LINGER IN THE WOODS

Using Nature to Create Intriguing Architecture

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Examiner: Daniel Norell

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Karin Hedlund

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Living a hectic life in bustling cities has become the norm for most of us, and seeking the tranquillity in nature has proven to be an easy way to restoration. Could the experience of nature become more enriching by adding architecture that enhances its qualities? Is it possible to design architecture that make people more explorative and aware of their surroundings?

To seek an answer to these questions a model study of public, site specific and small scale structures have been investigated. The set of three structures host functions of seating, playground, wind break and star gazing. By paying close attention to the placements the aim has been to enhance the variety of the different biotopes of Änggårdsbergen. Through the carefully placed architecture people will be intrigued to depart from the predictable path to see the site from new perspectives, making them linger in the woods.

A common expression has been developed with the use of wood but at the same time each structure embodys its own personality through different techniques applicable to this material. The shapes have derived from characteristic details found at each site, to further connect the architecture to the surrounding settings. The three structures also have their own site specific direction – through the woods, along the ground and towards the sky.

By amplifying the already existing restorative qualities in Änggårdbergen, more people would be attracted to this green area in the middle of the city. With a careful attention to the inspiration, placement and detailing the structures would work in a coherence with their surroundings and become like hidden treasures in the woods.

INTRODUCTION

Background, Purpose & Method

SOFIA JERNBERG

Student Background

Previous master courses “Design in context” and “Topology, typology and tectonics” deepend my interest in site specific design. They were both focusing on nature and architecture in a close relationship. Because of the project’s realistic approach and the fact that we built the final designs I improved my skills in materiality and detailing, something that is useful in the scale of this master´s thesis.

BSc Architecture 2014 - Chalmers University of Technology

Master’s Program:
Exchange year at NTNU
Architecture & Urban Design - Chalmers

ELLEN PLEIL

Student Background

After attending the course ”Material and Detail”, in the autumn of 2015, I realized that I very much enjoy working with detailing and was eager to take the opportunity to deepen my skills and tie it together with theoretical knowledge that can strengthen the result. I appreciate the simple yet beautiful solutions and seek to understand the entirety of the project and therefore enjoy working in the small scale achieving a complete process from first sketch to final result.

BSc Architecture 2014 - Chalmers University of Technology

Master’s Program:
Architecture & Urban Design - Chalmers

BACKGROUND

Purpose & Aim

Today's stressful society has a negative effect on people's well-being. Research (Ulrich, 2008, p. 125) also shows that nature has restorative qualities on us and our wellbeing. How well one achieve recreational outcomes is related to the choice of activity and site for it (Heintzman, 2009, p. 72-89).

This project's outcome benefits the architectural profession with an addition of studies regarding how to create enriched experiences for the users and further investigations on how to utilize wood with different techniques.

This master thesis is an investigation on how nature's qualities can be used as a starting point to create intriguing architecture that handles soft values and human scale.

The aim being to explore how to enhance nature's qualities and how to engage people to spend more time in nature.

Finsmossen in Änggårdsbergen

FOCUS

Thesis Questions & Delimitations

- How do you create intriguing architecture that enhances its surroundings?

- What is it in nature that creates fascinating qualities and can it be emphasized by architectural means?

- How to intrigue the users to become more explorative and aware of their surroundings?

- How to integrate architecture into existing conditions of a specific site?

- How to architecturally utilize woods properties to create a variety of expressions?

The topic of how nature impacts our well-being is a broad and recurring subject. This opens up for several possibilities of different directions and therefore there is a need for some limitations. This project is not concentrating on how to use the positive properties of nature as a symbolic example in the built environment, nor implementing nature's qualities in an urban environment.

Wood is the material chosen because of its close relation to nature and opportunities to versatile architectural expressions. The project aims to be able to be built on a site with limited access and leave a little impact if disassembled.

Sun casted on frosty branches in Änggårdsbergen

THEORY

Discussion in the Field Today

Nature is a broad and recurring subject and there are many different views on it. There are for example the health promoting aspects of how views of greenery generates better well-being and makes us recover from illnes faster (Ulrich, 2008, p. 125). There is also the environmentalists viewpoint to use nature to relax and learn more about the local settings. As stated in the book Sveriges Naturum:

”Naturen är ju inget man nyktert betraktar, naturen insuper man, hänger sig åt, förlorar sig i, omfamnas av – ”man går inte ut i naturen, man går in i den”, som det heter inom miljörörelsen.”
(Isitt, 2013, p. 7)

Nature’s effect on humans has been discussed greatly throughout time but is still a current subject. For example the architectural competition Skogen, issued in May 2017 by Oyster, brings up the question of creating new qualities and opportunities in a chosen forest, ranging from social, biodiverse to economical aspects (Sveriges Arkitekter, 2017).

There are also critical views on the subject debating weather it is even possible to say that we have untouched nature today due to the human impact. Therefore a definition of how this thesis interpret nature is necessary, this is to be found at page 24-25.

Dew on a willow tree in Änggårdsbergen

REFERENCE PROJECTS

Norska Turistvägar & Naturum

There are a lot of similar project already built. Norska Turistvägar consists of many small scale structures directed towards magnificent views. Although it has received positive reactions, it has been criticized for determining what is interesting and not (roomofpossibilities.com, 2017).

Naturum is a public building placed in a natural setting where you can observe and learn about the local biotopes and wildlife. It has increased in popularity during the recent years (naturvardsverket.se 2017). A critical reflection on the Naturum is that here you merely observe nature, not entering it and actually experience it. An example of this is the Tverrfjellhytta by Snöhetta where you can observe a scenic view, but it also has the glass sheat separating you from nature.

The project Seljord Lookout by Rintala Eggertsson Architects works with creating focused views by screening off the panoramic option which can be an effective way of focusing the attention.

Figure 1: Aurland Lookout, Saunders Architecture (flickr.com 2006)
Figure 2: Seljord Lookout, Rintala Eggertsson Architects (ri-eg.com 2017)
Figure 3: Tverrfjellhytta, Snøhetta (snohetta.com 2017)
Figure 4: Naturum Tåkern, Å. Lindman & J.O.Yxell (2012)

EXISTING STRATEGIES

The Meeting Between Architecture & Nature

How does one create the meeting between architecture and nature? Looking at existing work two separate strategies become apparent:

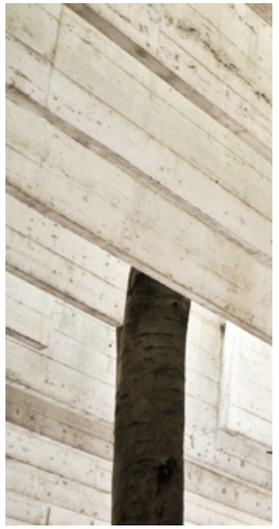
1. To make a clear distinction between the surroundings and the architecture. For example Nordic Pavillion by Sverre Fehn where the construction keeps a distance to the trees.

2. To create a sensation that architecture and nature blends together to an entirety. An example of this is the balconies in Fallingwater by Frank Lloyd Wright,that mimics the surrounding rocks.

In the article Visitors' Perceptions of a Trail Environment and Effects on Experiences: A Model for Nature-Based Recreation Experiences a participant states:

"It is the simple small parts of nature that we are amazed by even in a large massive forest. The appreciation of the small details... and if you are not paying attention, you miss them."
(Dorwart, 2009, p. 33)

This input led the designs towards the second of the two approaches.



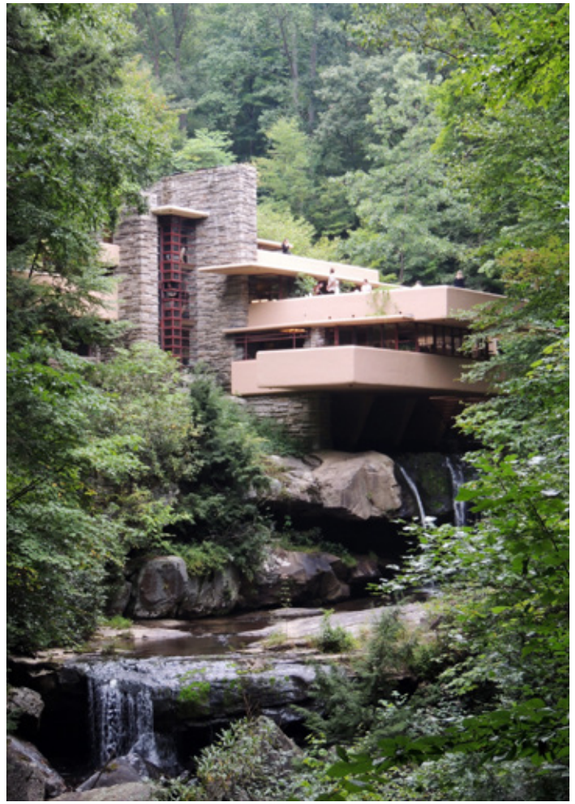


Figure 5: Nordic Pavilion, detail, Flickr. (2011)
Figure 6: Nordic Pavilion, Flickr. (2008)
Figure 7: Fallingwater. Photograph taken by author

FIELD TRIP

Hooke Park

Hooke Park is a part of the Architectural Association School of London, initialized by the architects Richard Burton, Frei Otto and Buro Happold. Located in Dorset, Southwest England, the 150 hectar forest gives both raw material for the structures as well as inspiring settings (hookepark.aaschool.ac.uk, 2017).

Here the students design and produce architecture in wood developing new techniques and architectural qualities. Utilizing 3d scanning and a robotic arm, equipped with a chain saw, one of their projects consists of branches assembled together by interlocking joints.Their work showcase how wood, that would typically be discarded for building with, can be used in a refined way.

Today man labour is the costly part of a project rather than the materials. Therefore the question regarding how to utilize machines becomes relevant, an aspect present in Silva where modern ginger bread work receives a rebirth.

Various wooden structures in Hooke park

Untouched Wildwoods

Example Antarctica, but is there purely untouched nature today, due to the human impact?

Cultured Forestry

The Swedish woods consists of 75% cultured forest. This is the result of humanly planted trees in a large area that is of the same type and age.

English Park

A parkland style from around 1700 which is charactarized by natural shapes and leafy greenery.

New York High Line

A narrow urban park placed on an old uplifted train tracks and is continiously maintained.

Image Representing Nature

According to research even images of nature has restorative impact on us (Ulrich, 2008, p.125).

Natural Forest

Primary natural forest means an area that has always functioned as a forest, including human impact. Secondary natural forest has previously been used for cultivation. Both having been untouched by humans for such a time that they now function close to wildwoods.

