

ECO SURVEILLANCE TOWER

Creating learning environments in nature
by transforming an old military air surveillance tower



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ECO SURVEILLANCE TOWER

The distance between man and nature is increasing and the wild is gradually becoming more and more alien to us, physically as well as mentally. The lack of emotional commitment to and knowledge about the environment risks leading to behaviors with negative climate impact. By introducing and using nature as a complementary learning tool in traditional pre-school teaching, my aim is to help kids establish a care for sustainability at an early age – an interest that can hopefully grow in the future.

This thesis explores how children's learning environments can be designed in nature by transforming an old air surveillance tower in Nollhaga Park, Alingsås. The character of the tower makes it possible to explore how environmental education can be linked to nature's vertical system. By adding, opening up and preserving parts of the building's history, this thesis addresses how architecture can function as a link between nature, learning and the built environment.

The method is a combination of literature studies and explorative techniques such as

sketching, physical models and collages.

The thesis is based on a breakdown of; nature, building and learning. These three systems have been analyzed for a better understanding of what constitutes them and how they can interact with each other. By decoding the logic behind the air surveillance tower's architecture, one can also understand nature. This has been an important factor in designing the learning environments. Furthermore the actual piece of nature – an old beech forest – and its special way of living has greatly influenced the different learning environments and their design.

Apart from providing a concrete suggestion on how one actual air surveillance tower can be architecturally transformed into a learning tool, my hope is that this thesis will inspire other – architectural and non-architectural – ideas on how we can make the forest more available to children in an effort to repair the broken bond between man and nature.

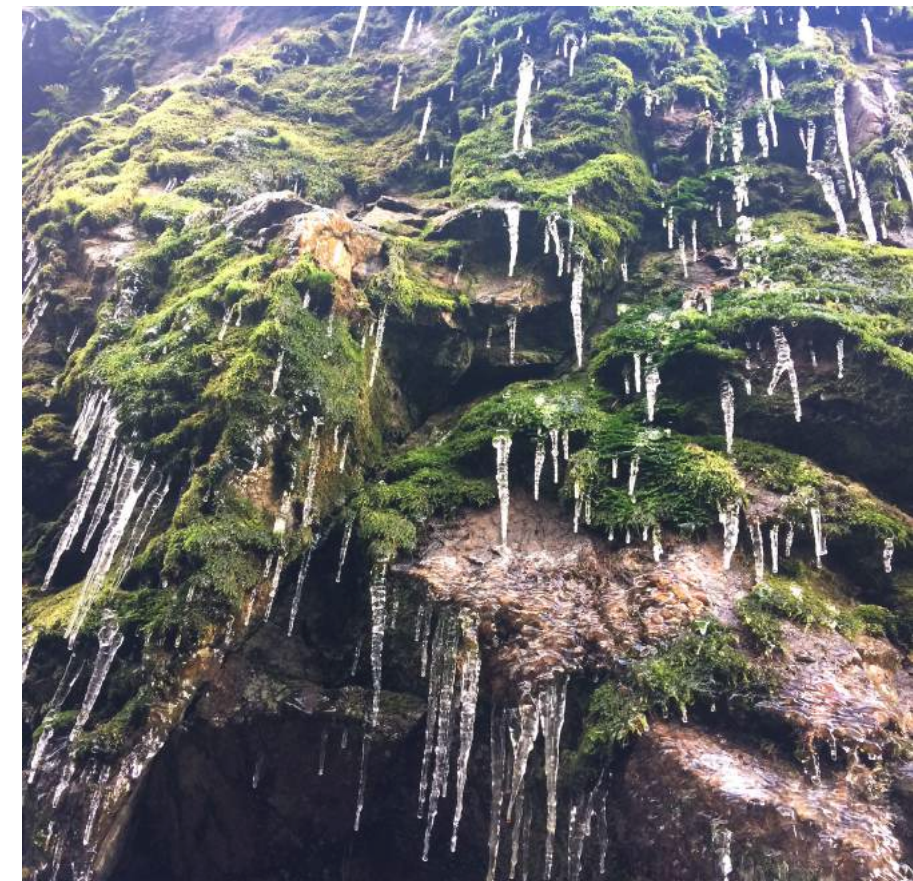


STUDENT BACKGROUND

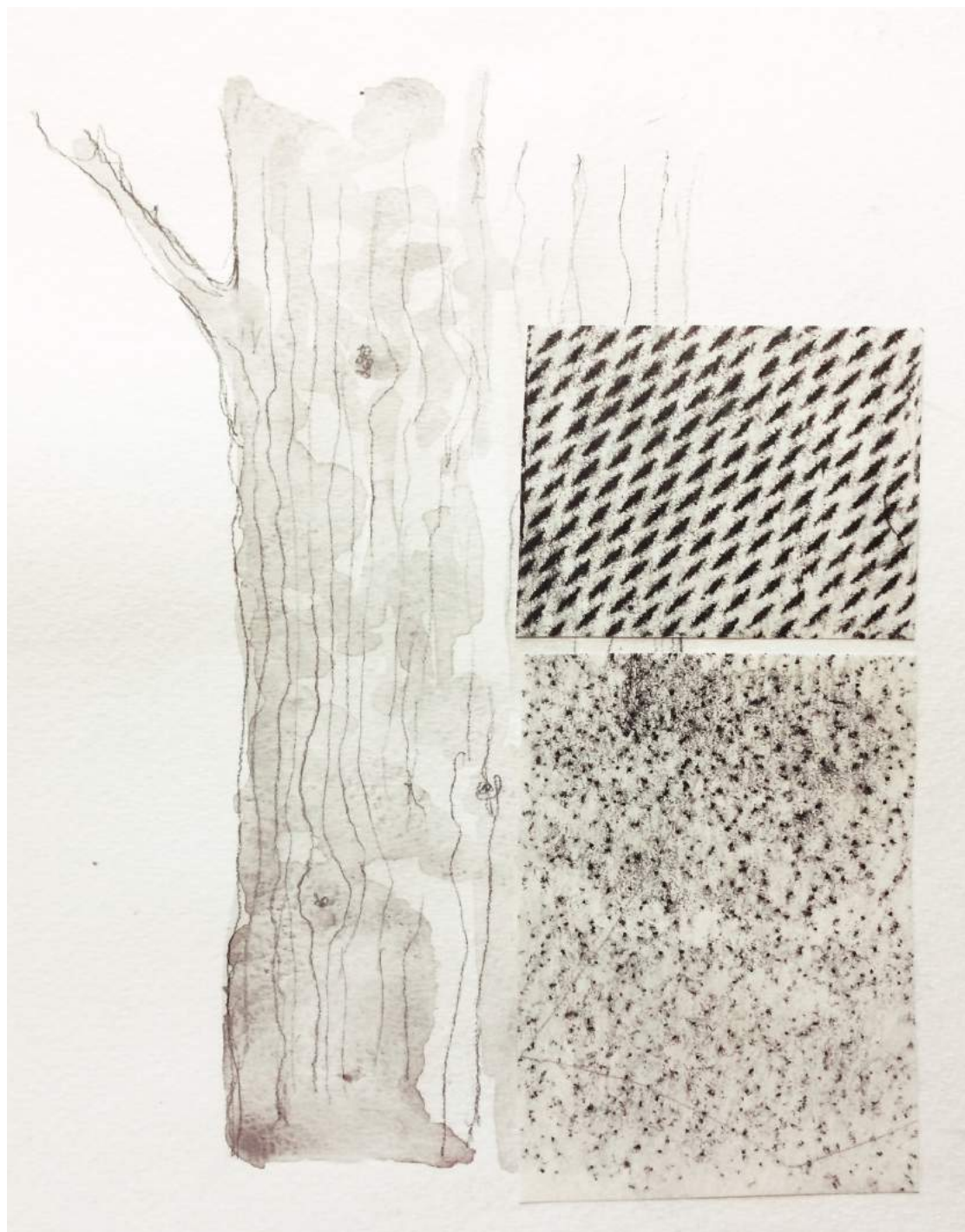
The previous master course “Architectural Heritage and Urban Transformation” deepened my interest in how to reuse old buildings and put them into a new context. This, in combination with my interest in sustainable architecture and environmental questions, created a foundation for this thesis which can also be understood as an intersection between my academic profile and personal interest.

BSc Architecture
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Icicles on the rock wall. Author's own copyright.



INTRODUCTION

AIM & PURPOSE

This thesis investigates how learning environments for children can be created in the nature by using the structure of a neglected air surveillance tower located in a forest in Alingsås. The character of the tower makes it possible to explore how learning spaces can relate to the nature's vertical systems and how it can become a link between the existing building and the surrounding nature.

The purpose of the thesis is to showcase how the forest can be made more accessible and to provide space for children to learn about nature. The result is a design proposal for a new learning center in the forest that offers learning environments, both inside and outside the tower, which could be used by preschools within the city as a complement to the traditional school education.



The air surveillance tower. Author's own copyright.

THESIS QUESTION & DELIMITATION

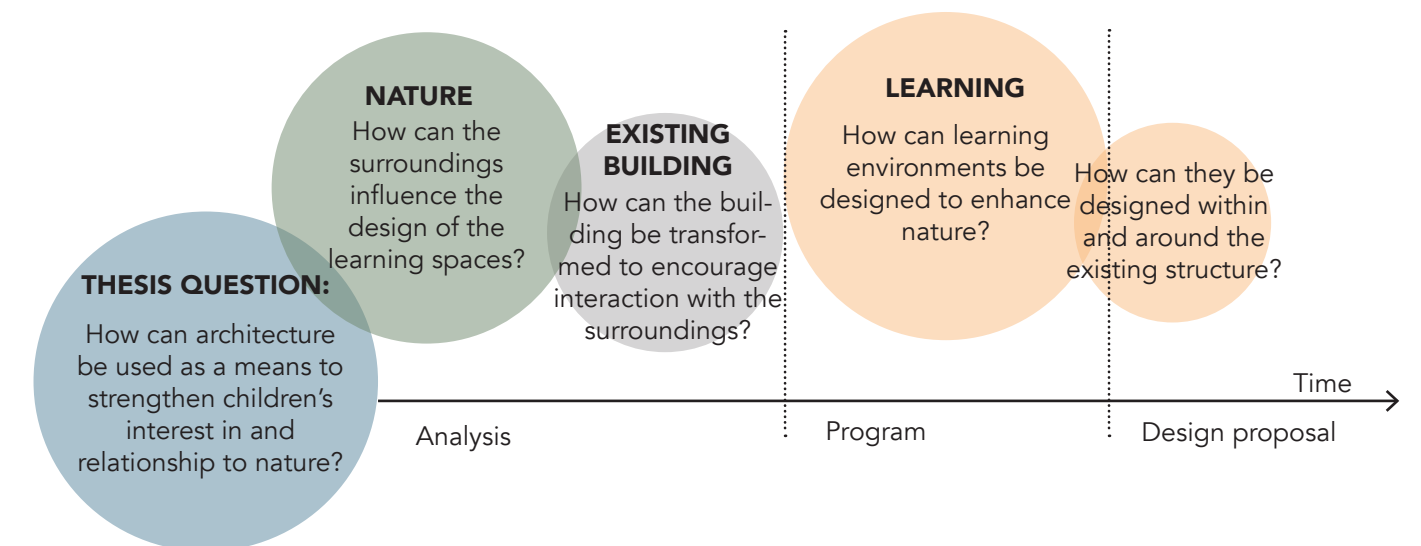
The thesis question is: How can architecture be used as a means to strengthen children's interest in and relationship to nature?

This thesis focuses on how children's learning spaces can be designed in the nature. The air surveillance tower is used as a structure for the learning center, however the architectural military heritage is not addressed in this thesis.

