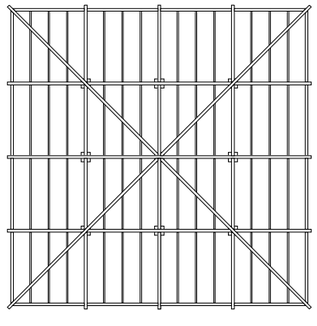


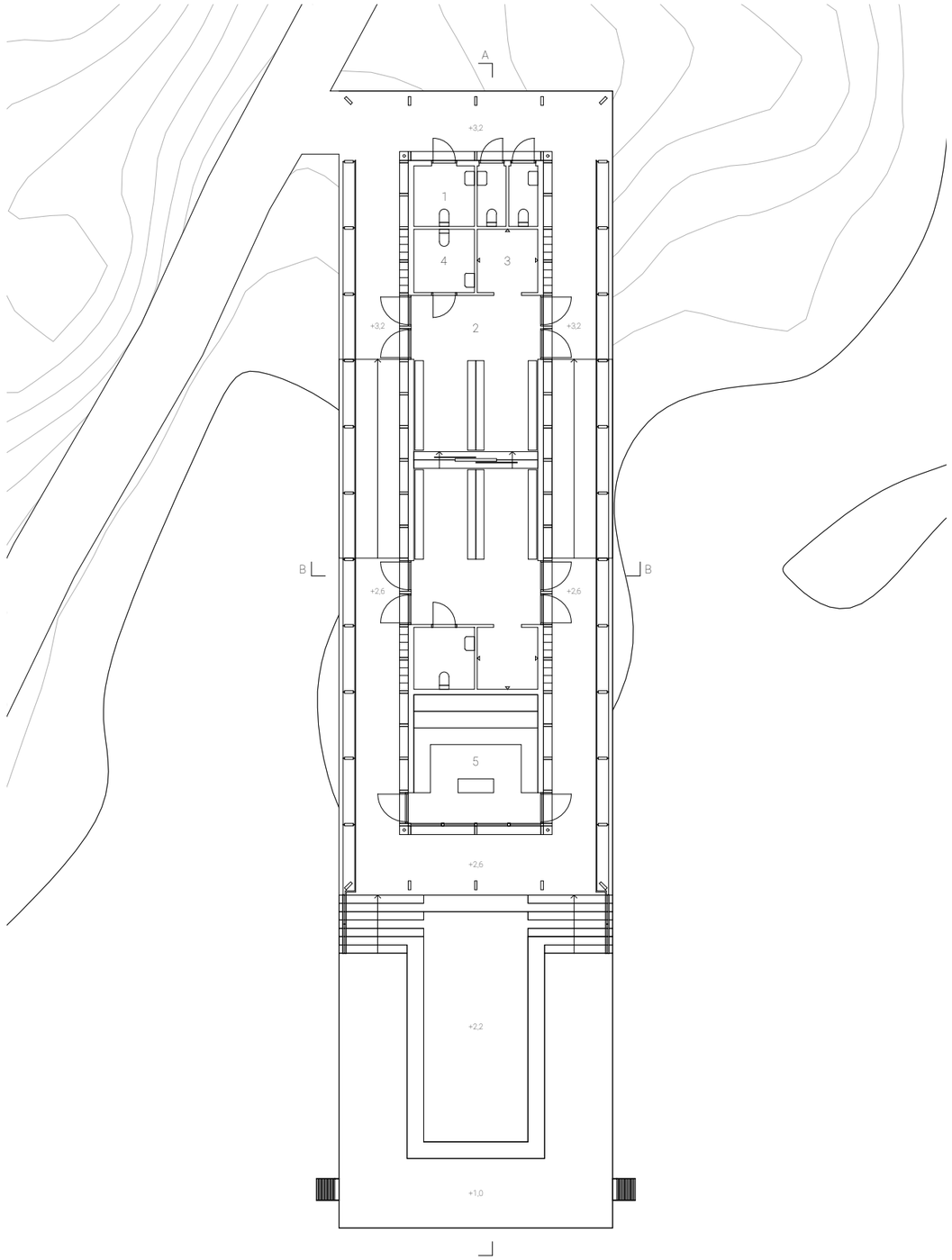
5. Primary - roofbeam
Inserted galvanized steel plate