Änggårdsbergen

A secondary natural forest. 1953 humans experimantaly started an arboretum with a mix of vegetation to test properties and resistance of local and forein plants. Today it has continued to grow and is mainly used to experience the qualities of the greenery in a park setting (Göteborgs Botaniska Trädgård, 2017).

French Park

Stricktly trimmed parks to function as an entirety between nature and architectrue, a meeting place.

Video of Nature

Moving pictures and sound enriching the impression of nature (BBC, 2017).

Scale of nature and the human impact

METHOD

Using Nature as a Guide

A method was formed in the initial stage of the project to guide the structures design. To tie them to the specific settings nature is used as inspiration, specifically a significant detail from each site. The inspiration range from an image based, performative and symbiotic approach. The method sets up rules and guidelines for how the structure is developed to enhance the chosen experience and character of each site.

1. Select specific locations in Änggårdsbergen based on enhancing the wide variety of the diffrent biotopes.

2. Focus on the human experience of the sites and how it could be enriched. Add architecture to give visitors the opportunity to explore the surroundings through carefully selected views.

3. Use and analyse a detail from the spot as inspiration and framework for the architecture.

Lichen and moss on a rock found in Änggårdsbergen

READING INSTRUCTION

How to Understand the Project

The chosen spots in Änggårdsbergen, with its specific characters and conditions, has a central part in the investigation. The project focus on human's interaction with nature and the architecture. Site analysis and study models are used to explore the relation between the architecture and its surroundings. This method of working results in research *by* design.

The project is a discussion of how to introduce architecture in a natural setting. To achieve an intriguing experience the construction and details are still a vital part of the architecture. The outcome of the project is a developed method and design of three public, small scale and site specific structures.

A blossoming cherry tree beside the path leading back to Finnsmossen in Änggårdsbergen

SITE

Änggårdsbergen

Änggårdsbergen, previuosly a pasture land, was 1975 turned into a nature reserve to preserve the Swedish west coast landscape that came to grow up here (Göteborgs Botaniska Trädgård, 2017). This is a location with suitable opportunities due to the closness to Gothenburg's city center. Here you can find a variety of different biotopes, ranging from highly located open plains, atmospheric forests, bird-rich bogs and winding pathways. The natural elements have a strong presence in the constantly changing settings. It has also been used as an experimental arboretum to test the durability of foreign vegetation but is now mainly a recreational green area.

Due to the experimental history of Botaniska and Änggårdsbergen this is a suitable site to keep pushing the question of what nature means today and explore new ways of using and inhabiting it.

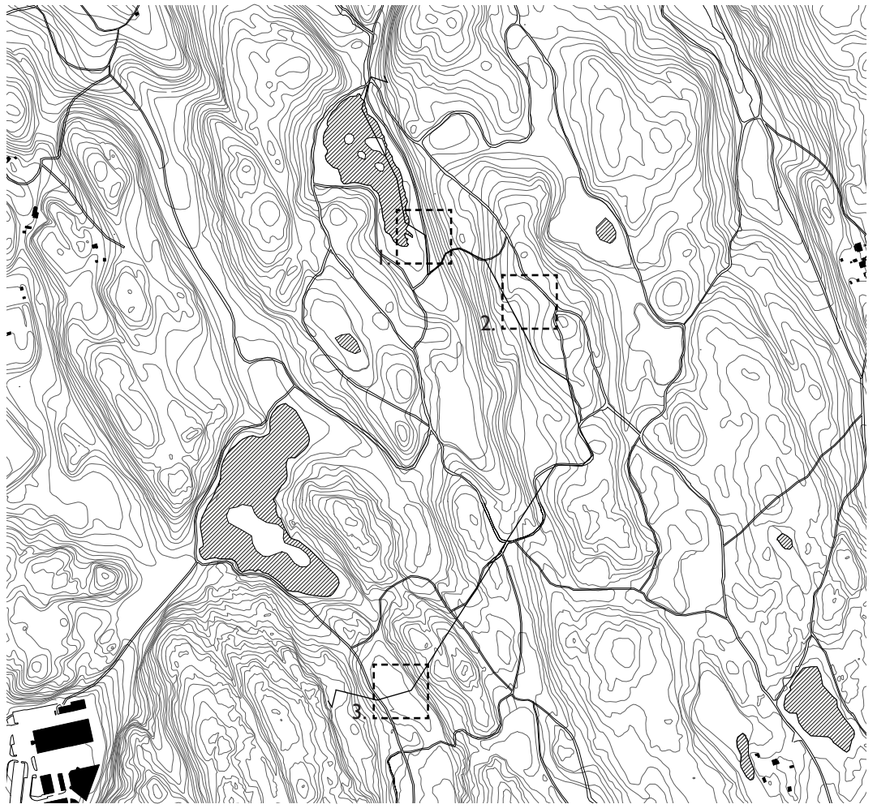
Ängårdsbergen's location in Gothenburg

THE PROMENADE

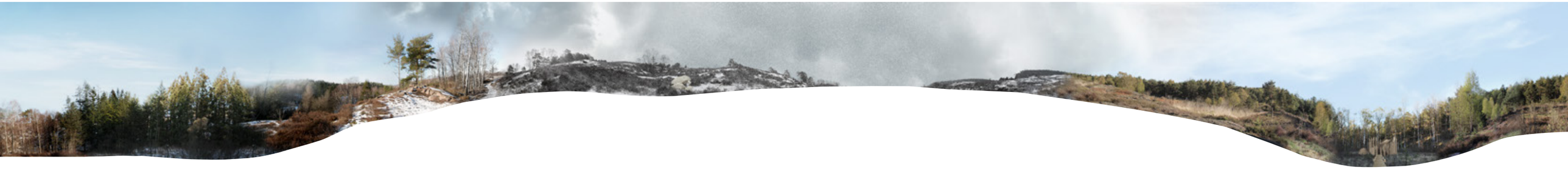
The Three Chosen Spots

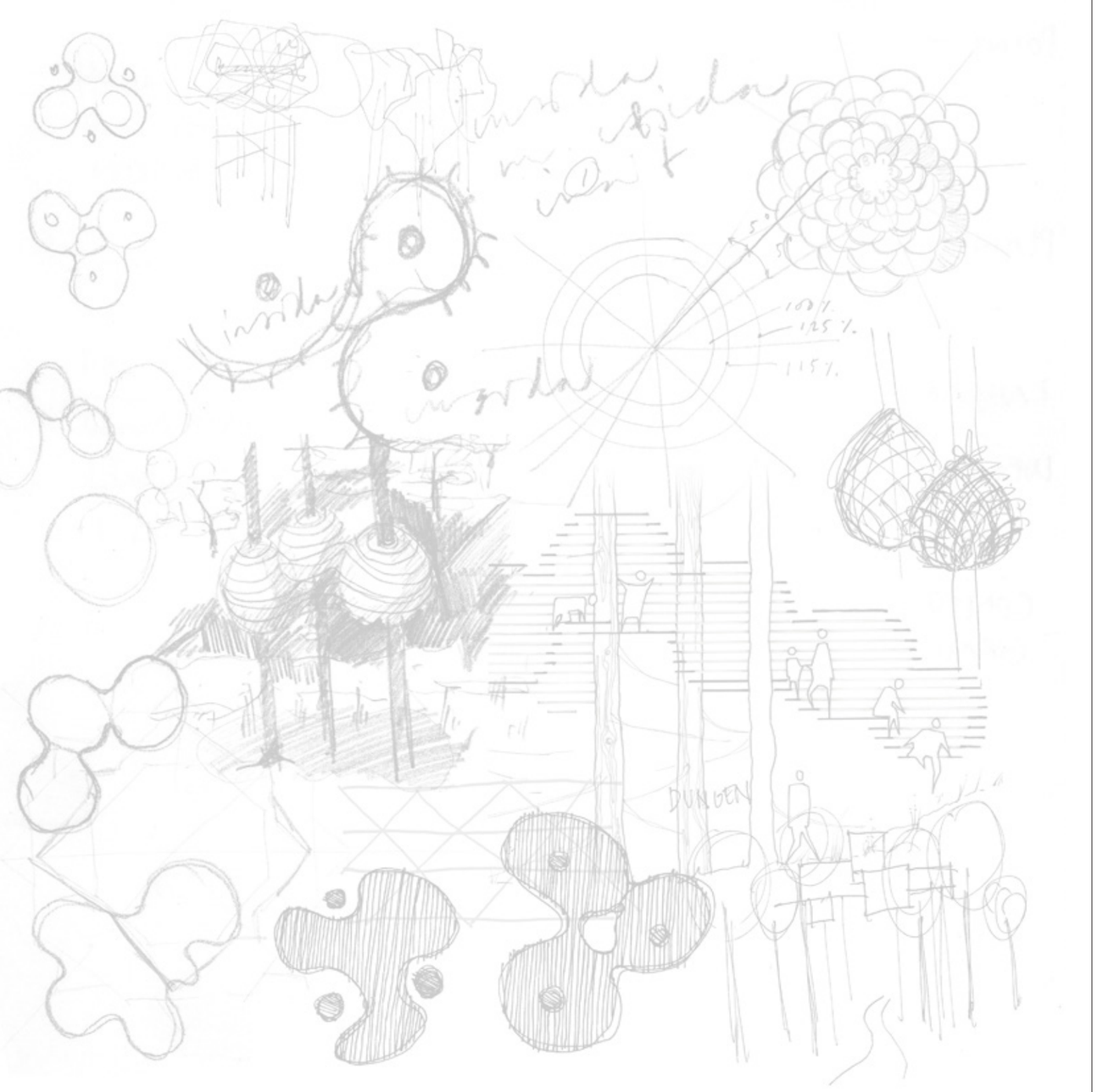
The different spots have been selected because of their special characters and to showcase the versatility of the biotopes in Änggårdsbergen. Even though they are located nearby the existing irregular system of paths they will only be found by the most attentive visitors because of their design and placement. There are paths connecting them but it is not the promenade between the architecture that is the focal point, rather to excite the visitors to seek after unforeseen revelations in the area.

1. The Grove
2. The Plain
3. The Swamp



The location of the three chosen spots in Änggårdsbergen





SILVA

Through the Woods

THE GROVE

Site Analysis

The large Japanese Cryptomeria pine trees have a strong impact on this place. The trunks with their characteristic bark creates a vertical direction and the branches embrace the spot, giving it an almost interior-like sensation. The fir needles provides greenery all year round and the branches that has fallen down turns into a complementary red.