In the transformation of the tower I have chosen to work with three strategies; adding, cutting and preserving. These

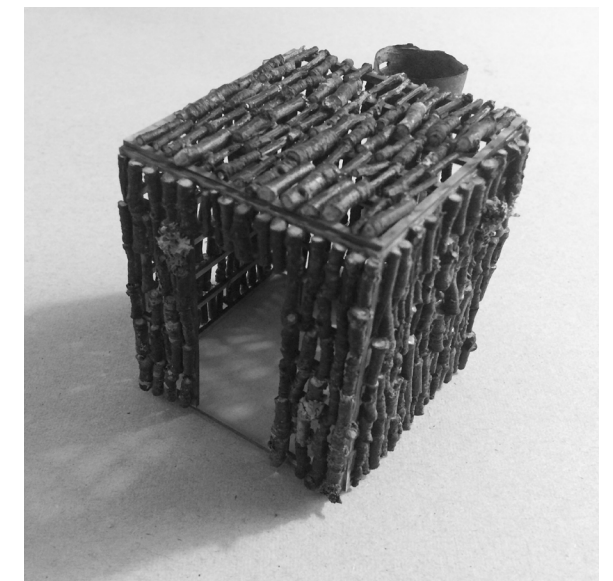
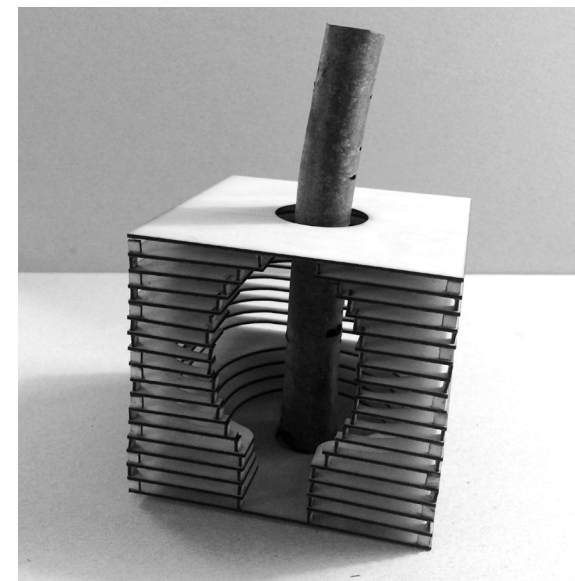
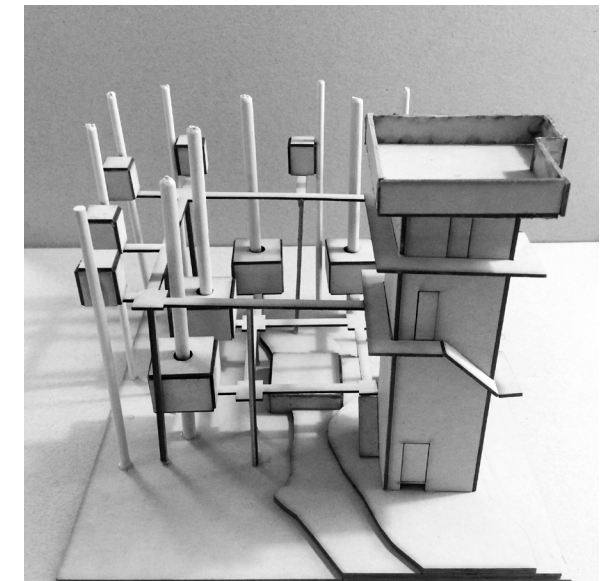
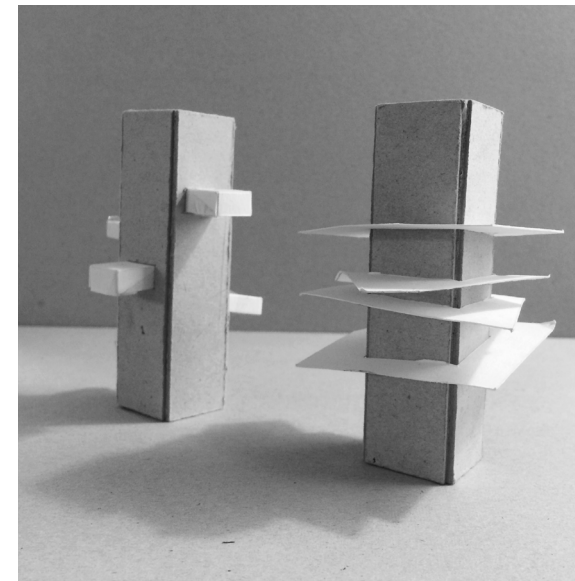
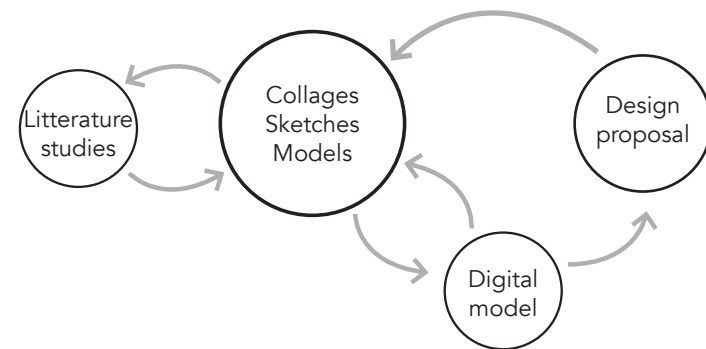
strategies enable an interaction between nature and the existing building as well as preserving historical elements in the tower. The belonging bomb shelter down in the mountain is not included in the thesis.

The thesis is built upon a division between nature, building and learning. The interactions between these components have resulted in questions that have been investigated through different methods during the design process (see diagram beside).



METHOD

The design process is based on a combination of literature studies, site visits and explorative techniques such as sketching, making physical models and collages. These have been tested and evaluated through digital models. The design proposal has been further evaluated and again processed by explorative techniques, digital tools and literature. The diagram shows the iterative process and the interaction between the different methods used in the design process.



Sketch models

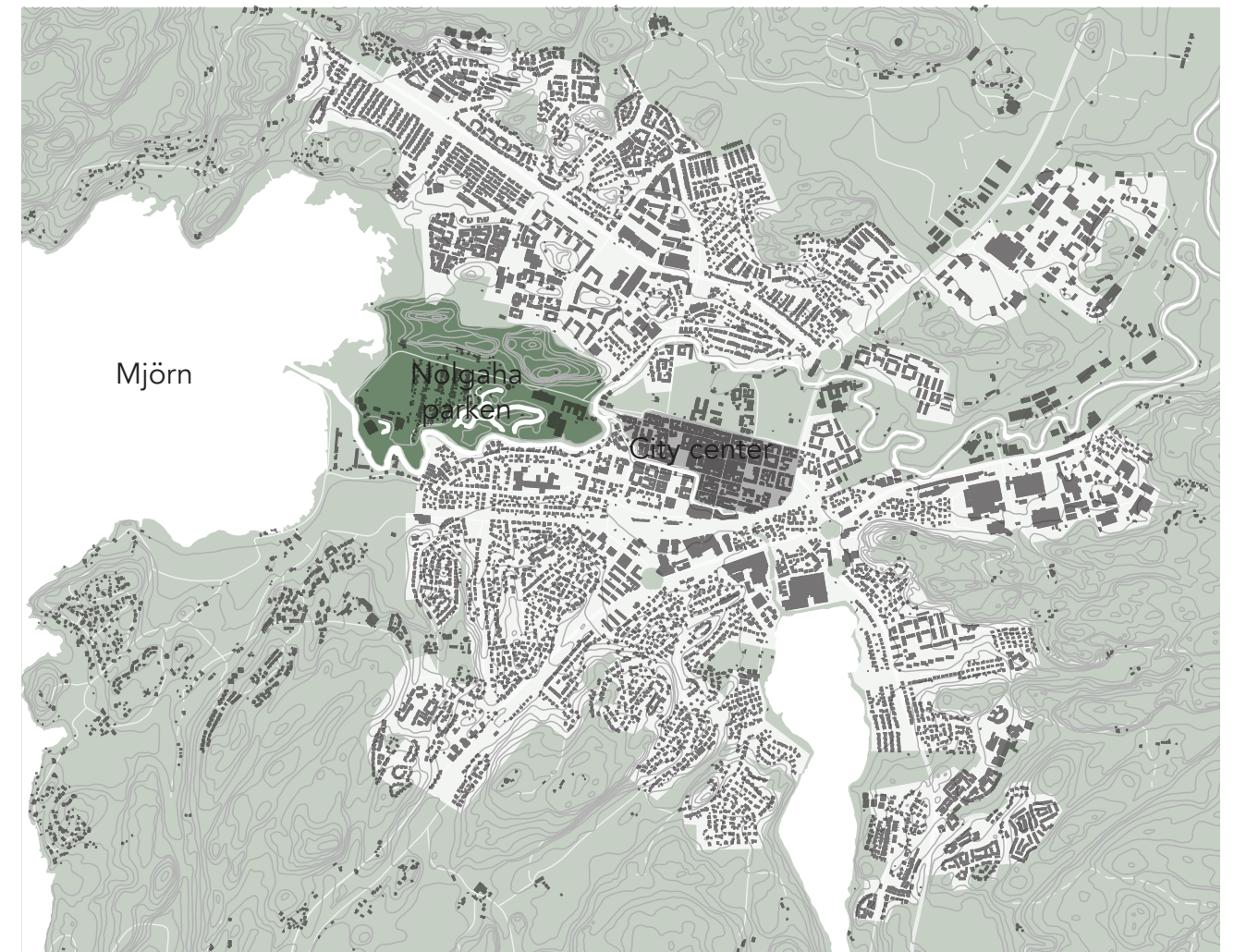
BACKGROUND

The air surveillance tower is located in Nohaga park, Alingsås. The park is located in the western part of the city, between the city center and the lake Mjörn. It serves as a popular green area in the city and an important node between the north and south of Alingsås.

The air surveillance tower was a place I often visited as a child and was a part of my explorations in the forest. Today it

is still a building that fascinates me and sparks an interest in investigating how it can be transformed and reused.

The central location of the park and its unique natural areas make it interesting to explore how the tower can be transformed and become a new public place in the city that supplies space for children to explore and experience the nature.



Nohaga park in relation to the city.

CHILDREN, NATURE & LEARNING

The growing distance

When searching for literature about nature and children I found several books, articles and reports that all identified a big societal problem: the growing distance between children and nature. The discussion mainly addresses two viewpoints: one focusing on children's physical health related to nature and the other discusses children's mental distance to nature.

Richard Louv, an American author and journalist, has written several books about children's relationship to nature. He means that children today do not have a relation to nature anymore. Outdoor activities in the forest have become something unfamiliar and are often replaced with sedentary activities in front of a screen. Louv believes that children's lost connection to nature may risk in leading to behaviors with negative climate impact. In order to save the nature he suggest that we have to start with the children (2008).

Children spend the majority of their

time in school; therefore it has a key role when it comes to turning this negative societal trend. Outdoors education becomes a great pedagogical tool when reestablishing children's relationship to nature (Ekvall, 2012).

Cognitive/social constructivism

Children's learning can also be understood by Jean Piaget's theory about cognitive constructivism. Piaget was a Swiss psychologist during the beginning of the 18th century and stated that learning is an active process where each child is going through the same developmental stages in life, where the surrounding environment has a great importance for the learning. However, there is also the social constructivism, presented by Lev Vygotskij, a Russian psychologist who was present during the same era as Piaget. In contrast to Piaget, he claimed that children learn through challenges and that all children do not follow the same developmental stages. Instead he believed that learning is constructed in the dialogue between children.



Beech trees on Nolhaga Mountain. Author's own copyright.

New pedagogical tool

By using nature as a complement in the traditional school education, more children get the opportunity to explore and learn about the nature. This idea challenges the understanding of the traditional classroom and the school education. John Dewey, an American philosopher and educational reformer, questioned the traditional school education already in the early 19th century. He coined the concept "learning

by doing" in which he emphasized the relation between theory and practice, where theory, practice and reflection together create a experienced based learning atmosphere. Additionally, Dewey saw the classroom as the most important tool for creating a democratic society and this idea also became a criticism to the school system. He believed that the optimal development of the individuals also is a condition for the optimal development of the society (UrSkola, 2017).

REFERENCE PROJECTS

I have studied reference projects that in different ways involve nature, learning and how to deal with the built environment. I have also studied different types of bridge systems in order to understand how the connection between the built structure and the nature can be dealt with.

The experience park “UPP” located in Djurparken in Skåne is a similar project where children can learn and observe the nature and animals among the trees. The experience park consists of suspension bridges that are made of wood and ropes. The bridges lead the visitors to various houses among the trees.