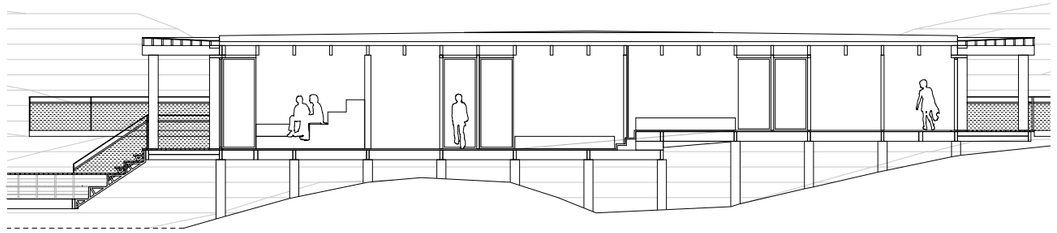
4. Primary / pillar
Inserted galvanized steel plate



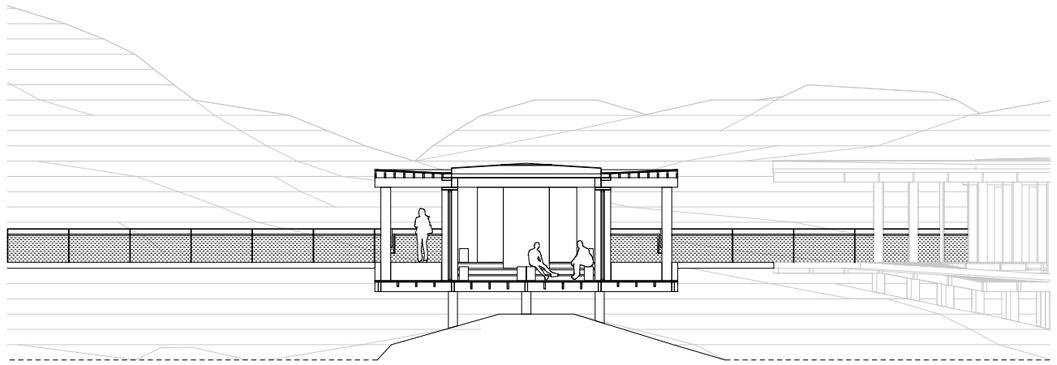




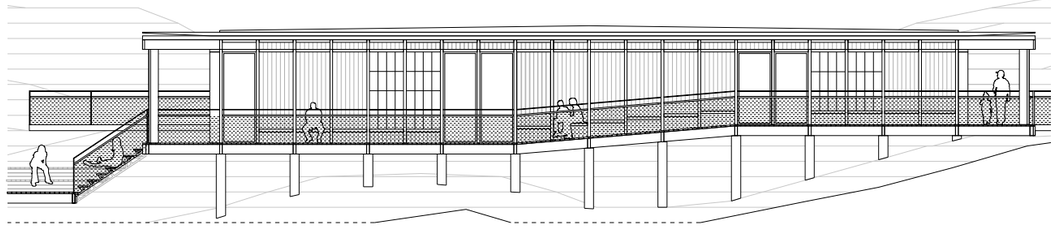
1 - External restrooms
2 - Changing (two units)
3 - Shower
4 - Restroom
5 - Sauna