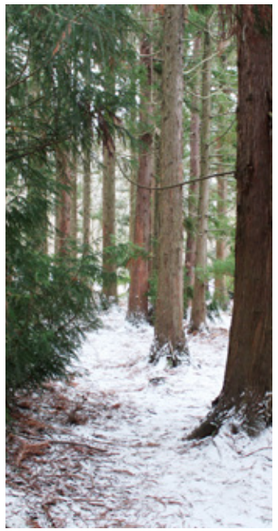
Keywords: Protected, Inside, Calm

Seasonal change

Sunlight

Wind exposure

Flow of visitors



CRYPTOMERIA PINE CONE

The Detail - Image Based Inspiration

The Japaneese Cryptomeria tree can become up to 65 meters tall and grow for 1000 years. This species has surprisingly not been used in Sweden to a greater extent even though it can withstand coldness.

The growth pattern of a pine cone consists of 8 spirals moving clockwise and 13 spirals moving counter clock-wise, both closely approximating the golden section proportions. The numbers 8 and 13 are well known by geometry in mathematics as adjacent pairs present in the Fibonacci sequence (Wade, 2006, p. 36).

Silva takes an image based inspiration from the Cryptomeria pine cone. From the hanging placement in the trees to the pattern that the constructive wires are placed. The planar shape is also based on the number of 8 and resembles the cones pointy texture.

PROCESS

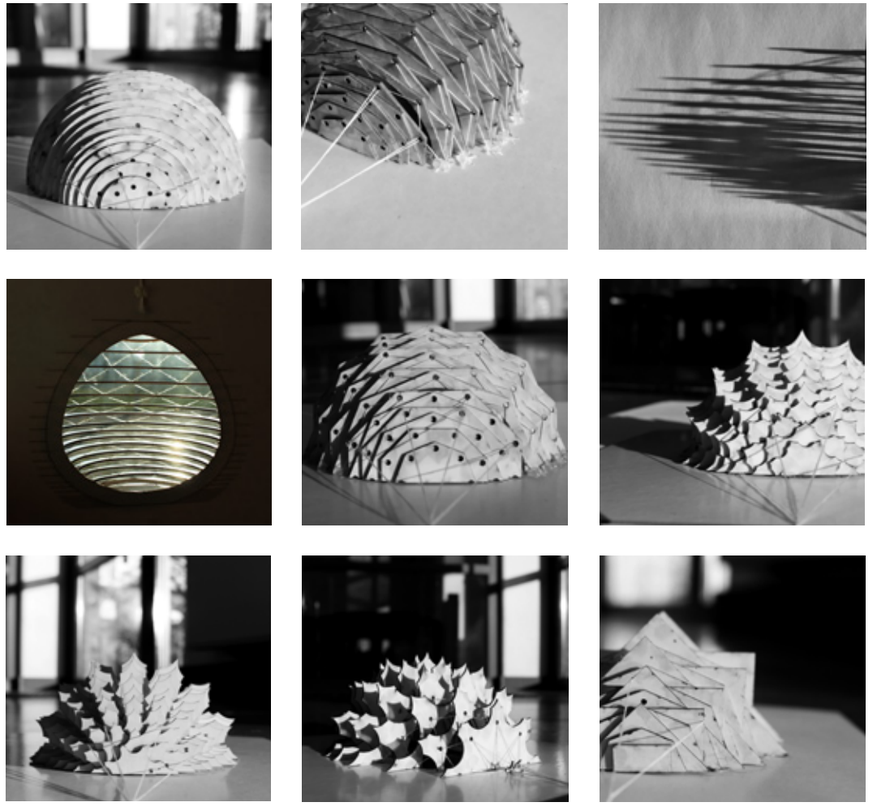
Texture

A selection of different shapes of the planes. The first test consists of a simple circle placed with a varying degree of distance between the planes. The change in density creates good horizontal views at the same time as it protects against people from the ground seeing in.

The opportunity of the digital fabrication technique is lost when only creating a circle, more texture can easily be added without greater additional effort. An abstract octagonal version of the cone was tested alongside an even more extreme shape consisting of squares rotated 45 degrees to each other. These were still not resembling the image based inspiration of the pine cone.

Two tests with a combination of points and curves are tested. As the points grow deeper the possibility to horizontal views are decreased and a balance is found between this and the texture created.

These tests also include different positioning of the wires, towards the interior, exterior and the middle. The placement further out is to prefer according to the experience of the interior room as this expression is most striking from the exterior.



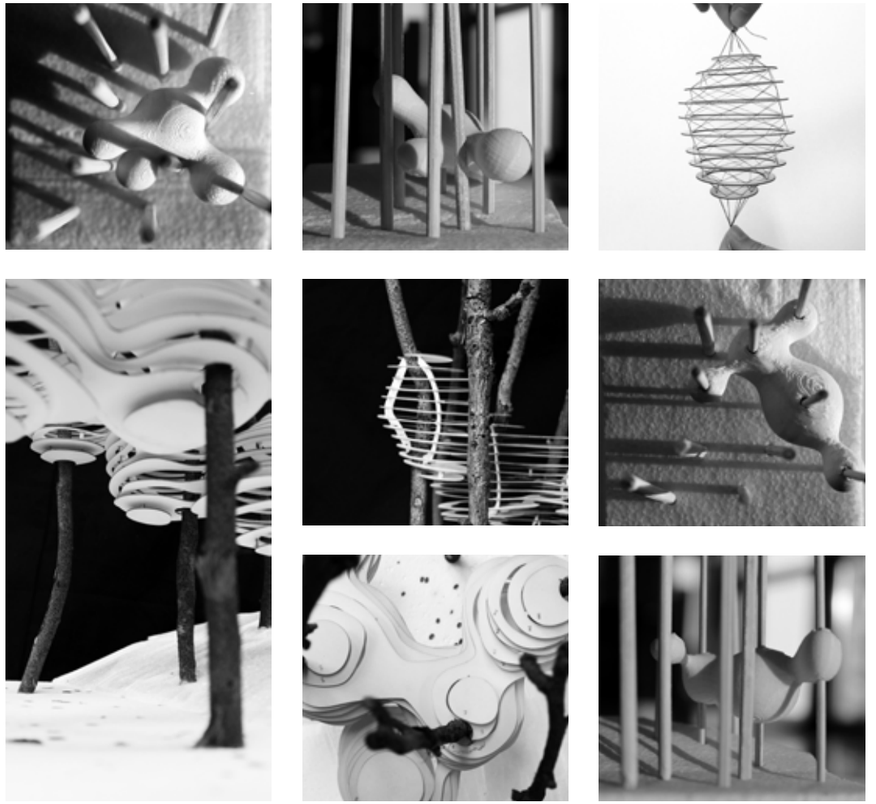
SHAPE

Connections & Construction

An elegant way of attaching the planes to each other is to introduce the wire. The thread pattern derives from the spiral growth of the pine cone. The conclusion is that the most efficient way of threading them is to have crossings only in the planes, both from a constructional and aesthetic point of view.

The hanging placement could be either centred on the trees or positioned in between them. The later creates an alluring and effectful expression of hovering in the air but would be harmful for the trees because of the large forces sideways. By choosing the centred position the structures can grow in size without causing as much strain on the trees which is an important requirement for the structures. Additionally this gives the possibility to come close to the tree trunks.

Here one can see how the views from beneath are limited because of the shapes of the planes.



SILVA

The Design Proposal

The visual impact when entering one of the rooms. In the centre of each space the tree trunk is the important feature. Silva also opens up to panoramic horizontal views seeing the crowns of the trees from a new perspective.

Steps to simplify climbing upwards grow out as part of the planar shapes, as well as seating opportunities.

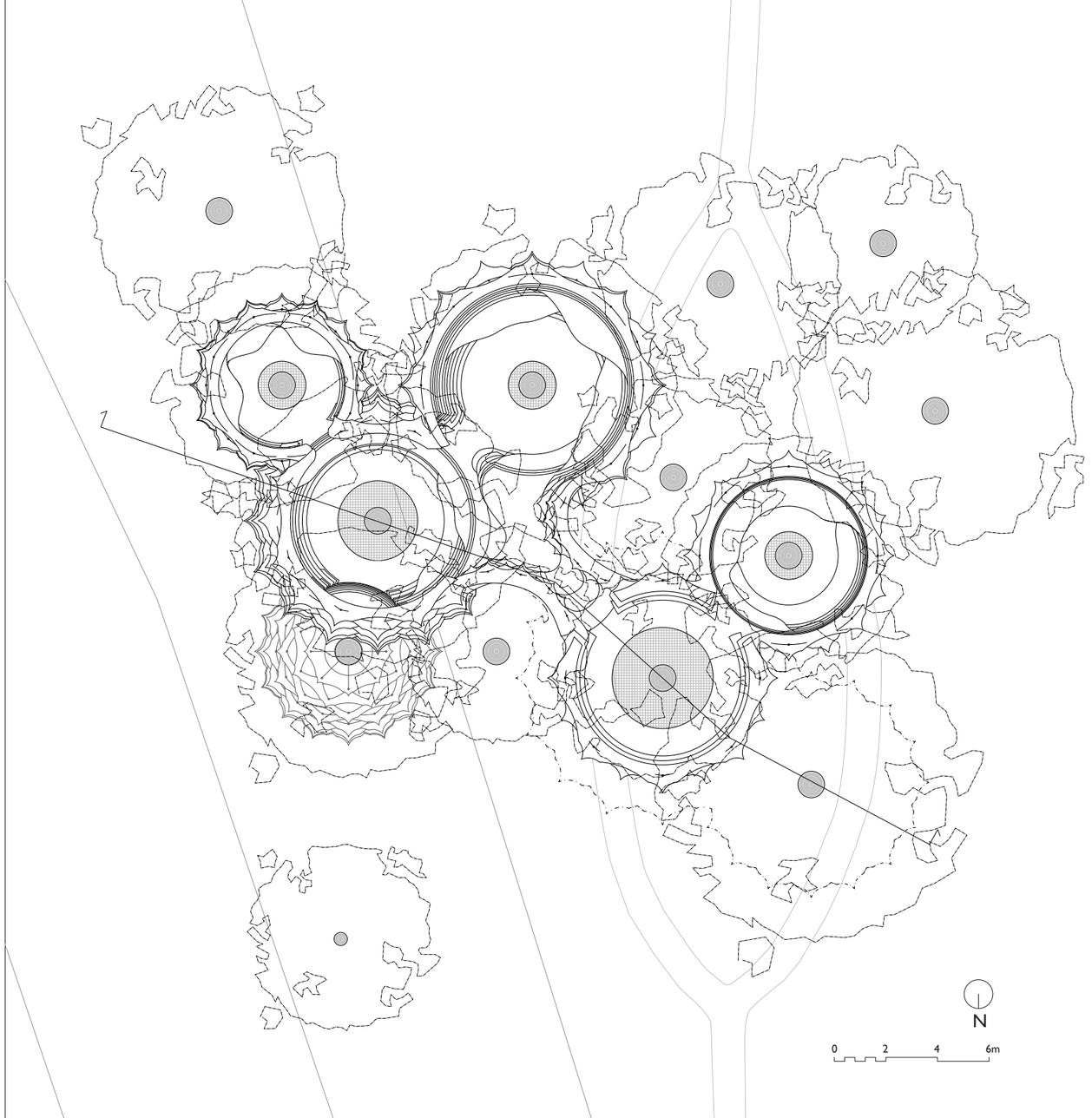
The openings follow the same design principle as the spherical exterior shapes. It is easy to distinguish the adjacent rooms because of the opacity as well as spotting other people when visiting the structure.