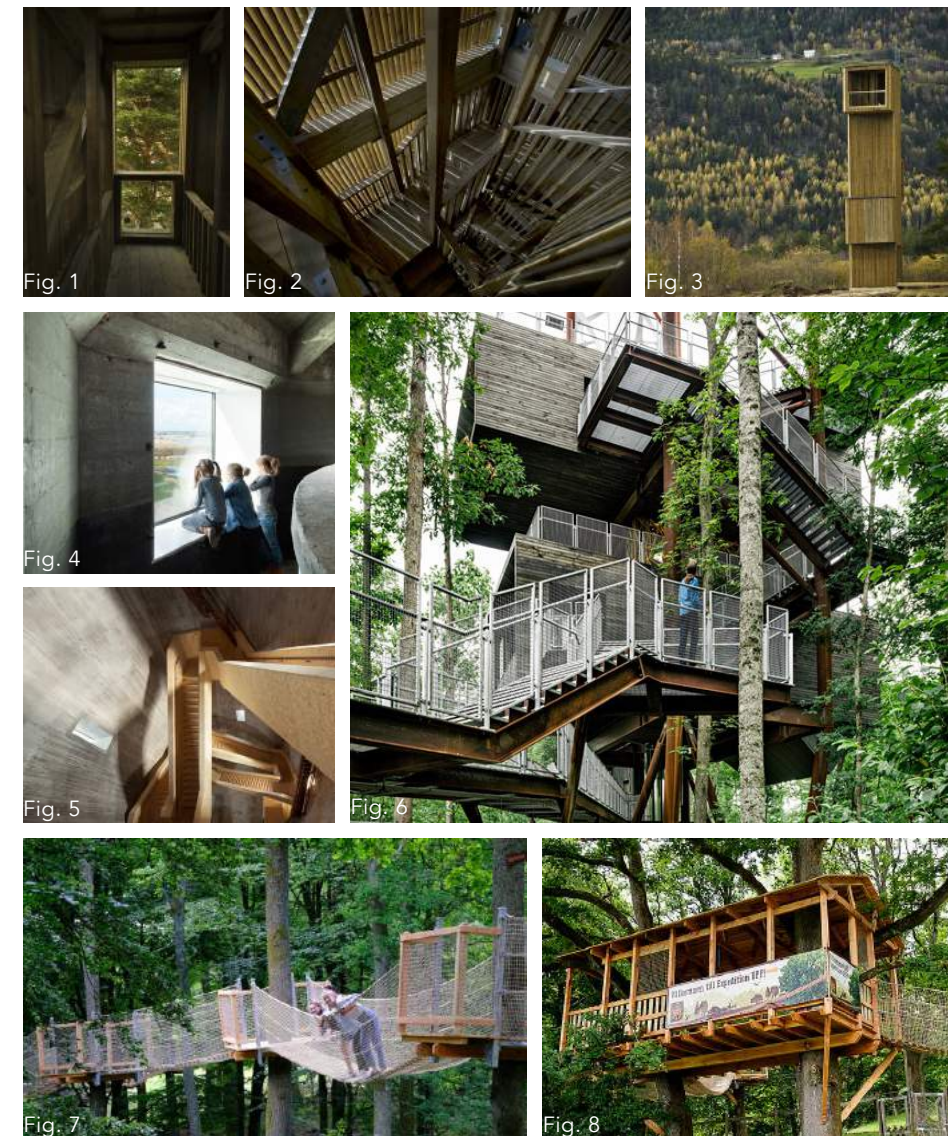


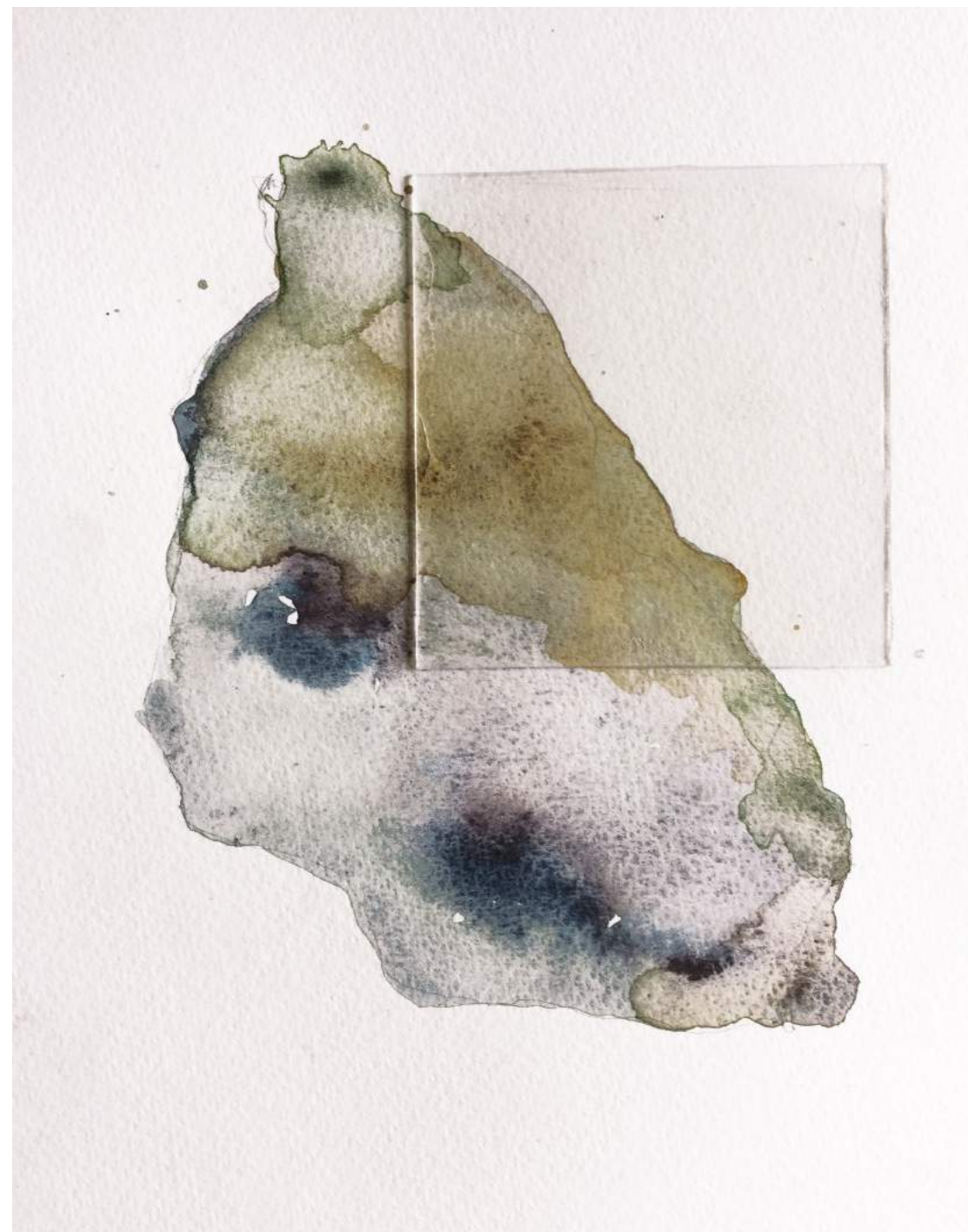
Fig. 1-3 Seljord Watch Tower, Rintala Eggertson Architects
 Fig. 4-5 A Watch/Watertower Sint Jansklooster, Zecc architecten
 Fig. 6 The Sustainability TreeHouse, West Virginia, Mithun
 Fig. 7-8 Sânes Djurpark

READING INSTRUCTIONS

This thesis report is divided into three parts; analysis, program and design proposal. The analysis consists of a study of; the surrounding nature and the air surveillance tower. These have been seen as two individual systems that have been broken down in order to better understand what constitutes them and how they can interact with each other. The program can be understood as the learning, that is influenced by literature studies and the knowledge gained from the analysis. The last part consists of the design concept and the design proposal, which showcases how the tower can be transformed to become an educational center and to connect to the surrounding nature.



Autumn in the beech forest. Author's own copyright.

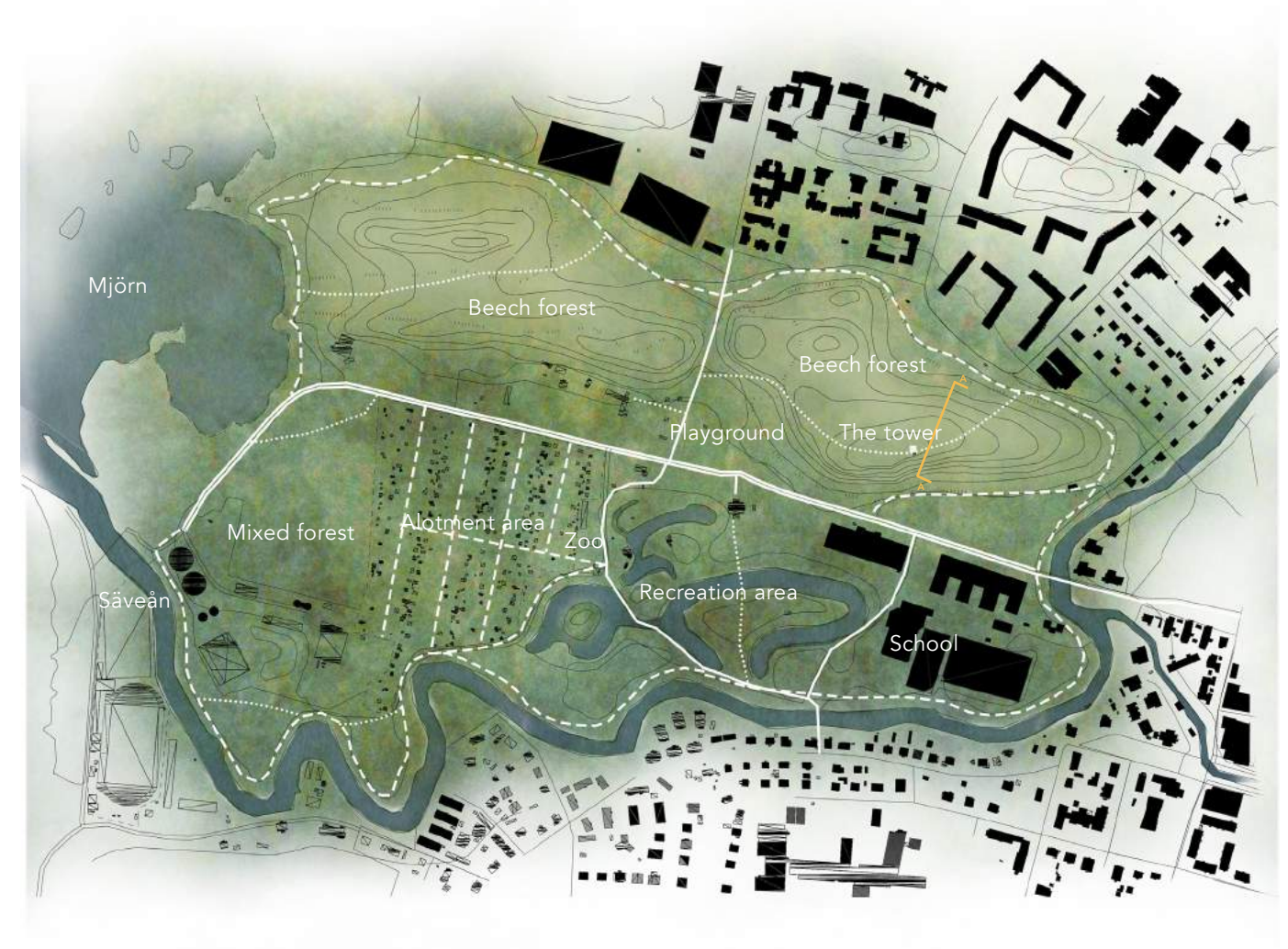


ANALYSIS

THE SURROUNDING NATURE
THE AIR SURVEILLANCE TOWER

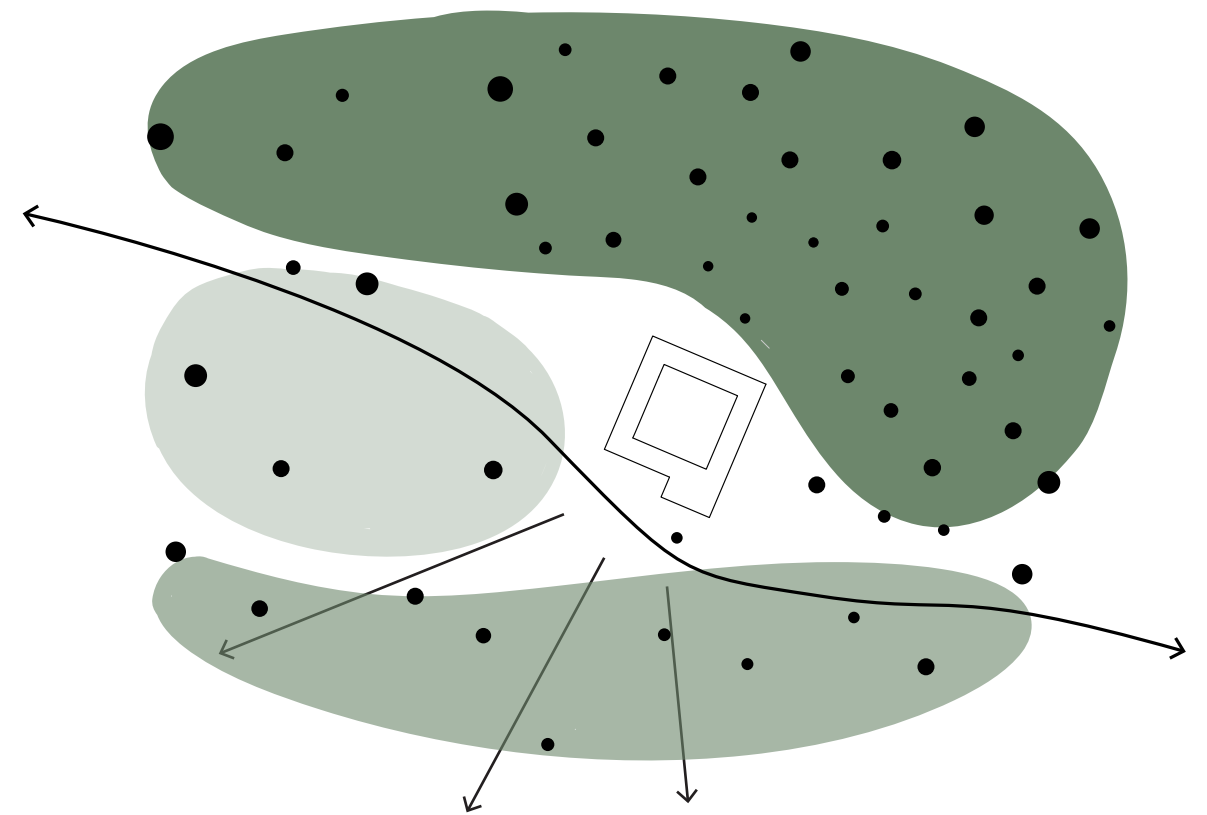
THE PARK

The park consists of different types of nature; old beech forests on the mountains, allotment gardens, recreation areas, playgrounds and a small zoo. The park is daily visited by families with children and exercisers and is an important green area for the citizens. The air surveillance tower is located on the top of the east mountain and can be reached by a pathway that crosses the mountain from east to west. The infrastructure in the park consists of bikeways through the park, running tracks around the park and small pathways inside the park.