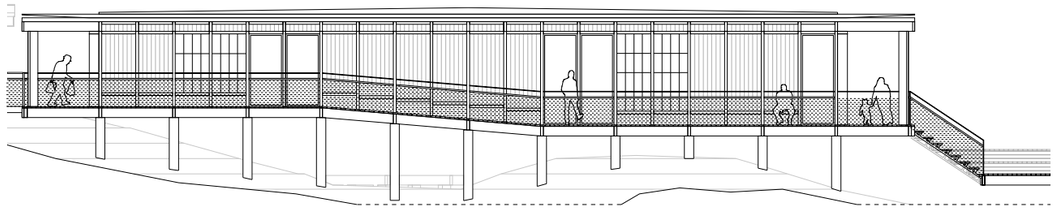
A-A



B-B



East



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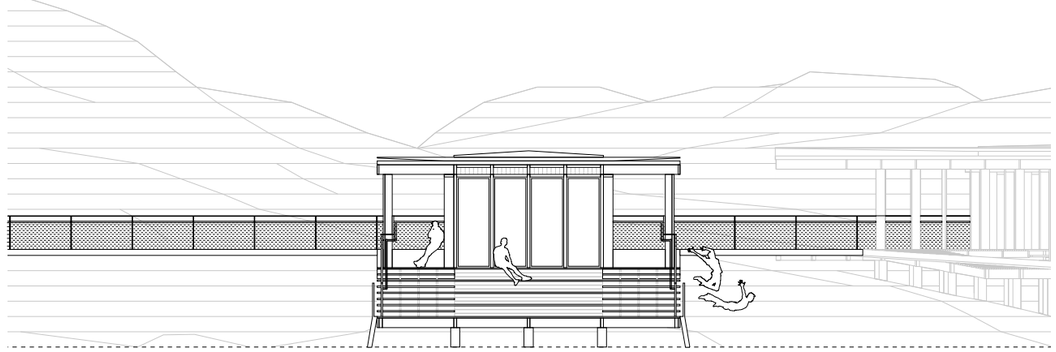