Interior view of the horizontal panoramic sightlines

PLAN

Scale 1:100

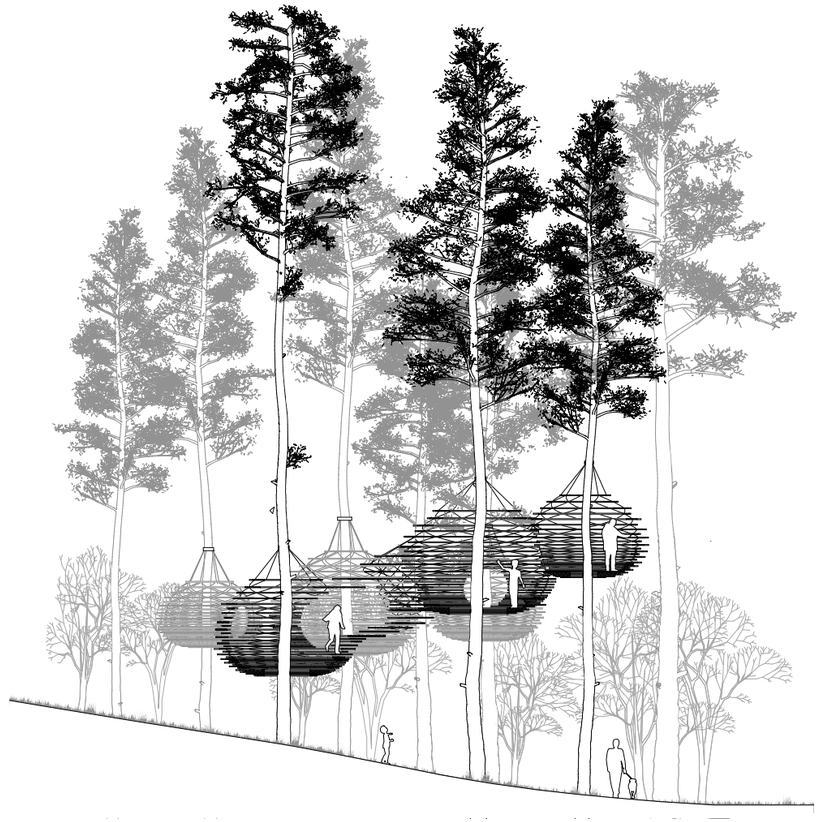
From this view the seating and stairs are visible. The connecting path between the two clusters follow the inverted design principles with the texture towards the inside, based on the nearby tree trunks. The varying sizes of the centred openings offers different opportunities to views, large openings are placed in rooms for circulation.



SECTION

Scale 1:200

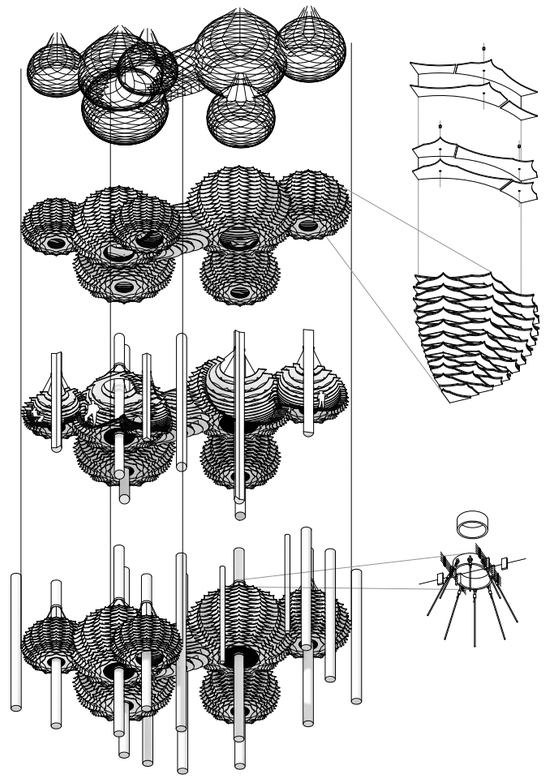
The gradient of the distance between the planes makes the structure less monotonous. The entrance follows the same design principle but the otherwise centred holes is skewed in order to make more room for climbing up. The ground slopes upwards in order for the whole structure to reach a higher level.



ISOMETRY

Scale 1:300

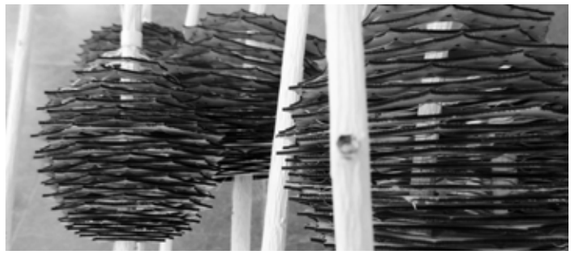
The shape of the planes are twisted and increase to achieve a spherical shape which creates a capturing view from underneath. The planes consist of double layers and could therefore be built from smaller pieces such as waste plywood from construction sites.

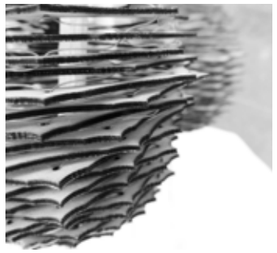


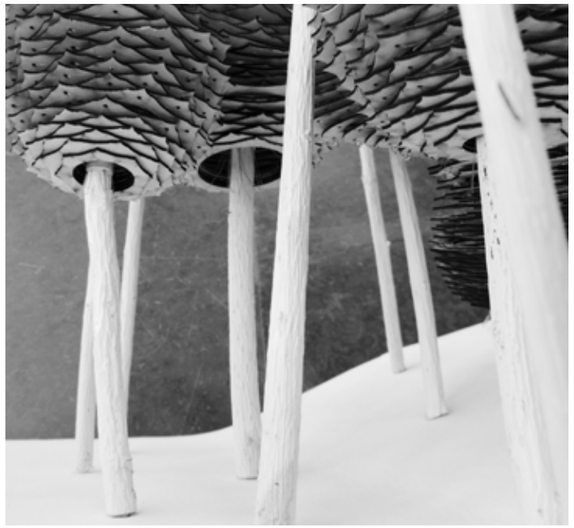
MODEL

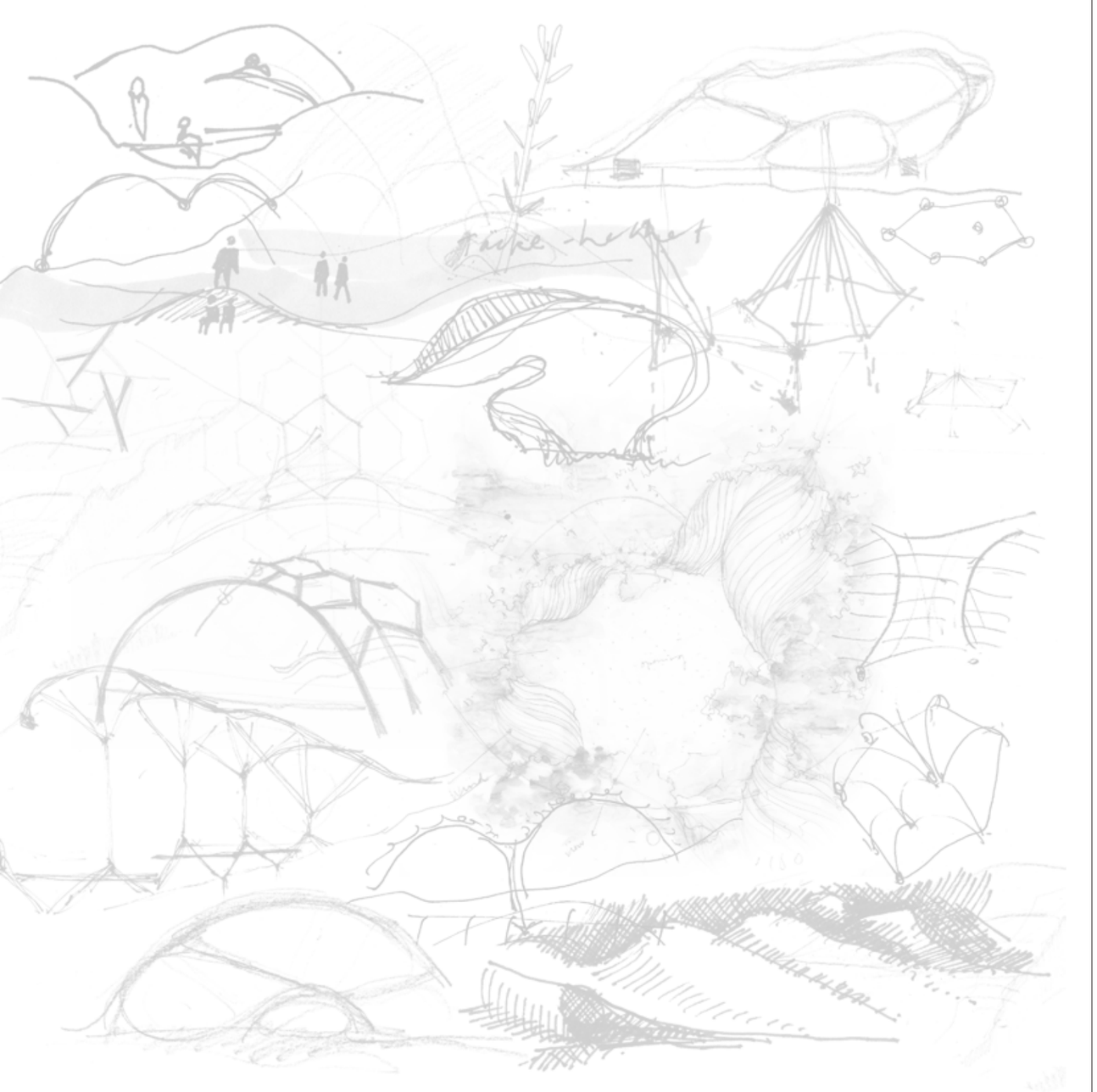
Scale 1:50

The characteristic texture of Silva is well visible from beneath. This is the first impression of the structure since it reaches above the trail and adapts to the existing trees. With a horizontal view through the rooms, the tree trunks give a strong impact on the experience.