THE SITE

The nature on the chosen site can be divided into three different types of spaces. On the north side of the tower the nature is dense and consists of larger fully-grown beech trees. A small amount of sunlight reaches the ground and the area becomes very shaded. On the west side of the tower the landscape is more open, there are less trees and therefore the area gets more sunlight. The south side has a steep slope with little vegetation and receives a lot of sunlight during the day. A pathway divides the north side from the south.



THE BEECH FOREST

The forest on the Nalhaga Mountain mainly consist of beech trees and due to its unique way of growing there are only a few other species that can live next to them. The horizontal growing direction of the leaves only allows 3% of the sunlight to reach the ground. The beech tree grows very slowly and can live up to 400 years. The slow molder process of the beech leaves contributes to a constant layer of brown withering leaves on the ground all year round. The molder process can take up to several years. The leaf is poor in nutrients which makes

the soil very thin and nutrient-poor, which the pine trees prefer. The thin soil contributes to a lack of earthworms that are normally needed to create fertile soil. Instead, insects like woodlice tend to live among the withering leaves. The few species that can actually grow under the beech tree are different types of mushrooms. The mushrooms and the beech trees live in symbiosis, meaning that they give and take nutrition from each other through their root systems ("Bergets Hedbokskog", 2017).

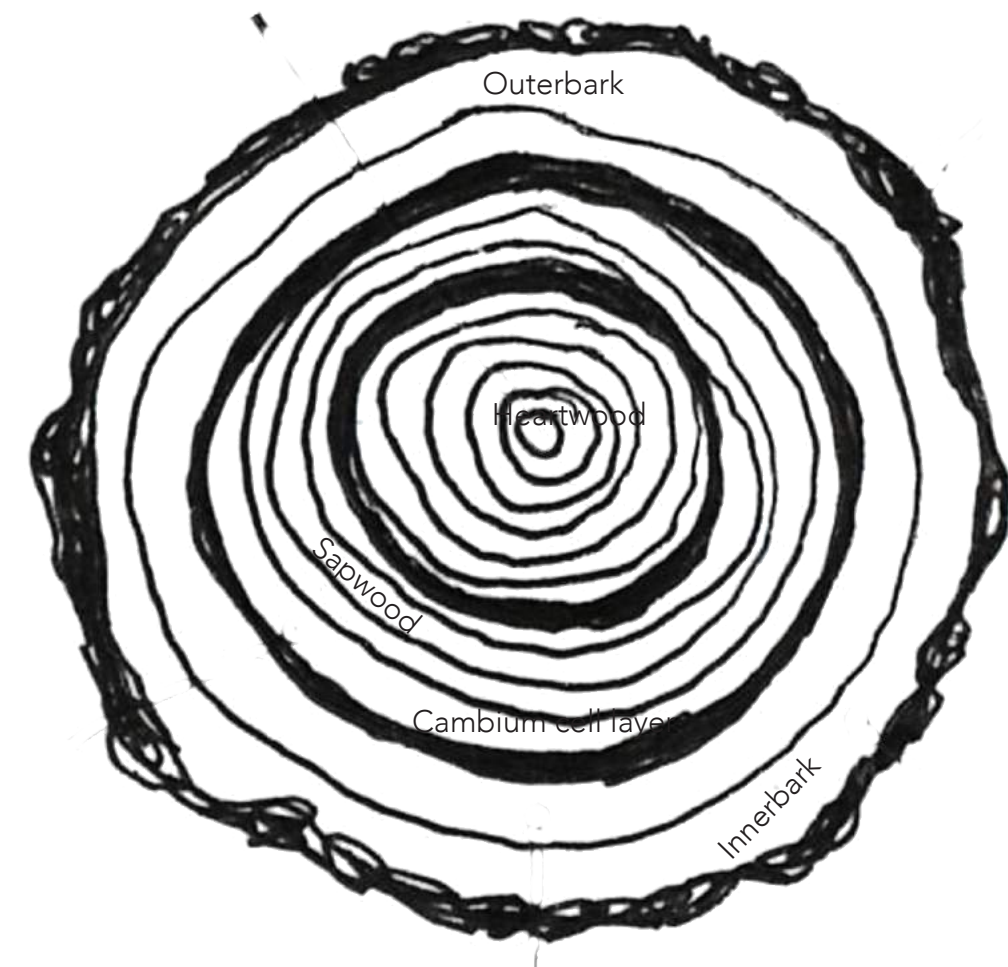


The beech forest on Nalhaga Mountain. Author's own copyright.

THE ANATOMY OF THE BEECH TREE

The trunk of the beech tree consist of five layers; outerbark, innerbark, cambium cell layer, sapwood and heartwood. The outerbark is the protective layer that keeps moisture and rain out but also prevents the tree from losing moisture. The second layer is called the innerbark and can be understood as a vertical transportation through the tree that transports food from the root system up to the crown. The cambium layer is the growing part of the tree and takes nutrients from the innerbark to produce

new bark. The sapwood layer transports water from the root system up to the crown. This layer constantly renews itself. When a new layer of sapwood is created the old one becomes a part of the heartwood. The heartwood is the central part of the tree. Even though it consists of old layers of wood it is also the strongest part of the tree. Cellulose fibers in combination with a chemical glue called lignin makes the heartwood strong as steel.



THE TOWER IN A HISTORICAL CONTEXT

The air surveillance tower on the Nohaga Mountain was built in 1941 and was a part of a military network in Alingsås during World War II. The purpose of the tower was to overlook and protect the city in case of invasion (Törnell, 2003). The daily work consisted of writing and evaluating reports that were sent by an errand boy down to the bomb shelter located in the mountain under the tower. The tower was strategically placed on the

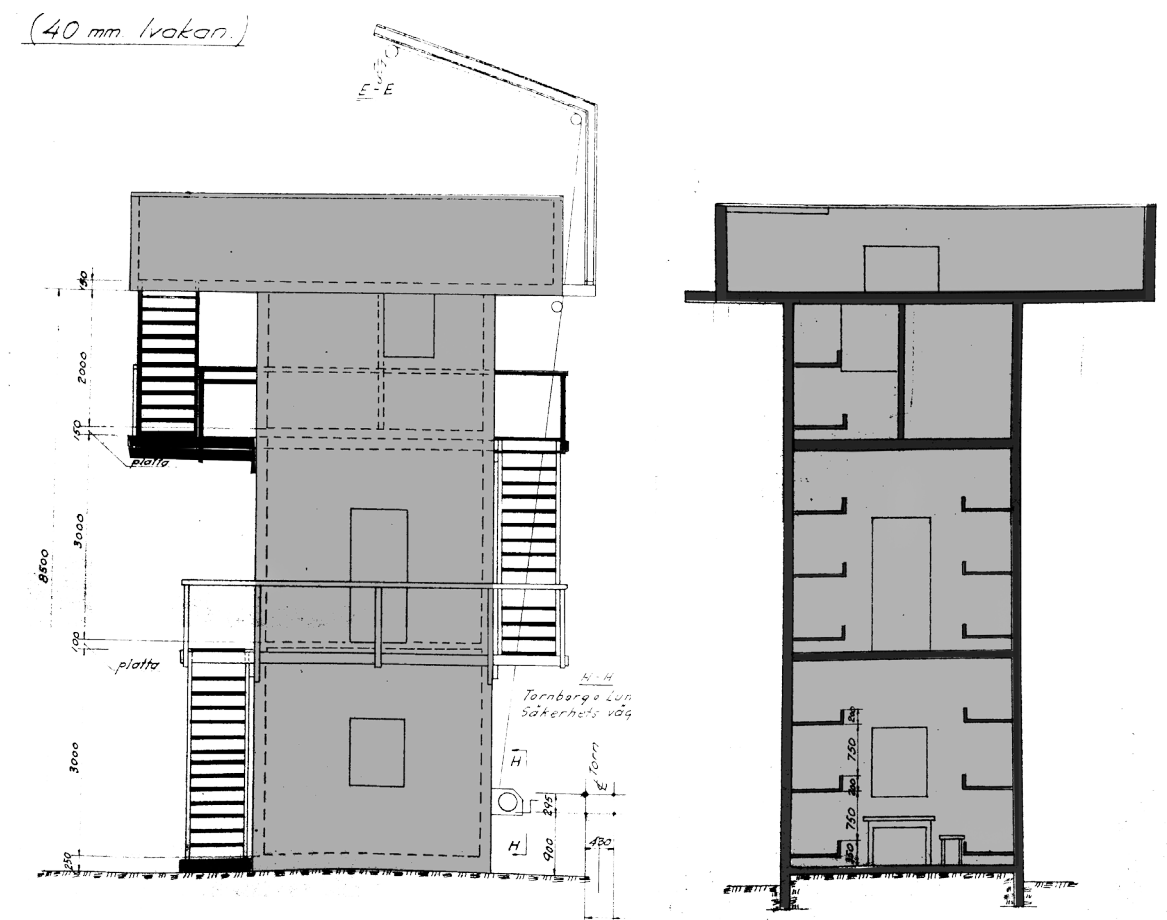
top of the Nohaga Mountain because of the central location in the city but also because of the topography. Based on old documents from the archive in Alingsås, the tower was a central node in a military structure in Alingsås during the 1940s. There was a naval outpost located next to the lake Mjörn and a second tower on the east side of the city which served a purpose of maintaining communication with each other.



THE ANATOMY OF THE TOWER

The original drawing from 1938 illustrates the first version of the tower with a height of 8.5 meters. The lack of updated plans makes it difficult to confirm the exact measurements of the tower, but through my own measurements I would say that the tower is 14 meters high and has a quadratic shape where the sides are 3.5 meters long. According to the old drawings from the archive, there was originally a staircase that went around the tower with a platform and an

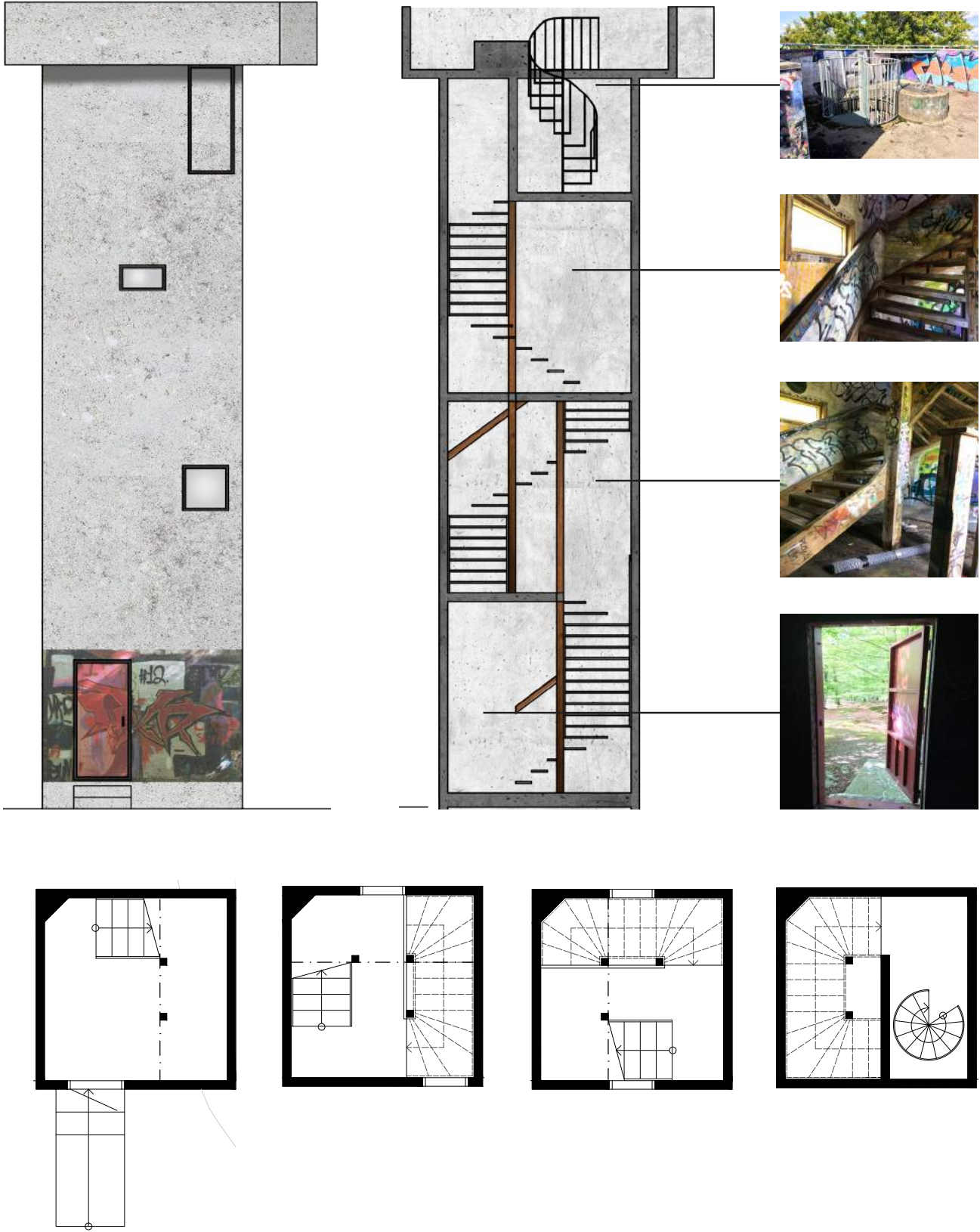
entrance on each floor. The ground floor and the first floor contained lodgments for soldiers with six beds each attached to the walls. The ceiling of the third floor under the platform is lower, due to being built for ammunition storage. There was a lifting device for the cannon ball on top of the platform. The tower can be understood as a modernistic building, where the shape has been formed as a result of the different functions.