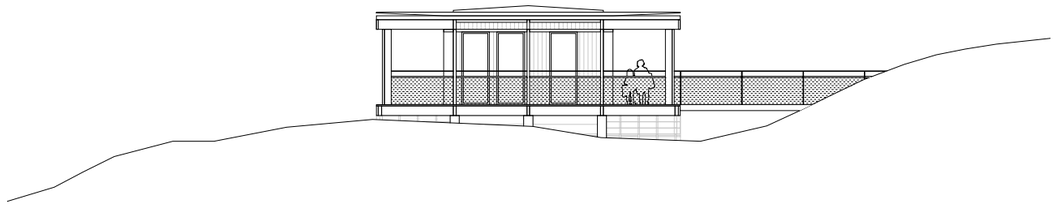
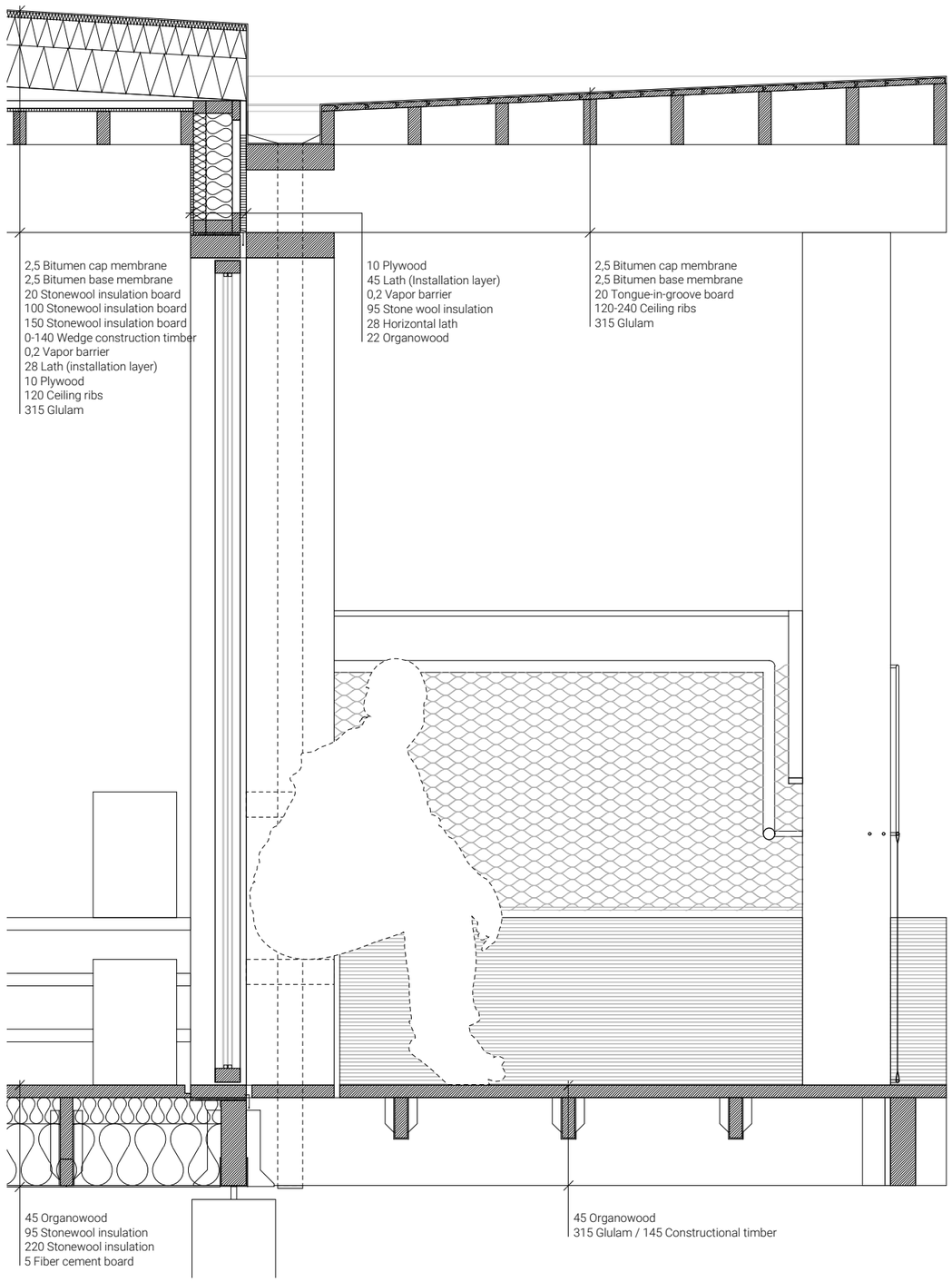
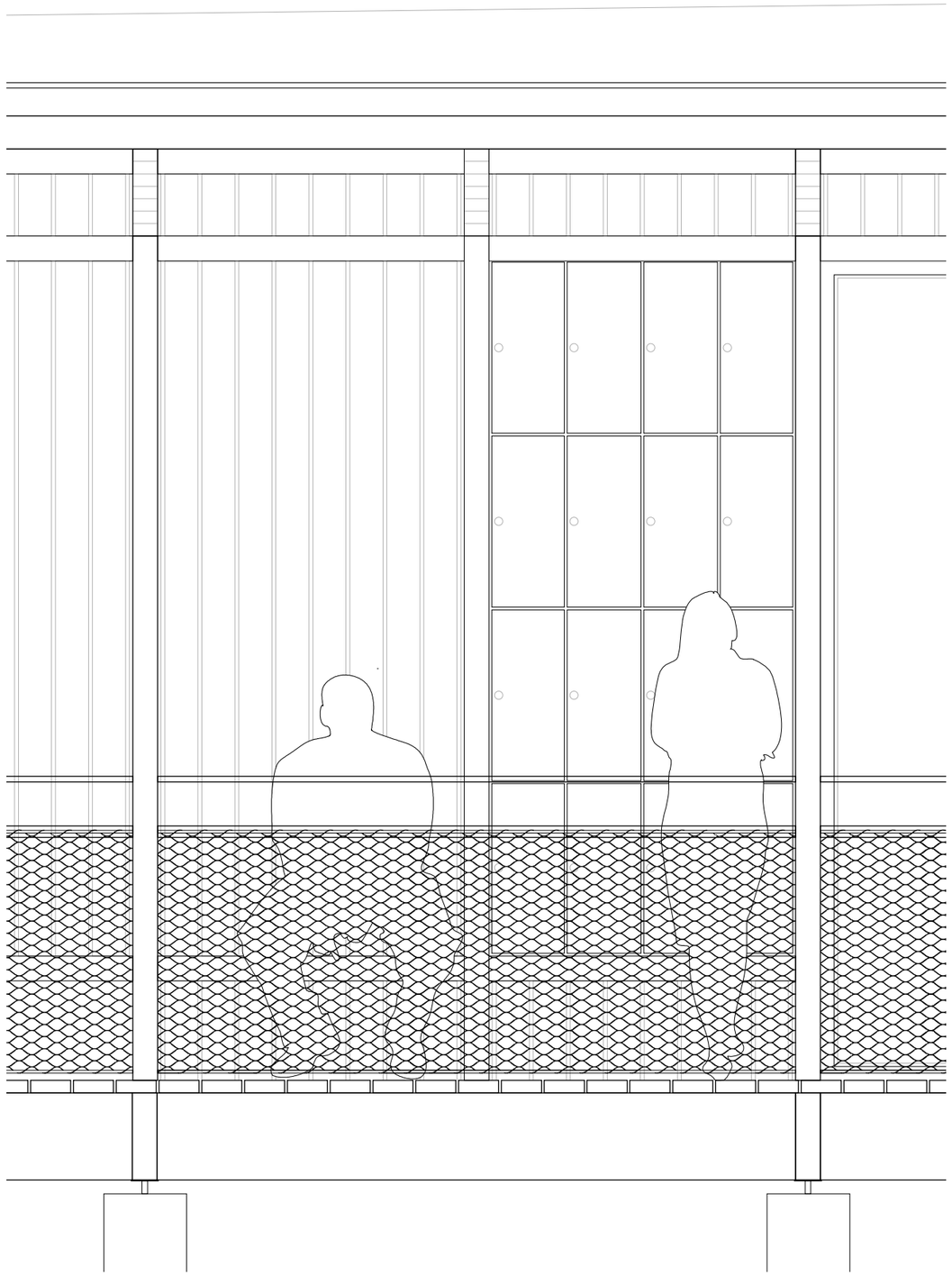