TERRA

Along the Ground

THE PLAIN

Site Analysis

The heather has spread over the rolling hill tops as a protecting cover. The lack of trees and variation of greenery gives a barren impression. When reaching the higher altitude one is rewarded with a scenic view including the harbour of Gothenburg.

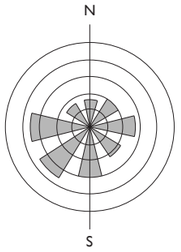
Seasonal change
Sunlight
Wind exposure
Flow of visitors

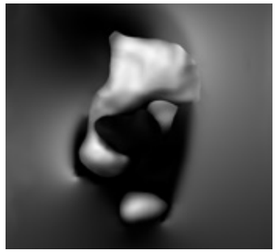
Keywords: Exposed, Large, Rolling

SITE CONDITIONS

Levels & Wind

The four shapes are placed to protect the courtyard from the harsh wind conditions at the site. The most common and strongest winds comes from the west, south-west and south according to SMHI. Autodesk Flow is used to analyse the new wind conditions of the structures and the courtyard. The ground is an important natural element of this site and Autodesk Remake generated a 3D-mesh of the ground based on photographs from the site. This gives the opportunity to tailor the structure to meet the ground in a manner that mimic the heathers soft and flowing shape.





Wind from west, south-west & south

HEATHER

The Detail - A Symbiotic Approach

The heather plant is a low-growing perennial shrub. The 20-50 cm high plants have late emerging flowers that gives the stocks its characteristic purple nuances, colouring the moors into purple and rusty red.

The Calluna becomes up to 50 years old and a hole in a stock is quickly patched by seed or layering. The later propagation method takes place when soil and leaves create a porous cover that bury some of the heather plant branches. Nine months later a root system has been formed and a new plantlet has developed. This phenomenon is called Rhizome.

Based on the botanical term Rhizome the French philosophers G. Deleuz and F. Guattari developed a philosophical model for the spreading of culture (Deleuze & Guattari, 1987). While a theory following the logic of a tree looks for the source and conclusion of something, the rhizomatic model develops by created connections with it's surrounding, lacking a start or an end.

Terra creates a symbiosis between the architecture that functions as a skeleton and the heather that later will cover it as the skin.

PROCESS

Different Grid Types

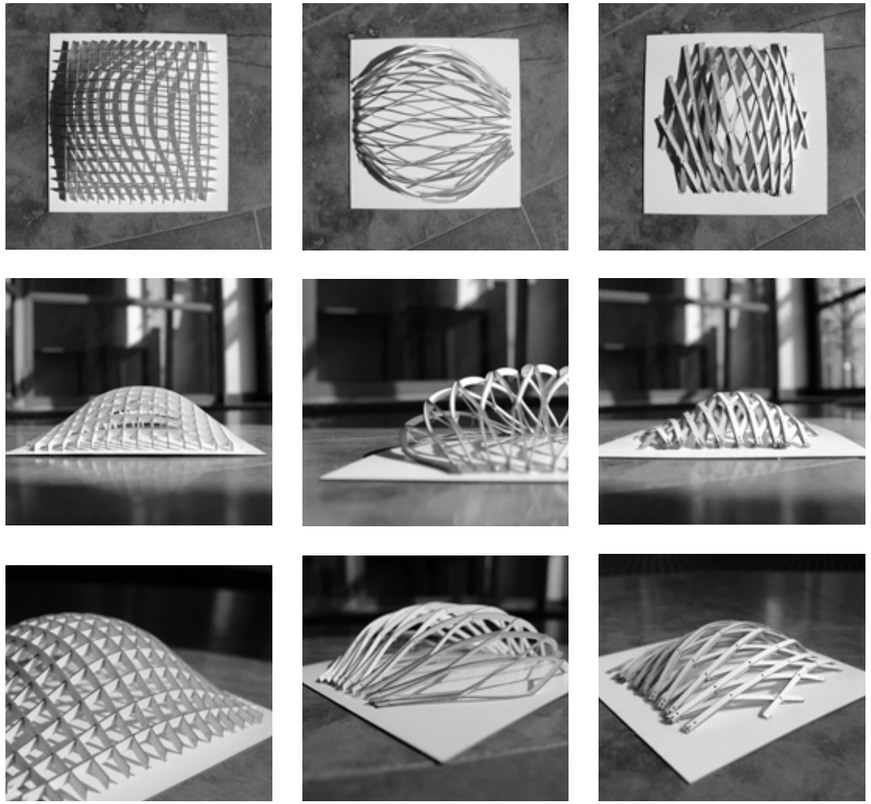
We met Alexander Sehlström (5 April, 2017), who currently works on a PhD in grid-shell structures at Chalmers University, to evaluate the grid models and give references to methods of joinery.

Waffle Grid
A rational system that is easy to tailor into both convex and concave shapes but requires a lot of material which will be challenging to transport to the site and not resource efficient.

Curved Arches
Challenging in aspects as both bending the wood but also having to make custom bending-forms and joints if the shape were to be irregular. Although, it creates an interesting shape.

Grid-shell
A lightweight and resourceful method that could be constructed off site. Works with simple joints and can constructively be combined with wires to become more stable.

The last one became the superior option after consulting with Karl-Gunnar Olsson (26 April, 2017), confirming that the organic structure functions in pure compression.

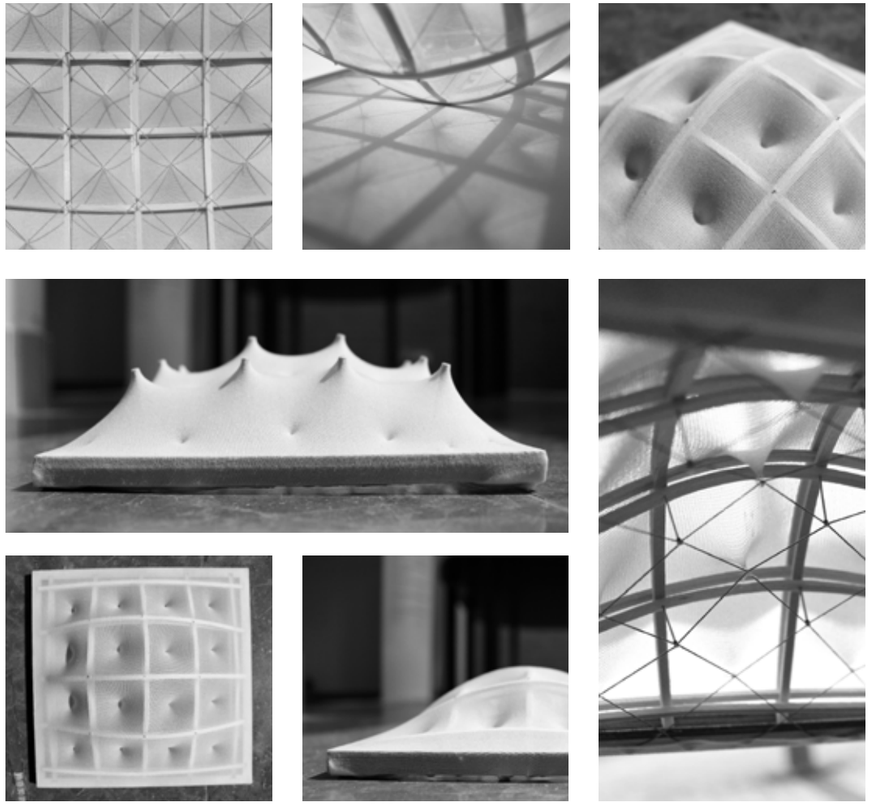


FABRIC

Texture

In order to create cavities for the heather to grow in, a fabric is introduced. It is attached to the wires which also stabilizes the structure from horizontal loads. Exploring different models the version of anchoring the fabric downwards is the most convincing option. It creates cavities deep enough for containing the earth, as well as giving the most interesting and sleek interior.

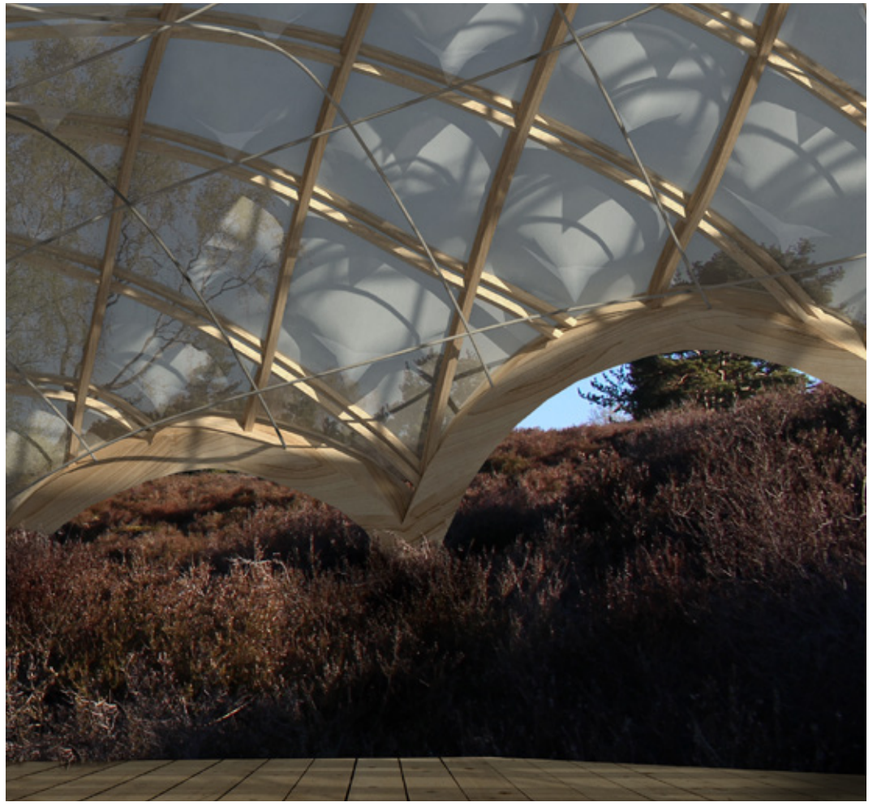
The tensioned fabric also enhances the shape of the grid from the exterior.



TERRA

The Design Proposal

The arched frame gives opportunities for horizontal views along the ground in eyesight since the structure is placed in a pit. The grid dives down forming pillars creating a diverse shape similar to heater, as well as room division in the interior space.