LIFE OF THE TOWER

The tower was renovated in 1980s to become a public lookout tower. The stairs that went around the tower were replaced by stairs inside the tower. Furthermore, the lookout tower became a place for youths to hang out during the nighttime, which resulted in walls covered with graffiti. Unfortunately, the tower also became a target for vandalization, which later forced the municipality to

close the tower. In the year of 2006, the tower became a place for art exhibitions run by an art association. In 2011, the art exhibition moved out to the park and since then the tower has been closed to the public (www.nolhaga.se/foreningen.se). Today one can still see traces from its earlier life as the walls that are still covered by graffiti.





PROGRAM

DIFFERENT TYPES OF LEARNING ENVIRONMENTS

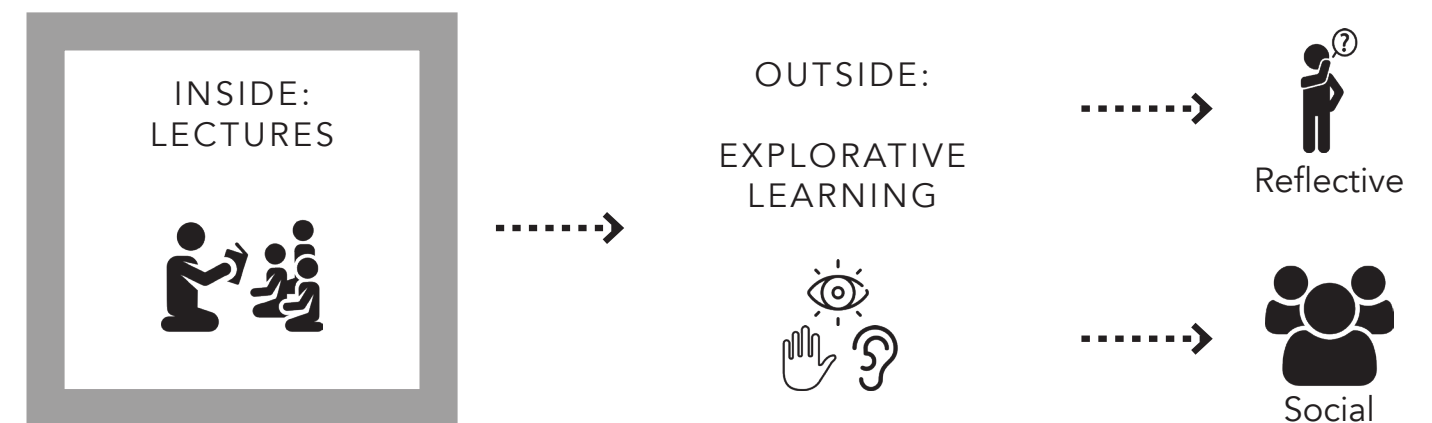
The learning environments are inspired by David Thornburg's theory on how learning can be optimized by creating alternative learning spaces. Thornburg claims that the traditional classroom is too monotone and does not consider the individual need. The traditional classroom lacks a diversity, which often leads to distracted students. Thornburg writes in his book "From Campfire to the Holodeck" how the traditional classroom can be further developed by dividing the space into smaller spaces for different group compositions and individual spaces. This is very much influenced by Piaget and Vygotsky. Thornburg divides the space according to four types of spaces:

- "The campfire" can be understood as the home of lectures.
- "The watering holes" can be understood

as the home of social interactions.

- "The cave" can be understood as a place for individual thinking.
- "The life" can be understood as "learning by doing" which is a more practical aspect of learning.

I have chosen to divide the learning environments in this project into the first two types of learning spaces. In this case, the tower becomes the home of lectures. The outside of the tower can be understood as an explorative zone, where the children are "learning by doing" and get to use their senses and dialogue as a learning tool. The learning spaces are also divided into two types of spaces; social and reflective. The social spaces can be used by groups for discussions and communicating ideas, whereas the reflective spaces only allow one person for individual reflection.



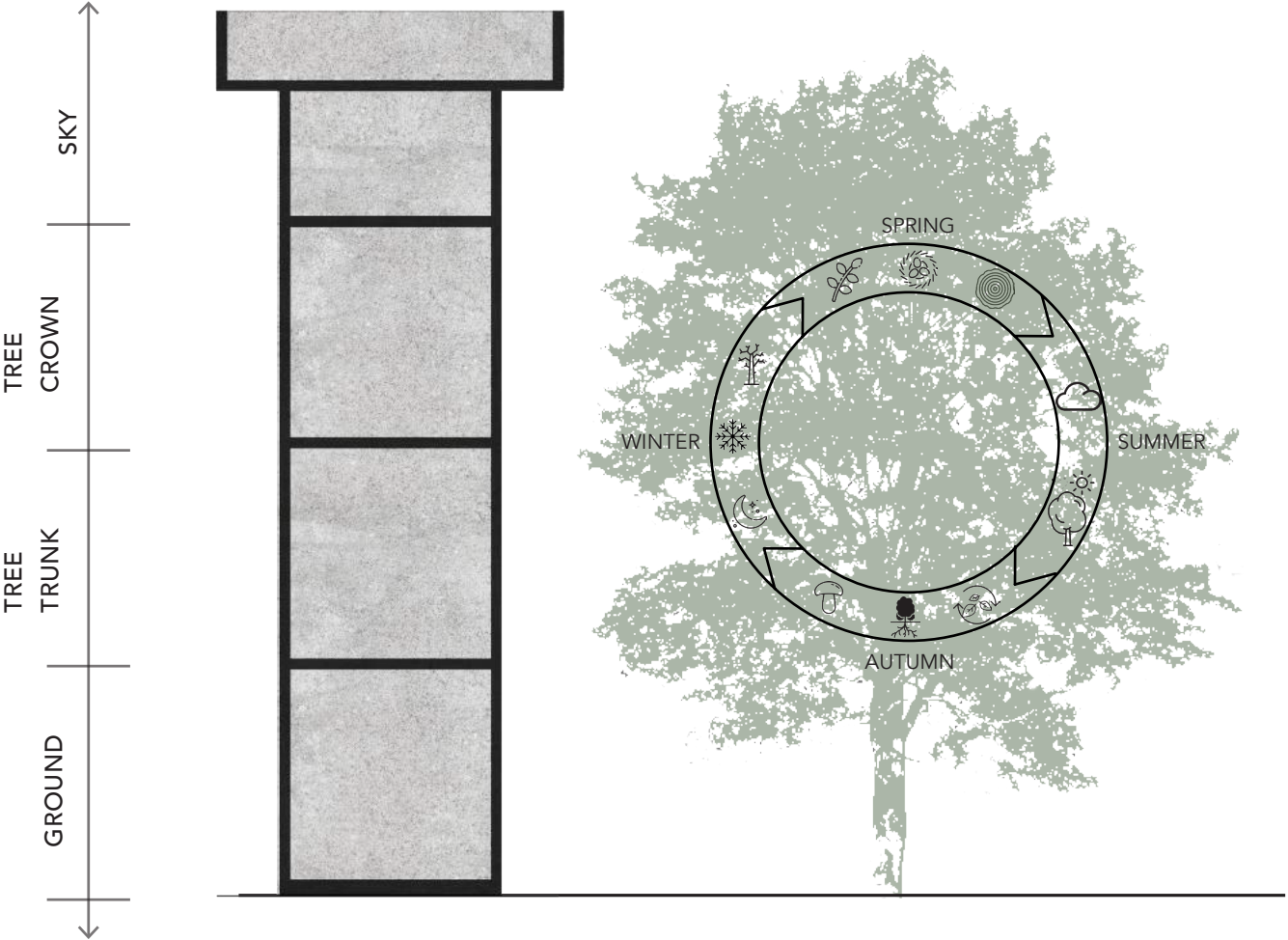
FUNCTIONS & MANAGEMENT

The program is based on a vertical scale where the different learning environments relate to nature on a specific height. The vertical scale is divided into four different levels; the ground, the tree trunk, the tree crown and the sky level.

The functions are based on the seasons. By listing nature and its physical space related to season - specific learning outcome has been confirmed. The learning outcome is translated into spatial qualities, related to

the vertical scale and what type of learning environment it could be.

The learning center could as a suggestion be a part of the already existing infrastructure in the park, where the employees open and close the tower on a daily basis and maintain a booking system for school classes. The tower is primarily a place for education where the inside of the tower is open for school classes during the day.



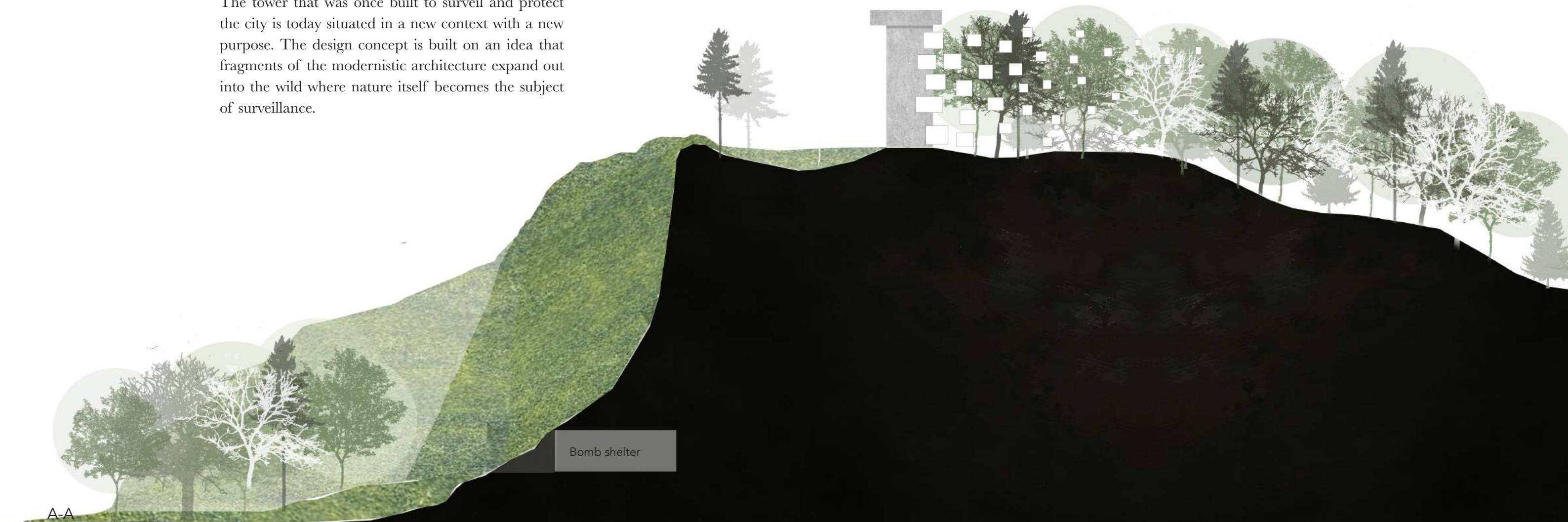
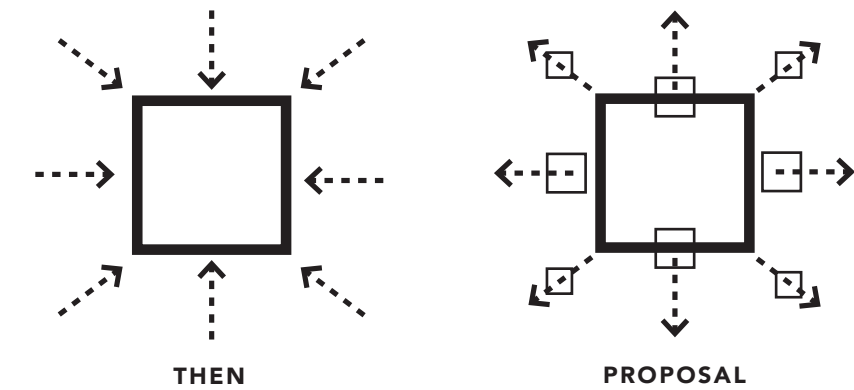


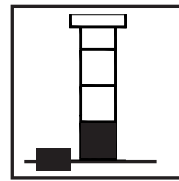
DESIGN PROPOSAL

DESIGN CONCEPT

The design concept is based on the result of the analysis. By analyzing the logic of the military heritage, one can also understand the forest. The dense forest on the north side of the tower was probably a strategy for the tower to merge into the nature while the south part, which is more open, was used to look out for enemies and to protect the city - a strategy that has greatly inspired the design concept.