South



North





Changing pavilion | Detail section 1:20

Changing pavilion | Detail elevation 1:20

East arcade with lockers and seating niches.

View from sauna.

View from sauna.

Changing pavilion | Perspective

View from bathing platform.

Pavilions | Perspective

View from southwest.

Pavilions | Perspective

View from south.

View from east.

Investigation

My theoretical investigation have mainly consisted of studying wood and glulams and their implementation as well as pedestrian bridges.

I have also met a number of key persons to learn more in their fields and that has helped me tremendously to develop the project further.

I have met Roberto Crocetti which is an engineer and professor at Royal institute of technology and he is specialized in wood based hybrid constructions. He has been tutoring me regarding the design process of the pedestrian bridge.

I have visited Moelven in Töreboda which is the world's oldest glulam factory where Thomas Johansson showed me the process of producing glulams. This gave me an understanding not only of the production process but developed my knowledge about the material in general.

I have also talked to Olof Wängborg at Västkuststiftelsen, he is project manager at Bohusleden which is a 340 km trail running along the Swedish west coast. He has been giving valuable input regarding outdoor spaces and material choices in archipelago settings.

Additional to this I have also visited the site several times to evaluate my design decisions during this thesis process.

Site

The site is located in Saltholmen the western part of the city, about 10 km from the city center which makes it a feasible bike distance of about 30 minutes. More precisely in an area called Långedrag, one of the wealthiest suburbs in Gothenburg. The typology is solely villas, many of them very large and many of them with sea plots.

Several private boat harbours are situated here as well as the municipal ferry terminal with departures to the islands outside Gothenburg in the southern archipelago.

A short walk from the tram stop of Saltholmen along a lush string the visitor will arrive to the pedestrian bridge which constitutes the first element of the project and enables Stora Jonsholmen to become a public and accessible island.

While the project enables the mainland to reach Stora Jonsholmen it unfortunately closes a boat shortcut for masted boats that are stationed in the Hinsholmen boat harbour.

It is only the masted boats that are affected and only those who is going or coming from north. If the bridge were to be built they have to go south of Lilla Jonsholmen in the future, an extended route of less than 10 minutes in 5 knots speed.

Pedestrian bridge

When designing this bridge i was looking for a minimalistic and slender construction that did not interfere with the beautiful landscape or disturb the horizon view.

A bridge that lied quietly in the landscape, both in constructional system but also in terms of materiality. On the same time i wanted to find a rational and economic feasible solution. I have looked into several bridge types but only had the opportunity to try a few.

The bridge is 3 meters wide, 3,2 meters high and 170 meters long divided into nine partitions, two of those, who are shorter in length are equipped with balconies as well as a staircase leading down to a bathing platform.

The balconies are facing west and east and are of interest on different time during the day and are also formed to create a break in the otherwise repetitive walk.