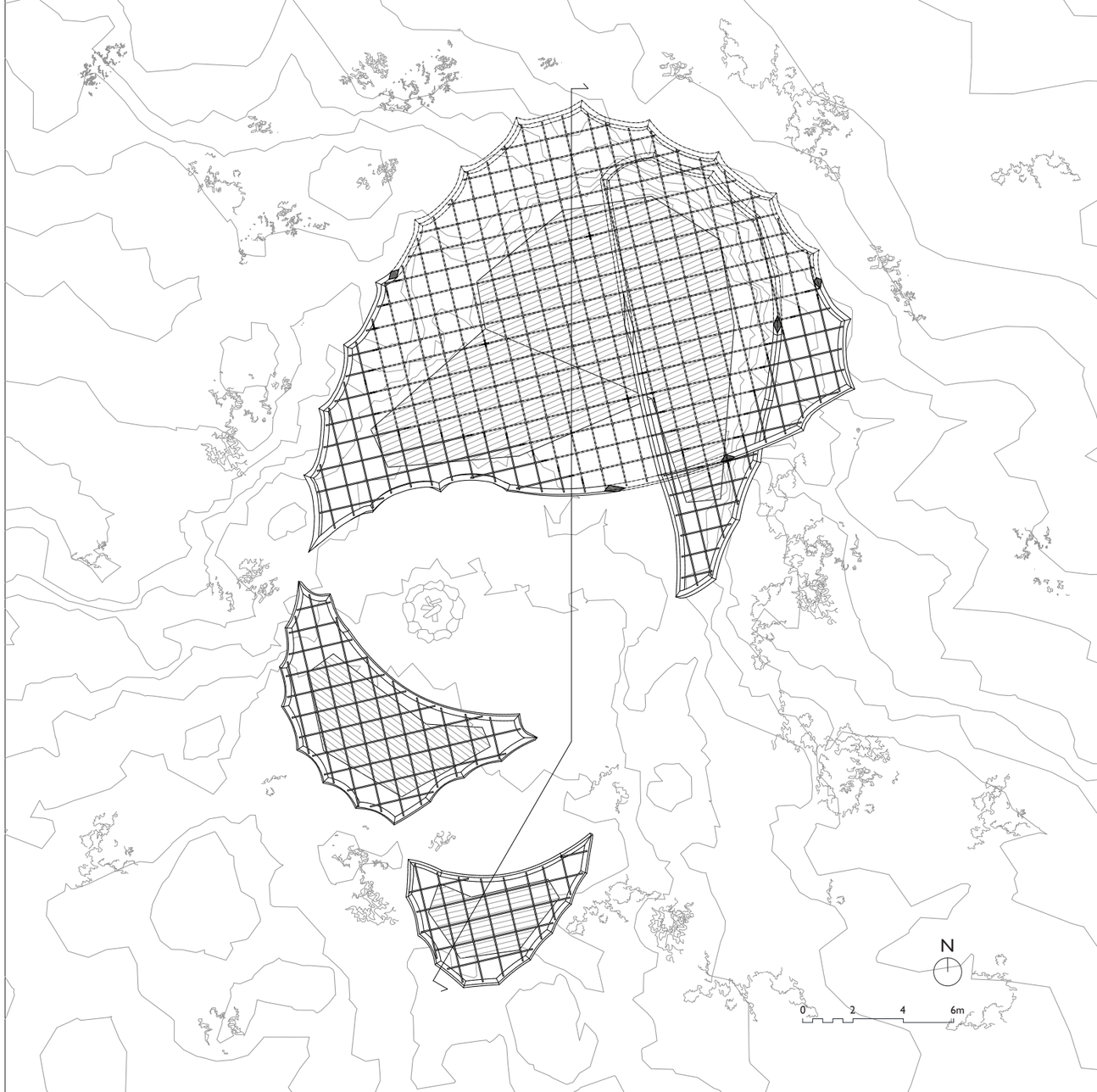


Interior view from the lower sleeping level with views along the ground

PLAN

Scale 1:100

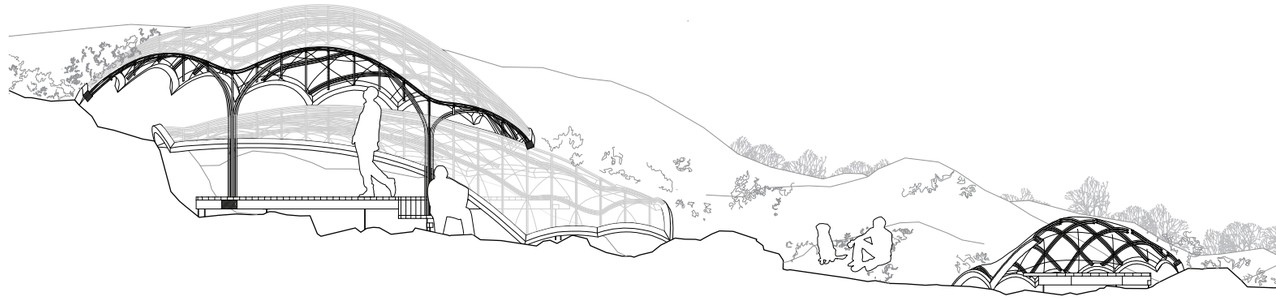
The structures are all based on the same grid appearing to be connected below the ground. The placement creates a pleasant courtyard with a fireplace and seating directed towards the morning as well as the evening sun. The firewood storage protects the large sleeping shelters from the strongest winds from the south and west.



SECTION

Scale 1:100

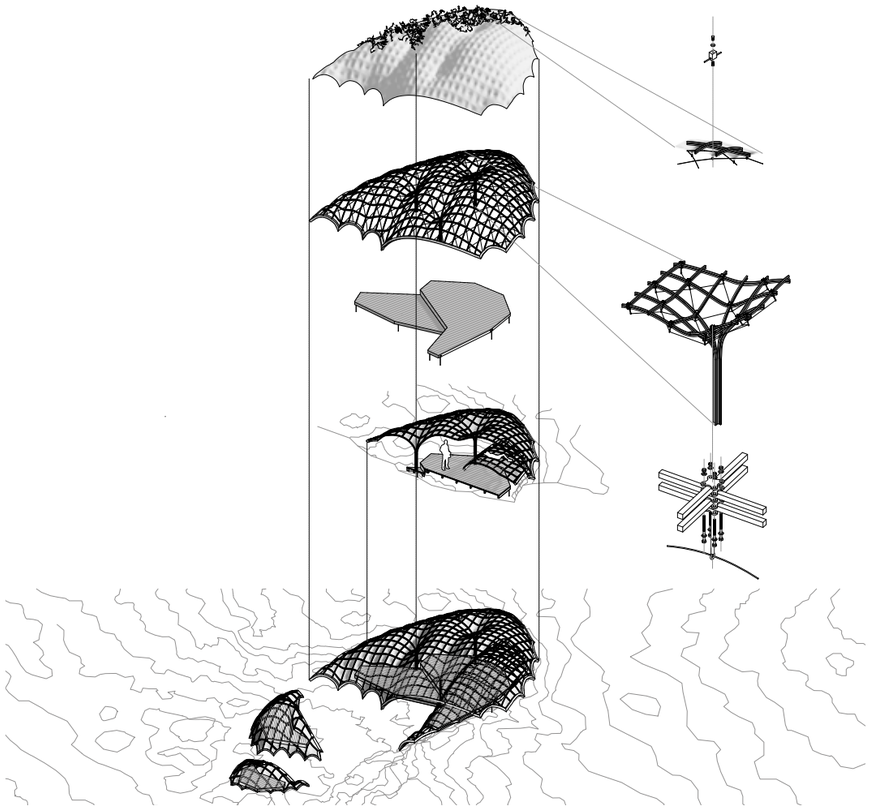
The two sleeping levels are created by an additional shape reaching below the protective cover. To enter you must crouch slightly, in order to protect the sleeping area from the wind, but well inside the appearance of the interior will be a pleasant reward.



ISOMETRY

Scale 1:300

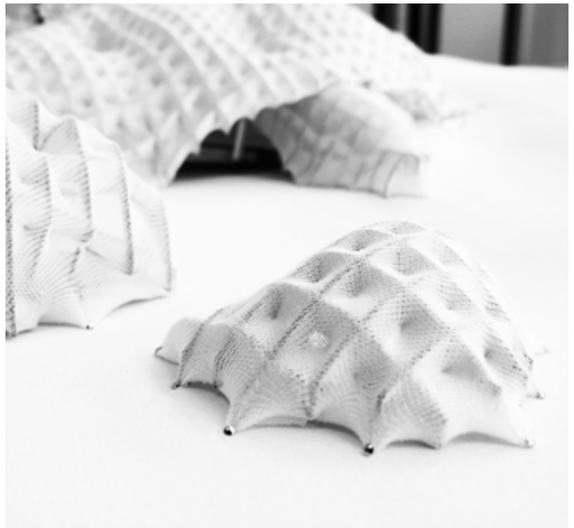
The grid is 400x400 mm and consists of a crossing double layer of wooden beams with the slim dimension of 20x20mm. The floor is divided into two levels to meet the irregular ground, creating two different rooms.