The tower that was once built to surveil and protect the city is today situated in a new context with a new purpose. The design concept is built on an idea that fragments of the modernistic architecture expand out into the wild where nature itself becomes the subject of surveillance.

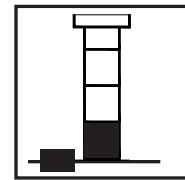




GROUND LEVEL

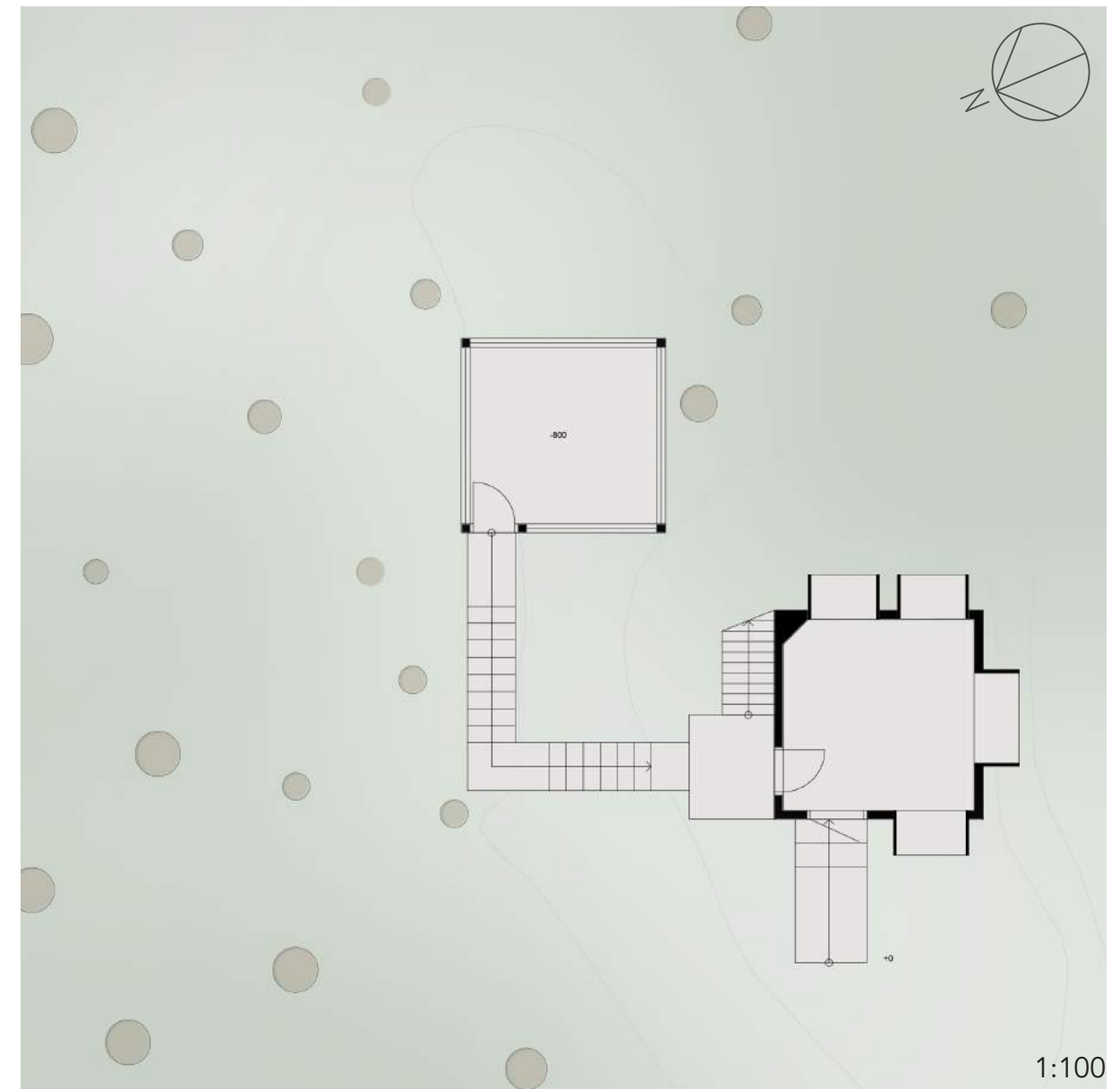
The learning environment inside the tower provides flexible space for different type of lectures with focus on different systems on and under the ground. The painting on the wall illustrates the different soil layers that could be a part of the lecture. There are seats for the children placed at different heights that are attached to the walls and also become extensions that push out from the facade.

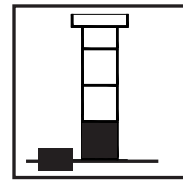




GROUND LEVEL

The plan view shows the entrance to the tower and the pathway down to the learning environment that is partly underground.

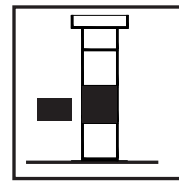




GROUND LEVEL

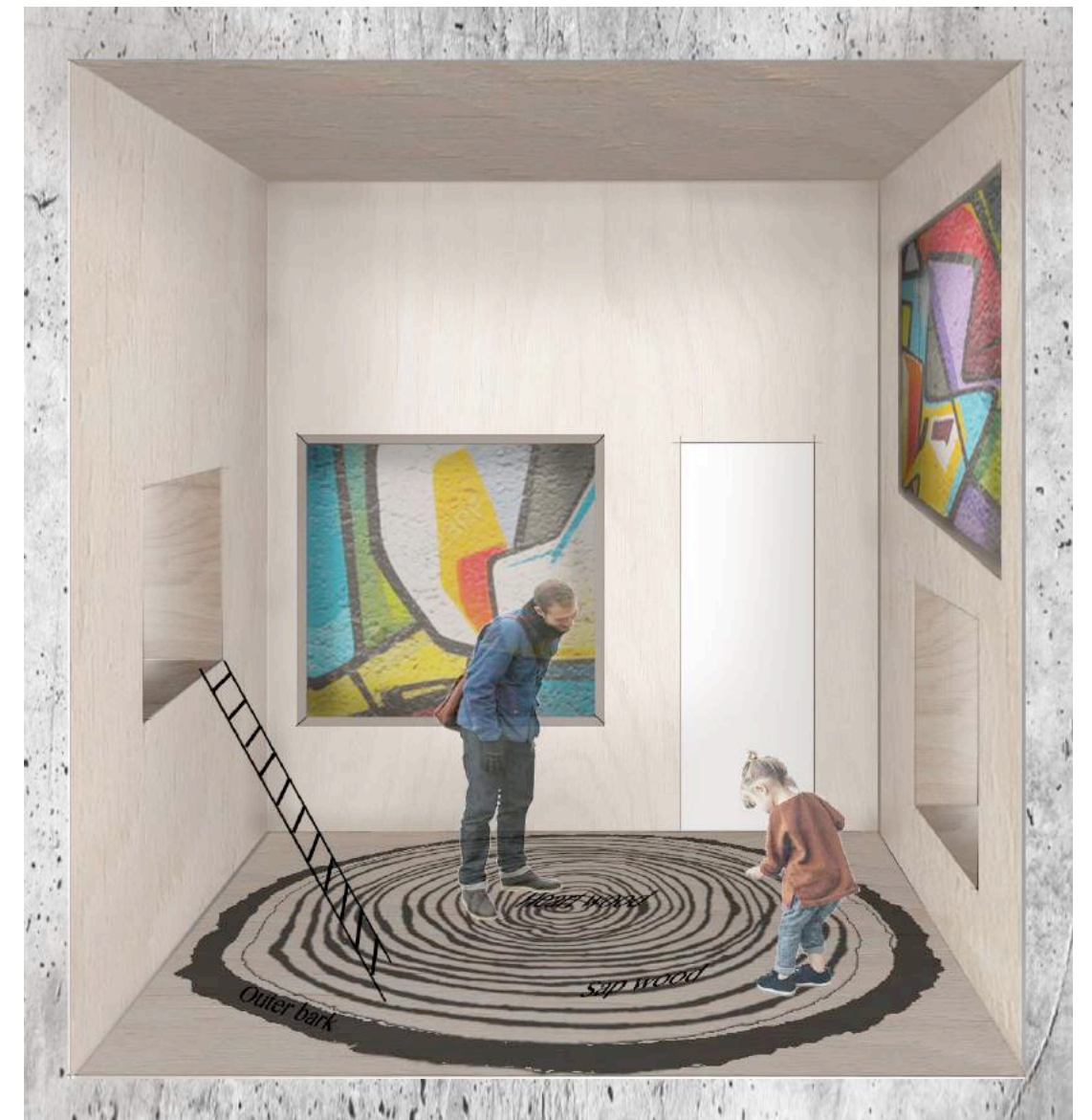
The learning environment that is partly underground, offers space where children could learn about the root system and the molder process of the beech leaves. The learning environment has glass facades that enable children to observe the different soil layers and the root systems. The roof is a perforated corten sheet representing the pattern of the leaves on the ground. In this way the children get the feeling of being covered with leaves.

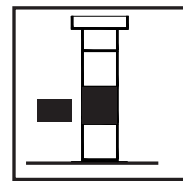




TREE TRUNK LEVEL

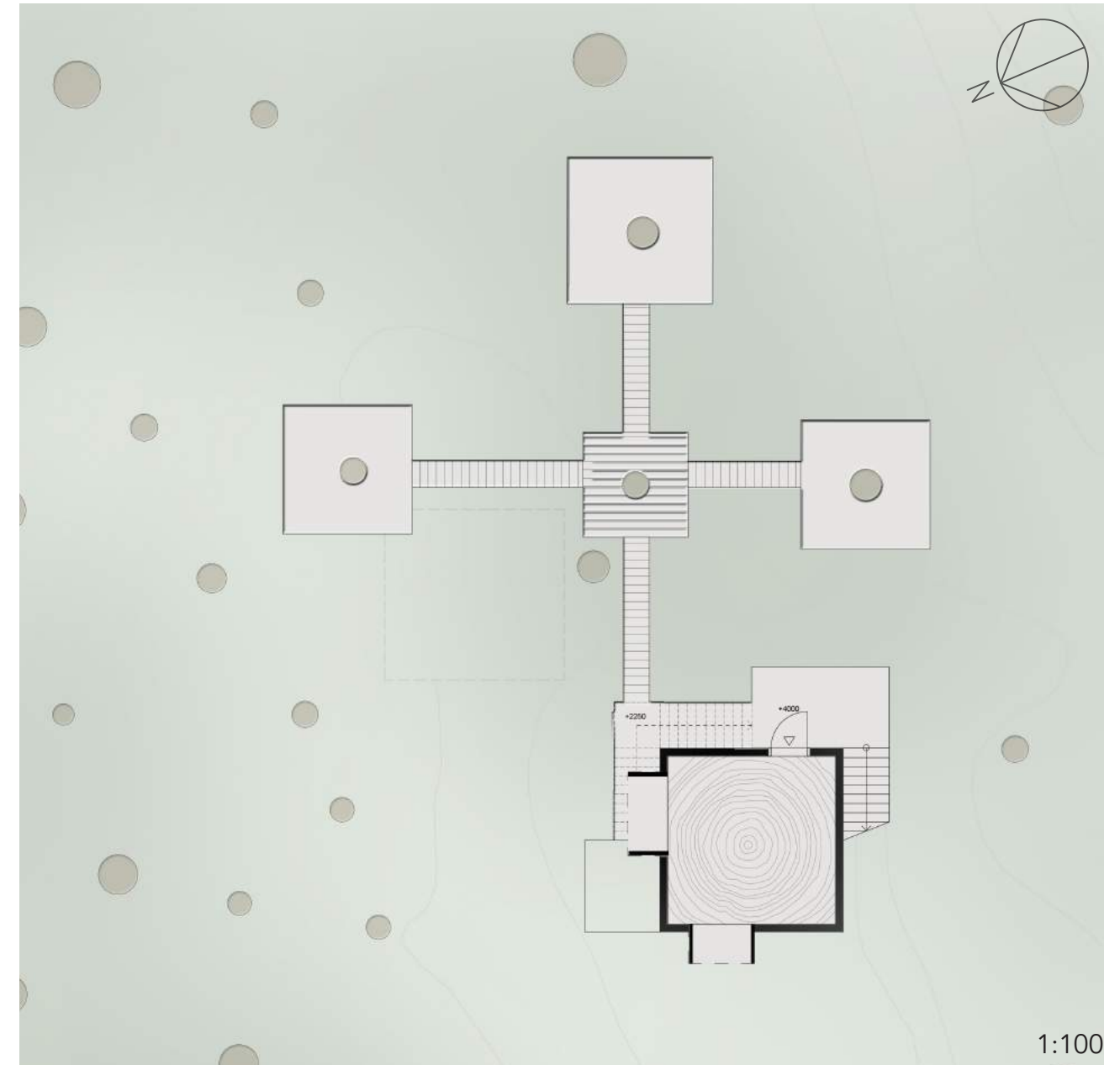
The learning environment inside the tower offers space for lectures with focus on the anatomy of the tree trunk. The floor becomes an active learning space, in which children can interact with the painting on the floor. The wooden panel that is attached on the concrete walls has in some part “cut-outs” which serves as a purpose to show the original concrete wall and the old graffiti.