The materiality of the bridge is almost exclusively wood and galvanized steel except the fundament that is of reinforced piled concrete. The walking surface itself consist of a three meter wide traditionally formed wood deck laid across the bridge direction and a one meter wide integrated galvanized steel plate for foothold during winter.

Walkway

The walkway consist of a simple wood construction. It enables the accessibility around the main part of the island as well as function as a guide and conjoining element in the project as a whole. The element was also most crucial to establish the base height of the project which is 3,2 meters above sea-level and the pathway construction is tangenting the third meter height curve of the island.

The reason for choosing this height is to enable enough space both below and above the walkway as much as possible. Worth mentioning is that this height was also affected of a decent passage dimension for boats underneath the pedestrian bridge as well as putting insulated building in safe distance from flooding.

In the steeper parts of the island there is always a handrail in the outer side of the walkway and on the flatter parts on the inside. This to always enabling a handrail for people in need of it. What breaks this rule is at the locations where there is risk of falling considerable heights, then an additional hand railing is placed to protect the visitor.

Other than this there is as little hand railing as possible to create as much freedom of movement as possible. Frequently openings in strategic locations both in the inner and outer perimeter let visitors move down towards the shoreline or up towards the higher points of the island.

Restaurant pavilion

A two partition wide outdoor deck with the enclosure of a rain roof loosens up the transition between outdoor and indoor space by creating a mixture of both.

Pillars in the facade create nisches around the buildings while the central placed pillars divide the wooden deck space into different functions. From the building a large staircase and pier is facing the water allowing the visitor to approach and enter it in different ways as well as offering seating mostly towards south and west.

The serving area is characterized by its massive glazed sliding portions in three directions letting the visitor always get a view of the sea. The sliding doors also enables the restaurant to open up these glazed surfaces in different configurations according to weather conditions.

The aim is also to create a serving area that can be flexible and utilized for different occasions or events. Because of this the roofbeam glulam construction height has been raised over this area to be able to avoid pillars and span almost ten meters.

The appearance of the indoor flooring is imitating the outdoor wooden deck and the wooden framing above the roof beams are continuously going into the serving area with the purpose of creating a smoother transition between inside and outside.

Changing pavilion

The changing pavilion is approached through two arcades going along the building, one facing east and one facing west to be oriented towards the morning and evening sun.

The arcades contains seating nisches, lockers as well as the entrances to both changing rooms. In the southern edge of the building a stair is leading the visitor down to a bathing platform with seating opportunities in three points of the compass.

The floor plan consist of external restrooms in the northern part of the building towards the walkway and visitors passing by.

In the central part of the building two identical changing rooms are placed separated both by a stair and sliding doors. This to enable flexibility of the changing room, it can be used as two separated groups or genders or shared as one big space.

In the southern end of the pavilion a large sauna is located with a glazed wall towards the sea and in direct contact with the bathing platform.

Books

Carling, O (2001) Limträ: *Handbok*
Sundsvall: *Print & Media Center i Sundsvall AB*

Keil, A (2013) *Pedestrian Bridges: ramps, walkways and stuctures.* Freiburg: *fgb freiburger graphische betriebe GmbH & CO. KG.*

Pousette, A (2008) Träbroar: konstruktion och dimensionering. Stockholm: *AB stjärntryck.*

Rudolf, K (1980) Långedrag: *1858-1943*
Göteborg: Typografia.

Figures

All figures are taken or made by me unless otherwise stated.

Figure 1, Olof Wängborg
[Electronic image]
By permission.

Figure 2, Roberto Crocetti
[Electronic image]
By permission.

Figure 3, Location in the city of Gothenburg.
[Electronic image]
Taken from Chalmers Geodataportal.

Figure 4, Location in the area of Långedrag.
[Electronic image]
Taken from Chalmers Geodataportal.

Homepages

Ekobyggportalen (2020) Taken from:
http://www.ekobyggportalen.se/huskonstruktioner/att-valja-konstruktion/

Svensk trä (2020) Taken from:
https://www.svenskttra.se/bygg-med-tra/om-limtra/

Setra Group (2020) Taken from:
https://www.setragroup.com/en/glulam/design-solutions/

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