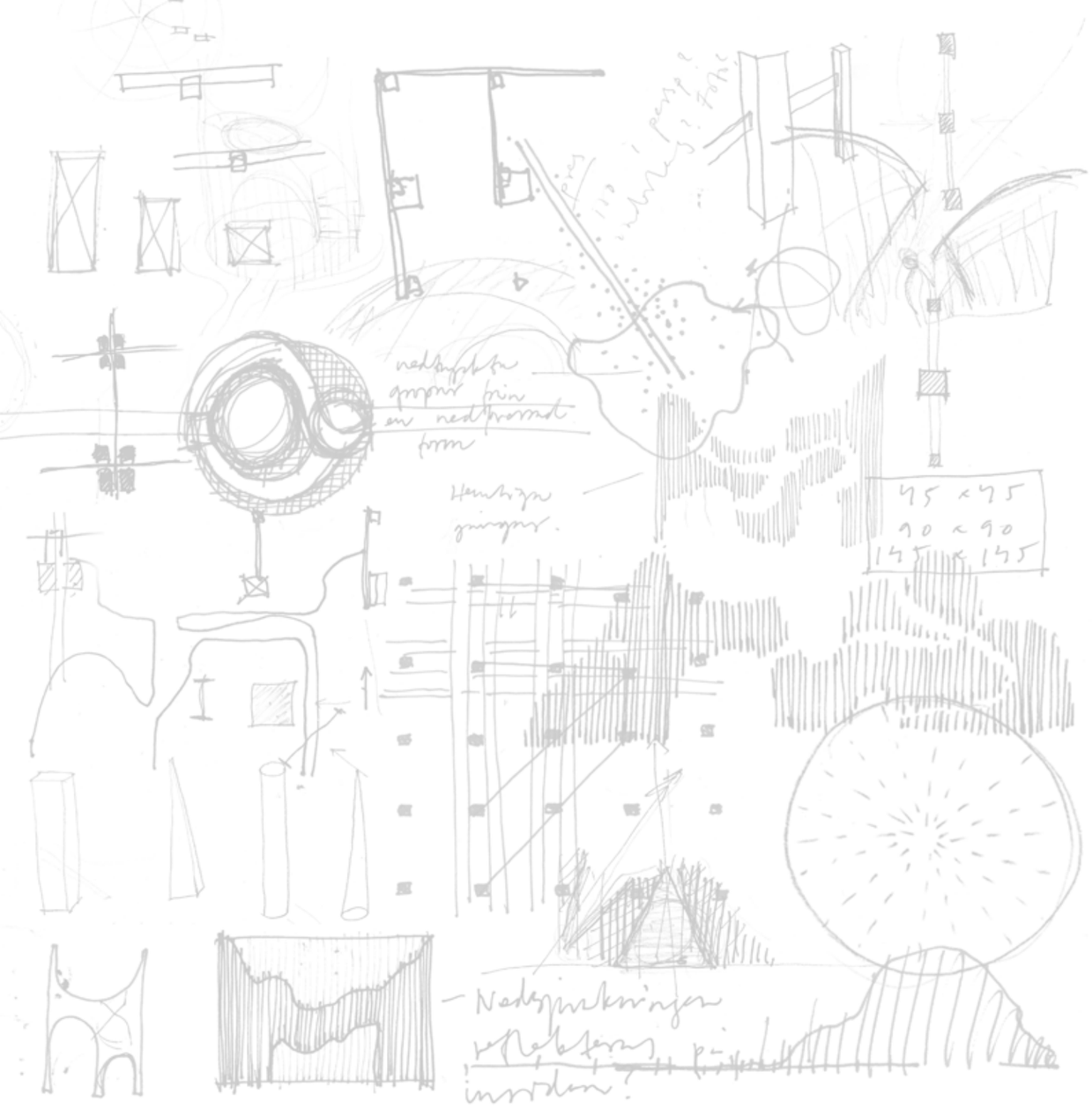


MODEL

Scale 1:50

Terra in an early stage, were the cavities in the fabric highlights the grid-shell construction underneath. Since the heather plant naturally gravitates towards cracks in the rocks, here simulated by the fabric, the whole structure will eventually be covered and hidden.





LUNA

Towards the Sky

THE SWAMP

Site Analysis

This spot is well hidden from the track by the surrounding trees. The drastic change of vegetation - from solid ground to damp moss - creates a well defined opening in the woods that without additions could not be experienced to its full potential.

Keywords: Hidden, Inaccessible, Vertical

Seasonal change

Sunlight

Wind exposure

Flow of visitors

HAIR MOSS

The Detail - A Performative Approach

This moss does not have any roots and therefore collects water directly through its cells. Because of this it requires high moisture and prefers restricted sunlight in order not to dry out. It grows in clusters and take support from each other, the stems in the centre of the cluster can become up to 40 cm high. The leaves become 5-10 mm long and collects carbon dioxide according to the photosynthesis process.

How the leaves anchor to each other, in addition to the clusters is the performative aspects that Luna is based on.

PROCESS

Testing Different Grids & Shapes

Depending on the grid the visual impact varies greatly. A circular grid gives the same exterior expression regardless of what direction you observe it, but it creates a clear focus point in the middle where the structure interiorly opens up to a panoramic 360 degree view.

The rectangular grid offers a better variety of exterior diversity when moving around the structure. This is enhanced even further when introducing rectangular shapes.

A quadratic cross section proves more effectfull when varying the size of the pillars. One can also see how the opacity changes were the interior rooms are hollowed out or not.

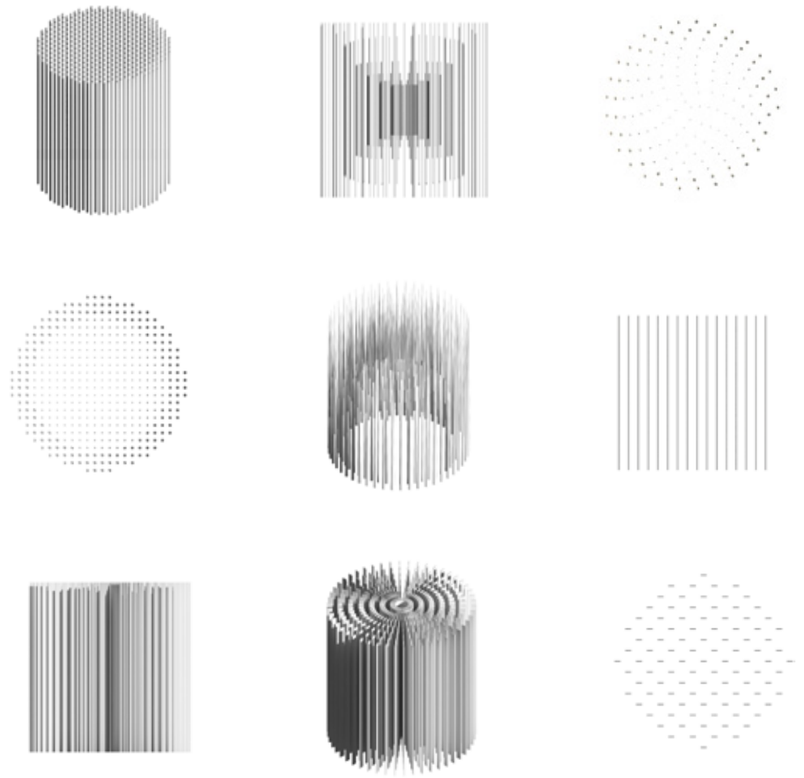


IMAGE TRACING

Placements & Shapes

Since Luna is based on clusters the design connects to Silva & Terra. It derives from image tracing a photograph from the spot, showing the density and growth pattern of the moss. The structure of Luna is divided into three degrees of grids; small, medium and large. The small grid consists of 45x45mm pillars placed with a distance of 200mm, medium is 90x90mm with a grid of 400mm and the large is 145x145mm with 800mm in between.

This division also affects how tall the pillars become. They function like trees in the woods, with a lot of space there is room to grow large while the dense ones become thinner.

INTERIOR SHAPE

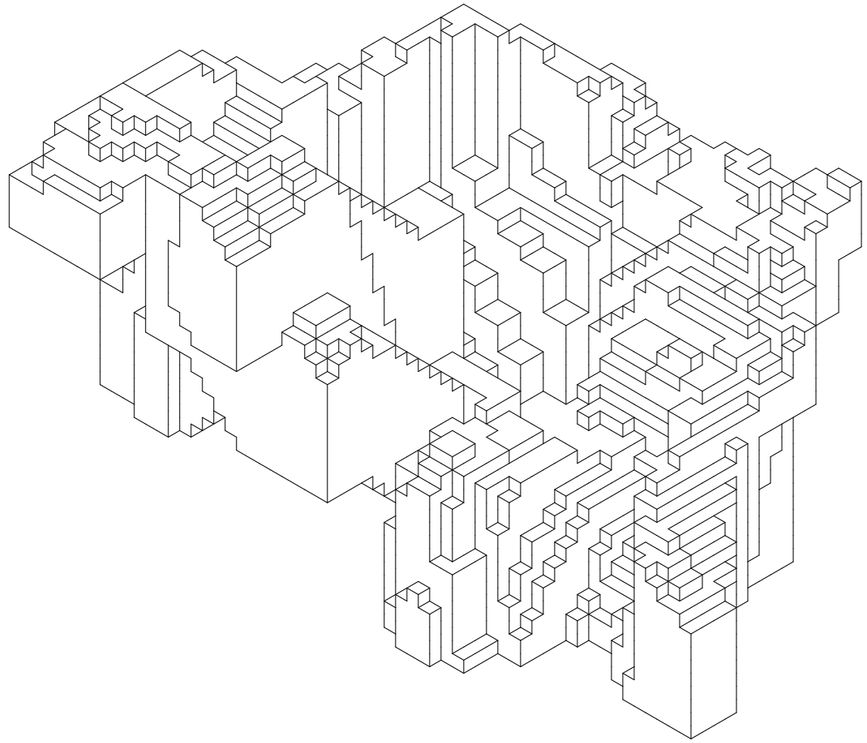
Rooms, Stairs & Openings

The image shows the negative shape creating the interior rooms in Luna.

The stairs winds upwards to reach a platform at the top, where one have a panoramic view of the sky. From here it is also possible to see the whole structure from above.

The small cluster opens up into a smaller interior room with an opening focusing your view towards the north.

Above the curved path is an opening following the direction of the moon.

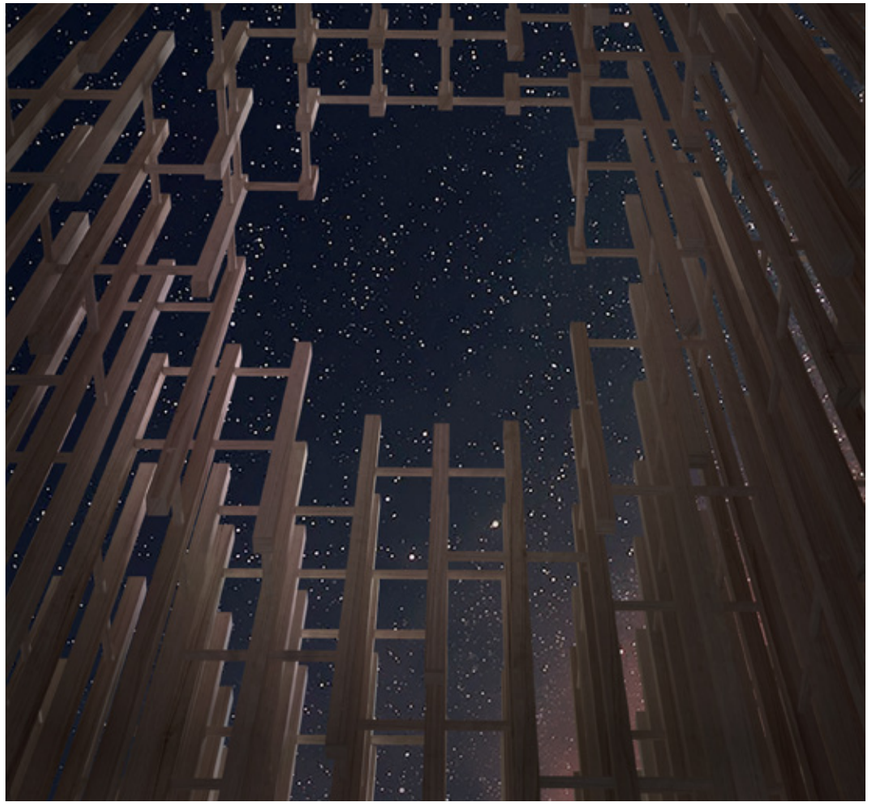


LUNA

The Design Proposal

The large quantity of pillars creates a strong vertical direction, both lifting your view upwards as well as mimicing the direction of the vegetation framing the site.