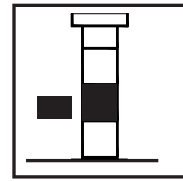




TREE TRUNK LEVEL

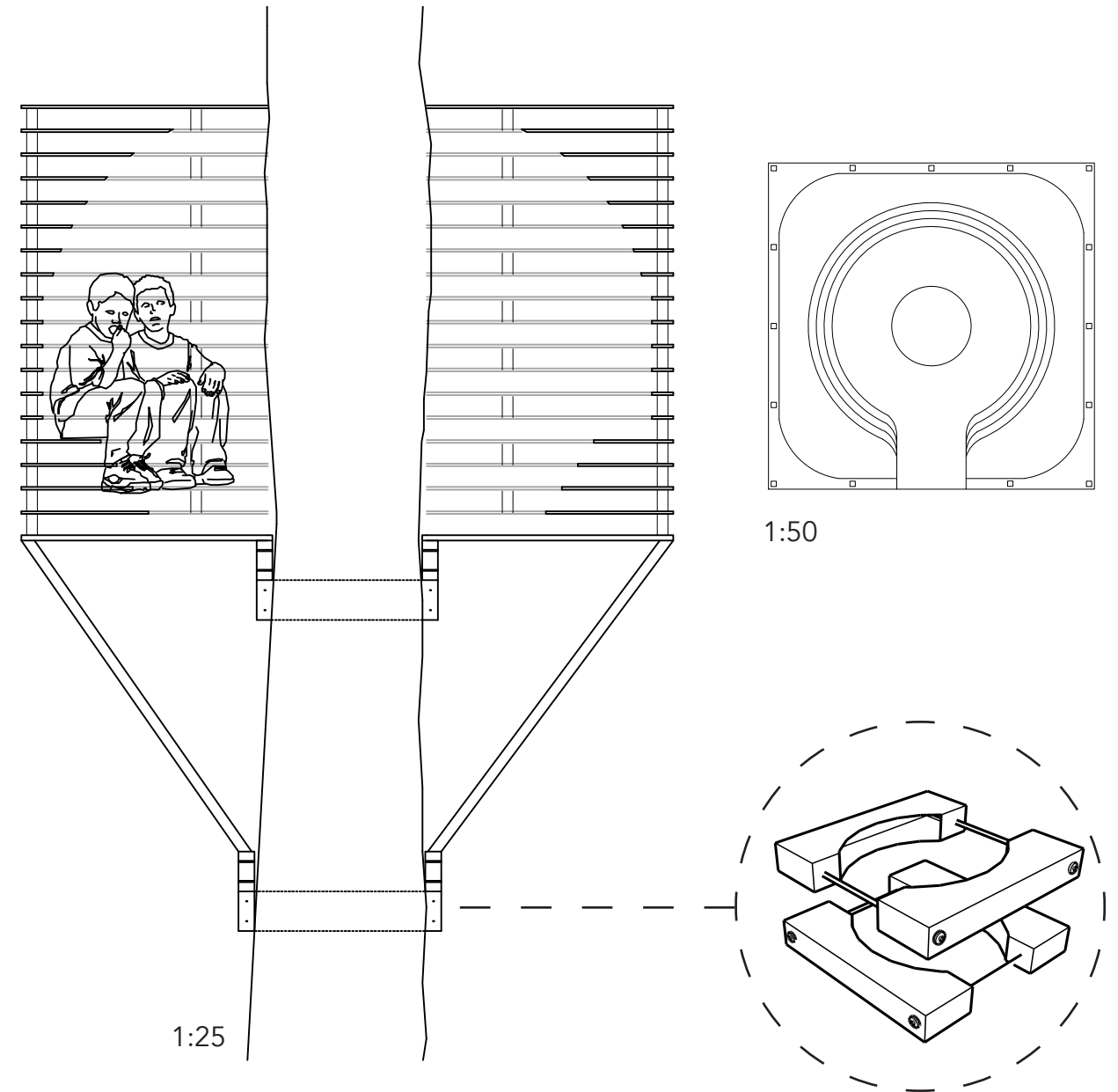
The plan view shows the tree trunk level and the connections between the tower and the social learning spaces among the trees.



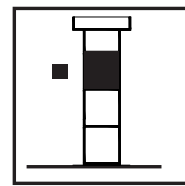


SOCIAL LEARNING SPACES

The social spaces are attached to the trees without damaging the trunk. The cabin with a cubistic expression gives a more organic feeling on the inside. The expression and material of the cabin refers to the layers and the anatomy of the trunk.

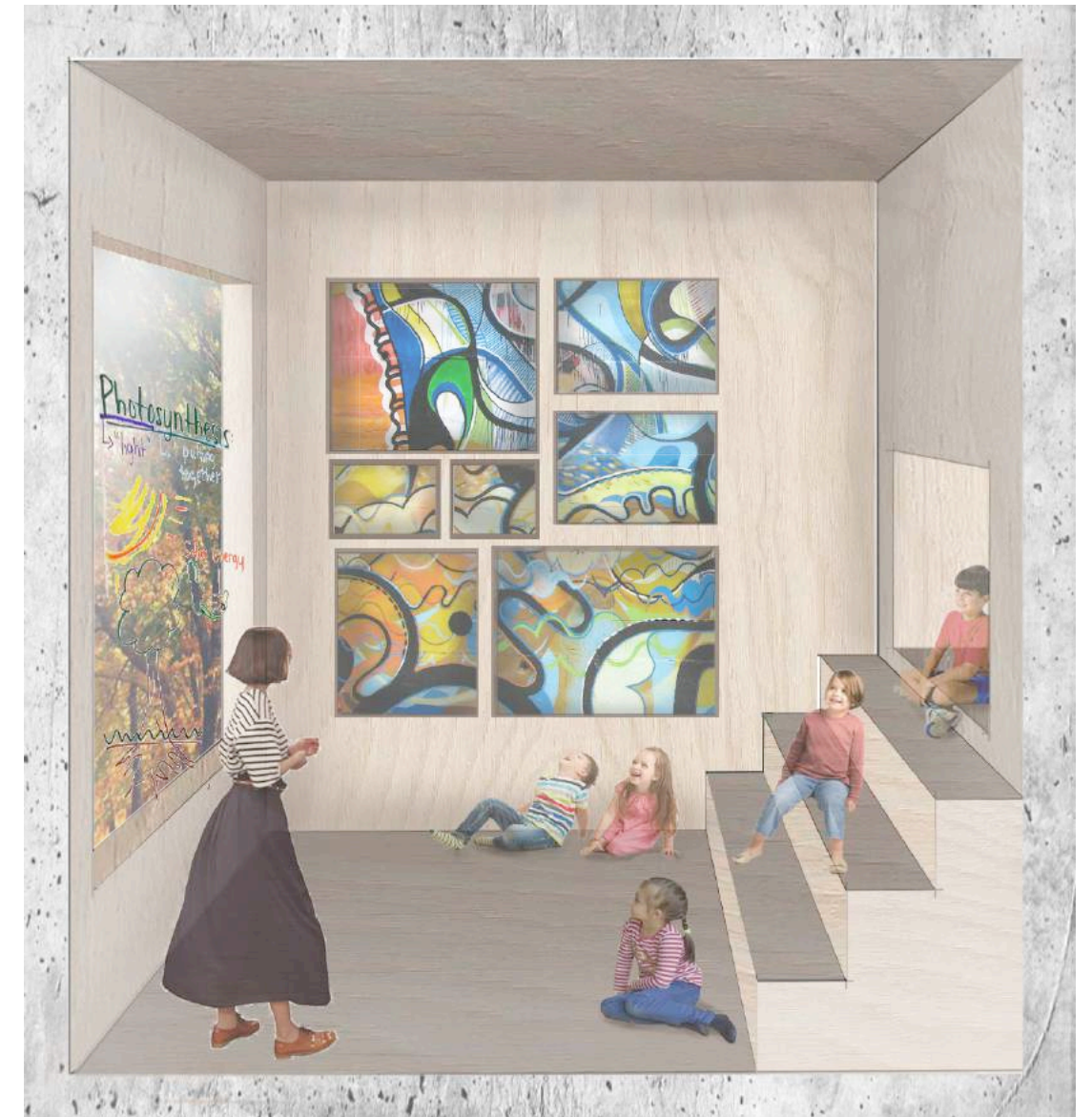


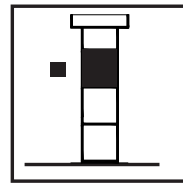




TREE CROWN LEVEL

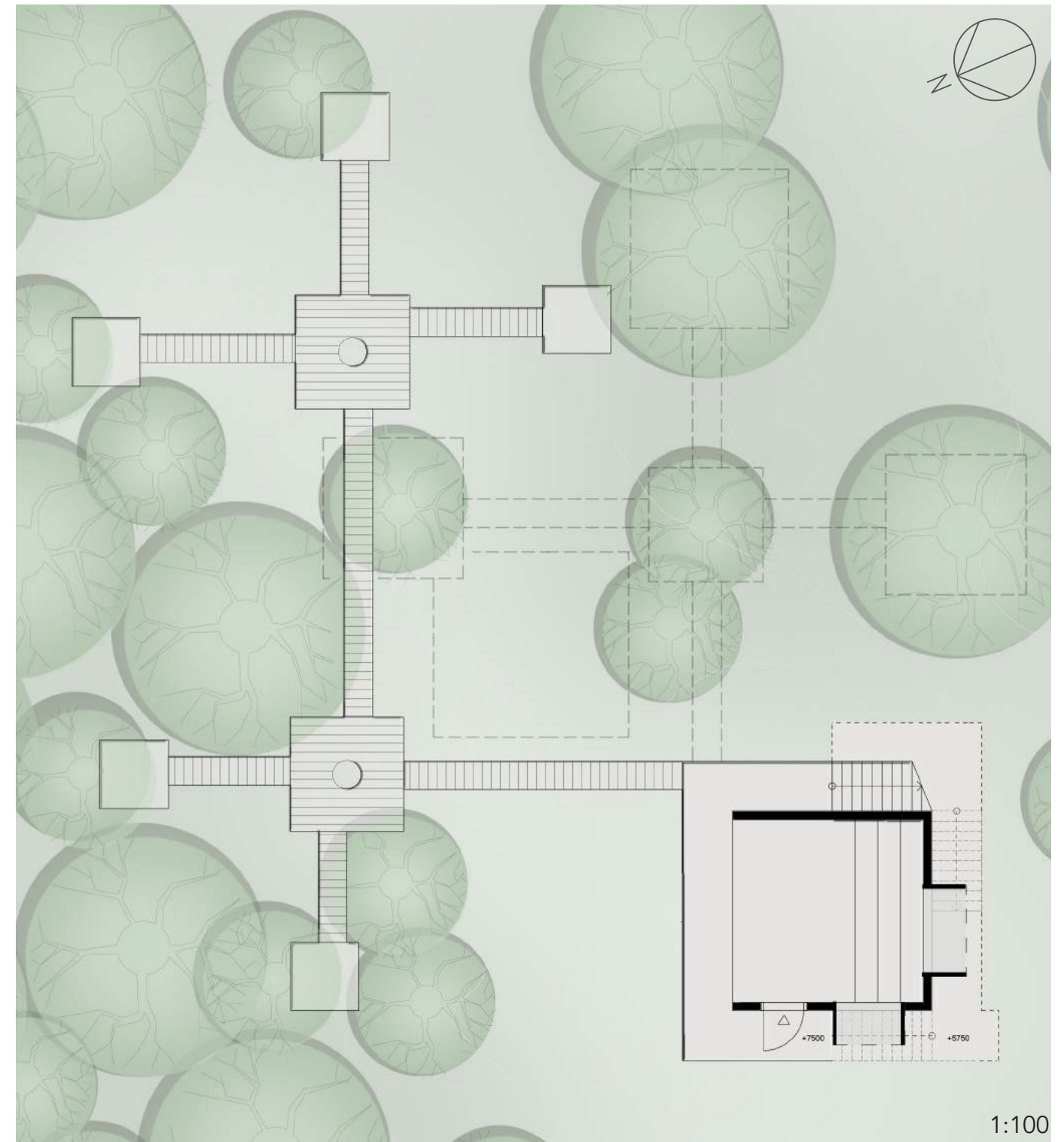
The learning environment offers space for lectures focusing on the systems within the tree crown. There is a large glassed area on the wall that could be used as a “whiteboard” with the nature as background.