Joints are introduced as round elements piercing the pillars and by this being visually subordinated the vertical direction. The joints connect shorter pillars to the neighbouring grounded ones, making it possible for the interior rooms to be created.

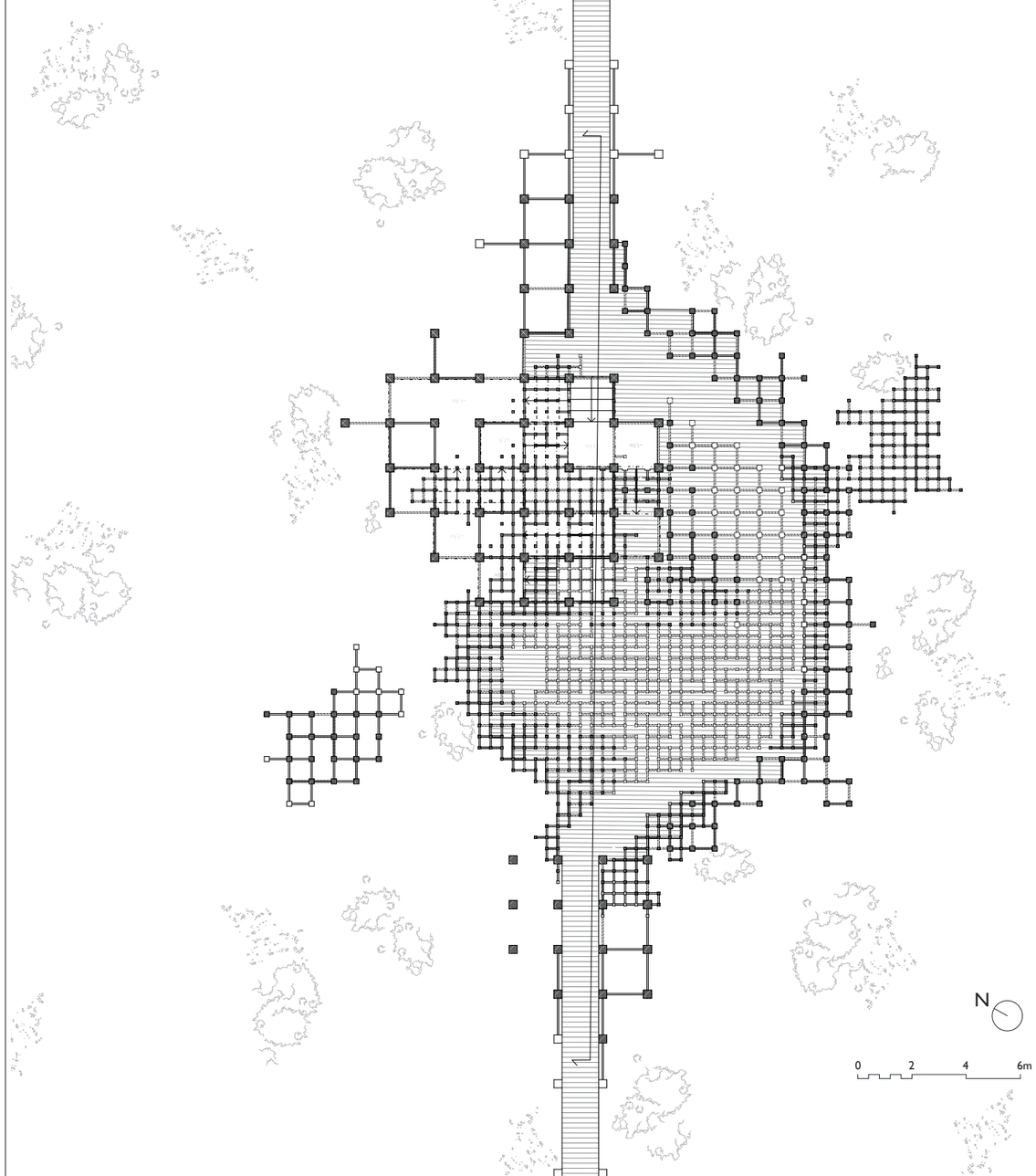


The strong vertical direction and the framing hole lifts your sight towards the night sky

PLAN

Scale 1:100

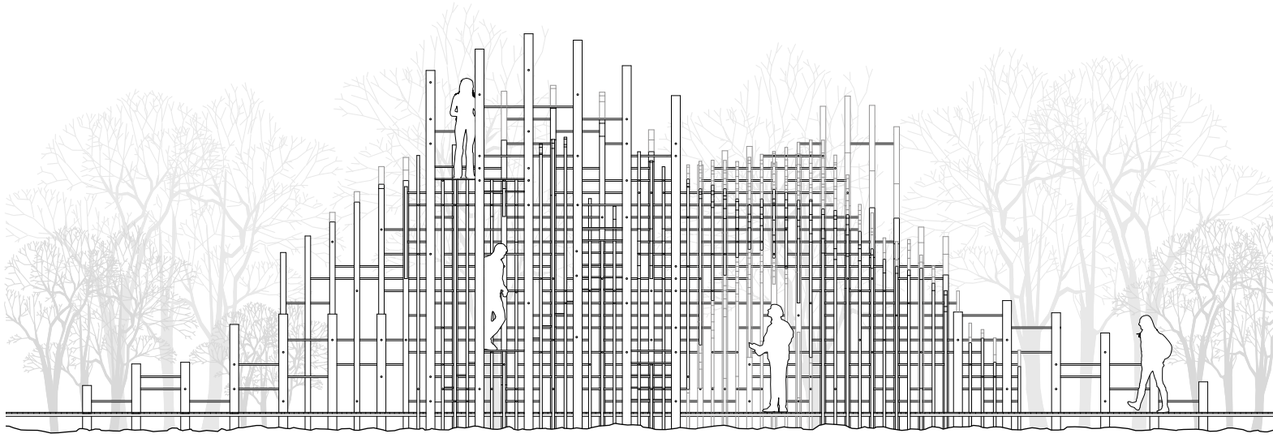
Here one can distinguish the interior room and the pathway. The overlaping clusters appear to be in motion of constant growth.



SECTION

Scale 1:100

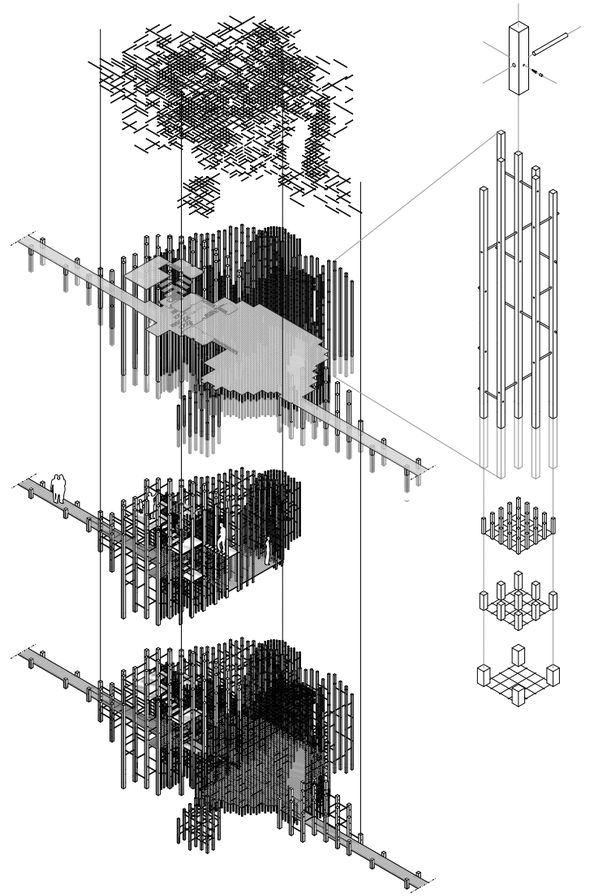
One enter the structure from one of the two bridges that follows the same design principles of the joinery. The height of the structure relates to the surrounding trees. When climbing the stairs, reaching the top, you receive nice views both towards the sky as well as an overview of the whole structure and the swamp.



ISOMETRY

Scale 1:300

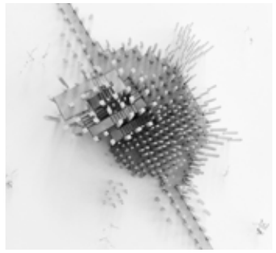
The stairs winds upwards inside one of the clusters. The pillars are pierced into the ground to reach frost-free depth and are made from accoya wood that can handle the change of water level without decay.

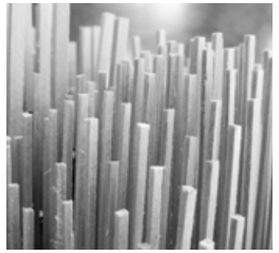


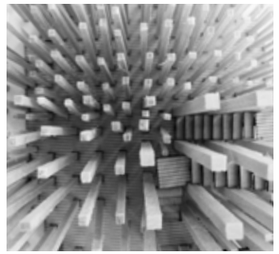
MODEL

Scale 1:50

Although the clusters differ in dimensions and density the structure is perceived as an entirety. The smooth outer shapes intersect with each other and dives down to meet the ground.







DISCUSSION

Reflections & Conclusions

DISCUSSION

Reflections & Conclusions

This project can be seen as an extension of the work of the Botanical garden, an investigation regarding biotopes and new ways to inhabit and explore nature. It consists of three designs but the concept allows it to keep growing, as long as it follows the same design principles. The central part being to create an unexpected experience on an overlooked site, with architecture that offers a guiding view.

The project could have resulted in a typical nature reserve visitor centre, but the ambition was to come closer to the experience. To be *in* nature rather than merely observing it. By choosing to mimic rather than to contrast, curiosity that goes beyond the architecture is created. The architecture might be what lures you in but once there, it directs your focus back to the surroundings.

There is a challenge in connecting theory and design, especially in the initial stages, since the subject nature, human and architecture is such a wide topic. One can for example look at it from a health promoting perspective, an ecological perspective, a critical perspective towards the traditional idea of nature or simply an architecture oriented perspective. Looking back, today it would be easier to see what part of the wide scope to focus on. On the other hand, we took an active decision to focus on research *by* design and therefore prioritized the development of the actual designs.

The developed method helped to constant progress in the project, functioning as a guide along the process.

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