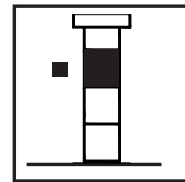




TREE CROWN LEVEL

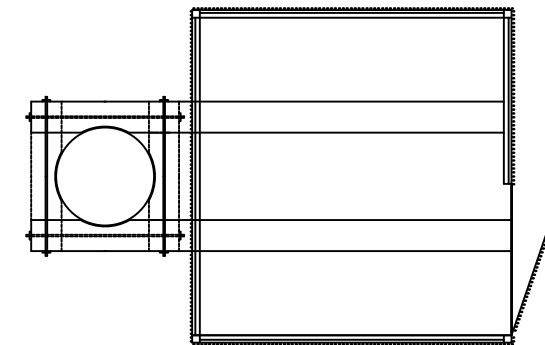
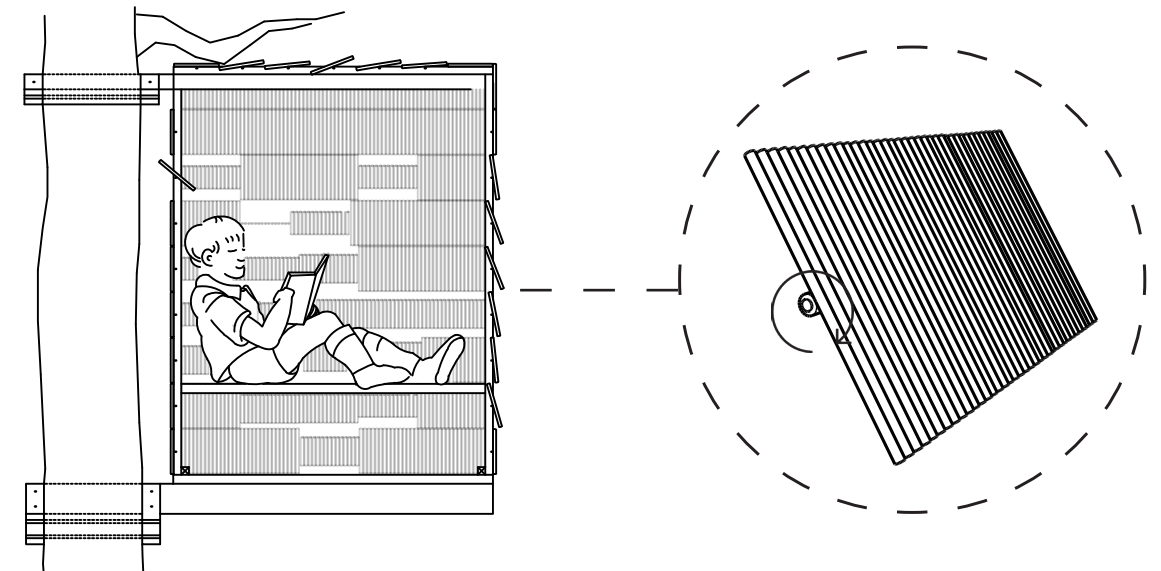
The plan view shows the connection between the tower and the reflective learning spaces among the tree crowns.





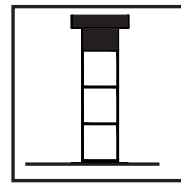
REFLECTIVE SPACES

The reflective learning spaces are small cabins among the tree crowns for individual reflection. The facade is built with beech-stick panels that can be manually controlled by the visitor to adjust the influx of natural light as well as the privacy of the space.



Scale 1:25

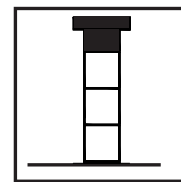




SKY LEVEL

The top-level offers space for learning about the sky. During daytime the sky level becomes a learning space for weather and the life above the crown of the trees. When the darkness falls, it becomes a space for watching the stars and learning about astronomy.

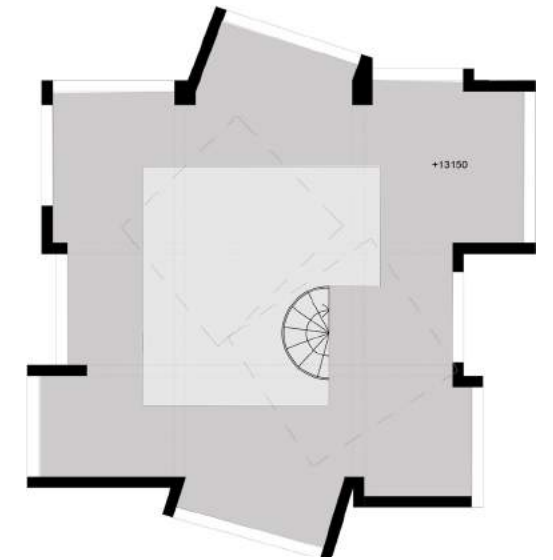
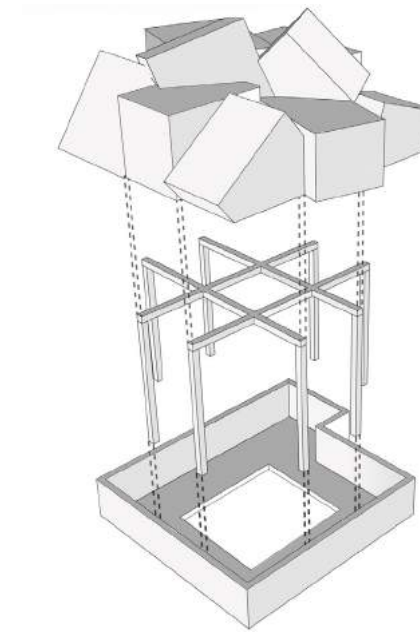




SKY LEVEL

The old floor between the two upper levels is removed and the old staircase is kept and serves as a vertical communication between the two floors.

A roof is added on the old platform. The roof has a cubistic expression representing a pile of cubes rotated in different angles and directions. The inside of some of the cubes become seats for the children.



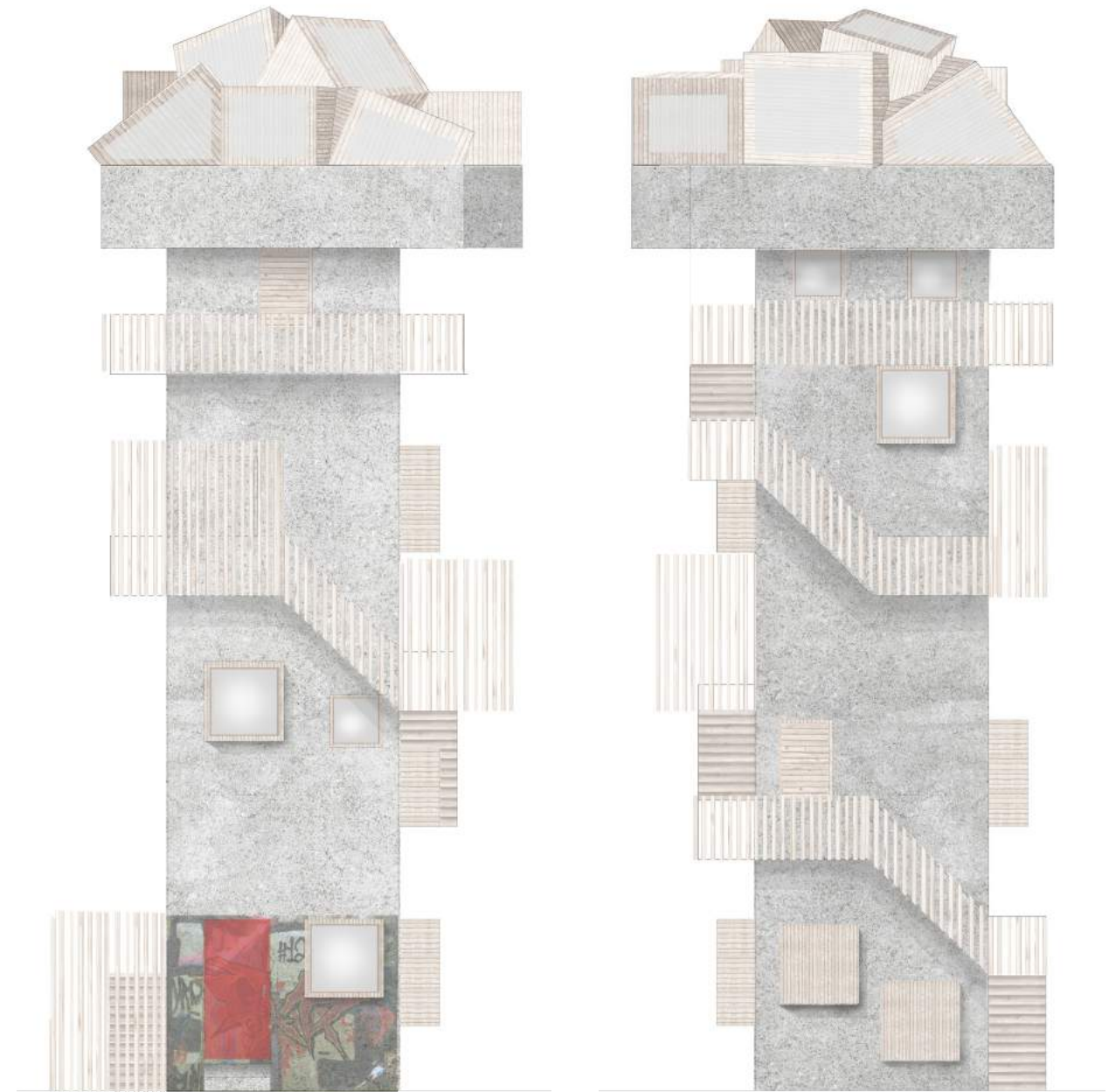
CONNECTIONS

The elevation shows the connection between the tower and the outdoor learning environments. The bridges are made of wood and ropes. Each cabin has its own bridge attached to a platform with the same construction as the cabins.



FACADES

The staircase and the additions are made of wood. Some parts of the staircase become spaces that enable visitors to stay for a while and enjoy the view.



Entrance 1:100

East facade 1:100

CONCLUSION AND REFELCTION

The Eco Surveillance Tower is a design proposal for a new learning center that offers nature-oriented learning environments for preschools in Alingsås.

This thesis shows how children can be brought closer to the nature and how to create a new interest for it by using pedagogical spaces as a link between children and nature.

Explorative techniques have been an important method when studying the relationship between the nature, learning and building. The result of these elaborations have shown that material and spatial dimensions have a great importance in creating pedagogical architecture for children. I believe it is important when designing this kind of spaces to break down and work with a variety of spaces and not only see the learning as collective but also as individual; an aspect that often tends to be forgotten in the traditional school environment.

In order to design learning environments in the nature, it is crucial to understand the nature's system. In this thesis the surrounding nature and its system have been a great inspiration for the design. Even though the design proposal is in a way very site specific I believe it could

be applicable on other sites and other types of forests. In the transformation of the tower I have chosen to not discuss the architectural military heritage on a deeper level but rather see the tower as an existing structure. During the process of analyzing the life of the tower I found the cultural perspective more relevant to discuss. I realized that its different epochs became like layers upon the built environment where each layer has a transparency that I also wanted to create in the learning environments inside the tower.

In a further development of the thesis I believe that both the program and the management of the tower could be discussed and also include how the learning center can be accessible for the public after school time. In order to make the outdoor spaces open for the public the security aspect needs to be further developed and for example consider how children without company by adults can visit the center.

Another aspect that wasn't discussed in the thesis, but that could also be integrated in a further step is the adjacent bomb shelter. This would also affect the vertical scale and the program of the learning center.



Entrance to the tower. Author's own copyright.

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